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FORENSIC TESTING PROGRAM

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GSR Distance Determination
Test No. 25-5301 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 111 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 distance shot fabric items and a questioned distance shot fabric item 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): 12 to 24, and 12 to 30.

Item(s)	Distance(s)	Substrate	Firearm	Ammunition
Known Distances	Contact - 30" (6" Increments)	White Knit Fabric (Cotton/Spandex Blend)	Walther PDP 9mm Handgun	Blazer 9mm Luger 124 grain FMJ
Questioned	21"	White Knit Fabric (Cotton/Spandex Blend)	Walther PDP 9mm Handgun	Blazer 9mm Luger 124 grain FMJ

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 21 inches away from the muzzle of the firearm. Refer to the Manufacturer's Information for preparation details.

In Table 1, 99 (89%) of the 111 responding participants reported a "greater than" distance between 12 and 18 inches and a "less than" distance between 24 and 30 inches. The remaining 12 participants either reported distance-related results or did not report any range. 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
26Q6NG	12	30	18
277GCE	12	24	12
2K8VVW	18	30	12
2KRWFD	12	30	18
2NQ8CD	12	30	18
2QDRGG	12	24	12
2TGHLC			
3AKG8K	18	30	12
3BCJRE	18	24	6
432H7D	18	24	6
49AYLU	12	30	18
4BBYNC			
4BX9XF	12	30	18
4FR3VG	12	24	12
4X9BWH	18	24	6
6X646A			
6YF8ER	18	30	12
779PM9	18	30	12
7NU2J9	12	30	18
7P8XPD	6	24	18
83QZHP			
88799B	12	30	18
88J2LP	12	30	18
89CVLE	12	30	18
89DW37	12	24	12
8A4X7A	12		
8N4RKP	18	30	12
8NTTQF	12	24	12
8PYBMQ	12	30	18
8RR6LF	12	24	12
8WHEWD	12	24	12
8YADBC	18	30	12
9NPNNC	18	24	6
9TG367	14	26	12
A27ZFC	12	24	12
AJ8KG7			
ATQ4Q6	12	24	12
ATX9BN	12	24	12
AXNPH8	18	30	12
B3X4Z7	18	30	12
C22ZU3	12	30	18
CAXZ8A	18	24	6
CJGAV3	18	30	12
D2GTZ6	18	30	12
D7QYL3			
DN96M2	12	30	18
DT4VE7	12	30	18
DXWWFK	18	30	12
DYU6N6	12	30	18
EBFWNY			
EWWB46	12	24	12
EZXET8	12	24	12
FMN6H3	18	24	6
FPN3P3	12	30	18
FX7KUG	18	30	12
G63W66	12	30	18
G6P4P4	18	24	6
GLCLH6	12	24	12
GU7QB7	12	24	12
GVUCX3	12	30	18
HEPD9Y	12	30	18
JAA6JE			
JANGFX	12	30	18
JTNJ3U			
JZZKEW	12		
K2A6LX	12	30	18
K9T9TZ	12	30	18
KHG9ZW	12	24	12
KJUVKW	12	24	12

TABLE 1

(Distance in Inches)

WebCode	Greater Than	Less Than	*Calc. Range*
KW3G9V			
L24ADB	12	30	*18*
LM9TQY	12	24	*12*
LMMCAV	12	30	*18*
LPAZLV	12	24	*12*
M4BRDR	12	24	*12*
MBN46X	12	24	*12*
MTT8RB	12	30	*18*
NAVA69	18	30	*12*
NLKD4T	18	30	*12*
NUG4VU	12	24	*12*
PA99TQ	15	27	*12*
PY8VGW	12	30	*18*
PZYX2Q	12	30	*18*
QG2ZEP	12	24	*12*
RMTHEL	12	30	*18*
RQP7VT	18	24	*6*
TEUCXQ	12	30	*18*
TX2Q9P	18	30	*12*
U4QGFL	12	30	*18*
UCG693	18	30	*12*
UUE84L	18	24	*6*
UUZXYR	12	24	*12*
V2TQKQ	12	30	*18*
VUWTXN	12	30	*18*
WA643L	12	24	*12*
X7JKWH	12	24	*12*
X8E3YJ	12	24	*12*
XY443M	18	30	*12*
XY4ZDH	12	30	*18*
XZU3GL	12	30	*18*
YGF82K	12	30	*18*
YPACVL	18	24	*6*
YXKEGL	18	30	*12*
Z2XNYH	18	30	*12*
Z442NW	18	30	*12*
ZCY6UE	12	30	*18*
ZGQDUE	12	30	*18*
ZKDXYJ	12	24	*12*
ZXXC3H	18	24	*6*
ZY8MVF	12	30	*18*
ZYB4TE	6	30	*24*

Response Summary		Distance Determination		Participants: 111	
Greater Than Distance	Participants Reporting	Less Than Distance	Participants Reporting	CTS Calculated Range	Participants Reporting
Contact / 0	0 *(0.0%)*	Contact / 0	0 *(0.0%)*	6	11 *(9.9%)*
6	2 *(1.8%)*	6	0 *(0.0%)*	12	49 *(44.1%)*
12	66 *(59.5%)*	12	0 *(0.0%)*	18	38 *(34.2%)*
18	31 *(27.9%)*	18	0 *(0.0%)*	24	1 *(0.9%)*
24	0 *(0.0%)*	24	39 *(35.1%)*	Other	0 *(0.0%)*
30	0 *(0.0%)*	30	58 *(52.3%)*	No Response	12 *(10.8%)*
Other	2 *(1.8%)*	Other	2 *(1.8%)*		
No Response	10 *(9.0%)*	No Response	12 *(10.8%)*		

