

From: Richard O'Donnell

To: Behnam Ghaffari

Date: July 15, 2014

Subject: FCC File No. 0122-EX-ML-2014

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Message:

Ben,

One of the objectives that we are currently supporting, is to understand the fundamental phenomenological barriers limiting the use of coherent distributed beamforming. Raytheon BBN plans to conduct instrumented data collections over the next 6-12 months to develop a comprehensive dataset at various frequencies, vibration and motion profiles, weather (rain) conditions and temperature changes. Our current license only allows for transmissions up to 970 MHz. We are asking to modify the FCC license to include additional select frequencies up to 18GHz to determine the phenomenological effects on RF transmissions to determine the limits for coherent distributed beamforming. Additional locations are being requested to provide an alternative local test site and for a location in southern Alabama to collect data from an aircraft to determine effects of aircraft vibration on clock oscillators and RF transmissions.

Data collected under the program will be processed to develop accurate dynamic models of oscillator dynamics and motion/vibration kinematics for operational scenarios that can be plugged into a tracking framework and allow us to quantify phenomenological barriers. We will perform goodness-of-fit testing by validating our models on separate datasets. Once the models have been validated, we will use these models to quantify the phenomenological limits of distributed coherent transmission through analytical techniques and numerical simulation. Specifically, we expect to be able to clearly delineate operational regions (carrier frequency, update rate, platform motion/vibration class and intensity, oscillator class, transmitter spacing, weather conditions, multipath) at which 90% or more of the ideal beamforming gain can be maintained as well as barriers to operation in regions where less than 90% of the ideal beamforming gain can be maintained.

Initially, these collects will be over the wire. These will be followed by data collections over the air performed over short ranges (< 0.5 km), and conducted locally at sites specified in our FCC license. The experimental configuration utilizes hardware (signal generator/transmitter) and RF data sampler (receiver).

Thanks,