



## **Shotgun Distance Determination Test No. 18-5306 Summary Report**

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Each sample set contained a questioned shotgun pattern image (Q1) and known shotgun pattern distances (K1). Participants were requested to examine and report the range of distances that the muzzle of the shotgun could have been from the target (Q1) at the time of discharge. Data were returned from 25 participants and are compiled into the following tables:

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

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

## **Manufacturer's Information**

Each sample set contained a questioned shotgun pattern image (Q1) and known shotgun pattern distances (K1). Participants were requested to examine and report the range of distances that the muzzle of the shotgun could have been from the questioned shotgun pattern (Q1) at the time of discharge.

SAMPLE PREPARATION: The shotgun used to produce the distance standards and evidence item was a Siaga 12 gauge shotgun with a cylinder choke and the ammunition was Winchester Super Target TRGT12M8.

DISTANCE STANDARDS (K1): Item K1 consisted of shotgun patterns on 24" wide white printer paper. The shotgun was locked into a fixture and the paper was placed at a predetermined distance from the shotgun. This was done for each of the predetermined distances. After firing, the shot patterns were scanned.

QUESTIONED ITEM (Q1): Item Q1 consisted of a shot pattern on 24" wide white printer paper. The shotgun was locked into a fixture and the paper was placed 14 feet away from the muzzle of the shotgun. After firing, the shot pattern was scanned.

SAMPLE SET ASSEMBLY: The Q1 and K1 envelopes were placed into a pre-labeled sample pack envelope, sealed with evidence tape, and initialed "CTS."

VERIFICATION: All three predistribution laboratories reported a greater than/less than range that was in close proximity to the expected distance.

## **Summary Comments**

This test was designed to allow participants to assess their proficiency in muzzle to target distance determination using shotgun patterns. Each sample set contained a questioned shotgun pattern image (Q1) and known shotgun pattern distances (K1). Participants were requested to examine and report the range of distances that the muzzle of the shotgun could have been from the target (Q1) at the time of discharge. The questioned shotgun pattern (Q1) was prepared with the firearm locked into a fixture and the white paper was placed 14 feet away from the muzzle of the shotgun. (Refer to the Manufacturer's Information for preparation details.)

In Table 1, all 25 responding participants (100%) reported a greater than distance between 9 and 12 feet and a less than distance between 12 and 18 feet. In the Summary of this table, CTS has grouped the responses provided by the participants based on their greater than/less than distance results and provided a tally of the ranges between responses as calculated by CTS.

For greater than/less than distances, a +/-3' allowance from the known shot distance (14') was used as the baseline. Any reported "greater than" values which were larger than 17' and reported "less than" values which were smaller than 11' were highlighted as inconsistent. CTS then analyzed the ranges of the reported values and determined the most common reported range, the mode, was 6'. A 3' allowance was provided to the modal value to account for the distance between the known distance standard images. Any reported range larger than 9' was highlighted as inconsistent.

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

## Distance Determination Results

*What is the distance range that the muzzle of the shotgun could have been from the target (Q1) at the time of discharge? Please report a numeral response (e.g. "6") from the supplied Distance Standards.*

TABLE 1 (Distance in Feet)

WebCode	Greater Than	Less Than	Calc. Range	WebCode	Greater Than	Less Than	Calc. Range	WebCode	Greater Than	Less Than	Calc. Range
36VUMG	12	15	3	AU92FR	12	15	3	Z2J3L4	12	15	3
378QU8	12	15	3	EFWGJV	11	15	4				
3DRPMZ	12	15	3	ER7WQZ	12	15	3				
6LQ2UE	9	15	6	G97NK2	9	18	9				
6QNKYX	12	15	3	GLXRPY	9	15	6				
6XN6Y9	9	15	6	GQQCUV	9	15	6				
77YNVC	9	15	6	GXP2BZ	11	13	2				
792L76	9	15	6	HKWY9X	9	15	6				
7KV3V7	9	18	9	UAYVA8	9	12	3				
8DPNPV	12	15	3	UULNWM	9	15	6				
9UW8X8	9	15	6	VCFGHK	9	15	6				
AKL3M2	9	15	6	X69RTC	12	15	3				

