Resonant Ultrasound Spectroscopy (RUS)

All stiff solids have unique acoustic fingerprints which result from, shape, size, density, and elastic properties of sample.

A 1 ounce gold or tungsten bar or coin have the same dimensions and almost the same densities but very different elastic properties (see pictures on last panel to observe the differences)

400 Troy to 1 oz tests showed detection of tungsten down to 1% giving pass/fail signal.

Now applied to cut/polished diamonds for fingerprinting and sorting of rough diamonds according to quality.

System good for 400 TO - 1 ounce coins and bars, and any stone (diamond, ruby, sapphire) from 0.25 ct to 50 ct.

Applicable to Au, Ag, Pt and Pd and cut/polished and rough diamonds

ASTM Standard 2985

Standard Practice for the Determination of Metal Purity by Resonant Ultrasound Spectroscopy

This standard practice benefits the precious metal industry where fake gold and silver bars and coins have been tampered with the substitution of inexpensive metals of similar density.

It is for use with resonant ultrasound spectrometers capable of exciting, measuring, recording and analyzing multiple whole body mechanical vibrations within parts exhibiting acoustical ringing in the acoustic or ultrasonic, (or both) frequency ranges.

This practice uses RUS to distinguish conforming parts, as determined from qualified training sets, from those containing significant anomalies in their elastic properties.

The basic functions of a RUS monitoring system are to detect and classify resonance phenomena governed by the parts dimensions, density and elastic properties.When a material substitution occurs in a pure metal,the components have almost identical densities and unchanged dimensions,leaving only the elastic properties to affect the resonances.

This practice replaces destructive methods,which damage the test object.

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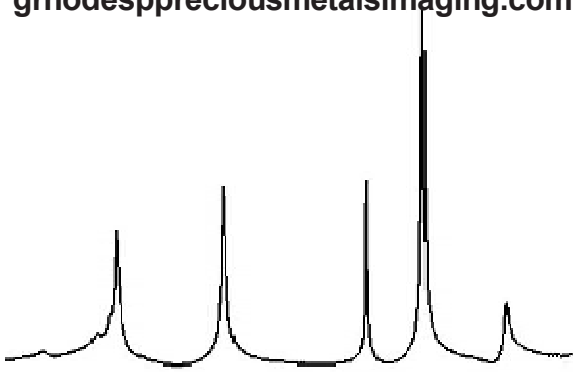


About PMI

The ASTM Standard for metals addresses the RUS method. PMI has the intellectual property rights to this application for precious metals and stones.

The method was developed by Dr. Rhodes who holds over 20 patents, many of which are in the RUS field. US Patent 9,304,112 covering this subject issued April 5, 2016 and provisional patents covering the fingerprinting and sorting of diamonds were filed this year.

Dr. Rhodes founded the first 2 companies to use RUS as CTO of the first and CEO of the 2nd. He is responsible for all development and manufacturing. He is also available for training, presentations and seminars to all customers.

Test Procedure

Bar, coin or stone is given unique ID

Load appropriate template into software i.e 400 TO Au bar, I Kg Au bar, I oz Krugerrand, loz Canadian Ag Mapleleaf, diamond, ruby …

Place sample on test nest

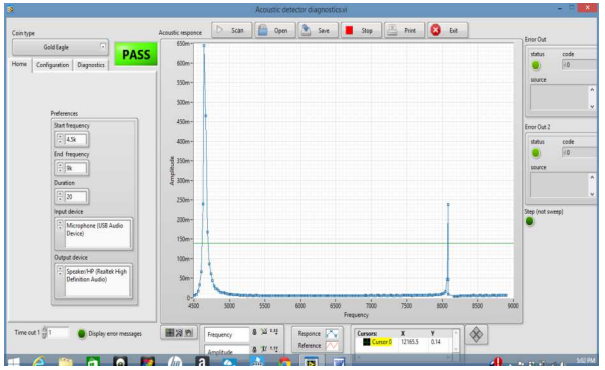
Press the scan button

Scan will take 15 seconds

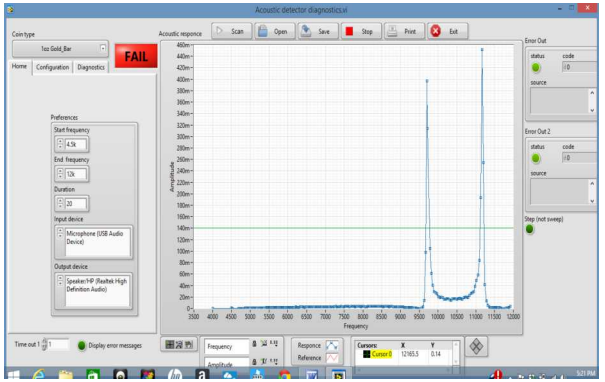
A display will appear showing the scan Dialog box will indicate pass or fail

Diamonds are like snowflakes in that no 2 are identical. If interested, we will provide any inquiry with photos, spectra and data showing how different are 5 identical 0.50 ct cut, polished, round diamonds. We produce a digital fingerprint that is accurate to 1 part in 12 billion providing a permanent record of any stone in less than 60 seconds.

This shows the spectra of 3 0.50 ct diamonds where each color is a different stone.



Here is a typical Gold Eagle, as seen by the dialog box above indicating authenticity.



And this indicates the display when a counterfeit 1 oz Gold coin is scanned.