



Forensic Video Analysis

Test No. 25-5581 Summary Report

Each participant received evidence data acquired from an Apollo Video Technology MR Series DVR, a multi-camera surveillance system on a city bus, incorporating footage from two distinct camera views. They were asked to examine the evidence utilizing their own tools and methods. Data were returned from 74 participants and are compiled in the following tables:

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This report contains the data received from the participants in this test. Since these participants are located in many countries around the world, and it is their option how the samples are to be used (e.g., training exercise, known or blind proficiency testing, research and development of new techniques, etc.), the results compiled in the Summary Report are not intended to be an overview of the quality of work performed in the profession and cannot be interpreted as such. The Summary Comments are included for the benefit of participants to assist with maintaining or enhancing the quality of their results. These comments are not intended to reflect the general state of the art within the profession.

Participant results are reported using a randomly assigned "WebCode". This code maintains participant's anonymity, provides linking of the various report sections, and will change with every report.

Manufacturer's Information

The Forensic Video Analysis test consisted of evidence data acquired from an Apollo Video Technology MR Series DVR, a multi-camera surveillance system on a city bus, incorporating footage from two distinct camera views. Participants were asked to enhance and clarify the video from the cameras and produce a derivative that makes it easier to see and understand the incident.

SAMPLE PREPARATION/VALIDATION

A motor vehicle accident involving a city bus and a privately-owned vehicle was captured on video. The incident was recorded using two different camera angles from the bus's onboard surveillance system.

The .MOV files were zipped and uploaded to the CTS Portal. A MD5 and SHA1 hash value was calculated and provided for the compressed file to validate the integrity of the downloaded file.

VERIFICATION

Predistribution results were consistent with each other and the manufacturer's preparation information. The combination of internal test validation and the responses received from predistribution testing structured the final questions utilized in this test. The following list of tools were utilized in the validation of this test: Amped FIVE (revision 36179), FFmpeg (version 7.1.1), Adobe Premiere Pro, and MediaInfo. CTS does not endorse any particular tools.

SCENARIO PROVIDED TO PARTICIPANTS

A motor vehicle accident occurred involving a city bus and a privately-owned vehicle. The city bus was outfitted with six video cameras, two of which captured content relevant to the accident. Camera view 1 was inside the bus, above the bus driver and aimed downward toward the front door of the bus; a portion of the windshield is also visible in the left-half of the view. Camera view 5 was a windshield-mounted camera also inside the bus, facing the forward motion of the bus.

Video exports were made of these two camera views in QuickTime MOV format. Investigators request video enhancement of the camera view 5 MOV file and a time-aligned composite video file with the two camera views placed side-by-side.

Manufacturer's Information, continued

Question Manufacturer's Response - Examination Questions

1-1 What is the SHA-256 hash value of the camera view 1 (Cam1) MOV file?

Manufacturer's Response:

1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946

1-2 What is the SHA-256 hash value of the camera view 5 (Cam5) MOV file?

Manufacturer's Response:

946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321

1-3 What are the pixel dimensions of the Cam1 MOV file?

Manufacturer's Response:

800x600

1-4 What are the pixel dimensions of the Cam5 MOV file?

Manufacturer's Response:

800x600

1-5 What is the reported frame rate of the Cam1 MOV file? (report as a numeric value in fps)

Manufacturer's Response:

10

1-6 What is the bit rate of the video stream in the Cam5 MOV file? Provide a NUMERIC response, appropriate units, and the tool that was used to determine this value.

Manufacturer's Response:

Bit rate: 10342921

Units: bits per second (bps)

Tool: MediaInfo/Ffprobe

1-7 How many video frames are there in the Cam1 MOV file?

Manufacturer's Response:

2402

1-8 How many video frames are there in the Cam5 MOV file?

Manufacturer's Response:

2406

1-9 Which of the MOV files contains an audio track? (e.g. Cam1, Cam2)

Manufacturer's Response:

Cam5

1-10 What is the sampling rate of the audio in the MOV file containing an audio track? Provide a NUMERIC response and appropriate units.

Manufacturer's Response:

Sampling Rate: 16000

Units: Samples per second

Manufacturer's Information, continued

Question	<i>Manufacturer's Response - Enhanced Video Examination</i>
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2-1	Note method(s) or tool(s) used and settings for the following: (You may submit reports or screen shots of filters and settings)
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- Cam5 video enhancement and export processes
- Time-aligned composite video preparation and export processes
- Still image export

<i>Manufacturer's Response:</i>
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This was a free form question on methods and tools used. No manufacturer's response is provided.

2-2	Note the margin of error of your approximate time alignment of camera views 5 and 1 in terms of (1) plus/minus frames and frame rate, or (2) plus/minus time (in seconds).
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<i>Manufacturer's Response:</i>
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+/- 1 frame at 10 FPS, or +/- 0.1 seconds

Summary Comments

This test was designed to allow participants to assess their proficiency in data verification, media characterization, data analysis and video enhancement using their own tools and methods. The participants were provided with data acquired from an Apollo Video Technology MR Series DVR, a multi-camera surveillance system on a city bus, incorporating footage from two distinct camera views. They were asked to answer questions as well as make enhancements to the video. Refer to the Manufacturer's Information for preparation details.

A total of 74 participants returned results for this test.

A variety of software tools were used by participants during examination with 69% reporting the tool Amped FIVE.

All ten examination questions achieved consensus. In a separate section of this test, participants were asked to perform specific enhancement steps to the video file and submit these enhanced video files and still images to CTS. An expert reviewed the files submitted by participants and those observational notes are presented in Table 3.

CTS recognizes that examiners in different organizations may not perform all the same tasks. In order to allow participants and accrediting bodies to objectively measure enhancement and/or investigative skills, this test may have included questions that are outside the laboratory's normal reporting procedures.

Forensic Video Examination Responses

TABLE 1

Question 1- 1 : Examination Questions

Question 1-1: What is the SHA-256 hash value of the camera view 1 (Cam1) MOV file?

Manufacturer's 1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946

Response:

WebCode	Response
23NUPF	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
2E4JNK	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
3RLTPG	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
3U7RXL	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
4DJMBC	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
4HBQ4F	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
69HX8A	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
6E7K3E	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
6GWL7H	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
6HTZTA	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
6XLRDB	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
77DR69	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
78RYTB	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
7W7VLC	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
89E4FG	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
AEXYFA	FE6AB73D97B08F1E8C140AF19918DCE818DDFF78
AGKJLD	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
AV6YND	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
AVHPF9	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
AWD9GB	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
AY6AKD	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
B3XQAC	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
B667J4	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
BLPWH3	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
BMKFK4	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
C6WL96	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
C9J7DA	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
DQEVA4	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
DY94T9	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946

TABLE 1

Question 1- 1 : Examination Questions	
WebCode	Response
F4FB94	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
G4PZMZ	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
G8BKR4	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
GJ6XR2	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
GKWW7Y	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
GM6AM2	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
GRVJXY	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
GULMQ7	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946.
GUMHBX	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
HPMNQ2	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
HTA8W6	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
JGPDVW	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
JQXPDZ	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
JR9RYY	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
JUVC43	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
KM93VW	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
KPY2AV	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
KVNMEW	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
KWJ6GX	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
MKFQ9W	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
NKCNWW	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
P9VYXR	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
PCVAUR	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
PGA8YT	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
PJVR6X	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
PVBUR	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
QGPQJQ	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
QTYDLX	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
R8V32T	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
R8VZCN	SHA256: 1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
RFP8UU	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
TUZ7EL	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
UENUMR	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946

TABLE 1

Question 1- 1 : Examination Questions	
WebCode	Response
UJWFBP	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
W9CNYK	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
X7EUEL	FE6AB73D97B08F1E8C140AF19918DCE818DDFF78
X97VHN	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
XJRW2J	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
XJRYQM	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
XPT9WF	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
YER9WG	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
YUKZHH	1219095ABE3877E3C02099BF740738F702C7A2FD38C1228399B0ADC5728F5946
YW7KML	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
ZE9LZK	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946
ZWLZHE	1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946

Question 1-1: What is the SHA-256 hash value of the camera view 1 (Cam1) MOV file?

Consensus Result: 1219095abe3877e3c02099bf740738f702c7a2fd38c1228399b0adc5728f5946

TABLE 1

Question 1- 2 : Examination Questions

Question 1-2: What is the SHA-256 hash value of the camera view 5 (Cam5) MOV file?

Manufacturer's 946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321

Response:

WebCode	Response
23NUPF	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
2E4JNK	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
3RLTPG	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
3U7RXL	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
4DJMBC	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
4HBQ4F	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
69HX8A	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
6E7K3E	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
6GWL7H	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
6HTZTA	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
6XLRDB	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
77DR69	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
78RYTB	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
7W7VLC	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
89E4FG	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
AEXYFA	E7F5FA921E6FC69AF8FF3647A7426A85809E8A8B
AGKJLD	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
AV6YND	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
AVHPF9	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
AWD9GB	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
AY6AKD	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
B3XQAC	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
B667J4	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
BLPWH3	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
BMKFK4	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
C6WL96	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
C9J7DA	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
DQEVA4	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
DY94T9	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
F4FB94	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
G4PZMZ	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321

TABLE 1

Question 1- 2 : Examination Questions	
WebCode	Response
G8BKR4	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
GJ6XR2	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
GKWW7Y	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
GM6AM2	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
GRVJXY	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
GULMQ7	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321.
GUMHBX	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
HPMNQ2	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
HTA8W6	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
JGPDVW	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
JQXPZD	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
JR9RYY	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
JUVC43	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
KM93VW	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
KPY2AV	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
KVNMEW	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
KWJ6GX	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
MKFQ9W	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
NKCNWW	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
P9VYXR	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
PCVAUR	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
PGA8YT	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
PJVR6X	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
PVB JUR	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
QGPQJQ	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
QTYDLX	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
R8V32T	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
R8VZCN	SHA256: 946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
RFP8UU	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
TUZ7EL	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
UENUMR	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
UJWFBP	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
W9CNYK	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321

TABLE 1

Question 1- 2 : Examination Questions	
WebCode	Response
X7EUEL	E7F5FA921E6FC69AF8FF3647A7426A85809E8A8B
X97VHN	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
XJRW2J	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
XJRYQM	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
XPT9WF	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
YER9WG	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
YUKZHH	946FF7F4C18E0DF7BE2E6F2234424EA510444ADC44C3F1AFE09B835AABEB3321
YW7KML	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
ZE9LZK	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321
ZWLZHE	946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321

Question 1-2: What is the SHA-256 hash value of the camera view 5 (Cam5) MOV file?

Consensus Result: 946ff7f4c18e0df7be2e6f2234424ea510444adc44c3f1afe09b835aabeb3321

TABLE 1

Question 1- 3 : Examination Questions

Question 1-3: What are the pixel dimensions of the Cam1 MOV file?

Manufacturer's 800x600

Response:

WebCode	Response
23NUPF	800 x 600
2E4JNK	800*600 (4:3)
3RLTPG	800 x 600 pixels
3U7RXL	800 × 600
4DJMBC	800x600
4HBQ4F	800x600
69HX8A	800 x 600
6E7K3E	Horizontal 800 pixels Vertical 600 pixels
6GWL7H	800×600
6HTZTA	800 x 600 (4:3)
6XLRDB	800x600 pixels
77DR69	800 x 600
78RYTB	800x600
7W7VLC	Width: 800 pixels Height: 600 pixels
89E4FG	800 x 600
AEXYFA	800 X 600
AGKJLD	800 x 600
AV6YND	800(width) x 600 (height) / Aspect ratio 4:3
AVHPF9	800 x 600
AWD9GB	Width 800 pixels by Height 600 pixels
AY6AKD	800 x 600 pixels
B3XQAC	800 x 600
B667J4	800x600
BLPWH3	800 x 600
BMKFK4	800x600
C6WL96	800 width 600 height
C9J7DA	800 x 600
DQEVA4	800x600 (1.333:1)
DY94T9	800 X 600 px
F4FB94	800 x 600
G4PZMZ	800 x 600

TABLE 1

Question 1- 3 : Examination Questions	
WebCode	Response
G8BKR4	800x600
GJ6XR2	800 (width) x 600 (height)
GKWW7Y	800 x 600
GM6AM2	800x600 pixels
GRVJXY	800x600
GULMQ7	800×600
GUMHBX	800x600 – however this includes empty space around the video. Once cropped to actual video only using Amped FIVE, the pixel dimensions are 793x533
HPMNQ2	800x600
HTA8W6	Width - 800 Height-600
JGPDVW	800 x 600
JQXPDZ	800x600
JR9RYY	Width: 800, Height: 600
JUVC43	800 x 600
KM93VW	Width (pixels): 800 Height (pixels): 600
KPY2AV	800 x 600
KVNMEW	800x600
KWJ6GX	800x600
MKFQ9W	800 Width 600 Height
NKCNWW	800 X 600
P9VYXR	800x600 pixels
PCVAUR	800x600
PGA8YT	800x600
PJVR6X	800 w x 600 h
PVB JUR	800 x 600
QGPQJQ	800x600 (pixels)
QTYDLX	800 x 600 (PAR: 1:1 (1.000) DAR: 4:3 (1.333))
R8V32T	800 x 600
R8VZCN	800x600
RFP8UU	Width: 800 pixels Height: 600 pixels
TUZ7EL	800 x 600 (Width x Height)
UENUMR	800 x 600 pixels
UJWFBP	800 × 600
W9CNYK	800x600

TABLE 1

Question 1- 3 : Examination Questions	
WebCode	Response
X7EUJEL	800 X 600
X97VHN	800 x 600
XJRW2J	800x600
XJRYQM	800x600
XPT9WF	800 x 600
YER9WG	800x600 (1.333:1)
YUKZHH	800/600 (1.333:1)
YW7KML	800 x 600
ZE9LZK	Width - 800 Height – 600
ZWLZHE	800x600

Question 1-3: What are the pixel dimensions of the Cam1 MOV file?

Consensus Result: 800x600

TABLE 1

Question 1- 4 : Examination Questions

Question 1-4: What are the pixel dimensions of the Cam5 MOV file?

Manufacturer's 800x600

Response:

WebCode	Response
23NUPF	800 x 600
2E4JNK	800*600 (4:3)
3RLTPG	800 x 600 pixels
3U7RXL	800 × 600
4DJMBC	800x600
4HBQ4F	800x600
69HX8A	800 x 600
6E7K3E	Horizontal 800 pixels Vertical 600 pixels
6GWL7H	800×600
6HTZTA	800 x 600 (4:3)
6XLRDB	800x600 pixels
77DR69	800 x 600
78RYTB	800x600
7W7VLC	Width: 800 pixels Height: 600 pixels
89E4FG	800 x 600
AEXYFA	800 X 600
AGKJLD	800 x 600
AV6YND	800(width) x 600 (height) / Aspect ratio 4:3
AVHPF9	800 x 600
AWD9GB	Width 800 pixels by Height 600 pixels
AY6AKD	800 x 600 pixels
B3XQAC	800 x 600
B667J4	800x600
BLPWH3	800 x 600
BMKFK4	800x600
C6WL96	800 width 600 height
C9J7DA	800 x 600
DQEVA4	800x600 (1.333:1)
DY94T9	800 X 600 px
F4FB94	800 x 600
G4PZMZ	800 x 600

TABLE 1

Question 1- 4 : Examination Questions	
WebCode	Response
G8BKR4	800x600
GJ6XR2	800 (width) x 600 (height)
GKWW7Y	800 x 600
GM6AM2	800x600 pixels
GRVJXY	800x600
GULMQ7	800 × 600
GUMHBX	800x600 – however this includes empty space around the video. Once cropped to actual video only using Amped FIVE, the pixel dimensions are 793x533
HPMNQ2	800x600
HTA8W6	Width-800 Height- 600
JGPDVW	800 x 600
JQXPDZ	800x600
JR9RYY	Width: 800, Height: 600
JUVC43	800 x 600
KM93VW	Width (pixels): 800 Height (pixels): 600
KPY2AV	800 x 600
KVNMEW	800x600
KWJ6GX	800x600
MKFQ9W	800 Width 600 Height
NKCNWW	800 X 600
P9VYXR	800x600 pixels
PCVAUR	800x600
PGA8YT	800x600
PJVR6X	800 w x 600 h
PVBJur	800 x 600
QGPQJQ	800x600 (pixels)
QTYDLX	800 x 600 (PAR: 1:1 (1.000) DAR: 4:3 (1.333))
R8V32T	800 x 600
R8VZCN	800x600
RFP8UU	Width: 800 pixels Height: 600 pixels
TUZ7EL	800 x 600 (Width x Height)
UENUMR	800 x 600 pixels
UJWFBP	800 × 600
W9CNYK	800x600

TABLE 1

Question 1- 4 : Examination Questions	
WebCode	Response
X7EUJEL	800 X 600
X97VHN	800 x 600
XJRW2J	800x600
XJRYQM	800x600
XPT9WF	800 x 600
YER9WG	800x600 (1.333:1)
YUKZHH	800/600 (1.333:1)
YW7KML	800 x 600
ZE9LZK	Width - 800 Height – 600
ZWLZHE	800x600

Question 1-4: What are the pixel dimensions of the Cam5 MOV file?

Consensus Result: 800x600

TABLE 1

Question 1- 5 : Examination Questions

Question 1-5: What is the reported frame rate of the Cam1 MOV file? (report as a numeric value in fps)

Manufacturer's 10

Response:

WebCode	Response
23NUPF	10.000
2E4JNK	10
3RLTPG	10
3U7RXL	10.000
4DJMBC	10.0
4HBQ4F	10
69HX8A	10
6E7K3E	10.000
6GWL7H	10
6HTZTA	10
6XLRDB	10.0
77DR69	10
78RYTB	10
7W7VLC	10
89E4FG	10.000
AEXYFA	10.000
AGKJLD	10
AV6YND	10
AVHPF9	10
AWD9GB	10
AY6AKD	10
B3XQAC	10
B667J4	10
BLPWH3	10
BMKFK4	10
C6WL96	10
C9J7DA	10
DQEVA4	10
DY94T9	
F4FB94	10
G4PZMZ	10

TABLE 1

Question 1- 5 : Examination Questions	
WebCode	Response
G8BKR4	10
GJ6XR2	10
GKWW7Y	10.000
GM6AM2	10
GRVJXY	10
GULMQ7	10
GUMHBX	10
HPMNQ2	10
HTA8W6	10.000
JGPDVW	10
JQXPDZ	10
JR9RYY	10
JUVC43	10
KM93VW	10
KPY2AV	10
KVNMEW	10
KWJ6GX	10
MKFQ9W	10
NKCNWW	10
P9VYXR	10
PCVAUR	10.0
PGA8YT	10
PJVR6X	10.0
PVBJUR	10.000
QGPQJQ	10
QTYDLX	10.000
R8V32T	10
R8VZCN	10
RFP8UU	10.000
TUZ7EL	10
UENUMR	10
UJWFBP	10
W9CNYK	10

TABLE 1

Question 1- 5 : Examination Questions	
WebCode	Response
X7EUJEL	10.000
X97VHN	10.0000
XJRW2J	10
XJRYQM	10
XPT9WF	10
YER9WG	10
YUKZHH	10
YW7KML	10
ZE9LZK	10.000
ZWLZHE	10

Question 1-5: What is the reported frame rate of the Cam1 MOV file? (report as a numeric value in fps)

Consensus Result: 10

TABLE 1

Question 1- 6 : Examination Questions

Question 1-6: What is the bit rate of the video stream in the Cam5 MOV file? Provide a NUMERIC response, appropriate units, and the tool that was used to determine this value.

Manufacturer's Bit rate: 10342921

Response: Units: bits per second (bps)

Tool: MedialInfo/Ffprobe

WebCode	Response
23NUPF	Bit rate: 10.3, Units: Mb/s, Tool: MedialInfo
2E4JNK	Bit rate: 10.3, Units: Mb/s, Tool: MedialInfo
3RLTPG	Bit rate: 10.3, Units: Mb/s, Tool: Mediainfo
3U7RXL	Bit rate: 10342921, Units: bps, Tool: Mediainfo
4DJMBC	Bit rate: 10.3, Units: Mbps, Tool: MINFO
4HBQ4F	Bit rate: 256, Units: kb/s, Tool: Amped Five
69HX8A	Bit rate: 10.3, Units: Megabits per second (Mb/s), Tool: Media info v24.12
6E7K3E	Bit rate: 10.3, Units: Mb/s, Tool: Media Info
6GWL7H	Bit rate: 10.3, Units: Mb/s, Tool: (Amped FIVE) Advanced File Info – MedialInfo
6HTZTA	Bit rate: 10.3, Units: Mb/s, Tool: In-house tool. Ffmpeg / Ffprobe.
6XLRDB	Bit rate: 10.3, Units: Mb/s, Tool: MedialInfo 19.07
77DR69	Bit rate: 10.3, Units: Mb/s, Tool: MedialInfo 18.08.1
78RYTB	Bit rate: 10.3, Units: Mb/s, Tool: MedialInfo
7W7VLC	Bit rate: 10.3, Units: Mb/s, Tool: MedialInfo
89E4FG	Bit rate: 10.3, Units: Mb/s, Tool: MotionDSP Forensic STUDIO 9.7.139
AEXYFA	Bit rate: 10.3, Units: mb/s, Tool: amped five professional-advance file info
AGKJLD	Bit rate: 10.6, Units: mb/s, Tool: MedialInfo 25.03
AV6YND	Bit rate: 10.3, Units: Mb/s, Tool: AMPED Five
AVHPF9	Bit rate: 10.3, Units: Mb/s, Tool: MedialInfo v24.12
AWD9GB	Bit rate: 10.3, Units: Mb/s, Tool: MedialInfo - v19.04
AY6AKD	Bit rate: 10.3, Units: Mb/s, Tool: Amped Five 36648
B3XQAC	Bit rate: 10.3, Units: Mb/s, Tool: AmpedFIVE/MedialInfo
B667J4	Bit rate: 15.3, Units: Mb/s, Tool: Media Info v25.04
BLPWH3	Bit rate: 10.6, Units: Mb/s, Tool: Media Info within Amped FIVE v37757
BMKFK4	Bit rate: 10.3, Units: Mb/s, Tool: Media Info
C6WL96	Bit rate: 10.3, Units: Mb/s, Tool: MedialInfo
C9J7DA	Bit rate: 10.3, Units: Mb/s, Tool: MedialInfo v24.06
DQEVA4	Bit rate: 10.3, Units: Mb/s, Tool: MedialInfo v20.08
DY94T9	Bit rate: 10.3, Units: Mbps, Tool: Invisor v3.17
F4FB94	Bit rate: 10581, Units: kbps, Tool: Windows 11 (Properties)

TABLE 1

Question 1- 6 : Examination Questions	
WebCode	Response
G4PZMZ	Bit rate: 10.3, Units: Megabits per second (Mb/s), Tool: Media Info
G8BKR4	Bit rate: 10.6, Units: Mb/s, Tool: Amped FIVE
GJ6XR2	Bit rate: 10.3, Units: 10342921 - Mb/s, Tool: Advanced file info/MediaInfo
GKWW7Y	Bit rate: 10.3, Units: Mb/s, Tool: MediaInfo
GM6AM2	Bit rate: 10.3, Units: Mb/s, Tool: Amped Five Media Info
GRVJXY	Bit rate: 10.3, Units: mb/s, Tool: Amped Five > Media Info
GULMQ7	Bit rate: 1000, Units: Kbit/sec, Tool: Kirara encoder
GUMHBX	Bit rate: 10.6, Units: Mb/s, Tool: Amped FIVE
HPMNQ2	Bit rate: 10.3, Units: Mb/s, Tool: Amped FIVE; Advanced File Info - MediaInfo
HTA8W6	Bit rate: 10.3, Units: Mb/s, Tool: Media Info V0.7.91
JGPDVW	Bit rate: 10.3, Units: Mb/s, Tool: MediaInfo v. 25.04
JQXPZD	Bit rate: 10342, Units: kb/s, Tool: FFprobe v.2023-01-12-git-fc263f073e-full_build
JR9RYY	Bit rate: 10.3, Units: Mb/s, Tool: MediaInfo
JUVC43	Bit rate: 256, Units: kbs, Tool: Media Info
KM93VW	Bit rate: 15.3, Units: Mbps, Tool: Amped ExifTool
KPY2AV	Bit rate: 10.3, Units: Mb/s, Tool: MediaInfo
KVNMEW	Bit rate: 10, Units: Megabytes per second bit rate, Tool: MediaInfo
KWJ6GX	Bit rate: 10.3, Units: Mb/s, Tool: FFprobe, MediaInfo (in Amped Five 37757)
MKFQ9W	Bit rate: 10.3, Units: Mbps, Tool: MediaInfo (in Amped FIVE)
NKCNWW	Bit rate: 10.6, Units: Mb/s, Tool: Amped Five Media Info
P9VYXR	Bit rate: 10.3, Units: Mega bits Per Second, Tool: Media Info
PCVAUR	Bit rate: 10.3, Units: Mb/s, Tool: Amped FIVE: Advanced File Info - MediaInfo
PGA8YT	Bit rate: 10.3, Units: Mb/s , Tool: MediaInfo using Amped FIVE 37757
PJVR6X	Bit rate: 10.3, Units: Mb/s, Tool: Amped 5
PVBJUR	Bit rate: 10.3, Units: Mb/s, Tool: MediaInfo version 25.04
QGPQJQ	Bit rate: 10.3, Units: Mbps, Tool: MediaInfo and Windows Properties
QTYDLX	Bit rate: 10342921, Units: Bits per second, Tool: MediaInfo 20.09
R8V32T	Bit rate: 10.6, Units: Mb/s, Tool: Amped 5- Advanced File Info
R8VZCN	Bit rate: 10.3, Units: Mb/s, Tool: MediaInfo within AmpedFIVE
RFP8UU	Bit rate: 10.3, Units: Mb/s, Tool: MediaInfo 25.04
TUZ7EL	Bit rate: 10342, Units: Kilobits per second (kb/s), Tool: FFmpeg version 6.0
UENUMR	Bit rate: 10.3, Units: Mb/s, Tool: Media Info
UJWFBP	Bit rate: 10.3, Units: Megabits per second, Tool: MediaInfo (called by Amped FIVE)

TABLE 1

Question 1- 6 : Examination Questions	
WebCode	Response
W9CNYK	Bit rate: 10325, Units: kbps, Tool: Windows Info Property Details
X7EUEL	Bit rate: 10.3, Units: mb/s, Tool: amped five professional-advance file info
X97VHN	Bit rate: 11978, Units: kbps, Tool: PotPlayer
XJRW2J	Bit rate: 10342, Units: kb/s, Tool: ffprobe
XJRYQM	Bit rate: 10.3, Units: Mb/s (megabytes per second), Tool: media info
XPT9WF	Bit rate: 10.6, Units: Mb/s, Tool: MediaInfo v23.11.1
YER9WG	Bit rate: 10.3, Units: Mb/s, Tool: MediaInfo, 25.04
YUKZHH	Bit rate: 10.3, Units: MB/s, Tool: MediaInfo
YW7KML	Bit rate: 256, Units: kb/s, Tool: Amped FIVE advanced file info
ZE9LZK	Bit rate: 10.3, Units: Mb/s, Tool: Media Info 24.06
ZWLZHE	Bit rate: 10.3, Units: Mb/s, Tool: Media Info V24.01.1.0

Question 1-6: What is the bit rate of the video stream in the Cam5 MOV file? Provide a NUMERIC response, appropriate units, and the tool that was used to determine this value.

