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FORENSIC TESTING PROGRAM

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GSR Distance Determination
Test No.19-5301/5 Summary Report

Each sample set contained one of the following: An evidence piece of clothing for chemical processing for a GSR pattern (Q1) and either photographs (19-5301) or directly downloadable digital images (19-5305) of GSR patterns produced by test shots at known distances. These were provided on untreated test fabric (K1a) and treated test fabric after chemical processing using Modified Griess (K1b) and Sodium Rhodizonate (K1c). Participants were requested to process the Q1 clothing sample and report the range of distances, along with their conclusions and comments. Data were returned from 119 participants and are compiled into the following tables:

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 contained a piece of clothing evidence (Q1) for chemical processing and either photographs or digital images of known distance test GSR patterns on unprocessed test fabric (K1a) and test fabric after chemical processing using Modified Griess (K1b) and Sodium Rhodizonate (K1c). Participants were requested to process the clothing item and report the range of distances that the muzzle of the firearm could have been from the fabric (Q1) at the time of discharge.

SAMPLE PREPARATION: The firearm used to produce the distance standards and evidence item was a Sig Sauer model MPX 9mm semiautomatic handgun and the ammunition was Prvi Partizan 9mm 115 grain FMJ.

DISTANCE STANDARDS (K1a-c): The fabric used for the known distances was white cotton. The firearm was locked into a fixture and the white cotton fabric was placed at a predetermined distance from the firearm. This was done for each of the predetermined distances. First, the known GSR patterns were imaged. Each known pattern was then processed using the Modified Griess procedure. Immediately following processing, the film paper was imaged. Finally, the known patterns were processed with Sodium Rhodizonate reagents, and the fabric imaged immediately after processing.

QUESTIONED ITEM (Q1): Item Q1 consisted of one section of a white T-shirt material (60% Cotton, 40% Polyester blend knit). The firearm was locked into a fixture and the shirt was placed 7 inches away from the muzzle of the firearm. After firing, the article of clothing (Q1) was packaged between two pieces of chipboard and placed into an envelope. This process was repeated until all of the items were created.

SAMPLE SET ASSEMBLY: For the printed photos, the Q1, K1a, K1b, and K1c envelopes were placed into a pre-labeled sample pack envelope, sealed with evidence tape, and initialed "CTS." For the Digital Download version, the Q1 item was placed in a pre-labeled sample pack envelope and the K1a, K1b and K1c files were loaded onto the CTS Portal.

VERIFICATION: All three predistribution laboratories reported a greater than/less than range that surrounded the expected distance.

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Summary Comments

This test was designed to allow participants to assess their proficiency in muzzle to target distance determination using gunshot residue (GSR) patterns. Each participant received an evidence piece of clothing for chemical processing (Q1), images of GSR patterns at known distances on untreated fabric (K1a), and images of GSR patterns at known distances on fabric chemically processed using Modified Griess (K1b) and Sodium Rhodizonate (K1c). The evidence piece of clothing (Q1) was prepared with the firearm locked into a fixture and the white T-shirt material (60% Cotton, 40% Polyester blend knit) placed 7 inches away from the muzzle of the firearm. (Refer to the Manufacturer's Information for preparation details.)

In Table 1, 117 of the 119 responding participants (98%) reported a "greater than" distance between contact and 9 inches and a "less than" distance between 6 and 21 inches. In the summary of this table, CTS has grouped the responses provided by the participants based on their "greater than"/"less than" distance results and provided a tally of the ranges between responses as calculated by CTS.

For greater than/less than distances, a +/-2 inch allowance from the known shot distance (7 inches) was used as the baseline. Any reported "greater than" values which were larger than 9 inches and reported "less than" values which were smaller than 5 inches were highlighted as inconsistent. CTS then analyzed the ranges of the reported values and determined the most common reported range, the mode, was 12 inches. A 3 inch allowance was provided to the modal value to account for the distance between the known distance standard images. Any reported range larger than 15 inches was highlighted as inconsistent.

CTS is aware that laboratory reporting policies differ and there are varying acceptable ranges. It will therefore be at the discretion of the laboratory to further evaluate participant's results based on their own policies and procedures.

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Distance Determination Results

What is the distance range that the muzzle of the firearm could have been from the shirt (Q1) at the time of discharge? Please report a numeral response (e.g. 6) from the supplied Distance Standards. If reporting Contact, indicate with the numeral 0.

TABLE 1

(Distance in Inches)

WebCode-Test	Greater Than	Less Than	Calc. Range	WebCode-Test	Greater Than	Less Than	Calc. Range	WebCode-Test	Greater Than	Less Than	Calc. Range
28GVN8-5301	3	15	*12*	7V9RJL-5301	3	15	*12*	AXKTXG-5301	0	12	*12*
2MTA76-5301	3	15	*12*	7Z4DGG-5301	3	15	*12*	AZBU46-5301	3	12	*9*
2YMQV7-5301	3	9	*6*	87NWC4-5301	6	15	*9*	B2XX7B-5301	3	15	*12*
37PZZD-5301	3	15	*12*	883HNQ-5301	3	15	*12*	B8P6NJ-5305	3	9	*6*
39RZ3V-5301	3	15	*12*	8K9BF3-5301	3	6	*3*	BNXU8B-5301	3	15	*12*
3NLPUL-5301	3	15	*12*	8RPR8C-5301	3	18	*15*	C4LNVL-5301	3	15	*12*
3R23RM-5301	6	15	*9*	8XR7ML-5305	6	12	*6*	C8J7A2-5301	6	18	*12*
3WD4XR-5301	3	15	*12*	8XVKZM-5301	0	15	*15*	CL4N4Q-5301	3	18	*15*
4ECHRQ-5301	3	21	*18*	9EU3JQ-5305	3	12	*9*	CTPGFP-5301	3	18	*15*
4GY4HT-5305	6	12	*6*	A33QTY-5301	3	18	*15*	DNKGAP-5305	3	12	*9*
6JKZPJ-5301	3	15	*12*	AHR3YD-5301	3	15	*12*	EKKJKH-5301	6	12	*6*
6WCMXZ-5305	3	15	*12*	AKWL6L-5301				ENML7D-5301	3	15	*12*
7BPHNF-5301	3	15	*12*	AQNTNV-5305	6	12	*6*	EPDMC2-5301	3	12	*9*
7FVFTD-5301	3	15	*12*	AUN6JV-5301	3	15	*12*	ER4MRK-5301	3	12	*9*

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TABLE 1

(Distance in Inches)

WebCode-Test	Greater Than	Less Than	*Calc. Range*	WebCode-Test	Greater Than	Less Than	*Calc. Range*	WebCode-Test	Greater Than	Less Than	*Calc. Range*
F6K7G7-5301	3	15	*12*	HR8PLL-5305	0	15	*15*	M8RPNG-5305	3	15	*12*
F9KELG-5301	6	15	*9*	HVBBJJ-5301	3	15	*12*	MDUXTN-5301	3	9	*6*
FAJFUU-5305				J4XT9C-5301	3	15	*12*	MNYQK4-5301	3	12	*9*
FG2NHQ-5301	3	18	*15*	JDNEEA-5305	6	18	*12*	N6JW8M-5301	3	12	*9*
FTE44P-5301	3	9	*6*	JFEFKX-5301	3	18	*15*	NNVLM7-5301	3	15	*12*
FVY28L-5301	0	12	*12*	JHJ9CB-5301	3	15	*12*	NPKWBD-5305	0	15	*15*
G22BEE-5301	3	12	*9*	JUWDJ8-5305	3	12	*9*	P6U37A-5301	3	18	*15*
G883PX-5301	3	12	*9*	KEXMJN-5301	3	12	*9*	PEMBQZ-5301	3	12	*9*
GBAWPM-5301	3	15	*12*	KJAUH8-5305	6	18	*12*	PMV3U4-5305	3	21	*18*
GC6GCM-5305	3	15	*12*	KWHAQX-5301	3	12	*9*	PNM2AM-5301	6	12	*6*
GJLW3B-5301	3	15	*12*	L4B622-5301	3	15	*12*	Q8ECNA-5301	3	12	*9*
H798LL-5301	3	12	*9*	L724HK-5301	6	18	*12*	Q9NG3X-5301	3	12	*9*
H86R9K-5301	3	15	*12*	LPQPY2-5301	3	15	*12*	QEGKV3-5301	3	12	*9*
H9U6PH-5301	3	15	*12*	LRGNEL-5301	6	21	*15*	QK64F6-5301	3	18	*15*
HFXZTB-5301	3	15	*12*	M2ZH79-5301	6	12	*6*	QPDJPT-5301	3	15	*12*

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TABLE 1

(Distance in Inches)

WebCode-Test	Greater Than	Less Than	*Calc. Range*	WebCode-Test	Greater Than	Less Than	*Calc. Range*	WebCode-Test	Greater Than	Less Than	*Calc. Range*
QY7U2A-5301	3	15	*12*	WC8JFW-5305	3	18	*15*	ZL244T-5301	3	12	*9*
RG3KUH-5301	3	9	*6*	X4C2ET-5305	3	15	*12*	ZP4W6J-5301	3	15	*12*
TJW329-5301	3	15	*12*	XEW9DH-5301	3	12	*9*				
TULPFJ-5301	9	15	*6*	XJMHNG-5301	3	12	*9*				
TVA3X3-5301	3	12	*9*	XLCV7Y-5301	3	15	*12*				
UGQVHG-5301	6	12	*6*	XPQLBU-5301	0	15	*15*				
URAALJ-5301	3	12	*9*	XQL9NX-5305	3	15	*12*				
UTL9FR-5301	3	12	*9*	YKU26P-5301	3	12	*9*				
UUFWTV-5305	3	12	*9*	YULKJX-5305	3	15	*12*				
UZ3G4N-5305	3	12	*9*	Z8GLA4-5305	3	15	*12*				
VFCXH4-5305	3	15	*12*	ZB6VPW-5301	3	18	*15*				
VFFCWP-5301	3	18	*15*	ZCYJ4L-5305	3	9	*6*				
VUYXJ6-5301	3	12	*9*	ZDEVU4-5305	3	15	*12*				
W3ZMRT-5301	3	12	*9*	ZGCGGZ-5301	0	15	*15*				
W8ZXNT-5301	3	12	*9*	ZJY2HX-5301	3	18	*15*				

