



## **Adhesive Tape Analysis**

### **Test No. 24-5471 Summary Report**

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Each sample set contained three pairs of known and questioned tape samples for comparison. Participants were asked to examine these items using their existing protocols. Data were returned from 29 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 set consisted of pairs of known and questioned adhesive tape samples for comparison. Participants were asked to examine each pair of adhesive tape samples and determine if either were associated with a single source. Additionally, participants were asked to determine if a physical end match existed between the known item and the questioned item.

**SAMPLE PREPARATION:** Each roll of tape was inspected and any debris removed.

Items K1 and Q1 (Welstik black gaffer tape) were produced from the same roll and hand torn in a manner to eliminate the possibility of a physical end match.

Items K2 (Commercial Electric™ black electrical tape) and Q2 (3M Temflex™ black electrical tape) were produced from two different rolls and each cut with a pair of scissors. The items were produced in a manner to eliminate the possibility of a physical end match.

Items K3 and Q3 (JayJayup General Purpose beige masking tape) were produced from the same roll and sheared from the blade of one tape dispenser.

All known and questioned items were affixed to silicone release paper, and then packed in their respective pre-labeled item envelopes.

**SAMPLE SET ASSEMBLY:** For each sample set, all item pairs were placed into a pre-labeled envelope and sealed. This process was repeated until all of the sample sets were prepared.

**VERIFICATION:** Predistribution results were consistent with each other and the manufacturer's preparation information with the following combined list of examination procedures: Stereomicroscopy, Polarized Light Microscopy, Macroscopic Examination, FTIR, UV, SEM/EDS, and PyGC/MS.

Item	Color	Tape Type	Association	Physical End Match
K1 & Q1	Black	Welstik gaffer tape	Yes	No
K2 & Q2	Black	Commercial Electric™ & 3M Temflex™ electrical tapes	No	No
K3 & Q3	Beige	JayJayup general purpose tape	Yes	Yes

## **Summary Comments**

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This test was designed to allow participants to assess their proficiency in the examination and comparison of adhesive tape samples. Participants were supplied with three pairs of adhesive tape samples, each containing one known item and one questioned item (K1/Q1, K2/Q2, K3/Q3). Items K1 and Q1 were produced from the same roll of black gaffer tape and hand torn. Items K2 and Q2 were produced from two different rolls of black electrical tape and each cut with a pair of scissors. Items K3 and Q3 were produced from the same roll of beige general purpose tape and sheared from the blade of one tape dispenser. Refer to the Manufacturer's Information for preparation details.

ITEMS K1 AND Q1: Of the 29 responding participants, 28 reported an association between the questioned tape sample (Q1) and the known tape sample (K1). In regard to the physical end match, 25 of the 27 participants that performed this comparison reported that Item Q1 did not exhibit a physical end match to Item K1.

ITEMS K2 AND Q2: Of the 29 responding participants, 28 reported no association between the questioned tape sample (Q2) and the known tape sample (K2). In regard to the physical end match, all 11 participants that performed this comparison reported that Item Q2 did not exhibit a physical end match to Item K2.

ITEMS K3 AND Q3: All 29 responding participants reported an association between the questioned tape sample (Q3) and the known tape sample (K3). In regard to the physical end match, 25 of the 28 participants who performed this comparison reported that Item Q3 did exhibit a physical end match to Item K3.

The most commonly reported examination procedures included: Stereomicroscopy, FTIR, and Macroscopic Examination.

# Examination Results

*For each set of items, is the questioned tape material associated with the submitted known sample and is there a physical end match between the known sample and questioned item?*

<b>TABLE 1 - K1 and Q1</b>							
<u>Physical End Match Comparison</u>				<u>Physical End Match Comparison</u>			
<u>WebCode</u>	<u>Association</u>	<u>Performed</u>	<u>End Match ID</u>	<u>WebCode</u>	<u>Association</u>	<u>Performed</u>	<u>End Match ID</u>
6VG7NW	Yes	Yes	No	MYUX9K	Yes	Yes	No
6VWRXX	Yes	Yes	No	PRPZDD	Yes	Yes	No
747FCW	Yes	Yes	No	Q7P2QE	[No results submitted for this item.]		
7P6GNZ	Yes	Yes	No	QMATPD	Yes	Yes	No
9TXK7W	Yes	No		RUM2QF	Yes	Yes	No
ANHCHX	Yes	Yes	No	T3FTCE	Yes	Yes	No
BYVWEY	Yes	Yes	No	TJJ78B	Yes	Yes	No
CCHKPN	Yes	Yes	No	U42WJC	Yes	Yes	No
CT2EDT	Yes	Yes	No	VH2V89	Yes	Yes	
D77WPR	Yes	Yes	No	WCA9P9	Yes	Yes	No
DA69KR	Yes	Yes	No	Y6KAC6	Yes	Yes	No
DTLGLT	Yes	Yes	No				
EN6AXT	Yes	Yes	No				
F8C2FL	Yes	Yes	No				
FDYNAR	Yes	Yes	Inc				
KRMKDK	Yes	Yes	No				
LUXQQD	Yes	Yes	No				
MJL87F	Yes	Yes	No				

<b>K1 &amp; Q1 - Summary Response</b>		<b>Participants: 29</b>	
<u>Physical End Match Comparison</u>			
<u>Association</u>		<u>Performed</u>	<u>End Match ID</u>
Yes	28 (96.6%)	Yes	27 (93.1%)
No	0 (0.0%)	No	1 (3.4%)
Inc	0 (0.0%)	N/A	0 (0.0%)
No Response	1 (3.4%)	No Response	1 (3.4%)
			Yes 0 (0.0%)
			No 25 (86.2%)
			Inc 1 (3.4%)
			No Response 3 (10.3%)

