

Google Inc.
1101 New York Ave. NW
Second Floor
Washington, DC 20005



Main 202 346-1100
Fax 202 346-1101
www.google.com

February 1, 2008

Ex Parte via Electronic Filing

Marlene H. Dortch
Office of the Secretary
Federal Communications Commission
445 12th Street, SW
Washington, D.C. 20554

Re: Authorized Ex Parte Contact – Unlicensed Operation in the TV Broadcast Bands (ET Docket No. 04-186); Additional Spectrum for Unlicensed Devices Below 900 MHz and In the 3 GHz Band (ET Docket No. 02-380)

Dear Ms. Dortch:

Google Inc. (“Google”), by its attorney, respectfully submits this notification concerning an authorized *ex parte* contact. On January 31, 2008, Phil Gossett and Dan McCloskey, engineers from Google’s Mountain View headquarters, traveled to the Commission’s Office of Engineering and Technology (OET) offices in Columbia, Maryland, to observe the ongoing bench trials of proof-of-concept devices submitted by various entities in the above-referenced dockets.

During the course of the visit, Mr. Gossett delivered to OET staff a customer premises equipment (CPE)-sized antenna that could be used in conjunction with device testing. Messrs Gossett and McCloskey explained how the sample CPE antenna (7.5” x 7.5”) was both efficient and cost-effective, and could be designed with minimal (~3db) loss. The Google representatives pointed out that the standard discone antenna the Company used in its December 4, 2007 meeting at OET, demonstrating preliminary test results of experimental broadband spectrum sensing technologies, was not intended to be representative of practical production antennas for commercial devices.¹

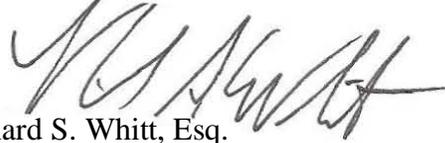
As part of their visit to the OET offices, Google representatives did not discuss the specific results of indoor testing. Those results, which are described in further detail

¹ See *ex parte* letter from Richard Whitt, Google, to Marlene Dortch, FCC, ET Docket 04-186, submitted on December 5, 2007.

in the attached presentation, show that a sensing threshold requirement of -114 dBm can be satisfied with a -117 dBm sensing threshold measured at the device using the handheld antenna.

Should you have any questions, please do not hesitate to contact the undersigned.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'R. S. Whitt', written in a cursive style.

Richard S. Whitt, Esq.
Washington Telecom and
Media Counsel
Google Inc.

Attachment: Presentation, "TV White Space Antenna Performance and Indoor Results"

TV White Space Antenna Performance and Indoor Results

Google Inc.

January 31, 2008

Overview

- This presentation clarifies two aspects of the spectrum sensing technology described in Google's previous submissions.
 1. Antennas can easily be designed that are small, efficient, and cost effective
 2. The observed variance of indoor measurements is well within the 30 dB range implicit in the proposed -114 dBm sensing threshold requirement

Antenna Designs

- Google's previous OET demonstration utilized a standard disccone antenna.
- However, as pointed out in our previous *ex parte* filing, the disccone antenna was not intended to be representative of practical production antennas.

