



GSR-Distance Determination Test No. 15-530 Summary Report

This test was sent to 262 participants. Each sample set contained an evidence piece of clothing (Q1) for chemical processing for a GSR pattern. The set also contained photographs of GSR patterns produced by test shots at known distances on untreated test fabric (K1a) and treated test fabric after chemical processing using Modified Griess (K1b) and Sodium Rhodizonate (K1c). Participants were requested to process the clothing sample and report the range of distances, along with their conclusions and comments. Data were returned from 212 participants (81% response rate) 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 piece of clothing evidence (Q1) for chemical processing in addition to photographs of known distance test GSR patterns on unprocessed test fabric (K1a) and processed test fabric after chemical processing using Modified Griess (K1b) and Sodium Rhodizonate (K1c). Participants were requested to process the clothing item and report the range of distances that the muzzle of the firearm could have been from the fabric (Q1) at the time of discharge.

SAMPLE PREPARATION-

The firearm used to produce the distance standards and evidence item was a GSG model 522P caliber .22 LR semiautomatic pistol with a 9" barrel and the ammunition was Federal 36 grain copper plated hollowpoint ammunition.

DISTANCE STANDARDS (K1a-c): The fabric used for the known distances was white cotton. The firearm was locked into a fixture and the white cotton fabric was placed at a predetermined distance from the firearm. This was done for each of the predetermined distances. Multiple shots were taken at the same distance to ensure reproducibility and the best representative shot was chosen for further processing. First the known GSR patterns were scanned. Then each known pattern was processed using the Modified Griess procedure. Immediately following processing, the film paper was scanned. Finally the known patterns were processed with Sodium Rhodizonate reagents, and the fabric scanned immediately after processing. The scanned images were printed onto photograph paper, packed into three pre-labeled envelopes (K1a, K1b and K1c) and packaged into the sample set as described below.

QUESTIONED ITEM (Q1): Item Q1 consisted of one section of a white t-shirt material (60% Cotton, 40% Polyester blend knit). The firearm was locked into a fixture and the shirt was placed 10 inches away from the muzzle of the firearm. After firing, the article of clothing (Q1) was packaged between two pieces of chipboard and placed into an envelope. This process was repeated until all of the items were created.

SAMPLE SET ASSEMBLY: Q1, K1a, K1b, and K1c envelopes were placed into a pre-labeled sample pack envelope, sealed with evidence tape, and initialed "CTS."

VERIFICATION: The predistribution laboratories reported the minimum distance to be from contact to 6 inches and the maximum distance to be 15-21 inches. CTS is aware of differing laboratory reporting policies and varying acceptable ranges. It will therefore be at the discretion of the laboratory to evaluate results based on their own policies and ranges.

Summary Comments

This test was designed to allow participants to assess their proficiency in muzzle to target distance determination using gunshot residue patterns. Each participant received an evidence piece of clothing (Q1) for chemical processing in addition to photographs of GSR patterns at known distances on untreated test fabric (K1a) and treated test fabric after chemical processing using Modified Griess (K1b) and Sodium Rhodizonate (K1c). The evidence piece of clothing (Q1) was prepared with the firearm locked into a fixture and the white t-shirt material (60% Cotton, 40% Polyester blend knit) was placed 10 inches away from the muzzle of the firearm. (Refer to the Manufacturer's Information for preparation details.)

In Table 1, 196 of the 212 participants (92%) reported a minimum distance between 3 and 9 inches. One hundred and ninety of the 212 participants (90%) reported a maximum distance between 12 and 18 inches. In the Summary Table on page 7, CTS has grouped the responses provided by more than 10% of participants for their minimum and maximum distance results. CTS is aware of differing laboratory reporting policies and varying acceptable ranges. It will therefore be at the discretion of the laboratory to evaluate results based on their own policies and ranges.

In future Distance Determination tests, CTS will incorporate an inches scale into the distance standard photos and will provide more detail about the Sodium Rhodizonate and Modified Griess processing techniques used for them.

Distance Determination Results

What is the minimum and maximum distance that the muzzle of the firearm could have been from the shirt (Q1) at the time of discharge? Please report a numeral response (e.g. "6") from the supplied Distance Standards. If reporting "Contact", indicate with the numeral "0".

TABLE 1 (Distance in Inches)

| WebCode | Minimum | Maximum | WebCode | Minimum | Maximum | WebCode | Minimum | Maximum |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 26V36V | 6 | 15 | 4VZWVT | 9 | 18 | 93RK82 | 6 | 21 |
| 29FUED | 6 | 18 | 4WYNH2 | 6 | 18 | 942PKQ | 3 | 15 |
| 2APYR2 | 6 | 18 | 62L3EL | 6 | 15 | 94M394 | 3 | 15 |
| 2KB32L | 6 | 21 | 697A37 | 3 | 15 | 9TH8RJ | 9 | 15 |
| 2WEHRX | 6 | 15 | 6BE9DE | 3 | 12 | 9YNNNY | 3 | 18 |
| 2Z33PF | 3 | 15 | 6CARH2 | 3 | 18 | 9Z3BZL | 3 | 15 |
| 2ZGHRV | 6 | 15 | 6MKGWV | 6 | 21 | A8FLN7 | 3 | 21 |
| 2ZKQBG | 3 | 15 | 6NF3M3 | 6 | 18 | ABHD3Y | 3 | 21 |
| 2ZKXBM | 3 | 15 | 6VDR7R | 3 | 21 | AEHT8F | 9 | 15 |
| 37AQ7M | 8 | 16 | 73E44A | 9 | 21 | AF8YPR | 3 | 12 |
| 3B3R7G | 3 | 18 | 786UTT | 6 | 12 | AUTC78 | 6 | 15 |
| 3BFFEY | 3 | 15 | 7GP4GL | 9 | 12 | B2LZ6H | 9 | 15 |
| 3BJ4LZ | 6 | 18 | 7JGT8U | 3 | 18 | BAZVDX | 6 | 21 |
| 3GMV8R | 6 | 18 | 84W2DK | 6 | 15 | BFKXCN | 3 | 15 |
| 3K3CFV | 6 | 15 | 86EQYL | 9 | 15 | BG33UL | 3 | 12 |
| 3KLFQG | 12 | 18 | 86K797 | 6 | 15 | BPBEA6 | 3 | 18 |
| 3ZYU6U | 6 | 18 | 8HYBHU | 6 | 12 | BRDE3A | 9 | 15 |
| 43H6JP | 6 | 12 | 8JWRL4 | 3 | 18 | C7BW8E | 6 | 15 |
| 43KWND | 6 | 15 | 8QJCVB | 9 | 15 | CDC38B | 6 | 12 |
| 4EBPXV | 9 | 15 | 8VCEZB | 6 | 12 | CGRPN2 | 6 | 18 |
| 4V3DEL | 3 | 15 | 8YRW9F | 6 | 12 | CHC88B | 9 | 15 |
| 4V46EE | 3 | 15 | 8Z4LHJ | 7 | 12 | CMJW9V | 6 | 15 |

TABLE 1 (Distance in Inches)

| WebCode | Minimum | Maximum | WebCode | Minimum | Maximum | WebCode | Minimum | Maximum |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| CP6V8L | 9 | 18 | FQA77L | 6 | 15 | K3RGLE | 3 | 12 |
| CX2E69 | 9 | 15 | FQABLV | 9 | 18 | K9VHNU | 6 | 18 |
| D78UVF | 6 | 12 | FQLW66 | 9 | 12 | KDMW34 | 6 | 15 |
| D79QGW | 3 | 15 | G6PQ77 | 0 | 15 | KHHJ3J | 3 | 18 |
| D7B3EZ | 3 | 12 | GLFNNT | 6 | 12 | KL3BEL | 6 | 15 |
| DCHRV9 | 3 | 21 | GU89BE | 6 | 18 | KT3PZM | 3 | 18 |
| DQCD7G | 7 | 14 | HFUJGG | 9 | 18 | KXRED6 | 3 | 15 |
| DUD8AD | 6 | 15 | HGP3JH | 6 | 15 | KZGP6X | 9 | 12 |
| E3BCMF | 9 | 15 | HHRNJ6 | 6 | 15 | L2PBHQ | 3 | 18 |
| E6RVDB | 9 | 12 | HQ4V6Z | 6 | 12 | L6UYZ2 | contact | 15 |
| E76E7L | 3 | 12 | HXHJ2M | 3 | 15 | LLX948 | 6 | 18 |
| EK3BKD | 9 | 12 | HXHJZ2 | 6 | 18 | LN4WJW | 6 | 12 |
| EKQLQ2 | 6 | 18 | HXYQWJ | 9 | 15 | LN6Q33 | 9 | 15 |
| ENGBEJ | 6 | 15 | HZU9BR | 0 | 18 | LXQRKX | 3 | 15 |
| ENN22A | 9 | 21 | J38PQ9 | 9 | 21 | LYMAHT | 6 | 15 |
| ENPWKF | 6 | 18 | JB8XHV | 6 | 21 | M2L4T3 | 9 | 15 |
| EWLPY2 | 6 | 12 | JD7B2E | | | MCP2YR | 3 | 15 |
| EZZM43 | 3 | 12 | JDTQ94 | 3 | 15 | MDHWF9 | 3 | 18 |
| F729MQ | 6 | 15 | JFVMYY | 6 | 18 | MJLXMU | 6 | 15 |
| F7EQFA | 6 | 15 | JKVUKW | 6 | 15 | MML44K | 6 | 18 |
| FDF6ZC | 6 | 12 | JPLDDE | 9 | 15 | MRJN86 | 12 | 24 |
| FDHNA9 | 3 | 15 | JQUF8P | 3 | 15 | MTVKEU | 6 | 15 |
| FETTKB | 9 | 15 | JXEE36 | 6 | 15 | MWECQW | 6 | 12 |
| FFW24W | 3 | 15 | K369EW | 6 | 12 | MXMP7D | 3 | 15 |

TABLE 1 (Distance in Inches)

| WebCode | Minimum | Maximum | WebCode | Minimum | Maximum | WebCode | Minimum | Maximum |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| NAXFRL | 3 | 15 | RRJCDW | | | WEXP2Y | 9 | 12 |
| NJHVAU | 6 | 15 | RX9WGC | 6 | 18 | WFC2PW | 9 | 15 |
| NP93VN | 6 | 18 | TB6JUX | 6 | 12 | WFRBR6 | 9 | 15 |
| NPTWGK | 6 | 18 | TDX9K7 | 12 | 18 | WGMZ6Y | 6 | 18 |
| NRDT24 | 6 | 12 | TEFBFL | 12 | 24 | WQDKBX | 3 | 15 |
| P2EKZW | 9 | 12 | TGGE42 | 6 | 15 | WQULAT | 3 | 15 |
| P6CBVA | 6 | 12 | TTCPC9 | 6 | 18 | WT3UHD | 6 | 18 |
| PD4QMZ | 9 | 15 | TWWGMC | 6 | 18 | WXVRAP | 9 | 21 |
| PFEEGX | 3 | 18 | U9NJMJ | 3 | 15 | X8XFGT | 6 | 15 |
| PPPWUP | 6 | 15 | UKHWMF | 6 | 15 | XGJXVK | 6 | 12 |
| PVPC66 | 9 | 18 | UNA7P2 | 6 | 21 | XHJPVE | 3 | 18 |
| PWH64U | 9 | 12 | UQMHTX | 24 | 27 | Y2M3VY | 3 | 21 |
| PXVNDR | 6 | 15 | UQYHLL | 6 | 12 | Y3XX9Q | 12 | 18 |
| QDMPN4 | 6 | 18 | URUXXH | 9 | 21 | Y7E4YY | 12 | 15 |
| QN779X | 12 | 15 | UZ8PNF | 6 | 15 | YBCM2X | 6 | 15 |
| QTLMWU | 6 | 18 | V8JA4X | 9 | 15 | YBCQQ3 | 6 | 12 |
| QWE3RV | 15 | 18 | V8QENG | 3 | 15 | YCN6HH | 6 | 21 |
| QWWRDW | 12 | 18 | VFWGN8 | 6 | 15 | YGFGBT | 6 | 12 |
| QYQE6R | 6 | 18 | VJELC6 | 3 | 15 | YXJXCZ | 9 | 15 |
| R7ZAEQ | 9 | 15 | VJELEP | 6 | 15 | YYFHAK | 9 | 15 |
| RCKL27 | 6 | 18 | VPLCGV | 6 | 12 | ZAT262 | 6 | 18 |
| REE26P | 3 | 18 | VPPMPL | 6 | 15 | ZGTFXP | 3 | 15 |
| RJP7HA | 9 | 18 | W6VB8E | 3 | 18 | ZL7FUF | 6 | 15 |
| RM99G3 | 3 | 18 | W7TE8G | 3 | 15 | ZP98DE | 3 | 15 |

TABLE 1 (Distance in Inches)

| WebCode | Minimum | Maximum | WebCode | Minimum | Maximum | WebCode | Minimum | Maximum |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| ZQ3WFM | 6 | 15 | | | | | | |
| ZQJ4K6 | 3 | 15 | | | | | | |

| Response Summary | | | | Participants: 212 | | | |
|---|--|----------------------------------|--|---|--|----------------------------------|--|
| Minimum Distance Determination Result (Total Participants Responding = 212) | | | | Maximum Distance Determination Result (Total Participants Responding = 212) | | | |
| <u>Minimum Distance</u> | | <u>Participants (Percentage)</u> | | <u>Maximum Distance</u> | | <u>Participants (Percentage)</u> | |
| <u>(Inches)</u> | | | | <u>(Inches)</u> | | | |
| Contact / 0 | | 3 (1.42%) | | Contact / 0 | | 0 (0.00%) | |
| 3 | | 58 (27.36%) | | 3 | | 0 (0.00%) | |
| 6 | | 95 (44.81%) | | 6 | | 0 (0.00%) | |
| 9 | | 41 (19.34%) | | 9 | | 0 (0.00%) | |
| 12 | | 8 (3.77%) | | 12 | | 38 (17.92%) | |
| 15 | | 1 (0.47%) | | 15 | | 95 (44.81%) | |
| 18 | | 0 (0.00%) | | 18 | | 55 (25.94%) | |
| 21 | | 0 (0.00%) | | 21 | | 17 (8.02%) | |
| 24 | | 1 (0.47%) | | 24 | | 2 (0.94%) | |
| 27 | | 0 (0.00%) | | 27 | | 1 (0.47%) | |
| Other | | 3 (1.42%) | | Other | | 2 (0.94%) | |
| No Response | | 2 (0.94%) | | No Response | | 2 (0.94%) | |
| CTS is aware of differing laboratory reporting policies and varying acceptable ranges. It will therefore be at the discretion of the laboratory to evaluate results based on their own policies and ranges. For this test, CTS grouped responses reported by more than 10% of participants to form the provided minimum and maximum ranges. | | | | | | | |

