



Glass Analysis Test No. 16-548 Summary Report

This test was sent to 118 participants. Each participant received a sample set consisting of one set of known glass fragments (Item 1) and two sets of questioned glass particles (Items 2 and 3). Participants were requested to analyze and compare these and report their findings. Data were returned from 96 participants (81% response rate) and are compiled into the following tables:

	<u>Page</u>
<u>Manufacturer's Information</u>	<u>2</u>
<u>Summary Comments</u>	<u>3</u>
<u>Table 1: Examination Results</u>	<u>4</u>
<u>Table 2: Examination Procedures</u>	<u>6</u>
<u>Table 3: Conclusions</u>	<u>10</u>
<u>Table 4: Additional Comments</u>	<u>26</u>
<u>Appendix: Data Sheet</u>	<u>28</u>

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 three samples of glass fragments, one Known (Item 1) and two Questioned (Items 2 & 3). Items 1 and 2 were from the same automotive door replacement window glass, while Item 3 was from a different automotive door replacement window glass. Examiners were instructed to examine the questioned glass particles and determine if any could have originated from the same source as the known recovered glass fragments (Item 1).

SAMPLE PREPARATION-

The glass from the two automotive door replacement windows was checked for defects and the edges taped off to prevent the use of those areas. The glass was then broken with a hammer and a glass cutting tool. Differing items were processed and packaged separately from each other to prevent cross-contamination.

ITEMS 1 and 2 (ASSOCIATION): For the Known Item 1 samples, two glass fragments approximately 1/8" x 1/8" in size were selected and packaged in a glassine bag and then a pre-labeled Item 1 coin envelope. For the questioned Item 2 samples, two glass particles approximately 1/16" x 1/16" in size were selected and packaged in a glassine bag and then a pre-labeled Item 2 coin envelope. Items 1 and 2 were taken in close spatial proximity to one another and were kept together as an identification group and packaged into the sample set as described below.

ITEM 3 (ELIMINATION): For the questioned Item 3 samples, two glass particles approximately 1/16" x 1/16" in size were selected and packaged in a glassine bag and then a pre-labeled Item 3 coin envelope. Item 3 was further packaged into the sample set as described below.

SAMPLE SET ASSEMBLY: For each sample set, an Item 1 and Item 2 from the same identification group were placed in a pre-labeled envelope along with an Item 3. The sample pack was sealed with invisible tape. Once verification was completed, all sample packs were further sealed with a piece of evidence tape and initialed "CTS".

The average refractive indices for the glass as reported by preliminary testing and predistribution laboratories are as follows: Item 1 RI = 1.51952, Item 2 RI = 1.51949, and Item 3 RI = 1.52185.

VERIFICATION: All three predistribution laboratories reported the expected association and elimination. The methods employed by the predistribution laboratories included Refractive Index (nD), UV fluorescence (long, short), thickness, color, and XRS/XRF.

Summary Comments

This test was designed to allow participants to assess their proficiency in the examination, comparison, and interpretation of glass samples. Each sample set consisted of three samples of glass, one Known (Item 1) and two Questioned (Items 2 and 3). Items 1 and 2 were from the same automotive door replacement window glass, while Item 3 was from a different automotive door replacement window glass. Participants were requested to determine if either set of questioned particles could have come from the known source. (Refer to the Manufacturer's Information for preparation details.)

All 96 responding participants reported that the Item 2 glass particles could have originated from the same source as the Item 1 known glass sample and the Item 3 glass particles could not have originated from the same source as Item 1.

Examination Results

Could the questioned glass particles in Item 2 and/or 3 have originated from the driver's side window of the victim's vehicle as represented by Item 1?

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
22ZQFG	Yes	No	D3FRR8	Yes	No
23DZR3	Yes	No	D8RYQQ	Yes	No
23V9HH	Yes	No	D9FD99	Yes	No
3H4KMG	Yes	No	D9JQ6H	Yes	No
3NUWKX	Yes	No	EF2N4P	Yes	No
3QH7WK	Yes	No	F82N4M	Yes	No
43R9T3	Yes	No	FNAE7R	Yes	No
62QVKZ	Yes	No	G2RV7A	Yes	No
6LA2NG	Yes	No	GDZE44	Yes	No
6PG7VB	Yes	No	HXP9BK	Yes	No
6X9QQB	Yes	No	J67YFC	Yes	No
74QHDX	Yes	No	JDBB9Y	Yes	No
7EDBC7	Yes	No	JRVQCY	Yes	No
7PV2NW	Yes	No	JTQ9DZ	Yes	No
7QKE7F	Yes	No	K4P8YE	Yes	No
7TUE92	Yes	No	KMGC6K	Yes	No
7U2W8W	Yes	No	LDLWTL	Yes	No
8FYKCX	Yes	No	LK9MFF	Yes	No
8HNYUF	Yes	No	M8X8BW	Yes	No
8ZPLLF	Yes	No	MJP6Q2	Yes	No
9FWDMB	Yes	No	MTWVEX	Yes	No
A4PHE8	Yes	No	NKFQXW	Yes	No
A8NUA8	Yes	No	NU8WYB	Yes	No
AFR6AG	Yes	No	P3WVDM	Yes	No
AN4EJV	Yes	No	PAFATD	Yes	No
AQAWJC	Yes	No	PCJALX	Yes	No
AV7JFL	Yes	No	Q398ZX	Yes	No
BGLB4F	Yes	No	QBNRJW	Yes	No
BKN47R	Yes	No	QH7BMW	Yes	No
BPTZPR	Yes	No	QZJUHE	Yes	No
BPXGNQ	Yes	No	R28URV	Yes	No
C4TYEA	Yes	No	R6U8YD	Yes	No
CFMF3P	Yes	No	R73NPW	Yes	No
CQ9JCA	Yes	No	R8KGXL	Yes	No

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
RMCD3W	Yes	No			
T2MDCR	Yes	No			
T997NR	Yes	No			
TAJ42A	Yes	No			
TETHLT	Yes	No			
TJN9TQ	Yes	No			
TL2NL7	Yes	No			
TTYBEQ	Yes	No			
TUUUGR	Yes	No			
U8ELQK	Yes	No			
UEXYJR	Yes	No			
UKYD6T	Yes	No			
VBTTGQ	Yes	No			
VYU4FW	Yes	No			
VZ8PAR	Yes	No			
WB3GVN	Yes	No			
WWZXAP	Yes	No			
XA8YUL	Yes	No			
XEYAHQ	Yes	No			
XPZXBN	Yes	No			
XXQJFL	Yes	No			
Y372JN	Yes	No			
YAJY6M	Yes	No			
YCMUNP	Yes	No			
YY8PNN	Yes	No			
ZAD6YL	Yes	No			
ZT9XKK	Yes	No			
ZXQ4DD	Yes	No			

Response Summary		Total Participants: 96	
<i>Could the questioned glass particles in Item 2 and/or 3 have originated from the driver's side window of the victim's vehicle as represented by Item 1?</i>			
Response		<u>Item 2</u>	<u>Item 3</u>
	Yes	96 (100.0%)	0 (0.0%)
	No	0 (0.0%)	96 (100.0%)
	Inconclusive	0 (0.0%)	0 (0.0%)

Examination Procedures

TABLE 2

WebCode	Refractive Index				Color	Density	Thickness	Elemental		UV		
	nD	nF	nC	Δ RI				SEM/ EDS	XRS/ XRF	Long	Short	Other
22ZQFG	✓				✓	✓	✓		✓	✓	✓	
23DZR3	✓				✓		✓		✓		✓	
23V9HH	✓				✓		✓		✓		✓	
3H4KMG	✓	✓	✓		✓	✓	✓			✓	✓	
3NUWKX	✓				✓		✓				✓	ICP-OES
3QH7WK	✓	✓	✓		✓	✓	✓			✓	✓	
43R9T3							✓	✓				
62QVKZ	✓			✓	✓		✓			✓	✓	[Refractive Index - delta RI: "(annealing)"]
6LA2NG	✓	✓			✓		✓				✓	
6PG7VB	✓				✓		✓		✓		✓	
6X9QQB	✓				✓	✓	✓			✓	✓	
74QHDX	✓				✓		✓			✓	✓	ICP-OES
7EDBC7	✓						✓	✓			✓	Laser ablation ICP-MS, crossed polarising filters
7PV2NW	✓				✓		✓		✓			
7QKE7F							✓		✓	✓	✓	
7TUE92					✓		✓				✓	LA-ICPMS
7U2W8W				✓	✓	✓	✓	✓		✓	✓	
8FYKCX	✓				✓		✓		✓	✓	✓	
8HNYUF	✓						✓	✓		✓	✓	
8ZPLLF	✓				✓		✓				✓	LA-ICP-MS
9FWDMB	✓				✓		✓			✓	✓	ICP-MS
A4PHE8	✓				✓		✓		✓		✓	
A8NUA8	✓				✓		✓				✓	
AFR6AG												ICP-MS
AN4EJV	✓				✓	✓	✓					

