

Date: May 1, 2015
Subject: Public and Redacted Version of Request for Confidential Treatment and Complementary Exhibits
FCC File Number: 0271-EX-PL-2015

To Whom It May Concern:

Google Inc. (Google), pursuant to 5 U.S.C. § 552 and Sections 0.457 and 0.459 of the Commission's Rules, 47 C.F.R. §§ 0.457, 0.459, hereby requests that certain information complementary to its above-referenced Experimental Radio Service License (Experimental License) be treated as confidential and not subject to public inspection. The designated information constitutes confidential and proprietary information that, if subject to public disclosure, would cause significant commercial, economic, and competitive harm. As described below, Google's request satisfies the standards for grant of such requests set forth in Sections 0.457 and 0.459 of the Commission's Rules.

In accordance with Section 0.459(b) and in support of this request, Google provides the following information:

1. Identification of the Information for Which Confidential Treatment is Sought:

Google's request for confidential treatment is limited to the following information that has been redacted from the Experimental License and complementary exhibits. Google does not seek to withhold from public inspection information in the Experimental License necessary for interference mitigation, including applicant name, contact information, test location, frequency, output power, effective radiated power, emission characteristics and modulation.

Exhibit A - Narrative Statement:

Google requests confidential treatment of the following underlined text from Exhibit A that contains confidential and proprietary information regarding the proposed tests/experiments:

Consistent with the standards set forth in Section 5.63 of the Federal Communications Commission's (FCC's or Commission's) Rules, 47 C.F.R. § 5.63, Google Inc. (Google) requests an Experimental Radio Service License (Experimental License) and outlines below the compelling reasons why 0271-EX-PL-2015 should be granted expeditiously.

Google requests that the Experimental License be granted for a period of 24 months beginning on June 8, 2015. The Experimental License is needed for

continued development of [REDACTED].¹ [REDACTED]. The Experimental License builds on testing conducted under Call Sign WH9XYD (File Nos. 0842-EX-ST-2014 and 0377-EX-ST-2015.)

As under Call Sign WH9XYD, testing will primarily involve [REDACTED]. [REDACTED]. [REDACTED]. [REDACTED] will automatically disable any transmitter [REDACTED] under the Experimental License if [REDACTED] exits the test area covered by the Experimental License.

Google will continue to test [REDACTED]. [REDACTED].

Operational parameters will vary across the three subregions identified below:

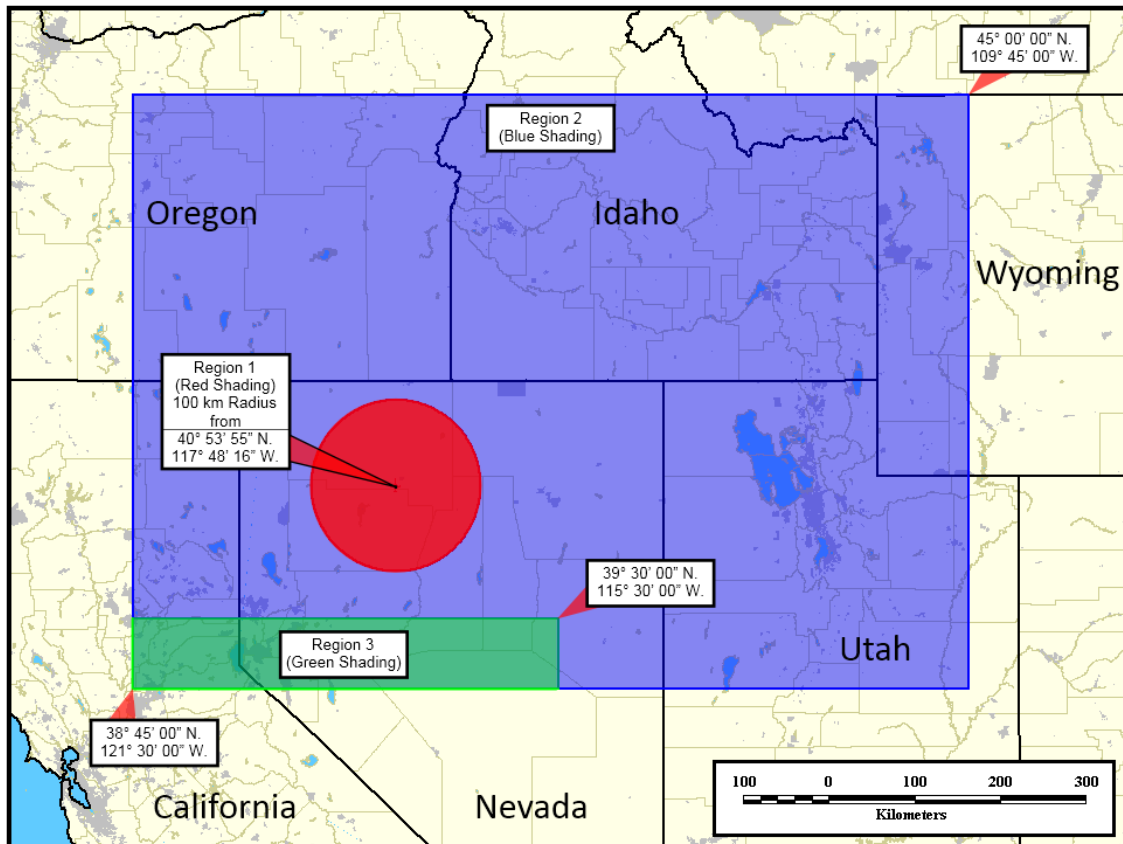


Figure 1: Proposed Operational Regions

¹ [REDACTED]

Region 1 (in red) is a 100 kilometer radius around: 40°53'55" N, 117°48'16" W

Region 2 (in blue) is the square area bounded by the following four coordinates, but excluding Region 1, and Region 3:

- 45°00'00" N, 109°45'00" W
- 45°00'00" N, 121°30'00" W
- 38°45'00" N, 109°45'00" W
- 38°45'00" N, 121°30'00" W

Region 3 (in green) is the square area bounded by the following four coordinates:

- 39°30'00" N, 115°30'00" W
- 39°30'00" N, 121°30'00" W
- 38°45'00" N, 115°30'00" W
- 38°45'00" N, 121°30'00" W

Region 1 Operations: In Region 1, [REDACTED]. [REDACTED]. [REDACTED]. [REDACTED]. [REDACTED]. Operations will be limited to the following frequencies: 75.21-75.79 GHz, 84.21-84.79 GHz, and 85.21-85.79 GHz. Operations in Region 1 will be consistent with Google's existing Special Temporary Authority (STA) for Call Sign WH9XYD, except that the [REDACTED].