Consensus Result: Bit rate: 10.3
Units: Megabits per second (Mbps)

TABLE 1

Question 1- 7 : Examination Questions

Question 1-7: How many video frames are there in the Cam1 MOV file?

Manufacturer's 2402

Response:

WebCode	Response
23NUPF	2402
2E4JNK	2400
3RLTPG	2402
3U7RXL	2402
4DJMBC	2402
4HBQ4F	2401
69HX8A	2402
6E7K3E	Clip duration is 4 mins 0 s. Frame rate is 10.000FPS. Total time of the clip duration is $4 \times 60 = 240$ s and total frames for approximately $240 \times 10 = 2400$ FPS
6GWL7H	2402
6HTZTA	2402
6XLRDB	2402
77DR69	2402
78RYTB	2402
7W7VLC	2402 include frame 0, whitout frame 0: 2401
89E4FG	2402
AEXYFA	2402
AGKJLD	2402
AV6YND	2402
AVHPF9	2402
AWD9GB	2,400 frames
AY6AKD	2402
B3XQAC	2402
B667J4	2402
BLPWH3	2402
BMKFK4	2402
C6WL96	2402
C9J7DA	2402
DQEVA4	2402 frames
DY94T9	2402
F4FB94	2402

TABLE 1

Question 1- 7 : Examination Questions	
WebCode	Response
G4PZMZ	2402
G8BKR4	2402
GJ6XR2	2402
GKWW7Y	2402
GM6AM2	2402
GRVJXY	2402
GULMQ7	2402 frames
GUMHBX	2402 (Including Frame 0)
HPMNQ2	2402
HTA8W6	2402
JGPDVW	2,402
JQXPDZ	2401
JR9RYY	2402
JUVC43	2402
KM93VW	2402
KPY2AV	2402
KVNMEW	2401 if counting begins at frame 0
KWJ6GX	2402
MKFQ9W	2402
NKCNWW	2402
P9VYXR	2402 Frames
PCVAUR	2402
PGA8YT	2402
PJVR6X	2401
PVBJUR	2402
QGPQJQ	2402
QTYDLX	Frame count: 2402
R8V32T	2402
R8VZCN	2402
RFP8UU	2401
TUZ7EL	2402
UENUMR	2402
UJWFBP	2402

TABLE 1

Question 1- 7 : Examination Questions	
WebCode	Response
W9CNYK	2402
X7EUEL	2402
X97VHN	2402
XJRW2J	2402
XJRYQM	Approximately 2400 frames (10fps x 4mins)
XPT9WF	2402
YER9WG	2402
YUKZHH	2401
YW7KML	2402
ZE9LZK	Clip shown on media info as 4 minutes 0 seconds total length... 4x60 = 240 seconds total length... Media info shows 10 FPS so 240x10 = 2400 frames Approx 2400 total frames
ZWLZHE	2402

Question 1-7: How many video frames are there in the Cam1 MOV file?

Consensus Result: 2402

TABLE 1

Question 1- 8 : Examination Questions

Question 1-8: How many video frames are there in the Cam5 MOV file?

Manufacturer's 2406

Response:

WebCode	Response
23NUPF	2406
2E4JNK	2400
3RLTPG	2406
3U7RXL	2406
4DJMBC	2406
4HBQ4F	2405
69HX8A	2406
6E7K3E	Clip duration is 4 mins 0 s. Frame rate is 10.000FPS. Total time of the clip duration is $4 \times 60 = 240$ s and total frames for approximately $240 \times 10 = 2400$ FPS
6GWL7H	2406
6HTZTA	2406
6XLRDB	2406
77DR69	2406
78RYTB	2406
7W7VLC	2406 (include frame 0), whitout frame 0: 2405
89E4FG	2406
AEXYFA	2402
AGKJLD	2406
AV6YND	2406
AVHPF9	2406
AWD9GB	2,400 frames
AY6AKD	2406
B3XQAC	2406
B667J4	2406
BLPWH3	2406
BMKFK4	2406
C6WL96	2406
C9J7DA	2405
DQEVA4	2406 frames
DY94T9	2406
F4FB94	2406

TABLE 1

Question 1- 8 : Examination Questions	
WebCode	Response
G4PZMZ	2406
G8BKR4	2406
GJ6XR2	2406
GKWW7Y	2406
GM6AM2	2406
GRVJXY	2406
GULMQ7	2406 frames
GUMHBX	2406 (Including Frame 0)
HPMNQ2	2406
HTA8W6	2406
JGPDVW	2,406
JQXPDZ	2405
JR9RYY	2406
JUVC43	2406
KM93VW	2406
KPY2AV	2406
KVNMEW	2405 if counting begins at frame 0.
KWJ6GX	2406
MKFQ9W	2406
NKCNWW	2406
P9VYXR	2406
PCVAUR	2406
PGA8YT	2406
PJVR6X	2405
PVBJUR	2406
QGPQJQ	2406
QTYDLX	Frame count: 2406
R8V32T	2406
R8VZCN	2406
RFP8UU	2405
TUZ7EL	2406
UENUMR	2406
UJWFBP	2406

TABLE 1

Question 1- 8 : Examination Questions	
WebCode	Response
W9CNYK	2406
X7EUEL	2402
X97VHN	2406
XJRW2J	2406
XJRYQM	Approximately 2400 frames (10fps x 4mins)
XPT9WF	2406
YER9WG	2406
YUKZHH	2405
YW7KML	2406
ZE9LZK	Clip shown on media info as 4 minutes 0 seconds total length... 4x60 = 240 seconds total length... Media info shows 10 FPS so 240x10 = 2400 frames Approx 2400 total frames
ZWLZHE	2406

Question 1-8: How many video frames are there in the Cam5 MOV file?

Consensus Result: 2406

TABLE 1

Question 1- 9 : Examination Questions

Question 1-9: Which of the MOV files contains an audio track? (e.g. Cam1, Cam2)

Manufacturer's Cam5

Response:

WebCode	Response
23NUPF	Cam5
2E4JNK	CAM5 MOV File
3RLTPG	Cam5
3U7RXL	cam5
4DJMBC	Cam5
4HBQ4F	Cam 5
69HX8A	Cam5.mov
6E7K3E	Cam5
6GWL7H	Cam5
6HTZTA	Cam5
6XLRDB	Cam5
77DR69	Cam5
78RYTB	Cam5
7W7VLC	Cam5
89E4FG	Cam5
AEXYFA	cam5
AGKJLD	Cam 5
AV6YND	Cam 5
AVHPF9	Cam5
AWD9GB	Cam5
AY6AKD	Cam 5.mov
B3XQAC	CAM5
B667J4	Cam5
BLPWH3	Cam5
BMKFK4	Cam5
C6WL96	Cam5
C9J7DA	Cam5.mov
DQEVA4	Cam5.mov
DY94T9	Cam5.mov
F4FB94	Cam5
G4PZMZ	Cam5

TABLE 1

Question 1- 9 : Examination Questions	
WebCode	Response
G8BKR4	Cam5
GJ6XR2	Cam5
GKWW7Y	Cam5
GM6AM2	Cam 5
GRVJXY	Cam5
GULMQ7	Cam5
GUMHBX	Cam 5
HPMNQ2	Cam5
HTA8W6	Cam 5
JGPDVW	Cam5
JQXPDZ	Cam5
JR9RYY	Cam5 contains an audio track.
JUVC43	Cam 5
KM93VW	Cam5
KPY2AV	Cam5
KVNMEW	Cam5
KWJ6GX	Cam5
MKFQ9W	Cam5
NKCNWW	Cam 5
P9VYXR	Cam5.mov
PCVAUR	Cam5
PGA8YT	Cam5
PJVR6X	Cam5
PVBJUR	Cam5
QGPQJQ	Cam5
QTYDLX	Cam 5
R8V32T	Cam5
R8VZCN	Cam5.mov
RFP8UU	Cam5
TUZ7EL	Cam5
UENUMR	Cam 5
UJWFBP	Cam5.mov
W9CNYK	Cam5

TABLE 1

Question 1- 9 : Examination Questions	
WebCode	Response
X7EUJEL	cam5
X97VHN	Cam5
XJRW2J	Cam5
XJRYQM	Cam 5
XPT9WF	Cam5
YER9WG	Cam5
YUKZHH	Cam5
YW7KML	Cam5
ZE9LZK	Cam 5
ZWLZHE	Cam5

Question 1-9: Which of the MOV files contains an audio track? (e.g. Cam1, Cam2)

Consensus Result: Cam5

TABLE 1

Question 1- 10 : Examination Questions

Question 1-10: What is the sampling rate of the audio in the MOV file containing an audio track? Provide a **NUMERIC** response and appropriate units.

Manufacturer's Sampling Rate: 16000

Response: Units: Samples per second

WebCode	Response
23NUPF	Sampling Rate: 16.0, Units: kHz
2E4JNK	Sampling Rate: 16.0, Units: kHz
3RLTPG	Sampling Rate: 16, Units: kHz
3U7RXL	Sampling Rate: 16000, Units: Hz
4DJMBC	Sampling Rate: 16.0, Units: KHz
4HBQ4F	Sampling Rate: 16, Units: kHz
69HX8A	Sampling Rate: 16000, Units: Hertz (Hz)
6E7K3E	Sampling Rate: 16.0, Units: kHz
6GWL7H	Sampling Rate: 16.0, Units: kHz
6HTZTA	Sampling Rate: 16, Units: kHz
6XLRDB	Sampling Rate: 16.0, Units: kHz
77DR69	Sampling Rate: 16.0, Units: kHz
78RYTB	Sampling Rate: 16.0, Units: kHz
7W7VLC	Sampling Rate: 16.0, Units: kHz
89E4FG	Sampling Rate: 16.0, Units: KHz
AEXYFA	Sampling Rate: 16.0, Units: khz
AGKJLD	Sampling Rate: 16, Units: kHz
AV6YND	Sampling Rate: 16000, Units: Hz (or 16KHz)
AVHPF9	Sampling Rate: 16.0, Units: kHz
AWD9GB	Sampling Rate: 16.0, Units: khz
AY6AKD	Sampling Rate: 16.0, Units: kHz
B3XQAC	Sampling Rate: 16.0, Units: kHz
B667J4	Sampling Rate: 16, Units: kHz
BLPWH3	Sampling Rate: 16.0, Units: KHz
BMKFK4	Sampling Rate: 16, Units: kHz
C6WL96	Sampling Rate: 16.0, Units: kHz
C9J7DA	Sampling Rate: 16, Units: kHz
DQEVA4	Sampling Rate: 16, Units: kHz
DY94T9	Sampling Rate: 16, Units: KHz
F4FB94	Sampling Rate: 16000, Units: Hz

TABLE 1

Question 1- 10 : Examination Questions	
WebCode	Response
G4PZMZ	Sampling Rate: 16.0, Units: Kilohertz (KHZ)
G8BKR4	Sampling Rate: 16.0, Units: kHz
GJ6XR2	Sampling Rate: 16, Units: 16000 Hz
GKWW7Y	Sampling Rate: 16, Units: kHz
GM6AM2	Sampling Rate: 16, Units: kHz
GRVJXY	Sampling Rate: 16.0, Units: kHz
GULMQ7	Sampling Rate: 16.000, Units: KHz
GUMHBX	Sampling Rate: 16.0, Units: KHz
HPMNQ2	Sampling Rate: 16.0, Units: kHz
HTA8W6	Sampling Rate: 16.0, Units: kHz
JGPDVW	Sampling Rate: 16, Units: kHz
JQXPDZ	Sampling Rate: 16000, Units: Hz
JR9RYY	Sampling Rate: 16, Units: kHz
JUVC43	Sampling Rate: 16, Units: khz
KM93VW	Sampling Rate: 16, Units: kHz
KPY2AV	Sampling Rate: 16.0, Units: kHz
KVNMEW	Sampling Rate: 16.0, Units: Khz
KWJ6GX	Sampling Rate: 16.0, Units: kHz
MKFQ9W	Sampling Rate: 16, Units: kHz
NKCNWW	Sampling Rate: 16.0, Units: Khz
P9VYXR	Sampling Rate: 16.0, Units: Kilo Hertz
PCVAUR	Sampling Rate: 16.0, Units: kHz
PGA8YT	Sampling Rate: 16.0, Units: kHz
PJVR6X	Sampling Rate: 16.0, Units: kHz
PVBJUR	Sampling Rate: 16.0, Units: kHz
QGPQJQ	Sampling Rate: 16, Units: kHz
QTYDLX	Sampling Rate: 16000, Units: Hertz
R8V32T	Sampling Rate: 16.0, Units: kHz
R8VZCN	Sampling Rate: 16.0, Units: kHz
RFP8UU	Sampling Rate: 16.0, Units: kHz
TUZ7EL	Sampling Rate: 16000, Units: Hertz (Hz)
UENUMR	Sampling Rate: 16.0, Units: kHz
UJWFBP	Sampling Rate: 16000, Units: Samples per second

TABLE 1

Question 1- 10 : Examination Questions	
WebCode	Response
W9CNYK	Sampling Rate: 16000, Units: Hz
X7EUEL	Sampling Rate: 16.0, Units: khz
X97VHN	Sampling Rate: 16000, Units: samples/sec
XJRW2J	Sampling Rate: 16000, Units: Hz
XJRYQM	Sampling Rate: 16.0, Units: KHz (kilohertz)
XPT9WF	Sampling Rate: 16, Units: kHz
YER9WG	Sampling Rate: 16, Units: kHz
YUKZHH	Sampling Rate: 16.0, Units: kHz
YW7KML	Sampling Rate: 16, Units: kHz
ZE9LZK	Sampling Rate: 16.0, Units: kHz
ZWLZHE	Sampling Rate: 16, Units: KHz

Question 1-10: What is the sampling rate of the audio in the MOV file containing an audio track? Provide a NUMERIC response and appropriate units.

Consensus Result: Sampling Rate: 16 (16000)
Units: kHz (Samples per second or Hz)

Forensic Video Enhancement Responses

TABLE 2

Question 2- 1 : Enhanced Video Examination

Part 2: Video Enhancement Instructions:

Perform the tasks listed below and provide derivative files, as requested, for review.

A. Conduct a video enhancement of the entirety of the camera view 5 file and export the final product to an MOV or MKV file with H.264 video encoding and uncompressed/PCM audio encoding, if an audio track is present.

B. Conduct an approximate time alignment of the camera view 5 video enhancement and the direct video from the camera view 1 file and prepare a composite, side-by-side representation of a segment which encompasses approximately 3 seconds prior to and 3 seconds following the time of the motor vehicle accident. The camera view 5 video should be in the left half of the composite video, and the camera view 1 video should be in the right half. Export the result to an MOV or MKV file with H.264 video encoding and uncompressed/PCM audio encoding.

C. Export 1 frame of video (as a PNG, BMP, or TIFF file) from the composite video above which corresponds to the approximate time of the motor vehicle accident (i.e., the approximate time of the collision).

Please Note: All files and reports indicated as uploaded or provided for reference were received by CTS unless explicitly noted. These provided files and reports are unable to be reproduced for this report publication.

Question 2-1: Note method(s) or tool(s) used and settings for the following: (You may submit reports or screen shots of filters and settings)

- Cam5 video enhancement and export processes
- Time-aligned composite video preparation and export processes
- Still image export

Manufacturer's Response: This was a free form question on methods and tools used. No manufacturer's response is provided.

WebCode	Response
23NUPF	Cam5 video enhancement and export processes: [Laboratory]-Cam5-enhancement.mov is the enhanced video file from Cam5. [Laboratory]-Cam5-enhancement.pdf is the report from the processing of the file in Amped Five. Explanation: The supposed original video recording proportions were 1.222:1 (probably it was CIF format - 352 x 288 px). This recording was resized to 798 x 533 and enclosed within the frame of dimensions 800 x 600 with added subtitle above and timestamp below the actual picture. The uneven resizing caused optical broadening of the picture. The correction consisted of restoring the original proportions of the picture while retaining the height unmodified so the width was changed to 652 px. The next step was the automatic color correction to enhance contrast. Time-aligned composite video preparation and export processes: [Laboratory]-Cam5-Cam1 composite 6s.mov is the file compositing side by side the 6 second fragment of the modified Cam5 and unmodified Cam1 recordings centered around the moment of collision. [Laboratory]-Cam5-Cam1 composite 6s.pdf is the report from the processing of the file in Amped Five. Still image export: [Laboratory]-Cam5-Cam1 collision frame.png is the file presenting the moment of collision exported from modified video [Laboratory]-Cam5-Cam1 composite 6s.mov. Cam5-Cam1 composite collision frame export.pdf is the report from processing the file in Amped Five.
2E4JNK	Cam5 video enhancement and export processes: Amped 5 Adjust filter- Brightness and contrast Levels Noise Time-aligned composite video preparation and export processes: load cam 5 enhanced load cam 1 video mixer- side by side horizontal range selector +/- 3 seconds prior to and after the accident video writer Export mov-h.264 format Still image export: load side by side video single selector (frame of accident 15:30:49) image writer Export TIFF format

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
3RLTPG	Cam5 video enhancement and export processes: Adobe Premiere Pro v25.3 was used to adjust colorimetry, debug with the NeatVideo 5.6.1 add-on, and add time-stamp and camera name banners. Duplicate images have not been removed (with amped Five for example) and framerate has not been modified. Time-aligned composite video preparation and export processes: Create a new sequence in premiere Pro and check event sync Still image export: Export to PNG with MPC-HC 2.4.3.15
3U7RXL	Cam5 video enhancement and export processes: Attach as a file (Part 2 Analysis Report (Participant Code).pdf) Time-aligned composite video preparation and export processes: Attach as a file (B - output.zip) Still image export: Attach as a file (C - crash_frame.png)
4DJMBC	Cam5 video enhancement and export processes: Amped FIVE: load Cam5 >> smart adjust >> (1) adjusted MKV / H264 / Audio uncompressed Time-aligned composite video preparation and export processes: Amped FIVE: load Cam1 >> range select load Cam5 >> smart adjust, range select the range select from Cam1 and the adjusted range select from Cam5 were compiled using the Multiview filter. Cam5 was loaded on the left half and Cam1 was loaded on the right half of the multiview. Multiview >> (1) side-by-side MKV / H264 / audio uncompressed Still image export: Multiview (from previous step) >> single select >> (1) side-by-side single frame PNG
4HBQ4F	Cam5 video enhancement and export processes: See the report: Cam 5 - video enhancement - report Time-aligned composite video preparation and export processes: See the report: Cam1 and Cam5 alignment video - report Still image export: See the report: Cam1 and Cam5 frame - report

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
69HX8A	Cam5 video enhancement and export processes: PART A (Enhance entire clip for Cam5): - Loaded Cam 5 file into Amped FIVE [v34212] - replay Engine: FFMS with Audio - Observed Low contrast / washed-out image. - Observed repeating RF interference bands rolling across frame. - Applied Histogram Equalisation to stretch contrast (selected 'ignore black') - Applied levels adjustment (Midtones = 104) - RF interference did not materially affect clarity of incident. (no FFT processing applied) - Rendered MKV file result as per test instructions: - MKV container, H264 codec ('Visually lossless quality'), 10fps, Audio stream 'copied' (PCM, mono, 16kHz) - [Laboratory]_A_Cam5_Enhanced.mkv [SHA256]: c68a4c467b781b483ffd35e7e581dc709bae516739ef2936bc5fec3b8495121e Time-aligned composite video preparation and export processes: PART B (Time alignment and Composite view): - Loaded both files into Amped FIVE [v34212] - Applied enhancement chain to Camera 5 (as per Part A) - Loaded 'Multiview' tool - Set layout - 1 row x 2 columns - selected source files: - LHS = Cam 5 (after levels processing) - RHS = Cam 1 (no processing) - Audio source = Cam 5 - output size = preserve original frame size ('Maximum width & height') - Aspect ratio maintained (pad/crop) - resize interpolation = bicubic (but not applied) - Added vertical line (red) between camera frames SYNCHRONISATION: - Reviewed collision point in both camera views. - Frame numnbers are desribed as per Amped software, where the first frame = 'Frame 0' - Cam 1 - car and bus collide at front right corner of bus. (bus strikes car as it enters traffic lane from RH curb-side street park). - precise point of contact is masked by objects within bus - damage to car is clearly visible on frame 1593 - Estimated point of contact is between frames 1591-1592. Frame rate = 10fps. Time between frames = 100ms (approx) - Cam 5 - Front widescreen view shows car entering roadway. - Point of contact is not visible. Corner of car bonnet is last visible in frame 1592, but this position cannot be resoved with respect to camera 1. - Horizon at top of frame lowers in frame 1593 (consistent with bus deceleration) - Estimated point of contact is between frames 1592-1593 (ref: 'frame 0'). - Total frames in composite view = 2406 (derived from Cam 5) - In camera 1, Frame 1591 - no movement (frame is held) Multiview display pauses camera 1 @ frame 1591. - synchronisation point estimated to be frame 1592 in composite display (with reference to 'Frame 0'). - No further delay applied to either camera view. - Synchronisation uncertainty estimated to be within 200ms. Range Selection: - Selected approx 3 seconds either side of synchronisation point (1592): - Frames 1560 to 1624 (ref frame 0) - rendered video file result as per test instrcutions: - MKV container, H264 codec ('Visually lossless quality'), 10fps, Audio stream 'raw PCM' (PCM, mono, 16kHz) - [Laboratory]_B_Composite_view.mkv - [SHA256]: e65dd9e9a3b166a628774ab84073ea9e2c065249ae36d52ddaf2d5239e24d810 Still image export: PART C (Export frame showing composite sync point): - Amped FIVE - Selected 'Image writer' - Exported Frame 1592 from composite view - Saved as PNG. - [Laboratory]_C_Composite_view_Frame.png - [SHA256]: b8fe942774400819fef1bb0d15fc6c48e1784f9ba309f43f8ae2c247c4a8476b
6E7K3E	Cam5 video enhancement and export processes: N/A Time-aligned composite video preparation and export processes: N/A Still image export: N/A [Participant did not report enhancement information and did not return any enhanced files.]
6GWL7H	Cam5 video enhancement and export processes: - enhancement : Adjust - CLAHE (Mode : Colors, Size : 1, Limit : 0) - Export : Using Amped Five (Format : MKV, Video Codec : H.264, Audio Codec : PCM) Time-aligned composite video preparation and export processes: - The videos were compared frame-by-frame to identify the synchronization point based on the moment when the vehicle stopped. - Cam5 frame : 1610, Cam1 frame : 1608, Frame rate : 10fps - Using the Range Selector filter - Export : Using Amped Five (Format : MKV, Video Codec : H.264, Audio Codec : PCM) Still image export: The frame was saved by clicking she Save Snapshot button in the Player toolbar and selecting the BMP file format.

