OET Unlicensed Devices Presentation

MSTV

September 25, 2007

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MSTV Position

- Spectrum sensing will not ensure operation outside the protected contour
- -114 dBm sensing level is inadequate to protect TV viewers
- Signal variation within the home and within the contour is too large for sensing to protect TV viewers

Recent Microsoft/Philips Study

- Microsoft finally putting some engineering data into the record
- Preliminary review
  - Study confirms sensing at -114 dBm level is inadequate
  - Study conclusively shows device fails to detect TV signals even well within the protected contour of a TV station

Comparison of Number of Sites

- MSTV Measurements
  - 9 outdoor *paired* sites. 8 paired on 8 channels for a total of 128 site/ch., and one paired site on 20 channels for a total of 40 site/ch.
  - 5 indoor *paired* sites on 20 channel for a total of 100 site/ch.

Total of 268 site/ch.
(128+40+100=268)

- WSC Measurements
  - 19 sites in New York on one channel for a total of 19 site/ch.
  - 12 sites in Los Angeles on 3 channels for a total of 36 site/ch.

Total of 55 site/ch.
(19+36=55)

Comparison of Studies Inside the TV Contour

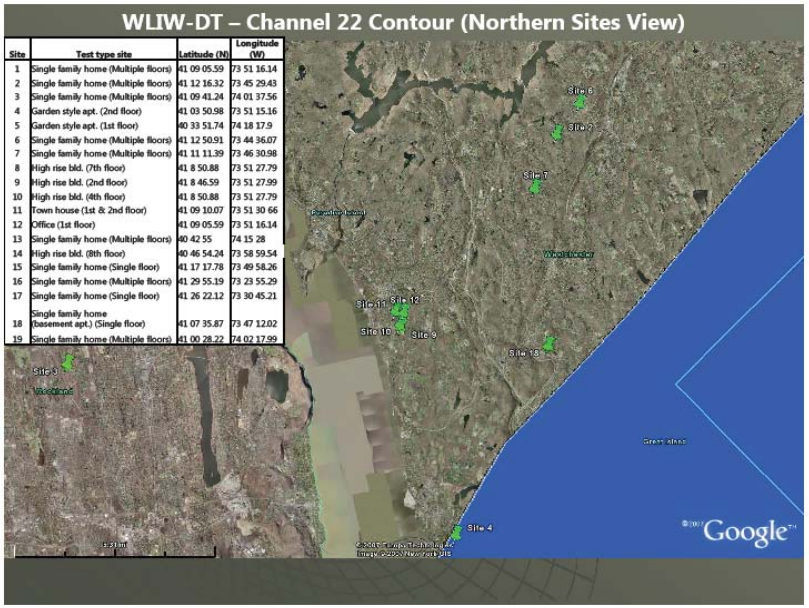
- MSTV Measurements
  - 215 out of the 268 sites/ch. or 80% were taken inside the contour of the TV station. 43 site/ch. were outside the TV contour.

Relatively large sample size (i.e., 216) to assess adequacy of sensing inside TV contour

- WSC Measurements
  - 26 out of the 55 site/ch. Or 47% were taken inside the contour of the TV station, 29 site/ch. were outside the TV contour.

