The Folly of Using S Meters to Measure the Power of a Remote Transmission

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It is all to common for some amateurs to try and 'measure' the power that other stations are running by making 'measurements' using their S meters. This short note is intended to show why this technique is fundamentally flawed and misleading.

In theory, S meters should ideally be calibrated to that 1 S point is equivalent to 6dB increase in received signal power. You will recall that 6dB is also equivalent to increasing power 4 fold.

Thus, if you are receiving someone at S2 and he increases power so that you read him at S2, in theory he must have increased his power 4 fold. *How much power he was originally using is irrelevant.*

To improve the receive signal from S1 to S9, an 8 x 6dB increase is required, or 48dB. 48dB corresponds to an 4^8 (or 4x4x4x4x4x4x4x4), which is 65536 fold.

So, if someone was S1 with say a modest 1W to increase his report to S9, he would need to increase his power to 65536W, or over 65kW!

A more modest increase, to say 1kW, 1000 fold, corresponds to 4^5 (4x4x4x4x4=1024) or 30dB, corresponding to a new report of S6. (We take 1024 to be the same as 1000.)

The above technique applies up to S9. Above S9, S meters are marked in dB (or dB over S9 in common parlance). In this region, the technique applies but needs to be slightly modified.

For example: Initial report S8. New report, S9 + 20dB .

Increase = 26 db

20 dB corresponds to 100 fold increase.
6 dB corresponds to 4 fold increase.

While we add dB increases we multiply the 'fold' increases, so 26dB is equivalent to 400 fold.

So, if the initial report corresponds to, say, 100W, the improved report, in theory, corresponds to 4000W or 4kW.

Thus far, we have considered the signal reports, or S meter readings, from a single station who is changing his power. What happens if we try to use the S meter to compare the signal of two different stations to compare the power we think they are using?

Suppose we are receiving a station at, say S3 who says he is using 100W. What power, based on our S meter, is a station we receive at, say, S9 using?

6 S points *difference*, 36 dB, is 1000 x 4 fold *increase*, 4000 fold. So, 100W x 4000= 400000=400kW. Not a very plausible conclusion. Even a more feasible, in amateur circles, 1kW, station, would correspond to less than a 2 S points on the S meter above the 100W station.

Even if our 100W station is running 1kW, the numbers don't become plausible, our second station would need to be running 40kW *if our method is reliable*.

The fact is, the method of using an S meter to estimate the power of an unknown station based on comparing it against a known station is not reliable.

Note: The above assumes our S meter is accurately calibrated to the standard of 6dB per S point up to S9 and the dB calibration above S9 is also accurate. The sensitivity of the receiver is not a factor.

Conclusion: You can't rely on your S Meter, even if it is calibrated correctly, to accurately measure the power of a remote transmission. Even if you are comparing it with another transmission of known power you need to treat any comparison with great care.