Collaborative Testing Services, Inc
FORENSIC TESTING PROGRAM

GSR-Distance Determination
Test No. 14-530 Summary Report

This test was sent to 234 participants. Each sample set contained an evidence piece of clothing (Q1) for chemical processing for a GSR pattern. The set also contained photographs 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 179 participants (76% 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 in addition to photographs 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 Ruger model MKIII 22/45 caliber .22 LR semiautomatic pistol with a 5.5" barrel and the ammunition was Federal American Eagle® 36 grain copper plated hollowpoint ammunition.

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. Multiple shots were taken at the same distance to ensure reproducibility and the best representative shot was chosen for further processing. First the known GSR patterns were scanned. Then each known pattern was 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. The scanned images were printed onto photograph paper, packed into three pre-labeled envelopes (K1a, K1b and K1c) and packaged into the sample set as described below.

QUESTIONED ITEM (Q1): Item Q1 consisted of one section of an off-white, cotton twill jean shirt. The firearm was locked into a fixture and the shirt was placed 19 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:
Q1, K1a, K1b, and K1c envelopes were placed into a pre-labeled sample pack envelope, sealed with evidence tape, and initialed "CTS."

VERIFICATION-
The predistribution laboratories reported the minimum distance to be from 12 to 15 inches and the maximum distance to be 24-27 inches. CTS is aware of differing laboratory reporting policies and varying acceptable ranges. It will therefore be at the discretion of the laboratory to evaluate results based on their own policies and ranges.

Release Date of Manufacturer's Information: 04-November-2014

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 off-white, cotton twill jean fabric was placed 19 inches away from the muzzle of the firearm. [Refer to Manufacturer's Information for production details.]

In Table 1, 154 of the 179 participants (86%) reported a minimum distance between 12 and 18 inches. One hundred and sixty-four of the 179 participants (92%) reported a maximum distance between 21 and 27 inches. CTS is aware of differing laboratory reporting policies and varying acceptable ranges. It will therefore be at the discretion of the laboratory to evaluate results based on their own policies and ranges. For this test, CTS grouped responses reported by more than 10% of participants to form the provided minimum and maximum ranges.

Release Date of Summary Report: 25-November-2014

Distance Determination Results

What is the minimum and maximum distance 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	Minimum	Maximum	WebCode	Minimum	Maximum	WebCode	Minimum	Maximum
2A4GDP	12	21	67CJFA	15	27	9G6EEV	15	21
2FUBHX	24	27	6JBB4A	12	24	ACN4NQ	15	27
2JCWKX	12	24	6LQ8UT	15	27	AEEZE6	12	27
2QNQ79	24	27	6MWVC	15	21	AL78LW	16	24
2RWTYY	21	27	6RCZ48	15	24	B9G6P3		
2TGFPU	15	27	6VCUWM	15	24	BBPQPJ	15	24
2VMW6D	12	24	77R2EA	15	24	BL96TL	12	24
39F7QW	18	24	79A2XG	15	27	BNEPFL	15	24
3BEBKW	15	27	7BVMRY	15	27	BNZL4Z	9	27
3BRTHH	12	21	7BWJXN	15	27	C8J6A4	18	21
3FYE82	21	24	7H2DAX	12	24	CFEK4W	18	24
3LHUC7	18	24	7P3MMH	15	24	CUUP8H	15	27
3URVGZ	12	27	87KFXJ	18	27	CZKPHA	15	27
3V3HCT	12	24	8CDKN3			D4DQZX	15	21
3W8ZKH	15	21	8QRZZU	12	27	D7J6EQ	15	27
4DB8LJ	12	24	94RE6V	15	24	DEFAVR		
4W8RDP	15	24	94X28N	15	21	DF3KYK	18	27
638Y9D	15	21	96BNN3	12	27	DFXDB6	18	24

TABLE 1 (Distance in Inches)

WebCode	Minimum	Maximum	WebCode	Minimum	Maximum	WebCode	Minimum	Maximum
DKZ74U	15	24	GTT97G	12	21	KRL63G	15	27
DNN2ZF	12	24	GVPXAH	15	21	L478JL	12	24
E3XPFH	12	27	GX9CDH	15	18	L8BUD4	12	21
EAMWKB	12	24	HWHEUH	12	27	LFT4A6	15	27
EB3T7D	12	27	HWVEQ8	15	24	LGV7KA	12	24
EBM39A	18	24	HZ7JWM	18	24	LHPRE2	15	24
EN3H2Z	12	24	J29273	12	27	LPTTGF	15	27
ENXXVR	12	24	J93HRV	12	24	M8ZN7Z	12	21
F2JJVQ	18	27	JH9Y8K	18	24	MBWAZN	15	21
F2NLDP			JHHNUY	12	27	MNM4AW	15	24
F6LH7J	12	27	JJRZAF	15	27	MR3CWB	12	27
F7HQHA	12	24	JLD8M3	12	27	MX4ARM	18	27
F89WWE	9	18	JM7FKE	18	24	MZNRW7	18	27
F9WYF3	15	27	JMUTA7	12	27	N2EPTX	18	27
FBPEVB	12	27	JXT2XV	12	24	N4ZQFX	12	27
FJM4GL	12	27	JYM6WR	15	21	NQ88KE	15	24
FRJAJF	15	27	K688CD	12	24	NWJVVW	18	27
FXV6TA	15	21	KEUHQU	15	27	P9PN89	18	24
GDTGEK	12	24	KQ4A2G	18	24	PM4YN4	18	27
GRLWUZ	12	24	KQ83R2	15	27	PVMX3G	16	25

TABLE 1 (Distance in Inches)

WebCode	Minimum	Maximum	WebCode	Minimum	Maximum	WebCode	Minimum	Maximum
PYWDWC	18	27	UYDP42	12	24	WVKKDZ	15	24
PZGUR8	15	24	V9QGW3	15	27	X26XWZ	12	27
R8UMV3	12	24	VAMP9T	21	27	X6NKGD		
RD9FLE	15	24	VFFRED	21	24	XDAJGC	15	21
RDEERE			VJBB4B			XE2JG9	18	24
RF8DGU	15	27	VXUTXY	12	24	XM7GYR	12	27
RFNRP4	12	24	VY2RYE	15	24	XNZAUB	12	24
T3WV8H			VZ7FYC	21	24	XXLNHD	12	27
TAA2NL	15	27	VZDH9J	15		XYYVPV	12	24
TBNBY9	12	27	W2MUKT	15	27	XZQVM7	12	24
TEHAVR	21	24	W3J3WJ	15	24	Y3PCHM	18	24
TNDZMY	12	27	WAM8N3	15	27	YBNQMM	15	24
TNLMRL	12	24	WGHAQE	15	24	YD8GHE	12	24
TTY37W	21	27	WGK8A4	15	27	YFEAL7	18	21
TYWENG	18	24	WHUGZF			YHA8BC	15	24
U8BVAU	12	21	WLGVQB			YHNHM4	15	24
UATAAV	21	27	WNV7D9	18	21	YJHMHH	18	27
UDVF33	12	24	WNW3KX	9	27	Z7QUB2	15	27
UET7MV	12	24	WQZTPR	15	24	ZEJQ8G	15	24
ULVRFB	15	21				ZFW8HA		

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TABLE 1 (Distance in Inches)

WebCode	Minimum	Maximum	WebCode	Minimum	Maximum	WebCode	Minimum	Maximum
ZJAJ4C	15	27						
ZMXN8G	21	27						
ZP3JNY	18	27						
ZUTW9A	15	24						
ZVKW87	18	24						
ZYG9YJ	18	24						

Response Summary

Participants: 179

Minimum Distance Determination Result
(**Total Participants Responding =** 179)

Minimum Distance (Inches)	Participants (Percentage)
Contact / 0	0 (0.00%)
3	0 (0.00%)
6	0 (0.00%)
9	3 (1.68%)
12	57 (31.84%)
15	66 (36.87%)
18	29 (16.20%)
21	9 (5.03%)
24	2 (1.12%)
27	0 (0.00%)
Other	2 (1.12%)
No Response	11 (6.15%)

Maximum Distance Determination Result
(**Total Participants Responding =** 179)

Maximum Distance (Inches)	Participants (Percentage)
Contact / 0	0 (0.00%)
3	0 (0.00%)
6	0 (0.00%)
9	0 (0.00%)
12	0 (0.00%)
15	0 (0.00%)
18	2 (1.12%)
21	21 (11.73%)
24	75 (41.90%)
27	68 (37.99%)
Other	1 (0.56%)
No Response	12 (6.70%)

Conclusions

TABLE 2

WebCode	Conclusions
2A4GDP	A pattern of gunshot residues 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 21".
2FUBHX	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[sic] at a distance smaller than 80 inches. Using the provided photgraphs[sic] of reference shots at known distances, it can be further estimated more precisely that the shooting took place at a muzzle to target distance between 24 and 27 inches.
2JCWKX	The white cloth sheet was chemically processed using MGT (Modified Griess Test) and SRT (Sodium Rhodizonate Test) for the presence of nitrites and lead. The processed sheet of photo paper with the MGT pattern was designated as sub-item #Q1a and will be retained with the evidence. The untreated white cloth sheet and the chemically processed patterns resulting from the MGT and the SRT were compared to the firearm discharge residue patterns of sub-items #K1a, #K1b, and #K1c, to conclude that the distance between the Ruger, model MKIII, caliber .22, semi-automatic pistol and the shirt was approximately 12 to 24 inches.
2QNQ79	After examining the victim's shirt (Q1) and comparing it to the known distance standards submitted by the laboratory, it was determined that the distance between the muzzle of the firearm and the victim's shirt was between 24 and 27 inches. This determination was based on the observations of the powder pattern and the density of the pattern around the bullet hole. Two different observations were made. The first observation was comparing the powder pattern of Q1, to the known distance patterns that were determined in the laboratory when untreated. The pattern of the Q1 appears to be between the known distances of 24 and 27 inches. Q1 was then treated with Sodium Rhodizonate. It was observed that the powder pattern and the density of the powder pattern when treated were similar to the known pattern that was tested in the laboratory at a distance of 24 to 27 inches. As a result it was determined that the distance between the muzzle of the firearm and the victim's shirt was a minimum of 24 inches and a maximum of 27 inches.
2RWTYY	The gun shot residues found around the entrance hole are consistent with a shot from a distance between 21" to 27" (short distance).
2TGFPU	Results of Examinations: The area around the hole in the item 2 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 2 was reproduced at a muzzle-to-target range greater than fifteen and less than twenty-seven inches when compared to the submitted distance standards. No other residues were detected.
2VMW6D	Item Q1 is a piece of white twill jean cloth with a single round hole of interest. The Item Q1 was visually and stereoscopically examined. Using the Modified Griess test for the detection of nitrites and the Sodium Rhodizonate test for the detection of lead, Item Q1 was chemically processed for the presence of gunshot residues. Based on the presence of gunpowder and lead residues, the single round hole was determined to be an entrance defect produced by the passage of a bullet. A visual comparison of the item Q1 residue patterns to those depicted in

