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October 8, 2004

FILED ELECTRONICALLY

Marlene Dortch, Esquire
Secretary
Federal Communications Commission
445 12th St. SW
Washington DC 20554

Re: **EX PARTE** in Reconsideration of the Memorandum Opinion and Order and Third Report and Order in The 4.9 GHz Band Transferred from Federal Government Use, WT Docket No. 00-32

Dear Ms. Dortch:

This letter and attachment is filed in response to the written correspondence filed in the above-captioned docket by Motorola on August 30, 2004 and September 13, 2004, and the National Public Safety Telecommunications Council on September 10, 2004. The ex parte is from the 4.9 GHz Open Standards Coalition, composed of Cisco Systems, Inc., Tropos Networks, Nortel Networks, and PacketHop, Inc..

Sincerely,

Mary L. Brown

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Appendix

WB Docket No. 00-32

Response of the 4.9 GHz Open Standards Coalition to Recent Ex Parte Filings from Motorola and the National Public Safety Telecommunications Council

I. Introduction

In Motorola's ex parte filings of August 30, 2004 and September 13, 2004, and in the National Public Safety Telecommunications Council's (NPSTC) ex parte filing of September 10, 2004, the core issue on reconsideration is reduced to the following:

> *What range of output power levels should be permitted for use with emissions mask DSRC-A?*

Both parties state they are comfortable with DSRC-A, but Motorola would prefer that the Commission mandate a different emissions mask, DSRC-C, for output power above 8 dBm, while NPSTC prefers allowing DSRC-A up to and including 20 dBm while compelling the use of Mask C above 20 dBm. Both assume a 20 MHz channel width.

The 4.9 GHz Open Standards Coalition, representing key manufacturers and providers in the 802.11 "WiFi" industry, believes that commercial off-the-shelf 802.11 technology will provide robust broadband data communications at the levels of integrity required by public safety operators, and that nothing in this reconsideration should in any way foreclose the use of emissions mask DSRC-A at output power levels up to and including 20 dBm. Based on our analysis of the record, the Commission has no basis for compelling the 8 dBm breakpoint. We urge the Commission to adopt rules that would permit Mask A to be used for devices employing the CSMA/CA protocol equivalent to that of the IEEE 802.11 standard up to and including output power of 20 dBm. In addition, the Commission should foster the broad potential of devices operating with an output power above 20 dBm by encouraging use of experimental licenses under Part A of the Commission's rules. In this ex parte filing, in addition to explaining the rationale for our view, we also take this opportunity to comment on Motorola's August 30, 2004 ex parte communication.[1]

[1] We join Motorola and NPSTC in asking the FCC to eliminate references to the "FCC Mask" for this band

II. Emissions Mask A Should Be Permitted up to and above 20 dBm at the 4.9 GHz Band

A. Output Levels Above 20 dBm Will Greatly Benefit Public Safety

The 4.9 GHz Open Standards Coalition has been consistent in its advocacy favoring use of commercial off-the-shelf 802.11 technology in this band. We have demonstrated, in our July 28, 2004 ex parte, that public safety departments around the country are already making use of commercial products in the 2.4 GHz band to deliver public safety data communications in a variety of contexts – from the Nation's largest cities to the smallest townships. One of the reasons for the popularity of 802.11 systems among the public safety community is their high utility, which is in part a function of their performance as measured by the range of signal and data rate.

In evaluating existing Commission rules for unlicensed devices, we see:

- Part 90 allows a 9 dBi antenna gain for an EIRP of (20+9=) 29 dBm.
- Part 15 UNII band (5250-5350 MHz) allows an EIRP limit of 30 dBm (250 mW plus 6 dBi antenna).
- Part 15 UNII band (5470-5725 MHz) allows an EIRP limit of 30 dBm (250 mW plus 6 dBi antenna).
- Part 15 UNII band (5725-5825 MHz) has an EIRP limit of 36 dBm (1W plus 6 dBi antenna).