Conclusions

TABLE 2

| WebCode | Conclusions |
|---------|---|
| 26V36V | Item Q1 is a white cloth panel with a generally central defect. It was visually and stereoscopically examined and chemically tested for the presence of gunshot residues. From the examinations and testing performed, a pattern of gunshot residues was found to be present around the defect. Based upon the comparison of the pattern of residues present on Item Q1 and the chemically developed patterns from Item Q1 as compared to the photos of the test fired gunshot residue patterns in Item K1a and the chemically developed patterns in Items K1b and K1c, the muzzle to target distance represented is consistent in size and density with having been produced at a distance of further than 6 inches and closer than 15 inches. |
| 29FUED | The Exhibit Q1 shirt was microscopically examined and chemically processed for the presence of gunshot residues. Copper residue that is indicative of the passage of a bullet was detected around the hole. The gunshot residue pattern was similar to the distance standards representing the firearm firing at a target from a minimum distance of 6" to a maximum of 18". |
| 2APYR2 | The muzzle of the firearm (as represented by the known distance standards K1a- c) was not closer than 6 inches and not further than 18 inches from the Q1 t- shirt when the questioned pattern was produced. |
| 2KB32L | The area around the hole in the Item 1 shirt was microscopically examined and chemically processed for the presence of gunshot residues, and a pattern of Nitrite and lead residues was found. The pattern of residues present on the Item 1 shirt was reproduced at a muzzle-to-target range of greater than six and less than twenty one inches. No other residues were detected. |
| 2WEHRX | During the optical examination of the shirt marked Q1 I noticed smoke blackening, bullet wipe and partially burnt propellant residue around the hole. During the chemical examination and tests of the shirt marked Q1 lead and propellant residue were found surrounding the hole. I am therefore of the opinion that the shot was fired at a distance of between 6 inches and 15 inches. |
| 2Z33PF | Item #Q1: The white cloth sheet was chemically processed using the Modified Griess Test (MGT) and the Sodium Rhodizonate Test (SRT) and the results indicated the presence of nitrites, a component of burnt gunpowder, and lead, a component of firearm discharge residue. The processed sheet of photo paper with the MGT pattern was designated as sub-item #Q1a and will be retained with the evidence. The pattern on the untreated white cloth sheet and the chemically processed MGT and SRT patterns were compared to the firearm discharge residue patterns of sub-items #K1a1 to #K1a10, #K1b1 to #K1b10 and #K1c1 to #K1c10, to conclude that the distance between the barrel muzzle of the GSG, model 522P, caliber .22 long rifle, semi-automatic pistol and the shirt was approximately 3 to 15 inches. |
| 2ZGHRV | 3. On 2015-09-03 during the performance of my official duties I received a sealed evidence bag with number PW4000461640 from Case Administration of the Ballistics Section, containing: 3.1 One (1) white shirt marked by me "196174/151". 4. The intention and scope of this forensic examination comprise the following: 4.1 Shot range determination. 5. I examined the white shirt mentioned in paragraph 3.1 and found: 5.1 One (1) hole with the appearance of a bullet hole in the centre. 5.2 During the optical and chemical examination of the bullet hole mentioned in paragraph 5.1 propellant residue was found surrounding the hole. 5.3 Shot range determination tests were performed and they indicate that the shot that |

TABLE 2

| WebCode | Conclusions |
|---------|---|
| | caused the hole mentioned in paragraph 5.1 was fired at a distance of between 6 inches and 15 inches. |
| 2ZKQBG | Item #Q1: The irregular-shaped hole and surrounding area was chemically processed for the presence of nitrite and lead residues using the Modified Griess Test (MGT) and Sodium Rhodizonate Test (SRT) and a pattern of residues was observed. The treated photo paper with the nitrite pattern from the white-colored cloth, designated as sub-item #Q1a, was obtained using the MGT. The photographs of known firearm discharge residue patterns, Items #K1a, K1b and K1c, were compared to the patterns on the untreated and chemically processed white-colored cloth and sub-item #Q1a, to conclude that the approximate distance from the muzzle end of the pistol to the white-colored cloth was at least 3 inches but not more than 15 inches. |
| 2ZKXBM | The area around the hole in Q1 was microscopically examined and chemically processed for gunshot residues and a pattern of residues was found. Using a GSG model 522 caliber .22LR semiautomatic pistol with a 9 inch barrel and Federal 36 grain copper plated hollow point ammunition, the pattern of residues around the hole on the shirt was reproduced at a muzzle to target distance of greater than 3 inches and less than 15 inches. |
| 37AQ7M | Chemical testing detected the presence of nitrates on the area around the hole in item Q1. Chemical testing detected the presence of a nitrite pattern on the area around the hole in item Q1, with the approximate diameter of 5 1/4". Chemical testing detected the presence of a cloudy pattern of lead residues on the area around the hole in item Q1. The results from the chemical testing on item Q1 are consistent with the deposit of gunshot residue after the discharge of a firearm. Based on information supplied by Collaborative Testing Services of a known firearm and ammunition, it was determined that the minimum distance is 8" and the maximum distance is 16". |
| 3B3R7G | The area around the hole was microscopically examined and chemically processed for the presence of gunshot residues (i.e. lead, copper, nitrites, particulate matter). A pattern of residues (lead, nitrites, particulate matter) was found. A pattern of gunshot residues was found. Using the identified weapon with ammunition similar to the questioned cartridges, this pattern was produced at a distance from the weapon to the target of between 3" and 18". |
| 3BFFEY | The item Q1 was examined for bullet defects. The garment and observations made are as follows: Cotton panel: This is a 10" x 10" cotton panel with a single defect (A) observed. Defect A is consistent with being produced by a bullet. Defect A on Item Q1 was examined macroscopically, microscopically and processed chemically for the presence of gunpowder and lead residues, a pattern of residues were found. Photographs of tests made with the recovered firearm were submitted with Item Q1. It was determined that residue patterns, like that found on the Item Q1 could be produced at a muzzle to target distance of approximately 3" to 15" inches. All conclusions were reached using microscopic and/or macroscopic examination. This report reflects the test results, conclusions, interpretations and/or the findings of the analysts and technical reviewers below as indicated by their signatures below. |
| 3BJ4LZ | Defect A is consistent with the passage of a bullet. A pattern of gunshot residues consistent with the discharge of a firearm were detected around the defect A. This pattern is consistent with the pattern produced at a muzzle to target distance between 6 to 18 inches, using the suspect firearm and Federal 22 LR caliber cartridges with 36 grain copper plated hollow point |

TABLE 2

| WebCode | Conclusions |
|---------|--|
| | ammunition. |
| 3GMV8R | The defect upon Item Q1, if created by the GSG brand semiautomatic pistol, model 522 P, caliber .22 long rifle loaded with 36 grain copper plated hollow point ammunition, is consistent with having been created at a distance between six (6) inches and eighteen (18) inches based upon comparison of item Q1 to test targets created at known distances. |
| 3K3CFV | During the optical examination of the shirt marked Q1 I noticed smoke blackening, bullet wipe and partially burnt propellant residue around the hole. During the chemical examination and tests (Sodium Rhodizonate & Modified Griess treatments) of the shirt marked Q1 lead and propellant residue were found surrounding the hole. I am therefore of the opinion that the shot was fired at a distance of between 6 inches and 15 inches. |
| 3KLFQG | Shooting distance = 12" - 18" (Close range) |
| 3ZYU6U | 3. On 2015-09-04 during the performance of my official duties I received a sealed evidence bag with number PW4000461637 from Case Administration of the Ballistics Section, containing the following item: 3.1 One (1) sealed envelope, marked "2015 CTS Forensic Testing Program Test No. 15-530: GSR-Distance Determination Sample Pack: GSRD", containing the following items: 3.1.1 One (1) sealed envelope, marked "Item Q1", containing the following exhibit: 3.1.1.1 One (1) white shirt. 3.1.2 One (1) sealed envelope, marked "Item K1a", containing the following exhibit: 3.1.2.1 One (1) pair of Powder Pattern distance standards. 3.1.3 One (1) sealed envelope, marked "Item K1b", containing the following exhibit: 3.1.3.1 One (1) Modified-Griess test distance standards. 3.1.4 One (1) sealed envelope, marked "Item K1c", containing the following exhibit: 3.1.4.1 One (1) pair of NaRh Pattern distance standards. 4. The intention and scope of this forensic examination comprise the following: 4.1 Shot range determination. 5. I examined the shirt mentioned in paragraph 3.1.1.1 and found the following: 5.1 One (1) hole, with the appearance of bullet hole, on the mid-section of the shirt marked "A1". 6. During the optical and chemical examination of the bullet hole mentioned in paragraph 5.1 propellant residue was found surrounding the hole. Modified-griess test was applied and compared to the standards mentioned in paragraph 3.1.3.1 and they indicate that the shots were fired at a distance of between "6" inches (15.24)cm and "18" inches (45.72)cm. |
| 43H6JP | 2.1 The muzzle of the firearm was held at a distance of between 6" - 12" when the shot was fired at the target. |
| 43KWND | This conclusion is based upon the following assumptions: 1. That there was no significant interference in the distribution of the firearms discharge residues between exit from the muzzle and interaction with the victims shirt (example the residues were partially blocked by an intervening target material). 2. That the test fired firearm and ammunition are the same combination that were responsible for the questioned discharge. Conclusion - I visually and chemically examined the exhibit T-shirt (Item Q1) in the area surrounding the perforation for the presence of firearms discharge residues (FDR's). FDR's were observed to be present. The pattern of FDR's observed on Item Q1 were compared to the FDR patterns of the distance standards (Items K1a-c). As a result of my examinations I formed the opinion that the muzzle of the .22 calibre GSG model 522P pistol was between 6 inches and 15 inches from the exhibit T-shirt (Item Q1) at the time of discharge. |

TABLE 2

| WebCode | Conclusions |
|---------|--|
| 4EBPXV | The square piece of fabric (Item Q1) was visually examined for holes. One hole, designated hole number 1, was observed. The area around hole number 1 was microscopically examined and chemically processed for the presence of gunshot residue. A residue pattern was found. This pattern was compared to photographs (Item K1a, K1b and K1c) of developed distance standards reportedly made using the suspect's firearm. Bases[sic] upon the comparison of the residue pattern on the square piece of fabric (Item Q1) to the distance standard photographs, the muzzle-to-target distance is consistent with being greater than nine (9) inches and less than fifteen (15) inches. |
| 4V3DEL | The area around Hole 1 was microscopically examined and chemically processed for the presence of gunshot residues, and a pattern of residues was found. Using a GSG model 522P caliber .22 LR semi-automatic pistol and Federal 36 grain copper plated hollow point ammunition this pattern of residues was reproduced at a muzzle-to-target distance of grater[sic] that[sic] 3 inches and less than 15 inches. |
| 4V46EE | The white cloth sheet was chemically processed using the Modified Greiss Test (MGT) and Sodium Rhodizonate Test (SRT) to test the presence of nitrites and lead. The chemical processing using the MGT resulted in patterns indicating the presence of nitrites and the SRT indicated the presence of lead. The untreated and chemically treated square white cloth panel was compared to the untreated and chemically treated firearm discharge residue patterns, Items K1a, K1b and K1c to conclude that the muzzle end of the firearm was at a distance between 3 to 15 inches from the square white cloth panel when it was discharged. |
| 4VZWVT | 5. I examined the white portion of the shirt mentioned in paragraph 3.1 and found the following: 5.1 One (1) hole with the appearance of a bullet hole in the centre. 5.2 During the optical and chemical examination of the hole mentioned in paragraph 5.1 propellant residue was found surrounding the hole. 5.3 Shot range determination tests were performed and they indicate that the shot that caused the hole mentioned in paragraph 5.1 was fired at a distance of between "9" inches and "18" inches. |
| 4WYNH2 | The submitted evidence (Q1) was visually examined and chemically processed for the presence of gunshot residues. The modified Greiss[sic] (presence of nitrites) and sodium rhodizonate (presence of vaporous lead) tests were performed and the results were compared to the known test panels. A pattern of residues was found and indicated a muzzle to target distance of greater than 6" but less than[sic] 18". |
| 62L3EL | The minimum distance the muzzle of the firearm could have been from the shirt Q1 was 6 inches (6") and the maximum distance was fifteen inches (15"). |
| 697A37 | The area around the hole located on Q1 was microscopically examined and chemically processed for the presence of gunshot residues, and a pattern was detected. Using the submitted firearm and ammunition, this pattern was reproduced at a distance of between three (3) and fifteen (15) inches. |
| 6BE9DE | The area around the hole in the white twill cloth was microscopically examined and chemically processed for the presence of gunshot residue and a pattern of residues were found. This pattern of residue consistent with the passage of a bullet was reproduced at a distance greater than 3 inches and less than 12 inches. |

TABLE 2

| WebCode | Conclusions |
|---------|---|
| 6CARH2 | Item 1.1 consists of three envelopes containing distance standards. Item 1.2 is a white colored piece of fabric with an apparent bullet hole. The area around the hole in the middle of the fabric was microscopically examined and chemically processed for the presence of gunshot residues, and a pattern of residues was found. Using the provided distance standards (Item 1.1), this pattern of residues was reproduced at a distance greater than three inches and less than eighteen inches. |
| 6MKGWV | Gunshot residue patterns were developed around hole A in the white shirt Q1. Based on test fires at known distances, these patterns are consistent with a muzzle to target distance of greater than 6 inches and less than 21 inches. |
| 6NF3M3 | A comparison of the gunshot residue pattern on Item Q1 with those on Items K1a, K1b and K1c revealed a muzzle to target range of 6 to 18 inches. |
| 6VDR7R | The area surrounding the hole in the Item 2 shirt was examined, chemically treated and compared to the Item 1 tests with the following conclusions: The hole in the Item 2 shirt is consistent with the passage of a bullet. The Item 2 shirt has gunshot residue patterns, which indicate the firearm was fired at a distance between 3 and 21 inches from the shirt. Distance determination materials from Item 1 have been retained in a packet labeled Packet FIR1. This packet is being returned to the submitting agency. |
| 73E44A | Q1 PORTION OF VICTIMS SHIRT RECOVERED UNDER PROPERTY# 73E44A WAS EXAMINED FOR THE PRESENCE OF GUNPOWDER RESIDUES AND LEAD TRACES WITH POSITIVE RESULTS. A GUNPOWDER PATTERN WAS DEVELOPED FROM THE RESIDUE ON THE FABRIC AROUND THE HOLE. THE PATTERN WAS COMPARED TO GUNPOWDER RESIDUE PATTERNS MADE WITH A GSG MODEL 522P .22 CALIBER SEMIAUTOMATIC PISTOL WITH A 9" BARREL FIRED INTO SIMILAR MATERIAL IN THE LABORATORY. THE RESULTS OF THIS COMPARISON INDICATE THE HOLE ON THE VICTIMS SHIRT (Q1) IS CONSISTENT WITH A SHOT BEING FIRED AT A DISTANCE OF APPROXIMATELY 9" TO 21" FROM THE TARGET WITH THIS WEAPON. +/- 5/8 OF AN INCH AT A COVERAGE PROBABILITY OF 95%. |
| 786UTT | During the optical and chemical examination of the bullet hole, propellant residue was found surrounding the hole indicating that the shot was fired between 6 inches and 12 inches from the target. |
| 7GP4GL | The examination of the gunshot residues round the bullet hole on protion[sic] of the shirt and compared with standard distance prepared from the suspect firearm reveal that: 1. The minimum distance for the muzzle of firearm could have been 9 in from the shirt. 2. The maximum distance could have been 12 in. |
| 7JGT8U | The pattern of residues observed on the shirt, item 4, were produced from a distance of at least 3 inches but less than 18 inches. |
| 84W2DK | During the optical and chemical examination of the bullet hole, propellant residue was found surrounding the hole. Shot range determination tests were performed and they indicate that the shot was fired with a muzzle distance of between 6 inches to 15 inches from the T-shirt. |
| 86EQYL | The distance of muzzle of the firearm minimum and maximum was between 9" and 15" from |

TABLE 2

| WebCode | Conclusions |
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| | the victim's shirt. |
| 86K797 | The area surrounding the defect in the white shirt section, Item 1A (Item Q1), was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed a pattern of gunshot residues. Images of test patterns, Items 1B-1D (Items K1a, K1b, and K1c), were submitted from a known firearm and analyzed. Using the test images, the pattern was duplicated at a muzzle to target distance between six and fifteen inches. The following is a summary of testing performed: Microscopic examination for unburnt/partially burnt gunpowder particles: particles consistent with the morphological (shape and size) properties of gunpowder were found. Chemical examination for nitrates that could originate from unburnt/partially burnt gunpowder particles using the Diphenylamine test: positive. Chemical examination for nitrite residues that could originate from gunpowder particles using the Modified Griess test: positive. Microscopic examination for lead residues: residues consistent with lead found. Chemical examination for lead residues using the Sodium Rhodizonate test: positive. Other than a visual examination, no additional analytical tests were performed on Items 1B, 1C, and 1D (Items K1a, K1b, and K1c). |
| 8HYBHU | I examined the cloth marked Item Q1 and found the following: The cloth had one bullet entrance defect visible. During the optical examination I found bullet wipe, soot, burnt and partially burnt propellant residue surrounding the bullet entrance defect. After chemical examinations of the cloth I found that the muzzle of the firearm was between 6 inches and 12 inches from the cloth when the shot was fired. |
| 8JWRL4 | The area around the hole in the middle area of this item was microscopically examined and chemically processed for the presence of gunshot residues (lead, copper, nitrites, particulate matter). A pattern of residues (vaporous lead, copper, nitrites, particulate matter) was found. A pattern of gunshot residues was found. Using the identified weapon with ammunition similar to the questioned cartridges, this pattern of residue was reproduced at a distance from the weapon to the target of between 3 inches and 18 inches. |
| 8QJCVB | In the fragment of cloth, it identifies inlet 4mm in diameter with cleaning ring and gunshot residue produced by the passage of firearm bullet single charge, setting the shooting distance short; with a range of shot and the other 9 to 15 inches. |
| 8VCEZB | Performed physical and chemical study and comparison with standard photographs taken at different distances from the dispersion of GRS; it follows that the shot was fired at a distance range between at least six (6) inches and maximum twelve (12) inches from the muzzle of the gun and the surface. Likewise, we see that the bullet had lead in the their constitution. |
| 8YRW9F | I compared the powder, Griess, and Sodium Rhodizonate patterns obtained from Q1 to the provided known powder, Griess and Sodium Rhodizonate test patterns K1a, K1b and K1c. Based on the comparison I determined the minimum muzzle to target distance to be 6", and the maximum muzzle to target distance to be 12". |
| 8Z4LHJ | Based on information supplied by Collaborative Testing Services of a known firearm and ammunition, it was determined that the minimum distance is 7" and the maximum distance is 12". |
| 93RK82 | A pattern of gunshot residues was found. Using the identified weapon with ammunition similar to the questioned cartridges, this pattern of residue was reproduced at a distance from the |