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
6HTZTA	Cam5 video enhancement and export processes: Imagery enhancement was conducted within Impress 8.8.1.10. The parameters/settings were implemented methodically in accordance with the forensic units SOP. The parameters and the settings added are as followed - Curves ((0,0), (105,9), (184, 232), (255, 255)), Contrast & Brightness (Contrast 53, Brightness = 2), Sharpening (Strength = 20, Square = 2.5, 2.5). The processing log was exported and has been included as an attachment. Time-aligned composite video preparation and export processes: Completed in Adobe Premiere Pro 25.3. The relevant presentation elements and both videos were uploaded onto the timeline. A new sequence was created from the videos, allowing alignment based on the on-screen clock and frames. This was exported. Still image export: An in house tool was used. Frames were extracted from the video and the optimal frame was selected.
6XLRDB	Cam5 video enhancement and export processes: See FIVE Report PDF Time-aligned composite video preparation and export processes: See FIVE Report PDF Still image export: See FIVE Report PDF
77DR69	Cam5 video enhancement and export processes: Amped FIVE version 36648 was utilized to perform the requested enhancements. The Cam5.mov provided video was loaded into Amped FIVE via the Load/Video Loader function. An Adjust/Levels adjustment was performed to correct brightness. The Deblurring/Motion Deblurring enhancement was performed to reduce the blurriness of the video. The Adjust/Refinex filter was applied to correct uneven lighting. The Adjust/Automatic Color Equalization filter was applied to adjust the contrast/brightness. The Denoise/Median Filter filter was applied to reduce the noise. The enhanced video was exported using the Write/Video Writer function. The video export settings were set to MKV format, H264 encoding, and uncompressed/PCM audio encoding. The exported, enhanced video was saved as Cam5-250728181027.mkv. The Generate Report function was used to save an html documenting the enhancement. Time-aligned composite video preparation and export processes: Amped FIVE version 36648 was utilized to perform the requested enhancements. A new session of Amped FIVE was opened. The enhanced video and the Cam1.mov provided video were loaded into Amped FIVE using the Load/Video Loader function. The Select Frames/Range Selector filter was applied to each video. For the Cam1 video, frames 1561-1639 were selected. For the enhanced video, frames 1561-1640 were selected. It was noted that Cam5.mov contained the same time range and framerate as Cam1.mov, but that Cam5.mov contains 4 additional frames than Cam1.mov does overall. The frames selected for the side-by-side video were selected based on the timestamp displayed on the video, so that all frames three seconds before, the second of, and three seconds after, were included for both videos. This resulted in one extra frame for the enhanced Cam5 video. Next, the Link/Video Mixer filter was used to display the two cameras side by side horizontally, with the enhanced video on the left and Cam1.mov on the right. The audio stream from Cam5.mov was not present following the Link/Video Mixer application until the Video Mixer filter was double clicked. Then, the Audio tab of the filter was selected and observed to have audio off by default. Audio was enabled from this filter tab. The resultant video with audio was exported using the Write/Video Writer function. The export settings selected were MKV format, H264 encoding, and uncompressed/PCM audio encoding. The video was saved as Cam5-250728181027-250728200105.mkv. The Generate Report function was used to save an html documenting the side-by-side and image export processes. Still image export: Amped FIVE version 36648 was utilized to perform the requested enhancements. Frame 31 was selected from the side-by-side video (Cam5-250728181027-250728200105.mkv.) and exported as a tiff file using Amped FIVE's Write/Image Write function. The image was saved as Cam5-250728181027-250728200105-250729163056_frame31.tif. The Generate Report function was used to save an html documenting the side-by-side and image export processes.
78RYTB	Cam5 video enhancement and export processes: see attached Amped Report Time-aligned composite video preparation and export processes: see attached Amped Report Still image export: see attached Amped Report

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
7W7VLC	Cam5 video enhancement and export processes: 1. Amped Five: new project, load file, global video stabilization, increase resolution, contrast, brightness, curves, export file. 2. Pazera Audio Extractor and Adobe Audition: load file, export audio track (PCM WAV). 3. Final Cut Pro: new project, import files from Amped Five and Adobe Audition/Pazera Audio Extractor. Synchronize and export (Apple Compressor) enhancement video file to an MOV (h.264, WAV PCM). Enhancement file name: CTS-Cam5_enhancement.mov. Time-aligned composite video preparation and export processes: 1. Amped Five: new project, load two video files, select approximately the part of two video files (view from CTS-Cam5_enhancement.mov and Cam1.mov (native file)) which encompasses approximately 3 seconds prior to and 3 seconds following the time of the motor vehicle accident. Export the selected video fragments. 2. Final Cut Pro: load two video files and one and the audio track from Cam5.mov. Synchronize the file fragments from CTS-Cam5_enhancement.mov, Cam1.mov and audio track from Cam5.mov. Export file to MOV (h264, WAV PCM) using Apple Compressor. File name: CTS-Cam5_Cam1_time_aligned.mov. Still image export: Software: Amped Five: new project, load file, locate approximate time alignment of CAM5 and CAM1 of the motor vehicle accident, export stil frame as *.png from CTS_time_aligned-Cam5_Cam1.mov. Because motor vehicle accident was only visible from Cam1, in view from Cam 5 we can only saw time of accident. File name: CTS-Cam5_Cam1_time_aligned_export_frame.png

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
89E4FG	Cam5 video enhancement and export processes: Tools - Amped FIVE revision 37757. 1. Video Loader • File Name: Cam5.mov • Video Engine: FFMS with Audio • Video Stream: 0 (main stream selected) • Color Range: From File (auto-detects full or limited range) • Chroma Upsampling: Accurate Rounding (higher quality, slower) • Audio Stream: 1 • Add Video Frames: Disabled • Frames Added: 0 (beginning and end) • Purpose: Ensures accurate decoding and synchronization of evidence video. 2. Automatic Color Equalization (ACE) Adjusts color balance and contrast using the ACE algorithm. • Method: Global (faster, applies average-based correction) • Strength: 2 (moderate enhancement) • Function: Removes color casts and balances illumination across frames. 3. Contrast Brightness Modifies image brightness and contrast linearly. • Contrast: 66 (enhanced detail contrast) • Brightness: -5 (slightly darkens the image) • Mode: Linear • Selection: Whole Image • Function: Improves visibility in low-light or high-glare areas. 4. Smart Adjust Locally enhances contrast without introducing halos or clipping. • Mode: Brighten • Strength: 64 (strong local contrast enhancement) • Edge Threshold: 15 (edge-preserving mode) • Function: Compensates for uneven lighting, haze, or fog. 5. Temperature Tint Manually adjusts the color temperature and tint of the video. • Color Temperature: 8941K (adds cooler tone by reducing orange) • Tint Correction: 0 (no purple/green adjustment) • Mode: Map Selected Color to White • Exposure Correction: 0 • Function: Corrects ambient lighting or camera color cast. 6. White Balance Applies global white balance correction using Gray World model. • Color Space: RGB • Exposure Correction: -0.3000 • Selection: Whole Image • Function: Neutralizes color by mapping average color to gray. 7. Curves Performs tone and color corrections using control points. • Curve Mode: Cubic Spline • RGB and Value Curves: Custom control points set • Selection: Whole Image • Function: Precisely adjusts brightness and color tone to enhance target areas. 8. Video Writer Saves the enhanced video in a standard format for output. • Output File: Cam5-250806110052.mkv • Container/Codec: MKV - H.264 • Audio Codec: Raw PCM (uncompressed) • Quality: Default (CRF 18) • Hardware Acceleration: None • GOP Size: Default (equal to frame rate) • Use B-Frames: Yes • Timing Source: From Average FPS • Function: Exports processed video for evidence presentation or further analysis. Time-aligned composite video preparation and export processes: Tools - Amped FIVE revision 37757 Video Loader (Cam5 & Cam1) • Loads enhanced video files Cam5 and Cam1 prepares them for analysis. • Cam5 File: Cam5-250806110052.mkv, with audio (1 stream), full color range, and FFMS video engine. • Cam1 File: Cam1.mov, no audio, color range from file, FFMS engine. • Chroma upsampling method: Accurate Rounding used for better color accuracy. Multiview Filter • Displays Cam5 and Cam1 side-by-side for visual comparison. • Grid layout: 2 columns × 1 row. • Resize with aspect ratio, black background, and no audio. Range Selector • Selects frames for focused analysis. o Selected range: Frames 1569 to 1629 (60 frames) o Timestamp range: 15:30:46 to 15:30:52 o Duration: 6 seconds Video Writer • Saves output as: cam5 & Cam1 side-by-side.mkv • Video codec: H.264, container: MKV • Audio Codec: Raw PCM (uncompressed) • Quality: Default CRF 18 • Hardware acceleration: None • Output timing: Based on average FPS • B-frames: Enabled • GOP size: Default (same as frame rate) Still image export: Tools - Amped FIVE revision 37757 Video Loader • File Loaded: cam5 & Cam1 side-by-side.mkv. Single Selector Used to extract just one specific frame. • Selected Frame: 23 (approximate time of the collision). Image Writer Saves the current frame as an image file. • File Saved As: cam5 & Cam1 side-by-side-250806113905.png • Format: PNG (Portable Network Graphics) • Frame Position: 0
AEXYFA	Cam5 video enhancement and export processes: amped five-link-video mixer Time-aligned composite video preparation and export processes: 1:19 selected frames-crop Still image export: [Laboratory] bookmark

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
AGKJLD	Cam5 video enhancement and export processes: AmpedFIVE Version 36648 was used to enhance the video using the Levels filter. It was set to Highlight: 186, Midtones: 153 and Shadows: 120. A report was generated to show the changes made, with stills included. The produced DME has been hashed using a SHA-256 algorithm generating the following hash: FD3E36A277C818ED0E0112DB900AAEEB9013A7EF3F4282A8AD6219B35D1288B8 Time-aligned composite video preparation and export processes: The mkv produced from the enhancement of Cam 5 was not initially recognised by Adobe Premiere Pro Version 24.5.0 which is being used as a non-linear editing tool. Due to this I rewrapped the file to an mp4 using FFmpeg (Version 2025-04-21) in Command Prompt. Once in Premiere Pro, I aligned the 2 videos next to each other with Cam 5 on the left and 1 on the right, I added a timecode to the bottom left hand corner, and a title screen before the video. The sequence setting was changed to a resolution of 1920 x 1080 and a frame rate of 25 fps. Digital video compiled as instructed using Adobe Premiere Pro CC (Version 24.5.0 Build 57) and then exported using the inbuilt encoder as a MOV. This was then exported at a target bitrate of 10 mb/s using a H264 encoder. An image uploaded above will show all the export settings. The produced DME has been hashed using a SHA-256 algorithm generating the following hash: B841DBE6F01FBCFD34157C3C61A0061E75C1216C43222C67B69B35681EBAA477 Still image export: The produced composite video was put into AmpedFIVE version 36648, the resolution of the video was confirmed to be correct as by looking at the details panel in the bottom left, a frame was selected which corresponds to the approximate time of the incident. Using the Image Writer filter a still was produced in a Bitmap format. A report was generated through AmpedFIVE to detail the actions taken. The produced DME has been hashed using a SHA-256 algorithm generating the following hash: F4A746B7E93F1A8B2E5BEA396EBE096ADDB4494FE41EBB7DCD508FE6E4A23F34
AV6YND	Cam5 video enhancement and export processes: For the Cam 5 enhancement, AMPED Five tool was utilized. Cam 5 video loaded to the tool and started to work from there. 'Contrast stretch' was used to balance out the contract across the video. Then 'Contrast Brightness' was used to adjust the lighter area of the video. And lastly 'Exposure' was used to darken the video and trying to obtain as much details as possible. Time-aligned composite video preparation and export processes: AMPED Five is also utilized for video composite. In order for me to sync the incident at the right time, I had to navigate as accurate as possible in video Cam 1 and Cam 5 where the incident (collision) happened. Once identified, AMPED five feature 'Multiview' (Link > Multiview) are able to composite both videos. Both videos were selected as inputs (Cam 5 on the left, Cam 1 on the right tile). Once satisfied with the adjustment, 'Range Selector' is used to select the relevant clips according to objective given. Lastly, 'Video Writer' is used to export the video. In the settings, container (*.mkv), video codec (H264) were chosen as required. Still image export: For image export, AMPED Five is utilized to achieve the result. The feature 'Image Writer' can be used to export the selected single frame according to preferred format. In this case 'Tiff' format was selected.
AVHPF9	Cam5 video enhancement and export processes: Cam5 video was enhanced using a combination of curves and hue/saturation adjustments, along with mild turbulence deblurring. The final output was exported as a MOV file with H.264 video encoding and uncompressed PCM audio. Detailed enhancement and export procedures are documented in the attached Amped FIVE PDF report. Time-aligned composite video preparation and export processes: A slight curves adjustment was applied to cam1.mov to recover shadow detail. The videos were then combined using Amped FIVE's Multiview filter, with the audio track from cam5.mov added. To prevent user playback issues related to aspect ratio or resizing, the canvas size was increased to 1920x1080. The timeline was trimmed from frame 1561 to frame 1620. The final output was exported as a MOV file with H.264 video encoding and uncompressed PCM audio. Detailed steps for adjustment, composition, and export are documented in the attached Amped FIVE PDF report. Still image export: Amped FIVE's Export Writer filter was used after cropping the image to 1600x600 px to remove the previously added black canvas. No further adjustments were necessary at this stage, as the video files had already been enhanced prior to their side-by-side composition. Detailed steps for adjustment, composition, and export are outlined in the attached Amped FIVE PDF report.

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
AWD9GB	Cam5 video enhancement and export processes: See below in additional comments Time-aligned composite video preparation and export processes: See below in additional comments Still image export: PNG export using Premiere Pro 23.5.0 see below for further information in additional comments
AY6AKD	Cam5 video enhancement and export processes: Summary: 1) Video Loader: Loads a video from file. 2) Deblocking: Reduces block artefacts from lossy compression, such as that of JPEG or most video formats. 3) Levels: Adjusts intensity and color levels. 4) Contrast Brightness: Adjusts the contrast and brightness values of the image. 5) Smart Adjust: Improves the local contrast of an image minimizing halo artifacts and the clipping of highlights. 6) Unsharp Masking: Sharpens the image using an unsharp masking filter. 7) Deblocking: Reduces block artefacts from lossy compression, such as that of JPEG or most video formats. Please refer to [Laboratory]-Enhancement_Cam5.pdf for detailed and [Laboratory]-Enhanced_Cam5.mov for the result. Export process, please refer to [Laboratory]-format for export video.png Tool used: Amped Five 36648 Time-aligned composite video preparation and export processes: Summary: 1) Enhance Cam5: - Video Loader: Loads a video from file. - Range Selector: Selects a range of frames in a video. Supports the trimming of the original video stream with no transcoding. 2) Cam1: - Video Loader: Loads a video from file. - Range Selector: Selects a range of frames in a video. Supports the trimming of the original video stream with no transcoding. 3) Chain - Multiview: Displays multiple chains (including their individual filters) simultaneously on a grid. Supports synchronization of streams. Please refer to [Laboratory]-time alignment composite.pdf for details of time alignment composite video and [Laboratory]-time alignment composite.mov for the result. Export process, please refer [Laboratory]-export process.png Tool used: Amped Five 36648 Still image export: Summary: Continue from time-aligned composite video preparation and export processes 3) Chain - Single Selector: Selects a single frame of the video. - Image Writer: Writes the current image to a new file. Please refer to [Laboratory]-time alignment composite.pdf for details of still image export and [Laboratory]-composite.tif for result. Tool used: Amped Five 36648
B3XQAC	Cam5 video enhancement and export processes: Loaded the original video into Amped FIVE, applied the "Contrast Brightness" filter onto the video, and adjusted the contrast to 49/100 and the brightness to -27/100, mode at linear. Then used the "Video Writer" filter: - Container - mov - Video Codec - H264 - Audio Codec - Raw PCM (Uncompressed) - Quality - Visually Lossless The Amped FIVE report (pdf) is included in the folders with the uploaded video file, which also includes filters and parameters used. Time-aligned composite video preparation and export processes: Loaded the original CAM1 footage and the enhanced CAM5 footage into Amped FIVE. Used the "Multiview" filter and set the rows to 1 and the columns to 2. Inputted CAM1 to the right side, and CAM5 to the left side. Then used the "Range Selector" filter and selected the first frame as 1561 (frame), and the last frame to be 1650 (frame). To approximately start and end the video with 3 seconds prior and after the incident. The Amped FIVE report (pdf) is included in the folders with the uploaded video file, which includes filters and parameters used. Still image export: Loaded the composite video from task 2 into Amped FIVE, and applied the "Image Writer" filter, selected frame 30 from the video as the image. Format selected was .BMP. The Amped FIVE report (pdf) is included in the folders with the uploaded image file, which includes filters and parameters used.

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
B667J4	Cam5 video enhancement and export processes: Video files imported into AmpedFIVE for examination. Cam5 looks "washed out" and low contrast. Histogram examined and found to be clustered. Levels optimised via level filter - Highlights 190, Midtones 155, Shadows 120 which has improved contrast. Appears to contain visual horizontal interference pattern - possibly from analogue cameras and electrical interference? Resultant file exported as MKV H264 encoding with uncompressed PCM audio as requested. File name Cam5-PROCESSED.mkv Time-aligned composite video preparation and export processes: OSD assumed to be accurate, and consistent between both files. No external reference or image que available for verification. Via AmpedFIVE Multiview filter, the processed Cam5 file was places left of screen and Cam1 file right of screen. Collision occurs approx. 15:30:48 OSD. As per request, approx. 3 sec prior and after collision exported. (15:30:45 - 15:30:51) File name Multiview_PROCESSED.mkv Still image export: Actual vehicle contact appears to occur at appro 15:30:49. Closest frame prior to contact chosen and exported via AmpedFIVE from the Multiview video. File name Collission.png
BLPWH3	Cam5 video enhancement and export processes: Amped FIVE v37757 - Curves filter adjustment to improve the overall levels within the Cam5 video. Exported using the video writer within FIVE. .MOV H264 encoded video file with uncompressed/PCM encoding. Please refer to the uploaded FIVE report for the complete settings. Time-aligned composite video preparation and export processes: Amped FIVE v37757 - Using the same FIVE project throughout Time-aligned video was completed using 'Multiview' to display Cam5 on the left and cam1 on the right. Range selector was used to select the 3 seconds prior to and 3 seconds following the accident. The accident taking place approximately 15:30:49 as shown on the camera time. Aspect ratio maintained for both Cam1 & Cam5. Please refer to the uploaded FIVE report for the complete settings. Still image export: Amped FIVE v37757 - Still image taken from video which corresponds to the approximate time of the motor vehicle accident of 15:30:49. Still image exported as .bmp file. Please refer to the uploaded FIVE report for the complete settings.
BMKFK4	Cam5 video enhancement and export processes: Cam5 video was enhanced in VDUB2 with the following filters: a. De-interlacing keep top field b. Levels adjustment 127_1.205_188 c. Add Timestamp/Frame Number Overlay for Tracking Purposes d. Export as Quick Time / MOV with Audio as PCM 16000 Hz 16-bit 1 ch e. File saved as: Cam5_enhanced.mov Time-aligned composite video preparation and export processes: Import both Cam1 and Cam5 videos into Adobe Premiere Pro Adjust sequence settings video frame size to 1600x600. Add both videos to the timeline and position to the following: a. Cam5 to 400_300 b. Cam1 to 1200_300 Export timeline as Quicktime (MOV) file with H.264 codec. File saved as: Side_by_Side.mov Still image export: In VDUB2 export frame 31. Save as: Side_by_Side_Frame31.png

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
C6WL96	Cam5 video enhancement and export processes: In Amped FIVE version 36648, performed the following enhancements. Applied Contrast/Brightness filter with following settings: Contrast: 39 Brightness: -40 Mode: Linear Selection: Whole Image Applied Levels filter with following settings: Value: 186, 93, 0 Red: 255, 127, 0 Green: 255, 127, 0 Blue: 255, 127, 0 Selection: Whole Image No enhancements made to audio stream. Exported enhanced full video with H.264 video codec and uncompressed WAV PCM audio codec. Saved file as "Cam5_Enhanced.mkv" with SHA256: D09ADCD596A5784AE7CDCE0C595D31B3AC3321427DBC6647E81C9B1C473182F9 Time-aligned composite video preparation and export processes: In Amped FIVE, loaded enhanced Cam5.mov and unmodified Cam1.mov. Advanced to frames 1592 in both videos (likely time of crash) and made bookmarks. Applied Multiview filter and selected inputs enhanced Cam5 video on the left and Cam1 on the right. Selected audio from Cam5 for output. Range Selector from frames 1562 to 1622, approximately 3 seconds before and after crash. Exported video as .MKV with H.264 video codec and uncompressed WAV PCM audio codec. Saved file as "Cams1and5_Time_Alignment_Composite.mkv" with SHA256: 855E9C8BDEC6290007646C8768217D05DD9FA9879EF6211E0BDE4D406863AD59C. Still image export: In Amped FIVE, Rage selected single frame 1592 from composite multiview chain. Exported as uncompressed .TIFF named "Cams1-5_Time_Aligned_Composite_Crash_fr1592.tif" with SHA256: 6C16FF5C5DB592F5F23EC1EA94C6D6F76F5213DF22AFFD8F4BDBC7B82D93CA9C Saved Amped FIVE report.
C9J7DA	Cam5 video enhancement and export processes: (Please see uploaded PDF for exact steps and settings used) · Opened Cam5.mov in Amped FIVE. · Used 'Levels' filter to fix the washed out look and improve contrast. · Used 'Median Filter' to remove some of the noise. Limited the filter to just the image portion of the screen, so timestamp and other text is untouched. · Used 'Video Writer' to save file as Cam5-250725115755.mkv. Time-aligned composite video preparation and export processes: (Please see uploaded PDF for exact steps and settings used) · Created new project in Adobe Premiere. · Added original Cam1.mov and enhanced Cam5-250725115755.mp4 (Premiere does not support MKV so I re-exported it from Amped FIVE as MP4). · Added standard [Laboratory] background graphics. · Added all 3 to sequence timeline. · Checked the two cams were time-sync'd by cross-referencing events between the two videos. Both timestamps were in sync and objects passed by a common reference point at the same time, showing that the videos were in sync (± 1 frame due to occasional stuttering). · Found the moment of impact, at 00:02:39:3. Dropped a Marker at this point on each clip. · Trimmed the clips leaving approx. 3 seconds of footage before and 3 seconds of footage after the impact. · Exported video as H.264 MOV with uncompressed PCM audio. Still image export: In Adobe Premiere, used 'Export Frame' to save a PNG showing the moment immediately before impact. This was chosen (rather than the actual moment of collision) as it shows the vehicle on both cameras.
DQEVA4	Cam5 video enhancement and export processes: Levels Adjustment filter in Axon Investigate v3.1.0 exported as an MOV file (see Axon report for filters and settings). Time-aligned composite video preparation and export processes: Multi-cam Canvas filter in Axon Investigate v3.1.0 exported as an MOV file (see Axon report for filters and settings). Still image export: Composite video was viewed in Axon Investigate v3.1.0 and still frame of accident was exported as a BMP file.
DY94T9	Cam5 video enhancement and export processes: 1- Video saturation, color, brightness, contrast values changed. 2- Video blur removed. 3- Video sharpen value increased. Adobe Premiere Pro software used for these processes. Time-aligned composite video preparation and export processes: 1- Video files compiled in time synchronization. Adobe Premiere Pro software used for these process. Still image export: The frames in the video file were exported using ffmpeg and a frame close to the moment of the accident was selected.

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
F4FB94	Cam5 video enhancement and export processes: Tool used: Axon Investigate Pro, version 4.2.1. Adjust Levels to minimum 122 and maximum 180 and export to MOV – transcode video = H264; set even width/height = True; change pixel format = SameAsInput; remove delta frames = False; transcode audio = Uncompressed Time-aligned composite video preparation and export processes: Tool used: Axon Investigate Pro, version 4.2.1. I did a visual inspection of the video and verified its metadata. I located the approximate time of the motor vehicle accident and selected 3 seconds prior and 3 seconds after the event to create subclips of both files (Cam5 already enhanced). Taking Cam5 and then Cam1, I created a Multi-cam Canvas organizing Cam5 in the left side and Cam1 in the right. File exported to MOV (transcode video codec = H264; set even width/height = True; change pixel format = SameAsInput; remove delta frames = False; transcode audio = Uncompressed). Still image export: Using Axon Investigate Pro, version 4.2.1, I reproduced the Canvas and located the approximate frame where the motor vehicle accident happened. I selected frame 32 and exported as a PNG file.

