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October 14, 2004

Marlene H. Dortch, Secretary
Federal Communications Commission
Office of the Secretary
445 12th Street, SW
Washington, DC 20554

Re: *Notice of Ex Parte Presentation* ET Docket Nos. 04-186, 02-380

Dear Ms. Dortch:

Pursuant to Section 1.1206(b)(2) of the Commission's Rules, this is to notify you that on October 14, 2004, Brian Markwalter (Consumer Electronics Association) provided to Bruce Franca of the Office of Engineering and Technology the attached test plan that CEA will undertake to collect data with respect to the Notice of Proposed Rulemaking in the above captioned docket.

Pursuant to the Commission's Rules, one copy of this notice is being filed electronically with the Commission. If you require any additional information please contact the undersigned at (703) 907-7441.

Sincerely,

A handwritten signature in cursive script that reads "Brian Markwalter".

Brian Markwalter
Senior Director, Technology and Standards
Consumer Electronics Association

cc: Bruce Franca



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CEA Test Plan for Unlicensed Operation in TV Bands

Developed under the auspices of the Government Affairs Council Spectrum Policy
Working Group and TV Manufacturers Caucus in support of:

FCC's NPRM on Unlicensed Device Operation in TV Bands
(ET Docket No. 04-186)

September 30, 2004

Introduction

This test plan defines a combination of lab and field tests to be organized by CEA for the purpose of collecting data relating to the FCC's NPRM on Unlicensed Device Operation in TV Bands (ET Docket No. 04-186).

Scope

Due to the short amount of time available to conduct testing during the NRM comment and reply comment cycle, this test plan is limited in its scope. It addresses a few key issues related to the expected operating environment for unlicensed devices attempting to use TV bands. This test plan does not attempt to quantify interference immunity of legacy receivers. The test plan assumes that tests may be conducted by individual companies or by contracted engineering firms as time and financial considerations allow.

Areas of Concern

CEA members in dialog with broadcasters developed the following list of concerns about various aspects of the NPRM and potential interference mechanisms.

- Grade B protection region proposed by FCC may underestimate rural reception. This is not a testing issue, and protection within the Grade B contour has been stated by the FCC to be all that they intend to protect.
- The Control signal required for personal/portable operation does not have specific requirements to ensure it is only receivable at locations for which its available channel list is accurate. This is not a testing issue. The FCC clarified verbally that accurate Control signal information is the responsibility of the signal provider.
- Using 10 meters as the distance for calculating whether an unlicensed device will interfere may lead to interference in dense environments, like apartments. This is not a testing issue. The FCC indicated that they believe this is the right distance for computing D/U ratios to select available channels. They assert that anything closer is either self-interference that can be ignored or interference to a neighbor mitigated by attenuation through walls.
- De-sensitization and overload. These are real concerns, but not the subject of this test plan due to the wide variance of TV and VCR designs. It is necessary to rely on ATSC A/74 numbers as the metric for TV performance.
- Direct Pickup. The allowed transmit power for both fixed access and personal/portable devices can create field strengths that exceed the 100 mV/m DPU limit contained in 47 CFR 15.118. This can be shown by calculation. It is desirable and part of this test plan to show that the field strength can exceed 100 mV/m by lab measurement as tangible proof for those that do not trust calculations.
- Interference from unlicensed device as an adjacent channel to a desired TV signal. The NPRM specifies that fixed devices must ensure D/U ratios are met for co-channel and first adjacent channel operation. Portable devices are required to ensure protection for co-channel operation only. As noted in ATSC A/74,

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television reception is affected by more than the first adjacent channel, so the proposed FCC rules are not sufficient to prevent interference. This issue is not the subject of this test plan, as the agreed upon limits for D/U ratios have been developed by due process in A/74.

- Ability of an unlicensed device to avoid selecting an occupied weak channel using spectrum sensing. Although the NPRM does not currently allow autonomous selection of available channels by an unlicensed device, there is much work underway in industry for using spectrum sensing either as an aid to a base station for fixed devices (being considered by IEEE 802.18) or as the sole mechanism for portable devices. This test plan does seek to collect field data in the form of spectral plots for environments where an unlicensed device would be attempting to determine available TV channels by looking for ATSC and NTSC signatures. Another related source of masking for the unlicensed device is the out of band energy from the allowed FCC mask on the lower adjacent channel. Although this mask is well known, this test plan specifies capturing one real-world plot of this characteristic. This test plan also specifies measuring the RF noise around a few CE devices in a lab environment to provide data to the industry developing spectrum sensing techniques.
- Attenuation from inside dwelling to outside dwelling. This characteristic affects the ability of portable devices inside a home to detect TV signals (where high attenuation makes the situation worse) and affects interference to a neighbor (where high attenuation makes the situation better.) Some data is available in the industry on this subject. This test plan seeks to collect more data on this characteristic while field measurements are being made.

Test Items

Environmental RF Noise

The amount of noise in TV bands in a typical consumer environment has an impact on an unlicensed device's ability to autonomously detect available channels. This is particularly true for an unlicensed device operating near a PC and other Class A equipment, as is expected to be the typical installation of a portable unlicensed device under this NPRM. This test measures environmental noise from a collection of consumer devices.

Devices to be measured: Portable CD player, DVD player, game machine, and PC or laptop, printer, cable modem, and router, as a group

Lab measurement: Measure Portable CD player, DVD player, and game machine separately in a lab environment. Repeat measurement with the PC, printer, cable modem, and router combination.

Field measurement: Measure the environmental RF noise near one entertainment cluster and one PC cluster on a TV channel for which no detectable broadcast signal is present.