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Distance Determination

Response Summary **Participants:** 119

Greater Than Distance	Participants Reporting	Less Than Distance	Participants Reporting	CTS Calculated Range	Participants Reporting
Contact / 0	7 *(5.88%)*	Contact / 0	0 *(0.00%)*	3	1 *(0.84%)*
3	94 *(78.99%)*	3	0 *(0.00%)*	6	14 *(11.76%)*
6	15 *(12.61%)*	6	1 *(0.84%)*	9	32 *(26.89%)*
9	1 *(0.84%)*	9	6 (5.04%)	12	50 *(42.02%)*
12	0 *(0.00%)*	12	38 *(31.93%)*	15	18 *(15.13%)*
15	0 *(0.00%)*	15	53 *(44.54%)*	18	2 *(1.68%)*
18	0 *(0.00%)*	18	16 *(13.45%)*	21	0 *(0.00%)*
21	0 *(0.00%)*	21	3 *(2.52%)*	24	0 *(0.00%)*
24	0 *(0.00%)*	24	0 *(0.00%)*	Other	0 *(0.00%)*
27	0 *(0.00%)*	27	0 *(0.00%)*	No Response	2 *(1.68%)*
Other	0 *(0.00%)*	Other	0 *(0.00%)*		
No Response	2 *(1.68%)*	No Response	2 *(1.68%)*		

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Conclusions

TABLE 2

WebCode-Test	Conclusions
28GVN8-5301	The shirt, item Q1, was visually examined. There was a hole in the center of the shirt. The area around the hole was microscopically examined and chemically processed for the presence of gunpowder and lead residues. Residues consistent with the discharge of a firearm were developed. The results of this processing were compared to patterns developed from proximity tests conducted with the recovered firearm. These comparisons showed that the pattern around the defect hole in Q1 is consistent with a gunshot occurring at a distance between 3" and 15".
2MTA76-5301	The muzzle to garment distance for hole 1 was greater than 3 inches and less than 15 inches.
2YMQV7-5301	Using the distance standards listed as K1a, K1b, and K1c, this pattern of residues was reproduced at a muzzle distance of between three (3) and nine (9) inches.
37PZZD-5301	The area surrounding the defect on the white cloth, Item 1A, was microscopically examined and chemically processed for the presence of gunshot residues. Images of test patterns, Items 1B through 1D, were submitted from a known firearm and analyzed. Using the test images, the pattern was duplicated at a muzzle to target distance between 3 and 15 inches. The following is a summary of the testing performed: Microscopic examination for unburnt/partially burnt gunpowder particles: particles consistent with the morphological (shape & size) properties of gun powder were found. Chemical examination for nitrates that could originate from unburnt/ partially burnt gunpowder particles using Diphenylamine test: Positive. Chemical examination for nitrite residues that could originate from gunpowder particles using the Modified Griess test: Positive. Microscopic examination for lead residues: residues consistent with lead found. Chemical examination for lead residues using the Sodium Rhodizonate test: Positive
39RZ3V-5301	The area around the hole in Q1 was microscopically examined and chemically processed for the presence of gunpowder and lead residues (gunshot residues). A pattern of residues was developed which was compared with distance patterns generated at approximately contact, 3, 6, 9, 12, 15, 18, 21, 24, and 27 inches. The gunshot residue pattern on Q1, based on size and density, is consistent with the muzzle of a firearm having been greater than approximately 3" and less than approximately 15" from this area at the time of firing.
3NLPUL-5301	The area surrounding the defect in the center of the fabric, Item 1A, was microscopically examined and chemically processed for the presence of gunshot residues. Images of test patterns, Items 1B through 1D, were submitted from a known firearm and analyzed. Using the test images, the pattern was duplicated at a muzzle to target distance between 3 and 15 inches. The following is a summary of testing performed: Microscopic examination for unburnt/partially burnt gunpowder particles: particles consistent with the morphological (shape & size) properties of gunpowder were found. Chemical examination for nitrates that could originate from unburnt/partially burnt gunpowder particles using the Diphenylamine test: positive. Chemical examination for nitrite residues that could originate from gunpowder particles using the Modified Griess test: positive. Microscopic examination for lead residues: residues consistent with lead found. Chemical examination for lead residues using the Sodium Rhodizonate test: positive
3R23RM-5301	By mean of physical study and chemical analysis, gun shot residues (gun powder, Nitrites and Lead) were detected around the shirt's (Q1) hole consistent with firing a gun from a muzzle to garment distance between six (6") to fifteen (15")inches. The provided distances standards (K1a, K1b and K1c) were used for the distance determination.

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TABLE 2

WebCode-Test	Conclusions
3WD4XR-5301	The area around defect A was visually examined, microscopically examined and chemically processed for the presence of gunshot residues. The pattern of gunshot residues around defect A is consistent with a muzzle to target distance between 3 inches and 15 inches.
4ECHRQ-5301	Examination of the Item Q1 section of fabric revealed a hole. The area around this hole was microscopically examined and chemically processed for the presence of gunshot residues, and a pattern of residues was found. The results of the chemical tests also indicated the presence of lead residues. The residue pattern found around the hole in the Item Q1 section of fabric is consistent in pattern size and density with having been produced at an approximate distance between 3 inches and 21 inches.
4GY4HT-5305	The distance between the causative weapon and the victims shirt at the tine of discharge was between 6" and 12", with the most likely distance being approximately 9".
6JKZPJ-5301	The area surrounding the defect in the cutting of the white shirt, Item 1A, was microscopically examined and chemically processed for the presence of gunshot residues. Images of test patterns, Items 1B - 1D, were submitted from a known firearm and analyzed. Using the test images, the pattern was reproduced at a muzzle to target distance between 3 and 15 inches. The following is a summary of testing performed: Microscopic examination for unburnt/partially burnt gunpowder particles: particles consistent with the morphological (shape & size) properties of gunpowder were found. Chemical examination for nitrates that could originate from unburnt/partially burnt gunpowder particles using the Diphenylamine test: positive. Chemical examination for nitrite residues that could originate from gunpowder particles using the Modified Griess test: positive. Microscopic examination for lead residues: residues consistent with lead found. Chemical examination for lead residues using the Sodium Rhodizonate test: positive
6WCMXZ-5305	The distance of firing from the muzzle of the firearm used to produce the known distance patterns to "Item 1" was found to be between 3 inches and 15 inches.
7BPHNF-5301	1) Exhibit 1 (Fabric) was visually and microscopically examined for the presence of a pattern of gunpowder residues consistent with the discharge of a firearm. a) A hole of entry with a pattern of gunpowder residues was found near the center of the fabric. 2) Exhibit 2 (Photographs of known distance test patterns from contact to 27 inches - visual, modified griess, and sodium rhodizonate) was submitted for comparison to the pattern of gunpowder residues found on Exhibit 1. a) The pattern of gunpowder reside that was found on Exhibit 1 was reproduced at a muzzle-to-target distance between approximately 3 inches to 15 inches.
7FVFTD-5301	Examination of Item 4 revealed a hole in the center of the fabric. The area surrounding the hole was visually and microscopically examined and chemically processed and a pattern of gunshot residues was detected. Using the submitted photo arrays of the firearm and submitted ammunition test patterns that were produced at the following muzzle-to-target distances: contact, three (3) inches, six (6) inches, nine (9) inches, twelve (12) inches, fifteen (15) inches, eighteen (18) inches, twenty one (21) inches, twenty four (24) inches, and twenty seven (27) inches. The detected pattern surrounding the hole in Item 4 is consistent in size, density, and appearance to the test patterns produced at muzzle-to-target distances of between three (3) and fifteen (15) inches.
7V9RJL-5301	Item Q1 "shirt" exhibits a single perforating defect surrounded by a pattern of black-in-color particles and sooting. One particle was removed and tested positive for gunpowder. The combination of visual and chemical examinations reveals that the defect in Q1 is consistent with the entry of a projectile occurring when the muzzle of the firearm was at a distance greater than 3 inches and less than 15 inches from the surface of the "shirt" at the time of firing.