Significantly, the broadband CSMA/CA technology, if adopted in public safety environments, should be operating at power levels commensurate with their operation in nearby UNII bands to ensure the integrity of transmissions. By reducing a CSMA/CA-802.11 device's EIRP at 4.9 GHz relative to existing 802.11 rules, the public safety devices will necessarily have reduced performance – as measured by the range of signal and data rate. The range of a cell will be dramatically reduced resulting in 3-6 times the number of cells to be deployed. This will foreclose opportunities that will otherwise be of benefit to Public Safety system users. There is simply no reason on this record to compel Public Safety to use a degraded form of 802.11.[2] The technology's direction of providing broader and higher levels of services will be foreclosed, preventing them from benefiting from the growth of the commercial industry. Restricting power levels, including those above 20 dBm, will relegate 802.11 based systems operating in 4.9 GHz to a secondary service, as they will be overtaken by more powerful devices used in other bands. This divergence will lead to frustration on the part of users and underutilization of this spectrum band.

[2] As a practical matter, agencies already using Wi-Fi equipment in other bands would be disappointed with the less robust 4.9 GHz system if output power were limited to 20 dBm. In fact, agencies may not be motivated to move to 4.9 GHz, or to adopt 4.9 GHz, leading to the disappointing possibility that the band will be less utilized than it could be.

We note, in addition, by limiting emissions mask A to devices employing the CSMA/CA protocol equivalent to that of the IEEE 802.11 standard, the Commission will ensure that only the proven 802.11 technology will employ the looser mask. This technology has been amply demonstrated in commercial environments to operate without intra-system or inter-system interference when using the DSCR-A mask. Other types of narrowband (<10 MHz) , non-CSMA/CA systems can utilize the emissions mask such as DSRC-C.

In addition to permitting mask A at or below 20 dBm with 20 MHz bandwidth, the coalition strongly recommends experimental licenses above 20 dBm for use of mask A. Higher output power supports more efficient deployment. Tropos, for example, has constructed numerous metro-scale public safety networks in the 2.4 GHz band at both the 26 dBm and 36 dBm EIRP levels. The additional 10 dB reduces the node density required to deliver a given performance level by at least one-third when compared to that required with the lower power levels, making the higher power network much more economical. Critically, because outdoor propagation in the 4.9 GHz band is far inferior to that in the 2.4 GHz band, higher power levels are that much more important to maintain an economical node density.

It is for these reasons that we urge the Commission to recognize the broad benefits of operations above 20 dBm, and to recognize the detriments that will accrue if barriers are imposed to high power operation. The Coalition urges the Commission not to foreclose the opportunities to operate at powers up to and above 20 dBm.

Attached are proposed rules that would encompass operations at higher levels. Specifically, the power tables are amended to correspond to the limits set for the UNII devices in the 5.725-5.825 GHZ band. This would make device performance in the two bands comparable. The record shows that these levels do not cause mutual interference in practice and there is much good field experience at these levels. The NPSTC studies also indicate that these levels caused no extra practical interference. We also suggest amending the notes about use of antennas for point-to-point systems to include both Class A and Class B devices, again corresponding to the UNII limits. The use of directional antennas at 5 GHz is particularly effective as there is minimal interference due to the directional nature of the antennas; this has worked well for the systems operating in the UNII bands.

Our fundamental point is to urge the Commission to allow benefits of 802.11 technology to be available to the public safety sector. The Commission's specific embrace, if not of these proposed rules, then in its willingness to consider other suitable forms of licenses for operations above 20 dBm will do much. It will clearly delineate parameters that will enable the market to move forward quickly to meet the needs of the Public Safety communications operators. To do so will rapidly extend the broad range of services that are already available in the commercial market place to the Public Safety community.

B. No Record Basis for 8 dBm "Breakpoint"

While there are many statements of "belief" and "opinion" in the record concerning the maximum output power level at which Mask A should be allowed, these statements are not backed up by facts. As a result, these opinions should be deeply discounted by the Commission. Statements of preference or belief are insufficient to overcome existing Commission practice with respect to output power for CSMA/CA-802.11 devices and the substantive analysis presented by NPSTC.