Region 2 Operations: In Region 2, [REDACTED] will operate with [REDACTED]. [REDACTED]. [REDACTED]. [REDACTED]. Operations will be limited to the following frequencies: 75.21-75.79 GHz, and 85.21-85.79 GHz. [REDACTED] will operate in Region 2. In other words, operations in Region 2 will track operations in Region 1, [REDACTED] and will not use the frequencies between 84.21 and 84.79 GHz.

Operations in Region 3: In Region 3, [REDACTED] will operate with [REDACTED]. [REDACTED]. [REDACTED]. Operations will be limited to the following frequencies: 75.21-75.79 GHz and 85.21-85.79 GHz. [REDACTED] will operate in Region 3. In other words, operations in Region 3 will track operations in Region 2, [REDACTED].

Grant of this Experimental License will not adversely impact any authorized user of RF spectrum. An interference study to assess the risk of harmful interference associated with Google's proposed test operations is attached as Exhibit C.²

Antenna Specifications: As with testing authorized under its STA for Call Sign WH9XYD, Google will continue to use [REDACTED].³ [REDACTED].

² See generally Exhibit C (Technical Declaration).

³ In general, the minimum antenna gain required is 50 dBi. 47 C.F.R. §101.115. However, antenna gains of as low as 43 dBi are permitted if the operator employs a proportional reduction in power. See 47 C.F.R. §101.115 n.15. ("Antenna gain less than 50 dBi (but greater than or equal to 43 dBi) is permitted only with a proportional reduction in maximum authorized EIRP in a ratio of 2 dB of power per 1 dB of gain, so that the

Protection of specific users: As fully explained in Exhibit C, Google’s proposed operations will not cause harmful interference to other users of the millimeter wave bands. We discuss each set of users below.

Commercial millimeter wave band users: In assessing the potential for harmful interference to other U.S. commercial millimeter wave bands users, an analysis of proposed operations under the requested Experimental License was conducted.⁴ The analysis draws upon a database maintained by an FCC-approved frequency coordinator for the millimeter wave bands for information regarding other millimeter wave links in the vicinity of the test sites.⁵ The analysis also uses assumptions [REDACTED] that are generally consistent with the Google’s proposed operations.⁶ Where assumptions deviated from the actual proposed test operations, parameters were made more conservative than the test plan. The conservative analysis concludes that neither [REDACTED] communications posed a risk of harmful interference to millimeter wave links.⁷

As set forth in greater detail in Exhibit C, Google’s transmissions will be well off-axis or separated physically and/or spectrally from other millimeter wave facilities.⁸

For Region 1, three facilities were studied in detail due to proximity, co-channel operation, or antenna orientation near the edge of the region.⁹

- The coordination facility nearest to the proposed test site is Call Sign WQEZ616, located near Sparks, Nevada.¹⁰ The site is 225 kilometers away from the center of Region 1.¹¹ Because the highly directional antennas at this location are all aimed away from Region 1, they will not be vulnerable to interference from Google’s operations.¹² A receiver associated with this call sign uses an antenna aimed northward along a radial that passes approximately 50 kilometers to the west of Region 1.¹³ This facility, however, is spectrally separated from Google’s operation—the lower sideband of Google’s proposed operation will be separated from the upper sideband of this facility by more than 2 GHz at a

maximum allowable EIRP (in dBW) for antennas of less than 50 dBi gain becomes $+55-2(50-G)$, where G is the antenna gain in dBi.”)

⁴ See Technical Declaration at ¶¶ 5, 12-15, 17-37, Attachment 1.

⁵ See *id.* at ¶ 18.

⁶ See *id.* at ¶¶ 19-25, 29.

⁷ See *id.* at ¶¶ 5, 12-15, 17-37, Attachment 1.

⁸ See *id.*, Attachment 1.

⁹ *Id.*, Attachment 1 at 1-3.

¹⁰ *Id.*, Attachment 1 at 1.

¹¹ *Id.*

¹² *Id.*

¹³ *Id.*

minimum.¹⁴ As a result, receiver selectivity alone should be sufficient to prevent harmful interference.¹⁵

- The closest co-channel link is associated with Call Sign WQFU991.¹⁶ Its southernmost receiver has an antenna aimed northward that passes approximately 50 km west of Region 1. However, its antenna is separated from the westernmost edge of Region 1 by 13.4 degrees. Taking into account minimum discrimination requirements for antennas operating in this band, as well as the antenna gain and power limits of Google's own operation, there will be sufficient losses along this radial to ensure interference is avoided.¹⁷
- A facility at Reno, Nevada, is spectrally separated from Google's proposed operation by over 1 GHz.¹⁸ Even discounting this spectral separation, the radials that would potentially be vulnerable to interference at this facility fall outside of Region 1.¹⁹

Operations in Regions 2 and 3 are limited to [REDACTED]. [REDACTED].²⁰ [REDACTED].²¹ Indeed, the boundaries and proposed EIRPs for Regions 2 and 3 were developed specifically to avoid interference from hypothetical full-power (41 dBW) [REDACTED].²² In Region 3, Google will reduce limit transmissions to 23 dBW EIRP to avoid harmful interference to authorized users.

Several existing sites were particularly studied due their proximity to Regions 2 and 3.