Conclusions

TABLE 2

WebCode	Conclusions
26Q6NG	The area surrounding the defect on evidence Item Q1 was visually and chemically examined for the presence of gunshot residues. This examination revealed the presence of gunshot residues. Using the provided Distance Standards, Item K1, the gunshot residue pattern identified surrounding the defect on Item Q1 could be reproduced at a muzzle to target distance greater than twelve (12) inches and less than thirty (30) inches.
277GCE	Examination of Item A1-1 revealed the presence of a hole, consistent with a bullet hole, to the center of the piece of cloth. The area around the hole was visually examined 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 Item A1-1 piece of cloth is consistent based on pattern size and density with having been produced at a distance between approximately twelve (12) inches and approximately twenty-four (24) inches.
2K8VVW	Clothing Analysis: Methodology: Physical (Visual Examination) Chemical (Color Test Modified Griess/Sodium Rhodizonate) No visible red-brown stains were observed on Item 1A, the piece of fabric. One (1) defect was observed on Item 1A, the piece of fabric: The defect/hole, designated as "A", measured approximately ¼ inch in greatest dimensions and was located approximately 4 inches from left side and 5 ½ inches from the bottom. Visual/microscopic examination of defect/hole "A" revealed the presence of apparent bullet wipe 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: Methodology: Physical (Visual Examination) Chemical (Color Test Modified Griess/Sodium Rhodizonate) The pattern of gunpowder/gunpowder residues observed and documented from Item 1A, the fabric, was reproduced at a muzzle to target distance between 18 and 30 inches. The chemical residue pattern as observed and documented from Item 1A, the fabric, was reproduced at a muzzle to target distance between 18 and 30 inches. Miscellaneous: Items 1A1, 1C1, 1D1, 1E1, 1F1, and 1G1. The chemical test patterns will each be sealed in a 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, the contact known distance standard. [Participant submitted data in a format that could not be reproduced in this report.]
2KRWFD	Item 01-01 (Shirt with bullet hole) has a single defect (hole). Using the provided set of known test panels, test patterns most similar to those detected on Item 01-01 were observed between 12- and 30-inch distances 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.
2NQ8CD	The Item 01-01 sheet of apparent cotton was examined for the presence of defects consistent with the passage of a bullet. One defect was found in the approximate center of the sheet and designated as Hole A. Hole A was analyzed visually, microscopically, and chemically for the presence of gun shot residues. Using the supplied test patterns, Items 01-02 through 01-07, test patterns similar to those detected on the Item 01-01 sheet were observed between the 12 inch and 30 inch distances during laboratory testing.
2QDRGG	The residue pattern from the cloth (item 1.1) indicates a muzzle-to-target distance between twelve (12) and twenty four (24) inches.
2TGHLC	The area surrounding the defect in the center of the piece of fabric, Item 1.A, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed

TABLE 2

WebCode	Conclusions
	the presence of gunshot residues; however, a reproducible pattern was not present. As a result, no muzzle to target distance can be provided.
3AKG8K	Visual examination and chemical processing of the submitted item Q1, in comparison to the submitted known standards put the muzzle of the firearm further than 18 inches and less than 30 inches from the T-shirt at the time of discharge.
3BCJRE	During the optical and chemical examination of the bullet hole, the propellant residues were found surrounding the hole. This indicates that the shot was fired at a distance between 472 mm and 609.6 mm.
432H7D	During optical and chemical examination of the bullet hole, the propellant residues were found surrounding the hole. This indicates that the shot was fired at a distance between 672 mm and 609.6 mm.
49AYLU	A hole was present in the approximate center of the Item 1 shirt. The hole and the area around the hole was visually, microscopically, and chemically processed for the presence of firearm discharge residues. The gunshot residue pattern around the hole is consistent with the Item 2 tests fired at a muzzle -to-target distance greater than 12 inches and less than 30 inches.
4BBYNC	The defect in the section of fabric, item Questioned Distance, was consistent with the passage of a bullet. The presence of lead residues and powder particles appear consistent with an intermediate muzzle-to-target distance. Based on the submitted test panels, drop-off distance is greater than 30". Note: drop-off distance is defined as the maximum distance that gunshot residue particles will be deposited barring the presence of an intervening object.
4BX9XF	The item Q1 section of cloth displayed one hole that appeared to have been created by the passage of a bullet. The hole will be referred to as hole 1. The areas around the hole were examined visually and microscopically for the presence of gunpowder particles. Gunpowder particles were found all around the hole. Item Q1 was tested chemically using the Modified Griess Test and the Sodium Rhodizonate Test. The Modified Griess Test and the Sodium Rhodizonate Test are color-producing tests for the presence of nitrites (burned or partially burned gunpowder) and lead, respectively, found in gunshot residues. A particulate nitrite pattern was detected around hole 1. No vaporous lead was detected around hole 1. The supplied test fire cloths were examined and also chemically tested with the Modified Griess Test and the Sodium Rhodizonate Tests. As a result of the examinations and chemical testing, The distance from the muzzle of the suspect firearm, barring an intervening object to item Q1, was determined to be greater than 12 inches and less than 30 inches.
4FR3VG	Comparison of the residue pattern on the fabric with the bullet hole to the patterns on the supplied 'known distance standards' indicated that the shot was fired with the muzzle at a minimum distance of 12 inches and a maximum distance of 24 inches to the target.
4X9BWH	The distance range between the muzzle of the firearm and the shirt was 18 inches and 24 inches.
6X646A	The questioned item was within muzzle-to-target distance for this firearm when the shot was fired. However, without the appropriate controlled test-fire simulations with the suspect weapon, the maximum muzzle-to-target distance cannot be determined.
6YF8ER	1. One (1) cardboard box labeled in part "25-5301" 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, the cloth, 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" containing one (1) white cotton knit cloth with one (1) defect. 1D. One (1) manila envelope labeled in part "12" containing one (1) white cotton knit cloth with one (1) defect. 1D1. Chemical test pattern (Modified Griess) collected from Item 1D, the cloth, during laboratory examination. 1E. One (1) manila envelope labeled in part "18" containing one (1) white cotton knit cloth with one (1) defect. 1E1. Chemical test pattern (Modified Griess) collected from Item 1E, the cloth, during laboratory examination. 1F. One (1) manila envelope

