



Fibers Analysis Test No. 23-5439 Summary Report

Each sample set consisted of one known piece of fabric and two sets of questioned fibers. Participants were requested to compare the items and report their findings. Data were returned from 92 participants and are compiled into 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

Each sample pack consisted of one section of known fabric (Item 1) and two sets of questioned fibers (Items 2 and 3). Items 1 and 3 were from the same red fabric labeled as 100% cotton. Item 2 was from a different red fabric labeled as 100% polyester. All fabric was purchased from a local fabric store. Participants were requested to examine the fibers, identify the fiber type, and determine if the questioned fibers could have originated from the known fabric.

SAMPLE PREPARATION:

The fabric was laid out and rolled with a lint roller to remove any extraneous debris. All items were prepared at different times to prevent any possibility of cross-contamination.

ITEMS 1 AND 3 (ASSOCIATION): For the known fabric (Item 1) and the questioned fibers (Item 3), a 1-yard section of fabric was first cut into 2" x 2" square swatches. A predetermined number of full swatches were then packaged into glassine bags and pre-labeled Item 1 envelopes; the remaining swatches were used to prepare the Item 3 questioned fibers. For each item in this set, warp and weft fibers were teased from the edges of the fabric swatches, then packaged into glassine bags and pre-labeled Item 3 envelopes.

ITEM 2 (ELIMINATION): For the questioned fibers (Item 2), a 1/2-yard section of fabric was first cut into 2" x 2" square swatches. Warp and weft fibers were teased from the edges of the fabric swatches. The fibers were then packaged into glassine bags and pre-labeled Item 2 envelopes.

SAMPLE SET ASSEMBLY: For each sample set, an Item 1, 2, and 3 were placed in a pre-labeled sample pack envelope. The sample pack was sealed with invisible tape. This process was repeated until all of the sample sets were prepared. Once predistribution results were obtained, all sample sets were further sealed with a piece of evidence tape and initialed "CTS."

VERIFICATION:

All predistribution laboratories reported expected identification results and determined the fiber type of Items 1 and 3 to be Vegetable, Cotton and the Item 2 fibers as Manufactured, Polyester. The following procedures used to examine the items were: Stereomicroscopy, Polarized Light, Comparison Microscopy, IR-FTIR, Fluorescence, Raman Micro-spectroscopy, and microspectrophotometry.

Summary Comments

This test was designed to allow participants to assess their proficiency in the examination, identification, and comparison of fibers. Participants were provided with a 2 inch x 2 inch swatch of known fabric for Item 1 and a collection of questioned fibers for Items 2 and 3. They were requested to examine the submitted items and determine if either set of questioned fibers could have originated from the known fabric swatch. Items 1 and 3 originated from the same red fabric labeled as 100% Cotton and Item 2 originated from a different red fabric labeled as 100% Polyester. (Refer to the Manufacturer's Information for preparation details.)

Table 1: Association Results:

Items 1 and 3 (Association): Of the 92 responding participants, 90 (98%) participants reported that the questioned fibers found within the trunk of the car (Item 3) could have originated from the known section of fabric from the torn bed sheet that the victim was wrapped in (Item 1). One participant reported that the Item 3 questioned fibers could not have originated from the Item 1 known section, and one participant stated their laboratory does not report fiber comparisons.

Item 2 (Elimination): Of the 92 responding participants, 91 (99%) participants reported that the questioned fibers found stuck to the driver's side floor mat (Item 2) could not have originated from the known section of fabric from the torn bed sheet that the victim was wrapped in (Item 1). The remaining participant stated their laboratory does not report fiber comparisons.

Table 2: Fiber Type Determination:

In regard to Fiber Type, 87 of the 92 participants (95%) reported the expected fiber type of Items 1 and 3 which consisted of Vegetable, Cotton. Furthermore, 75 of the 92 participants (82%) reported that the fiber type for Item 2 consisted of Manufactured, Polyester. Several participants only identified Item 2 as "Manufactured, not further categorized" with a few mentioning that analysis is discontinued after the item is determined to not be associated with the known sample.

Table 3: Examination Methods:

Of the 92 responding participants, 523 methods of analysis were reported in total. Stereomicroscopy and Polarized Light were the most commonly reported examination methods used. Each were reported 89 and 79 times, respectively. Another frequently reported method is IR/FTIR, reported 72 times. There was no correlation between the examination methods used by participants and the reporting of inconsistent results for fiber type determination.

Association Results

Could either of the questioned fibers found stuck to the driver's side floor mat (Item 2) or within the trunk of the car (Item 3) have originated from the torn bed sheet that the victim was wrapped in (Item 1)?

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
2AG7JC	No	Yes	AYYMW	No	Yes
2V43D6	No	Yes	AZ8G8R	No	Yes
36NTBG	No	Yes	BNP89Z	No	Yes
3GGDR8	No	Yes	CL232E	No	Yes
3J6PTX	No	Yes	CL2K6X	No	Yes
47XGLL	No	Yes	CPX9MQ	No	Yes
678KDX	No	No	CXCMCU	No	Yes
6TM6AX	No	Yes	DA34UM	No	Yes
6VPFC7	No	Yes	DK8EJJ	No	Yes
7ELTEY	No	Yes	E8DKLF	No	Yes
84GNWM	No	Yes	E8FRTW	No	Yes
8D6G9J	No	Yes	EJ9VUM	No	Yes
8Q7BBW	No	Yes	FVEKC4	No	Yes
8ZVFFU	No	Yes	G92VAE	No	Yes
9HTX34	No	Yes	GXG4QP	No	Yes
9NZLHQ	No	Yes	HA3Z6T	No	Yes
9X84E4	No	Yes	HDPC7J	No	Yes
AECGHJ	No	Yes	HEYLXG	No	Yes
AF76ZE	No	Yes	J76WB7	No	Yes
ARFFW3	No	Yes	JHEBVY	No	Yes
ATA6EX	No	Yes	JRKQQQ	No	Yes

TABLE 1 - Association Results

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
JTF3XC	No	Yes	R28886	No	Yes
JZY6U	No	Yes	R4PEHL	No	Yes
K7GRVJ	No	Yes	RBV2J3	No	Yes
KLVJ8	No	Yes	RGU3NG	No	Yes
KRWTUK	No	Yes	RKUDKG	No	Yes
KWBBHD	No	Yes	RMK84J	No	Yes
LCXMCD	No	Yes	RWBLF3	No	Yes
LMHWYL	No	Yes	THKHZH	No	Yes
M7TTQ3	No	Yes	TYNH2D		
MBLKAR	No	Yes	U2VYXN	No	Yes
MGT3UE	No	Yes	U3RDKF	No	Yes
MXD3EH	No	Yes	ULGQY6	No	Yes
N424VM	No	Yes	URM7AA	No	Yes
N773JH	No	Yes	V2RWMA	No	Yes
N8JT8T	No	Yes	V8BGWC	No	Yes
NW3BA9	No	Yes	V9NBCD	No	Yes
NYYATF	No	Yes	W67CN7	No	Yes
PD2J8T	No	Yes	WCMZCG	No	Yes
PKZ72D	No	Yes	WFLJRG	No	Yes
QCP4FD	No	Yes	WW9UZG	No	Yes
QDJRX9	No	Yes	XC372D	No	Yes
QPCWYY	No	Yes	XJ24X9	No	Yes
QX6AYX	No	Yes	XYCEGA	No	Yes

TABLE 1 - Association Results

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
Y3TYYH	No	Yes			
YJ2G63	No	Yes			
ZTZ8U2	No	Yes			
ZWYUTC	No	Yes			

Association Response Summary			Participants: 92	
<p>Could either of the questioned fibers found stuck to the driver's side floor mat (Item 2) or within the trunk of the car (Item 3) have originated from the torn bed sheet that the victim was wrapped in (Item 1)?</p>				
		<u>Item 2</u>	<u>Item 3</u>	
Yes:	0	(0.0%)	90	(97.8%)
No:	91	(98.9%)	1	(1.1%)
Inc:	0	(0.0%)	0	(0.0%)
<p>The sum of the responses here may be less than the total number of participants responding due to missed or omitted responses.</p>				

Fiber Type Determination

What is the fiber type and generic name of the fiber(s) in each item?

TABLE 2

WebCode	Item 1	Item 2	Item 3
2AG7JC	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
2V43D6	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
36NTBG	Vegetable, Cotton	Manufactured, not further categorized	Vegetable, Cotton
3GGDR8	Vegetable, Cotton	Manufactured, not characterized further	Vegetable, Cotton
3J6PTX	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
47XGLL	Manufactured Nylon	Manufactured Nylon	Manufactured Nylon
678KDX	Manufactured, Rayon	Manufactured, Polyester	Manufactured, Rayon
6TM6AX	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
6VPFC7	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
7ELTEY	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
84GNWM	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
8D6G9J	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
8Q7BBW	Vegetable, Cotton	Manufactured	Vegetable, Cotton
8ZVFFU	Vegetable, Cotton	Polyester, Manufactured	Vegetable, Cotton
9HTX34	Manufactured, Rayon (MODAL)	Manufactured, Polyester	Manufactured, Rayon (MODAL)
9NZLHQ	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
9X84E4	Natural; Cotton	Manufactured; not further characterized	Natural; Cotton
AECGHJ	Vegetable, Cotton	N/A	Vegetable, Cotton
AF76ZE	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
ARFFW3	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
ATA6EX	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
AYYMVV	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
AZ8G8R	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
BNP89Z	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
CL232E	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
CL2K6X	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
CPX9MQ	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton

TABLE 2- Fiber Type Determination

WebCode	Item 1	Item 2	Item 3
CXCMCU	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
DA34UM	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
DK8EJJ	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
E8DKLF	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
E8FRTW	Vegetable, Cotton	Not characterized	Vegetable, Cotton
EJ9VUM	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
FVEKC4	Vegetable, Cotton	Manufactured, not further characterized	Vegetable, Cotton
G92VAE	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
GXG4QP	Vegetable, Cotton	Manufactured, Polyester (Polyethylene terephthalate - PET)	Vegetable Cotton
HA3Z6T	Vegetable, Cotton	Manufactured, not further characterized	Vegetable, Cotton
HDPC7J	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
HEYLXG	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
J76WB7	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
JHEBYY	Vegetable, Cotton	Manufactured, not further characterized	Vegetable, Cotton
JRKQQQ	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
JTF3XC	Vegetable - Cotton	Manufactured - Polyester, Manufactured - Polyester	Vegetable - Cotton
JZY6U	Vegetable, Cotton	Manufactured - unable to determine type under LPM	Vegetable, Cotton
K7GRVJ	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
KLVLJ8	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
KRWTUK	Vegetable, Cotton	Manufactured, Polyester (2 types)	Vegetable Cotton
KWBBHD	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
LCXMCD	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
LMHWYL	Vegetable Cotton	Manufactured Polyester	Vegetable Cotton
M7TTQ3	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
MBLKAR	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
MGT3UE	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
MXD3EH	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
N424VM	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton

TABLE 2- Fiber Type Determination

WebCode	Item 1	Item 2	Item 3
N773JH	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
N8JT8T	Vegetable, Cotton	Manufactured, not further categorized	Vegetable, Cotton
NW3BA9	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
NYYATF	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
PD2J8T	Vegetable, Cotton	Manufactured, not further categorized	Vegetable, Cotton
PKZ72D	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
QCP4FD	Manufactured, Rayon	Manufactured, Polyester	Manufactured, Rayon
QDJRX9	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
QPCWYY	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
QX6AYX	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
R28886	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
R4PEHL	Vegetable, Cotton	manufactures, Polyester	Vegetable, Cotton
RBV2J3	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
RGU3NG	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
RKUDKG	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
RMK84J	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
RWBLF3	Vegetable, Cotton	Manufactured, Unknown	Vegetable, Cotton
THKHZH	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
TYNH2D	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
U2VYXN	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
U3RDKF	Vegetable, Cotton	Manufactured, no further categorized	Vegetable, Cotton
ULGQY6	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
URM7AA	Vegetable, Cotton	Manufactured fiber	Vegetable, Cotton
V2RWMA	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
V8BGWC	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
V9NBCD	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
W67CN7	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
WCMZCG	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
WFLJRG			

TABLE 2- Fiber Type Determination

WebCode	Item 1	Item 2	Item 3
WW9UZG	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
XC372D	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
XJ24X9	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
XYCEGA	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
Y3TYYH	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
YJ2G63	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
ZTZ8U2	Vegetable, Cotton	Manufactured, Polyester	Vegetable, Cotton
ZWYUTC	Vegetable, Cotton	Manufactured- Polyester	Vegetable, Cotton

Fiber Type Determination Response Summary			Participants: 92
What is the fiber type and generic name of the fiber(s) in each item?			
<u>Item 1</u>	<u>Item 2</u>	<u>Item 3</u>	
Cotton: 87 (94.6%)	Polyester: 75 (81.5%)	Cotton: 87 (94.6%)	
*Other: 4 (4.3%)	*Other: 16 (17.4%)	*Other: 4 (4.3%)	
*This category represents the total number of participants that reported a response other than the consensus response.			

