



January 26, 2016

Via ELS

Dr. Nnake Nweke
Chief, Experimental Licensing Branch
Federal Communications Commission
445 Twelfth Street SW
Washington, DC 20554

Re: File No. 0747-EX-PL-2015

Dear Dr. Nweke:

In File No. 0747-EX-PL-2015, Google Inc. (Google) seeks experimental authorization to conduct nationwide testing of airborne and terrestrial transmitters in the 71-76 and 81-86 GHz bands (collectively, the E-band). Below, we address the two issues commenters on the application have raised: (1) whether Google's testing would have health or environmental impacts and (2) mitigation of potential harmful interference to existing fixed microwave operations in the E-band.

1. Google's proposed testing does not pose health or environmental risks.

Some commenting parties worry that the radio-frequency (RF) energy from Google's proposed testing could harm humans, animals, or plants in the vicinity of the test operations.¹ The proposed experimental operations in fact present vastly less risk from RF exposure than other transmissions the Commission routinely authorizes. Thus,

¹ See Letter from Ed Friedman and Marcey Kliparchuk, Global Union Against Radiation Deployment from Space, to Marlene H. Dortch, Secretary, FCC, File No. 0747-EX-PL-2015 (Dec. 17, 2015); Letter from Dimitri Magiasis to Marlene H. Dortch, Secretary, FCC, File No. 0747-EX-PL-2015 (Dec. 31, 2015); Letter from Kate Kheel, et al., Maryland Smart Meter Awareness, to Marlene H. Dortch, Secretary, FCC, File No. 0747-EX-PL-2015 (Jan. 11, 2016); Letter from Warren Woodward, File No. 0747-EX-PL-2015 (submitted Jan. 11, 2016); Letter from Cynthia Price, File No. 0747-EX-PL-2015 (submitted Jan. 12, 2016); Letter from Rebecca, File No. 0747-EX-PL-2015 (submitted Jan. 12, 2016); Letter from Shannon, File No. 0747-EX-PL-2015 (submitted Jan. 12, 2016); Letter from Nina Beety, Member, California EMF Safety Coalition, to Office of Engineering and Technology, FCC, File No. 0747-EX-PL-2015 (Jan. 13, 2016); Letter from Evelyn Savarin to Marlene H. Dortch, Secretary, FCC, File No. 0747-EX-PL-2015 (Jan. 18, 2016).

although we respect that the commenters' concerns are genuinely held, there is no factual basis for them.

Terrestrial operations: Google's proposed terrestrial operations comply with the technical standards set forth in the FCC's Part 101 rules for fixed microwave services. Unlike typical fixed microwave operations, though, Google's terrestrial antennas will be pointed upward. This will greatly mitigate RF exposure on the ground, as received power from Google's directional transmissions drops off by 1,000 times at just a few degrees off-boresight.

Airborne operations: Transmitted power levels from airborne transmitters will not exceed -2 dBW and EIRP will not exceed 41 dBW, well below the maximum power allowed in the band. These emissions also will follow the formula set forth in 47 C.F.R. § 101.115(b) (note 15), which specially limits maximum allowable EIRP for antennas with gain between 43 and 50 dBi. And again, receivers or persons even slightly off-boresight from the directional antennas will receive only a small fraction of the maximum transmitted energy.

The great distances involved further reduce power levels received on the ground. Even if an airborne transmitter were aimed precisely at a person on the ground directly below it, the signal strength received on the ground would be millions of times weaker than FCC limits for the band.

For all these reasons, the proposed operations present no meaningful health or environmental risks.

2. Google will avoid harmful interference to other users of the E-band.

Google's proposed experimental operations are designed to protect existing users of the E-band from harmful interference.² The authorized transmitters will be collocated on shared platforms, and Google anticipates that only a small percentage of the authorized transmitters typically will be in use in the United States at any given time. To avoid harmful interference, Google's proprietary interference-mitigation methods rely on the Commission's link registrations and information regarding Google's own operations, including the precise location of transmitters and the technical characteristics both the transmitters and the antennas deployed. To ensure current information, Google will retrieve E-band licensee information daily from an FCC-authorized third-party database manager.

With this information, Google will dynamically calculate available frequencies, optimal bandwidths, and maximum transmit powers for any given location. Google will not use combinations of center frequency, bandwidth, transmit power, and pointing

² See Letter from Wesley K. Wright, Counsel to Fixed Wireless Communications Coalition, Inc., to Marlene H. Dortch, Secretary, FCC (filed Jan. 11, 2016) (asking for further information regarding interference mitigation strategy).

Google Inc.
File No. 0747-EX-PL-2015

direction that would cause its operations to exceed the non-interference objective set forth in 47 C.F.R. § 101.105(a)(5)(i) at any registered receiver. If a non-interfering link cannot be confirmed, Google's transmissions will be suspended.

Google has been conducting similar experiments under Call Signs WH9XYD and WH2XUP without any known harmful interference. Should interference concerns arise in connection with the proposed testing, however, E-band operators can report them to Google at eband_testing@google.com.

Because Google has developed a robust non-interference methodology and has developed protocols for discontinuing transmissions if harmful interference is possible or reported, its operations do not pose a meaningful risk to existing licensees and should be approved.

Please do not hesitate to contact me with any questions regarding this submission.

Sincerely yours,



Aparna Sridhar