TABLE 2

WebCode	Conclusions
	labeled in part "24" containing one (1) white cotton knit cloth with one (1) defect. 1F1. Chemical test pattern (Modified Griess) collected from Item 1F, the cloth, during laboratory examination. 1G. One (1) manila envelope labeled in part "30" containing one (1) white cotton knit cloth with one (1) defect. 1G1. Chemical test pattern (Modified Griess) collected from Item 1G, the cloth, during laboratory examination. Clothing Analysis: Methodology: Physical (Visual Examination) Chemical (Color Test Modified Griess/Sodium Rhodizonate) No visible red-brown stains were observed on the Item 1A, the cloth. One (1) defect was observed on Item 1A, the cloth, and described as follows: The defect/hole, designated as "Q1", measured approximately 3/8 inch in greatest dimensions and was located approximately 5.5 inches from the bottom and 4 inches from the left side. Visual and microscopic examination of defect/hole "Q1" revealed the presence of apparent bullet wipe and gunpowder. Chemical testing of defect/hole "Q1" indicates the presence of *nitrite residues and **lead residues. Note: *Nitrites are present in gunpowder residue. **Lead residue can be present in bullets/bullet cores and ammunition primers. Opinion/Interpretation: Examination of defect "Q1" indicated that it was visually consistent with the passage of a projectile/bullet based upon the physical properties observed and the chemical tests performed. Distance Determination: Methodology: Physical (Visual Examination) Chemical (Color Test Modified Griess/Sodium Rhodizonate) The pattern of gunpowder and gunpowder residues observed and documented from Item 1A, the cloth, and 1A1, the chemical analysis of defect/hole "Q1", was reproduced at a muzzle to target distance between 18 and 30 inches. Miscellaneous: Items 1A1, 1D1, 1E1, 1F1, and 1G1, the chemical test patterns, will each be sealed in a manila envelope and will be returned with the evidence to the submitted agency. No Analysis Performed: No further analysis on the following item(s): Item 1B, the cloth with defect
779PM9	The deposit on the unknown shirt was consistent with test shots provided at a distance of 24-30 inches. The range of this conclusion is that the shot occurred at a distance of farther than approximately 18 inches and, given this set of test, closer than 30 inches. Additional testing would be useful to determine the maximum drop off distance of this gun and ammo combination and to generate additional test samples at the range indicated.
7NU2J9	Item 1.1 is stated to be "a shirt with bullet hole" (questioned distance). Item 1.2 consists of six pieces of cloth stated to be "known originals" (known distance standards stated to be contact, 6 inches, 12 inches, 18 inches, 24 inches and 30 inches) submitted with Item 1.1. The distance standards from Item 1.2 were chemically processed. Item 1.1 was microscopically examined and chemically processed for gunshot residues and a pattern of residues was found. Using the known distance standards, the pattern of residues on Item 1.1 were reproduced at a distance greater than 12 inches and less than 30 inches.
7P8XPD	The item 1-1 shirt cutting displayed one (1) hole that appears to have been made by the passage of a bullet. The hole will be referred to as hole 1. The area around the hole was examined visually and microscopically for the presence of gunpowder particles. Gunpowder particles were observed around hole 1. Item 1-1 and the known distance test samples were tested chemically using the Modified Griess Test and the Sodium Rhodizonate test. The Modified Griess Test and the Sodium Rhodizonate Test are color-producing tests for the presence of nitrites (burned or partially burned gunpowder) and lead, respectively, found in gunshot residue. A particulate nitrite pattern and a particulate lead pattern were developed around hole 1. Using the supplied known distance test samples and their developed Modified Griess Test and Sodium Rhodizonate Test patterns, the distance from the muzzle of the suspect firearm to item 1-1 was determined to be greater than six (6) inches and less than twenty-four (24) inches.
83QZHP	The area surrounding the defect in the center of the white jean twill fabric, Item 1.A, 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. Item 1.B was inspected to verify and document contents. No analysis was performed on the item listed.
88799B	The area around defect A was visually examined, microscopically examined, and chemically processed for the presence of gunshot residues. The pattern of gunshot residues around defect A is consistent with a muzzle to target distance between 12 inches and 30 inches.

TABLE 2

WebCode	Conclusions
88J2LP	Items #1, #2, #3, #4, #5, #6, and #7 were microscopically examined and chemically processed for the presence of gunshot residues. A pattern of residues was found on item #1. Using the residues observed on items #2, #3, #4, #5, #6, and #7, the pattern of residues observed on item #1 was determined to be reproduced within a muzzle to garment range of greater than 12 inches and less than 30 inches.
89CVLE	Based on the comparison of the patterns developed on the questioned to the patterns developed on the knowns, the questioned item was separated from the muzzle of the firearm at some distance that is greater than 12 inches and less than 30 inches at the time of discharge.
89DW37	I concluded, that in the absence of any intervening object (s), the distance between the firearm's muzzle and the victim's shit, (Q), at the time of discharged would have been approximately 12 inches to 24 inches, inclusive.
8A4X7A	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 12 inches (30.5cm).
8N4RKP	1. One (1) cardboard box labeled in part "25-5301 [participant 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, the cloth, 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" containing one (1) white cotton knit cloth with one (1) defect. 1D. One (1) manila envelope labeled in part "12" containing one (1) white cotton knit cloth with one (1) defect. 1D1. Chemical test pattern (Modified Griess) collected from Item 1D, the cloth, during laboratory examination. 1E. One (1) manila envelope labeled in part "18" containing one (1) white cotton knit cloth with one (1) defect. 1E1. Chemical test pattern (Modified Griess) collected from Item 1E, the cloth, during laboratory examination. 1F. One (1) manila envelope labeled in part "24" containing one (1) white cotton knit cloth with one (1) defect. 1F1. Chemical test pattern (Modified Griess) collected from Item 1F, the cloth, during laboratory examination. 1G. One (1) manila envelope labeled in part "30" containing one (1) white cotton knit cloth with one (1) defect. 1G1. Chemical test pattern (Modified Griess) collected from Item 1G, the cloth, during laboratory examination. Clothing Analysis: Methodology: Physical (Visual Examination) Chemical (Color Test Modified Griess/Sodium Rhodizonate) No visible red-brown stains were observed on the Item 1A, the cloth. One (1) defect was observed on Item 1A, the cloth, and described as follows: The defect/hole, designated as “A”, measured approximately 1/4 inch in greatest dimensions and was located approximately 5.5 inches from the top edge and 4 inches from the left edge. Visual and microscopic examination of defect/hole “A” revealed the presence of apparent bullet wipe and gunpowder. Chemical testing of defect/hole “A” indicates the presence of *nitrite residues and **lead residues. Note:*Nitrites are present in gunpowder residue. **Lead residue can be present in bullets/bullet cores and ammunition primers. Opinion/Interpretation: Examination of defect “A” indicated that it was visually consistent with the passage of a projectile/bullet based upon the physical properties observed and the chemical tests performed. Distance Determination: Methodology: Physical (Visual Examination) Chemical (Color Test Modified Griess/Sodium Rhodizonate) The pattern of gunpowder and gunpowder residues observed and documented from Item 1A, the cloth, and 1A1, the chemical analysis of defect/hole “A”, was reproduced at a muzzle-to-target distance between 18 and 30 inches. Miscellaneous: Items 1A1, 1D1, 1E1, 1F1, and 1G1, the chemical test patterns, will each be sealed in a manila envelope and will be returned with the evidence to the submitting agency. No Analysis Performed: No further analysis on the following item(s): Item 1B, the cloth with a defect
8NTTQF	Tests were fired on laboratory testing fabric with the seized firearm and the same ammunition at 6 inch intervals. The tests were compared to the questioned pattern on the shirt of the victim. Based on my observations from comparing the tests and the questioned pattern I found that the muzzle of the firearm was further 12 inches and closer than 24 inches from the shirt when the shot was discharged.
8PYBMQ	Item 1 was visually and microscopically examined; one hole was located. Item 1 was chemically

