HARRIS CORPORATION

Government Relations
600 Maryland Avenue, S.W.
Suite 850E
Washington, D.C. 20024
phone 1-202-729-3700
fax 1-202-729- 3735

www.harris.com

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Via Electronic Filing

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

Re: Ex Parte Notice, PS Docket No. 13-209

Dear Ms. Dortch:

Pursuant to 47 C.F.R. § 1.1200, et seq., Harris Corporation (Harris) hereby notifies the Federal Communications Commission (Commission) of the following ex parte communication in the above-referenced proceedings.

On February 3, 2014, Dr. Dennis Martinez and Patrick Sullivan, on behalf of Harris, met with Michael Wilhelm, Brian Marenco, John Evanoff, Renee Roland, and Roberto Mussenden of the Public Safety and Homeland Security Bureau. The discussion centered on the above-referenced docket and the document attached.

Dr. Martinez urged the Commission to swiftly adopt its proposals to require that: 1) digital technologies comply with Emission Mask H when operated in the 800 MHz National Public Safety Planning Advisory Committee (NPSPAC) band (806-809/851-854 MHz); and 2) subscriber equipment have analog FM capability when operating on the 800 MHz mutual aid channels designated in §90.617(a)(1) of the rules and on the nationwide public safety interoperability calling channels in the 150–174 MHz VHF and 450-470 MHz UHF bands.[1]

Dr. Martinez noted that the record in this proceeding has science-based, technical evidence making clear that the Commission must immediately finalize rules requiring H Mask compliance for digital technologies operation in 800 MHz NPSPAC channels. Dr. Martinez made clear that arguments to the contrary in the record do not embody accurate or scientifically-sound assertions, and that these arguments do not merit further entertainment prior to Commission action.

1. **Claims That H Mask Certified Equipment Does Not Comply With The H Mask Requirements Are Inaccurate.**

Dr. Martinez addressed several assertions made in a recent ex parte by PowerTrunk.[2] First, Dr. Martinez clarified the claims of PowerTrunk in its ex parte and Exhibits A and B of that ex parte that could lead one to believe that digital equipment authorized to operate in 800 MHz NPSPAC channels exceed the H Mask. Dr. Martinez made clear that, in truth, the exhibits displayed make