Small sample size (i.e. 26) to determine adequacy of sensing inside TV contour

Philips New York Data



Site	Test type site	Latitude (N)	Longitude (W)
1	Single family home (Multiple floors)	41 09 05.59	73 51 16.14
2	Single family home (Multiple floors)	41 12 16.32	73 45 29.43
3	Single family home (Multiple floors)	41 09 41.24	74 01 37.56
4	Garden style apt. (2nd floor)	41 03 50.98	73 51 15.16
5	Garden style apt. (1st floor)	40 33 51.74	74 18 17.9
6	Single family home (Multiple floors)	41 12 50.91	73 44 36.07
7	Single family home (Multiple floors)	41 11 11.39	73 46 30.98
8	High rise bld. (7th floor)	41 8 50.88	73 51 27.79
9	High rise bld. (2nd floor)	41 8 46.59	73 51 27.99
10	High rise bld. (4th floor)	41 8 50.88	73 51 27.79
11	Town house (1st & 2nd floor)	41 09 10.07	73 51 30 66
12	Office (1st floor)	41 09 05.59	73 51 16.14
13	Single family home (Multiple floors)	40 42 55	74 15 28
14	High rise bld. (8th floor)	40 46 54.24	73 58 59.54
15	Single family home (Single floor)	41 17 17.78	73 49 58.26
16	Single family home (Multiple floors)	41 29 55.19	73 23 55.29
17	Single family home (Single floor)	41 26 22.12	73 30 45.21
18	Single family home (basement apt.) (Single floor)	41 07 35.87	73 47 12.02
19	Single family home (Multiple floors)	41 00 28.22	74 02 17.99

- Only one site (site 4) measured was inside protected contour
  - See site on Map
- Coalition states no signal variation in excess of 20 dB observed
- Coalition indicates 22 of 22 successful detections for site 4

Philips Data

- Philips slide identifies site as “outside contour” Map inside?
- If chart plots accurate, variability in excess of 20 dB (LR vs. Kitchen or BR)
- Sensing level needed for “successful” detection less than -114 dBm

Philips Data

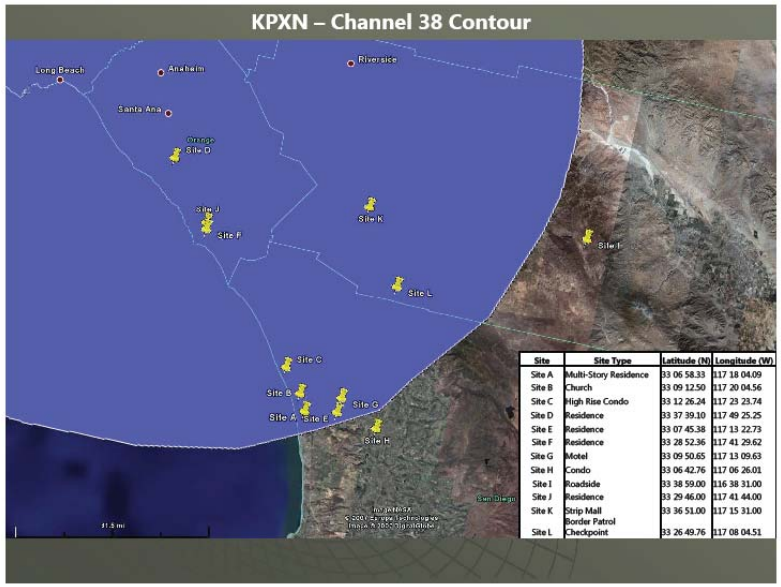
- Philips data shows that Living Room had “usable” DTV signal
- Levels in Kitchen and Bedroom below -114 dBm
- Confirms MSTV indoor measurements

Microsoft California Data

- Microsoft data shows many locations where sensing at -114 dBm fails and nearby usable DTV signal available