TABLE 2

WebCode	Conclusions
	items K1a though K1c reveal the muzzle-to-target distance to be further than 12 inches and closer than 24 inches.
39F7QW	The shirt presents a bullet hole produced by a short distance shot in a range between 18 to 24 inches.
3BEBKW	The shirt (Item 2) was visually examined and chemically processed for gunshot residues; and residue deposits were noted. In comparing the results from processing the shirt (Item 2) to the submitted photographs (Item 1.1, 1.2 and 1.3) it was determined that the muzzle of the firearm would have been between 15 and 27 inches from the shirt when the firearm was discharged.
3BRTHH	Item Q1, one t-shirt with a bullet hole, was visually examined and chemically processed using the modified Griess test for nitrite residues and using the sodium Rhodizonate test for lead residues. Visual examination and chemical processing of the submitted item Q1 in comparison to the submitted photographed standards put the muzzle of the firearm at a minimum of 12 inches and a maximum of 21 inches from the t-shirt at the time of discharge.
3FYE82	physical examination on the tshirt portion was made at first, and a bullet hole was observed. According to physical view of bullet hole and its surroundings, shooting distance was evaluated between 21 and 24. After physical examination, the sodium rhodizonate test was applied to the sample as a confirmatory test. As a result of sodium rhodizonate test, gunshot residue was observed on bullet hole and its surroundings. According to distribution of gunshot residue, the shooting distance was evaluated between 21 and 24. In our procedure, this distance is presented as intermediate shooting distance.
3LHUC7	Based on the comparisons of the appearance and distribution of powder particles, sooting, nitrites, and lead between the shirt (Item Q1) and the supplied test targets (Item K1a, K1b and K1c), the muzzle to target distance was between 18 inches and 24 inches. This is based on the assumption that the ammunition and firearms used were the same on the shirt and supplied test prints, and the target was perpendicular to the firearm's barrel at the time of the shooting.
3URVGZ	A visual examination and chemical processing were made of Item Q1. The resulting observations were visually compared with Items K1a-c. Based on these observations, it is the opinion of this Examiner that Item Q1 was greater than 12 inches, but less than 27 inches, from the muzzle of the seized firearm when it was fired.
3V3HCT	A muzzle-to-target distance determination test was conducted with the white shirt, item Q1. The shirt was examined visually, microscopically, and chemically, and a pattern of gunshot residue was detected around the hole in the shirt. Photographs of chemically processed test patterns produced at various distances, items K1b and K1c, were compared to the pattern on the t-shirt. Based on these test patterns, it was determined that a similar pattern of gunshot residue products to that present on the t-shirt, item Q1, can be produced at a distance of greater than 12 inches but less than 24 inches.
3W8ZKH	The muzzle of the firearm was approximately 15 to 21 inches from the surface in question at the time the shot was fired.
4DB8LJ	The area around the hole in the center of the R-1 twill cloth was microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was found. Patterns similar to the pattern around the R-1 hole were produced at distances greater than twelve (12) inches and less than or equal to twenty-four (24) inches.

TABLE 2

WebCode	Conclusions
4W8RDP	Q1, portion of t-shirt with suspected bullet hole, was microscopically examined and chemically processed for the presence of gunshot residues, and a pattern of residues was developed. The hole in Q1 t-shirt piece was found to be consistent with the passage of a bullet. Using the supplied test fired distance standards from Ruger MKIII .22 caliber pistol (labeled K1 a through c), the pattern of residues was determined to be consistent with a muzzle to target distance of between 15 and 24 inches.
638Y9D	According to dispersing and density of GSR around bullet entry hole on shirt, shooting distance is evaluated as "CLOSE SHOOTING". NOTE: By using Sodium Rhodizonate for Short Barreled Weapons; 0-4 cm Contacted Shooting 4-100 cm Close Shooting >100 cm Long Distance Shooting
67CJFA	Visual, microscopic and chemical examination on the cut portion of the shirt (Q1) revealed the presence of gunshot residue. The hole on the shirt is consistent with the passage of a bullet with a muzzle to target distance of 15"-27". This is determination is based on a comparison of Q1 to known muzzle to target distance utilizing the same firearm and similar ammunition.
6JBB4A	Q1 is a white in color portion of shirt, unknown brand, unknown size, which has one (1) hole, located in the middle of the garment. The area around the hole was microscopically examined and chemically processed for the presence of gunshot residue and a pattern of residue was found. Using the seized Ruger, model MKIII, .22 caliber semi- automatic pistol with ammunition like which is represented by the bullet recovered from victim a pattern of residues was reproduced at a distance of between twelve (12) and twenty four (24) inches. Residues were also found which consistent with the passage of a bullet.
6LQ8UT	Results of Examinations: The area around Hole 1 in the Item 2 shirt was microscopically examined and chemically processed for the presence of gunshot residues, and particulate lead residues and a pattern of nitrite residues were found. The pattern of nitrite residues present on the item 2 shirt was reproduced at a muzzle-to-target range of greater than fifteen inches and less than twenty-seven inches when using the submitted item 1 distance standards. No other residues were detected.
6MVVVC	By means of physical study and chemical analysis gunshot residues (gunpowder, nitrites, lead and copper) were detected around the shirt's (Q1) hole consistent with a muzzle to garment distance between 15 and 21 inches. The provided distance standards (K1a, K1b and K1c) were used for distance determination.
6RCZ48	Examination of submitted items conducted with the following results: Estimated distance: 15" to 24".
6VCUWM	A pattern of gunshot residues 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 15 and 24 inches.
77R2EA	The cloth Q1 was visually and chemically examined for gunshot residue patterns. The item was treated with the MGT-method for detection of nitrite, KTM-method for detection of copper and with the MFPM-method for detection of lead according to the laboratory standard operating procedures. Several particles of nitrite, copper and lead were detected around the damage. The result from the visual and chemical treatment of the item Q1 was compared with the test samplings (Item K1a and Item K1b). The result shows that the shooting distance is somewhere

TABLE 2

WebCode	Conclusions
	between 15" and 24".
79A2XG	A PIECE OF WHITE TWILL JEAN MATERIAL FROM VICTIM'S SHIRT WITH A SUSPECT BULLET HOLE APPROXIMATELY IN THE CENTER WAS SUBMITTED FOR DISTANCE DETERMINATION TESTING. THE AREA AROUND THE HOLE WAS MICROSCOPICALLY EXAMINED AND CHEMICALLY PROCESSED FOR THE PRESENCE OF GUNSHOT RESIDUES. AS A RESULT OF THESE EXAMINATIONS IT IS CONCLUDED; THE MUZZLE TO TARGET DISTANCE WAS BETWEEN 15" AND 27".
7BVMRY	The defect upon the exterior of the item Q1 garment, if created by the Ruger model MKII[sic] .22 caliber pistol loaded with Federal 36 grain copper plated hollow point ammunition, is consistent with having been created at a distance between fifteen (15) inches and twenty-seven (27) inches based upon comparison of the item Q1 garment to test targets created at known distances.
7BWJXN	The area around the hole in Q1 was microscopically examined and chemically processed for gunshot residues and a pattern of residues was found. Using a Ruger MKIII .22 caliber semiautomatic pistol with a 5.5 inch barrel and Federal 36 grain copper plated hollow point ammunition, the pattern of residues around the hole on the shirt was reproduced at a muzzle to target distance between 15 inches and 27 inches.
7H2DAX	The fabric panel (Q1) was examined visually, microscopically and chemically and compared to test panels fired at known distances with the following results: The muzzle to target distance was farther than approximately 12 inches and closer than approximately 24 inches.
7P3MMH	The piece of white cloth (Item Q1) was visually and chemically examined for the presence of gunshot residues with the the[sic] following results: - A single defect consistent with the passage of a fired bullet was observed in the approximate middle of the piece of cloth surrounded by a sparse pattern of gunpowder particles. - Chemical testing of the piece of cloth resulted in the detection of nitrite and lead particles surrounding the defect. The patterns of gunpowder, nitrite and lead particles on the cloth were compared to the photographs of test panels indicating a minimum muzzle to target distance of 15 inches and a maximum distance of 24 inches.
87KFXJ	A pattern of gunshot residues 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 18 and 27 inches.
8CDKN3	The area surrounding the defect in the front of the white shirt section, Item 1A, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed the presence of gunshot residues, however a reproducible pattern was not present. As a result, no muzzle to target distance can be provided. 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
8QRZZU	The fabric square was examined for the presence of bullet defects and gunshot residue using visual, microscopic, and chemical techniques. A bullet entry defect (Hole A) was observed in the

TABLE 2

WebCode	Conclusions
	center of the fabric square. Gunshot residue in the form of gunpowder, nitrite residue, and lead residue were observed. Submitted photographs of distance test standards were examined. Using data from those distance test standards, a muzzle-to-garment distance was determined for Hole A. The minimum distance between the muzzle of the firearm and the fabric is twelve inches. The maximum distance between the muzzle of the firearm and the fabric is twenty-seven inches.
94RE6V	Physical and chemical testing of the "shirt with a bullet hole" (Q1), utilizing the standards contained in item K1, indicates a muzzle to target range of 15 to 24 inches.
94X28N	The approximate bracketed distance of the firearms muzzle to target was greater than 15" and less than 21".
96BNN3	A hole and residues consistent with the discharge of a firearm were detected on Laboratory Item 001.D (Q1) portion of shirt with bullet hole. The firearm discharge distance was determined to be greater than 12 inches but less than 27 inches.
9G6EEV	One (1) white colored heavy cloth square (8½" X 8¾") submitted with a hole appoximately[sic] ¼" and particles consistent with gunshot residues. A distance determination test was requested. A distance determination test was conducted with the following result: The distance from muzzle to target is approximately 15 - 21 inches.
ACN4NQ	1.Exhibit 2 (White cloth square with hole) was visually and microscopically examined and chemically processed for the presence of residues that indicate the passage of a bullet. Gunpowder particles were located around the hole, but no soot was visible. 2. Exhibit 1 (Printed images of known distance patterns) contains images that show patterns of gunshot residues that were deposited by firing from known distances in increments of 3 inches from contact to 27 inches. Exhibit 1 includes three sets of photos depicting unprocessed patterns, Modified Griess test results, and Sodium Rhodizonate test results for each distance. 3. The gunpowder residues that were identified around the hole in Exhibit 2 were compared to Exhibit 1 in order to estimate the muzzle-to-target distance. a. Based solely on the comparison of Exhibit 2 to the submitted images in Exhibit 1, the residues on Exhibit 2 are consistent with those produced by the tested firearm and ammunition from a muzzle-to-target distance between approximately 15 inches and 27 inches.
AEEZE6	The area around the hole in the center of Item 2 (a square of white cloth) was visually examined and chemically processed for the presence of gunshot residues. Comparisons against Item 1 (known distance standards) indicate the pattern of residues was produced at a distance of between 12 to 27 inches.
AL78LW	The results from the chemical testing on the hole in item Q1 are consistent with the deposit of gunshot residue after the discharge of a firearm. A muzzle to target distance determination test was conducted using photographs submitted as "item K1a" compared to photograph[sic] labeled "CTS 14-530A ITEM Q1". Results: The GSR pattern on "item Q1" is consistent with being fired from a distance of approximately 16" to 24".
B9G6P3	The area surrounding the defect in the center of the cloth section, Item 1, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed the presence of gunshot residues, however a reproducible pattern was not present. As a result, no muzzle to target distance can be provided. The following is a summary of testing performed: Microscopic examination for unburnt/partially burnt gunpowder particles: particles