Demo Antenna



Antenna Performance and Sensing Level



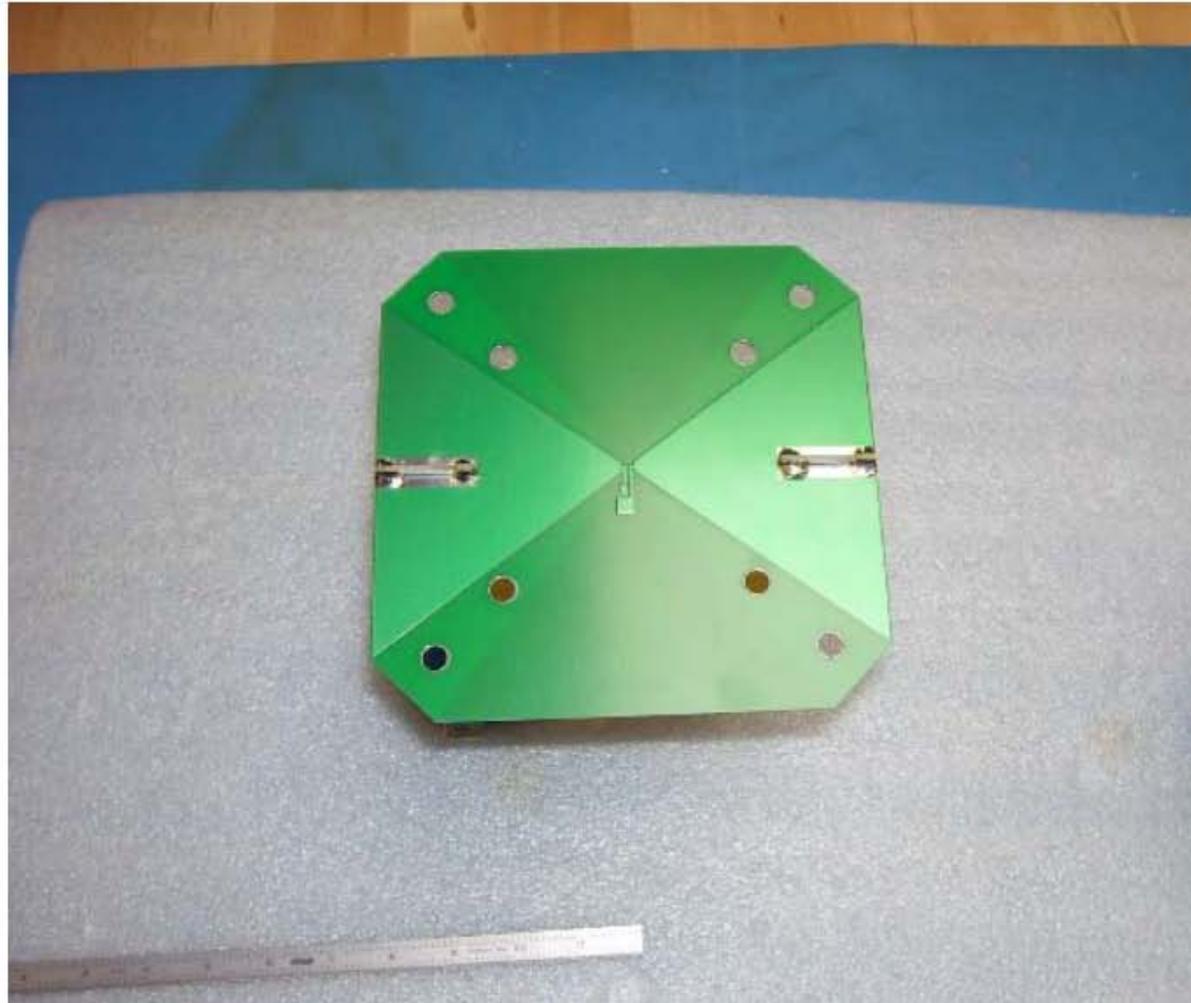
- Actual antenna gain and performance affects required sensing level
- 0 dBi not practical or realistic