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
G4PZMZ	Cam5 video enhancement and export processes: Cam5 Video Enhancement and Export Processes From Amped FIVE Report... Exposure Adjusts the image exposure. Details: The Exposure tool performs a non-linear mapping of the input image values. It adjusts the image gamma applying a power function that has three parameters: Exposure, Offset and Recover. Exposure modifies the pixel values in the midtone-to-white range with minimal effect on the shadows. Decreasing (respectively increasing) the Offset darkens (resp. lightens) the pixel values in the midtone-to-black range with minimal effect on the highlights. Recover controls the overall brightness of the image. Parameters: Exposure: 0 Adjusts the exposure of the image. Offset: 0.0700 Adds or subtracts an offset to the pixel values. Recover: 0.6310 Recovers the saturated pixels of the image. Selection: Whole Image The selection where the filter is applied to. It may be the whole image, a static region, or a region containing a tracked object of interest. Contrast Brightness Adjusts the contrast and brightness values of the image. Details: Contrast Brightness maps input image values to output image values according to a linear transformation. The mapping involves two operations: multiplication and addition with constants respectively controlled by the Contrast and Brightness parameters. Increasing (or reducing) the Contrast makes the difference between light and dark areas appears sharper (or smoother). Similarly, increasing (or decreasing) the Brightness makes the overall image appear lighter (or darker). These changes can improve the definition of excessively dark or light areas in the image, but will tend to saturate the image if used in excess. Parameters: Contrast: 54 Extends the intensity difference among pixels (linear gain). Brightness: 12 Adds or subtracts an offset to image pixels (bias). Mode: Linear The domain in which the image is mapped to. The Linear mode is the standard mode. The Logarithmic mode retains the black and white points and therefore prevents saturation. Selection: Whole Image The selection where the filter is applied to. It may be the whole image, a static region, or a region containing a tracked object of interest. Unsharp Masking Sharpens the image using an unsharp masking filter. Details: The Unsharp Masking filter is implemented as a window-based operator, i.e. it relies on a convolution kernel to perform spatial filtering. The original image is first convolved with a Radius x Radius Gaussian kernel to produce its smoothed version, i.e. a low-passed image. The resulting image is then pixel subtracted from the original image in order to produce a description of image edges, i.e. a high-passed image. Only the pixel differences (edges) greater than certain Threshold values are retained, so that sharpening of small image details can be suppressed. In order to increase the sharpness of the original image, a percentage (proportional to Strength) of the thresholded high-passed image is added back onto the original image. Parameters: Strength: 0.2100 Intensity of the sharpening effect: larger values provide increasing amounts of sharpening. Size: 23 Length, in pixels, of the side of the square filter window. High resolution images allow for a higher size. Threshold: 0 The minimum difference in pixel values that indicates an edge where sharpen must be applied. Areas of smooth tonal transition can be protected from the creation of blemishes in the facial, sky or water surface. Mode: Intensity Type of adjustment to be performed. Selection: Whole Image The selection where the filter is applied to. It may be the whole image, a static region, or a region containing a tracked object of interest. Video Writer Writes the current video to a file. Supports the writing of variable frame durations. Details: The Video Writer tool encodes all frames of the current clip to the specified video file format. Parameters: File: Cam5-250807120203.mov Path of the file to save. Container and Video Codec: mov - H264 Container used to store, and codec used to encode/compress the media stream(s). Audio Codec: Raw PCM (Uncompressed) Codec used to copy or encode/compress the audio stream. Select "None" to omit the audio stream from writing. Quality: Default When a lossy codec has been selected, the following options can be customized: Default: Uses a Constant Rate Factor of 18 High: Uses a Constant Rate Factor of 12 Visually Lossless: Uses a Constant Rate Factor of 1 HW Acceleration: None Offers the ability to use a GPU (Graphic Processing Unit) or the CPU chipset to speed up the outputting of frames during conversion. Output speed will directly depend on the specific make and model of the hardware in use. This option is not available (or greyed out) unless the Output Video Codec selected is either H264 or H265. GOP Size: Default (same as Frame Rate) Sets the Group of Picture size for the encoding of the video (i.e. how frequently a new keyframe should be used). When set to default, videos of over 25fps will be limited to a GOP of 25. Use B Frames: Yes Sets the option to encode frames using bidirectional prediction for the encoding the video. Timing Source: From PTS The source to be used for computing output video stream's PTS values. Additional Information: Video Streams: 1 Number of video streams in the video Audio Streams: 1 Number of audio streams in the video Subtitle Streams: 0 Number of subtitle

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
	streams in the video Time-aligned composite video preparation and export processes: Time Aligned Composite Video Preparation and Export Process From Amped FIVE Report... Chain Multiview Displays multiple chains (including their individual filters) simultaneously on a grid. Supports synchronization of streams. Details: The Multiview filter displays multiple chains simultaneously on a grid. Parameters: Columns: 2 The number of columns in the grid layout. Rows: 1 The number of rows in the grid layout. Inputs: Cam5 - Video Writer - 5 Cam1 - Video Loader - 6, The list of filters to display in a grid (NB this list can also be populated by dragging individual filters from the history panel directly into this window) Input Delay: 0 / 0 Two specific positions in the mixed videos to compare. Output Size: Minimum Width and Height The size of each cell in the output grid. Output Mode: Resize with Aspect Ratio Available options if the cell has a different size than the input. Interpolation: Area Interpolation algorithm used when the image is resized. Line Color: #000000 The color of the optional line separating the cells. Line Thickness: 0 The thickness of the optional line separating the cells. Audio Source: No Audio See Below. Selects the audio (if available) played in the output video. Background Color: #000000 Selects the Color of the area outside of the original clip. Audio added using Adobe Premiere Pro... I realized in the process that Amped Five does not allow audio when applying the Multiview tool. I decided to export the composite that I had created and add the audio separately using Adobe Premiere 2025. I exported the multiview as MOV with H264 video encoding. I then opened the composite in Premiere, unlinked the audio from Cam 5 and aligned with the composite. I then exported the final composite, 3 seconds prior to collision and 3 seconds after the collision, as an MOV file with H.264 encoding and uncompressed/PCM audio encoding named Multiview 6 Seconds. Export settings in following screenshot. Still image export: Multiview 6 Seconds-250811141903.tif Still Image Export from Amped Five Report Multiview 6 Seconds Video Loader Loads a video from file. Details: The Video Loader decodes a standard-format video file into a sequence of frames that can be displayed and processed. Parameters: File: Final composite 6 second video/Multiview 6 Seconds.mov Path of the video to load. Video Engine: FFMS with Audio Video decoder to use. Video Stream: 0 Select one specific video stream, when multiple streams are available from the input file. Color Range: Limited Uses the color range specified in the video file or force it to full or limited (16-235). Works only with the FFMS Video Engine. Chroma Upsampling: Accurate Rounding (Slower) Selects the chroma upsampling method. Use Accurate Rounding for a more robust interpolation of color information and Standard Rounding or Nearest for faster decoding. Applies only to FFMS-based video engines. Audio Stream: 1 Audio Stream selection, useful when multiple streams are available. Add Video Frames: false Adds video frames at the beginning or end of the clip to retain sync with the audio stream. Added Frames Color: #000000 The color of the frames added at the beginning or end of the clip. Frames added at the beginning: 0 Number of video frames to be added at the beginning of the clip in order to retain audio sync. Frames added at the end: 0 Number of video frames to be added at the end of the clip in order to retain audio sync. Original File: Original video file that has been converted from a proprietary DVR format or otherwise imported. Concatenate File List: List of files that were concatenated as part of the conversion process Additional Information: Video Streams: 1 Number of video streams in the video Audio Streams: 1 Number of audio streams in the video Subtitle Streams: 0 Number of subtitle streams in the video Image Writer Writes the current image to a new file. Details: The Image Writer encodes the current frame to the specified file in the chosen format. Parameters: File: Multiview 6 Seconds-250811141903.tif Path of the image to save. Format: Tiff Format used to encode the image file. Additional Information: Frame Position: 31 Position of the saved frame in the input video.

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
G8BKR4	Cam5 video enhancement and export processes: The Cam5 MOV video file was examined using Amped FIVE software. The video was loaded into the software and the unsharp masking tool was utilized for the whole image. The strength and size were adjusted. The contrast brightness tool was utilized with both the contrast and brightness adjusted for the whole image. The color equalization tool was also utilized. The video writer tool was used to export the video as the requested MOV file with H264 encoding and uncompressed audio. Time-aligned composite video preparation and export processes: Both the Cam1 and enhanced Cam5 MOV video files were examined using Amped FIVE software. Cam1 and enhanced Cam5 were clipped to approximately 3 seconds before and 3 seconds after the accident. The clipped files were exported using the video writer tool. The clipped video files were loaded into the software and the video mixer tool was utilized to create a side-by-side view of both videos. As requested, the first input of the video mixer was the clipped Cam5 enhanced video and the second input was the clipped Cam1 video. The audio source was from the first input of the clipped Cam5. The video writer tool was used to export the video as the requested MOV file with H264 encoding and uncompressed audio. Still image export: The side-by-side view was examined using Amped FIVE software. The video was examined frame by frame to determine the best possible image of the accident in both videos. In Cam1, the front end of the vehicle can be seen and in Cam5 the front driver side of the vehicle can be seen through the bus window at the time of the accident. The image writer tool was used to export the still image as the requested TIFF file.
GJ6XR2	Cam5 video enhancement and export processes: see report Case 2A Time-aligned composite video preparation and export processes: see report Case 2B Still image export: see report Case 2C
GKWW7Y	Cam5 video enhancement and export processes: Used Amped FIVE and applied the levels filter. File was exported as .mkv with H.264 encoding and the uncompressed/PCM raw audio encoding. Time-aligned composite video preparation and export processes: Used Amped FIVE and loaded both Cam1 and Cam5_clarified videos. Used the multiview filter to create a side by side composite with Cam5 on the left and Cam1 on the right. Used the range selector to select the frames showing approximately 3 seconds prior and approximately 3 seconds after the accident. File was exported as .mkv with H.264 encoding and uncompressed/PCM raw audio encoding. Still image export: Used Amped FIVE and selected a frame showing the accident. Image was exported as .png.
GM6AM2	Cam5 video enhancement and export processes: Loaded extracted file "Cam5.mov" into Amped Five and began analysis. Used following procedures: (1) global stabilization, (2) white balance, (3) contrast brightness, (4) exposure, (5) export product to mkv H.264 uncompressed/PCM, filename, "Cam5-250807123237-enh.mkv". Please see report approx. pages 1-5 for filter settings. Time-aligned composite video preparation and export processes: Loaded "Cam1.mov" with "Cam5-250807123237-enh.mkv" into Amped Five. Conducted a time alignment, and selected Link, Multiview, 1 row, 2 columns, added Cam5 view to the left side, and Cam1 view to the right side. Selected frames for composite video, selected lossless trim in range selector. "In" frame #1561, "out" frame #1621, a selection 3 seconds prior and following the area of interest of impact, frame #1593. Exported composite video to mkv, H.264, uncompressed/PCM, video clip named, "Cam5-250807123237-enhCompositClip.mkv". Please see report approx. pages 6-8 for details. Still image export: Using Amped Five, I exported frame #1593, which became frame #32 after exporting the composite clip file, at the 15:30:49 mark; and saved still image as, "Cam5enh-CompositClipStill.bmp" (attached). Please see report approx. page 8 for details.
GRVJXY	Cam5 video enhancement and export processes: see attached Amped FIVE report Time-aligned composite video preparation and export processes: see attached Amped FIVE report Still image export: see attached Amped Five report; label added using PS

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
GULMQ7	Cam5 video enhancement and export processes: Tools used: Amped FIVE Professional software See above uploaded screenshot of settings used for enhancement methods and export processes of Cam5 video. Time-aligned composite video preparation and export processes: Tools used: CapCut software Video preparation: - We uploaded Cam 5 video to CapCut - Then, selected the necessary part of video Cam 5 with timeline alignment from 2:36:02 - 2:39:02, then exported. - We uploaded Cam 1 video to CapCut - Then, selected the necessary part of video Cam 1 with timeline alignment from 2:39:03 - 2:41:03, then exported. - We uploaded the video selected in Cam 5 with the video selected in Cam 1 to create a composite video with approximately 3 seconds prior to and 3 seconds following the time of the motor vehicle accident, then exported. See above uploaded composite video and screenshot of the export process Still image export: Tools used: Amped FIVE Professional software See above uploaded still images in PNG and BMP formats and screenshots of the processes and settings/filters in both BMP & PNG formats.
GUMHBX	Cam5 video enhancement and export processes: File imported directly into Amped FIVE (v34212) using Video Loader Function. Applied 'Full' Colour range option. Applied Filter: 'Levels' to adjust intensity and colour range – Validated Method Exported using Video Writer Tool as: Video: Mov, H264. Audio: Uncompressed RAW PCM Given the generic nature of request to enhance the whole video, minimal filters were used. In this case, using levels as an accredited filter alone provided significant improvement to the colour of the video. Additional filters such as deburring or sharpening provided no significant improvement and would have impacted the video throughout. If the request had been for an enhanced still image of a single item/person/incident, additional filters may have improved the end product. Time-aligned composite video preparation and export processes: Imported both files (Cam 5 Enhanced & Cam 1 Unaltered) into Adobe Premiere Pro (24.6.1) Created sequence matching clips: 800x600, 10fps, 32Khz (Premiere can only playback at minimum 32KHz instead of 16KHz which matches source). Adjusted resolution to 1600 width to allow full side by side view. Aligned videos side by side and aligned time to match at time of incident. Time appeared to be consistently accurate with minor deviations of 1 frame difference at times. Cut video to 3 seconds either side of incident. Exported sequence: Mov, H264, uncompressed audio 16Khz. Still image export: Frame selected within pre-existing Premiere sequence (see File 2B) and exported as PNG. This process deviated from our standard accredited process. Per our SOPs, a still image would have been created by opening the footage in a suitable player (that opens and plays correctly e.g. resolution, fps, colour, time/date data etc), then creating a still image (PNG) via the ShareX screen capture tool. It was decided to use Premiere in this instance to create a still to follow the steps provided and reduce the amount of compression occurring. By using ShareX to capture a still from the export, it would have involved another layer of compression and reduced the quality further, therefore reducing the point of enhancement.

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
HPMNQ2	Cam5 video enhancement and export processes: Using Amped FIVE, selected the video frame (not including black boarder along the lower & upper edges); applied Level to selection; adjusted the highlights and shadows (Highlights = 188 & Shadows = 106); adjusted Video Writer settings (MKV file with H.264 video encoding and uncompressed/PCM audio encoding Reviewed exported clarified video). Reviewed export which appeared as expected. Time-aligned composite video preparation and export processes: Cam5.mov Reviewed video with Amped FIVE. The accident occurred at approximately 00:02:39.100 (15:30:49) into the video (2:36:00= 3 approximately seconds prior; 2:42.10=3 seconds after). It is difficult to determine exactly when the accident occurred given the range of view (an impact is not visible; it's perceived by movement and sound). Applied range selector based on the timeframe noted above to previously clarified video; frames 1560-1621; 62 frames. Moved to frame 9 of selected range which shows a portion of the back wheel on a light contrast vehicle/minivan. Compared this frame to a frame in Cam1.mov (frame 8) that begins to show the back wheel of the minivan. This is an approximation given the differences in focal lengths between the two cameras (wide angle vs "normal") and angles of view. Cam1.mov The accident appears to occur at approximately 15:30:49 / 00:02:39.200 into video (02:36.000 = 3 approximately seconds prior. However, the impact is not visible given the view is partially obstructed by the bus door framing. Damage is visible on the car 1 frame later (00:02:39.300). Applied range selector; frames 1560 – 1620; 61 frames Moved to frame 8 of selected range which shows the taillight and portion of the back wheel on a light contrast vehicle. This is an approximate moment that shows a similar timeframe in Cam5 (Frame 9) above, but given the limitations between the two views (focal lengths, angles and partially obstructed views), it cannot be conclusively confirmed. Applied Multiview using Amped FIVE; 2 columns & 1 row. Selected Cam5 – Range Selector with Frame 9 visible into 1st input; Left Side Selected Cam1 – Range Selector with Frame 8 visible into 2nd input; Right Side Included Cam5 – Range Selector level for Audio Source. Video Writer: Video Writer: MKV file with H.264 video encoding and uncompressed/PCM audio encoding Reviewed exported clarified video. Appeared as expected. NOTE: We do not have an SOP that outlines how to create an approximate time alignment. However, I recall learning a process while attending an Amped FIVE class. Steps for this process are not outlined in the three references. Still image export: Based on notes regarding question 2-1b, the following was applied using Amped FIVE: Selected frame 32 from Multiview Chain. Exported as Tiff format still image using "Imaging Writer" Reviewed exported image. Appeared as expected.
HTA8W6	Cam5 video enhancement and export processes: Using Amped 5 V342112 - Cam 5: applied Video Loader, Levels, Hue Saturation Value and Video Writer (Mov, H.264, Audio codec raw PCM (uncompressed) filters - Exhibit created: DH/1 Time-aligned composite video preparation and export processes: Using Amped 5 V342112 - Using the Multiview filter, added camera 1 and enhanced camera view 5 (Exhibit DH/1) to create a composite view, applied Range Selector and Video Writer (Mov, H.264, Audio codec raw PCM (uncompressed) filters) - Exhibit created - DH/2 Still image export: Using Amped 5 V342112 - Still exported as .png from exhibit DH/2 - Exhibit created - DH/3

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
JGPDVW	Cam5 video enhancement and export processes: After verifying that my software was working correctly, I imported the video file into Amped-Five. I then verified my hash, which I collected after downloading the video match within Amped-Five. I then adjusted the video levels to the following settings: Highlights – 211, Midtones – 161, and Shadows – 112. I then reviewed the results and exported the enhanced video as an .mkv file with the audio. Time-aligned composite video preparation and export processes: I reviewed the playback time of each video file and found that Video Cam5.mov was approximately 0.4 seconds, or four frames, longer than Cam1.mov. I then used the Change Frame Rate option within Amped-Five and adjusted the play time of the enhanced Cam5.mov video to match the play time of Cam1.mov. This resulted in an adjusted frame rate for Cam5.mov, from 10 fps to 10.0167 fps. I then selected an Area of Interest (AOI) for Cam1.mov and the now-adjusted frame rate for Cam5.mov, focusing on the approximately 3 seconds before and after the impact of the bus and car. I then linked the two AOI videos in a Multiview video and exported the new video along with the audio from Cam5.mov. Still image export: From the Multiview video, I used the Select Frame option within Amped-Five and selected the frame that shows the approximate time of the collision, at around 15:30:49. I then exported the image from Amped-Five as a .tif file.
JQXPDZ	Cam5 video enhancement and export processes: Used Amped FIVE to import the Cam5 video, perform Unsharp masking, and a levels adjustment. Exported as an H.264 encoded .MKV video with a PCM encoded audio stream. Time-aligned composite video preparation and export processes: Used Amped FIVE and used the Multiview filter to the enhanced Cam5 video on the left side of the video and Cam1 video on the right side of the video. Then used the Audio/Video Muxer to link the composite video to the Cam5 audio stream, then used the Range Selector to select the time of 15:30:46 - 15:30:54 on the visible timestamp (Frames 1561 - 1641 of the full composite video). Then used the Video Writer to export the composite video as an H.264 encoded .MKV video file containing a PCM audio stream. Still image export: Used Amped FIVE to export a .TIFF still images from the composite video that happens at 15:30:49 on the visible timestamp (Frame 1593 of the full composite video)
JR9RY Y	Cam5 video enhancement and export processes: Amped FIVE: -Wiener filter > Levels > Gaussian Blur > Video writer Time-aligned composite video preparation and export processes: I used the previously enhanced Cam5 file. I looked for starting points, and i also took into calculation the time of crash for the alignment of the 2 videos. I used Adobe Premiere Pro for the sideby side presentation. Adobe Premiere Pro: - Brightness & Contrast > Lumetri color > Levels > Export Media Still image export: I used the previously enhanced Cam5 file. Exported png file using Amped FIVE
JUVC43	Cam5 video enhancement and export processes: Axon Investigate (4.3.0)>Filter - Levels Adjustment Range 102.1-180.7>export in .mkv format Time-aligned composite video preparation and export processes: Axon Investigate (4.3.0)>Cam 5>Filter - Levels Adjustment Range 102.1-180.7>Mulit-Cam Canvas>Cam 1>Multi-Cam Canvas>Export in .mov format>create 6 second subclip (frame 1562-1622)>export in .mov format Still image export: Axon Investigate (4.3.0)>CCTV Composite .mov>frame 30>create still>export in .png format
KM93VW	Cam5 video enhancement and export processes: Using Amped5 (revision 37757), I enhanced the Cam5 video via the Automatic Color Equalization (set to 10) and Hue Saturation Value (set to 80) filters/settings. I exported the enhanced video with the following settings: Container - mkv, Video Codec - H.264, Audio Codec - Raw PCM (Uncompressed). Time-aligned composite video preparation and export processes: Using the Amped5 Multiview feature, I arranged the Cam5 enhanced video on the left, with three seconds prior and following the accident (60 frames, from frame 1562-1621). The collision frame in Cam5 is at frame 1594. I arranged the Cam1 video on the right, with three seconds prior and following the accident (60 frames, from frame 1561-1620). The collision frame in Cam1 is at frame 1593. I exported the Multiview video with the following settings: Container: mkv Video Codec: H.264 Audio Codec: Raw PCM (Uncompressed). Still image export: Using Amped5, I exported frame 32 (point of collision) as a .PNG file named "frame32.png."

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
KPY2AV	Cam5 video enhancement and export processes: Adobe Premiere Pro; Levels and Unsharp Mask filters; exported as .mov with H.264 video encoding and uncompressed audio (see screenshots) Time-aligned composite video preparation and export processes: Adobe Premiere Pro; New Sequence (1600x600), placed both videos side-by-side with approximate time aligned; exported clip from approximately 3 seconds before to approximately 3 seconds after the incident as .mov with H.264 video encoding and uncompressed audio (see screenshots) Still image export: Adobe Premiere Pro; Export Frame; exported as bmp (see screenshot)
KVNMEW	Cam5 video enhancement and export processes: Axon Investigate. Cam1.mov records the interior of the bus with a beginning DVR timestamp of 9-22-2015 beginning at 15:28:10. Cam5.mov is the forward-facing camera of the bus with a beginning timestamp of 9-22-2015 beginning at 15:28:10. A levels adjustment was applied to Cam5.mov to correct the lighting issue. The adjusted Cam5.mov was exported out of Investigate as an MOV file with H264 encoding and uncompressed audio encoding. Time-aligned composite video preparation and export processes: I reviewed both cameras to determine the time of impact. Both cameras showed the crash occurring at approximately 15:30:49 DVR time. For both cameras I manually navigated to the frame when the DVR timestamp rolled over to 15:30:46 as the beginning point of a sub clip. I repeated this process for when the timestamp rolled over to 15:30:52 to create a 3 second before and after buffer from the time of vehicle impact. Cam1: Frames 1561-1620 Cam5: 1561-1621. Added both sub clips to a Multi-cam canvas with camera view 5 on the left and camera view 1 on the right. Retained default padding with a final resolution of 1630x620." The composited video was played back in Investigate. Frame 30 shows the approximate moment of the collision. Frame 30 was bookmarked and exported out of Investigate as a TIFF image. Upon further review of the composited video, the seconds digit of the DVR timestamp do not fully match the opposing camera. For instance, Cam 1 will roll over to the 47 second mark 1 frame before Cam 5, both will match when rolling over to the 48 second mark, Cam 1 will roll over to the 49 second mark 1 frame before Cam 5, and then both will match for the 50 second mark. A hash analysis was run back on the original clips to check for duplicate frames. No frames reported identical hash values. Therefore, the margin of error of the time alignment is approximately 1 frame or 1/10 of a second. Still image export: Uploaded, Composite Collision Frame.tif
KWJ6GX	Cam5 video enhancement and export processes: In Amped Five (revision 37757), Levels adjustment applied (Highlights:190, Midtones: 152, Shadows: 115) Exported Format: mkv, Video Codec: H264 (Visually Lossless), Audio Codec: Copy Time-aligned composite video preparation and export processes: In Amped Five (revision 37757), Cam5 relevant segment selected (Frames 1561-1630). A levels adjustment with the previous settings in Part A was applied. Cam1 relevant segment selected (Frames 1561-1630). Both selected segments merged into a side-by-side multiview. Audio was added from the Cam5 relevant segment. Exported (Format: mkv, Video Codec: H264 (Visually Lossless), Audio Codec: Raw PCM (Uncompressed)) Still image export: In Amped Five (revision 37757), Frame 32 of the composite video in Part B was exported via frame bookmark in PNG format.