TABLE 2

WebCode	Refractive Index					Density	Thickness	Elemental		UV		
	nD	nF	nC	Δ RI	Color			SEM/ EDS	XRS/ XRF	Long	Short	Other
AQAWJC	✓				✓		✓		✓	✓	✓	Physical Fit/Fracture Match
AV7JFL	✓				✓	✓	✓	✓			✓	
BGLB4F	✓				✓		✓	✓		✓	✓	
BKN47R	✓						✓					
BPTZPR	✓						✓			✓	✓	
BPXGNQ	✓				✓		✓					
C4TYEA	✓				✓		✓		✓	✓	✓	
CFMF3P				✓	✓		✓				✓	Surface features - interferometry. [UV-short: "(259 nm)"]
CQ9JCA	✓			✓	✓		✓	✓			✓	
D3FRR8	✓				✓		✓			✓	✓	ICP-MS
D8RYQQ	✓	✓	✓	✓	✓	✓	✓			✓	✓	
D9FD99	✓				✓		✓	✓			✓	Appearance of toughened cubes
D9JQ6H	✓				✓	✓	✓	✓		✓	✓	
EF2N4P	✓				✓		✓				✓	
F82N4M				✓				✓				
FNAE7R	✓			✓	✓		✓				✓	
G2RV7A	✓				✓		✓			✓	✓	
GDZE44	✓				✓	✓	✓	✓	✓	✓	✓	
HXP9BK	✓						✓		✓	✓	✓	stereomicroscopy, PLM
J67YFC	✓				✓	✓	✓	✓		✓	✓	
JDBB9Y	✓						✓		✓	✓	✓	
JRVQCY	✓				✓		✓			✓	✓	
JTQ9DZ	✓				✓		✓			✓	✓	ICP-MS
K4P8YE	✓				✓		✓		✓	✓	✓	
KMGC6K	✓				✓	✓	✓	✓		✓	✓	LA-ICP-MS
LDLWTL				✓			✓	✓		✓	✓	LIBS, PLM

TABLE 2

WebCode	Refractive Index				Color	Density	Thickness	Elemental		UV		
	nD	nF	nC	Δ RI				SEM/ EDS	XRS/ XRF	Long	Short	Other
LK9MFF	✓	✓	✓		✓	✓	✓				✓	
M8X8BW	✓	✓	✓		✓		✓	✓		✓	✓	
MJP6Q2												LA-ICP-MS
MTWVEX	✓				✓		✓		✓	✓	✓	PLM
NKFQXW	✓				✓		✓		✓	✓	✓	
NU8WYB	✓				✓		✓		✓		✓	Stereomicroscope/ Polarized Light Microscope
P3WVDM	✓			✓			✓	✓		✓	✓	
PAFATD				✓	✓		✓		✓			
PCJALX	✓			✓	✓		✓	✓				✓
Q398ZX	✓				✓			✓				✓
QBNRJW				✓	✓		✓					✓
QH7BMW	✓				✓		✓		✓			
QZJUHE	✓				✓		✓		✓	✓	✓	
R28URV					✓		✓		✓			
R6U8YD	✓				✓		✓		✓	✓	✓	
R73NPW	✓						✓	✓		✓	✓	
R8KGXL	✓				✓		✓	✓				
RMCD3W	✓				✓		✓		✓	✓	✓	Raman
T2MDCR	✓			✓	✓		✓		✓		✓	
T997NR	✓				✓		✓	✓		✓	✓	
TAJ42A	✓				✓		✓		✓	✓	✓	
TETHLT	✓				✓		✓		✓	✓	✓	
TJN9TQ	✓				✓	✓	✓		✓	✓	✓	
TL2NL7	✓				✓		✓					✓
TTYBEQ	✓						✓		✓			✓
TUUUGR				✓	✓	✓	✓			✓	✓	

TABLE 2

WebCode	Refractive Index						Thickness	Elemental		UV		
	nD	nF	nC	Δ RI	Color	Density		SEM/ EDS	XRS/ XRF	Long	Short	Other
U8ELQK	✓			✓	✓		✓	✓			✓	
UEXYJR	✓				✓		✓			✓	✓	LA-ICP-MS
UKYD6T	✓				✓		✓		✓	✓	✓	
VBTTGQ	✓				✓		✓	✓		✓	✓	LIBS
VYU4FW	✓						✓	✓				
VZ8PAR	✓				✓		✓		✓		✓	Tempered
WB3GVN	✓				✓		✓			✓	✓	
WWZXAP				✓	✓		✓	✓				
XA8YUL	✓						✓		✓	✓	✓	
XEYAHQ	✓											
XPZXBN					✓		✓	✓				
XXQJFL				✓	✓		✓					
Y372JN	✓				✓		✓		✓	✓	✓	
YAJY6M	✓				✓		✓				✓	
YCMUNP	✓											
YY8PNN	✓				✓		✓		✓	✓	✓	
ZAD6YL						✓						LIBS, μ XRF
ZT9XKK					✓		✓		✓			
ZXQ4DD	✓			✓	✓		✓			✓	✓	LA-ICP-MS

Response Summary

Participants	Refractive Index						Thickness	Elemental		UV	
	nD	nF	nC	Δ RI	Color	Density		SEM/ EDS	XRS/ XRF	Long	Short
96	78	6	5	18	76	16	89	26	34	49	76
Percent	81%	6%	5%	19%	79%	17%	93%	27%	35%	51%	79%

Conclusions

TABLE 3

WebCode	Conclusions
22ZQFG	The glass in Item 2 was identical to the glass in Item 1 in optical, physical, and elemental properties. This means that the questioned glass recovered from the suspect's shirt pocket could have come from the driver's side window of the victim's vehicle. The glass in Item 3 was different from the glass in Item 1. This means that the questioned glass recovered from the suspect's shoe did not come from the driver's side window of the victim's vehicle.
23DZR3	Questioned glass fragments recovered from a shirt pocket (Item 2) and from a shoe (Item 3) were compared to known glass from a window (Item 1) using physical characteristics, refractive index measurements, and elemental analysis by X-Ray Fluorescence (XRF). All of the fragments consisted of tempered float glass. The questioned glass from the shirt pocket was similar to the known glass in all examinations conducted. The window represented by Item 1 is a possible source of the questioned glass from the shirt pocket. Because similar glass has been manufactured that would be indistinguishable from the submitted evidence, an individual source cannot be determined. The questioned glass from the shoe differed from the known glass in thickness, elemental content, and refractive index measurements. The questioned glass from the shoe did not originate from the window represented by Item 1.
23V9HH	Results/Conclusions: The fragments of glass in Exhibits 2 and the known glass in Exhibit 1 exhibited similar characteristics using the techniques described above [Table 2 - Examination Procedures]. The fragments in Exhibit 1 and 2 could share a common origin. The fragments of glass in Exhibit 3 and the known glass in Exhibit 1 were dissimilar in respect to thickness and elemental composition. The fragments in Exhibit 1 and 3 could not have shared a common origin.
3H4KMG	The glass in Item 2 could have originated from the same source as the glass standard in Item 1. The glass in Items 1 and 3 did not originate from the same source.
3NUWKX	Glass recovered from the debris from the suspect's shirt pocket (CTS Item 2) is indistinguishable in the observed and measured physical properties, refractive indices, and chemical concentrations from the glass sample from the driver's side window of the victim's vehicle (CTS Item 1). Therefore, the glass recovered from debris from the suspect's shirt pocket (CTS Item 2) either originated from the driver's side window of the victim's vehicle as represented by CTS Item 1, or from another source of broken glass indistinguishable in all the observed and measured physical properties, refractive indices, and chemical composition. Glass recovered from the debris from the suspect's shoe (CTS Item 3) is different in thickness than the glass sample from the driver's side window of the victim's vehicle (CTS Item 1). Accordingly, the driver's side window of the victim's vehicle as represented by CTS Item 1 is eliminated as a possible source of the glass recovered from the debris from the suspect's shoe (CTS Item 3).
3QH7WK	The glass in Exhibit 2 could have originated from the same source as the glass in Exhibit 1. The glass in Exhibit 3 did not originate from the same source as the glass in Exhibit 1.
43R9T3	The evidence (elemental composition of glass samples as well as the thickness measurements) provides support for the proposition that glass fragments recovered from suspect's short pocket (Item 2) could be originated from the control glass (Item 1) whereas glass fragments recovered from suspect's shoes (Item 3) could be originated from different glass object than the control glass (Item 1).
62QVKZ	The particles recovered from the suspect's shirt pocket (Item 2) match the fragments from the driver's side window of the victim's vehicle (Item 1) in all properties measured. It can therefore originate from this window. The particles recovered from the suspect's shoe (Item 3) are different