<b>TABLE 1 - K2 and Q2</b>							
<u>WebCode</u>	<u>Physical End Match Comparison</u>			<u>WebCode</u>	<u>Physical End Match Comparison</u>		
	<u>Association</u>	<u>Performed</u>	<u>End Match ID</u>		<u>Association</u>	<u>Performed</u>	<u>End Match ID</u>
6VG7NW	No	Yes	No	Q7P2QE	[No results submitted for this item.]		
6VWRXX	No	Yes	No	QMATPD	No	No	
747FCW	No	No		RUM2QF	No	No	
7P6GNZ	No	No		T3FTCE	No	N/A	
9TXK7W	No	No		TJJ78B	No	Yes	No
ANHCHX	No	Yes	No	U42WJC	No	Yes	No
BYVWEY	No	No		VH2V89	No	No	
CCHKPN	No	Yes	No	WCA9P9	No	N/A	
CT2EDT	No	No		Y6KAC6	No	No	
D77WPR	No	Yes	No				
DA69KR	No	No					
DTLGLT	No	No					
EN6AXT	No	No					
F8C2FL	No	Yes	No				
FDYNAR	No	No					
KRMKDK	No	N/A					
LUXQQD	No	Yes	No				
MJL87F	No	No					
MYUX9K	No	Yes	No				
PRPZDD	No	Yes	No				

<b>K2 &amp; Q2 - Summary Response</b>		<b>Physical End Match Comparison</b>		<b>Participants: 29</b>	
<u>Association</u>		<u>Performed</u>		<u>End Match ID</u>	
Yes	0 (0.0%)	Yes	11 (37.9%)	Yes	0 (0.0%)
No	28 (96.6%)	No	14 (48.3%)	No	11 (37.9%)
Inc	0 (0.0%)	N/A	3 (10.3%)	Inc	0 (0.0%)
No Response	1 (3.4%)	No Response	1 (3.4%)	No Response	18 (62.1%)

**TABLE 1 - K3 and Q3**

<u>Physical End Match Comparison</u>				<u>Physical End Match Comparison</u>			
<u>WebCode</u>	<u>Association</u>	<u>Performed</u>	<u>End Match ID</u>	<u>WebCode</u>	<u>Association</u>	<u>Performed</u>	<u>End Match ID</u>
6VG7NW	Yes	Yes	Yes	Q7P2QE	Yes	Yes	Yes
6VVRXX	Yes	Yes	Yes	QMATPD	Yes	Yes	Yes
747FCW	Yes	Yes	Yes	RUM2QF	Yes	Yes	Yes
7P6GNZ	Yes	Yes	Yes	T3FTCE	Yes	Yes	Yes
9TXK7W	Yes	No		TJJ78B	Yes	Yes	Yes
ANHCHX	Yes	Yes	Yes	U42WJC	Yes	Yes	Yes
BYVWEY	Yes	Yes	Yes	VH2V89	Yes	Yes	Yes
CCHKPN	Yes	Yes	Yes	WCA9P9	Yes	Yes	Yes
CT2EDT	Yes	Yes	Yes	Y6KAC6	Yes	Yes	Yes
D77WPR	Yes	Yes	Yes				
DA69KR	Yes	Yes	Yes				
DTLGLT	Yes	Yes	Yes				
EN6AXT	Yes	Yes	No				
F8C2FL	Yes	Yes	Yes				
FDYNAR	Yes	Yes	Inc				
KRMKDK	Yes	Yes	Yes				
LUXQQD	Yes	Yes	No				
MJL87F	Yes	Yes	Yes				
MYUX9K	Yes	Yes	Yes				
PRPZDD	Yes	Yes	Yes				



<b>K3 &amp; Q3 - Summary Response</b>		<b>Physical End Match Comparison</b>		<b>Participants: 29</b>	
<u>Association</u>		<u>Performed</u>		<u>End Match ID</u>	
Yes	29 (100.0%)	Yes	28 (96.6%)	Yes	25 (89.3%)
No	0 (0.0%)	No	1 (3.4%)	No	2 (6.9%)
Inc	0 (0.0%)	N/A	0 (0.0%)	Inc	1 (3.4%)
No Response	0 (0.0%)	No Response	0 (0.0%)	No Response	1 (3.4%)

# Examination Procedures

## TABLE 2 - K1 and Q1

WebCode	Stereo Microscope	Polarized Light	Comparison	Macroscopic Exam	Fluorescence	FTIR	XRD	XRS/XRF	SEM/EDX	Pyrolysis GC	Other
6VG7NW	✓	✓	✓	✓	✓	✓		✓			
6VVRXX	✓			✓	✓						
747FCW	✓	✓	✓	✓	✓	✓		✓			
7P6GNZ	✓		✓	✓	✓	✓					
9TXK7W	✓	✓		✓	✓	✓			✓		
ANHCHX	✓		✓	✓	✓	✓					Thickness measurement
BYVWEY	✓	✓		✓	✓	✓					
CCHKPN	✓	✓	✓	✓		✓		✓			GC-MS, IRMS
CT2EDT	✓	✓	✓	✓	✓	✓		✓			width, thickness
D77WPR	✓			✓	✓	✓		✓			Raman
DA69KR	✓			✓							
DTLGLT	✓			✓	✓	✓					
EN6AXT	✓					✓			✓		EA-IR/MS
F8C2FL	✓				✓	✓		✓			Raman
FDYNAR	✓			✓		✓					
KRMKDK	✓	✓		✓	✓	✓		✓	✓		Raman, UV-Vis
LUXQQD	✓	✓		✓		✓					Melting point
MJL87F	✓	✓		✓		✓		✓			UV light source
MYUX9K	✓			✓	✓	✓					
PRPZDD	✓	✓	✓	✓	✓	✓					Raman
Q7P2QE											
QMATPD	✓	✓	✓	✓	✓	✓		✓			
RUM2QF	✓		✓	✓		✓		✓			Raman, Scrim examination