TABLE 2

WebCode	Conclusions
	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 bullet wipe found. Chemical examination for lead residues using the Sodium Rhodizonate test: positive
BBPQPJ	Examination of item Q1 revealed one (1) hole in the center of the panel. The area around this hole was examined microscopically and processed chemically for the presence of gunpowder and lead residues (gunshot residues). A pattern of gunshot residues was developed around the hole in item Q1 which is consistent in size and density with the muzzle of a firearm having been greater than approximately 15 inches and less than approximately 24 inches from this area at the time of firing. Chemically processed material produced from Item Q1 is being returned as item Q1P and should be maintained for possible future examinations.
BL96TL	Item #2 (shirt with bullet hole) was examined on 11/01/2014 [sic]. A defect was located in the approximate middle area of the shirt section. The area around this defect was microscopically examined and chemically processed for the presence of gunshot residues. A pattern of residues consistent with the discharge of a firearm was found. Using item #1 (Distance Standards at 3" increments from Contact to 27" provided as photographs of GSR patterns on untreated white twill-jean cotton cloths, and Modified Griess Test and Sodium Rhodizonate chemical treatments), the residue pattern found on item #2 (shirt with bullet hole) is consistent with a muzzle-to-target minimum distance of approximately 12 inches and a maximum distance of 24 inches.
BNEPFL	Item #2 ("T-shirt" Q1) was examined on 10/01/2014 and a defect was located near the center. The area around this defect was microscopically examined and chemically processed for the presence of gunshot residues. A pattern of residues consistent with the discharge of a firearm was found. Referencing the distance standards K1a, K1b and K1c, the muzzle-to-target distance was determined to be between approximately 15 inches and 24 inches.
BNZL4Z	Residues consistent with the discharge of a firearm were detected on Laboratory Item # 001.D (Q1) a piece of white cloth with a bullet hole. Using the submitted Powder Patterns (001.A; K1a), Modified Griess test sheets (001.B; K1b) and Sodium Rhodizonate patterns (001.C; K1c), the firearm discharge distance was determined to be greater than 9 inches but less than 27 inches.
C8J6A4	In my opinion, Item Q1 has an approximate muzzle to target range between 18" and 21". This opinion is based on the visual examinations with and without chemical enhancment[sic] of Item Q1 to known test firings using a firearm/ammunition combination consistent with that believed to have been used in the incident. This opinion is also based on the assumption that the replicates were relatively reproducible as they were not provided as part of the proficiency test. Please note that the comparison was assessed on the information given. If replicates had been provided this may have changed the result.
CFEK4W	The result from the chemical testing on item Q1 are consistent with the deposit of gunshot residue after the discharge of a firearm. Distance determination test conducted: muzzle to target distance approximately 18" to 24".
CUUP8H	The area around the hole in the item 2 shirt was microscopically examined and chemically processed for the presence of gunshot residues, and a pattern of Nitrite residues was found. The pattern of residues present on the item 2 shirt was reproduced at a muzzle-to-target range of

TABLE 2

WebCode	Conclusions
	greater than fifteen and less than twenty-seven inches when using the submitted distance standards. No other residues were detected.
CZKPHA	A pattern of gunshot residues 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 15 and 27 inches.
D4DQZX	Conclusions: Pictures were visually examined and the minimum and maximum distance that the muzzle of the firearm could have been from the shirt (Q1) at time of discharge is approx. 15" to 21".
D7J6EQ	The shooting distance range in the fragment of garment for the hole No. 1 is established as between fifteen (15) inches and twenty-seven (27) inches from the muzzle of the firearm and the impacted surface. The above conclusion is reached , by comparison with photograph printed patterns for comparison CTS.
DEFAVR	The area surrounding the defect in the center of the white shirt, Item 1A, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed the presence of gunshot residues, however a reproducible pattern was not present. As a result, no muzzle to target distance can be provided. 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
DF3KYK	Item #2 was examined and ound to be a piece of white denim cloth exhibiting a single bullet hole. The area surrounding the hole was visually, microscopically, and chemically examined fo rhte presence of gunshot residues. Lead and a pattern of nitrite residues were detected in the area surrounding the hole. Comparison of hte nitrite pattern observed on the cloth with the photos of nitrite test results in Item #1 indicates a muzzle-to-target distance of approximately greater than 18 inches but less than 27 inches. The nitrite test of the cloth has been sub-exhibited and is being returned with the evidence. [sic]
DFXDB6	The piece of white cloth (item Q1) was chemically tested and indicated a pattern of residues consistent with the discharge of the Ruger model MKIII .22 caliber semiautomatic pistol at a distance of between 18 inches and 24 inches from the point of contact.
DKZ74U	One (1) defect, designated #1, was located in the center of Item Q1. The defect is circular and measures approximately 5/32 inch in diameter. 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. Using the distance standards listed under K1a-K1c, this pattern of residues was reproduced at a muzzle distance of between fifteen (15) and twenty-four (24) inches.
DNN2ZF	A pattern of gunshot residues 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 inches and 24 inches.

TABLE 2

WebCode	Conclusions
E3XPFH	Examination of the fabric submitted in item #2 revealed the presence of one hole in the center. Microscopic and chemical examination of the fabric surrounding this hole revealed the presence of a gunshot residue pattern. Comparisons of this pattern with the test patterns submitted in item #1 indicate that the muzzle of the firearm is consistent with being held at a distance greater than twelve inches and less than twenty seven inches from the fabric when the shot was fired. Patterns processed during analysis are being returned with the evidence
EAMWKB	The area around Hole A of Item Q1 was microscopically and chemically examined for the presence of gunshot residues and a pattern of residues was found. Using known test standards this pattern of residues was determined to be reproduced at a distance of between 12 inches and 24 inches.
EB3T7D	Chemical and microscopic examination of the shirt (Q1) revealed nitrites and lead, characteristic of firearm discharge. Distance tests conducted revealed a muzzle to target distance not closer than 12 inches and no further than 27 inches.
EBM39A	We apply color test technique on the shirt sample using fresh modified griss[sic] and we conclude that there is nitrite anion wich[sic] give indication the presence of close shooting by comparing the result obtained above we can estimate the distance of the muzzle of the firearm from the shirt was about 21 Inches.
EN3H2Z	The square piece of fabric (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 the comparison of residue patterns on the square piece of fabric (Item Q1) to the distance standard photographs, the muzzle-to-target distance is consistent with being greater than twelve (12) inches and less than twenty-four (24) inches.
ENXXVR	The results from the chemical testing on the hole in item Q1 are consistent with the deposit of gunshot residue after the discharge of a firearm. Submitted evidence: Item's K1a - c, photographs of GSR patterns with distance standards at 3" increments from contact to 27". Item Q1 - sample cloth measuring 8 1/2 X 8 1/4, with a bullet hole having approximate diameter of 3/16". Conclusion: Distance determination completed by examiner. It was determined that the firing distance of the sample submitted (Q1) was approximately between 12" and 24" inches.
F2JJVQ	The cloth (Item Q1) was examined microscopically, then chemically processed for the presence of gunshot residues. The square of white cloth (Item Q1) has a bullet hole in the middle of the cloth and a sparse pattern of partially burned smokeless gunpowder adjacent to the hole. A particle of that powder gave a positive chemical color test for Nitrates. Chemical color test conducted on the cloth (Item Q1) revealed the presence of gunshot residues. The pattern on the cloth (Item Q1) was then visually compared to the reference test patterns (Items K1a-c). The powder pattern observed on the cloth (Item Q1) was determined to have been made at a muzzle to target distance between 18 inches and 27 inches. The pattern on the cloth (Item Q1) is most consistent with reference patterns test fired at 21 & 24 inches.
F2NLDP	Evidence submission K1a: Other than visual examination, no additional analytical tests were performed on the item listed. Evidence submission K1b: Other than visual examination, no additional analytical tests were performed on the item listed. Evidence submission K1c: Other than visual examination, no additional analytical tests were performed on the item listed. The

TABLE 2

WebCode	Conclusions
	area surrounding the defect in the material, Item Q1, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed the presence of gunshot residues, however a reproducible pattern was not present. As a result, no muzzle to target distance can be provided. 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
F6LH7J	The item 004-004-001 white cloth ("Q1: Shirt with bullet hole") was examined for the presence of bullet defects and gunshot residues utilizing visual, microscopic and chemical techniques. A single bullet entry defect (Hole A) was detected in the middle of the white cloth. Gunpowder, bullet wipe, nitrite residue and lead residue were observed surrounding Hole A. The gunshot residue patterns from the provided series of test targets were evaluated and compared to the gunshot residue patterns detected on the item 004- 004-001 white cloth (Q1). Based on the gunshot residue patterns on the test targets, the range-of-fire was determined to be at some distance from 12 inches (12") to twenty-seven inches (27") from the gun muzzle to the cloth at the time the shot was fired.
F7HQHA	Item Q1, the portion of the victim's shirt, was examined visually and one defect was observed. The area around this defect was microscopically examined and chemically processed for the presence of gunshot residues, which were detected. The resultant GSR patterns were compared to the known distance standards K1a, K1b, and K1c. It was determined that the muzzle-to-garment distance was between 12 and 24 inches.
F89WWE	Results of Examinations: The area around the hole in the item 2 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 2 shirt was reproduced at a muzzle-to-target range of greater than nine and less than eighteen inches when using the submitted item 1 distance standards. No other residues were detected.
F9WYF3	The delivered item Q1 was first searched for penetrations. Figure 1 shows an identified penetration that, due to shape and size, may be induced by a bullet of caliber .22. From the penetration area possible traces of GSR were transfered to a secondary trace carrier, which was subsequently treated with chemographical colouring methods. Firstly the Na-Rhodizonate method was applied. Hereby a bullet wipe ring could be identifed as it occurs when a bullet penetrates an object like a fabric. Additionally, spotlike coloured 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 coloured 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 achived coloured pattern with the comparison shots results in an estimation of a shooting distance in the range of 15 to 27 inches. This statement is made under the assumption that no depletion of GSR has taken place (e.g. by other objects present in the line of fire or by the ablation of GSR by blood or in process of the medical supply). [sic]

