November 4, 2010

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

Re: ***Ex Parte*** **Letter**

Establishment of a Model for Predicting Broadcast Television Field Strength Received at Individual Locations, ET Docket No. 10-152; Measurement Standards for Digital Television Signals Pursuant to the Satellite Home Viewer Extension and Reauthorization Act of 2004, ET Docket No. 06-94

Dear Ms. Dortch:

Throughout the above-captioned proceedings, DIRECTV and DISH Network (the "Satellite Carriers") have, consistent with the statutory changes made in the Satellite Television Extension and Localism Act of 2010 ("STELA"), called on the Commission to account for the use of indoor antennas in the predictive model and measurement standards used to determine whether consumers are eligible to receive distant network signals. In this letter, the Satellite Carriers respond to some of the criticisms leveled at these positions by the broadcast interest commenters – the National Association of Broadcasters, the ABC Television Affiliates Association, the CBS Television Affiliates Association, the Fox Broadcast Company Affiliates Association, the NBC Television Affiliates, and the Association for Maximum Service Television (the "Broadcasters"). The Satellite Carriers next and identify some alternative ways for the Commission to take into account consumers' actual experiences.

Response to Broadcasters' Criticism

The Broadcasters have complained repeatedly that use of indoor antennas in the prediction and measurement methods would require them to increase their transmit power. Broadcasters' Comments at 12 ("Abandoning the outdoor antenna standard now would require stations massively to increase their Effective Radiated Power."); Broadcasters' Reply Comments at 27-28 ("Whether universal service to indoor antennas would require a 2.5 million-fold increase in power or merely a 50,000-fold increase, it is utterly impractical. At such extraordinary levels of power (if our utilities could somehow generate power in such vast quantities), stations would create tremendous interference with one another."). These complaints are irrelevant to the tasks the Commission must undertake in this rulemaking – developing a modified predictive model and new measurement standards to accurately reflect the signal strength received by consumers, such as it is.

As the Satellite Carriers' engineering expert Christopher Kurby explains, the Broadcasters have misread his proposals. Mr. Kurby's reports have not called upon broadcasters to increase their transmit power. Rather, they have focused exclusively upon predicting or measuring the received signal strength. The statute likewise does not provide an opportunity for the broadcasters to "remedy" an unserved household designation. The law simply defines an unserved household and attaches certain consequences – the eligibility to receive distant network signals in certain circumstances – to unserved household status. The broadcasters do not need to be able to "undo" an unserved household designation by increasing power.

Technical Submission

The Commission's rulemaking also suggested the possibility of applying different methodologies accounting for consumers' use of both outdoor and indoor antennas. *See NPRM* ¶ 23 ("We remain concerned about such instances, and therefore are again inviting comment and suggestions and new information that would provide a solution for those satellite television subscribers who are either not able to use an outdoor antenna or cannot receive service using an outdoor antenna and cannot receive service with an indoor antenna."). Attached is a technical paper, developed by Mr. Kurby, that suggests alternative ways for the Commission to take into account of this mix in the contexts of the predictive model and measurement methodology.

Predictive Model

Mr. Kurby proposes using a weighted average of indoor and outdoor antennas. For outdoor antennas, he assumes the current height of 20 or 30 feet and no wall penetration losses. For indoor antennas, among other things, he assumes a very conservative antenna height of 10 feet (and the signal loss associated with this height), and similarly conservative losses associated with wall penetration. Mr. Kurby thus develops strength loss predictions for outdoor and indoor antennas. Then, Mr. Kurby weight-averages the two predicted loss numbers based on data collected by the Consumer Electronics Association on the proportion of indoor (58%) and outdoor (42%) users. This information is further validated by data collected by Channel Master. This alternative no longer takes into account the deficiencies identified with TV tuners.

Measurement

With respect to measurement, Mr. Kurby likewise proposes an alternative method for taking into account a simple, ascertainable fact – whether the household in question is equipped with an outdoor antenna. For those households equipped with an outdoor antenna, Mr. Kurby explains that the test should simply use that actual antenna. For those households that do not have an outdoor antenna, Mr. Kurby suggests a way of addressing the Satellite Carriers' concerns by means of outdoor testing, which would moot the objections and fears of manipulation raised in connection with indoor testing by the Broadcasters (unfounded though those fears are). Mr. Kurby's outdoor testing regime uses a rabbit ears or loop antenna, and adjusts the resulting measurement to reflect wall penetration loss.