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TABLE 2

WebCode-Test	Conclusions
7Z4DGG-5301	The area surrounding the defect in the center of the shirt, Item 1A, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed a pattern of gunshot residues which was reproduced using the known standards, Item 1B, at a muzzle to target distance between 3 and 15 inches. The following is a summary of testing performed: Microscopic examination for unburnt/partially burnt gunpowder particles: particles consistent with the morphological (shape & size) properties of gunpowder were found. Chemical examination for nitrates that could originate from unburnt/partially burnt gunpowder particles using the Diphenylamine test: positive. Chemical examination for nitrite residues that could originate from gunpowder particles using the Modified Griess test: positive. Microscopic examination for lead residues: residues consistent with lead found. Chemical examination for lead residues using the Sodium Rhodizonate test: positive
87NWC4-5301	In the portion of the t-shirt is established the presence of a bullet hole caused by the passage of projectile fired of a firearm, being determined as distance short, with range greater than 6 inches and less than 15 inches approximately between the muzzle of the weapon and impact site in the from the shirt. This based on the comparison of the results found between the distance os standards and the sample.
883HNQ-5301	Examination of the Item Q1 piece of fabric revealed the presence of a hole, consistent with a bullet hole, through the fabric. The area around this hole was examined microscopically, and processed chemically for the presence of propellant and lead residues (gunshot residues), and a pattern of residues was found. Comparison of the items K1a, K1b and K1c submitted test patterns to the item Q1 submitted piece of fabric, showed the item Q1 residue pattern to be consistent in size and density with patterns observed on the items K1a, K1b and K1c submitted standards. Based on this comparison, the bullet hole observed on item Q1 is consistent with a shot fired from a distance between approximately three (3) inches, and approximately fifteen (15) inches from muzzle to target.
8K9BF3-5301	We think the shooting distance is closer to the 6" then the 3". We think the correct distance is approx. 5".
8RPR8C-5301	Clothing Analysis: Methodology – Visual Examination/Microscopy, Chemical- Color Test (Modified Griess and Sodium Rhodizonate). No visible red-brown stains were observed on Item Q1, the twill jean. One (1) defect was observed on Item Q1, the twill jean, and described as follows: The defect/hole, designated as “A”, measured approximately 1/4 inch in greatest dimensions and was located approximately 3 3/4 inches from the top seam and 4 1/2 inches from the right side seam on the anterior portion of the twill jean. Visual and microscopic examination of defect/hole “A” revealed the presence of apparent bullet wipe, soot, and gunpowder. Chemical testing of defect/hole “A” indicates the presence of *nitrite residues and **lead residues. Note: *Nitrites are present in gunpowder residue. **Lead residue can be present in bullets/bullet cores and ammunition primers. Opinion/Interpretation: Examination of defect/hole “A” indicated that it was visually consistent with the passage of a projectile/bullet based upon the physical properties observed and the chemical tests performed. Distance Determination Analysis: Methodology – Visual Examination, Chemical – Color Test (Modified Griess and Sodium Rhodizonate). The pattern of gunpowder and gunpowder residues observed and documented from Item Q1, the twill jean, and Item Q1A, the chemical test patterns of Item Q1 defect/hole “A”, was reproduced at a muzzle to target distance between 3 and 18 inches. Miscellaneous: Item Q1A, the chemical test patterns, will be sealed in a manila envelope and will be returned with the evidence to the submitting agency. Item K1a, the photographs, will be sealed in a manila envelope and will be returned with the evidence to the submitting agency. Item K1b, the photographs, will be sealed in a manila envelope and will be

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TABLE 2

WebCode-Test	Conclusions
	returned with the evidence to the submitting agency. Item K1c, the photographs, will be sealed in a manila envelope and will be returned with the evidence to the submitting agency.
8XR7ML-5305	Distance testing of Item Q1 revealed a muzzle to target distance no closer than 6 inches and no further than 12 inches.
8XVKZM-5301	Examination of the Item Q1 shirt revealed a hole in the center area. The area around this hole was microscopically examined and chemically processed for the presence of gunshot residues. The residue pattern found around the hole in Item Q1 is consistent in pattern size and density with having been produced at an approximate distance between contact and 15 inches. Materials produced as a result of chemically processing Item Q1 are being returned as Item Q1P and should be maintained for possible future examinations.
9EU3JQ-5305	According with the distance standards, the hole in the fabric "Q1" was produced by the entry of a ballistic projectile shooted at a distance ranging from 3 inches to 12 inches approximately.
A33QTY-5301	The swatch of white cloth from item Q1 was visually examined. A single hole was located in the lower half of the swatch. The area around the hole was microscopically examined and chemically processed for the presence of gunpowder and lead residues. Residues consistent with the discharge of a firearm were observed and chemical patterns were developed. The resulting patterns from this processing were compared to patterns developed from proximity tests and provided as items K1(a-c). These comparisons showed that the pattern of gunpowder residue on the swatch of item Q1 is consistent with a shot fired from between three (3) and eighteen (18) inches.
AHR3YD-5301	The area around Hole 1 was microscopically examined and chemically processed for gunshot residues and a pattern of residues was found consistent with discharge of a firearm and passage of a bullet. Using a Sig Sauer model MPX 9mm semiautomatic handgun and Prvi Partizan 9mm 115 grain FMJ ammunition, this pattern of residues was reproduced at a muzzle-to-target distance of between 3 inches and 15 inches.
AKWL6L-5301	The piece of fabric, item Q1, was visually, stereoscopically, and chemically examined for possible bullet defects and gunshot residues. One possible bullet defect was located in the middle of the fabric. The defect in the fabric tested positive for copper and lead residues and was consistent with having been created by the passage of a bullet. There were gunpowder particles stereoscopically observed and chemically detected adjacent to the defect. Based on the presence of the gunpowder particles, the muzzle to target distance for the defect in item Q1 was determined to be intermediate. This is the range at which a firearm and ammunition combination will deposit visible or detectible gunpowder particles on a target.
AQNTNV-5305	Observations and comparisons between shirts allow us to estimate the distance of the muzzle of the firearm from the shirt greater than 6" and less than 12". However an interpretation can be made by knowing elements of the investigation. Therefore, all new data may have an effect on the interpretation of analytical results.
AUN6JV-5301	distance corresponds with a short distance range, less than 15 inch
AXKTXG-5301	The area around the hole in the middle of the evidence fabric (Item 1.1) was microscopically examined and chemically processed for the presence of gunshot residues, and a pattern of residues was found. Using the provided distance standards (Item 1.2), this pattern of residues was reproduced at a distance greater than contact and less than twelve inches.

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TABLE 2

WebCode-Test	Conclusions
AZBU46-5301	The area surrounding the defect in the cutting of the white shirt, Item 1A, was microscopically examined and chemically processed for the presence of gunshot residues. Images of test patterns, Items 1B - 1D, were submitted from a known firearm and analyzed. Using the test images, the pattern was reproduced at a muzzle to target distance between 3 and 12 inches. The following is a summary of testing performed: Microscopic examination for unburnt/partially burnt gunpowder particles: particles consistent with the morphological (shape & size) properties of gunpowder were found. Chemical examination for nitrates that could originate from unburnt/partially burnt gunpowder particles using the Diphenylamine test: positive. Chemical examination for nitrite residues that could originate from gunpowder particles using the Modified Griess test: positive. Microscopic examination for lead residues: residues consistent with lead found. Chemical examination for lead residues using the Sodium Rhodizonate test: positive
B2XX7B-5301	The area around Hole #1 in Item 1 was microscopically examined and chemically processed for the presence of gunshot residues. Residues were found which are consistent with the passage of a bullet and the discharge of a firearm. Using the Sig Sauer model MPX 9mm semiautomatic handgun with Prvi Partizan 9mm 115 grain full metal jacket ammunition, this pattern of residues was reproduced at a muzzle-to-target distance of greater than 3 inches and less than 15 inches.
B8P6NJ-5305	Distance testing of Item Q1 revealed a muzzle to target distance no closer than 3 inches and no further than 9 inches.
BNXU8B-5301	The following submitted evidence was visually and microscopically examined: Exhibit 1: Known distance pattern images from contact to 27 inches. Exhibit 2: Cloth rectangle with one hole. 1. Exhibit 2 was chemically processed and a pattern gunpowder residues from the discharge of a firearm was present. a. The pattern of damage and residues on Exhibit 2 were compared to the Exhibit 1 known distance test patterns from visual, Modified Griess and Sodium Rhodizonate processing. 2. The damage and residues on Exhibit 2 have similar characteristics to those that were produced in the test patterns between approximately 3 and 15 inches.
C4LNVL-5301	The area surrounding the defect in approximately the center of the piece of white T-shirt, Item Q1, was visually examined, microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed a pattern of gunshot residues. Using the provided Distance Standards, Items K1A - K1C, it was determined that a pattern of residues like that displayed on Item Q1 could be produced at a muzzle to target distance between three (3) inches and fifteen (15) inches.
C8J7A2-5301	Within [laboratory] we report range to, contact, close range or longer distance. Cases are not reported to inches from muzzle to target, rather in feet or metres. However for purposes of this trail we conclude that the muzzle of the firearm was greater than 6 inches and less than 18 inches from the shirt (Q1)(the shot occurred at close range to the target [less than 2ft).
CL4N4Q-5301	The area around the hole in the white cloth (Item Q1) was microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was found. Using the submitted evidentiary photos this pattern of residues was reproduced at a distance of between 3 inches and 18 inches.
CTPGFP-5301	The area around the hole on Item 1 was microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was found. Using the distance standards created by firing the Sig Sauer model MPX 9mm Luger caliber semiautomatic pistol and the Prvi Partizan 9mm Luger caliber 115 grain FMJ ammunition this pattern of residues was reproduced at a distance of between 3 inches and 18 inches.

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TABLE 2

WebCode-Test	Conclusions
DNKGAP-5305	The muzzle of the firearm was between 3 inches and 12 inches from the shirt (Item Q1) at the time of discharge. This was based on comparisons of the appearance and distribution of powder particles, sooting, nitrites, and lead patterns between the shirt and the supplied distance standard targets. Evaluation of the patterns included visual examination and chemical enhancement. This conclusion is based on the assumptions that the targets were produced under the same conditions as the shirt target and reproducibility of the supplied test targets was verified.
EKKJKH-5301	The powder pattern on the shirt item (Q1) was compared with the series of test firings and I estimate the shot was fired from a distance of between 6" and 12".
ENML7D-5301	Exhibit Q1 is a portion of a white cloth shirt with a defect located in the approximate center. Exhibit Q1 was microscopically examined and chemically processed (designated Q1-T1) for the presence of gunshot residues. Results of chemical processing indicate the defect observed in Exhibit Q1 is consistent with the passage of a bullet. Additionally, a pattern of residues was detected and visually compared to the known distance standards represented by Exhibits K1a, K1b, and K1c. Based on these comparisons, the pattern of residues present on Exhibit Q1 is consistent with having been produced at a muzzle-to-target distance of greater than three (3) inches and less than fifteen (15) inches.
EPDMC2-5301	The portion of the shirt was examined and found to contain a bullet hole just off the approximate center of the piece. The hole and the areas surrounding it were visually, microscopically and chemically processed for the presence of firearm discharge residues. The gunshot residue pattern around the hole is consistent with tests fired at a muzzle-to-target distance of greater than 3 inches and less than 12 inches.
ER4MRK-5301	The residue pattern from item 1.1.1 (Q1) indicates a muzzle-to-target distance between 3 and 12 inches.
F6K7G7-5301	The area around Hole 1 was microscopically examined and chemically processed for the presence of gunshot residues. Residues were found which are consistent with discharge of a firearm. Using the Sig Sauer model MPX 9mm pistol with Prvi Partizan 9mm 115 grain FMJ ammunition, this pattern of residues was reproduced at a distance of greater than 3 inches and less than 15 inches.
F9KELG-5301	The delivered item Q1 was first searched for penetrations. Figure 1 shows an identified penetration that, due to shape and size, could be induced by a bullet of caliber 9mm. From the penetration area possible traces of GSR were transferred to a secondary trace carrier, which was subsequently treated with chemographical coloring methods. Firstly the Na-Rhodizonate method was applied. Hereby a bullet wipe ring could be identified as it occurs when a bullet penetrates an object like a fabric. Additionally, cloudy and spot-like colored traces could be identified around the entrance hole. Subsequently, the delivered shirt was investigated regarding potential NC particles using a modified Griess Test. Hereby several colored NC particles could be identified. For the estimation of the shooting distance a comparison shot series was performed using the delivered weapon and ammunition. The treatment of the comparison shots was performed using the same procedures as with the delivered T-shirt. The visual comparison of the archived colored pattern with the comparison shots results in an estimation of a shooting distance in the range of 6 to 15 inches. This statement is made under the assumption that no depletion of GSR has taken place (e.g. by other objects present in the line of fire or by the ablation of GSR by blood or in process of the medical supply).

