

Douglas Young

From: Douglas Young
Sent: Wednesday, November 09, 2016 5:50 PM
To: 'selmer@google.com'
Subject: Request for Info - File #0539-EX-PL-2016
Attachments: FCC_concerns_Google_Exp_Req.docx

Please address the attached concerns of the FCC's international Bureau's Satellite Division.

The items indicated above must be submitted before processing can continue on the above referenced application. Failure to provide the requested information within 30 days of November 09, 2016 may result in application dismissal pursuant to Section 5.67 and forfeiture of the filing fee pursuant to Section 1.1108.

IB/SD has reviewed the Google experimental request File No. 0539-EX-PL-2016 and has performed an analysis to assess the potential of interference to FCC license FSS earth stations operating in the 3600-3800 MHz band for each propose site (24 propose sites).

Our analysis in the 3550 – 3800 MHz band indicates a **high potential of harmful interference in-band and adjacent band** to FCC license FSS earth stations from the experimental request. We assume worst-case scenario, taking into consideration the deployment of 350 experimental transmitters (100 base stations and 250 user terminals) with their associated high EIRP power levels that could be placed anywhere within a 10 km and 30 km radius for most locations and not knowing the exact number of small-cell topology, antenna altitudes, antenna directions and specific antenna gains and locations, Our study identified a significant number of FSS earth stations that could potentially be co-located with the experimental deployment.

For all 24 propose locations, our analysis indicates that the experimental operations in the 3700-3800 MHz (in-band) will be very difficult or **impossible** with the testing technical parameters provided. We note that in the exhibit document, page 8, it states the following, “Google intends to avoid operations **above 3600 MHz** due to the number of incumbents...” Based on our analysis, we don’t see the electromagnetic compatibility and the feasibility of sharing in the 3700-3800 MHz band with FSS incumbent stations.

We also note that in the exhibit document, it states “Google Inc. (Google) requests authorization to conduct radio experiments in support of developing Citizens Broadband Radio Service (CBRS) technologies” and we note that the authorize frequency operations for CBRS giving in §96.11: Frequencies, (a) The Citizens Broadband Radio Service is authorized in the 3550-3700 MHz frequency band.

Furthermore, our analysis in the 3600 – 3700 MHz band also indicate a high potential of harmful interference in-band in **some locations** and adjacent band into FCC license to FSS receiver earth stations from the experimental testing.

We are also concern with the propose power level being requested which exceeds the power limit establish in §96.41 (b) *Power limits*. the maximum effective isotropic radiated power (EIRP) and maximum Power Spectral Density (PSD) of any CBSD and End User Device must comply with the limits shown in the table in this paragraph (b):

Device	Maximum EIRP (dBm/10 MHz)	Maximum PSD (dBm/MHz)
End User Device	23	n/a
Category A CBSD	30	20
Category B CBSD ¹	47	37

¹Category B CBSDs will only be authorized for use after an ESC is approved and commercially deployed consistent with §§96.15 and 96.67.

For operations in the 3600-3700 MHz, the power levels establish in §96.41 would reduce the potential of harmful interference into license FCC earth stations in-band and adjacent band. Also, the propose CW tone signal should only operate below 3600 MHz due to its high 31k watts (ERP) power concentrated in very narrow emission.

To complete our analysis, we need additional detail information to determine if compatibility with incumbent FSS earth stations is possible in the 3600-3700 MHz band.

The experimental application requests fixed station operations only, yet in the exhibit it states that “Google will use a mobile receiving station in a car, on a bike, or in a backpack “

- Will all the EUD units be fixed when transmitting? Or will there be EUD units transmitting while in motion?
- What is the maximum antenna height above ground level for EUD stations envisioned?
- What are the antenna gains, beamwidths, associated EIRPs and associated emissions for point to multipoint?

Detail antenna gains and beamwidth were not provided for specific testing only a range of values were provided but we could not determine which values belong with specific testing.

