



GSR Distance Determination Test No. 26-5301 Summary Report

Each participant received a sample pack containing known distance shot fabric items (Contact to 30 inches) and a questioned distance shot fabric item for chemical processing and comparison, which they were asked to process each of the provided shot fabric items and report the distance range that the firearm muzzle could have been from the fabric item at the time of discharge. Data were returned from 104 participants and are compiled into the following tables:

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This report contains the data received from the participants in this test. Since these participants are located in many countries around the world, and it is their option how the samples are to be used (e.g., training exercise, known or blind proficiency testing, research and development of new techniques, etc.), the results compiled in the Summary Report are not intended to be an overview of the quality of work performed in the profession and cannot be interpreted as such. The Summary Comments are included for the benefit of participants to assist with maintaining or enhancing the quality of their results. These comments are not intended to reflect the general state of the art within the profession.

Participant results are reported using a randomly assigned "WebCode". This code maintains participant's anonymity, provides linking of the various report sections, and will change with every report.

Manufacturer's Information

Each sample pack contained known and questioned distance-shot fabric items for chemical processing and comparison. Participants were asked to process each of the provided shot fabric items and report the distance range that the firearm muzzle could have been from the fabric item at the time of discharge.

SAMPLE PREPARATION: The fabric was precut, adhered to chipboard, and marked with an "up arrow" as a guide for the direction of the shot pattern to reference during production and examination.

KNOWN AND QUESTIONED DISTANCE(S): The firearm was set on a gun rest and the fabric was placed at predetermined distance(s) from the muzzle of the firearm. This was done for each of the known distances and the questioned distance. Immediately following this procedure, each of the item(s) were secured with another piece of chipboard, placed in a pre-labeled envelope and sealed.

SAMPLE PACK ASSEMBLY: For each sample pack, one item from each known distance and one questioned-distance item were placed into a pre-labeled box and sealed.

VERIFICATION: Predistribution results were consistent with each other and the manufacturer's preparation information with the following "greater than" and "less than" ranges (in inches): 0 to 18, 6 to 12, and 6 to 18.

Item(s)	Distance(s)	Substrate	Firearm	Ammunition
Known Distances	Contact - 30" (6" Increments)	White Knit Fabric (Cotton/Spandex Blend)	Smith & Wesson bodyguard 2.0 (0.380 caliber)	Speer Lawman 380 ACP 95 gr TMJ
Questioned	10"	White Knit Fabric (Cotton/Spandex Blend)	Smith & Wesson bodyguard 2.0 (0.380 caliber)	Speer Lawman 380 ACP 95 gr TMJ

Summary Comments

This test was designed to allow participants to assess their proficiency in muzzle to target distance determination using GSR patterns. Participants were supplied with known distance shot fabric items (Contact to 30 inches) and a questioned distance shot fabric item for chemical processing and comparison. The firearm was set on a gun rest and the fabric was placed 10 inches away from the muzzle of the firearm. Refer to the Manufacturer's Information for preparation details.

In Table 1: Distance Determination Results, all 95 responding participants (100%) reported a "greater than" distance between Contact/0 and 9 inches and a "less than" distance between 12 and 24 inches. Nine participants that did not report Distance Determination results in Table 1 provided distance-related results in Table 2: Conclusions. In the summary of this table, CTS has grouped the responses provided by the participants based on their "greater than"/"less than" distance results and provided a tally of the ranges between responses as calculated by CTS.

CTS then reviewed the ranges based on participants' reported values and determined the most common reported range, the mode, was 12 inches. A 6-inch allowance was applied to the modal value of 12 inches to account for the difference between the known standard distances. Therefore, any calculated range greater than 18 inches was highlighted as inconsistent.

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

Distance Determination Results

What is the distance range that the muzzle of the firearm could have been from the shirt (Questioned) at the time of discharge? Please report a numeral response (e.g. 6) from the supplied Distance Standards.

TABLE 1
(Distance in Inches)

WebCode	Greater Than	Less Than	Calc. Range	WebCode	Greater Than	Less Than	Calc. Range	WebCode	Greater Than	Less Than	Calc. Range
243326	6	12	6	B4RFGV	6	18	12	LDJGNG	6	18	12
26XL38	6	18	12	B9XABQ	6	18	12	LJPAHD	6	18	12
2G6QTY	6	12	6	BJ6UXT	6	12	6	LU9NJU			
2VMJG7	6	18	12	BJHNC8	6	18	12	LWEA9F	6	18	12
2ZJ9ZY	6	12	6	BU7CD3	6	18	12	LX8ZEU			
3LVK8C	6	18	12	CL4PU2	6	18	12	MMHQ8C	6	12	6
42MH62	0	18	18	CQJZ86				N2UNPH	6	12	6
4VL7A4	6	18	12	D6C7GQ	6	18	12	N3Q63E	0	12	12
4YGZ86	6	18	12	D79MTM	6	12	6	NB6QFP	6	18	12
4YLG64	6	18	12	EA6NAV	6	18	12	NWNVL	6	12	6
6H7VWX	6	18	12	EL2EC3				PTKJDR			
6LPPX6	6	18	12	ER4NHV	6	18	12	PXBUPB	6	18	12
6PP2T6	6	18	12	EVK98W	6	12	6	Q28XVN	6	12	6
7P88TV	6	18	12	EWXHK4	6	18	12	Q2CEUM	0	18	18
7YV3RB	6	18	12	F8TDTH	6	18	12	QHGL9N	0	18	18
8HGGJ6	0	18	18	F9M4YW	6	18	12	QKKJDP	6	18	12
8L4WD7	6	12	6	FEAQU3	0	18	18	QT3QFN	6	18	12
92CA43	6	18	12	FJ987W				QU8KVK	6	12	6
97G6N3	0	12	12	FN3YJZ	6	18	12	QUB6JN	6	24	18
98DLZZ	6	18	12	FWVE4X	0	12	12	QXD4XM	6	18	12
9JQLWT	0	18	18	G6KHMK	6	18	12	R4UXAB	9	18	9
9R6UXV	6	18	12	GFZCZY				R8EQLD	0	18	18
9ZFTR7	6	12	6	GQZ3JL	6	12	6	RECHU8	6	18	12
A3XBMV	6	18	12	H7B3TG	0	12	12	RKZ3XM	6	18	12
A729V4	6	18	12	H84WNZ	0	18	18	RPD4YK	6	12	6
ADYXET	6	18	12	HB3ABP	6	18	12	RTCEUK	6	18	12
AGHTFZ	6	18	12	JFCNXU	6	18	12	TLTFXK	6	18	12
AGJQQV	6	18	12	JJCYPN	6	12	6	TNUJML	0	18	18
B2ZH74	6	18	12	LCQHDP	6	18	12	U9KRKG	6	12	6

TABLE 1
(Distance in Inches)

WebCode	Greater Than	Less Than	Calc. Range	WebCode	Greater Than	Less Than	Calc. Range	WebCode	Greater Than	Less Than	Calc. Range
VCE9AF	6	18	12								
VELQ9C	6	12	6								
WJANEE	6	18	12								
WNPXRH	6	18	12								
WQQ7RL	0	18	18								
X9T4VH	6	18	12								
XAZKP8	0	12	12								
XF6GDD	6	18	12								
XPFJYE	6	18	12								
Y8RR9D											
YVA9NG											
YWQ6FG	6	18	12								
Z48ZWB	6	12	6								
Z9HDEA	6	18	12								
ZCFR2Y	6	18	12								
ZKBU4B	6	18	12								
ZT7YWC	6	12	6								