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TABLE 2

WebCode-Test	Conclusions
FAJFUU-5305	Conclusion: The white cloth (Item #2) contains one hole in the center. The hole in the white cloth was examined microscopically and processed chemically for gunpowder, copper and lead (gunshot residues). Gunpowder, vaporous lead, copper bullet wipe and a pattern of nitrite residues were detected. Interpretation of these results requires testing of the questioned firearm and ammunition. When obtained, the firearm and ammunition should be submitted to the Ballistics Unit and a request for comparison to the above case number should be made.
FG2NHQ-5301	The muzzle of the firearms was at a distance greater than 3 inches and less than 18 inches from the victim's Shirt at the time of discharge.
FTE44P-5301	Request: A request was received from ######### on 1 Apr 2019 to conduct Range estimation examinations on Item 1 in accordance with the direction contained within the CTS19-5301 GSR Distance Determination proficiency test. The aim of these examinations was to estimate the muzzle to target distance based on the scenario presented. Examinations: Nil test firings were required as images of the test firings for the raw and chemically enhanced patterns were provided. Item 1 contained 1 x section of fabric with an apparent bullet hole in the centre. Visual examinations of the untreated pattern, noting the pattern shape, pattern density and the degree of dispersion were recorded. The fabric from Item 1 was chemically treated to enhance the visualisation the nitrite pattern using the Modified Greiss test. Visual examinations of the nitrite pattern, noting the pattern shape, pattern density and the degree of dispersion were recorded. The fabric from Item 1 was also chemically treated to enhance the visualisation the vaporous and particulate lead pattern using the Sodium Rhodizonate test. Visual examinations of the lead pattern, noting the pattern shape, pattern density and the degree of dispersion were recorded. The untreated, nitrite and lead patterns were compared to the test firing images provided and a subjective comparison was made. Results: Untreated - Based on visual comparison to the test firings, the questioned fabric exhibits a pattern between 3" and 9". Nitrite - Based on visual comparison to the test firings, the questioned fabric exhibits a pattern between 3" and 9". Lead - Based on visual comparison to the test firings, the questioned fabric exhibits a pattern between 3" and 12". Conclusion: Based on subjective visual and chemical enhancement comparison examinations including the Modified Griess test for Nitrites and the Sodium Rhodizonate test for Lead, it is my opinion that the estimated muzzle to target distance lies between 3" and 9". Note: This opinion assumes that the test firings were conducted in a manner comparable to the alleged case circumstances.
FVY28L-5301	Results of Examinations: The area around the hole in the Item 1 shirt was microscopically examined and chemically processed for the presence of gunshot residues, and a pattern of nitrite and lead residues was found. The pattern of nitrite residues present on the Item 1 shirt was reproduced at a muzzle-to-target range of greater than contact and less than 12 inches when using the submitted Item 2 distance standards. No other residues were detected.
G22BEE-5301	The bullet hole was examined and found to be entrance hole made by a firearm projectile, while the item Q1 shirt was at the distance of between 3 inches to 12 inches from the muzzel of the firearm at the time of firing.
G883PX-5301	The piece of T-shirt of the victim has an entrance hole located in the central half, whose was chemically processed and examined macroscopically and microscopically to identify the possible presence of firing waste, the previous procedures allowed to detect the presence of combustion granules and a deposit of soot (sooting) around the orifice, with characteristics of concentration and magnitude obtained through the applied test, in comparisson with the reference standards allows to conclude that the shooting distance, between the mouth of fire of the gun and the surface of the shirt, is in a range of shooting distance the greater than 3" and 6" and less than 9" and 12".

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TABLE 2

WebCode-Test	Conclusions
GBAWPM-5301	In my opinion the muzzle of the exhibit self-loading pistol was approximately 3 to 15 inches from the deceased at the moment of discharge.
GC6GCM-5305	The muzzle of the firearm was not less than 3 inches or more than 15 inches from the shirt at the time of discharge.
GJLW3B-5301	The Exhibit Q1 white cloth contains a hole in the center. The Q1 cloth was microscopically examined and chemically processed (designated Q1T1) for the presence of gunshot residues. A pattern of gunshot residues was found around a suspect bullet entrance hole located approximately in the center of the white cloth. Comparisons of the Exhibit Q1 pattern of residues to the Exhibit K1A, K1B and K1C photographs indicate that the pattern of residues was produced at a muzzle-to-target distance of greater than three (3) inches and less than fifteen (15) inches.
H798LL-5301	I conducted a visual and modified Griess test comparison of questioned shot item (Q1) with the provided photographs depicting distance standards (K1a - K1c) from contact to 27 inches. In my opinion the shot into Q1 was discharged no closer than 3 inches from the firearms muzzle and at a distance no further than 12 inches.
H86R9K-5301	The pattern of gunshot residues around defect A is consistent with a muzzle to target distance between 3 inches and 15 inches.
H9U6PH-5301	Results of Examinations: The area around the hole in the Item 1 shirt was microscopically examined and chemically processed for the presence of gunshot residues, and a pattern of Nitrite and lead/copper residues was found. The pattern of residues present on the Item 1 shirt was reproduced at a muzzle-to-target range of greater than three and less than fifteen inches when using the submitted distance standards. No other residues were detected.
HFXZTB-5301	The pattern of gunshot residues around defect A is consistent with a muzzle to target distance between 3 inches and 15 inches.
HR8PLL-5305	Based on the comparison of test shots (K1a-c) to the GSR pattern on the shirt (Q1), Q1 is estimated to be a muzzle-to-target distance of approximately greater that contact and less than 15 inches.
HVBBJJ-5301	The area around the hole in the middle chest area of the shirt (Item Q1) was microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was found. Using the provided known test panels (Items K1a, K1b and K1c) this pattern of residues was reproduced at a distance greater than 3 inches and less than 15 inches.
J4XT9C-5301	A series of test patterns, items 1.2-1.4, was examined and compared to the section of cloth, item 1.1. A similar pattern of residues as that seen on the cloth, item 1.1, can be produced at distances of greater than 3 inches but less than 15 inches.
JDNEEA-5305	The area around the suspected bullet hole on Item 4 was microscopically examined and chemically processed and a pattern of residues was found. The pattern on Item 4 was compared to the digitally provided known distance patterns depicted in Items 1, 2, and 3. The pattern of residues displayed on Item 4 most resembles test patterns generated between a minimum distance of 6 inches, and a maximum distance of 18 inches.
JFEFKX-5301	Q1. One (1) manila envelope labeled in part “Item Q1” containing one (1) cotton twill jean (white cloth) (unknown sample) with one (1) defect/hole present, designated as defect “A”. Q1A. Chemical test pattern collected from Item Q1, the white cloth, during laboratory examination. K1a. One (1) manila envelope labeled in part "Item K1a", containing ten (10)

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TABLE 2

WebCode-Test	Conclusions
	standard distance panel photographs (unprocessed) shot at contact, 3 inches, 6 inches, 9 inches, 12 inches, 15 inches, 18 inches, 21 inches, 24 inches, and 27 inches. K1b. One (1) manila envelope labeled in part "Item K1a", containing ten (10) standard distance panel photographs (processed with Modified Griess) shot at contact, 3 inches, 6 inches, 9 inches, 12 inches, 15 inches, 18 inches, 21 inches, 24 inches, and 27 inches. K1c. One (1) manila envelope labeled in part "Item K1b", containing ten (10) standard distance panel photographs (processed with sodium rhodizonate) shot at contact, 3 inches, 6 inches, 9 inches, 12 inches, 15 inches, 18 inches, 21 inches, 24 inches, and 27 inches. Clothing Analysis: Methodology: Physical (Visual Examination), Chemical (Color Test Modified Griess/Sodium Rhodizonate). Analysis of Item Q1: No visible red-brown stains were observed on the Item Q1, the white cloth. One (1) defect was observed on Item Q1, the white cloth, and described as follows: The defect/hole, designated as "A", measured approximately ¼ inch in greatest dimensions and was located approximately 3 ½ inches from the top and 3 ¼ inches from the right side the white cloth. Visual and microscopic examination of defect/hole "A" revealed the presence of apparent bullet wipe, soot, and gunpowder. Chemical testing of defect/hole "A" indicates the presence of *nitrite residues and **lead residues. Note: *Nitrites are present in gunpowder residue. **Lead residue can be present in bullets/bullet cores and ammunition primers. Opinion/Interpretation: Examination of defect "A" indicated that it was visually consistent with the passage of a projectile/bullet based upon the physical properties observed and the chemical tests performed. Distance Determination Analysis: Methodology: Physical (Visual Examination), Chemical (Color Test Modified Griess/Sodium Rhodizonate). The pattern of gunpowder and gunpowder residues observed and documented from Item Q1, the white cloth, and Q1A, the chemical analysis of defect/hole "A", was reproduced at a muzzle to target distance between 3 and 18 inches. Miscellaneous: Item Q1A, the chemical test patterns, was sealed in a manila envelope and will be returned with the evidence to the submitted agency. Item K1a, the photographs, was sealed in a manila envelope and will be returned with the evidence to the submitted agency. Item K1b, the photographs, was sealed in a manila envelope and will be returned with the evidence to the submitted agency. Item K1c, the photographs, was sealed in a manila envelope and will be returned with the evidence to the submitted agency. Evidence in this case will be returned to the investigative agency.
JHJ9CB-5301	Examination of the Item Q1 shirt revealed a hole in the center. The area around this hole was microscopically examined and chemically processed for the presence of gunshot residues, and a pattern of residues was found. The residue pattern found around the hole in the center of the Item Q1 shirt is consistent in pattern size and density with having been produced at an approximate distance between 3 inches and 15 inches. Materials produced as a result of chemically processing Item Q1 are being returned as Item Q1P in Sample Pack GSRP and should be maintained for possible future examinations.
JUWDJ8-5305	The hole located on the received piece of fabric (from the shirt Q1) was produced by the entry of a ballistic projectile fired at a distance above 3 inches and less 12 inches approximately, based in the results from the gunshot residues testing of the received fabric and their comparation with the received distance standards.
KEXMJN-5301	The defect present in the t-shirt (item Q1) is consistent with entrance hole. After comparing the pattern of gunshot residues surrounding this hole (Q1) and the submitted photographs of gunshot residues patterns we can estimate that the shooting distance was greater than 3 inches and less than 12 inches
KJAUH8-5305	Q1 had one hole located in the center. It was processed for gunshot residue to determine the muzzle to target distance. The hole in Q1 was positive for burned gun powder and lead