TABLE 3

WebCode	Conclusions
	from the window glass and cannot originate from this source.
6LA2NG	1. The two particles of questioned glass (item 2), recovered from the suspect's shirt pocket, conformed in all investigated properties with the two fragments of known glass, originated from the driver's side window of the victim's vehicle (item 1). These results have to commend it the two particles, recovered from the suspect's shirt pocket (item 2), and the two fragments of known glass, originated from the driver's side window of the victim's vehicle (item 1), originated from one single glass pane. It has to be considered the possibility that the questioned glass (item 2) may be originated from another pane with the same properties. 2. The two particles of questioned glass (item 3), recovered from the suspect's shoe, not conformed with the two fragments of known glass originated from the driver's side window of the victim's vehicle (item 1).
6PG7VB	The glass fragments in Item 3 are different to the known sample in terms of their thickness and RI. The glass fragments in Item 2 could not be distinguished from the known sample in terms of their colour, appearance, thickness, RI and elemental composition. In my opinion, the findings provide moderate support for the proposition that the glass in the suspect's shirt pocket originated from the driver's side window of the victim's vehicle rather than from an unrelated source.
6X9QQB	Items 1, 2 and 3 were examined visually and using stereomicroscopy, a digital caliper, ultraviolet light and a density comparison technique. Items 1 and 2 were further examined using the Glass Refractive Index Measurement system (GRIM3). Based on the fragments examined, the Item 2 glass fragments were consistent with the Item 1 glass in color, thickness, temper, curvature, density, float properties and refractive index. It was concluded that these Item 2 fragments could have originated from the broken glass source represented by Item 1 or another source of broken glass with the same properties. The Item 3 glass fragments could not be associated with the Item 1 glass due to differences in thickness and density.
74QHVDV	Glass recovered from the debris from the suspect's shirt pocket (Item 2) is indistinguishable in all of the measured or observed physical properties, refractive index, and elemental composition from the glass recovered from the driver's side window of the victim's vehicle (Item 1,). Therefore, the glass recovered from the debris from the suspect's shirt pocket (Item 2,) either originated from the same broken glass source as the glass recovered from the driver's side window of the victim's vehicle (Item 1), or from another source(s) of broken glass indistinguishable in all of the measured or observed physical properties, refractive index, and elemental composition. Glass recovered from the debris from the suspect's shoe (Item 3), is different in thickness than the glass recovered from the driver's side window of the victim's vehicle (Item 1). Consequently, the driver's side window as represented by Item 1 is eliminated as a potential source of the glass recovered from the debris from the suspect's shoe (Item 3).
7EDBC7	Item 1 comprised two full thickness fragments of pale green toughened float glass collected from the driver's side window (control glass). The fragments were found to have an average thickness of 4.12mm, an average refractive index of 1.5196 and were principally composed of the elements O, Si, Na, Ca, Mg, Al, K and Fe. Item 2 comprised two full thickness fragments of pale green toughened float glass recovered from the suspect's shirt pocket. Both fragments were found to have a thickness of 4.12mm, a refractive index of 1.5196 and were both principally composed of the elements O, Si, Na, Ca, Mg, Al, K and Fe. These fragments corresponded in appearance, thickness, toughening state, refractive index, gross elemental composition and trace elemental concentrations to the control glass (Item 1). These results strongly support the proposition that the glass fragments recovered from the suspect's shirt pocket (Item 2) originated from the driver's side window (Item 1). Item 3 comprised two full thickness fragments of pale

TABLE 3

WebCode	Conclusions
	green toughened float glass recovered from the suspect's shoe. The fragments were found to have a thickness of 3.96mm and 3.95mm, respectively, and a refractive index of 1.5219. These fragments did not correspond in thickness or refractive index to the control glass (Item 1) and could not have originated from the driver's side window (Item 1).
7PV2NW	The glass samples from Items 1 and 2 have similar physical and optical properties as well as similar trace elemental content. It is possible that the glass samples from Items 1 and 2 came from the same source. The glass samples from Items 1 and 3 have different thicknesses, refractive indices, and trace elemental content. The samples of glass from Items 1 and 3 did not come from the same source.
7QKE7F	The results of our analyses demonstrate that the glass fragments from Item 2 cannot be differentiated from the known window source (Item 1) by any of the properties we have evaluated. The combination of these characteristics supports the conclusion that the glass fragments from Item 2 could have originated from the same source as the glass fragments from Item 1. Our analyses also demonstrate that Item 3 can be differentiated from Item 1. Therefore, Item 3 does not originate from the same source as Item 1.
7TUE92	The two particles of questioned glass, recovered from the suspect's shirt pocket (item 2) are similar in elemental composition compared with the known glass (item 1). These results are much more likely if the questioned particles (item 2) have originated from the broken side window represented by the particles from item 1, than if they have originated from a random other glass object. The two particles of questioned glass, recovered from the suspect's shoe (item 3) differ in elemental composition from the known glass (item 1). Therefore these particles (item 3) could not have originated from the broken side window represented by the particles from item 1.
7U2W8W	The analysis revealed that the measured physical and chemical properties of Item #1 and Item #2 are indistinguishable. The measured physical and chemical properties of Item #1 and Item #3 are dissimilar. The glass from Item #1 cannot be eliminated as the source of glass for Item #2. The glass from Item #1 cannot be the source of glass for Item #3.
8FYKCX	Based on our analysis Item 2 could not be differentiated from the glass of comparison, Item 1, whereas Item 3 must come from another unknown source.
8HNYUF	1) The particles of questioned glass recovered from the suspect's shirt pocket (Item 2) could not be excluded as having come from the driver's side window of the victim's vehicle (Item 1). Therefore, these glass particles came from either the driver's side window of the victim's vehicle or from another source or sources of broken, greenish, tempered glass indistinguishable from item 1 in thickness, color, refractive index and elemental composition. 2) The particles of questioned glass recovered from the suspect's shoe (Item 3) were found to be distinguishable from the driver's side window of the victim's vehicle (Item 1). This negative comparison indicates a different origin between both items.
8ZPLLF	The two glass particles found in the suspect's shirt pocket could originate from the driver's side window of the victim's vehicle. The two glass particles recovered from the suspect's shoe do not originate from the driver's side window of the victim's vehicle.
9FWDMB	Microscopic and elemental analysis and comparison of Item 1, glass from driver's side window of the victim's vehicle, to item 2, glass recovered from suspect's shirt pocket, revealed them to be the same with respect to physical properties, optical properties, and elemental composition. Therefore Item 2 came from the source represented by Item 1 or another source with the same physical properties, optical properties, and elemental composition. Microscopic and elemental analysis and comparison of Item 1, glass from driver's side window, to Item 3, glass from

TABLE 3

WebCode	Conclusions
	suspect's shoe, revealed them to be inconsistent with respect to optical properties and elemental composition. Therefore Item 3 could not have come from the source represented by Item 1.
A4PHE8	Based on physical characteristics, RI and elemental analysis, Item 3 could be differentiated from Item 1. Therefore, Item 1 can not be the source of the glass recovered in Item 3. Based on physical characteristics, RI and elemental analysis, Item 2 could not be differentiated from Item 1. Therefore, the glass recovered in Item 2 has originated from Item 1 or from another source with indistinguishable physical characteristics, RI and elemental composition.
A8NUA8	In my opinion, based on the physical characteristics and the measured Refractive Index, the two glass fragments recovered from the suspects shirt are indistinguishable to the glass from the MV window and hence could have come from that source. In my opinion, based on the physical characteristics and the measured Refractive Index the two glass fragments recovered from the suspect's shoe are distinguishable to the glass from the MV window and hence could not have come from that source.
AFR6AG	Item 2 cannot be distinguished from Item 1 using 4x standard deviation criteria and therefore could have originated from the same source. Item 3 can be distinguished from Item 1 using the 4x standard deviation criteria based on the following elements: Al, K, V, Mn, Ga, Sr, Zr, Nb, Ba, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Yb, Hf, Th, and U. Therefore, Item 3 could not have originated from the same source as Item 1.
AN4EJV	RESULTS : The analyzed glass fragment from item #1-2 corresponded in color, thickness, density, and refractive index to the known glass sample, item #1-1. The analyzed glass fragment from item #1-3 corresponded in color to the known glass sample, item #1-1. However, the glass fragment from item #1-3 did not correspond in thickness or density to the known glass sample, item #1-1. OPINION : The glass fragment from item #1-2 could have originated from the broken glass represented by known item #1-1 or another source of broken glass with the same properties. This is a Type III Association. See Association Key below. The glass fragment from item #1-3 could not have originated from the same source as item #1-1. This is an Elimination. See Association Key below. [No Association Key included.]
AQAWJC	1. Comparative examinations of the glass fragments in Exhibit 1 (known glass from the victim's driver's side window) with the glass fragments in Exhibit 3 (questioned glass recovered from the suspect's shoe) disclosed them to be dissimilar in their physical characteristics and elemental composition. Therefore, the glass fragments in Exhibits 1 and 3 do not share a common source of origin. 2. Comparative examinations of the glass fragments in Exhibit 1 (known glass from the victim's driver's side window) with the glass fragments in Exhibit 2 (questioned glass recovered from the suspect's shirt pocket) disclosed them to be indistinguishable in their physical characteristics, elemental compositions, and refractive indices. Therefore, the glass fragments in Exhibits 1 and 2 could have had a common source of origin.
AV7JFL	Items 1 through 3 were examined visually, microscopically, by density determination, by scanning electron microscopy with energy dispersive x-ray analysis and by determination of refractive index. Known glass (Item 1), reportedly from the driver's side window, was examined and found to be consistent with the questioned glass (Item 2), reportedly from the suspect's shirt pocket with respect to color, thickness, density, gross elemental composition and refractive index. Based on these observations, it is the opinion of this analyst that the known glass (Item 1) and the questioned glass (Item 2) are of the same type and could have a common origin. This analyst recognizes that other sources of glass with properties consistent with the above glass exist. Known glass (Item 1), reportedly from the driver's side window, was examined and found to be inconsistent with the questioned glass (Item 3), reportedly from the suspect's shoe, with respect to thickness and refractive index.

