NAB TV TechCheck

The Weekly NAB Newsletter for Television Broadcast Engineers

May 19, 2008

Consumer Indoor Antenna Test Results Reported at the NAB Broadcast Engineering Conference

On Monday, April 14, during the "DTV Reception Issues" session which was part of the NAB Broadcast Engineering Conference (BEC), Dennis Wallace of Meintel, Sgrignoli, & Wallace gave a presentation describing the testing that they performed on consumer indoor antennas. One objective of the testing was to develop indoor "planning factors" based on the measured capabilities of the products currently in the marketplace. The facilities at Electronics Research, Inc. (ERI) were used for the tests.

As background, the presentation noted that indoor antennas will be important for consumers in the DTV transition. The tests were to determine the types and numbers of indoor antennas and to assess their performance specifications versus measured performance and then based on this data, suggest the antenna assumptions that might be used for indoor reception/propagation models.

Their research (in 2007) indicated over 107 available models:

- 8 VHF Only Models
- 10 UHF Only Models
- 89 VHF/UHF Models
- 64 Antennas with no electronic components (passive)
- 43 Antennas had pre-amplifiers (active)
- No "Smart" Antennas were found (it was reported that some are in development to use the CEA 909 interface).

The investigation revealed that there was very little published performance data on the antennas; rather they found lots of marketing hyperbole about "Digital" or "HDTV" Antennas; "Low Noise", "High Gain" and such. Further, there was little measured data available. The presentation showed each antenna with the available published data.

Measurement of a selected sub-set of these antennas was undertaken using ERI's Anechoic Chamber. Ten antennas were selected, a mix of five active antennas and five passive antennas. The measurements made included:

- Gain of Antenna Relative to Dipole
- Azimuth Pattern
- Elevation Pattern
- Polarization Isolation
- Output Return Loss
- Active Antenna Gain/Loss
- Active Antenna Noise Figure

The presentation included the measured patterns for each antenna (not shown here) and summary tabular data, some of which is shown below.

The measured passive antenna gains (dBd) for selected channels are shown in the following table.

Antenna	Claimed Bands	Ch. 7	Ch. 14	Ch. 33	Ch. 51
ANT 115 RCA	All	-5.2	-2.7	-6.2	-0.8
Silver Sensor Philips	UHF	-25	3.1	2.4	3.0
SS1000 Winegard	Hi-VHF, UHF	-20.4	2.5	6.0	2.7
DB-2 Antennas Direct	UHF	-14.1	6.4	7.3	5.7
303F Terrestrial Digital	UHF	-18.2	-1.4	-1.3	4.7

The measured active antenna gains (dBd) for selected channels are shown in the following table.

Antenna	Claimed Bands	Ch. 7	Ch. 14	Ch. 33	Ch. 51
ANT 585 RCA	All	13.4	11.7	21.0	15.6
MANT 940 Philips	UHF	7.2	16.4	18.1	20.5
SS2000 Winegard	Hi-VHF, UHF	-10.5	12.3	15.8	14.6
TV25 Terk	All	24.3	12.4	13.7	12.6
SS3000/HDTVIp Winegard/Terk	All	-3.8	13.3	15.4	13.6

Each of the five active indoor antennas was evaluated for preamplifier performance. Selected results are shown in the following table.

Antenna	Gain dB	Noise Figure dB
ANT 585	21.5	3.1
MANT 940	20.9	3.6
SS2000	8.8	4.6
TV 25	21.5	3.9
SS3000	8.6	4.7

Mr. Wallace offered the following conclusions:

> Some antennas have very well behaved directional UHF patterns as exemplified by the Silver Sensor, SS1000, SS2000, DB2, and SS3000/HDTVIp. They typically had good Front/Back ratio (>10dB) and polarization Isolation 6-10dB. The Sharpshooter behaved well at Hi-VHF frequencies as well.

Hi-VHF Performance for the UHF Only Antennas was generally poor and variable. For example, the Silver Sensor Hi-VHF reception was 90 degrees from “front” of antenna. Other antennas were “Quasi-Omni-

directional" (ANT115, ANT585, MANT940, TV25, 303F) with broad patterns for azimuth and poorer polarization isolation. Some of these had greater gain in vertical orientation.

Active antennas generally had better return loss and would provide impedance mismatch isolation to the receiver.

Generalizing from the results these antennas suggest are appropriate, the following preliminary planning factors were among those suggested.

Parameter	Hi-VHF Passive	UHF Passive	Hi-VHF Active	UHF Active
Net Gain	-5 dBd	+3 dBd	+11 dBd	+14 dBd
Pre Amp Gain	NA	NA	+20 dB	+17 dB
Pre Amp NF	NA	NA	3.5	4.0
Return Loss	3 dB	6 dB	10 dB	10 dB

The presentation is part of the BEC audio recordings which can be purchased through the NAB Store online at http://www.nabstore.com/audio-products.html. Several sessions are also available for free at NAB365: http://nab365.bdmetrics.com/SPC-8-11044/2008-NAB-Show-Audio-Recordings.aspx.

JUST A FEW SPACES LEFT FOR NAB'S JUNE SATELLITE UPLINK OPERATORS TRAINING SEMINAR

Whether you are a satellite uplink operator, engineer or even a technical manager who just wishes to become more familiar with satellite communications, NAB's Satellite Uplink Operators Training Course is for you. This four-day course is designed to instruct students in the proper technical and operational practices that will ensure safe, successful and interference free satellite transmissions. The course will be offered June 2-5, 2008 in at NAB's headquarters in Washington DC. For more information call Cheryl Coleridge at (202) 429-5346 or go to NAB Satellite Uplink Operators Seminar.

***TV TechCheck* will not be published on May 26 but will return on June 2.**