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Radio TechCheck



The Weekly NAB Newsletter for Radio Broadcast Engineers

New Report on Lab Testing of FM IBOC with Asymmetric Sidebands



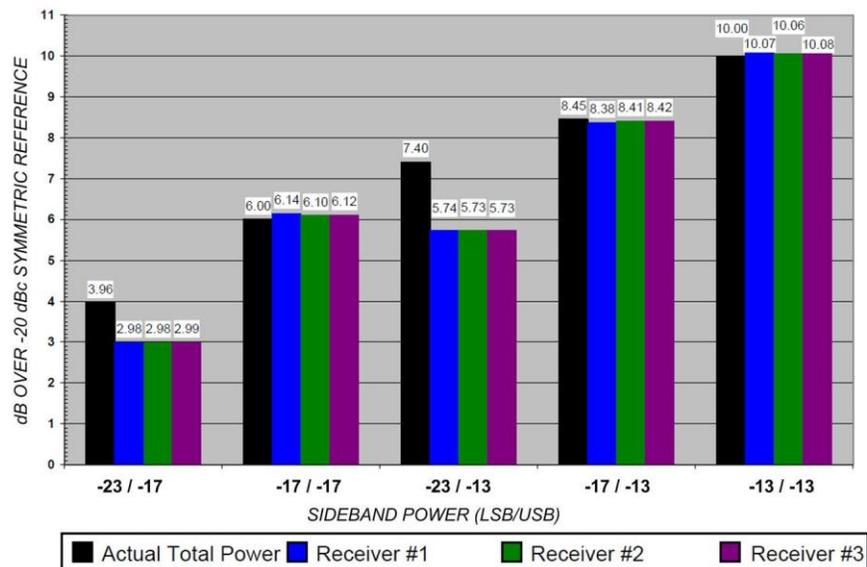
FM broadcasters using the HD Radio digital radio system have, since early 2010, been allowed to increase the power in the digital sidebands of their IBOC signals by 6 to 10 dB, resulting in a much improved coverage area, better signal penetration into buildings, better multicast channel reception and enhanced performance into portable consumer devices. For some stations, the amount of power increase allowed is limited by the presence of a close upper- or lower-first adjacent signal, and in these cases it would be helpful if broadcasters were allowed to operate the upper and lower digital sidebands at different (unequal) power levels (currently, FCC rules require equal-power sidebands).

There have been a number of technical studies conducted on so-called asymmetric sideband technology, and last month [a report was released](#) on a laboratory test effort conducted by iBiquity Digital Corporation with funding provided by the NAB FASTROAD technology advocacy program (see the [February 28, 2011 issue](#) of *Radio TechCheck* for information on an earlier companion field test report). This latest report was also submitted to the FCC by iBiquity in December 2011 along with comments on an [FCC Public Notice](#) proposing to authorize use of asymmetric sideband technology.

In the lab test report, iBiquity discusses the improvements in the peak-to-average power ratio reduction (PAPR) algorithms needed to implement the asymmetric sideband waveform, and then summarizes the results of a laboratory evaluation of the expected improvement in digital signal-to-noise ratio (SNR) that may be realized by FM stations using asymmetric sidebands. The laboratory tests were performed using three typical automotive HD Radio receivers, each with a different HD Radio chipset (either the ST Micro STA-680, the NXP SAF 3560 or the Texas Instruments Jacinto).

Description (dBc corresponding to total digital power)	LSB Power (dBc)	USB Power (dBc)	Asymmetry (dB)	Increased Total Digital Power Above Legacy (dB)
LSB equiv. to -20 dBc, USB equiv. to -14 dBc	-23	-17	6	3.96
-14 dBc symmetric sideband case	-17	-17	0	6.00
LSB equiv. to -20 dBc, USB equiv. to -10 dBc	-23	-13	10	7.40
LSB equiv. to -14 dBc, USB equiv. to -10 dBc	-17	-13	4	8.45
-10 dBc symmetric sideband case	-13	-13	0	10.00

Briefly, these tests established the bit error rate (BER) performance of the receivers under test as a function of digital SNR for various digital sideband configurations, both symmetric and asymmetric. Shown in the table is the increase in total digital power for various sideband configurations compared to the legacy configuration (equal power sidebands, total digital power of -20 dBc). Ideally, the improvement in digital SNR should track this increase in digital power so that, for example, in the case where the LSB and USB powers are set to -23 and -17 dBc, respectively (first row in table), and the total increased digital power is 3.96 dB, the expected improvement in digital SNR would also be 3.96 dB.



An example of the lab test results is shown in the figure, for a case where there is no interfering adjacent channel present. Each group of columns in the figure corresponds to one of the configurations shown in the table. The measured values indicate the improvement in digital SNR (in dB above the -20 dBc symmetric reference case) at which a BER of 5×10^{-5} was achieved.

Note that in the symmetric cases (-17/-17 and -13/-13), the expected performance (black columns) and the observed performance is virtually identical, as is also true for the case with a 4 dB asymmetry (-17/-13).

However, the cases with greater asymmetry demonstrate a shortfall over the expected performance. For the first case (-23 /-17), the expected digital SNR improvement is 3.96 dB, however the measured improvement for each receiver was only about 3 dB (a 1 dB shortfall), and similarly for the third case (-23 / -13) where a 2 dB shortfall is measured. iBiquity believes that this shortfall is due to coding losses that are brought about by the extreme asymmetry in these received signals.

The full text of this report and information on the NAB FASTROAD technology advocacy program are available at www.nabfastroad.org. Inquiries on these results are encouraged – please contact NAB Technology Senior Director, Advanced Engineering David Layer at dlayer@nab.org. NAB's filed comments with the FCC on the asymmetric sideband public notice are available [here](#).

NAB Accepting Nominations for 2012 NAB Engineering Achievement Awards

NAB is currently accepting nominations for the 2012 NAB Engineering Achievement Awards. Established in 1959, the NAB Engineering Achievement Awards are presented each year to individuals for their outstanding accomplishments in the broadcast industry. In 1991, NAB began giving awards separately for achievements in radio and television. The award winners will be recognized at the Technology Luncheon at 2012 NAB Show on April 18 in Las Vegas, Nev.

Additional information and a nomination form are available on NAB's [website](#). The deadline for nominations is January 23, 2012.



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