Signal Level Here Doesn't Matter

Signal Level Here Matters

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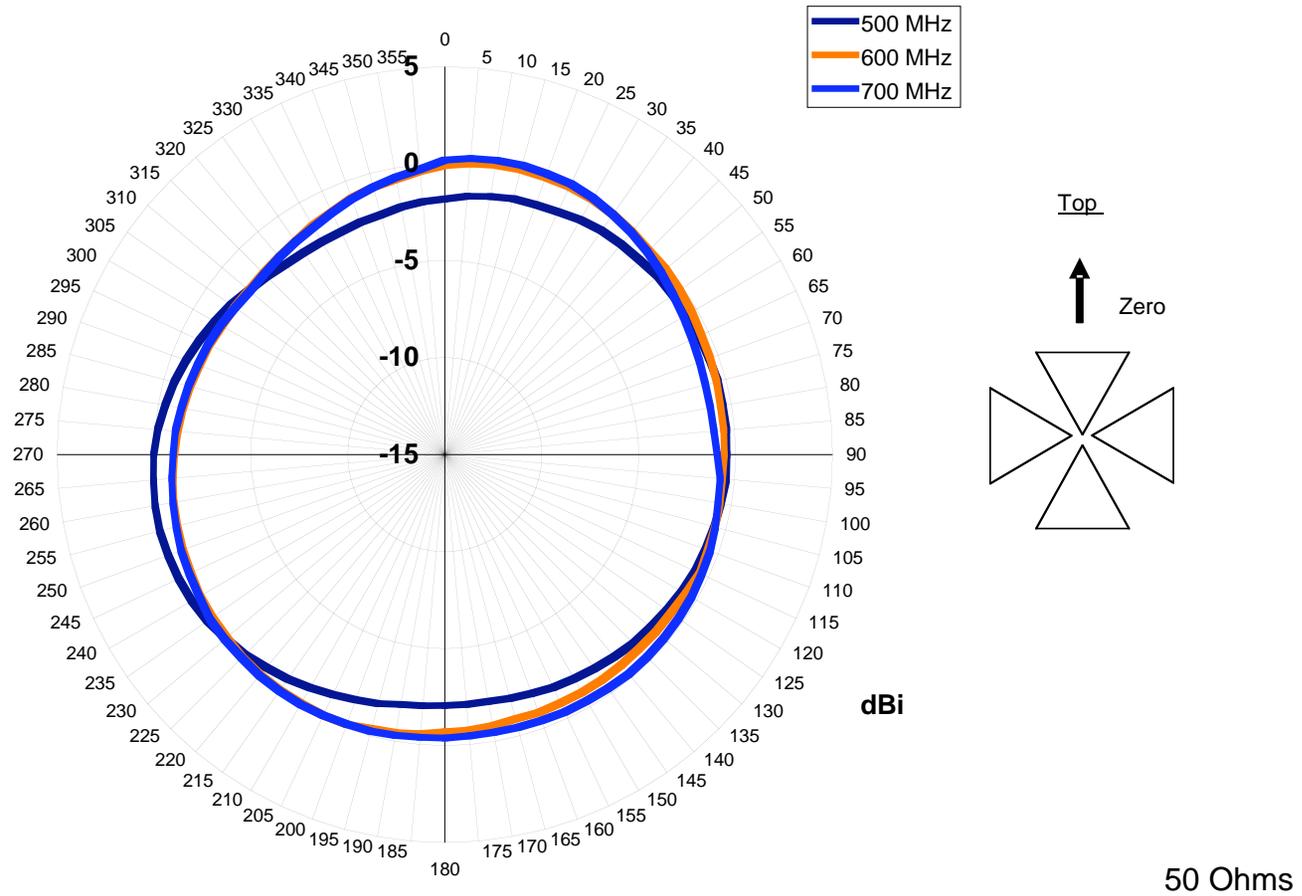
Practical CPE Antenna



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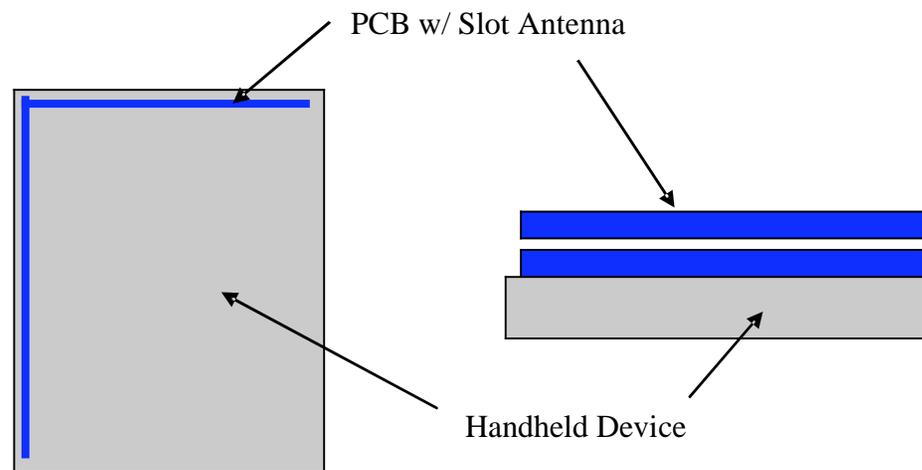
Measured Efficiency

Azimuth Pattern; No Ground Plane; On-Horizon (0 deg Elevation)