Response Summary		Distance Determination		Participants: 104	
Greater Than Distance	Participants Reporting	Less Than Distance	Participants Reporting	CTS Calculated Range	Participants Reporting
Contact / 0	15 (14.4%)	Contact / 0	0 (0.0%)	6	20 (19.2%)
6	79 (76.0%)	6	0 (0.0%)	12	63 (60.6%)
12	0 (0.0%)	12	25 (24.0%)	18	11 (10.6%)
18	0 (0.0%)	18	69 (66.3%)	24	0 (0.0%)
24	0 (0.0%)	24	1 (1.0%)	Other	1 (1.0%)
30	0 (0.0%)	30	0 (0.0%)	No Response	9 (8.7%)
Other	1 (1.0%)	Other	0 (0.0%)		
No Response	9 (8.7%)	No Response	9 (8.7%)		

Conclusions

TABLE 2

WebCode	Conclusions
243326	Due to the number of remaining gunpowder particles and their scattering diameter, the muzzle of the firearm at the moment of firing was between 6 to 12 inches, near to the middle. (9-10 inches)
26XL38	The absence of fouling, the powder grain pattern, and the nitrite pattern detected on the griess test for defect A entrance on the section of white fabric labeled shirt with bullet hole, (item 1), are consistent with the absence of fouling and with the diameter and particle population of the powder grain patterns and the nitrite patterns of the griess tests from the test fire target series labeled distance standards, (item 2), between the distance of greater than 6 inches and less than 18 inches.
2G6QTY	The questioned shirt and the reference test samples of known firing distances were examined using the Modified Griess Test, prepared and validated prior to analysis. The examination revealed the presence of nitrite anions, which are indicative of the deposition of firearm discharge residues associated with close-range firing. A comparative assessment of the residue patterns observed on the questioned sample and the reference samples of known firing distances was conducted. Based on the distribution, density, and overall characteristics of the nitrite residue patterns, it was possible to estimate the firing distance between the muzzle of the firearm and the shirt. The results indicate that the firing distance was approximately between 6 and 12 inches.
2VMJG7	The powder grain pattern and the nitrite pattern from the griess test for defect A entrance on item 1, the section of white fabric labeled shirt with bullet hole, are consistent in diameter and particle population with the powder grain patterns and the nitrite patterns from the griess tests for item 2, the test fire target series labeled distance standards at 6-inch increments from contact to 30 inches on untreated white fabric, between the distances of 6 inches and 18 inches.
2ZJ9ZY	The distance between the firearm's muzzle and the shirt is between 6 and 12 inches - (Closer from 6 inches than 12 inches)-
3LVK8C	RESULTS AND CONCLUSIONS The following results and conclusions for the items in this report are based upon direct analysis, measurements, and examination by the reporting scientist and reviewed by the scientist performing the technical and administrative review. Clothing Analysis: Methodology: Physical (Visual Examination) Chemical (Color Test Modified Griess) Chemical (Color Test Sodium Rhodizonate) The defect/hole, designated as "A", measured approximately 1/4 inch in greatest dimensions and was located approximately 4 1/2 inches from the right side and 4 inches from the right side of the fabric. Visual/microscopic examination of defect/hole "A" revealed the presence of apparent bullet wipe/gunpowder. Visually/microscopy did not reveal the presence of apparent soot. Chemical testing of defect/hole "A" indicates the presence of *nitrite residues/**lead residues. Note: *Nitrites are present in gunpowder residue. **Lead residue can be present in bullets/bullet cores and ammunition primers Opinion/Interpretation Examination of defect/hole "A" indicated that it was visually consistent with the passage of a projectile/bullet based upon the physical characteristics observed and the chemical tests performed. Distance Determination Analysis: Methodology: Physical (Visual Examination) Chemical (Color Test Modified Griess) Microscopy (Comparison Microscope) Item 2, the untreated white cloth, is a distance of contact. Item 2 was chemically analyzed for gunpowder residues. Item 3, the untreated white cloth, is a distance of 6 inches. Item 3 was chemically analyzed for gunpowder residues. Item 4, the untreated white cloth, is a distance of 12 inches. Item 4 was chemically analyzed for gunpowder residues. Item 5, the untreated white cloth, is a distance of 18 inches. Item 5 was chemically analyzed for gunpowder residues. Item 6, the untreated white cloth, is a distance of 24 inches. Item 6 was chemically analyzed for gunpowder residues. Item 7, the untreated white cloth, is a distance of 30 inches. Item 7 was chemically analyzed for gunpowder residues. The pattern of gunpowder/gunpowder residues observed and documented from Item 1, defect A, the white cloth, was reproduced at a muzzle to target distance between 6 to 18 inches. The chemical residue pattern observed and documented from Item 1, defect A, the white cloth, was produced at a muzzle to target distance between 6 and 18 inches. Miscellaneous Analysis: Methodology Physical (Visual Examination) Item 1A, the chemical test pattern, was sealed in a manila envelope and will be returned with the evidence for possible future analysis. Item 2A, the chemical test pattern, was sealed in a manila

TABLE 2

WebCode	Conclusions
	envelope and will be returned with the evidence for possible future analysis. Item 3A, the chemical test pattern, was sealed in a manila envelope and will be returned with the evidence for possible future analysis. Item 4A, the chemical test pattern, was sealed in a manila envelope and will be returned with the evidence for possible future analysis. Item 5A, the chemical test pattern, was sealed in a manila envelope and will be returned with the evidence for possible future analysis. Item 6A, the chemical test pattern, was sealed in a manila envelope and will be returned with the evidence for possible future analysis. Item 7A, the chemical test pattern, was sealed in a manila envelope and will be returned with the evidence for possible future analysis. Red-Brown Stain Analysis: Methodology: Physical (Visual Examination) No visible red-brown stains were observed on Items 1, 2, 3, 4, 5, 6, and 7, the cotton twill jean fabric. Evidence in this case will be returned to the investigative agency.
42MH62	Q1 – Patterns of residues consistent with the discharge of a firearm and residues consistent with the passage of a bullet were observed. The residues produced by the test patterns were compared to the patterns of residues around Q1. It is the opinion of the undersigned that the residue patterns from Q1 indicate a muzzle-to-target distance that is greater than contact and less than 18".
4VL7A4	Based on the comparison between Test 26-5301 QUESTIONED DISTANCE envelope 1 and the textile fragments from the sample package of shot distance residues received: Test 26-5301 KNOWN DISTANCE CONTACT envelope 2, Test 26-5301 KNOWN DISTANCE 6 INCHES envelope 3, Test 26-5301 KNOWN DISTANCE 12 INCHES envelope 4, Test 26-5301 KNOWN DISTANCE 18 INCHES envelope 5, Test 26-5301 KNOWN DISTANCE 24 INCHES envelope 6, Test 26-5301 KNOWN DISTANCE 30 INCHES envelope 7. And the results of the physical studies and chemical tests applied to the textile fragment, item 1, indicate that the estimated distance for the shot that caused the analyzed hole is within a range of 6 to 18 inches, considered between the muzzle of the weapon and the surface of the textile fragment, with the samples sent, items 2 to 7.
4YGZ86	The powder grain pattern and the nitrite pattern from the griess test for defect A entrance on the section of white fabric labeled shirt with bullet hole, (item 1), are consistent in diameter and particle population with the powder grain patterns and the nitrite patterns from the griess tests for the test fire target series labeled distance standards at 6-inch increments from contact to 30 inches on untreated white fabric, (item 2), between the distances of 6 inches and 18 inches.
4YLG64	The distance range between the muzzle of the firerm and the shirt was 6 inches and 18 inches.
6H7VWX	Test patterns were supplied from contact to thirty inches at six-inch intervals. A comparison of test patterns to the questioned pattern indicates the muzzle to garment distance was between six and eighteen inches.
6LPPX6	The residue pattern from the cloth (item 1.1) indicates a muzzle-to-target distance between six (6) and eighteen (18) inches.
6PP2T6	The results of the visual examinations and chemical tests for items 1.3-1.5 (pattern tests) were compared to the results of the visual examinations and chemical tests of item 1.1. Similar characteristics were observed between items 1.3-1.5 and item 1.1. Therefore, the residue pattern from item 1.1 indicates a muzzle-to-target distance between 6 and 18 inches.
7P88TV	Comparison of the gunshot residue patterns found on item Q1 to a series of known distance standards (K1) indicates that the muzzle-to-target distance was greater than 6 inches and less than 18 inches.
7YV3RB	Examination of the Item A1-1 revealed the presence of a hole in the center of the piece of cloth. The area around this hole was examined visually, and processed chemically for the presence of gunpowder and lead residues (gunshot residues), and a pattern of residues was found. Test patterns were provided at distances of contact, six (6), twelve(12), eighteen (18), twenty-four (24) and thirty (30) inches. The residue pattern found on the center of Item A1-1 is consistent based on pattern size and density with having been produced at a distance between approximately six (6) inches and approximately eighteen (18) inches.
8HGGJ6	The questioned fabric was examined visually and processed chemically for the presence of gunshot