Thus, while the Commission's *NPRM* suggests making special provision for those users who cannot have an outdoor antenna, the Satellite Carriers believe it is more appropriate to base the regime applicable to the consumer upon the decisions the consumer already has made – i.e. whether the household is equipped with an outdoor antenna. The satellite carriers have already discussed the possibility of self-certification, backed by a robust verification mechanism. *See* DIRECTV/DISH Comments at 21-23.

The Satellite Carriers continue to believe that the Commission should adopt the earlier proposals put forth by Mr. Kurby and submitted previously in this proceeding. In particular, the Satellite Carriers point to the views expressed in these prior submissions on time availability, clutter loss and co-channel or adjacent channel interference. The Satellite Carriers do note, however, that there are ways open to the Commission to meet their concerns in part. But the Commission does not have a reasonable option of doing nothing: the very large number (indeed majority) of indoor antenna users should no longer simply be assumed away by the model.

Respectfully submitted,

/s/

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Prediction and measurement of DTV signal levels for residential antennas

In our previous work addressing the NPRM FCC 10-133 we took a realistic approach to estimating the losses experienced by a user with an indoor antenna to DTV Digital TV also known as DVB-T (Digital Video Broadcast-Terrestrial) signals. The resulting estimates most assuredly would identify with high probability those users who were underserved. The fact that many customers who are truly "unserved" may lie within the Broadcasters' coverage contours is, in my view, irrelevant to the prediction and measurement tasks at hand. In that respect, the submissions made by the Broadcasters complain repeatedly that the prediction and measurement methods I have proposed would require broadcast stations to increase their transmit power exponentially in order to make the household in questions "served" again, with consequences for interference among broadcast stations and for the digital television allotment plan. Broadcasters' Comments at 12 ("Abandoning the outdoor antenna standard now would require stations massively to increase their Effective Radiated Power."); Broadcasters' Reply Comments at 27-28 ("Whether universal service to indoor antennas would require a 2.5 million-fold increase in power or merely a 50,000-fold increase, it is utterly impractical. At such extraordinary levels of power (if our utilities could somehow generate power in such vast quantities), stations would create tremendous interference with one another.").

These complaints misread my proposals, however. These proposals never made a call for broadcasters to increase their transmit power. I confined my task to predicting or measuring the received signal strength and I have not recommended any requirement on the broadcasters to increase the strength that is predicted or measured to be received by the consumer.

This paper suggests certain alternative ways in which the Commission might take into account the mix of outdoor and indoor antenna users. In this regard, I note that the FCC's rulemaking suggested the possibility of accounting for the mix of indoor and outdoor antenna users. *See NPRM* ¶ 23 ("We remain concerned about such instances, and therefore are again inviting comment and suggestions and new information that would provide a solution for those satellite television subscribers who are either not able to use an outdoor antenna or cannot receive service using an outdoor antenna and cannot receive service with an indoor antenna.").

With respect to the predictive model, I propose using, using a weighted average of indoor and outdoor antennas. For outdoor antennas, I assume the current height of 20 or 30 feet and no wall penetration losses. For indoor antennas, among other things, I assume a very conservative antenna height of 10 feet (and the signal loss associated with this height) for indoor antennas, and similarly conservative losses associated with wall penetration for indoor antennas. I thus develop strength loss predictions for outdoor and indoor antennas. I then weight-average the two predicted loss numbers based on data collected by the Consumer Electronics Association on the proportion of indoor (58%) and outdoor (42%) users. This information is further validated by data collected by Channel Master. This alternative no longer takes into account the deficiencies identified with TV tuners.

With respect to measurement, I likewise propose an alternative method for taking into account a simple, ascertainable fact – whether the household in question uses an outdoor or indoor antenna. I believe it is more appropriate to base such a distinction on the decisions the consumer already has made – i.e. whether the household is equipped with an outdoor antenna. The satellite carriers have already discussed the possibility of self-certification, backed by a robust verification mechanism. *See* DIRECTV/DISH Comments at 21-23.

Thus, while the satellite carriers continue to believe that the Commission should adopt my earlier proposals, they do note that there are other ways open to the Commission to meet their concerns in part.

Antenna Height

Previously I used an indoor antenna height of 3 ft surmising that the worst case user would mount their antenna on a table top. Confirming my original proposal the FCC in [1] also suggests that the indoor user would use 1m to 2m antenna heights. But I now move to a 10ft antenna height above the ground as a way to average out a mix of floor heights of 1 and 2 story houses and raised ranch homes vs. ground level ranches. This also is a large increase of height from my original proposal and recognizes that most users will be somewhere between 3ft and 20ft. The use of the 10ft antenna height requires a simple adjustment to the signal strength results predicted at 20 feet.

