QUALCOMM Incorporated

1730 Pennsylvania Ave., NW ■ Suite 850 ■ Washington, DC 20006 ■ Tel: 202.263.0020 www.qualcomm.com

April 6, 2012

James Ball
International Bureau
Chief – Policy Division
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: Petition for Rulemaking To Establish A Next Generation Air-Ground Service On A Secondary Licensed Basis In The 14.0 to 14.5 GHz Band, RM-11640

Dear Mr. Ball:

In its March 29, 2012 filing, QUALCOMM Incorporated ("Qualcomm") explained that the OFDM signal it used in the interference calculations in Appendix A to the Next-Generation Air-Ground ("Next-Gen AG") Petition for Rulemaking has a Gaussian distribution and will appear as additive white Gaussian interference to a satellite uplink receiver. In Section 2 of the Attachment to that filing, Qualcomm provided simulation results for samples of the interference process from a single Next-Gen AG Ground Station ("GS") beam showing that, regardless of the satellite receiver's bandwidth, the interference envelope is very well approximated by a Gaussian distribution. And, because total interference is the superposition of Next-Gen AG signals from multiple GSs and multiple beams, the composite interference is also very well approximated as Gaussian.

A rigorous analytical investigation of the claim that an OFDM signal can be approximated as a Gaussian random process is provided in a recent IEEE publication by Wei, *et al.*[1] This IEEE technical publication explains that the complex envelope of a bandlimited uncoded OFDM signal converges weakly to a Gaussian random process as the number of subcarriers (*i.e.*, tones) increases towards infinity. Theorem 2 in that technical publication establishes that as the number of tones grows large, assuming the data symbols are independent and identically distributed over a bounded signal constellation (which would be the case for the Next-Gen AG service), the joint distribution of any collection of samples of an OFDM signal over a finite time interval approaches that of a multivariate Gaussian distribution. Furthermore, the multivariate Gaussian distribution in question has a correlation structure that corresponds to a flat (*i.e.*, white) spectral density over the OFDM signal bandwidth. Theorems 3 and 4 in the technical publication go on to demonstrate that convergence to a multivariate Gaussian distribution holds for more generally coded OFDM systems and even for OFDM systems that employ unequal power allocation across tones.

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[1] *See* S. Wei, D. L. Goeckel, and P. A. Kelly, "Convergence of the Complex Envelope of Bandlimited OFDM Signals", IEEE TRANSACTIONS ON INFORMATION THEORY, Vol. 56, No. 10 at 4893-4903 (Oct. 2010).

Accordingly, Theorems 2, 3 and 4 in the Wei technical publication provide further support for the simulation results and associated explanations in Qualcomm's March 29, 2012, filing. Specifically, an OFDM signal is essentially a Gaussian random process with a flat spectral density across the signal bandwidth, and filtering the OFDM signal over any narrower bandwidth also results in a white Gaussian noise process. Thus, the effect of any Next-Gen AG OFDM signal interference to a satellite uplink is that of additive white Gaussian noise.

Please contact me if you or your colleagues have questions or would like additional information relating to this or any of Qualcomm's earlier filings relating to RM-11640.

Respectfully submitted,

Dean R. Brenner
Vice President, Government Affairs

Att.

cc (via email): Kathleen Collins
Thomas Derenge
Peter Georgiou
Howard Griboff
Ira Keltz
Paul Locke
Robert Nelson
Sankar Persaud
Jamison Prime