TABLE 2 - K1 and Q1 - Examination Procedures

WebCode	Stereo Microscope	Polarized Light	Comparison	Macroscopic Exam	Fluorescence	FTIR	XRD	XRS/XRF	SEM/EDX	Pyrolysis GC	Other
T3FTCE				✓		✓					
TJJ78B	✓	✓	✓	✓	✓	✓		✓			
U42WJC	✓			✓		✓					Toolscan
VH2V89	✓			✓		✓					
WCA9P9	✓	✓	✓	✓	✓	✓			✓		Melting Point
Y6KAC6	✓	✓	✓	✓		✓			✓		

K1 & Q1 - Exam Methods Response Summary											Participants: 29
	Stereo Microscope	Polarized Light	Comparison	Macroscopic Exam	Fluorescence	FTIR	XRD	XRS/XRF	SEM/EDX	Pyrolysis GC	
Total	27	14	12	26	15	27	0	5	8	3	
Percent	93%	48%	41%	90%	52%	93%	0%	17%	28%	10%	

TABLE 2 - K2 and Q2 - Examination Procedures

WebCode	Stereo Microscope	Polarized Light	Comparison	Macroscopic Exam	Fluorescence	FTIR	XRD	XRS/XRF	SEM/EDX	Pyrolysis GC	Other
6VG7NW	✓		✓								
6VWRXX	✓		✓		✓						
747FCW	✓		✓								
7P6GNZ	✓		✓								
9TXK7W	✓	✓	✓	✓	✓	✓			✓		
ANHCHX	✓		✓	✓	✓	✓					Thickness measurement
BYVWEY	✓		✓								
CCHKPN			✓								
CT2EDT	✓		✓								
D77WPR	✓		✓	✓	✓						
DA69KR			✓								
DTLGLT	✓		✓								
EN6AXT	✓					✓			✓		EA-IR/MS
F8C2FL	✓					✓					
FDYNAR	✓		✓		✓						
KRMKDK	✓	✓			✓	✓					
LUXQQD	✓	✓	✓		✓						
MJL87F	✓	✓	✓								UV light source
MYUX9K	✓		✓	✓	✓						
PRPZDD	✓	✓	✓	✓	✓	✓					Raman
Q7P2QE											
QMATPD	✓		✓								
RUM2QF	✓		✓	✓							
T3FTCE			✓								

TABLE 2 - K2 and Q2 - Examination Procedures

WebCode	Stereo Microscope	Polarized Light	Comparison	Macroscopic Exam	Fluorescence	FTIR	XRD	XRS/XRF	SEM/EDX	Pyrolysis GC	Other
TJJ78B	✓		✓								
U42WJC	✓		✓		✓						Toolscan
VH2V89	✓		✓		✓						
WCA9P9			✓								
Y6KAC6	✓		✓								

K2 & Q2 - Exam Methods Response Summary											Participants: 29
	Stereo Microscope	Polarized Light	Comparison	Macroscopic Exam	Fluorescence	FTIR	XRD	XRS/XRF	SEM/EDX	Pyrolysis GC	
Total	24	5	3	25	6	13	0	0	0	2	
Percent	83%	17%	10%	86%	21%	45%	0%	0%	0%	7%	

TABLE 2 - K3 and Q3 - Examination Procedures

WebCode	Stereo Microscope	Polarized Light	Comparison	Macroscopic Exam	Fluorescence	FTIR	XRD	XRS/XRF	SEM/EDX	Pyrolysis GC	Other
6VG7NW	✓		✓								
6VWRXX	✓		✓		✓						
747FCW	✓		✓								
7P6GNZ	✓		✓	✓							
9TXK7W	✓	✓		✓	✓	✓				✓	
ANHCHX	✓		✓	✓	✓	✓					Thickness measurement
BYVWEY	✓			✓							
CCHKPN	✓			✓							
CT2EDT	✓			✓							
D77WPR	✓			✓	✓	✓		✓			Raman
DA69KR	✓			✓							
DTLGLT	✓			✓	✓	✓					
EN6AXT	✓					✓			✓		EA-IR/MS
F8C2FL	✓										
FDYNAR	✓			✓		✓					
KRMKDK	✓										
LUXQQD	✓	✓		✓		✓					
MJL87F	✓	✓		✓							UV light source
MYUX9K	✓			✓	✓	✓					
PRPZDD	✓	✓	✓	✓	✓	✓					Raman
Q7P2QE	✓			✓							
QMATPD	✓			✓							
RUM2QF	✓		✓	✓		✓					Raman
T3FTCE				✓							

TABLE 2 - K3 and Q3 - Examination Procedures

WebCode	Stereo Microscope	Polarized Light	Comparison	Macroscopic Exam	Fluorescence	FTIR	XRD	XRS/XRF	SEM/EDX	Pyrolysis GC	Other
TJJ78B	✓		✓								
U42WJC	✓		✓		✓						Toolscan
VH2V89	✓		✓		✓						
WCA9P9	✓		✓								
Y6KAC6	✓		✓								