TABLE 3

WebCode	Conclusions
BGLB4F	The glass fragments in Item 2 were consistent in color, thickness, fluorescence, refractive index and elemental content with the fragments in Item 1, and could have come from the same source. The glass fragments in Item 3 showed differences from the fragments in Item 1 in thickness, refractive index and elemental content, and could not be identified with that source.
BKN47R	THE FRAGMENT OF KNOWN GLASS TAKEN FROM THE DRIVER'S SIDE WINDOW OF THE VICTIM'S VEHICLE "ITEM 1" AND TWO PARTICLES OF QUESTIONED GLASS RECOVERED FROM THE SUSPECT'S SHIRT POCKET "ITEM 2", EXHIBIT THE SAME RESULTS IN ALL INVESTIGATED PHYSICAL PROPERTIES. BOTH OF THEM ARE SIGNIFICANTLY DIFFERENT FROM ITEM 3.
BPTZPR	ITEM 2 COULD HAVE ORIGINATED FROM ITEM 1 (BASED ON nD) ITEM 3 IS NOT CONSISTENT TO ITEM 1
BPXGNQ	On analysis, I found: i. The refractive index of the questioned glass Item 2 and the refractive index of the known glass Item 1 to be similar. ii. The refractive index of the questioned glass Item 3 to be different with the refractive index of the known glass Item 1. Therefore, I am of the opinion that the: i. Questioned glass Item 2 and the known glass Item 1 could have come from the same source. ii. Questioned glass Item 3 did not come from the same source as Item 1.
C4TYEA	The glass samples in Items 2 and 3 were examined and compared to the glass from Item 1 for the purpose of determining if they could have originated from that source. The glass in Item 1 consists of two full thickness fragments of green tempered float sheet glass. This glass was used as a standard represented as being from the broken driver's side window of the victim's vehicle. The glass in Item 2, represented as being recovered from the subject's shirt pocket, consists of two full thickness fragments of green tempered float sheet glass. Microscopic and instrumental examination of these two fragments revealed that they are like the glass in Item 1 with respect to color, thickness, refractive index and chemical characteristics. It is therefore concluded that the glass from the subject's shirt pocket originated either from the broken driver's side window of the victim's vehicle or from another source of broken green tempered float sheet glass having these same characteristics. The latter possibility is considered somewhat unlikely. The glass in Item 3, represented as being recovered from the subject's shoe, consists of two full thickness fragments of light green tempered float sheet glass. Microscopic and instrumental examination of these two fragments revealed that, although they are similar to the glass in Item 1 with respect to color and glass type, they are different with respect to thickness, refractive index and chemical characteristics; therefore, the two glass fragments from the subject's shoe did not originate from the broken driver's side window of the victim's vehicle.
CFMF3P	The results of this examination provide support for the proposition that the two found in the shirt pocket could have originated from the driver's side window. The fragments in item 3 originated from a different source
CQ9JCA	The results of the examination give support for the hypothesis that the analysed glass particle in Item 2 originates from the vehicle window as represented by Item 1 (Level +2). The results of the examination give extremely strong support for the hypothesis that the analysed glass particle in Item 3 does not originate from the vehicle window as represented by Item 1 (Level -4).
D3FRR8	Microscopic and instrumental analysis and comparison of Item 2, glass from subject's shirt pocket, to Item 1, glass from driver side window of victim's vehicle, revealed them to be the same with respect to physical properties, refractive index, and elemental composition. Therefore, the glass from the subject's shirt pocket came from the source of glass represented by the glass from the driver side window or another source of broken glass with identical physical properties, optical properties, and elemental composition. Microscopic and instrumental analysis and

TABLE 3

WebCode	Conclusions
	comparison of Item 3, glass from subject's shoe, to Item 1, glass from driver side window of victim's vehicle, revealed them to be inconsistent with respect to physical properties, refractive index, and elemental composition. Therefore, the glass from the subject's shoe could not have come from the source of glass represented by the glass from the driver side window.
D8RYQQ	Glass particles from Item 1 were examined and compared to Items 2 and 3. Items 1 and 2 are consistent with respect to their physical characteristics, relative density and optical properties (refractive index and dispersion). Therefore, the glass from Item 2 could have originated from Item 1, as represented by the known submitted exemplar or from another source of glass exhibiting all of the same analyzed characteristics. Item 1 is dissimilar to Item 3 in physical characteristics, relative density and optical properties (refractive index and dispersion) and therefore Item 3 could not have come from Item 1, as represented by the known submitted exemplar.
D9FD99	In assessing the significance of the results, I have taken into account that the glass fragments recovered from the shirt pocket (Item 2) were found to be indistinguishable from the control glass sample (Item 1) in the tests performed, the glass fragments recovered from the shoe (Item 3) did not match the control glass sample and I have also considered the less common nature of the control glass sample. I have considered the following two propositions: The glass recovered from the shirt pocket and/or shoe originated from the broken driver's side window of the victim's vehicle. The glass recovered from the shirt pocket and/or shoe originated from another unrelated source of glass. In my experience, the findings are what I might expect if the glass recovered from the shirt pocket originated from the broken window of the driver's side window of the victim's vehicle. If it did not, then it must have originated from another broken flat, toughened glass object, which by chance had the same properties as the control glass sample from the victim's car. I am unable to say how or when these cubes of glass were acquired in the shirt pocket. Based on the information provided to me and the results of the examinations, I consider that the findings are more likely if the glass from the shirt pocket originated from the broken window of the victim's vehicle rather than from another unrelated source of glass. The findings indicate that the glass recovered from the shoe originated from another unrelated source of glass.
D9JQ6H	Based on the particles examined, the glass from Item #2 was consistent with Item #1 glass in the physical properties examined, refractive index, and inorganic composition. It was concluded that these particles could have originated from the same source or another source of broken glass with the same properties. Glass recovered from Item #3 could not be associated with Item #1 glass due to differences in their thickness, refractive index, and density.
EF2N4P	From the refractive index measurement, the glass fragments recovered from the suspect's shirt pocket may have originated from the broken car window. The fragments found in the suspect's shoe are likely not to come from the broken car window. As glass is a mass product, a matching refractive index is not an individual match, but a different refractive index indicates origin from different sources.
F82N4M	It was concluded that these glass sample/fragments/particles could have originated from the broken glass source represented by Item 1 and Item 2 or another source of broken glass with the same properties. The Item 3 glass sample/fragments/particles could not be associated with Item 1 glass due to differences in physical properties and/or refractive index.
FNAE7R	Particles of questioned glass recovered from the suspect's shirt pocket (Item 2) could have a common origin with glass fragments of known glass taken from the driver's side window of the victim's vehicle (Item 1). Particles of questioned glass recovered from the suspect's shoe (Item 3) are different from glass fragments of known glass (Item 1).

TABLE 3

WebCode	Conclusions
G2RV7A	Examination and comparison of Item 2 with Item 1 revealed the items to be glass that were similar in all measured physical and optical properties. Items 1 and 2 could have come from the same source or from other glass with the same properties. Examination and comparison of Item 3 with Item 1 revealed the items to be glass that were dissimilar in physical and optical properties. Items 1 and 3 could not have come from the same source.
GDZE44	the questioned glass particles from the suspect shirt pocket (item 2) could have originated from the driver side window of the victim vehicle as represented by (item 1) due to similarities in thickness ,specific gravity, refractive index and chemical composition.
HXP9BK	Questioned glass fragments Q1a, Q1b, Q2a, and Q2b were submitted to the Police laboratory for glass analysis and comparison to the known glass fragments Ka and Kb. All six fragments were visually and microscopically (stereomicroscope and PLM) examined, probed for hardness, and subjected to solubility testing in water. The six fragments were found to be hard, isotropic, insoluble in water, and all exhibited conchoidal fractures, which are class characteristics of glass. In addition, all fragments submitted exhibited characteristics of tempered glass: dicing, "hackle" marks near each original parallel surface and "frosted" line "running" through the middle of each fragment's cross-section. Thickness of each glass fragment was measured between two parallel surfaces and X-Ray Fluorescence Spectrometry (XRF) instrumental analysis was performed on all fragments. Visual and microscopic examination and XRF instrumental analysis of the questioned glass, Q2a and Q2b, and comparison to the known glass, Ka and Kb, disclosed that they are different with respect to thickness and elemental composition. It is the opinion of the undersigned that the questioned glass Q2a and Q2b (Laboratory item #3) could not have originated from the same source as represented by the known glass Ka and Kb (Laboratory item #1). Ka, Kb, Q1a, and Q1b were analyzed by Glass Refractive Index Measurement System (GRIM). Visual and microscopic examination and instrumental analysis (XRF and GRIM) of the questioned glass, Q1a and Q1b, and comparison to the known glass, Ka and Kb, disclosed that they are consistent and no discriminating differences were observed with respect to color, appearance, thickness, response to UV light, elemental composition and refractive index. Therefore, it is the opinion of the undersigned that the questioned glass Q1a and Q1b (Laboratory item #2) could have originated from the same source as the known glass Ka and Kb (Laboratory item #1) or from another source exhibiting all of the same analyzed characteristics. GRIM slides were packaged with Laboratory items #1, 2, and 3. Laboratory items #1, 2, 3, and GRIM slides will be forwarded to the Evidence Control Section.
J67YFC	Based on the particles examined, the glass from Item #2 was consistent with Item #1 glass in the physical properties examined, refractive index, and inorganic composition. It was concluded that these particles could have originated from the same source or another source of broken glass with the same properties. Glass recovered from Item #3 could not be associated with Item #1 glass due to differences in the thickness, refractive index, and inorganic composition.
JDBB9Y	The glass recovered from the suspect's shirt pocket (Item 2) is similar in thickness, fluorescence, elemental composition and refractive index in comparison to the glass taken from the driver's side window of the victim's vehicle (Item 1). The glass from Item 2 could have originated from Item 1 or any other broken glass source similar in thickness, fluorescence, elemental composition and refractive index. The glass recovered from the suspect's shoe (Item 3) is similar in fluorescence, but is different in thickness, elemental composition and refractive index in comparison to the glass taken from the driver's side window of the victim's vehicle (Item 1). The glass from Item 3 could not have originated from Item 1 .
JRVQCY	The examined portions of green glass from the Trace item – two particles of questioned glass recovered from the suspect's shirt pocket (Item 1-2) were found to be consistent in the observed

