GSR-Distance Determination
Test No.17-5301/5 Summary Report

This test was sent to 204 participants. Each sample set contained one of the following: An evidence piece of clothing (Q1) for chemical processing for a GSR pattern and either photographs (17-5301) or online downloadable images (17-5305) of GSR patterns produced by test shots at known distances 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 clothing sample and report the range of distances, along with their conclusions and comments. Data were returned from 167 participants (82% response rate) and are compiled into the following tables:

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 processed 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 Smith & Wesson Model M&P 9mm semiautomatic handgun with a 4.25" barrel and the ammunition was Remington Model L9MM3BP 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 scanned. Each known pattern was then processed using the Modified Griess procedure. Immediately following processing, the film paper was scanned. Finally, the known patterns were processed with Sodium Rhodizonate reagents, and the fabric scanned 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 14 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.

Summary Comments

This test was designed to allow participants to assess their proficiency in muzzle to target distance determination using gunshot residue patterns. Each participant received an evidence piece of clothing (Q1) for chemical processing in addition to photographs of GSR patterns at known distances on untreated test fabric (K1a) and treated test fabric after chemical processing 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) was placed 14 inches away from the muzzle of the firearm. (Refer to the Manufacturer's Information for preparation details.)

In Table 1, 157 of the 167 responding participants (94%) reported a greater than distance between 3 and 15 inches. 166 of the 167 responding participants (99%) reported a less than distance between 15 and 27 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.

In previous years, the consensus was considered to be the greater than/less than distances reported by more than 10% of participants. For this test, CTS analyzed the greater than/less than distances as they related to the known shot distance, along with the range between participant's responses.

For greater than/less than distances, a +/-2" allowance from the known shot distance (14") was used as the baseline. Any reported "greater than" values which were larger than 16" and reported "less than" values which were smaller than 12" were highlighted as inconsistent. CTS then analyzed the ranges of the reported values and determined the most common reported range, the mode, was 12". A 3" allowance was provided to the modal value to account for the distance between the known distance standard images. Any reported range larger than 15" was highlighted as inconsistent.

CTS believes that this analysis of the greater than/less than reported values better aligns with expected results within this discipline, especially when combined with the analysis of the ranges reported.

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.

[Summary Comments revised on 1/2/18 in paragraph 4 regarding "greater than/less than" values.]

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
2A4VZQ-5305	12	24	*12*	4RTXN6-5301	9	21	*12*	7PEEBD-5301	12	21	*9*
2BEXMP-5301	6	21	*15*	4UYHC6-5301	6	18	*12*	7XWJQR-5301	12	18	*6*
2C7VWG-5301	9	21	*12*	6A77VJ-5301	12	21	*9*	82QRGK-5305	12	24	*12*
2KJW8J-5305	12	27	*15*	6NDPZ6-5301	9	21	*12*	84F7Y3-5301	6	18	*12*
2LF3WQ-5301	12	24	*12*	6TGXXK-5301	9	15	*6*	8N6KFD-5301	9	21	*12*
3328HP-5301	12	27	*15*	6UKDGD-5301	9	24	*15*	8V62QJ-5301	9	18	*9*
3FLQCE-5301	12	24	*12*	6V76HH-5301	15	27	*12*	9EP8RE-5301	12	27	*15*
3KGC9N-5301	9	21	*12*	6VQY6D-5301	9	21	*12*	9HTY3Z-5301	12	24	*12*
3Q7WAH-5301	9	27	*18*	72XMHE-5301	9	18	*9*	9KXV6F-5301	12	21	*9*
3TTMBM-5301	9	21	*12*	739LFA-5301	9	21	*12*	9QPT3J-5305	9	21	*12*
42M79V-5301	12	27	*15*	74JDJJ-5305	9	24	*15*	A7RWWA-5301	21	27	*6*
48PB6L-5301	9	24	*15*	7DRZHC-5305	9	18	*9*	A9LJVR-5301	12	21	*9*
4B98QQ-5301	12	24	*12*	7HHDFT-5301	9	21	*12*	ABPEEV-5301	9	21	*12*

TABLE 1 (Distance in Inches)

WebCode-Test	Greater Than	Less Than	Calc. Range
ARCRTM-5301	9	18	9
AWABVL-5301	21	27	6
B7T6L9-5301	12	18	6
BJFCJ9-5301	6	24	18
BKTTRG-5301	9	21	12
BW6EZF-5301	9	18	9
C8KMYT-5301	12	24	12
CHYLMA-5301	12	18	6
CJCEJX-5301	9	21	12
CNRL8W-5301	12	21	9
CTXF2T-5301	12	18	6
CUUZM7-5301	21	24	3
CVQ6QF-5301	3	18	15
CZHGJQ-5301	15	21	6
CZXWEJ-5301	9	21	12
D4G9TF-5301	12	18	6
DHYYU3-5301	12	21	9
DKV8TK-5301	9	21	12
DLXDDL-5301	9	24	15
DPWQXQ-5301	6	18	12
E2YLN7-5301	6	9	3
E3FL6A-5301	12	21	9
EAX7WT-5301	12	24	12
EJNPDM-5301	15	18	3
EPTE99-5301	12	21	9
EZEQAD-5301	9	24	15
F3UMAN-5301	12	21	9
F3W6DE-5301	6	18	12
F979KF-5301	12	18	6
FYERVC-5301	12	24	12
FYRNR4-5301	12	21	9
FZTAUB-5301	12	24	12
G4MVUC-5301	15	24	9
GB3EEC-5301	12	24	12
GDRP66-5301	12	27	15
GFGVP2-5301	21	24	3
GKAZH7-5301	12	21	9
GRAE48-5301	12	24	12
GTKCGN-5301	15	21	6
GUHMFC-5301	12	27	15
HP3FRD-5301	12	18	6
HQCGDC-5301	15	21	6
HRARBZ-5301	9	21	12
HUVGTR-5301	9	24	15
HYPBQT-5301	12	21	9

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
HZE2DJ-5301	12	21	*9*	M3UTT6-5305	12	18	*6*	Q48T28-5301	12	21	*9*
J6TWTF-5301	12	24	*12*	MFFC3Z-5301	9	18	*9*	QEUVJ3-5301	12	24	*12*
JDJKNJ-5301	9	24	*15*	MH9Y44-5301	15	27	*12*	QHCUYH-5301	9	21	*12*
JHVA78-5301	15	21	*6*	MJXCK2-5301	12	21	*9*	QTATN4-5301	18	27	*9*
JWYUPJ-5301	15	27	*12*	MQ29CD-5301	12	18	*6*	R22N7Y-5301	12	18	*6*
JZX3XZ-5301	12	27	*15*	N6GRLT-5301	12	21	*9*	RDCZG8-5301	12	21	*9*
K27EDG-5301	21	27	*6*	NA77BZ-5301	12	24	*12*	RE9GVP-5301	18	27	*9*
KLB6L4-5301	9	21	*12*	NFEULG-5301	15	21	*6*	RLRKZ8-5305	6	24	*18*
KNYR3X-5301	6	21	*15*	P726EV-5301	6	15	*9*	RTRYRZ-5305	9	21	*12*
KWF3FY-5301	12	18	*6*	P9QBYR-5301	21	27	*6*	RWL6XP-5301	21	24	*3*
L7AZG4-5301	9	18	*9*	PC8WQE-5301	9	21	*12*	T6FPJH-5301	3	27	*24*
LPCKGD-5301	9	21	*12*	PCBEU6-5301	9	18	*9*	TFY2XF-5301	6	21	*15*
LQ6EDH-5301	12	21	*9*	PPVTX4-5301	9	21	*12*	TJDJBQ-5301	12	21	*9*
LUJ77V-5301	9	24	*15*	PTYGM2-5301	15	21	*6*	TW64X9-5301	12	21	*9*
LWNNJ7-5305	12	27	*15*	PY49Z7-5301	18	24	*6*	TXJNNX-5301	12	21	*9*

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*
U78YBX-5301	9	18	*9*	WZ8FYP-5301	6	15	*9*	YBQMYQ-5301	9	27	*18*
UCG2GZ-5301	12	21	*9*	WZCTN8-5301	12	24	*12*	YDTPHZ-5301	9	21	*12*
UCWKZC-5301	9	21	*12*	WZCTQT-5301	9	15	*6*	YFHRRV-5301	9	24	*15*
UK7T37-5301	9	21	*12*	WZFBTX-5301	6	18	*12*	YHML8R-5301	15	24	*9*
UWJAA4-5301	12	18	*6*	WZREX9-5301	12	24	*12*	YUYRHU-5301	12	27	*15*
UZZF9Y-5301	9	21	*12*	WZT3JT-5301	6	18	*12*	ZD7EJR-5301	12	24	*12*
V8GDCC-5301	9	18	*9*	X2ZTYM-5305	13	17	*4*	ZWLLYV-5301	12	24	*12*
V9T8UX-5301	12	18	*6*	X94TF6-5301	15	24	*9*	ZXA7GK-5305	15	21	*6*
VDZKRW-5301	9	15	*6*	XF2HW9-5301	9	18	*9*				
VK4NGU-5301	12	18	*6*	XMGYR4-5301	12	21	*9*				
VRLVFM-5301	9	24	*15*	XP92EJ-5301	15	18	*3*				
WAF7K2-5301	12	24	*12*	XYEZ7T-5305	15	21	*6*				
WDYZL9-5301	15	21	*6*	Y8K7J9-5301	12	21	*9*				
WFLNYT-5301	15	18	*3*	Y9J8LT-5305	12	24	*12*				
WJ4YYJ-5301	12	24	*12*	Y9XXA4-5301	9	21	*12*				

