

CubeSounder: Development of Microwave Radiometer 3D Weather Imaging Sensors

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Abstract—Satellite based microwave radiometers are the most important driver of global weather forecasting (WMO 2012, NAS 2018). Current sensors rely on high-SWaP-C LO/mixer/RF components. We present ground testing and designs of a novel low-SWaP-C microwave sounding weather sensor, that will fly with a NASA technology demonstration flight on a stratospheric balloon. Our weather sensor utilizes parallel 60GHz/180GHz millimeter-wave filter bank spectrometers. The spectrometers work by amplifying a broadband signal with an LNA then channelizing with a millimeter-wave filter bank. Each channel of the filter bank is detected by a separate diode. We designed this sensor system for measuring 3D atmospheric water vapor and temperature by observing the pressure broadened 183 GHz water line and 60GHz oxygen line. The NASA tech flight will allow us to demonstrate our weather sensor technology in a relevant environment, paving the way for either commercial adoption or space-based demonstrations. We will present progress on constructing and characterizing a flight ready prototype weather sensor system and demonstrate that the maturation and adoption of our novel sensor system would greatly improve weather forecasting.

Keywords—Millimeter-wave, Remote Sensing, Weather, Spectrometer

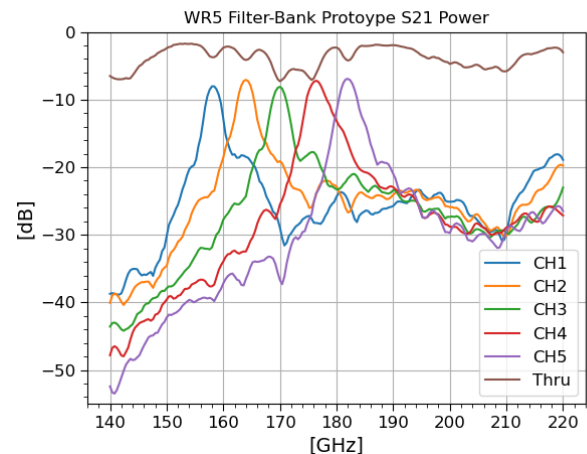


Fig. 1. The lab-measured scattering amplitude of a 180GHz WR5 filter bank prototype, showing the transmission of each channel.

REFERENCES

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