TABLE 2

Question 2- 1 : Enhanced Video Examination

WebCode	Response
MKFQ9W	Cam5 video enhancement and export processes: From Amped FIVE ver. 26914 report: Cam5 Video Loader Loads a video from file. Details: The Video Loader tool renders a video file that can be encoded in a variety of standard formats to a sequence of bitmaps that can be displayed and processed. Parameters: • File: Cam5.mov Path of the video to load. • Video Engine: FFMS with Audio Video decoder to use. • Color Range: Full Use the color range specified in the video file or force it to full or limited (16-235). Works only with the FFMS Video Engine. • Chroma Upsampling: Accurate Rounding (Slower) Select the chroma upsampling method. Applies only to FFMS-based video engines. • Audio Stream: 1 Audio Stream selection, useful when more than one are available. • Original File: Original video file that has been converted from a proprietary DVR format. Additional Information: • Video Streams: 1 Number of video stream in the video • Audio Streams: 1 Number of audio stream in the video • Subtitle Streams: 0 Number of subtitle stream in the video. Levels Adjusts intensity and color levels. Details: The Levels filter maps the values of the input image to the values of output image according to a piece-wise linear transformation controlled by the values of Highlights, Midtones and Shadows. The Midtones slider changes the intensity values of the middle range of intensity levels without significantly changing the highlights and shadows in the image. The Highlights and Shadows sliders set the black point and the white point of the image. Each channel of the input image is configured using the sliders of the corresponding parameter: Value, Red, Green or Blue. For each parameter, the histogram of the tonal range of the input image is displayed. If the input image is in grayscale, changing the setting of Red, Green and Blue parameters has no effect on the output image. Parameters: • Value: 175, 145, 115 Highlights, Midtones and Shadows settings used to map the pixel values of the grayscale converted image. • Red: 255, 127, 0 Highlights, Midtones and Shadows settings used to map the pixel values of the red channel of image. • Green: 255, 127, 0 Highlights, Midtones and Shadows settings used to map the pixel values of the green channel of image. • Blue: 255, 127, 0 Highlights, Midtones and Shadows settings used to map the pixel values of the blue channel of image. • Selection: Whole Image Selection where the filter is applied. It may be the whole image, a static region, or a region containing a tracked object of interest. Video Writer Writes the current video to a file. Details: The Video Writer tool encodes all frames of the current video to the specified video file format. Parameters: • File: ../Cam5_enhanced.mov Path of the file to save. • Container and Video Codec: mov - H264 Container used to store media stream(s) and codec used to write the video stream. • Audio Codec: Raw PCM (Uncompressed) Codec used to write the audio stream. • Frame rate: 10 Frame rate (in frames per second) of the output video. Note that some video formats support only a limited set of frame rates, and the frame rate may influence some properties of the output video (e.g. the GOP size) for some codecs. • Quality: Visually Lossless If a codec has been selected that allows quality control, the following options can be selected: Default: Uses a Constant Rate Factor of 18 High: Uses a Constant Rate Factor of 12 Visually Lossless: Uses a Constant Rate Factor of 1 • HW Acceleration: None Allows selecting a video encoding acceleration hardware. Actual availability will be tested when the filter is applied. Additional Information: • Video Streams: 1 Number of video stream in the video • Audio Streams: 1 Number of audio stream in the video • Subtitle Streams: 0 Number of subtitle stream in the video Time-aligned composite video preparation and export processes: From Amped FIVE ver. 26914 report: Cam1 Video Loader Loads a video from file. Details: The Video Loader tool renders a video file that can be encoded in a variety of standard formats to a sequence of bitmaps that can be displayed and processed. Parameters: • File: Cam1.mov Path of the video to load. • Video Engine: FFMS Video decoder to use. • Color Range: Full Use the color range specified in the video file or force it to full or limited (16-235). Works only with the FFMS Video Engine. • Chroma Upsampling: Accurate Rounding (Slower) Select the chroma upsampling method. Applies only to FFMS-based video engines. • Audio Stream: None Audio Stream selection, useful when more than one are available. • Original File: Original video file that has been converted from a proprietary DVR format. Additional Information: • Video Streams: 1 Number of video stream in the video • Audio Streams: 0 Number of audio stream in the video • Subtitle Streams: 0 Number of subtitle stream in the video. Range Selector Selects frames of the video within an interval with an optional step. Support the trimming of the original video stream without transcoding. Details: The Range Selector tool outputs a video of specific frames that are part of the input video. Parameters: • First Frame: 1561 First frame of the selection of interest. • Last Frame: 1630 Last frame of the selection of interest. • Step: 1 Take only one frame every Step frames. Additional Information: This filter has no additional information. Cam5 Video Loader Loads a video from file.

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
	Details: The Video Loader tool renders a video file that can be encoded in a variety of standard formats to a sequence of bitmaps that can be displayed and processed. Parameters: • File: Cam5.mov Path of the video to load. • Video Engine: FFMS with Audio Video decoder to use. • Color Range: Full Use the color range specified in the video file or force it to full or limited (16-235). Works only with the FFMS Video Engine. • Chroma Upsampling: Accurate Rounding (Slower) Select the chroma upsampling method. Applies only to FFMS-based video engines. • Audio Stream: 1 Audio Stream selection, useful when more than one are available. • Original File: Original video file that has been converted from a proprietary DVR format. Additional Information: • Video Streams: 1 Number of video stream in the video • Audio Streams: 1 Number of audio stream in the video • Subtitle Streams: 0 Number of subtitle stream in the video. Levels Adjusts intensity and color levels. Details: The Levels filter maps the values of the input image to the values of output image according to a piece-wise linear transformation controlled by the values of Highlights, Midtones and Shadows. The Midtones slider changes the intensity values of the middle range of intensity levels without significantly changing the highlights and shadows in the image. The Highlights and Shadows sliders set the black point and the white point of the image. Each channel of the input image is configured using the sliders of the corresponding parameter: Value, Red, Green or Blue. For each parameter, the histogram of the tonal range of the input image is displayed. If the input image is in grayscale, changing the setting of Red, Green and Blue parameters has no effect on the output image. Parameters: • Value: 175, 145, 115 Highlights, Midtones and Shadows settings used to map the pixel values of the grayscale converted image. • Red: 255, 127, 0 Highlights, Midtones and Shadows settings used to map the pixel values of the red channel of image. • Green: 255, 127, 0 Highlights, Midtones and Shadows settings used to map the pixel values of the blue channel of image. • Blue: 255, 127, 0 Highlights, Midtones and Shadows settings used to map the pixel values of the green channel of image. • Selection: Whole Image Selection where the filter is applied. It may be the whole image, a static region, or a region containing a tracked object of interest. Range Selector Selects frames of the video within an interval with an optional step. Support the trimming of the original video stream without transcoding. Details: The Range Selector tool outputs a video of specific frames that are part of the input video. Parameters: • First Frame: 1561 First frame of the selection of interest. • Last Frame: 1630 Last frame of the selection of interest. • Step: 1 Take only one frame every Step frames. Additional Information: This filter has no additional information. Chain Multiview Displays multiple chains (including their individual filters) simultaneously on a grid. Supports synchronization of streams. Details: The Multiview filter displays multiple chains simultaneously on a grid. Parameters: • Rows: 1 The number of rows in the layout. • Columns: 2 The number of columns in the layout. • Inputs: Cam5 - Range Selector - 13 Cam1 - Range Selector - 12, The list of filters to display in a grid (NB this list can also be populated by dragging individual filters from the history panel directly into this window) • Input Delay: 0 / 0 Two specific positions in the mixed videos to compare. • Output Size: Minimum Width and Height The size of each cell in the output grid. • Output Mode: Resize with Aspect Ratio Available options if the cell has a different size than the input. • Interpolation: Area Interpolation algorithm. • Line Color: #000000 The color of the optional line separating the cells. • Line Thickness: 0 The thickness of the optional line separating the cells. • Audio Source: Cam5 - Range Selector - 13 The input (if available) whose audio is played. Additional Information: This filter has no additional information. Video Writer Writes the current video to a file. Details: The Video Writer tool encodes all frames of the current video to the specified video file format. Parameters: • File: ../Cam5_Cam1_composite.mov Path of the file to save. • Container and Video Codec: mov - H264 Container used to store media stream(s) and codec used to write the video stream. • Audio Codec: Raw PCM (Uncompressed) Codec used to write the audio stream. • Frame rate: 10 Frame rate (in frames per second) of the output video. Note that some video formats support only a limited set of frame rates, and the frame rate may influence some properties of the output video (e.g. the GOP size) for some codecs. • Quality: Visually Lossless If a codec has been selected that allows quality control, the following options can be selected: Default: Uses a Constant Rate Factor of 18 High: Uses a Constant Rate Factor of 12 Visually Lossless: Uses a Constant Rate Factor of 1 • HW Acceleration: None Allows selecting a video encoding acceleration hardware. Actual availability will be tested when the filter is applied. Additional Information: • Video Streams: 1 Number of video stream in the video • Audio Streams: 1 Number of audio stream in the video • Subtitle Streams: 0 Number of subtitle stream in the video Still image export: From Amped FIVE ver. 26914 report: Image Writer Writes the current image to a new

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
	file. Details: The Image Writer tool encodes the current frame to the specified file with the chosen format. Parameters: • File: ../Cam5-Cam1.tif Path of the image to save. • Format: Tiff Format used to encode the image file. • Quality: 100 Quality of the image to save (the higher it is, the better it is). Used only when saving in Jpeg format. Additional Information: • Frame Position: 31 Position of the saved frame in the input video.

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
NKCNWW	Cam5 video enhancement and export processes: Report Generation: 2025-08-17 13:41:43 Project Name: Author: Description: Software version info: Build date: 20240711 Revision: 34212 Platform: Operating System: Microsoft Windows, 64 bit CPU Model: Intel(R) Core(TM) i9-10920X CPU @ 3.50GHz Project File: Cam1-250817113450.afp Input File Details: Filename: ../soalan/Cam5.mov MD5 Hash Code: af963cea0ed99b48c9fc94f00f4b4515 File Size (bytes): 318837107 Format: mov,mp4,m4a,3gp,3g2,mj2 Codec: h264 Width (pixels): 800 Height (pixels): 600 Fps: 10 Length (frames): 2406 Duration (time): 00:04:00.600 Output File Details: Filename: ../soalan/Cam5-250817134026.mov MD5 Hash Code: 62cac052111a3ba95bf93588bd6513c6 File Size (bytes): 137136453 Format: mov,mp4,m4a,3gp,3g2,mj2 Codec: h264 Width (pixels): 800 Height (pixels): 600 Fps: 10 Length (frames): 2406 Duration (time): 00:04:00.600 Summary: Cam5 Video Loader: Loads a video from file. Contrast Brightness: Adjusts the contrast and brightness values of the image. Video Writer: Writes the current video to a file. Cam5 Video Loader Loads a video from file. Details: The Video Loader decodes a standard-format video file into a sequence of frames that can be displayed and processed. Parameters: File: soalan/Cam5.mov Path of the video to load. Video Engine: FFMS with Audio Video decoder to use. Color Range: From File Uses the color range specified in the video file or force it to full or limited (16-235). Works only with the FFMS Video Engine. Chroma Upsampling: Accurate Rounding (Slower) Selects the chroma upsampling method. Use Accurate Rounding for a more robust interpolation of color information and Standard Rounding or Nearest for faster decoding. Applies only to FFMS-based video engines. Audio Stream: 1 Audio Stream selection, useful when multiple streams are available. Add Video Frames: false Adds video frames at the beginning or end of the clip to retain sync with the audio stream. Added Frames Color: #000000 The color of the frames added at the beginning or end of the clip. Frames added at the beginning: 0 Number of video frames to be added at the beginning of the clip in order to retain audio sync. Frames added at the end: 0 Number of video frames to be added at the end of the clip in order to retain audio sync. Original File: Original video file that has been converted from a proprietary DVR format or otherwise imported. Concatenate File List: List of files that were concatenated as part of the conversion process Additional Information: Video Streams: 1 Number of video streams in the video Audio Streams: 1 Number of audio streams in the video Subtitle Streams: 0 Number of subtitle streams in the video Contrast Brightness Adjusts the contrast and brightness values of the image. Details: Contrast Brightness maps input image values to output image values according to a linear transformation. The mapping involves two operations: multiplication and addition with constants respectively controlled by the Contrast and Brightness parameters. Increasing (or reducing) the Contrast makes the difference between light and dark areas appears sharper (or smoother). Similarly, increasing (or decreasing) the Brightness makes the overall image appear lighter (or darker). These changes can improve the definition of excessively dark or light areas in the image, but will tend to saturate the image if used in excess. Parameters: Contrast: 69 Extends the intensity difference among pixels (linear gain). Brightness: 0 Adds or subtracts an offset to image pixels (bias). Mode: Linear The domain in which the image is mapped to. The Linear mode is the standard mode. The Logarithmic mode retains the black and white points and therefore prevents saturation. Selection: Whole Image The selection where the filter is applied to. It may be the whole image, a static region, or a region containing a tracked object of interest. Additional Information: This filter has no additional information. References: Anil. K. Jain, "Fundamentals of Digital Image Processing", Prentice Hall, pp. 234–241, 1989. ISBN: 0-13-336165-9. Vasile Patraşcu and Vasile Buzuloiu, "The affine transforms for image enhancement in the context of logarithmic models", in Proceedings of the International Conference on Computer Vision and Graphics, Vol. 2, pp. 596–601, September 2002. Video Writer Writes the current video to a file. Details: The Video Writer tool encodes all frames of the current clip to the specified video file format. Parameters: File: soalan/Cam5-250817134026.mov Path of the file to save. Container and Video Codec: mov - H264 Container and codec used to store the media stream(s). Audio Codec: Raw PCM (Uncompressed) Codec used to write the audio stream. Frame rate: 10 Frame rate (in frames per second) of the output video. Note that some video formats support only a limited set of frame rates, and the frame rate may influence some properties of the output video (e.g. the GOP size) for some codecs. Quality: Default If a codec with quality control has been selected, the following options can be selected: Default: Uses a Constant Rate Factor of 18 High: Uses a Constant Rate Factor of 12 Visually Lossless: Uses a Constant Rate Factor of 1 HW Acceleration: None Enables encoding acceleration of the on-board Graphic

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
	Processing Unit. Acceleration will be tested when the filter is applied. Additional Information: Video Streams: 1 Number of video streams in the video Audio Streams: 1 Number of audio streams in the video Subtitle Streams: 0 Number of subtitle streams in the video Time-aligned composite video preparation and export processes: Amped FIVE Report Report Generation: 2025-08-17 13:14:54 Project Name: Author: Description: Software version info: Build date: 20240711 Revision: 34212 Platform: Operating System: Microsoft Windows, 64 bit CPU Model: Intel(R) Core(TM) i9-10920X CPU @ 3.50GHz Project File: Cam1-250817113450.afp Input File Details: Filename: ../Cam1-250817113450.mov MD5 Hash Code: 3cdf3c271990ed5101e1dcad21eb1a18 File Size (bytes): 2504334 Format: mov,mp4,m4a,3gp,3g2,mj2 Codec: h264 Width (pixels): 800 Height (pixels): 600 Fps: 10 Length (frames): 46 Duration (time): 00:00:04.600 Filename: ../Cam5-250817105706-250817113752.mov MD5 Hash Code: d32221862cf80724fa7014b52e363872 File Size (bytes): 2017274 Format: mov,mp4,m4a,3gp,3g2,mj2 Codec: h264 Width (pixels): 800 Height (pixels): 600 Fps: 10 Length (frames): 34 Duration (time): 00:00:03.400 Filename: ../soalan/Cam5.mov MD5 Hash Code: af963cea0ed99b48c9fc94f00f4b4515 File Size (bytes): 318837107 Format: mov,mp4,m4a,3gp,3g2,mj2 Codec: h264 Width (pixels): 800 Height (pixels): 600 Fps: 10 Length (frames): 2406 Duration (time): 00:04:00.600 Output File Details: Filename: ../soalan/Cam5.mov MD5 Hash Code: af963cea0ed99b48c9fc94f00f4b4515 File Size (bytes): 318837107 Format: mov,mp4,m4a,3gp,3g2,mj2 Codec: h264 Width (pixels): 800 Height (pixels): 600 Fps: 10 Length (frames): 2406 Duration (time): 00:04:00.600 Summary: Cam1-250817113450 Video Loader: Loads a video from file. Cam5-250817105706-250817113752 Video Loader: Loads a video from file. Cam5 Video Loader: Loads a video from file. Contrast Brightness: Adjusts the contrast and brightness values of the image. Chain Multiview: Displays multiple chains (including their individual filters) simultaneously on a grid. Supports synchronization of streams. Chain Multiview: Displays multiple chains (including their individual filters) simultaneously on a grid. Supports synchronization of streams. Chain Timeline: Displays multiple chains (including their individual filters) in sequence. Chain Multiview: Displays multiple chains (including their individual filters) simultaneously on a grid. Supports synchronization of streams. Cam1-250817113450 Video Loader Loads a video from file. Details: The Video Loader decodes a standard-format video file into a sequence of frames that can be displayed and processed. Parameters: File: Cam1-250817113450.mov Path of the video to load. Video Engine: FFMS Video decoder to use. Color Range: Full Uses the color range specified in the video file or force it to full or limited (16-235). Works only with the FFMS Video Engine. Chroma Upsampling: Accurate Rounding (Slower) Selects the chroma upsampling method. Use Accurate Rounding for a more robust interpolation of color information and Standard Rounding or Nearest for faster decoding. Applies only to FFMS-based video engines. Audio Stream: None Audio Stream selection, useful when multiple streams are available. Add Video Frames: false Adds video frames at the beginning or end of the clip to retain sync with the audio stream. Added Frames Color: #000000 The color of the frames added at the beginning or end of the clip. Frames added at the beginning: 0 Number of video frames to be added at the beginning of the clip in order to retain audio sync. Frames added at the end: 0 Number of video frames to be added at the end of the clip in order to retain audio sync. Original File: Original video file that has been converted from a proprietary DVR format or otherwise imported. Concatenate File List: List of files that were concatenated as part of the conversion process Additional Information: Video Streams: 1 Number of video streams in the video Audio Streams: 0 Number of audio streams in the video Subtitle Streams: 0 Number of subtitle streams in the video Cam5-250817105706-250817113752 Video Loader Loads a video from file. Details: The Video Loader decodes a standard-format video file into a sequence of frames that can be displayed and processed. Parameters: File: Cam5-250817105706-250817113752.mov Path of the video to load. Video Engine: FFMS with Audio Video decoder to use. Color Range: Full Uses the color range specified in the video file or force it to full or limited (16-235). Works only with the FFMS Video Engine. Chroma Upsampling: Accurate Rounding (Slower) Selects the chroma upsampling method. Use Accurate Rounding for a more robust interpolation of color information and Standard Rounding or Nearest for faster decoding. Applies only to FFMS-based video engines. Audio Stream: 1 Audio Stream selection, useful when multiple streams are available. Add Video Frames: false Adds video frames at the beginning or end of the clip to retain sync with the audio stream. Added Frames Color: #000000 The color of the frames added at the beginning or end of the

TABLE 2

Question 2- 1 : Enhanced Video Examination

WebCode	Response
	clip. Frames added at the beginning: 0 Number of video frames to be added at the beginning of the clip in order to retain audio sync. Frames added at the end: 0 Number of video frames to be added at the end of the clip in order to retain audio sync. Original File: Original video file that has been converted from a proprietary DVR format or otherwise imported. Concatenate File List: List of files that were concatenated as part of the conversion process Additional Information: Video Streams: 1 Number of video streams in the video Audio Streams: 1 Number of audio streams in the video Subtitle Streams: 0 Number of subtitle streams in the video Cam5 Video Loader Loads a video from file. Details: The Video Loader decodes a standard-format video file into a sequence of frames that can be displayed and processed. Parameters: File: soalan/Cam5.mov Path of the video to load. Video Engine: FFMS with Audio Video decoder to use. Color Range: From File Uses the color range specified in the video file or force it to full or limited (16-235). Works only with the FFMS Video Engine. Chroma Upsampling: Accurate Rounding (Slower) Selects the chroma upsampling method. Use Accurate Rounding for a more robust interpolation of color information and Standard Rounding or Nearest for faster decoding. Applies only to FFMS-based video engines. Audio Stream: 1 Audio Stream selection, useful when multiple streams are available. Add Video Frames: false Adds video frames at the beginning or end of the clip to retain sync with the audio stream. Added Frames Color: #000000 The color of the frames added at the beginning or end of the clip. Frames added at the beginning: 0 Number of video frames to be added at the beginning of the clip in order to retain audio sync. Frames added at the end: 0 Number of video frames to be added at the end of the clip in order to retain audio sync. Original File: Original video file that has been converted from a proprietary DVR format or otherwise imported. Concatenate File List: List of files that were concatenated as part of the conversion process Additional Information: Video Streams: 1 Number of video streams in the video Audio Streams: 1 Number of audio streams in the video Subtitle Streams: 0 Number of subtitle streams in the video Contrast Brightness Adjusts the contrast and brightness values of the image. Details: Contrast Brightness maps input image values to output image values according to a linear transformation. The mapping involves two operations: multiplication and addition with constants respectively controlled by the Contrast and Brightness parameters. Increasing (or reducing) the Contrast makes the difference between light and dark areas appears sharper (or smoother). Similarly, increasing (or decreasing) the Brightness makes the overall image appear lighter (or darker). These changes can improve the definition of excessively dark or light areas in the image, but will tend to saturate the image if used in excess. Parameters: Contrast: 68 Extends the intensity difference among pixels (linear gain). Brightness: -20 Adds or subtracts an offset to image pixels (bias). Mode: Linear The domain in which the image is mapped to. The Linear mode is the standard mode. The Logarithmic mode retains the black and white points and therefore prevents saturation. Selection: Whole Image The selection where the filter is applied to. It may be the whole image, a static region, or a region containing a tracked object of interest. Additional Information: This filter has no additional information. References: Anil. K. Jain, "Fundamentals of Digital Image Processing", Prentice Hall, pp. 234–241, 1989. ISBN: 0-13-336165-9. Vasile Patraşcu and Vasile Buzuloiu, "The affine transforms for image enhancement in the context of logarithmic models", in Proceedings of the International Conference on Computer Vision and Graphics, Vol. 2, pp. 596–601, September 2002. Chain Multiview Displays multiple chains (including their individual filters) simultaneously on a grid. Supports synchronization of streams. Details: The Multiview filter displays multiple chains simultaneously on a grid. Parameters: Rows: 1 The number of rows in the grid layout. Columns: 2 The number of columns in the grid layout. Inputs: - empty - - empty - , The list of filters to display in a grid (NB this list can also be populated by dragging individual filters from the history panel directly into this window) Input Delay: 0 / 0 Two specific positions in the mixed videos to compare. Output Size: Minimum Width and Height The size of each cell in the output grid. Output Mode: Resize with Aspect Ratio Available options if the cell has a different size than the input. Interpolation: Area Interpolation algorithm used when the image is resized. Line Color: #000000 The color of the optional line separating the cells. Line Thickness: 0 The thickness of the optional line separating the cells. Audio Source: No Audio Selects the audio (if available) played in the output video. Additional Information: This filter has no additional information. Chain Multiview Displays multiple chains (including their individual filters) simultaneously on a grid. Supports synchronization of streams. Details: The Multiview filter displays multiple chains simultaneously on a grid. Parameters: Rows: 1 The number of rows in the grid layout. Columns: 2 The number of columns in the grid layout. Inputs: Cam5-250817105706-250817113752 - Video Loader - 2 Cam1-250817113450 - Video

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
	Loader - 1, The list of filters to display in a grid (NB this list can also be populated by dragging individual filters from the history panel directly into this window) Input Delay: 0 / 0 Two specific positions in the mixed videos to compare. Output Size: Minimum Width and Height The size of each cell in the output grid. Output Mode: Resize with Aspect Ratio Available options if the cell has a different size than the input. Interpolation: Area Interpolation algorithm used when the image is resized. Line Color: #000000 The color of the optional line separating the cells. Line Thickness: 0 The thickness of the optional line separating the cells. Audio Source: Cam5-250817105706-250817113752 - Video Loader - 2 Selects the audio (if available) played in the output video. Additional Information: This filter has no additional information. Chain Timeline Displays multiple chains (including their individual filters) in sequence. Details: The Timeline filter displays multiple chains (including their individual filters) videos one after another in sequence. Parameters: Inputs: Cam1-250817113450 - Video Loader - 1 Cam1-250817113450 - Video Loader - 1 Cam5-250817105706-250817113752 - Video Loader - 2, The list of filters to display in sequence (NB this list can also be populated by dragging individual filters from the history panel directly into this window) Output Size: Maximum Width and Height The size of each cell in the output grid. Output Mode: Resize with Aspect Ratio Available options if the cell has a different size than the input Interpolation: Bicubic Interpolation algorithm used when the image is resized. Additional Information: This filter has no additional information. Chain Multiview Displays multiple chains (including their individual filters) simultaneously on a grid. Supports synchronization of streams. Details: The Multiview filter displays multiple chains simultaneously on a grid. Parameters: Rows: 1 The number of rows in the grid layout. Columns: 2 The number of columns in the grid layout. Inputs: Cam5-250817105706-250817113752 - Video Loader - 2 Cam1-250817113450 - Video Loader - 1, The list of filters to display in a grid (NB this list can also be populated by dragging individual filters from the history panel directly into this window) Input Delay: 0 / 0 Two specific positions in the mixed videos to compare. Output Size: Minimum Width and Height The size of each cell in the output grid. Output Mode: Resize with Aspect Ratio Available options if the cell has a different size than the input. Interpolation: Area Interpolation algorithm used when the image is resized. Line Color: #000000 The color of the optional line separating the cells. Line Thickness: 0 The thickness of the optional line separating the cells. Audio Source: No Audio Selects the audio (if available) played in the output video. Additional Information: This filter has no additional information. use video writer to eksport the video Still image export: Amped FIVE Report Report Generation: 2025-08-17 13:44:46 Project Name: Author: Description: Software version info: Build date: 20240711 Revision: 34212 Platform: Operating System: Microsoft Windows, 64 bit CPU Model: Intel(R) Core(TM) i9-10920X CPU @ 3.50GHz Project File: Cam1-250817113450.afp Input File Details: Filename: ../Question B side by side videoCam5-250817105706-250817113752-250817123600.mov MD5 Hash Code: 0f444055bb5150e25fd1d0776cd3c6c2 File Size (bytes): 4376660 Format: mov,mp4,m4a,3gp,3g2,mj2 Codec: h264 Width (pixels): 1600 Height (pixels): 1200 Fps: 10 Length (frames): 46 Duration (time): 00:00:04.600 Output File Details: Filename: ../Question B side by side videoCam5-250817105706-250817113752-250817123600-250817134421.tif MD5 Hash Code: f0630a081a809c9cc064df3ea7168fe3 File Size (bytes): 1475580 Format: tif Width (pixels): 1600 Height (pixels): 1200 Summary: Question B side by side videoCam5-250817105706-250817113752-250817123600 Video Loader: Loads a video from file. Image Writer: Writes the current image to a new file. Question B side by side videoCam5-250817105706-250817113752-250817123600 Video Loader Loads a video from file. Details: The Video Loader decodes a standard-format video file into a sequence of frames that can be displayed and processed. Parameters: File: Question B side by side videoCam5-250817105706-250817113752-250817123600.mov Path of the video to load. Video Engine: FFMS with Audio Video decoder to use. Color Range: Full Uses the color range specified in the video file or force it to full or limited (16-235). Works only with the FFMS Video Engine. Chroma Upsampling: Accurate Rounding (Slower) Selects the chroma upsampling method. Use Accurate Rounding for a more robust interpolation of color information and Standard Rounding or Nearest for faster decoding. Applies only to FFMS-based video engines. Audio Stream: 1 Audio Stream selection, useful when multiple streams are available. Add Video Frames: false Adds video frames at the beginning or end of the clip to retain sync with the audio stream. Added Frames Color: #000000 The color of the frames added at the beginning or end of the clip. Frames added at the beginning: 0 Number of video