TABLE 2

WebCode	Conclusions
	residues. Using the provided standards, distance determination testing indicate that the muzzle of the unknown firearm was greater than contact and less than 18 inches from the questioned fabric when discharged.
8L4WD7	The area surrounding the perforation in the Questioned item was visually and chemically examined for the presence of gunshot residues. The known distance standards (contact, 6 inches, 12 inches, 18 inches, 24 inches and 30 inches) that were created using the exhibit Smith & Wesson handgun were also visually and chemically examined for the presence of gunshot residues and compared to the Questioned item. As a result, I formed the opinion that the muzzle of the Smith & Wesson handgun was more than 6 inches and less than 12 inches from the victim when it was discharged.
92CA43	The distance of firing from the muzzle of the firearm used for the known distance standards to the victim's shirt was estimated to be between 6 inches to 18 inches.
97G6N3	Muzzle to target distance greater than 0 inches (contact) and less than 12 inches from muzzle of firearm.
98DLZZ	The powder grain pattern and the nitrite pattern detected around defect A entrance are consistent in diameter and particle population with the powder grain patterns and nitrite patterns detected from the test fire targets between the distances of 6 inches and 18 inches.
9JQLWT	Comparisons have been made between the questioned item pattern and control patterns generated by firing at measured distances. The findings indicate that the firing distance between the gun muzzle and the surface of the questioned item pattern was greater than contact and less than 18 inches.
9R6UXV	The area around Hole #1 in Item 2 was microscopically examined and chemically processed for the presence of gunshot residues. Residues were found which are consistent with the discharge of a firearm and passage of a bullet. Using the Smith & Wesson Bodyguard 2.0 .380 caliber handgun with the Speer Lawman 380 ACP 95gr TMJ ammunition, the pattern of residues observed around Hole #1 in Item 2 was reproduced at a distance of between approximately 6 inches to 18 inches.
9ZFTR7	Item 1.1 was visually and microscopically examined and chemically processed for the presence of gunshot residues. A single defect consistent with the passage of a fired bullet was observed on Item 1.1 surrounded by gunshot residues. Using the known distance standards, the defect on Item 1.1 is consistent with a muzzle to target distance of greater than 6 inches and less than 12 inches.
A3XBMV	The muzzle of the pistol was further than 6 inches and closer than 18 inches from the target when the shot was discharged.
A729V4	Item 1A (white fabric) was visually examined. One defect was observed near the center of the fabric (Hole A). The area around Hole A in the center of the white fabric (Item 1A) was visually inspected, microscopically examined, and chemically processed for the presence of gunshot residues. A pattern of residues was observed. A similar pattern of residues was reproduced at an approximate muzzle-to-target distance of greater than 6 inches and less than 18 inches.
ADYXET	The piece of fabric, Exhibit ITEM1, has damage to centre of the fabric that is consistent with having been caused by the passage of a fired bullet traveling in a front to back direction. Using the known distance test panels, ITEM2 through ITEM7, the damage and firearm discharge residue pattern observed on the piece of fabric, Exhibit ITEM1, is consistent with having been caused by a shot fired at a muzzle to target distance greater than 6 inches and less than 18 inches.
AGHTFZ	The defect and area surrounding the defect were examined microscopically and processed chemically for the presence of gunshot residues. A pattern of residues was found and developed. The distance standards listed under Items 01-B through 01-G were used to compare to the pattern of residues developed around defect #1. The muzzle-to-target distance at which the pattern of residues was reproduced is in the range of 6 to 18 inches. Note: The reported shooting distance is an estimation based on test patterns created under controlled conditions and the following assumptions: (1) Item 01-A was the first medium to be hit by the bullet, (2) no intervening objects interfered with gunshot residue deposition, and (3) no major amounts of gunshot residues were lost during medical treatment or the