TABLE 2

| WebCode | Conclusions |
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| | weapon to the target of between 6 and 21 inches. |
| 942PKQ | The area surrounding the hole in Q1 was examined microscopically and processed chemically for the presence of gunshot residues and a pattern of residues was found. Test patterns were produced at various distances using the suspect weapon and like ammunition. Based on comparisons of the test patterns with the pattern on Q1, it was determined that a pattern of residues like that found on Q1 could be produced at muzzle-to-garment distances of greater than three inches (3") , but less than fifteen inches (15"). |
| 94M394 | Examination: The area around the hole in the center of item 1-2 (shirt) was microscopically examined and chemically processed for the presence of gunshot residues (lead, copper, nitrites and particulate matter). A pattern of residues(vaporous lead, copper, nitrites and particulate matter) was found. A pattern of gunshot residues was found. Using the identified weapon with ammunition similar to the questioned cartridges, this pattern of residue was reproduced at a distance from the weapon to the target of between 3 inches and 15 inches. |
| 9TH8RJ | Based on information supplied by Collaborative Testing Services of a known firearm and ammunition, it was determined that the minium[sic] distance is 9" and the maxium[sic] distance is 15". |
| 9YNNNY | The area around the hole in the t-shirt marked Q-1 was visually, chemically and microscopically examined for the presence of gunshot residues and a pattern of gunshot residues was found. Patterns like the pattern found on item Q-1 were produced at a distance greater than 3 inches and less than 18 inches. |
| 9Z3BZL | Item 2 was examined for any evidence related to the discharge of a firearm at close distance. A hole with apparent bullet wipe was perceived in the middle of the fabric. Surrounding the hole is a pattern consisting of powder particles. There was also a faint smoke residue surrounding the hole. Item 2 was processed for the presence of nitrites (byproducts from the combustion of smokeless propellant) using the Modified Griess method and the presence of lead using Sodium Rhodizonate (chemical used for the detection of lead). A pattern was obtained from the Modified Griess method and a positive reaction was perceived for the presence of lead. After chemically processing Item 2 and comparing it to the known test fired distances (unprocessed, Modified Griess and Sodium Rhodizonate), it was determined that the muzzle of the firearm was between 3" and 15" from the target at the time of discharge. |
| A8FLN7 | 1. Examination of Exhibit 2 (shirt) disclosed a perforating defect near the center of the fabric. The area around the hole was visually examined and chemically processed. Physical characteristics and a pattern of gunshot residues associated with the discharge of a firearm were located. 2. The pattern of gunshot residues on Exhibit 2 was compared to Exhibit 1 (photographs of known distance test patterns). The pattern of gunshot residues on Exhibit 2 was reproduced at a muzzle to target distance between approximately 3 inches and 21 inches. |
| ABHD3Y | Residues consistent with the discharge of a firearm were detected on Laboratory Item (001.D) (Q1) white cloth shirt with bullet hole. The area around the hole was microscopically examined and chemically processed for the presence of gunshot residues. The firearm discharge distance was determined to be greater than 3 inches, but less than 21 inches. |
| AEHT8F | Based on information supplied by Collaborative Testing Services of a known firearm and ammunition, it was determined that the minimum distance is 9" and the maximum distance is |

TABLE 2

| WebCode | Conclusions |
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| 15". | |
| AF8YPR | Item #2 (white t-shirt section) was examined on 10/12/2015. A defect was located on the mid-section of the material. The area around this defect was microscopically examined and chemically processed for the presence of gunshot residues. A pattern of residues consistent with the discharge of a firearm were found. Using Item #1 (supplied test photos) that are images of test patterns that were produced at various muzzle-to-target distances. The residue pattern found on the Item #2 (white t-shirt section) is consistent with a muzzle-to-target distance between approximately 3 inches and 12 inches. |
| AUTC78 | The minimum distance between the muzzle of the firearm and the cloth was six "6" inches and the maximum distance of fifteen "15" inches. |
| B2LZ6H | During the optical and chemical examination of the bullet hole, propellant residue was found surrounding the hole. Shot range determination tests were performed and supplied to me, shots were fired with the pistol and ammunition with the same specifications, and they indicate that the shot was fired at a distance between 9 and 15 inches. |
| BAZVDX | I visually examined the submitted cloth (Item Q1) and found partially burned gun powder particles around the bullet hole. I conducted the following tests on Item Q1: I visually compared the size and density of the residue pattern on Item Q1 with the patterns in the photos from Item K1a. I processed the cloth square for the presence of nitrites (partially burned gunpowder particles) and visually compared the size and density of the nitrite pattern from Item Q1 with the patterns in the photos from Item K1b. I processed the cloth square for the presence of vaporous lead and visually compared the size and density of the lead pattern on Item Q1 with the patterns in the photos from Item K1c. Based on the tests and visual examinations, the square cloth (Item Q1) was shot at a muzzle to target distance greater than 6 inches and less than 21 inches. The tests showed that the shot is most consistent with a muzzle to target distance of 9 and 12 inches. |
| BFKXCN | Examination of Item 4 revealed a hole in the center of the cloth. The area surrounding the hole was visually and microscopically examined and chemically processed and a pattern of gunshot residues was detected. Test pattern photo arrays were submitted at the following muzzle-to-target distances: contact, three (3) inches, six (6) inches, nine (9) inches, twelve (12) inches, fifteen (15) inches, eighteen (18) inches, twenty-one (21) inches, twenty-four (24) inches, and twenty-seven (27) inches. The detected pattern surrounding the hole in the center of Item 4 is consistent in size, density, and appearance to the test patterns produced at muzzle-to-target distances of between three (3) and fifteen (15) inches. |
| BG33UL | The residue pattern indicates a muzzle-to-target distance between three (3) and twelve (12) inches. |
| BPBEA6 | The area surrounding the defect in the center of the shirt, Item Q1, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed a pattern of gunshot residues. Images of test patterns, Items K1A - K1C, were submitted from a known firearm and analyzed. Using the test images, the pattern was duplicated at a muzzle to target distance between 3 and 18 inches. The following is a summary of testing performed: Microscopic examination for unburnt/partially burnt gunpowder particles: particles consistent with the morphological (shape & size) properties of gunpowder were found. Chemical examination for nitrates that could originate from unburnt/partially burnt gunpowder |

TABLE 2

| WebCode | Conclusions |
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| | particles using the Diphenylamine test: positive. Chemical examination for nitrite residues that could originate from gunpowder particles using the Modified Griess test: positive. Microscopic examination for lead residues: residues consistent with lead found. Chemical examination for lead residues using the Sodium Rhodizonate test: positive. |
| BRDE3A | We observe in the trimmed piece of the t-shirt submitted, the presence of a bullet hole compatible with the entrance of a bullet with a caliber of .22 LR. Shooting distance was higher than 9 inches, but lower than 15 inches. |
| C7BW8E | The area around the hole on Item Q1 (shirt) was microscopically examined and chemically processed for the presence of gunshot residues. A pattern of residues was found and the results are consistent with the passage of a bullet with a muzzle to target distance between 6 and 15 inches. |
| CDC38B | The nitrite pattern detected on the griess test for defect A entrance on item 4 is consistent in diameter and particle population with the nitrite patterns detected from the test fire targets of item 2, the "photo set of test fire targets treated with griess test", between the distances of 6 inches and 12 inches. |
| CGRPN2 | Exhibits K1a, K1b and K1c consist of thirty (30) photographs that depict gunshot residue distance standards fired at 3" increments from contact to 27". The distance standards are comprised of untreated twill jean cloths, as well as modified griess and sodium rhodizonate chemical test results. Exhibit Q1 contains one (1) hole in the center of the cloth. The Q1 hole and surrounding area was examined microscopically and processed chemically for the presence of gunshot residues (GSRs). The chemically processed test media results, designated Q1-T1, detected a GSR residue pattern produced by the passage of a bullet. The Q1 GSR residue pattern was compared to the K1a, K1b and K1c photographs. It was determined that the Q1 hole was fired from a minimum distance of six (6) inches and a maximum distance of eighteen (18) inches, muzzle to garment. |
| CHC88B | The clothing was treated using the standard Na-Rhodizonate test. Using this test the presence of bi-valent metallic elements can be shown. As in classic GSR particles both lead and barium will be colored using this test, the distribution of GSR particles around the entrance hole can be observed. From the observed pattern on the clothing it is clear that a shooting occurred at a distance smaller than 80 inches. Using the provided photographs of reference shots at known distances, it can be further estimated more precisely that the shooting took place at a muzzle to target distance between 9 and 15 inches. |
| CMJW9V | The area around the hole in the R-1 shirt (Item Q1) was microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was found. The T-1, T-2 and T-3 distance standards (Items K1a-c) were compared and patterns similar to that observed on the R-1 shirt (Item Q1) were produced at distances of greater than six (6) inches and less than fifteen (15) inches. |
| CP6V8L | The piece of white material from a shirt has one entrance bullet hole marked "Q1". During the optical and chemical examination of the hole, I noticed smoke blackening, powder soot, bullet wipe and partially burnt propellant residue around the hole. During the chemical examination and tests (Sodium Rhodizonate & Modified Griess treatments) of the bullet hole marked Q1, lead and propellant residue were found surrounding the hole. I am therefore of the opinion that the shot mentioned, was fired at a distance of between 9 inches and 18 inches. |

TABLE 2

| WebCode | Conclusions |
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| CX2E69 | The piece of T-shirt with the bullet hole (Q 1) was visually and microscopically examined and chemically tested. Chemical tests developed and made visible additional gunshot residues on the piece of cloth (Q1) which were then visually compared to the provided reference test patterns (K1a -c). The gunshot residue pattern observed on the piece of T-shirt (Q 1) was determined to have been made at a muzzle to target distance between 9 and 15 inches, and is most consistent with the provided 12 inch test patterns. |
| D78UVF | We examined this case at two steps. At the first step, we investigated and compared the physical view of bullet hole to the patterns provided. At the second step, we performed the NaRH test to obtain distribution fo[sic] gunshot residue. We noticed that there exists gunshot residue around the bullet hole on the t-shirt. We compared the distribution of gunshot residue to the patterns fo[sic] NaRH test. As a result, we evaluated it as "close shooting" (between 6-12 inches). |
| D79QGW | The area around the hole in Item Q1 was examined and chemically processed for the presence of gunshot residues. The gunshot residue pattern around the hole in Item Q1 is consistent with tests fired at a muzzle-to-target distance greater than 3 inches and less than 15 inches using the known standards K1a, K1b, and K1c. |
| D7B3EZ | The area around the hole in Q1 was microscopically examined and chemically processed for the presence of gunshot residues, and a pattern of residues was found. Using K1a-c, this pattern of residues was reproduced at a distance of between 3 inches and 12 inches. |
| DCHRV9 | The item 005-001-001 fabric square with defect ("Q1: Shirt with bullet hole") was examined for the presence of bullet defects and gunshot residues utilizing visual, microscopic and chemical techniques. A single bullet entry defect (Hole A) was detected centrally in the fabric. Gunpowder, bullet wipe, soot, nitrite residue and lead residue were observed surrounding Hole A. The gunshot residue patterns from the provided series of test targets (items 005-002-001 "K1a", 005-003-001 "K1b" and 005-004-001 "K1c") were evaluated and compared to the gunshot residue patterns detected on item 005-001-001 ("Q1: Shirt with bullet hole"). Based on the gunshot residue patterns on the test targets, the range-of-fire was determined to be at some distance greater than three inches (3") but less than twenty-one inches (21") from the gun muzzle to item 005-001-001 at the time the shot was fired. |
| DQCD7G | The shirt worn by the victim at the time of the shooting has been visually and chemically analyzed. The firearm muzzle to shirt surface distance at the time of discharge is determined to be between 7 and 14 inches. |
| DUD8AD | Item Q1, one T-shirt with a bullet hole, was visually examined and chemically processed using the Modified Griess Test for nitrite residues and using the Sodium Rhodizonate Test for lead residues. Visual examination and chemical processing of the submitted Item Q1 in comparison to the submitted photographed standards put the muzzle of the firearm at a minimum of 6 inches and a maximum of 15 inches from the t-shirt at the time of discharge. |
| E3BCMF | Based on information supplied by Collaborative Testing Services of a known firearm and ammunition, it was determined that the minimum distance is 9" (inches) and the maximum distance is 15" (inches). |

TABLE 2

| WebCode | Conclusions |
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| E6RVDB | As a result of the reactions from the modified Griess, modified Dithiooxamide and modified Sodium Rhodizonate tests and based on the comparisons of the appearance and distribution of powder particles, sooting, lead, cooper[sic] and nitrites between the shirt (Item Q) and the supplied test prints (Items K1a, K1b, K1c), the muzzle to target distance was between 9 and 12 inches. This is based on the assumption that the ammunition and firearm used was the same on the shirt and supplied test prints, and the target was perpendicular to the firearm's barrel at the time of the shooting. |
| E76E7L | Item Q1 defect is consistent with the passage of a bullet having been fired when the muzzle of the firearm is at a distance greater than 3 inches and less than 12 inches. |
| EK3BKD | During the optical and chemical examination of the bullet hole on the shirt, propellant residue was found around the hole. Shot range determination samples shows the shot was fired at a distance of between "9" inches and "12" inches. |
| EKQLQ2 | CONCLUSIONS: A PORTION OF A WHITE T-SHIRT MARKED Q1, WITH A SUSPECTED BULLET HOLE IN THE AREA OF THE CENTER OF THE SHIRT WAS SUBMITTED TO THE FIREARMS EXAMINATION UNIT FOR DISTANCE DETERMINATION TESTING. THE AREA AROUND THE HOLE WAS EXAMINED MICROSCOPICALLY, AND WAS ALSO CHEMICALLY PROCESSED FOR THE PRESENCE OF GUNSHOT RESIDUES. AS A RESULT OF THESE EXAMINATIONS THE FOLLOWING WAS CONCLUDED: THE HOLE IS CONSISTENT WITH A BULLET PASSING THROUGH THE T-SHIRT. THE MUZZLE TO TARGET DISTANCE WAS BETWEEN 6" AND 18". THE STATED MEASUREMENT OF UNCERTAINTY IS +/- 5/8" AT A COVERAGE PROBABILITY OF 95% |
| ENGBEJ | On 2015-09-03 during the performance of my official duties I received a sealed evidence bag with number PW4000461642 from Case Administration of the Ballistics Section, containing the following exhibits: 3.1 One (1) piece of white t-shirt material marked 196177/15. 3.2 One (1) set of 10 photographs of GSR patterns on untreated white twill-jean cotton cloths marked "K1a", showing distance standards at 3" (7,6cm) increments from Contact to 27" (68,6cm). 3.3 One (1) set of 10 photographs of GSR patterns treated with the Modified Griess Test marked "K1b", showing distance standards at 3" (7,6cm) increments from Contact to 27" (68,6cm). 3.4 One (1) set of 10 photographs of GSR patterns treated with Sodium Rhodizonate marked "K1c", showing distance standards at 3" (7,6cm) increments from Contact to 27" (68,6cm). 4. The intention and scope of this forensic examination comprise of the following: 4.1 Shot range determination. 5. I examined the piece of white t-shirt material mentioned in paragraph 3.1 and found the following: 5.1 One (1) hole with the appearance of a bullet entrance hole in the centre of the piece of white t-shirt material. 5.2 During the optical and chemical examination of the (alleged) bullet hole mentioned in paragraph 5.1 propellant residue was found surrounding the hole. 5.3 The Modified Griess test was performed on the (alleged) bullet hole mentioned in paragraph 5.1 and the results was compared with the set of photographs mentioned in paragraph 3.3. After the comparison was done, I am of the opinion that the shot was fired from a distance between 6" (15cm) and 15" (38cm). |
| ENN22A | The area around the hole in the Item 1 shirt was microscopically examined and chemically processed for the presence of gunshot residues, and a pattern of Nitrite and lead residues was found. The pattern of nitrite residues present on the Item 1 shirt was reproduced at a muzzle-to-target range of greater than nine and less than twenty-one inches when using the submitted Item 2 distance standards. No other residues were detected. |