- Results confirm MSTV submitted studies and data

Microsoft Data

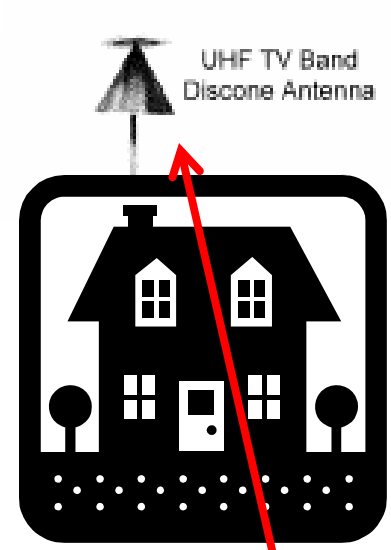


Site	Site Type	Latitude (N)	Longitude (W)
Site A	Multi-Story Residence	33 06 58.33	117 18 04.09
Site B	Church	33 09 12.50	117 20 04.56
Site C	High Rise Condo	33 12 26.24	117 23 23.74
Site D	Residence	33 37 39.10	117 49 25.25
Site E	Residence	33 07 45.38	117 13 22.73
Site F	Residence	33 28 52.36	117 41 29.62
Site G	Motel	33 09 50.65	117 13 09.63
Site H	Condo	33 06 42.76	117 06 26.01
Site I	Roadside	33 38 59.00	116 38 31.00
Site J	Residence	33 29 46.00	117 41 44.00
Site K	Strip Mall	33 36 51.00	117 15 31.00
Site L	Border Patrol Checkpoint	33 26 49.76	117 08 04.51

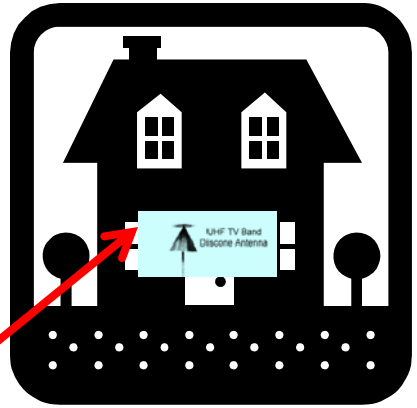
- At Site C, “Discone Roof” show usable DTV signal levels on Ch. 38 with typical outdoor antenna for all five trials
- Apt 7B at same site indicates less than -115 dBm and “no detection” for all five trials on Ch. 38

The 30 dB Margin!!!

Site C



Difference > than 30 dB between outdoor and indoor Discone antenna measurements

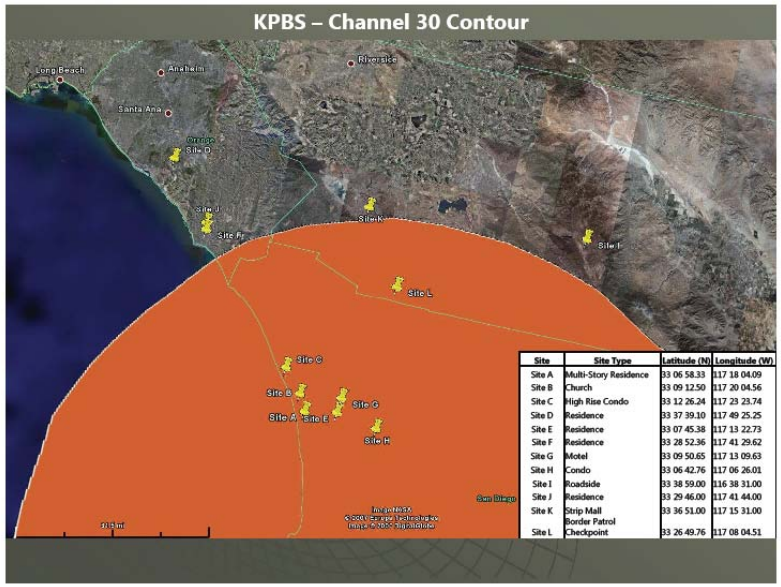


Channel Power High Rise Condo						
Channel 38 Trial	Discone Roof	Monopole Roof	Discone Apt 7B	Monopole Apt 7B	Discone Parking	Monopole Parking
1	-83.4	-93.1	less than -115 dBm	-101.7	-102.7	less than -115 dBm
2	-86.7	-92.7	less than -115 dBm	less than -115 dBm	-104.6	less than -115 dBm
3	-87.1	-90.7	less than -115 dBm	less than -115 dBm	-101.4	less than -115 dBm
4	-84.6	-97.7	less than -115 dBm	less than -115 dBm	-100.2	less than -115 dBm
5	-82.8	-92.2	less than -115 dBm	less than -115 dBm	-99.3	less than -115 dBm