TABLE 2

WebCode	Conclusions
	handling/transport of the item(s).
AGJQQV	The powder grain pattern and the nitrite pattern detected around defect A entrance is consistent in diameter and particle population with the powder grain patterns and nitrite patterns detected from the test fire targets between the distances of 6 inches and 18 inches.
B2ZH74	The questioned garment was found to consist of a piece of white fabric with an apparent bullet hole near the centre. Test firings from a suspect firearm were also submitted. Visual examination and chemical testing of the area around the apparent bullet hole indicated a pattern of residues consistent with the discharge of the firearm in question at a distance of between 6 inches and 18 inches from the point of contact.
B4RFGV	Item "Questioned" was microscopically examined and chemically processed for the presence of gunshot residue. Residues were found that are consistent with the passage of a bullet. Distance standards were prepared using the suspected firearm, a Smith and Wesson Bodyguard 2.0 380 Auto caliber pistol, and rounds of Speer Lawman 380 Auto 95 grain total metal jacket ammunition. The evidence item "Questioned" was compared to the distance standards and the pattern of residues for the apparent bullet hole was reproduced at a muzzle to garment distance of greater than approximately 6 inches and less than approximately 18 inches.
B9XABQ	By physical examination and chemical analysis, it was detected the presence of gunshot residues (gunpowder, nitrites and lead) around the area surrounding the hole in item P-2. A study of gunshot residue distance determination/muzzle to garment was conducted, using the known distances provided from in item P-1. It was determined that the hole found in P-2 is consistent with approximated muzzle to garment distance between 6 inches and 18 inches.
BJ6UXT	One (1) White cotton t-shirt, having a 1/4" by 1/4" defect with a 4" by 3" gunshot residue pattern. A distance determination examination was conducted and determined the distance from muzzle to target was greater than 6" but less than 12".
BJHNC8	The area around the suspected bullet hole in Item 2 was visually examined and chemically processed to observe / develop any muzzle residue pattern. The pattern developed was compared to the standard patterns listed as Item 1 and appears to have been generated at a distance beyond the pattern marked as from 6 inches but less than the pattern marked as from 18 inches.
BU7CD3	The area surrounding the defect in the center of the white cotton section, Item 1.A, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed a pattern of gunshot residues which was reproduced using the known standards, Item 1.B, at a muzzle to target distance between 6 inches and 18 inches.
CL4PU2	The area around Hole A on the center of Item 1A (white fabric) was visually inspected, microscopically examined, and chemically processed for the presence of gunshot residues. A pattern of residues was observed. Using supplied test panels a similar pattern of residues was reproduced at an approximate muzzle-to-target distance of greater than six (6) inches and less than eighteen (18) inches.
CQJZ86	The defect in the shirt was tested and is consistent with the passage of a bullet. The muzzle to target distance for the shirt at the time of discharge was determined to be intermediate. No drop-off distance was determined at this time. Intermediate: The range at which a firearm and ammunition combination will deposit visible or detectible gunpowder particles on a target.
D6C7GQ	The area around Hole 1 in Item 2 was microscopically examined and chemically processed for the presence of gunshot residues. Residues were found which are consistent with the discharge of a firearm and passage of a bullet. Using the suspect firearm and ammunition, the pattern of residues observed around Hole 1 in Item 2 was reproduced at a distance of between approximately 6 to 18 inches.
D79MTM	The estimated distance between the firearm's muzzle and the shirt, is between 6 and 12 inches.
EA6NAV	The area surrounding the defect in the center of the white fabric rectangle, Item 1.A, was microscopically examined and chemically processed for the presence of gunshot residues. This

TABLE 2

WebCode	Conclusions
	examination revealed a pattern of gunshot residues which was reproduced using the known standards, Item 1.B, at a muzzle to target distance between 6 inches and 18 inches.
EL2EC3	1. Examination of Exhibit 2 (Fabric) revealed physical characteristics consistent with those observed at a close range of fire. TECHNICAL NOTES Contact or Near Contact is defined as when the muzzle of the firearm is in/near contact with the target at the time of discharge. Close is defined as the range of fire at which a firearm and ammunition combination will deposit a pattern of gunpowder or vaporous lead on a target. Undetermined is defined as when a specific muzzle to target distance could not be determined due to a lack of defined gunshot residue patterns. This may indicate the shot was discharged from a distance beyond the maximum distance for the deposition of residues, an intervening object was present at the time of discharge, or that residues were lost during handling of the item prior to examination.
ER4NHV	ANALYSIS AND RESULTS: The questioned sample, item #1, was visually and microscopically examined. It was found to have one (1) circular defect located in the middle of the white fabric piece. The area around the defect was chemically processed for the presence of gunpowder residues. Using known distance patterns for comparison, the defect on item #1 is consistent with a gunshot occurring at a distance greater than 6 inches and less than 18 inches.
EVK98W	The shirt (questioned) was examined visually, microscopically, and chemically tested for firearm discharge residues. The observed patterns were compared to the provided distance standards. The standards, items 6 inches, 12 inches, and 18 inches, were also chemically tested for firearm discharge residues. These samples were chosen as they were visually the most similar to the questioned sample. The remaining standards, Contact, 24 inches, and 30 inches, were eliminated and not further chemically treated due to significant differences seen during visual examination. The distance range that the muzzle of the firearm could have been from the shirt at the time of discharge was in my opinion, greater than 6 inches and less than 12 inches.
EWXHK4	The chemical pattern observed on the questioned sample was reproduced at a muzzle to target distance between 6 inches and 18 inches.
F8TDTH	All items were examined for the presence of bullet defects and gunshot residue using visual, microscopic, and chemical techniques. Bullet holes were observed in each piece of fabric. Deposits characteristic of the discharge of a firearm were detected around the holes on the items. A pattern of nitrites was observed on all items submitted. The characteristics of 26-5301.01 were compared against the known patterns provided (26-5301.02 through 26-5301.07). The residue pattern indicates a muzzle to target distance greater than 6 inches but less than 18 inches.
F9M4YW	Item 1A (portion of white cloth) was visually examined and a single defect labeled hole A was observed in the approximate center. The area around hole A located on item 1A was visually inspected, microscopically examined, and chemically processed for the presence of gunshot residues. A pattern of residues was observed. Using the supplied distance standards (items 1B through 1G) a similar pattern of residues was observed at an approximate muzzle-to-target distance of greater than 6 inches and less than 18 inches.
FEAQU3	Item 1 was microscopically examined, chemically processed and a pattern of residue was developed / observed consistent with the discharge of a firearm at an intermediate distance (typical arm's length, but greater than contact). Items 2-7 were chemically processed and patterns of residue were developed / observed. Using the residue patterns developed / observed on Items 2-7, the residue pattern developed on Item 1 was most similar to the test patterns described as being developed between contact and eighteen (18) inches.
FJ987W	The Questioned panel was visually, microscopically, and chemically examined for the presence of gunshot residues. The defect in the Questioned panel was consistent with the passage of a bullet. Residues found around the defect on the Questioned panel were consistent with a muzzle-to-target distance of intermediate. Testing to determine the approximate drop-off distance was not performed due to a lack of a submitted firearm. Glossary: Gunshot residues: The total residues resulting from the discharge of a firearm. It includes both gunpowder and primer residues, carbonaceous material,

