Radiometry and the Ever Shrinking Spectra and Ever Expanding Needs

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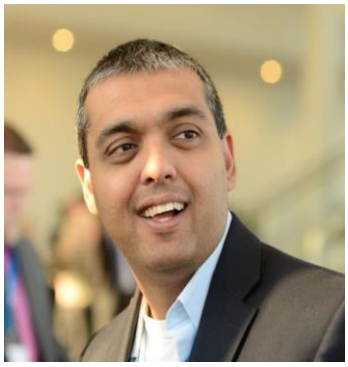

ABSTRACT

Over recent years radiometric designs have been undergoing several innovations that need to answer to our ever-increasing science needs obtainable from wide spectra measurements and yet conversely deal with the ever shrinking frequency spectra available for these measurements.

Frequency, wavelength, spectra have been synonymous with microwave and millimetre-wave radiometry and their science returns from radio-astronomy, earth-observing remote-sensing, or planetary missions. Yet, over the past decade or so the spectral allocations that governed typical radiometric designs have been shrinking and under duress due to increased shared usage. Spectra lost equates to science lost for radiometry. Radiometer design trends over the past decade within the microwave community have resulted in receiver and back-end designs that respond to increasing radio frequency interference (RFI), such as the SMAP (Soil Moisture Active Passive) mission or the CubeRRT mission (CubeSat Radiometer RFI Technology validation) space borne missions or several airborne and ground-based designs. These design changes have made the radiometers sensitive to RFI detection in order to salvage science returns within spectral interference [1-6].

On the other hand, the science community and radiometric community are realizing the potential advantages of wide-bandwidth millimeter and microwave radiometry with respect to geophysical science returns. Measurements previously considered improbably are now potentially attainable. Some examples include, high resolution atmospheric sounding, planetary-boundary layer detection, increased sensitivity to polar salinity, increased sea-ice thickness coverage etc [7-10]. The need for wide bandwidths has resulted in several radiometric design innovations from photonic receivers, ultra wide-band digital backend systems.

This talk will briefly present the challenges of both dealing with RFI and spectral allocations, and the resultant architectural innovations. This talk will also cover the potential science returns from wider spectra measurements and the innovative receiver architecture required to meet those.

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