TABLE 2

| WebCode | Conclusions |
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| ENPWKF | The area around the hole identified as area "A" in the approximate center of the portion of submitted white cloth (item Q1) was microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was found. From known standards provided (items K1a, K1b, and K1c), this pattern of residues is consistent with those observed at distances of between 6 inches and 18 inches. |
| EWLPY2 | Visually comparing the results of the Test Item Q1 in its original form, the Modified Griess Test and the Sodium Rhodizonate Test to the known distances for each method it is my opinion that the distance between target (Q1) and muzzle of the firearm is 9 inches plus or minus 3 inches. |
| EZZM43 | The cloth was visually and chemically examined for gunshot residue patterns. The item was treated with the MGT-method for detection of nitrite, KTM-method for detection of copper and with the MFPM-method for detection of lead according to the laboratory standard procedures. Several particles of nitrite, copper och[sic] lead were detected around the damage. The results form[sic] the visual and chemical treatment of the item Q1 was compered with test samplings (Item K1a and Item K1b). The result shows that the shooting distance is over 3" but below 12". |
| F729MQ | The R-1 shirt panel was microscopically examined and chemically processed for the presence of gunshot residues and residues were found. Using the standards submitted, the patterns similar to the pattern on the R-1 shirt panel were produced at distances greater than six (6) inches and less than fifteen (15) inches. |
| F7EQFA | Item #Q1 is a white shirt that has one (1) bullet hole in the middle of the cut portion submitted. The area around the hole was microscopically examined and chemically processed for the presence of gunshot residues and residues were found. Using the seized GSG model 522P .22 caliber pistol and the submitted Federal 36 grain copper washed hollow point ammunition. This pattern of residues was reproduced at a distance of between 6 inches and 15 inches. |
| FDF6ZC | After comparing the test photos mentioned in 3.2 with the chemical examination result conducted on the bullet hole on the cut piece of cloth mentioned in 3.1 it was indicated that the shot was fired at a possible minimum distance of 6" to a possible maximum distance of 12". |
| FDHNA9 | Item #2 was examined and found to be one section of white t-shirt approximately 9-7/8 X 9-3/4" with a bullet entrance hole near the center. The area around the hole was microscopically examined and chemically processed for the presence of lead and nitrites and a pattern of residues was found. Lead and nitrites are common components of gunshot residue. Comparisons of Item #2 with the submitted photos of test patterns produced using the suspect's firearm revealed a muzzle-to-target distance greater than 3" but less than 15". |
| FETTKB | The hole located on the cloth, was produced by the entry of a ballistic projectile fired at a distance ranging from 9 inches to 15 inches approximately. But likely the actual shooting distance value is near the lower limit the ambit. |
| FFW24W | The area surrounding the defect in the center of the piece of white shirt, Item 1A, was microscopically and chemically processed for the presence of gunshot residues. This examination revealed a pattern of gunshot residues. Images of test patterns, Items 1B-1D, were submitted from a known firearm and analyzed. Using the test images, the pattern was |

TABLE 2

| WebCode | Conclusions |
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| | <p>duplicated at a muzzle to target distance between 3 and 15 inches. The following is a summary of testing performed: Microscopic examination for unburnt/partially burnt gunpowder particles consistent with the morphological (size & shape) properties of gunpowder were found. Chemical examination for nitrates that could originate from unburnt/partially burnt gunpowder particles using the Diphenylamine test: positive. Chemical examination for nitrite residues that could originate from gunpowder particles using Modified Greiss test: positive. Microscopic examination for lead residues: residues consistent with lead found. Chemical examination for lead residues using the Sodium Rhodizonate test: positive.</p> |
| FQA77L | An examination of the shirt and comparison with the set of distance standards indicated that the shot was fired from a distance of between 6 inches and 15 inches. |
| FQABLV | A pattern of gunshot residues was found. Using the identified weapon with ammunition similar to the questioned cartridges, this pattern of residue was reproduced at a distance from the weapon to the target of between 9 inches and 18 inches. |
| FQLW66 | According our lab procedures, after to proceed to examine the physical characteristics of the entrance hole and the GSR Sodium Rhodizonate chemical test result, the firearm muzzle was place at a short range from the victim body, between 9 and 12 inches. |
| G6PQ77 | Item Q-1 was examined visually and microscopically and processed chemically for the presence of bullet defects and gunshot residues. Hole A, a single bullet entry defect, was located in the center of item Q-1. Hole A was surrounded by bullet wipe, soot, gunpowder, nitrite residue and lead wipe, vaporous lead, and lead particulate residue. Using data from the provided test targets, the muzzle of the gun that fired the bullet that created Hole A was determined to be at a distance greater than contact but less than fifteen inches away form item Q-1. This range of fire is an estimate, provided there was no interposed target between the muzzle of the gun and item Q-1. |
| GLFNDD | Based on the comparisons of the appearance and distribution of powder particles, sooting, nitrites, and lead between the shirt (Item Q1) and the supplied test targets (Items K1a, K1b, and K1c), the muzzle to target distance was most likely between 6 inches and 12 inches. This is based on the assumption that the ammunition and firearms used were the same on the shirt and supplied test prints, and the target was perpendicular to the firearm's barrel at the time of the shooting. |
| GU89BE | The area around the hole in the center of Item Q1 (piece of white fabric) was examined and chemically processed for the presence of gunshot residues and a pattern of residues was found. Using the submitted photographic examplars[sic] as an index, this pattern of residues was reproduced at a distance greater than 3 inches and less than 21 inches. |
| HFUJGG | I examined the piece of cloth mentioned and found the following: A) The cloth mentioned has one entrance bullet hole marked "Q1". B) During the optical and chemical examination of the hole mentioned, I noticed bullet wipe, smoke blackening, powder soot, and partially burnt propellant residue around the hole. C) During the chemical examination and tests (Modified Griess treatments) of the bullet hole mentioned, propellant residue were found around the hole. I am therefore of the opinion that the shot mentioned, was fired at a distance of between 9 inches and 18 inches. |

TABLE 2

| WebCode | Conclusions |
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| HGP3JH | During the optical examination of the shirt marked Q1 I noticed smoke blackening, bullet wipe and partially burnt propellant residue around the hole. During the chemical examination and tests of the shirt marked Q1 lead and propellant residue were found surrounding the hole. I am therefore of the opinion that the shot was fired at a distance of between 6 inches and 15 inches. |
| HHRNJ6 | Light fouling was observed visually. Powder grains were observed visually. A wipe-off rim was observed visually. A griess test was performed on defect A entrance and a nitrite pattern was detected. The nitrite pattern detected on the griess test for defect A entrance on item 4, the section of white shirt, is consistent in diameter and particle population with the nitrite patterns detected from the test fire targets between the distances of 6 inches to 15 inches. |
| HQ4V6Z | The shirt presents a bullet hole inflected by short distance in a range between 6 and 12 inches. |
| HXHJ2M | Visual, microscopic and chemical examination on the cut portion of the shirt (Q1) revealed the presence of gunshot residue. The hole on the shirt is consistent with the passage of a bullet with a muzzle to target distance of 3"-15". This determination is based on a comparison of Q1 to known muzzle to target distance utilizing the same firearm and similar ammunition. |
| HXHJZ2 | The area around the defect on Item Q1 was visually inspected, microscopically examined, and chemically processed for gunshot residues, and a pattern of residues was detected. Using photographs of test shots with the suspected firearm and ammunition, a pattern of residues consistent with what was detected on the evidence was reproduced at an approximate distance of greater than 6" and less than 18". |
| HXYQWJ | 2. During the optical and chemical examination (modified griess test was used) of the bullet-hole in the piece of white shirt (item Q1). 2.1 Propellant residue was found surrounding the hole. 3. This was compared with the tests (photos of tests fired on cloth and photos of modified griess tests) and I came to the following conclusion: 3.1 The muzzle of the fire-arm (that fired the shot in the shirt: item Q1) was no closer than 9 inches and no further than 15 inches from the shirt. |
| HZU9BR | Laboratory Item 001.D (Item Q1) a cut piece of white t-shirt material with an apparent bullet hole was microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was found. This pattern of residues was reproduced at a distance that was greater than contact but less than 18 inches. |
| J38PQ9 | The submitted fabric contains a pattern consistent with gunshot residue. The shirt was examined visually, microscopically and chemically with the following results: The pattern on the shirt was consistent with test patterns generated at muzzle to target distances of greater than approximately 9 inches but closer than approximately 21 inches. |
| JB8XHV | The area around the hole in the Q1 shirt was microscopically examined and chemically processed for the presence of gunshot residues, and a pattern of Nitrite and lead/copper residues was found. The pattern of residues present on the Q1 shirt was reproduced at a muzzle-to-target range of greater than six and less than twenty-one inches when using the submitted distance standards. |
| JD7B2E | The results from the chemical testing on the outside surface around hole Q1A are consistent |

TABLE 2

| WebCode | Conclusions |
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| | with the deposit of gunshot residue after the discharge of a firearm. Any further conclusions as to the muzzle to target distance will be reported by the Firearms Identification Unit. |
| JDTQ94 | The area around Hole 1 was microscopically examined and chemically processed for the presence of gunshot residues, and a pattern of residues was found. Using a GSG model 522P caliber .22 LR firearm, and Federal 36 grain copper plated hollow point ammunition, this pattern of residues was reproduced at a muzzle-to-target distance of greater than 3 inches and less than 15 inches. |
| JFVMMY | 1. Exhibit 2 (Shirt with bullet hole) was visually and microscopically examined and chemically processed. Gunpowder residues consistent with the discharge of a firearm were observed. Exhibit 1 (Distance Standards) was submitted for comparison to determine the approximate muzzle-to-target distance. 2. The pattern of gunpowder residues that were developed on Exhibit 2 are consistent with those produced by the same firearm and ammunition as those used to create Exhibit 1 from a muzzle-to-target distance between approximately 6 and 18 in. |
| JKVUKW | Physical and chemical testing of the 'Shirt with bullet hole' (item Q1) indicates a muzzle to target range of 6 to 15 inches. The packets of photographs (items K1a, K1b, and K1c) were received as known reference materials, and used as necessary in the course of this analysis |
| JPLDDE | The shape of spread pattern of GSR and the result of color reaction test indicate that the distance of the muzzle of the firearm from the shirt is between 9 inches and 15 inches. |
| JQUF8P | The area around the hole in this item was microscopically examined and chemically processed for the presence of gunshot residues (particulate matter, nitrites, copper, and lead). A pattern of residues (particulate matter, nitrites, and vaporous lead) was found. Using the identified weapon with ammunition similar to the questioned cartridges, this pattern of residue was reproduced at a distance from the weapon to the target of between 3 and 15 inches. |
| JXEE36 | The area around the hole in the middle of the shirt piece in Item #Q1 was microscopically examined and chemically processed for the presence of gunshot residues, and a pattern of residues was found. Using the photographs in Items #K1A through #K1C for comparison, a similar pattern was produced at a distance of between six and fifteen inches. |
| K369EW | The garment (cloth) received for Physicochemical study was hit by gun fire a short distance from a range of about 6 a[sic] 12". |
| K3RGLE | The area surrounding the hole in Item Q1 was examined microscopically and processed chemically for the presence of gun powder and lead residues, and a pattern of residues was found. Using the suspect firearm and like ammunition, a series of test residue patterns (Item K1a) were produced at muzzle to target distances of contact, 3", 6", 9", 12", 15", 18", 21", 24", and 27". Based on these test residue patterns, it was determined that a pattern of residues like that on Item Q1 could be produced at muzzle to target distances of greater than 3" but less than 12". |
| K9VHNU | The area around the hole in the Item 1 shirt was microscopically examined and chemically processed for the presence of gunshot residues, and a pattern of nitrite and lead residues was found. The pattern of residues present on the Item 1 was reproduced at a muzzle-to-target range greater than six and less than eighteen inches when compared to the submitted distance standards. No other residues were detected. |

TABLE 2

| WebCode | Conclusions |
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| KDMW34 | Examination of the submitted shirt (white twill cloth square), item #2, revealed the presence of a hole located in the centered[sic] of the item. Microscopic and chemical examination of the fabric surrounding the damaged area revealed the presence of a gunpowder pattern. The submitted series of test patterns, item #1, were compared to the gunpowder pattern present on the submitted shirt (white twill cloth square), item #2. These comparisons revealed that the gunpowder pattern surrounding the hole on the shirt is consistent with a muzzle to target distance of greater than six (6) inches and less than fifteen (15) inches. The test paper sample generated from the chemical examination of the submitted shirt (white twill cloth square), item #2, will be returned with the evidence. |
| KHHJ3J | The pattern of gunshot residues around defect (A) is consistent with a muzzle to target distance of 3 to 18 inches. |
| KL3BEL | The R-1 twill cloth was examined and chemically processed for the presence of gunshot residues and a pattern was found. The distance standard photographs of T-1, T-2 and T-3 were compared to the pattern seen on the R-1 twill cloth and the patterns were similar. The pattern on the R-1 twill cloth was found to be from a distance of greater than six (6) inches and less than fifteen (15) inches. |
| KT3PZM | The area around the hole in the shirt marked Q1 was visually, chemically and microscopically examined for the presence of gunshot residues and a pattern of gunshot residues were found. Patterns like the pattern found on item Q1 were produced at a distance greater than 3 inches and less than 18 inches. |
| KXRED6 | The area around Hole #1 in the center of the fabric (Item Q1) was microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was found. Using the GSG model 522P caliber .22LR semiautomatic pistol and Federal 36 grain copper plated hollow point ammunition, this pattern of residues was reproduced at a muzzle-to- target distance of greater than 3 inches and less than 15 inches. |
| KZGP6X | [No Conclusions Reported.] |
| L2PBHQ | The area around the hole in Item 1-2 (shirt) was microscopically examined and chemically processed for the presence of gunshot residues (lead, copper, nitrites and particulate matter). A pattern of residues (vaporous lead, copper, nitrites and particulate matter) was found. A pattern of gunshot residues was found. Using the identified weapon with ammunition similar to the questioned cartridges, this pattern of residue was reproduced at a distance from the weapon to the target of between 3 and 18 inches. |
| L6UYZ2 | Item Q1 was examined for the presence of bullet defects and gunshot residue using visual, microscopic, and chemical techniques. One defect was observed centrally located and was labeled Hole A. Test targets were generated at known distances using a GSG model 522P, 22 Long Rifle caliber semiautomatic pistol and Federal brand ammunition. Only photographs of the test targets were evaluated to establish a muzzle-to-garment distance between the GSG pistol and Hole A in item Q1. Gunpowder, nitrite residue, and lead residues were observed surrounding Hole A. The muzzle of the GSG pistol was determined to be greater than contact, but not farther than 15 inches from item Q1 at the time the shot that created the Hole A (bullet entry defect) was fired, provided that no intervening object was between the muzzle of the |