Examination Methods

TABLE 3

WebCode	Stereomicroscope	Comparison	Polarized Light	Fluorescence	Macroscopic Exam	IR/FTIR	Microspectrophotometry	Solubility Tests	Cross-Section	Melting Point	Other
2AG7JC	✓	✓	✓	✓	✓	✓	✓				
2V43D6	✓	✓	✓	✓		✓	✓				
36NTBG	✓	✓	✓	✓			✓				
3GGDR8	✓	✓	✓	✓	✓		✓				
3J6PTX	✓		✓	✓	✓	✓	✓				
47XGLL	✓	✓	✓		✓						
678KDX	✓		✓	✓	✓	✓					
6TM6AX	✓	✓	✓	✓	✓	✓	✓	✓			
6VPFC7	✓	✓	✓	✓	✓	✓	✓				
7ELTEY	✓	✓	✓		✓			✓		✓	
84GNWM	✓	✓	✓			✓	✓				
8D6G9J	✓	✓	✓	✓	✓	✓	✓				
8Q7BBW	✓	✓		✓	✓	✓	✓				
8ZVFFU	✓	✓	✓	✓	✓	✓					
9HTX34	✓		✓			✓					GCMS- PYROLYSIS
9NZLHQ	✓	✓	✓	✓	✓	✓		✓			
9X84E4	✓	✓	✓	✓	✓		✓				
AECGHJ	✓	✓	✓	✓	✓		✓	✓			
AF76ZE	✓	✓	✓	✓		✓	✓				Raman
ARFFW3	✓		✓			✓	✓				

TABLE 3- Examination Methods

WebCode	Stereomicroscope	Comparison	Polarized Light	Fluorescence	Macroscopic Exam	IR/FTIR	Microspectrophotometry	Solubility Tests	Cross-Section	Melting Point	Other
ATA6EX	✓	✓	✓		✓	✓	✓				
AYYMW	✓				✓	✓					
AZ8G8R	✓	✓	✓	✓	✓						
BNP89Z	✓		✓	✓	✓	✓	✓				
CL232E	✓	✓	✓	✓	✓	✓	✓				
CL2K6X	✓	✓	✓	✓	✓	✓	✓				
CPX9MQ	✓	✓	✓		✓	✓	✓				
CXC MCU	✓	✓	✓	✓	✓	✓	✓				
DA34UM	✓	✓	✓	✓	✓	✓	✓			✓	
DK8EJJ	✓	✓	✓	✓	✓	✓	✓				
E8DKLF	✓	✓	✓	✓	✓	✓	✓				Thin-layer chromatography
E8FRTW	✓	✓	✓	✓	✓		✓				
EJ9VUM	✓	✓	✓	✓		✓					
FVEKC4	✓	✓	✓	✓	✓		✓				
G92VAE	✓	✓	✓	✓	✓	✓	✓				longitudinal cross-section
GXG4QP	✓	✓	✓	✓	✓	✓	✓				
HA3Z6T	✓	✓	✓	✓	✓		✓				
HDPC7J	✓	✓	✓	✓	✓	✓	✓				
HEYLXG	✓				✓	✓					
J76WB7	✓	✓	✓	✓	✓	✓	✓				
JHEB VY	✓	✓	✓	✓	✓		✓				✓

TABLE 3- Examination Methods

WebCode	Stereomicroscope	Comparison	Polarized Light	Fluorescence	Macroscopic Exam	IR/FTIR	Microspectrophotometry	Solubility Tests	Cross-Section	Melting Point	Other
JRKQQQ	✓	✓	✓	✓	✓	✓	✓				
JTF3XC	✓	✓	✓	✓	✓	✓	✓	✓	✓		
JZY6U	✓										
K7GRVJ						✓					SEM/EDS
KLVLJ8	✓	✓	✓	✓		✓	✓				
KRWTUK	✓	✓	✓	✓	✓	✓	✓		✓		
KWBBHD	✓	✓	✓		✓	✓			✓		
LCXMCD	✓	✓	✓	✓		✓	✓		✓		
LMHWYL			✓			✓	✓				
M7TTQ3	✓	✓		✓		✓	✓				Dye classification
MBLKAR	✓	✓	✓		✓	✓	✓				ALS
MGT3UE	✓	✓	✓	✓	✓	✓	✓				TLC
MXD3EH	✓	✓	✓	✓		✓	✓				
N424VM	✓	✓	✓	✓	✓	✓	✓				
N773JH	✓	✓		✓		✓	✓				
N8JT8T	✓	✓	✓	✓	✓		✓				
NW3BA9	✓	✓	✓	✓	✓	✓	✓				
NYATF	✓	✓	✓	✓		✓	✓				HPLC-MS
PD2J8T	✓	✓	✓	✓	✓		✓				
PKZ72D			✓	✓	✓	✓					GC/MS-PYROLYSIS
QCP4FD	✓	✓				✓					DXR raman microscope

TABLE 3- Examination Methods

WebCode	Stereomicroscope	Comparison	Polarized Light	Fluorescence	Macroscopic Exam	IR/FTIR	Microspectrophotometry	Solubility Tests	Cross-Section	Melting Point	Other
QDJRX9	✓		✓			✓	✓				
QPCWYY	✓	✓	✓	✓	✓	✓	✓				
QX6AYX	✓				✓	✓					Dye extraction
R28886	✓		✓	✓	✓	✓	✓				
R4PEHL	✓	✓	✓	✓	✓	✓	✓				
RBV2J3	✓	✓			✓	✓					Stereoscopic UV
RGU3NG	✓				✓	✓					PyGC/MS, SEM/EDS
RKUDKG	✓		✓		✓	✓	✓				
RMK84J	✓		✓	✓		✓	✓	✓			
RWBLF3	✓		✓	✓	✓		✓	✓			ALS
THKHZH	✓		✓	✓	✓	✓	✓				
TYNH2D	✓		✓		✓	✓					
U2VYXN	✓	✓	✓					✓			
U3RDKF	✓	✓	✓	✓	✓		✓				
ULGQY6	✓		✓		✓	✓	✓				
URM7AA	✓				✓						
V2RWMA	✓	✓	✓	✓	✓	✓	✓				
V8BGWC	✓	✓	✓	✓	✓	✓	✓				
V9NBCD	✓	✓	✓	✓	✓		✓		✓		
W67CN7	✓	✓	✓		✓	✓					
WCMZCG	✓	✓	✓	✓	✓	✓	✓				

TABLE 3- Examination Methods

WebCode	Stereomicroscope	Comparison	Polarized Light	Fluorescence	Macroscopic Exam	IR/FTIR	Microspectrophotometry	Solubility Tests	Cross-Section	Melting Point	Other
WFLJRG	✓				✓	✓					Response in basic solution
WW9UZG	✓	✓	✓	✓	✓	✓	✓				
XC372D	✓		✓			✓		✓			
XJ24X9	✓	✓	✓		✓						
XYCEGA	✓	✓	✓	✓	✓	✓	✓				
Y3TYYH	✓	✓	✓	✓	✓	✓	✓				
YJ2G63	✓	✓	✓	✓	✓	✓					
ZTZ8U2	✓	✓	✓		✓	✓					
ZWYUTC	✓		✓	✓	✓	✓		✓			Optical microscopy and Raman spectroscopy

Examination Methods Response Summary											Participants: 92
	Stereomicroscope	Comparison	Polarized Light	Fluorescence	Macroscopic Exam	IR/FTIR	Microspectrophotometry	Solubility Tests	Cross-Section	Melting Point	
	89	67	79	63	71	72	64	3	14	1	
Percent	97%	73%	86%	68%	77%	78%	70%	3%	15%	1%	

Conclusions

TABLE 4

WebCode	Conclusions
2AG7JC	Examinations: Visual examination, stereomicroscopy, polarized light microscopy, fluorescence microscopy, infrared spectroscopy (IR), microspectrophotometry (MSP) MSP was performed at the [Laboratory]. Information: Questioned fibers were reportedly collected from the driver's side floormat (Item 1B) and the trunk (Item 1C). A known fabric sample was reportedly collected from a blanket that the decedent was wrapped within (Item 1A) for comparison to the questioned fibers. Results: Questioned fibers from Item 1C were similar in all tests performed to the known fibers from Item 1A. Additionally, both Items 1A and 1C were composed of cotton fibers. In the opinion of the undersigned, the questioned fibers collected from the trunk came from either the bedsheet or another source with similar characteristics (Level 3 – Association). Questioned fibers from Item 1B were dissimilar in microscopic characteristics to the known fibers from Item 1A. The fibers in Item 1B were confirmed to be polyester fibers. The bedsheet is excluded as a source of the questioned fibers from the driver's side floormat (Elimination). Additional Remarks: Please contact the undersigned if additional knowns are collected for possible further comparisons to Item 1B.
2V43D6	High probability for the questioned fibers found within the trunk (Item 3) to have originated from the torn bed sheet (Item 1). Questioned fibers found stuck to the driver's side floor mat (Item 2) could not have originated from the torn bed sheet (Item 1).
36NTBG	Red cotton fibers recovered from Item 3 exhibit the same microscopic characteristics and optical properties as the fibers comprising Item 1. Accordingly, these fibers are consistent with originating from the same source as Item 1 or another source that is comprised of fibers that exhibit the same microscopic characteristics and optical properties. Red synthetic fibers recovered from Item 2 are microscopically dissimilar to the fibers comprising Item 1. Accordingly, these fibers are not consistent with originating from the same source as Item 1. The specimens were examined visually and using stereomicroscopy, comparison microscopy, polarized light microscopy, fluorescence microscopy, and instrumentally using microspectrophotometry.
3GGDR8	Pink cotton fibers recovered from Item 3 exhibit the same microscopic characteristics and optical properties as the fibers comprising Item 1. Accordingly, these fibers are consistent with originating from Item 1, or another item comprised of fibers that exhibit the same microscopic characteristics and optical properties. Textile fibers recovered from Item 2 are microscopically dissimilar to the fibers comprising Item 1. Accordingly, these fibers are not consistent with originating from Item 3. The specimens were examined visually using stereomicroscopy, comparison microscopy, polarized light microscopy, fluorescence microscopy, and instrumentally using microspectrophotometry, where appropriate.
3J6PTX	Item 1 was identified as red cotton fiber. Item 2 and item 3 were identified as red polyester and cotton fibers, respectively. These components were confirmed by FTIR, and the color was confirmed by MSP. Item 3 could have originated from item 1.
47XGLL	Fibers found within the trunk of the car (#3) could have originated from the torn bed sheet (#1) that the victim was wrapped in.
678KDX	On examination, I found the questioned red fibers found stuck to the driver's side floor mat (Item 2) and questioned red fibers found within the trunk (Item 3) to be dissimilar to the red fibers in the known section of fabric from the bed sheet that the victim was wrapped in (Item 1).
6TM6AX	The red polyester fibers recovered from Item# 1-2 are dissimilar to the red cotton fibers which compose Item# 1-1; therefore, no association can be made between Items# 1-2 and 1-1. Red cotton fibers recovered from Item# 1-3 are consistent with the red cotton fibers which compose the red swatch in Item# 1-1; therefore, these fibers could have originated from the same source as the fibers in Item# 1-1
6VPFC7	Questioned fibers found within the trunk (Item 3) are not differentiated from known section of fabric from the bed sheet that the victim was wrapped in (Item 1). Fibres from Item 3 can come from the fabric of the bed sheet (Item 1) or from another textile material with the same characteristics. Questioned