- One of the WQFU991 facilities at Reno, Nevada, operates with center frequencies of 73.5 and 83.5 GHz, and bandwidths of 4.95 and 3.66 GHz respectively. Because this path is located near Region 2, it was tested for susceptibility to the higher power (41 dBW) EIRP.²³ As shown in Table 8 of the attachment to Exhibit C, [REDACTED] and, therefore, will not cause harmful interference.²⁴
- There are several terrestrial microwave systems located within Region 2. All but three of these systems do not operate co-channel with Google's proposed operations, and each of the registered receivers feature

¹⁴ *Id.*, Attachment 1 at 1.

¹⁵ *Id.*.

¹⁶ *Id.*, Attachment 1 at 2.

¹⁷ *See id.*

¹⁸ *Id.*, Attachment 1 at 3.

¹⁹ *Id.*

²⁰ *Id.*

²¹ *Id.*

²² *Id.*

²³ *Id.*, Attachment 1 at 4-5 & Table 8.

²⁴ *Id.*

significant adjacent channel rejection.²⁵ The three co-channel systems within Region 2 have sufficient receive directional antenna suppression to prevent harmful interference.²⁶

- Limiting operations to the lower power proposed for Region 3 eliminates predicted interference to co-channel facilities that have receive antennas aimed at that region, even if the facilities themselves are not located within the test area.²⁷

Accordingly, Google's operations will pose no material risk of harmful interference to other commercial millimeter wave band users.

International users: Because the test site is more than 440 kilometers away from U.S. borders, no international coordination is required.

Federal users: Google has a coordination agreement in place with the National Radio Astronomy Observatory (NRAO) to ensure that that operations under Google's current STA for for Call Sign WH9XYD do not cause interference to radio astronomy observations at NRAO's Owens Valley location. Google is prepared to coordinate with the National Telecommunications and Information Administration to ensure that other federal operations in the band do not experience harmful interference.

As under the STA for Call Sign WH9XYD, Google [REDACTED]. First, [REDACTED]. [REDACTED]. Second, [REDACTED]. Third, [REDACTED].

Finally, as noted, Google has already been conducting similar tests in this general area, and no disruptions have been noted.

Exhibit B - Technical Information:

Google requests confidential treatment of the following underlined text from Exhibit B that contain confidential and proprietary information regarding the proposed tests/experiments:

Applicant Name: Google Inc.
Applicant FRN: 0016069502

²⁵ *Id.*

²⁶ *Id.*

²⁷ *Id.*

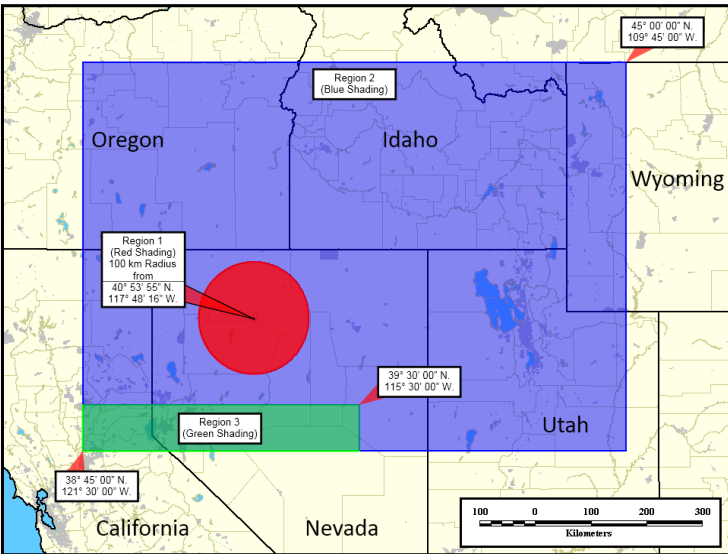
Legal Contact Details

Name of Contact	Aparna Sridhar
Contact Details	Counsel 25 Massachusetts Avenue NW, Ninth Floor Washington DC 20001

Technical Contact Details

Name of Contact	Jeff Gilbert
Contact Details	1600 Amphitheatre Parkway Mountain View, CA 94043 Phone: (650) 933-7471 Email: jegilbert@google.com

Areas of Operation



Summary of Operations by Region

Region	[REDACTED] Range	Max [REDACTED] Station Tx EIRP	Max [REDACTED] Tx EIRP	Frequency Ranges
1 (Red)	[REDACTED]	[REDACTED]	[REDACTED]	75210-75790 MHz 84210-84790 MHz 85210-85790 MHz
2 (Blue)	[REDACTED]	[REDACTED]	[REDACTED]	75210-75790 MHz 85210-85790 MHz
3 (Green)	[REDACTED]	[REDACTED]	[REDACTED]	75210-75790 MHz 85210-85790 MHz

Region 1: [REDACTED] Transmitter Equipment and Station Details

Equipment	[REDACTED]
Number of Terminals	[REDACTED] ^a
Areas of Operation	Region 1 (see map describing Region 1 above)

^a [REDACTED]

Frequency Ranges	High (MHz)	Low (MHz)
[REDACTED]	75790	75210
	84790	84210
	85790	85210

Radio	Modulation	Emission Designator	Bandwidth	Maximum Power Out	Maximum EIRP
[REDACTED] ^b	Digital	60M0D1D-580MD1D ^c	60-580 MHz	0.631 W with 43 dBi antenna 0.447 W with 41.5 dBi antenna 0.200 W with 38 dBi antenna	41 dBW with 43 dBi antenna 38 dBW with 41.5 dBi antenna 31 dBW with 38 dBi antenna

^b In all cases, this transmitter will operate within the broader frequency ranges described above in the “Frequency Range” table.

^c During the course of testing, Google plans operate transmitters with a range of bandwidths between 60 and 580 MHz. In no case will the bandwidth be smaller than 60 MHz or exceed 580 MHz. Nevertheless, precise emissions designators for the transmitters will vary according to the bandwidth of operation.