<b>Response Summary</b>				<b>Participants: 25</b>	
<b>Greater Than Distance</b>	<b>Participants Reporting</b>	<b>Less Than Distance</b>	<b>Participants Reporting</b>	<b>CTS Calculated Range</b>	<b>Participants Reporting</b>
1	0 (0.00%)	1	0 (0.00%)	3	10 (40.00%)
3	0 (0.00%)	3	0 (0.00%)	6	11 (44.00%)
6	0 (0.00%)	6	0 (0.00%)	9	2 (8.00%)
9	14 (56.00%)	9	0 (0.00%)	12	0 (0.00%)
12	9 (36.00%)	12	1 (4.00%)	15	0 (0.00%)
15	0 (0.00%)	15	21 (84.00%)	18	0 (0.00%)
18	0 (0.00%)	18	2 (8.00%)	21	0 (0.00%)
21	0 (0.00%)	21	0 (0.00%)	24	0 (0.00%)
24	0 (0.00%)	24	0 (0.00%)	27	0 (0.00%)
27	0 (0.00%)	27	0 (0.00%)	30	0 (0.00%)
30	0 (0.00%)	30	0 (0.00%)	Other	2 (8.00%)
33	0 (0.00%)	33	0 (0.00%)		
Other	2 (8.00%)	Other	1 (4.00%)		
No Response	0 (0.00%)	No Response	0 (0.00%)		

# Conclusions

TABLE 2

WebCode	Conclusions
36VUMG	the hypothesis that the questioned shotgun was fired at a distance between 12 feet and 15 feet is very strongly supported.
378QU8	The distance of firing between the muzzle of the shotgun and the target (Q1) was estimated to be between 12 feet and 15 feet.
3DRPMZ	Compared the questioned shotgun pattern with the twelve distance standards obtained with the evidence shotgun (Siaga 12 gauge with a cylinder choke) and measurements by equivalent circle method, established a range of fire between 12 feet and 15 feet.
6LQ2UE	The distance between the muzzle of the shotgun and the target at the time of firing must have been greater than 9 feet and less than 15 feet. Of the twelve distance standards from 1 feet to 33 feet, the shotgun pattern created at a distance of 12 feet is in good agreement with the questioned shotgun pattern (Q1).
6QNKYX	Once the different standards samples of the distance patterns are observed from 1 to 33 feet (K1) and compared with the patterns sample of the incriminated shotgun (Q1), as well as applying the circle diameter method of the equivalent circle; it is established that the sample shot (Q1) was performed at a distance range of 12 to 15 feet.
6XN6Y9	Item Q1 was visually compared with the Twelve Distance Standards, K1. The results show that the shooting distance is greater than 9" but less than 15". The best match was found at a shooting distance of 12".
77YNVC	The shotgun patterns of holes produced by the test fired standards (K1) were measured and compared visually to the questioned shotgun pattern of holes found around Q1. It is the opinion of the undersigned that the shotgun pattern for Q1 indicates a muzzle to target distance greater than 9 feet and less than 15 feet.
792L76	Items K1 and Q1 were visually examined and compared. Questioned pattern Q1 is consistent in size and density with having been produced at an approximate distance of between nine (9) feet and fifteen (15) feet from the muzzle of the shotgun at the time of firing.
7KV3V7	The shotgun pattern observed on the photograph (Item Q1) was compared to the photographs of shotgun patterns at various muzzle to target distances (Items K1) reported to have been made by the suspect's firearm. Based on this comparison, the shotgun pattern observed on the Q1 photograph is consistent with having been made at a muzzle to target distance of greater than nine (9) feet and less than eighteen (18) feet.
8DPNPV	The results obtained are set by digital photography. Taken into account the test carried out in comparison patterns using the equivalent circle, with the firearm Siaga, calibre 12 gauge and ammunition Winchester Super Target TRGT12M8, it was possible to establish a distance determination of shot greater than 12 feet and less than 15 feet.
9UW8X8	In my opinion, the muzzle of the shotgun that had damaged the poster was somewhere between 9 and 15 feet away when the shot was fired.
AKL3M2	After the comparison on the known distance standards to the questioned distance it was determined that the muzzle of the shotgun was discharged between 9' and 15' from the target.
AU92FR	The shot made with the shotgun firearm to the poster was made at a distance greater than 12 feet and less than 15 feet.
EFWGJV	Visual examination and comparison of twelve (12) shot patterns fired at known distances and the questioned shot pattern at an unknown distance revealed the following: The questioned pattern is consistent with being fired at a distance of between eleven (11) feet and fifteen (15)