Response Summary					Participants: 167
Greater Than Distance	Participants Reporting	Less Than Distance	Participants Reporting	CTS Calculated Range	Participants Reporting
Contact / 0	0 (0.00%)	Contact / 0	0 (0.00%)	3	7 (4.19%)
3	2 (1.20%)	3	0 (0.00%)	6	31 (18.56%)
6	14 (8.38%)	6	0 (0.00%)	9	42 (25.15%)
9	53 (31.74%)	9	1 (0.60%)	12	58 (34.73%)
12	69 (41.32%)	12	0 (0.00%)	15	23 (13.77%)
15	18 (10.78%)	15	5 (2.99%)	18	4 (2.40%)
18	3 (1.80%)	18	35 (20.96%)	21	0 (0.00%)
21	7 (4.19%)	21	63 (37.72%)	24	1 (0.60%)
24	0 (0.00%)	24	41 (24.55%)	Other	1 (0.60%)
27	0 (0.00%)	27	21 (12.57%)		
Other	1 (0.60%)	Other	1 (0.60%)		
No Response	0 (0.00%)	No Response	0 (0.00%)		

Conclusions

TABLE 2

WebCode-Test	Conclusions
2A4VZQ-5305	The hole in the shirt is consistent with the passage of a bullet with the a muzzle to target distance between 12 and 24 inches.
2BEXMP-5301	The area around the hole in the piece of fabric of Item 1-2 was microscopically examined and chemically processed for the presence of gunshot residues (lead, copper, nitrites, particulate matter). A pattern of residues (vaporous lead, copper, nitrites and particulate matter) were found. Using the identified weapon with ammunition similar to the questioned cartridges, this pattern of residue was reproduced at a distance from the weapon to the target of between 6 and 21 inches.
2C7VWG-5301	1. Visual and chemical testing of the Exhibit 2 cloth square revealed gunpowder residues. The pattern of residues revealed on Exhibit 2 was compared to Exhibit 1, which consists of photographs of gunpowder residue patterns at distances reported to be between contact and 27 inches and to be created using the same gun and the same type of ammunition. a. The Exhibit 2 cloth displays a pattern that corresponds to the Exhibit 1 photos created from reported distances of greater than 9 inches and less than 21 inches.
2KJW8J-5305	The area around the hole in the shirt Q1 was microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was found. This was compared to patterns produced on fabric from test firings at different distances using the suspect firearm and ammunition consistent with the bullet recovered from the victim. Patterns similar to the pattern on Q1 were produced at distances greater than 12 inches and up to 27 inches.
2LF3WQ-5301	The area around the hole in the center 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 submitted evidence Items K1a - K1c, this pattern of residues on Item Q1 was consistent a muzzle to garment distance of between 12 inches and 24 inches.
3328HP-5301	The area around the hole in the center of 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 provided photographs of test fires this pattern of residues was reproduced at a distance of between 12 inches and 27 inches.
3FLQCE-5301	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 (Item K1a and Item K1b). The result shows that the shooting distance is over 12" but bellow 24".
3KGC9N-5301	Item 1.1 is a white colored piece of fabric with an apparent bullet hole. The area around the hole 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 of greater than nine inches and less than twenty-one inches. Item 1.2 consists of three envelopes containing distance standards.
3Q7WAH-5301	The area surrounding the defect in the middle of the white t-shirt, Item 1A (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 CTS samples, Items 1B-1D (K1a-c), at a muzzle to target distance between 9 inches and 27 inches.

TABLE 2

WebCode-Test	Conclusions
	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
3TTMBM-5301	The defect upon Item Q1, if created by the Smith & Wesson brand semiautomatic pistol, model M&P, 9mm, caliber 9mm luger, loaded with Remington model L9MM3BP 9mm 115 grain full metal jacket ammunition, is consistent with having been created at a distance between (9) inches and twenty-one (21) inches based upon comparison of Item Q1 to test targets created at known distances.
42M79V-5301	The defect in the middle of the white shirt material, item Q1, was consistent with the passage of a bullet. The presence of gunpowder particles surrounding the defect indicated that the muzzle-to-target distance was approximately twelve to twenty-seven inches. The area surrounding the defect was visually and chemically examined for the presence of gunshot residues. The defect was positive for copper and lead.
48PB6L-5301	The area around the hole in the R-1 shirt (Item Q1) was microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was found. The T-1, T-2 and T-3 distance standards (Items K1a-c) were compared and patterns similar to that observed on the R-1 shirt (Item Q1) were produced at distances of greater than nine (9) inches and less than twenty-four (24) inches.
4B98QQ-5301	Item (Q1) One (1) white colored cloth square approx. 8 1/2" x 8 1/2" with bullet swipe, soot, and powder particles submitted. A distance determination was requested. A distance determination conducted with the following results: Based on information by Collaborative Testing Services of a known firearm and ammunition it was determined that the minimum distance is 12" and the maximum distance is 24".
4RTXN6-5301	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 9 and less than twenty-one inches when compared to the submitted distance standards.
4UYHC6-5301	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 six and less than eighteen inches when using the submitted Item 2 distance standards. No other residues were detected.
6A77VJ-5301	Distance testing of Item Q1 revealed a muzzle to target distance no closer than 12 inches and no further than 21 inches.
6NDPZ6-5301	Item 1-1-1 (Q1) was examined visually and microscopically and processed chemically for the presence of bullet defects and gunshot residue. One bullet entry defect, Hole A, was observed in item 1-1-1. Gunshot residue in the form of bullet wipe, gunpowder particles, nitrite residue,

TABLE 2

WebCode-Test	Conclusions
	lead wipe, and vaporous lead residue were observed surrounding Hole A. Items 1-2-1, 1-3-1, and 1-4-1 (K1a, K1b, and K1c) are photographs of untreated and chemically processed test targets produced at muzzle to target distances of contact, 3 inches, 6 inches, 9 inches, 12 inches, 15 inches, 18 inches, 21 inches, 24 inches, and 27 inches. Based on data obtained by examination of the items 1-1-1, 1-2-1, 1-3-1, and 1-4-1, the muzzle of the gun was at a distance greater than 9 inches but less than 21 inches from item 1-1-1 at the time the shot that created Hole A was fired, provided that no interposed object was between the muzzle of the gun and item 1-1-1 at the time the shot was fired.
6TGXXK-5301	In the piece of shirt received (Item Q1) there is evidence of a bullet entry hole. The area around the hole in the t-shirt (Item Q1) was visually and chemically examined for the presence of gunshot residues and a pattern of gunshot residues was found. Based on the pattern of gunshot residue observed around the hole in the item Q1 and comparing it to the Known test fired distances (unprocessed, Ka1 y (Modified Griess Test, Kb1), it was determined to that the muzzle of the firearm was between 9 and 15 inches from the target at the time of discharge.
6UKDGD-5301	A hole consistent with the passage of a bullet was observed on the 01-AA (Q1) section of cloth. The hole in the 01-AA section of cloth was microscopically examined and chemically processed for the presence of gunshot residues. A pattern was developed and compared to the distance standards. The pattern of gunshot residues observed on the 01-AA section of cloth is consistent with having been deposited by the suspect firearm at a distance of greater than 9 inches and less than 24 inches.
6V76HH-5301	The size and density of the questioned propellant pattern was compared to patterns produced with the seized handgun and ammunition at various ranges. The questioned pattern was subsequently subjected to the Modified Griess treatment and a Sodium Rhodizonate treatment and compared again to treated test patterns. The estimated range of fire was between 15 and 27 inches.
6VQY6D-5301	1. Examination of Exhibit 2 (shirt) disclosed a perforating defect near the center of the fabric. The area around the hole was visually examined and chemically processed. 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 9 inches and 21 inches.
72XMHE-5301	The area surrounding the defect in the white cloth, Item 1A, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed a pattern 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 9 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

TABLE 2

WebCode-Test	Conclusions
739LFA-5301	The area around the hole in the cut piece of white t-shirt, Laboratory Item 001.D (Q1) was microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was detected. Using the Smith & Wesson model M&P 9mm evidence handgun and Remington L9MM3BP 9mm evidence ammunition, this pattern of residues was reproduced at a distance of greater than 9 inches but less than 21 inches.
74JDJJ-5305	Comparison of the questioned item (Q1) with the results of shots fired from known distances indicates that the shot for Q1 was fired from a distance between 9 and 24 inches.
7DRZHC-5305	The area around defect number one in Item Q1 bears gunshot residue and is consistent with a muzzle to target distance between 9 and 18 inches.
7HHDFT-5301	The pattern of gunshot residues around defect A is consistent with a muzzle to target distance in-between 9" and 21".
7PEEBD-5301	Exhibit Q-1 (victim's shirt) was examined and a patterned deposit of gunshot residues was found around a bullet entrance hole. Exhibit K-1 (firearm) was found to produce similar deposits of gunshot residues when fired at a target from a minimum distance of 12 inches out to a maximum distance of 21 inches.
7XWJQR-5301	Shooting distance from the muzzle to impact surface has been from 12" to 18".
82QRGK-5305	The area around the hole in the center of Item 2 (said to be a piece of shirt) was visually examined and chemically processed for the presence of gunshot residues. Based on a comparison against the images of Item 1 (distance standards), the pattern of residues was reproduced at a distance of between 12 to 24 inches.
84F7Y3-5301	Item 002-001-001 was examined for the presence of bullet defects and gunshot residue using visual, microscopic, and chemical techniques. A defect, Hole A, was observed to the center of item 002-001-001. Gunpowder, bullet wipe, nitrite residue, lead wipe, and vaporous lead residue was observed surrounding Hole A. Using the submitted photographs of gunshot residue patterns created by the evidence firearm and evidence ammunition, a range of fire was determined. The muzzle of the firearm was at some distance greater than six inches but less than eighteen inches from item 002-001-001 when the shot that created Hole A was fired, provided there was no interposed target.
8N6KFD-5301	1) Exhibit 2 (Cloth) was visually, microscopically, and chemically 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 1 (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 2. a) The pattern of gunpowder residues that was found on Exhibit 2 was reproduced at a muzzle-to-target distance between approximately 9 inches and 21 inches. 3) Exhibit 2.1 (Modified Griess Test Paper and Sodium Rhodizonate Controls) was created during chemical examination of Exhibit 2 and is being returned with Exhibit 2.
8V62QJ-5301	Item Q1 is an approximately 9 ½" x 9 ¾" square of white cloth that has a centrally located defect. The cloth was visually and stereoscopically examined with apparent gunpowder particles and smoke residue being located in the vicinity of the defect. A mapping of the pattern of apparent gunpowder particles was made using a sheet of clear acetate. Item Q1 was chemically processed for the presence of nitrites and lead residues. The patterns of