The literature was further reviewed to refine our determination of the height conversion factor appropriate for a height reduction of 20 feet to 10 feet. The survey is shown in table 1 lists factors primarily for a 10m to 3m conversion but there are others as well. The data seems to show consistent behavior of between 6 and 10dB for rural and suburban environments. I selected the data points shaded in grey and listed in the election box as the representative data for antennas transitioning from 10m to 3m as they also result in the lowest loss factor for rural to suburban. Note that I selected 7dB for L-VHF because the FCC [1] showed no change for L-VHF to VHF although it may be a 1 dB or 2 dB higher. If so it would have minor impact in the conservative direction and so a factor of 7 dB is used for L-VHF and VHF and 6.5dB for UHF.

Table 1 Antenna Height factor (dB)

			3m to 10m		
Ref	**Source**	**Environment**	**L-VHF**	**VHF**	**UHF**
13	OT 78-144	flat-rural	9 to 10	7	
		urban	9 to 10	10 to 11	14
		suburban			6 to 7
9	Lee	Plane earth	10.5	10.5	10.5
10	Okumura	Urban		4 to 6	4 to 5
		Suburban		7	6 to 7
11	COST231	URBAN	8.2	11.9	15.5
			30ft to 8ft m(2.5m to 9 m)		
12	iBLAST	Portland urban			6.7
			30ft to 1,2m		
1	TV Tech update	Suburban-Urban?	7	7	
			2m to 9m		
14	NTIA 79-28	Suburban-Urban?	5.9		6

			Gain 3m to 10m	
Election	Rural -Suburban	7	7	6.5

Next I generated a formula to predict the antenna height antenna loss using a simple power law that is commonly applied and is usually between a power of 1 and 2.

$$\Delta G = k\log\left(\frac{h_2}{h_1}\right) \text{ dB} \qquad \text{eq (1)}$$

The k factor for the three bands are

L-VHF, VHF K=13.4

UHF K=12.4

This translates into a "power law" ratio of 1.34 and 1.24 respectively.

Next we compute the change from 20ft to 10 ft using eq(1) and the k factors and round up to a value we will use throughout the paper as -4dB as seen in Table 2.

Table 2 Correction for 20 ft antenna to 10ft

	dB correction for antenna height		
	L-VHF	VHF	UHF
Calculated Change from 20ft to 10ft	-4.0	-4.0	-3.7
Used change from 20ft to 10ft	-4.0	-4.0	-4.0

Antenna gain

Fitzgerrel [2] measured several antenna types suitable for indoor deployment. The rabbit ear dipole was used for L-VHF and VHF and a circular loop and bow tie loop used for UHF. The dipole was fully extended and set with the arms at 90 degrees from each other. The antenna gains showed reasonable performance with the dipole having an average antenna gain of about -3dBd vs. 0dBd with an ideal antenna. The -3dB is attributed to tuning loss, directivity loss, balun loss and antenna efficiency and makes sense.

He further measured more antenna types in [3] shown in the figure below and generated an average antenna gain vs. frequency. H&E [4] reported a calculated average antenna gain based on the NTIA [3] for the three bands as seen below. It is unknown where the average is calculated but it appears that the gain for UHF might have been under estimated at -3dB vs. an approximate average of -1dB. Thus, I will use values for L-VHF and VHF presented by H&E but modify the UHF antenna gain setting it to -1dB as a conservative measure, i.e. not underestimate the signal received.