Site C Example

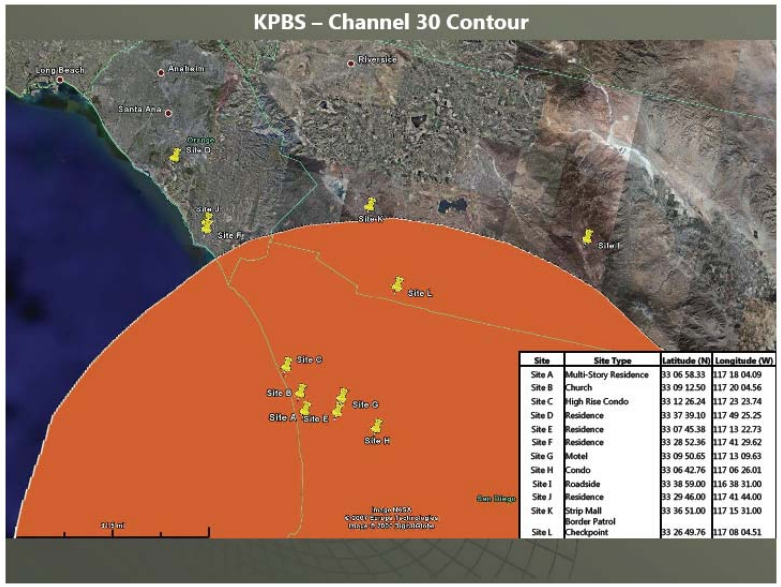
- “Discone Roof” measurements show values from -82.8 to -87.1 dBm with typical outdoor TV antenna these values become -72.8 to -77.1 dBm well above what is needed for reliable DTV service
- “Discone Apt 7B” measurements show less than -115 dBm indicating channel is available
- Sensing **fails** in all 5 out of 5 trials
- How does Microsoft suggest that this data shows devices detected with 100% accuracy?

Microsoft Data



- At Site D “Discone Home Office 2nd Floor” show usable DTV signal levels on Ch. 30 with typical outdoor antenna
- Family Room indicates less than -115 dBm and “no detection” for Ch. 30

Microsoft Data



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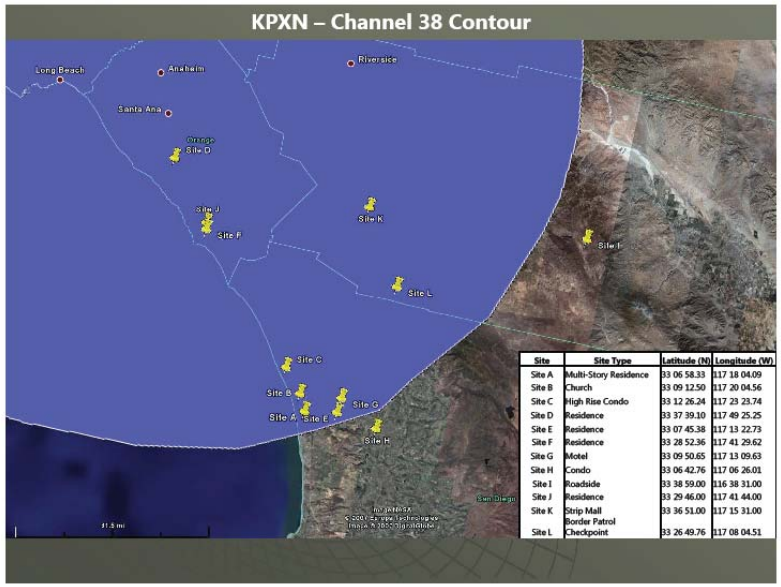
- At Site E “Guest Bedroom 2nd Floor” show usable DTV signal levels on Ch. 30
- “Monopole Master Bedroom 2nd Floor” and “Monopole Family Room” indicates less than -115 dBm and “no detection” for Ch. 30