TABLE 2

WebCode-Test	Conclusions
	residues developed on Item Q1 were compared to the Item K1a, K1b and K1c known standards provided. Based on the evaluation of the Item Q1 test results, it was determined that the muzzle of the firearm was further than 9 inches and closer than 18 inches when discharged. The mapping transparency and a CD/DVD containing all images of the examination and chemical testing processes will be packaged separately as one unit and returned as Item Q1.1.
9EP8RE-5301	The area around the hole in item 4 (Q1) was microscopically examined and chemically treated for the presence of gunshot residues and a pattern of residue was found. This pattern was created at a distance greater than 12 inches and less than 27 inches.
9HTY3Z-5301	A hole consistent with a bullet hole was observed in the piece of T shirt (Exhibit Q1) which has a pattern of particles consistent with smokeless gunpowder suitable for a distance determination. This piece of T shirt (Exhibit Q1) was photographed prior to chemical testing. The piece of T shirt (Exhibit Q1) was chemically processed and tested positive for the presence of Nitrite and for vaporous Lead patterns. The gunshot residue pattern observed adjacent to the bullet hole in the piece of T shirt (Exhibit Q1) was visually compared to the reference gunshot residue test patterns (Exhibits K1a - c). The powder pattern on the piece of T shirt (Exhibit Q1) was determined to have been fired at a muzzle to target distance greater than 12 inches but less than 24 inches, and is most consistent with the test patterns fired at 15 to 18 inches.
9KXV6F-5301	Examination of Item Q1 revealed damage to the following area: small hole located in the middle of the white shirt. Chemical and microscopic examination of the area immediately adjacent to the damaged area of Item Q1 revealed residue characteristic of a firearm discharge and a firearm projectile entrance hole. Distance testing of Item Q1 revealed a muzzle to target distance no closer than 12" and no further than 21".
9QPT3J-5305	Item Q1 was examined and found to be a piece of cloth containing a defect that is centrally located with particles surrounding it. Item Q1 was processed for the presence of nitrites (a by-product from the combustion of propellant) using the Modified Griess test and for the presence of lead using Sodium Rhodizonate. Both processes revealed positive reactions. After visual inspection and chemical processing of Item Q1 the results were compared to Item K1a-c (known distance standards). It was determined that the muzzle of the firearm was between 9" and 21" from the target at the time of discharge.
A7RWWA-5301	Microscopic and chemical examinations were conducted on submitted Item Q1 (one cut cotton t-shirt with a suspected bullet hole). Observation and examination of Item Q1 revealed what is consistent with a gunshot residue pattern around the entrance of a suspected bullet hole. The modified Griess test for the presence of nitrites and the sodium rhodizonate test for the presence of lead were performed, including control samples prior to testing. Each of the chemical examinations produced positive results. The provided distance standards photographs (K1a-c) from the suspected recovered firearm, in comparison to the suspected bullet hole and gunshot residue pattern on Q1 determined that the distance from muzzle to target is approximately between 21" minimum to 27" maximum.
A9LJVR-5301	It is been stablished 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 approximately twelve (12) to twenty-one (21) inches, which is consistent with a short distance shoot.

TABLE 2

WebCode-Test	Conclusions
ABPEEV-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 and passage of a bullet. Using the Smith & Wesson Model M&P 9mm pistol with Remington L9MM3BP 9mm 115 grain FMJ ammunition, this pattern of residues was reproduced at a distance of greater than 9 inches and less than 21 inches.
ARCRTM-5301	Item #2 (Q1: shirt with apparent bullet defect) was microscopically examined and chemically processed for the presence of gunshot residue on 10/05/2017. A pattern of residues consistent with the discharge of a firearm and passage of a projectile was located near the center of the shirt. Referencing the distance standards K1a, K1b, and K1c, the muzzle-to-target distance was determined to be between approximately 9 inches and 18 inches.
AWABVL-5301	Based on information and a cloth sample (9 x 9 3/4") supplied by Collaborative Testing Services of a known firearm and ammunition, it was determined that the minimum distance is 21" and the maximum distance is 27".
B7T6L9-5301	The cut-out of portion of the white shirt (item Q1) bears one hole. The area around the hole was stereoscopically examined and chemically treated for the presence of gunshot residues. Gunshot residues and partially burned gunpowder particles were detected in an area surrounding the hole which is consistent with an entrance hole of single bullet. The pattern of gunshot residues (untreated and chemically treated) on the cut-out of the shirt was compared to the provided test target photographs (Items K1 a-c) and was determined to be consistent with a muzzle to target distance of between twelve to eighteen inches.
BJFCJ9-5301	The area surrounding the defect in the middle of the section of 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 in the test targets, Items 1B, 1C and 1D, at a muzzle to target distance between 6 and 24 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
BKTTRG-5301	Photographs were supplied of test patterns fired at three inch intervals from contact to twenty-seven inches inclusive. An examination of the test patterns indicates that the gunshot residues on the questioned garment, Q1, were produced at a distance greater than nine inches but less than twenty-one inches.
BW6EZF-5301	Deposits characteristic of the discharge of a firearm were detected around the hole on Q1 (white cloth). A pattern of nitrites was observed. The residue pattern indicates a muzzle to target distance between nine inches and eighteen inches.
C8KMYT-5301	Item 001-A was examined and determined to be a piece of twill cloth exhibiting a suspected bullet hole. Item 001-A was microscopically 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 Items 001-A-01 and 001-A-02. Test patterns were created at known muzzle to target distance intervals using the same firearm and ammunition used to generate

TABLE 2

WebCode-Test	Conclusions
	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, 001-A-01, and 001-A-02 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 twelve to twenty-four inches from the target. The above listed evidence is being retained in the proficiency test files at the laboratory. Findings concurred with by [Name].
CHYLMA-5301	Visual examination and chemical processing of the submitted Item Q1 in comparison to submitted standards put the muzzle of the firearm between 12 inches and 18 inches from the t-shirt at the time of discharge.
CJCEJX-5301	The distance of firing between the muzzle of the firearm and the shirt marked "Item Q1" was estimated to be between 9 inches to 21 inches.
CNRL8W-5301	The area around the hole in the cloth piece in Item Q1 was microscopically examined and chemically processed for the presence of gunshot residues and a pattern was found. Using the photographs in Exhibits #K1A through #K1C for comparison, this pattern of residues was reproduced at a distance of between 12 inches and 21 inches.
CTXF2T-5301	We observe in the trimmed piece of shirt submitted the presence of a bullet hole compatible with the entrance of a bullet with a caliber of 9 mm.
CUUZM7-5301	The area around the hole interrogated in the jacket, item Q1, was examined microscopically and chemically processed for the presence of shot residues. Visible residues that are indicative of the passage of a bullet found the hole during a microscopic examination prior to chemical processing. The patterns of nitrite and lead residues were detected chemically in the Q1 item compared to the test targets. Based on the presence, general pattern and residue density observed between item Q1 and photographs provided from test standards, the bullet hole questioned in item Q1 appears to have been created by a shot fired at a distance of approximately Twenty-one (21) inches to twenty-four (24) inches of the shirt. This is a conservative estimate based on an evaluation of the untreated and chemically processed waste patterns and assumes there were no intermediate objects between the gun barrel and the shirt at the time the shots were created.
CVQ6QF-5301	The area around the hole of Item 1-2 was microscopically examined and chemically processed for the presence of gunshot residues (lead, copper, nitrites, particulate matter). A pattern of residues, vaporous lead, copper and nitrites were found. Using the identified weapon with ammunition similar to the questioned cartridges, this pattern of residue was reproduced at a distance from the weapon to the target of between three inches and eighteen inches.
CZHGJQ-5301	The piece of cloth received for the physicochemical study was struck by a projectile of a firearm at a short distance between a range of approximately fifteen (15) to twenty-one (21) inches.
CZXWEJ-5301	A series of test patterns was examined and compared to the section of shirt, item 1.1. A similar pattern of residues as that seen on the shirt, item 1.1, can be produced at distances of greater than 9 inches but less than 21 inches.
D4G9TF-5301	Muzzle to target distance is approximately twelve (12) to eighteen (18) inches.
DHYYU3-5301	The portion of the shirt was examined and found to contain a bullet hole at 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