TABLE 2

WebCode	Conclusions
	processed for the presence of gunshot residues; residues consistent with the discharge of a firearm and passage of a bullet were found. The gunshot residue pattern on Item 1 is consistent with Item 2 distance standards fired at a muzzle to target distance greater than 12 inches and less than 30 inches.
8RR6LF	This damaged is consistent with the discharge of a pistol with a muzzle to target range of between 0.3 and 0.6 metres (1 to 2 feet).
8WHEWD	According to the test made in our Lab, we would come to the conclusion that the shooting might have been produced between 12 and 24 inches.
8YADBC	The results of the visual examinations and chemical tests for items 1.4.1-1.7.1 (pattern tests) were compared to the results of the visual examinations and chemical tests of item 1.1.1. Item 1.1.1 is at a greater distance than item 1.5.1 (18″). Similar characteristics were observed between item 1.6.1 (24″) and 1.7.1 (30″), and item 1.1.1. Therefore, the residue pattern from item 1.1.1 indicates a muzzle-to-target distance between 18 and 30 inches.
9NPNNC	In view of the revelations obtained and the comparisons made with the matrix/weapon/ammunition trio, the shotting distance is estimated between 18 and 24 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.
9TG367	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 fourteen and twenty-six inches
A27ZFC	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 passage of a bullet and discharge of a firearm. Using the firearm with ammunition, the pattern of residues observed around Hole 1 in Item 2 was reproduced at a distance of between approximately 12 inches to 24 inches.
AJ8KG7	The shirt was visually and microscopically examined and chemically processed for the presence of gunshot residues. Residues were found which were consistent with an intermediate muzzle-to-target distance. In a normal laboratory setting the drop-off distance with the specific firearm and ammunition combination would have been performed. Drop-off distance is the distance where the firearm and ammunition combination will no longer deposit observable/detectible residues on a specific target material.
ATQ4Q6	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 item P-1. It was determined that the hole found in P-2 is consistent with a muzzle to garment distance between 12 and 24 inches.
ATX9BN	The bullet defect in Item 2 (shirt) was visually examined and chemically treated. The bullet defect was compared to test patterns made using the subject's pistol and ammunition. It was determined that the muzzle-to-target distance is between 12 inches and 24 inches.
AXNPH8	Test shots fired with the pistol and ammunitions with the same specification, indicate that the shot was fired at a distance between 18 inches and 30 inches. No vortex ring present. Propellent spread is less concentrated and occupies a large surface area. Therefore, intermediate shot range
B3X4Z7	It is determined that this was a shot fired at medium distance, between 18" and 30", being the most likely about 24″.
C22ZU3	Item 2 was visually examined and chemically processed for a pattern of gunshot residues. Residues like that on Item 2 were reproduced in Item 1 at a distance between 12 inches and 30 inches.
CAXZ8A	Due to the number of remaining gunpowder particles and their scattering diameter, the muzzle of the firearm at the moment of firing was between 18 to 24 inches, near to the middle.

TABLE 2

WebCode	Conclusions
CJGAV3	The hole on the submitted shirt marked #1 was visually and chemically examined. Gunshot residue patterns like the pattern appearing on the white shirt marked #1 were produced at a distance greater than 18 inches and less than 30 inches.
D2GTZ6	The victim's shirt was shot from a distance of greater that 18 inches.
D7QYL3	The defect in the t-shirt, item Q1 (25-5301A, Sample Pack GSRP), was consistent with the passage of a bullet. The presence of gunshot residues around the bullet defect indicated that the muzzle-to-target distance was intermediate. Drop-off distance was not determined for the purposes of this report. Intermediate: The range at which a firearm and ammunition combination will deposit visible or detectible gunpowder particles on a target. Drop-off: The distance where the firearm and ammunition combination will no longer deposit observable/detectible residues on a specific target material.
DN96M2	[No Conclusions Reported.]
DT4VE7	Based on the results of the testing, and barring an intervening object, the muzzle-to-target distance for Hole 1 in the Item 1-QD cloth is determined to be greater than 12" and less than 30".
DXWWFK	Assuming the unknown pattern (Item 2) was created a by the same firearm and ammunition combination that was used to create the test patterns (Item 1), the muzzle of the firearm was greater than 18 inches and less than 30 inches from Item 2 when the associated shot was fired.
DYU6N6	Upon examining hole 1 in the shirt (Exhibit Q1), I 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 12 inches to 30 inches. *The shooting distance estimation is based on the assumption that Exhibit Q1 was the first medium to be hit by the bullet, and that the shooting was performed under normal conditions.
EBFWNY	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 examined and chemically processed. b. Chemical processing material from Exhibit 2 was labeled as Exhibit 2.1. c. Characteristics associated with the discharge of a firearm were observed on Exhibit 2 and are consistent with a close range of fire.
EWWB46	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 12 inches and 24 inches.
EZXET8	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 2), 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 on untreated white fabric, (item 1), between the distances of 12 inches and 24 inches.
FMN6H3	3. On 2025-06-10 during the performance of my official duties I received an intact sealed evidence bag with number PA3000328893, unmarked, from Case Administration of the Ballistics Section. I opened the bag and found the following: 3.1 One (1) white shirt marked by me “227987/25”. 3.2 One (1) piece of white fabric marked by me “227987/25 contact”. 3.3 One (1) piece of white fabric marked by me “227987/25 6 inches” (15,24cm). 3.4 One (1) piece of white fabric marked by me “227987/25 12 inches” (30,48cm). 3.5 One (1) piece of white fabric marked by me “227987/25 18 inches” (45,72cm). 3.6 One (1) piece of white fabric marked by me “227987/25 24 inches” (60,96cm). 3.7 One (1) piece of white fabric marked by me “227987/25 30 inches” (76,02cm). 4. The intention and scope of this forensic examination comprises of the following Ballistic techniques: 4.1 Shot range determination. 5. I examined the white shirt mentioned in paragraph 3.1 and the pieces of white fabric mentioned in paragraphs 3.2 to 3.7 (known distance standards) and found the following: 5.1 One (1) hole with the appearance of a bullet entrance hole towards the centre of the white shirt mentioned in paragraph 3.1, marked by me “227987/25 A”. 5.2 During the optical examination of the bullet hole mentioned in paragraph 3.1, propellant residue was observed surrounding the hole. Comparison of the spread patterns observed with the known distance standards mentioned in paragraphs 3.2 to 3.7, indicates that the shot was fired at a distance of between 18 inches (45,72cm)