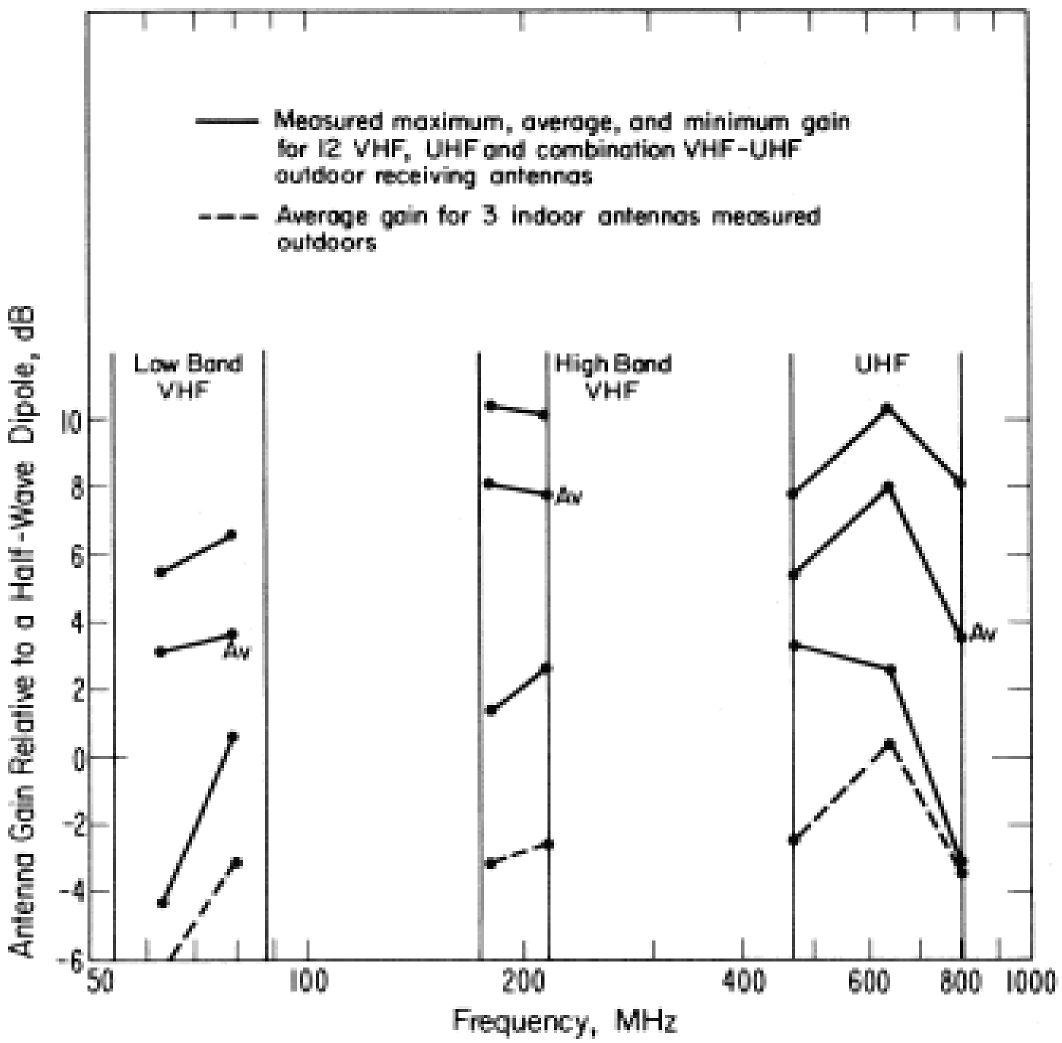

Figure 1 Measured antenna gain from [16]

It is interesting to note that the paper authored by Mr. Stillwell of the FCC in [1] used a substantially lower gain than I elect to use here. I now have established the indoor antenna gain for L-VHF,VHF and UHF shown in bold in Table 3.

Table 3 Antenna gain (dBd)

ref	Environment	Source	L-VHF	VHF	UHF
	outdoor	FCC planning	4	6	10
1	indoor	TV Tech update	-12	-6	
3,4	indoor	H&E	-4.4	-2.8	-3
3	indoor	Est from fig 14	**-4.4**	**-2.8**	**-1**
2	Indoor	NTIA 79-28	-6 to -3	~-3	-3.5 to .5

Now I calculate the loss with respect to the FCC planning gain for the outdoor antennas as shown in Table 4.

Table 4 Antenna gain factor (dB)

	Source	L-VHF	VHF	UHF
Loss rel to FCC planning	NTIA 79-22	8.4	8.8	11

Building Penetration

I next further surveyed available literature to refine my analysis for building penetration loss. I found the average building penetration loss and identified a standard deviation of building penetration and again,conservatively, disregarded the statistics and use of the standard deviation associated with Lognormal large scale distribution and the Rayleigh distribution factor associated with small scale distribution. This forces the building penetration losses to drop dramatically, which of course reduces our confidence in the service provided to the user. I also compiled a list of average (and median where necessary) building loss and building loss with a line of sight (LOS) exposure to transmitter which further reduces losses and which might be the case for rural and occasionally suburban environments. The results are shown in the table 5.