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
	frames to be added at the beginning of the clip in order to retain audio sync. Frames added at the end: 0 Number of video frames to be added at the end of the clip in order to retain audio sync. Original File: Original video file that has been converted from a proprietary DVR format or otherwise imported. Concatenate File List: List of files that were concatenated as part of the conversion process Additional Information: Video Streams: 1 Number of video streams in the video Audio Streams: 1 Number of audio streams in the video Subtitle Streams: 0 Number of subtitle streams in the video Image Writer Writes the current image to a new file. Details: The Image Writer encodes the current frame to the specified file in the chosen format. Parameters: File: Question B side by side videoCam5-250817105706-250817113752-250817123600-250817134421.tif Path of the image to save. Format: Tiff Format used to encode the image file. Additional Information: Frame Position: 8 Position of the saved frame in the input video.
P9VYXR	Cam5 video enhancement and export processes: 1. import to "Adobe Premiere Pro CC2022 2. apply "Levels" filter. 3. Apply "Shadows & Highlights" filter. 4. Export Video using "Adobe Media Encoder" Format "Quick Time" with uncompressed RGB 8Bit and Audio Uncompressed. 5. Converting Exported file to MKV H.264 Time-aligned composite video preparation and export processes: 1. Open new Sequence in the project using "Adobe Premiere Pro CC2022" - Parameters: Frame size 1600x600 Pixel and Frame Rate: 10 FPS. 2. Import "Cam1.mov" + enhanced file "Cam5.mov" to the new sequence: "Cam5" - Layer1 / "Cam1" - Layer2. 3. Using the Motion tool I Placed "Cam5" on the left side of the screen and "Cam1" on the right of the screen. 4. Synchronizing the files was on base of the internal clock stamp of both files. Still image export: 1. Export Frame using "Export Media" Command and selecting "BMP" format 2. the approximate time of the collision (according to the time stamp) is "15:30:49"
PCVAUR	Cam5 video enhancement and export processes: The file Cam5.mov was loaded into Amped FIVE. Filters CLAHE, Deblocking and Global Stabilization were applied. A .mov file of the enhanced video was exported from Amped FIVE with H.264 video encoding and uncompressed/PCM audio encoding. Time-aligned composite video preparation and export processes: The direct Cam1.mov file and the enhanced Cam5.mov file were loaded into Amped FIVE. Range selector was used to select frames 1561 to 1630 (15:30:46 to 15:30:52) from Cam1 and Cam5. A composite video was generated with the cam5 video on the left half and Cam1 video on the right half. The video was exported as a .mov file with H.264 encoding and uncompressed/PCM audio encoding. Still image export: The composite video was loaded into Amped FIVE. The Select Frames filter was used to select frame 31. The approximate time of the accident at the selected frame was 15:30:49 on 09-22-2015.
PGA8YT	Cam5 video enhancement and export processes: Refer to attached PDF report from Amped FIVE Time-aligned composite video preparation and export processes: Refer to attached PDF report from Amped FIVE Still image export: Refer to attached PDF report from Amped FIVE
PJVR6X	Cam5 video enhancement and export processes: Video from camera 5 processed with Amped 5 (Revision 25587), the following filters were utilized to enhance the submitted video; levels, white balance, automatic color equalization, and contrast brightness. See uploaded report for filter values. Time-aligned composite video preparation and export processes: Video temporally synced in Amped 5, Camera 5 was determined to have no offset. The video from camera 1 and 5 were placed side by side using the multiplexer tool in Amped 5. The requested point of impact was determined to be at frame min, the video was clipped at frame min and frame min which provided a new video multiplexed of frames min long. This video was exported in the requested format of MOV (H264 encoding) with an uncompressed audio to produce file "Cam5-1 Multiview.mov" Still image export: The Multiview video was processed and an image in TIF format was produced of the vehicle impact. The image produced was of the time frame 2015-09-22 15:30:49, frame 60 of the video "Cam 5-1 Multiview.mov".

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
PVB JUR	Cam5 video enhancement and export processes: Time-aligned composite video preparation and export processes: Still image export: [Participant did not provide responses in this section of the Data Entry Form. An Amped Five report was uploaded with submitted files.]
QGPQJQ	Cam5 video enhancement and export processes: Adobe Premiere Pro (version 25.3.0) Add Cam5.mov video to a 10fps (800x600) sequence. Lumetri Color - Light and Curves adjustments (see two screenshots included with submitted files for details) Unsharp Mask - Amount: 68.0 Radius 1.000 Threshold: 0.00 Export: Format - QuickTime Video Codec - H.264 Audio Codec - Uncompressed File - "Cam5_Enhanced Video.mov" Time-aligned composite video preparation and export processes: Adobe Premiere Pro (version 25.3.0) Add Cam5.mov video to a 10fps (1920x1080) sequence. Lumetri Color - Light and Curves adjustments (see two screenshots included with submitted files for details) Unsharp Mask - Amount: 68.0 Radius 1.000 Threshold: 0.00 Add Cam1.mov video to the sequence. Move video positions so Cam5.mov is on the left and Cam1.mov is on the right. Adjust Cam1.mov video track one frame later (to the right) of the Cam5.mov video track. (Based on Cam1.mov frame 1594 showing objects inside the bus moving and damage on the second vehicle already visible and Cam5.mov frame 1594 showing a quick downward movement. Confirmed based on Cam1.mov frames 1614 and 1615 showing the bus shifting upward and Cam5.mov frames 1615 and 1616 showing the bus shifting upward.) Mark an In Point that was 3 seconds prior to the time of the collision and an Out Point that was 3 seconds after the time of the collision. Export: In to Out Points Format - QuickTime Video Codec - H.264 Audio Codec - Uncompressed File - "Side-by-Side Video.mov" Still image export: Adobe Premiere Pro (version 25.3.0) Export the video frame from the Side-by-Side Video which represents frame 1593 from Cam1.mov and frame 1594 from Cam5.mov. Export as a .tif file with no additional compression or adjustments applied.
QTYDLX	Cam5 video enhancement and export processes: Amped FIVE version 33279 has been used for this enhancement. The file has been loaded into Amped FIVE and Histogram Equalisation and Parametric Curves filters have been applied to improve the image contrast and adjust tonal values. A resize has been applied for presentation due to the low quality of the video and the pixel dimensions. Further minor adjustments have been made to improve the video quality and the file has been exported using the Video Writer. An Amped FIVE report has been uploaded outlining the steps. Time-aligned composite video preparation and export processes: Amped FIVE version 33279 has been used to prepare this side by side video. The Video Mixer filter has been applied and the files have been set in their relevant positions. An Undistort filter has been used to create a border for presentation, the requested range of frames has been set using the Range Select filter and the Video Writer filter has been used to export the file. An Amped FIVE report has been uploaded outlining the steps. Still image export: The still image has been exported from the composite video and shows the collision from the viewpoints of Camera 5 and Camera 1. The still was produced using Amped FIVE version 33279 and has been exported in a Bitmap format to retain image quality. An Amped FIVE report has been uploaded outlining the steps.
R8V32T	Cam5 video enhancement and export processes: Attached: [Laboratory]-2.1 Enhancement Settings.png Time-aligned composite video preparation and export processes: Attached: [Laboratory]-Collision Enhancement Composite.mov Still image export: Attached: [Laboratory]-Exported Frame_Time of Collision.png

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
R8VZCN	Cam5 video enhancement and export processes: Tool used: AmpedFIVE (Build: 20250618, Revision: 37757) Imported the working copy of Cam5.mov into Amped FIVE and obtained recording properties. Utilized the Levels filter to adjust intensity and color levels of the video. Applied the Global Stabilization filter to stabilize the overall scene of the shaking video. Exported clarified video as 25-5581_Cam5_Clarified_Video-AMC.mkv, with H.264 video encoding and uncompressed/PCM audio encoding. See uploaded Amped FIVE report, 25-5581_AF_Project.pdf, for additional information. Time-aligned composite video preparation and export processes: Tool used: Amped FIVE (Build: 20250618, Revision: 37757) Located the approximate time of the accident in both videos at the displayed timestamp: 2015-09-22 15:30:49. (CAM 1 - frame 1593, CAM 5 - frame 1592) As per the instructions from CTS, selected the range of video starting approximately 3 seconds prior to and ending 3 seconds after the accident, using the Range Selector filter. The range begins at the first frame of the timestamp: 15:30:46 and ends at the last frame of the timestamp: 15:30:52, in both videos. (Frames 1561 - 1630) Applied the Multiview filter to display the time-aligned videos side-by-side with Cam 5 view on the left and Cam 1 view on the right. Exported the resulting video as 25-5581_Time-aligned_Video-AMC.mkv, with H.264 encoding and uncompressed/PCM audio encoding. See uploaded Amped FIVE report, 25-5581_AF_Project.pdf, for additional information. Still image export: Tool used: Amped FIVE (Build: 20250618, Revision: 37757) Reviewed the time-aligned videos and located the approximate time of the accident at frame 31, with the displayed timestamp: 2015-09-22 15:30:49. Utilized the Image Writer option to export a still image as 25-5581_Still_Image-AMC.bmp. See uploaded Amped FIVE report, 25-5581_AF_Project.pdf, for additional information.
RFP8UU	Cam5 video enhancement and export processes: I used the 'Levels Adjustment' filter in 'Amped FIVE'. I then exported the enhanced video from 'Amped FIVE' as a h264 .mov file with uncompressed PCM audio encoding. Please see attached 'Amped FIVE' report. Time-aligned composite video preparation and export processes: I used Adobe Premiere Pro to perform the time alignment of Camera view 5 and Camera view 1, and edited the footage down to 3 seconds prior to the collision and 3 seconds after it. I then exported the time aligned clips as an h264 .mov file with uncompressed PCM audio encoding. Still image export: I exported a still image from Adobe Premiere Pro in PNG (Portable Network Graphics) format, to preserve the best image quality at the approximate time of impact: 2015-09-22 15:30:49
TUZ7EL	Cam5 video enhancement and export processes: I used Amped FIVE revision 37757 to apply filters in the order below to the Cam5.mov file. I attached the report from Amped FIVE report with the filters and settings used as file as "Cam1 and Cam5.pdf". Below is a summary. 1. Contrast Brightness filter • +75 contrast and -24 brightness, applied in Linear mode 2. Resize filter • 2X resize to 1600x1200, with Bilinear interpolation 3. Laplacian Sharpening filter • 0.3 strength, Intensity mode 4. Video Writer filter with settings below • MOV container • H264 video codec • Raw PCM (Uncompressed) audio codec Time-aligned composite video preparation and export processes: I used Adobe Premiere Pro version 24 to create the composite video. 1. I imported the original Cam1.mov file and the Cam5 enhanced video file that I produced. 2. I created a new sequence that was 1600x1200-pixels and 10 FPS, with 32 kHz, Mono audio. 3. I placed the Cam5 enhanced video and (non-enhanced) audio on the timeline at frame 0 and resized the video to 50%. I moved the video image so the left edge of the video was aligned with the left edge of the sequence video. 4. I placed the Cam1 video on the timeline at frame 0 in a track above the Cam5 video. I moved the video image so that the right edge was aligned to the right edge of the sequence video. 5. I marked the sequence with in and out marks for the three seconds prior to and three seconds after the collision occurs on the Cam1.mov video. 6. I checked that the videos were aligned in time at the time of the collision based on the visible time on each video and the events in the video. 7. I exported out the composite video sequence for the marked in and out points as an MOV file with the H.264 codec for video; the audio was exported as uncompressed 32 kHz, 16-bit, mono PCM. Still image export: 1. I used the snapshot button in the Program Monitor of Premiere Pro to save the frame of interest from the Composite sequence as a PNG file. 2. I used Adobe Photoshop to remove the transparency of the PNG file by applying a black background layer and flattening the image.

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
UENUMR	Cam5 video enhancement and export processes: Please see [Laboratory]-Screenshot 2025-07-10 090125.jpg (uploaded) taken from exam notes with images. Time-aligned composite video preparation and export processes: Please see [Laboratory]-Screenshot 2025-07-10 090151.jpg (uploaded) taken from exam notes with images. Still image export: In premiere Pro, a snapshot of the footage 'Composite_Export.mov' was saved using the Export frame tool and saved as 'Part C - Composite_Frame Export.bmp'.

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
UJWFBP	Cam5 video enhancement and export processes: 1. Using Amped FIVE: 1.1 Apply Video Loader filter (FFMS with Audio) to import Cam5.mov. 1.2 Apply Levels filter (Highlights: 187, Midtones: 153, Shadows: 119) to normalize the dynamic range. 1.3 Apply Retinex filter (10 iterations) to balance the illumination. 1.4 Apply Laplacian Sharpening filter (Strength: 0.2, Intensity mode) to enhance edges. 1.5 Apply Video Writer (Container: MKV; Video: H.264, Visually Lossless, 10 FPS) to save Cam5_clarified_1.mkv. 2. Use FFmpeg to multiplex the clarified video stream from Cam5_clarified_1.mkv and the audio stream from Cam5.mov. 2.1 Apply the command "ffmpeg -i Cam5_clarified_1.mkv -i Cam5.mov -map 0:v -map 1:a -c:v copy -c:a copy [Laboratory]-25-0075_Cam5_clarified.mov" 3. Checking the output file in Adobe Audition reveals no delay or truncation of the audio stream. Time-aligned composite video preparation and export processes: 1. In Amped FIVE, review both videos, Cam5.mov and Cam1.mov. 1.1 Note that the collision occurs at approximately frame 1592 in each video. 1.2 In Advanced File Info, export the Frame Analysis data for both videos to a spreadsheet. 1.3 Note that the MPEG-4 PTS data for both videos is exactly 0.1 seconds for every frame, without variation. This suggests that the PTS data is not coming from a clock source but is being calculated from an assumed constant frame rate. 1.4 Note that for Cam5.mov, the on-screen date/time (OSD) is consistently 10 frames per OSD clock second, consistent with the PTS data. 1.5 Note that for Cam1.mov, the OSD is not consistent with the PTS data. In the portion spanning the collision, the OSD varies between 9 and 11 frames per OSD second. 2. In Adobe Audition, review Cam5.mov to determine the moment of impact. 2.1 The impact can be heard at 02:39.168 elapsed time. 2.2 This occurs during frame 1591 of Cam5.mov, which is the first frame in which the OSD is showing "15:30:49". 2.3 Three seconds prior would be "15:30:46" which first appears in the Cam5 OSD in frame 1561, starting at elapsed time 02:36.1. 2.4 Three seconds after would be "15:30:52" which first appears in the Cam5 OSD in frame 1621, ending at elapsed time 02:42.2. 2.5 Select the waveform segment from 02:36.1 to 02:42.2 and save to the new file Cam5_audio_segment2.wav. 3. In Excel: 3.1 Note the OSD clock time for each frame that spans "15:30:46" and "15:30:52". This span is 61 frames of Cam5 and 60 frames of Cam1. 3.2 Note that both camera views demonstrate repeat frames at a cadence of every 16 - 18 frames in the segment spanning the collision. 3.3 The segment from each camera starts at the same elapsed time, 02:36.1, however, due to the variable OSD frame rate of Cam1, 26 frames are out of sync with Cam5. 3.4 Given, the stability of Cam5, use it as the reference timing source. 3.5 To keep the OSD clocks synchronized between camera views, the following adjustments to Cam1 need to be made: Eliminate duplicate frames 1574 and 1591. Repeat frames 1569, 1589, and 1619. This results in the OSD clocks remaining in sync throughout the video without the loss of any unique image frames, and reduces the number of frames out of sync in elapsed time to nine. 4. In Amped FIVE: 4.1 Apply a Range Selector to the Cam1 chain to select frames 1561 to 1620. 4.2 Apply a Sequence Writer to write the frames out to the files Cam1-1561.png through Cam1-1620.png. 5. In Windows Explorer: 5.1 Delete files Cam1-1574.png and Cam1-1591.png. 5.2 Copy file Cam1-1569.png to Cam1-1569a.png. 5.3 Copy file Cam1-1589.png to Cam1-1589a.png. 5.4 Copy file Cam1-1619.png to Cam1-1619a.png. 6. In Adobe Bridge, rename the modified Cam1 sequence to Cam1A-1561.png through Cam1A-1621.png. 7. In Amped FIVE: 7.1 Create a new chain "Cam1 Adjusted" by applying a Sequence Loader on the Cam1A images. 7.2 Apply a Range Selector to the Cam5 chain to select frames 1561 to 1621. 7.3 Create a new "Composite" chain by applying a Multiview filter. Set it for a 1x2 grid, choosing the clarified Cam5 subrange on the left and the "Cam1 Adjusted" chain on the right. Manually confirmed that OSDs are in sync. 7.4 Add a Video Writer (H.264, Visually Lossless, 10 FPS) to the end of the Composite chain to create the file Composite_video_only.mov. 8. Use FFmpeg to multiplex the Composite_video_only.mov video stream and the Cam5_audio_segment2.wav audio stream. 8.1 Apply the command "ffmpeg -i Composite_video_only.mov -i Cam5_audio_segment2.wav -map 0:v -map 1:a -c:v copy -c:a copy [Laboratory]-25-0075_Composite_segment.mov" 9. Checking the output file in Adobe Audition reveals no delay or truncation of the audio stream. Still image export: 1. In Amped FIVE: 1.1 Disable the Video Writer filter of the "Composite" chain created above. 1.2 Set the timeline to frame 31 of 61. 1.3 Apply a Image Writer filter to save file "[Laboratory]-25-0075_Composite_collision.png".

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
W9CNYK	Cam5 video enhancement and export processes: Axon Investigate v.4.4.1 software Examine the Cam5 video file for possible playback issues and enhancement options. Used Levels filter enhancement (see History Report) and exported requested MKV video file with H.264 video encoding and uncompressed/PCM audio encoding. Examined exported MKV video file for correct playback and desired enhancement. Time-aligned composite video preparation and export processes: Axon Investigate v.4.4.1 software Examined the Cam1 video file for possible playback issues. None found, so proceeded to create the short video clips requested from Cam1 and Cam5 video files. Marked the approximate point of collision on the two video files. Used Multi-Cam Canvas filter (see History Report) to combine the Cam1 and Cam5 short video clips and exported requested MKV video file with H.264 video encoding and uncompressed/PCM audio encoding. Examined exported MKV multi-cam video file for correct playback and desired result. Still image export: Axon Investigate v.4.4.1 software Returned to marked point in the canvas video which the approximate collision occurred. Exported a single BMP image (see History Report).
X7EUEL	Cam5 video enhancement and export processes: amped five-link-video mixer Time-aligned composite video preparation and export processes: 1:19 selected frames-crop Still image export: [Laboratory] bookmark
X97VHN	Cam5 video enhancement and export processes: Amped5>Unsharp Masking>Automatic Color Equalization Time-aligned composite video preparation and export processes: Frame Comparison>Snapshot Still image export: Snapshot
XJRW2J	Cam5 video enhancement and export processes: Amped FIVE 34212 Correct Fisheye/Mapping function: Stereographic/Focal Length: 0.6240/Field of View: 87/Canvas Size: 1.4000/Interpolation: Bicubic/Background Color: #000000/Focal Length Computation: Automatic (From Lines)/Points on Line 1: (464,191) (499,220) (595,286) (669,349)/Points on Line 2: (5,370) (172,372) (358,372) (540,367) (697,362)/Points on Line 3: (5,484) (63,494) (396,514) (608,496) (783,477)/Longitude Correction (degrees): 0/Latitude Correction (degrees): 0/Rotation (degrees): 0 Crop/Selection: x: 25, y: 20, w: 1069, h: 572 Contrast Brightness/Contrast: 40/Brightness: -15/Mode: Linear/Selection: Whole Image Levels/Value: 213,120,67/Red: 255,127,0/Green: 255,127,0/Blue: 255,127,0/Selection: Whole Image Unsharp Masking/Strength: 0.1500/Size: 35/Threshold: 50/Mode: Intensity/Selection: Whole Image Video Writer/Container and Video Codec: mkv – H264/Audio Codec: Raw PCM (Uncompressed)/Frame Rate:10/Quality: Visually Lossless/HW Acceleration: None/ Time-aligned composite video preparation and export processes: Amped FIVE 34212 Multiview/Rows: 1/Columns: 2/Inputs: Cam5 – Unsharp Masking -10, Cam1 – Video Loader – 1/Input Delay: 1 / 0/Output Size: Maximum Width and Height/Output Mode: Pad / Crop/Interpolation: Nearest/Line Color: #FFFFFF/Line Thickness: 1/Audio Source: Cam5 – Unsharp Masking -10 Range Selector/First Frame: 1560/Last Frame: 1621/Step:1 Video Writer/Container and Video Codec: mkv – H264/Audio Codec: Raw PCM (Uncompressed)/Frame Rate:10/Quality: Visually Lossless/HW Acceleration: None/Video Streams: 1/Audio Streams: 1/Subtitle Streams: 0 Still image export: Amped FIVE 34212 Image Writer/Format: Bitmap/Frame Position: 33
XJRYQM	Cam5 video enhancement and export processes: N/A Time-aligned composite video preparation and export processes: N/A Still image export: N/A [Participant did not report enhancement information and did not return any enhanced files.]

