



FM Digital Power Increase Shown to Improve Indoor Reception

Testing done by CBS Radio has shown that increasing the digital power of an FM IBOC signal by 10 dB significantly improves indoor HD Radio reception. This study was done in conjunction with the digital coverage and analog interference study done by iBiquity on the impact of an FM digital power increase (see the [June 16, 2008 issue](#) of *Radio TechCheck* for information on the iBiquity test program).

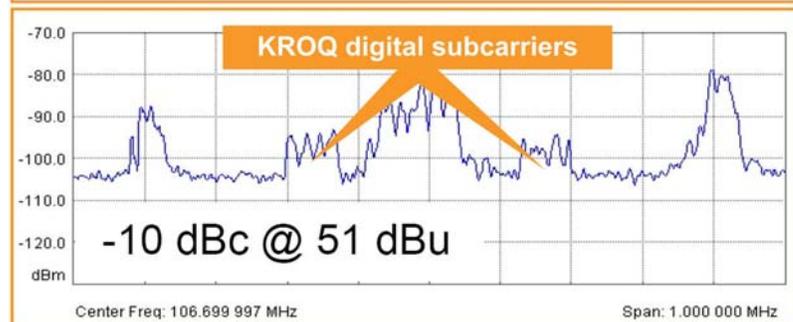
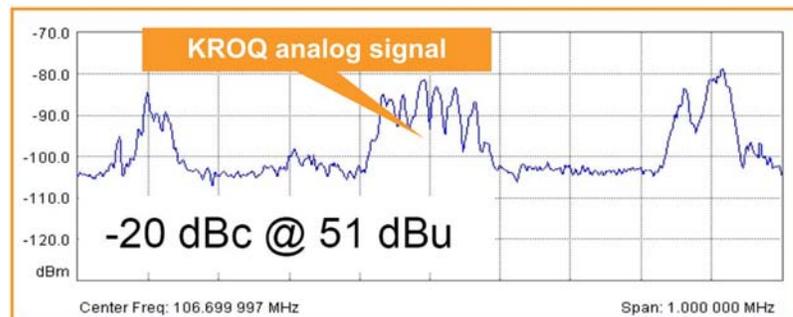
Together, the results from these studies offer compelling evidence that the FM digital power increase proposed by a group of broadcasters and equipment manufacturers, and recently put out on Public Notice by the FCC, would provide significantly improved digital radio coverage and not meaningfully increase potential interference to analog. The CBS Radio indoor reception study was reported on at the 2008 NAB Broadcast Engineering Conference in April of this year, and in addition was submitted into the FCC's terrestrial digital radio proceeding (Media Bureau Docket No. 99-325) on June 10, 2008.

Station KROQ-FM, a Class B FM commercial radio station operating on 106.7 MHz in Pasadena, CA, was used for these indoor reception tests, operating under an Experimental Authorization from the FCC. A "common amplification" IBOC configuration is used at KROQ, and the transmitter is connected to a 3-bay antenna, generating 5.6 kW of analog effective radiated power (ERP) and a digital ERP of either 56 W at -20 dBc (nominal IBOC operation), or 560 W at -10 dBc (operation with proposed 10 dB power increase).

Ten test structures were selected so as to provide a variety of construction types and usage (see table). At each site the following test procedure was followed:

- Receive antenna was placed outside the structure at a point where visual observation indicated that the signal was being received with minimal multipath. Spectrum analyzer data and signal level was then recorded to establish the unattenuated RF signal level for this site;
- The antenna, HD Radio receiver and spectrum analyzer were moved to an indoor location near a window where an attempt was made to receive the digital signal with the sidebands at -20 dBc. Analyzer data and signal level were recorded at this point (the "window location");
- Measurements were made at a more interior point within the building in an attempt to determine where the (-20 dBc) digital signal failed (point-of-failure or POF);
- The digital power at the transmitter was increased to -10 dBc and the antenna was then moved further into the interior of the building to establish the new POF.

Some example spectrum analyzer plots obtained during these tests are shown in the figures. These plots were taken at test site #6 (Hollywood Highland entertainment complex). At this site, the digital signal was lost as soon as the test setup was brought inside (upper plot), and the analog reception was found to be poor. When the digital signal power was increased to -10 dBc (lower plot), there was good digital reception,



however the analog reception was still poor since increasing the digital signal power does not change the quality or reception of the analog signal.

