ÖMER ALPEREN KATI
2017401069

HW4

In Fig. 1 (a), one can see the received power in dBm. This data is converted into W using (1), and presented in Fig. 1 (b).

$$W = (10^{(dBm/10)})/1000 \quad (1)$$

Then, the received voltage in Volt is calculated by sqrt(2*50*W) and presented in Fig. 1 (c). Also using the inverse of (1), the received voltage is plotted in dBuV in Fig. 1 (d).

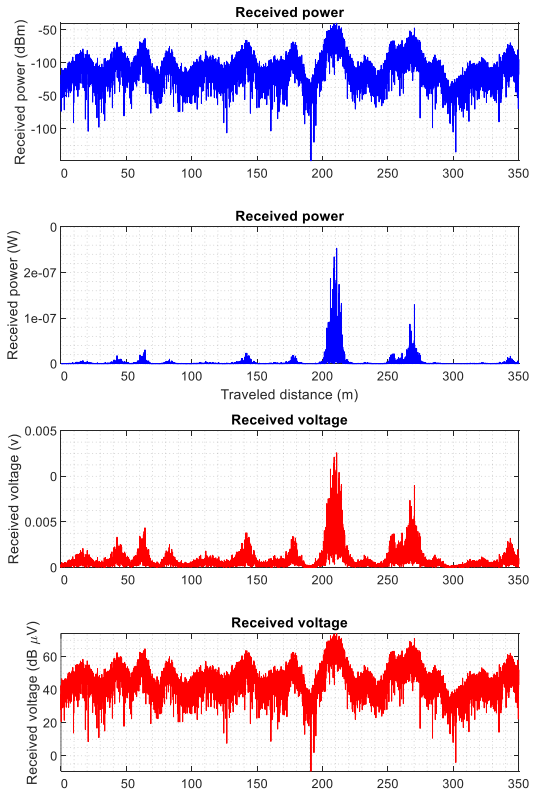

Fig. 1: Received power in units of (a) dBm and (b) W. Received voltage in units of (c) V and (d) dBuV.

Fig. 2 (a) and (b) is generated by low pass filtering the data of Fig. 1 (c) and (d). Also, by using these filtered versions, fast variations are demonstrated by normalizing it according to the filtered slow variation plots, as can be seen in Fig. 2 (c) and (d). Finally, one can see the overall and slow variations together in Fig. 2 (e). Among the three types of level changes of the signals in Week 10 slides, Fig. 2 (b) is an example of shadowing effect due to the objects obstructing the propagation path between transmitter and receiver, whereas the fast and short-term variations in Fig. 2 (d) is an example of the multipath effect which is due to reflection, diffraction, scattering or intersymbol interference (ISI).

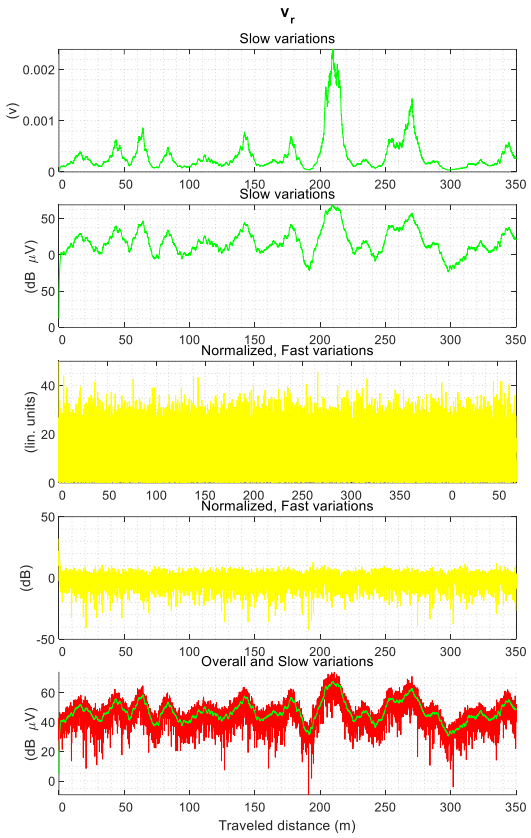

Fig: 2: Filtered slow variations of the received voltage in units of (a) V and (b) dBuV. Filtered normalized fast variations of the received voltage in (c) lin. units and (d) dB. The comparison of overall and slow variations in units of (e) dBuV.

In Fig. 3 (a) and (b), it is noted that CDFs of the measured/theoretical slow and fast variations are in line with each other. While calculating the theoretical data, the required sigma, standard deviation and mean values are given as input to selected CDFs of Rayleigh and Gaussian for fast and slow variations respectively. Note that Fig. 3 (a) and (b) show us those CDF assumptions are correct.

In Fig. 3 (c), the measured CDFs of slow and overall variations are compared, and it seems that slow variations are delayed. This is due to the fact that the summation of Fig. 2 (b) and (d),

which are both in units of dB, will give us the overall variations in units of dB. Fig. 2 (d) has always negative values, and this will shift the measured overall CDF to the left some extent.

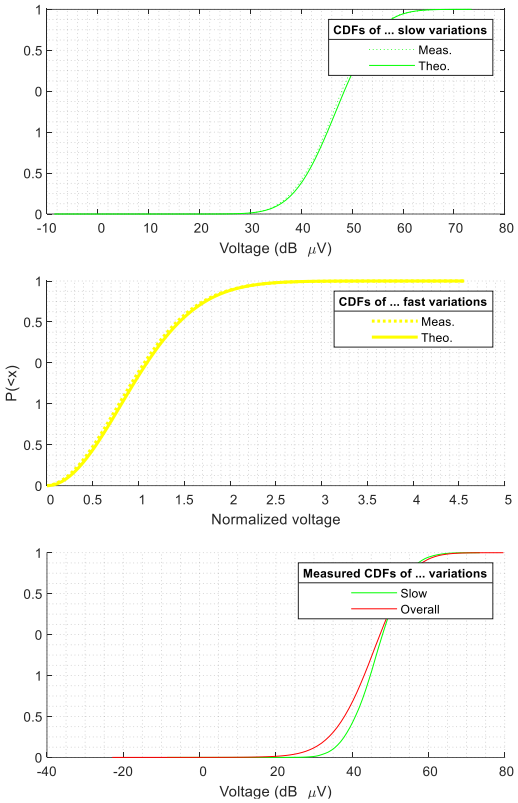

Fig: 3: CDFs of the measured/theoretical (a) slow and (b) fast variations. The comparison of measured CDFs of (c) slow and overall variations.