Microsoft Data



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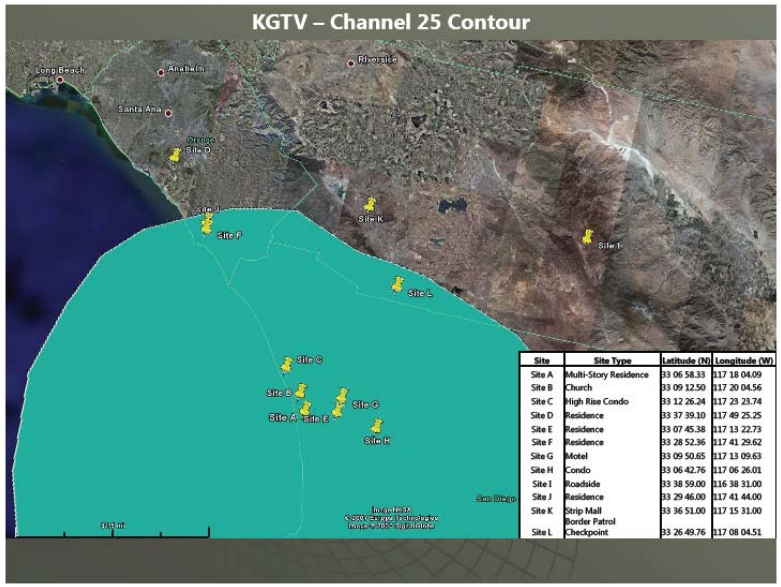
- At Site F, “Discone Patio” show usable DTV signal levels on Ch. 38 with typical outdoor antenna
- “Monopole Bedroom” and Monopole Kitchen” at same site indicates less than -115 dBm and “no detection” on Ch. 38

Microsoft Data



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Site K	Strip Mall	33 36 51.00	117 15 31.00
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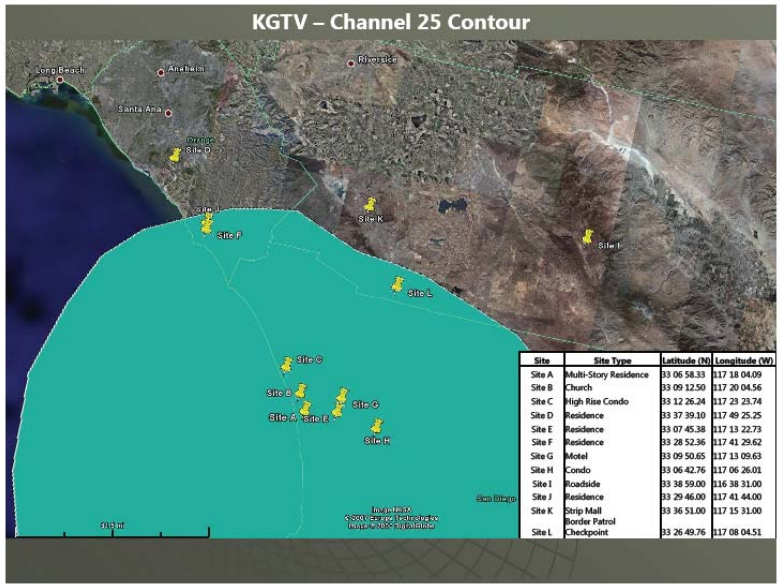
- At Site G, “Discone Room 203” and “Discone Room 318” show usable DTV signal levels on Ch. 25 with typical outdoor antenna
- “Monopole Room 137” at same site indicates less than -115 dBm and “no detection” on Ch. 25

Microsoft Data



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- At Site H, “Discone Bedroom” show usable DTV signal levels on Ch. 25 with typical antenna
- “Monopole Living Room” and “Monopole Bedroom” at same site indicates less than -115 dBm and “no detection” on Ch. 25

Summary of Microsoft/Philips Data (Microsoft Math?)

