

FBI Laboratory Firearms/Toolmarks Unit Silencer Testing

1 Scope

This procedure is designed for the examination of muzzle attachments to determine if they have the design and capability to reduce the sound intensity of a firearm's report.

2 Equipment/Materials/Reagents

Bruel & Kjaer, Model 2231 or Larson-Davis, Model 800B decibel meter (or equivalent decibel meter), including standard tone generator (performance check); the system must feature a rise time of 50 μ sec or better, with a measuring range of 0 to 170 decibels; note pad; hearing and eye protection; pen/pencil; ammunition; measuring tape.

3 Standards and Controls

Standards are not applicable. The tone generator is used as a control to determine if the sound meter is functioning properly.

4 Calibration

Not applicable.

5 Sampling

Not applicable.

6 Procedures

6.1 Before conducting the sound reduction test, ensure that all other tests that were requested by the contributor have been conducted, if possible. The firearms examiner may wish to confer with the latent fingerprint examiner on the processing of the muzzle attachment. After all other exams have been completed, and at the discretion of the examiner, a patch can be passed through the inside of the device, which then can be examined/tested for the presence of gunpowder or lead.

6.2 Visually inspect the muzzle attachment to determine if it can be classified as a silencer by design. This would include looking for design features that are consistent with typical “homemade” silencers. Literature is available in the FTU library to aid in this determination and the use of an X-ray machine may be warranted to allow an internal view of silencer construction (contact the Chemistry Unit for assistance with x-ray machine).

6.3 The sound reduction test should be conducted in an area with as little interfering sounds as possible. Outdoor testing over grass is ideal, but indoors on a firing range with sound absorbing walls is acceptable.

6.4 If possible, the microphone should be situated to the right of the firearm, 1 meter from, and at the same elevation as, the muzzle. A porous foam windshield should be used to cover the microphone if testing is conducted outdoors. The decibel meter should be set on the “A” weighting network, using the peak detector and peak hold circuit, if applicable.

6.5 A performance check of the decibel meter using the tone generator must be performed before each examination. If necessary, refer to manufacturer’s operating manuals (FTU Controlled Document, FTU005). The results of this performance check will be recorded in the examination notes.

6.6 For decibel (db) readings exceeding 160db, and when using the Larson-Davis model 800B with the 160db option, calibrate the meter to read 10db low. This allows for readings up to 170db.

6.7 The submitted or reference firearm should be fired ten (10) times without the muzzle attachment, along the horizontal plane.

6.8 If no ammunition was submitted or no specific ammunition requested, then a major brand of ammunition should be used.

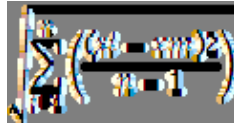
6.9 The readings of the decibel meter will be recorded for each of the ten shots.

6.10 The submitted or reference firearm will be fired using the same ammunition and procedures as were used in steps 6.6 - 6.8, this time with the muzzle attachment.

6.11 The readings recorded from the decibel meter are in decibel units. Calculate three standard deviations from the mean for the first set of ten (10) measurements without muzzle attachment. Calculate three standard deviations from the mean for the second set of ten (10) measurements with muzzle attachment.

7 Calculations

$$\text{Mean} = x_m = (\sum_i x_i)/n$$



$$\text{Standard Deviation} = S =$$

8 Uncertainty of Measurement

For the examination of a muzzle attachment in the FTU, the uncertainty of measurement is not applicable. However, if a quantitative numerical measurement result is requested to be included in an FBI Laboratory *Report of Examination* (7-1), the uncertainty of measurement must be reported. The method used to determine the estimation of uncertainty can be found in the FTU Quality Assurance Manual *Procedure for Estimating Uncertainty for Reported Quantitative Measurements*.

9 Limitations

Sound attenuation tests are not intended to measure an absolute value for sound reduction, but rather the measured difference with and without a silencer installed.

Additionally, excessive wind velocity in outdoor tests could yield inaccurate results. Testing indoors on a small range with no sound absorbing material whatsoever on walls or ceiling could also yield inaccurate results.

10 Safety

Hearing and eye protection must be worn by all participants and observers when test firing. Safety protocols and range rules will be followed at all times. If an X-ray machine from another unit in the Laboratory is needed, their personnel will perform the imaging and ensure that all safety protocols/precautions are followed.

11 References

Stephen Bell, Measurement Good Practice Guide No. 11 (Issue 2), A Beginner's Guide to Uncertainty of Measurement, Crown Publication, 1999, Issue 2 – 2001.

Alan C. Paulson, Silencer: History and Performance, vol. 1. Paladin Press, 1996.

Phillip H. Dater, "Sound Measurement Techniques," Small Arms Review, vol. 3, No. 11, August,

2000.

Manufacturer's Operating Manuals for sound meter kit, FTU Controlled Document FTU005.

FBI Laboratory Safety Manual

FBI Laboratory Quality Assurance Manual

FTU Quality Assurance Manual

Rev. #	Issue Date	History
0	07/10/06	Original issue for ASCLD/LAB- <i>International</i> accreditation.
1	01/20/10	In Section 2 added B&K and Larson-Davis decibel meters (or equivalent). Sections 4 and 5 changed for consistency with other SOPs. Added contact Chemistry Unit to Section 6.2 and added Section 6.5.
2	08/19/11	Updated section 8 for consistency with QAM.
3	03/07/12	Updated title. Replaced reference material with literature in section 6.2. Added requirement for recording performance check and added FTU controlled document 005 to section 6.5. For sections 6.7 and 6.10, replaced “suspect or control weapon” with “submitted or reference firearm”. Updated sections 7 and 8 for consistency with uncertainty of measurement in Revision 5, QAM. Section 9 updated for consistency with FTU report writing examples and added conditions when tests could be affected. Updated references in section 11.
4	05/02/13	Section 1 revised. Added Section 6.11 for calculating standard deviation. Section 8 was updated to include when uncertainty of measurement is calculated.

Approval

Redacted - Signatures on File