Table 5 Building Penetration Loss

		Mean or Median loss (dB)					
Ref	**Source**	**Environment**	**Polarization**	**L-VHF**	**VHF**	**UHF**	**800-900**
8	Cost 231	Urban LOS 1 wall	V				4
9	NTIA 94-306 fig21	suburban LOS 1 wall	V				2
9	NTIA 94-306 fig 20	suburban LOS all data	V				4
10	NTIA 79-28		H	6.6	6.6	6.6	6.6
11	Mejuto	large buildings	V	24	22	17	14.2
12	Broadcast ref		H		8	7	
13	TV Technology update		H	10	10		
14	DVB-T Field	large building, two sites	H		8.5 to 9.1	6.4 & 7 to 8.5	
	Elected model			9	8	7	

Notably, the FCC in [1] used a constant 10 dB building mean or median penetration loss for L-VHF and VHF to establish some parameters for indoor DTV planning factors. I elected to use the data presented by the Broadcast Engineer's reference book [5], which cites an extensive CEPT measurement campaign[7] for DVB-T.

It is known that building penetration losses increase for L VHF frequencies but this only came out in ref [6] where Mejuto shows more loss for L-VHF in large buildings. Therefore I added a loss of another 1 dB L-VHF [5].

Building variability

All of the references determined a sigma for the building penetration loss but we decided to select the standard deviation associated with the Broadcast Engineers [5] and the paper cited therein [7]. Here, they identified the standard deviation of building penetration loss of 3dB for VHF and 6dB for UHF. In [7] they selected 95% variability as providing good coverage. At 95% the VHF additional building penetration loss is 5dB and for UHF it is 10 dB due to building penetration alone and is calculated as 1.645*sigma. In [7] they also calculate and use an outdoor location factor together with an indoor building penetration loss factor that increase the total standard deviation to 6.3dB and 8.1dB for VHF and UHF respectively.

Total correction factor and weighted average

We now are in position to calculate the total correction for outdoor predictions to "in-building" with an antenna of lower antenna height. In Table 6 I provide the factors for in building signal loss for an antenna only and we see a typical 26dB loss for indoor antennas vs. the outdoor FCC planning factors at 20ft antenna height.

Table 6 Total indoor correction factor (dB)

Factor	**L VHF**	**VHF**	**UHF**
Ant ht 20ft to 10ft	4	4	4
Avg Building loss	9	8	7
Avg ant gain rel to fcc	8.4	8.8	11
Outdoor line loss	1	2	4
Total Avg adjustment	20.4	18.8	18
Sigma inbuilding	**3**	**3**	**6**
Total inbuilding at 95%	**25.3**	**23.7**	**27.9**

I next attempt to make the predictive model reflect the fact that different households use different types of antennas. I do so through the use of a weighted average of antenna types. In April, 2010, CEA released a report called "Accessories Purchasing in the 21st Century,"[19] relevant portions thereof are attached as Appendix A to this report for convenience. According to that survey, 24 percent of respondents reported owning an indoor antenna, while 17 percent reported owning an outdoor antenna. Assuming they are mutually exclusive for simplicity, this would indicate that 58 percent of the universe of antenna owners own an indoor antenna, while 42 percent own an outdoor antenna. The CEA data is further validated by the very similar numbers provided by Channel Master, which similarly suggests a 60/40 % split[20].

The resulting correction factor for a mixture of indoor and outdoor antennas is shown below.

$$Correction = \frac{loss_{outdoor} * \%users_{outdoor}}{100} + \frac{loss_{indoor} * \%users_{indoor}}{100}$$

eq(2)

The $loss_{outdoor}$ =0dB and the $loss_{indoor}$ is from Table 6. So this simplifies to

$$Correction = \frac{loss_{indoor} * \%users_{indoor}}{100}$$

eq(3)

Using the mixture of 58% indoor and 42 % outdoor, the last row in Table 7 gives the weighted average signal loss. I note that if the actual DTV antennas used in planning have gains greater than the low gains in the FCC planning factors the losses will increase by the weighting. Thus, if the antennas have 4dB more gain then the weighted loss will increase by .58*4=2.3dB.

Table 7 Total correction factor (dB)

Factor	**L VHF**	**VHF**	**UHF**
Ant ht 20ft to 10ft	4	4	4
Avg Building loss	9	8	7
Avg ant gain rel to FCC	8.4	8.8	11
Outdoor line loss	1	2	4
Total Avg adjustment	20.4	18.8	18
Sigma inbuilding	**3**	**3**	**6**
Total inbuilding at 95%	25.3	23.7	27.9
Total weighted avg58/42	**14.7**	**13.8**	**16.2**

Clutter, time variability and co-channel/adjacent channel interference

With respect to clutter, time variability and co-channel/adjacent channel interference, I refer the reader to my proposals set forth in my previous submissions.