As to Motorola's 8 dBm breakpoint, 8 dBm of output power causes extremely short ranges that will significantly impair the performance of, and utility of, 802.11 systems. An 802.11a system can be expected to provide a typical range of about 30 meters with 17dBm commercial cards utilizing 20 MHz bandwidth. If output power is reduced to 8 dBm, there will be a maximum range of less than 10 meters, which is highly inadequate for virtually all applications. For example, in a typical incident management application, a minimum range equivalent to a block in a city (about 300 feet) is highly desirable. Also, when mobile units are meshed, shorter ranges require larger number of hops to cover a given distance, which can increase total latency**.**

Moreover, Motorola has offered no analysis, quantitative or otherwise, that would support this power output level. Its August 30, 2004 ex parte simply repeats its concluding statement, made in its April 15, 2004 filing, that 8 dBm should be the breakpoint. In examining that filing, there is no information linking Motorola's purported analysis to the selection of 8 dBm. The only fact remotely approaching an explanation or justification is that up until today, 5 GHz equipment certified for the band appears to operate at lower than maximum allowed power. That fact – which should be considered irrelevant given the nascent state of the 5 GHz band and because those certified devices were generally for indoor usage – is never linked to an 8 dBm breakpoint. Nor have we been able to uncover any other analysis of Motorola's preference.

We also note that the NPSTC September 10, 2004 ex parte supports that Mask A can serve public safety's needs at power levels much higher than 20 dBm.[3] In addition, NPSTC's earlier-filed ex parte also supports the alternative view that the Commission should at least collect more evidence on the operation of Mask A by authorizing experimental licenses above 20 dBM.[4] NPSTC's proposed rule has a much broader and

[3] "[I]t was made clear that the selection of a standard emission mask (i.e., DSRC Mask A or IEEE 802.11a/j) over a more stringent mask (i.e., DSRC Mask C) has little, if any, effect upon real life user operations at power levels up to 20 dBm - and potentially to much higher power levels, as demonstrated in NPSTC's August 19 filing." NPSTC Ex Parte Filing, September 10, 2004.

[4] NPSTC suggests that the Commission "…*postpone new action on transmitters operating at power levels above 20 dBm until real life testing indicates what Mask(s)*

robust vision of operations in 4.9 GHz, than Motorola's; and as we have noted there are compelling reasons to encourage experimental licenses above 20 dBm.

III. Responses to Motorola's August 30, 2004 Ex Parte

In addition to commenting on the preferred emissions mask, the 4.9 GHz Open Standards Coalition also wishes to comment on several statements made by Motorola in its ex parte letter of August 30, 2004.

- The letter claims that NPSTC's August 19, 2004 filing includes an analysis of an incident scene that is a "best case" scenario, rather than a "worst case" scenario as NPSTC states, arguing that there can be operational scenarios using Mask A where "devastating" interference effects such as denial of service can occur.
    - The NPSTC analysis is unimpeached and the Commission is fully justified in relying upon it to conclude that Mask A will serve Public Safety's needs in this band. No quantitative rebuttal to the NPSTC scenario is presented. Nor does Motorola provide its own incident analysis. As a result, the allegations of "devastating interference" are undefined and ambiguous, as well as unsupported by fact. Moreover, it is the Coalition's view that in the event some "devastating interference" of some type was to occur, Mask C would provide no more protection from it than Mask A.

- A blanket statement is made that "[p]ublic safety users will be better off with more margin against interference than with less. "
    - No quantified analysis is presented as to how more "margin" provides benefits when compared to the downside cost of adopting a low breakpoint for Mask C. We refer the Commission to our ex parte of August 23, 2004 for a detailed explanation of the downsides of Mask C. This view also does not consider the actions of the CSMA/CA protocol used by modern broadband systems such as the 802.11 devices to automatically sense and compensate for co-channel and adjacent channel interference.