Antenna 1 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ^d
Gain	43 dBi
Beam Width at Half-Power Point	1.2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 2 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ^d
Gain	43 dBi
Beam Width at Half-Power Point	1.2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 3 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ^d
Gain	43 dBi
Beam Width at Half-Power Point	1.2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 4 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ^d
Gain	41.5 dBi gain @ 71-76 GHz 43 dBi gain @ 81-86 GHz
Beam Width at Half-Power Point	1 deg @ 71-76 GHz 0.8 deg @ 81-86 GHz
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 5 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ^d
Gain	38 dBi
Beam Width at Half-Power Point	2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 6 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ^d
Gain	43 dBi
Beam Width at Half-Power Point	1.2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

^d[REDACTED]

Region 1: [REDACTED] Transmitter Equipment and Station Details
[REDACTED]

Equipment	[REDACTED]
Number of Terminals	[REDACTED]
Areas of Operation	Region 1 (see map of Region 1 above)

Frequency Ranges	High (MHz)	Low (MHz)
[REDACTED]	75790	75210
	84790	84210
	85790	85210

Radio	Modulation	Emission Designator	Bandwidth	Maximum Power Out	Maximum EIRP
[REDACTED] ^e	Digital	60M0D1D-580MD1D ^f	60-580 MHz	1.585 W	55 dBW

^e This transmitter will operate within the broader frequency ranges described above in the "Frequency Range" table.

^f During the course of testing, Google plans operate transmitters with a range of bandwidths between 60 and 580 MHz. In no case will the bandwidth be smaller than 60 MHz or exceed 580 MHz. Nevertheless, precise emissions designators for the transmitters will vary according to the bandwidth of operation.

Antenna 1 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED]
Gain	53 dBi
Beam Width at Half-Power Point	0.37 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 2 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED]
Gain	53 dBi
Beam Width at Half-Power Point	0.37 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Region 2: [REDACTED] Transmitter Equipment and Station Details

Equipment	[REDACTED]
Number of Terminals	[REDACTED] ⁹
Areas of Operation	Region 2 (see map describing Region 2 above)

⁹[REDACTED]

Frequency Ranges	High (MHz)	Low (MHz)
[REDACTED]	75790	75210
	85790	85210

Radio	Modulation	Emission Designator	Bandwidth	Maximum Power Out	Maximum EIRP
[REDACTED] ^h	Digital	60M0D1D - 580MD1D ⁱ	60-580 MHz	0.631 W with 43 dBi antenna 0.447 W with 41.5 dBi antenna 0.200 W with 38 dBi antenna	41 dBW with 43 dBi antenna 38 dBW with 41.5 dBi antenna 31 dBW with 38 dBi antenna

^h In all cases, this transmitter will operate within the broader frequency ranges described above in the “Frequency Range” table.

ⁱ During the course of testing, Google plans operate transmitters with a range of bandwidths between 60 and 580 MHz. In no case will the bandwidth be smaller than 60 MHz or exceed 580 MHz. Nevertheless, precise emissions designators for the transmitters will vary according to the bandwidth of operation.

Antenna 1 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ^j
Gain	43 dBi
Beam Width at Half-Power Point	1.2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 2 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ^j
Gain	43 dBi
Beam Width at Half-Power Point	1.2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 3 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ^j
Gain	43 dBi
Beam Width at Half-Power Point	1.2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 4 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ^j
Gain	41.5 dBi gain @ 71-76 GHz 43 dBi gain @ 81-86 GHz
Beam Width at Half-Power Point	1 deg @ 71-76 GHz 0.8 deg @ 81-86 GHz
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 5 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ^j
Gain	38 dBi
Beam Width at Half-Power Point	2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 6 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ^j
Gain	43 dBi
Beam Width at Half-Power Point	1.2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

^j [REDACTED]

Region 3: [REDACTED] Transmitter Equipment and Station Details

Equipment	[REDACTED]
Number of Terminals	[REDACTED] ^k
Areas of Operation	Region 3 (see map describing Region 3 above)

^k [REDACTED]

Frequency Ranges	High (MHz)	Low (MHz)
[REDACTED]	75790	75210
	85790	85210

Radio	Modulation	Emission Designator	Bandwidth	Maximum Power Out	Maximum EIRP
[REDACTED] ^l	Digital	60M0D1D-580MD1D ^m	60-580 MHz	0.010 W with 43 dBi antenna 0.014 W with 41.5 dBi antenna 0.032 W with 38 dBi antenna	23 dBW with 43 dBi antenna 23 dBW with 41.5 dBi antenna 23 dBW with 38 dBi antenna

^l In all cases, this transmitter will operate within the broader frequency ranges described above in the “Frequency Range” table.

^m During the course of testing, Google plans operate transmitters with a range of bandwidths between 60 and 580 MHz. In no case will the bandwidth be smaller than 60 MHz or exceed 580 MHz. Nevertheless, precise emissions designators for the transmitters will vary according to the bandwidth of operation.

Antenna 1 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ⁿ
Gain	43 dBi
Beam Width at Half-Power Point	1.2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 2 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ⁿ
Gain	43 dBi
Beam Width at Half-Power Point	1.2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 3 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ⁿ
Gain	43 dBi
Beam Width at Half-Power Point	1.2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 4 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ⁿ
Gain	41.5 dBi gain @ 71-76 GHz 43 dBi gain @ 81-86 GHz
Beam Width at Half-Power Point	1 deg @ 71-76 GHz 0.8 deg @ 81-86 GHz
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 5 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ⁿ
Gain	38 dBi
Beam Width at Half-Power Point	2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 6 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ⁿ
Gain	43 dBi
Beam Width at Half-Power Point	1.2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

ⁿ [REDACTED]

[REDACTED]

[REDACTED]

Exhibit C - Technical Declaration:

Google requests confidential treatment of the declaration in its entirety.

2. Identification of the Commission proceeding in which the information was submitted or a description of the circumstances giving rise to the submission.

The above-referenced Exhibits were submitted to the Commission in support of the Experimental License. These Exhibits were filed with the Office of Engineering and Technology on May 1, 2015. For additional information, please see 0271-EX-PL-2015.

3. Explanation of the degree to which the information is commercial or financial or contains a trade secret or is privileged.

The information requested to be kept confidential has significant commercial value. The details of the Experimental License tests/experiments may include trade secret information. The Commission has clarified that confidential treatment should be afforded to trade secrets.²⁸ Google's tests/experiments and proprietary wireless applications using particular radio frequency equipment represent a "secret commercially valuable plan" within the meaning of a trade secret as recognized by the Commission.