TABLE 2

WebCode-Test	Conclusions
	pattern around the hole is consistent with tests fired at a muzzle-to-target distance of greater than 12 inches and less than 21 inches.
DKV8TK-5301	Item 1-1: This item consisted of test firings at contact, 3", 6", 9", 12", 15", 18", 21", 24" and 27" distances. The area around the holes in the test firings were microscopically examined and chemically processed for the presence of gunshot residues (lead, nitrites, and particulate matter) and compared to the hole in Item 1-2. Item 1-2: The area around the hole in this item was microscopically examined and chemically processed for the presence of gunshot residues (lead, copper, nitrites, and particulate matter). A pattern of residues (vaporous lead, copper, nitrites, and particulate matter were found. Using the identified weapon with ammunition similar to the questioned cartridges, this pattern of residue was reproduced at a distance from the weapon to the target of between 9 and 21 inches.
DLXDDL-5301	Examination of the Item Q1 piece of fabric revealed the presence of a hole approximately in the middle of the item. 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 nine (9) inches, and approximately twenty four (24) inches from muzzle to target.
DPWQXQ-5301	The area around Hole 1 was microscopically examined and chemically processed for the presence of gunshot residues, and a pattern of residues was found. Using a Smith & Wesson model M&P 9mm semiautomatic pistol with Remington model L9MM3BP 9mm 115 grain FMJ ammunition, this pattern of residues was reproduced at a muzzle-to-target distance of greater than 6 inches and less than 18 inches.
E2YLN7-5301	We examined this case at two steps. At the first step, we investigated and compared the physical view of bullet hole to the pattens provided.(K1a-c) At second step, we tried to see the distribution of gunshot residue by NaRH test. As a result acording to the distribution of gunshot residues we evaluated it as 'close shooting'.
E3FL6A-5301	Visual and chemical examination on the Item Q1 indicated that the estimated distance of the muzzle of the firearm from the shirt was between 12 inches and 21 inches.
EAX7WT-5301	A hole consistent with a bullet hole was observed in the piece of white cloth (Item Q1) which has a pattern of particles consistent with smokeless gunpowder. This piece of white cloth (Item Q1) was photographed prior to chemical testing. The white cloth (Item Q1) was chemically processed and tested positive for the presence of Nitrite and for vaporous Lead patterns. The gunshot residue pattern observed adjacent to the bullet hole in the piece of white cloth (Item Q1) was visually compared to the reference gunshot residue test patterns (Items K1a - c). The powder pattern on the piece of white cloth (Item Q1) was determined to have been fired at a muzzle to target distance of greater than 12 inches but not more than 24 inches.
EJNPDM-5301	[No Conclusions Reported.]
EPTE99-5301	By means 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

TABLE 2

WebCode-Test	Conclusions
	garment distance between twelve (12")to twenty-one (21") inches. The provided distances standards (K1a, K1b and K1c) were used for the distance determination.
EZEQAD-5301	The area surrounding the hole on Item Q1 was examined microscopically and processed chemically for the presence of gunshot residues and a pattern of residues was found. This pattern was examined in conjunction with photos of test patterns produced at various distances using the suspect firearm and like ammunition. Based on these comparisons, it was determined that a pattern of residues like that found on Item Q1 could be produced at muzzle-to-garment distances greater than 9 inches but less than 24 inches.
F3UMAN-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 Smith & Wesson Model M&P 9mm semiautomatic handgun with Remington Model L9MM3BP 9MM 115 grain full metal jacket ammunition, this pattern of residues was reproduced at a muzzle-to-target distance of greater than 12 inches and less than 21 inches.
F3W6DE-5301	Item 1 - Photographs of test powder patterns at three inch increments from contact to twenty-seven inches (untreated test powder, modified Greiss, and Sodium Rhodizonate) The photographs were used in comparison to the Item 2 questioned sample. Item 2 - One square piece of white cloth with suspected bullet hole The cloth was visually examined for the presence of suspected bullet holes. One suspected bullet hole was found in the cloth. The cloth was then visually and stereo-microscopically examined for the presence of gunpowder particles. Several gunpowder particles were noted on the cloth. The cloth was then chemically processed by way of the Modified Greiss test for nitrites and Sodium Rhodizonate test for lead residues. Both tests produced positive results. The results of the visual examination and chemical test results were compared to the Item 1 photographs. Based on this comparison the muzzle to target distance at the time of discharge was six to eighteen inches.
F979KF-5301	Based on the information supplied it was determined that the minum distance is 12" and the maxium distance is 18"
FYERVC-5301	The area around the hole found on Item Q1 was microscopically examined and chemically processed for the presence of gunshot residues. Residues were found that are consistent with the passage of a bullet. Gunshot residue patterns were developed and were compared to photographs of developed distance determination standards reportedly made using the suspect's firearm. The muzzle to target distance is consistent with being greater than twelve inches and less than twenty four inches.
FYRNR4-5301	A comparison of the gunshot residue pattern on the shirt (Item Q1) to a series of test targets (Items K1a, K1b and K1c) made using the same firearm and similar ammunition indicates a muzzle to target distance between 12 and 21 inches.
FZTAUB-5301	The R-1 twill cloth was examined and chemically processed for the presence of gunshot residues and a pattern was found. The distance standard photographs of T-1 and T-2 were compared to the pattern seen on the R-1 twill cloth. Patterns similar to the R-1 twill cloth were produced at distances greater than twelve (12) inches and less than twenty-four (24) inches.
G4MVUC-5301	Based on information and a cloth sample (10" x 9 3/4") supplied by Collaborative Testing Services of a Known firearm and ammunition. It was determined that the minimum distance is 15" and the maximum distance is 24".

TABLE 2

WebCode-Test	Conclusions
GB3EEC-5301	Based on information and a cloth sample (9 3/4" x 10 1/4") supplied by Collaborative Testing Services of a known firearm and ammunition, it was determined that the minimum distance is 12" and the maximum distance is 24".
GDRP66-5301	The fabric, Item Q1, was examined for the presence of a bullet hole and gunshot residues. When compared to test targets provided as K1 (a-c), the presence and appearance of the gunshot residues on the fabric, Item Q1, are consistent with a muzzle-to-garment distance of greater than 12 inches and less than 27 inches.
GFGVP2-5301	The area around the questioned hole in the shirt, Item Q1, was microscopically examined and chemically processed for the presence of gunshot residues. Visible residues which are indicative of the passage of a bullet were found around the hole during a microscopic examination prior to chemical processing. Patterns of nitrite and lead residues were chemically detected on Item Q1 and compared with test targets. Based on the presence, overall pattern, and density of residues observed between Item Q1 and the provided photographs of the test standards, the questioned bullet hole on Item Q1 appears to have been created by a shot fired at a distance of approximately twenty one (21) to twenty four (24) inches from the shirt.
GKAZH7-5301	The required number of "1" numbered fabric pieces were made thin, the photographs numbered "2" and the end result of the comparative; it was concluded that the hole was the result of a shot from a distance of 12 inches to 21 inches. (minimum Distance 12 inches-maximum distance 21 inches)
GRAE48-5301	Examination of Item 4 revealed a hole in the center of the cloth. The area surrounding the hole was visually and microscopically examined and chemically processed and a pattern of gunshot residues was detected. The submitted firearm test patterns produced at the following muzzle-to-target distances were examined: 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 the center of Item 4 is consistent in size, density, and appearance to the test patterns produced at muzzle-to-target distances of between twelve (12) and twenty-four (24) inches.
GTKCGN-5301	The powder grain pattern observed on defect A entrance on item 1, Q1, the section of shirt with bullet hole, and the nitrite pattern detected on the griess test for defect A entrance on item 1, Q1, the section of shirt with bullet hole, are consistent in diameter and particle population with the powder grain patterns observed on item 2, K1a, the images of test fire series on white cotton, and with the nitrite patterns detected from item 3, K1b, images of griess test fire series, between the distances of 15 inches and 21 inches.
GUHMFC-5301	Base on information supplied by Collaborative Testing Services of a firearm & ammunition, it was determined the minimum distance is greater than 12" and less than 27".
HP3FRD-5301	One (1) white colored cloth square (10" x 10") consistent with bullet wipe, soot and powder particles submitted. A distance determination test was requested. A distance determination test was conducted with the following result: Based on information supplied by Collaborative Testing Services of a known firearm and ammunition, it was determined that the minimum distance is (12") and the maximum distance is (18").
HQCGDC-5301	Submitted evidence which displays GSR is labeled as "Test No. 17-5301 - Item Q1". On 09/27/2017 a distance determination test for gunshot residue was conducted with the following results: When test patterns were compared with the questioned evidence (Item Q1),