- What is the maximum antenna height above ground level for each base station envisioned?
- What are the antenna gains, beamwidths, associated EIRPs and associated emissions for point to multipoint?
- Will their antenna be down tilted? If yes, what is the tilt angle?

The exhibit mentions deployment of point to point.

- What is the maximum antenna height above ground level for each base station envisioned?
- What are the antenna gains, beamwidths, associated EIRPs and associated emissions for point to multipoint?
- What is the maximum number of point to point deployment for each location envisioned?
- Does the experimental transmitter use filtering and if so what is the filter roll-off (in dB per decade)?
- What is the power level between 3700 - 3701 MHz and 3701 - 3702 MHz?
- What is the power level between 3625 - 3626 MHz and 3626 - 3627 MHz?
- What mitigation technique will the transmitter use to avoid interference?

Plan of deployment initially in Atwater, CA, Mountain View, CA, Palo Alto, CA, San Bruno, CA, San Francisco, CA, San Jose, CA, Boulder, CO, Kansas City, KS, Omaha, NE, Raleigh, NC, Provo, UT, and Reston, VA.

Our database search in the 3600-3700 MHz provided the following FSS license for some locations:

Mountain View: there are **6** FCC FSS earth station licenses that operate in 3625-4200 MHz

Palo Alto: there are **6** FCC FSS earth station licenses that operate in 3625-4200 MHz

San Bruno: there are **6** FCC FSS earth station licenses that operate in 3625-4200 MHz

San Francisco: there are **6** FCC FSS earth station licenses that operate in 3625-4200 MHz

San Jose: there are **6** FCC FSS earth station licenses that operate in 3625-4200 MHz within close proximity of the experimental transmitter.

Reston: there are **17** FCC FSS earth station licenses that operate in **3625-4200 MHz**; **4** operate within the radius of operation and could be co-located with the experimental transmitters.

Chicago: there is one (1) FCC FSS earth station license that operates in 3625-4200 MHz with two locations. **This FCC earth station license operates within the test radius of operation and could be co-located with the experimental transmitters.**

Portland: there are two (2) FCC FSS earth station licenses that operate in 3625-4200 MHz within close proximity of the experimental transmitters.

Los Angeles: there are **18** FCC FSS earth station licenses that operate in 3625-4200 MHz and **4** of these licenses are within close proximity of the experimental transmitters.

New York: there are **19** FCC FSS earth station licenses that operate in 3625-4200 MHz and **8 operate within the radius of operation and could be co-located with the experimental transmitters. One** license is within close proximity of the experimental transmitters.

For co-located FSS earth station with experimental transmitter, the out-of-band emission levels from the experimental may need to exceed the limits in Section 96.41(e). There may be a need to use distance separation, guard bands, antenna direction restrictions and reduce the output EIRP to mitigate potential interference to license earth stations.

Be aware that a lot of the FSS earth stations are managed by the National Spectrum Managers Association (NSMA) frequency coordinator and Google will be required to notify them by e-mail. The notice must include the contact information of the stop buzzer personnel, testing parameters, day and times of each testing. Although Google has requested confidentiality/proprietary status, additional information will be required to be provided to incumbents license operators/managers in order to assess the potential interference impact to their network and to ensure the proper mitigation and protection are implemented to safeguard their daily network operations. NSMA contact information can be found in the website:
http://wireless.fcc.gov/services/index.htm?job=licensing_1&id=microwave

We also want to bring attention to Google's proposed use of the NTIA model to determine if the FSS earth station will be impacted; using this model may not be appropriate for FSS operations. Based on the NTIA website (<https://www.ntia.doc.gov/report/2015/35-ghz-exclusion-zone-analyses-and-methodology>), the NTIA model was designed "...to protect federal radar operations (ship and land based) from aggregate interference in the band 3550-3650 MHz" and it was not intended to be used for protection of FSS earth stations. FSS earth stations have very sensitive receivers to detect weak signals from geostationary orbit satellite networks which are 35,786 km away (this distance does not consider slant angle distance). ITU has a PDF protection limit used by some countries that protect FSS earth station.