TABLE 2

WebCode	Conclusions
	feet. All items retained at the laboratory.
ER7WQZ	The range of shot distance from the shotgun to the poster is in a range greater than twelve feet and less than fifteen feet.
G97NK2	Q1 - A pattern of shotshell pellet holes were observed around the hole. The shotshell pellet patterns produced by the test fires were compared to the shotshell pellet pattern around Q1. It is the opinion of the undersigned that the shotshell pellet pattern from Q1 indicates a muzzle-to-distance between 9 feet and 18 feet.
GLXRPY	The characteristics observed on Item 001 were compared to the characteristics observed on the submitted test patterns created at muzzle-to-target distances of 1 foot, 3 feet, 6 feet, 9 feet, 12 feet, 15 feet, and 18 feet (Item 002). The test patterns created at muzzle-to-target distances from 21 feet through 33 feet were not examined. The questioned shotgun pattern (Item 001) was created at a muzzle-to-target distance greater than 9 feet and less than 15 feet.
GQQCUV	The unknown pattern from Item SDD is most consistent with the test pattern created at a muzzle-to-target distance of 12 feet. Assuming the shotgun and ammunition used to create the test patterns are the same as those used to create the unknown pattern, the muzzle of the shotgun was greater than 9 feet and less than 15 feet from the target when the associated shot was fired. This distance range can potentially be narrowed further if additional test patterns are provided at the following muzzle-to-target distances: 10 feet, 11 feet, 13 feet, and 14 feet.
GXP2BZ	The muzzle to target range is estimated to be between 11 to 13 feet at the time of discharge.
HKWY9X	In my opinion, at the moment of discharge the distance between the muzzle of the gun and the damaged poster was greater than 9 feet and less than 15 feet.
UAYVA8	Compared by the patterns take at diferent distances the conclusion that the increded sample concerns with a range of distance greater than nine feet and less than twelve feet. This conclusion is compared by comparing the dispersion of the particles with the samples taken at diferent distances.
UULNWM	Based on the visual comparison and the approximate diameter of the patterning of Item Q1 as compared to the twelve known distances at three foot increments I determined that the distance determination for Item Q1 is greater than 9 feet and less than 15 feet.
VCFGHK	The comparison shots show that the distance at the crime scene was between 9 feet and 15 feet. The assumed distance is (about) 12 feet. The comparison shots were done with the same weapon and ammunition used at the crime scene.
X69RTC	When comparing the submitted poster to the prepared test shots we could observe similar shotgun patterns at distances between 12ft to 15ft. This observation supports strongly the hypothesis that the muzzle of the shotgun used to cause this pattern was held at a distance of about 12ft to 15ft during the shooting. A certain error tolerance has to be included in those observations, as shotguns, even if the test shots where made with the same gun, do not always show exactly the same shot pattern. For this reason we did not chose a precise shooting distance.
Z2J3L4	Compared the questioned shotgun pattern with the twelve distances standards obtained with the evidence shotgun and measurements by equivalent circle method, established a range of fire between 12 and 15 feet.