TABLE 3

WebCode	Conclusions
	<p>and measured physical properties and in refractive index with the examined portions of green glass from the Trace item – two fragments of known glass taken from the driver’s side window of the victim’s vehicle (Item 1-1). Accordingly, the examined portions of green glass recovered from the suspect’s shirt pocket could have originated from the examined portions of the driver’s side window of the victim’s vehicle or another source of broken glass with consistent physical properties and refractive index. The examined portions of green glass from the Trace item – two particles of questioned glass recovered from the suspect’s shoe (Item 1-3) were found to be different in thickness and refractive index with the examined portions of green glass from the Trace item – two fragments of known glass taken from the driver’s side window of the victim’s vehicle (Item 1-1). Accordingly, the examined portions of green glass recovered from the suspect’s shoe could not have originated from the examined portions of green glass from the driver’s side window of the victim’s vehicle.</p>
JYQ9DZ	<p>Physical, microscopic, and instrumental analysis and comparison of item 1, known glass, in conjunction with item 2, questioned glass, revealed them to be the same. Therefore, item 2 came from the source represented by item 1 or another source with identical physical and microscopic properties and elemental composition. Physical, and microscopic analysis and comparison of item 1, known glass, in conjunction with item 3, questioned glass, revealed them to be different. Therefore, item 3 could not have come from the source represented by item 1.</p>
K4P8YE	<p>Microscopic (Stereomicroscope & PLM) examination of the known glass from the driver's side window of the victim's vehicle (Item #1) revealed the presence of two (2) small pieces of clear glass with a slight green tint. Microscopic examination (Stereomicroscope & PLM) of the questioned glass recovered from the suspect's shirt pocket (Item #2) revealed the presence of two (2) small pieces of clear glass with a slight green tint. One (1) of these questioned glass pieces was compared to the known glass from the driver's side window of the victim's vehicle (Item #1) by stereomicroscope, digital micrometer, refractive index analysis by rIQ and elemental analysis by Micro-XRF. The questioned glass piece was found to be indistinguishable from the known glass with respect to color, texture, thickness, refractive index and elemental composition. Based on these findings, this questioned glass piece could have originated from the same source as the known glass, but not exclusively since other manufactured items in this class might be indistinguishable from the submitted evidence. Microscopic examination (Stereomicroscope & PLM) of the questioned glass recovered from the suspect's shoe (Item #3) revealed the presence of two (2) small pieces of clear glass with a slight green tint. One (1) of these questioned glass pieces was compared to the known glass from the victim's vehicle (Item #1) by stereomicroscope, digital micrometer and elemental analysis by Micro-XRF. The questioned glass fragment exhibited distinct differences in both thickness and elemental composition from the known glass. Based on these findings, this questioned glass fragment did not originate from the same source as the known glass.</p>
KMGC6K	<p>The questioned glass fragments from “Item 2” were found to be similar to the control glass fragments from “Item 1” in terms of colour, fluorescence, thickness, density, refractive index and trace elemental composition. Hence, the questioned glass fragments from “Item 2” are likely to have originated from the same source as the control glass fragments from “Item 1”, or another source of glass with similar characteristics. The questioned glass fragments from “Item 3” were examined and found to be different from the control glass fragments from “Item 1” in terms of thickness, refractive index and trace elemental composition. Hence, the questioned glass fragments from “Item 3” did not originate from the same source as the control glass fragments from “Item 1”.</p>
LDLWTL	<p>Examinations Performed: Visual, Luminescence, thickness, PLM, SEM-EDS, ECCO(LIBS), and GRIM3. The questioned glass fragments in Item 2 are consistent with the known glass fragments</p>

TABLE 3

WebCode	Conclusions
	<p>in Item 1 based on thickness, luminescence, PLM, elemental composition, and refractive index. The questioned glass fragments in Item 3 are not consistent with the known glass fragments in Item 1 based on refractive index. Therefore, the questioned glass in Item 2 could have originated from the known glass in Item 1.</p>
LK9MFF	<p>The glass in Item #2 could have originated from the same source as the glass in Item #1. The glass in Item #3 did not originate from the same source as the glass in Item #1.</p>
M8X8BW	<p>Glass fragments from Item 2 corresponded in general appearance, thickness, fluorescence, refractive index (GRIM - 656nm, 589nm and 488 nm) and elemental composition (SEM/EDS) to the known glass from Item 1. Therefore, Items 1 and 2 could have come from a common source. However, the [Laboratory] currently does not have the instrumentation that would provide for additional discrimination, which would allow for a higher association (Type IV Association). Glass fragments from Item 3 corresponded in general appearance, fluorescence and in elemental composition (SEM/EDS), but were different in thickness and refractive index (GRIM – 589nm) to the known glass in Item 1. Therefore, Item 1 can be eliminated as the source of the Item 3 glass fragments (Elimination). KEY for instrument acronyms: GRIM – Glass Refractive Index Measurement, SEM/EDS – Scanning Electron Microscopy/Energy Dispersive Spectroscopy. Interpretation: The following descriptions are meant to provide context to the opinions reached in this report. Every type of conclusion may not be applicable in every case or for every material type. Type I Association: Identification - An association in which items share individual characteristics and/or physically fit together that demonstrate the items were once from the same source. Type II Association: Association with distinct characteristics - An association in which items correspond in all measured physical properties, chemical composition and/or microscopic characteristics and share distinctive characteristic(s) that would not be expected to be found in the population of this evidence type. The distinctive characteristics were not sufficient for a Type I Association. Type III Association: Association with conventional characteristics - An association in which items correspond in all measured physical properties, chemical composition and/or microscopic characteristics and could have originated from the same source. Because it is possible for another sample to be indistinguishable from the submitted evidence, an individual source cannot be determined. Type IV Association: Association with limitations - An association in which items could not be differentiated based on observed and/or measured properties and/or chemical composition. As compared to the categories above, this type of association has decreased evidential value as a result of items that are more commonly encountered in the relevant population, the inability to perform a complete analysis, limited information, or minor variations observed in the data. Inconclusive: No conclusion could be reached regarding an association or an elimination between the items. Dissimilar: The items were dissimilar in physical properties and/or chemical composition, indicating that the items may not have originated from the same source. However, these dissimilarities were insufficient for a definitive Elimination. Elimination: Items exhibit dissimilarities in one or more of the following: physical properties, chemical composition or microscopic characteristics and, therefore, conclusively did not originate from the same source.</p>
MJP6Q2	<p>1.1 The chemical composition of the glass fragments of the Item1 and Item 2 are indistinguishable, therefore they could have the same origin. 1.2 The chemical composition of the glass fragments of the Item1 and Item 3 are distinguishable therefore they could not have the same origin.</p>
MTWVEX	<p>Examination showed the questioned glass in Item #2 is consistent in physical properties, refractive index, and elemental composition with the known glass in Item #1. These fragments could have shared a common origin. No association was found between the questioned glass in Item #3 and the known glass in Item #1.</p>

TABLE 3

WebCode	Conclusions
NKFQXW	The glass recovered from the suspect's shirt pocket, Item2, was indistinguishable in physical properties, refractive index and elemental composition to the glass taken from the driver's side window of the victim's vehicle, Item1, therefore, the glass recovered from the suspects' shirt pocket could have originated from the victim's vehicle or from another source of glass produced by the same manufacturer exhibiting the same physical and chemical properties. The glass recovered from the suspect's shoe, Item3 could not have originated from the glass taken from the driver's side window of the victim's vehicle, Item1.
NU8WYB	Visual, microscopic and instrumental analyses (EDXRF,GRIM III) of item 2 and comparison with the known glass, item 1, revealed they are consistent with no discriminating differences found with respect to color, clarity, UV fluorescence, thickness, elemental composition and refractive index. Therefore,it is the opinion of the undersigned that item 2 could have originated from the same source as the known glass (item 1)from the victim's car or any other source exhibiting all of the same analyzed class characteristics. Questioned glass fragments Q3 and Q4 (item 3)were instrumentally analyzed (EDXRF) and compared to the known glass fragments K1 and K2 (item 1) and were found to be different in elemental composition and thickness. Additionally, glass fragment Q3 was instrumentally analyzed by GRIM III and compared to glass fragments K1 and K2 and was found to be different in refractive index measurement. Therefore, it is the opinion of the undersigned that item 3 could not have originated from the victim's car as represented by the submitted known fragments (item 1).
P3WVDM	I formed the opinion based on the techniques used, that the fragments of glass recovered from the suspect's shirt pocket (item 2) had the same appearance, elemental composition and refractive index as the known glass collected from the drivers side window of the victims vehicle (item 1) and could have come from it. I also formed the opinion based on the techniques used, that the fragments of glass recovered from the suspect's shoe (item 3) had a different appearance and refractive index to the known glass collected from the driver's side window of the victim's vehicle (item 1) and could not have come from it.
PAFATD	Thickness, color, relative refractive index and trace elements concentrations of Item 2 are equal to the suitable features of Item 1. Refractive index, thickness, color and trace elements concentrations of Item 3 are different to the suitable features of Item 1.
PCJALX	In my opinion, the findings provide moderately strong support for the proposition that the pieces of glass from the t-shirt pocket originated from the damaged window of the motor vehicle. In my opinion, the findings provide conclusive support for the proposition that the pieces of glass from the shoe of the suspect did not originate from the damaged window of the motor vehicle.
Q398ZX	In my opinion the findings provide moderately strong support for the proposition that the pieces of glass in item 2, from the suspect's shirt pocket, originated from the broken driver's side window in the victim's car, rather than from some other source of broken glass. The pieces of glass in item 3, from inside the suspects shoe, could not have originated from the broken driver's side window of the victims car.
QBNRJW	Item 2 was noted to be similar in terms of colour, thickness and RI to the control sample. Item 2 could have had a common origin with the control sample. Item 3 was noted to be different in thickness from the control sample and therefore they have not had a common origin.
QH7BMW	Items 2 and 3 were compared to Item 1 to determine if a possible common origin exists. Items 1, 2 and 3 were examined for color, thickness, refractive index by GRIM 3 and elemental composition by X-Ray Fluorescence. Item 2 was indistinguishable by color, thickness, refractive index and by elemental composition from the standard submitted, Item 1. Therefore, Item 2 could have originated from Item 1 or a source with similar physical, optical and elemental