Measurement method

In my earlier papers we suggested that measurements be conducted inside the residence in the room the DTV receiver was to be used. However this was opposed due to the horizontal maximum length of the calibrated dipole antenna of nearly 9ft and the difficulty of measuring multiple locations. While it should not really be a problem to measure a single point as most residential rooms used to watch a TV surely are larger than 9ft by 9ft I offer an alternative solution.

First, for those households actually equipped with an outdoor antenna, the test should simply be conducted using that antenna.

Second, for households without an outdoor antenna, I abandon the requirement for a calibrated dipole because of the high cost, large size and conversion factor to an indoor antenna but we allow that a calibrated dipole can be used if available. I believe that using a true indoor antenna will address these issues directly and economically. Moreover the simplicity of design of a rabbit ear dipole for L-VHF and VHF and a loop antenna for UHF will allow the use of most of these structures for measurement. The selection of a single loop UHF antenna will provide the greatest bandwidth for UHF, is typical for indoor antennas and has a reasonable typical size of 7.5 inches in circumference. It is left to a reputable and unbiased measurement team to select the antennas for use and they preferably are the same antennas the user will install.

The L-VHF,VHF rabbit ear shall be deployed with the arms horizontal to the ground. The arms will then be approximately tuned to the channel measured by adjusting the length of each arm according to the table below. The table sets the length of each arm as 91% of that in free space, while some of the literature uses 95%. This discrepancy should make little difference; it should be permitted for the technician to adjust this from 100% to 90% as desired to maximize the signal. In the event the arms cannot be extended to the correct length then they will be set at a maximum or minimum length as necessary. The line formed by elements should be oriented perpendicular to the direction of the desired transmitter. The face of the UHF loop should be oriented parallel to the ground. This is because the testing antenna is an H field antenna not an E field antenna so the H field is vertical from the ground for the horizontally polarized E field.

Table 8 L-VHF, VHF Individual Arm length

TV channel	Arm length (in)
2	47.1
3	42.6
4	38.9
5	34.0
6	31.6
7	15.2
8	14.7
9	14.2
10	13.8
11	13.4
12	13.0
13	12.6

Next I set the height of the antenna at 10ft above ground level on a non conductive surface. One possibility is to set it on top of a 10ft fiberglass ladder with the proper arm length for VHF and orientation for both VHF and UHF. Of course, any other device for setting the length can be used if it is non conductive. I note that a calibrated dipole can also be used but in this case correction factors will have to be applied.

Location for buildings with non-metallic walls

The location of the measurements to be taken must also be identified. The measurement should be done outside the building outer wall facing the direction of the transmitter to be measured. This means that for some transmitters a different outer wall may have to be selected. Then measurements along the outer wall should be measured at 3 meter separation as possible. If only one measurement is possible then that will have to suffice. I suggest a distance of 4.5ft away from the outer wall and adjacent structures to minimize physical interference between the wall and the antenna, but this distance is not critical. The median signal level is then calculated per transmitter frequency (channel).

This method may not be a perfect indicator of signal quality because it does not address multipath in any meaningful way. Ignoring multipath interference may yield an overly optimistic result, favoring the Broadcasters.

Location for buildings with metallic walls

Houses and buildings that have metallic walls require special consideration because the metal walls cause reflections and so the wall becomes part of the measurement antenna. These buildings include aluminum sided and steel structures. The position is illustrated in Figure 2.

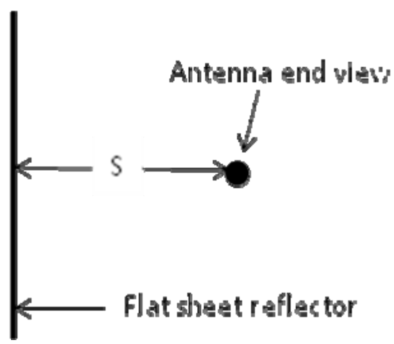

Figure 2: Antenna position

We use the equation for the field gain G described in [8] as below.

$$G = 2K\left|\sin S_r\right| \qquad \text{eq(2)}$$

Where K is a constant dependent upon the antenna losses and with normal values is approximately equal to 1. And the field gain G is in the direction orthogonal to the plane of the wall and the dipole “V”.

$$S_r = 2\pi\frac{S}{\lambda} \qquad \text{eq(3)}$$

S= Spacing between the metallic wall and the antenna.

λ is the wavelength.