## Additional Comments

TABLE 3

WebCode	Additional Comments
9UW8X8	Considered giving 12-15 feet range because unknown pattern appears to be slightly bigger than the 12 feet pattern, but decided to give more conservative 9-15 feet range instead to allow for (i) possible uncertainty of measurement when measuring patterns and (ii) possible shot to shot spread variation at the same distance (impossible to discount when only one test pattern provided for each distance). In real casework I would probably have reported the range of firing as c. 10-14 feet (or even 11-13 feet with further test firing at those other distances).
EFWGJV	Our current laboratory procedure would preclude a conclusion being offered and a report being issued, based on the material submitted. The procedure requires three (3) known shot patterns at each distance. (Example: Test for this case would have been fired at 1, 2, 3, 4, 5, & 6 yards.) Maximum & minimum spreads for each pattern would be determined and graphed in a manner to generate two curves. (The area between the maximum & minimum curves would contain all points.) Similar measurements would be taken of the questioned pattern with the graph now utilized to determine a bracketed distance conclusion. (Result offered to a 1/10 of a yard & rounded outward to the nearest whole foot.) Based on the submitted questioned pattern, firing patterns at 1, 3, 6, 9, 12, 15, 18, & 21 feet would be useful as demonstrative aids for trial. The ammunition used to fire the significantly smaller & larger patterns could have been better utilized to fire two (2) additional patterns for each of the following distances: 9, 12, & 15 feet.
HKWY9X	The damage to the poster is consistent with a perpendicular shot with no specific indication of an angled trajectory.

-End of Report-  
(Appendix may follow)



# Appendix: Data Sheet

Collaborative Testing Services ~ Forensic Testing Program

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## Test No. 18-5306: Shotgun Distance Determination

DATA MUST BE RECEIVED BY December 03, 2018 TO BE INCLUDED IN THE REPORT

Participant Code:

WebCode:

### Accreditation Release Statement

CTS submits external proficiency test data directly to ASCLD/LAB, ANAB, and A2LA. 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, ANAB, and/or A2LA. (Accreditation Release section on the last page must be completed and submitted.)
- This participant's data is **NOT** intended for submission to ASCLD/LAB, ANAB, and/or A2LA.

### Scenario:

Police are investigating an armed robbery at a liquor store. The victim stated that the suspect shot at him, missed and hit a poster. The suspect was apprehended later that night and police recovered a Siaga 12 gauge shotgun with a cylinder choke and Winchester Super Target TRGT12M8 ammunition from his vehicle. Investigators are asking you to compare the recovered poster with the distance standards provided to determine the distance from the muzzle of the shotgun to the poster.

*Please note the following:*

*-The distance determination for this test should be reported by pattern recognition only. Chemical processing cannot be performed, as the questioned shotgun pattern is a printed image.*

### Items Submitted (Sample Pack SDD):

**K1:** Twelve Distance Standards from 1' to 33'.

**Q1:** Questioned shotgun pattern.

- 1.) What is the distance range that the muzzle of the shotgun could have been from the target (Q1) at the time of discharge? Please report a numeral response (e.g. "6") from the supplied Distance Standards.

Greater than \_\_\_\_\_ (feet) and Less than \_\_\_\_\_ (feet)

**Please return all pages of this data sheet.**

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## RELEASE OF DATA TO ACCREDITATION BODIES

The following Accreditation Releases will apply only to:

Participant Code:

WebCode:

for Test No. **18-5306: Shotgun Distance Determination**

This release page must be completed and received by **December 3, 2018** to have this participant's submitted data included in the reports forwarded to the respective Accreditation Bodies.

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

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

**ANAB** Certificate No. \_\_\_\_\_

(Include ASCLD/LAB Certificate here)

**A2LA** Certificate No. \_\_\_\_\_

### **Step 2: Complete the Laboratory Identifying Information in its entirety**

Signature and Title \_\_\_\_\_

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](mailto:forensics@cts-interlab.com)*

**Please return all pages of this data sheet.**

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