2024 Tuneup Results

Thanks to all who brought rigs to test at this year's picnic. We had close to a dozen rigs at 10 GHz and half a dozen at 24 GHz. One rig even traveled all the way from Oregon!

See https://50mhzandup.org/show/ukv6 for a description of the test range and methods, as well as some of the possible measurement errors and ideas for interpreting your results. The range was not calibrated (we just estimated the distance based on past years) and the effects of ground gain are not well calibrated, although we did identify the best height for your rig's antenna as about "K6ML chin high" (about 5 ft) for the 10 GHz tests. We "crowd calibrated" the range by using a fudge factor based on the rigs that came closest to expectations as "golden" rigs. So, the relative results are more meaningful than the absolute numbers reported.

The 10 GHz 'crowd calibration' fudge factor was 5 dB for both ERP and MDS, roughly on the order of the expected ground gain. In general, the 10 GHz measurements are probably (relatively) accurate to within a few dB, so don't going tearing into your rig trying to 'fix' it if it was only 1-2 dB off of expectations. If you are 10 dB or more off the mark, maybe some further tests are warranted :) Also, I tried as hard as I could, but I can't promise that there were no data entry errors during testing (the sunlight washing out my laptop screen made accurate data entry very difficult); consider this possibility along with all other errors before tearing into your radio :)

As in previous years, the 24 GHz results are much more questionable...the ERP measurements (especially for the weaker ERPs) were too close to the test head's noise floor for comfort, and results varied much more from each other and from expectations. The fudge factors were 16 and 34 dB for the 24 GHz MDS and ERP results, respectively. We still need to come up with a better test system (better NF, ref locked LO, remote gain and band switching).

Discussion of Reported Results (attached)

MDS500 tests your rig's minimum detectable signal level, which depends on both your **antenna gain** and **receiver sensitivity**. For all rigs except one (WF6R) we measured the signal + noise to noise ratio (in a 2500 Hz passband) at your transverter's IF output while listening to a distant test source.

WF6R brought an IC-905 to test, which does not have an IF output, so we had to fall back to the old 'step attenuator at the source' and 'can you still hear me' method at the rig. His result was 42 dB of attenuation, which was estimated as a 'measured' SNNR2500 ~ 27 dB, assuming an ability to hear a carrier at about SNR2500 = -15, a bit of an apples and orange SWAG (we need to work on a better way to address all-in-one rigs like the IC-905 next year; we can expect more to show up).

We then back calculated from SNNR2500 to SNR500 to **MDS500 at your rig's antenna**. This is the signal at your antenna that would be equal to your noise floor (in a 500 Hz bandwidth). **The results are sorted on MDS500 at Rx antenna and reflect**

the overall weak signal capability of your rig (a weaker, more negative signal is better).

The next column in the results subtracts out the expected antenna gain to get an inferred **MDS500 at the input to your receiver**. Given that we expect somewhere between 2 and 3 dB of test range background noise coming in thru the antenna, an **MDS500 of -144 dBm at the receiver input is about the best we can expect**, even with a sub 1 dB NF LNA; this corresponds to an 'ideal' **system NF** of 3 dB (Ta + Tr). The MDS500 at Rx (and Sys NF) results reflect receiver performance if and only if the antenna gain was correct; a poor antenna can make your Rx look bad when it's really just peachy.

Using the diagnostic method outlined at the end of https://50mhzandup.org/show/ukv6 , the results give some **comments** on Rx performance (very good, ok, possible antenna/common path underperformance, possible Rx path underperformance, antenna is too large for accurate measurement on this range, etc). When a negative number is shown, it's the shortfall in dB; larger numbers are more concerning. A few dB at 10 GHz is close to measurement error; maybe 10 or more dB at 24 GHz. As the https: link stresses, consider possible antenna pointing erros and also antenna errors show up as similar MDS and ERP shortfalls, while different shortfalls point to either Rx or Tx path.

ERP tests your rig's effective radiated power, a measure of both your antenna gain and transmitter output power. One at a time, each operator sent a carrier and we measured the received signal power at the test head. At 10 Ghz, this was always well above the test head noise floor; at 24 GHz, not so much. **The results are sorted by Measured ERP, the indicator of your rig's overall transmitted signal strength (larger is better).**

We compared this **Measured ERP** with a **Calculated ERP** (expected based on the user's reported antenna size/gain and PA output power) to find a **shortfall in dB**, which can be used to diagnose potential Antenna (common path) and Tx path problems. The **test SNR** (should be great than 10 dB for more accurate measurements) and **diagnostic comments** are also provided.

Again, the 10 GHz results are much more reliable; measurement scatter and fudge factor were much less and the crowd sourcing the data was twice as large. The 24 GHz results and test gear are considerably less reliable, but the ranking may still be indicative.

Good luck in the contest!

See you on the microwaves,
Mike K6ML