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TABLE 2

WebCode-Test	Conclusions
	residue. The residue is consistent with the passage of a bullet with the muzzle of the firearm being greater than 6 inches and less than 18 inches from Q1.
KWHAQX-5301	A hole was present in the approximate center of the Q1 shirt. The hole and the area around the hole was visually, microscopically, and chemically processed for the presence of firearm discharge residues. The gunshot residue pattern around the hole is consistent with tests fired at a muzzle -to-target distance greater than 3 inches and less than 12 inches.
L4B622-5301	The area surrounding the defect in the lower third area of the white section of fabric, Item Q1, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed a pattern of gunshot residues which was reproduced using the provided targets, Items K1a - K1c, at a muzzle to target distance between 3 inches and 15 inches. The following is a summary of testing performed: Microscopic examination for unburnt/partially burnt gunpowder particles: particles consistent with the morphological (shape & size) properties of gunpowder were found. Chemical examination for nitrates that could originate from unburnt/partially burnt gunpowder particles using the Diphenlyamine test: positive. Chemical examination for nitrite residues that could originate from gunpowder particles using the Modified Griess test: positive. Microscopic examination for lead residues: residues consistent with lead found. Chemical examination for lead residues using the Sodium Rhodizonate test: positive.
L724HK-5301	Item 001-A was examined and determined to be a piece of twill cloth exhibiting a suspected bullet hole. Item 001-A was examined and chemically processed for the presence of gunshot residues and a pattern of residues was found. The test materials from Item 001-A were retained as Item 001-A-01. Test patterns were created at known muzzle to target distance intervals using the same firearm and ammunition used to generate the defect in Item 001-A. These test patterns were also chemically processed and all three sets were retained as digital images, Items 001-B through 001-D. Items 001-A and 001-A-01 were compared to the known test patterns, Items 001-B through 001-D, and it was determined that the firearm used to generate the defect in Item 001-A was approximately six to eighteen inches from the target.
LPQPY2-5301	The area surrounding the defect in the cutting of white fabric, Item 1A, was microscopically examined and chemically processed for the presence of gunshot residues. Images of test patterns, Items 1B - 1D, were submitted from a known firearm and analyzed. Using the test images, the pattern was duplicated at a muzzle to target distance between 3 and 15 inches. The following is a summary of the testing performed: Microscopic examination for unburnt/partially burnt gunpowder particles: particles consistent with the morphological (shape and size) properties of gunpowder were found. Chemical examination for nitrates that could originate from unburnt/partially burnt gunpowder particles using the Diphenylamine test: positive. Chemical examination for nitrite residues that could originate from gunpowder particles using the Modified Griess test: positive. Microscopic examination for lead residues: residues consistent with lead found. Chemical examination for lead residues using the Sodium Rhodizonate test: positive
LRGNEL-5301	The white shirt section, item Q1, was visually examined. There was a circular defect located near the center of the fabric. The area around the defect was microscopically examined and chemically processed for the presence of gunshot residues, and a pattern of residues was found. The results of this processing were compared to the patterns developed from test-fires conducted with the recovered firearm and ammunition. The defect in this shirt of item Q1 was found to be consistent with a gunshot occurring at a distance greater than six (6) inches and less than twenty-one (21) inches from this item.

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TABLE 2

WebCode-Test	Conclusions
M2ZH79-5301	The shooting distance has been between 6-12 inches.
M8RPNG-5305	a. It is extremely probable that the hole in the T-shirt (Exhibit Q1) is a bullet entrance hole. b. It is highly likely that this bullet was shot at a distance in the range of 3"-15" (muzzle to shirt). This shooting distance estimation is based on the assumption that this target was the first medium hit by the bullet.
MDUXTN-5301	The shirt presents a bullet hole inflected by short distance in a range between 3 and 9 inches.
MNYQK4-5301	The gunshot residue pattern on exhibit 1 was compared to the provided exhibit 2 distance standards. This comparison was performed before and after chemical processing of exhibit 1 for the enhancement of gunshot residues. Based upon this comparison, the gunshot residue pattern on exhibit 1 was produced from a firearm having the muzzle held approximately three to twelve inches away from the shirt.
N6JW8M-5301	The shot fired in the fragment of fabric consistent with a short distance range, between three and twelve inches, from the muzzle of the weapon and the target.
NNVLM7-5301	The area around defect A was visually examined, microscopically examined and chemically processed for the presence of gunshot residues. The pattern of gunshot residues around defect A is consistent with a muzzle to target distance between 3 inches and 15 inches.
NPKWBD-5305	Based on comparison of item Q1 to known distance standards, the distance of the muzzle of the firearm to item Q1 was greater than contact and less than 15 inches.
P6U37A-5301	One apparent bullet hole was observed in the cloth. A dispersion of soot consistent with gunpowder residue was observed scattered around the hole. Two concentric smoke-like gray rings were also observed around the hole as well as a dark gray ring encircling the edges of the hole. A stereomicroscopic exam of the particles around the hole found that the residues around the hole were consistent with gunpowder residue. However, the type of gunpowder was indeterminate. The cloth was chemically processed for nitrites and lead residues using the Modified Griess Test and the sodium rhodizonate test, respectively. A moderately dense cloud-like dispersion of distinct pinpoint-like reactions was observed surrounding the hole as a result of the Modified Griess Test. The sodium rhodizonate test resulted in cloud-like reaction surrounding the hole as well as a ring-like reaction encircling the hole edges. The reactions observed for both chemical tests were positive for the presence of nitrites and for the presence of vaporous lead and lead wipe. The observed reactions were then compared to the reactions provided by the scaled photos in Items 1C and 1D. As a result, an estimated muzzle-to-garment range was developed. The Item 1A cloth was separated from the muzzle of the firearm at the time of discharge by a distance that was greater than 3 inches but less than 18 inches.
PEMBQZ-5301	Examination of Item Q1 revealed a hole (Hole A). Visual/microscopic examination and chemical processing of the area around the hole revealed a pattern of gunshot residues. The test patterns were submitted at contact, 3, 6, 9, 12, 15, 18, 21, 24, and 27 inches. The residue pattern from Item Q1 was consistent in size, appearance and/or density with the patterns obtained between 3 and 12". The evidence will be retained at the laboratory.
PMV3U4-5305	Item 4 was physically examined and chemically processed for the presence of a gunshot residue pattern. The developed pattern from Item 4 is most consistent to the submitted standards in the distance range of greater than 3" and less than 21". This would be considered an intermediate range.

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TABLE 2

WebCode-Test	Conclusions
PNM2AM-5301	Test residue of shooting with positive result - (Gunshot residue POSITIVE). The shot was made at close range, varying from 6 to 12 inches.
Q8ECNA-5301	The defect upon the Item Q1 garment, if created by the Sig Sauer brand semiautomatic pistol, 9mm Luger caliber, model MPX loaded with Prvi Partizan brand 115 grain full metal jacket ammunition, is consistent with having been created at a distance between three (3) inches and twelve (12) inches based upon comparison of the Item Q1 garment to test targets created at known distances.
Q9NG3X-5301	We observe in the trimmed piece of shirt submitted the presence of a bullet hole compatible with the entrance of a bullet hole with a caliber 9 mm.
QEGKV3-5301	The questioned Item Q1 was compared to tests fired with the same firearm and ammunition at 3 inch intervals from contact to 27 inches. The tests were compared to the questioned item visually without chemical enhancement and thereafter visually with the modified Griess Test applied and the Sodium Rhodizonate test applied. The size and density of all the visual firearms discharge residues and those made visible by chemical enhancement were taken into account. The muzzle of the firearm could not have been closer than 3 inched and not further than 12 inches from Item Q1 whenthe shot was discharged.
QK64F6-5301	Examination of the Item Q1 fabric revealed a hole in the center. The area around this hole was microscopically and chemically processed for the presence of gunshot residues, and a pattern of residues was found. Using the provided distance standards, it was determined that this pattern of residues is consistent in size and density with having been produced at an approximate distance between 3 and 18 inches. Materials produced as a result of chemically processing Item Q1 are being returned in Sample Pack GSRP as Item Q1P and should be maintained for possible future examinations.
QPDJPT-5301	1. Examination of Exhibit 2 (shirt) disclosed a perforating defect near the center of the fabric. a. The area around the hole was visually examined and chemically processed. b. Exhibit 2.1 (Modified Griess test standard) was created for comparison purposes and is being returned with Exhibit 2. c. Physical characteristics and a pattern of gunshot residues associated with the discharge of a firearm were located. 2. The pattern of gunshot residues on Exhibit 2 was compared to Exhibit 1 (photographs of known-distance test-patterns). The pattern of gunshot residues on Exhibit 2 was reproduced at a muzzle-to-target distance between approximately 3 inches and 15 inches.
QY7U2A-5301	The area around the hole in Item Q1 (white fabric) was microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was found. Using the provided photographs of the test shots and chemical processing this pattern of residues was reproduced at a distance of between 3 inches and 15 inches.
RG3KUH-5301	The distance range between the muzzle of the firearm and the shirt marked as "Item Q1" was estimated between 3 inches and 9 inches.
TJW329-5301	Results of Examinations: The area around the hole in the Item 1 shirt was microscopically examined and chemically processed for the presence of gunshot residues, and a pattern of nitrite and lead residues was found. The pattern of residues present on the Item 1 was reproduced at a muzzle-to-target range greater than three inches and less than fifteen inches when compared to the submitted distance standards.
TULPFJ-5301	It's been established that the drilling hole found in the piece of cloth analyzed was produced by the passage of the projectile shot by a firearm of single charge, made between the muzzle of the firearm and the affected area, in a distance of approximately 9 to 15 inches, which is