- One New York site measured within the contour shows sensing at -114 dBm fails
  - Second site (site 7) shows successful detection 10 out 12 attempts?
- At six out of eleven California sites measured, sensing failed and a viewable DTV signal level was available at the same site
- Failure rate of 6 out of 11 California sites does not equal detection with “100% accuracy”

Microsoft Misstatements

- Statement: "Within a Test Site (building), **no** signal strength variation in **excess of 20 dB** was observed."

- Fact: Some examples where variation is in excess of 20 dB:

Site A-ch. 38	Famly Rm – 80.9	Kitchen – 104.2	23.3 dB
Site C-ch. 38	Roof - -82.8	Apt 7B - less than -115	>32.2 dB
Site D – ch. 30	Home office -91.9	Kitchen – less than -115	23.2 dB
Site E – ch 30	Guest BR (2nd Floor) – 82.9	Master BR (2nd Floor) – less than -115	>32.1 dB

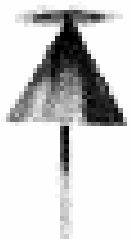
Microsoft Misstatements

- Statement: “Within a room, TV signal strength variations typically did not exceed 5 dB.”

- Fact: Variation in excess of 30 dB shown in same room

The other 30 dB Margin !!!!

Site H



UHF TV Band
Discone Antenna

1. Antenna Gain: 2 dBi

Discone is >30 dB more sensitive than monopole

Channel Power
Escondio, California Residence

Channel 25 Trial	Discone Living Room	Monopole Living Room	Discone Bedroom	Monopole Bedroom	Discone East Balcony	Monopole East Balcony	Discone West Balcony	Monopole West Balcony
1	-95.7	less than -115 dBm	-85.7	less than -115 dBm	-91.6	-97.8	-87.6	-97.4
2	-94.3	less than -115 dBm	-84.4	less than -115 dBm	-91.0	-98.4	-79.3	-97.4
3	-96.8	less than -115 dBm	-84.7	less than -115 dBm	-91.4	-99.7	-77.1	-98.0
4	-93.1	less than -115 dBm	-85.7	less than -115 dBm	-91.1	-99.2	-77.6	-98.0
5	-97.7	less than -115 dBm	-87.7	less than -115 dBm	-92.2	-99.7	-79.1	-97.9

The Other Way !!!
Site D

Monopole is >19 dB more sensitive than discone

Channel Power
Irivne Residence

Channel 30 Trial	Discone Family Room	Monopole Family Room	Discone Kitchen	Monopole Kitchen	Discone Home Office 2nd Flr	Monopole Office 2nd Flr
1	less than -115 dBm	-98.5	less than -115 dBm	less than -115 dBm	-92.1	-97.3
2	less than -115 dBm	-103.7	less than -115 dBm	less than -115 dBm	-92.8	less than -115 dBm
3	less than -115 dBm	less than -115 dBm	less than -115 dBm	-92.9	-91.9	-101.7
4	less than -115 dBm	-96.8	-92.4	-98.8	less than -115 dBm	-100.5
5	less than -115 dBm	less than -115 dBm	less than -115 dBm	less than -115 dBm	less than -115 dBm	-100.0

Conclusion

- FCC Receiver study indicates 30 dB or more signal variation between indoor and outdoor reception
- MSTV studies show sensing at -114 dBm inadequate
- Recent Microsoft/Philips data shows -114 dBm inadequate

Bottomline

- Coalition states “A TV receiver is to be protected only if it receives a viewable signal at its antenna input (e.g., …-84 dBm) and is within the protected contour.”
- Hold the Coalition to its stated position
- All the science and data (including most recent Coalition filing) show that this standard can Not be met by personal/portable devices relying on sensing
  - A sensing success rate of less than 50% for Microsoft “handpicked” sites is not protection for TV viewers