Measurement distance: One meter (representative of expected installation)

Measurement procedure:

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Conduct lab tests inside a screen room. Use an appropriate dipole antenna for the VHF or UHF band being measured. Place the antenna one meter from the Device Under Test (DUT). Run the antenna signal, through a low-noise amplifier if needed, to the screen room bulkhead. Operate the spectrum analyzer outside the screen room. With the DUT powered and operating normally and the VHF antenna in place, record the spectrum in dBm from 50 MHz to 250 MHz using a 3 kHz resolution bandwidth. Change to the UHF antenna and record the spectrum in dBm from 450 MHz to 850 MHz using a 3 kHz resolution bandwidth. Repeat for each DUT. This procedure may be adapted for measurement chambers with permanently installed rotating DUT tables and measurement equipment.

Equivalent field measurements can be made by placing the appropriate antenna one meter from the entertainment cluster or PC cluster with the spectrum analyzer removed an appropriate distance. Record the location for field measurements so that the broadcast TV stations are known and can be accounted for in the spectrum plots. Record the VHF and UHF spectrum for each cluster measured at each field location measured.

For all measurements, carefully document the devices under test, the facility or location, measurement equipment, including antennas, and the test operator and witnesses.

Relevance of data to NPRM: The results of this procedure will be used by the industry in setting thresholds for autonomous spectrum sensing.

Building Attenuation

Building attenuation affects the difference in signal strength between a portable unlicensed device inside the house and the outside TV antenna. Building attenuation also affects the interference potential of an unlicensed device to a neighbor's TV reception. This test measures the field strength of 8VSB or NTSC signals outside at the planning factor height of 30 feet and outside at an antenna height of 6 feet. Then the received signal field strength is recorded inside the house at one or more representative locations of an unlicensed device. The difference between field strength outside at six feet and inside at six feet is the main data to be analyzed after measurements are made.

Lab measurement: Not applicable

Field measurement: Field measurement at locations selected for capturing spectral plots related to weak TV channel detection below.

Measurement: Record field strength at locations specified

Measurement procedure:

Record field strength at the selected house location with an antenna height of 30 feet. Record field strength at four equally distributed locations three meters outside the house with an antenna height of 6 feet. With the antenna at six feet, record field strength at four locations inside the house that are situated as closely as possible to a location that is three meters inside from each of the four outdoor locations. Record field strength and antenna height of two locations selected to be near an entertainment cluster and near a PC cluster.

Relevance of data to NPRM: The results of this procedure will be processed to determine the average and standard deviation of the field strength difference between

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outside six feet measurements and all inside measurements per location. The average and standard deviation will be used by the industry to guide development of spectrum sensing techniques and to determine interference scenarios.

Spectral Plots for Autonomous Signal Detection

This test collects some sample spectral plots of locations where a weak but occupied TV channel is adjacent to a stronger TV channel. These plots can be used by the industry to guide development of signal detection algorithms and thresholds. Spectrum captures use a narrow resolution bandwidth anticipated for use by unlicensed devices.

Lab measurement: Not applicable

Field measurement: Field measurement at locations that are within Grade B contour for two stations, one of which is a strong lower adjacent. The two stations' relative signal strength must meet the First Adjacent Channel Thresholds (D/U ratio) of Table 4.2 in ATSC A/74 using an outside antenna at 30 feet.

Measurement: Record six MHz wide spectral plot of each TV channel signal with a dipole antenna outside at 30 feet and inside at a location with the dipole antenna located one meter from an entertainment or PC cluster.

Measurement procedure:

Record the power in dBm of the adjacent TV channels using a commercial TV antenna at 30 feet to ensure the D/U ratio threshold is met. Record the spectral plot of each channel with a dipole antenna at 30 feet and a resolution bandwidth of 1 kHz. Record the spectral plot of each channel with a dipole antenna inside the house located one meter from an entertainment or PC cluster and a resolution bandwidth of 1 kHz. Record the spectral plot at the same location and resolution bandwidth for an unoccupied TV channel.

Relevance of data to NPRM: The results of this procedure provide spectral plots that can be used to set spectrum sensing thresholds and certification requirements.

Out of Band Energy from Television

The amount of out of band energy, especially at the band edge, has a strong effect on the unlicensed device in terms of its ability to detect available channels. This test measures the out of band energy allowed by FCC masks from an NTSC and an ATSC transmitter at a single location.

Lab measurement: Not applicable

Field measurement: Field measurement for one NTSC station and one ATSC station.

Measurement procedure:

Record the spectral plot of an NTSC channel with no adjacent channels using an appropriate antenna at 30 feet and a resolution bandwidth of 10 kHz. Record the spectral plot of an ATSC channel with no adjacent channels using an appropriate antenna at 30 feet and a resolution bandwidth of 10 kHz.

Relevance of data to NPRM: The results of this procedure are simply to capture on paper the known characteristics of TV transmitters allowed by FCC rules.

Direct Pickup (DPU)

The allowed field strength from proposed unlicensed devices is likely to exceed the 100 mV/m DPU immunity specified for analog cable ready devices in 47 CFR 15.118. For TVs and VCRs connected to cable, the effect will be uncorrelated direct pickup noise. This test measures the field strength at 3 and 10 meters for a 100 mW unlicensed transmitter.

Lab measurement: Measure field strength at 3 and 10 meters from a 100 mW unlicensed transmitter with a 6 dBi antenna.

Field measurement: Not applicable

Measurement procedure:

In a chamber or otherwise sufficiently quiet environment, measure the field strength at 3 and 10 meters from a 100 mW unlicensed transmitter that is transmitting with a 6 dBi antenna. If a suitable shielded environment is unavailable, the transmitter power may be scaled down to prevent interference to nearby services during the experiment.

Relevance of data to NPRM: The results of this procedure should correlate with the calculated field strength from unlicensed devices and simply provide recorded verification.