K3 & Q3 - Exam Methods Response Summary											Participants: 29
	Stereo Microscope	Polarized Light	Comparison	Macroscopic Exam	Fluorescence	FTIR	XRD	XRS/XRF	SEM/EDX	Pyrolysis GC	
Total	28	4	3	26	7	13	0	1	0	2	
Percent	97%	14%	10%	90%	24%	45%	0%	3%	0%	7%	

# Conclusions

TABLE 3

WebCode	Conclusions
6VG7NW	<p>Pair K1/Q1: Items K1 and Q1 each comprised a length of scrim-reinforced black tape with a white adhesive. No physical fit was established between Q1 and K1. Item Q1 corresponded in width, appearance and composition to Item K1. These results support the proposition that Q1 originated from the roll of tape represented by K1, or another indistinguishable roll. The frequency of tapes available on the market with indistinguishable properties from those of Item K1 is unknown. Pair K2/Q2: Items K2 and Q2 each comprised a length of black tape. No physical fit was established between Q2 and K2. Items K2 and Q2 exhibited differences in width and in appearance of the backing. These results do not support the proposition that Q2 originated from the roll of tape represented by K2. Pair K3/Q3: Items K3 and Q3 each comprised a length of white tape. A physical fit was established between Q3 and K3. These results strongly support the proposition that Q3 originated from the roll of tape represented by K3.</p>
6VWRXX	<p>Case 1: The morphology and the width of K1 and Q1 is the same. There isn't a physical end match between samples K1 and Q1. The composition of the backing, adhesives and fibers of both tapes are indistinguishable with the techniques employed. According to these results, K1 and Q1 could have the same origin. Case 2: The morphology and the width of K2 and Q2 are slightly different. There isn't a physical end match between samples K2 and Q2. There are differences in the composition of the backing and the adhesive of both tapes. According to these results, K2 and Q2 have different origins. Case 3: The morphology and the width of K3 and Q3 is the same. There is a physical end match between samples K3 and Q3. The composition of the adhesive and backing of both tapes are indistinguishable with the techniques employed. Therefore, K3 and Q3 have the same origin.</p>
747FCW	<p>The tape sections in Q1 and K1 exhibit similarities in construction, chemical composition and microscopic characteristics. The tape in Q1 could have originated from the same source as the tape in K1 or from another source with similar characteristics. The tape sections in Q2 and K2 exhibit dissimilarities in appearance of the backing and in width. The tape in Q2 did not originate from the same source as the tape in K2. The tape sections in Q3 and K3 exhibit corresponding torn margin contours. The tape sections in Q3 and K3 were once one item.</p>
7P6GNZ	<p>In my opinion, the section of tape Q1 could have originated from the roll of tape as represented by the section of tape K1, or another roll of similar manufacture. I consider that it is not possible to evaluate the significance of these findings further. In my opinion, the section of tape Q2 has not originated from the roll of tape as represented by the section of tape K2. In my opinion, the findings show conclusively that the section of tape Q3 was the last piece of tape to be removed from the roll of tape as represented by the section of tape K3.</p>
9TXK7W	<p>Item K1 and Item Q1 are similar in physical properties and chemical composition. Item K2 and Item Q2 are different in physical properties and chemical composition. Item K3 and Item Q3 are similar in physical properties and chemical composition.</p>
ANHCHX	<p>Item 1: there is no physical match between the ends of K1 and Q1. K1 and Q1 are undifferentiated. Q1 can come from the roll of adhesive tape represented by the tape section item K1 or from another roll with the same characteristics. Item 2: there is no physical match between the ends of K2 and Q2. We can observe differences between K2 and Q2. Q2 does not come from the roll of adhesive tape represented by the tape section item K2. Item 3: one end of the adhesive tape of item Q3 physically corresponds to the end of the section of adhesive tape represented by item K3. Q3 come from the roll of adhesive tape represented by the tape section item K3.</p>
BYVWEY	<p>Case 1 black duct tape: The tape from Q1 and K1 are similar to each other in morphological features. The microscopic and/or chemical composition of the backing, adhesive, and scrim are also similar. The torn edge contours from either end of Q1 were not able to be aligned to the torn edge contours of one end of K1 and no physical fit was determined. The tape from Q1 could have come from the same source as K1, or from any other source with similar morphological features and chemical composition. Case 2 plastic and electrical type tapes: The backing from K2 and Q2 differ morphologically in texture and also in surface markings. Additionally, the adhesive from K2 is colorless and the adhesive from Q2 is black. These morphological differences indicate the tape from Q2 and the tape from K2 could not</p>



