A. Purpose:

To describe the procedures for documenting and classifying bullet/projectile evidence.

B. Responsibility:

Forensic Science Examiners assigned to the Firearms Unit.

C. Safety:

To avoid exposure to any potential bio-hazardous material, bullet/projectile evidence should be decontaminated.

D. Procedure:

The characteristics and condition of bullet/projectile evidence will be documented in the notes, using QR FA-11 Projectile Worksheet, QR FA-13 Notes Page, or QR FA-14 Fillable Blank Notes Page.

Some of the details that will be recorded on the QR FA-11 Projectile Worksheet will include whether the bullet evidence is suitable for microscopic comparison.

1. Write the laboratory case number and the analyst's initials on the outer packaging of the evidence submission(s).
2. Mark the bullet(s)/projectile(s) located in the evidence packaging with the case number, the submission number designation, and the analyst's initials. Note: Scribe the above information on the bullet(s)/projectile(s) that will be used to generate a list of potential makes/models using the FBI GRC database.
3. Using a stereo microscope and/or comparison microscope, evaluate the fired bullet(s)/projectile(s) to determine which item(s), if any, should be used to generate a list of potential makes/models using the FBI GRC database.
4. Caliber determination
   a. Measure the base diameter of the evidence bullet/projectile using a measuring device such as calipers. Damage may preclude this measurement.
   b. Caliber may also be determined by the use of the following equation (formula for determining the circumference of a circle). This calculation will be verified during technical review.

$$(L + G)n \approx \pi d$$

(L + G) is the measurement of one land impression plus the measurement of one groove impression in inches

n is the number of lands/grooves

π is approximately 3.14

d is the diameter of the bullet in inches.

c. Physical characteristics of the evidence bullet/projectile, such as weight, bullet shape, composition, nose design, and number and placement of cannelures may aid in caliber determination.

d. Caliber is written as a numerical term and may be written with or without the decimal point.

5. Other Characteristics

a. Any trace material (refer to FA SOP-15 Removing Debris and FB SOP-19 Trace.HLF Examination for guidance).

b. Caliber

c. Weight in grains

d. Number of lands and grooves

e. Dimensions of lands and grooves

f. Type of rifling

g. Direction of twist

h. Composition of bullet

i. Type of bullet

j. Base description

k. Possible manufacturer of bullet

l. Cannelures

m. Any other physical description of the bullet's condition

6. Measuring Land and Groove Dimensions

a. The land and groove dimensions may be measured in two ways on a comparison microscope: live image or by photograph. This data may be used to determine possible suspect weapons with the assistance of a general rifling characteristics database. The NIST-traceable stage micrometers may be used as needed to ensure the measuring tools are measuring accurately.

b. Measuring should be done on any suitable land and/or groove impressions.

i. If a bullet/projectile is identified as having been fired in specific firearm, L&G measurements are not necessary.

ii. Some unusual or common rifling characteristics, such as 4R, 5R, 7L, 7R, 9L, etc., do not require measurements to determine possible suspect weapons.

c. Mount the bullet/projectile on a microscope stage.

d. Adjust the lighting as needed.

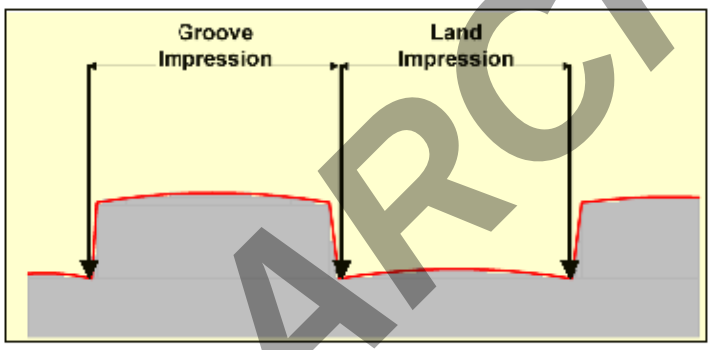
e. Using the imaging software, follow the steps below for the chosen method.

To measure by live image:

1. Click the Measure tab.
2. Choose the Distance Line Tool.
3. Measure the dimensions of the land or groove impression from shoulder to shoulder (see diagram below).
4. Record the data in case notes.

To measure by photograph:

1. Capture an image of the bullet by clicking on the "Acquire" button. Save the image in the appropriate folder.
2. Click Process tab → Annotate tab → Extended Annotation toolbox.
3. Using the Distance Line Tool, measure the dimensions of the land or groove impression from shoulder to shoulder (see diagram below).
4. Click Merge to add the measurement annotations to the image of the bullet. Save the image in the appropriate folder.



4. Using the Land/Groove Measurements to Determine Suspect Weapons

a. The acquired measurements may be input into the FBI GRC Database.

b. Examiners will use a +/- 0.005" input tolerance for entry into the GRC database. More information on the entry into the FBI's GRC File document is located in Qualtrax under Firearms Unit – Controlled Electronic Reference Documents.

c. The search results list will be printed and kept in the case jacket.

d. When reporting possible suspect weapons, it should be indicated that the list is being provided. A copy of the GRC list will be attached to the report provided to the requesting agency.

5. In the event that numerous bullets/projectiles are included in the submission and the analyst will be screening the projectiles to generate a GRC list, the following steps are recommended:
   a. The following class characteristics should be considered:
      1) Caliber
      2) Number of land and groove impressions
      3) Direction of twist of the rifling
      4) Type of rifling
      5) Width of the land and groove impressions
   b. If the class characteristics of the evaluated bullets/projectiles are the same, select the best exemplar of the submitted evidence.
   c. If the class characteristics of the evaluated bullets/projectiles vary, an exemplar from each group should be selected.
   d. Generate a GRC list for the selected projectile(s).

E. References:

1. AFTE Glossary
2. GL 2 Safety Manual
3. FA SOP-15 Removing Debris
4. Forensic Biology SOP-19 Trace.HLF Examination
5. General rifling characteristics databases (FBI and AFTE)
6. General Rifling Characteristics File document from the Firearms/Toolmarks Unit FBI Laboratory