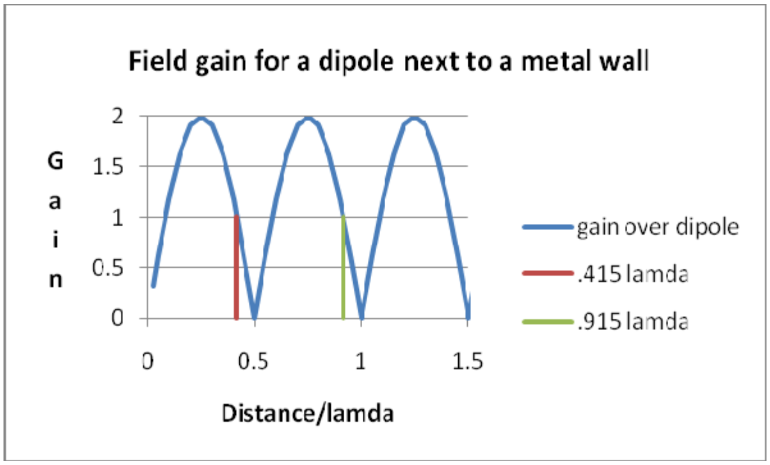

Figure 3: Field Gain

The goal is to place the antenna at a position from the metal wall so the reflection neither adds nor subtracts from the antenna gain. This is achieved if the antenna is placed at .415 wavelengths or .415 and an integer multiple of half wavelengths from that as seen in figure 3. Next I generate a table for the position of the antenna vs. TV channel number. The blue highlighted distances are distances that seem practical.

Table 9: Antenna distance from metal wall in feet

TV channel	0.415 lamda	plus 1/2 lamda	plus 2 lamda
2	7.2	15.5	
3	6.5	14.0	
4	5.9	12.8	
5	5.2	11.2	
6	4.8	10.4	
7	2.3	5.0	
8	2.2	4.8	
9	2.2	4.7	
10	2.1	4.5	
11	2.0	4.4	
12	2.0	4.3	
13	1.9	4.2	
14	0.9	1.9	5.0
15	0.9	1.8	4.9
16	0.8	1.8	4.9
17	0.8	1.8	4.8
18	0.8	1.8	4.7
19	0.8	1.8	4.7

20	0.8	1.7	4.6
21	0.8	1.7	4.6
22	0.8	1.7	4.5
23	0.8	1.7	4.5
24	0.8	1.7	4.4
25	0.8	1.6	4.4
26	0.7	1.6	4.3
27	0.7	1.6	4.3
28	0.7	1.6	4.2
29	0.7	1.6	4.2
30	0.7	1.6	4.1
31	0.7	1.5	4.1
32	0.7	1.5	4.1
33	0.7	1.5	4.0
34	0.7	1.5	4.0
35	0.7	1.5	3.9
36	0.7	1.5	3.9
37	0.7	1.4	3.9
38	0.7	1.4	3.8
39	0.7	1.4	3.8
40	0.6	1.4	3.8
41	0.6	1.4	3.7
42	0.6	1.4	3.7
43	0.6	1.4	3.6
44	0.6	1.4	3.6
45	0.6	1.3	3.6
46	0.6	1.3	3.5
47	0.6	1.3	3.5
48	0.6	1.3	3.5
49	0.6	1.3	3.5
50	0.6	1.3	3.4
51	0.6	1.3	3.4

Procedure

The measurement should be done outside the building outer wall facing the direction of the area's primary transmitter antenna location. Then measurements along the outer wall should be measured at 3 meter separation as possible in an attempt to get 5 measurements. If only one is possible then that will have to suffice. Each transmitter (channel) shall be measured and the median determined separately for that transmitter.

1. Orient the measurement antenna in the direction of the first station to be measured, and record the field strength for all stations.
2. Move the measurement antenna to the next position along the outer wall and repeat step 1. Do this all along the outer wall and attempt to get 5 measurements if possible.

Once the values are obtained they are translated to the indoor value by adding the building loss from table 5. They will also be adjusted downward to account for the conversion to 50% time reliability to 90% as by using the correction factor as determined below taken from H&E[4].

$$Adjustment_{factor} = F(50,50) - F(50,90)\frac{dBuV}{m}$$

Using the procedure in 47 CFR 625(b)

$$Adjustment_{factor} = \frac{(F(50,10) - F(50,50))dBuV}{m}$$

As

$$F(50,90) = F(50,50) - Adjustment_{factor}$$

This factor is always<= 0dBuV/m and moves the measured F(50,50) signal lower.

Note if a calibrated dipole is used then measured signal is converted to an indoor antenna using the indoor gain values below.

