



GSR Distance Determination Test No. 24-5301/5 Summary Report

Each sample set contained one of the following: a questioned shot fabric item and six known distance shot fabric items (Contact to 30 inches), and either digitally produced photographs (24-5301) or downloadable digital images (24-5305) of known GSR distance standards processed with powder, Modified Griess, and Sodium Rhodizonate. Participants were asked to process the questioned shot fabric item and the six known distance shot fabric items and report the distance range. Data were returned from 108 participants: 76 for 24-5301 and 32 for 24-5305 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 set contained a questioned shot fabric item and six known distance shot fabric items (Contact to 30 inches) for chemical processing and comparison. In addition, either printed photographs or digital images of known GSR distance standards processed with powder, Modified Griess, and Sodium Rhodizonate (NaRh) were provided. Participants were asked to process the questioned fabric item and the six known distance 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 firearm used to produce the questioned item and known distance standards was a Sig Sauer P322 .22 caliber pistol and the brand of ammunition used was CCI Mini Mag 22LR 40 grain (copper plated round nose). The precut fabric used for the questioned item and known distance standards was listed as a cotton/spandex blend knit.

DISTANCE STANDARDS: The firearm was set on a gun rest and the fabric was placed at a predetermined known distance from the muzzle of the firearm. This was done for each of the known distances. For the processed photographs/digital images, the standards were first scanned for the powder pattern, and then processed using the Modified Griess procedure. Immediately following this processing, the film paper was scanned. Finally, the known GSR distance standards were processed with NaRh reagents, and the fabric scanned immediately.

QUESTIONED ITEM: The firearm was set on a gun rest and the fabric was placed 15 inches away from the muzzle of the firearm. After firing, the fabric with a bullet hole was packaged, and this process was repeated until all of the items were created.

SAMPLE SET ASSEMBLY: For each sample set, a questioned item and six known distance fabric items (Contact to 30 inches) were placed into a pre-labeled envelope. Additionally, processed known standard distances (Powder, Modified Griess, and NaRh) were provided in photographic or digital download format and either packaged in pre-labeled sample set envelopes or uploaded onto the CTS Portal.

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): 6 to 24, and 12 to 24.

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 a questioned shot fabric item and six known distance shot fabric items (Contact to 30 inches) for chemical processing and comparison. In addition, either printed photographs or digital images of known GSR distance standards processed with powder, Modified Griess and Sodium Rhodizonate (NaRh) were provided. The firearm was set on a gun rest and the fabric was placed 15 inches away from the muzzle of the firearm. Refer to the Manufacturer's Information for preparation details.

In Table 1, 103 of the 108 responding participants (95%) reported a "greater than" distance between 6 and 12 inches and a "less than" distance between 18 and 30 inches. Of the remaining five participants, four did not report a "greater than/less than" range but did provide distance-related results in their conclusions or additional comments and the remaining participant reported a "greater than" distance of 18 inches. In the summary of this table, CTS has grouped the responses provided by the participants based on their "greater than"/"less than" distance results and provided a tally of the ranges between responses as calculated by CTS.

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. 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- Test	Greater Than	Less Than	Calc. Range	WebCode- Test	Greater Than	Less Than	Calc. Range	WebCode- Test	Greater Than	Less Than	Calc. Range
26WXHN- 5305	12	24	12	7DC3HC- 5301	12	18	6	B4M87N- 5305	6	24	18
2K6PKU- 5301	12	24	12	7L4KWK- 5301				BGB8YC- 5301	6	24	18
3FQFNG- 5301	12	24	12	7UDAAH- 5301	12	24	12	C79ANH- 5305	6	24	18
3RZFXF- 5301	12	18	6	7UU4BT- 5301	12	30	18	C9Z6DB- 5301	6	24	18
3VLVWN- 5305	6	24	18	7W69NG- 5301	6	24	18	CG9Y84- 5305	12	30	18
4F3PZE- 5305	6	18	12	832AHF- 5301	12	18	6	CW2J37- 5305	6	24	18
4LNRWJ- 5301	18	30	12	8WYBTC- 5301	12	24	12	CWHNK6- 5301	12	24	12
4RW7PF- 5301	6	24	18	9274KL- 5301	6	24	18	D7692M- 5305	6	24	18
4UM64E- 5301				966FGL- 5301	12	24	12	DF99T9- 5301	6	18	12
4XMFYE- 5301	12	24	12	9M86PC- 5305	12	24	12	DKNRWC- 5301	6	24	18
69Y3LK- 5301	12	24	12	9MP7FL- 5305	6	30	24	DRJUXM- 5301	12	24	12
6JGJDQ- 5301	12	24	12	A2P8TM- 5301	12	18	6	DYNHUA- 5301	12	18	6
6MKHNJ- 5301	12	24	12	A7XN2B- 5301	12	24	12	EC4Z24- 5301	6	24	18
6TAQF6- 5301	12	24	12	ABEVPA- 5301	12	24	12	EDGMJH- 5301	6	24	18
742ZWB- 5301	12	24	12	AUZWAB- 5305	12	24	12	EF9J9C- 5305	12	24	12
74JUXK- 5305	12	24	12	AWRVNA- 5301	12	18	6	EYZR78- 5305	12	24	12

TABLE 1
(Distance in Inches)

WebCode- Test	Greater Than	Less Than	Calc. Range	WebCode- Test	Greater Than	Less Than	Calc. Range	WebCode- Test	Greater Than	Less Than	Calc. Range
F9JH66-5301	6	24	18	MB7D8D-5305	6	24	18	RVJLBU-5301	12	24	12
G84LD6-5305	12	18	6	MGBATX-5301	12	30	18	RYHW8U-5301	12	24	12
GUJ4HF-5301	6	24	18	MJHRQU-5305	6	24	18	T2YQDT-5305	12	30	18
H4MDP6-5301	12	24	12	MNAVHD-5301	6	24	18	T6FY2T-5301	6	24	18
HBHFQG-5305	12	24	12	MQM9MA-5301	12	24	12	TEMNM4-5301	6	24	18
HL3MQ7-5305	12	18	6	MTQ47C-5301	12	24	12	TJHHK6-5301	12	24	12
HN6UL4-5301	6	18	12	MYFG8Z-5305	12	24	12	U4Z9W7-5301	12	24	12
J8393G-5301	12	24	12	NHGZCY-5305	12	30	18	V9BQML-5305	6	30	24
JB2LQ8-5301	12	24	12	NQWWZ7-5301	12	24	12	VCA3HL-5301	6	24	18
JHDXJX-5305	12	24	12	P8D6TU-5301	12	24	12	VHZ8K4-5305	6	24	18
JMU78X-5301	12	24	12	PA4LQ9-5301	12	24	12	W8UUUM-5301	6	24	18
JZXQ83-5301	12	30	18	PR4C8C-5301	12	24	12	WBACXP-5305	12	18	6
KG3HMC-5301	6	24	18	Q3Y6VT-5301	6	24	18	WBVQNN-5301	12	24	12
KHUEC7-5305	12	24	12	QLYVCW-5305	12	24	12	WDMP3L-5305	6	24	18
KRH6XX-5301				QUMVJT-5301	6	24	18	WHFUU6-5301	12	24	12
LKFHJ4-5301	12	24	12	R2MPY8-5301	12	24	12	WNLMNZ-5301	12	24	12
LZ8FLY-5301	12	18	6	RF3N7T-5301	12	24	12	WUQJAL-5301			
MB4RBW-5301	12	24	12	RQL7FR-5301	12	24	12	XF4H9L-5301	12	30	18