²⁸ *Examination of Current Policy Concerning the Treatment of Confidential Information Submitted to the Commission*, Report and Order, GC Docket No. 96-55, at para. 3, (released Aug. 4, 1998) (defining "trade secrets" for purpose of Commission rules on confidential treatment).

In addition, agreements entered into between Google and the parties that provided equipment for testing or will provide analysis of test results require that confidential information of the parties be held in strict confidence, and that such information not be disclosed to any third party (with limited exceptions not applicable to this request). The manufacturer name and model number constitutes confidential trade secrets, technical information, and business information under the agreements.

4. Explanation of the degree to which the information concerns a service that is competitive.

The services and technologies that are the subject of this Experimental License have not yet been fully developed but are expected to lead to material developments in markets subject to competition from multiple U.S. and non-U.S. third parties.

5. Explanation of how disclosure of the information could result in substantial competitive harm.

The technology under development is highly sensitive and confidential in nature. The release of such information would provide valuable insight into Google's technology innovations and potential business plans and strategies. Public disclosure would jeopardize the value of the technology under examination by enabling others to utilize Google's information to develop similar products in a similar time frame.

6. Identification of any measures taken by the requesting party to prevent unauthorized disclosure.

Google has taken steps to keep confidential the information set forth in the confidential exhibits by limiting the number of people involved in the tests/experiments to only those on a "need to know" basis, and will require any third parties involved in the analysis execute robust nondisclosure agreements.

7. Identification of whether the information is available to the public and the extent of any previous disclosures of the information to any third parties.

The information contained in the confidential exhibits is not available to the public, and has only been disclosed to third parties pursuant to the restrictive safeguards described above.

Google voluntarily provides the information to the Commission at this time with the expectation that it will be treated confidentially in accordance with the Commission's rules. See *Critical Mass Energy Project v. Nuclear Regulatory Comm'n*, 975 F.2d 871, 879 (D.C. Cir. 1992) (commercial information provided on a voluntary basis "is 'confidential' for the purpose of

Freedom of Information Act (FOIA) Exemption 4 if it is of a kind that would customarily not be released to the public by the person from whom it was obtained.”)

8. Justification of the requested period of confidentiality.

Google expects that confidential treatment will be necessary for the length of the proposed experiment and thereafter in order to protect its evolving business and technology strategies.

9. Any other information that would be useful in assessing whether this request should be submitted.

The information subject to this request for confidentiality should not be made available for public disclosure at any time. There is nothing material that public review of this information would add to the Commission’s analysis of Google’s request for an experimental authorization.

Moreover, public disclosure of the sensitive information in the confidential exhibits to the Experimental License after the Commission has ruled on the Request for Confidentiality is not necessary for the Commission to fulfill its regulatory responsibilities.

Consistent with 47 C.F.R. § 0.459(d)(1), Google requests notification if release of the information subject to this request is requested pursuant to the FOIA or otherwise, so that Google may have an opportunity to oppose grant of any such request.

Sincerely yours,



Aparna Sridhar

EXHIBIT A – NARRATIVE STATEMENT

Consistent with the standards set forth in Section 5.63 of the Federal Communications Commission's (FCC's or Commission's) Rules, 47 C.F.R. § 5.63, Google Inc. (Google) requests an Experimental Radio Service License (Experimental License) and outlines below the compelling reasons why 0271-EX-PL-2015 should be granted expeditiously.

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Google will continue to test [REDACTED]. [REDACTED].

Operational parameters will vary across the three subregions identified below:

¹ [REDACTED]