TABLE 2

WebCode	Conclusions
	and 24 inches (60,96cm) away from the shirt.
FPN3P3	(Distance standards Item 001) at muzzle-to-target distances of contact, 6 inches, 12 inches, 18 inches, 24 inches, and 30 inches were also evaluated. A single circular defect, consistent with an entrance defect, was observed on each submitted fabric panel. The visible appearance of each test pattern was evaluated and chemical tests for the presence of nitrites and lead were performed on the questioned item and all test patterns between 6 inches and 30 inches. The visible characteristics of the defect present on Item 002 were not consistent with the contact panel, and no chemical testing was performed on the contact panel. The patterns of residues observed on the questioned item (Item 002) were compared to the residue patterns observed on the test panels. The residue patterns observed on the questioned item (Item 002) are similar to those observed at a muzzle-to-target distance greater than 12 inches and less than 30 inches. Chemical test panels from the nitrite testing were retained and designated Item 003. Lead testing was performed directly on the submitted fabric panels (Items 001 and 002).
FX7KUG	Based on the visual and or MGT and Sodium Rhodizonate testing of the exhibits titled "CONTACT", "6 INCHES", "12 INCHES", "18 INCHES", "24 INCHES", "30 INCHES" and "QUESTIONED", it is my opinion that the distance between the muzzle of the firearm and the "QUESTIONED" exhibit at the time when the firearm was discharged, was between 18 inches and 30 inches.
G63W66	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 pattern(s) of residues around Q1. It is the opinion of the undersigned that the residue pattern from Q1 indicates a muzzle-to-target distance greater than 12 inches and less than 30 inches.
G6P4P4	The estimated range of shooting distance on the analyzed fabric sample, for entry hole No. 1, was approximately between eighteen (18) inches and twenty-four (24) inches, from the firearm's muzzle to the impacted surface.
GLCLH6	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 on untreated white fabric, (item 2), between the distances of 12 inches and 24 inches.
GU7QB7	I concluded that the muzzle of the suspect's firearm could have been at a distance range greater than 12 inches and less than 24 inches from the questioned shirt, at the time of discharge.
GVUCX3	The white fabric submitted in laboratory evidence item 1.1 was chemically tested for gunshot residue pattern and a pattern was detected. Laboratory evidence item 1.2-1.7 contained externally prepared witness panels said to have been test fired at distances of contact/near-contact, 6", 12", 18", 24" and 30" inches using Walther PDP 9mm caliber handgun with Blazer 9mm luger 124 grain FMJ ammunition. The submitted witness panels were visually examined and chemically tested for gunshot residue pattern and a pattern was detected. The resulting patterns were compared to the pattern found on laboratory evidence item 1.1 with the following results. The gunshot residue pattern found on laboratory evidence item 1.1 is consistent with having been produced at a muzzle to target distance of between 12 and 30 inches.
HEPD9Y	The area around defect A was visually examined, microscopically examined and chemically processed for the presence of gunshot residues. The pattern of gunshot residues around defect A is consistent with a muzzle to target distance between 12 inches and 30 inches.
JAA6JE	The area surrounding the defect on the fabric cutout, Item 1.A, 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.
JANGFX	Damage to the shirt, Exhibit 4, is consistent with having been caused by a muzzle to target distance of

TABLE 2

WebCode	Conclusions
	greater than 12 inches, less than 30 inches.
JTNJ3U	The area surrounding the defect in the center of the white cloth, Item 1.A, was microscopically examined and chemically processed for the presence of gunshot residues. Test targets, Item 1.B, were submitted from a known firearm and analyzed. 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.
JZZKEW	The fabric panel, Exhibit QUESTIONED, has damage that is consistent with having been caused by the passage of a fired bullet traveling in a front to back direction. Upon comparison to the fabric test panels, Exhibit KNOWN STD, the damage and firearm discharge residue pattern observed on the fabric panel, Exhibit QUESTIONED, is consistent with having been caused by a shot fired at a muzzle to target distance greater than 12 inches.
K2A6LX	Item 1G (section of white fabric) was visually examined and one (1) defect was observed in the center (Hole A). The area around Hole A in the center of Item 1G was visually inspected, microscopically examined, and chemically processed for the presence of gunshot residues. A pattern of residues was observed. Using the submitted test panels (Items 1A through 1F) a similar pattern of residues was reproduced at an approximate muzzle-to-target distance of greater than 12 inches and less than 30 inches. Test papers generated will be returned to the submitting agency.
K9T9TZ	The Item Q1 cloth was visually and microscopically examined and chemically processed for the presence of holes and firearm discharge residues. One hole was found in the approximate center. As a result of the visual and microscopic examinations and chemical testing, the muzzle to object distance was determined to be greater than 12 inches and less than 30 inches, barring an intervening object.
KHG9ZW	During the optical and chemical examination of the bullet hole, propellant residues were found surrounding the hole. This indicate that the shot was fired at a distance of between 12 inches and 24 inches but the most likely distance is 18 inch.
KJUVKW	The research findings of the examination of the questioned shirt with bullet hole are more probable* when the shooting distance is equal to or between 12 and 24 inches than if the shooting distance is smaller than 12 inches or greater than 24 inches. *The verbal term comes from a standard set of terms (the left column in the table below). This series of verbal terms is used when the researcher has no or insufficient numerical data to explicitly substantiate a numerical judgment. The verbal term used is based, among other things, on professional knowledge and experience gained in (case)research. To promote transparency for the reader and uniformity between different experts, the [Lab] has defined the verbal terms numerically. These definitions are expressed in orders of magnitude that are shown in the right column of the table below. For example: the term 'slightly more probably' means that the chance of observing the research results is considered two to ten times greater when one hypothesis is true than when the other hypothesis is true. Verbal term Order of magnitude equally probable 1-2 slightly more probable 2-10 more probable 10-100 much more probable 100-10.000 very much more probable 10.000-1.000.000 extremely more probable >1.000.000 The conclusion expresses the evidential value of the results with regard to the hypotheses. The conclusion does not reflect the probability that a particular hypothesis is true. That chance also depends on other evidence and information outside the forensic area of expertise and therefore falls outside the scope of this report. For more information about this method of conclusion, see the professional appendix "The series of probability terms of the [Lab]". This can be found on the [Lab Website].
KW3G9V	The defect to the questioned item was visually and microscopically examined and chemically processed for the presence of gunshot residues. Gunshot residues were found on the questioned item that were consistent with an intermediate range gunshot. 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 detectible 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