TABLE 1
(Distance in Inches)

WebCode- Test	Greater Than	Less Than	Calc. Range	WebCode- Test	Greater Than	Less Than	Calc. Range	WebCode- Test	Greater Than	Less Than	Calc. Range
XF72EW- 5301	6	18	12								
XJJ2CN- 5305	12	24	12								
Y6JLNY- 5305	12	30	18								
Z7UNBX- 5305	6	24	18								
Z9C77N- 5301	12	24	12								
ZYP8EH- 5301	12	24	12								

Response Summary		Distance Determination		Participants: 108	
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	10 (9.3%)
6	34 (31.5%)	6	0 (0.0%)	12	56 (51.9%)
12	69 (63.9%)	12	0 (0.0%)	18	36 (33.3%)
18	1 (0.9%)	18	14 (13.0%)	24	2 (1.9%)
24	0 (0.0%)	24	79 (73.1%)	Other	0 (0.0%)
30	0 (0.0%)	30	11 (10.2%)	No Response	4 (3.7%)
Other	0 (0.0%)	Other	0 (0.0%)		
No Response	4 (3.7%)	No Response	4 (3.7%)		

Conclusions

TABLE 2

WebCode-Test	Conclusions
26WXHN-5305	Examined visually and with chemical testing. Defect A entrance: (3/8 inch diameter) located at the center of the section of the white shirt. No fouling was observed visually. Powder grains were observed visually. A wipe-off rim was observed visually. 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 12 inches and 24 inches.
2K6PKU-5301	<p>Clothing Analysis: Methodology: Physical (Visual Examination). Chemical (Color Test Modified Griess/Sodium Rhodizonate). Microscopy (Stereo Microscope). Analysis of Item 1: No visible red-brown stains were observed on the Item 1, the white cloth. One (1) defect was observed on Item 1, the white cloth, and described as follows: The defect/hole, designated as "A", measured approximately 1/4 inch in greatest dimensions and was located approximately 4 1/4 inches from the left side and 5 1/2 inches from the bottom side the white cloth. Visual and microscopic examination of defect/hole "A" revealed the presence of apparent bullet wipe and gunpowder. Visual and microscopic examination of defect/hole "A" did not reveal the presence of apparent soot. 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.</p> <p>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 1, the white cloth, and 1A, the chemical analysis of defect/hole "A", was reproduced at a muzzle to target distance between 12 and 24 inches. Miscellaneous: Item 1A, the chemical test patterns, was sealed in a manila envelope and will be returned with the evidence to the submitted agency. Item 2, the photographs, was sealed in a manila envelope and will be returned with the evidence to the submitted agency. Item 3, the photographs, was sealed in a manila envelope and will be returned with the evidence to the submitted agency. Item 4, the photographs, was sealed in a manila envelope and will be returned with the evidence to the submitted agency. No Analysis Performed: No further analysis will be performed on the following Item(s): Items 5, 6, 7, 8, 9, and 10, the untreated known distance shot fabrics Evidence in this case will be returned to the investigative agency.</p>
3FQFNG-5301	A Distance determination test was conducted with the following results: Base on the information supplied by Collaborative Testing Services (CTS) of a known firearm and ammunition, it was determined that the minimum distance is 12" and the maximum distance is 24".
3RZFXF-5301	We apply color test technique on the shirt sample using fresh modified griss and we conclude that there if nitrite anion which give indication of the presence of close shooting. By comparing the result obtained above we can estimate the distance of the muzzle of the firearm from the shirt was between (12-18) inches.
3VLVWN-5305	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, Q1, (item 1), are consistent in diameter and particle population with the powder grain patterns of the test fire target series and the nitrite patterns from the griess tests for the test fire target series labeled distance standards on untreated white fabric, K1a, (item 2), between the distances of 6 inches and 24

TABLE 2

WebCode- Test	Conclusions
	inches.
4F3PZE- 5305	The bullet entry hole in the front of the white fabric (item 1) was visually and microscopically inspected and processed chemically for the presence of gunpowder and lead residue patterns. A pattern consisting of discharge residues was identified. The provided test panels were at incremental muzzle-to-target distances and they were also visually and microscopically inspected and processed chemically for the presence of gunpowder and lead residue patterns. Results indicate the most probably firing distance was between approximately six (6) and eighteen (18) inches.
4LNRWJ- 5301	The victim's shirt was at a distance between 18 and 30 inches from the barrel of the firearm when the shot was fired.
4RW7PF- 5301	Based on the results of the testing, the muzzle-to-target distance for Hole 1 in the Item Q cloth is determined to be greater than 6" and less than 24".
4UM64E- 5301	The submitted questioned material, Item Q, was examined. The white cloth panel exhibited one perforating defect surrounded by apparent gun powder particles. The panel was microscopically examined and chemically processed for the presence of gunshot residue and the defect area tested positive for lead and gunpowder. The resulting patterns on Item Q were visually compared to scaled photographs of test panels that were previously processed. The bullet defect on Item Q was consistent to an intermediate muzzle-to-target distance. Testing to determine the approximate drop-off distance could be performed with more information.
4XMFYE- 5301	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 twelve (12) inches and approximately twenty-four (24) inches.
69Y3LK- 5301	The muzzle was separated from the target at a distance that is greater than 12" and less than 24" at the time of discharge.
6JGJDQ- 5301	At the time of discharge the muzzle of the Sig Sauer pistol was at a distance of greater than 12 inches and less than 24 inches from the victim's t-shirt.
6MKHNJ- 5301	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 Sig Sauer P322 .22 caliber firearm with CCI 22LR 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.
6TAQF6- 5301	The area around the hole on the Questioned shirt was microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was found. Based on a visual comparison with the provided test patterns (unprocessed, Modified Griess and Sodium Rhodizonate tests) at known distances, the pattern on the Questioned shirt was produced at a muzzle to target distance greater than 12 inches and less than 24 inches.
742ZWB- 5301	Item 1A (piece of white cloth) was visually examined. A single defect was observed in the approximate center (Hole A). The area around Hole A on item 1A was visually inspected, microscopically examined, and chemically processed for the presence of gunshot residues. A pattern of residues was observed. Using items 1B through 1J, a similar pattern of residues was observed at an approximate muzzle-to-target distance of greater than 12 inches and less than