- The letter repeats the claim that it is only $3.00 in additional cost for "parts" to be added to mask C.
    - The investment required is substantial and our ex parte of August 23, 2004, explains the extensive costs of implementing Mask C in this band. Members of the coalition do not believe this investment will be made in the large scale as it would move the equipment outside the "main-stream" of low cost commercial equipment. Public safety operations in 4.9 GHz will be stranded and dependent on a small number of manufacturers and

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would be required to effectively support Public Safety operations at these higher power levels. Until such testing is complete, any operations at power levels above 20 dBm (or 29 dBm ERP) would be subject to the Mask specified in the 2003 MO&O of Docket 00-32." NPSTC Ex Parte August 19, 2004.

providers, who will be the only interests to benefit. This premise has not been rebutted.

- The letter suggests in (d) on page 11 regarding alternate specs for 20dBm that "all emissions shall conform to section 15.407(b)(1)"
    - The Coalition agrees with NPSTC that this proposal would be inconsistent with the use of 802.11 technology, and we agree with NPSTC's that this proposed rule should not be adopted. This rule would limit devices to integral antennas. Such a limit is inconsistent with the needs of the licensed Public Safety operators and would limit their choice for deployment of communications equipment within their apparatus.
- Motorola also suggests in (d) on page 11 of its ex parte regarding alternate specs for 20dBm that "all emissions shall conform to section 15.407(b)(1)"
    - The Coalition agrees with NPSTC that this proposal would be inconsistent with the use of 802.11 technology, and we agree with NPSTC's that this proposed rule should not be adopted.

Summary

In this proceeding, public safety agencies can gain the broad range of broadband communication services from a competitive market. Yet that benefit will not be recognized if a degraded form of 802.11, such as an 8 dBm output power level breakpoint for Mask A, is imposed. The NPSTC evidence demonstrates that power levels up to 20 dBM ensure the integrity of public safety transmissions. Thus, the Coalition recommends that Mask A be approved for power levels up to and including 20dBm with 20 MHz bandwidth.

Moreover, actual public safety deployment of equipment using power levels above 20 dBM in other bands reflects that public safety agencies have much to gain from higher power levels. The Coalition therefore also recommends that experimental licenses be allowed for power levels above 20 dBm. We urge the Commission to look at the 4.9 GHz band in a forward way and provide opportunity where it can evolve to assist public safety tangibly with new and cost effective services and to avoid the band being isolated from the advancements pervading 802.11 technology. Adopting the 4.9 GHz Open Standards Coalition's recommendation of Mask A for 20 dBm and below and Mask C with experimental licenses for Mask A at above 20 dBm will accomplish these goals."

Recommended Part 90 Rules Modifications
Regarding Emissions Masks and Power Limits
September 13, 2004

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§ 90.210 Emission masks.

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APPLICABLE EMISSION MASKS

Frequency band (MHz)	Mask for equipment with audio low pass filter	Mask for equipment without audio low pass filter
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4940-4990 MHz	L, M	L, M
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(l) **Emission Mask L**. For Class A transmitters operating in the 4940-4990 MHz frequency band, the power spectral density of the emissions must be reduced as follows:

(1) On any frequency removed from the assigned frequency by more than 50 percent but less than 55 percent of the channel bandwidth: At least 26 dB.
(2) On any frequency removed from the assigned frequency by more than 55 percent but less than 100 percent of the channel bandwidth: At least 32 dB.
(3) On any frequency removed from the assigned frequency by more than 100 percent but less than 150 percent of the channel bandwidth: At least 40 dB.
(4) On any frequency removed from the assigned frequency by more than 150 percent of the channel bandwidth: At least 50 dB.
(5) On any frequency outside the channel bandwidth, the power spectral density of the device must meet the attenuation in the mask above or -50 dBm/MHz, whichever is the lesser attenuation.
(6) The zero dB reference is measured relative to the highest average power of the fundamental emission measured across the designated channel bandwidth using a resolution bandwidth of at least one percent of the occupied bandwidth of the fundamental emission and a video bandwidth of 30 kHz. The power spectral density, $P(f)/\Delta f$ will be the power (P) measured within the resolution bandwidth of the measurement device (Δf) divided by the resolution bandwidth of the measurement device (Δf). Emission levels are also based on the use of measurement instrumentation employing a resolution bandwidth (Δf) of at least one percent of the occupied bandwidth.