TABLE 2

WebCode-Test	Conclusions
	the distance was found to be between a minimum of fifteen (15) inches and a maximum of twenty-one (21) inches from muzzle to target.
HRARBZ-5301	The section of white cloth (Item Q1) was visually examined for holes/defects. One hole, designated Hole #1, was observed. The area around hole # 1 was microscopically examined and chemically processed for the presence of gunshot residues. Residues were found that are consistent with the passage of a bullet. Further gunshot residue patterns were observed that were compared to photographs (Items K1a, K1b and K1c) of developed distance standards reportedly made using the suspect's firearm. Based upon a comparison of residue patterns on the cloth (Item Q1) to the distance standard photographs, the muzzle to target distance is consistent with being greater than nine (09) inches and less than twenty-one (21) inches.
HUVGTR-5301	A PORTION OF A WHITE T-SHIRT MARKED Q1, WITH A SUSPECTED BULLET HOLE IN THE AREA OF THE CENTER OF THE SHIRT WAS SUBMITTED TO THE FIREARMS EXAMINATION UNIT FOR DISTANCE DETERMINATION TESTING. THE AREA AROUND THE HOLE WAS EXAMINED MICROSCOPICALLY, AND WAS ALSO CHEMICALLY PROCESSED FOR THE PRESENCE OF GUNSHOT RESIDUES. AS A RESULT OF THESE EXAMINATIONS THE FOLLOWING WAS CONCLUDED: THE HOLE IS CONSISTENT WITH A BULLET PASSING THROUGH THE T-SHIRT. THE MUZZLE TO TARGET DISTANCE WAS BETWEEN 9" AND 24".
HYPBQT-5301	Item Q1 consisted of a rectangle of white fabric, approximately 25x23cm. There was an approximately 9mm diameter hole in the centre of the rectangle. There was a dark ring around the circumference of the hole consistent with "bullet wipe". There were particles of soot and partially burnt propellant surrounding the hole, these were distributed in a pattern approximately 40mm around the hole, however there were individual particles observed up to 105mm from it. A sodium Rhodizonate test for the presence of lead was carried out by spraying the fabric directly, This confirmed the ring around the hole was bullet wipe but no further lead residues were visualised. The method in use in our laboratory omits the tartrate buffer and so it is not as sensitive as the method used to produce the test photographs. The Greiss test is also not used to determine range in our laboratory so comparisons were could not be made to these photographs either. Comparison of the Pattern on the untreated cloth Q1 with the images in K1a of the untreated cloth at various distances showed that the distance the shot was fired at was consistent with being between 15" and 18". However, without the firearm to carry out further testing a distance greater than 12" but less than 21" could not be excluded.
HZE2DJ-5301	The shoot distance range from the muzzle of the firearm to the target is between twelve (12) and twenty-one (21) inches.
J6TWTF-5301	The shirt, Item Q1, was visually and chemically examined for the presence of gunshot residues. Lead and gunshot residue patterns were detected around a defect, designated Defect 1. These patterns were compared to the known patterns K1a, K1b, and K1c. The gunshot residue pattern observed on the shirt, Item Q1, was consistent with a muzzle to target distance greater than 12 inches and less than 24 inches.
JDJKNJ-5301	CONCLUSIONS: A PORTION OF A WHITE T-SHIRT MARKED Q1, WITH A SUSPECTED BULLET HOLE IN THE AREA OF THE CENTER OF THE SHIRT WAS SUBMITTED TO THE FIREARMS EXAMINATION UNIT FOR DISTANCE DETERMINATION TESTING. THE AREA AROUND THE HOLE WAS EXAMINED MICROSCOPICALLY, AND WAS ALSO CHEMICALLY PROCESSED FOR THE PRESENCE OF GUNSHOT RESIDUES. AS A RESULT OF THESE

TABLE 2

WebCode-Test	Conclusions
	EXAMINATIONS THE FOLLOWING WAS CONCLUDED: THE HOLE IS CONSISTENT WITH A BULLET PASSING THROUGH THE T-SHIRT. THE MUZZLE TO TARGET DISTANCE WAS BETWEEN 9" AND 24"
JHVA78-5301	We noticed that there exists gunshot residue around the bullet hole on the part of cloth. We compared the distrubution of gunshot to the patterns of NaRH test. As a result, we evaluated it as "CLOSE SHOOTİNG".
JWYUPJ-5301	The shooting distance range to the periphery of the entry hole present in cutting cloth Item Q1; it was stablished between fifteen (15) inches and twenty seven (27) inches from muzzle of the gun to the cloth. The avove was set by comparison with CTS photographs received with the results of the physical and chemical study tetstt on fabric.
JZX3XZ-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, Item 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 12 and 27 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
K27EDG-5301	The distance range that the muzzle of the firearm could have been from the shirt (Q1) at the fire discharge was greater than twenty-one (21) inches and less than twenty-seven (27) inches, that based on the comparison of the results found between the distance of standards and the sample was determinated that the shoot was a short distance fired.
KLB6L4-5301	Q1 displays a single perforating defect consistent with the passage of a bullet. Faint sooting and a pattern of particulate material was visible around the defect. A particle from this pattern was collected, chemically tested, and confirmed to be gunpowder. With ammunition consistent with that used in the incident, the suspect firearm produces a pattern of similar size and density when fired from a distance of greater than 9 and less than 21 inches.
KNYR3X-5301	The area around Defect A on Lab Item 1 (Q1) was visually inspected, microscopically examined, and chemically processed for gunshot residues, and a pattern of residues was detected. Using the submitted photographs of test distances and chemically processed test distances, Lab Item 2 (K1a-c), a pattern of residues consistent with what was detected on the evidence was reproduced at an approximate muzzle-to-target distance of greater than 6" and less than 21".
KWF3FY-5301	Based on chemical processing and visual comparison it is the opinion of the examiner that the approximate distance from the muzzle of the firearm to the target was greater than 12" and less than 18".
L7AZG4-5301	The residue pattern from item 1.1.1 indicates a muzzle-to-target distance between 9 and 18 inches.

TABLE 2

WebCode-Test	Conclusions
LPCKGD-5301	The pattern of gunshot residues around defect A is consistent with a muzzle to target distance in-between 9 and 21 inches.
LQ6EDH-5301	Physical comparison of the "shirt with a bullet hole" (Q1), to the distance standards contained in item K1a, indicates a muzzle to target range of greater than 12 inches and less than 21 inches. Items K1b and K1c were received and documented, but not analyzed.
LUJ77V-5301	The area around the hole in Item Q1 was microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was found. Using the known distance standards K1a, K1b and K1c, the concentration of residues was reproduced within a muzzle to garment range of greater than 9 inches and less than 24 inches.
LWNNJ7-5305	The fabric submitted has a pattern of gunshot residue consistent with a shot originating from greater than approximately 12 inches and closer than approximately 27 inches. The target submitted is most like the test targets in the 15 to 18 inch range.
M3UTT6-5305	in my opinion it is highly probable that the bullet that created the hole was shot from a distance greater than 12 inches and less than 18 inches.
MFFC3Z-5301	I concluded that the muzzle of the firearm was at a distance range of between nine (9") inches to eighteen (18") inches from the shirt Q1 at the time of discharge.
MH9Y44-5301	The area around a hole in the section of white T-shirt (Item Q1) was microscopically examined and chemically processed for the presence of gunshot residues and residue deposits were found. Using the provided known distance standards (Items K1a, K1b and K1c) this pattern of residues was consistent with having been produced at a distance of between 15 inches and 27 inches.
MJXCK2-5301	Chemical and microscopic examination of the area immediately adjacent to the damaged area of Item Q1 revealed residue characteristic of a firearm discharge. Distance testing of Item Q1 revealed a muzzle to target distance no closer than 12 inches and no further than 21 inches.
MQ29CD-5301	The fragment of cloth belonging to the victim's shirt presents a hole consisting of an entrance generated by the projectile passage fired charge firearm; based on physical study, chemical test results and comparison with the standard photographs taken at different distances from dispersion of shot residues, Griess tests and sodium rodizonate; it is inferred thata the shot was performed in a range of minimum distance of twelve (12) inches to maximum eighteen (18) inches between the firearm's muzzle and the jacket.
N6GRLT-5301	The muzzle to target distance, based upon visual and chemical comparisons was greater that 12 inches and less than 21 inches.
NA77BZ-5301	I compared the material with bullet hole (Q1) with the images of distance standards Items K1a - K1c; before and after treatment with the modified Griess and Sodium Rhodizonate tests. I measured and compared the results and in my opinion the distance between muzzle and target at the time of discharge is conservatively estimated to have been not less than 12 inches and no greater than 24 inches.
NFEULG-5301	Item 1 Defect A entrance (3/16 inch diameter) located 5 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 fouling was observed visually or with the infrared viewer. 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 a nitrite pattern was detected. The absence of fouling and the

TABLE 2

WebCode-Test	Conclusions
	powder grain pattern detected on the section of white fabric labeled “shirt with bullet hole, Q1”, (item 1), 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 1), are consistent in diameter and particle population with the powder grain patterns observed on item 2, the photo set of test fire targets, K1a, and the nitrite patterns detected on item 3, the photo set of test fire targets treated with griess test, K1b, between the distances of greater than 15 inches and less than 21 inches.
P726EV-5301	According to visual examination of physical characteristics (powder pattern, entrance hole, type of fabric...)and chemical analysis result, using Sodium Rhodizonate as reagent (colourant technique, the muzzle was place at short distance from the victim's cloth, in a range between 6 and 15 inches, except singular circumstances (adverse/severe environment conditions, ricochet...).
P9QBYR-5301	Initially, a direct observation was made on the photographs that showed the different shooting distances that were submitted to the standard garment, as well as the photographs after the standard garment was subjected to both the Griess (Nitrate) test and the Sodium Rhodizonate (lead). Before the chemical test, the physical test consisting of the description of the incriminated garment was carried out, and by placing the center of the acetate grid on the hole of the garment, the particles or grains were counted. After subjecting the garment to the griess test, we proceeded to count the particles of the grains and made the comparison with the pattern showing shirt distance range between twenty one (21) and twentyseven (27) inches. Same result for the sodium rhodizonate test.
PC8WQE-5301	The Q1 garment was separated from the firearm at some distance that was greater than 9 inches and less than 21 inches at the time of discharge.
PCBEU6-5301	Examination of Item Q1 revealed the presence of one hole in the center of the cloth. The area surrounding this hole was examined microscopically and processed chemically for the presence of gun powder and lead residues, and a pattern of residues was found. Based on submitted test patterns, it was determined that a pattern of residues like those found around the hole on Item Q1 could be produced at muzzle-to-garment distances of greater than 9", but less than 18".
PPVTX4-5301	Examination of Item Q1 revealed a hole. Visual/microscopic examination and chemical processing of the area around the hole revealed a pattern of gunshot residues. Test patterns were provided. The residue pattern from Item Q1 was consistent in size, appearance and/or density with the patterns obtained between 9 and 21 inches. The evidence will be returned to the submitter.
PTYGM2-5301	By means 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 fifteen (15")to twenty-one (21") inches. The provided distances standards (K1a, K1b and K1c) were used for the distance determination.
PY49Z7-5301	The results from the chemical testing on Q1 are consistent with the deposit of gunshot residue after the discharge of a firearm. Based on information and cloth sample (8 3/8" x 8 3/8") supplied by Collaborative Testing Services of a Known firearm and ammunition, it was determined that the minimum distance is 18" and the maximum distance is 24".

