Digital Receiver With Interference Suppression for Microwave Radiometry

PIs: Joel T. Johnson (Ohio State) and Steven W. Ellingson (Virginia Tech)

Objectives
• Future sea salinity and soil moisture sensing missions use L-Band microwave radiometry
• RF interference is a major problem and limits useable bandwidth to 20 MHz.
• An interference suppressing radiometer could
  • reduce RFI effects on these systems
  • allow operation in a larger bandwidth for more accurate moisture/salinity retrievals
• Project developed a radiometer digital backend including real-time removal of time and/or frequency localized RFI sources

200 MSPS
10 bit
ADC’s

Implemented in Altera FPGA’s

Real-time “pulse blanking” algorithm

1K FFT = high spectral resolution
RFI removal

Digital filtering/1K FFT pulse blanking
Spectral processing/integration

Accomplishments
• Receiver prototypes developed; sample 100 MHz bandwidth with real-time pulse blanking and 1K FFT
• Demonstrated at Arecibo radio observatory and in local observations of water pool and sky targets
• Results qualitatively show significant RFI mitigation and advantages of high spectral resolution
• RFI surveys at L-band (including airborne measurements) completed under project support
• System developed can be applied in other RF bands: NPOESS sponsored project using this system at C-band in progress: results to influence CMIS design
• Proposal to utilize these technologies at L-band in the HYDROS program under evaluation

TRL_in = 3; TRL_out = 4

Project URL: http://esl.eng.ohio-state.edu/~rstheory/iip/docserv.html