RFI CHARACTERIZATION FOR SMAP USING L-BAND DIRECT SAMPLED DATA OBTAINED DURING THE SMAPVEX12 AIRBORNE CAMPAIGN

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NASA's Soil Moisture Active Passive (SMAP) mission (scheduled for launch in 2014) will have an L-band radiometer to measure brightness temperature values for retrieving soil moisture information. Previous studies have shown that, although the 1400-1427 MHz frequency band is allocated for geophysical remote sensing applications, significant RFI corruption nevertheless occurs. The SMAP radiometer will utilize a digital backend to improve the detection and mitigation of RFI. The digital backend will use a 3.2 kHz sampling frequency to allow sub-milisecond pulse detection and mitigation techniques. In addition, the digital backend will also provide 16 frequency channels (1.5 MHz bandwidth each) so that spectral RFI detection methods can be applied. Finally, the SMAP digital backend will compute the first four moments of observed fields, making computation of the Kurtosis statistic possible as well.

To study the performance of all the SMAP digital backend under RFI exposure, the temporal (i.e. "pulsed" or "continuous"), spectral (i.e. "narrowband" or "wideband"), statistical, and spatial characteristics of potential RFI sources should be well known in addition to source power amplitude levels. L-band microwave radiometry missions currently in operation such as SMOS and Aquarius can provide RFI source amplitude information, but the lack of high temporal and spectral resolution in the Aquarius and SMOS datasets prevents knowledge of detailed source emission properties. Detailed source information is available from airborne campaigns that include advanced RFI characterization subsystems. SMAPVEX12 (conducted Summer 2012) is one such campaign that was conducted over soil moisture test sites near Winnipeg, Canada as well as an RFI test flight in the vicinity of Denver, CO. The SMAPVEX12 campaign included a direct sampling digital backend developed by NASA JPL deployed with the NASA JPL PALS L-band radiometer. This direct sampling digital backend records raw IF analog-to-digital converter voltages at the rate of 75Msps for both the horizontally and vertically polarized radiometer channels.

The direct sampled data enables a variety of RFI source analyses to be performed, including detailed tests of the spectral, temporal and statistical properties of the RFI sources encountered. A particular concern for SMAP performance assessment is the prevalence of "wideband continuous" sources as compared to "narrowband" and "pulsed" types. The presentation will provide results of RFI characterization studies using the direct sampled data. RFI contamination in the dataset will be classified according to its temporal and spectral properties, and selected RFI sources will be examined in detail. Finally, these results will be discussed with regard to implications for the SMAP project and for other L-band radiometer missions.