TABLE 4

WebCode	Conclusions
	fibers found stuck to the driver's side floor mat (Item 2) are different from fibers of the fabric of the bed sheet (Item 1). They don't come from the same source (Item 1).
7ELTEY	1. The sample received as the "Known section of fabric from the bed sheet that the victim was wrapped in" (Item 1) is made by red cotton fibers. 2. The sample received as the "Questioned fibers found stuck to the drivers side floor mat" (Item 2) is made by red polyester fibers. 3. The sample received as the "Questioned fibers found within the trunk" (Item 3) is made by red cotton fibers. 4. According with the physical properties evaluated, the questioned fibers received as item 3 are indistinguishable from the sample received as item 1.
84GNWM	Item 1 consists of a red woven fabric swatch composed of cotton fibers. Item 2 consists of red apparent threads composed of polyester fibers. Item 3 consists of red apparent threads composed of cotton fibers. The cotton bedsheet (Item 1) is not the source of the questioned polyester fibers removed from the floor mat (Item 2). The cotton fibers from Items 1 (Known from bedsheet) and 3 (Questioned from trunk) are similar in appearance, microscopic characteristics (PLM and Comparison Microscope), and color (PLM and Comparison Microscope). The bedsheet, or another item composed of the same fabric, could be the source of the fibers found within the trunk.
8D6G9J	The known section of fabric (Item 1) from the bed sheet that the victim was wrapped in consisted of a red-coloured, plain weave fabric with multifilament threads containing cotton fibres in a 'Z' twist. The questioned fibres (Item 2) found stuck to the driver's side floor mat consisted of four red-coloured multifilament threads in a 'S' twist and a 'Z' twist. The threads contained polyester fibres. These fibres were different to the fibres from the bed sheet and therefore have not come from the bed sheet. The questioned fibres (Item 3) found within the trunk consisted of four red-coloured multifilament threads in a 'Z' twist. The threads contained cotton fibres. These fibres had the same visual appearance, fluorescent properties and colour as the known section of fabric from the bed sheet (Item 1). Therefore, the questioned fibres found within the trunk could have come from the bed sheet, or from another source of this type of fibres.
8Q7BBW	The results very strongly support the proposition that the threads in Item 3 are of the same type as the threads in Item 1.
8ZVFFU	The fibers in Item 2 could not have originated from Item 1. The fibers in Item 3 could have originated from Item 1, although other sources cannot be excluded.
9HTX34	Item 3 could have been generated from item 1. Item 2 could not have been generated from item 1.
9NZLHQ	The trace material was viewed and compared under the stereomicroscope (Leica M 165FC) and the microscope (Leica DM4 M) at different magnifications and illuminations (incident light, transmitted light, fluorescence and polarization). The comparison between the trace material was made in terms of properties such as color, structure, thickness and cross-sectional shape. The fibers from the bed paint and the fibers from the trunk of the vehicle are red cotton fibers. With the means at our disposal, Item 1 and Item 3 are visually indistinguishable in all of the aforementioned criteria. Based on the aforementioned findings, it is possible that the traces found in the trunk (item 3) originate from the bed linen (item 1) or from a red cotton textile of the same type. Further instrumental analytical or discriminatory investigations (e.g. MSP for the determination of the dye) would have to be carried out by an appropriately equipped body. The fibers from the driver's side floor mat onward are polyester fibers. Due to the different fiber type, the fibers from the driver's side floor mat (item 2) are visually distinguishable from the fibers of the bed varnish (item 1) and are therefore excluded from having a common origin.
9X84E4	The pink cotton fibers comprising Item 1 exhibit the same microscopic characteristics and optical properties as the pink cotton fibers found in Item 3; accordingly, the Item 3 pink cotton fibers are consistent with originating from the same source as Item 1 or from another source which is comprised of fibers which exhibit the same microscopic characteristics and optical properties. The red fibers in Item 2 are microscopically dissimilar to the fibers comprising Item 1; accordingly, the Item 2 fibers are not consistent with originating from the same source as Item 1. No other trace evidence examinations were conducted on the submitted items. The items were examined visually using stereomicroscopy,

TABLE 4

WebCode	Conclusions
	comparison microscopy, polarized light microscopy, and fluorescence microscopy, and instrumentally using microspectrophotometry, as appropriate.
AECGHJ	The following methodologies were used in the examination of this case: visual examination, physical examination, microscopy, fluorescence and MSP. Examination of Item 1 revealed the presence of a swatch of red woven fabric constructed of red yarns designated as Direction 1 and Direction 2, which were each composed of red cotton fibers. Examination of Item 3 revealed the presence of four individual red yarns. Two yarns were consistent in construction with the Direction 1 yarns in Item 1. One of these yarns was selected for further analysis. This yarn, composed of red cotton fibers, was consistent in color, construction and composition with the Direction 1 yarns composed of red cotton fibers from the fabric in Item 1. Therefore, this yarn could have originated from the same source as the fabric in Item 1. The remaining two yarns were consistent in construction with the Direction 2 yarns in Item 1. One of these yarns was selected for further analysis. This yarn, composed of red cotton fibers, was consistent in color, construction and composition with the Direction 2 yarns composed of red cotton fibers from the fabric in Item 1. Therefore, this yarn could have originated from the same source as the fabric in Item 1. No further analysis was performed on this item. Examination of Item 2 revealed the presence of four individual red yarns. The construction of these yarns is not consistent with the construction of the yarns comprising the fabric in Item 1. Therefore, these yarns in Item 2 could not have originated from the same source as the fabric in Item 1. According to the Technical Procedure for the Examination of Fibers at this lab, if at any point during the course of examination items are found to be inconsistent with one another, analysis may be halted and a lab report issued stating a negative finding. Therefore, no further analysis to identify the generic fiber class of the fibers in Item 2 was performed.
AF76ZE	The sheet, as represented by item 1, was eliminated as a possible source of the fibres from the driver's side floor mat, item 2. The sheet, as represented by item 1, could not be eliminated as a possible source of the red cotton fibres from the trunk, item 3. As such, these fibres either came from the sheet, as represented by item 1, or from another source of fibres that are indistinguishable in yarn construction, fibre microscopic appearance, composition and colour.
ARFFW3	The fibers from Items 1 and 3 were examined via stereomicroscopy, polarized light microscopy, and UV-VIS microspectrophotometry. The fibers from Item 2 were examined via polarized light microscopy and infrared spectroscopy. The questioned red threads from Item 3 and the known red fabric from Item 1 each consisted of cotton fibers. The questioned fibers from Item #3 are consistent in composition, microscopic characteristics, thread composition, and color with the fibers from Item 1 and could have originated from this source (Level 3 association). The questioned red threads from Item 2 consisted of polyester fibers. The questioned fibers from Item #3 are inconsistent in chemical composition with the known red fabric from Item 1 and did not originate from this source (elimination). Terminology Key for Associative Evidence: The following descriptions are meant to provide context to the levels of opinions reached in this report. Every level of conclusion may not be applicable in every case nor for every material type. Level I Association: A physical match; items physically fit back to one another, indicating that the items were once from the same source. Level II Association: An association in which items are consistent in observed and measured physical properties and/or chemical composition and share atypical characteristic(s) that would not be expected to be readily available in the population of this evidence type. Level III Association: An association in which items are consistent in observed and measured physical properties and/or chemical composition and, therefore, could have originated from the same source. Because other items have been manufactured that would also be indistinguishable from the submitted evidence, an individual source cannot be determined. Level IV Association: An association in which items are consistent in observed and measured physical properties and/or chemical composition and, therefore, could have originated from the same source. As compared to a Level III association, items categorized within a Level IV share characteristics that are more common amongst these kinds of manufactured products. Alternatively, an association between items would be categorized as a Level IV if a limited analysis was performed due to the characteristics or size of the specimen(s). Level V Association: An association in which items are consistent in some, but not all, physical properties and/or chemical composition. Some minor variation(s) exists between the known and questioned items and could be due to factors such as sample heterogeneity, contamination of the sample(s), or having a sample of insufficient size to adequately assess the homogeneity of the entity from which it was derived.

TABLE 4

WebCode	Conclusions
	Inconclusive: No conclusion could be reached regarding an association/elimination between the items. Elimination: The items were dissimilar in physical properties and/or chemical composition, indicating that they did not originate from the same source.
ATA6EX	The fiber type of Item 1 and Item 3 are identical but not Item 2. Therefore, the fiber found in the car trunk has originated from the torn bed sheet.
AAYMVV	Examination and comparison between the questioned fibers found stuck to the driver's side floor mat (Item 2) and known fabric from the torn bed sheet that the victim was wrapped in (Item 1) were consistent in colours. However, they also have significant differences in terms of microscopic structures, width of fiber and chemical composition (Item 2 was identified as Polyester and Item 1 was identified as Cotton). Examination and comparison between the questioned fibers found within the trunk of the car (Item 3) and known fabric from the torn bed sheet that the victim was wrapped in (Item 1) were consistent in microscopic structures, colours, width of fiber and chemical composition (Both Item 3 and Item 1 were identified as Cotton). Therefore, in my professional opinion; (a) Questioned fibers found stuck to the driver's side floor mat (Item 2) could not have originated from the torn bed sheet that the victim was wrapped in (Item 1). (b) Questioned fibers found within the trunk of the car (Item 3) could have originated from the torn bed sheet that the victim was wrapped in (Item 1).
AZ8G8R	Item 1: One piece of red fabric composed of cotton fibers was analyzed for comparison to items 2 and 3. Item 2: Four (4) red threads composed of polyester fibers were present. In the sample analyzed, the unknown red polyester fibers "found stuck to the driver's side floor mat" and the red cotton fiber standard (item 1) from "the bed sheet that the victim was wrapped in" are not the same in physical or optical characteristics. The unknown fibers could not have originated from the standard. Item 3: Four (4) red threads composed of cotton fibers were present. In the sample analyzed, the unknown red cotton fibers "found within the trunk" either originated from the red cotton fiber standard (item 1) from "the bed sheet that the victim was wrapped in" or another source of fibers possessing the same distinct physical and optical characteristics.
BNP89Z	Questioned fibers found within the trunk (Item 3) could have originated from the bed sheet that the victim was wrapped in (Item 1) while questioned fibers found stuck to the driver's side floor mat (Item 2) couldn't have originated from the bed sheet that the victim was wrapped in (Item 1).
CL232E	Item 1 (control fabric) comprised a piece of plain red fabric, approximately 5cm by 5cm. Both the warp and the weft consisted of Z-twisted yarns composed solely of red cotton fibres. Item 2 (questioned fibres from driver's side floor mat in vehicle) comprised 4 red yarns. All 4 red yarns were composed solely of red polyester fibres and could not have originated from the fabric represented by control Item 1. Item 3 (questioned fibres from trunk of vehicle) comprised 4 red yarns. All 4 red yarns were Z-twisted yarns composed solely of red cotton fibres. The macroscopic appearance of the 4 yarns was consistent with yarns recovered from the control fabric Item 1. The cotton fibres from the 4 yarns were consistent in colour and appearance via brightfield and fluorescence microscopy with the cotton fibres from the control fabric Item 1. This supports the proposition that the 4 yarns recovered from the trunk of the vehicle have originated from the fabric represented by control Item 1.
CL2K6X	The questioned fibers found within the trunk (Item3) were consistent (indistinguishable) with the fibers of the known section of fabric from the bed sheet that the victim was wrapped in (Item1) in macroscopic, microscopic and color (MSP) characteristics. Therefore the questioned fibers found within the trunk (Item3) could have come from the known section of fabric from the bed sheet that the victim was wrapped in (Item1) or another source of fibers with similar macroscopic, microscopic and color (MSP) characteristics. The questioned fibers found stuck to the driver's side floor mat (Item2) were dissimilar (distinguishable) to the fibers of the known section of fabric from the bed sheet that the victim was wrapped in (Item1). Therefore the questioned fibers found stuck to the driver's side floor mat (Item2) could not have come from the known section of fabric from the bed sheet that the victim was wrapped in (Item1).
CPX9MQ	The questioned red cotton fibers found within the trunk (item #3) exhibit the same physical and optical properties as the known red cotton fibers from the bedsheets (item #1) and could have originated from this bedsheets or another of similar color and composition. It should be noted that individual textile fibers