TABLE 2

WebCode-Test	Conclusions
Q48T28-5301	The pattern of gunshot residues around defect A is consistent with a muzzle to target distance in between 12 and 21 inches.
QEUVJ3-5301	Gunshot Residue Distance Determination Testing supplied by Collaborative Testing Services were the following: (Items K1A, K1B and K1C) multiple photographs of GSR patterns ranging from contact to 27". (Item Q1) One (1) white colored 8 1/2" x 8 1/2" section of cloth (cotton), displaying a round hole (approximately 1/4" in diameter) having a considerable amount of dark colored residue. The following results were formed using the supplied distance standards of known firearm and ammunition: It was determined that muzzle to target distance is approximately 12 inches to 24 inches.
QHCUYH-5301	Q1 PORTION OF T-SHIRT WITH SUSPECTED BULLET HOLE WAS MICROSCOPICALLY EXAMINED AND CHEMICALLY PROCESSED FOR THE PRESENCE OF GUNSHOT RESIDUES. THE HOLE IN Q1 T-SHIRT WAS FOUND TO BE CONSISTENT WITH THE PASSAGE OF A BULLET. USING THE SUPPLIED TEST FIRE DISTANCE STANDARDS FROM THE REMINGTON MODEL L9MM3BP (LABELED K1 a THROUGH c), THE PATTERN OF RESIDUES WAS DETERMINED TO BE CONSISTENT WITH A MUZZLE TO TARGET DISTANCE OF BETWEEN APPROXIMATELY 9 AND 21 INCHES.
QTATN4-5301	The results from the chemical testing on Item Q1 are consistent with the deposit of gunshot residue after the discharge of a firearm. A visual examination of the photographed test patterns was conducted, and considering the absence of pattern on "Item Q1", it is my opinion that the minimum distance is approximately 18" and the maximum distance is approximately 27".
R22N7Y-5301	Item 1-1 K1 a-c Distance Standards, Modified Griess Test, and Sodium Rhodizonate chemical treatments: This item consisted of photographs of each type of testing for the following distances: contact, 3", 6", 9", 12", 15", 18", 21", 24", and 27" on untreated white cotton cloth. Item 1-2 Q1 Shirt with bullet hole: This item consisted of a piece of white cloth measuring approximately 10" by 10". A hole measuring approximately ¼" was noted in the center of the cloth. Black particles were present on the cloth. The area around the hole of this item was microscopically examined and chemically processed for the presence of gunshot residues (lead, copper, nitrites, particulate matter). A pattern of residues (lead, copper, nitrites, particulate matter) was found. Using the identified weapon with ammunition similar to the questioned cartridges, this pattern of residue was reproduced at a distance from the weapon to the target of between 12 and 18 inches.
RDCZG8-5301	The area around the hole in Item Q1 was microscopically examined and chemically processed for the presence of gunshot residues (gunpowder and lead residues). Patterns of residues on Item Q1 are consistent in size and density with the muzzle of a firearm having been greater than approximately 12 inches and less than approximately 21 inches from this area, at the time of firing. Materials produced from chemically processing Item Q1 are being returned as Item Q1P in Container GSRP and should be maintained for possible future examinations.
RE9GVP-5301	1. I examined the remaining portion of the T-shirt (Q1) and found the following: 1.1 A single hole measuring approx 3-4mm in diameter was located in the central back region of the T-shirt. 1.2 During optical and chemical examination of the hole mentioned in (1.1), propellant and lead residues were found surrounding the hole. 1.3 Based on the supplied shot range "Distance Standards" (K1a to K1c), I am of the opinion the distance between the muzzle of the firearm and the T-shirt was greater than approximately 18 inches and less than approximately 27 inches.

TABLE 2

WebCode-Test	Conclusions
RLRKZ8-5305	The area around the bullet entry hole in the remnant of the white shirt (item 1) was visually and microscopically inspected and processed chemically for the presence of a gunpowder and lead residue pattern. A pattern consisting of discharge residues was identified. Using the photos of the chemical processing of test patterns at known distances (item 2), results indicate the firing distance was most likely between approximately 6 and 24 inches. The gunpowder and lead residue test materials from distance testing ([Laboratory]) are being returned with the evidence (item 1.1).
RTRYRZ-5305	Item Q1, the shirt with a bullet hole, was visually and microscopically examined. It was then chemically processed for the presence of gunshot residues. Gunshot residue was detected. The muzzle to target distance was greater than 9 inches and less than 21 inches.
RWL6XP-5301	As a result of the reactions from the modified Griess, modified Dithiooxamide and modified Sodium Rhodizonate tests and based on the comparisons of the appearance and distribution of powder particles, lead, copper and nitrites between the shirt (item Q) and the supplied test prints (items k1a, k1b, k1c), the muzzle to target distance was between 21 and 24 inches. This is based on the assumption that the ammunition and firearm used the same on the shirt and supplied test prints, and the target was perpendicular to the firearm's barrel at the time of shooting.
T6FPJH-5301	The clothing was treated using the standard Na-Rhodizonate test. Using this test the presence of bi-valent metallic elements can be shown. As in classic GSR particles both lead and barium will be colored using this test, the distribution of GSR particles around the entrance hole can be observed. From the observed pattern on the clothing it is clear that a shooting occurred at a distance smaller than 80 inches. Using the provided photographs of reference shots at known distances, it can be further estimated that the shooting was not a contact shot, but took place at a muzzle to target distance between 3 and 27 inches.
TFY2XF-5301	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 six and less than twenty-one inches when using the submitted Item 2 distance standards.
TJDJBQ-5301	Analysis of the shirt panel by visual and chemical means determined that the muzzle of the firearm at the time of discharge was at a distance of between 12 to 21 inches from the shirt.
TW64X9-5301	The shoot fired in the fragment of fabric is consistent with a short distance range, between twelve (12) and twenty-one (21) inches from the muzzle of the weapon to the target.
TXJNNX-5301	The R-1 shirt panel (Q-1) was microscopically examined and chemically processed for the presence of gunshot residues and residues were found. Using the standards submitted, the patterns similar to the pattern on the R-1 shirt panel (Q-1) were produced at distances greater than twelve (12) inches and less than twenty one (21) inches.
U78YBX-5301	Item #2 (Q1: shirt with apparent bullet defect) was microscopically examined and chemically processed for gunshot residues on 10/5/2017. A pattern of residues consistent with the discharge of a firearm and the passage of a bullet was observed near the center of the shirt. Using Item #1 (Distance Standards K1 a-c) the muzzle to target distance was determined to be between 9 inches and 18 inches.

TABLE 2

WebCode-Test	Conclusions
UCG2GZ-5301	One (1) white in color cloth sample measuring 8 1/2" b 8 1/2" markings on cloth are consistent with a bullet hole. Gunshot residue, soot, and powder particles noted around approximate 1/3" hole showing bullet wipe. A distance determination was conducted with the following results: Based on information received from Collaborative Testing Service using known firearm and ammunition distance determination testing concluded that the minimum distance of muzzle to target was from (12") and maximum distance was (21").
UCWKZC-5301	The muzzle to garment distance was greater than 9 inches and less than 21 inches.
UK7T37-5301	Item Q1 was microscopically examined and chemically tested using the Modified Griess and Sodium Rhodizonate tests. The results from these tests were compared to the known distance tests submitted as Items K1a-c and it was determined that the shot to Item Q1 was reproduced at a distance greater than 9 inches and less than 21 inches.
UWJAA4-5301	The powder pattern on the shirt was compared with the series of test firings and I estimate that the shot was fired from a distance of between 12 and 18 inches.
UZZF9Y-5301	Muzzle to target distance: 9" to 21".
V8GDCC-5301	One (1) white cloth square (10 x 10") consistent with bullet wipe, soot and powder particles submitted. A distance determination test was requested. A distance determination test was conducted with the following results: Based on information supplied by Collaborative Testing Services of a known firearm and ammunition, it was determined that the minimum distance is (9") and the maximum distance is (18").
V9T8UX-5301	A distance determination of test no. 17-5301 (R) was requested with the following results. The distance was 12" to 18".
VDZKRW-5301	Using the received distance standards, it is possible to indicate that the firing that caused the entrance hole in the piece of cloth received as a Q1 sign was produced by the entry of a ballistic projectile fired at a distance ranging from 9 inches to 15 inches approximately.
VK4NGU-5301	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 12 inches and less 18 inches approximately, based in the results from the gunshot residues testing of the received fabric and their comparation with the received distance standards.
VRLVFM-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 9 to 24 inches. This