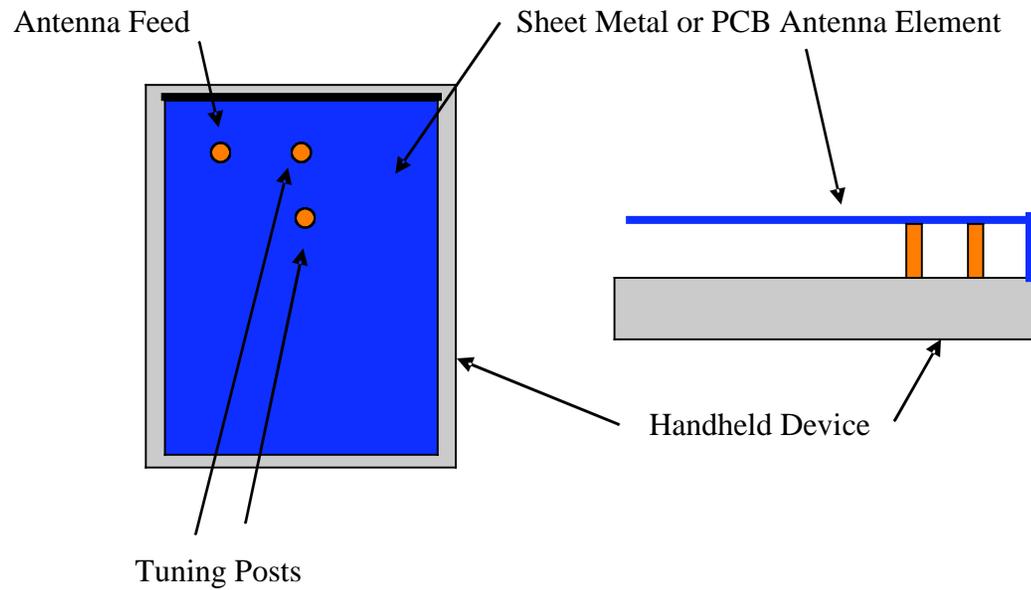
Handheld Antenna Design (I)

Perimeter Slot Antenna



Handheld Antenna Design (II)

Planar Inverted-F Antenna



Antenna Designs

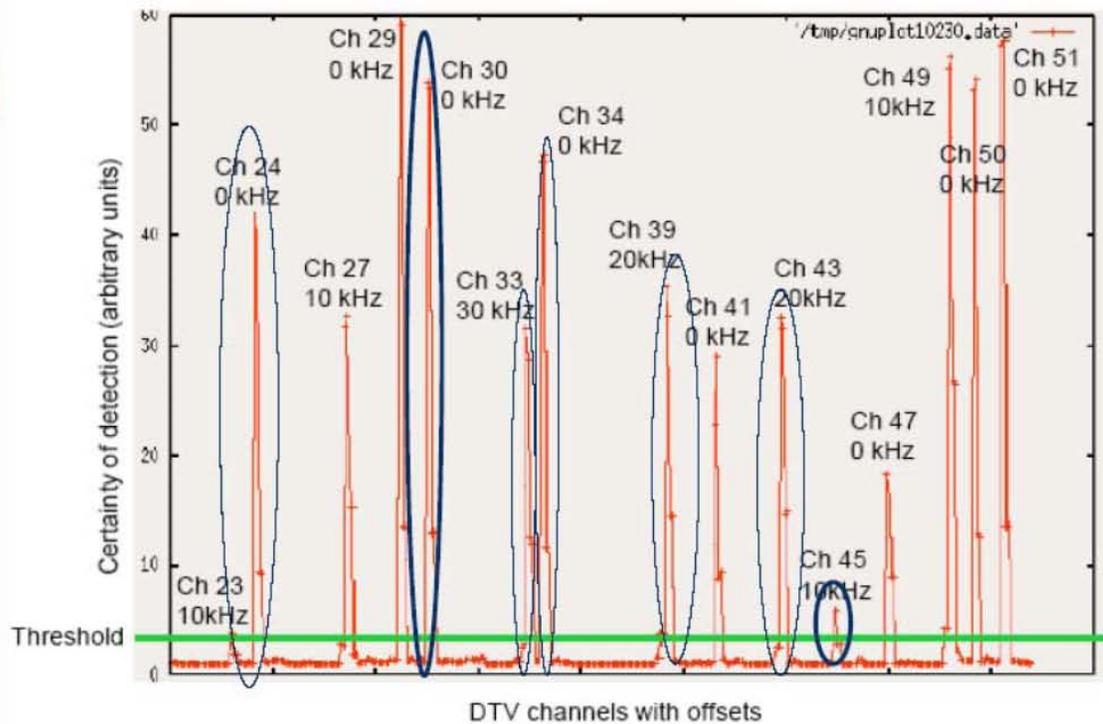
- A practical antenna (7.5" x 7.5") can be designed with minimal (~ 3 dB) loss
- A sensing threshold requirement of -114 dBm can be satisfied with an easily achieved -117 dBm sensing threshold measured at the device
- Even smaller antennas obviously are possible

Indoor Results

- A clear distinction should be made between statistical certainty and estimated power levels.
- The variation in estimated power over 2 days across 4 rooms on 2 floors was minimal.
- The arbitrary units of detection certainty are irrelevant to power variation.