TABLE 2

WebCode-Test	Conclusions
74JUXK-5305	<p>24 inches. The test papers generated will be returned to the investigating agency.</p> <p>The absence of fouling, the powder grain pattern, and the nitrite pattern from the griess test of defect A entrance on the section of white fabric labeled shirt with bullet hole, Q1, (item 1), are consistent with the absence of fouling and with the diameter and particle population of the powder grain patterns and of the nitrite patterns of the griess tests from the test fire target series labeled distance standards on untreated white fabric, K1a, (item 2), between the distances of 12 inches and 24 inches.</p>
7DC3HC-5301	<p>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 18 inches than if the shooting distance is smaller than 12 inches or greater than 18 inches. *The verbal term comes from a standard set of terms (the left column in the table below) [Participant did not submit the referenced table]. 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 [Laboratory] 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 probable' 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 [Laboratory]". This can be found on the [Laboratory] [website].</p>
7L4KWK-5301	<p>The white fabric (Item #2) contains one (1) hole characteristic of the passage of a bullet, labeled Hole A. The entire questioned target (Item #2) was examined microscopically and processed chemically for the presence of gunpowder, copper, and lead residues (gunshot residues). Patterns of nitrite and lead residues were detected. Copper wipe residue was also detected. Comparison of these results with the questioned firearm (Items #1, #3, #4 and #5) will be reported separately by the Ballistics Unit.</p>
7UDA AH-5301	<p>The garment was separated from the muzzle at a distance that was greater than 12" and less than 24" at the time of discharge.</p>
7UU4BT-5301	<p>A hole was present in the approximate center of the Q1 shirt. The hole and the area around the hole was visually, microscopically, and chemically processed for the presence of firearm discharge residues. The gunshot residue pattern around the hole is consistent with tests fired at a muzzle -to-target distance greater than 12 inches and less than 30 inches.</p>
7W69NG-5301	<p>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 six inches and less than twenty-four inches.</p>

TABLE 2

WebCode-Test	Conclusions
832AHF-5301	it is determined to be a shot at medium distance, result between 12" and 18" based on comparison made between the recovered victim's shirt chemically treated with NaRH with the distance standards provided and also treated with NaRH.
8WYBTC-5301	The area around the hole in the white fabric was microscopically examined and chemically processed for the presence of gunpowder residues, and a pattern of residues was found. Referencing the known distance patterns, this item's pattern of residues was determined to have been produced at a distance greater than 12" and less than 24".
9274KL-5301	A defect in the center of item 001-AJ was microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was found. The concentration of residues was reproduced within a muzzle to garment distance range of greater than six (6) inches and less than twenty-four (24) inches. Lab generated evidence was submitted to the Firearms Unit Non-Case Storage and assigned the following item numbers: --- 1RL - copper and lead lifts from item 001-AJ; --- 2RL - chemically processed photo papers from items 001-AD, 001-AE, 001-AF, 001-AG, 001-AH, 001-AI, and 001-AJ; and --- 3RL - lead lifts from items 001-AD, 001-AE, 001-AF, 001-AG, 001-AH, 001-AI, and 001-AJ.
966FGL-5301	Clothing Analysis: Methodology: Physical (Visual Examination). Chemical (Color Test Modified Griess/Sodium Rhodizonate). One (1) apparent defect was observed on Item 10, the shirt sample, and described as follows: The defect, designated as "A", measured approximately 1/4 inch in greatest dimensions and was located approximately 5 1/2 inches from the bottom and 4 1/2 inches from the right on the anterior portion of the shirt sample. Visual examination of defect "A" revealed the presence of apparent bullet wipe and gunpowder. Chemical testing of defect "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 characteristics observed and the chemical tests performed. Item 10A, the chemical test pattern, was sealed in a manila envelope and will be returned with the evidence to the submitting agency. Distance Determination: Methodology: Physical (Visual Examination). Chemical (Color Test Modified Griess/Sodium Rhodizonate). The Sig Sauer pistol was test fired at distances identified to be contact, 6, 12, 18, 24, and 30 inches as observed on Items 1, 2, and 3, the photographs of known test patterns. The test target media was identified to be white fabric. The test targets were chemically analyzed for gunpowder residues. The gunpowder/gunpowder residue and chemical residue pattern as observed and documented from Item 10, the shirt sample, was reproduced at a muzzle to target distance between 12 and 24 inches.
9M86PC-5305	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 12 inches and less than 24 inches (± 2 inches) from the shirt (Questioned Item) at the time of discharge.
9MP7FL-5305	The cloth piece cut from the shirt, Exhibit ITEM 1, has damage that is consistent with having been caused by the passage of a fired bullet. The damage and firearm discharge residue pattern observed on the cloth piece cut from the shirt, Exhibit ITEM 1, is consistent with having been caused by a shot fired at a muzzle to target distance greater than 6.0 in (15 cm) and less than the maximum range of firearm discharge residue travel, which was not determined. From experimental results, it is expected that this maximum range would be at a distance beyond 30.0 in (76.2 cm).

TABLE 2

WebCode-Test	Conclusions
A2P8TM-5301	Questioned fabric from the deceased was examined and subjected to a number of chemical enhancement techniques to aid in the estimation of shooting distance. These tests included recording of the raw unenhanced pattern, enhancement of the nitrite pattern by the Modified Griess test and, enhancement of the lead pattern by the sodium rhodizonate test. A series of controlled test firings were also performed using the questioned firearm (Sig Sauer pistol .22LR) on a target material of comparable construction to the exhibit fabric. Test fires were collected at multiple ranges between contact and 30 inches, and were subsequently examined and subjected to the same enhancement techniques, with the resulting observations compared against the evidential fabric. Based on the observations of the above examinations, including comparison of the questioned fabric and the results of controlled test firings, it is my opinion that the distance between the muzzle of the firearm and the target at the time when the firearm was discharged, was between 12 inches and 18 inches.
A7XN2B-5301	The questioned shirt was visually and stereoscopically examined and a centrally located defect was observed with apparent bullet wipe. Surrounding the defect was a pattern gunpowder particles. The shirt was chemically processed for gunshot residues using the Modified Griess Test (detects nitrites which is a by-product from the combustion of gunpowder) and Sodium Rhodizonate (detects lead). The visual and chemically processed patterns from the questioned shirt were compared to the Known Originals (unprocessed cloth), Known Powder (photographs), Known Griess (photographs) and Known NaRH (photographs) standards. It was determined that the muzzle of the firearm was further than 12 inches and less than 24 inches from the questioned shirt at the time of discharge. Limitation Statements: Interpretation of gunshot residues is stated in terms of residues that are found to be present. Bracketed range was based on comparison to the known standards supplied.
ABEVPA-5301	The muzzle of the firearm was at a distance between 12 and 24 inches from the shirt (Questioned) at the time of discharge.
AUZWAB-5305	Items Q1, KD-C, KD-6, KD-12, KD-18, KD-24, and KD-30 were examined for the presence of bullet defects and gunshot residue using visual, microscopic, and chemical techniques. Bullet holes were observed in the center of all items submitted. Deposits characteristic of the discharge of a firearm were detected around the holes on the items. A pattern of nitrites was also observed on all items submitted. The characteristics of Q1 were compared against the known patterns provided. The residue pattern indicates a muzzle to target distance greater than 12 inches but less than 24 inches.
AWRVNA-5301	Distance of firing: At the moment of discharge the muzzle of the pistol was between 12 and 18 inches from the victim's shirt.
B4M87N-5305	The residue pattern found around the hole in the Questioned Item is consistent in pattern size and density with having been produced at an approximate distance between 6 inches and 24 inches from the muzzle of the submitted firearm.
BGB8YC-5301	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. A vaporous lead pattern along with particulate lead was also developed around hole 1. Using the supplied photographs of the test shots, the actual