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TABLE 2

WebCode-Test	Conclusions
	consistent with short distance.
TVA3X3-5301	Short distance. Most probably ina rank between 3" and 12"
UGQVHG-5301	The minimum distance between the muzzle of the firearm and the cloth was six (6) inches and the maximum distance of twelve (12) inches.
URAALJ-5301	The range of distance between the muzzle of the firearm to the impact garment is between three (3) inches to twelve (12) inches.
UTL9FR-5301	The area surrounding the defect in the center of the white t-shirt, Item 1A, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed a pattern of gunshot residues which was reproduced using the CTS samples, Items 1B-1D, at a muzzle to target distance between three (3) and twelve (12) inches. The following is a summary of testing performed: Microscopic examination for unburnt/partially burnt gunpowder particles: particles consistent with the morphological (size and shape) properties of gunpowder were found. Chemical examination for nitrates that could originate from unburnt/partially burnt gunpowder particles using the Diphenylamine test: positive. Chemical examination for nitrite residues that could originate from gunpowder particles using the Modified Griess test: positive. Microscopic examination for lead residues: residues consistent with lead found. Chemical examination for lead residues using the Sodium Rhodizonate test: positive
UUFWTV-5305	By comparing the distribution of gunshot residues around the entry hole in the analyzed sample (ITEM Q1), with the patterns generated with the firearm Sig Sauer model MPX 9mm semiautomatic handgun and the Ammunition Prvi Partizan 9mm 115 grain FMJ, used to perform the investigated facts, it is possible to conclude that the firing distance ranges between 8 cm (3 inches) and 30 cm (12 inches).
UZ3G4N-5305	The cloth was visually and chemically examined for gunshot residue patterns. Several powder particles was visible around the damage. The results from the visual and chemical treatment of the item Q1 was compared with test samplings. The result shows that the shooting distance is greater than 3" but less than 12".
VFCXH4-5305	A hole through the shirt exhibited bullet wipe around the hole. Gunshot residue in the form of gunpowder particles, nitrites and vaporous lead were also detected around the hole. Comparison of the unknown pattern to test shots generated at known distances revealed that the distribution of gunshot residue detected on the recovered shirt was consistent with tests in the overall range of 3" to 15". The patterns were most similar to test shots in the 6" to 9" range.
VFFCWP-5301	The area surrounding the defect in the center of the shirt, Item 1A, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed a pattern of gunshot residues which was reproduced using the test images, Items 1B, 1C and 1D, at a muzzle to target distance between 3 inches and 18 inches. The following is a summary of testing performed: Microscopic examination for unburnt/partially burnt gunpowder particles: particles consistent with the morphological (shape & size) properties of gunpowder were found Chemical examination for nitrates that could originate from unburnt/partially burnt gunpowder particles using the Diphenylamine test: positive Chemical examination for nitrite residues that could originate from gunpowder particles using the Modified Griess test: positive Microscopic examination for lead residues: residues consistent with lead found Chemical examination for lead residues using the Sodium Rhodizonate test: positive

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TABLE 2

WebCode-Test	Conclusions
VUYXJ6-5301	Deposits with characteristics of gunshot residue were detected. The hole has characteristics observed in entrance holes caused by the passage of a projectile. The residue pattern indicates a muzzle-to-target distance between three (3) and twelve (12) inches.
W3ZMRT-5301	The powder grain pattern observed on defect A entrance on item 4, Q1, the section of shirt with bullet hole, and the nitrite pattern detected on the griess test for defect A entrance on item 4, Q1, the section of shirt with bullet hole, are consistent in diameter and particle population with the powder grain patterns observed on item 1, K1a, the images of test fire series on white cotton, and with the nitrite patterns detected from item 2, K1b, images of griess test fire series, between the distances of 3 inches and 12 inches.
W8ZXNT-5301	Fouling was observed visually. Powder grains were observed visually. A wipe-off rim was observed visually. A griess test was performed on defect A entrance and a nitrite pattern was detected that indicates an close approximate muzzle to target distance. The fouling and powder grain patterns and the nitrite pattern detected on the griess test for defect A entrance on item 4, the section of white shirt, is consistent in diameter and particle population with the fouling and powder grain patterns and nitrite patterns detected from the test fire targets between the distances of greater than 3 inches and less than 12 inches.
WC8JFW-5305	The area around the hole in Item 4 was microscopically examined and chemically processed for a pattern of residues. Residues like that observed on Item 4 were reproduced in Items 1, 2, and 3 at a minimum distance of 3 inches and a maximum distance of 18 inches.
X4C2ET-5305	The area around the hole in Item 2 (shirt with bullet hole) was visually examined and chemically processed for the presence of gunshot residues. Based on a comparison of the pattern observed on Item 2 against Item 1 (known distance gunshot residue patterns), the pattern observed on Item 2 is consistent with being produced at a distance between three and fifteen inches.
XEW9DH-5301	During the examination of the untreated gunshot residue pattern on Item 001-Q1 I observed a pattern that was most similar to the known pattern produced at a distance of 6 inches. I then processed Item 001-Q1 with Modified Griess for nitrites and Sodium Rhodizonate for lead for comparison to the treated test patterns produced at known distances. I determined that these patterns were also most similar to the known pattern produced at 6 inches. Therefore, assuming there is limited variation between test shots made at the same known distances, Item 001-Q1 was produced at a muzzle to target distance of greater than 3 inches and less than 12 inches.
XJMHNG-5301	The area around the hole near the middle of the piece of fabric in Item #Q1 was microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was found. Using the photographs in Exhibits #K1A through #K1C for comparison this pattern of residues was produced at a distance between approximately 3 inches and 12 inches.
XLCV7Y-5301	Range of fire based on extent of visual powder and GSR. After 12 inches there is no "border" on test card photos, just diffuse GSR fading out. Q1 has margin. Halo concentric ring only appears on 3 inches to 12 inches test cards as per Q1. Propellant density is less on test at 15 inches than on Q1. There is little particulate GSR/ propellant at 3 inch test vs Q1. Therefore range of firing in my opinion from visual is in excess of 3 inches and less than 15 inches. We do not use the Greiss test. With sodium rhodizonate only a bullet wipe and a few specks of Pb based GSR are apparent. Unlike test cards K1C. if I were relying on NaRH I would estimate range of fire based on these cards as 15 inches or more.

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TABLE 2

WebCode-Test	Conclusions
XPQLBU-5301	The area around the hole in Exhibit Q1 was microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was observed (Modified Griess paper retained as Exhibit Q1.T1). The pattern of residues on Q1 was physically compared to the standards and photos provided (Exhibits K1a, K1b and K1c). Based on visual, microscopic and chemical analysis, the distant from the muzzle of the firearm to Exhibit Q1 was greater than contact, but less than 15".
XQL9NX-5305	The firearm was greater than 3 inches and less than 15 inches from the shirt, Item Q1, at the time of discharge.
YKU26P-5301	Defect A entrance (3/8 inch diameter) located 4 inches below the top edge of the section of white fabric and 3 1/2 inches left of the right edge of the section of white fabric. No blast destruction was observed visually. Fouling was observed visually. Powder grains were observed visually and with stereomicroscopy. A wipe-off rim was observed visually. A griess test was performed on defect A entrance and nitrites were detected. The presence of fouling and the powder grain pattern detected on the section of white fabric labeled "shirt with bullet hole, Q1", (item 4), and the nitrite pattern detected on the griess test for defect A entrance on the section of white fabric labeled "shirt with bullet hole, Q1", (item 4), are consistent in diameter and particle population with the fouling and powder grain patterns observed on item 1, the photo set of test fire targets, K1a, and the nitrite patterns detected on item 2, the photo set of test fire targets treated with the griess test, K1b, between the distances of greater than 3 inches and less than 12 inches.
YULKJX-5305	The firearm was greater than 3 inches and less than 15 inches from the shirt, Item Q1, at the time of discharge.
Z8GLA4-5305	The firearm was greater than 3 inches and less than 15 inches from the shirt, Item Q1, at the time of discharge.
ZB6VPW-5301	Examination of the Item Q1 shirt revealed a hole in the center area. The area around this hole was microscopically examined and chemically processed for the presence of gunshot residues, and a pattern of residues was found. The residue pattern found around the hole in the center area of Item Q1 is consistent in pattern size and density with having been produced at an approximate distance between 3 inches and 18 inches from the muzzle of the firearm. Materials produced as a result of chemically processing Item Q1 are being returned as Item Q1P in Container 1 and should be maintained for possible future examinations.
ZCYJ4L-5305	Distance testing of Item Q1 revealed a muzzle to target distance no closer than 3 inches and no further than 9 inches.
ZDEVU4-5305	The distance between the muzzle of the exhibit 9mm Sig Sauer model MPX pistol and the exhibit shirt (item Q1) was greater than 3" and less than 15" at the time it was discharged.
ZGCGGZ-5301	The area around the hole observed in item Q1 was microscopically examined and chemically processed for the presence of gunshot residues (GSR) and a pattern of residues was found. Using the distance standards that were submitted, item Q1 GSR pattern is consistent with being produced at a distance of greater than contact and less than 15 inches.
ZJY2HX-5301	One defect consistent with the passage of a bullet was located on the shirt (item 01-01). Assuming the same firearm and ammunition were used to produce the defect in the shirt and the test standards and chemical reactions on the shirt were similar to those on the test standards, visual and chemical patterns most similar to those surrounding the defect indicate the muzzle of the firearm was greater than 3 inches but less than 18 inches from the shirt at the time of discharge. This range of fire (distance determination) is also based on the general