TABLE 2

WebCode	Conclusions
	are observed or chemically detected.
L24ADB	Based on visual comparison and chemical processing, a similar pattern of nitrite particles to what's present on Exhibit 1.1 was reproduced at a distance between 12 and 30 inches.
LM9TQY	medium range
LMMCAV	Item 1A (white cotton twill fabric) was visually examined. One defect was observed in the approximate center of the fabric (Hole A). The area around Hole A (Item 1A) was visually inspected, microscopically examined, and chemically processed for the presence of gunshot residues. A pattern of residues was observed. Using submitted test panels a similar pattern of residues was reproduced at an approximate muzzle-to-target distance of greater than 12 inches and less than 30 inches.
LPAZLV	The distance determination for the CTS test indicates that the distance bracketing was between 12 inches and 24 inches. Based on the reference samples received, the results suggest that the distance is closest to the reference sample at 18 inches.
M4BRDR	The area around the suspected bullet hole on Item 1 was microscopically examined and chemically processed and a pattern of residues was found. When compared to the provided known distance pattern standards (in Items 2 through 7), the pattern of residues displayed on Item 1 most resembles the known patterns depicted at a distance of greater than 12 inches and less than 24 inches.
MBN46X	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 questioned distance, (item 2), are consistent with the absence of fouling and with the diameter and particle population of the powder grain patterns and the nitrites patterns of the griess tests from the test fire series labeled known distances on untreated white fabric, (item 1), between the distance of greater than 12 inches and less than 24 inches.
MTT8RB	The area surrounding the defect in the center of the section of white fabric, Item 1.A, was microscopically examined and chemically processed for the presence of gunshot residues. Distance standards, Item 1.B, were submitted from a known firearm and analyzed. This examination revealed a pattern of gunshot residues which was reproduced at a muzzle to target distance between 12 and 30 inches.
NAVA69	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 bullet hole indicated a pattern of residues consistent with the discharge of the firearm in question at a distance of between 18 inches and 30 inches from the point of contact.
NLKD4T	The shot, from the muzzle to the impact surface, was fired from a distance between 18 inches and 30 inches. The most accurate distance estimate would be approximately 24 inches.
NUG4VU	The results of the visual examinations and chemical tests for item 1.1.1 were compared to the results of the visual examinations and chemical tests of the generated test patterns (1.3.1 through 1.6.1). The residue patterns from item 1.1.1 indicate a muzzle-to-target distance greater than 12" and less than 24".
PA99TQ	See attached report [Report was not included.]
PY8VGW	Examination of Item 2 revealed a hole in the center of the cloth. The area surrounding the hole was visually and microscopically examined and chemically processed and a pattern of gunshot residues was detected. The detected pattern surrounding the hole in Item 2 is consistent in size, density, and appearance to the test patterns produced at muzzle-to-target distances of between twelve (12) and thirty (30) inches. This range was determined using the submitted distance standards (Item 1) which were processed but not produced at this laboratory.
PZYX2Q	Damage to the shirt, Exhibit 6, is consistent with having been caused by a muzzle to target distance of greater than 12 inches and less than 30 inches.

TABLE 2

WebCode	Conclusions
QG2ZEP	The item Q1 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 approximately distance between 12 to 24 inches from the muzzle of the firearm at the time of firing.
RMTHEL	Item 2 was visually examined and processed chemically for a pattern of muzzle residues. A pattern indicative of an intermediate range gunshot was observed / developed. The pattern of muzzle residues observed / developed on Item 2 was found to be most similar to the standard patterns provided as Item 1 that were described as being generated between 12 and 30 inches.
RQP7VT	The entry hole present in the cloth was caused by a projectile fired from a firearm between 18 and 24 inches approximately.
TEUCXQ	A sample of a white shirt. A hole compatible with the passage of a bullet is present in its center. Analysis revealed the presence of gunshot residues, i.e. a propellant powder pattern. Range-of-fire tests were performed on white cloths at various distance using the suspect's Walther PDP pistol and cartridges consistent with the bullet recovered from the victim. After comparing the gunshot evidence on the white shirt sample and these white cloths, the distance between the firearm's muzzle and the shirt was between 12 and 30 inches at the time of discharge.
TX2Q9P	The close resemblance to 24 inches suggests that it is likely to be close to this distance, although we cannot provide formal proof.
U4QGFL	The muzzle to target distance of Questioned Distance was found to be greater than 12" and less than 30".
UCG693	In my opinion the Questioned article was impacted by a fired bullet, with a muzzle to target range of between 18 to 30in.
UUE84L	We apply color test technique on the shirt unknown distance sample and all of known distance samples and using fresh modified griss we conclude that if there nitrite anion will give indication of the presence of close shooting. By comparing the result of unknown distance sample obtained above with the results of known distance samples we can estimate the distance of the muzzle of the firearm from the shirt was between (18-24) inches.
UUZXYR	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 known firearm and ammunition, the pattern of residues observed around Hole 1 in Item 2 was reproduced at a distance of between approximately 12 to 24 inches.
V2TQKQ	The muzzle of the firearm was separated from the fabric at a distance of greater than 12 inches and less than 30 inches at the time of discharge.
VUWTXN	Based on the results of the chemical tests, as well as visual and microscopic examinations, the muzzle to target distance for H1 is greater than 12" and less than 30", absent an intervening object.
WA643L	After comparing the pattern of gunshot residues of questionned sample and the patterns of gunshot. Residues of known distances samples we can estimate that the shooting distance was greater than 12 inches and less than 24 inches.
X7JKWH	EVIDENCE SUBMITTED Lab Item # Agency Item # Description 1 GSRP One (1) cardboard box containing: 1.1 GSRP One (1) piece of white cotton with defect. 1.2 GSRP Six (6) witness panels shot at distances of Contact, 6", 12", 18", 24" and 30". CONCLUSIONS OF ANALYSIS The piece of white cotton was examined and found to have a defect consistent with a bullet hole. The white cotton, item 1.1, was compared to submitted witness panels, item 1.2. Based upon the analysis, the muzzle to target distance was found to be greater than 12" but less than 24". [Participant submitted data in a format that could not be reproduced in this report.]
X8E3YJ	The shooting distance measured from the muzzle has been 12 - 24 inches.

TABLE 2

WebCode	Conclusions
XY443M	Examined visually, with infrared light, and with chemical testing. Defect A entrance (1/4 inch diameter) located at the center of the section of white fabric. No fouling was observed visually or with infrared light. Powder grains were observed visually. A wipe-off rim was observed visually and with infrared light. 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 18 inches and 30 inches.
XY4ZDH	Distance determination testing indicate that the muzzle-to-target distance of the victim's shirt (Questioned) was greater than 12 inches and less than 30 inches at the time of discharge.
XZU3GL	The known distance standards were used to compare to the pattern of residues developed on the unknown item. The muzzle-to-target distance at which the pattern of residues was reproduced is in the range of 12 to 30 inches. Note: The reported shooting distance is an estimation based on test patterns created under controlled conditions and the following assumptions: (1) Item 01 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 handling/transport of the item(s).
YGF82K	The muzzle of the barrel of the gun was at a distance from 12 inches to 30 inches of the victim's shirt when the shot was fired.
YPACVL	The range of distance at which the frirearm muzzle couldhave been from the garment (questioned shirt) at the time of the shot is approximately betwwen 18 and 24 inches
YXKEGL	Based on the comparison between Test 25-5301 QUESTIONED DISTANCE envelope 1 and the textile fragments from the sample package of shot distance residues received: Test 25-5301 KNOWN DISTANCE CONTAC envelope 2 Test 35-5301 KNOWN DISTANCE 6 INCHES envelope 3 Test 45-5301 KNOWN DISTANCE 12 INCHES envelope 4 Test 55-5301 KNOWN DISTANCE 18 INCHES envelope 5 Test 65-5301 KNOWN DISTANCE 24 INCHES envelope 6 Test 75-5301 KNOWN DISTANCE 30 INCHES envelope 7 The results of the physical studies and chemical tests applied to the textile fragment indicate that the estimated distance for the shot that caused the analyzed hole is within a range of 18 to 30 inches. Considered between the muzzle of the weapon and the surface of the textile fragment. [Participant submitted data in a format that could not be reproduced in this report.]
Z2XNYH	The best distance for the shoot distance is greater than 18 inches and less than 30 inches. To be more precise, we estimate the distance of the case around 24 inches.
Z442NW	A visual comparison of the results obtained from the 'victim's shirt' in its original form and after it had undergone the Modified Griess Test to the known distances for each test method, it is my opinion that the distance between the victims shirt and the muzzle of the firearm is greater than 18 inches (minimum) and less than 30 inches (maximum), with the discharge pattern more closely approximating that of the 24 inch target. Although there did not appear to be any visible signs of residue disturbance or loss, as loss could potentially occur, the estimation of shooting distance between the muzzle and target could be closer than reported.
ZCY6UE	The hole on the t-shirt marked item #1 was visually chemically examined. Gunshot residue patterns like the pattern appearing upon the t-shirt marked item #1 were produced at a distance greater than 12 inches and less than 30 inches.
ZGQDUE	In my opinion, when the shot was fired, the muzzle of the gun was at a distance of more than 12 inches from the garment, but no greater than 30 inches away, assuming there was nothing between the muzzle and the garment.
ZKDXYJ	The cloth was visually and chemically examined for gunshot residue patterns. The results from the visual and chemical treatment of the item Q1 was compared with test samplings. The result shows that the shooting distance is estimated to be greater than 12" but less than 24".
ZXXC3H	The evaluation of the shooting distance carried out by optical detection then by revelation with the Griess Test and Rhodizonate made it possible to evaluate a shooting distance (muzzle - target) of