TABLE 2

WebCode-Test	Conclusions
	cloths of the test shots, the photographs of the results of the Modified Griess Tests and the Sodium Rhodizonate tests, the distance from the muzzle of the suspect firearm, barring an intervening object to item Q1, was determined to be greater than six inches and less than 24 inches.
C79ANH-5305	The shirt, LIMS 0001, has damage that is consistent with having been caused by the passage of a fired bullet. Using a Sig Sauer model P322 and CCI 22 Long Rifle ammunition, the damage and firearm discharge residue pattern observed on the shirt, LIMS 0001, is consistent with having been caused by a shot fired at a muzzle to target distance greater than 6 inches and less than 24 inches.
C9Z6DB-5301	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 areas around the hole were examined visually and microscopically for the presence of gunpowder particles. Gunpowder particles were observed around hole 1. Item 1-1 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 residue. A particulate nitrite pattern, a particulate lead pattern, and a faint vaporous lead pattern were developed around hole 1. Using the supplied photographs of the Gunshot Residue, Modified Griess Test, and Sodium Rhodizonate Test standards, 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.
CG9Y84-5305	The muzzle of the firearm was approximately between 12 inches to 30 inches from the questioned shirt at the time of discharge.
CW2J37-5305	Given the limits of the test samples provided (only 6 inch intervals); the unknown GSR pattern on the shirt is consistent with the shot originating from farther than 6 inches but closer than 24 inches. The evidence pattern is most consistent with being within the range of 12 to 18 inches. Additional test samples generated at other muzzle to target distances may assist in narrowing down the reported overall range. In addition, multiple tests at the provided ranges would be helpful.
CWHNK6-5301	The shooting distance has been 18 inches \pm 6 inches.
D7692M-5305	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, 3 inches, 6 inches, 12 inches, 18 inches, 24 inches, 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 6 inches and less than 24 inches.
DF99T9-5301	Test patterns were fired using the 22 Long Rifle caliber Sig Sauer semiautomatic pistol, model P322, unknown serial number. The distance was measured from the muzzle to the target. Patterns like the pattern exhibited on the questioned shirt were produced at a distance greater than six inches and less than eighteen inches.
DKNRWC-5301	Examination of Item 5 revealed a hole in the center of the cloth. The area surrounding the hole was visually and microscopically examined and chemically processed. The detected pattern surrounding the hole in the center of Item 5 is consistent in size, density, and appearance to the test patterns produced at muzzle-to-target distances of greater than six (6) and less than twenty-four (24) inches. The range was determined by examining Item 5, the

TABLE 2

WebCode-Test	Conclusions
	submitted "distance standards" (Item 1), and the submitted photo arrays (Items 2, 3, and 4) which represent test patterns at known distances.
DRJUXM-5301	The evidence Submission #1 was visually and microscopically examined and chemically processed for the presence of gunshot residue. Gunshot residue was present around the hole in the evidence material. The muzzle to target distance is greater than 12" inches and less than 24".
DYNHUA-5301	It is a perpendicular shot, with a homogeneous distribution of lead around the aperture, indicating a distance of between 12 and 18 inches.
EC4Z24-5301	A comparison of test patterns to the questioned cloth indicates the muzzle to cloth distance was greater than 6 inches and less than 24 inches.
EDGMJH-5301	The area around the suspected bullet hole on Item Q1 was microscopically examined and chemically processed and a pattern of residues was found. Using the provided materials (in Items K1A, K1B, K1C, and K1D) the pattern of residues displayed on Item Q1 most resembles the known patterns depicted at a distance of greater than 6 inches and less than 24 inches.
EF9J9C-5305	The absence of fouling, the powder grain pattern and the nitrite pattern detected on the griess test for defect A entrance on item 1, the section of white fabric labeled shirt with bullet hole, Q1, is consistent with the absence of fouling, diameter and particle population with the powder grain patterns and nitrite patterns detected from item 2, the test fire target series labeled distance standards on untreated white fabric, K1a, between the distances of 12 and 24 inches.
EYZR78-5305	In view of the revelations obtained and the comparisons made with the matrix/weapon/ammunition trio, the shooting distance is estimated between 12;24. 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.
F9JH66-5301	Item 1 (white fabric) was visually examined. One defect was observed in the center of the fabric (Hole A). The area around Hole A on the Questioned distance white fabric (Item 1) 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 six inches and less than twenty-four inches.
G84LD6-5305	The shot fired in the fragment of fabric consistent with a short distance range, between twelve (12) inches and eighteen (18) inches from the muzzle of the weapon and the target
GUJ4HF-5301	A pattern of muzzle residues was developed on Item 1 that is consistent with an intermediate range gunshot. When compared to the known test standards and known test standard images submitted as Items 2-10, the muzzle residue pattern observed on Item 1 is consistent with a gunshot at a range greater than 6 inches and less than 24 inches.
H4MDP6-5301	Hole H1 on Item Q1 is consistent with having been made by the passage of a bullet. The muzzle to object distance for hole H1 is greater than 12 inches and less than 24 inches. The item 1 box and items KD1 to KD6 standards were not examined. Item Q1-MGT will be forwarded to the submitting agency.
HBHFQG-5305	The area surrounding the defect in approximately the center of the piece of the white cotton panel, Item 1, was visually examined, microscopically examined, and chemically processed for the presence of gunshot residues. This examination revealed a pattern of gunshot residues.

TABLE 2

WebCode-Test	Conclusions
	Test panels that were test-fired from various know distances, were provided by the submitting agency. The test panels were visually examined, microscopically examined, and chemically processed for the presence of gunshot residues. The examination revealed patterns of gunshot residues. Based on these test patterns, it was determined that a pattern of residues like that displayed on Item 1 could be produced at a muzzle to target distance between twelve (12) inches, minimum and twenty-four (24) inches, maximum. All evidence items are being returned.
HL3MQ7-5305	estimated distance 15 inch it is the limit in between two ranges (short range and mid long range) it would be reported as mid long range (30 cm - 2 m)
HN6UL4-5301	Test patterns were fired using the 22 LR caliber Sig Sauer 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 greater than six inches and less than eighteen inches.
J8393G-5301	The piece of white shirt marked Q1 was chemically processed. Gunshot residue patterns like the pattern appearing upon the shirt marked Q1 were produced at a distance greater then 12 inches and less than 24 inches.
JB2LQ8-5301	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.
JHDXJX-5305	The unknown portion of shirt with bullet hole was visually, microscopically, and chemically examined. The unknown portion of shirt with bullet hole is consistent in pattern size and density with having been produced at an approximate distance between 12 inches and 24 inches from the muzzle of the pistol.
JMU78X-5301	The questioned item was examined visually and processed chemically for the presence of gunshot residues. Distance determination testing indicate that the muzzle of the unknown firearm was greater than twelve (12) inches and less than twenty -four (24) inches from the questioned item when discharged.
JZXQ83-5301	In my opinion the estimated range of muzzle to target is greater than 12 inches but less than 30 inches (very likely to be between 18"-24"). However, within [Laboratory] we do not routinely report range results within such a narrow parameters, instead reporting; contact, near contact or greater than X (ft or m) distance.
KG3HMC-5301	The area around the hole in Item 2 was microscopically examined and chemically processed for a pattern of residues. Residues like that observed on Item 2 were reproduced in Items 1, 3, 4, and 5 at a distance greater than 6 inches but less than 24 inches.
KHUEC7-5305	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, Q1, (item 1), are consistent with the absence of fouling and with the diameter and particle population of the power grain patterns and of the nitrite patterns of the griess tests from the test fire series labeled distance standards on untreated white fabric, K1a, (item 2), between the distance of greater than 12 inches and less than 24 inches.
KRH6XX-5301	The defect in the Questioned Distance piece of fabric was consistent with the passage of a bullet. The presence of lead residues and powder particles was consistent with a muzzle-to-target distance of intermediate. Based on the submitted test panels, drop-off distance is beyond 30".