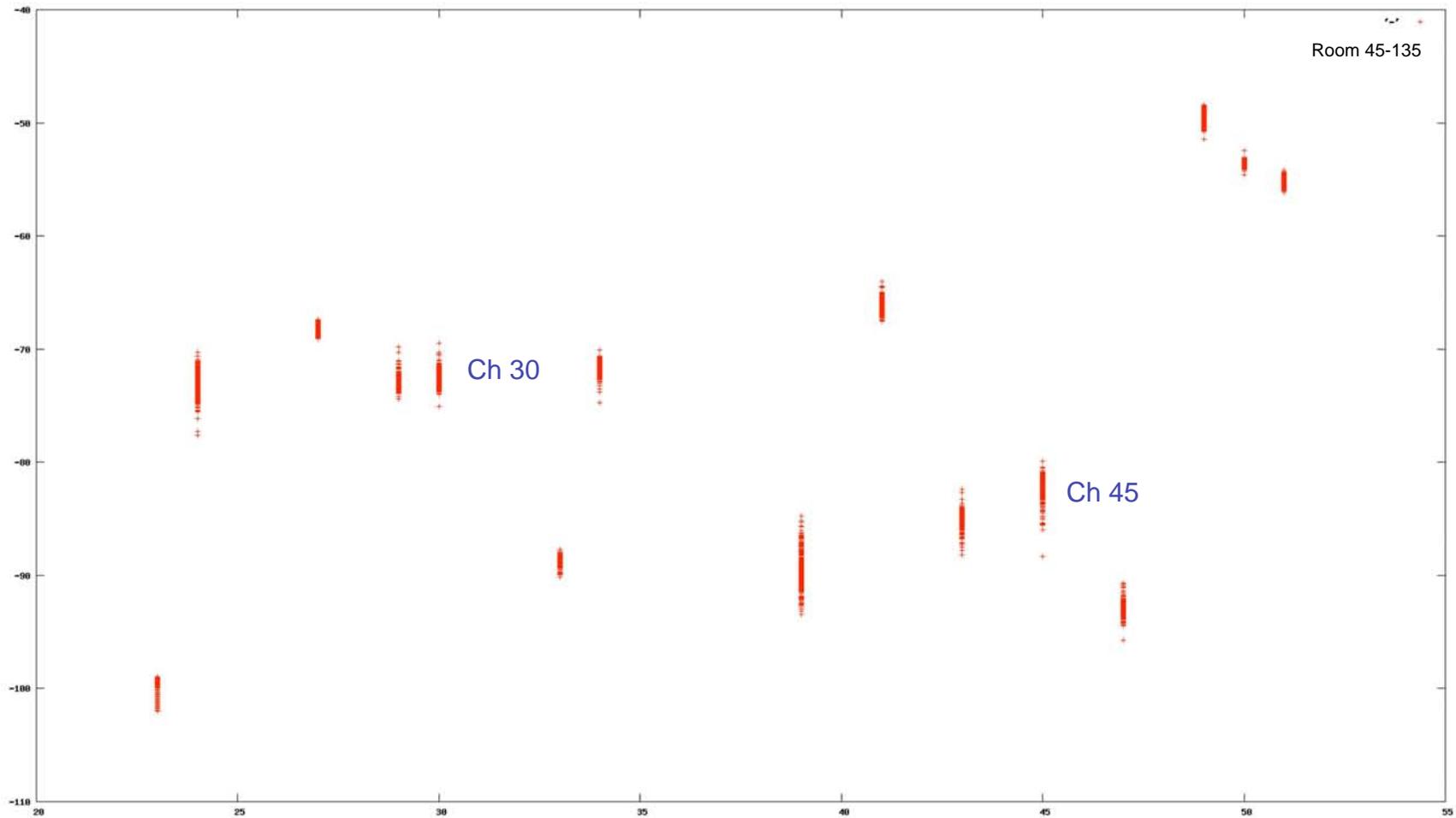
Certainty of Detection

Google Indoor Results (Circled results at same location)