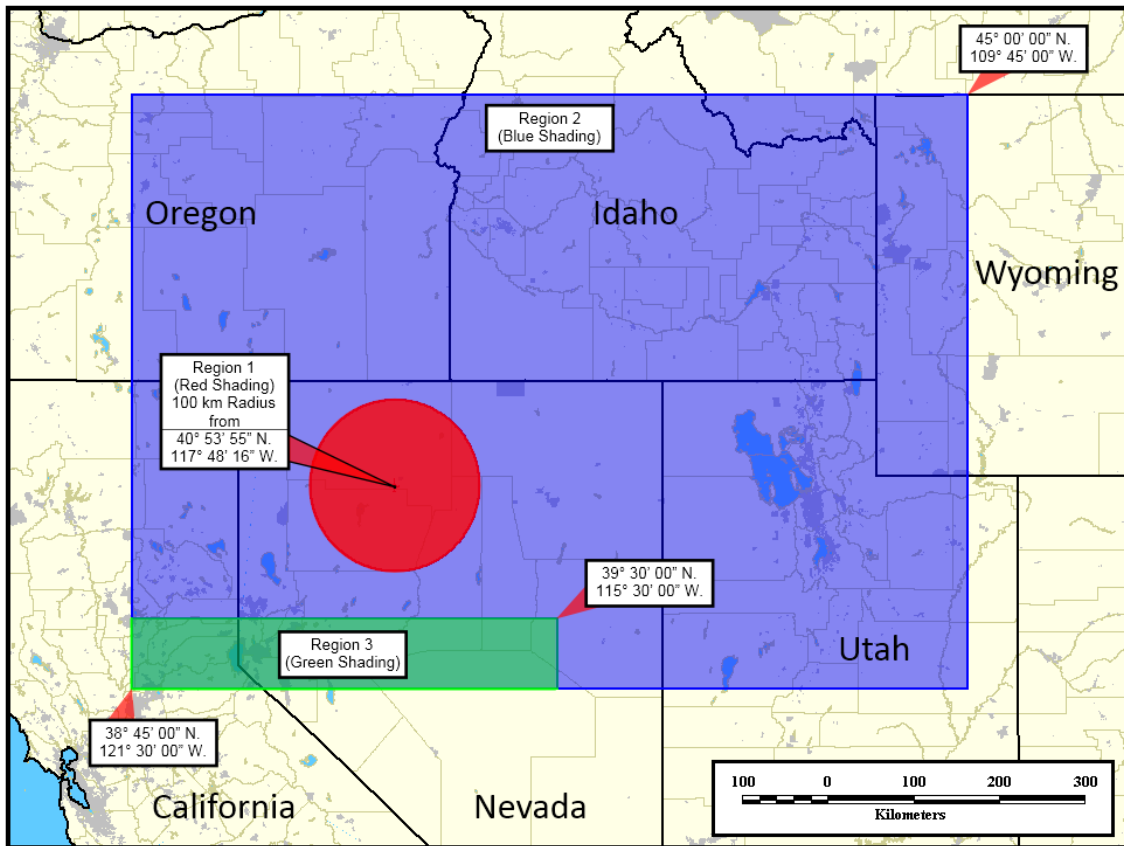


Figure 1: Proposed Operational Regions

Region 1 (in red) is a 100 kilometer radius around: 40°53'55" N, 117°48'16" W

Region 2 (in blue) is the square area bounded by the following four coordinates, but excluding Region 1, and Region 3:

- 45°00'00" N, 109°45'00" W
- 45°00'00" N, 121°30'00" W
- 38°45'00" N, 109°45'00" W
- 38°45'00" N, 121°30'00" W

Region 3 (in green) is the square area bounded by the following four coordinates:

- 39°30'00" N, 115°30'00" W
- 39°30'00" N, 121°30'00" W
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Region 2 Operations: In Region 2, [REDACTED] will operate with [REDACTED]. [REDACTED]. [REDACTED]. [REDACTED]. Operations will be limited to the following frequencies: 75.21-75.79 GHz, and 85.21-85.79 GHz. [REDACTED] will operate in Region 2. In other words, operations in Region 2 will track operations in Region 1, [REDACTED] and will not use the frequencies between 84.21 and 84.79 GHz.

Operations in Region 3: In Region 3, [REDACTED] will operate with [REDACTED]. [REDACTED]. [REDACTED]. Operations will be limited to the following frequencies: 75.21-75.79 GHz and 85.21-85.79 GHz. [REDACTED] will operate in Region 3. In other words, operations in Region 3 will track operations in Region 2, [REDACTED].

Grant of this Experimental License will not adversely impact any authorized user of RF spectrum. An interference study to assess the risk of harmful interference associated with Google's proposed test operations is attached as Exhibit C.²

Antenna Specifications: As with testing authorized under its STA for Call Sign WH9XYD, Google will continue to use [REDACTED].³ [REDACTED].

Protection of specific users: As fully explained in Exhibit C, Google's proposed operations will not cause harmful interference to other users of the millimeter wave bands. We discuss each set of users below.

Commercial millimeter wave band users: In assessing the potential for harmful interference to other U.S. commercial millimeter wave bands users, an analysis of proposed operations under the requested Experimental License was conducted.⁴ The analysis draws upon a database maintained by an FCC-approved frequency coordinator for the millimeter wave bands for information regarding other millimeter wave links in the vicinity of the test sites.⁵ The analysis also uses assumptions [REDACTED] that are generally consistent with the Google's proposed operations.⁶ Where assumptions deviated from the actual proposed test operations, parameters were made more conservative than the test plan. The conservative analysis

² See generally Exhibit C (Technical Declaration).

³ In general, the minimum antenna gain required is 50 dBi. 47 C.F.R. §101.115. However, antenna gains of as low as 43 dBi are permitted if the operator employs a proportional reduction in power. See 47 C.F.R. §101.115 n.15. ("Antenna gain less than 50 dBi (but greater than or equal to 43 dBi) is permitted only with a proportional reduction in maximum authorized EIRP in a ratio of 2 dB of power per 1 dB of gain, so that the maximum allowable EIRP (in dBW) for antennas of less than 50 dBi gain becomes +55-2(50-G), where G is the antenna gain in dBi.")

⁴ See Technical Declaration at ¶¶ 5, 12-15, 17-37, Attachment 1.

⁵ See *id.* at ¶ 18.

⁶ See *id.* at ¶¶ 19-25, 29.

concludes that neither [REDACTED] communications posed a risk of harmful interference to millimeter wave links.⁷

As set forth in greater detail in Exhibit C, Google's transmissions will be well off-axis or separated physically and/or spectrally from other millimeter wave facilities.⁸

For Region 1, three facilities were studied in detail due to proximity, co-channel operation, or antenna orientation near the edge of the region.⁹

- The coordination facility nearest to the proposed test site is Call Sign WQEZ616, located near Sparks, Nevada.¹⁰ The site is 225 kilometers away from the center of Region 1.¹¹ Because the highly directional antennas at this location are all aimed away from Region 1, they will not be vulnerable to interference from Google's operations.¹² A receiver associated with this call sign uses an antenna aimed northward along a radial that passes approximately 50 kilometers to the west of Region 1.¹³ This facility, however, is spectrally separated from Google's operation—the lower sideband of Google's proposed operation will be separated from the upper sideband of this facility by more than 2 GHz at a minimum.¹⁴ As a result, receiver selectivity alone should be sufficient to prevent harmful interference.¹⁵
- The closest co-channel link is associated with Call Sign WQFU991.¹⁶ Its southernmost receiver has an antenna aimed northward that passes approximately 50 km west of Region 1. However, its antenna is separated from the westernmost edge of Region 1 by 13.4 degrees. Taking into account minimum discrimination requirements for antennas operating in this band, as well as the antenna gain and power limits of Google's own operation, there will be sufficient losses along this radial to ensure interference is avoided.¹⁷
- A facility at Reno, Nevada, is spectrally separated from Google's proposed operation by over 1 GHz.¹⁸ Even discounting this spectral separation, the radials that would potentially be vulnerable to interference at this facility fall outside of Region 1.¹⁹

⁷ See *id.* at ¶¶ 5, 12-15, 17-37, Attachment 1.

⁸ See *id.*, Attachment 1.

⁹ *Id.*, Attachment 1 at 1-3.

¹⁰ *Id.*, Attachment 1 at 1.

¹¹ *Id.*

¹² *Id.*

¹³ *Id.*

¹⁴ *Id.*, Attachment 1 at 1.