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
XPT9WF	Cam5 video enhancement and export processes: "Cam5.mov" opened in VirtualDub v1.10.4. RGB video levels adjusted. deflicker v1.3 filter (from www.rationalqm.us/deflick/flick.html) used to reduce horizontal black bars. Settings for Deflicker as follows: Window size: 50, softening: 30, scene change disabled, interlaced source left unchecked. Saved as an uncompressed 800 x 600 10 fps AVI file, with 48 kHz 16 bit mono PCM audio. Imported into Adobe Premiere Pro v24.5.0 (Build 57). Exported as an H264 Quicktime movie file (800 x 600, 10 fps, 12 Mbps CBR, 48 kHz 16 bit stereo (2-channel) audio). Time-aligned composite video preparation and export processes: "Cam1.mov" and the abovementioned level-adjusted and deflickered uncompressed AVI file imported into Adobe Premiere Pro v24.5.0. Placed side-by-side in a sequence as per instructions. A short portion of this sequence from approximately 15:30:47 to approximately 15:30:54 exported as an H264 Quicktime movie (1600 x 600, 10 fps, 12 Mbps CBR, 48 kHz 16 bit stereo (2-channel) audio). Still image export: 1 x bmp showing the incident of interest was exported from the abovementioned composite video sequence in Premiere Pro.
YER9WG	Cam5 video enhancement and export processes: The video file Cam5.mov was loaded into Amped FIVE (Build Date: 2025-06-18, Revision: 37757). The file's properties were reviewed using the File Info tool and the File Info filter was added to document the file properties in the report. The SHA-256 hash value was generated and verified to confirm the file's integrity. The Levels filter was applied with value settings adjusted to 175, 149, and 124. The enhanced video was then exported using the Video Writer filter, with the output format set to MKV, the video encoded with H.264, and the audio exported as raw PCM (uncompressed). Time-aligned composite video preparation and export processes: Using the same Amped FIVE project, Cam1.mov was loaded. The File Info tool was used to review the file properties, and the File Info filter added to document them. The SHA-256 hash value was generated and verified to confirm the file's integrity. The Multiview filter was used to prepare a side-by-side composite video, with the enhanced Cam5 video placed on the left and Cam1 on the right. A segment was selected using the Range Selector filter, covering the time period from 15:30:46 (frame 1561) to 15:30:52 (frame 1630), which includes approximately three seconds before and after the motor vehicle accident. The composite video was exported using the Video Writer filter with output settings of MKV format, H.264 video encoding, and raw PCM (uncompressed) audio. Still image export: To export a still frame, the Multiview composite video chain was duplicated within the same Amped FIVE project. The Range Selector filter was removed, and the Single Selector filter was applied to select frame 1592, which corresponds to the approximate time of the motor vehicle collision. This frame was exported in BMP format using the Image Writer filter.
YUKZHH	Cam5 video enhancement and export processes: Cam5 video worked on in AmpedFive. Did a Levels adjusted of Highlights of 189, Midtones of 149, Shadows of 116. Written out to a MOV file name: Cam5-250812124814.mov. See also: 2025-Proficiency test-AmpedFive project.pdf Time-aligned composite video preparation and export processes: Used AmpedFive Multiview filter put the two video cameras together. See 2025-Proficiency test-AmpedFive project.pdf, for further details from the program Still image export: Used AmpedFive Image Writer filter put the two export the image. See 2025-Proficiency test-AmpedFive project.pdf, for further details from the program
YW7KML	Cam5 video enhancement and export processes: See Amped FIVE report: Cam5 video enhancement and export process. Time-aligned composite video preparation and export processes: See Amped FIVE report: Time-aligned composite video preparation and export process. Still image export: See Amped FIVE report: Still image Export.
ZE9LZK	Cam5 video enhancement and export processes: n/a Time-aligned composite video preparation and export processes: n/a Still image export: n/a [Participant did not report enhancement information and did not return any enhanced files.]

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	Response
ZWLZHE	Cam5 video enhancement and export processes: - SanDisk USB thumb drive handed to me by PD13188 - photographed and assigned as 25-5581. - Connected 25-5581 to PD86046 LAB PC via writeblocker WB130 (verified for operation using CRU WiebeTech WriteBlock Validation Utility). - Copy and hash logical contents from 25-5581 to PD86046 LAB PC - Teracopy V3.17 - copy process hash verified. - Verify supplied MD5 and SHA256 hash values against supplied ZIP file - matched. - Extract contents of zip file into new working folder (named: 25-5581 Forensic Video Analysis - Test Material - WorkingCopy). - Process Cam5.mov and apply filters using Amped FIVE V36179 (refer Cam05_AmpedFIVE_enhancement_report.pdf). - Summary of Amped FIVE processing applied: Auto Colour Equalisation, Levels adjustment, Unsharp mask. - Export enhanced video as MKV; H264 codec, CRF1, PCM audio (enhanced file name: Cam5_Enhanced.mkv). - Generate MD5 hash on export (MD5: 8F98438746B400B2D94614FD6DC46E5C). - Playback of enhanced file verified using Media Player Classic/same frame count as original file. Time-aligned composite video preparation and export processes: - Process Cam5.mov and Cam1.mov and apply filters using Amped FIVE V36179 (refer Cam05_AmpedFIVE_enhancement_report.pdf). - Generate frame timing information for Cam1.mov and Cam5.mov using Amped FIVE V36179. - Review of frame timing information shows constant frame rate – PTS duration constant. - Visual review of both files for corroborating events to synchronise vision. No definitive synchronise point identified, approximate corroborating points identified at frame 1129 & 1593 on both files (Frame 1129 – bus is stationary then accelerates / Frame 1593 – bus crashes into vehicle). - Add text overlay to both files displaying frame number and frame type – positioned bottom left of each file. - Synchronise both files commencing at frame 0 – no frame offset between files applied (both corroborating points appear to be within 1 frame accuracy). - Range selector applied from frame 1562 to frame 1623 to show approx. 3 seconds pre and post incident. - Export composite as MKV; H264 codec, CRF1, PCM audio (Filename: Cam05_Cam01_Composite.mkv). - Generate MD5 hash on export (MD5: d61b2f8ceded6463f62e8a342bad2f02). - Playback of composite file verified using Media Player Classic. Still image export: - Select frame 1593 from time-aligned composite video (Cam05_Cam01_Composite.mkv). - Export as BMP from Amped FIVE. - Generate MD5 hash on export (MD5: 46885e2c1b3f6af763a874be88999d73). - Playback of BMP picture verified using Windows Preview.

Question 2-1: Note method(s) or tool(s) used and settings for the following: (You may submit reports or screen shots of filters and settings)

- Cam5 video enhancement and export processes
- Time-aligned composite video preparation and export processes
- Still image export

Consensus Result: This was a free form question on methods and tools used. No consensus response is expected.

TABLE 2

Question 2- 2 : Enhanced Video Examination

Question 2-2: Note the margin of error of your approximate time alignment of camera views 5 and 1 in terms of (1) plus/minus frames and frame rate, or (2) plus/minus time (in seconds).

Manufacturer's +/- 1 frame at 10 FPS, or +/- 0.1 seconds

Response:

WebCode	Response
23NUPF	On both Cam 1 MOV and Cam5 MOV files the moment of collision was recorded on frame 1593. Which corresponds to the time 15:30:48 $\pm$ 0.1 s.
2E4JNK	+/- 1 frame or +/- 0.1 seconds
3RLTPG	1 frame
3U7RXL	0.05 fps (Attach as a file (Part 2 Analysis Report (Participant Code).pdf))
4DJMBC	This is not an expected calculation of our agency. Any necessary calculations would be noted in our SOPs.
4HBQ4F	We haven't noted frame rate errors in time alignment process. Video Cam 5 is 4 frames longer than Cam 1.
69HX8A	+/- 1 frame (200ms range)
6E7K3E	[No Margin of Error Reported.]
6GWL7H	plus/minus 1 frames, plus/minus 0.1 seconds
6HTZTA	Approximately, there's a +0.006 second time difference between camera 5 and camera 1 (00:00:00:06 in hh:mm:ss.ms)
6XLRDB	Plus/minus .1 seconds
77DR69	This question is outside the scope of services provided by this laboratory.
78RYTB	the laboratory does not report this information
7W7VLC	Approximate error: 1 frame (10 fps).
89E4FG	plus / minus 0.004 seconds
AEXYFA	[No Margin of Error Reported.]
AGKJLD	Margin of error plus/minus 1 second.
AV6YND	Margin of error is very minimal as Cam 5 possibly has slightly higher frame rate (by 1 fps). Notably visible during the accident where the bus hit the vehicle on Cam 5 first even though timestamp is in sync
AVHPF9	+/- 1 frames at 10 fps
AWD9GB	The original footage near the time of the collision of cam5 (the full second) at 15:38:48 has 10 frames with no duplicate frames and at 15:38:49 (the full second) has 10 frames including 1 duplicate frame. The original footage near the time of the collision of cam1 (the full second) at 15:38:48 has 9 frames with no duplicate frames and at 15:38:49 (the full second) has 11 frames including 1 duplicate frame. On average cam5 footage is 1 frame behind cam1 footage. The aligned output file 'Cam5_Cam1_Aligned_H.264.mov' has a sequence setting of 30fps. Cam5 footage is 1 (nonduplicate) frame behind Cam1 footage at the time of collision.
AY6AKD	0.1 fps
B3XQAC	0 frames/seconds

TABLE 2

Question 2- 2 : Enhanced Video Examination	
WebCode	Response
B667J4	Given there is no visual reference shared between files that can be used as a datum, the OSD was assumed to be the common point of reference. During spot checking of the Multiview file, it appears that the change in second position of time occasionally varies by 1 frame between videos. Conservatively, the error in alignment can be assumed to be up to 2 frame misalignment.
BLPWH3	Cam1 and 5 can be plus/minus 1 frame and 10FPS. Throughout playback of the side by side there appears to be very little error apart from Camera 1 potentially become 1 frame ahead in parts of the footage.
BMKFK4	N/A This laboratory does not report margin of error. This is no guidance or SOPs for reporting out margin of error.
C6WL96	+/- 1 frame at 10 fps. See Additional Comments.
C9J7DA	Margin of error is ± 1 frame: the 2 cameras do not cover the same field of view, so the precise moment of impact does not appear on both cameras at the same time, they are approx. 1 frame apart. Cam 5 is facing forwards, giving a "1st person perspective" view. The field of view of this camera is elevated so that the actual point of impact on the white car cannot be definitively seen.
DQEVA4	At a reported frame rate of 10 fps, Cam1 is at times 1 frame faster (+1 frame) than Cam5 (see next page [Additional Comments] for more info).
DY94T9	In the video called Cam5, there are 10 frames for every 1-second change in the timestamp, while in the video called Cam1, this value varies between 9 and 11. Therefore, the time difference is ± 1 frame.
F4FB94	+/- 1 frame
G4PZMZ	+/- 1-2 frames
G8BKR4	Margin of error was approximately +/- (1) or (2) frames
GJ6XR2	Cam 5 has 400 ms or 4 frames more than cam 1.
GKWW7Y	We do not have procedures to document margin of error.
GM6AM2	+/- 1 second
GRVJXY	plus/minus 2 frames
GULMQ7	The margin of error of approximate time alignment of Camera view 5 and 1 were (2).
GUMHBX	Time appeared to be consistently accurate with minor deviations of 1 frame/0.1 seconds difference at times. Camera 1 being 1 frame ahead of camera 5. However, this evened out.
HPMNQ2	I am not providing an answer to this question due to the following: 1. We do not have an SOP that outlines how to create an approximate time alignment. However, I recall learning a process while attending an Amped FIVE class. Steps for this process are not outlined in the three references. 2. I have not received any training on how to calculate the margin of error of such an alignment. An equation for this calculation is not listed in the three references as well. 3. Our laboratory does not report on measurements that matter as outlined in our quality program.
HTA8W6	plus/minus 1 frame
JGPDVW	Not in scope.
JQXPDZ	Cam5 is sometimes .10 seconds behind Cam1.
JR9RYY	+1 frame / 10fps
JUVC43	+/- 1 frame

TABLE 2

Question 2- 2 : Enhanced Video Examination	
WebCode	Response
KM93VW	At frames 19, 39, and 49, Cam5 increments up one second one frame before Cam1. Therefore, the maximum margin of error is .1 seconds.
KPY2AV	+/- 1 frame; 10 fps
KVNMEW	plus/minus 1 frame plus/minus 1/10 of a second
KWJ6GX	plus/minus 1 frame in 10 frames/second
MKFQ9W	+/- 2 frames with 10 fps
NKCNWW	2
P9VYXR	+/- 1 frame (0.1 second) due to the accident, Cam1 "froze" at the moment of impact
PCVAUR	plus/minus 4 frames and .4 fps
PGA8YT	1 frame at 10 fps
PJVR6X	The frame rate for each video is 10.0 FPS with no apparent offset at the start of the videos.
PVB JUR	This is not calculated at my laboratory.
QGPQJQ	For the video clip, +/- 1 frame, at 10fps, due to the apparent duplicate frames present in both videos.
QTYDLX	Aligned within +/- 1 frame (+/- 100 ms at 10 fps)
R8V32T	plus/minus 1 frame 10fps, or 0.1 seconds.
R8VZCN	[No Margin of Error Reported.]
RFP8UU	The margin of error is -1 frame for the displayed frame rate of 10 fps.
TUZ7EL	plus/minus 0.10 seconds
UENUMR	[No Margin of Error Reported.]
UJWFBP	No traceable source of the timing information derived from the MPEG-4 presentation time stamps (PTS) or the on-screen date/time (OSD) was provided, so any measures of uncertainty will be relative. The review of the timing information noted previously shows that the two video streams may be off by one frame at certain times. The maximum margin of error within the analyzed segment is ± 1 frame at 10 frames per second, equivalent to ± 0.1 seconds, affecting 9 out of 61 frames. More formally, the estimated proportion of frames in sync is $52/61 = 0.852$. Margin of error (MoE) for a proportion estimation equals standard error (SE) times the confidence factor (z), which I'll choose 99% ($z = 2.576$). The standard error for a proportion estimate is $\text{SQRT}(p*(1-p)/n)$. Here, $p = 52/61 = 0.852$ and $n = 61$, so $\text{SE} = \text{SQRT}(0.852 \times 0.148 \div 61) = 0.045$. $\text{MoE} = \text{SE} \times z = 0.045 \times 2.576 = 0.117$. The proportion of frames in sync is 85.2% with a margin of error of 11.7% with 99% confidence.
W9CNYK	Alignment appears to be +/- 1 frame from playback of the short video combo clip. Appears to be duplicate frames on both camera clips, where the motion stops on one camera view, but not on the other.
X7EUEL	[No Margin of Error Reported.]
X97VHN	± 1 frame
XJRW2J	+/- 1 frame at 10 fps
XJRYQM	[No Margin of Error Reported.]

TABLE 2

Question 2- 2 : Enhanced Video Examination	
WebCode	Response
XPT9WF	+/- 100 ms
YER9WG	The time alignment between Cam5 and Cam1 was done by matching the visible timestamps displayed in the videos. From 15:30:46 to 15:30:52, a 6.9 second clip totaling 69 frames, the timestamps matched, except for frames 9, 29 and 59 (referencing Amped FIVE), where the time was off by one second. The margin of error is plus/minus 1 frame at a frame rate of 10 fps and the margin of error in time is plus/minus 0.1 seconds.
YUKZHH	1/0 frames
YW7KML	Plus / minus one (1) frame
ZE9LZK	[No Margin of Error Reported.]
ZWLZHE	+/- 2 frames @10fps (0.2 seconds)

Question 2-2: Note the margin of error of your approximate time alignment of camera views 5 and 1 in terms of (1) plus/minus frames and frame rate, or (2) plus/minus time (in seconds).

Consensus Result: +/- 1 frame at 10 FPS, or +/- 0.1 seconds; or more conservative responses.

Forensic Video Enhancement Observations

TABLE 3

Part 2: Video Enhancement Instructions:

Perform the tasks listed below and provide derivative files, as requested, for review.

A. Conduct a video enhancement of the entirety of the camera view 5 file and export the final product to an MOV or MKV file with H.264 video encoding and uncompressed/PCM audio encoding, if an audio track is present.

B. Conduct an approximate time alignment of the camera view 5 video enhancement and the direct video from the camera view 1 file and prepare a composite, side-by-side representation of a segment which encompasses approximately 3 seconds prior to and 3 seconds following the time of the motor vehicle accident. The camera view 5 video should be in the left half of the composite video, and the camera view 1 video should be in the right half. Export the result to an MOV or MKV file with H.264 video encoding and uncompressed/PCM audio encoding.

C. Export 1 frame of video (as a PNG, BMP, or TIFF file) from the composite video above which corresponds to the approximate time of the motor vehicle accident (i.e., the approximate time of the collision).

WebCode	Observational Notes
23NUPF	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. Frame 1593 in both files has a timestamp of "15:30:49", not "15:30:48" as noted by the participant, and the re-sizing process in FIVE was to a width of 651, not 652 as indicated by the participant; the output file does have a width of 652, but this was likely forced by the "Video Writer" filter.
2E4JNK	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. Video enhancement of "Cam5" was conducted but the participant did not adhere to several requests in the test: settings for the video filters were not provided; no audio was included in the output file; the video was not encoded in H.264 format. No audio was included in the output file for the time-aligned composite copy, as requested.
3RLTPG	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The enhancement processes improved the overall appearance of the recorded video content, but the primary issue of the source video (poor contrast) persists in the enhanced file. The participant's notes indicate that they "add[ed] time-stamp and camera name banners," but this has not been added to the output video file; the overlaid text from the source file is still present but no additional text has been added. The frame rate of the "Cam5" enhancement has been modified to 18FPS, despite the participant indicating that the "framerate has not been modified." However, the frame rate of the time-aligned composite video is 10FPS. The audio in both output video/audio files was upsampled to a sample rate of 48 kHz from the original 16 kHz. Upsampling of the audio was not requested. No filter settings were provided as requested.
3U7RXL	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the exception of Step A. Step A observational note: No file was provided for the "Cam5" video enhancement. Furthermore, the AI-based "upscaling" process discussed in the report did not address the primary issue of the source video (poor contrast). Step B observational notes: Upscaling of the video files was not requested in the test. All upscaling processes utilized non-linear factors. Margin of error does not align with the parameters of the provided materials given that the video frame rate is 10 frames/second.
4DJMBC	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. While the video enhancement process of the "Cam5" video provided for a minor change to the video content, the primary issue of the source video (poor contrast) persists in the enhanced file.
4HBQ4F	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The video enhancement of the "Cam5" video was re-sized to 1600x1200. Re-sizing of the enhanced video file was not requested.

TABLE 3

Forensic Video Enhancement Observations	
WebCode	Observational Notes
69HX8A	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The enhancement processes improved the overall appearance of the recorded video content, but the primary issue of the source video (poor contrast) persists in the enhanced file. Visual details in both the shadow/lower luminance areas and highlight/brighter luminance areas were not preserved through the application of the "Histogram Equalization" filter.
6E7K3E	[Not applicable as participant did not report enhancement information and did not return any enhanced files.]
6GWL7H	No output video files were provided, despite references to them included in the participant's notes.
6HTZTA	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The "Cam5" video enhancement was conducted but was not exported with H.264 encoding as requested (video is encoded as Apple ProRes instead). The time-alignment was conducted but it was not exported with H.264 encoding as requested (video is encoded as Apple ProRes instead). While there is an audio track present in the file, the corresponding audio from "Cam5" is not present in the audio track; the frame rate was increased to 30 frames/second. Also, the audio in both output video/audio files was upsampled to a sample rate of 48 kHz from the original 16 kHz, although upsampling of the audio was not requested. Margin of error does not align with the parameters of the provided materials given that the video frame rate is 10 frames/second.
6XLRDB	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
77DR69	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The enhancement processes did improve the details of the recorded video content, but two of the processes applied ("Motion Deblurring" and "Median Filter") negatively impacted the readability of the text information. Particularly, the running date/time stamp below the recorded video is very difficult to discern.
78RYTB	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
7W7VLC	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The specific filter settings were not provided by the participant, as requested. The video enhancement of the "Cam5" video was re-sized to 1446x1080 (a non-linear upscaling), and each camera view was upscaled for the time-aligned composite copy (to approx. 894x671, again non-linear upscaling). The re-sizing processes of the files for the time-aligned composite copy are not noted in their methods/tools response. Re-sizing of the video files was not requested.
89E4FG	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Steps A and B observational notes: Participant supplied only the still image export, which does appear to show that "Cam5" was enhanced and that the time alignment was conducted. Separate video files of the video enhancement of "Cam5" and the time-alignment of "Cam1" and "Cam5" were not provided. The participant's notes regarding the tools/methods indicate that video files named "Cam5-250806110052.mkv" and "cam5 & Cam1 side-by-side.mkv" were produced, but neither file was provided. Margin of error does not align with the parameters of the provided materials given that the video frame rate is 10 frames/second.

TABLE 3

Forensic Video Enhancement Observations	
WebCode	Observational Notes
AEXYFA	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Step A observational note: No file was provided for the "Cam5" video enhancement, and from review of the "Cam5" video in the time-aligned composite video file and of the participant's notes, no video enhancement of "Cam5" was conducted, as requested. The time-aligned composite copy runs for a longer timeframe (1m19s) than requested in the test (limit to 3 seconds prior to and following the approximate time of the crash). Audio encoding for the time-aligned composite copy is AAC, not PCM as requested. A still image was exported as a JPG image file and not in one of the requested formats (BMP, TIFF, PNG).
AGKJLD	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Step B observational note: No output video file was provided for the time-aligned composite copy, though the process is described in the participant's notes. The time-aligned composite copy notes indicate that the participant re-sized the two source files (by a non-linear factor) and changed the frame rate to 25FPS, although these processes were not requested.
AV6YND	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. Settings for the video filters applied to "Cam5" were not provided, as requested. No audio was included in the output file for the time-aligned composite copy, as requested.
AVHPF9	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
AWD9GB	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The audio in both output video/audio files was upsampled to a sample rate of 48 kHz from the original 16 kHz, although upsampling of the audio was not requested. The frame rate of both output video/audio files was increased to 30 frames/second which was not requested. The provided still image contains visible distortion around the text that was overlayed by the participant; this distortion is not visible in the time-aligned composite video/audio copy.
AY6AKD	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The audio is encoded as AAC not as PCM audio, as requested. The screen capture of the export function indicates PCM audio, but the audio is AAC.
B3XQAC	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The enhancement processes improved the overall appearance of the recorded video content, but the primary issue of the source video (poor contrast) persists in the enhanced file. Margin of error does not align with the parameters of the provided materials.
B667J4	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
BLPWH3	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
BMKFK4	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The deinterlacing step applied during the video enhancement of "Cam5" resulted in some of the details of the date/time stamp (centered across the bottom edge) not being preserved. The same goes for the static overlaid text near the upper left-hand corner.

TABLE 3

Forensic Video Enhancement Observations	
WebCode	Observational Notes
C6WL96	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The enhancement processes improved the overall appearance of the recorded video content, but the primary issue of the source video (poor contrast) persists in the enhanced file.
C9J7DA	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The audio in the output time-aligned composite file was upsampled to a sample rate of 32 kHz from the original 16 kHz, although upsampling of the audio was not requested.
DQEVA4	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
DY94T9	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. Settings for the video filters applied to "Cam5" were not provided as requested. The audio was upsampled to a sample rate of 48 kHz from the original 16 kHz, although upsampling of the audio was not requested. In the time-aligned composite copy, both videos have been slightly shifted vertically, resulting in some of the text information at the top being cut off; the exported still image from the time-aligned composite copy does not contain the vertical shift. While the time-aligned composite copy contains an audio track, it does not contain the corresponding audio from "Cam5", as requested. The audio is encoded as AAC not as PCM audio, as requested.
F4FB94	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The time-aligned composite video file contains no audio track, meaning that the corresponding audio from "Cam5" is not present in the audio track, as requested.
G4PZMZ	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. Levels filter for the shadows/lower luminance areas show limited change from the source file. The audio in the time-aligned composite output video/audio file was upsampled to a sample rate of 48 kHz from the original 16 kHz, although upsampling of the audio was not requested.
G8BKR4	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The "Cam5" video enhancement processes negatively impacted the readability of the text information above and below the recorded video area. The specific filter settings were not provided by the participant, as requested. The "Cam5" video and corresponding audio end before the selected segment; the "Cam1" video continues for 8 frames (0.8 second) after the "Cam5" content.
GJ6XR2	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The video enhancement of the "Cam5" video was re-sized to 1600x1200, although re-sizing of the enhanced video file was not requested. The "Correct Fisheye" filter resulted in loss of visual content at all four edges of the recorded video.
GKWW7Y	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The specific filter settings were not provided by the participant, as requested.
GM6AM2	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The enhancement processes improved the overall appearance of the recorded video content, but the primary issue of the source video (poor contrast) persists in the enhanced file.

TABLE 3

Forensic Video Enhancement Observations	
WebCode	Observational Notes
GRVJXY	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The enhancement processes improved the overall appearance of the recorded video content, but visual details in both the shadow/lower luminance areas and highlight/brighter luminance areas were not preserved through the application of the "Histogram Equalization" filter.
GULMQ7	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the exceptions of Steps B and C. Step A observational notes: The specific filter settings for the "Cam5" video enhancement were not provided by the participant, as requested. The "Cam5" enhanced file does not include the corresponding audio, as requested, and the frame rate has been changed to 20FPS. One of the processes appears to have negatively impacted the readability of the text information above and below the video area. Step B observational note: No time-aligned composite video file was provided. A file with "Composite" in the name was provided but only includes "Cam5". That file was upscaled to 1440x1080, although upscaling was not requested. Step C observational note: A still image of the time-aligned composite copy was not provided. BMP and PNG still images were provided but they only show a frame from "Cam1" (also upscaled to 1440x1080).
GUMHBX	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
HPMNQ2	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
HTA8W6	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The enhancement processes improved the overall appearance of the recorded video content, but the primary issue of the source video (poor contrast) persists in the enhanced file.
JGPDVW	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
JQXPZD	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
JR9RYY	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Step C observational note: The still image exported shows only "Cam1" and is not from the time-aligned composite video of "Cam1" and "Cam5", as requested in the test. Also, the specific filter settings were not provided by the participant, as requested in the test.
JUVC43	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. Time-aligned composite video was exported with uncompressed video format, not H.264 encoding, as requested. The camera views are in the opposite orientation; requested orientation was "Cam5" in the left half and "Cam1" in the right half. The exported still image from the time-aligned composite copy shows them in the requested orientation.
KM93VW	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Steps A and B observational notes: Participant supplied only the still image export, which does appear to show that "Cam5" was enhanced and that the time-alignment was conducted. Separate video files of the video enhancement of "Cam5" and the time-alignment of "Cam1" and "Cam5" were not provided, although the participant's tools/methods notes indicate that video files were produced.
KPY2AV	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.