TABLE 2

WebCode	Conclusions
	between 18 and 24 inches.
ZY8MVF	The piece of fabric, Exhibit QUESTIONED, has damage that is consistent with having been caused by the passage of a fired bullet. Using the distance standards, Exhibit KNOWN STD, the damage and firearm discharge residue pattern observed on the piece of fabric, Exhibit QUESTIONED, is consistent with having been caused by a shot fired at a muzzle-to-target distance greater than 12 inches to beyond 30 inches.
ZYB4TE	Comparison of the questioned distance with the known distance standards indicates that the shot was fired between 6" and 30" away (muzzle to fabric distance).

Additional Comments

TABLE 3

WebCode	Additional Comments
2NQ8CD	I use internal LIMS numbers. Those numbers are as follows: Item 01-01 = Questioned Distance; Item 01-02 = Contact Test; Item 01-03 = 6 inch Test; Item 01-04 = 12 inch Test; Item 01-05 = 18 inch Test; Item 01-06 = 24 inch Test; Item 01-07 = 30 inch Test; The cloth material used for this test had significant elastic properties to it. When attempting to remove the cloth sheets from the cardboard, it resulted in the cloth stretching in the corners and distorting.
2TGHLC	Photos of already processed known test targets would have been helpful to compare to the unknown that we processed ourselves. Per our policy we cannot make determination based on the lack of information or patterns that are not reproducible.
4BBYNC	Greater than and less than fields intentionally left blank on answer page. Bracket-type conclusion based on submitted test panels was approximately between 18" and a distance greater than 30". Per this agency's technical procedures, distance is not reported as a bracketed range, but as a qualitative statement as defined below: 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 a specific target material.
6X646A	Residues were detected at 30 inches. Apart from a contact/near contact shot, it is this agency's procedure to obtain two negative Griess tests at separate distances to report the maximum muzzle-to-target distance of the firearm and ammunition. Not having distance standards between 4 to 7 feet does not allow us to process the item or report the results from this test how they would be reported in casework.
6YF8ER	If more standard patterns were available and at distances in smaller increments than 6 inches, the pattern may have been able to be a smaller range or an adjusted bracket. Ideally there would be a standard shot at 33 or 36 inches, one beyond your upper limit.
8N4RKP	This test needs to be in the pattern of three (3) inch increments to represent a case study accurately. When you create test standards with six (6) inch standards, this creates a difficult interpretation at more distant shots, and reported ranges can be larger.
AJ8KG7	Glossary: Gunshot residues: The total residues resulting from the discharge of a firearm. It includes both gunpowder and primer residues, carbonaceous material, metallic residues from projectiles, fouling, and any lubricant associated with the projectiles. Intermediate: The range at which a firearm and ammunition combination will deposit visible or detectible gunpowder particles on the target.
ATQ4Q6	In this proficiency only fabrics were sent to a known distance, which better resembles the regular analysis process. Therefore, there were no photos of the chemical treatments with Griess Modified for nitrites and sodium rhodizonate for lead. The lack of this information limited the shot distance process as additional shots and repeat shots were needed.
AXNPH8	At 18-30 inches. Visible propellant spread. No Burnt appearances. No gas tears. Intermediate shot range because of the present propellant
B3X4Z7	The determination of the shot distance is based on a comparison between the victim's recovered shirt and distance standards provided by LIBS (Laser-Induced Breakdown Spectroscopy) - (iForenLIBS) technology. In addition, the colorimetric technique of chemically treated NaRH was also performed, but it was observed that practically no lead was revealed from a distance of 12 inches or further. Colorimetric development of the 18", 24", and 30" samples showed an indistinguishably a amount of lead, as was the case with the test sample (the victim's shirt).
D2GTZ6	The less than answer would be 30+ inches if available. There is no known target that allows for a less

TABLE 3

WebCode	Additional Comments
	than answer.
DXWWFK	If additional test panels were created at distances of 21 inches and 27 inches, it might be possible to narrow the conclusion range further.
DYU6N6	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 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 comparing and interpreting the patterns that were obtained solely by our lab work. 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 21 inches. 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 inches instead of 3 inches. Providing K targets in intervals of 3 inches, mainly for the purpose of lab work, will improve the examiner's capability to make more accurate estimations. For example, we consider (in accordance with many other American forensic labs) a 12 inches difference between the minimum and maximum values in an examiner's report to the courts to be an optimal combination of a reliable result, good science, and high-strength evidence. As our estimated single value is 20 inches, a range of 12 inches or even 15 inches to 27 inches (i.e. min.-max. difference of 15 inches or even 12 inches) would be more representative of both the real result and the examiners' proficiency in result interpretation. Yet, this year, we were limited by the K targets having only 6 inch intervals. In order to report a calculated result of 21 inches, we had to use the 12" to 30" range, although we know we could have given a narrower range; we simply did not have (and were not provided with) narrow-enough K-target intervals to scientifically support and base such conclusion.
EBFWNY	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.
G6P4P4	Conclusions in Spanish La estimación del rango de distancia de disparo en el trozo de tela analizado, para el orificio de entrada N° 1 fue: entre dieciocho (18) pulgadas y veinticuatro (24) pulgadas aproximadamente, entre la boca de fuego del arma y la superficie impactada.
GVUCX3	Note: Reported ranges were determined under controlled laboratory conditions and do not take into account factors from the incident which may include weather conditions, dynamic movement of the target material at the time of the shot, non-flat surfaces, as well as, treatment of the material post incident.
JTNJ3U	Per [Laboratory] policy, we do not report a range when the pattern is scattered.
JZZKEW	I was unable to reach a conclusion as the upper bracket of the range due to a lack of test panels fired from a distance greater than 30 inches. According to our policies, the 30 inch test panel still fell within the same proximity zone as my Questioned test panel. I need test panels created at greater ranges to see where residues are no longer deposited in order to reach a "less than" conclusion for my upper bracket. An additional observation was that the results of the lead testing, Sodium Rhodizonate, were lighter/less than what is typically seen with shots fired at this range. Personally I make a fairly strong Sodium Rhodizonate solution and still, while the results were positive, they weren't nearly as vibrant as I typically see with test panels like this.
KHG9ZW	12 inch is slightly close and 24 inch is slightly far where by our possible distance is 18 inch.
KJUVKW	Traces from the untreated white fabrics were transferred onto filter paper, which then underwent the