¹⁵ *Id.*

¹⁶ *Id.*, Attachment 1 at 2.

¹⁷ See *id.*

¹⁸ *Id.*, Attachment 1 at 3.

¹⁹ *Id.*

Operations in Regions 2 and 3 are limited to [REDACTED]. [REDACTED].²⁰ [REDACTED].²¹ Indeed, the boundaries and proposed EIRPs for Regions 2 and 3 were developed specifically to avoid interference from hypothetical full-power (41 dBW) [REDACTED].²² In Region 3, Google will reduce limit transmissions to 23 dBW EIRP to avoid harmful interference to authorized users.

Several existing sites were particularly studied due their proximity to Regions 2 and 3.

- One of the WQFU991 facilities at Reno, Nevada, operates with center frequencies of 73.5 and 83.5 GHz, and bandwidths of 4.95 and 3.66 GHz respectively. Because this path is located near Region 2, it was tested for susceptibility to the higher power (41 dBW) EIRP.²³ As shown in Table 8 of the attachment to Exhibit C, [REDACTED] and, therefore, will not cause harmful interference.²⁴
- There are several terrestrial microwave systems located within Region 2. All but three of these systems do not operate co-channel with Google's proposed operations, and each of the registered receivers feature significant adjacent channel rejection.²⁵ The three co-channel systems within Region 2 have sufficient receive directional antenna suppression to prevent harmful interference.²⁶
- Limiting operations to the lower power proposed for Region 3 eliminates predicted interference to co-channel facilities that have receive antennas aimed at that region, even if the facilities themselves are not located within the test area.²⁷

Accordingly, Google's operations will pose no material risk of harmful interference to other commercial millimeter wave band users.

International users: Because the test site is more than 440 kilometers away from U.S. borders, no international coordination is required.

Federal users: Google has a coordination agreement in place with the National Radio Astronomy Observatory (NRAO) to ensure that that operations under Google's current STA for Call Sign WH9XYD do not cause interference to radio astronomy observations at NRAO's Owens Valley location. Google is prepared to coordinate with the National Telecommunications

²⁰ *Id.*

²¹ *Id.*

²² *Id.*

²³ *Id.*, Attachment 1 at 4-5 & Table 8.

²⁴ *Id.*

²⁵ *Id.*

²⁶ *Id.*

²⁷ *Id.*

and Information Administration to ensure that other federal operations in the band do not experience harmful interference.

As under the STA for Call Sign WH9XYD, Google [REDACTED]. First, [REDACTED]. [REDACTED]. Second, [REDACTED]. Third, [REDACTED].

Finally, as noted, Google has already been conducting similar tests in this general area, and no disruptions have been noted.

EXHIBIT B - TECHNICAL INFORMATION

Applicant Name: Google Inc.
Applicant FRN: 0016069502

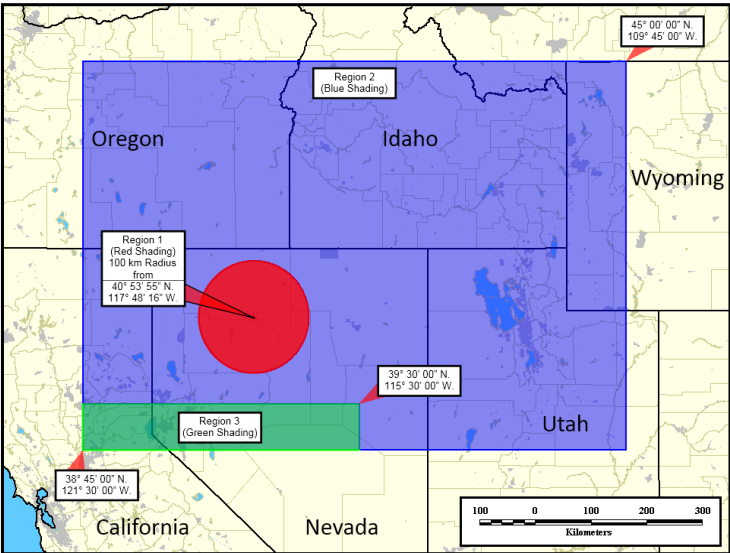
Legal Contact Details

Name of Contact	Aparna Sridhar
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Technical Contact Details

Name of Contact	Jeff Gilbert
Contact Details	1600 Amphitheatre Parkway Mountain View, CA 94043 Phone: (650) 933-7471 Email: jegilbert@google.com

Areas of Operation



Summary of Operations by Region

Region	[REDACTED] Range	Max [REDACTED] Station Tx EIRP	Max [REDACTED] Tx EIRP	Frequency Ranges
1 (Red)	[REDACTED]	[REDACTED]	[REDACTED]	75210-75790 MHz 84210-84790 MHz 85210-85790 MHz
2 (Blue)	[REDACTED]	[REDACTED]	[REDACTED]	75210-75790 MHz 85210-85790 MHz
3 (Green)	[REDACTED]	[REDACTED]	[REDACTED]	75210-75790 MHz 85210-85790 MHz

Region 1: [REDACTED] Transmitter Equipment and Station Details

Equipment	[REDACTED]
Number of Terminals	[REDACTED] ^a
Areas of Operation	Region 1 (see map describing Region 1 above)

^a[REDACTED]

Frequency Ranges	High (MHz)	Low (MHz)
[REDACTED]	75790	75210
	84790	84210
	85790	85210

Radio	Modulation	Emission Designator	Bandwidth	Maximum Power Out	Maximum EIRP
[REDACTED] ^b	Digital	60M0D1D-580MD1D ^c	60-580 MHz	0.631 W with 43 dBi antenna 0.447 W with 41.5 dBi antenna 0.200 W with 38 dBi antenna	41 dBW with 43 dBi antenna 38 dBW with 41.5 dBi antenna 31 dBW with 38 dBi antenna

^b In all cases, this transmitter will operate within the broader frequency ranges described above in the “Frequency Range” table.

^c During the course of testing, Google plans operate transmitters with a range of bandwidths between 60 and 580 MHz. In no case will the bandwidth be smaller than 60 MHz or exceed 580 MHz. Nevertheless, precise emissions designators for the transmitters will vary according to the bandwidth of operation.