The results from these tests are summarized in the table. In 75% of the buildings tested the analog reception was described as nonexistent, noisy or poor and there was no digital reception when the digital power level was at -20 dBc. With the digital power level elevated to -10 dBc, the digital radio signal could be received reliably in 75% of the buildings and at selected locations in the remaining 25% of the buildings. For the parking

No.	Site	Dwelling type	Distance from TX (mi)	Reception		
				Analog	IBOC @ -20 dBc	IBOC @ -10 dBc
1	KROQ studios	Concrete block	12.6	Noisy	None	Solid
2	801 Tower	Concrete block	9.2	Fair	Intermittent	Solid
3	Long Beach apts.	Concrete & steel	28.5	Poor	None	Intermittent
4	CBS Radio HQ	Wood frame stucco	10.8	None	None	Solid
5	SBS office bldg.	Concrete & steel	10.7	None	None	Solid
6	Hollywood Highland	Concrete & steel	8.1	Poor	None	Solid
7	San Pedro Residence	Concrete & steel	33.4	Poor	None	Intermittent
8	Toluca Lake apts.	Wood frame stucco	6.6	Good	Solid	Solid
9	Studio City Parking Garage	Concrete & steel	7.7	<i>Point of failure tests only</i>		
10	Ralph's Parking Garage	Concrete & steel	3.4	<i>Point of failure tests only</i>		

garage tests, the distance within the structure for which the digital signal was receivable increased from 30 feet (with -20 dBc) to 165 feet (with -10 dBc) for site #10; for site #9, the digital signal at -20 dBc failed at the bottom of the entrance ramp to the garage, but was receivable throughout the parking structure when the digital power was increased to -10 dBc.

A copy of the CBS Radio test report (entitled “FM IBOC Building Penetration Tests at Elevated Carrier Levels”), as well as a copy of the iBiquity digital coverage and analog interference study, can be downloaded from the iBiquity Web page at: www.ibiquity.com/i/pdfs/10db%20HD%20Radio%20Increase.zip.

Broadcasters interested in filing comments in response to the FCC’s Public Notice on the proposed FM digital power increase may obtain a copy of the Public Notice from the FCC’s Web site at: http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-08-2340A1.pdf. Comments are due on November 28, 2008 and replies are due on January 4, 2009. Comments and replies may be filed electronically by accessing the Electronic Comment Filing System (ECFS) at www.fcc.gov/cgb/ecfs/. Filers should follow the instructions provided on the Web site for submitting comments, and should include their full name, U.S. Postal service mailing address, and the applicable docket number: MM Docket No. 99-325. Parties may also submit an electronic comment by email—to get filing instructions, send an e-mail to ecfs@fcc.gov, and include the words “get form” in the body of the message. A sample form and instructions will be sent in response.

The FCC Adopted Computer Modeling for AM Antenna Proof of Performance on September 24, 2008



Attend NAB’s AM Antenna Computer Modeling Seminar and Learn How It’s Done

Computer modeling for AM Antenna proof of performance was adopted by the FCC on September 24. To learn the basics needed to utilize modeling software, such as MININEC and nodal analysis – used for designing performance-optimized AM directional antenna phasing and coupling systems and proving the performance of directional antenna patterns — plan on attending NAB’s AM Antenna Computer Modeling Seminar in Washington, D.C. November 20 and 21.

You will learn about:

- Moment Method Modeling Basics
- DA Proofing Using Moment Method Modeling
- Overcoming Limitations of Using Field Strength Measurements for DA Proofs
- State of the Art in Phasing System Design Nodal Analysis of AM DA Phasing and Coupling Systems
- Pattern Design Considerations for Optimum Performance

AM antenna experts Ron Rackley and Ben Dawson, along with antenna modeling software specialist Jerry Westberg, will lead the seminar demonstrating how moment method modeling makes analysis of actual tower current distributions possible and how a model can be used to proof an array provided the proper criteria are considered. All instructors are well known in the radio industry as experts in the field of directional antenna design and maintenance. Their decades of experience offer station engineers an opportunity to learn techniques, tips and tricks that can be immediately useful.

Seminar fee: \$395.00 (NAB members) and \$495.00 (non-members). For more information on the curriculum, how to register or housing go to [AM DA Seminar](#) on the NAB Web site or call Sharon Devine at (202)-429-5338. Register now for the NAB AM Antenna Computer Modeling Seminar!