TABLE 3

Forensic Video Enhancement Observations	
WebCode	Observational Notes
KVNMEW	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
KWJ6GX	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
MKFQ9W	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
NKCNWW	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. In the time-aligned composite file, the length is 4.6 seconds, which is shorter than the requested 6 seconds (3 seconds prior to and 3 seconds following the time of the crash). The "Cam5" video and corresponding audio end before the selected segment; the "Cam1" video continues for 11 frames (1.1 second) after the "Cam5" content. The time-aligned composite file is a 2x2 matrix, instead of a single row with two columns.
P9VYXR	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Step A observational note: While the video enhancement was conducted of "Cam5", the resulting MKV file contains 12 less frames (from the beginning) than the source "Cam5" file. The specific filter settings were not provided by the participant, as requested. The audio in all output video/audio files was upsampled to a sample rate of 48 kHz from the original 16 kHz, although upsampling of the audio was not requested.
PCVAUR	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The enhancement processes improved the overall appearance of the recorded video content, but visual details in both the shadow/lower luminance areas and highlight/brighter luminance areas were not preserved through the application of one or more of the filters. The specific filter settings were not provided as requested.
PGA8YT	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Steps A and B observational notes: Participant supplied only the still image export, which does appear to show that "Cam5" was enhanced and that the time-alignment was conducted. Separate video files of the video enhancement of "Cam5" and the time-alignment of "Cam1" and "Cam5" were not provided, although the participant's tools/methods notes indicate that video files were produced.
PJVR6X	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The still image exported is not frame 60 of the output video named "Cam 5-1 Multiview.mov", as indicated by the participant in their notes; the MOV file contains only 61 frames, and the exported is not frame 60. The participant's notes appear to be missing frame numbers in the description of the time-aligned composite copy.
PVB JUR	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
QGPQJQ	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The Lumetri Color filter for the shadows/lower luminance areas show limited change from the source file. Some detail in the highlights/higher luminance areas were not preserved through the processes. The audio in both output video/audio files was upsampled to a sample rate of 48 kHz from the original 16 kHz, although upsampling of the audio was not requested.

TABLE 3

Forensic Video Enhancement Observations	
WebCode	Observational Notes
QTYDLX	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The video enhancement of the "Cam5" video included a re-sizing of the video by 4x (2x in each dimension). Re-sizing of the video was not requested. "Cam1" was also re-sized for the time-aligned composite copy, although not requested.
R8V32T	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Step A observational note: No file was provided for the "Cam5" video enhancement, but a review of the "Cam5" video in the time-aligned composite video file and of the participant's notes, a video enhancement of "Cam5" was conducted.
R8VZCN	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
RFP8UU	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The audio in the output file for the time-aligned composite copy was upsampled to a sample rate of 48 kHz from the original 16 kHz, although upsampling of the audio was not requested.
TUZ7EL	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The video enhancement of the "Cam5" video included a re-sizing of the video by 4x (2x in each dimension). Re-sizing of the video was not requested. The audio in the time-aligned composite video/audio file was upsampled to a sample rate of 32 kHz from the original 16 kHz, although upsampling of the audio was not requested.
UENUMR	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The audio in both output video/audio files was upsampled to a sample rate of 48 kHz from the original 16 kHz, although upsampling of the audio was not requested.
UJWFBP	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
W9CNYK	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. Levels filter for the shadows/lower luminance areas show limited change from the source file.
X7EUEL	Submitted file(s) were reviewed by an expert who confirmed that this participant did not complete the requested video enhancement steps with the following note(s). No output video or image files were provided. The two video files included in the ZIP file are simply the source "Cam1" and "Cam5" files.
X97VHN	No output video or image files were provided. The participant's notes indicate that the enhancement, alignment, and export processes were conducted, though no specific settings were provided.
XJRW2J	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
XJRYQM	[Not applicable as participant did not report enhancement information and did not return any enhanced files.]
XPT9WF	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The audio in both output video/audio files was upsampled to a sample rate of 48 kHz from the original 16 kHz, although upsampling of the audio was not requested.
YER9WG	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.

TABLE 3

Forensic Video Enhancement Observations	
WebCode	Observational Notes
YUKZHH	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following notes. The time-aligned composite copy runs for the full length of the source files instead of limiting it to 3 seconds prior to and following the approximate time of the crash, as requested. Audio encoding for the time-aligned composite copy is AAC, not PCM as requested.
YW7KML	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Step A observational note: No file was provided for the "Cam5" video enhancement, despite reference to an enhancement being conducted using Amped FIVE. Review of the "Cam5" video in the time-aligned composite video file indicates that a video enhancement of "Cam5" was conducted. Step C observational note: No still image file was provided, despite reference to an export being conducted using Amped FIVE. The Amped FIVE reports referenced in the participant's notes were not provided, so it is not certain what filters and settings were applied.
ZE9LZK	[Not applicable as participant did not report enhancement information and did not return any enhanced files.]
ZWLZHE	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.

Additional Comments

TABLE 4

WebCode	Additional Comments
23NUPF	Before taking the test, to verify a complete and accurate download, HashMyFiles v2.50 was used to verify the integrity of the file. 25-5581 Forensic Video Analysis - Test Material.zip MD5 and SHA1 hash values were in accordance with those provided in the scenario. There was observed distortion of the picture on both Cam1 and Cam5 recording but we refrained from correcting it as it was making the peripheries of the screen very warped. The moment of collision recorded on Cam5 mov file was observed in the right bottom corner of the frame.
6E7K3E	Our forensic unit does not perform enhancement or time alignment processes so part 2 has been intentionally left blank
6HTZTA	I don't do audio as we have another expert for that. My focus is on the imagery.
AGKJLD	When hashing data in the processing of this request QuickHash (Version 3.3.4) was used with a SHA-256 algorithm. To assess and analyze the technical data from the source material, converted DME and produced output MediaInfo Version 25.03 and AmpedFIVE Version 36648 were used. When inputting the files to PremierePro version 24.5.0 the mkv produced as the enhancement video was not recognised, so this file was rewrapped into a mp4 file using FFMPEG (Version 2025-04-21) in Command Prompt.
AVHPF9	The synchronization margin of error is conservatively estimated at ± 1 frame at 10 fps (± 0.1 seconds). This accounts for both the base synchronization uncertainty (± 0.5 frames) and the misalignment caused by a periodic pattern of repeated frames observed approximately every 16 to 18 frames in both videos. One such cycle occurs near the moment of impact, which was considered when interpreting timing alignment.
AWD9GB	27/06/25 - I downloaded the zip file 25-5581%20Forensic%20Video%20Analysis%20-%20Test%20Material.zip and used 7zip (23.01) to verify the hash, the hashes match: MD5: 0a9be36b82eeff396833fd5c6cb22019 SHA-1: 1ee352f1f2a4ff33222841ff03ccdb056ab9bc0 11/07/25 - 25-5581%20Forensic%20Video%20Analysis%20-%20Test%20Material.zip unzipped and SHA256 generated. Footage examined on workstation VL0480 (OS Win10 Pro 19045.5608). No supplied player with the footage, VLC media player version 3.0.18 used to review the footage. Both files are h264 in a .mov container, the footage is non-interlaced - Progressive, aspect ratio 4:3. The footage from both cameras have time and date stamps displayed and footage from camera 5 also has audio. Footage from camera 1 appears to have noise interference (horizontal floating lines), compression artifacts and lens barrel distortion, it also appears to suffer from chromatic aberration. Footage from camera 5 may not be from the original source as the text displayed on the upper section of the screen appears to have been redacted and the timestamp text edges lack contrast just like the imagery. The footage appears to have noise interference (horizontal floating lines) and compression artifacts, it also appears to suffer from chromatic aberration and lens barrel distortion. Footage quality appears the same when using an alternative player (SMPlayer 23.6.0.0). 17/07/25 - Premiere Pro 23.5.0 will be used to complete section 2a, 2b and 2c of the test. Project titled 25-5581 Forensic Video Analysis.prproj 18/07/25 - Source files transcoded to ProRes 422HQ 30fps using Shutter Encoder 17.2 and imported into project. Two sequences created titled 'Cam5_Levels_Adjusted' (frame size 800x600) and 'Cam5_Cam1_Aligned' (frame size 1600x720). 21/07/25 - Using the lumetri curve level adjustments on the cam5 footage, the black levels were increased and white levels reduced by referencing the lumetri histogram to avoid any clipping see attached screenshots. Text added on center top of frame 'Level adjusted'. 22/07/25 - The footage from cam5 with levels adjusted inserted into the sequence 'Cam5_Cam1_Aligned' on the left side of frame and footage from cam1 inserted into right side of frame. As footage from both cameras are from the same system I aligned both videos to start at screen time 15:30:45 and end at 15:30:55. Text overlay added to inform viewers of 'Simultaneous playback of video imagery' and cam5 footage confirming audio 'Cam 5 - contains audio'. The sequence 'Cam5_Levels_Adjusted' exported in Premiere Pro 23.5.0 using Quicktime format, video codec: Apple ProRes 422 HQ (match source), audio codec uncompressed. The export was encoded to h.264 .mov, Video bitrate 15000kb/s. audio: PCM16Bits using Shutter Encoder 17.2. The sequence 'Cam5_Cam1_Aligned' exported in Premiere Pro 23.5.0 using Quicktime format, video codec: Apple ProRes 422 HQ (match source), audio codec uncompressed. The export was encoded to h.264 .mov,

TABLE 4

WebCode	Additional Comments
	Video bitrate 15000kb/s. audio: PCM16Bits using Shutter Encoder 17.2. Output files Cam5_Cam1_Aligned_H.264.mov and Cam5_Levels_Adjusted_H.264.mov visually checked against the original footage and analysed in Mediainfo 23.06. Frame exported as PNG from Premiere Pro at player time 00:00:05:05 from the sequence 'Cam5_Cam1_Aligned' showing the collision. File named as 'Cam5_Cam1_Aligned_Collision.png'. 7zip used to hash output files: Name: Cam5_Levels_Adjusted_H.264.mov Size: 250194312 bytes (238 MiB) SHA256: 896b0f992c1788095df07de935de8d772ea7c7d2d26766ac7a5e7028b216c868 Name: Cam5_Cam1_Aligned_H.264.mov Size: 24798043 bytes (23 MiB) SHA256: 50beba766b6be80a8cca0d148941dd8ea56d61ff7bf55630bda6d5bc5dc94841 Name: Cam5_Cam1_Aligned_Collision.png Size: 1463627 bytes (1429 KiB) SHA256: 561edf7e0eedabc8594ea9b1948327cd77dc25272187ec30f42f35c020c4b6c6 RSU_001_Test_Output hash: Folders: 2 Files: 12 Size: 276873228 bytes (264 MiB) SHA256 checksum for data: fc7f5037eca93c3fdf700b3865e12345e90619e524949a770d4e7c436b8aea36-00000005 SHA256 checksum for data and names: d3af23b113509bf604095d3e06e103b55b1ac5916ccd7a3cb06e792c00205fed-00000006
B667J4	Primary software tool used was Amped FIVE Build date: 20250618 Revision: 37757 Other tools include MedialInfo FFMPEG
BLPWH3	Integrity of the downloaded zip file from the CTS portal completed using 7zip 25.01, MD5 and SHA1 values matched. The following text shows the notes recorded by the practioner during the completion of the examination. The Amped FIVE report has been attached as part of the 'Enhanced Video Examination' section. 2025-08-11 10:16:25 - : Initial Handling. tasking form completed and authorised by [Initial]. Exhibit suitable for examination: Yes. Processing Officer: [Initial]. Any known time discrepancy: Not known. HASH Values - See Hash Code document attached. Exhibit Details. Master or Working Copy: master. Exhibit number: [Initial]/180725/1. Exhibit description: ZIP FILE FORENSIC VIDEO ANALYSIS FILES. Seal number: MPSA27952714. Seized on date/time: 18/07/25 14:30. Seized by: [Initial]. Seized from (address): Deliberately withheld. Continuity completed: Yes. Produced Exhibit Details Exhibit number: [Initial]/180725/2. Bag serial number: MPSA27952716. Physical media type: DVD-R. Exhibit format - unzipped .mov files Copied to server: Yes, HASH Values - SEE HASH CODE DOCUMENT, Does HASH code of working copy match the master: Yes. All exhibits packaged and sealed by [Initial] Exhibits placed into IRAT secure storage Yes, exhibit handling form updated Yes. Exhibit/s to be enhanced: [Initial]/180725/2. Activity log: Enhancement Software - AMPED 5, Software Version: 37757. Process log completed Yes -please see Amped 5 report and Answer Sheet saved on the server Equipment used, Viewing Pod Asset: NE-60021 Has Peer review been completed: Yes - [Initial]. Produced Exhibit Details Exhibit number: [Initial]/110825/1, Bag serial number: MPSA27952613. Physical media type: DISC, Exhibit format: .MOV & BMP Copied to server: Yes. All exhibits packaged and sealed by [Initial] Exhibits placed into secure storage: Yes. Exhibit handling form updated: Yes.
BMKFK4	Question 1-6 Depending on the metadata reader used, various levels of detail could be revealed, it was not clear as to how far you wanted us to go. My reported answer was from Media Info. See other reader results below: Media Info 10.3 Mb/s VDub2 Info 10342 kb/sec FF Probe 10.342921 Mbit/s
C6WL96	The margin of error in the approximate time alignment of the videos is based on two methods: visual observation/estimation and the elapsed time between frames as determined by the clock displayed at the bottom of the video in hours:minutes:seconds. Presumably, the clock is system-generated and originally matched for both videos. Visually, it is difficult to determine if the accident occurs beginning at frame 1592 or 1593 (a difference of 1 frame). Cam1.mov has a limited field-of-view of the car and the point of collision is not clearly shown but can be estimated to within a 1 frame margin. While Cam5.mov appears to show contact with the front of the car at frame 1592, the view is partially obscured, and movement of objects and persons inside the bus camera view occur one frame later at frame 1593. 10 fps is a low frame rate, and the exact point of collision may have occurred in-between frames. While the frame rate, or the total number of frames in a second, is constant for both videos according to metadata, the elapsed time between frames varies by as much as +/- 100 milliseconds, resulting in 1 second intervals that contain 9-11 frames instead of the nominal 10 fps. It is also noted that there is a difference of 4 total frames in the frame count of the videos (i.e. Cam5.mov is 4 frames longer than Cam1.mov). It is also noted that frame timing analysis for ISO base media files, which both Cam1.mov and Cam5.mov are, requires an external timing source to calculate a margin of error according to

TABLE 4

WebCode	Additional Comments
	SWGDE-Best-Practices-for-Frame-Timing-Analysis-of-Video-Stored-in-ISO-Base-Media-File-Formats_v1.1, page 7.
DQEVA4	Although Axon Investigate v3.1.0 reports the frame rate for both Cam1 and Cam5 as 10 fps, the frame rate varies from 9-11 fps at various points throughout each file per the timestamp. Based on the timestamp in the videos, the crash occurred at approximately 15:30:49 in both the Cam1 and Cam5 video files. Subclips were made in Axon Investigate v3.1.0 of the Cam1 and Cam5_Enhanced video files from 15:30:46 to 15:30:52, 3 seconds before and after the observed crash. For the composite side by side video, the video from each camera was aligned on the first frame of 15:30:46. In the portion of video selected for the composite side by side video, the frame rate for Cam5 is consistent at 10 fps whereas the frame rate for Cam1 varies from 9-11 fps. Therefore, at times throughout the composite side by side video, the timestamps will show the video from Cam1 is 1 frame faster (+1 frame) than the video from Cam5. This could possibly be due to repeated frames observed at times throughout each file.
F4FB94	I wasn't sure which file I had to upload, so I uploaded all.
GJ6XR2	It would be great, for the next test, if we could enhance a number plate or stuff like that!
GKWW7Y	Our laboratory does not report margin of error, so we do not have procedures on how to do this and I could not answer #2 on the Enhanced Video Examination portion. Not sure why there are questions specific to audio on a video PT. In our laboratory, we may have video examiners that are not authorized to perform audio analysis and therefore may not be able to answer audio questions.
GM6AM2	The video is interlaced and lens distortion exists towards the edges, but de-interlacing and undistort processes did not improve the intelligibility of the area of interest.
HPMNQ2	This proficiency test was purchased to fulfill the Transcoding and Enhancement component of our ANAB accreditation program. However, several questions included in the "Enhanced Video Examination" section/tab appear to be outside the defined scope of this test. Specifically, Point B of this section requests "an approximate time alignment" of two submitted video files. Additionally, Question 2-2 further asks for the margin of error of that time alignment. This type of analysis more appropriately falls under Content Analysis or Reconstruction, which are distinct components of the ANAB accreditation structure. Additionally, in completing the time alignment question, I had to rely on vendor-provided training rather than the three references listed under the "Scenario" tab of the test. None of these references included guidance or procedures on how to perform time alignment, nor did they include any methodology or equation for calculating a margin of error. As a result, I did not answer Question 2-2, as I have not received training on how to calculate such a margin, and our laboratory does not produce or report metrics involving measurement uncertainty, in line with our quality assurance protocols. In conclusion, these questions — particularly Questions 2-1 and 2-2 — are not representative of the Transcoding and Enhancement service domain. Their inclusion aligns more closely with analytical interpretation of content.
JQXPDZ	Attached .PDF is the Amped FIVE generated report showing full settings. All enhancement/video exporting was done within Amped FIVE. Amped FIVE v36648.
NKCWW	All questions have been answered
PCVAUR	Our laboratory does not calculate margin of error for the time alignment of the camera views.
RFP8UU	Re: Part 2 - B I synced the the 2 clips towards the beginning of the footage to produce my composite video. However, even though both clips reported a frame rate of 10 fps, they actually had variable frame rates which at times was 9 fps, sometimes 10 fps, and at other times 11 fps. Consequently, Cam5 occasionally fell 1 frame behind Cam1, but synced up again further into the footage.
UJWFBP	The only reference to margin of error calculation in the sources cited for this test is section 4.4 of the current version (18-V-001-1.1, March 22, 2024) of "SWGDE Best Practices for Digital Forensic Video Analysis" which states, "In instances where a quantitative response is required, a margin of error may be expected, based on the frame information and compression of the images." This leaves the term "margin of error" open to quite a bit of interpretation.
W9CNYK	Reasonable request for a demonstrative combined video camera views. Uncertain about "margin of error" since we try to bring the different camera views "into sync". One tries to "line them up" and watch on playback that it appears "normal". Sometimes the video is not even "in synch" when encoded or played back on the DVR system.

TABLE 4

WebCode	Additional Comments
X97VHN	Can not upload file. Upload error: Upload error: Upload error: Upload error
XJRYQM	Our Forensic unit does not perform enhancement or time alignment processes so part 2 has been intentionally left blank
XPT9WF	The approximate time alignment between camera views 5 and 1 at the incident is within +/- 100 ms. Alignment is made such that aligned consecutive frames show immediately before and after impact for each camera. At 10 fps, these consecutive frames are 100 ms apart, however more exact timing/offsets between these cameras cannot be ascertained.
ZE9LZK	Our forensic department does not perform enhancement or time align processes therefore part 2 has not been completed.
ZWLZHE	Video files supplied are most likely not the original, and appear to be a converted copy. The following observations support this: * Frame analysis for both video files shows a constant frame rate with limited variance. * Bit rate is high in comparison to the quality of supplied vision. * Displayed vision is shows artifacts consistent with being an interlaced recording, however supplied files are progressive. Any disclosed reports/files are supplied with the following disclaimer: * The video files supplied do not appear to be original. Results supplied are from analysis performed on the supplied video files, and may not represent actual events as they occurred. * An additional frame has been incorporated into the stated margin of error due to duplicate frames identified on both video files.

Test No. 25-5581: Forensic Video Analysis

DATA MUST BE SUBMITTED BY **Aug. 18, 2025, 11:59 p.m. EDT** TO BE INCLUDED IN THE REPORT

Participant Code: U1234A

WebCode: 8MEV7Q

Scenario:

A motor vehicle accident occurred involving a city bus and a privately-owned vehicle. The city bus was outfitted with six video cameras, two of which captured content relevant to the accident. Camera view 1 was inside the bus, above the bus driver and aimed downward toward the front door of the bus; a portion of the windshield is also visible in the left-half of the view. Camera view 5 was a windshield-mounted camera also inside the bus, facing the forward motion of the bus.

Video exports were made of these two camera views in QuickTime MOV format. Investigators request video enhancement of the camera view 5 MOV file and a time-aligned composite video file with the two camera views placed side-by-side.

Test Instructions:

This test is designed to measure your knowledge and skill in the following digital forensic video processes: Data verification, Media characterization, Video processing, and Video enhancement.

The skills assessed in this exercise are based on the following best practice documents from the Scientific Working Group on Digital Evidence (swgde.org):

- 1. Technical Overview of Digital Video Files*
- 2. Best Practices for Digital Forensic Video Analysis*
- 3. Fundamentals of Resizing Imagery and Considerations for Legal Proceedings*

Because of the inherent subjectivity of video "enhancement" due to differences in an individual's personal preferences and vision, you will be asked to perform specific tasks including processing the file in a way that is designed to show your understanding of a certain principle or concept. It is critical that you read the instructions carefully and execute all of the tasks.

Evidence:

To verify a complete and accurate download, use the tool of your choice to verify the integrity of the file.

25-5581 Forensic Video Analysis - Test Material.zip MD5 hash value: 0a9be36b82eeff396833fd5c6cb22019

25-5581 Forensic Video Analysis - Test Material.zip SHA1 hash value: 1ee352f1f2a4ff33222841ff03cccd056ab9bc0

Part 1: Examination Questions

1-1). What is the SHA-256 hash value of the camera view 1 (Cam1) MOV file?

1-2). What is the SHA-256 hash value of the camera view 5 (Cam5) MOV file?

1-3). What are the pixel dimensions of the Cam1 MOV file?

1-4). What are the pixel dimensions of the Cam5 MOV file?

1-5). What is the reported frame rate of the Cam1 MOV file? (report as a numeric value in fps)

1-6). What is the bit rate of the video stream in the Cam5 MOV file? Provide a NUMERIC response, appropriate units, and the tool that was used to determine this value.

Bit rate:

Units:

Tool:

1-7). How many video frames are there in the Cam1 MOV file?

1-8). How many video frames are there in the Cam5 MOV file?

1-9). Which of the MOV files contains an audio track? (e.g. Cam1, Cam2)

1-10). What is the sampling rate of the audio in the MOV file containing an audio track? Provide a NUMERIC response and appropriate units.

Sampling Rate:

Units:

Part 2: Video Enhancement Instructions

Perform the tasks listed below and provide derivative video files, as requested, for review.

A. Conduct a video enhancement of the entirety of the camera view 5 file and export the final product to an MOV or MKV file with H.264 video encoding and uncompressed/PCM audio encoding, if an audio track is present.

B. Conduct an approximate time alignment of the camera view 5 video enhancement and the direct video from the camera view 1 file and prepare a composite, side-by-side representation of a segment which encompasses approximately 3 seconds prior to and 3 seconds following the time of the motor vehicle accident. The camera view 5 video should be in the left half of the composite video, and the camera view 1 video should be in the right half. Export the result to an MOV or MKV file with H.264 video encoding and uncompressed/PCM audio encoding.

C. Export 1 frame of video (as a PNG, BMP, or TIFF file) from the composite video above which corresponds to the approximate time of the motor vehicle accident (i.e., the approximate time of the collision).

Uploaded file name:

2-1). Note method(s) or tool(s) used and settings for the following: (You may submit reports or screen shots of filters and settings)
Cam5 video enhancement and export processes

Time-aligned composite video preparation and export processes

Still image export

2-2). Note the margin of error of your approximate time alignment of camera views 5 and 1 in terms of (1) plus/minus frames and frame rate, or (2) plus/minus time (in seconds).

Additional Comments

Note: Please use appropriate punctuation to indicate the end of sentences, sections, and statements in the free-form space below. Extra spacing and returns used for separation within your text will not transfer and may cause your information to be illegible in the Summary Report. The use of lists and tabular formats to deliver information is also cautioned against, as these do not transfer.

RELEASE OF DATA TO ACCREDITATION BODIES

The Accreditation Release is accessed by pressing the "Continue to Final Submission" button online and can be completed at any time prior to submission to CTS.

CTS submits external proficiency test data directly to ANAB and/or A2LA. Please select one of the following statements to ensure your data is handled appropriately.

- ☐ This participant's data is intended for submission to ANAB and/or A2LA. (Accreditation Release section below must be completed.)
- ☐ This participant's data is **not** intended for submission to ANAB and/or A2LA.

Have the laboratory's designated individual complete the following steps
only if your laboratory is accredited in this testing/calibration discipline
by one or more of the following Accreditation Bodies.

Step 1: Provide the applicable Accreditation Certificate Number(s) for your laboratory.

ANAB Certificate No.

A2LA Certificate No.

Step 2: Complete the Laboratory Identifying Information in its entirety.

Authorized Contact Person and Title

Laboratory Name

Location (City/State)