TABLE 2

WebCode-Test	Conclusions
	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).
WAF7K2-5301	The hole in the article of clothing was examined visually and processed chemically for the presence of gunshot residue. Residue was observed and it was determined that the pattern was fired at greater than 12 inches but less than 24 inches
WDYZL9-5301	Light 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. The presence of light fouling and the powder grain pattern detected on the section of white shirt labeled "Q1", (item 1), and the nitrite pattern detected on the griess test for defect A entrance on the section of white shirt labeled "Q1", (item 1), are consistent in diameter and particle population with the powder grain patterns observed on item 2, the photo set of test fire targets labeled "K1a", and the nitrite patterns detected on item 3, the photo set of test fire targets treated with griess test labeled "K1b" between the distances of 15 inches and 21 inches.
WFLNYT-5301	by the optical examination of the shirt marked Q1. i am therefore of the opinion that the shot was fired at distance between 15 inches and 18 inches.
WJ4YYJ-5301	A hole was present in the approximated 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 12 inches and less than 24 inches.
WZ8FYP-5301	The muzzle of the firearm was held at a distance between 6" and 15" away from the target at the time of discharge.
WZCTN8-5301	I determined the distance of the muzzle of the firearm to Item Q1 at time of discharge to be greater than 12" and less than 24" based on a visual comparison of Item Q1 to Items K1a, K1b, and K1c.
WZCTQT-5301	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 9" and 15".
WZFBTX-5301	The pattern on the white twill was greater than 6 inches and less than 18 inches.
WZREX9-5301	The barrel of the firearm was within 12" to 24" from the victim cloth at the time of discharge.
WZT3JT-5301	[No Conclusions Reported.]
X2ZTYM-5305	Based on the comparison made between the test sample and the different pattern samples both chemically treated with Sodium Rodizonate and untreated(Powder), it is determined that the distance range between the muzzle of the firearm and the shirt is between 13" and 17".Closer to the 13" than the 17".
X94TF6-5301	The minimum distance between the muzzle of the firearm and the cloth is fifteen (15) inches and the maximum distance is twenty-four (24) inches.
XF2HW9-5301	The defect and area surrounding the defect were examined microscopically and processed chemically for the presence of gunshot residues and a pattern of residues was developed.

TABLE 2

WebCode-Test	Conclusions
	Using the distance standards listed under K1a-c, this pattern of residues was reproduced at a muzzle distance of between nine (9) and eighteen (18) inches.
XMGYR4-5301	The shirt presents a bullet hole inflicted by a short distance shoot in a range between twelve (12) and twenty-one (21) inches.
XP92EJ-5301	Visual and stereoscopic examination of the shirt, Item Q1, reveals the presence of perforating defect just right and high of center. Bullet wipe and light sooting are visible around the defect. The shirt was microscopically examined and chemically processed for the presence of gunshot residues. Visible residues which are indicative of the passage of a bullet were found around the hole during microscopic examination prior to chemical processing. Patterns of nitrite and lead residues were chemically detected on Item Q1 and compared with test targets. Based on the presence, overall pattern, and density of residues observed between Item Q1 and the provided photographs of the test standards, the questioned bullet hole on Item Q1 appears to have been created by a shot fired at a distance of approximately fifteen (15) to eighteen (18) inches from the shirt.
XYEZ7T-5305	The victim´s shirt has an entrance hole of a bullet fired at a distance beetwen 15 inches and 21 inches from the muzzle to the target.
Y8K7J9-5301	The distance from the muzzle of the firearm to the shirt marked "Item Q1" is between 12 inches and 21 inches.
Y9J8LT-5305	The Q1 shirt was visually and chemically processed for the presence of a gunshot residue pattern. A gunshot residue pattern was present and compared against the provided K1 a-c distance standards. It was determined that the muzzle of the firearms was approximately between 12 and 24 inches from the shirt at the time of discharge.
Y9XXA4-5301	The area around the hole in item 1 was microscopically examined and chemically processed for gunshot residues and a pattern of residues was found. Using a Smith & Wesson Model M&P 9MM semiautomatic handgun and Remington Model L9MM3BP 9MM 115 grain FMJ ammunition, the pattern of residues around the hole on the swatch was reproduced at a muzzle to target distance of greater than 9 inches and less than 21 inches.
YBQMYQ-5301	The submitted evidence (Q1) was visually examined and chemically processed for the presence of gunshot residues. The modified griess test for the presence of nitrites and sodium rhodizonate test for the presence of vaporous lead were performed and the results were compared to known test panels. A pattern of residues was found and indicated a muzzle to target distance of greater than 9 inches and less than 27 inches.
YDTPHZ-5301	The bullet hole A is located in the approximate center of the Q1 tee shirt square. Gunshot residues were found and reproduced using the known firearm and similar ammunition. The bullet hole A on the Item Q1 was shot at a distance greater than nine (9) inches but less than twenty-one (21) inches
YFHRRV-5301	Item Q1 was examined, chemically processed for gunshot residues, and visually compared to Items K1a, K1b, and K1c. Based on the gunshot residue patterns on Item Q1, the muzzle distance from the firearm to Item Q1 at the time of firing was greater than 9 inches and less than 24 inches.
YHML8R-5301	The results from the chemical testing on Item Q1 are consistance with the deposit of gunshot residue after discharge of a firearm. Based on information supplied by Collaborative Testing

TABLE 2

WebCode-Test	Conclusions
	Services of a known firearm and ammunition, it was determined that the minimum distance is 15" and the maximum distance is 24".
YUYRHU-5301	The area surrounded the hole (area "A") in the approximate center of the submitted white cloth (item Q1) was microscopically examined and chemically processed for the presence of gunshot residues, and a pattern of residues was found. As compared with the provided photographs, it appears this pattern of residues was reproduced at a distance of between 12 inches and 27 inches.
ZD7EJR-5301	The area around the hole in the center of item Q1 (damaged white cloth) was microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was observed. Using K1a, K1b, and K1c (photographs of the known distance standards), the observed pattern of gunshot residues is consistent with a muzzle to garment distance of greater than twelve inches and less than twenty-four inches.
ZWLLYV-5301	Exhibit 1 was visually and chemically examined for the presence of gunshot residues. The gunshot residue patterns observed and developed on Exhibit 1 were compared to photographs of gunshot residue patterns at known distances (Exhibits 2-4). The distance range that the muzzle of the firearm could have been from Exhibit 1 at the time of discharge is greater than 12 inches and less than 24 inches.
ZXA7GK-5305	According to the pattern and density of the gun shot residues, the shooting distance has been between 15-21 inches.

Additional Comments

TABLE 3

WebCode-Test	Additional Comments
3FLQCE-5301	The laboratory standard procedures is not the same as used in the test samplings. Our standard operating procedures for examination of gunshot damages are: IR-detection, Modified Griess test, DTO for cupper and Modified Sodium Sulphite test for lead.
3Q7WAH-5301	The Modified Griess Test samples provided by CTS appeared to be smeared which affected the range of the distance given. The Sodium Rhodizonate Test samples provided by CTS appeared to be contaminated which affected the range of the distance given.
4RTXN6-5301	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 #1] 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.
4UYHC6-5301	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 presences 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

TABLE 3

WebCode-Test	Additional Comments
	specific chemical. The tests used for nitrite compounds, lead, and copper are the Modified Griess Test, the Sodum 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 test 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.
6TGXXK-5301	1. 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 clothing items. J Forensic Sci 2000; 45 (4): 801-806. One of the advantages of this procedure is that the sheet of photographic paper attached to the adhesive plastic can be checked under the microscope for morphological characterization of particles. These particles can be drawn for chemical confirmation (TLC, FT-IR, GC-MS), which also allows to exclude the possibility of false positive results (e.g. paint traces with nitrocellulose lacquers) and locate other materials that may be of interest (e.g. fragments of metallic lead or copper/nickel from bullets, fragments of glass, asphalt, cement, etc.). After this procedure, the fabric or substrate remains available to perform the rhodizonate test (directly or indirectly). On the other hand, the rhodizonate test for processing fabrics from test firings (in the proficency test), has several lead sources, namely: vaporous lead that condenses into the fabric and lead from gunpowder granules contamination, as well as from metal fouling. This can cause some difficulties in the interpretation of results. Our procedure allows removal of finely broken material before visualizing lead dispersion pattern. My results were based mainly on the distribution pattern of the powder and the Griess pattern. The lead pattern was not very useful due to the reasons explained above. 2. It is required to have