Antenna 1 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ^d
Gain	43 dBi
Beam Width at Half-Power Point	1.2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 2 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ^d
Gain	43 dBi
Beam Width at Half-Power Point	1.2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 3 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ^d
Gain	43 dBi
Beam Width at Half-Power Point	1.2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 4 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ^d
Gain	41.5 dBi gain @ 71-76 GHz 43 dBi gain @ 81-86 GHz
Beam Width at Half-Power Point	1 deg @ 71-76 GHz 0.8 deg @ 81-86 GHz
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 5 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ^d
Gain	38 dBi
Beam Width at Half-Power Point	2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 6 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ^d
Gain	43 dBi
Beam Width at Half-Power Point	1.2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

^d [REDACTED]

Region 1: [REDACTED] Transmitter Equipment and Station Details
[REDACTED]

Equipment	[REDACTED]
Number of Terminals	[REDACTED]
Areas of Operation	Region 1 (see map of Region 1 above)

Frequency Ranges	High (MHz)	Low (MHz)
[REDACTED]	75790	75210
	84790	84210
	85790	85210

Radio	Modulation	Emission Designator	Bandwidth	Maximum Power Out	Maximum EIRP
[REDACTED] ^e	Digital	60M0D1D-580MD1D ^f	60-580 MHz	1.585 W	55 dBW

^e This transmitter will operate within the broader frequency ranges described above in the "Frequency Range" table.

^f During the course of testing, Google plans operate transmitters with a range of bandwidths between 60 and 580 MHz. In no case will the bandwidth be smaller than 60 MHz or exceed 580 MHz. Nevertheless, precise emissions designators for the transmitters will vary according to the bandwidth of operation.

Antenna 1 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED]
Gain	53 dBi
Beam Width at Half-Power Point	0.37 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 2 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED]
Gain	53 dBi
Beam Width at Half-Power Point	0.37 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Region 2: [REDACTED] Transmitter Equipment and Station Details

Equipment	[REDACTED]
Number of Terminals	[REDACTED] ⁹
Areas of Operation	Region 2 (see map describing Region 2 above)

⁹ [REDACTED]

Frequency Ranges	High (MHz)	Low (MHz)
[REDACTED]	75790	75210
	85790	85210

Radio	Modulation	Emission Designator	Bandwidth	Maximum Power Out	Maximum EIRP
[REDACTED] ^h	Digital	60M0D1D - 580MD1D ⁱ	60-580 MHz	0.631 W with 43 dBi antenna 0.447 W with 41.5 dBi antenna 0.200 W with 38 dBi antenna	41 dBW with 43 dBi antenna 38 dBW with 41.5 dBi antenna 31 dBW with 38 dBi antenna

^h In all cases, this transmitter will operate within the broader frequency ranges described above in the "Frequency Range" table.

ⁱ During the course of testing, Google plans operate transmitters with a range of bandwidths between 60 and 580 MHz. In no case will the bandwidth be smaller than 60 MHz or exceed 580 MHz. Nevertheless, precise emissions designators for the transmitters will vary according to the bandwidth of operation.

Antenna 1 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ^j
Gain	43 dBi
Beam Width at Half-Power Point	1.2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 2 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ^j
Gain	43 dBi
Beam Width at Half-Power Point	1.2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 3 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ^j
Gain	43 dBi
Beam Width at Half-Power Point	1.2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 4 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ^j
Gain	41.5 dBi gain @ 71-76 GHz 43 dBi gain @ 81-86 GHz
Beam Width at Half-Power Point	1 deg @ 71-76 GHz 0.8 deg @ 81-86 GHz
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 5 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ^j
Gain	38 dBi
Beam Width at Half-Power Point	2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 6 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ^j
Gain	43 dBi
Beam Width at Half-Power Point	1.2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

^j [REDACTED]

Region 3: [REDACTED] Transmitter Equipment and Station Details

Equipment	[REDACTED]
Number of Terminals	[REDACTED] ^k
Areas of Operation	Region 3 (see map describing Region 3 above)

^k [REDACTED]

Frequency Ranges	High (MHz)	Low (MHz)
[REDACTED]	75790	75210
	85790	85210

Radio	Modulation	Emission Designator	Bandwidth	Maximum Power Out	Maximum EIRP
[REDACTED] ^l	Digital	60M0D1D-580MD1D ^m	60-580 MHz	0.010 W with 43 dBi antenna 0.014 W with 41.5 dBi antenna 0.032 W with 38 dBi antenna	23 dBW with 43 dBi antenna 23 dBW with 41.5 dBi antenna 23 dBW with 38 dBi antenna

^l In all cases, this transmitter will operate within the broader frequency ranges described above in the “Frequency Range” table.

^m During the course of testing, Google plans operate transmitters with a range of bandwidths between 60 and 580 MHz. In no case will the bandwidth be smaller than 60 MHz or exceed 580 MHz. Nevertheless, precise emissions designators for the transmitters will vary according to the bandwidth of operation.

Antenna 1 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ⁿ
Gain	43 dBi
Beam Width at Half-Power Point	1.2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 2 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ⁿ
Gain	43 dBi
Beam Width at Half-Power Point	1.2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 3 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ⁿ
Gain	43 dBi
Beam Width at Half-Power Point	1.2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 4 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ⁿ
Gain	41.5 dBi gain @ 71-76 GHz 43 dBi gain @ 81-86 GHz
Beam Width at Half-Power Point	1 deg @ 71-76 GHz 0.8 deg @ 81-86 GHz
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 5 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ⁿ
Gain	38 dBi
Beam Width at Half-Power Point	2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

Antenna 6 Details	[REDACTED]
Type	[REDACTED]
Quantity	[REDACTED] ⁿ
Gain	43 dBi
Beam Width at Half-Power Point	1.2 degrees
Orientation in Horizontal Plane	N/A
Orientation in Vertical Plane	N/A

ⁿ [REDACTED]

[REDACTED]

[REDACTED]

EXHIBIT C - TECHNICAL DECLARATION

[REDACTED]