TABLE 2

WebCode-Test	Conclusions
LKFHJ4-5301	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 Sig Sauer P322 .22 caliber pistol with CCI 22LR 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.
LZ8FLY-5301	The residue pattern from the cloth indicates a muzzle-to-target distance between twelve (12) and eighteen (18) inches.
MB4RBW-5301	I concluded that the distance range the muzzle of the firearm could have been from the questioned shirt is approximately greater than 12 inches and less than 24 inches, at the time of discharge.
MB7D8D-5305	Examination of Item 1 revealed a hole near the middle of the cloth. The area around this hole was examined microscopically and processed chemically for the presence of gunshot residues, and a pattern of residues was found. The gunshot residue pattern found around the hole in the cloth is consistent in pattern size and density with the muzzle of the pistol having been greater than approximately 6 inches and less than approximately 24 inches from this area of the cloth at the time of firing.
MGBATX-5301	After comparing the pattern of gunshot residues surrounding the hole and the submitted photographs we can estimate that the shooting distance was greater than 12 inches and less than 30 inches.
MJHRQU-5305	1. Upon examining hole 1 in the shirt (Exhibit Q1), I have found a full match to characteristics of a bullet entrance hole. 2. Upon examining hole 1 in the shirt (Exhibit Q1), I have found a full match to the scenario in which the shooting towards the victim occurred from an estimated distance in the range of 6" to 24". *The shooting distance estimation is based on the assumption that exhibit 1 was the first medium to be hit by the bullet, and that the shooting was performed under normal conditions.
MNAVHD-5301	[No Conclusions Reported.]
MQM9MA-5301	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 12 inches and 24 inches from the point of contact.
MTQ47C-5301	The area around hole #1 of Item 1.1 was microscopically examined and chemically processed for the presence of gunshot residues. Examinations showed hole #1 was consistent with the passage of a bullet. The residues and physical effects were consistent with a muzzle to garment distance of greater than twelve (12) inches and less than twenty-four (24) inches.
MYFG8Z-5305	"In the portion of the shirt wat was recovered and was send for examination, is established the presence of and bullet hole caused by the passage of projectile fired of a firearm. Being determined as short distance, with a range greater than 12 inches and less than 24 inches approximately between the muzzle of the weapon and impact site in the shirt. This based on the comparison of the results found between the distance of standards and the sample analyzed."
NHGZCY-5305	The cut out of the shirt, Exhibit Q1, has damage to the centre that is consistent with having been caused by the passage of a fired bullet. Using the provided distance standards, Exhibit KNOWN GRIESS, reportedly produced with a SIG Sauer P322 pistol in 22 calibre with CCI

TABLE 2

WebCode-Test	Conclusions
	<p>22 Long Rifle ammunition, the damage and firearm discharge residue pattern observed on the cut out of the shirt, Exhibit Q1, is consistent with having been caused by a shot fired at a muzzle to target distance greater than 12 inches and less than 30 inches.</p>
NQWWZ7-5301	<p>Clothing Analysis: Methodology: Physical (Visual Examination). Chemical (Color Test Modified Griess Test/Sodium Rhodizonate). Microscopy (Stereo/Comparison Microscope). No visible red-brown stains were observed on Item 1, the twill jean. One (1) defect was observed on Item 1, the twill jean, and is described as follows: The defect/hole, designated as "A" of Item 1, measured approximately ¼ inch in greatest dimensions and was located approximately 4 ½ inches from the right side of the twill jean and 5 ¾ inches from the bottom of the twill jean. Visual/microscopic examination of defect/hole "A" revealed the presence of apparent bullet wipe and gunpowder. No soot was observed. Chemical testing of defect/hole "A" indicates the presence of *nitrite residues and **lead residues. Note: *Nitrites are present in gunpowder residue. **Lead residue can be present in bullets/bullet cores and ammunition primers. Opinion/Interpretation: Examination of defect/hole "A" indicated that it was visually consistent with the passage of a projectile/bullet based upon the physical characteristics observed and the chemical tests performed. Distance Determination: Methodology: Physical (Visual Examination). Chemical (Color Test Modified Griess Test/Sodium Rhodizonate). The pattern of gunpowder and gunpowder residues observed and documented from defect A of Item 1, the twill jean, and from Item 1A, the chemical test patterns of Item 1, the twill jean, was reproduced at a muzzle to target distance between 12 and 24 inches. Miscellaneous: Item 1A, the chemical test patterns, will be sealed in a manila envelope and will be returned with the evidence to the submitting agency. Item 2, the photographs, will be sealed in a manila envelope and will be returned with the evidence to the submitting agency. Item 3, the photographs, will be sealed in a manila envelope and will be returned with the evidence to the submitting agency. Item 4, the photographs, will be sealed in a manila envelope and will be returned with the evidence to the submitting agency. Item 5, the manila envelopes identified to contain twill jean, will be sealed in a manila envelope and will be returned with the evidence to the submitting agency.</p>
P8D6TU-5301	[No Conclusions Reported.]
PA4LQ9-5301	<p>Items 001-02 through 001-07 are all test panels shot with the firearm recovered from the suspect and ammunition loaded with bullets similar in design to the bullet recovered at the autopsy of the victim. These six test panels were each shot at a different distance, from contact to 30 inches. I visually and microscopically examined each panel. I photographed each panel before and after chemically processing each panel for nitrite (Modified Griess Test) and lead (Sodium Rhodizonate Test). All six of the panels tested positive for the presence of nitrite and lead and the patterns were documented for comparison to Item 001-01, a portion of the victim's clothing. I did not evaluate or use the photographs contained in Items 001-08 through 001-10 during my examination. Item 001-01 is a white cloth portion of the victim's clothing. I visually examined and photographed this item before and after chemically processing the panel for nitrite and lead. I documented and compared the pattern of partially burned and unburned gunpowder particles, nitrite pattern, and lead pattern to the six known panels, Items 001-02 through 001-07. Based on these comparisons, I determined that the portion of the victim's clothing, Item 001-01, was shot at a muzzle-to-target distance of greater than 12 inches and less than 24 inches.</p>
PR4C8C-5301	<p>The area around hole #1 of Item Q1 was microscopically examined and chemically processed for the presence of gunshot residue. Examinations showed hole #1 was consistent</p>

