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NRSC-G201 RF Mask Compliance Measurement Guideline Adopted

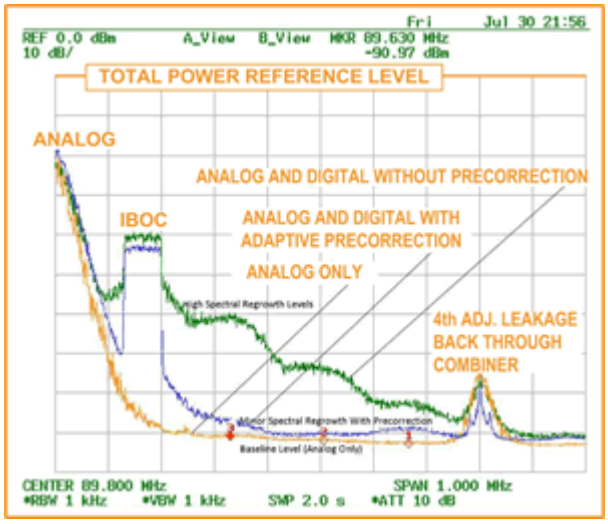
Nearly two years of work came to fruition at the National Radio Systems Committee (NRSC) DRB Subcommittee meeting, held last Saturday, April 18, 2009 in Las Vegas, NV (in conjunction with the 2009 NAB Show, www.nabshow.com), when the Subcommittee adopted an important NRSC Guideline document dealing with measurement of RF mask compliance for AM and FM in-band/on-channel (IBOC) digital radio signals.

NRSC-G201, *NRSC-5 RF Mask Compliance: Measurement Methods and Practice*, was adopted by the Digital Radio Broadcasting (DRB) Subcommittee which is co-chaired by Andy Laird, Vice President and Chief Technology Officer, Journal Broadcast Group, and Mike Bergman, Vice President, New Digital Technologies, Kenwood USA. It was developed by the Subcommittee's IBOC Standards Development Working Group (ISDWG) which is chaired by Dom Bordonaro, Chief Engineer, Cox Radio, Connecticut. The ISDWG also the group responsible for development and subsequent modification of the NRSC-5 IBOC Digital Radio Broadcasting Standard.

The idea for developing this Guideline arose from the ISDWG's work on developing the "B" version of the NRSC-5 IBOC Standard. The group recognized that, given the variety of IBOC transmission facility configurations as well as the need to characterize IBOC RF signals by both equipment manufacturers (during construction and testing of IBOC transmission equipment) and broadcasters, various methods must be utilized to determine compliance with the RF masks specified by NRSC-5. The purpose of the Guideline is to provide background information as well as detailed instructions on the best methods and practices for determining compliance, for both hybrid AM and hybrid FM IBOC, for the situations most likely to be encountered.

Some of the topics covered in this new NRSC Guideline, which is nearly 100 pages in length, include the following:

- *Modulating signals and compliance measurement (Section 4.2 – FM IBOC)* – the signal(s) used for modulating the analog portion of the HD Radio hybrid FM IBOC signal can introduce variance in RF mask compliance measurement results. Since the shape of the PSD envelope of the analog portion of the hybrid signal is determined by the modulating signals applied to the analog carrier, a test signal is recommended which results in repeatable measurements, thereby eliminating variances due to the modulation. The recommended test signal has been found to be more "demanding" against the mask (by about 2 dB) than using "pink" noise or program audio.



- *Troubleshooting (Section 4.7 – FM IBOC)* – intermodulation products, generally caused by amplification problems, result in widened "shoulders" of the digital OFDM subcarrier sidebands and in "spectral regrowth" that appears as "beehive" bumps of energy out of the station's occupied bandwidth (see spectrum plot). Suggestions on how to evaluate these types of problems are provided.

- *AM IBOC mask compliance procedures (Section 5.2.5)* – this section addresses use of both the 47 CFR §73.44 analog peak mask ("legacy mask") and the NRSC-5 hybrid AM IBOC PSD masks when doing AM IBOC mask compliance measurements. A three-step procedure is described involving a legacy analog mask measurement, an analog-sideband-to-digital overlap measurement, and a full hybrid IBOC measurement.

- *Measurement methodology – spectrum analyzers (Section 6.1)* – detailed information on the use and operation of spectrum analyzers for purposes of performing IBOC RF mask compliance measurements is provided, including information on input levels, dynamic range, resolution bandwidth and noise bandwidth, detectors, and limit lines. Specific recommended settings for AM IBOC and FM IBOC measurements are also included.

- *Additional material* – six annexes are included as part of the NRSC Guideline. *Annex 1* is a white paper which provides more in-depth information about the theory behind IBOC RF mask compliance measurements; *Annex 2* provides a list (currently unpopulated but entries are expected in the near future) of "self-certified" test and measurement equipment suitable for determining if an RF signal is compliant with the NRSC-5 AM IBOC and FM IBOC emission masks; *Annex 3* is the test and measurement equipment self-certification form; *Annex 4* describes a method for measuring hybrid FM IBOC signals on separate-line systems using a "CHIMP" (Combined Hybrid IBOC Measurement Package); *Annex 5* presents information on recommended AM antenna bandwidth specifications for hybrid AM IBOC; and *Annex 6* is a short technical primer on AM transmitter modulation theory.

This document will be available free-of-charge on the NRSC's web site at www.nrscstandards.org, following a final, procedural review which will take approximately four weeks. Additional information about the NRSC, including information on becoming a member, is also available on the web site.