TABLE 2

WebCode	Conclusions
FBPEVB	The portion of the victim's shirt, item Q1, was examined and chemically tested for the presence of nitrites (using the Modified Griess test) and lead (using the Sodium Rhodizonate test). There were visible particles on the shirt, nitrites detected, and particulate lead. These results were compared to the known distance standards in K1a-K1c. Based on those comparisons, the muzzle of the Ruger pistol was between 12 inches and 27 inches from the defect in the victim's shirt at the time of discharge.
FJM4GL	The submitted evidence (Q1) was visually examined and chemically processed for the presence of gunshot residues. The Modified Griess Test was performed for the presence of nitrites and the Sodium Rhodizonate Test was performed for the presence of vaporous lead. The results were copared[sic] to the known test panels. A pattern of residues was found and indicated a muzzle to target distance of greater than 12" but less than 27".
FRJAJF	The area around the defect on item Q1 was visually inspected, microscopically examined, and chemically processed for gunshot residues and a pattern of residues was detected. Using the photographs of test shots with the suspected firearm and ammunition, a pattern of residues consistent with what was detected on the evidence was reproduced at an approximate distance greater than 15" and less than 27".
FXV6TA	Visual examination of Q1 revealed a central defect with discoloration consistent with bullet wipe and a clearly visible pattern of dark colored particles. One of these particles was removed and chemically tested. The morphology of the particle and the results of the chemical testing confirmed it as a gunpowder particle. Additional testing of Q1 developed a pattern of both nitrite and lead particles. A vivid ring of lead bullet wipe was developed around the central defect. No vaporous lead was developed. The visible and chemically developed patterns on Q1 were compared with the patterns displayed on the K1a, K1b, and K1c images. Based on these comparisons it was concluded that the defect in Q1 was caused by the discharge of a firearm with a muzzle to target distance of greater than 15 inches and less than 21 inches.
GDTGEK	The item 1-1-1 fabric square was examined for the presence of bullet defects and gunshot residues using visual, microscopic, and chemical techniques. One bullet entry defect (Hole A) was observed to the center of the fabric square. Hole A was surrounded by gunpowder, nitrite residue, lead particulate residue, and lead wipe. Photographs of test targets produced with a Ruger 22 caliber pistol, model MKIII and Federal brand 22 caliber ammunition along with photographs of the chemical test media of the test targets were submitted to the laboratory for comparisons with item 1-1-1 and laboratory produced chemical test media. Based on these comparisons, the muzzle of the Ruger model MKIII pistol was determined to be at a minimum of 12 inches to a maximum of 24 inches away from the item 1-1-1 fabric at the time the shot that created Hole A was fired.
GRLWUZ	Item #Q1 is a white shirt that has one (1) bullet hole in the middle of the cut portion submitted. The area around the hole was microscopically examined and chemically processed for the presence of gunshot residues and residues were found. Using the seized Ruger model MKIII .22 caliber pistol and the submitted Federal 36 grain copper washed hollow point ammunition. This pattern of residues was reproduced at a distance of between 12 inches and 24 inches.
GTT97G	The R-1 clothing (Item 4) was microscopically examined and chemically processed for the presence of gunshot residues and gunshot residues were found. Using the supplied photographs of cloth shot with the suspect firearm (Items 1,2 and 3), it was determined that the R-1 clothing (Item 4) was shot at a distance greater than 12" but less than 21".

TABLE 2

WebCode	Conclusions
GVPXAH	The shirt (Q1) is consistent with K1a standard. The Modified Griess Test applied on the shirt (Q1) revealed a GSR pattern which is consistent with distance standards K1b and it allowed to determine that the distance from muzzle to target was approximately between 15" to 21 ".
GX9CDH	1. Ring. 22 particles were found. 2. Ring. 25 particles were found. 3. Ring. 19 particles were found. The shot was a short distance one in a range between 15 and 18" with respect to the gun nozzle and the impact surface.
HWHEUH	Item Q1 was examined for the presence of bullet defects and gunshot residue using visual, microscopic, and chemical techniques. One defect was centrally located and was labeled Hole A. Test targets were generated at known distances using a Ruger brand, model MK III, 22 caliber semiautomatic pistol and Federal brand ammunition. Photographs of the test targets were evaluated to establish a muzzle-to-garment distance between the Ruger pistol and Hole A in item Q1. Gunpowder, nitrite residue, and lead residues were observed surrounding Hole A. The muzzle of the Ruger pistol was determined to be at least 12 inches, but not farther than 27 inches from item Q1 at the time the shot that created the Hole A (bullet entry defect) was fired, provided that no interposed object was between the muzzle of the Ruger pistol and item Q1 at the time the shot was fired.
HWVEQ8	Muzzle to target surface at the time of discharge was approximately 15 to 24 inches.
HZ7JWM	Distance determination request of test# 14-530 (GSR). With the following results: Approximate distance was 18" and 24"
J29273	Item Q1 (piece of cloth). The pattern of gunshot residues around defect A is consistent with a muzzle to target distance of 12 to 27 inches.
J93HRV	Item #Q1 is a portion of a shirt, white in color, unknown brand, unknown size, which has one (1) hole located in the center of the garment. The area around hole #1 was microscopically and chemically processed for the presence of gunshot residue and a pattern of residue was found. Using the recovered Ruger, caliber .22, semi-automatic pistol, model MKIII, with ammunition like that represented by the bullet recovered from the victim, a pattern of residues was reproduced at a distance of between twelve (12) and twenty-four (24) inches. Residues were also found which are consistent with the passage of a bullet.
JH9Y8K	The powder grain pattern detected on the white shirt, (item 4), and the nitrite pattern detected on the griess test for defect A entrance on the white shirt, (item 4), are consistent in diameter and particle population with the powder grain patterns observed on item 1, the photo set of test fire targets, and the nitrite patterns detected on item 2, the photo set of test fire targets treated with griess test, between the distances of 18 inches and 24 inches.
JHHNUY	The K1 a-c known distance standards were compared against the Q1 shirt with bullet hole after the shirt was subjected to Modified Greiss[sic] Test and Sodium Rhodizonate chemical processing. The gunshot residue patterns represented by known distance standards fired at contact, 3 inches, 6 inches, 9 inches and 12 inches are noticeably smaller and denser than the gunshot residue patterns evident on the Q1 shirt after chemical processing. The gunshot residue patterns represented by the known distance standards fired at 27 inches are noticeably larger and less dense than the gunshot residue patterns evident on the Q1 shirt after chemical processing. The muzzle of the firearm was at a distance of between 12 inches and 27 inches from the Q1 shirt at the time of discharge.

TABLE 2

WebCode	Conclusions
JJRZAF	The area surrounding the hole in the shirt(Q1)was examined microscopically and processed chemically for the presence of gunshot residues and a pattern of residues was found. Test patterns were produced at various distances using the suspect weapon 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 of greater than 15 inches, but less than 27 inches.
JLD8M3	Item 1 - 2 piece of shirt (victim): This item consisted of a piece of white cloth measuring approximately 8½" by 8½" with a hole in the center. The hole measured approximately 4mm in diameter. The area around the hole of this item was microscopically examined and chemically processed for the presence of gunshot residues (i.e. lead, copper, nitrites, particulate matter). A pattern of residues (lead, nitrites, particulate matter) was found. Copper residues were not found at the area around the hole. 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 27 inches.
JM7FKE	I compared the powder pattern on item Q1 as received to the powder pattern photographs provided in item K1a. I also compared the Griess and Sodium Rhodizonate test patterns that I produced from Item Q1 to the provided photographs of known Griess and Sodium Rhodizonate test patterns in Items K1b and K1c. Based on these comparisons, I determined the minimum muzzle to target distance to be 18", and the maximum muzzle to target distance to be 24".
JMUTA7	Residues were detected near the hole located in the middle of Item 1 (Q1). When compared to the photos of the test targets (K1a-c), the presence and appearance of the gunshot residues are consistent with a muzzle-to-garment distance of greater than 12" and less than 27".
JXT2XV	Microscopic and chemical examinations were performed on the shirt for gunpowder and gunshot residues. Gunshot residues were found around hole #1. The powder pattern around hole #1 is consistent with the photographs of test results observed at distances between 12 and 24 inches.
JYM6WR	A distance determination of test No. 14-530 was requested with the following results: The distance was 15" - 21".
K688CD	Item #Q1: The irregular-shaped hole and surrounding area was chemically processed for the presence of nitrite and lead residues using the Modified Griess Test (MGT) and Sodium Rhodizonate Test (SRT) and a pattern of residues was observed. The treated photo paper with the nitrite pattern from the white- colored cloth was obtained using the MGT and designated as sub-item #Q1a. The photographs of known firearm discharge residue patterns, Items #K1a to K1c, were compared to the patterns on the untreated and chemically processed white- colored cloth and sub-item #Q1a, to conclude that the approximate distance from the muzzle end of the pistol to the white-colored cloth was at least 12 inches but not more than 24 inches.
KEUHQU	Distance determination test conducted muzzle to target distance is approximately 15" to 27" inches.
KQ4A2G	The piece of fabric, item B3 was impacted by a bullet shot from a distance between 18 to 24" (short distance).
KQ83R2	MICROSCOPIC EXAMINATION OF Q1 CUT SQUARE FROM T-SHIRT WITH SUSPECTED BULLET HOLE REVEALED THE PRESENCE OF GUNSHOT RESIDUES AND AFTER CHEMICAL

TABLE 2

WebCode	Conclusions
	PROCESSING, A GUNSHOT RESIDUE PATTERN WAS OBSERVED. AS A RESULT, THE HOLE WAS DETERMINED TO BE CONSISTENT WITH THE PASSAGE OF A BULLET. THE DISTANCE STANDARDS PROVIDED FROM THE RUGER MKIII .22 CALIBER PISTOL DETERMINED THAT THE PATTERN DEVELOPED IS CONSISTENT WITH A DISTANCE BETWEEN 15" TO 27" FROM MUZZLE TO TARGET.
KRL63G	The reactions observed on the cloth were compared to the reactions observed from the test patterns. Based on the comparison, the white cloth was separated from the muzzle of the Ruger pistol at an approximate range of 15-27 inches at the time of discharge.
L478JL	Test patterns were fired using the .22 Long Rifle caliber Ruger semiautomatic pistol serial number XXX. The distance was measured from the muzzle to the target. Patterns like the patterns found on the shirt (specimen #Q1) were produced at a distance greater than 12 inches and less than 24 inches.
L8BUD4	The area around the hole near the center of Item Q1 was microscopically examined and chemically processed for the presence of gunshot residues, and residues were found. Using the known patterns from Items K1a, K1b, and K1c, this pattern of residues was reproduced at a distance between 12 and 21 inches.
LFT4A6	I examined the white shirt, item Q1, and noted an apparent bullet hole. I noted smokeless powder particles around the hole. I did not observe any soot or smoke on the shirt. I chemically processed item Q1 for gunpowder residues and lead deposits. Based on comparison of the patterns around the hole and on provided distance standards, I concluded that the muzzle to shirt distance was between 15 and 27 inches when the gun was fired, assuming no intervening objects.
LGV7KA	The area around the hole in the item 2 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 2 shirt was reproduced at a muzzle-to-target range of greater than twelve and less than twenty four inches when using the submitted item 1 distance standards. No other residues were detected.
LHPRE2	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 EXAMINATIONS THE FOLLOWING WAS CONCLUDED: THE HOLE IS CONSISTENT WITH A BULLET PASSING THROUGH THE T-SHIRT. THE MUZZLE TO TARGET DISTANCE WAS BETWEEN 15" AND 24"
LPTTGF	The area around the hole was chemically processed for the presence of nitrites and lead. Both nitrites and lead were found to be present. The nitrite and lead residues present on the shirt were compared to the photographs of the test patterns (Item 1), and a muzzle to target range was developed. The firearm was discharged at a muzzle-to-target range of 15 to 27 inches from the shirt.
M8ZN7Z	In my opinion: The minimum distance the muzzle of the firearm was from the target, Item Q1 when the shot was discharged is 12 inches and the maximum distance it could have been from the target, Item Q1 is 21 inches.