TABLE 2

WebCode- Test	Conclusions
	with the passage of a bullet. The residue and physical effects were consistent with a muzzle to garment distance of twelve (12) to twenty-four (24) inches.
Q3Y6VT- 5301	Item Q1 was examined and was found to display one hole/defect. The hole/defect is denoted as H1. Visual and microscopic examinations of the area immediately surrounding H1 show a pattern of burned/partially burned gunpowder particles as well as possible bullet wipe. H1 is consistent with having been created by the passage of a bullet. H1 was chemically processed for the presence of nitrites (Modified Griess test) and lead (Sodium Rhodizonate test). Based on the results of the chemical tests, as well as the visual and microscopic examinations, the muzzle to target distance for H1 is greater than 6" and less than 24".
QLYVCW- 5305	it has been established that the drilling hole found in the piece of cloth analyzed was produced by the passage of the projectile fired by a single-loading firearm, made between the muzzle of the firearm and the affected area, at range 3 at a distance of approximately 12 to 24 inches, which is consistent with the short distance.
QUMVJT- 5301	Based on processing of samples and references provided, the distance the questioned shirt would have been from the muzzle of the firearm would be between 6 inches to 24 inches inclusive.
R2MPY8- 5301	The area around the hole located in the center of Item 1.1 (JAW-1) (recovered victim's shirt) was examined visually, stereoscopically and processed chemically for the presence of gunshot residues and physical effects and a pattern of residues was found. Comparing these results against the supplied reference photographs of gunshot residues and chemical testing results made using the suspect firearm and like ammunition, a similar pattern of residues was produced at a muzzle to garment distance of greater than twelve (12) inches and less than twenty-four (24) inches.
RF3N7T- 5301	Item 1A (white twill square) was visually examined. One defect was observed and labeled Hole A. The area around Hole A 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 photographs of known test panels and the submitted known test panels a similar pattern of residues was observed at an approximate muzzle-to target distance greater than 12 inches and less than 24 inches.
RQL7FR- 5301	Visual examination and chemical processing of the submitted Item Q1 in comparison to submitted standards and micrographs put the muzzle of the firearm further than 12 inches and less than 24 inches from the t-shirt at the time of discharge.
RVJLBU- 5301	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 (items 1.2.1 through 1.7.1). The residue patterns from item 1.1.1 indicate a muzzle-to-target distance greater than 12" and less than 24".
RYHW8U- 5301	The results of the visual examinations and chemical tests for items 1.3.1-1.7.1 (pattern tests) were compared to the results of the visual examinations and chemical tests of item 1.1.1. Similar characteristics were observed between item 1.5.1 (18") and item 1.1.1. Item 1.1.1 is at a greater distance than item 1.4.1 (12") and at a lesser distance than item 1.6.1 (24"). Therefore, the residue pattern from item 1.1.1 indicates a muzzle-to-target distance between 12 and 24 inches.
T2YQDT- 5305	In my opinion, based on the results of the tests I conducted, the muzzle of the gun was between 12 and 30 inches from the shirt when the shot was fired.

TABLE 2

WebCode- Test	Conclusions
T6FY2T- 5301	Damage to the shirt, Exhibit 1, is consistent with having been caused by a gunshot at a muzzle to target distance of greater than 6 inches, less than 24 inches.
TEMNM4- 5301	Item 1 was physically and chemically processed for the presence of gunshot residue patterns. The developed pattern sizes are most consistent with the known patterns found in between the 6" and 24" provided standard sets.
TJHHK6- 5301	The shirt in Item 2 was microscopically examined and chemically processed for the presence of gunshot residue. Item 2 bears gunshot residues consistent with a muzzle to target distance between 12 and 24 inches.
U4Z9W7- 5301	Gunshot residue patterns like the pattern appearing upon the shirt marked Q1 were produced at a distance greater than 12 inches and less than 24 inches.
V9BQML- 5305	Comparison of the questioned distance with the known distance standards indicates that the shot was fired between 6" and 30" (inches) away (muzzle to fabric distance).
VCA3HL- 5301	Supplied test patterns were fired at intervals of 6 inches from contact to 30 inches. Test patterns were visually, microscopically and chemically examined. A comparison of the test patterns to the questioned cloth indicates the muzzle to cloth distance was greater than 6 inches and less than 24 inches.
VHZ8K4- 5305	The unknown item was tested using the modified Griess test for nitrites and Sodium Rhodizonate test for lead. The results of the visual examination, IR photography, and chemical testing were compared to the supplied reference standards and digital images. The muzzle to target distance of the questioned item is estimated to be greater than 6 inches and less than 24 inches.
W8UUUM- 5301	Questioned piece of white colored cloth exhibits one perforating defect surrounded by bullet wipe and a visual pattern of black in color particulate. One particle was removed and was morphologically and chemically positive for gunpowder. The combination of visual and chemical examinations reveals the defect in the questioned "shirt" is consistent with the passage of a projectile occurring when the muzzle of the seized firearm, using laboratory ammunition, was at a distance greater than 6 inches and less than 24 inches from the surface of the material at time of firing.
WBACXP- 5305	The firing distance range for the hole found in the fabric cutout was greater than 12 inches and less than 18 inches from the muzzle of the gun to the impacted surface.
WBVQNN- 5301	Based on visual observations and chemical testing, the distance between the muzzle of the firearm and the shirt at the moment of firing was greater than 12 inches but less than 24 inches.
WDMP3L- 5305	The areas around the holes in Items K and Q were visually and microscopically examined and chemically processed for gunpowder and lead residues (gunshot residues). The gunshot residues found around the hole in Item Q are consistent in size and density with the muzzle of a firearm having been greater than approximately 6 inches and less than approximately 24 inches from this area at the time of firing.
WHFUU6- 5301	The area around the (1) hole in the center of Item 1.1, recovered victim's shirt, was microscopically examined and chemically processed for the presence of gunshot residue, and a pattern of residue was found. Using the provided photographs of developed test panels, created with the evidence pistol and ammunition like the suspect cartridges, this pattern of residue was reproduced at a distance greater than Twelve (12) inches and less than Twenty-Four (24) inches.

TABLE 2

WebCode-Test	Conclusions
WNLMNZ-5301	The area around the suspected bullet hole in Item 1 was visually and processed chemically to develop a pattern of gunshot residues that most resembled the provided test patterns described as generated between 12" and 24" inches.
WUQJAL-5301	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 are observed or chemically detected.
XF4H9L-5301	In my opinion, the shot was fired from a distance (muzzle to target) no less than 12 inches and no greater than 30 inches.
XF72EW-5301	Clothing Analysis: Methodology: Physical (Visual Examination). Chemical (Color Test Modified Griess/Sodium Rhodizonate). The defect/hole on Item 1 measured approximately 1/4 inch in greatest dimensions and was located approximately center of the twill jean. Visual examination of Item 1 revealed the presence of apparent bullet wipe, soot, and gunpowder. Opinion/Interpretation: Examination of the defect/hole on Item 1 indicated that it was visually consistent with the passage of a projectile/bullet based upon the physical characteristics observed and the chemical tests performed. Chemical testing of Item 1 indicates the presence of *nitrite residues and **lead residues. *Nitrites are present in gunpowder residue. **Lead residue can be present in bullets/bullet cores and ammunition primer. Distance Determination: Methodology: Physical (Visual Examination). Chemical (Color Test Modified Griess/Sodium Rhodizonate). Items 3, 4, 5, and 6, the test patterns, were test fired at distances of 6, 12, 18, and 24 inches with submitted ammunition. The test target media was twill jean. The chemical residue/gunpowder pattern as observed and documented from Item 1 was reproduced at a muzzle to target distance between 6 and 18 inches. No Further Analysis: No further analysis was conducted on the following item(s): Item 2, the contact test pattern Item 7, the 30 Inch test pattern Item 8, the photos Item 9, the photos Item 10, the photos
XJJ2CN-5305	2.) The cut of fabric belonging to the victim's shirt has one (1) entry hole generated by the passage of one (1) projectile fired from a single-load firearm; Once the results of the physical analysis, the results of the chemical tests and the direct comparison with the nearby fabric samples as standard and the reference photographs taken at different distances have been examined, it is determined that the shot was taken at a minimum distance range of twelve inches (12") and a maximum of twenty-four inches (24") between the muzzle of the firearm and the shirt.
Y6JLNY-5305	The area around the hole in Item Q1 was examined and chemically processed for the presence of gunshot residues. The area around the hole in Item Q1 is consistent with tests fired at a muzzle-to-target distance greater than 12 inches and less than 30 inches using the known standards.
Z7UNBX-5305	The shirt (questioned distance) was examined visually, microscopically, and chemically tested for firearm discharge residues. The observed patterns were compared to the provided distance standard images and the known distance samples provided. The distance range that the muzzle of the firearm could have been from the shirt at the time of discharge was in my