TABLE 4

WebCode	Conclusions
	do not possess enough distinct characteristics to be positively identified as originating from a particular textile to the exclusion of all others. The questioned red polyester fibers from the driver's side floor mat (item #2) exhibit different physical, chemical and optical properties than the known red cotton fibers from the bedsheet (item #1) and therefore could not have originated from the bedsheet.
CXCMCU	The red polyester fibers found on the driver's side floor mat of suspect's car (item 2) are not consistent with the red cotton fibers of the bed sheet that the victim was wrapped (item 1). Item 2 could not be originated from item 1. The red cotton fibers found on trunk of the suspect's car (item 3) are consistent with the red cotton fibers of the bed sheet that the victim was wrapped (item 1). Item 3 could be originated from item 1.
DA34UM	The red polyester fibers recovered from Item 1-2 are dissimilar to the fibers which compose Item 1-1; therefore, no association can be made between Items 1-1 and 1-2. The red cotton fibers recovered from Item 1-3 are consistent with the fibers which compose the swatch in Item 1-1; therefore, these fibers could have originated from the sheet where the swatch was retrieved from in Item 1-1.
DK8EJJ	Item 1 is a known section of fabric from the bed sheet and is composed of red cotton fibers. The fibers from Item 3 are red cotton fibers and are similar in microscopic characteristics, measured color, and fluorescence microscopy to the red cotton fibers from the known section of fabric, Item 1. The fibers from Item 3 could have come from the same source as Item 1 or from another source consisting of similar red cotton fibers. The red fibers from Item 2 are synthetic and are not similar in microscopic characteristics to the known section of fabric from Item 1. The red synthetic fibers from Item 2 could not have originated from the same source as the red cotton fibers in Item 1. Items 1, 2, and 3 were examined visually and using stereomicroscopy and Polarized Light Microscopy. Items 1 and 3 were examined using Microspectrophotometry (MSP) and Fluorescence Microscopy. Item 2 was also examined using Fourier Transform Infrared Spectroscopy (FTIR). Samples collected and analyzed during examination and analysis of the items in this case (ex. slides) were returned to and retained with the original item.
E8DKLF	Item 2 was examined by stereomicroscopy, polarized light microscopy, and infrared spectroscopy. Items 1 and 3 were examined by stereomicroscopy, polarized light microscopy, comparison microscopy, fluorescence microscopy, microspectrophotometry, and thin-layer chromatography. Two types of red cotton yarn were found in Item 3, which were indistinguishable from the two types of red cotton yarn comprising the fabric in Item 1 in color, construction, fiber type, and microscopic characteristics (Type 3 Association). This means the yarns found in the trunk could have come from the bedsheet the victim was wrapped in. The two types of yarn found in Item 2 were different from Item 1 (Elimination). This means the fibers found stuck to the driver's side floor mat did not come from the same source as the fabric in Item 1.
E8FRTW	Two of the four red threads recovered from Item 3 (Your Item 3) have the same color, construction, and composition as the red threads that comprise the warp of the Item 1 fabric sample (Your Item 1). The other two red threads recovered from Item 3 (Your Item 3) have the same color, construction, and composition as the red threads that comprise the weft of the Item 1 fabric sample (Your Item 1). Accordingly, the red threads are consistent with originating from the bed sheet Item 1 was sampled from or from another item with the same color, construction, and composition. The four red threads recovered from Item 2 (Your Item 2) differ in macroscopic color and construction from the red threads comprising the warp and weft of the Item 1 fabric sample (Your Item 1). Accordingly, the red threads from Item 2 are not consistent with having originated from the same source as Item 1. The specimens were examined visually using stereomicroscopy, comparison microscopy, fluorescence microscopy, and polarized light microscopy, and instrumentally using microspectrophotometry, where appropriate.
EJ9VUM	The fibers in item 1 and item 3 did not show any differences with regards to physical properties (construction, color, dye distribution, crimp measurements) and optical properties (PLM and fluorescence). The fibers in item 1 can not be eliminated as a possible source of the fibers in item 3.
FVEKC4	Reddish-pink cotton fibers comprising Item 3 exhibits the same microscopic characteristics and optical properties as the fibers comprising Item 1. Accordingly, these fibers are consistent with originating from Item 1, or another item comprised of fibers that exhibit the same microscopic characteristics and optical

TABLE 4

WebCode	Conclusions
	<p>properties. The reddish-pink fibers comprising Item 2 are microscopically dissimilar to the fibers comprising Item 1. Accordingly, these fibers are not consistent with originating from Item 1. The specimens were examined using stereomicroscopy, comparison microscopy, polarized light microscopy, fluorescence microscopy, and microspectrophotometry.</p>
G92VAE	<p>The known section of fabric from the bed sheet the victim was wrapped in (Item 1) was examined, and known standards were collected. Item 3, the questioned fibers from the trunk, was examined and found to contain four (4) red yarns. The yarns were macroscopically and microscopically examined and compared to the red yarns comprising Item 1, the fabric from the bed sheet the victim was wrapped in. These examinations and comparisons revealed that the four (4) red yarns from Item 3 are consistent in color, construction, and appearance with the red yarns comprising Item 1. Comparative examinations between at least two hundred (200) red cotton fibers from the Item 3 yarns and the red cotton fibers comprising the Item 1 fabric revealed that the red cotton fibers from the trunk, Item 3, are consistent in color, appearance, fiber type, and microscopic characteristics with the red cotton fibers comprising the Item 1 bed sheet. Further instrumental examination and comparison of color of thirty (30) of the red cotton fibers from the trunk revealed that they are consistent with the red cotton fibers comprising the known section of bed sheet that the victim was wrapped in, Item 1. Therefore, at least thirty (30) of the red cotton fibers from the trunk, Item 3, could have originated from that source. Item 2, the questioned fibers from the driver's side floor mat, was examined and found to contain four (4) red yarns. Further examination revealed that the four (4) red yarns were comprised of two types: Type A Large diameter yarn. Type B Small diameter yarn. The four (4) red yarns were macroscopically and microscopically examined and compared to the red yarns comprising Item 1, the fabric from the bed sheet the victim was wrapped in. These examinations and comparisons revealed that the four (4) red yarns from the floor mat are different in construction and appearance from the red yarns comprising Item 1. Therefore, the four (4) red yarns from the driver's side floor mat, Item 2, could not have originated from that source. Identification examinations of at least one hundred (100) red fibers from Type A and fifty-five (55) red fibers from Type B revealed that they are consistent with Polyester.</p>
GXG4QP	<p>The findings provide very strong support for the view that the yarns (fibres) recovered from the trunk of the suspect's vehicle (Item 3), originated from the damaged bedsheets found wrapped around the body of the victim (Item 1), rather than from another item(s) made from identical fibres. The fibres recovered from the driver's footwell mat of the suspect's vehicle (Item 2) could not have originated from the damaged bedsheets (Item 2).</p>
HA3Z6T	<p>The pink cotton fibers from Item 3 have the same microscopic characteristics and optical properties as the fibers comprising Item 1. Accordingly, these fibers are consistent with originating from the same source as Item 1 or another source comprised of fibers with the same microscopic characteristics and optical properties. The Item 2 fibers are microscopically dissimilar to the fibers comprising Item 1. Accordingly, the Item 2 fibers are not consistent with originating from the same source as the Item 1 known sample. The specimens were examined visually using stereomicroscopy, comparison microscopy, polarized light microscopy, and fluorescence microscopy, and instrumentally using microspectrophotometry, where appropriate.</p>
HDPC7J	<p>The red polyester fibers labeled questioned fibers found stuck to the driver's side floor mat, item 2, display differences in physical characteristics and chemical composition as compared to the red cotton fibers labeled known section of fabric from the bed sheet that the victim was wrapped in, item 1. Elimination. The red cotton fibers labeled questioned fibers found within the trunk, item 3, are consistent in color, physical characteristics and chemical composition as compared to the red cotton fibers labeled known section of fabric from the bed sheet that the victim was wrapped in, item 1. Level IV association.</p>
HEYLXG	<p>We found cotton fiber from Item 1 and Item 3. However, Item 2 composed with polyester fiber distinct to Item 1 and Item 3.</p>
J76WB7	<p>In my opinion: a) The questioned fibres said to be recovered from the driver's side floor mat (Item 2) did not come from the known section of fabric from the bed sheet (Item 1) and were present due to chance. b) The findings moderately support the proposition that the questioned fibres found within the trunk (Item 3) share the same source as a bed sheet that the victim was wrapped in (Item 1).</p>