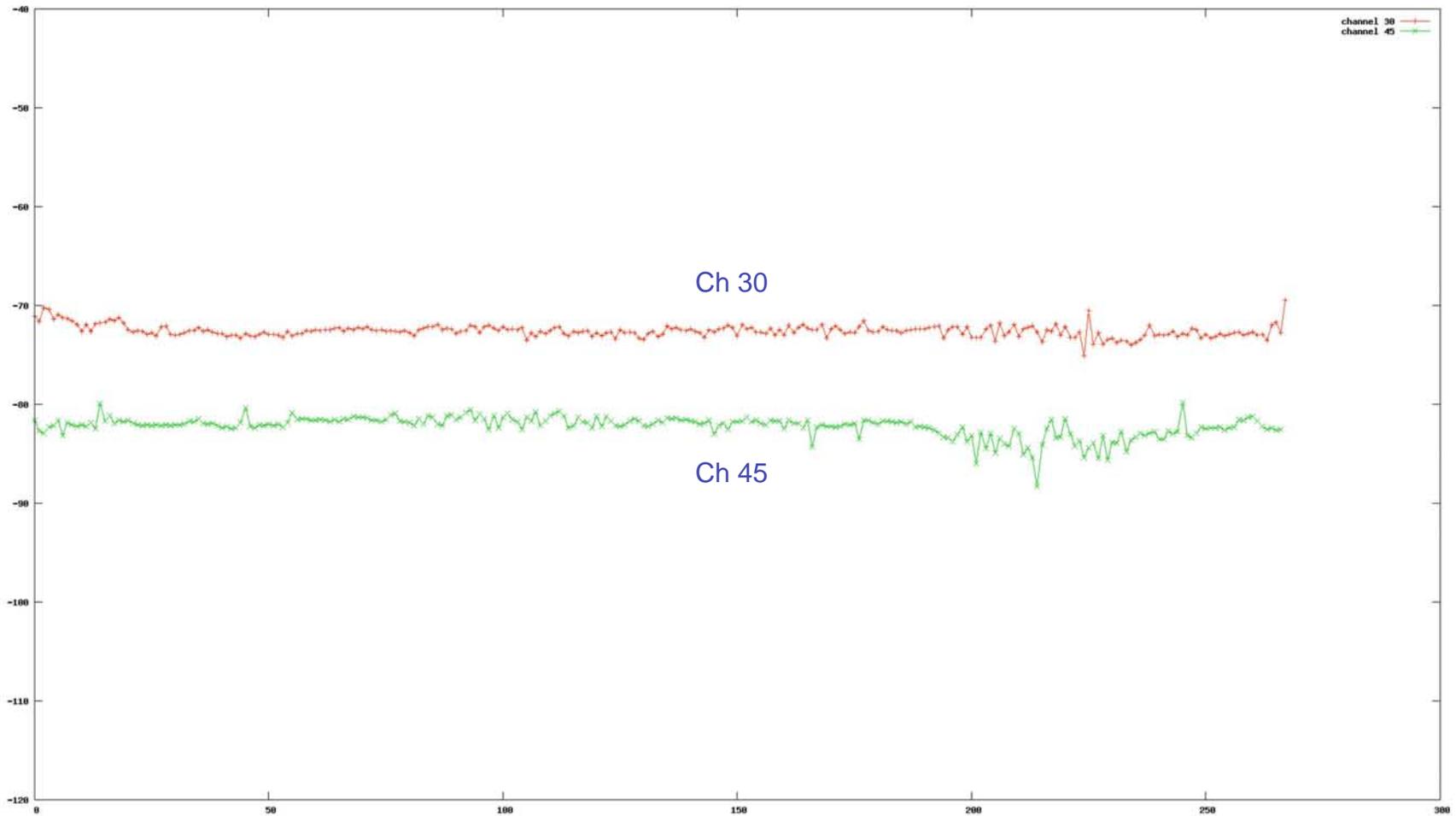


50 unit difference for 2 db difference
in TV power and height

Sensed power over 2 days