TABLE 2

| WebCode | Conclusions |
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| | firearm and the item Q1 at the time the shot was fired. |
| LLX948 | One (1) defect, designated #1, was located in the center of Item Q1. The defect is circular and measures approximately 1/8 inch in diameter. The defect and area surrounding the defect were examined microscopically and processed chemically for the presence of gunshot residues and a pattern of residues was developed. Using the distance standards listed as Items K1a-c, this pattern of residues was reproduced at a muzzle distance of between six (6) and eighteen (18) inches. |
| LN4WJW | It's been established that the drilling hole found in the piece of cloth analyzed was produced by the passage of the projectile shot by firearm of single charge, made between the muzzle of the firearm and the affected area, in a distance of approximately 6 to 12 inches, which is consistent with short distance. |
| LN6Q33 | Based on information supplied by CTS of a known firearm and ammunition, it was determined that the minimum distance is 9" and the maximum distance is 15". |
| LXQRKX | The piece of cloth marked "Item Q1" contained a small hole near its centre. The area surrounding the hole was microscopically examined, and tested for the presence of a firearm discharge pattern using the Modified Griess Test and the Sodium Rhodizonate Test. Based on the comparison of the patterns to those of the distance standards marked "Item K1a" to "Item K1c", the distance of firing between the muzzle of the firearm to the cloth was estimated to be between 3 inches and 15 inches. |
| LYMAHT | The area surrounding the defect in the white T-shirt, Item 1A, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed a pattern of gunshot residues. Images of test patterns, Items 1B-1D, were submitted from a known firearm and analyzed. Using the test images, the pattern was duplicated at a muzzle to target distance between 6 and 15 inches. The following is a summary of testing performed: Microscopic examination for unburnt/partially burnt gunpowder particles: particles consistent with the morphological (shape & size) properties of gunpowder were found. Chemical examination for nitrates that could originate from unburnt/partially burnt gunpowder particles using the Diphenylamine test: positive. Chemical examination for nitrite residues that could originate from gunpowder particles using the Modified Griess test: positive. Microscopic examination for lead residues: residues consistent with lead found. Chemical examination for lead residues using the Sodium Rhodizonate test: positive. |
| M2L4T3 | Based on information supplied by Collaborative Testing Services of a known firearm and ammunition, it was determined that the minimum is 9 inches and the maximum distance is 15 inches. |
| MCP2YR | Q1 had one hole that is consistent with the passage of a bullet at a distance between 3" and 15". This distance was determined by the dispersion and density of the burned powder and lead particulate present. |
| MDHWF9 | Photographs were supplied of test patterns fired a[sic] 3 inch intervals from contact to twenty-seven inches inclusive. An examination of the test patterns indicates that the gunshot residues on the questioned garment, Q1, were produced at a distance greater than 3 inches but less than eighteen inches. |

TABLE 2

| WebCode | Conclusions |
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| MJLXMU | The area surrounding the defect in the white T-shirt, Item 1A, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed a pattern of gunshot residues. Images of test patterns, Items 1B-1D, were submitted from a known firearm and analyzed. Using the test images, the pattern was duplicated at a muzzle to target distance between 6 and 15 inches. The following is a summary of testing performed: Microscopic examination for unburnt/partially burnt gunpowder particles: particles consistent with the morphological (shape & size) properties of gunpowder were found. Chemical examination for nitrates that could originate from unburnt/partially burnt gunpowder particles using the Diphenylamine test: positive. Chemical examination for nitrite residues that could originate from gunpowder particles using the Modified Griess test: positive. Microscopic examination for lead residues: residues consistent with lead found. Chemical examination for lead residues using the Sodium Rhodizonate test: positive. |
| MML44K | The defect and the area around the defect on the fabric in Item Q1 were microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was found. Characteristics of this defect area were compared to corresponding characteristics of defect areas contained within images of known distance test patterns in Items K1a, K1b and K1c. The defect in Item Q1 is indicative of being reproduced at a distance of between 6 and 18 inches. |
| MRJN86 | Analysis of GSR pattern on submitted evidence Q-1 conducted with the following results: Distance of Q-1 from muzzle: 12" to 24". |
| MTVKEU | The shooting distance range to the periphery of the entry hole present in cutting cloth; it was established 6 inches and fifteen 15 inches from muzzle of the gun until cloth, the above was set by comparison with photographs CTS received for study. |
| MWECQW | Item Q1 was examined and chemically processed for a gunshot residue pattern with the following results: the gunshot residue pattern observed and chemically developed on Item Q1 was reproduced at muzzle to target distances of greater than 6 inches and less than 12 inches. |
| MXMP7D | Examination of Item Q1 revealed one (1) hole in the center of the panel. The area around this hole was examined microscopically and processed chemically for the presence of gunpowder and lead residues (gunshot residues). A pattern of gunshot residues was developed around the hole in Item Q1 which is consistent in size and density with the muzzle of a firearm having been greater than approximately 3 inches and less than approximately 15 inches from this area at the time of firing. |
| NAXFRL | RESULTS OF EXAMINATION: Submission #1 consisted of an envelope containing item #1-1 (Item Q1), #1-2 (Item K1a - powder test fires), #1-3 (Item K1b - Griess processed test fires) and #1-4 (Item K1c - NARh processed test fires). Item #1-1 was a piece of cloth measuring 10" X 10-1/4" in size. Located in the approximate center of this cloth was a bullet-like hole with a margin of bullet wipe. A faint powdery deposit was noted in a 2" X 2-1/2" pattern surrounding the hole. This hole was surrounded by a 4-1/4" X 4-1/2" pattern of burned gunpowder type particles. This item was processed with the Modified Griess method and Sodium Rhodizonate methods. The patterns located on item #1-1 were then compared to items #1-2, #1-3 and #1-4. Items #1-2, #1-3 and #1-4 each consisted of a series of ten (10) images of known test fires ranging from contact, 3", 6", 9", 12", 15", 18", 21", 24" and 27". Item #1-2 were images showing powder/gunpowder type deposits at various distances. |

TABLE 2

| WebCode | Conclusions |
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| | Item #1-3 were images showing the patterns of the test fires for the various distances after processing with Griess reagent. Item #1-4 were images showing the patterns for the test fires at the various distances after processing with the sodium rhodizonate method. Each item was compared to item #1-1 to determine a range of possible distance of discharge of the weapon. CONCLUSION: It was determined that the distance of discharge of the weapon to the surface of item #1-1 was between 3" and 15". |
| NJHVAU | The area around the hole in the center of Item 1-2 (portion of shirt) was microscopically examined and chemically processed for the presence of gunshot residues (lead, copper, nitrites, particulate matter). A pattern of vaporous lead, copper, nitrites, particulate matter was found. A pattern of gunshot residues was found. Using the identified weapon with ammunition similar to the questioned cartridges, this pattern of residue was produced at a distance from the weapon to the target of between 6 inches and 15 inches. |
| NP93VN | Exhibits K1A, K1B and K1C are thirty (30) photographs representing distance standards of Gunshot Residue patterns. The Exhibit Q1 white cotton fabric was microscopically examined and chemically processed (designated Q1T1 and Q1T2) for the presence of gunshot residues. A pattern of gunshot residue was found around a bullet entrance hole located in the center of the white cotton fabric. Comparisons of the Exhibit Q1 pattern of residues to the Exhibit K1A, K1B and K1C photographs indicate that the pattern of residues could be re-produced at a minimum distance of 6" to a maximum distance of 18". |
| NPTWGK | Laboratory Item 001.D (Q1) one white cloth with powder pattern and hole was examined using magnification and chemical procedures. A hole consistent with the passage of a bullet and residues consistent with the discharge of a firearm were detected on Laboratory Item 001.D (Q1). Laboratory Item 001.D (Q1) was compared to the distance standards submitted, Laboratory Items 001.A (K1a), 001.B (K1b), 001.C (K1c). The firearm discharge distance for Laboratory Item 001.D (Q1) was determined to be greater than 6 inches but less than 18 inches. |
| NRDT24 | One (1) white colored cloth square (10" x 10") consistent with bullet wipe, soot and powder particles submitted. A distance determination test was requested. A distance determination test was conducted with the following result: Based on information supplied by Collaborative Testing Services of a known firearm and ammunition, it was determined that the minimum distance is (6") and the maximum distance is (12"). |
| P2EKZW | Item 4 Defect A entrance (1/8 inch diameter) located at the center of the section of white fabric. Light fouling was observed visually. Powder grains were observed visually and with stereomicroscopy. A wipe-off rim was observed visually. A griess test was performed on defect A entrance and a nitrite pattern was detected. The presence of light fouling and the powder grain pattern detected on the section of white fabric labeled "shirt with bullet hole", (item 4), and the nitrite pattern detected on the griess test for defect A entrance on the section of white fabric labeled "shirt with bullet hole", (item 4), are consistent in diameter and particle population with the powder grain patterns observed on item 1, the photo set of test fire targets, and the nitrite patterns detected on item 2, the photo set of test fire targets treated with griess test, between the distances of 9 inches and 12 inches. |
| P6CBVA | I examined the cotton cloth and sets of photographs provided and found the following: 5.1 One (1) bullet hole visible and marked it 222677/15Q1. 5.2 During the optical and chemical |

TABLE 2

| WebCode | Conclusions |
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| | examination of the bullet hole marked Q1, propellant residue was found surrounding the hole. Shot range determination tests were performed with the Modified Griess Test and were determined to be fired at a distance of between 6 inches and 12 inches. |
| PD4QMZ | Microscopic and chemical examination of the victim's shirt, Item Q1, reveals a gunpowder pattern. Images of test patterns. Items K1a-c, were submitted[sic] from a known firearm and analyzed[sic]. Using the test images, the pattern was duplicated at a muzzle to target distance between 9 and 15 inches. |
| PFEEGX | Item 004-001-001 was examined visually, microscopically, and processed chemically for the presence of bullet defects and gunshot residue. Item 004-001-001 exhibited a single defect. Hole A, a bullet entry defect, was observed in the center of item 004-001-001. Gunshot residue in the form of gunpowder, bullet wipe, nitrite residue, lead wipe, vaporous lead, and lead particulate was observed around Hole A. Photographs of the visual presentation, modified Griess test results, and sodium rhodizonate test results were provided by the requesting agency. Using data from those photographs, a range of fire was determined for Hole A. Based on these photographs, the muzzle of the firearm was at a distance greater than 3 inches but less than 18 inches at the time the shot that produced Hole A was fired, provided there was no interposed target. |
| PPPWUP | The shirt with bullet hole submitted (Q1) was visually compared with the distance Standards of K1a - c. Q1 was also processed using the Griess test as well as the application of sodium rhodizonate. In my opinion the distance between muzzle and target at the time of discharge is conservatively estimated to have been no less than 6 inches and no greater than 15 inches. |
| PVPC66 | The area around the questioned hole in the shirt, Item Q1, was microscopically examined and chemically processed for the presence of gunshot residues. Visible residues which are indicative of the passage of a bullet were found around the hole during a microscopic examination prior to chemical processing. Patterns of nitrite and lead residues were chemically detected on Item Q1 and compared with the distance standards provided for evaluation. Based on the presence, overall pattern, and density of residues observed between Item Q1 and the provided photographs of the distance standards (which represent a very limited sample on which to evaluate shot-to-shot variability), the questioned bullet hole on Item Q1 appears to have been created by a shot fired at a distance of between nine (9) to eighteen (18) inches from the shirt. This is a conservative estimate based on an evaluation of the untreated and chemically processed residue patterns and assumes there were no intervening objects between the muzzle of the firearm and the shirt at the time the shots were created. This estimated range is also predicated on the submitted distance standards being an accurate representation of the range of variation exhibited by the entire set of original test standards. |
| PWH64U | The analysis that the portion of the shirt with bullet hole made with NaRH, the conclusion was positive. There was a lot of particules of the gunshot residue on portion of the shirt with bullet hole. The conclusion of the comparasion of between the reference shots and our analysis, we found that the shot was made nearly 10 inch distance. |
| PXVNDR | The area surrounding the defect in the white T-shirt, Item 1A, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed a pattern of gunshot residues. Images of test patterns, Items 1B-1D, were submitted from a known firearm and analyzed. Using the test images, the pattern was duplicated at a muzzle to |

TABLE 2

| WebCode | Conclusions |
|---------|---|
| | <p>target distance between 6 and 15 inches. The following is a summary of testing performed: Microscopic examination for unburnt/partially burnt gunpowder particles: particles consistent with the morphological (shape & size) properties of gunpowder were found. Chemical examination for nitrates that could originate from unburnt/partially burnt gunpowder particles using the Diphenylamine test: positive. Chemical examination for nitrite residues that could originate from gunpowder particles using the Modified Griess test: positive. Microscopic examination for lead residues: residues consistent with lead found. Chemical examination for lead residues using the Sodium Rhodizonate test: positive.</p> |
| QDMPN4 | <p>The patterns at 6 and 18 inches are clearly distinguishable from Q1 (untreated & Rhodizonate treated), indicating that Q1 was fired from a distance greater than 6 inches and less than 18. The available results appear to suggest a distance of between 9 and 12 inches (although these narrow limits cannot be confirmed due to uncertainty in relation to optimal test results and shot to shot variation).</p> |
| QN779X | <p>Initially an observation is made to the shirt and around the hole that this presents, using the binocular microscope to identify the nature of the particles present. Bullet wipe and light sooting are visible around the hole. The shirt was then tested chemically for the presence of nitrites, lead and copper. The chemical patterns made with the suspect firearm at known distances. Based on these comparisons the shooting distance is consistent with having been made between 12 and 15 inches away from the surface of the shirt, the results of the chemical test for lead detection evidence results consistent with the patterns obtained for a shooting distance between 12 and 15 inches. [sic]</p> |
| QTLMWU | <p>The area around the hole in Item #Q1 was microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was detected. Using the submitted test panel photos in Items #K1(a,b,c), the muzzle-to-target distance range at which the detected residues are best duplicated under laboratory conditions is 6" to 18".</p> |
| QWE3RV | <p>The area around the questioned hole in the shirt, Item Q1, was microscopically examined and chemically processed for the presence of gunshot residues. Visible residues which are indicative of the passage of a bullet were found around the hole during a microscopic examination prior to chemical processing. Patterns of nitrite and lead residues were chemically detected on Item Q1 and compared with test targets. Based on the presence, overall pattern, and density of residues observed between Item Q1 and the provided photographs of the test standards, the questioned bullet hole on Item Q1 appears to have been created by a shot fired at a distance of approximately fifteen (15) to eighteen (18) inches from the shirt. This is a conservative estimate based on an evaluation of the untreated and chemically processed residue patterns and assumes there was no intervening objects between the muzzle of the firearm and the shirt at the time the shots were created.</p> |
| QWWRDW | <p>The area around the questioned hole in the shirt, Item Q1, was microscopically examined and chemically processed for the presence of gunshot residues. Visible residues which are indicative of the passage of a bullet were found around the hole during a microscopic examination prior to chemical processing. Patterns of nitrite and lead residues were chemically detected on Item Q1 and compared with test targets. Based on the presence, overall pattern, and density of residues observed between Item Q1 and the provided photographs of the test standards, the questioned bullet hole on Item Q1 appears to have been created by a shot fired at a distance of approximately twelve (12) to eighteen (18) inches from the shirt. This is a conservative</p> |