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TABLE 2

WebCode-Test	Conclusions
	assumptions that no significant quantities of residues were lost in the collection and handling of the shirt and no intervening objects blocked deposition of gunshot residue on the shirt.
ZL244T-5301	Visual examination and chemical processing of the submitted Item Q1 in comparison to submitted standards put the muzzle of the firearm further than 3 inches and less than 12 inches from the t-shirt at the time of discharge
ZP4W6J-5301	Clothing Analysis: Methodology- Visual Examination/Microscopy, Chemical-Color Test (Modified Griess and Sodium Rhodizonate). One (1) apparent defect was observed on Item 1A (Q1), the shirt sample, and described as follows: The defect designated as "A", measured approximately 1/4 inch in greatest dimensions and was located approximately 6 1/4 inches from the bottom and 4 inches from the right edge of the anterior side of the shirt sample. Visual/microscopic examination of defect "A" revealed the presence of apparent bullet wipe, soot and gunpowder. Chemical testing of defect "A" indicates the presence of nitrite and lead residues which are found in gunpowder residue. Opinion/Interpretation: Examination of defect "A" indicated that it was visually consistent with the passage of a projectile/bullet based on the physical characteristics observed and the chemical tests performed. Distance Determination: Opinion Interpretation: The pattern of gunpowder/gunpowder residues observed and documented from Item 1A (Q1), the shirt sample, was compared to the test standards identified to be produced by CTS and determined to be between 3 and 15 inches.

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Additional Comments

TABLE 3

WebCode-Test	Additional Comments
4ECHRQ-5301	It would be helpful if duplicates were provided to determine if distances are reproducing. Also, it would be helpful if sodium rhodizonate test standards were provided prior to HCl processing. In addition, please provide controls for sodium rhodizonate tests.
4GY4HT-5305	It should be noted that as a laboratory we do not use the Griess Test or Sodium Rhodizonate test in the manner outlined in the document and therefore the results of these tests were not used in the above interpretation. The powder and gas dispersion formed the basis of our interpretation.
7FVFTD-5301	The reported range reflects the fact that there is only one (1) test pattern per distance. This laboratory has a practice of shooting (3) shots per distance to evaluate if the firearm is reproducing patterns reliably. Should additional test patterns be made available the reported range may be reevaluated.
7V9RJL-5301	Q1 defect is most consistent with having been made when the muzzle of the firearm was at a distance of 6 inches from the surface of the shirt at the time of firing.
9EU3JQ-5305	With respect to standards would require explicit reference mark points of location (for example, up [arrow]), since only presents a scale (photographic scale). The fabric in this test has no reference mark (eg label) so you can not know what the lower or upper of it. The piece of fabric should be larger, in order to evaluate the complete distribution of gunshot residues. The procedure used in our laboratory is different from that used in the processing of fabrics from test firings. We use an additional step that consists in a lifting with adhesive plastic sheet to remove gunpowder granules on the fabric. Each adhesive plastic is processed by alkaline hydrolysis of nitrate esters (with heating). Finally, a detection is performed with photo paper impregnated with Griess reagent. This procedure was described by the staff of Toolmarks and Materials Laboratory of Division of Identification and Forensic Science Israel National Police Headquarters, in: Glattstein B, Vinokourov, Levin N, Zeichner. Improved method for shooting distance estimation. Part 1. Bullet holes in fabricing items. J Forensic Sci 2000; 45 (4): 801-806.
AKWL6L-5301	Per our protocol, we are no longer reporting ranges for gunshot residue muzzle to target distance determinations. Typically, if a conclusion of intermediate is reached, the drop-off distance for the firearm and ammunition combination will be determined and reported. The drop-off distance is defined as the distance where the firearm and ammunition combination will no longer deposit observable/detectible residues on a specific target material barring the presence of an intervening object. None of the test panel images provided indicate/represent the drop-off distance for the firearm and ammunition combination.
AQNTNV-5305	This test was achieved without Modified Griess chemical treatment (This method is not currently used in our lab for the moment)
AUN6JV-5301	we do not apply the 5% HCl treatment
DNKGAP-5305	I suggest the next distance determination proficiency include a Quantofix Nitrite Sheet set/option. I know this lab is one of several that will be moving away from making the Modified Griess sheets in house.
F9KELG-5301	According to the SOPs that are used in our lab, the coloring process is not directly performed on the fabrics (case shot and comparison shot series). A secondary trace carrier is used which is desensitized photo paper in the case of Sodium Rhodizonate treatment, and adhesive

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TABLE 3

WebCode-Test	Additional Comments
	transparency film for the NC verification (following the method of B. Glattstein et al.). These circumstances may lead to a different distance estimation (as the case shot was treated according to our SOP and not colored directly on the fabric as done with the provided comparison shots). This was taken into consideration by using wider error ranges when estimating the range margins.
FAJFUU-5305	Distance determination (aside from Contact/Near Contact) is determined by the [laboratory] Ballistics Unit, not the Trace Evidence Unit.
FVY28L-5301	Methods: Items submitted for gunshot residue testing are examined visually and microscopically for the presence of suspected bullet holes, physical effects from a firearm discharge such as singeing or tearing of fabric, and embedded particles of gunpowder, lead, and copper. If some or all of these conditions are noted, a series of chemical tests for the presence of nitrites (a component of gunpowder), lead, and copper may be performed. Each of these tests are chemically specific and produce a color reaction when in the presence of the specific chemical. The tests used for nitrite compounds, lead, and copper are the Modified Griess Test, the Sodium Rhodizonate Test, and the Dithiooxamide Test, respectively. If a suspect firearm and ammunition are submitted, test-fired exemplars are created at a variety of muzzle-to-target distances, are visually examined and chemically processed in the same manner as the evidence, and are compared directly with the submitted evidence. When test results at specific distances are distinctly different than the results on the submitted evidence, this is used as the basis for excluding an appropriate range of distances ("could not be reproduced at a distance of four inches or less"). When no suspect firearm and/or ammunition is submitted, results are more general and are based on common maximum distances for the deposition of gunshot residues ("residues like those found on the [Item #] are rarely deposited at a distance of six feet or greater"). If the only reaction produced in testing is a small ring of lead and/or copper around a suspected bullet hole, this is considered consistent with the passage of a bullet, but no distance determination can be made. Limitations: While firearms are known to produce consistent gunshot residue pattern results under controlled conditions, variables including shooting environment, barrel condition and ammunition design can all influence the results of tests conducted on the submitted evidence and test-fired exemplars. Accordingly, gunshot residue test results are primarily used to exclude particular muzzle-to-target ranges and should only be considered valid for the particular combination of firearm and ammunition type used during testing in the Laboratory. The use of the phrase "consistent with" in this report is meant to indicate physical effects that are commonly found in a given shooting environment. No conclusions can be drawn when residues are absent due to the possibility of intervening objects or environmental and handling conditions. When a bullet impacts an intervening object, vaporous lead residue deposits can be produced that are occasionally dispersed onto neighboring items. Distance determinations involving a wound and/or injury are outside the scope of this procedure.
GBAWPM-5301	Various circumstances, including the environmental conditions at the time of discharge as well as subsequent handling of the exhibit shirt after the shooting incident could impact the results.
H798LL-5301	The best match is in the vicinity of around 6 inches.
H9U6PH-5301	Methods: Gunshot Residue: Items submitted for gunshot residue testing are examined visually and microscopically for the presence of suspected bullet holes, physical effects from a firearm discharge such as singeing or tearing of fabric, and embedded particles of gunpowder, lead, and copper. If some or all of these conditions are noted, a series of chemical tests for the presence of nitrites (a component of gunpowder), lead, and copper may be performed. Each of these tests are chemically specific and produce a color reaction when in the presence of the