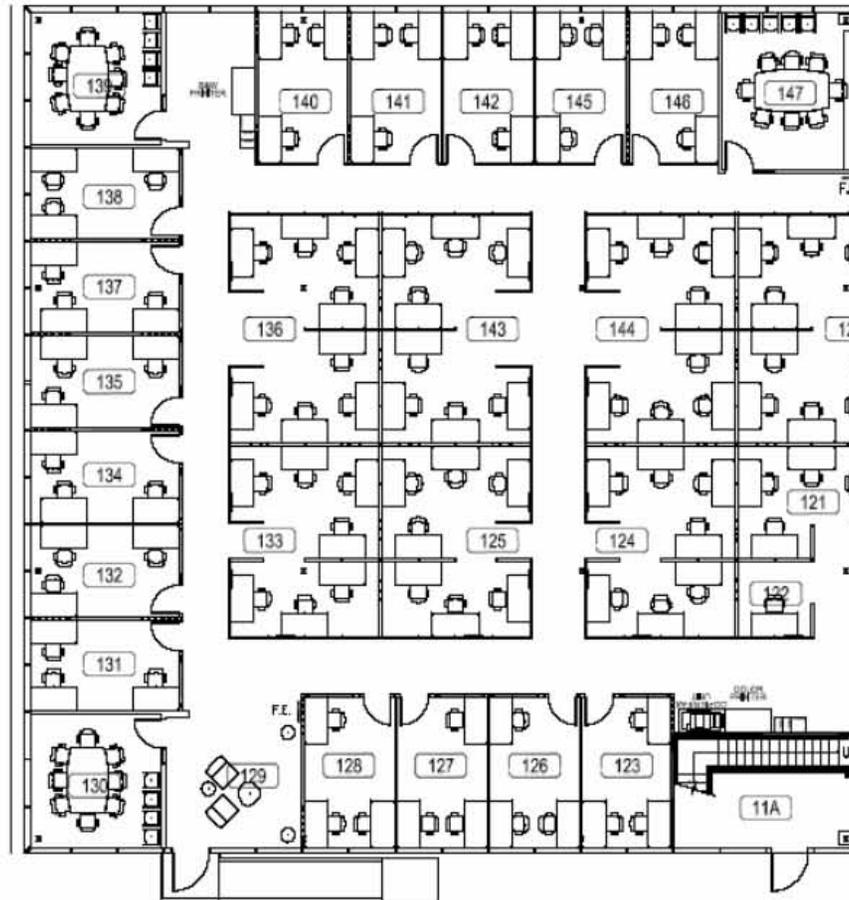


Variation over 2 days



First floor locations

N

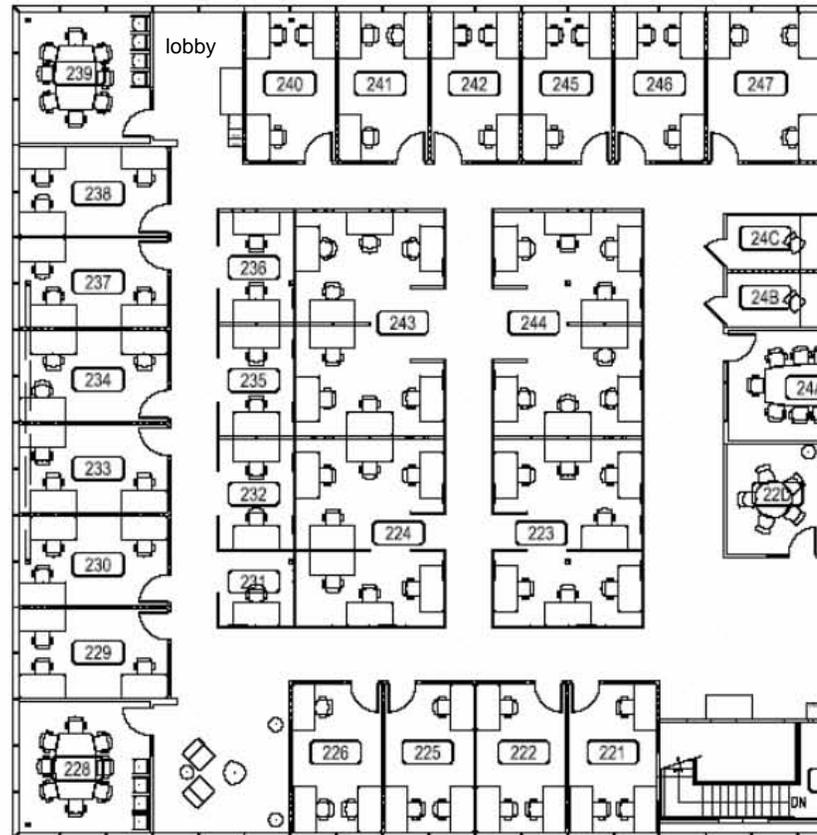


BLDG 45-1 Google Inc.