TABLE 2

WebCode	Conclusions
	metallic residues from projectiles, fouling, and any lubricant associated with the projectiles. Distant: A range at which only the bullet reaches the target. No tearing of the target material observed, and no gunpowder particles or soot are observed or chemically detected. Intermediate: The range at which a firearm and ammunition combination will deposit visible or detectible gunpowder particles on a target. Contact/Near Contact: The muzzle of the firearm was in contact with or very near the target at the time of discharge with possible sooting, ripping, tearing, and/or singeing of the target material. Drop-off Distance: The distance where the firearm and ammunition combination will no longer deposit observable/detectible residues on a specific target material.
FN3YJZ	1. One (1) cardboard box labeled in part "26-5301 [Code]", containing the following: 1A. One (1) manila envelope labeled in part "QUESTIONED", containing one (1) white cotton knit cloth with one (1) defect. 1A1. Chemical test pattern (Modified Griess) collected from Item 1A during laboratory examination. 1B. One (1) manila envelope labeled in part "CONTACT", containing one (1) white cotton knit cloth with one (1) defect. 1C. One (1) manila envelope labeled in part "6 INCHES", containing one (1) white cotton knit cloth with one (1) defect. 1C1. Chemical test pattern (Modified Griess) collected from Item 1C during laboratory examination. 1D. One (1) manila envelope labeled in part "12 INCHES", containing one (1) white cotton knit cloth with one (1) defect. 1D1. Chemical test pattern (Modified Griess) collected from Item 1D during laboratory examination. 1E. One (1) manila envelope labeled in part "18 INCHES", containing one (1) white cotton knit cloth with one (1) defect. 1E1. Chemical test pattern (Modified Griess) collected from Item 1E during laboratory examination. 1F. One (1) manila envelope labeled in part "24 INCHES", containing one (1) white cotton knit cloth with one (1) defect. 1F1. Chemical test pattern (Modified Griess) collected from Item 1F during laboratory examination. 1G. One (1) manila envelope labeled in part "30 INCHES", containing one (1) white cotton knit cloth with one (1) defect. 1G1. Chemical test pattern (Modified Griess) collected from Item 1G during laboratory examination. RESULTS AND CONCLUSIONS The following results and conclusions for the items in this report are based upon direct analysis, measurements, and examination by the reporting scientist and reviewed by the scientist performing the technical and administrative review. Clothing Analysis: Methodology: Physical (Visual Examination) Chemical (Color Test Modified Griess) Chemical (Color Test Sodium Rhodizonate) Microscopy (Stereo Microscope) Item 1A with one (1) defect, designated as "A", measured approximately 1/4 inch in greatest dimensions and was located approximately 5 1/2 inches from the top edge and 4 inches from the right edge. Chemical testing of defect/hole "A" indicates the presence of *nitrite residues/**lead residues. Note: *Nitrites are present in gunpowder residue. **Lead residue can be present in bullets/bullet cores and ammunition primers Visual/microscopic examination of defect "A" revealed the presence of apparent bullet wipe and gunpowder. No visible soot was observed. Opinion/Interpretation Examination of defect "A" indicated that it was visually consistent with the passage of a projectile/bullet based upon the physical characteristics observed and the chemical tests performed. Distance Determination Analysis: Methodology: Physical (Visual Examination) Chemical (Color Test Modified Griess) Chemical (Color Test Sodium Rhodizonate) The pattern of gunpowder/gunpowder residues observed and documented from Item 1A was reproduced at a muzzle to target distance between 6 and 18 inches. Item 1A1, Item 1C1, Item 1D1, Item 1E1, Item 1F1 and Item 1G1 were each sealed in an individual manila envelope and will be returned with the evidence to the submitting agency. No Analysis Performed: No further analysis was performed on the following item(s): Item 1B
FWVE4X	Upon examining the hole in the shirt (Exhibit Q), we have found a high-level match to the scenario in which the shooting towards the victim occurred from an estimated distance in the range of near-contact to 12". *The shooting distance estimation is based on the assumption that Exhibit Q was the first medium to be hit by the bullet, and that the shooting was performed under normal conditions.
G6KHKM	The questioned clothing item was examined visually, microscopically and chemically with the following results: -bullet wipe was surrounding the bullet hole -gunpowder was dispersed approximately circularly around the bullet hole out to approximately 2 inches -quantofix and sodium rhodizonate processing was performed on the known and unknown samples Collectively, the gunshot residue pattern on the questioned shirt was consistent with having been shot at a distance greater than 6 inches but closer than 18 inches.

TABLE 2

WebCode	Conclusions
GFZCZY	The defect in the shirt was examined visually and stereoscopically and was chemically tested and was determined to be consistent with the passage of a bullet. The muzzle-to-target distance for this defect at the time of discharge was determined to be intermediate. Drop-off distance was not determined at this time. Intermediate: The range at which a firearm and ammunition combination will deposit visible or detectable gunpowder particles on a target. Drop-off distance: The distance where the firearm and ammunition combination will no longer deposit observable/detectable residues on a specific target material.
GQZ3JL	Once the analysis using LIBS (Laser-Induced Breakdown Spectroscopy) technology was completed, it was observed that the shot was fired at a distance of between 6 and 12 inches, and that it was not a completely perpendicular shot, but rather described a trajectory from right to left, with a higher concentration of shot residue in this right area
H7B3TG	The shirt, Exhibit 2, has damage to it that is consistent with having been caused by the passage of a fired bullet. The physical characteristics and chemical test results of the damaged area are consistent with having been caused by a shot fired at a muzzle to target distance greater than contact and less than 12 inches (30.5 cm).
H84WNZ	The area around the hole in Item 2 was microscopically examined and chemically processed for a pattern of gunshot residues. A pattern of residues like that observed on Item 2 was reproduced in Item 1 at a distance greater than contact but less than 18 inches.
HB3ABP	The powder grain pattern and the nitrite pattern from the griess test for defect A entrance on the section of white fabric labeled shirt with bullet hole, (item 1), are consistent in diameter and particle population with the powder grain patterns and the nitrite patterns from the griess tests for the test fire target series labeled distance standards at 6-inch increments from contact to 30 inches on untreated white fabric, (item 2), between the distances of 6 inches and 18 inches.
JFCNXU	Following a visual comparison of the results obtained from the victims garment (Questioned Item) in its original form and after it had undergone the Modified Griess Test and Sodium Rhodizonate Test to the known distances, it is my opinion that the distance between the target and muzzle of the firearm and a distance of greater than 6 inches and less than 18 inches was observed with the discharge pattern more closely approximating that of the 12 inch discharge pattern. No visible signs of residue disturbance or loss was observed, however as loss could potentially occur, the estimation of shooting distance between muzzle and target could be closer than reported.
JJCYPN	The shot fired in the fragment of fabric consistent with a short distance range, between six (6) inches and twelve (12) inches from the muzzle of the weapon and the target.
LCQHDP	The submitted shirt was examined, and a suspect bullet hole was found near the center of the shirt. The hole was microscopically and chemically examined, and a pattern of gunshot residues was observed. Tests fired panels were microscopically and chemically examined, and a pattern of residues like that observed around the suspect bullet hole on the submitted t shirt were reproduced at a distance between 6 and 18 inches.
LDJGNG	The item Q1 shirt was examined and one hole H1 was observed on it. The hole H1 was microscopically examined and chemically processed and found to be entrance hole made by a firearm bullet while the item Q1 shirt was at approximate distance between 6 to 18 inches from the muzzle of the firearm at the time of firing.
LJPAHD	Damage to the shirt, Exhibit 4, is consistent with having been caused by a muzzle to target distance of greater than 6 inches and less than 18 inches.
LU9NJU	The defect in the shirt was tested and is consistent with the passage of a bullet. The muzzle to target distance for the shirt at the time of discharge was determined to be intermediate. No drop-off distance was determined at this time. Intermediate: The range at which a firearm and ammunition combination will deposit visible or detectable gunpowder particles on a target.