TABLE 3

WebCode	Conclusions
	<p>have come from the same tape roll and do not share a common source. The tape pieces were not chemically examined or compared. Case 3 masking tape: The tape from Q3 and K3 are similar to each other in morphological features. The torn edge contours from one end of Q3 align with the torn edge contours from one end of K3. Additionally, alignment of ripples in the crepe texture of the paper backing that run perpendicular to the length of the tape correspond along the torn edges between Q3 and K3. The tape from Q3 and the tape from K3 were at one time a single continuous unit. The tape pieces were not chemically examined or compared.</p>
CCHKPN	<p>Results of examinations were as follows: Known (K1) and Questioned (Q1) tape samples could not be differentiated on the basis of any of the following: appearance (macroscopic and microscopic), physical dimensions (width and thickness), weight per unit area, backing composition, adhesive composition, chemical profile of hexane-extractable components (excluding adhesive), inorganic components, carbon and hydrogen isotope ratios, scrim construction and composition. On the basis of the above results, Item Q1 could not be excluded as having originated from the roll of tape represented by Item K1, or from another roll of tape from the same batch. Known (K2) and Questioned (Q2) tape samples were found to have different physical dimensions (specifically, width), thus the tape in Item Q2 could be excluded as having originated from the roll of tape represented by tape section Item K2. Numerous points of fit and correspondence were found between Known (K3) and Questioned (Q3) tape samples. These results provide extremely strong support for the proposition that Items K3 and Q3 both once formed part of the same roll of tape.</p>
CT2EDT	<p>1. Collaborative Testing Services (CTS) Test 24-5471 consists of three unrelated cases in which questioned and known tape samples were submitted for analysis. a. Exhibit 1: CTS Item 1, a known and a questioned sample from Case 1. b. Exhibit 2: CTS Item 2, a known and a questioned sample from Case 2. c. Exhibit 3: CTS Item 3, a known and a questioned sample from Case 3. 2. The questioned and known tape samples in Exhibit 1 each consist of a single piece of tape with black polymeric backing, scrim fabric, and a white adhesive. The tape samples are consistent with duct tape applications. a. Physical fit examinations were performed and disclosed that the questioned and known tape samples were not once physically connected at their tape ends. This does not imply whether the compared tapes originated from the same source or from different sources, thus additional examinations were performed. b. Comparative examinations of the questioned and known tape samples in Exhibit 1 disclosed them to be consistent in their physical, chemical, and elemental characteristics. As a result of these findings, the questioned and known tapes in Exhibit 1 could have originated from the same source of duct tape or another source of tape with the same characteristics. c. A tape association is not a means of positive identification and the number of possible sources for a specific tape is unknown. 3. The questioned and known tape samples in Exhibit 2 each consist of a single piece of tape with black polymeric backings. The tape samples are consistent with electrical tape applications. a. The questioned piece of tape had a black adhesive while the known piece of tape had a colorless adhesive. Based on these exclusionary differences in overall class characteristics, physical fit examinations were not performed. b. Comparative examinations of the questioned and known tape samples in Exhibit 2 disclosed them to be inconsistent in their physical characteristics. As a result of these findings, the questioned tape could not have originated from the same source as the known tape sample. 4. The questioned and known tape samples in Exhibit 3 each consist of a single piece of tape with a white paper backing and a colorless adhesive. The tape samples are consistent with masking tape applications. a. Physical fit examinations were performed. No exclusionary differences in overall class characteristics were observed. Physical features along the compared separation boundary of the tape ends realign in a manner that indicate the tape samples in Exhibit 3 were once physically connected along their tape ends. b. Based on the results of the physical fit examinations, additional comparisons were not performed.</p>
D77WPR	<p>K 1 tape in Q 1 tape have the same morphological characteristics. The width, layers and fibre pattern are the same. Both ends of sample Q 1 do not match with the end of sample K 1. FTIR spectrum of baking layer, glue layer and textile fibres of both samples are the same. The baking and glue layers of both samples have the same elemental composition according to <math>\mu</math>XRF analysis. K 2 tape and Q 2 tape have different morphological appearance (width). The glue layer and baking of both samples have different FTIR as well. K 3 tape in Q 3 tape have the same morphological characteristics. One end of tape Q 3 physically matches with the end of K 3. FTIR spectrum of baking layer and glue layer of both</p>

TABLE 3

WebCode	Conclusions
	sample are the same. The layers of both samples have the same elemental composition according to $\mu$ XRF analysis.
DA69KR	K1 vs Q1 The tapes are of similar construction and both could have originated from the same roll. However, no specific link has been found between them and I cannot exclude the possibility that the 2 items originated from different rolls. K2 vs Q2 The tapes differ in width and construction and could not have originated from the same roll. K3 vs Q3 A physical fit was found between the ends of the 2 pieces of tape indicating that they originated from the same roll of tape.
DTLGLT	1. The adhesive tape in item Q1 agreed with the adhesive tape in item K1 with regard to the properties examined. So it is possible that the adhesive tape Q1 originated from the adhesive tape represented by item K1. But no end of the adhesive tape in item Q1 physically match with the end of the adhesive tape represented by item K1. 2. The adhesive tape in item Q2 was different from the adhesive tape represented by item K2. 3. The adhesive tape in item Q3 agreed with the adhesive tape in item K3 with regard to the properties examined. Additionally the end of the adhesive tape in item Q3 physically match with the end of the adhesive tape represented by item K3. So it strongly suggests that the adhesive tape Q3 originated from the adhesive tape represented by item K3.
EN6AXT	K1 vs Q1: match. K2 vs Q2: mismatch. K3 vs Q3: match.
F8C2FL	Item 1: The questioned tape Q1 was similar in physical and chemical properties to the known used tape K1. Therefore, tape Q1 could be associated with tape K1, or another type of tape displaying the same physical and chemical properties. Item 2: The questioned sample of tape Q2 was physically and chemically different from the known reference tape K2. Therefore, the questioned tape Q2 could not have originated from the same roll of tape as K2. Item 3: A unique physical fit was found between one end of the questioned tape Q3 and the outermost end of the tape K3. Based on the unique physical fit observed, the questioned tape Q3 and the tape K3 came from the same roll of tape.
FDYNAR	K1 and Q1 may have a common origin. K2 and Q2 don't have a common origin. K3 and Q3 may have a common origin.
KRMKDK	The questioned section of black grip-style fiber reinforced tape (Item 001-Q1) and the known section of black grip-style tape (Item 001-K1) could have come from the same roll of black grip-style tape or another roll of black grip-style tape with the same physical and chemical properties. The questioned section of black electrical-style tape (Item 001-Q2) and the known section of black electrical-style 24-002560-0001 tape (Item 001-K2) did not come from the same roll of tape. The questioned section of off-white masking tape (Item 001-Q3) was torn from the known off-white masking tape section (Item 001-K3). The torn end of the questioned section of off-white masking tape (Item 001-Q3) physically fits to the torn end of the known off-white masking tape (Item 001-K3). Therefore, Item 001-Q3 was torn from the end of Item 001-K3.
LUXQQD	Item Q1 is consistent with item K1 Item Q2 is not consistent with item K2 Item Q3 is consistent with item K3
MJL87F	Conclusions Items 1A and 1B were examined visually, stereoscopically, and instrumentally using Fourier Transform Infrared Spectrometry and Scanning Electron Microscopy/Energy Dispersive Spectroscopy. No physical match was observed between edges of known item 1A and questioned item 1B. Questioned item 1B was consistent with known item 1A with respect to color, width, and chemical composition. This indicates that items 1A and 1B could share a common source of origin. The questioned item 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. Items 2A and 2B were examined visually and stereoscopically. These items display different physical properties and are not consistent. Items 3A and 3B were examined visually and stereoscopically. A physical match existed between the torn edge of known item 3A and a torn edge of questioned item 3B. This indicates that item 3B originated from the item submitted as 3A. The physical/fracture match cannot exclude all other sources and no statistical or numerical probabilities can be applied to the conclusions of this report.
MYUX9K	Item K1 and Item Q1 are similar in width, backing colour, UV light, scrim pattern and chemical