TABLE 3

WebCode	Additional Comments
	sodium rhodizonate test chemical treatment. In our reports, a shooting distance range is reported with a certainty degree according to the Bayesian approach.
KW3G9V	Normally a drop off distance would be determined using the suspect firearm and ammunition and this would be reported. The drop off distance is the distance where the firearm and ammunition combination will no longer deposit observable/detectible residues on a specific target material, barring the presence of an intervening object, environmental factors affecting the deposition of gunshot residues, or factors that may have dislodged particles.
LMMCAV	Left/Right designation is based on looking at the item. All measurements taken from center of hole, unless otherwise specified. Visual examination: Hole A is located in the approximate center of fabric ~4" from right side and ~3 7/8" from left side. No apparent heavy vaporous lead observed. Small amount observed around hole (bullet wipe). Examiner markings in upper right hand corner. Gunpowder pattern observed. Max deposition of particles observed ~4.5" from center of hole. Microscopic examination: Partially burned gunpowder particles observed. No unburned gunpowder particles observed. Residue consistent with vaporous lead bullet wipe observed around hole. Results: Hole A was microscopically and visually examined and compared to test panels, processed Griess photo paper, and Sodium Rhodizonate processing. Test panels and Hole A were processed chemically using the Modified Griess Test and the Sodium Rhodizonate test. Reproducible residues were observed at an approximate muzzle-to-target distance of greater than 12" and less than 30". Distance greater than 12" was based on vaporous lead pattern observed on 12" test panel (1A-TP3), lack of vaporous lead present on the 18" test panel (1A-TP4), and no vaporous lead observed on Item 1A other than bullet wipe. Gunpowder particles observed on 30" test panel (1A-TP6) appear more spread out than Item 1A with a wider deposition of particles (1A - 4.5" vs. 30 inch test panel - 5.25"). Additionally, deposition of particles observed on the 24" test panel (1A-TP5) was similar to Item 1A and could not be ruled out as a possibility therefore 30" was used as the upper distance.
NLKD4T	The study was conducted using the forensic tool iForenLIBS (LIBS TECHNOLOGY).
PY8VGW	This range is based on the submitted test patterns which were not produced by this lab. The submitted standards only had (1) shot per distance. Our laboratory practice is to shoot (3) shots per distance to establish that the patterns are reproducing. With additional test patterns it may be possible to further restrict the reported distance. Since this lab did not produce the test patterns, no statement regarding the uncertainty of measurement could be provided.
UUE84L	We also do an color test of the muzzle by the sodium rhodizonate (NARH) and compare the result of unknown distance sample with the results of known distance samples.
XY4ZDH	Did not chemically test Known at Contact or Known at 6”, as visual examination of Questioned shows no ripping/tearing and little to no vaporous lead. Did not conduct DTO testing, as visible bullet wipe on every known and unknown panel indicates hole is from passage of a bullet. If gun available, would have created more known test panels to make reported bracket smaller (with a goal of bracket being 12").
XZU3GL	Would very much like to have a test shot from 21" and 15" to build a better bracket (27" would be nice as well) for the estimated distance in this case. I understand the limitations on having them at 3" when you're creating and shipping out that many known distance standards; however, it would help build confidence in a tighter conclusion.
YGF82K	NOT IN THE REPPORT (WORKING NOTES FOR LAB REVIEW ONLY) Extrapolation from powder count (density) of questionned items using fixed (common) radius from bullet hole is centered around 20.6 inches from muzzle to target. If the same brand of ammunition where seized with the gun I would have documented the propellant type and average charge weigh. Would have duplicated this load (averaged charge weight, with same bullet and seating dept using Blazer primed brass) for confirmation shots @ 16 inches / 18 inches / 20 inches / 22 inches / 24 inches in the shooting range (triplicate for each).
Z442NW	In order to account for variation in the residue patterns that is often observed at known shooting distances, this laboratory's SOP requires that at least duplicate targets are obtained for each distance.

TABLE 3

WebCode	Additional Comments
	Given that only one known target was provided for each shooting distance, a conservative estimate for the unknown target (shirt) is considered appropriate.
ZGQDUE	It may be possible to reduce the estimated range bracket by carrying out more test-shots, at each distance and at intervening distances
ZXXC3H	In practice, we would have made 2 additional comparison shots at 18 and 24 inches in order to evaluate the repeatability of the targets obtained at these distances.
ZY8MVF	There were no replicates available to analyze. I needed to have tests beyond 30 inches. Since there were no replicates and the panels were small, a possibility was objectively present, even though I understood that this was a PT. Therefore, I decided to be more conservative. Stating "...to beyond 30 inches." is not the wording that our lab usually uses. -Lead testing results were very weak. Soot rings did not exhibit any colouration. I increased the concentration of the sodium rhodizonate solution and it didn't help.
ZYB4TE	The shot-to-shot variation is not clear given that the samples for 18" and 24" could be considered the other way around based on appearance. It would also be recommended that the fabric itself is marked with the distance rather than just the envelope to ensure samples are not unintentionally mis-matched.

-End of Report-
(Appendix may follow)

Collaborative Testing Services ~ Forensic Testing Program

Test No. 25-5301: GSR Distance Determination

DATA MUST BE SUBMITTED BY **June 16, 2025, 11:59 p.m. EDT** TO BE INCLUDED IN THE REPORT

Participant Code: U1234A WebCode: AWVRB2

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 Walther PDP 9mm 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 Blazer 9mm luger 124 grain FMJ ammunition (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:

-CTS has changed the design of this test to provide shot fabric for the known distance standards.

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

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)