37.420464, -122.0823424

Second floor location

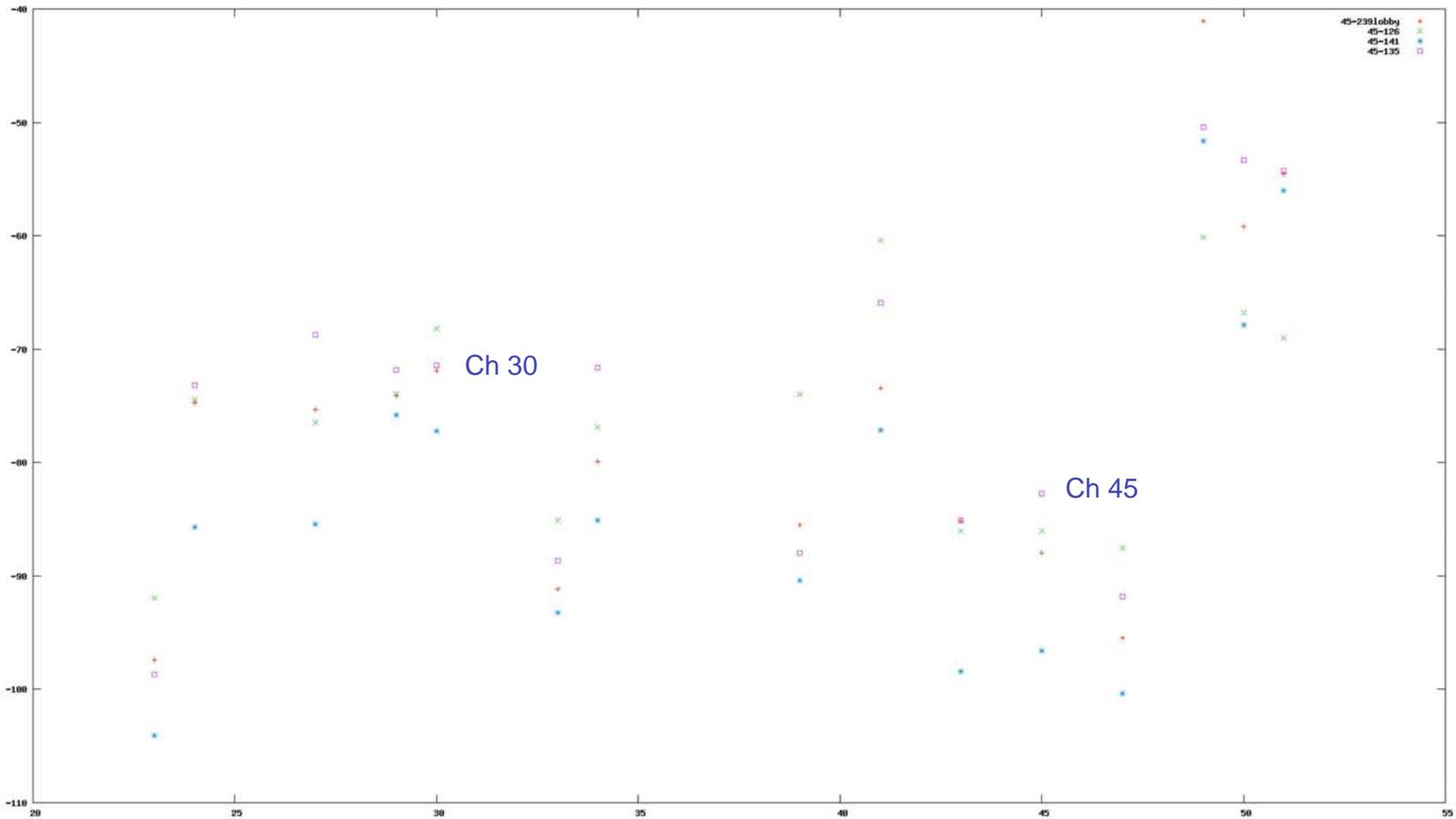
N



BLDG 45-2 Google Inc.

37.420464, -122.082345

Sensed power across 4 rooms



Indoor Results

- Across 4 rooms on 2 floors over 2 days, the maximum observed variation was less than 20 dB.
- Given the ATSC receiver decoding threshold of -84 dBm, the proposed sensing threshold requirement affords ample protection for 30 dB of variation.
- The proposed -114 dBm threshold provides an additional margin of 10 dB.

Conclusion

- Unlicensed devices can safely coexist with licensed devices, without fear of harmful interference.
 1. Efficient, practical antennas easily can be designed.
 2. A sensing threshold requirement of -114 dBm is more than adequate to cover the observed variation of indoor measurements.