TABLE 3

WebCode	Conclusions
	composition, but do not constitute a physical match. Item K2 and Item Q2 are different in width, backing colour, UV light, scrim pattern and chemical composition. Item K3 and Item Q3 are similar in width, backing colour, UV light, scrim pattern and chemical composition. One end of the adhesive tape in Item Q3 physically matched with the end of the adhesive tape roll represented by Item K3.
PRPZDD	Separate reports for material comparison and physical match comparison. Material comparison: The tape Q1 in Item 1 is similar to the tape K1 in Item 1 regarding the physical and chemical properties of the glue and film. The tape Q2 in Item 2 is different from the tape K2 in Item 2 regarding the physical and chemical properties of the glue and film. The tape Q3 in Item 3 is similar to the tape K3 in Item 3 regarding the physical and chemical properties of the glue and film. Physical match comparison: In the item Q1 there is an adhesive tape which corresponds in color and in width with the adhesive tape roll represented by the item K1. Other end of the item K1 is cut with a tool, which leaves straight end and the other end is torn. Both ends of item Q1 are torn. Neither end of item Q1 correspond in shape and individual characteristics with tape roll ends represented by item K1. In the item Q2 there is an adhesive tape which doesn't correspond in width with the adhesive tape roll represented by item K2. Conclusion is that adhesive tape in item Q2 does not originate from the adhesive tape roll represented by item K2. In the item Q3 there is an adhesive tape which corresponds in color and in width with the adhesive tape roll represented by the item K3. Other end of adhesive tape roll represented by item K3 is cut with a tool, which leaves straight end and the other end is torn. Both ends of the item Q3 are torn. Other end of item Q3 corresponds in shape and individual characteristics with tape roll torn end represented by item K3.
Q7P2QE	The following methodologies were used in the examination of this case: visual examination, physical examination and microscopy. Examination of Q3 and K3 (Item 3-1 and 3-2, respectively) each revealed a strip of white paper tape. A torn edge of the tape in Item 3-1 physically fits the torn edge of the tape in Item 3-2. Therefore, Items 3-1 and 3-2 were once joined to form a single item. The remaining items were not examined.
QMATPD	1. Comparative examinations of Exhibit 2.1 (Q2 tape) with Exhibit 2.2 (K2 tape) disclosed them to be inconsistent in their physical characteristics. As a result of these findings, Exhibit 2.1 could not have originated from the same source as Exhibit 2.2. 2. Physical fit examinations were performed on Exhibits 3.1 (Q3 tape) and 3.2 (K3 tape). Exhibits 3.1 and 3.2 were once physically connected at the boundary between one of the two fractured edges of Exhibit 3.1 and the single fractured edge of Exhibit 3.2. 3. Physical fit examinations were performed on Exhibits 1.1 (Q1 tape) and 1.2 (K1 tape). Exhibits 1.1 and 1.2 were not once physically connected at the boundary between either of the two fractured edges of Exhibit 1.1 and the single fractured edge of Exhibit 1.2, based on a lack of alignment of individual characteristics. This does not imply whether the compared items originated from the same source or from different sources. 4. Comparative examinations of Exhibit 1.1 with Exhibit 1.2 disclosed them to be consistent in their physical, chemical, and elemental characteristics. As a result of these findings, Exhibit 1.1 could have originated from Exhibit 1.2, or another source with the same characteristics. A tape association is not a means of positive identification and the number of possible sources for a specific tape is unknown.
RUM2QF	1) Based on the comparison of physical characteristics and chemical compositions of the sampled backings and adhesive layers of the tapes, the strip of tape in Item Q1 could have originated from the roll of tape in Item K1, or rolls of tape with similar characteristics. 2) Based on exclusionary differences in width and surface texture, the strip of tape in Item Q2 did not originate from the roll of tape in Item K2. 3) Based on physical fitting and, the comparison of physical characteristics and chemical compositions of the sampled backings and adhesive layers of the tapes, the strip of tape in Item Q3 originated from the roll of tape in Item K3.
T3FTCE	The results very strongly support the proposition that K-1 and Q-1 are of the same type. We are inconclusive whether K-1 and Q-1 have common origin. The results very strongly support the proposition that K-2 and Q-2 are not of the same type. The results very strongly support the proposition that K-3 and Q-3 are of the same type. The results very strongly support the proposition that there is a physical match between K-3 and Q-3.
TJJ78B	The black tapes Q1 and K1 are similar in color, construction, microscopic characteristics, and chemical

