



## iBiquity Submits Report on “High Power” FM IBOC to FCC

There has been considerable discussion recently within the radio broadcasting industry about the possibility of increasing the power of the digital sidebands in a hybrid FM IBOC signal, so as to improve the IBOC signal’s coverage and to provide for improved building penetration. Last week, iBiquity Digital Corporation (Columbia, MD, [www.ibiquity.com](http://www.ibiquity.com)) submitted a comprehensive study to the FCC, detailing their investigation of so-called “high power” FM IBOC operation and concluding that raising the power of the digital portion of the hybrid FM IBOC signal by 10 dB, from the current level of -20 dB below the analog carrier (i.e., -20 dBc) to -10 dBc, will significantly improve digital coverage and not “meaningfully increase” potential interference to analog.

The iBiquity test program consisted of two principal parts. The first part focused on establishing the extent of the digital coverage improvement with the 10 dB increase in digital power. To determine this, coverage measurements were made for seven radio stations (see first table) operating at -20 dBc (digital signal power) and then at -10 dBc, and the results were compared.

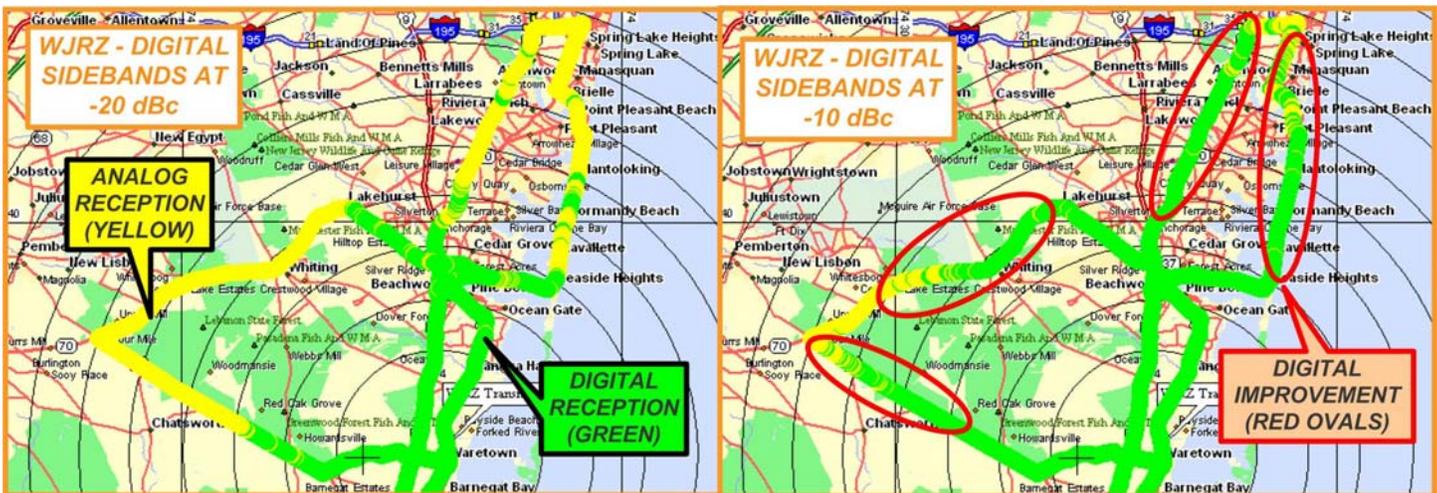
CALL SIGN /FREQ (MHz)	LOCATION	HAAT (ft)	ERP, kW			AVERAGE INCREASE IN COVERAGE AREA
			ANALOG	-20 dBc	-10 dBc	
WCSX / 94.7	Detroit, MI	950	13.5	0.135	1.35	74%
WKCI / 101.3	New Haven, CT	909 / 833	12.0	0.09	0.90	62%
KOST / 103.5	Los Angeles, CA	3,148 / 2,849	12.5	0.042	0.42	58%
KROQ / 106.7	Los Angeles, CA	759	6.5	0.065	0.65	29%
WDHA / 105.5	Dover, NJ	581 / 568	1.0	0.01	0.10	28%
WJRZ / 100.1	Manahawkin, NJ	455	1.7	0.017	0.17	105%
WRAT / 95.9	Point Pleasant, NJ	264	4.0	0.04	0.40	67%

Note that in the table, stations with two numbers listed for Height

Above Average Terrain (HAAT) use a dual-antenna IBOC configuration. The stations used in this study were located in three different areas of the country and represent a variety of RF environments:

- *NY/NJ/Connecticut/Rhode Island* – varied terrain (rolling hills, water, etc.), multipath interference and closely spaced stations;
- *Detroit* – flat terrain and extensive analog coverage;
- *Los Angeles/San Diego/Santa Barbara* – terrain obstructions and high power analog operations.