(m) **Emission Mask M**. For Class B transmitters operating in the 4940-4990 MHz frequency band, the power spectral density of the emissions must be reduced as follows:

(1) On any frequency removed from the assigned frequency by more than 50 percent but less than 55 percent of the channel bandwidth: At least 10 dB.
(2) On any frequency removed from the assigned frequency by more than 55 percent but less than 100 percent of the channel bandwidth: At least 20 dB.
(3) On any frequency removed from the assigned frequency by more than 100 percent but less than 150 percent of the channel bandwidth: At least 28 dB.
(4) On any frequency removed from the assigned frequency by more than 150 percent of the channel bandwidth: At least 40 dB.

(5) On any frequency outside the channel bandwidth, the power spectral density of the device must meet the attenuation in the mask above or -50 dBm/MHz, whichever is the lesser attenuation.
(6) The zero dB reference is measured relative to the highest average power of the fundamental emission measured across the designated channel bandwidth using a resolution bandwidth of at least one percent of the occupied bandwidth of the fundamental emission and a video bandwidth of 30 kHz. The power spectral density, $P(f)/\Delta f$ will be the power (P) measured within the resolution bandwidth of the measurement device (Δf) divided by the resolution bandwidth of the measurement device (Δf). Emission levels are also based on the use of measurement instrumentation employing a resolution bandwidth (Δf) of at least one percent of the occupied bandwidth.

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§ 90.1215 Power limits.
The transmitting power of stations operating in the 4940-4990 MHz band must not exceed the maximum limits in this section.

(a) The peak transmit power should not exceed:

Channel Bandwidth (MHz)	Class A Peak Transmitter Power (dBm)	Class B Peak Transmitter Power (dBm)
1	20	17
5	27	24
10	30	27
15	31.8	28.8
20	33	30

(i) Class A devices are limited to a peak power spectral density of 21 dBm per 1 MHz. Class A devices using channel bandwidths other than those listed above are permitted; however, they are limited to a peak power spectral density of 21 dBm/MHz. If transmitting antennas of directional gain greater than 9 dBi are used, both the peak transmit power and the peak power spectral density should be reduced by the amount in decibels that the directional gain of the antenna exceeds 9 dBi.
(ii) Point-to-point or point-to-multipoint operation (both fixed and temporary-fixed rapid deployment) devices may employ transmitting antennas with directional gain up to 26 dBi without any corresponding reduction in the transmitter power or spectral density. Corresponding reduction in the peak transmit power and peak power spectral density should be the amount in decibels that the directional gain of the antenna exceeds 26 dBi.
(iii) Class B devices are limited to a peak power spectral density of 8 dBm per 1 MHz. Class B devices using channel bandwidths other than those listed above are permitted; however they are limited to a peak power spectral density of 8 dBm/MHz. If transmitting antennas of directional gain greater than 9 dBi are used, both the peak transmitter power and the peak power spectral density should be reduced by the amount in decibels that the directional gain of the antenna exceeds 9 dBi.

(b) The peak transmit power is measured as a conducted emission over any interval of continuous transmission calibrated in terms of an RMS-equivalent voltage. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement conforming to the definitions in this paragraph for the emission in question.

The peak power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A resolution bandwidth less than the measurement bandwidth can be used, provided that the measured power is integrated to show total power over the measurement bandwidth. If the resolution bandwidth is approximately equal to the measurement bandwidth, and much less than the emission bandwidth of the equipment under test, the measured results shall be corrected to account for any difference between the resolution bandwidth of the test instrument and its actual noise bandwidth.