TABLE 3

WebCode	Conclusions
U42WJC	<p>composition. Tape Q1 could have originated from the same source as tape K1 or another source of black tape with similar characteristics of manufacture. The black tapes Q2 and K2 are different in tape width and color of adhesive. Tape Q2 did not originate from the same source as represented by tape K2. The paper tapes Q3 and K3 are similar in general characteristics of construction and exhibit a physical fit. Tape Q3 and tape K3 were at one time a single piece of tape.</p> <p>A) The questioned adhesive tape in Item Q1 was found to be consistent in width, thickness, UV light reaction, backing colour, backing surface texture, backing chemical composition, adhesive colour, adhesive surface texture and adhesive chemical composition to those of the known adhesive tape originated from the adhesive tape roll represented by the tape section, Item K1. Neither one end of the adhesive tape in Item Q1 physically matches with the end of the section of adhesive tape represented by Item K1. (B) The questioned adhesive tape in Item Q2 was found to be consistent in thickness, UV light reaction, backing colour and adhesive colour to those of the known adhesive tape originated from the adhesive tape roll represented by the tape section, Item K2. However, it was found that the width, backing surface texture, backing chemical composition, adhesive surface texture and adhesive chemical composition in questioned Item Q2 was inconsistent to those of the known adhesive tape Item K2. Neither one end of the adhesive tape in Item Q2 physically matches with the end of the section of adhesive tape represented by Item K2. (C) The questioned adhesive tape in Item Q3 was found to be consistent in width, thickness, UV light reaction, backing colour, backing surface texture, backing chemical composition, adhesive colour, adhesive surface texture and adhesive chemical composition to those of the known adhesive tape originated from the adhesive tape roll represented by the tape section, Item K3. One end of the adhesive tape in Item Q3 physically matches with the end of the section of adhesive tape represented by Item K3. Based on the above findings, in my opinion, (i) the adhesive tape in Item Q1 could have originated from the adhesive tape roll represented by the tape section, Item K1. (ii) the adhesive tape in Item Q2 could not have originated from the adhesive tape roll represented by the tape section, Item K2. (iii) the adhesive tape in Item Q3 came from the adhesive tape roll represented by the tape section, Item K3.</p>
VH2V89	<p>Q1 cannot be differentiated from K1 via infrared spectroscopy in all two layers, nor by their fibers. However, adhesive tape is a mass produced product. Overall, the results weakly support the hypothesis that Q1 originates from the same tape roll as K1. Due to a difference in materials, the results very strongly contradict the hypothesis that Q2 originates from the same tape roll as K2. Rather, it is extremely more likely that Q2 originates from a different, unknown tape roll. All layers of Q3 are indistinguishable from the respective layers of K3 by infrared spectroscopy. Furthermore, one end of Q3 matches with the end of the section of adhesive tape represented by K1 in a physical match comparison. Considering all of the above, the results strongly support the hypothesis that Q3 originates from the same tape roll as K3.</p>
WCA9P9	<p>The black duct tapes of Item 1 (K1 and Q1) have torn ends and were examined to determine if a physical edge match could be established. The torn ends of Q1 do not display features that establish a physical edge connection with the torn end of K1. The length of black duct tape in Item Q1 is similar in color, construction, physical characteristics, and chemistry in comparison to the length of black duct tape of Item K1. The length of black duct tape in Item Q1 could have originated from the same source of black duct tape in Item K1 or from another source of black duct tape with similar color, construction, physical characteristics and chemistry as the black duct tape in Item K1. Items K1 and Q1 were examined visually and using Stereomicroscopy, Polarized Light Microscopy (PLM), Fluorescence, a digital caliper, Fourier-Transform Infrared Spectroscopy (FT-IR), Scanning Electron Microscopy – Energy Dispersive X-ray Spectroscopy (SEM-EDS), and Melting Point Microscopy. The black electrical tape in Item Q2 is different in measured width when compared to the black electrical tape in Item K2. The black tape in Item Q2 is excluded from originating from the same source as the black tape in Item K2. Items K2 and Q2 were examined visually. The tan masking tapes in Item 3 (K3 and Q3) have torn ends and were examined to determine if a physical edge match could be established. The torn end of one edge of Q3 has a torn profile, unique features, and tags that correspond to the torn end of K1. The tan masking tape in Item Q3 was once connected to the tan masking tape in Item K3. Items K3 and Q3 were examined visually and using Stereomicroscopy.</p>
Y6KAC6	<p>Gaffer Tape Comparisons: The non-manufactured, irregular edges of items 1.1 and 1.4 were</p>