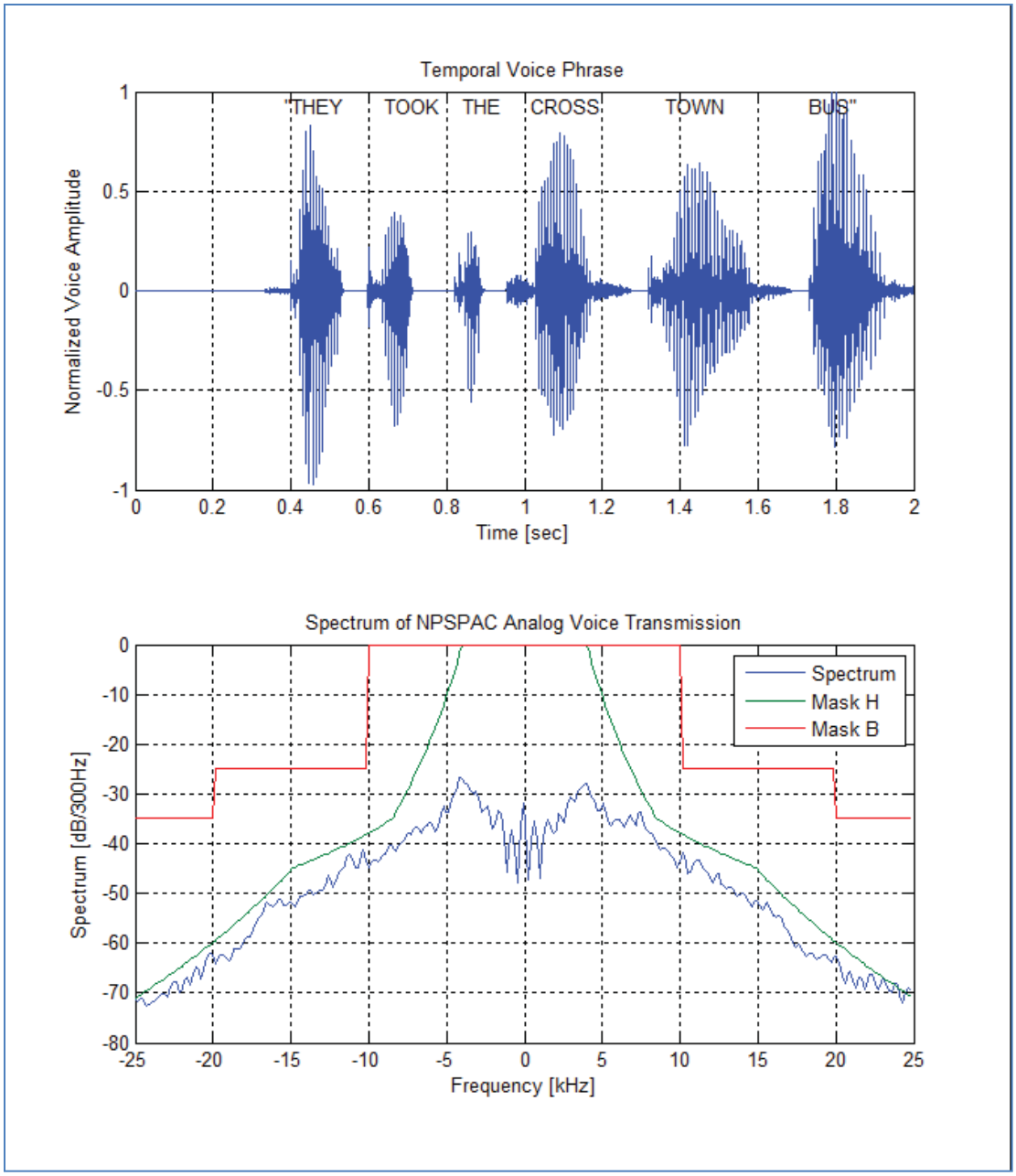
[1] *See* Emission Mask Requirements for Digital Technologies on 800 MHz NSPAC Channels; Analog FM Capability on Mutual Aid and Interoperability Channels, PS Docket No. 13-209, RM-11663, Notice of Proposed Rulemaking, FCC 13-117 (rel. Aug. 27, 2013) (H Mask NPRM).
[2] *See* PowerTrunk ex parte, filed Jan. 28, 2014.

no such demonstration. With regard to the documents in Exhibit A, Dr. Martinez stated that PowerTrunk has failed to understand the modes of a radio which are being tested under Mask H and Mask B, respectively. Exhibit A, he explained, showed analog operations, which are by rule mandated to comply with Mask B. However, PowerTrunk has suggested that these analog technologies should be compliant with Mask H, which is neither accurate from the view of the rule or the proposed polices of the NPRM. Therefore, he explained, the claim that the Exhibit A analog technologies properly comply with Mask B is in no way demonstrative of non-compliance with the NPRM or a threat to adjacent channel interference.

Dr. Martinez discussed claims of PowerTrunk that the waveforms and test results reflected in Exhibit B of the PowerTrunk ex parte[3] show land mobile radio emissions exceeding Mask H for the TIA mask compliance test.[4] Dr. Martinez noted that this test does not demonstrate radio performance for typical voice transmissions. To be clear, analog FM voice transmissions that comply with current rules will adhere to the H Mask except in extreme, statistically insignificant cases. To illustrate this point, the time domain representation of a normalized voice transmission typically used in industry-accepted Mean Opinion Score (MOS) voice quality tests is presented in the top portion of Figure 1. Spectral output of the transmitted analog FM voice waveform presented in the bottom portion of Figure 1. Notice that the spectral characteristics are well within the H Mask specification, indicating that analog FM voice has similar interference characteristics to digital waveforms compliant to the H Mask. Based upon these findings, it is clear that digital and analog systems can be deployed cooperatively with minimal cross-interference. This is a delicate balance that will be disrupted by interleaving non-H Mask compliant digital technologies in the same spectrum. For this reason, the Commission must act swiftly to adopt its proposed rules.