TABLE 2

WebCode	Conclusions
MBWAZN	The hole located on the cloth, was produced by the entry of a ballistic projectile fired at a distance ranging from 15 inches to 21 inches approximately.
MNM4AW	The minimum distance that the muzzle of the firearm could have been from the shirt Q1 at discharge was 15 inches and the maximum distance it could have been was 24 inches.
MR3CWB	Examination of the submitted shirt (twill cloth), item #2, revealed the presence of a damaged area located in the center of the item. Microscopic and chemical examination of the fabric surrounding the damaged area revealed the presence of a gun powder pattern. The submitted series of test gun powder patterns, item #1, were compared to the gun powder pattern present on the shirt (twill cloth), item #2. These comparisons revealed the gun powder pattern surrounding the damage on the shirt (twill cloth), item #2, is consistent with a muzzle to target distance of greater than twelve (12) inches and less than twenty seven (27)inches. The paper sample generated from chemical examination of item #2 will be returned with the evidence.
MX4ARM	The residue pattern indicates a muzzle-to-target distance between eighteen (18) and twenty seven (27) inches.
MZNRW7	A pattern of gunshot residues 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 18 and 27 inches.
N2EPTX	Q1 CUT PORTION OF T-SHIRT WAS EXAMINED FOR THE PRESENCE OF GUNPOWDER RESIDUE AND LEAD TRACES WITH POSITIVE RESULTS. A GUNPOWDER PATTERN WAS DEVELOPED FROM THE RESIDUE ON Q1 AROUND THE HOLE IN THE FABRIC (HOLE #1). THE PATTERN WAS COMPARED TO GUNPOWDER RESIDUE PATTERNS MADE USING THE RECOVERED RUGER MK111 CALIBER .22 PISTOL (K1A-C). THE RESULTS OF THIS COMPARISON INDICATE THE HOLE IN Q1 IS CONSISTENT WITH A SHOT BEING FIRED AT A DISTANCE OF APPROXIMATELY 18"-27" FROM THE TARGET WITH THIS WEAPON.
N4ZQFX	One (1) hole/defect was observed on the fabric item 1 and is identified as defect A. This defect and measurements can be referenced in Figure 1. Defect is consistent with the passage of a bullet due to the physical characteristics of the hole and gunshot residues detected around the defect. The pattern of gunshot residue around defect A is consistent with a muzzle to target distance of 12 to 27 inches.
NQ88KE	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 the 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 twenty-four (24) inches from the shirt. This is a conservative estimate based on an evaluation of the untreated and chemically processed residue patterns and assumes there were no intervening objects between the muzzle of the firearm and the shirt at the time the shots were created.
NWJVVW	Q1 PORTION OF VICTIMS SHIRT WAS EXAMINED FOR THE PRESENCE OF GUNPOWDER RESIDUE AND LEAD TRACES WITH POSITIVE RESULTS. A GUNPOWDER PATTERN WAS

TABLE 2

WebCode	Conclusions
	DEVELOPED FROM THE RESIDUE ON THE FABRIC AROUND THE HOLE. THE PATTERN WAS COMPARED TO GUNPOWDER RESIDUE PATTERNS MADE BY A RUGER MKIII .22 CALIBER SEMIAUTOMATIC PISTOL WITH A 5.5" BARREL FIRED INTO SIMILAR MATERIAL IN THE LABORATORY. THE RESULTS OF THIS COMPARISON INDICATE THE HOLE IN THE VICTIMS SHIRT(Q1) IS CONSISTENT WITH A SHOT BEING FIRED AT A DISTANCE APPROXIMATLEY[sic] 18" TO 27" INCHES FROM THE TARGET WITH THIS WEAPON.
P9PN89	It is concluded that the hole found on the fabric is consistent with the action of a bullet fired from a firearm single charge, from a distance between 18" to 24" (short distance).
PM4YN4	Visual and chemical examination on the Item Q1 indicated that the estimated muzzle-to-target distance was between 18 inches and 27 inches.
PVMX3G	Submitted samples of gunshot residue patterns were analyzed. It was determined that the muzzle to target distance of submitted evidence is consistent with 16 to 25 inches.
PYWDWC	An entrance hole was analyzed in the garment by means of macroscopic, microscopic and chemical techniques. The results were compared to the shot patterns as seen in the photographs. This allowed to stablish that the impact of the projectiles containing lead in their constitution was from a distance of between 18 to 27 inches.
PZGUR8	The area around the hole in the R-1 shirt 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 were compared and patterns similar to that observed on the R-1 shirt were produced at distances of greater than fifteen (15) inches and less than twenty-four (24) inches.
R8UMV3	The R-1 piece of twill cloth was microscopically examined and chemically processed for the presence of gunshot residues and a pattern was found. The distance standard photographs of T-1, T-2 and T-3 were compared to the pattern seen on the R-1 twill cloth and the patterns were similar. The pattern on the R- 1 twill cloth was found to be from a distance of greater than twelve (12) inches and less than twenty-four (24) inches.
RD9FLE	The nitrite pattern detected on the griess test for the defect on item 4, the section of white shirt, is consistent in diameter and particle population with the nitrite patterns detected from the test fire targets between the distances of 15 inches to 24 inches.
RDEERE	The area surrounding the defect in the center of the cloth, Item 1A, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed the presence of gunshot residues, however a reproducible pattern was not present. As a result, no muzzle to target distance can be provided. 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
RF8DGU	The pattern of gunshot residues around defect "A" is consistent with a muzzle to target distance of 15 to 27 inches.

TABLE 2

WebCode	Conclusions
RFNRP4	The Q1 shirt was microscopically examined and chemically processed for the presence of gunshot residues and residues were found. Using the K1a, K1b, and K1c distance standards, patterns similar to that seen on the Q1 shirt were produced at distances greater than twelve (12) inches and less than twenty-four (24) inches.
T3WV8H	The area surrounding the defect in the shirt, Item Q1, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed the presence of gunshot residues, however, a reproducible pattern was not present. As a result, no muzzle to target distance can be provided. The following is a summary of testing performed: Microscopic examination for unburnt/partially burnt gunpowder particles: particles consistent with the morphological 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.
TAA2NL	Visual and chemical examination conducted on Q1 and the tests revealed a muzzle to target distance from 15 to 27 inches.
TBNBY9	1. Examination of Exhibit 2 (portion of 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 12 inches and 27 inches.
TEHAVR	2.1.) The bullet hole present in the shirt (Item Q1), was processed for the presence of gunshot residues; combusted gunpowder granules and not combusted gunpowder were detected. Nitrite and lead residue were found. The bullet hole present in the shirt was produced by a bullet from firearm. 2.2.) The modified Griess test for the presence of nitrites and the sodium rhodizonate test for the presence of lead produced patterns consistent with photographs of GSR patterns of a distance of aproximate[sic] range of 21 inches (minimum distance) and 24 inches (maximum distance) from muzzle of the weapon to the bullet hole.
TNDZMY	A comparison of the gunshot residue pattern on item Q1 with those in items K1a, K1b and K1c revealed a muzzle to target range of 12 to 27 inches.
TNLMRL	Item #Q1 is a portion of a shirt, white in color, unknown brand, unknown size, which has one (1) hole located in the center of the garment. The area around hole #1 was microscopically examined and chemically processed for the presence of gunshot residue and a pattern of residue was found. Using the recovered Ruger, .22 caliber semi-automatic pistol, model MKIII, with ammunition like that represented by the bullet recovered from the victim, a pattern of residues was reproduced at a distance of between twelve (12) and twenty-four (24) inches. Residues were also found which are consistent with the passage of a bullet.
TTY37W	THE CLOTH MATERIAL SUBMITTED WAS SUBJECTED TO A VISUAL, MICROSCOPIC AND PRESUMPTIVE CHEMICAL TEST TO INDICATE THE PRESENCE OF LEAD. AS A RESULT OF THIS EXAMINATION WE ARE OF THE OPINION THAT THE LIKELY RANGE OF DISCHARGE IS 21" TO 27" WHEN COMPARING THE POWDER PATTERN TO THE TEST POWDER PATTERNS.

TABLE 2

WebCode	Conclusions
	HOWEVER, WHEN COMPARING THE SODIUM RHODIZONATE TEST CARDS WITH THE QUESTIONED CLOTH WE WOULD BE OF THE OPINION THAT THE RANGE OF DISCHARGE IS LIKELY TO BE GREATER THAN 27".
TYWENG	A pattern of nitrites characteristic of gunshot residue was detected on item 1. This is observed on surfaces that were within the proximity of a discharging weapon. The residue pattern from item 1 indicates a muzzle-to-target distance between eighteen and twenty-four inches.
U8BVAU	Item Q1 defect is consistent with the passage of a bullet having been fired when the muzzle of the firearm is at a distance greater than 12 inches and less than 21 inches.
UATAAV	Gunshot residue deposits were found but without a discernible pattern. Accordingly, the garment (Q1 shirt with bullet hole) was within the muzzle-to-target distance for this firearm when the shot was fired. Using the known weapon with ammunition similar to the questioned cartridges (K1a thru c - Distance Standards), this residue was detected to a maximum distance between 21 inches and greater than 27 inches.
UDVF33	The area around the hole in the R-1 twill cloth was microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was found. Using the T-1, T-2, and T-3 distance standard photographs submitted, patterns similar to the pattern on the R-1 twill cloth were produced at distances greater than twelve (12) inches and less than twenty-four (24) inches.
UET7MV	The defect in Item Q1 is consistent with the passage of a bullet fired from a firearm whose muzzle was greater than 12 inches and less than 24 inches away from the surface of the shirt.
ULVRFB	The hole located on the received piece of fabric was produced by the entry of a ballistic projectile fired at a distance ranging from 15 inches to 21 inches approximately.
UYDP42	The R-1 shirt panel was microscopically examined and chemically processed for the presence of gunshot residues and residues were found. Using the T-1, T-2, and T-3 distance standards submitted, the patterns similar to the pattern on the R-1 shirt panel were produced at distances greater than twelve (12) inches and less than twenty four (24) inches.
V9QGW3	The area around the hole in the shirt in item #Q1 was microscopically examined and chemically processed for the presence of gunshot residues, and a pattern of residues was found. Using the recovered firearm and ammunition, this pattern of residues was reproduced at a distance between fifteen and twenty-seven inches.
VAMP9T	On the basis of the gun shot residues around the bullet hole in the victim's shirt the shooting distance has been between 21" - 27".
VFFRED	The distance from the muzzle of the firearm to the shirt at the time of discharge could have been between 21" and 24"
VJBB4B	The area surrounding the defect in the center of the white fabric, Item Q1, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed the presence of gunshot residues, however a reproducible pattern was not present. As a result, no muzzle to target distance can be provided. 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

