



## Observations of Ionospheric Scintillation Impacts on Wideband Channels

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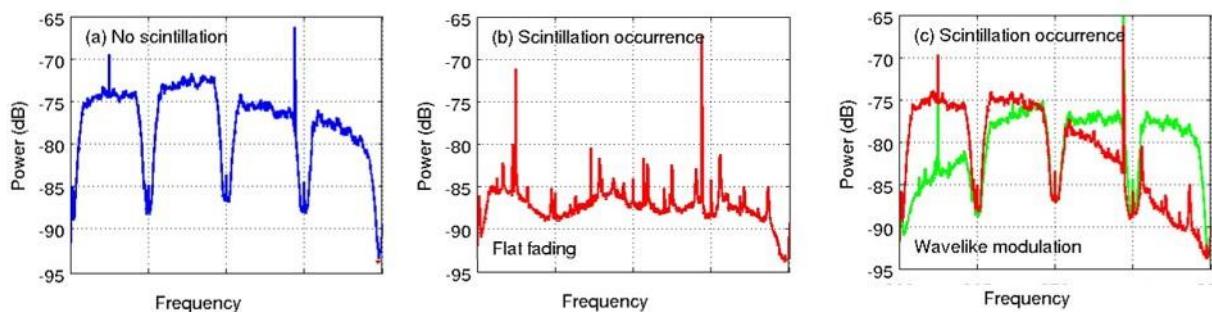
### 1. Extended Abstract

Statistical characteristics of fading on transionospheric radio signals due to scintillation have been recorded and analyzed for decades. Recent technological advances have provided capabilities for significant increases in bandwidth making use of wideband channels for satellite-to-ground communication. To examine the characteristics of ionospheric scintillations as measured on wideband channels, an array of data recorders built on a software digital radio platform were deployed to the Atlantic on Ascension Island in October 2016. The systems were aligned along magnetic East-West over a distance of ~800 m providing data for analysis of both temporal and spatial impacts.



**Figure 1.** A map of Ascension Island ( $7.9^{\circ}\text{S}$ ,  $14.8^{\circ}\text{W}$ ) showing the deployment of a chain of software digital radios aligned in the magnetic E-W plane for the analysis of scintillation impacts on wideband propagation channels.

In this paper, we present an analysis of data collected at Ascension Island along with results from a follow-on experiment tentatively scheduled for the spring of 2017 in the Pacific. We discuss the varying characteristics of ionospheric scintillation as exhibited in wideband measurements and describe our methodology for determination of coherence bandwidth estimates to delineate between coherent flat fading and frequency selective (or dispersive) fading across 5 MHz channels. Our goal for this effort to the development of metrics to fully describe the wideband propagation channel for use in waveform development or mitigation strategies for spread spectrum signals.



**Figure 2.** Spectral analysis of wideband channels under a variety of ionospheric conditions: (a) quiet, no scintillations; (b) scintillation with flat fading across a 20 MHz spectrum; and (c) dispersive modulation across the band due to scintillation.

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