TABLE 2

WebCode	Conclusions
LWEA9F	Test patterns were fired using the 380 Auto caliber Smith & Wesson pistol serial number XXXXX. The distance was measured from the muzzle to the target. Patterns like the pattern appearing on the questioned shirt were produced at a distance of greater than 6 inches and less than 18 inches.
LX8ZEU	The defect near the center of the questioned item was visually and microscopically examined and chemically processed for the presence of gunshot residues. Gunshot residues present around the defect were consistent with a muzzle-to-target distance of intermediate.
MMHQ8C	The shot was fired from a distance greater than 6 inches and less than 12 inches
N2UNPH	According to the test made in our Lab, we would come to the conclusion that the shooting might have been produced between 6 and 12 inches.
N3Q63E	The shirt, Exhibit ITEM1, has damage that is consistent with having been caused by the passage of a fired bullet. Using the known standards, Exhibits ITEM2, ITEM3, ITEM4, ITEM5, ITEM6 and ITEM7, the damage and firearm discharge residue pattern observed on the shirt, Exhibit ITEM1, is consistent with having been caused by a shot fired at a muzzle to target distance greater than contact and less than 12 inches.
NB6QFP	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 a pattern of gunshot residues which was reproduced using provided known standard test targets, Item 1.B, at a muzzle to target distance between 6 and 18 inches.
NWNVL	The estimated range of firing distance on the garment with ID EMP 1, for entry hole No. 01 (OE1), corresponds to a short range; according to approximate distance standards, the range of distance at which the muzzle of the firearm could have been at the time of the firing, was at a distance greater than 6 inches and less than 12 inches, produced by the passage of a single-charge firearm projectile.
PTKJDR	1. Examination of Exhibit 2 disclosed a shirt with a perforating defect near the center of the fabric. a. The area around the hole was visually and microscopically examined. b. Physical characteristics and a pattern of gunshot residues associated with the discharge of a firearm were observed. These characteristics are consistent with a close range of fire.
PXBUPB	The area surrounding the defect on evidence, Item Q1, was visually, microscopically, and chemically examined for the presence of gunshot residues. This examination revealed the presence of gunshot residues. Using the provided GSR Distance Standards, Item K1, the gunshot residue pattern identified surrounding the defect on Item Q1 could have been produced at a muzzle to target distance between 6 inches and 18 inches.
Q28XVN	Assuming the perforation in the white shirt from Item 2 was caused by a fired bullet consistent with Speer Lawman 380 ACP cartridges fired from the Smith & Wesson Bodyguard 2.0 pistol, the muzzle-to-target distance is greater than 6 inches and less than 12 inches.
Q2CEUM	The shirt, Exhibit Item 1, has damage to the centre that is consistent with having been caused by the passage of a fired bullet traveling in a front to back direction. Using the distance standards provided, Exhibits Item 2, Item 3, Item 4, Item 5, Item 6 and Item 7, the damage and firearm discharge residue pattern observed on the shirt, Exhibit Item 1, is consistent with having been caused by a shot fired at a muzzle to target distance greater than contact and less than 18 inches.
QHGL9N	The area around the defect in the center of Item 001-AA was microscopically examined and chemically processed for the presence of gunshot residues and a faint pattern of residues was found. The concentration of residues was reproduced using the known test panels from Item 001-AB within a muzzle to garment range of greater than contact to less than 18 inches.
QKKJDP	Examination of the Item 2 shirt revealed a hole in the middle. The area around this hole was microscopically examined and chemically processed for the presence of gunshot residues. The residue pattern found around the hole in the middle of the Item 2 shirt is consistent in pattern size and density with having been produced at an approximate distance between 6 inches and 18 inches.

TABLE 2

WebCode	Conclusions
QT3QFN	In my opinion, the muzzle to target distance during the discharge of the firearm at the Questioned garment was between 6 - 18in.
QU8KVK	short distance
QUB6JN	The Questioned item (item 01-01) was examined visually, microscopically, and processed chemically for the presence of gunshot residues. Assuming the same firearm and ammunition were used to create the test panels, test patterns most similar to those detected on the Questioned item were observed between six- and twenty-four-inches during laboratory testing. This range of fire (distance determination) is also based on the general assumptions that no significant quantities of residues were lost in the collection and handling of the item, that no intervening objects blocked deposition of GSR on the item, nor does it consider the actions of involved subjects, environmental conditions at the time of the event, or any other factor that could have materially affected the deposition of residues on the item.
QXD4XM	Clothing Analysis: Methodology: Physical (Visual Examination) Chemical (Color Test Modified Griess) Chemical (Color Test Sodium Rhodizonate) The defect/hole, designated as "A", measured approximately 1/4 inch in greatest dimensions and was located approximately 4 inches from the right side and 5 inches from the top on the anterior portion of the shirt. Visual/microscopic examination of defect/hole "A" revealed the presence of apparent bullet wipe, soot, and gunpowder. Chemical testing of defect/hole "A" indicates the presence of *nitrite residues/**lead residues. Note: *Nitrites are present in gunpowder residue; **Lead residue can be present in bullets/bullet cores and ammunition primers. Opinion/Interpretation: Examination of defect/hole "A" indicated that it was visually consistent with the passage of a projectile/bullet based upon the physical characteristics observed and the chemical tests performed. Distance Determination Analysis: Methodology: Physical (Visual Examination) Chemical (Color Test Modified Griess) Chemical (Color Test Sodium Rhodizonate) The pattern of gunpowder/gunpowder residues and chemical residues observed and documented from Item 1 was reproduced at a muzzle to target distance between 6 and 18 inches. Distance standards at distances of Contact, 6 inches, 12 inches, 18 inches, 24 inches, and 30 inches with laboratory standard and/or submitted ammunition. The test target media was twill. The test targets were chemically analyzed for gunpowder residues.
R4UXAB	Services Requested Examine defect in EV1 shirt and attempt to determine muzzle to target distance compared to test samples collected using the known EV2 evidentiary firearm. Evidence Examined EV1 – White T-shirt with apparent bullet defect EV2 – Smith & Wesson Bodyguard 2.0 .380 caliber firearm Examination and Results The EV1 T-shirt was examined and a visible pattern of gunshot residue was observed. Photographs were taken prior to chemical processing and will be retained in the digital database. The EV2 firearm was used to create patterns of gunshot residue on white cotton test blanks every 6 inches from a contact shot out to 24 inches. It can therefore be concluded that under similar conditions the muzzle to target distance in regards to the defect in the EV1 T-shirt is consistent with a distance range of 9 inches to 18 inches. This would not account for any obstructions between muzzle and target at the time of the shooting. Photographs were taken prior to and after chemical processing and will be retained in the digital database. These photos will be retained in a secure file (FORAY) under this RB number. Test materials were retained and booked into Evidence/Property as follows: EV1 – T-shirt EV2 – Evidentiary firearm
R8EQLD	Analysis of questioned holes: Q1- visible bullet wipe (darkened area around the periphery of the hole), pattern of possible smokeless gunpowder particles, pattern of nitrites, lead bullet wipe, faint pattern of vaporous lead, random lead particulate. Residues consistent with the passage of a bullet as well as patterns of residues consistent with the discharge of a firearm were observed. The residues produced by the test patterns were compared to the patterns of residues around Q1. It is the opinion of the undersigned that the residue patterns from Q1 indicates a muzzle-to-target distance greater than 0" and less than 18".
RECHU8	Damage to the shirt, Exhibit 6, is consistent with having been caused by a muzzle to target distance of greater than 6 inches, less than 18 inches.