TABLE 2

WebCode	Conclusions
	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
VXUTXY	Visual inspection of the white cotton cloth, Lab Item Q1, revealed a single perforating defect in the center of the cloth which was labeled as Defect A. Defect A displays characteristics consistent with the passage of a bullet. The area around Defect A on Lab Item Q1 was visually inspected, microscopically examined, and chemically processed for gunshot residues and a pattern of residues was detected. Using the submitted test patterns for comparison, a pattern of residues consistent with what was detected on Lab Item Q1 was reproduced at a minimum approximate muzzle-to-garment distance of 12 inches and a maximum distance of 24 inches.
VY2RYE	Gunshot residue distance determination was requested using the following: One (1) off-white colored 8½" X 8½" section of cloth, displaying a round whole (approximately ¼" in diameter) and a considerable amount of dark colored residue. Multiple photographs of GSR patterns (distance standards) ranging from contact to 27". Conclusion: Gunshot residue distance determination test performed with the following results: The muzzle to target distance is approximately 15 inches to 24 inches.
VZ7FYC	As a result from the photographs the muzzle distance was between 21 an 24 inches.
VZDH9J	remark question 1.) The maximum distance could not be determined on basis of the foto's[sic] that we received. In a case then the database with standaards[sic] would be used. The wording of the conclusion in the report would be: "The results of the research are more probable if the firing range between 15 inches and 40 inches was then if the firing range outside this firing range was." The following grades are used: - almost approximately equal - slightly more probable - more probable - much more probable - extremely more probable
W2MUKT	CONCLUSIONS: MICROSCOPIC AND CHEMICAL EXAMINATIONS WERE CONDUCTED ON SUBMITTED ITEM Q1 (ONE WHITE CUT SQUARE SWATCH OF MATERIAL EXHIBITING A SUSPECTED BULLET HOLE). OBSERVATION AND EXAMINATION OF Q1 REVEALED WHAT IS CONSISTENT WITH A GUNSHOT RESIDUE PATTERN AROUND THE ENTRANCE OF A SUSPECTED BULLET HOLE. THE 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. K1b, K1c) IN COMPARISON TO THE SUSPECTED BULLET HOLE AND GUNSHOT RESIDUE PATTERN ON Q1 DETERMINED THAT THE DISTANCE FROM MUZZLE TO TARGET IS APPROXIMATELY BETWEEN 15" MINIMUM TO 27" MAXIMUM.
W3J3WJ	a. It is very highly probable that the hole in the T-shirt (Exhibit Q1) is a bullet hole. b. It is probable that this bullet was shot at a distance of 15" - 24" (from the muzzle).
WAM8N3	Item 1 consists of photographs of untreated distance standards. Item 2 consists of photographs of Modified Griess distance standards. Item 3 consists of photographs of Sodium Rhodizonate distance standards. Item 4 is stated to be a shirt with a bullet hole. It was microscopically examined and chemically processed for gunshot residues and a pattern of residues was found. Using the provided distance standards, this pattern of residues was reproduced at a distance greater than fifteen inches and less than twenty-seven inches.

TABLE 2

WebCode	Conclusions
WGHAQE	The residue pattern indicates a muzzle to target distance between fifteen and twenty four inches.
WGK8A4	The areas around and including the irregular shaped hole was chemically processed using the Modified Greiss[sic] Test (MGT), Dithiooxamide Test (DTO), and Sodium Rhodizinate[sic] Test (SRT) to test the presence of nitrites, copper, and lead. The chemical processing using the MGT resulted in patterns indicating the presence of nitrites, the DTO indicated the presence of copper, and the SRT indicated the presence of lead. The photo paper with the MGT pattern was designated as sub-item Q1a. The distance standards of untreated and chemically treated firearm discharge residue patterns, Items #K1a, K1b, and K1c were compared to the untreated and chemically treated square white cloth panel, Item Q1 and sub-item Q1a, to conclude that the muzzle end of the firearm was at a distance between 15 to 27 inches from the square white cloth panel when it was discharged.
WHUGZF	The area surrounding the defect in the center of the white fabric, Item 1, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed the presence of gunshot residues, however a reproducible pattern was not present. As a result, no muzzle to target distance can be provided. 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
WLGVQB	The area surrounding the defect in the center of the portion of white t-shirt, Item 1A, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed the presence of gunshot residues, however a reproducible pattern was not present. As a result, no muzzle to target distance can be provided. 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 were found. Chemical examination for lead residues using the Sodium Rhodizonate test: positive
WNV7D9	Have identified the distance based on the density of the gunpowder located around the hole on the shirt.
WNW3KX	Results: Items 1, 2, 3, and 4 were examined and are as described above. Examination of Item 4 revealed a hole in the center of the cloth. The area surrounding the hole was visually examined and chemically processed. Unburned gunpowder grains and chemical residues that are consistent with the entrance hole produced by a firearm discharge were detected. The submitted photo arrays of test patterns were produced at the following muzzle-to-target distances; contact, three (3) inches, six (6) inches, nine (9) inches, twelve (12) inches, fifteen (15) inches, eighteen (18) inches, twenty-one (21) inches, twenty-four (24) inches, twenty-seven (27) inches. The detected pattern surrounding the hole in the center of item 4 is consistent in size and density to the test patterns produced at muzzle-to-target distances of between nine (9) and

TABLE 2

WebCode	Conclusions
	twenty-seven (27) inches.
WQZTPR	Using the submitted distance standard for comparison the pattern of gunshot residue on the shirt, item 2, was produced at a distance of greater than 15 inches but less than 24 inches.
WVKKDZ	Results of Examination: The area around the item 2 shirt (twill jean) 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 2 shirt was reproduced at a muzzle-to-target range of greater than fifteen and less than twenty-four inches when using the submitted item 1 photographs.
X26XWZ	Examination of the shirt in Item #Q1 revealed the presence of one (1) hole. The area surrounding this hole was examined microscopically and processed chemically for the presence of gun powder and lead residues with the following results: A) A pattern of gunpowder and lead residues was found around Hole A. Using the supplied Distance Standards, it was determined that a pattern of residues like those found around Hole A could be produced at muzzle-to-target distances between twelve inches (12") and twenty-seven inches (27").
X6NKGD	The area surrounding the defect in the portion of the white t-shirt, Item 1A, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed the presence of gunshot residues, however a reproducible pattern was not present. As a result, no muzzle to target distance can be provided. 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
XDAJGC	The bullet hole located in the portion of the shirt was produced by the entry of a ballistic projectile fired at a distance ranging from 15 inches to 21 inches approximately.
XE2JG9	We observe in the trimmed piece of the t-shirt submitted, the presence of a bullet hole compatible with the entrance of a bullet with a caliber of .22. Shooting distance was higher than 18 inches, but lower than 24 inches.
XM7GYR	A pattern of gunshot residues was found. Using the identified weapon with ammunition similar to the questioned cartridges, this pattern of residues was reproduced at a distance from the weapon to the target of between 12 and 27 inches.
XNZAUB	The area surrounding the defect in the center of the white cloth section, Item Q1, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed a pattern of gunshot residues which reproduced powder pattern images, Item K1a, modified Griess test images, Item K1b, and sodium rhodizonate test images, Item K1c, at a muzzle to target distance between 12 inches 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.

TABLE 2

WebCode	Conclusions
	Microscopic examination for lead residues: residues consistent with lead were found. Chemical examination for lead residues using the Sodium Rhodizonate test: positive
XXLNHD	Residues consistent with the discharge of a firearm were detected on Laboratory Item (001.A) (Item Q1) shirt. The firearm discharge distance was determined to be between 12 inches and 27 inches.
XYYVPV	The defect and the area around the defect on the fabric in item Q1 were microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was found. Characteristics of this defect area were compared to corresponding characteristics of defect areas contained within images of known distance test patterns in items K1a, K1b and K1c. The defect in exhibit Q1 is indicative of being reproduced at a distance of between 12 and 24 inches.
XZQVM7	I examined Item Q1 visually and microscopically. There is a single hole consistent with the passage of a bullet surrounded by a sparse pattern of gunpowder particles. I chemically tested this item for the presence of nitrites (Modified Griess Test) and lead (Sodium Rhodizonate Test) then compared these results to the provided photograph standards (K1a thru K1c). Based on the results of the examination and testing I concluded the following: A muzzle to target distance of greater than 12 inches but less than 24 inches is indicated by the results of observation and testing of Item Q1.
Y3PCHM	The area around the hole in the middle of the R-1 Cut Shirt Portion was visually examined and chemically processed for the presence of gunshot residues, and a pattern of residues was found. Patterns similar to the R-1 pattern were produced at greater than eighteen (18) inches and less than twenty-four (24) inches.
YBNQMM	The pattern of gunshot residues around defect "A" on item Q1 is consistent with a muzzle to target distance of 15 to 24 inches.
YD8GHE	Item #Q1 is a white shirt that has one (1) bullet hole in the middle of the cut portion submitted. The area around the hole was microscopically examined and chemically processed for the presence of gunshot residue and residue was found. Using the submitted Ruger, caliber .22 pistol, model MKIII, and the submitted Federal copper washed hollow point ammunition, this patter[sic] of residue was reproduced at distances between 12 inches and 24 inches.
YFEAL7	The item Q1 cotton panel was examined for bullet defects. The garment and observations made are as follows: Cotton panel: This is an 8.5" x 8.5" cotton panel with a single defect (A) observed. Defect A is consistent with being produced by a bullet. Defect A on item Q1 was examined macroscopically, microscopically and processed chemically for the presence of gun powder and lead residues, a pattern of residues was found. Photographs of tests made with the recovered weapon were submitted with item Q1. It was determined that the residue patterns, like that found on the item Q1 cotton panel, could be produced at a muzzle-to-target distance at approximately 18 to 21 inches.
YHA8BC	The white cotton cloth displayed a hole in the approximate center of the cloth. The hole and the area surrounding the hole were examined and chemically processed for the presence of firearm discharge residues. The firearm discharge residue pattern around the hole is consistent with a muzzle-to-target distance greater than 15 inches and less than 24 inches.
YHNHM4	The piece of cloth marked "Item Q1" contained a small hole near the centre. The area

TABLE 2

WebCode	Conclusions
	surrounding the hole was microscopically examined, and tested for the presence of a firearm discharge pattern using the Modified Griess Test. Based on comparisons of the patterns to those of the distance standards marked "Item K1a" and "Item K1b", the distance of firing between the muzzle of the firearm and the front of the cloth marked "Item Q1" was estimated to be between 15 inches and 24 inches.
YJHMHH	The minimum distance that the muzzle of the firearm could have been was 18 inches, and the maximum distance was 27 inches.
Z7QUB2	Item 2 one square piece of cloth. The cloth was visually examined for the presence of suspected bullet holes. One suspected bullet hole was found in the cloth. The cloth was the[sic] visually and stereomicroscopically examined for the presence of gun powder particles. Several gun powder particles were noted on the cloth. The cloth was then chemically processed by way of the modified Griess test for nitrite residues 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 fifteen to twenty-seven inches.
ZEJQ8G	1. I examined the square of cloth (Q1) and found the following: 1.1 A single hole measuring approximately 3-4mm in diameter was located in the centre of the square of cloth. 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 square of cloth was between approximately 15 to 24 inches at the time of discharge.
ZFW8HA	The area surrounding the defect in the center of the piece of white shirt, Item 1A, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed the presence of gunshot residues, however a reproducible pattern was not present. As a result, no muzzle to target distance can be provided. 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
ZJAJ4C	Conclusion: Gunshot distance determination of Wc-1 against K1A, K1B and K1C was conducted with the following results: distance of firearm muzzle was approximately 15 to 27 inches from Wc-1 surface at time of discharge. Note: Wc = white cloth.
ZMXN8G	Q1 (shirt) was visually examined and chemically processed to detect the presence of nitrites and lead. Visual examination revealed a circular defect in the middle of Q1 with bullet wipe. A pattern of propellant particles was also observed around the defect. The pattern tested postive[sic] for nitrites (Modified Griess Test) and positive for lead (Sodium Rhodizonate). The pattern observed on Q1 after visual examination and chemical processing was compared to known standards (K1a-c). It was determined that the muzzle of the firearm was between 21" and 27" from Q1 at the time of discharge.
ZP3JNY	The area surrounding the hole in Item Q1 was examined microscopically and processed chemically for the presence of gun powder and lead residues, and a pattern of residues was

TABLE 2

WebCode	Conclusions
	found. Based on the provided test patterns, it was determined that a pattern of residues like that developed on Item Q1 could be produced at muzzle-to-garment distances of greater than 18", but less than 27".
ZUTW9A	The unknown test target was compared to the submitted targets via visual, microscopic, and chemically processed techniques. The size and distribution of the gunshot residues on the unknown target are consistent with a muzzle to target distance of greater than approximately 15 inches and closer than approximately 24 inches.
ZVKW87	The nitrite pattern detected on the griess test for defect A entrance on item 4 is consistent in diameter and particle population with the nitrite patterns detected from the test fire targets of item 2, the "photo set of test fire targets treated with griess test", between the distances of 18 inches and 24 inches.
ZYG9YJ	The provided distance standards were compared with the observed and chemically developed patterns of the shirt Q1. After that it was determined that the muzzle to target distance was in the range between 18" and 27".