Table 10 Indoor antenna gain

L-VHF	VHF	UHF
-4.4(dBd)	-2.8(dBd)	-1(dBd)

Certification

The tester conducting the measurement will certify that the household either has or does not have an outdoor antenna.

References.

[1] A. Stillwell, “TV Technology Update,” National Translator Association Convention, FCC/Office of Engineering and Technology, May2010, slide 12.

http://www.tvfmtranslators.com/PastPapers/2010%20PAPERS/FCC%20OET%20-%20Alan%20Stillwell%20Presentation%202010.pdf

[2] R.G.FitsGerrel,”Indoor Television Antenna Performance,” NTIA Report-79-28,Oct 1979,fig 5.

[3] FitzGerrel, R.G.et al.,"Television Receiving Antenna System Component Measurements," NTIA Report 79-22,June 1979,fig 14.

[4] R.Weller, “Statement of Hammett & Edison,” Inc., Hammett & Edison, Inc., wrt Notice of Proposed Rulemaking FCC 06-51,August 7,2006,E,pg. 6.

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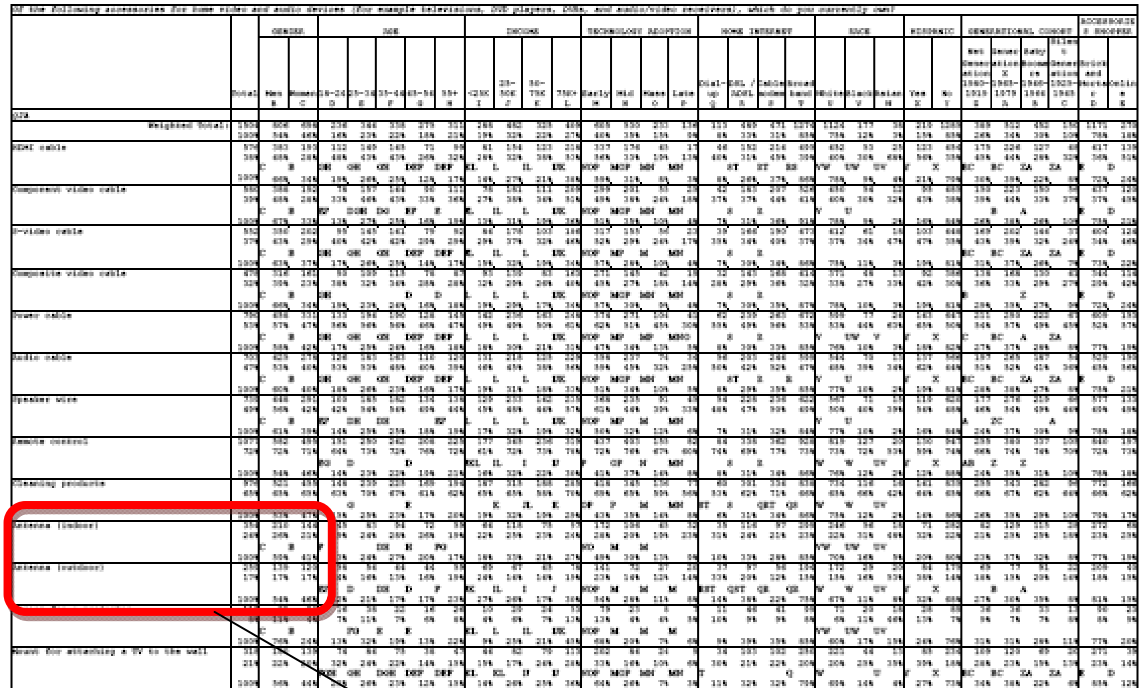
http://spmembers.ce.org/Research/ResearchStudies/USResearch/Lists/Consumer%20Research%20Studies/Attachments/377/Data%20-%20Accessories%20Purchasing%20in%20the%2021st%20Century%20-%20CRS375.pdf

[20] Private email communication from Channel Master

Appendix A. CEA antenna data



	Total		Men	Women	
	100%		53%	47%	
Antenna (indoor)	354		210	144	
	24%		26%	21%	
		C	B		F
	100%		59%	41%	
Antenna (outdoor)	259		139	120	
	17%		17%	17%	
					E
	100%		54%	46%	

DECLARATION

I, Christopher Kurby, declare that I have prepared the engineering analysis contained in the foregoing Declaration using facts of which I have personal knowledge or upon information provided to me. I declare under penalty of perjury that the foregoing is true and correct to the best of my information, knowledge and belief.

Executed on November 3, 2010.

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Christopher Kurby, MEM, MEE, BSEE