TABLE 2

WebCode	Conclusions
RKZ3XM	The piece of white fabric, item 1.1, was examined and found to have a defect consistent with a bullet hole. The white fabric, item 1.1, was compared to submitted witness panels, items 1.2 – 1.7. Based upon the analysis, a similar pattern of residues as that seen on the fabric, item 1.1, can be produced at distances of greater than six (6) inches but less than eighteen (18) inches.
RPD4YK	The area surrounding the defect in the center of the white t-shirt, Item 1.A, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed a pattern of gunshot residues that was reproduced using the known standards, Item 1.B, at a muzzle to target distance between 6 inches and 12 inches.
RTCEUK	The area surrounding the defect in the center of the white t-shirt cutting, Item 1.A, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed a pattern of gunshot residues which was reproduced using the known standards, Item 1.B, at a muzzle to target distance between 6 inches and 18 inches.
TLTFXK	The finding are much more probable (LR=100 to 10.000) when the shooting distance is between 6 and 18 inches, then when the shooting distance is smaller than 6 or greater than 18 inches.
TNUJML	The hole on item 1, White t-shirt with one bullet hole was visually and chemically examined. Gunshot residue patterns like the pattern appearing on item 1 were produced at a distance greater than contact and less than 18".
U9KRKG	In view of the revelations obtained and the comparisons made with the matrix/weapon/ammunition trio the shooting distance is estimated between 6 and 12 inches. It should be noted, however, that an interpretation can only be made on the basis of the elements brought to our attention in the investigation. The emergence of an additional element may have an influence on interpretation of analysis results.
VCE9AF	The muzzle of the firearm was at a distance between 6 and 18 inches from the submitted shirt (questioned) at the time of the discharge.
VELQ9C	The fragment of white fabric belonging to the victim's t-shirt has one (1) entry wound caused by a projectile fired from a single-shot firearm. After examining the results of the physical analysis, the results of the chemical tests, and direct comparison with nearby fabric samples used as reference patterns and photographs taken at different distances, it is determined that the shot was fired from a minimum distance of six inches (6") and a maximum of twelve inches (12") between the muzzle of the firearm and the t-shirt.
WJANEE	Based on the visual and microscopic examination and the chemical testing of the "Questioned" target (Item 001-01) and the "Contact, 6 Inches, 12 Inches, 18 Inches, 24 Inches, and 30 Inches" targets (items 001-02 through 001-07) it can be concluded that the shot into the "Questioned" target was greater than 6 inches and less than 18 inches.
WNPXRH	In my opinion, the questioned fabric was more than 6 inches but less than 18 inches away from the muzzle of the firearm that shot the fabric when this firearm was discharged
WQQ7RL	Items 1-6 were test patterns generated at the listed known distances and were utilized for comparison purposes. The pattern of muzzle residues observed on Item 7 was determined to be consistent with an intermediate range gunshot greater than contact and less than eighteen inches.
X9T4VH	The questioned shirt (Item 2) was examined visually and chemically. It was determined that the muzzle to target distance was greater than 6" and less than 18".
XAZKP8	1. Q1 - Residues consistent with the passage of a bullet and patterns of residues consistent with the discharge of a firearm were observed. 2. The residues produced by the test patterns were compared to the patterns of residues around Q1. It is the opinion of the undersigned that the residue patterns from Q1 indicate a muzzle-to-target distance of greater than contact and less than 12 inches.
XF6GDD	The area around the hole in Item Q1 was examined and chemically processed for the presence of gunshot residues. The gunshot residue pattern around the hole in Item Q1 is consistent with tests fired

TABLE 2

WebCode	Conclusions
	at a muzzle-to-target distance greater than 6 inches and less than 18 inches using the known standards Item K1.
XPFJYE	Question (Known Original/s) - The piece of shirt was examined and found to contain a bullet hole just off the approximate center of the piece. The hole and the areas surrounding it were visually and microscopically examined, and also chemically processed for the presence of firearm discharge residues. Using the submitted known originals (visual and chemically tested) the gunshot residue pattern around the hole (Question) is consistent with known originals fired at a muzzle-to-target distance of greater than 6 inches and less than 18 inches.
Y8RR9D	The white piece of cloth, item questioned, had one defect that was consistent with one bullet path (based on presence of chemically detected nitrite gunshot residues). The defect in the white piece of cloth, item questioned, was consistent with a muzzle-to-target distance of intermediate.
YVA9NG	The defect on the questioned panel in item CTS 26-5301A was determined to be consistent with the passage of a bullet. The presence of gunshot residues and vaporous lead around the bullet defect indicated that the muzzle-to-target distance was intermediate. Drop-off distance was not determined at this time.
YWQ6FG	The hole labeled 2026-0464-1, Item 1 Shirt with bullet hole, was visually and chemically examined. Gunshot residue patterns like the pattern appearing on Item 1 were produced at a distance greater than 6" and less than 18".
Z48ZWB	In my opinion the firearm was discharged when the muzzle was greater than 6inches and less than 12inches from the victim's shirt.
Z9HDEA	All the samples are studied under a stereoscopic microscope, and the Griess and sodium rhodazionate tests are performed. The results of these analyses indicate that the shooting distance may range between 6 and 18 inches, most likely around 12 inches.
ZCFR2Y	Visual examination and chemical processing of the submitted (Questioned Item) in comparison to submitted standards (Known Items) put the muzzle of the firearm greater than 06 inches and less than 18 inches (± 2 inches) from the shirt (Questioned Item) at the time of discharge.
ZKBU4B	The comparative examination of the residue patterns produced during these test fires, combined with the microscopic and chemical analyses performed, allows me to conclude that the muzzle of this pistol was positioned at a distance between 6 inches (15,24 cm) and 18 inches (45,72 cm) from the the victim's shirt at the time of discharge.
ZT7YWC	[No Conclusions Reported.]

Additional Comments

TABLE 3

WebCode	Additional Comments
2G6QTY	A colorimetric examination was performed on the fabric using Sodium Rhodizonate (Na-Rh) reagent for the detection of lead residues. The residue pattern obtained from the questioned sample was compared with those observed on the reference samples of known firing distances. The findings were consistent with and corroborated the results obtained from the Modified Griess Test, supporting the estimated firing distance of approximately 6 to 12 inches. It should be noted that the estimated firing distance is based on a comparison of the questioned sample with the reference test samples generated under the test conditions employed in this examination
9JQLWT	The quantity and density of the particulate on the questioned pattern appears more consistent with the pattern observed at the distance of 6 inches. However, no soot is present on the questioned pattern. This may be attributable to shot-to-shot variation. A more refined assessment and repeat of tests could be conducted at 3-inch increments.
AGHTFZ	Test shots every 3 inches would be nice to have. I do understand the factors that make it challenging to do so for a test like this, but it would be nice to have those shots at 3 inch increments for creating the bracket and increasing confidence in reporting.
BU7CD3	Item 1.B (known test standards) are in different increments from which is outlined as suggested increments in the [Lab's] policy.
CQJZ86	Our technical procedures manual mandates that our distance opinions are limited to Contact/near contact, intermediate, and distant.
D79MTM	This result is established by considering that additional firing tests were carried out at the 2 selected limit distances (6 and 12 inches) and that these tests showed that the contamination of the target is repeatable at these distances. These additional tests are recommended by the procedure used in the Laboratory.
F8TDTH	Disclaimer: Ranges are determined under controlled conditions. Conditions that may have been present during the time of the incident may have an adverse effect on the possible range.
FJ987W	Our technical manual does not allow for a bracketed range when it comes to distance determinations. We have three conclusions we can use: contact/near contact, intermediate, and distant. This is why the brackets were left blank on page 1 of this answer sheet.
FWVE4X	1. The match-level scale that is made use of in our laboratory for this type of examinations is (in descending order): A. Full match. B. High-level match. C. Partial match. D. Inconclusive. 2. In this year's PT, the test provider has once again provided us with physical targets for the test firing, i.e. physical known-distance references ("K targets" hereinafter). We chemically developed nitrite, lead, and copper mark patterns from the K targets, as well as the questioned object. Conclusions were made by interpreting the Q target patterns as a result of comparisons with the K target patterns. 3. We believe that this year's test is more indicative of a real lab- and casework standard operating and working procedures. This year's test was more straightforward and was far less time consuming, in comparison with last years. We further believe that our reported range will include the real-life result approximately around 7 or 8". 4. If we may – an advice for further improvement of the test (for the years to come): This year, the K targets were given in intervals of 6" instead of 3". Providing K targets in intervals of 3", mainly for the purpose of lab work, will improve the examiner's capability to make more accurate estimations.
GFZCZY	Our technical procedures manual mandates that our distance determination opinions are limited to contact/near contact, intermediate, and distant.
H7B3TG	Note: Only 1 test fire at each known distance was provided. Results and conclusions are based on the fact that if additional known test fires were taken, the visual and chemical results would be the same as what was recorded above.
JFCNXU	In order to account for variation in the residue patterns that is often observed at known shooting