TABLE 2

| WebCode | Conclusions |
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| | estimate based on an evaluation of the untreated and chemically processed residue patterns and assumes there was no intervening objects between the muzzle of the firearm and the shirt at the time the shots were created. |
| QYQE6R | The cloth (Q1) was visually examined for holes. One hole, designated Hole #1, was observed. The area around hole #1 was chemically processed for the presence of gunshot residues. Residues were found that are consistent with the passage of a bullet. The gunshot residue patterns were compared to photographs (K1a, K1b, and K1c) of developed distance standards reportedly made using the suspect's firearm. Based upon the comparison of residue patterns on the cloth (Q1) to the distance standard photographs, the muzzle-to-target distance is consistent with being greater than twelve (6) inches and less than twenty-four[sic] (18) inches. |
| R7ZAEQ | The shirt (item Q1) bears one hole which was stereoscopically examined and chemically treated for the presence of gunshot residues. Gunshot residues and partially burned gunpowder particles were detected in an area surrounding the hole which is consistent with an entrance hole of single bullet. The pattern of chemically enhanced gunshot residues on the shirt was compared to the provided test target photographs (Items K1a, K1b, and K1c) and was determined to be consistent with a nine to fifteen inch muzzle to target distance. |
| RCKL27 | On 2015-09-03 during the performance of my official duties I received a sealed evidence bag with number PW4000461641 from Case Administration of the Ballistics Section, containing the following exhibits: 2.1 One (1) set of ten (10) photographs of GSR patterns marked "K1a". 2.2 One (1) set of ten (10) photographs of Modified Griess Tests marked "K1b". 2.3 One (1) set of ten (10) photographs of Sodium Rhodizonate chemical treatments marked "K1c". 2.4 One (1) piece of white cloth marked "Q1". 3. The intention and scope of this forensic examination comprise the following: 3.1 Shot range determination. 4. I examined the piece of white cloth mentioned in paragraph 3.4 and found the following: 4.1 One (1) hole with the appearance of a bullet hole in the centre marked by me "A". 5. During the optical and chemical examination of the alleged bullet hole mentioned in paragraph 4.1, propellant residue was found surrounding the hole. Shot range determination tests were compared with the photographs mentioned in paragraphs 2.1 and 2.2. The shot mentioned in paragraph 4.1 was fired at a distance of between 15,24cm (6") and 45,72cm (18"). |
| REE26P | 1.Exhibit 2 (Shirt) was visually, microscopically, and chemically examined for the presence of a pattern of gunpowder residues consistent with the discharge of a firearm. a. A hole of entry with a pattern of gunpowder residues was found near the center of the fabric. 2. Exhibit 1.1 (Photographs of known distance test patterns - Visual), Exhibit 1.2 (Photographs of known distance test patterns - Griess), and Exhibit 1.3 (Photographs of known distance test patterns - Sodium Rhodizonate) were submitted for comparison to the pattern of gunpowder residues found on Exhibit 2. a.The pattern of gunpowder residues that were found on Exhibit 2 was reproduced at a muzzle-to-target distance between approximately 3 inches and 18 inches. 3. Exhibit 2.1 (Griess Test Paper and Sodium Rhodizonate Controls) was created during chemical examination of Exhibit 2 and is being returned with Exhibit 2. |
| RJP7HA | According to the pattern and density of the gun shot residues, the shooting distance has been between 9-18 inches. |
| RM99G3 | Photographs were supplied of test patterns fired from a distance of contact to twenty-seven inches inclusive, at three inch intervals. An examination of the test patterns indicates that the |

TABLE 2

| WebCode | Conclusions |
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| | gunshot residues on the questioned garment, Q1, were produced at a distance greater than three inches but less than eighteen inches. |
| RRJCDW | Microscopic examination detected the presence of gunpowder particles around the hole in Item Q1. Chemical testing detected the presence of nitrates in the particles around the hole in Item Q1. Chemical testing detected the presence of a nitrite pattern around the hole in Item Q1 with an approximate diameter of 5 1/2 inches. Chemical testing detected a pattern of lead residues around the hole in Item Q1. The results from the chemical testing on Item Q1 are consistent with the deposit of gunshot residue after the discharge of a firearm. Any further conclusions as to the muzzle to target distance will be reported by the Firearms Identification Unit. |
| RX9WGC | The submitted evidence shirt was visually examined and chemically processed for the presence of gunshot residues. The modified Greiss[sic] Test for the presence of nitrites and Sodium Rohdizonate[sic] Test for the presence of vaporous lead were performed and the results were compared to known test panels. A pattern of residues was found and indicated a muzzle to target minimum distance of 6" and a maximum distance of 18". |
| TB6JUX | I examined the cloth marked Item Q1 and found the following: The cloth has one entrance bullet hole. During the optical examination of the cloth I noticed bullet wipe, soot, burnt and partially burnt propellant residue around the hole. During the chemical examinations of the cloth I found; that the muzzle of the firearm could have been between 6 inches and 12 inches from the shirt at the time of discharge. |
| TDX9K7 | Visual and chemical examination on the Item Q1 indicated that the estimated muzzle-to-target distance was between 12 inches and 18 inches. |
| TEFBFL | Q1 PORTION OF T-SHIRT WITH SUSPECTED BULLET HOLE WAS MICROSCOPICALLY EXAMINED AND CHEMICALLY PROCESSED FOR THE PRESENCE OF GUNSHOT RESIDUES, AND A PATTERN OF RESIDUES WAS DEVELOPED. THE HOLE IN Q1 T-SHIRT WAS FOUND TO BE CONSISTENT WITH THE PASSAGE OF A BULLET. USING THE SUPPLIED TEST FIRE DISTANCE STANDARDS FROM THE GSG MODEL 522P (LABELED K1 a THROUGH c), THE PATTERN OF RESIDUES WAS DETERMINED TO BE CONSISTENT WITH A MUZZLE TO TARGET DISTANCE OF BETWEEN 12 AND 24 INCHES. |
| TGGE42 | a. It is very highly probable that the hole in the shirt (Exhibit Q1) is a bullet hole. b. It is probable that this bullet was shot at a distance of 6" - 15" (from the muzzle). This shooting distance estimation is based on the assumption that this target was first target hit by the bullet. |
| TTCPC9 | Item A1-4: Examination of the Item A1-4 piece of fabric revealed the presence of a hole approximately in the middle of the item. The area around this hole was examined microscopically, and processed chemically for the presence of propellant and lead residues (gunshot residues), and a pattern of residues was found. Comparison of the Items A1-1, A1-2 and A1-3 submitted test patterns to the item A1-4 submitted piece of fabric showed the Item A1-4 residue pattern to be consistent in size and density with patterns observed on the items A1-1, A1-2 and A1-3 submitted standards. Based on this comparison, the bullet hole observed on Item A1-4 was fired at a distance between approximately six (6) inches, and approximately eighteen (18) inches from muzzle to target. |

TABLE 2

| WebCode | Conclusions |
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| TWWGMC | The victim's shirt (Item Q1) was visually compared with the submitted Distance Standards (K1a). Item Q1 was then chemically treated to make visible any presence of nitrites (following the Modified Griess - Direct Application Technique), and any presence of lead (following the Sodium Rhodizonate - Direct Application Technique). These resulting treatments were compared with the similarly treated Distance Standards (K1b,c respectively). After considering the comparisons of Item Q1 and Distance Standards K1a-c, it is the opinion of this Examiner that the muzzle of the firearm was a minimum of six (6) inches, but a maximum of eighteen (18) inches, from the victim's shirt at the time of discharge. |
| U9NJMJ | The area surrounding the defect in the white T-shirt, Item 1A, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed a pattern of gunshot residues. Images of test patterns, Items 1B-1D, were submitted from a known firearm and analyzed. Using the test images, the pattern was duplicated at a muzzle to target distance between 3 and 15 inches. The following is a summary of testing performed: Microscopic examination for unburnt/partially burnt gunpowder particles: particles consistent with the morphological (shape & size) properties of gunpowder were found. Chemical examination for nitrates that could originate from unburnt/partially burnt gunpowder particles using the Diphenylamine test: positive. Chemical examination for nitrite residues that could originate from gunpowder particles using the Modified Griess test: positive. Microscopic examination for lead residues: residues consistent with lead found. Chemical examination for lead residues using the Sodium Rhodizonate test: positive. |
| UKHWMF | Ex Q-1 The shirt was examined and a hole was observed in the approximate K-1a—c center. The hole and the area around the hole was examined and chemically processed for the presence of firearm discharge residues. The firearm discharge residue pattern around the hole is consistent with tests fired at a muzzle-to-target distance greater than 6 inches and less than 15 inches using the Exhibit K-1a through K-1c photographs. |
| UNA7P2 | The area around the hole in the submitted portion of white shirt material (Q1) was microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was found. Using the seized firearm (.22 LR caliber, GSG, model 522P semiautomatic pistol) and ammunition like that represented by the evidence from the scene (Federal 36 grain copper plated hollow point) this pattern of residues was reproduced at a distance of between 6 inches and 21 inches. |
| UQMHTX | Distance determination test conducted with the following results. Muzzle to target distance is approximately[sic] twenty four (24) to twenty seven (27) inches. |
| UQYHLL | The area surrounding the defect in the center of the white cloth section, Item 1A, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed a pattern of gunshot residues which reproduced powder pattern images, Item 1B, modified Griess test images, Item 1C, and sodium rhodizonate test images, Item 1D, at a muzzle to target distance between 6 inches and 12 inches. The following is a summary of testing performed: Microscopic examination for unburnt/partially burnt gunpowder particles: particles consistent with the morphological (shape & size) properties of gunpowder were found. Chemical examination for nitrates that could originate from unburnt/partially burnt gunpowder particles using the Diphenylamine test: positive. Chemical examination for nitrite residues that could originate from gunpowder particles using the Modified Griess test: positive. Microscopic examination for lead residues: residues consistent with lead found. Chemical examination for |

TABLE 2

| WebCode | Conclusions |
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| | lead residues using the Sodium Rhodizonate test: positive. |
| URUXXH | The area around the hole in Q1 was microscopically examined and chemically processed for the presence of gunshot residues. A pattern of residues was observed and compared to the standards provided (K1a, K1b and K1c). Based on visual, microscopic and chemical analysis, the minimum distance of Q1 is 9" and the maximum distance is 21". |
| UZ8PNF | The area around the hole in the center of Item 1-2 was microscopically examined and chemically processed for the presence of gunshot residues (lead, copper, nitrites, particulate matter). A pattern of residues (vaporous lead, copper, nitrites, and particulate matter) was found. Using the identified weapon with ammunition similar to the questioned cartridges, this pattern of residue was reproduced at a distance from the weapon to the target of between 6 and 15 inches. |
| V8JA4X | By means of physical study and chemical analysis, gun shot residues (gun powder, Nitrites and Lead) were detected around the shirt's (Q1) hole consistent with firing a gun from a muzzle distance of nine (9") inches to fifteen (15") inches. The provided distance standards (K1a, K1b and K1c) were used for distance determination. |
| V8QENG | The area around the hole in the center area of Item 1-2 (Q1: Shirt with bullet hole) was microscopically examined and chemically processed for the presence of gunshot residues (lead, copper, nitrites, and particulate matter). A pattern of vaporous lead, copper, vaporous copper, nitrites, and particulate matter was found. A pattern of gunshot residues was found. Using the identified weapon with ammunition similar to the questioned cartridges, this pattern was reproduced at a distance from the weapon to the target of between three and fifteen inches. |
| VFWGN8 | The pattern of gunshot residues around Defect A is consistent with a muzzle to target distance of 6 to 15 inches. |
| VJELC6 | Distance testing conducted with the submitted firearm revealed a muzzle to target distance no closer than 3" and no further than 15". |
| VJELEP | Microscopic and chemical examination of the white shirt, Item Q1, revealed a GRS patterns. Using the test patterns provided, Item K1a, K1b and K1c, this laboratory determines that the distance of the muzzle of the firearm from the shirt is 6" like minimum distance and 15" like maximum distance. |
| VPLCGV | The bullet hole located in the portion of the shirt was produced by the entry of a ballistic projectile fired at a distance ranging from 6 inches to 12 inches approximately. |
| VPPMPL | 1 Examined the piece of fabric (Q1) and found the following: 1.1 A single hole measuring approximately 3-4 mm in diameter was located in the central region of the piece of fabric (Q1). 1.2 During optical and chemical examination of the piece of fabric mentioned in (1) propellant and lead residues were found surrounding the hole. 1.3 Based on the supplied shot range 'Distance Standards', I am of the opinion the distance between the muzzle of the firearm and the piece of fabric was approximately between 6 to 15 inches at the time of discharge. |
| W6VB8E | The area around the hole in Item 1-2 "Q1 shirt with bullet hole" was microscopically examined and chemically processed for the presence of gunshot residues (lead, copper, nitrites, |

TABLE 2

| WebCode | Conclusions |
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| | particulate matter). A pattern of residues (vaporous lead, copper, nitrites, particulate matter) was found. A pattern of gunshot residues was found. Using the identified weapon with ammunition similar to the questioned cartridges, this pattern of residue was reproduced at a distance from the weapon to the target of between 3 inches and 18 inches. |
| W7TE8G | The area surrounding the defect in the white t-shirt, Item 1A, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed a pattern of gunshot residues. Images of test patterns, Items 1B-1D, were submitted from a known firearm and analyzed. Using the test images, the pattern was duplicated at a muzzle to target distance between 3 and 15 inches. Microscopic examination for unburnt/partially burnt gunpowder particles: particles consistent with the morphological (shape & size) properties of gunpowder were found. Chemical examination for nitrates that could originate from unburnt/partially burnt gunpowder particles using the Diphenylamine test: positive. Chemical examination for nitrite residues that could originate from gunpowder particles using the Modified Griess test: positive. Microscopic examination for lead residues: residues consistent with lead found. Chemical examination for lead residues using the Sodium Rhodizonate test: positive. |
| WEXP2Y | We apply color test technique on the shirt sample (Q1) using fresh modified griss[sic] and we conclude that there is Nitrite anion which give indication on 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 9 to 12 Inches. |
| WFC2PW | The hole located on the received piece of fabric (from the shirt Q1) was produced by the entry of a ballistic projectile fired at a distance ranging from 9 inches to 15 inches approximately. |
| WFRBR6 | During the optical and chemical examination of the bullet hole found on the shirt submitted, propellant residue was found surrounding the hole and was compared with the submitted photos of tests fired at different distances and I came to the conclusion that the shot on the shirt was fired at distance not closer than 9 inches and no further than 15 inches. |
| WGMZ6Y | The square piece of white cotton cloth with a hole in it (Item Q1) was microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was observed. Utilizing the known distance standards (Items K1a, K1b, and K1c), this pattern of gunshot residues is consistent with a muzzle to garment distance of greater than six inches but less than eighteen inches. |
| WQDKBX | The area around the hole in the submitted fabric (Item Q1) was microscopically examined and chemically processed for the presence of gunshot residues and a pattern of residues was found. Using the distance standards provided, a similar pattern was produced at a distance of between 3 inches and 15 inches. |
| WQULAT | As a result of the reactions from the modified Griess and sodium rhodizonate tests, the hole on "Q1: Shirt with Bullet Hole" ([Laboratory] Sample No. 10342610) is positive for the presence of nitrites and lead residues and consistent with the passage of a bullet through the garment. The reactions observed from the modified Griess and sodium rhodizonate tests on "Q1: Shirt with bullet hole" ([Laboratory] Sample No. 10342610) were compared to the photographed reactions provided ([Laboratory] Sample Numbers 10342611 A through C through 10342620 A through C). An estimated bracketed muzzle-to-target range was developed as a result of the comparison. "Q1: Shirt with Bullet Hole" ([Laboratory] Sample No. 10342610) was separated |

TABLE 2

| WebCode | Conclusions |
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| | from the muzzle of the firearm at the time of discharge at an estimated muzzle-to-target range of approximately 3 to 15 inches. |
| WT3UHD | A pattern of gunshot residues was found. Using the identified weapon with ammunition similar to the questioned cartridges, this pattern of residue was reproduced at a distance from the weapon to the target of between 6 and 18 inches. |
| WXVRAP | The distance of firing between the muzzle of the firearm and the exhibit marked "Item Q1" was estimated to be between 9" to 21". |
| X8XFGT | The muzzle of the suspect's firearm the GSG model 522 P calibre 22 LR semi-automatic pistol was at a distance between 6" to 15" from the bullet hole on the shirt of the victim. |
| XGJXVK | The shot fired in the fragment of fabric consistent with a short distance range, between six and twelve inches from the muzzle of the weapon and the target. |
| XHJPVE | The area surrounding the defect in the white T-shirt section, Item 1A, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed a pattern of gunshot residues. Images of test patterns, Items 1B-1D, were submitted from a known firearm and analyzed. Using the test images, the pattern was duplicated at a muzzle to target distance between 3 and 18 inches. The following is a summary of testing performed: Microscopic examination for unburnt/partially burnt gunpowder particles: particles consistent with the morphological (shape & size) properties of gunpowder were found. Chemical examination for nitrates that could originate from unburnt/partially burnt gunpowder particles using the Diphenylamine test: positive. Chemical examination for nitrite residues that could originate from gunpowder particles using the Modified Griess test: positive. Microscopic examination for lead residues: residues consistent with lead found. Chemical examination for lead residues using the Sodium Rhodizonate test: positive. |
| Y2M3VY | The item 2 piece of cotton twill has one suspect bullet hole in the approximate center. The area around the hole was microscopically examined for the presence of gunshot residues and gunshot residues were found. The Item 2 piece of cotton twill was also chemically processed to determine muzzle to target distance. Using the submitted standards, the muzzle to target distance was determined to be between 3 and 21 inches. |
| Y3XX9Q | The delivered item Q1 was first searched for penetrations. Figure 1 shows an identified penetration that, due to shape and size, may be induced by a bullet of caliber .22. From the penetration area possible traces of GSR were transferred[sic] to a secondary trace carrier, which was subsequently treated with chemographical colouring methods. Firstly the Na-Rhodizonate method was applied. Hereby a bullet wipe ring could be identified[sic] as it occurs when a bullet penetrates an object like a fabric. Additionally, cloudy and spotlike coloured traces could be identified around the entrance hole. Subsequently, the delivered shirt was investigated regarding potential NC particles using a modified Griess Test. Hereby several coloured NC particles could be identified. For the estimation of the shooting distance a comparison shot series was performed using the delivered weapon and ammunition. The treatment of the comparison shots was performed using the same procedures as with the delivered T-shirt. The visual comparison of the achieved[sic] coloured pattern with the comparison shots results in an estimation of a shooting distance in the range of 12 to 18 inches. This statement is made under the assumption that no depletion of GSR has taken place (e.g. by other objects present in the line of fire or by the ablation of GSR by blood or in process of the medical supply). |