TABLE 4

WebCode	Conclusions
JHEBVY	Pink cotton fibers recovered from Item 3 exhibit the same microscopic characteristics and optical properties as the pink cotton fibers which comprise Item 1. Accordingly, these fibers are consistent with having originated from Item 1, or from another source comprised of fibers which exhibit the same microscopic characteristics and optical properties. No other apparent transfer of textile fibers was detected between Items 1 through 3. The specimens were examined using the following techniques as appropriate: stereomicroscopy, comparison microscopy, polarized light microscopy, fluorescence microscopy, and microspectrophotometry.
JRKQQQ	Item 1 and Item 3 were found to consist of microscopically red cotton yarns. Item 2 was found to consist of microscopically red polyester yarns. Based on yarn characteristics, microscopic characteristics, fluorescence and instrumental colour analysis of the fibres, the examined red yarns from Item 3 could have originated from the Item 1, or other sources of containing yarns with similar characteristics. Based on yarn characteristics, microscopic characteristics and fluorescence of the fibres, the red yarns from Item 2 were found to be different from Item 1.
JTF3XC	The questioned yarns found inside the suspect's vehicle (Items 2 and 3) were examined and compared to a known section of fabric from the bed sheet associated with the victim (Item 1) to determine if they could have originated from that source. 1 – Section of red fabric. Item 1 was opened and found to contain one (1) section of red, plain-weave fabric. Yarns and fibers were collected from the section of fabric to be used for comparison purposes. 2 – Questioned red yarns from driver's side floor mat. Examination of Item 2 revealed the presence of four (4) red yarns comprised of two population of pink-red polyester fibers, type 'A' and type 'B', which can be differentiated by diameter. These red yarns were examined and compared to the red yarns comprising the section of red fabric in Item 1 and were found to be different in construction. It is therefore concluded that the red yarns from the driver's side floor mat of the suspect's vehicle could not have originated from the section of red fabric. 3 – Questioned red yarns found in the trunk of the suspect's vehicle. Examination of Item 3 revealed the presence of four (4) red yarns. These red yarns were examined and compared to the red yarns comprising the section of red fabric in Item 1 and were found to be consistent in color, construction, size, and appearance. Macroscopic and microscopic examinations and comparisons of at least two-hundred and eighty (280) pink-red cotton fibers comprising the red yarns revealed that they are consistent in color, appearance, fiber type and microscopic characteristics with the pink-red cotton fibers comprising the red fabric. Further instrumental examination and comparison of thirty (30) pink-red cotton fibers comprising the red yarns in Item 3 revealed that they are consistent with the pink-red cotton fibers comprising the section of red fabric in Item 1 and therefore could have originated from that source.
JZY6U	The examination of items 1, 2 and 3 submitted in relation to this case have now been completed and the results are as follows: Fibres from item 2 (found stuck to drivers floor mat) are different from the constituent fibres of item 1 and therefore can be eliminated from having originated from item 1. Fibres from item 3 (found within the trunk) are indistinguishable (under low power microscopy) from the constituent fibres of item 1. Items 1 and 3 will be sent to a forensic provider for further analysis in order to establish whether or not item 1 has been the source of the fibres in item 3
K7GRVJ	Based on the results of FTIR analysis and on the shape and elemental composition of the fibres (as determined by SEM and EDS), fibres from item 2 (fibres found stuck to the driver's side floor mat) cannot have originated from item 1 (fabric from the bed sheet that the victim was wrapped in). Conversely, using the same analysis techniques, the fibres from item 3 (fibres found within the trunk) cannot be excluded from having originated from item 1.
KLVLJ8	The Item 1 known section of fabric consists of a red woven cotton fabric. The Item 2 fibers from floor mat consists of red polyester yarns. The Item 3 fibers from trunk consists of red cotton yarns. The Item 1 red cotton fibers were compared to the Item 2 red polyester fibers. The Item 2 fibers are different in color and microscopic characteristics from the Item 1 fibers. This is an elimination. The Item 1 red cotton fibers were compared to the Item 3 red cotton fibers. The Item 3 fibers are similar in color and microscopic characteristics to the Item 1 fibers. This is a Type IV association.
KRWTUK	The items submitted were examined to assist with whether the fibres from the driver's side floor mat (Item

TABLE 4

WebCode	Conclusions
	2) and/or the fibres from the trunk of the car (Item 3) originated from the bed sheet that the victim was wrapped in (Item 1). The above findings provide strong support for the view that the red fibres from the trunk (Item 3) originated from the fabric from the bed sheet (Item 1) rather than from a different source. I have chosen the above phrase from the following scale: weak support, moderate support, moderately strong support, strong support, very strong support, extremely strong support. Note: No inference can be made on the activity that led to the presence of fibres in the trunk. The findings also show that the fibres from the driver's side floor mat (Item 2) originated from a source other than the bed sheet (Item 1).
KWBBHD	Items 1 and 3 exhibit the same microscopic characteristics and chemical composition. The cotton fibers in Item 3 could have originated from the same source as the cotton fibers in Item 1. Item 2 exhibits differences in microscopic characteristics and chemical composition from Item 1. The polyester fibers in Item 2 could not have originated from the same source as Item 1.
LCXMCD	Examination and comparison of representative Fibers A and B from Item 3 and representative warp and weft fibers from Item 1 were found to be red cotton fibers similar in all measured microscopic and color properties. They could have come from the same source or any other source with the same properties. Examination and comparison of representative Fibers A and B from Item 2 were found to red polyester fibers dissimilar in all measured microscopic properties to representative warp and weft red cotton fibers from Item 1. They could not have come from the same source.
LMHWYL	The fiber found within the trunk of the car (Item 3) have originated from the torn bed sheet that the victim was wrapped in (Item 1).
M7TTQ3	The fabric from the bed sheet (Item 1) was constructed with yarns of twisted, red cotton fibres woven together. The yarns in both the warp and weft had a crimped appearance from being woven into fabric, with the warp yarns appearing less crimped than weft yarns. Both the warp and weft yarns appeared to have lighter coloured regions in the valleys of the crimps indicating that the fabric was dyed after being woven. The fibres found 'stuck to the driver's side floor mat' (Item 2) consisted of four yarns constructed with red polyester fibres. Consequently, the four lengths of yarn that were 'stuck to the driver's side floor mat' could not have originated from the bed sheet. The fibres found 'within the trunk' (Item 3) consisted of four yarns constructed with red cotton fibres. The four yarns had a crimped appearance, indicating they likely originated from a woven fabric, with two of the yarns appearing less crimped than the other two. The four yarns appeared to have lighter coloured regions in the valleys of the crimps indicating that they originated from a fabric that was dyed after being woven. Two of the yarns from 'within the trunk' (Item 3) were indistinguishable in appearance and construction from the warp yarns in the fabric from the bed sheet (Item 1). The other two yarns from 'within the trunk' were indistinguishable in appearance and construction from the weft yarns in the fabric from the bed sheet. In addition to this, the red cotton fibres in the four yarns from 'within the trunk' (Item 3) were indistinguishable from the red cotton fibres in the yarns from the bed sheet (Item 1) with respect to their colour, fluorescent properties and the dye class. In my opinion, this result provides strong support for the contention that the four red cotton yarns from 'within the trunk' (Item 3) originated from the bed sheet (Item 1).
MBLKAR	Item 1.3 could have originated from item 1.1 or from another source exhibiting all of the same analyzed/measured characteristics. Item 1.2 yarns could not have originated from item 1.1.
MGT3UE	Item 1: This item was used for comparison. Item 2: The questioned threads are dissimilar in texture and fiber type to the known fabric from the blanket the victim was wrapped in (01-01-AA). It is my opinion that the questioned threads could not have come from the blanket the victim was wrapped in (Category 5). No further analysis done. Item 3: The questioned threads are similar in visual color and texture to the known fabric from the blanket the victim was wrapped in (01-01-AA). A portion of the threads were selected for further analysis and are similar in optical properties, including fluorescence, color, and fiber type to the known fabric from the blanket the victim was wrapped in (01-01-AA). It is my opinion that the questioned fibers could have come from the blanket the victim was wrapped in or any other garment with similar fiber characteristics (Category 2B). No analysis was performed on the remaining threads. No further analysis done.
MXD3EH	Item 1 consists of a red, square-shaped piece of fabric with a woven construction. A representative

TABLE 4

WebCode	Conclusions
	<p>sample consisting of one fiber from each weave direction was examined and identified as cotton. Item 2 is composed of four yarns of red fibers. A representative sample consisting of one fiber from each yarn was examined and identified as polyester. These four fibers are dissimilar in microscopic characteristics to the fibers examined from item 1. Therefore, the fibers found on the driver's side floor mat could not have originated from the bed sheet the victim was wrapped in. Item 3 is composed of four yarns of red fibers. A representative sample consisting of one fiber from each yarn was examined and identified as cotton. These four fibers are similar in microscopic and optical characteristics to the two exemplar fibers examined from item 1. Therefore, the fibers found within the trunk could have come from the bed sheet that the victim was wrapped in or any other textile with the same class characteristics.</p>
N424VM	<p>Item 1 and Item 3 were found to consist of cotton yarns, each consisting of two types. Item 2 was found to consist of polyester yarns. Based on yarn characteristics and microscopic characteristics, fluorescence and instrumental colour analysis of fibres constituting the yarns, one yarn from each type in Item 3 could have originated from Item 1, or other sources containing yarns with similar characteristics. Based on differences in yarn characteristics and microscopic characteristics (morphology) of fibres constituting the yarns, Item 2 did not originate from Item 1.</p>
N773JH	<p>Interpretation: HP: fibres from trunk from sheet. HD: Fibres from trunk not from sheet, match by chance. if hp true, expect to find matching fibres. if hd true, fibres must match by chance. Empirical studies show that the chance of finding matching fibers by chance is small; this decreases with the number of different comparative tests performed. Although cottons in general are a common fibre type, led cottons are not. Also they were shown to be undistinguishably using low power + high power microscopy fluorescence of microscpetrophotometry. 4 threads were recovered, not just individual fibres; as the sheet was torn, there was the possibility of whole threads being transferred from the torn edges which increases the strength of support for the fibres recovered from the trunk having originated from the sheet. Conclusion: in my option the scientific findings provider very strong support for a view that the fibres (item 3) recovered from the trunk originated from teh sheet (item 1) rather than they did not & match by chance.</p>
N8JT8T	<p>Red cotton fibers recovered from Item 3 exhibit the same microscopic characteristics and optical properties as the red cotton fibers comprising Item 1. Accordingly, the red cotton fibers from Item 3 are consistent with originating from the source of Item 1, or another item comprised of fibers exhibiting the same microscopic characteristics and optical properties. Red manufactured fibers recovered from Item 2 are microscopically dissimilar to the fibers comprising Item 1. Accordingly, these fibers are not consistent with originating from the source of Item 1. The specimens were examined using the following methods as appropriate: stereomicroscopy, comparison microscopy, polarized light microscopy, fluorescence microscopy, and microspectrophotometry.</p>
NW3BA9	<p>CONCLUSIONS: Four yarns identified as from the trunk (Item 3) originated from the bed sheet (Item 1) or another source of textile material possessing the same distinct characteristics. Four yarns identified as from the driver's side floor mat (Item 2) did not originate from this portion of the bed sheet (Item 1). RESULTS: Questioned yarns identified as from the driver's side floor mat and the trunk (Items 2 and 3) were examined for the purpose of determining whether or not they are consistent with the known fabric of the bed sheet (Item 1). Examination of Item 2 revealed the presence of four red yarns composed of polyester fibers. Examination of Item 3 revealed the presence of four red yarns composed of cotton fibers. Examination and comparison of the four questioned yarns from Item 2 with known yarns from the fabric of the bed sheet (Item 1) revealed they are inconsistent in construction and generic fiber type. It is therefore concluded these yarns did not originate from this portion of the bed sheet. Examination and comparison of the four questioned yarns from Item 3 with known yarns from the fabric of the bed sheet (Item 1) revealed they are consistent in construction. Further examination and comparison of fibers composing the yarns from Item 3 with fibers composing yarns from the bed sheet (Item 1) revealed they are consistent in microscopic and optical characteristics. It is therefore concluded the yarns identified as from the trunk originated from the bed sheet or another source of textile material possessing the same distinct characteristics. METHODS OF ANALYSIS: Examinations were performed visually, by stereo microscopy, brightfield/polarized light comparison microscopy, fluorescence microscopy, microspectrophotometry, and Fourier transform infrared microspectroscopy.</p>
NYYATF	<p>Item 1 is a woven textile. The threads in the weft and weave directions have a different morphology.</p>