TABLE 3

WebCode	Conclusions
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examined for the presence of a physical match, and none was observed. No exclusionary differences were observed between items 1.1 and 1.4 with respect to their physical characteristics (color, thickness, width, texture, scrim count, weave pattern) and chemical composition (determined by FT-IR and SEM/EDS), including the measured properties of the fibers comprising the scrim of the tape. Based on the above observations, the questioned gaffer tape (item 1.1) and the known gaffer tape (item 1.4) were not joined directly together, but could have originated from the same source as represented by the known gaffer tape sample or from another source exhibiting all of the same analyzed characteristics. Electrical Tape Comparisons: Exclusionary differences were found to exist between the color of the adhesive of items 1.2 (black adhesive) and 1.5 (colorless adhesive). Therefore, the questioned electrical tape (item 1.2) could not have originated from the same source as represented by the known submitted electrical tape (item 1.5). Masking Tape Comparisons: A physical match was found to exist between one of the non-manufactured, irregular edges of the questioned masking tape (item 1.3) and the irregular, non-manufactured edge of the known masking tape (item 1.6). Therefore, items 1.3 and 1.6 were at one time joined together to be one continuous length of tape.

# Additional Comments

TABLE 4

WebCode	Additional Comments
Q7P2QE	Only Case 3 was examined by this analyst.
VH2V89	Physical match comparison was done by different department in our institute.

-End of Report-  
(Appendix may follow)

## Test No. 24-5471: Adhesive Tape Analysis

DATA MUST BE SUBMITTED BY **July 01, 2024, 11:59 p.m. EDT** TO BE INCLUDED IN THE REPORT

Participant Code: U1234A

WebCode: ZP372

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:**

In three unrelated cases, adhesive tape material was collected and submitted for analysis. Each Item (1-3) below represents a separate, independent case.

*A Hole Punch located at one end of the silicone release paper housing a known item indicates the end of tape which was removed from the roll and is not intended for physical end match analysis.*

### **Items Submitted (Sample Pack TAPE):**

Item 1 - (K1, Q1): A known and a questioned sample from Case 1.

Item 2 - (K2, Q2): A known and a questioned sample from Case 2.

Item 3 - (K3, Q3): A known and a questioned sample from Case 3.

**Item 1:**

**1.1) Could the adhesive tape in Item Q1 have originated from the adhesive tape roll represented by the tape section, Item K1?**

- Yes
  No
  Inconclusive

**1.2) Was a physical match comparison performed?**

- Yes
  No
  N/A

**1.3) If a Physical match comparison was performed, does either end of the adhesive tape in Item Q1 physically match with the end of the section of adhesive tape represented by Item K1?**

- Yes
  No
  Inconclusive

**1.4) Indicate the procedure(s) used to examine the submitted items:**

Please check all that apply.

<b>Microscopic Exams:</b>	<input type="checkbox"/> Stereo	<input type="checkbox"/> Comparison
	<input type="checkbox"/> Polarized Light	
<input type="checkbox"/> Macroscopic Exam	<input type="checkbox"/> Fluorescence	<input type="checkbox"/> FTIR
<input type="checkbox"/> XRD	<input type="checkbox"/> XRS/XRF	<input type="checkbox"/> SEM/EDX
<input type="checkbox"/> Pyrolysis GC		
Other (specify): <input type="text"/>		



**Item 2:**

**2.1) Could the adhesive tape in Item Q2 have originated from the adhesive tape roll represented by the tape section, Item K2?**

- Yes
  No
  Inconclusive

**2.2) Was a physical match comparison performed?**

- Yes
  No
  N/A

**2.3) If a Physical match comparison was performed, does either end of the adhesive tape in Item Q2 physically match with the end of the section of adhesive tape represented by Item K2?**

- Yes
  No
  Inconclusive

**2.4) Indicate the procedure(s) used to examine the submitted items:**

Please check all that apply.

<b>Microscopic Exams:</b>	<input type="checkbox"/> Stereo	<input type="checkbox"/> Comparison
	<input type="checkbox"/> Polarized Light	
<input type="checkbox"/> Macroscopic Exam	<input type="checkbox"/> Fluorescence	<input type="checkbox"/> FTIR
<input type="checkbox"/> XRD	<input type="checkbox"/> XRS/XRF	<input type="checkbox"/> SEM/EDX
<input type="checkbox"/> Pyrolysis GC		
Other (specify): <input type="text"/>		

**Item 3:**

**3.1) Could the adhesive tape in Item Q3 have originated from the adhesive tape roll represented by the tape section, Item K3?**

- Yes
  No
  Inconclusive

**3.2) Was a physical match comparison performed?**

- Yes
  No
  N/A

**3.3) If a Physical match comparison was performed, does either end of the adhesive tape in Item Q3 physically match with the end of the section of adhesive tape represented by Item K3?**

- Yes
  No
  Inconclusive

**3.4) Indicate the procedure(s) used to examine the submitted items:**

Please check all that apply.

<b>Microscopic Exams:</b>	<input type="checkbox"/> Stereo	<input type="checkbox"/> Comparison
	<input type="checkbox"/> Polarized Light	
<input type="checkbox"/> Macroscopic Exam	<input type="checkbox"/> Fluorescence	<input type="checkbox"/> FTIR
<input type="checkbox"/> XRD	<input type="checkbox"/> XRS/XRF	<input type="checkbox"/> SEM/EDX
<input type="checkbox"/> Pyrolysis GC		
Other (specify): <input type="text"/>		

*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**

## RELEASE OF DATA TO ACCREDITATION BODIES

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

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

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

ANAB Certificate No.

A2LA Certificate No.

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

Authorized Contact Person and Title

Laboratory Name

Location (City/State)