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TABLE 3

WebCode-Test	Additional Comments
	specific chemical. The tests used for nitrite compounds, lead, and copper are the Modified Griess Test, the Sodium Rhodizonate Test, and the Dithiooxamide Test, respectively. If a suspect firearm and ammunition are submitted, test-fired exemplars are created at a variety of muzzle-to-target distances, are visually examined and chemically processed in the same manner as the evidence, and are compared directly with the submitted evidence. When test results at specific distances are distinctly different than the results on the submitted evidence, this is used as the basis for excluding an appropriate range of distances ("could not be reproduced at a distance of four inches or less"). When no suspect firearm and/or ammunition is submitted, results are more general and are based on common maximum distances for the deposition of gunshot residues ("residues like those found on the [Item #] are rarely deposited at a distance of six feet or greater"). If the only reaction produced in testing is a small ring of lead and/or copper around a suspected bullet hole, this is considered consistent with the passage of a bullet, but no distance determination can be made. Limitations: Gunshot Residue: While firearms are known to produce consistent gunshot residue pattern results under controlled conditions, variables including shooting environment, barrel condition and ammunition design can all influence the results of tests conducted on the submitted evidence and test-fired exemplars. Accordingly, gunshot residue test results are primarily used to exclude particular muzzle-to-target ranges and should only be considered valid for the particular combination of firearm and ammunition type used during testing in the Laboratory. The use of the phrase "consistent with" in this report is meant to indicate physical effects that are commonly found in a given shooting environment. No conclusions can be drawn when residues are absent due to the possibility of intervening objects or environmental and handling conditions. When a bullet impacts an intervening object, vaporous lead residue deposits can be produced that are occasionally dispersed onto neighboring items. Distance determinations involving a wound and/or injury are outside the scope of this procedure.
HR8PLL-5305	Based on the comparison of test shots (K1a-c) to the GSR pattern on the shirt (Q1), Q1 most closely resembles a muzzle to target distance of approximately 6 inches; however, a muzzle to target distance of approximately greater than contact and less than 15 inches would be reported to be conservative.
JUWDJ8-5305	Some observations and recommendations: 1. Our standard operating procedure (SOP) is different from that used in the processing of fabrics from test firings. Our SOP includes an additional step that consists in a lifting with adhesive plastic sheet to remove gunpowder granules on the fabric. Each adhesive plastic is processed by alkaline hydrolysis of nitrate esters (with heating). Finally, detection is performed with photo paper impregnated with Griess reagent. This procedure was described by the staff of Toolmarks and Materials Laboratory of Division of Identification and Forensic Science Israel National Police Headquarters, in: Glattstein B, Vinokourov, Levin N, Zeichner. Improved method for shooting distance estimation. Part 1. Bullet holes in clothing items. J Forensic Sci 2000; 45 (4): 801-806. Recently this methodology has been recommended by Berger, J.; Upton, C.; Springer, E. (2018). Evaluation of Total Nitrite Pattern Visualization as an Improved Method for Gunshot Residue Detection and its Application to Casework Samples. Journal of Forensic Sciences. 10.1111/1556-4029.13802. That situation influences the comparison of our results with the test distance standards of this proficiency test, principally in the Modificated Griess Test. 2. I think it´s INDISPENSABLE to review replicates of test distance standards (unprocessed and their rhodizonate/Griess test results) and not only one of them at each distance, for considerate the variability in the gunshot residues deposition on the fabric or surface. 3. I think the test could include some controlled sources of complexity such as other kind of fabrics, dark fabrics, impermeable fabrics; fabrics with two adjacent orifices, etc., for more realistic

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TABLE 3

WebCode-Test	Additional Comments
	approach.
L4B622-5301	When I received my questioned target, visually, microscopically, and also as indicated with the Griess Test, gunpowder had fallen off the target and deposited in a line across the bottom of the target. The bottom of target was unusable due to a portion of the pattern overlapping with the line of gunpowder deposition. Duplicate tests of each target & test would be great in showing the reproducibility of each target's pattern.
M8RPNG-5305	1. The probability scale used in our laboratory for examinations like this is, (in descending order): A. Extremely probable; B. Highly likely; C. Probable; D. Possible; E. Cannot be Ruled Out. 2. The procedures used by the manufacturers of this test, as well as the conditions of the test firing used here, are different from those applied routinely by our laboratory. As a result, the figures quoted for the minimum and maximum shooting ranges may be wider, and the probability, therefore lower. 3. In estimating the shooting distance on this test, we used mainly the test shot results supplied with the proficiency test.
MNYQK4-5301	IN future test, in order to make the test results more scientific, please include duplicates shots of the distances to allow for assessment of variation.
NPKWBD-5305	CTS should either provide all items (knowns and unknowns) as photographs, or it should provide all items to be processed by the test taker. Although I was using the same formulations for Griess and Sodium Rhodizonate as specified by CTS, I did not have confidence that I was comparing like things.
Q9NG3X-5301	Shooting distance patterns to display Pb was made adapting the method published on the Journal of Forensic Science 2000; 45 (4) ; 801 - 806 and (5) 1000-1008.
TJW329-5301	Methods: Gunshot Residue: Items submitted for gunshot residue testing are examined visually and microscopically for the presence of suspected bullet holes, physical effects from a firearm discharge such as singeing or tearing of fabric, and embedded particles of gunpowder, lead, and copper. If some or all of these conditions are noted, a series of chemical tests for the presence of nitrites (a component of gunpowder), lead, and copper may be performed. Each of these tests are chemically specific and produce a color reaction when in the presence of the specific chemical. The tests used for nitrite compounds, lead, and copper are the Modified Griess Test, the Sodium Rhodizonate Test, and the Dithiooxamide Test, respectively. If a suspect firearm and ammunition are submitted, test-fired exemplars are created at a variety of muzzle-to-target distances, are visually examined and chemically processed in the same manner as the evidence, and are compared directly with the submitted evidence. When test results at specific distances are distinctly different than the results on the submitted evidence, this is used as the basis for excluding an appropriate range of distances ("could not be reproduced at a distance of four inches or less"). When no suspect firearm and/or ammunition is submitted, results are more general and are based on common maximum distances for the deposition of gunshot residues ("residues like those found on the [Item #] are rarely deposited at a distance of six feet or greater"). If the only reaction produced in testing is a small ring of lead and/or copper around a suspected bullet hole, this is considered consistent with the passage of a bullet, but no distance determination can be made. Limitations: Gunshot Residue: While firearms are known to produce consistent gunshot residue pattern results under controlled conditions, variables including shooting environment, barrel condition and ammunition design can all influence the results of tests conducted on the submitted evidence and test-fired exemplars. Accordingly, gunshot residue test results are primarily used to exclude particular muzzle-to-target ranges and should only be considered valid for the particular combination of firearm and ammunition type used during testing in the Laboratory. The use of the phrase "consistent with" in this report is meant to indicate physical effects that

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TABLE 3

WebCode-Test	Additional Comments
	are commonly found in a given shooting environment. No conclusions can be drawn when residues are absent due to the possibility of intervening objects or environmental and handling conditions. When a bullet impacts an intervening object, vaporous lead residue deposits can be produced that are occasionally dispersed onto neighboring items. Distance determinations involving a wound and/or injury are outside the scope of this procedure.
UTL9FR-5301	Per policy of [laboratory], specifically [SOP]: "3. The results will be reported as a range based on obvious differences surrounding the approximate muzzle to target distance reproduced by the test targets." While the untreated, Modified Griess, and sodium rhodizonate-treated measurements strongly recommend a range of six (6) to nine (9) inches, the above quoted internal policy requires me to report one additional increment both high and low.
UZ3G4N-5305	The laboratory standard procedures is not the same as used in the test samplings. Our standard operating procedures for examination of gunshot damages are: Visual examination, IR-detection, Modified Griess test, DTO for cupper and Modified Sodium Sulphite test for lead.
X4C2ET-5305	Nitrite Testing: Our laboratory uses the Griess test (using Marshall's reagent) and a transfer to filter paper. The known distance standards were processed using the Modified Griess Test (alpha-naphthol) transfer onto desensitized photo paper. This results in different color reactions and different surface characteristics when comparing the results. Lead Test: Our laboratory tests a transfer of residues from the item to filter paper. The known distance standards appear to have been tested by direct application of the reagents to the target. This may result in greater detection sensitivity on the known distance standards, with the potential for observation of vaporous lead at greater distances, than testing performed on Item 2. Also, the sodium rhodizonate reaction on the known distance standards was treated with dilute hydrochloric acid, resulting in a different end color to reactions with lead.
ZJY2HX-5301	The bracket was widened by 3" on either end due to comparing evidence to photographs and the potential use of different brands/lot numbers of chemicals the testing company used versus chemicals used by this examiner.

-End of Report-
(Appendix may follow)

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Collaborative Testing Services ~ Forensic Testing Program

Test No. 19-5301: GSR Distance Determination

DATA MUST BE SUBMITTED BY **May 13, 2019, 11:59 p.m.** TO BE INCLUDED IN THE REPORT

Participant Code: U1234A WebCode: 2MYMU2

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

Scenario:
Police are investigating a shooting at a night club. The victim's shirt was cut and removed by paramedics. The portion of the shirt with the bullet hole was recovered and is being submitted for examination. The coroner confirmed that no exit hole was present on the victim. A suspect was apprehended later that day and the police seized a Sig Sauer model MPX 9mm semiautomatic handgun from his possession. The bullet recovered from the victim was identified as having come from the suspect's firearm. Rounds of Prvi Partizan 9mm 115 grain FMJ ammunition (which was consistent with the bullet recovered from the victim) were test fired with the suspect firearm and the distance standards prepared. Investigators are asking you to compare the recovered victim's shirt with the distance standards provided to determine the distance of the muzzle of the firearm from the shirt.

Please note the following:
-The Modified Griess treatment was performed in accordance to the following article:
Dillon, J.H. (1990) The Modified Griess test: A chemically specific chromophoric test for nitrite compounds in gunshot residues. AFTE J. 22(3), 243-□250.
-The Sodium Rhodizonate treatment was performed in accordance to the following article:
Dillon, J.H. (1990) The Sodium Rhodizonate test: A chemically specific chromophoric test for lead in gunshot residues. AFTE J. 22(3) 251-□256.

Items Submitted (Sample Pack GSRP - Photographs):
Item K1a-c: Distance Standards at 3 inch increments from Contact to 27 inches provided as images of GSR patterns on untreated white cotton cloths, and Modified Griess Test and Sodium Rhodizonate chemical treatments.
Item Q1: Shirt with bullet hole.

1.) What is the distance range that the muzzle of the firearm could have been from the shirt (Q1) at the time of discharge? Please report a numeral response (e.g. 6) from the supplied Distance Standards. If reporting Contact, indicate with the numeral 0.

Greater than _____ (inches) and Less than _____ (inches)

Please note: *Any additional formatting applied in the free form spaces 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.*

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

3.) Additional Comments

RELEASE OF DATA TO ACCREDITATION BODIES

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

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

○ This participant's data is intended for submission to ASCLD/LAB, ANAB, and/or A2LA. (Accreditation Release section below must be completed.)
○ This participant's data is **not** intended for submission to ASCLD/LAB, 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.
(Include ASCLD/LAB Certificate here)

A2LA Certificate No.

Step 2: Complete the Laboratory Identifying Information in its entirety

Authorized Contact Person and Title

Laboratory Name

Location (City/State)