[3] *See id.*
[4] *See* TIA 603-D, pg. 75.

Figure 1: NPSPAC Analog Voice Transmission.
Time domain (top) and Frequency domain (bottom)



2. Claims That H Mask Certified Digital Equipment Cause Adjacent Channel Interference Comparable to Low-Power TETRA Are Inaccurate.

Dr. Martinez also described the undeniable reality that the equipment certified pursuant to the H Mask cited by PowerTrunk in its Exhibits A and B pose a nominal threat to adjacent channel interference, but that non-H Mask compliant digital technologies (*e.g.*, low-power TETRA) pose a great threat to adjacent channel interference for first responders. Dr. Martinez responded to assertions described by the Commission of PowerTrunk that H Mask compliant OpenSky systems

produce interference comparable to low-power TETRA. He provided a response citing data presented in Figure 2 and Table 1.

Figure 2 presents a comparison of two 4-slot TDMA technologies with an H Mask overlay. In this figure, the comparison between OpenSky and low-power TETRA and the relative interference threats are made clear. Figure 2 demonstrates that OpenSky is fully H Mask compliant, while low-power TETRA is not. This data demonstrates clearly that the non-compliance of low-power TETRA will significantly interfere with adjacent channels, unlike the OpenSky waveform.

To articulate this interference threat from a low-power TETRA device another way, the interference potential in typical scenarios with Open-Sky and low-power TETRA are both examined in the table below using adjacent channel power (ACP). ACP is typically defined as the ratio of the average power in the adjacent frequency channel to the average power in the transmitted frequency channel. In the examined case, the adjacent channel is assumed to host a typical P25 receiver. The adjacent channel powers (ACP) of the two systems are tabulated for comparison in Table 1. The table shows the difference in Adjacent Channel Power (ACP) for the two 4-slot TDMA technologies. The table clearly shows low-power 4 slot TDMA TETRA providing 24 dB more adjacent channel power (ACP) as compared to the Open-Sky 4 slot TDMA system.