TABLE 3

WebCode	Conclusions
	characteristics. Item 3 was distinguished from originating from the standard, Item 1, by thickness, refractive index by GRIM 3 and elemental composition by X-Ray Fluorescence. Therefore, Item 3 could not have originated from Item 1.
QZJUHE	The glass from questioned "item 2" was found to be consistent with the know glass "item 1". Therefore the glass from the "item 2" could have come from the same source as the glass from "item 1". However, the glass from questioned "item 3" was found to be inconsistent with the know glass "item 1".
R28URV	Item 1, 2, and 3 were visually examined using a stereomicroscope in order to compare physical properties. Based on the visual examination of glass fragments, the thickness of Item 1 was consistent with that of Item 2. However, Item 3 was not consistent with Item 1 in the thickness of samples. Elemental analysis of these samples (Item 1, 2, and 3) was also performed by XRF and LIBS as a confirmatory method. Based on the relative abundance of elements found in each sample, Item 1 and 2 showed similar relative abundances for Si, Ca, Mg, and Fe. However, Item 3 showed different relative abundances for Si, Ca, and Mg. Therefore, Item 1 and Item 2 could have originated from a same glass source. However, Item 3 glass fragment could not be associated with the Item 1 glass fragment due to differences in physical property and relative elemental abundances.
R6U8YD	The two particles of questioned glass recovered from the suspect's shir pocket (item 2) can come from the driver's side window of the victim's vehicle (item 1) or from another glass material with the same characteristics. The two particles of questioned glass recovered from the suspect's shoe (item 3) are different from the two fragments of known glass taken from the driver's side window of the victim's vehicle (item 1) = they don't come from the same origin.
R73NPW	1) The particles of questioned glass recovered from the suspect 's shirt pocket (Item 2) could not be excluded as having come from the driver 's side window of the victim 's vehicle (Item 1). Therefore, these glass particles came from either the driver 's side window of the victim 's vehicle or from another source or sources of broken, greenish, tempered glass indistinguishable from item 1 in thickness, color, refractive index and elemental composition. 2). The particles of questioned glass recovered from the suspect 's shoe (Item 3) were found to be distinguishable from the driver 's side window of the victim 's vehicle (Item 1). This negative comparison indicates a different origin between both items.
R8KGXL	The known glass sample in item 1 taken from the driver's side window of the victim's vehicle comprised two pieces of transparent and colourless glass fragments, which were found to agree in colour, thickness, refractive index* and elemental composition with each other. The questioned glass sample in item 2 recovered from the suspect's shirt pocket comprised two pieces of transparent and colourless glass fragments. These recovered glass fragments were found to agree in colour, thickness, refractive index* and elemental composition with the known glass sample item 1, suggesting that they could have come from the same source. The questioned glass sample in item 3 recovered from the suspect's shoe comprised two pieces of transparent and colourless glass fragments. These recovered glass fragments were found to agree in colour, but differed in thickness, refractive index* and elemental composition with the known glass sample item 1, suggesting that they did not originate from the same source. *Refractive index is a physical property of glass, which is a measurement of the degree of refraction of light after passing through the glass and can vary from glass to glass.
RMCD3W	The particles of questioned glass (Item2) recovered from the suspect's shirt's pocket are consistent with the fragments of known glass taken from the driver's side window of the victim's vehicle (Item1) in color, thickness, UV fluorescence, refractive index, elemental composition and Raman spectrum. Therefore, Item2 could have originated from the driver's side window of the

TABLE 3

WebCode	Conclusions
	victim's vehicle. On the other hand, the particles of questioned glass (Item3) recovered from the suspect's shoe are different from Item 1 in thickness, refractive index and Raman spectrum. Therefore, Item3 could not have originated from the driver's side window of the victim's vehicle.
T2MDCR	The two glass particles, which were found in the pocket of the suspect's shirt (item 2), matched the known glass item 1 with respect to glass type (toughened glass), colour, thickness, refractive index before and after an annealing procedure and elemental composition. Hence there is serious evidence that these two particles come from the driver's side window of the victim's vehicle. Due to the mass product character of automotive glass a different source cannot be excluded with certainty. The two glass particles, which were found in the suspect's shoe (item 3), could be well distinguished from item 1 and thus cannot come from the broken window of the car. To estimate the frequency the matching glass particles from the suspect (item 2) were compared with our casework database. In this case the comparison was restricted to entries of toughened glass, because from the offence it was known, that only toughened glass would be of interest. Among a total of 1689 samples of toughened glass four control glass samples matched the glass from the suspect's shirt with respect to colour, thickness and refractive index. Thus the overall frequency of the evaluated characteristics is well below one percent.
T997NR	It was found that Item 2 could have originated from Item 1, Item 3 could not have originated from Item 1.
TAJ42A	All particles submitted (Q1a, Q1b, Q2a, Q2b, K1a, K1b) were tested with a probe and examined visually and microscopically, with the aid of a Polarized Light Microscope. They were all found to be hard, cubed, isotropic, insoluble in water, exhibited conchoidal fractures, hackle marks along the edges and a frosted line running through the center of the edge, which are characteristic of tempered glass. K1a, Q1a and Q2a were instrumentally analyzed using X-Ray Fluorescence Spectrometry (XRF) and Glass Refractive Index Measurement 3 (GRIM 3). In addition, questioned glass Q2b was instrumentally analyzed using XRF. K1b and Q1b were not instrumentally analyzed, and no further conclusions can be made regarding these samples. Q2b was not instrumentally analyzed using the GRIM 3. Questioned glass Q1a (Laboratory item 2) and known glass K1a (Laboratory item 1) are consistent and no discriminating differences were observed with respect to color, appearance, thickness, response to UV light, elemental composition and refractive index. Therefore, it is the opinion of the undersigned that the questioned glass Q1a (Laboratory item 2) could have originated from the same source as the known submitted exemplar, K1a (Laboratory item 1), or from another source exhibiting all of the same analyzed characteristics. Questioned glass, Q2a and Q2b (Laboratory item 3), and the known glass, K1a (Laboratory item 1), are different with respect to their thickness and elemental composition. In addition, questioned glass Q2a (Laboratory item 3) and known glass K1a (Laboratory item 1) are different with respect to their refractive index. It is the opinion of the undersigned that questioned glass, Q2a and Q2b (Laboratory item 3), could not have originated from the source represented by the known glass K1a (Laboratory item 1).
TETHLT	Comparative examinations of Exhibit 1 (known glass taken from the driver's side window of the victim's vehicle) with Exhibit 2 (particles of questioned glass recovered from the suspect's shirt pocket) disclosed them to be consistent in physical characteristics, refractive indices, and elemental compositions. Therefore, Exhibit 2 could have originated from Exhibit 1. Comparative examinations of Exhibit 1 with Exhibit 3 (questioned glass recovered from the suspect's shoe) disclosed them to have visual differences as well as thickness differences. Therefore, Exhibit 3 could not have originated from Exhibit 1.
TJN9TQ	The glass in Item 2 was identical to the glass in Item 1 in optical, physical, and elemental properties. This means the glass recovered from the suspect's shirt pocket could have come from

