Measuring Mighty Fine Junk

Many hams have several pieces of MFJ equipment. I have purchased a number of items myself. Recently I bought an MFJ-762 81 decibel (dB) step attenuator. I plan on conducting some scientific experiments that require a reasonable amount of precision with regard to signal attenuation.

MFJ specifies that their unit's accuracy is 0.2 dB, or 5% of total attenuation, whichever is greater. I need to know when I push the 3 dB attenuation button, for example, that I am indeed getting 3 dB of attenuation, +/- 0.2 dB.

I enlisted the help of a friend, Mike AJ4NR, to help with the measurement of this MFJ attenuator. Mike has some exceptionally good multi-meters. We used Tektronix DDM 4020 to measure the input voltage from a 1,000 Hz signal generator. A Fluke 289 was used to measure the output. A 50 ohm load was applied to the output lead for circuit load stability.

A FlukeView Forms program logged data from the Tektronix unit. The Fluke instrument could log data to its internal memory. Many voltage samples were taken every second, and once each second the minimum, maximum and average voltage was recorded. The test at each attenuation level was run for one minute, so sixty readouts were reported, and an overall voltage average was obtained for input and output from the attenuator.

Then with an amplitude calculation for decibels, a rather precise figure was obtained to compare with the dB reading for that MFJ switch position.

MFJ Switch	Actual Attenuation	dB Error	% Error	MFJ Standard	Pass/Fail
1 dB	1.053 dB	0.053 dB	5.29%	0.2 dB	Pass
2	2.143	0.143	7.16%	0.2 dB	Pass
3	3.163	0.163	5.45%	0.2 dB	Pass
5	5.031	0.031	0.63%	0.25 dB	Pass
10	10.316	0.316	3.16%	0.5 dB	Pass
20	19.726	-0.274	-1.37%	1 dB	Pass
20	19.731	-0.269	-1.35%	1 dB	Pass
20	19.718	-0.282	-1.41%	1 dB	Pass

Mike determined the pass/fail of every combination of attenuation switches. There are 255 possibilities. All but three combinations passed. Those which failed missed in the range of 0.02 to 0.06 dB. However, other combinations with fewer buttons depressed to give the same total attenuation passed. One should always use the fewest buttons possible.

So my only question is: Can I trust the reading from the Tektronix and Fluke multi-meters? I believe trusting the results is a reasonable assumption. The Fluke 289 does not come with a Certificate of Traceable Calibration. While the Tektronix DMM 4020 had such a certificate, the calibration was done in 2012 and the certificate has since expired.

My next project is to use this MFJ attenuator for a rather precise set of tests on HF receivers. I can use the Actual Attenuation column. This will be very important as I undertake a scientific study of S Meter scale accuracy. Attenuation accuracy is important. I have now labeled each of the eight buttons with their actual attenuation value for ease of reference.

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