Figure 2: OpenSky and low-power TETRA

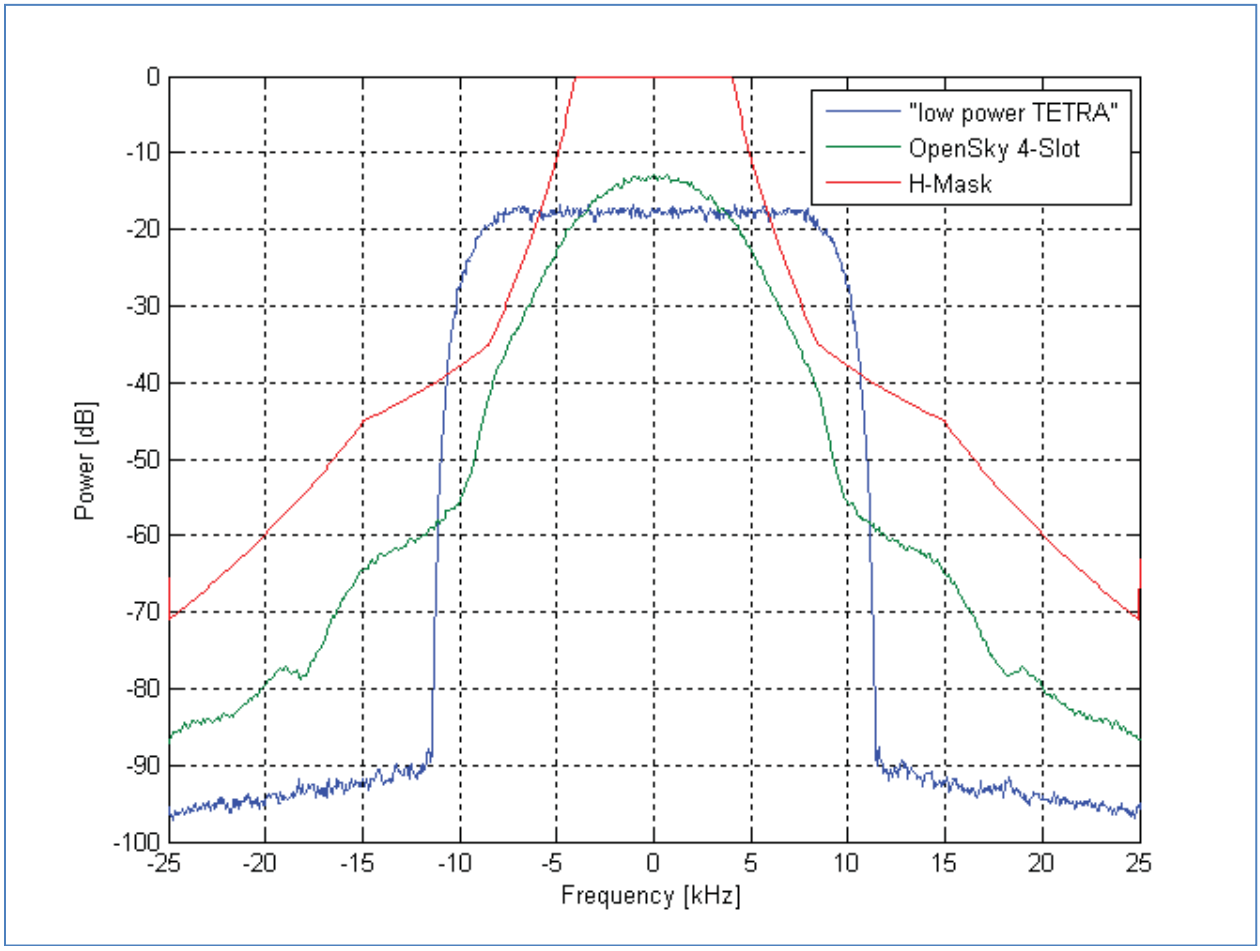
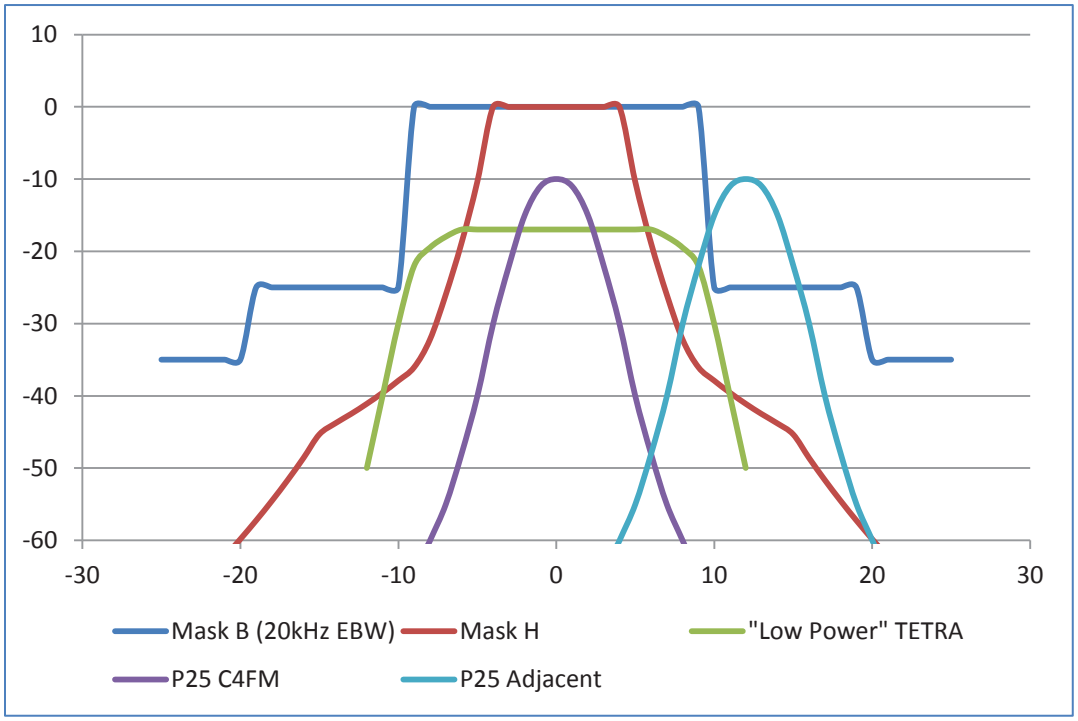