TABLE 3

WebCode-Test	Additional Comments
	multiple patterns to determine shooting distance, so I suggest you send us digital photographs of at least three patterns for each of the standards. In addition, the chemical treatment with Modified Griess and Sodium Rhodizonate should be performed at the same GSR pattern so that there is reproducibility when making comparisons between different distance standards. Also, I think you should send a larger portion of the sample for estimating the shooting distance.
72XMHE-5301	The gunpowder particles and resulting patterns were very difficult to determine from the photos provided. Had there not been vaporous lead observed on the questioned item, this could have made the test much more difficult to complete with the information provided.
74JDJJ-5305	Griess test not used. Lab method uses tartrate rather than hydrochloric acid.
82QRGK-5305	The level of background discoloration on the sodium rhodizonate known distance images makes determination of the vaporous lead maximum range difficult. The procedures used by this laboratory differ from those used to process the known distance patterns, making direct comparison of results more challenging.
8V62QJ-5301	Limitation Statements Material submitted for testing is approximately 9 ½" x 9 ¾" in size and was evaluated in totality. It is presumed that range patterns were produced with a muzzle-to-target presentation of 90 degrees. Interpretation of the Item Q1 pattern results should not be applied to any other angle of incidence. It is presumed that range patterns are based upon indoor range conditions with limited handling of the patterns prior to their evaluation. It is presumed that the Item Q1 pattern was produced absent any intervening objects.
9EP8RE-5301	Griess test results were very light and faded quickly, as did the Sodium Rhodizonate results.
CTXF2T-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.
FZTAUB-5301	Due to a pink-purple haze present on the photographs it was hard to decipher the presence of vapor on the distance standards. Therefore, the results that are being recorded are from the visual examination and Modified Griess Test results.
G4MVUC-5301	In real life, I would have repeated the test patterns for verification, being that there was not much difference in some of the submitted patterns.
GRAE48-5301	The conclusion above regarding the muzzle to target distance determination assumes that the suspect firearm is reproducing patterns at each distance. Given the fact the analyst is given only one pattern per distance it must be assumed that the patterns reproduce. Our laboratory practice is that a minimum of (3) shots per distance would be taken to determine if the firearm reproduces patterns.
JZX3XZ-5301	Test target photos for the Sodium Rhodizonate results appeared to be contaminated in some way. The background was purple rather than the anticipated white or whiter background. This makes visualizing the actual lead residues apart from the background color more challenging.
KLB6L4-5301	Background response in the submitted sodium rhodizonate tests made determination of the point of extinction for vaporous lead difficult to determine reliably. Smearing of pinpoint nitrite reactions in the submitted Griess test patterns, combined with some shot to shot variation that seemed to present itself, also contributed to a somewhat broad bracket of possible muzzle to

TABLE 3

WebCode-Test	Additional Comments
	target distances. With more defined tests, it is possible that this bracket could be narrowed.
NA77BZ-5301	The most probable distance in my estimation is approximately 19 inches (+ or - 3 inches). Not having produced the solutions and conducted the testing myself for standards K1a - K1c, I have reported a relatively broad range of distances. Also the further from the muzzle the less distinct the pattern and harder it is to estimate a more precise range.
PY49Z7-5301	Chemical testing detected the presence of nitrates on Q1. Chemical testing detected the presence of a nitrite pattern on the surface around Q1, with the approximate diameter of 6". Chemical testing detected the presence of a cloudy pattern of lead residues on the surface around Q1.
QEUVJ3-5301	The picture of the hole/pattern do not seem to accurately coinside with the actual sample. Because of this, in real life, I would have taken additional test samples in order to make my comparisons.
QTATN4-5301	Nitrate test - detected. Nitrite test - detected. Lead Residue Test - detected. Chemical testing detected the presence of nitrates on Q1. Chemical testing detected the presence of a nitrite pattern on the outside surface around hole Q1A, with the approximate diameter of 9". Chemical testing detected the presence of a cloudy pattern of lead residue on the outside surface around hole Q1A.
RLRKZ8-5305	Upon opening the item and inspecting the press-board, it appeared a fair amount of lead residue was transferred to the press-board during packaging and shipping. Some of the test shots (particularly when looking at the Griess test results) appear that they may have been shot at an angle. The differences in the deposition of lead residues from test shot to shot is not consistent, concerning me that some of the shots may have been mislabeled. For these reasons a larger distance bracket was reported than may have been reported in casework where the firearm and test shots have been created in house.
RWL6XP-5301	Our evaluation was based of the physically and chemically processed residue patterns assumes there was no intervening objects between the muzzle of the firearm and the shirt at the time the shots were created.
T6FPJH-5301	Our results for this test are based only on the performance of the Na-Rhodizonate method. We do not perform IR imaging nor Griess reagent testing in our lab. Furthermore, as we do not treat the sheet with acid after Rhodizonate reaction (to eliminate the possible Ba particles), it is possible that we under-estimate the shooting distance, since we see more colored particles than we normally would if only pure lead-containing particles were left over. These effects are taken into account in our regular reporting by stating that we observe the presence of lead-containing GSR particles, and thus conclude that a medium-range shooting distance - larger than a few inches, but smaller than about 80 inch (2m) - was observed. We have found that even this rough estimate suffices to aid police in their inquiries in most cases.
TFY2XF-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

TABLE 3

WebCode-Test	Additional Comments
	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 #1] 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.
V8GDCC-5301	Given the similarities on the samples provided, I would have done more test shots at every 1" increments.
VDZKRW-5301	1. With respect to photographic standards would require explicit reference mark points of location (for example, up [arrow]), since only presents a scale (photographic scale). 2. The cloth in this test has no reference mark (eg label) so you can not know what the lower or upper of it. 3. The piece of cloth should be larger, in order to evaluate the complete distribution of gunshot residues, since in this case the rodizonato stain is incomplete. 4. The procedure used in our laboratory is different from that used in the processing of cloths from test firings. We use an additional step that consists in a lifting with adhesive plastic sheet to remove gunpowder granules on the cloth. 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 clothing items. J Forensic Sci 2000; 45 (4): 801-806.
VK4NGU-5301	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:

TABLE 3

WebCode-Test	Additional Comments
	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. 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 all the 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. They can be sent as digital images on a DVD, or another option is to develop a controled access to CTS web page for review/to print all the replicates of the distance standards. 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 approach.
VRLVFM-5301	According to the SOP's 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 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.
WFLNYT-5301	the testing program and materials are excellent ,thank you.
X2ZTYM-5305	Our laboratory does not use the Modified Griess Test.
XP92EJ-5301	This is a conservative estimate based on an evaluation of the untreated and chemically processed residue patterns and assumes there was no intervening objects between the muzzle of the firearm and the shirt at the time the shots were created.
Y9XXA4-5301	Item 1 – One swatch of white t-shirt like material measuring approximately 10 inches by 10 inches with a hole measuring approximately ¼ inch in diameter in the approximate center. There is a gray apparent bullet wipe around the perimeter of the hole. There are gray and black particles up to 3 inches from the hole, but concentrated approximately 2 inches from the hole and light sooting approximately 3 inches from the hole.
YDTPHZ-5301	There appeared to be possible contamination of the sodium rhodizonate Known standards due to pink colored backgrounds in all Knowns that also had clear straight edges as borders. There was also some false positive nitrite (orange) reaction from the questioned tee shirt square.
YHML8R-5301	Microscopic examination detected the presence of dark and tan irrigular and round shape particles on the outside surface around the hole. Chemical testing detected the presence of nitrates on the collected particle from the outside surface around the hole. Chemical testing detected the presence of a nitrite pattern on the outside surface around hole. Chemical testing detected the presence of a cloudy pattern of lead residue on the outside surface around the hole.
ZWLLYV-5301	Exhibit 1 is Item Q1. Exhibits 2-4 are Items K1a, K1b and K1c.

Appendix: Data Sheet

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Collaborative Testing Services ~ Forensic Testing Program

Test No. 17-5301: GSR Distance Determination

DATA MUST BE RECEIVED BY ***October 09, 2017*** TO BE INCLUDED IN THE REPORT

Participant Code: WebCode:

Accreditation Release Statement

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

☐ This participant's data is intended for submission to ASCLD/LAB, ANAB, and/or A2LA.
(Accreditation Release section on the last page must be completed and submitted.)

☐ This participant's data is NOT intended for submission to ASCLD/LAB, ANAB, and/or A2LA.

Scenario:

Police are investigating a shooting at a nightclub. 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. A suspect was apprehended later that day and the police seized a Smith & Wesson Model M&P 9mm semiautomatic handgun from his possession. The bullet recovered from the victim was identified as having come from the suspect's firearm. Rounds of Remington Model L9MM3BP 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):

K1a-c: Distance Standards at 3" increments from Contact to 27" provided as images of GSR patterns on untreated white cotton cloths, and Modified Griess Test and Sodium Rhodizonate chemical treatments.

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 return all pages of this data sheet.

Participant Code:
WebCode:

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

3.) Additional Comments

Return Instructions: Data must be received via online data entry, fax (please include a cover sheet), or mail by ***October 09, 2017*** to be included in the report. Emailed data sheets are not accepted.

QUESTIONS?
TEL: +1-571-434-1925 (8 am - 4:30 pm EST)
EMAIL: forensics@cts-interlab.com
www.ctsforensics.com

Participant Code:

ONLINE DATA ENTRY: www.cts-portal.com

FAX: +1-571-434-1937

MAIL: Collaborative Testing Services, Inc.
P.O. Box 650820
Sterling, VA 20165-0820 USA

Please return all pages of this data sheet.

RELEASE OF DATA TO ACCREDITATION BODIES

The following Accreditation Releases will apply only to:

Participant Code: WebCode:

for Test No. **17-5301: GSR Distance Determination**

This release page must be completed and received by ***October 9, 2017*** to have this participant's submitted data included in the reports forwarded to the respective Accreditation Bodies.

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

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

ASCLD/LAB Certificate No. _____

ANAB Certificate No. _____

A2LA Certificate No. _____

Step 2: Complete the Laboratory Identifying Information in its entirety

Signature and Title _____

Laboratory Name _____

Location (City/State) _____

Accreditation Release

Return Instructions

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

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

Please return all pages of this data sheet.