TABLE 2

| WebCode | Conclusions |
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| Y7E4YY | The victim's shirt has an entrance hole corresponding to a shot fired from 12 to 15 inches. |
| YBCM2X | Q1) Characteristics of gunshot residue were detected. The residue pattern observed indicates a muzzle-to-target distance between six inches and fifteen inches. |
| YBCQQ3 | The area surrounding the defect in approximately the center of the piece of white T-shirt, Item Q1, was visually examined, microscopically examined, and chemically processed for the presence of gunshot residues. This examination revealed a pattern of gunshot residues. Using the provided Distance Standards, Items K1A-K1C, it was determined that a pattern of residues like that displayed on Item Q1 could be produced at a muzzle to target distance between six inches and twelve inches. |
| YCN6HH | 1. Examination of Exhibit 2 (portion of shirt) disclosed a perforating defect near the center of the fabric. The area around the hole was visually and microscopically examined, and then chemically processed. Physical characteristics and a pattern of gunshot residues associated with the discharge of a firearm were observed. 2. The pattern of gunshot residues on Exhibit 2 was compared to Exhibit 1 (photographs of known-distance test-patterns). The pattern of gunshot residues on Exhibit 2 is consistent with a muzzle-to-target distance between approximately 6 inches and 21 inches. |
| YGFGBT | By means of physical study and chemical analysis gunshot residues (gunpowder, nitrites and lead) were detected around the shirt's (Q1) hole consistent with a muzzle to garment distance between 6 to 12 inches. The provided distance standards (K1a, K1b, K1c) were used for distance determination. |
| YXJXCZ | During the optical and chemical examination of the bullet hole mentioned, propellant residue was found around the hole. Shot range determination test samples mentioned shows the shot was fired at a distance between 9 inches and 15 inches. |
| YYFHAK | At the time of the discharge, the distance between the muzzle of the firearm and the target (shirt) was between 9" and 15". |
| ZAT262 | The material in Item Q1 was examined for the presence of holes consistent with the passage of a bullet and one (1) hole was located in the center of the garment. The area surrounding this hole was examined microscopically and processed chemically for the presence of gun powder and lead residues, and a pattern of residues was found. This pattern was processed and compared to the provided test patterns that were produced at various distances. Based on comparison to these test patterns, it was determined that a pattern of residues like those found around the hole in Item Q1 could be produced at a muzzle-to-target distance of greater than six (6") inches, but less than eighteen (18") inches. |
| ZGTFXP | The area around the hole in Q1 (questioned article) was microscopically examined and chemically processed for the presence of gunshot residues. Physical effects and a pattern of residues were found. This pattern of residues was reproduced at a distance of between three (3) and fifteen (15) inches. |
| ZL7FUF | Item #Q1 is a portion of the victims shirt, white in color, unknown brand, unknown size, which has one (1) hole located in the center of the garment. The area around hole #1 was microscopically examined and chemically processed for the presence of gunshot residue and a |

TABLE 2

| WebCode | Conclusions |
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| | <p>pattern of residue was found. Using the recovered GSG, caliber .22 LR semi automatic pistol, model 522P, with ammunition like that represented by the bullet recovered from the victim, a pattern of residue was reproduced at a distance of between six (6) and fifteen (15) inches. Residues were also found which are consistent with the passage of a bullet.</p> |
| ZP98DE | <p>The area surrounding the defect in the white T-shirt, Item 1A, was microscopically examined and chemically processed for the presence of gunshot residues. This examination revealed a pattern of gunshot residues. Images of test patterns, Items 1B-1D, were submitted from a known firearm and analyzed. Using the test images, the pattern was duplicated at a muzzle to target distance between 3 and 15 inches. The following is a summary of testing performed: Microscopic examination for unburnt/partially burnt gunpowder particles: particles consistent with the morphological (shape & size) properties of gunpowder were found. Chemical examination for nitrates that could originate from unburnt/partially burnt gunpowder particles using the Diphenylamine test: positive. Chemical examination for nitrite residues that could originate from gunpowder particles using the Modified Griess test: positive. Microscopic examination for lead residues: residues consistent with lead found. Chemical examination for lead residues using the Sodium Rhodizonate test: positive.</p> |
| ZQ3WFM | <p>Examination of the submitted white cloth, item #2, revealed the presence of one (1) hole located near the center of the cloth. Visual and chemical examination of the fabric surrounding hole #1 revealed the presence of a gun powder pattern. The submitted series of test gun powder patterns, item #1, were compared with the gun powder pattern present on the cloth, item #2. These comparisons revealed that the gun powder pattern surrounding hole #1 on the white cloth, item #2, is consistent with a muzzle to target distance of greater than six (6) inches and less than fifteen (15) inches. Test paper generated from the chemical examination of item #2 will be returned with the evidence.</p> |
| ZQJ4K6 | <p>The area around the hole in Item 2 (a piece of white cloth) was visually examined and chemically processed for the presence of gunshot residues. Comparisons against Item 1 (known distance standards) indicate the pattern of residues was produced at a distance between 3 and 15 inches.</p> |

Additional Comments

TABLE 3

| WebCode | Additional Comments |
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| 2APYR2 | In addition to the nitrite spot reactions surrounding the bullet hole (consistent with a GSR pattern), there were several large blot like reactions present on the sensitized photographic paper. The source of these reactions are unknown. |
| 2KB32L | [Participant included an attachment that could not be reproduced within the report.] |
| 3KLFQG | The testing program and materials are excellent.. Thank you.. |
| 43KWND | Items K1a-c were test fired standards discharged at 3" increments from contact to 27". The set marked as item K1a depicted untreated pieces of fabric. The set marked as item K1b depicted pieces of fabric that displayed FDR patterns resulting from the application of the modified griess test. The set marked as item K1c depicted pieces of fabric that displayed FDR patterns resulting from the application of a lead test using Sodium Rhodizonate and 5% Hydrochloric Acid. These tests were said to be the result of firing the exhibit .22 Long Rifle calibre, GSG model 522P pistol, using Federal brand, 36 grain, copper plated, hollow point ammunition. |
| 4EBPXV | When a pattern of gunshot residues is found on a victim or submitted item (clothing) and questioned firearm and ammunition are known. The bracketing of the muzzle to target distance tests results with a minimum and a maximum distance will determine approximate distance. |
| 4V3DEL | The soot pattern with a void surrounding the hole on Item Q1 was similar to the pattern observed on the 9 inch test fire. |
| 62L3EL | Shooter was possibly approximately nine inches (9") from questioned shirt Q1 at time of discharge. |
| 786UTT | I am not trained in the copper/lead test and therefor[sic] no tests of this nature were performed. |
| 8JWRL4 | For the distance standards, please include scales with inches. Please add a reference to the top side of the questioned item to prevent opening the cardboard on the bottom side and needing to manipulate the evidence more than necessary. |
| 8VCEZB | The bullet had lead in their constitution. |
| 94M394 | Would also like to see copper testing done when applicable since our lab does both tests for lead and copper. Would prefer indirect method standard tests since most casework is performed this way. |
| AF8YPR | Note: this is based on the MG tests indicating a distance greater than 3 inches but less than 9 inches (close to 6 inches) and based on the SoRo tests indicating greater than 6 inches but less than 12 inches (close to 9 inches). Items were examined on October 12, 2015 and processed on October 13, 2015. |
| BFKXCN | This laboratory does not typically base muzzle to target distance determination on photos of test fire photo arrays. Also it is common practice in this laboratory to use multiple test shots at each distance to determine if the firearm is reproducing patterns at each distance. Had this been done for this case, it may have resulted in a different reported range. |

TABLE 3

| WebCode | Additional Comments |
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| BPBEA6 | The inability to examine the physical test targets results in a more conservative and larger range. |
| BRDE3A | Shooting distance patterns to display Pb was made adapting the method published on the Journal of Forensic Science 2000; 45 (4): 801-806 and (5): 1000-1008. In the NaRh test, Pb stain doesn't follow a logical decreasing with distance (see 18" and 24" standards) |
| CHC88B | Our results for this test are based only on the performance of the Na- Rhodizonate method. We do not perform IR imaging nor Griess reagent testing in our lab. Furthermore, as we do not treat the sheet with acid after Rhodizonate reaction (to eliminate the possible Ba particles), it is possible that we under-estimate the shooting distance, since we see more colored particles than we normally would if only pure lead-containing particles were left over. These effects are taken into account in our regular reporting by stating that we observe the presence of lead-containing GSR particles, and thus conclude that a medium-range shooting distance - larger than a few inches, but smaller than about 80 inch (2m) - was observed. We have found that even this rough estimate suffices to aid police in their inquiries in most cases. |
| CX2E69 | There were more unburned and partially burned powder particles adjacent to the bullet hole on the Q1 T-shirt cloth than was observed on any of the provided reference patterns from 0 - 27 inches. I would not have expected to see this amount of variation in actual case work where the firearm and ample ammunition of the same vintage were provided for testing. The quantity of powder within the pattern on the Q1 T-shirt had to be disregarded to some degree in the evaluation process to the reference patterns (K1a-c). |
| E3BCMF | This result was formed using the supplied distance standards. |
| EK3BKD | I am of the opinion that the shot was fired at a distance of "10" inches. |
| ENN22A | [Participant included an attachment that could not be reproduced within the report.] |
| EWLPY2 | Gunshot residue (GSR) is ejected from the muzzle of a firearm when it is discharged and can be deposited on the target surrounding the bullet hole where range is relatively close. The change in the distribution and concentration of GSR can be used to estimate range. The purpose of this examination was to determine the minimum and maximum distance the muzzle of the firearm could have been from the t-shirt (Q1) at the time of discharge using known distances from three distance methods: 1. Visual Comparison; 2. Modified Griess Test; 3. Sodium Rhodizonate Test. |
| EZZM43 | The laboratory standard procedures is not the same as used in the test samplings. Our standard operating procedures for examination of gunshot damages are: IR-detection, Modified Griess test, Dithionamide[sic] test for copper and Modified Sodium Sulphite test for lead. |
| FETTKB | Every photograph has a scale (photographic scale), it would be necessary to explicitly mark reference points (e.g. above) at the start of pattern generation. The cloth in this test has no reference mark (example label) so we can not know which is the lower or upper part of it. The cloth should be larger, in order to assess the distribution of powder particles completely. The procedure used in our laboratory is different from that used in the processing of fabrics from test firings. We use an additional step that consists in a lifting with adhesive plastic sheet to remove gunpowder granules on the fabric. Each adhesive plastic is processed by alkaline |

TABLE 3

| WebCode | Additional Comments |
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| | <p>hydrolysis of nitrate esters (with heating). Finally, a detection is performed with photo paper impregnated with Griess reagent. This procedure was described by the staff of Toolmarks and Materials Laboratory of Division of Identification and Forensic Science Israel National Police Headquarters, in: Glatstein B, Vinokourov, Levin N, Zeichner. Improved method for shooting distance estimation. Part 1. Bullet holes in clothing items. J Forensic Sci 2000; 45 (4): 801-806. One of the advantages of this procedure is that the sheet of photographic paper attached to the adhesive plastic can be checked under the microscope for morphological characterization of particles. These particles can be drawn for chemical confirmation (TLC, FT-IR, GC-MS), which also allows to exclude the possibility of false positive results (e.g. paint traces with nitrocellulose lacquers) and locate other materials that may be of interest (e.g. fragments of metallic lead or copper/nickel from bullets, fragments of glass, asphalt, cement, etc.). After this procedure, the fabric or substrate remains available to perform the rhodizonate test (directly or indirectly). On the other hand, the rhodizonate test for processing fabrics from test firings (in the proficiency test), has several lead sources, namely: vaporous lead that condenses into the fabric and lead from gunpowder granules contamination, as well as from metal fouling. This can cause some difficulties in the interpretation of results. Our procedure allows removal of finely broken material before visualizing lead dispersion pattern. Particularly, we were displeased that iron marks appeared at rhodizonate-based developings, a condition that does not use to happen in our analysis. Our results were more based on the distribution of granules in powder patterns, as well as on lead patterns. Griess reagent-based developings were not very useful for us because of the reasons explained above. Unprocessed patterns do not match the patterns revealed. For example, in the 6" unprocessed pattern not as many particles of gunpowder are observed as shown in the 6" pattern of sodium rhodizonate.</p> |
| FQA77L | <p>We would not have examined this in a real-case situation without further information. The scenario did not explain why a determination of the distance was necessary in this instance, especially as the range being considered was only just over 2 feet. It would have been helpful to have been given detailed information as to how the Modified Griess and the Sodium Rhodizonate treatments had been performed on the test firings, (e.g. was the Sodium Rhodizonate a direct application?), in order to allow laboratories to replicate the treatment on the sample.</p> |
| GLFNDD | <p>1. The procedure for the "sodium rhodizonate treatment" is not noted but it is obviously more than just applying a sodium rhodizonate solution to the target. Different procedures are possible and may produce different results. The procedure used should be listed. 2. The results on some of the chemically processed targets did not appear linear, directly affecting the determination of muzzle to target distance. This emphasizes the need for more than one test target at each distance. 3. Test targets were listed as being on "white twill-jean cotton cloths" although in viewing the photographs, they did not appear to be a twill weave. The "shirt" material (Q1) was not twill weave.</p> |
| GU89BE | <p>Given only these exemplars as an index, I would report "greater than/less than" data, rather than "minimum/maximum" data.</p> |
| JB8XHV | <p>[Participant included an attachment that could not be reproduced within the report.]</p> |
| JFVMYY | <p>This test was not made properly. It was impossible to tell the exact diameter of some of the patterns because they ran all the way to the edges of the provided photographs.</p> |

TABLE 3

| WebCode | Additional Comments |
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| JQUF8P | Our report template no longer has a separate conclusions section for GSR testing. The above statements would be included in the examinations section of my report. |
| LYMAHT | Item 1A - white t-shirt (Item Q1). Item 1B - powder pattern standards (Item K1a). Item 1C - Griess standards (Item K1b). Item 1C - Sodium Rhodizonate standards (Item K1c). |
| MML44K | I would suggest for future tests that when trying to evaluate/determine reproducibility of the shots do not cherry pick the "best representative" shot at a certain distance but rather evaluate the entire series as a whole. Evaluation should lead to a choice between series A, series B or series C, each taken as a whole. Alternatively, supply the test takers with all three series of test shots so we can evaluate which shots are the "best representative" of a particular distance. |
| MXMP7D | A powder overlay and a chemically processed material produced from Item Q1 are being returned as Item Q1M in Container GSRD and should be maintained for possible future examinations. |
| PPPWUP | The distance is more likely to have been between 9 & 12 inches but a more conservative range was reported as this examiner does not have control of the methods used to prepare and apply the chemicals used to produce standards K1b & K1c. Although it's expected that all care would have been taken by CTS, this examiner can't be 100% certain that item Q1 has not been unduly handled during its collection and packaging. |
| QDMPN4 | 3) The modified Greiss test is not part of our operating procedures. Based on the results provided for comparison it was thought that this test method would not add anything to the overall assessment of shooting distance and hence, the conclusions given above. |
| QN779X | The results of the chemical test for cooper[sic] detection showed a distribution similar to the original distribution of the particles initially observed using a microscope. |
| RCKL27 | The scenario information confirms that multiple tests were fired at the same distance to ensure reproducibility. Photographs of only one (1) alleged representative shot was provided to me for distance determination purposes. It is unknown if this shot emulate the findings on the clothing. In order to come to a sensible conclusion at least three (3) test shots must be provided. |
| TGGE42 | 1. The probability scale used in our Lab, for examinations like this, is (in descending order): A. Very highly probable, B. Highly probable, C. Probable, D. Possible, E. Inconclusive. 2. The procedures used by the manufacturers of this Test, as well as the conditions of the test firing used here, are different than these applied routinely by this Lab. Hence, the figures quoted for the minimum and maximum shooting ranges may be wider, and the probability- lower. 3. For this reason, we prefer getting the untreated test shots targets, rather than the provided photographs. 4. In estimating the shooting distance on this test, we used mainly the test shot results found in our database (for similar ammunition and firearm). |
| TWWGMC | These conclusions are dependent on the fact that the firearm and ammunition used to make the Distance Standards are indeed the same as was used in the commission of the reported offense. |
| UQYHLL | DOFS Item 1A one white cloth section CTS Item Q1. DOFS Item 1B powder pattern images CTS Item K1a. DOFS Item 1C Modified Griess test images CTS Item K1b. DOFS Item 1D Sodium Rhodizonate test images CTS Item K1c. |