TABLE 2

WebCode- Test	Conclusions
Z9C77N- 5301	<p>opinion, greater than 6 inches and less than 24 inches.</p> <p>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 a Sig Sauer P322 .22 caliber pistol with CCI 22LR 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.</p>
ZYP8EH- 5301	<p>One (1) circular defect, designated #1, is located in the center of Item 1A (shirt). The defect and area surrounding the defect were examined microscopically and processed chemically for the presence of gunshot residues. A pattern of residues was developed. The distance standards listed under Item 1B and 1C (Knowns) were used to compare to the pattern of residues developed on Item 1A. The muzzle-to-target distance at which the pattern of residues was reproduced is in the range of 12 to 24 inches. Note: The reported shooting distance is an estimation based on test patterns created under controlled conditions and the following assumptions: (1) Item 1A 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).</p>

Additional Comments

TABLE 3

WebCode-Test	Additional Comments
3RZFXF-5301	We also do an color test of the muzzle by the sodium rhodizonate (NARH) and compare the result with samples photos.
4F3PZE-5305	The results are a conservative estimate due to the packaging of the evidence. The distance panels were sandwiched tightly in between two pieces of cardboard. Due to the packaging, there is a possibility that lead and gunpowder residues from the panels could have been transferred on to the cardboard.
4UM64E-5301	[Laboratory] policy limits our Proximity Determination conclusions to: 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 are observed or chemically detected. Drop-off distance: The distance where the firearm, ammunition, and target surface combination will no longer deposit observable/detectible residues on a specific target material. A variety of scenario-based variables may have affected the evidence which could change the drop-off distance greater than any measurement uncertainty in the performed laboratory tests.
7DC3HC-5301	Traces from the untreated white fabric were transferred onto filter paper, which then underwent the sodium rhodizonate test chemical treatment. The resulting images appeared to be less sensitive than the supplied images of GSR patterns of Sodium Rhodizonate Test chemical treatment. The formed discoloration patterns appeared less intense than the supplied images.
7L4KWK-5301	The reason question #1 is blank is because our laboratory only determines distance at contact/near contact. Our Ballistics Unit determines all other distance estimations. However, our laboratory assists the Ballistics Unit with the chemical processing of questioned and known targets related to the distance determination.
7UU4BT-5301	Is there any way you can just provide photos of the Q and the Ks? Similar to how the shot pellet pattern test is done. This would provide the most accurate comparison of Q and K processed samples. There is still inconsistency with this new design in how well the test patterns we now have to process actually appear after processing. Our lab had 2 individuals take the test and we noticed inconsistencies in how my Q sample looked after processing versus my colleagues Q sample. Further, now with all the extra processing that has to be done, the time to complete the proficiency test has grown by a large margin.
8WYBTC-5301	I noticed the witness panel distances were in 6" increments, whereas previous CTS tests have utilized 3" increments. I am wondering if this change was simply due to cost-saving, or if there were other reasons that pertain to the testing process. I believe this pattern was produced at a distance less than 21" but there was not a 21" distance pattern to compare against. However, it seems the field is moving toward broader ranges for conclusions (contact/near contact, deposition, and beyond deposition), which would make this a moot point. Does CTS intend to offer future Distance Determination tests that incorporate Quantofix testing as an alternative to Modified Griess? Like many laboratories, our lab intends to transition to using Quantofix for distance determination casework, rather than Modified Griess. It would not make sense for examiners to take proficiency tests in one method (Modified Griess) but then use a different

TABLE 3

WebCode-Test	Additional Comments
966FGL-5301	<p>method for actual casework. We should be testing our competency in the methods we employ.</p> <p>No Analysis Performed: No further analysis was performed on the following item(s): Item 4, the manila envelope identified to contain untreated known distance shot fabric. Item 5, the manila envelope identified to contain untreated known distance shot fabric. Item 6, the manila envelope identified to contain untreated known distance shot fabric. Item 7, the manila envelope identified to contain untreated known distance shot fabric. Item 8, the manila envelope identified to contain untreated known distance shot fabric. Item 9, the manila envelope identified to contain untreated known distance shot fabric.</p>
9M86PC-5305	<p>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.</p>
9MP7FL-5305	<p>Our lap policy states: "A sufficient number of tests will be fired to ensure reproducibility of test patterns and to develop the parameters at which a similar test pattern may be replicated." This case did not include a sufficient number of tests to ensure reproducibility of the soot pattern at 12 in. Due to the lack of reproducibility, the lower limit of range was chosen to be 6 in, where a dense cloud of soot was observed. This is a conservative choice, as ITEM 3, the test at 6", is dramatically different than the patterns observed visually and in chemical tests on the questioned exhibit, ITEM 1. The farthest distance tested in ITEM 7 was 30 in, and had a distinct pattern of deposited powder particles. This is not beyond the range of firearm discharge residue travel and again was not tested more than once for reproducibility. If additional tests had been conducted to test the disappearance of powder grains (the distant range), an upper bound for range could have been determined. Due to the lack of tests establishing the distant range where no powder particles are deposited, an upper bound for range was not determined.</p>
B4M87N-5305	<p>Did not examine provided patterns at Contact or 30".</p>
CG9Y84-5305	<p>Questioned pattern most consistent with the 18 inch and 24 inch known distance standards after chemical processing. Additional 6 inches allowed on both ends of distance bracket to account for possible variations in pattern reproducibility between questioned and known distance standards, and possible variation in chemical reactions to reagents. Muzzle-to-target distance interpreted as approximately 12 inches to 30 inches at time of discharge.</p>
DKNRWC-5301	<p>"Distance standards" used for some distances due to smudging of pinprick reactions and haze noted on some of the Modified Griess photographs. Range could possibly be narrowed with additional test shots at ranges smaller than 6" increments and/or repeated test shots. There were some differences noted between processed "distance standards" and the provided photographs. Although CTS plans to eliminate the provided photographs in future years, it is suggested that both the photographs and the fabric be included as this allows reproducibility or the lack thereof to be evaluated when determining a bracket.</p>
DYNHUA-5301	<p>The execution of this test was carried out using the ballistic tool iForenLIBS, based on LIBS technology</p>
F9JH66-5301	<p>Similarities were observed between the unknown processed Griess and TP-3-G9 (12" processed Griess) and therefore a distance of greater than 6" was selected. Based on the</p>