Additional Comments

TABLE 3

WebCode	Additional Comments
2FUBHX	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.
2TGFPU	[Participant included a full Methods and Limitations section that could not be reproduced here]
3LHUC7	No description of method for NaRh treated targets and the treatment was obviously not just a NaRh solution. Was tartrate buffer used? Looked like HCl use, but not stated. Was the NaRh treatment done on a test target after the target was processed with an overlay for Griess? Or was the NaRh treatment done on a previously untreated test target?
3V3HCT	Not having several standards at each distance makes it difficult to establish reproducibility.
6LQ8UT	[Participant included a full Methods and Limitations section that could not be reproduced here].
77R2EA	We don't use the same methods at our laboratory as have been used in the test sampling. Our standard operating procedures for examination of gunshot damages are: IR-detection, modified Griess test, Ditiooxamide[sic] test for copper (KTM) and Modified Sodium Sulphite-test (MFPM) for lead.
7BWJXN	Please contact the Crime Laboratory if additional testing is required. Any digital images for Crime Laboratory case records are maintained at and available in the Crime Laboratory.
8CDKN3	Item 1A = White shirt section (Q1), Item 1B = Test Target Images (K1a), Item 1C = Modified Griess Test Images (K1b), Item 1D = Sodium Rhodizonate Images (K1c). Other than a visual examination, no other analytical tests were performed on the photographs submitted by CTS, Items 1B – 1D. Per Crime Laboratory policy, when a reproducible pattern is not present, a muzzle to target distance cannot be provided.
ACN4NQ	1) Either the patterns need to be produced on larger pieces of cloth, or much closer distances need to be used for the Questioned pattern. This test had insufficient distance patterns because the last three could not be differentiated from each other due to the small size of the material used to collect the[sic] both the known and questioned patterns. The edges of the patterns could not be visualized with any certainty on the last 3-4 test patterns as well as the Questioned pattern. With the gun and ammo in an actual case, I would have extended my end point farther, until powder was no longer present, because I could not determine the exact size of the questioned pattern. I was very uncomfortable using the end point provided because powder was still present. 2) It would not be proper to have the test patterns printed by each individual agency. There is no way to ensure that the quality of each image would be printed the same by different printers. A valid test must be the same for every person taking the test, which could not be guaranteed if each agency printed their own "known" patterns.

TABLE 3

WebCode	Additional Comments
AL78LW	Chemical testing detected the presence of nitrates on the outside surface around the hole in item Q1. Chemical testing detected the presence of a nitrite pattern on the outside surface around the hole in item Q1, with the approximate diameter of 5.5". Chemical testing detected the presence of lead residue on the outside surface around the hole in item Q1.
B9G6P3	Laboratory policy does not allow a range to be reported when a reproducible pattern is not present. Item Q1 had a scattered distribution of loose particles. Loose particles were also present in the bottom of the manila envelope. As such it was difficult to determine the original distribution and density. This could lead to an error in interpretation. It could not be determined by photograph if there were any embedded particles at the known distances, and at what point it transitioned from embedded to only loose particles. At greater distances, this aids in the determination if a reproducible pattern is present at a given location. If this were real evidence that had been manhandled and covered in blood, it would just be a guessing game as to distance. There are too many variables in a real world scenario to make information accurate. Per laboratory policy, we are required to perform a negative Griess control on an area way from any suspected gunpowder to make sure the material is not nitrite sensitive. This could not be done on such a small piece of fabric. The shirt section from previous tests was adequate.
C8J6A4	Feedback for Collaborative Testing Services - the use of photographs for the comparison to the questioned exhibit were well done. They were printed at a 1:1 ratio making it easier for comparison during the examination - I think it is important for the Forensic Scientist to have access to the replicate images to form an opinion of whether or not their questioned sample should be included/or excluded from a certain range (due to the variation often encounted[sic] in range estimation at the same distance using the same ammunition/firearm combination) - While we observed a Pb pattern for our Q1 it was nothing like any of the comparison photographs. We would like to know if any of the other labs found this. Perhaps you could share your method as our pattern was a lot weaker. When you performed the sodium rhodizonate test did you do this on the fabric that had already undertaken modified griess test or was it done on fabric that had not been subjected to the modified griess test.
CUUP8H	[Participant included a full Methods and Limitations section that could not be reproduced here].
DEFAVR	Digital images would be beneficial but only as extra information beyond what it already submitted. The scale digital print outs are best for comparing to the evidence. Another suggestion would be to take a photo of the evidence before it is shipped to the test taker. Upon receiving the test, many of the gunpowder particles had fallen off and many were loose in the package. Since we are comparing against photos taken immediately after test firing it would be beneficial to see how the evidence looked after shooting as well. Per our lab policy we are unable to report out on a lack of pattern. This test should have been closer for a reproducible pattern to be present.
DNN2ZF	Testing for copper residue was conducted on item 1-2 because the test is typically done on holes to help determine the passage of a projectile per our protocol CRIM-D015-V03. Also per the aforementioned protocol we do not conduct the direct method on items for the sodium rhodizonate or dithiooximide tests, unless it is for special circumstances.
EB3T7D	During our testing flakes of burned/partially burned/unburned gun powder was noted falling off the sample and found inside the envelope (packaging). May have an effect on results. May want to consider a different packaging procedure/method; especially when tests are being sent via mail.

TABLE 3

WebCode	Additional Comments
ENXXVR	Microscopic examination detected the presence of numerous gray and blackened disk shaped particles in a radius of 4 1/2 to 6 inches around the hole in item Q1. Chemical testing detected the presence of nitrates in one (1) particle tested from Q1. Chemical testing detected the presence of a nitrite pattern around the hole in Q1. Chemical testing detected the presence of lead deposit at the perimeter of the hole in Q1 and in areas surrounding the hole.
F2NLDP	No discernable/measureable pattern is observed, only scattered particles. Many of the particles observed are very close to the edges of the target. Also, almost all of the particles are loose, therefore a definitive pattern cannot be measured. Per our agency's policy, when no discernable pattern can be measured, no minimum and maximum distances are reported.
F6LH7J	In actual casework, I would fire additional test shots beyond 27".
F89WWE	[Participant included a full Methods and Limitations section that could not be reproduced here]
F9WYF3	According to the SOPs that are used in our lab, the coloring process is not directly performed on the fabrics (case shot and comparison shot series). A secondary trace carrier is used which is desensitized photo paper in the case of Sodium Rhodizonate treatment, and adhesive 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 comparison shots). This was taken into consideration by using wider error ranges when estimating the range margins.
FXV6TA	There was some concern, based on the rather large and diffuse patterns found on Q1, that the entire pattern may not have been captured on the target material. In spite of this, observation of the visible patterns and their relative densities were sufficient to render the reported conclusion.
HWHEUH	1. In casework, I would have created test targets beyond 27 inches. I typically generate test targets outside the reported range. 2. Typically, I do not use the report wording available, as seen on page 1 [of Datasheet]. If I establish a range, I generally use the terms "greater than" and "less than" to signify the parameters. In this instance, the reported parameters would not be included in the muzzle-to-garment distance. Using the available report wording, the minimum and maximum distances are included in the range. 3. In casework, I would have also generated a "blank". Before shooting test targets, a blank test cloth would be subjected to the chemical process being used on the evidence to determine if any contaminants or interferences are present.
JLD8M3	Difficult to examine photos "microscopically" as we would in casework. Their lead testing appears to be done 1) w/o testing for copper first and 2) directly. This is different from how we process our Q and K samples. This makes comparison more difficult.
JMUTA7	Comments about test materials. On first impression of K1a-c, the patterns appeared to be of differing patterns (i.e. K1a 3" in relation to K1b 3" and K1c 3"). Upon further inspection it was realized that they were different process of the same target pattern, but that the photos were oriented differently in most cases. Patterns K1b contact, K1c (21", 24" and 27") could not be verified. Once the orientations were noted, it was noticed that there were slight discrepancies to the pattern to indicate that the photos are not one to one. Although there is a scale present, it seems to be placed as part of the border and not taken in the photo of the pattern. Therefore measurements of the diameter of the pattern could not be taken and used in the determination. There is only one of three patterns that were provided. All three patterns for each distance should be provided so that variability could be evaluated and if there is an oddity or anomaly in any of

TABLE 3

WebCode	Additional Comments
	the patterns, such as K1b 9", the other two shots could be used. For instance, the pattern K1b 9" has a trailing reaction that makes it appear to be further than the 12" pattern. A majority of these issues would be alleviated if the actual test material was marked with some identifying information. The orientation would easily be based off of this annotation, along with knowing that the pattern was the same throughout and that there was no mix up of the patterns. The Griess process seems a bit weak. It is not unusual to have the entire paper have an orange tinge. The photo is almost too white, either the reaction was not as strong as normal, or the white balance was used to lighten the photograph.
JXT2XV	Normal brackets for the unit are 6" - 12".
L8BUD4	There was a great deal of loss of gunpowder particles to the cardboard in which Item Q1 was sent.
LGV7KA	[Participant included a full Methods and Limitations section that could not be reproduced here]
MBWAZN	1. Every photograph has a scale (photographic scale), it would be necessary to explicitly mark reference points (e.g. above ?) at the start of pattern generation. 2. The cloth in this test has no reference mark (example label) so we can not know which is the lower or upper part of it. 3. The cloth should be larger, in order to assess the distribution of powder particles completely. 4. 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[sic] 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. Particularly, we were displeased that iron marks appeared at rhodizonate-based developings, a condition that does not use to happen in our analysis. Our results were more based on the distribution of granules in powder patterns, as well as on lead patterns. Griess reagent-based developings were not very useful for us because of the reasons explained above.
PYWDWC	1. The analyzed garment fragment had only a single firearm shot. 2. The following chemical test were used: Lunge (for nitrites and nitrates pattern detection), sodium rhodizonate (for [sic]
T3WV8H	No minimum or maxumum[sic] distance has been listed for this case in the findings section since our laboratory's muzzle to target distance determinations are based on analyzing obvious

