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Yaguang Zhang; Nicolo Mich+4 more

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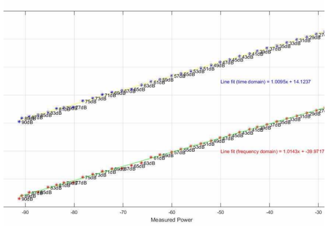

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Action Items

Yaguang (and Soumya if you're interested in helping).

Ok, that's a great start, it's a great aid to visualize each of the measurement environments and any interesting multipath structure we saw. Looks like in most cases we're only getting a couple of multipath, although Figs. 75-77 look very interesting.

The next step (after the GPS and distances) is going to be to produce a scatterplot of the receive power (or path loss) as a function of distance. To do that, you'll have to go through the calibration data and come up with a linear relationship between the calculated power (from Matlab) and the actual received power (which we measured in the lab).

Traditionally, for broadband measurements, the power calculation has been done in the time domain by integrating the total area under the Power Delay Profile. The problem is that is an overestimate of the actual "CW Equivalent" received power, because one is presuming all those multipath add in phase (basically, the assumption is that the receiver has perfect Rake combining). Over the past few months, I've been investigating a frequency-domain technique that should preserve the phase relationships and yield a more accurate estimate of received power.

The basic process is:

1. Take the I/Q voltage waveforms (filtered) you recorded from the USRP.

2. Threshold each waveform to eliminate cross-correlation and system noise. I usually find the standard deviation in the first 5-10% of samples before the first peak, and set my threshold at 3*sigma above that.

3. Remove the samples below the threshold and replace them with zeros.

4. Compute the complex FFT of the I/Q waveforms and generate a power spectral density in the frequency domain.

5. Total received power is then the area under the frequency domain curve.

You'll also need to factor in the gain setting of the USRP, similar to what Chris Rowe did for his Masters Thesis.

When you're done, you should get a plot that looks like the one I attached. The marker points in this case are the attenuation values we used, the X-Axis is the true measured power, and the y-axis is the power computed in both frequency and time domain.

Hopefully that makes sense. Let me know if you have any questions.

Dr. A