Table 1: ACP of OpenSky and low-power TETRA

System	ACP (measured in a 6 kHz bandwidth at a 12.5 kHz offset)
Low-Power 4 slot TETRA compliant to B Mask	-22 dBc
OpenSky 4-slot TDMA system compliant to the H Mask	-46 dBc

Figure 3 presents a summary view of P25 systems (primary and adjacent) and low-power TETRA as they relate to B and H Masks. Simply put, low-power TETRA systems cause adjacent channel interference to a detrimental degree, and P25 and OpenSky H Mask compliant digital technologies do not.

Figure 3: Summary view of low-power TETRA and P25



3. Claims That An Audio Low Pass Filter Mitigates Interference in Digital Audio Technologies Are Inaccurate.

Dr. Martinez further made clear that claims that digitally modulated equipment can mitigate interference by virtue of use of an audio low pass filter are false upon evaluation of the technologies being considered and understanding what an audio low-pass filter is designed to do. The audio low-pass filter requirement in Commission rules is only available and of use to equipment modes utilizing analog FM modulation. Dr. Martinez noted that this interpretation is supported by the fact there is absolutely no difference in the spectrum profile of voice transmissions and data transmissions when digital modulation is concerned. However, the same is not true for equipment employing analog FM modulation. What is referred to as "Primary Audio Filter" (α=0.2 square root raised cosine filter) by Power Trunk is in fact a spectral shaping filter, as it works on an already-modulated signal. This spectral shaping filter is inserted after the ACELP vocoder and is not an audio filter in the context of Mask B. This spectral shaping filter is used to modify the final transmit spectrum to meet Mask B and adjacent channel power requirements. It operates on the modulated waveform, and not on the audio input, and therefore does not meet the function of an audio low pass filter. Furthermore, no audio low pass filter applied to the system would ever be utilized in transmission of data or control signals. An audio low pass filter in a digital system will not mitigate adjacent channel interference.

Dr. Martinez summarized the technical facts: An audio low pass filter does not define the bandwidth of a digital voice transmission, and therefore does not mitigate interference produced in other systems. Furthermore, an audio low pass filter is never applied to the control or data transmissions. Therefore, by extension of the Commission's rules, these transmissions should be subject to the H Mask.

4. Contrary to Claims, Cost of H Mutual Aid Compliance is Minimal.

Dr. Martinez noted that, contrary to claims, ensuring that subscriber equipment have analog FM capability when operating on the 800 MHz mutual aid channels designated in §90.617(a)(1) of the rules and on the nationwide public safety interoperability calling channels in the 150–174 MHz VHF and 450-470 MHz UHF bands is not prohibitively expensive. Dr. Martinez noted that, for software defined land mobile radios currently deployed and certified for operation in 800 NPSPAC channels, mutual aid compliance is a matter of properly programming the radio. Therefore, he explained, there is minimal incremental manufacturing cost associated with ensuring that a radio has mutual aid capability.

Dr. Martinez also explained that there is discrepancy between intent/common implementation and the exact wording of the Commission's rule. This has resulted in recent confusion in rule application that will lead to adjacent channel interference. This confusion must be rectified so that regional planning commissions (RPCs), manufacturers, and the Commission may consistently apply rules and frequency planning programs to mitigate interference inevitable should non-H Mask compliant digital technologies be fielded across the country.

Dr. Martinez stated in conclusion that, for these reasons, the need for rule clarity to drive reliable public safety communications technologies and system planning, and a total absence of legitimate claims why non-H Mask compliant technologies should operate in 800 MHz NPSPAC channels to the peril of first responders, Dr. Martinez urged the Commission to move forward and finalize its proposed rules as described above.

Respectfully submitted,

_____/s/_____

Patrick Sullivan
Government Relations
Harris Corporation

CC:

Michael Wilhelm
Brian Marenco
John Evanoff
Renee Roland
Roberto Mussenden

Attachment