TABLE 3

WebCode	Additional Comments
	differences in gunshot residue patterns from test fires made from different known distances using the same firearm and ammunition. In this case, since there are no patterns visible (microscopically or chemically) no determination is attempted. Perhaps this test should only involve situations of contact and pattern shots in order that some range of distance can be tested and determined. It is our lab's practice to perform a negative Griess control on the submitted fabric to make sure that the garment does not react. In this case, the evidence garment was so small that only a tiny portion located at a far corner could be used to perform this control. This was less than ideal.
TTY37W	THE DISPARITY IN THE RESULTS ABOVE [Table 2: Conclusions] IS LIKELY TO BE DUE TO LOSS OF EVIDENCE WHILE THE CLOTH WAS IN TRANSIT. A RANGE OF FIRE HAS BEEN QUOTED IN THE RESULTS SECTION FROM THE EXAMINATION, HOWEVER, WE WOULD NOT BE CONTENT IN REPORTING THIS CASE. WE WOULD SUGGEST THAT GIVEN THE POSSIBILITY OF LOSS OF EVIDENCE WHILE THE QUESTIONED MATERIAL IS IN TRANSIT THAT RATHER THAN SEND THE CLOTH MATERIAL SEND THE PHOTOGRAPH OF THE RESULTANT CHEMICAL TEST or AN ACTUAL SIZE PHOTOGRAPH OF THE GSR PATTERN BEFROE[sic] CHEMICALLY TESTED. WE DO NOT UNDERTAKE THE MODIFIED GRIESS TEST IN OUR PROCEDURES.
UATAAV	The distance standards should have continued past 27 inches, until a negative Griess pattern was obtained (usually - 48") for an accurate maximum range to be reported. Per our GSR protocol, the direct method for Sodium Rhodizonate test can be attempted after the transfer method has been performed. A transfer method for the distance standards would have been more accurate for comparison to the questioned sample.
ULVRFB	I have some observations and recommendations[sic]: Our procedure is a little 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. That situation influences the comparison of our results with the test distance standards of this proficiency test, principally in the Modificated[sic] Griess Test. If CTS send the test distance standards as digital images on a DVD (in the future) it is convenient to include replicates of the standards at each distance for considerate the variability in the gunshot residues deposition on the fabric or surface. 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.
V9QGW3	The verbiage above [Table 2: Conclusions] is similar to what would be written had the actual firearm and ammunition been submitted for analysis.
VJBB4B	Strictly following policy a distance could not be given.
VZDH9J	using foto's[sic] and databases is not optimal.
W3J3WJ	1. The probability scale used in our Lab, for examinations like this, is (in descending order): A. Very highly probable, B. Highly probable, C. Probable, D. Possible, E. Inconclusive. 2. The procedures used by the manufacturers of this test, as well as the conditions of the test firing used

WebCode	Additional Comments
	here, are different than those applied routinely by this Lab. Hence, the figures quoted for the minimum and maximum shooting ranges may be wider, and the probability - lower. 3. For this reason, we prefer getting the untreated test shots targets, rather than the provided photographs. 4. In estimating the shooting diatance[sic] in this test, we used mainly the test shot results found in our database (for similar ammunition and firearm).
WHUGZF	Laboratory policy prevents distance from being reported when no reproducible pattern is present.
WLGVQB	Laboratory policy prevents a minimum and maximum distance from being reported when no reproducible pattern is present. Item 1A - Item Q1, Item 1B - Item K1a, Item 1C - Item K1b, Item 1D - Item K1c
WNW3KX	The range bracket is based on only having 1 test target per distance and establishing the low end is clearly closer distance than the unknown, the high end is clearly a further distance than the unknown. Additional test shots between 9 and 27 inches may result in a more narrow range in the conclusion. At this time based on only having 1 shot per distance, how well this firearm/ammunition combination is reproducing GSR patterns is unknown. This lab recommends taking 3 test shots per distance to determine how well the firearm is producing patterns at a given distance.
WVKKDZ	[Participant included a full Methods and Limitations section that could not be reproduced here]
X6NKGD	No distance was given as the particles of gunpowder present on the fabric were loose and did not indicate a pattern, rather scattered particles. Laboratory policy prevents reporting a muzzle to target distance when a reproducible pattern is not present.
XDAJGC	1. This proficiency test could be a parameter to measure the performance of the laboratory in gunshot residue analysis on the impact surface, in order to estimate the shooting distance. However, the test could hardly involve other factors different from gun and ammunition, such as: angle of shot, atmospheric conditions of the environment (indoor or outdoor spaces), bleeding, garment manipulation, exposure to adverse weather conditions, influence of washing and immersion in fluids, fragmentation of projectiles, contamination of the victim's clothing by gunpowder in the scenario. Since these factors are not all controllable, the proficiency test would exclude from its design those circumstances that can cause additional complications in the interpretation of results derived from chemographical tests. In other words, the proficiency test would fail to fully cover the reality and complexity of cases received in the laboratory. However, from the point of view of those “ideal” cases, this test is a good evaluation for chemographical methods and comparison techniques applied by the expert. 2. Although every photograph has a scale (photographic scale), it would be necessary to explicitly mark reference points (e.g. above ?) at the start of pattern generation. 3. 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

WebCode	Additional Comments
	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[sic] 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 mainly based on the distribution pattern of the granules of gunpowder. Griess patterns and lead patterns were not very useful for me because of the reasons explained above. 4. I think that the following aspects should be taken into consideration for the development of proficiency tests for distance determination: · Tests should be performed with the same type of fabric as the sample received, to ensure the same thermal effects as well as the same adhesion of gunpowder particles to the fabric. Also, I think you should send a larger portion of the sample for estimating the shooting distance.
XE2JG9	Shooting distance patterns to display Pb was made adapting the method pusblished[sic] on the Journal of Forensic Science 2000; 45 (4): 801-806 and (5): 1000-1008
XM7GYR	The cloth appeared too smooth for adhesion of the particles. When I opened the package, I observed particles rolling on the cloth.
XYYVPV	There were instances of suspicious artifacts in many of the photographs within K1b and K1c. These artifacts appear in the same/near location and position in multiple photos mimicking gunpowder.
YHA8BC	If I had the actual gun and ammunition, then my report statement would read: The firearm discharge residue pattern around the hole is consistent with a muzzle-to-target distance greater than 15 inches and less than 24 inches using the Exhibit X firearm and evidence ammunition.
YHNHM4	1. Can the procedure that was used by CTS be described? Are the sodium rhodizonate patterns developed from the cloths that had already been pre-processed with MGT, or from untreated cloths? 2. Would be better to include multiple shots at each distance for the standards to evaluate variability.
YJHMHH	The test, as received, showed some dislodgement of unburnt propellant particles, as shows by a line of particles present at the edge of the test material. This repositioning of particles from their original position, apparently due to transport when being sent in the mail could perhaps be factored in by sending a photograph of the test, as well as the actual material.
ZFW8HA	Per policy, no distance determination is performed when there is no reproducible pattern. My particular test contained a piece of fabric with a few copper-wash lead shavings and all the gunpowder was loose barely adhering to the fabric. This test must improve if it to be used as a proficiency test. First, the known distance standards provided are only pictures. I cannot microscopically observe the gunpowder present to distinguish embedded and loose gunpowder particles on pictures. Second, based on caliber, firearm, and environmental conditions; the test cannot be uniform unless each test is verified before it is shipped. Third, shipping and handling can cause the powder to fall off the fabric. This was true in my case, when I shook the pieces of flat cardboard paper on my workbench, loose gunpowder fell out.

TABLE 3

WebCode	Additional Comments
ZMXN8G	Upon opening Q1 it was noticed that a lot of particles dislogded[sic] from it and was seen on the cardboard protecting it. Modified Griess test was very faint.
ZYG9YJ	The chosen shooting distances of the distance standards corresponds poorly with the estimated shooting distance. One or two larger distances would be helpful.

Appendix: Data Sheet

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Collaborative Testing Services ~ Forensic Testing Program

Test No. 14-530: GSR - Distance Determination

DATA MUST BE RECEIVED BY *October 14, 2014* TO BE INCLUDED IN THE REPORT

Participant Code: WebCode:

Accreditation Release Statement

CTS submits external proficiency test data directly to ASCLD/LAB and ANSI-ASQ NAB/FQS. 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 and/or ANSI-ASQ NAB/FQS. (Accreditation Release section on the last page must be completed and submitted.)

☐ This participant's data is NOT intended for submission to ASCLD/LAB or ANSI-ASQ NAB/FQS.

Online Data Entry

Visit www.cts-portal.com to enter your proficiency test results online. If you have any questions please do not hesitate to contact CTS.

Scenario:

Police are investigating a shooting at a mall. 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 Ruger model MKIII .22 caliber semiautomatic pistol with a 5.5" barrel from his possession. The bullet recovered from the victim was identified as having come from the suspect's firearm. Rounds of Federal® 36 grain copper plated hollow point 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:

- For the Distance Standards, multiple shots were taken at the same distance to ensure reproducibility and the best representative shot was chosen for further processing.

- For the Modified Griess treatment, before use the photo paper was tested using chemically treated nitrite swabs on the paper which tested positive.

- For the Sodium Rhodizonate treatment, before use the solution was tested on a lead mark on filter paper which tested positive.

Items Submitted (Sample Pack GSRD):

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

Q1: Shirt with bullet hole.

1.) What is the minimum and maximum distance 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".

Minimum distance _____*(inches) and Maximum distance* _____*(inches)*

Please return all pages of this data sheet.

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

3.) Additional Comments

4.) Would your laboratory be interested in receiving the GSR - Distance Determination test distance standards as digital images on a DVD? (Please circle your response) YES or NO

Return Instructions: Data must be received via online data entry, fax (please include a cover sheet), or mail by ***October 14, 2014*** to be included in the report.

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
or Toll-Free: 1-866-FAX-2CTS (329-2287)

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

Please return all pages of this data sheet.

Collaborative Testing Services ~ Forensic Testing Program

RELEASE OF DATA TO ACCREDITATION BODIES

The following Accreditation Releases will apply only to:

Participant Code: WebCode:

for Test No. **14-530: GSR - Distance Determination**

This release page must be completed and received by ***October 14, 2014*** to have this participant's submitted data included in the reports forwarded to the respective Accreditation Bodies.

ASCLD/LAB RELEASE

If your lab has been accredited by ASCLD/LAB and you are submitting this data as part of their external proficiency test requirements, have the laboratory's designated individual complete the following.
The information below must be completed in its entirety for the results to be submitted to ASCLD/LAB.

ASCLD/LAB Legacy Certificate No. _____ ASCLD/LAB International Certificate No. _____

Signature _____ Date _____

Laboratory Name _____

Location (City/State) _____

ANSI-ASQ NAB/FQS RELEASE

If your laboratory maintains its accreditation through ANSI-ASQ NAB/FQS Certificate No., please complete the following form in its entirety to have your results forwarded.

ANSI-ASQ NAB/FQS Certificate No. _____

Signature and Title _____ Date _____

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.