TABLE 3

WebCode	Conclusions
	the driver's side window of the victim's vehicle. The glass in Item 3 was different from the glass in Item 1. This means the glass recovered from the suspect's shoe did not come from the driver's side window of the victim's vehicle.
TL2NL7	Examination of Items #1 - #3 revealed each Item to consist of two (2) fragments of tinted float glass. Each piece of glass had two (2) factory surfaces. The questioned glass from Item #2 was compared to the known glass from Item #1 and was found to be indistinguishable with respect to color, thickness and refractive index (rIQ). Based on the above finding, this questioned glass may have had a common origin with the known glass; but not exclusively since other glass might be indistinguishable from the submitted evidence. Further discrimination that may result in a more definitive conclusion may be possible with elemental composition analysis. This analysis was not performed at this time. The questioned glass from Item #3 was compared to the known glass from Item #1 and was found to be different with respect to color, thickness and refractive index (rIQ). Based on the above finding, this questioned glass and the known glass did not have a common origin.
TTYBEQ	Lab Item 1 (1) – KNOWN GLASS FROM R. RUNNER'S VEHICLE: This item consisted of two fragments of glass. Lab Item 2 (2) – FRAGMENTS OF GLASS FROM W. COYOTE'S SHIRT: This item consisted of two fragments of glass. The glass fragments from the shirt (lab item 2) are consistent with the glass from the victim's vehicle (lab item 1) with respect to physical characteristics, elemental analysis, and refractive index. The glass fragments from the shirt (lab item 2) cannot be excluded from the submitted glass from the victim's vehicle (lab item 1), therefore the glass fragments from the shirt (lab item 2) could have come from the victim's vehicle (lab item 1) or other broken glass with the same physical, elemental, and optical properties. This is a Type III Association. Lab Item 3 (3) – FRAGMENTS OF GLASS W. COYOTE'S SHOE: This item consisted of two fragments of glass. The glass fragments from the shoe (lab item 3) differed from the glass from the victim's vehicle (lab item 1) with respect to physical characteristics, elemental analysis, and refractive index. This is an Elimination. The glass from the shoe (lab item 3) did not originate from the glass from the victim's vehicle (lab item 1).
TUUUGR	Examination of Item 2 revealed two glass fragments. Both greenish tinted, tempered fragments were tested further and found to correspond with the greenish tinted, tempered glass standard with respect to color, thickness, fluorescence, density and refractive index. Therefore, this glass from Item 2 is consistent with originating from the same source as the glass standard (Item 1) or another source having these same characteristics. Examination of Item 3 revealed two glass fragments. Both greenish tinted, tempered fragments were tested further and found to differ from the greenish tinted, tempered glass standard with respect to thickness. Therefore, this glass from Item 3 did not originate from the same source as the glass standard (Item 1). The evidence is available for pickup.
U8ELQK	The glass taken from the driver's side window (item 1) and the glass recovered from the shirt pocket (item 2) and shoe (item 3) were each composed of toughened, float glass. The glass recovered from the shirt pocket (item 2) was also found to be indistinguishable from the driver's side window glass (item 1) in relation to colour, thickness, refractive index and elemental composition. These items may therefore share a common origin. The glass recovered from the shoe (item 3) was found to have a different thickness and refractive index to the driver's side window glass (item 1) and therefore these items could not share a common origin.
UEXYJR	The glass recovered from the suspect's shirt pocket, Item 001-2, was indistinguishable in physical properties, refractive index, and elemental composition to the glass taken from the driver's side window of the victim's vehicle, Item 001-1. Therefore, the glass recovered from the

TABLE 3

WebCode	Conclusions
	suspect's shirt pocket could have originated from the driver's side window of the victim's vehicle or from another source of glass produced by the same glass manufacturer exhibiting the same physical and chemical properties. The thickness of the glass recovered from the suspect's shoe, Item 001-3, was significantly different from driver's side window of the victim's vehicle, Item 001-1, and therefore is eliminated.
UKYD6T	1. Comparative examinations of Item 2 (questioned glass) with Item 1 (known glass) revealed them to be consistent in their physical characteristics, refractive indices, and elemental composition. Therefore, the glass in Item 2 could have a common origin with the glass represented in Item 1. 2. Comparative examinations of Item 3 (questioned glass) with Item 1 (known glass) revealed them to be inconsistent in their physical characteristics and elemental composition. Therefore, the glass in Item 3 could not have had a common origin with the glass represented in Item 1.
VBTTGQ	The known glass and the questioned glasses were examined with the following methods as appropriate: visual examination, stereomicroscopy, Glass Refractive Index Measurement, Laser Induced Breakdown Spectroscopy and Scanning Electron Microscopy with Energy Dispersive Spectroscopy. The known glass from the driver side window of the victim's vehicle (item 1) and the questioned glass from the suspect's shirt pocket (item 2) exhibit the same physical, optical, microscopic and chemical properties. Therefore, the known glass from the driver side window of the victim's vehicle and the questioned glass from the suspect's shirt pocket originated from the same source of glass or another glass with the same physical, optical, microscopic and chemical properties. The known glass from the driver side window of the victim's vehicle (item 1) and the questioned glass from the suspect's shoe (item 3) differ in refractive index. Therefore, the known glass from the driver side window of the victim's vehicle and the questioned glass from the suspect's shoe could not have originated from the same source.
VYU4FW	Item 2 was optically, physically, and elementally consistent with Item 1. Item 3 was not optically, physically or elementally consistent with Item 1. Item 3 appeared to be slightly thinner, had a slightly higher refractive index, and did not contain detectable amounts of K and Al (as Items 1 and 2 did).
VZ8PAR	The known glass in Item 1 and the questioned glass in Item 2 were found to be alike in all measured characteristics. Therefore, the glass in Item 1 and the glass in Item 2 could have originated from the same source. The questioned glass in Item 3 was found to be inconsistent with the known glass in Item 1.
WB3GVN	The two particles of questioned glass recovered from suspect's shirt pocket in Item 2 could have originated from the same source of glass as Item 1 known glass from the driver's side window of the victim's vehicle or from another source of glass with indistinguishable thickness and similar color and refractive index. The two particles of questioned glass recovered from the suspect's shoe in Item 3 could not have originated from the same source of glass as Item 1 known glass from the driver's side window of the victim's vehicle.
WWZXAP	Based on our findings, we find that Item 1 and Item 2 by high degree of certainty are of similar type. We can not conclude that Item 1 and Item 2 have a common source. Item 1 and Item 3 do not share the same source.
XA8YUL	The glass from Item 2 (glass from shirt pocket) was found to be similar in physical properties, refractive index, and elemental composition in comparison to the glass from Item 1 (standard). The glass from Item 2 could have come from the same source of glass as Item 1 or from another glass source similar in all aspects to the glass of Item 1. The glass from Item 3 (glass from shoe) was found to be different in thickness and elemental composition in comparison to

TABLE 3

WebCode	Conclusions
	the glass from Item 1 (standard) and did not come from the same source of glass as Item 1. Chemical Analysis performed on Items 1, 2, and 3 includes: Polarized Light Microscopy, Fluorescence, X-ray Fluorescence Spectroscopy (XRF). Refractive Index was performed on Items 1 and 2 only.
XEYAHQ	Particles of questioned glass recovered from the suspect's shirt (item 2) did originate from the glass taken from the driver's side window of the victim's vehicle (item 1). Particles of questioned glass recovered from the suspect's shoe (item 3) did not originate from the glass taken from the driver's side window of the victim's vehicle (item 1).
XPZXB	The questioned glass particle item 2 could have originated from item 1. The questioned glass particle item 3 could not have originated from item 1
XXQJFL	The particles of questioned glass (Item 2) recovered from the suspect's shirt pocket are identical with the fragments of known glass taken from the driver's side window of the victim's vehicle (Item 1) in color and refractive index. However, the particles of questioned glass (Item 3) recovered from the suspect's shoe are found to be different from Item 1 in refractive index. Therefore, the questioned glass in Item 2 could have originated from the known glass in Item 1.
Y372JN	CONCLUSIONS: The two questioned glass fragments recovered from the suspect's shirt pocket (CTS Item 2) either originated from the driver's side window of the victim's vehicle (CTS Item 1) or another source of broken glass possessing the same distinct physical, optical, and chemical characteristics. The two questioned glass fragments recovered from the suspect's shoe (CTS Item 3) did not originate from the driver's side window of the victim's vehicle (CTS Item 1).
YAJY6M	The glass recovered from the suspect's shirt pocket matched the glass that comprised the broken vehicle window, by the applied laboratory tests. Hence, in my opinion, these findings provide moderately strong support for the view that the glass from the suspect's pocket originated from the smashed vehicle window in question. The glass recovered from the suspect's shoe did not match the glass that comprised the broken vehicle window in question and therefore could not have originated from this window.
YCMUNP	1. The fragments of questioned glass recovered from the suspect's shirt pocket (Item 2) had similar physical characteristics as the fragments of known glass from the driver's side of the victim's vehicle (Item 1) and could have originated from Item 1. 2. The fragments of questioned glass recovered from the suspect's shoe (Item 3) did not originate from the known glass taken from the driver's side window of the victim's vehicle (Item 1).
YY8PNN	CONCLUSIONS: Three glass fragments recovered from the suspect's shirt pocket (Item 2) either originated from the driver's side window of the victim's vehicle (Item 1) or another source of broken glass possessing the same distinct physical, optical, and chemical characteristics. Two glass fragments recovered from the suspect's shoe (Item 3) did not originate from the driver's side window of the victim's vehicle (Item 1). RESULTS: Questioned glass identified as from the suspect's shirt pocket and shoe (Items 2 and 3) was examined for the purpose of determining whether or not there is any glass present like the known glass standard from the driver's side window of the victim's vehicle (Item 1). The known glass standard from the driver's side window of the victim's vehicle (Item 1) is medium blue-green tempered sheet float glass. Examination of the questioned glass identified as from the suspect's shirt pocket (Item 2) revealed three full thickness glass fragments. Examination and comparison of these three questioned glass fragments (Item 2) with the known glass standard from the driver's side window of the victim's vehicle (Item 1) reveals they are alike with respect to physical, optical, and chemical characteristics. It is therefore concluded that these three questioned glass fragments recovered from the suspect's shirt pocket (Item 2) either originated from the driver's side window of the

