41 -- 2017-03-04 18:05:36
Session 7A Paper 2
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Virtual SATCOM, Skywave High-Frequency Communications at SATCOM Speeds Without Satellite Vulnerabilities.

The ionosphere is an underutilized channel path. We can harness this path to communicate at long range (3000 km) and high speeds (_32 Mbps). We can service mobile users (e.g., maritime and aviation) using narrow beam apertures with wide bandwidths. For example; a base station in Guam, Hawaii, and California connects the Pacific Ocean from San Diego to China. An HF communications channel that can match the throughput of SATCOM constellations at significantly reduce cost, without the vulnerability of satellite attack advances information technology.

Current SATCOM systems are expensive and vulnerable; current HF systems are bandwidth limited and slow. This concept, employing narrow beams, avoids interference outside the beam and strong signal to noise (SNR) within the beam. Narrow beams at HF requires physically large antennas. Additionally, the beam must be electronically steerable to move with the ionosphere to service multiple mobile platforms. The architecture is similar to over the horizon (OTH) radar but applied to communication. It requires accurate knowledge of the ionosphere. OTH radars use ionosondes to see the best channel as the path flexes with the ionosphere.For communications, a worldwide, real-time, Internation Reference Ionosphere (IRI) database accessible to all, will incentivise adoption of this concept.

Our research is using a ray tracing tool with IRI data to show high available of 3- 6 MHz of bandwidth 24 hours per day. The key is visibility and capability (agility) to move the signals' frequency and azimuth and elevation of the base station as the channel path changes. Noise and multipath fading are issues, but agility and focused power negate the effect. If fielded, this system drives the need for real time IRI database. With additional research and development, this concept can compliment and reduce dependency on SATCOM communications.