TABLE 4

WebCode	Conclusions
	Both were found to contain red cotton fibres. We consider two hypotheses to evaluate the results of the comparative analyses. These hypotheses will be evaluated individually for Item 2 and Item 3. Hypothesis 1: Item 1 is the source of Item#. Hypothesis 2: An arbitrary other red textile is the source of Item#. Item 2 consists of a number of threads that contain polyester fibres. Item 1 is not the source of these threads, which implies that hypothesis 2 is true. Item 3 consists of a number of threads that contain red cotton fibres. These fibres could not be distinguished from the fibres in item 1 by any of the methods used. Red cotton fibres occur reasonably often. There is a small chance that other red textiles could shed identical fibres. It is concluded that the results form a moderate support for hypothesis 1.
PD2J8T	Red cotton fibers recovered from Item 3 exhibit the same microscopic characteristics and optical properties as the fibers comprising Item 1. Accordingly, these fibers are consistent with originating from Item 1 or another item comprised of fibers that exhibit the same microscopic characteristics and optical properties. Red manufactured fibers recovered from Item 2 are microscopically dissimilar to the fibers comprising Item 1. Accordingly, these fibers are not consistent with originating from Item 1. The specimens were examined using the following techniques as appropriate: stereomicroscopy, comparison microscopy, polarized light microscopy, fluorescence microscopy, and microspectrophotometry.
PKZ72D	The questioned fiber (Item 2) that was found stuck to the driver's side floor matt COULD NOT have been originated from the bed sheet that the victim was wrapped in (Item 1) because of their differences in physical properties and chemical compositions. The questioned fiber (Item 3) that was found within the trunk COULD have been originated from the bed sheet that the victim was wrapped in (Item 1) because of their similarities in physical properties and chemical compositions.
QCP4FD	Physical comparison of the fibers in item No. 1,2, and 3 was done using stereoscope and comparison microscope. All fibers are red in color. Item No. 2 had an obvious shiny like texture, but item No 1 and item No. 3 were found to be similar in texture. Two types of patterns was observed in each of the item, wavy and straight (less wavy). The dimensions were measured under stereoscope and comparison microscope. The wavelength (distance between the crust) and the thickness of the fibers. By comparing Item No. 1 and Item No. 3 were approximately close to each other. Chemical analysis of the fibers showed that item No.1 and Item No. 3 are Manufactured Rayon. We conclude that the fiber found in the trunk (item 3) could be from the bed sheet (item1).
QDJRX9	Items 1 and 3 are cotton fibers, and Item 2 is polyester fibers. As a result of analyzing Item 1 and Item 3, which have the same components, with a polarizing microscope and a microspectrophotometer, items 1 and 3 were similar in color and polarization shape. Therefore, item 3 would be originated from item 1.
QPCWYY	Based on the results of the examinations and analysis of the items received, I have formed the following opinions: I am unable to exclude the proposition that the known section of red coloured fabric from the bed sheet in item 1 could be a source of the red coloured yarns recovered from the trunk that were provided in item 3. I am also unable to exclude the proposition that another piece of red coloured fabric similar to the known section of fabric provided in item 1 could also be a source of the red coloured yarns provided in item 3. I am able to exclude the proposition that the known section of of red coloured fabric from the bed sheet in item 1 could be a source of the red coloured yarns stuck to the driver's side floor mat provided in item 2.
QX6AYX	Item 1 - Known section of fabric from the bed sheet that the victim was wrapped in - Contained a swatch of red fabric (approximately 5cm x 5cm). This fabric was found to consist of red cotton fibres. Item 2 - Questioned fibres found stuck to the driver's side floor mat - Contained four threads of red fibres approximately 5cm in length. These threads were found to consist of red polyester fibres. Item 3 - Questioned fibres found within the trunk - Contained four threads of red fibres approximately 5cm in length. These threads were found to consist of red cotton. In relation to appearance, colour and fibre composition the red cotton fibres found within the trunk (item 3) were found to be indistinguishable to the red cotton fibres from the swatch of fabric from the bed sheet (item 1). Therefore these two fibre samples may share a common origin. The red dye from these items (item 1 and 3) was not able to be extracted using a variety of extraction solvents. The fibres found stuck to the floor mat (item 2) were found to have a different chemical composition to the fibres from the bed sheet (item 1) and therefore could not have originated from that source.

TABLE 4

WebCode	Conclusions
R28886	The known section of the fabric from the bedsheet that the victim was wrapped in (item 1) comprised red cotton fibres. The questioned fibres from the trunk (item 3) comprised red cotton fibres, agreeing in colour, fibre type and microscopic appearance under various lighting conditions with the red cotton fibres from the known section of fabric from the bedsheet that the victim was wrapped in (item 1), indicating that they could have originated from the same source. The questioned fibres from the driver's side floor mat (item 2) differed in fibre type with the red cotton fibres from the known section of fabric from the bedsheet that the victim was wrapped in (item 1), indicating that they did not originate from the same source. Based on the above laboratory findings, there could have been a contact having occurred between the bedsheet and the trunk, rendering a transfer of textile fibres from the bedsheet to the trunk.
R4PEHL	The fibres from the trunk of the suspects car match the fibres from the bed sheet the victim was wrapped in. The fibres found on the drivers floor mat could not have originated from the bed sheet.
RBV2J3	Items 1-3 were examined visually, stereoscopically with white and UV light, microscopically and instrumentally using Fourier Transform Infrared Spectrometry (FTIR). The fibers from Item 2 were not consistent with the fabric from Item 1. The fibers from Item 3 were visually, microscopically and instrumentally consistent with the fibers from the fabric in Item 1. This indicates the fibers recovered from within the trunk (Item 3) and fabric from the sheet the victim was wrapped in (Item 1) could share a common origin. Questioned Item 3 could also have originated from additional sources that are indistinguishable in all assessed examinations and analyses. No statistical or numerical probabilities can be applied to the conclusions of this report.
RGU3NG	According to above mentioned analyses, item 3 was found to have similar physical and chemical structure with item 1, but item 2 has different physical and chemical structure from item 1. Therefore, item 3 may have originated from item 1.
RKUDKG	The constituent fibers from Item 1 were identified as red cotton. Item 2 and Item 3 were identified as red polyester and red cotton, respectively. Item 3 were indistinguishable from Item 1 in microscopic characteristic (PLM), color (MSP), and chemical composition (FT-IR). Item 3, the questioned fibers found within the trunk could have come from Item 1, the known section of fabric from the bed sheet that the victim was wrapped in.
RMK84J	The questioned fibres found within the trunk of the car (item 3) match in all examined criteria the fibres from the torn bed sheet that was used to wrap in the victim's body (item 1). Therefore it is likely that item 3 comes from a textile similar to the torn bed sheet (item 1). There is no evidence that the questioned fibres that stuck to the driver's side floor mat (item 2) come from the bed sheet.
RWBLF3	When the Questioned Item 2, Exhibit 2 was compared to Item 1; Exhibit 1 it was determined that the unidentified fibers of Exhibit 2 exhibited significant differences in the microscopic and physical properties and it could not have originated from the same source as the natural cotton fibers from Exhibit 1. When the Questioned Item 3, Exhibit 3 was compared to Item 1; Exhibit 1 it was determined that no significant differences were observed in the microscopic and color properties. The questioned fibers of Exhibit 3 could have originated from the same source represented by the fibers of Exhibit 1 or another source of natural cotton fibers with the same physical and microscopic properties.
THKHZH	The fibers of Item 1 and Item 3 have the same characteristics. Thus the questioned fibers found within the trunk (Item 3) could come from the bed sheet that the victim was wrapped in. The questioned fibers found stuck to the driver's side floor mat (Item 2) were inconsistent with Item 1 and could not have the same source.
TYNH2D	Item 1, known section of fabric from the bed sheet, contains vegetable fibers, typical of cotton. Item 2, questioned fibers found stuck to the driver's side floor mat, contains manufactured fibers identified as polyester. Item 3, questioned fibers found within the trunk, contains contains vegetable fibers, typical of cotton.
U2VYXN	The submitted items were examined and analyzed by stereo microscope, polarized light comparison microscope and solubility test. The red fibers found in Item 1 composed of Cotton. The red fibers found in Item 2 composed of Polyester. The red fibers found in Item 3 composed of Cotton. The fibers found in Item 2 exhibited different microscopic appearance and physical characteristic as Item 1. Therefore,

TABLE 4

WebCode	Conclusions
	fibers found stuck to the driver's side floor mat could not have originated from the bed sheet that the victim was wrapped in. The fibers found in Item 3 exhibited similar microscopic appearance and physical characteristic as Item 1. Therefore, fibers found within the trunk could have originated from the bed sheet that the victim was wrapped in.
U3RDKF	Red cotton fibers recovered from Item 3 exhibit the same microscopic characteristics and optical properties as the fibers comprising Item 1. Accordingly, these fibers are consistent with originating from Item 1, or another item comprised of fibers that exhibit the same microscopic characteristics and optical properties. Fibers found on Item 2 are microscopically dissimilar to the fibers comprising Item 1. Accordingly, these fibers are not consistent with originating from Item 1. The items were examined using stereomicroscopy, comparison microscopy, polarized light microscopy, fluoresce microscopy, and microspectrophotometry, where appropriate.
ULGQY6	Item 1 consists of cotton fibers twisted in the Z-direction. Item 2 consists of polyester fibers twisted in the S- & Z-direction. Item 3 is same as Item 1 in composition and twisted direction.
URM7AA	Item 1 and Item 3 are characterized by the same morphological characteristics: color, color tone and structure. Item 1 and Item 2 represent different types of fiber.
V2RWMA	In my opinion, the fibres recovered from the driver's floor mat as Item 2 have not originated from the torn bedsheet used to wrap the body of the deceased as represented by Item 1. There is, in my opinion, strong support for the view that the fibres recovered from the trunk of the vehicle as Item 3 have originated from the torn bedsheet in question rather than they have not.
V8BGWC	1. Examination of Exhibit 1 (known section of fabric from the bed sheet that the victim was wrapped in) disclosed the presence of a red piece of woven fabric composed of red cotton fibers. 2. Examination of Exhibit 2 (questioned fibers found stuck to the driver's side floor mat) disclosed the presence of red polyester fibers. Comparative examinations of the red polyester fibers in Exhibit 2 to the red cotton fibers that compose the fabric in Exhibit 1 disclosed them to be inconsistent in their physical and chemical compositions. As a result of these findings, these questioned polyester fibers could not have originated from the source of fabric in Exhibit 1. 3. Examination of Exhibit 3 (questioned fibers found within the trunk) disclosed the presence of red cotton fibers. Comparative examinations of the red cotton fibers in Exhibit 3 to the red cotton fibers that compose the fabric in Exhibit 1 disclosed them to be consistent in their physical characteristics and chemical characteristics. As a result of these findings, these questioned red cotton fibers could have originated from the source of fabric in Exhibit 1. 4. A fiber association is not a means of positive identification and the number of possible sources for a specific fiber is unknown. Due to the variability in manufacturing, dyeing, and consumer use, one would not expect to encounter a suitable fiber selected at random to be consistent with a particular source.
V9NBCD	1. Examination of Exhibits 1 (known section of fabric from the bed sheet that the victim was wrapped in) and 3 (questioned fibers found within the trunk) disclosed the presence of red cotton fibers. Comparative examinations of the fibers from Exhibit 1 with the fibers from Exhibit 3 disclosed them to be consistent in their physical and chemical characteristics. As a result of these findings the fibers from Exhibit 3 could have originated from Exhibit 1, or another source with the same characteristics. A fiber association is not a means of a positive identification and the number of possible sources for a specific fiber is unknown. Due to the variability in manufacturing, dyeing, and consumer use, one would not expect to encounter a suitable fiber selected at random to be consistent with a particular source. 2. Examination of Exhibit 2 (questioned fibers found stuck to the driver's side floor mat) disclosed the presence of red polyester fibers. Comparative examinations of the fibers from Exhibit 1 with the fibers from Exhibit 2 disclosed them to be inconsistent in their physical and chemical characteristics. As a result of these findings the fibers from Exhibit 2 could not have originated from Exhibit 1.
W67CN7	Physical examination of Item 1 revealed the presence of a swatch of red fabric. Physical examination of Item 2 revealed the presence of a bundle of red fibers. Physical examination of Item 3 revealed the presence of a bundle of red fibers. Physical, microscopic, and instrumental comparison of the red polyester fibers from the floor mat in Item 2 with fibers from the construction of the bedsheet in Item 1 revealed them to be inconsistent with respect to physical and optical properties and fiber type. Therefore, the fibers recovered from the driver's side floor mat could not have come from the bedsheet.