TABLE 3

WebCode	Conclusions
	<p>victim's vehicle (Item 1) or another source of broken glass possessing the same distinct physical, optical, and chemical characteristics. Examination of the questioned glass identified as from the suspect's shoe (Item 3) revealed two full thickness glass fragments. Examination and comparison of these two questioned glass fragments with the known glass standard from the driver's side window of the victim's vehicle (Item 1) reveals they are dissimilar with respect to thickness. It is therefore concluded that these two questioned glass fragments recovered from the suspect's shoe (Item 3) did not originate from the driver's side window of the victim's vehicle (Item 1). METHODS OF ANALYSIS: Examinations were performed visually, by stereo microscopy, polarized light microscopy, ultraviolet fluorescence, micrometry, refractive index determination, and x-ray fluorescence spectroscopy.</p>
ZAD6YL	<p>The density measurement of item 1 yielded a density of 2.4947 g/cm³ which matches the density of item 2. The density of item 3 is 2.5032 g/cm³ and therefore does not match with any of the two other samples. The analyses of the chemical composition by LIBS and μXRF also show that items 1 and 2 match. The chemical compositions of item 1 and 2 show clear differences in magnesium, calcium and aluminum oxide content in comparison to item 3. The results are within measurement inaccuracy.</p>
ZT9XKK	<p>Item 2 is considered to have originated from the drivers side window as it had a similar elemental composition, thickness and colour. Item 3 had a different composition and thickness when compared to item 1 and 2 and was not considered to have come from the window.</p>
ZXQ4DD	<p>CONCLUSIONS: Glass (item 2) recovered from the suspect's shirt pocket could not be excluded as having come from the vehicle window (item 1). As such, item 2 came from either the vehicle window (item 1) or another source or sources of broken clear, blue-green, tempered, float glass, indistinguishable from item 1 with respect to thickness, refractive index and elemental composition. Glass (item 3) recovered from the suspect's shoe was excluded as having come from the vehicle window (item 1). As such, item 3 did not come from the vehicle window (item 1).</p>

Additional Comments

TABLE 4

WebCode	Additional Comments
23DZR3	Association levels and an association scale would be placed in the report that would give context to the conclusions.
3H4KMG	The glass in Items 1 and 2 is similar in color, type of glass, UV fluorescence, thickness, density and refractive index. The glass in Items 1 and 3 is dissimilar in density and refractive index.
3NUWKX	Any report issued in my laboratory also contains information about the methods used, interpretation of data and limitations of the examinations.
43R9T3	The answer is based on results of likelihood ratio calculations.
74QHVDV	In addition to the conclusions, our reports also contain sections for methodology, interpretation of the results, limitations of the examinations, and remarks.
7EDBC7	Trace elemental concentrations of selected elements were determined using laser ablation ICP-MS.
8FYKCX	The elemental analysis (XRF) confirmed the GRIM results.
8HNYUF	The refractive index was measured with a Glass Refractive Index Measurement 3 (GRIM3, Foster and Freeman) system. And the elemental analysis was measured with a SEM/EDS (Jeol Mod. LV6610 / EDS Oxford).
A8NUA8	Refractive Index (RI) measurement is a useful tool to compare glass samples, however these values are not unique. Therefore, in the case of indistinguishable control and recovered glass RI values, sources for the recovered glass other than the control sample may be possible.
BKN47R	T-TEST FOR THICKNESS AND REFRACTION INDEX.
BPTZPR	IN ORDER TO FULLY DISCRIMINATE BETWEEN ITEMS 1 AND 2 ELEMENTAL ANALYSIS MUST BE PERFORMED. THIS TECHNIQUE IS NOT AVAILABLE IN THIS LAB AT THIS MOMENT.
D8RYQQ	Methods of Analysis: Glass was analyzed using a combination of stereomicroscopy, high power and polarized light microscopy, ultraviolet light examination, relative density comparison, and Emmons Double Variation, which is a standard glass refractive index procedure. Note: Elemental analysis, which is not available in this laboratory, could provide additional discrimination
D9FD99	1) The submission of only 2 cubes/chunks of toughened glass from the known/control glass (driver's side window) is not typical for casework at this laboratory. Numerous cubes (ideally greater than 20) are usually submitted and a selection of approximately 6 cubes are examined and analysed, to allow a better assessment of the variation of the refractive index across the window. 2) At this laboratory, the recovery of fragments of glass with a freshly broken appearance from the surfaces of clothing is usually considered more evidentially significant than that recovered from pockets or in shoes. This is because it is not possible to say when glass in pockets and shoes would have been deposited, whereas glass on the surfaces of the clothing is typically lost within a few hours and can be an indicator of recent activity. 3) I understand CTS will not reproduce interpretation scales, scale of conclusions or terminology keys in the final report and should not be submitted with our data sheet. At this laboratory, we would typically use and include such information for our interpretation and final conclusion.
JDBB9Y	Chemical Analysis performed includes: Polarized Light Microscopy, Fluorescence, X-Ray Fluorescence Spectroscopy, and Refractive Index. Samples collected and/or analyzed during the examination and analysis of the items in this case (ex. glass slides) have been returned to and retained with the original item.
KMGC6K	Refractive index (3SD): Item 1: 1.5194 - 1.5197, Item 2: 1.5195 - 1.5197, Item 3: 1.5218 -

TABLE 4

WebCode	Additional Comments
	1.5221. Comparison of trace elemental compositions: The match criterion for LA-ICP-MS analysis was set at 4SD range (minimum 3% RSD) around the control sample. The elements compared were: Li7, Na23, Mg24, Al27, K39, Ca42, Ti49, Mn55, Fe57, Rb85, Sr88, Zr90, Ba137, La139, Ce140, Nd146, Hf178, Pb208. Comparing Item 1 and Item 3, the concentrations of the following elements were different: Li7, Mg24, Al27, K39, Ca42, Ti49, Mn55, Rb85, Sr88, Zr90, Ba137, La139, Ce140, Nd146, Hf178, Pb208.
Q398ZX	Note - comparison of colour (ticked above [Table 2 - Examination Procedures]) was visual comparison only
QH7BMW	A larger sample size of the standard (Item 1) is more representative in the analysis of casework
R73NPW	The refractive index was measured with a Glass Refractive Index Measurement 3 (GRIM3, Foster and Freeman) system. And the elemental analysis was measured with a SEM/EDS (Jeol Mod. LV6610 / EDS Oxford).

Appendix: Data Sheet

Collaborative Testing Services ~ Forensic Testing Program

Test No. 16-548: Glass Analysis

DATA MUST BE RECEIVED BY August 01, 2016 TO BE INCLUDED IN THE REPORT

Participant Code:

WebCode:

Accreditation Release Statement

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

- This participant's data is intended for submission to ASCLD/LAB, ANAB, and/or A2LA. (Accreditation Release section on the last page must be completed and submitted.)
- This participant's data is NOT intended for submission to ASCLD/LAB, ANAB or A2LA.

Scenario:

Police are investigating an attempted carjacking in which the suspect broke the driver's side window when the victim resisted, then fled the scene. A known sample was taken from the glass remaining in the driver's side window. A week later, the police apprehended a suspect and conducted a search of his home. Particles of glass were found in a shirt pocket and in a shoe. Investigators are requesting that you examine and compare the glass particles recovered from the suspect's shirt and shoe with the fragments recovered from the driver's side window of the victim's vehicle.

Please Note:

- Samples contained within each individual Item are from a single source.
- CTS will not reproduce Interpretation Scales, Scale of Conclusions or Terminology Keys in the final report, please do not submit with the participant's data sheet.

Items Submitted (Sample Pack GL):

- Item 1: Two fragments of known glass taken from the driver's side window of the victim's vehicle.
- Item 2: Two particles of questioned glass recovered from the suspect's shirt pocket.
- Item 3: Two particles of questioned glass recovered from the suspect's shoe.

1.) Could the questioned glass particles in Item 2 and/or 3 have originated from the driver's side window of the victim's vehicle as represented by Item 1?

- | | | | |
|----------------|------------------------------|-----------------------------|---------------------------------------|
| Item 2: | Yes <input type="checkbox"/> | No <input type="checkbox"/> | Inconclusive <input type="checkbox"/> |
| Item 3: | Yes <input type="checkbox"/> | No <input type="checkbox"/> | Inconclusive <input type="checkbox"/> |

Please return all pages of this data sheet.

Page 1 of 3

Participant Code:

WebCode:

2.) Indicate the procedures used to examine the submitted items:

Refractive Index:

nD

nC

nF

Δ RI

UV Fluorescence:

Long

Short

Color

Thickness

Density

Elemental Analysis:

SEM/EDS

XRS/XRF

Other (specify): _____

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

4.) Additional Comments

<p>Return Instructions: Data must be received via online data entry, fax (please include a cover sheet), or mail by August 01, 2016 to be included in the report. Emailed data sheets are not accepted.</p> <p>QUESTIONS?</p> <p>TEL: +1-571-434-1925 (8 am - 4:30 pm EST)</p> <p>EMAIL: forensics@cts-interlab.com www.ctsforensics.com</p>	<p>Participant Code:</p> <p>ONLINE DATA ENTRY: www.cts-portal.com</p> <p>FAX: +1-571-434-1937</p> <p>MAIL: Collaborative Testing Services, Inc. P.O. Box 650820 Sterling, VA 20165-0820 USA</p>
--	---

Please return all pages of this data sheet.

Collaborative Testing Services ~ Forensic Testing Program

RELEASE OF DATA TO ACCREDITATION BODIES

The following Accreditation Releases will apply only to:

Participant Code:

WebCode:

for Test No. **16-548: Glass Analysis**

This release page must be completed and received by **August 1, 2016** to have this participant's submitted data included in the reports forwarded to the respective Accreditation Bodies.

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

ASCLD/LAB Certificate No. _____

ANAB Certificate No. _____

A2LA Certificate No. _____

Step 2: Complete the Laboratory Identifying Information in its entirety

Signature and Title _____

Laboratory Name _____

Location (City/State) _____

Accreditation Release

Return Instructions

Please submit the completed Accreditation Release at the same time as your full data sheet. See Data Sheet Return Instructions on the previous page.

*Questions? Contact us 8 am-4:30 pm EST
Telephone: +1-571-434-1925
email: forensics@cts-interlab.com*

Please return all pages of this data sheet.

Page 3 of 3