TABLE 3

WebCode	Additional Comments
	distances, this laboratory's SOP requires that at least duplicate targets are obtained for each distance. Given that only one known target was provided for each shooting distance, a conservative estimate for the questioned item (victim's shirt) is considered appropriate.
JJCYPN	The shot made at the fragment of cloth was made at a range between six (6) and twelve (12) inches between the muzzle and the target
LU9NJU	Our technical procedures manual mandates that our distance opinions are limited to Contact/near contact, intermediate, and distant. No 24" panel was included in the proficiency kit.
LX8ZEU	Our technical procedures manual mandates that our distance opinions are limited to contact/near contact, intermediate, and distant. With this range of conclusions, a drop-off distance using the suspect firearm and ammunition would be reported. Drop off distance is the distance where the firearm and ammunition combination will no longer deposit observable/detectable residues on a specific target material, barring the presence of an intervening object, environmental factors affecting the deposition of gunshot residues, or factors that may have dislodged particles. Glossary: Contact/near contact: The muzzle of the firearm was in contact with or very near the target at the time of discharge with possible sooting, ripping, tearing, and/or singeing of the target material. Intermediate: The range at which a firearm and ammunition combination will deposit visible or detectable gunpowder particles on a target. Distant: Only the bullet reaches the target {determined by chemical testing (bullet wipe), defect characteristics, or autopsy information}. No tearing of the target material observed and no gunpowder particles or soot are observed or chemically detected.
MMHQ8C	The study was carried out using the LIBS technique and the iForenLIBS forensic tool.
N2UNPH	Both the patterns and the problem sample have not revealed well, as it appears that particles of shooting residue are coming off the photographic paper with which it is revealed.
PTKJDR	TECHNICAL NOTES Contact or Near Contact is defined as when the muzzle of the firearm is in/near contact with the target at the time of discharge. Close is defined as the range of fire at which a firearm and ammunition combination will deposit a pattern of gunpowder or vaporous lead on a target. Undetermined is defined as when a specific muzzle to target distance could not be determined due to a lack of defined gunshot residue patterns. This may indicate the shot was discharged from a distance beyond the maximum distance for the deposition of residues, an intervening object was present at the time of discharge, or that residues were lost during handling of the item prior to examination.
QKKJDP	Materials produced as a result of chemically processing the Item 2 shirt are being returned as Item 2M with Item 2. Materials produced as a result of chemically processing the Item 1 test patterns are being returned as Item 1P with Item 1.
U9KRKG	The analyses were conducted during the period of extreme heat in [Country], on June 19 and 22, 2026. While the impact on the results is unlikely, it cannot be ruled out.
WJANEE	It seemed as if the Reverse Modified Griess test results for targets Questioned, Contact, 6 inches, and 12 inches were muted as compared to what I was expecting based on experience. My Griess controls were all positive.
Y8RR9D	Our technical procedures manual mandates that our distance opinions are limited to Contact/near contact, intermediate, and distant.
YVA9NG	Glossary: Contact/near contact: The muzzle of the firearm was in contact with or very near the target at the time of discharge with possible sooting, ripping, tearing, and/or singeing of the target material. Intermediate: The range at which a firearm and ammunition combination will deposit visible or detectable gunpowder particles on a target. Distant: Only the bullet reaches the target {determined by chemical testing (bullet wipe), defect characteristics, or autopsy information}. No tearing of the target material observed, and no gunpowder particles or soot are observed or chemically detected. Drop-off distance: The distance where the firearm and ammunition combination will no longer deposit observable/detectable residues on specific target material. [Laboratory] Firearms/Tool Marks Technical Procedures Manual mandates that distance opinions are limited to contact/near contact, intermediate, and distant.

TABLE 3

WebCode	Additional Comments
Z48ZWB	NaRhod tests proved inconclusive
ZCFR2Y	Contact or Near Contact is defined as when the muzzle of the firearm is in/near contact with the target at the time of discharge .Close is defined as the range of the fire at which a firearm and ammunition combination will deposit a pattern of gunpowder or vaporous lead on a target. Undetermined is defined as when a specific muzzle to target distance could not be determined due to a lack of defined gunshot residues patterns. This may indicate the shot was discharged from a distance beyond the maximum distance for the deposition of residues, an intervening object was present at the time of discharge, or that residues were lost during handling of the item prior examination.

-End of Report-
(Appendix may follow)

Test No. 26-5301: GSR Distance Determination

DATA MUST BE SUBMITTED BY **June 15, 2026, 11:59 p.m. EDT** TO BE INCLUDED IN THE REPORT

Participant Code: U1234A

WebCode: Q6RP8Q

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

Scenario:

Police are investigating a shooting. 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 medical examiner confirmed that no exit hole was present on the victim. A suspect was apprehended later that day, and a Smith & Wesson Bodyguard 2.0 .380 caliber handgun was seized from his possession. The bullet recovered from the victim was identified as having come from the suspect's firearm. Rounds of Speer Lawman 380 ACP 95gr TMJ ammo (consistent with the bullet recovered from the victim) were test fired with the suspect's firearm and the distance standards prepared. Investigators request that you compare the victim's shirt with the provided distance standards to determine the distance between the firearm's muzzle and the shirt.

Please note the following:

-An arrow has been stamped in an upward position on the shot fabric to represent orientation.

-Each piece of shot fabric have been placed inside their corresponding, labeled envelopes. It is suggested that when the fabric is removed from their envelopes, they be marked according to your laboratory procedure.

Items Submitted (Sample Pack GSRP):

Known Originals: Distance Standards at 6-inch increments from Contact to 30 inches provided on untreated white fabric.
Questioned: Shirt with bullet hole.

1.) What is the distance range that the muzzle of the firearm could have been from the shirt (Questioned) at the time of discharge? Please report a numeral response (e.g. 6) from the supplied Distance Standards.

Greater than (inches) and Less than (inches)

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

Note: Please use appropriate punctuation to indicate the end of sentences, sections, and statements in the free-form space below. Extra spacing and returns used for separation within your text will not transfer and may cause your information to be illegible in the Summary Report. The use of lists and tabular formats to deliver information is also cautioned against, as these do not transfer.

3.) Additional Comments

Note: Please use appropriate punctuation to indicate the end of sentences, sections, and statements in the free-form space below. Extra spacing and returns used for separation within your text will not transfer and may cause your information to be illegible in the Summary Report. The use of lists and tabular formats to deliver information is also cautioned against, as these do not transfer.

RELEASE OF DATA TO ACCREDITATION BODIES

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

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

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

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

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

ANAB Certificate No.

A2LA Certificate No.

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

Authorized Contact Person and Title

Laboratory Name

Location (City/State)