TABLE 4

WebCode	Conclusions
	Physical and microscopic comparison of the red cotton fibers from the trunk in Item 3 with the fibers from the construction of the bedsheet in Item 1 revealed them to be consistent with respect to physical and optical properties and fiber type. Therefore, the fibers recovered from the trunk could have come from the bedsheet or another source with these same properties.
WCMZCG	Item #1-Macroscopic, microscopic and UV/Visible Spectroscopic examination of Item #1 revealed a section of red- colored fabric (approximately 5cm in length by 5 cm in width) that was constructed of numerous yarns composed of red-colored cotton fibers (K1 and K2). Item #2- Macroscopic examination of Item #2 revealed four (4) sections of yarn (Q1a, Q1b, Q1c and Q1d), each approximately 5 cm in length. Microscopic and IR Spectroscopic examination of Q1a, Q1b, Q1c and Q1d revealed the yarns to be composed of numerous red-colored polyester fibers that were not consistent with the knowns K1 and K2 with respect to fiber type. Therefore, Q1 (Q1a, Q1b, Q1c and Q1d) could not have originated from the known source as represented by K1 and K2. Item #3- Macroscopic examination of Item #3 revealed four (4) sections of yarn (Q2a, Q2b, Q2c and Q2d), each approximately 5 cm in length. Microscopic and UV/Visible Spectroscopic examination of Q2a, Q2b, Q2c and Q2d revealed the yarns to be composed of numerous red-colored cotton fibers that were consistent with the knowns K1 and K2 with respect to color , optical properties and fluorescence. Therefore, Q2 (Q2a, Q2b, Q2c and Q2d) could have originated from the known source as represented by K1 and K2 or from another textile source composed of fibers that exhibit all the same analyzed characteristics.
WFLJRG	According to the different tests we made, we can say that: Item 1 and item 2 have different sources. Item 1 and item 3 may have the same source.
WW9UZG	Examinations: Visual examination, stereomicroscopy, polarized light microscopy, fluorescence microscopy, microspectrophotometry, infrared spectroscopy Information: Questioned fibers from red yarns recovered from a floor mat (Item 2) and questioned fibers from red yarns recovered from a trunk (Item 3) were examined and compared to known fibers from a fabric swatch from a bed sheet (Item 1). All three items had two sets of yarns. Results: Comparison of Items 1 and 2: The yarns and fibers from Items 1 and 2 differed in physical characteristics, microscopical characteristics, and fiber type (cotton versus polyester, respectively). The questioned fibers from Item 2 did not originate from the sheet represented by Item 1. (Elimination) Comparison of Items 1 and 3: The yarns and fibers from Items 1 and 3 corresponded in all examinations performed. The tested yarns and fibers from Item 3 originated either from the sheet represented by Item 1 or from another fiber source or combination of sources with indistinguishable yarn and fiber characteristics. Because similar fabrics have been manufactured that would be indistinguishable from the submitted evidence, an individual source cannot be determined. (Level 3 - Association) Additional remarks: Multiple associations of questioned and known fibers (e.g., from different sets of yarns) may increase the significance of the fiber evidence.
XC372D	The sample consists of three items: Item 1: Known section of fabric from the bed sheet that the victim was wrapped in, is composed of vegetable, cotton. Item 2: Questioned fibers found stuck to the driver's side floor mat, is composed of manufactured, polyester. Item 3: Questioned fibers found within the trunk, is composed of vegetable, cotton. The fibers from Item 3, found in the truck of the car, could have originated from fibers from Item 1. Both fibers have similar composition, coloration, diameter and longitudinal and cross section appearance.
XJ24X9	The known fibers from the bed sheet (Item 1) were found to be red cotton fibers. The questioned fibers from the driver's side floor mat (Item 2) were found to be moderately delustered red polyester fibers. The questioned red fibers from the suspect's trunk (Item 3) were found to be composed of red cotton fibers. The questioned red cotton fibers from the suspect's trunk (Item 3) were found to be consistent with the known red cotton fibers from the bed sheet (Item 1) with respect to color, morphology, optical properties, and fiber type. Based upon these observations, it is the opinion of this analyst that the questioned red fibers (Item 3) could have originated from the known bed sheet (Item 1) or any other source exhibiting the same characteristics. The questioned red polyester fibers from the driver's side floor mat (Item 3) were found to be inconsistent with the known red cotton fibers from the bed sheet (Item 1) with respect to fiber type.

TABLE 4

WebCode	Conclusions
XYCEGA	<p>The bed sheet, item 1, is composed of red cotton fibres and sheds threads of such fibres from its edges. The threads shed from one direction of the fabric were wavier and slightly thicker in width than the threads shed from the other direction of the fabric. Item 3, from the boot, consisted of four threads of red cotton fibres. These threads were of the same visual appearance as the threads shed from the bedsheet, with two of the threads being slightly wavier and of thicker width, and two of the threads being slightly less wavy. The red cotton fibres comprising the threads from the boot were indistinguishable by microscopy and instrumental colour analysis from the red cotton fibres comprising the bed sheet. In my opinion, the findings provide strong support for the red threads (item 3) from the boot having originated from the bed sheet (item 1). In my opinion, one possible explanation for the findings is that the damaged bed sheet had been inside the boot of the vehicle. If Suspect was to provide an alternative explanation, further evaluation could be made; such an evaluation is best done in advance of trial. Item 2, found stuck to the driver's side floor mat, consisted of four threads of red polyester fibres. Two threads were wavy but of a different appearance to the threads comprising the bedsheet, and the other two threads of item 2 were straight. Therefore, in my opinion, these threads were not from the bedsheet.</p>
Y3TYYH	<p>The fibers found stuck to the driver's side floor mat (Item 2) do not come from the victim's bed sheet (Item 1). The results support that the fibers found within the trunk of the car (Item 3) come from the victim's bed sheet (Item 1).</p>
YJ2G63	<p>The known section of fabric from the bed sheet (Item 1) was used for comparison purposes and consisted of red threads composed of red cotton fibers. The questioned fibers from the driver's side floor mat (Item 2) consisted of red threads containing red polyester fibers. These fibers are dissimilar in fiber type to known fibers from fabric from the bed sheet (Item 1). The red threads are dissimilar in visual appearance to the red threads from the fabric from the bed sheet. It is my opinion that these threads did not originate from the fabric from the bed sheet. The questioned fibers from the trunk (Item 3) consisted of red threads composed of red cotton fibers. The threads are similar in visual color and construction to threads from the fabric from the bed sheet (Item 1). A portion of the fibers were sampled and are similar in color, fiber type, and optical properties to known fibers from the fabric from the bed sheet. It is my opinion that these red cotton fibers could have come from the fabric from the bed sheet, or any other textile with a similar construction and fiber characteristics. The remaining fibers from the threads from the trunk were not further examined.</p>
ZTZ8U2	<p>The known fibers collected from the bed sheet (Item #1) are similar in physical (crimp pattern and diameter), optical, and chemical properties to the red colored fibers recovered from the trunk (Item #3). The fibers from the bed sheet (Item #1) or another material with similar fiber characteristics could have been the source of the fibers found in the trunk (Item #3). The known fibers collected from the bed sheet (Item #1) were excluded as a possible source to the red colored fibers recovered from the driver side floor mat (Item #2). Differences in optical and chemical properties were observed. Note, additional techniques used to resolve minor color/dye differences were not available at the time of this report that could either support or refute a common source determination.</p>
ZWYUTC	<p>Item 1 is composed of pink fibers. Regarding the type of fibers, they are cotton fibers. Item 2 is composed of red fibers, treated with delustrant. There are two different fibers, ones have a 10 um diameter and the other ones have an irregular diameter as a result of their twist. In addition, they have a different cross-section. Regarding the type of fibers, they are manufactured fibers identified as Polyester by FTIR. Item 3 is composed of pink fibers. Regarding the type of fibers, they are cotton fibers. Considering the similar morphology, color, cross-section and behavior under fluorescence and polarized light, no significant differences were observed between Item 1 and Item 3. The analysis performed by FTIR and Raman spectroscopy determined that both samples are indistinguishable with the techniques used. the Fibers found stuck to the driver's side floor mat (Item 2) have a different origin other than the torn bed sheet that the victim was wrapped in. The Fibers found within the trunk (Item 3) and the fibers from the torn bed sheet that the victim was wrapped in (Item 1) could have the same origin.</p>

Additional Comments

TABLE 5

WebCode	Additional Comments
2AG7JC	Insert Association Scale [Scale not included with report].
3GGDR8	if construction of yarns not intended as point of comparison, would tease yarns out further
8Q7BBW	The findings strongly support the hypothesis that says Item 3 and Item 1 are of the same origin, rather than the alternative hypothesis that says Item 3 and Item 1 are of different origin.
9NZLHQ	The quantity of material does not correspond to the quantity usually encountered in real cases.
AECGHJ	At this laboratory, fiber analyses with a negative association stop as soon as a difference is noted; the exam does not continue to identify the fiber types. The examination of this proficiency test did not follow our lab's Technical Procedures in that aspect.
BNP89Z	Item 2 comprise with the two type of thread which were easily differentiated macroscopically based on their structure as well as colour shade. Each thread was composed of matt, polyester fibers. Fibers of those two thread was easily differentiated based of their longitudinal view, which indicated among others on different shape of this fibers. Item 2 was easily differentiated from Item 1 and 3 already during stereomicroscopy examination.
E8DKLF	Type 3 Association: Association with Conventional characteristics—Items are consistent in all measured and observed physical properties, chemical composition and/or microscopic characteristics, and therefore could have originated from the same source. Because other items have been manufactured or are naturally occurring that would also be indistinguishable from the submitted evidence, an individual source cannot be determined. Elimination—Items exhibit differences in one or more of the following: physical properties, chemical composition, or microscopic characteristics and therefore did not originate from the same source.
KLVLJ8	Having vegetable and manufactured fibers in a comparison is a poor assessment of fiber comparison when one of the fiber sources can be excluded from stereoscopic examination alone.
MBLKAR	Because textile materials are mass produced, it is not possible to state that a fiber originated from a particular textile source to the exclusion of all other textile materials composed of fibers which exhibit the same chemical and optical properties.
QX6AYX	This laboratory does not have access to microspectrophotometry and therefore any colour comparisons undertaken are subjective.
RWBFL3	Item 2, Exhibit 2 was not identified using FTIR due to the instrument being out of service.
TYNH2D	This laboratory does not report fiber comparisons.
U3RDKF	The results of the trace evidence examinations (fiber) are included in this report. Methods: Microscopic examination of fibers is accomplished by using one or more analytical techniques including stereomicroscopy, comparison microscopy, polarized light microscopy, fluorescence microscopy, and instrumentally using microspectrophotometry and Fourier transform-infrared spectroscopy. The microscopic characteristics and optical properties determined by these techniques are used for the examination and comparison of fibers. Interpretation: Fibers can differ as to type (e.g., rayon, cotton), color, shape, size, microscopic features (e.g., delustrant, voids) and optical properties (e.g., refractive index, sign of elongation). These are characteristics that may associate fibers with a group of items, but never to a single item to the exclusion of all others. However, even fibers with many similar properties may be excluded as originating from the same source by using the identified analytical methods. The characteristics and optical properties of the fiber(s) are used as comparison criteria. When the characteristics and optical properties of a recovered fiber(s) are the same as a known sample, the recovered fibers are consistent with originating from the source of the known sample, or from another item comprised of fibers that exhibit the same microscopic characteristics and optical properties. A fiber association is not a means of positive identification and the number of possible sources for a specific