TABLE 3

| WebCode | Additional Comments |
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| URUXXH | <p>In an actual case, multiple test shots at the minimum and maximum distances would be conducted followed by chemical processing of each to establish reproducibility. All photos of the test shots should have been provided and all test shots should have been chemically processed. All photos of the chemical processing should have been included in order to accurately evaluate how this particular firearm and ammunition combination deposit GSR. Additionally, it appears the photos for the Sodium Rhodizonate (NaRh) test may have been mislabeled. Generally, there is a linear relationship between distance and pattern size and an inverse relationship between distance and pattern density. The NaRh photos at 21", 24" and 27" do not appear to show these relationships.</p> |
| VPLCGV | <p>1. This proficiency test could be a parameter to measure the performance of the laboratory in gunshot residue analysis on the impact surface, in order to estimate the shooting distance. However, the test could hardly involve other factors different from gun and ammunition, such as: angle of shot, atmospheric conditions of the environment (indoor or outdoor spaces), bleeding, garment manipulation, exposure to adverse weather conditions, influence of washing and immersion in fluids, fragmentation of projectiles, contamination of the victim's clothing by gunpowder in the scenario. Since these factors are not all controllable, the proficiency test would exclude from its design those circumstances that can cause additional complications in the interpretation of results derived from chemographical tests. In other words, the proficiency test would fail to fully cover the reality and complexity of cases received in the laboratory. However, from the point of view of those "ideal" cases, this test is a good evaluation for chemographical methods and comparison techniques applied by the expert. 2. Although every photograph has a scale (photographic scale), it would be necessary to explicitly mark reference points (e.g. above) at the start of pattern generation. 3. The procedure used in our laboratory is different from that used in the processing of fabrics from test firings. We use an additional step that consists in a lifting with adhesive plastic sheet to remove gunpowder granules on the fabric. Each adhesive plastic is processed by alkaline hydrolysis of nitrate esters (with heating). Finally, a detection is performed with photo paper impregnated with Griess reagent. This procedure was described by the staff of Toolmarks and Materials Laboratory of Division of Identification and Forensic Science Israel National Police Headquarters, in: Glatstein B, Vinokourov, Levin N, Zeichner. Improved method for shooting distance estimation. Part 1. Bullet holes in clothing items. J Forensic Sci 2000; 45 (4): 801-806. One of the advantages of this procedure is that the sheet of photographic paper attached to the adhesive plastic can be checked under the microscope for morphological characterization of particles. These particles can be drawn for chemical confirmation (TLC, FT-IR, GC-MS), which also allows to exclude the possibility of false positive results (e.g. paint traces with nitrocellulose lacquers) and locate other materials that may be of interest (e.g. fragments of metallic lead or copper/nickel from bullets, fragments of glass, asphalt, cement, etc.). After this procedure, the fabric or substrate remains available to perform the rhodizonate test (directly or indirectly). On the other hand, the rhodizonate test for processing fabrics from test firings (in the proficiency test), has several lead sources, namely: vaporous lead that condenses into the fabric and lead from gunpowder granules contamination, as well as from metal fouling. This can cause some difficulties in the interpretation of results. Our procedure allows removal of finely broken material before visualizing lead dispersion pattern. My results were mainly based on the distribution pattern of the granules of gunpowder. Griess patterns and lead were not very useful for me because of the reasons explained above. 4. I think that the following aspects should be taken into consideration for the development of proficiency tests for distance determination: Tests should be performed with the same type of fabric as the</p> |

TABLE 3

| WebCode | Additional Comments |
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| | sample received, to ensure the same thermal effects as well as the same adhesion of gunpowder particles to the fabric. 5. It is required to have multiple patterns to determine shooting distance, so I suggest you send us digital photographs of at least three patterns for each of the standards. In addition, the chemical treatment with Modified Griess and Sodium Rhodizonate should be performed at the same GSR pattern so that there is reproducibility when making comparisons between different distance standards. Also, I think you should send a larger portion of the sample for estimating the shooting distance. |
| W7TE8G | 1A- question. 1B- untreated test ref. 1C- griess test ref. 1D- NaRho test ref. |
| WFC2PW | Some observations and recommendations: 1. Our standard operating procedure (SOP) is different from that used in the processing of fabrics from test firings. Our SOP includes an additional step that consists in a lifting with adhesive plastic sheet to remove gunpowder granules on the fabric. Each adhesive plastic is processed by alkaline hydrolysis of nitrate esters (with heating). Finally, detection is performed with photo paper impregnated with Griess reagent. This procedure was described by the staff of Toolmarks and Materials Laboratory of Division of Identification and Forensic Science Israel National Police Headquarters, in: Glatstein B, Vinokourov, Levin N, Zeichner. Improved method for shooting distance estimation. Part 1. Bullet holes in clothing items. J Forensic Sci 2000; 45 (4): 801-806. That situation influences the comparison of our results with the test distance standards of this proficiency test, principally in the Modified Griess Test. 2. I think it's favorable to send the test distance standards as digital images on a DVD, including replicates of the standards at each distance, and their rhodizonate/Griess test results, for considerate the variability in the gunshot residues deposition on the fabric or surface. If it is not possible, the replica selected from the multiple shots, must be the same untreated and from the chemographic tests. 3. I think the test could include some controlled sources of complexity such as other kind of fabrics, dark fabrics, impermeable fabrics; fabrics with two adjacent orifices, etc., for more realistic approach. |
| WQULAT | [Laboratory] Sample Numbers correspond to the following items: 10342610 – Q1 Shirt with Bullet Hole. 10342611 – K1 Contact. 10342611A – K1 Contact Powder Pattern Images. 10342611B – K1 Contact Griess Images. 10342611C – K1 Contact NaRh Pattern Images. 10342612 – K1 3". 10342612A – K1 3" Powder Pattern Images. 10342612B – K1 3" Griess Images. 10342612C – K1 3" NaRh Pattern Images. 10342613 – K1 6". 10342613A – K1 6" Powder Pattern Images. 10342613B – K1 6" Griess Images. 10342613C – K1 6" NaRh Pattern Images. 10342614 – K1 9". 10342614A – K1 9" Powder Pattern Images. 10342614B – K1 9" Griess Images. 10342614C – K1 9" NaRh Pattern Images. 10342615 – K1 12". 10342615A – K1 12" Powder Pattern Images. 10342615B – K1 12" Griess Images. 10342615C – K1 12" NaRh Pattern Images. 10342616 – K1 15". 10342616A – K1 15" Powder Pattern Images. 10342616B – K1 15" Griess Images. 10342616C – K1 15" NaRh Pattern Images. 10342617 – K1 18". 10342617A – K1 18" Powder Pattern Images. 10342617B – K1 18" Griess Images. 10342617C – K1 18" NaRh Pattern Images. 10342618 – K1 21". 10342618A – K1 21" Powder Pattern Images. 10342618B – K1 21" Griess Images. 10342618C – K1 21" NaRh Pattern Images. 10342619 – K1 24". 10342619A – K1 24" Powder Pattern Images. 10342619B – K1 24" Griess Images. 10342619C – K1 24" NaRh Pattern Images. 10342620 – K1 27". 10342620A – K1 27" Powder Pattern Images. 10342620B – K1 27" Griess Images. 10342620C – K1 27" NaRh Pattern Images. "Macroscopic and Microscopic Analysis" and "Chemical Analysis" descriptions are included in addition to "Conclusions" when producing reports. The following |

TABLE 3

| WebCode | Additional Comments |
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| | <p>is a description of macroscopic and microscopic analysis and chemical analysis based upon testing of the submitted items: Macroscopic and Microscopic Analysis Q1: Shirt with Bullet Hole ([Laboratory] Sample No. 10342610) was examined for the presence of holes. One (1) suspected bullet hole was observed on the approximate center of the rectangular piece of reported twill jean cloth. Approximate location of the hole is as follows: Hole #1: ~13cm below top (marked arbitrarily) and ~12cm from the right side The hole was examined visually and microscopically. Fibers were directionally unremarkable. Multiple grey-black particles were observed surrounding the area of the hole and a faint gray discoloration encircled the hole in a cloud-like manner. The tightest concentration of visible particles is approximately 6 cm radius from the hole. Chemical Analysis Q1: Shirt with Bullet Hole ([Laboratory] Sample No. 10342610) was chemically processed for the presence of nitrites using the direct application method for the modified Griess test. It was then chemically processed for the presence of lead using the direct application method for the sodium Rhodizonate test. Postitive reactions as a result of the modified Griess test inlucded[sic] a relatively dense cloud-like reaction and several scattered positive reactions were observed centered around the hole. The densest reaction is approximately 3 cm in radius from the hole with an additional area of organized reactions encircling the hole, extending to approximately 4 cm to 5 cm. Scattered reactions were observed around the hole as far as approximately 10 cm radius from the hole. All of the positive reactions as a result of the modified Griess test described above are consistent with the presence of nitrites. A dense cloud-like reaction encircling the hole with an approximate 2 cm radius was observed as a positive result of the sodium rhodizonate test. Several pinpoint-like positive reactions of a moderate density also encircled the area of the hole. Pinpoint-like reactions were observed as wide as a 13 cm radius from the hole. The positive cloud-like reaction is consistent with the presence of vaporous lead while the pinpoint-like reactions are consistent with particulate lead.</p> |
| XHJPVE | <p>Item 1A = Item Q1; Item 1B = Item K1a; Item 1C = Item K1b; Item 1D = Item K1c. In comparing the evidence, Item 1A, to the submitted photographs, there was an obvious visual difference at 6 inches and 12 inches for the gun powder and vaporous lead patterns; at 3 inches and 15 inches for the Modified Griess test; and at 6 inches and 18 inches for the Sodium Rhodizonate test. These distances were also supported by measuring the gun powder pattern and the patterns revealed by the Modified Griess and Sodium Rhodizonate tests on the evidence, and comparing it to the pattern measurements on the test target photographs. Given that photographs were measured and not the actual test targets, and that I was unable to duplicate the patterns, the minimum and maximum muzzle to target distance reported for Item 1A will bracket the results of all the data gathered from the comparison of the evidence to the photographs of the gunpowder, Modified Griess, and Sodium Rhodizonate patterns.</p> |
| Y3XX9Q | <p>According to the SOPs that are used in our lab, the coloring process is not directly performed on the fabrics (case shot and comparison shot series). A secondary trace carrier is used which is desensitized photo paper in the case of Sodium Rhodizonate treatment, and adhesive transparency film for the NC verification (following the method of B. Glattstein et al.). These circumstances may lead to a different distance estimation (as the case shot was treated according to our SOP and not colored directly on the fabric as done with the comparison shots). This was taken into consideration by using wider error ranges when estimating the range margins.</p> |
| ZQJ4K6 | <p>The procedures used in the chemical processing of the known distance standards (Item 1 - K1b and K1c) are not the only generally accepted methods used in the scientific community.</p> |

TABLE 3

| WebCode | Additional Comments |
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| | <p>For example, the use of Marshall's reagent v the Modified Griess Reagent, direct application of sodium rhodizonate reagents to the target v application to filter paper transfers and the application of dilute hydrochloric acid as the final step in the analysis for lead. For laboratories utilizing methods different from those of CTS, the comparison of the results of analysis is problematic.</p> |

Appendix: Data Sheet

Collaborative Testing Services ~ Forensic Testing Program

Test No. 15-530: GSR - Distance Determination

DATA MUST BE RECEIVED BY October 13, 2015 TO BE INCLUDED IN THE REPORT

Participant Code:

WebCode:

Accreditation Release Statement

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

- This participant's data is intended for submission to ASCLD/LAB and/or ANAB.
(Accreditation Release section on the last page must be completed and submitted.)
- This participant's data is NOT intended for submission to ASCLD/LAB or ANAB.

Online Data Entry

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

Scenario:

Police are investigating a shooting at a nightclub. The victim's shirt was cut and removed by paramedics. The portion of the shirt with the bullet hole was recovered and is being submitted for examination. The coroner confirmed that no exit hole was present. A suspect was apprehended later that day and the police seized a GSG model 522P caliber .22 LR semiautomatic pistol with a 9" barrel from his possession. The bullet recovered from the victim was identified as having come from the suspect's firearm. Rounds of Federal® 36 grain copper plated hollow point ammunition (which was consistent with the bullet recovered from the victim) were test fired with the suspect firearm and the distance standards prepared. Investigators are asking you to compare the recovered victim's shirt with the distance standards provided to determine the distance of the muzzle of the firearm from the shirt.

Please note the following:

- For the Distance Standards, multiple shots were taken at the same distance to ensure reproducibility and the best representative shot was chosen for further processing.
- For the Modified Griess treatment, before use the photo paper was tested using chemically treated nitrite swabs which tested positive.
- For the Sodium Rhodizonate treatment, before use the solution was tested on a lead mark on filter paper which tested positive.

Items Submitted (Sample Pack GSRD):

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

Q1: Shirt with bullet hole.

- 1.) What is the minimum and maximum distance that the muzzle of the firearm could have been from the shirt (Q1) at the time of discharge? Please report a numeral response (e.g. "6") from the supplied Distance Standards. If reporting "Contact", indicate with the numeral "0".

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

Please return all pages of this data sheet.

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Participant Code:
WebCode:

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

3.) Additional Comments

| | |
|---|---|
| <p>Return Instructions: Data must be received via online data entry, fax (please include a cover sheet), or mail by <i>October 13, 2015</i> to be included in the report.</p> <p>QUESTIONS?</p> <p>TEL: +1-571-434-1925 (8 am - 4:30 pm EST)</p> <p>EMAIL: forensics@cts-interlab.com www.ctsforensics.com</p> | <p>Participant Code:</p> |
| | <p>ONLINE DATA ENTRY: www.cts-portal.com FAX: +1-571-434-1937</p> <p>MAIL: Collaborative Testing Services, Inc. P.O. Box 650820 Sterling, VA 20165-0820 USA</p> |

Please return all pages of this data sheet.

Collaborative Testing Services ~ Forensic Testing Program

RELEASE OF DATA TO ACCREDITATION BODIES

The following Accreditation Releases will apply only to:

Participant Code:

WebCode:

for Test No. **15-530: GSR - Distance Determination**

This release page must be completed and received by **October 13, 2015** to have this participant's submitted data included in the reports forwarded to the respective Accreditation Bodies.

ASCLD/LAB RELEASE

If your lab has been accredited by ASCLD/LAB and you are submitting this data as part of their external proficiency test requirements, have the laboratory's designated individual complete the following.

The information below must be completed in its entirety for the results to be submitted to ASCLD/LAB.

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

Signature _____ Date _____

Laboratory Name _____

Location (City/State) _____

ANAB RELEASE

If your laboratory maintains its accreditation through ANAB Certificate No., please complete the following form in its entirety to have your results forwarded.

ANAB Certificate No. _____

Signature and Title _____ Date _____

Laboratory Name _____

Location (City/State) _____

Accreditation Release**Return Instructions**

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

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

Please return all pages of this data sheet.

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