TABLE 3

WebCode-Test	Additional Comments
	radius of the pattern observed with both the processed and unprocessed panel observations, the 18" test panel could not be ruled out as a possible distance and therefore 24" was used as the upper distance.
GUJ4HF-5301	Most of the photographs provided as Modified Griess standards showed some smearing of the pattern, indicating the cloth or griess test paper shifted as it was being processed. This smearing was particularly bad on the 12 inch griess test pattern. In the future, if this happens again, I suggest processing additional test samples, so the images of the known test patterns you send with the test at least look like they were properly processed.
HL3MQ7-5305	no HCl has been applied, optimized Rhod method used
KRH6XX-5301	"Greater than" and "less than" fields left intentionally blank on answer page. Bracketing-type conclusions based on submitted test panels for proficiency purposes in case file notes was between approximately 6" and 18". Per this agency's technical procedures, range bracketing is not typically reported. 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.
LZ8FLY-5301	The uncertainty of measurement in the creation of known test fire patterns was established for our laboratory. Since the test patterns supplied were created by CTS, the uncertainty of measurement does not apply and will not be reported.
MB4RBW-5301	The shooter may have been approximately 19 inches from the victim.
MJHRQU-5305	<p>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.</p> <p>2. In this PT, for the first time for our lab staff regarding CTS GSR Distance Determination tests, the test provider has provided us with physical targets, physical Distance STDs. We chemically developed nitrite, lead, and copper mark patterns from the Distance STDs, as well as the questioned object. Conclusions were made by comparing and interpreting the patterns that were obtained solely by our lab work. No use was made of the pattern images that were provided by CTS.</p> <p>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 the middle values of the range (i.e. ca. 15"), rather the extremities of it (i.e. ca. 6" or 24").</p> <p>4. If we may – an advice for further improvement of the test (for the years to come): This year, the Distance STDs were given in intervals of 6" instead of 3". Providing STDs in intervals of 3", 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" 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 15", a range of 6" or 9" to 21" (i.e. min.-max. difference of 15" or even 12") would be more representative of both the real result and the examiners' proficiency in result interpretation. Yet, this year, we were limited by the</p>

TABLE 3

WebCode-Test	Additional Comments
	Distance STDs having only 6" intervals. In order to report a calculated result of 15", we had to use the 6" to 24" range, although we know we could have given a narrower range; we simply did not have (and were not provided) narrow-enough STD intervals to scientifically support and base such conclusion.
MNAVHD-5301	Minimal point reactions on the known Griess images at 6-inches and 12-inches. Appears to be more of hazy cloud formations. Would like for those to be less hazy.
PA4LQ9-5301	Thank you for including known panels for us to process. This was effective in using for the comparison and mimics casework more closely. Also, please note that the last sentence of the scenario needs to be adjusted for the next test as it is not written clearly.
QUMVJT-5301	The M.G.T and Rhodizonate tests done had an interpreted range from muzzle to shirt between 12 inches to 24 inches, however the powder pattern seen on the unprocessed shirt samples received would have caused me to include the range from 6 inches.
RVJLBU-5301	The uncertainty of measurement in the creation of known test fire patterns was established for our laboratory. Since the test patterns supplied were created by CTS, the uncertainty of measurement does not apply and will not be reported.
W8UUUM-5301	Conclusions were impacted by a number of issues. The main one being the evident enhancement or alteration of the photographs provided. Photographs of all three tests, visual, Modified Griess, and Sodium Rhodizonate, were vastly different from Known originals provided. This lab chose to use the cloth known originals to duplicate the distance bracket reached from visual examination of the questioned "shirt" to the photographs; however, the differences between the cloth knowns and the photographs provided could not prove reproducibility. Also it was evident that an incorrect method of applying heat to the Modified Griess photograph standards resulted in smearing. These issues, along with the new 6 inch increments, lead to a larger distance bracket.
WUQJAL-5301	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/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.
Y6JLNY-5305	I like the directionality arrows on the untreated fabric; however, if there is a way to add distance as well. I think a better (and more consistent approach) would be to give the test takers photos of the unprocessed patterns, modified Griess tests, and sodium rhodizonate tests at the various known distance increments. The unknown (Q1) should also be images (unprocessed patterns, modified Griess test, and sodium rhodizonate test. This way all test takers are evaluating exactly the same Q1 patterns, modified Griess test, and sodium rhodizonate test. This would provide consistency amongst all test takers. Given also the potential variability shot to shot, this approach would help. If CTS needs to really see that test taker is able to chemically process items, then an unknown should be submitted for the sole purpose of chemical examinations. This would be independent of the actual test.
Z7UNBX-5305	The additional known distance samples processed in the laboratory appeared different to those provided in the digital download images. Specifically, the Griess and NaRH for known distances 12" and 18". In my opinion, if multiple physical samples at the same known distances were provided, the information provided through chemical testing would help account for the variability of patterns that could be observed.

-End of Report-
(Appendix may follow)

Test No. 24-5301: GSR Distance Determination

DATA MUST BE SUBMITTED BY **June 24, 2024, 11:59 p.m. EDT** TO BE INCLUDED IN THE REPORT

Participant Code: U1234A

WebCode: UV9QHX

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 seized a Sig Sauer P322 .22 caliber pistol from his possession. The bullet recovered from the victim was identified as having come from the suspect's firearm. Rounds of CCI 22LR ammunition (which was consistent with the bullet recovered from the victim) were test fired with the suspect's firearm and the distance standards prepared. Investigators are asking you to compare the recovered victim's shirt with the distance standards provided to determine the distance the muzzle of the firearm from the shirt.

Please note the following:

-The Modified Griess treatment was performed in accordance to the following article:

Dillon, J.H. (1990) The Modified Griess test: A chemically specific chromophoric test for nitrite compounds in gunshot residues. AFTE J. 22(3), 243-250.

-The Sodium Rhodizonate treatment was performed in accordance to the following article:

Dillon, J.H. (1990) The Sodium Rhodizonate Test: A chemically specific chromophoric test for lead in gunshot residues. AFTE J. 22(3), 251-256.

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

Items Submitted (Sample Pack GSRP - Photographs):

Known Originals: Distance Standards at 6 inch increments from Contact to 30 inches provided on untreated white fabric.

Questioned: Shirt with bullet hole.

Known Powder: Distance Standards at 6 inch increments from Contact to 30 inches provided as images of GSR patterns on untreated white fabric.

Known Griess: Distance Standards at 6 inch increments from Contact to 30 inches provided as images of GSR patterns of Modified Griess Test chemical treatment.

Known NaRH: Distance Standards at 6 inch increments from Contact to 30 inches provided as images of GSR patterns of Sodium Rhodizonate Test chemical treatment.

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)

Please note: Any additional formatting applied in the free form spaces below will not transfer to the Summary Report and may cause your information to be illegible. This includes additional spacing and returns that present your responses in lists and tabular formats.

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

3.) Additional Comments

RELEASE OF DATA TO ACCREDITATION BODIES

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

CTS submits external proficiency test data directly to 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)