TABLE 5

WebCode	Additional Comments
	<p>fiber is unknown. However, due to the variability in manufacturing, dyeing, and consumer use, one would not expect to encounter a fiber selected at random to be consistent with a particular item. The inability to associate persons/items through a microscopic fiber examination does not necessarily mean the persons/items of interest had no contact. A number of factors can produce this result, including: 1) Fiber evidence may not have transferred. 2) Fibers that did transfer may have been lost prior to submission to the laboratory. 3) The fibers transferred or the known sample submitted may not be representative of the source. 4) The fibers may be from a different source.</p>
V2RWMA	<p>The evaluation has taken into account the morphology of the threads forming Item 3 and the information that the bedsheet was torn as well as the fibres from which the threads and sheet are composed. Where I have stated that the findings provide a degree of support for a scenario, I have selected what I consider to be the most appropriate term from the following: none, limited, moderate, moderately strong, strong, very strong and extremely strong.</p>
WCMZCG	<p>It should be noted that textile fibers are massed produced and it is not possible to state that a questioned fiber originated from a known textile source to the exclusion of all other materials composed of fiber that exhibit the same physical characteristics and/or chemical composition.</p>
WW9UZG	<p>An Association Scale for Trace Evidence would be included in the report that described the possible conclusions and levels.</p>
XYCEGA	<p>We have assumed that the bed sheet was damaged in such as way that it shed threads of fibres from both directions of the weave.</p>
Y3TYYH	<p>We have assumed that Item 1 is a representative sample from the bed sheet.</p>

Test No. 23-5439: Fibers Analysis

DATA MUST BE SUBMITTED BY **March 13, 2023, 11:59 p.m. EDT** TO BE INCLUDED IN THE REPORT

Participant Code: U1234A

WebCode: H2UNA2

The Accreditation Release section can be accessed by using the "Continue to Final Submission" button above. This information can be entered at any time prior to submitting to CTS.

Scenario:

Police are investigating the homicide of a young women found in a field. The victim's body was found wrapped in a torn bed sheet and partially buried in the ground. Hours later, police reviewed the camera footage from across the street from where the body was dumped and were able to identify a suspect by the vehicle's license plate. Police obtained a search warrant and found fibers stuck to the driver's side floor mat and within the trunk of the car, similar to the bed sheet that the victim was wrapped in. Police are requesting that you examine the fiber(s), report their identification(s), and determine if the fibers recovered from the suspect's vehicle could have come from the bed sheet that the victim was wrapped in.

Items Submitted (Sample Pack FIBR):

Item 1: Known section of fabric from the bed sheet that the victim was wrapped in.

Item 2: Questioned fibers found stuck to the driver's side floor mat.

Item 3: Questioned fibers found within the trunk.

1.) Could either of the questioned fibers found stuck to the driver's side floor mat (Item 2) or within the trunk of the car (Item 3) have originated from the torn bed sheet that the victim was wrapped in (Item 1)?

	Yes	No	Inconclusive
Item 2:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Item 3:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2.) Fiber Type Determination.

Please enter the fiber type (Manufactured, Animal, or Vegetable) and generic name in the blank provided for each Item. For Manufactured fibers please use the terminology in the appendix provided. (Example: Item 1 Vegetable, Cotton)

Item 1:

Item 2:

Item 3:

3.) Indicate the procedure(s) used to examine the submitted items:

Please check all that apply.

<u>Microscopic Exams:</u>	<input type="checkbox"/> Stereo	<input type="checkbox"/> Comparison
	<input type="checkbox"/> Polarized Light	<input type="checkbox"/> Fluorescence

Macroscopic Exam IR/FTIR Microspectrophotometry
 Solubility Tests Cross-Section Melting Point

Other (specify):

Please note: Any additional formatting applied in the free form space below will not transfer to the Summary Report and may cause your information to be illegible. This includes additional spacing and returns that present your responses in lists and tabular formats.

4.) What would be the wording of the Conclusions in your report?

5.) Additional Comments

Appendix: Manufactured Fibers - Names & Definitions

Federal Trade Commission Rules and Regulations Under the Textile Fiber Products Identification Act 16 CFR Part 303

§303.7 Generic Names and Definitions for Manufactured Fibers

Pursuant to the provisions of Section 7(c) of the Act, the Commission hereby establishes the generic names for manufactured fibers, together with their respective definitions, set forth in this section, and the generic names for manufactured fibers, together with their respective definitions, set forth in International Organization for Standardization ISO 2076: 1999(E), "Textiles - Man-made fibres - Generic names."

(a) Acrylic

A manufactured fiber in which the fiber-forming substance is any long chain synthetic polymer composed of at least 85% by weight of acrylonitrile units.

(b) Modacrylic

A manufactured fiber in which the fiber-forming substance is any long chain synthetic polymer composed of less than 85% but at least 35% by weight of acrylonitrile units, except fibers qualifying under paragraph (j)(2) of this section and fibers qualifying under paragraph (q) of this section.

(c) Polyester

A manufactured fiber in which the fiber-forming substance is any long chain synthetic polymer composed of at least 85% by weight of an ester of a substituted aromatic carboxylic acid, including but not restricted to substituted terephthalate units, and para substituted hydroxy-benzoate units. (1) Where the fiber is formed by the interaction of two or more chemically distinct polymers (of which none exceeds 85% by weight), and contains ester groups as the dominant functional unit (at least 85% by weight of the total polymer content of the fiber), and which, if stretched at least 100%, durably and rapidly reverts substantially to its unstretched length when the tension is removed, the term elasterell-p may be used as a generic description of the fiber. (2) Where the glycol used to form the ester consists of at least ninety mole percent 1,3-propanediol, the term "trixta" may be used as a generic description of the fiber.

(d) Rayon

A manufactured fiber composed of regenerated cellulose, as well as manufactured fibers composed of regenerated cellulose in which substituents have replaced not more than 15% of the hydrogens of the hydroxyl groups. Where the fiber is composed of cellulose precipitated from an organic solution in which no substitution of the hydroxyl groups takes place and no chemical intermediates are formed, the term lyocell may be used as a generic description of the fiber.

(e) Acetate

A manufactured fiber in which the fiber-forming substance is cellulose acetate. Where not less than 92% of the hydroxyl groups are acetylated, the term triacetate may be used as a generic description of the fiber.

(f) Saran

A manufactured fiber in which the fiber-forming substance is any long chain synthetic polymer composed of at least 80% by weight of vinylidene chloride units.

(g) Azlon

A manufactured fiber in which the fiber-forming substance is composed of any regenerated naturally occurring proteins.

(h) Nylril

A manufactured fiber containing at least 85% of a long chain polymer of vinylidene dinitrile where the vinylidene dinitrile content is no less than every other unit in the polymer chain.

(i) Nylon

A manufactured fiber in which the fiber-forming substance is a long chain synthetic polyamide in which less than 85% of the amide linkages are attached directly to two aromatic rings.

(j) Rubber

A manufactured fiber in which the fiber-forming substance is comprised of natural or synthetic rubber, including the following categories: (1) A manufactured fiber in which the fiber-forming substance is a hydrocarbon such as natural rubber, polyisoprene, polybutadiene, copolymers of dienes and hydrocarbons, or amorphous (noncrystalline) polyolefins. (2) A manufactured fiber in which the fiber-forming substance is a copolymer of acrylonitrile and a diene (such as butadiene) composed of not more than 50% but at least 10% by weight of acrylonitrile units. The term lastrile may be used as a generic description for fibers falling within this category. (3) A manufactured fiber in which the fiber-forming substance is a polychloroprene or a copolymer of chloroprene in which at least 35% by weight of the fiber-forming substance is composed of chloroprene units.

(k) Spandex

A manufactured fiber in which the fiber-forming substance is a long chain synthetic polymer comprised of at least 85% of a segmented polyurethane.

(l) Vinal

A manufactured fiber in which the fiber-forming substance is any long chain synthetic polymer composed of at least 50% by weight of vinyl alcohol units, and in which the total of the vinyl alcohol units and any one or more of the various acetal units is at least 85% by weight of the fiber.

(m) Olefin

A manufactured fiber in which the fiber-forming substance is any long chain synthetic polymer composed of at least 85% by weight of ethylene, propylene, or other olefin units, except amorphous (noncrystalline) polyolefins qualifying under paragraph (j)(1) of this section. Where the fiber-forming substance is a cross-linked synthetic polymer, with low but significant crystallinity, composed of at least 95% by weight of ethylene and at least one other olefin unit, and the fiber is substantially elastic and heat resistant, the term lastol may be used as a generic description of the fiber.

(n) Vinyon

A manufactured fiber in which the fiber-forming substance is any long chain synthetic polymer composed of at least 85% by weight of vinyl chloride units.

(o) Metallic

A manufactured fiber composed of metal, plastic-coated metal, metal-coated plastic, or a core completely covered by metal.

(p) Glass

A manufactured fiber in which the fiber-forming substance is glass.

(q) Anidex

A manufactured fiber in which the fiber-forming substance is any long chain synthetic polymer composed of at least 50% by weight of one or more esters of a monohydric alcohol and acrylic acid.

(r) Novoloid

A manufactured fiber containing at least 85% by weight of a cross-linked novolac.

(s) Aramid

A manufactured fiber in which the fiber-forming substance is a long-chain synthetic polyamide in which at least 85% of the amide linkages are attached directly to two aromatic rings.

(t) Sulfar

A manufactured fiber in which the fiber-forming substance is a long chain synthetic polysulfide in which at least 85% of the sulfide linkages are attached directly to two (2) aromatic rings.

(u) PBI

A manufactured fiber in which the fiber-forming substance is a long chain aromatic polymer having reoccurring imidazole groups as an integral part of the polymer chain.

(v) Elastoeater

A manufactured fiber in which the fiber-forming substance is a long-chain synthetic polymer composed of at least 50% by weight of aliphatic polyether and at least 35% by weight of polyester, as defined in 16 CFR 303.7(c).

(w) Melamine

A manufactured fiber in which the fiber-forming substance is a synthetic polymer composed of at least 50% by weight of a cross-linked melamine polymer.

(x) Fluoropolymer

A manufactured fiber containing at least 95% of a long-chain polymer synthesized from aliphatic fluorocarbonmonomers.

(y) PLA

A manufactured fiber in which the fiber-forming substance is composed of at least 85% by weight of lactic acid ester units derived from naturally occurring sugars.

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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 ASCLD/LAB, ANAB, and/or A2LA. Please select one of the following statements to ensure your data is handled appropriately.

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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.

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