For all cases, the increased digital power level significantly improved digital coverage (see first table). The maps below show the extent of the improvement for one portion of the WJRZ listening area. The green and yellow paths in the maps represent the test routes that the iBiquity test vehicle drove along, with yellow indicating analog reception and green indicating digital reception. The left and right maps



are for the cases with -20 dBc and -10 dBc digital signal power, respectively, with the improvement areas highlighted with red ovals in the right map.

In the second part of the study, analog audio was recorded from stations 1st-adjacent to IBOC stations, operating first with -20 dBc digital signal power, then with -10 dBc.

Four specific scenarios were tested and are shown in the second table, where “short spaced” refers to the situation where the two stations (the IBOC and 1st-adjacent channel analog) are spaced more closely than

CONDITION	DESIRED (ANALOG)	INTERFERER (1st-adj DIGITAL)
“B” to “B”	WWBB (Providence) and WCBS (New York)	WKCI (New Haven)
“B” to “B” short spaced	WXKR (Port Clinton, OH)	WCSX (Detroit)
“Super B” to “B”	KSCF (San Diego)	KOST (Los Angeles)
“Super B” to “Super B”	KVYB (Santa Barbara)	KOST (Los Angeles)

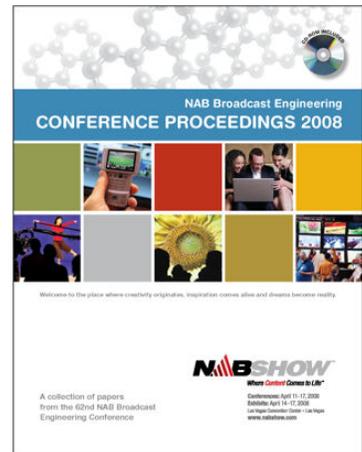
current FCC allocation rules would allow. For each situation, audio recordings were made using six commercially available radio receivers: home hi-fi (1), tabletop (2), automotive OEM (1) and automotive aftermarket (2).

These recordings were sent to Salisbury University (Salisbury, MD, [www.salisbury.edu](http://www.salisbury.edu)) for formal subjective evaluation using general population listeners. Based on this analysis, iBiquity concluded that “...in the vast majority of circumstances, the increase in digital power will not result in a meaningful increase in the potential for harmful digital to analog interference.” They further suggest that any actual interference that may occur as a result of an increase in power can be addressed by the stations or the FCC on a case-by-case basis.

The iBiquity report is entitled “Compatibility and Performance Tests at Elevated FM Digital Power Levels” and includes four appendices: a detailed test procedure, detailed system performance results, a subjective evaluation report by Dr. Ellyn Sheffield et.al. of Salisbury University, and information on class B and super B stations, including an analysis of the number of short-spaced B-to-B stations and the level of severity of the short spacing. All of these documents can be obtained by going to the FCC’s Electronic Comment Filing System (ECFS) Web page ([http://gulfoss2.fcc.gov/prod/ecfs/comsrch\\_v2.cgi](http://gulfoss2.fcc.gov/prod/ecfs/comsrch_v2.cgi)) and entering “99-325” into BOX 1 on this page, then clicking on “Retrieve Document List” at the bottom of the page. On the resulting page, look for the 116 page report filed on behalf of iBiquity Digital Corporation on 6/10/08 (the report is contained in six separate documents).

Additional information on operation of hybrid FM IBOC at elevated digital power levels is available in technical papers presented at the 2008 NAB Broadcast Engineering Conference (BEC) this past April in Las Vegas, NV:

- *FM IBOC Building Penetration Tests at Elevated Digital Subcarrier Levels* by E. Glynn Walden, Senior VP of Engineering with CBS Radio, discusses tests conducted by CBS Radio on HD Radio signal building penetration in the Los Angeles radio market. Ten buildings were tested, differing in construction type and usage. These buildings ranged from a residential dwelling to an office building in downtown Los Angeles;
- *Implications of IBOC Injection Levels above -20dB* by Gary Liebisch, Regional Sales Manager, Nautel, offers an assessment of the impact of higher IBOC injection on the broadcast signal. The implications of changing existing broadcast infrastructure and an update on new installation recommendations are considered, and information is provided on transmitter performance along with possibilities for performance enhancement through peak-to-average ratio reduction, precorrection and combining techniques.



These papers are included in the 2008 BEC Proceedings which are available online from the NAB Store at [www.nabstore.com/20brencopr.html](http://www.nabstore.com/20brencopr.html).



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