

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554**

In the matter of )  
 )  
Establishment of an Interference Temperature )  
Metric to Quantify and Manage Interference ) ET Docket No. 03-237  
and to Expand Available Unlicensed Operation )  
in Certain Fixed, Mobile, and Satellite )  
Frequency Bands )

**REPLY COMMENTS OF MOTOROLA, INC.**

Motorola, Inc. (“Motorola”) respectfully submits these reply comments in response to the Federal Communications Commission’s (“FCC” or “Commission”) *Notice of Inquiry* and *Notice of Proposed Rulemaking* in the above captioned proceeding.<sup>1</sup> In this proceeding, the Commission’s stated interest is in exploring options for developing a regulatory regime in assessing interference based on the actual radiofrequency (“RF”) environment, as opposed to being based only on transmitter operations. The Commission therefore seeks comment on a new analytical and regulatory model it calls the interference temperature metric.

In its opening round comments, Motorola expressed concern that significant technical challenges would need to be overcome before implementation of the interference temperature concept could be realized without threatening incumbent radio services.<sup>2</sup> Primary among these challenges is the need to account for a wide variety of design characteristics of primary services

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<sup>1</sup> Establishment of an Interference Temperature Metric to Quantify and Manage Interference and to Expand Available Unlicensed Operation in Certain Fixed, Mobile and Satellite Frequency Bands, *Notice of Inquiry and Notice of Proposed Rulemaking*, FCC 03-289 (Nov. 28, 2003) (“*NOI*” or “*NPRM*”).

<sup>2</sup> Comments of Motorola, Inc., ET Docket No. 03-237, submitted April 5, 2004, at 1 (“*Motorola Comments*”). Unless otherwise noted, all referenced comments can be found in ET Docket No. 03-237 and were filed on April 5, 2004.

without impeding the ability of those systems to evolve system designs or technologies.<sup>3</sup> In this regard, Motorola noted the difficulty of measuring the noise floor in frequency bands that are actively used by primary services and the inability of an unlicensed transmitter to determine the path conditions between it and a potential victim receiver operating on a primary basis.<sup>4</sup>

Motorola concluded that the technology necessary to overcome these challenges is well beyond current state of the art.<sup>5</sup> Given the resulting stringent impact on the design of systems that could be implemented under the interference temperature concept, Motorola indicated that there is little counter balancing benefit to pursuing the concept at this time.

The overwhelming majority of parties submitting comments in this proceeding agree with Motorola's view. Simply put, there is little, if any, support for application of the interference temperature metric in any licensed band. While commenters appreciate the Commission's desire to explore options for improving access to spectrum, numerous parties disagree with the fundamental premise that the interference temperature metric is needed to replace existing spectrum management tools. For example:

- The New York State Office for Technology is concerned that the interference temperature represents a “revolutionary change” in the way spectrum management is conducted and would foster interference-limited environments at a time when controlling transmitter radiation and increasing receiver sensitivity/selectivity to enhance spectrum efficiencies would better address spectrum congestion.<sup>6</sup>
- CTIA argues that implementation of underlay spectrum rights based on the interference temperature metric is a perpetuation of the “command and control” approach to spectrum management and urges the Commission to instead rely on

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<sup>3</sup> *Id.* at 2.

<sup>4</sup> *Id.*

<sup>5</sup> *Id.*

<sup>6</sup> Comments of New York State Office for Technology Statewide Wireless Network (“New York State Comments”) at 4.

primary users sublicensing underlay rights through secondary markets. If underlay operations prove to be technically feasible and efficient, primary licensees would have the economic incentive to sublease the right to use their spectrum to such uses.<sup>7</sup>

- TIA notes that imposition of an interference temperature metric will not compensate for the absence of spectrum management that potentially arises as a result of excessive flexibility in the Commission’s rules. TIA believes that the current spectrum management approach of defining a service in terms of frequency bands, transmitter power and the required shape of the emitted spectrum, limits on out-of-band and spurious emissions provides much of the information needed by manufacturers to design receivers responsive to market needs.<sup>8</sup>
- The Wi-Fi Alliance, comprised of companies supporting IEEE 802.11x standards, argues that the interference temperature metric “will not be broadly practical and applicable” and urges the Commission to “carefully analyze the cost of a major change on transmitting systems design in relation to the expected benefits.”<sup>9</sup>

The concerns on implementing the interference temperature metric are in large measure predicated on the difficulties associated with providing real time information on the applicable spectrum environment to interference temperature controlled devices. In its opening comments, Motorola expressed great concern that propagation and funding issues render all of the monitoring alternatives discussed in the *NOI* as problematic.<sup>10</sup> Many commenters expressed similar views:

- The IEEE 802.11 Committee states that the cost of creating and maintaining a ubiquitous network of monitoring stations would completely overwhelm any short term or long term benefit in new economic activity. More importantly, the committee notes that the complexity of the monitoring process would cast doubt on the reliability of the resulting data.<sup>11</sup>

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<sup>7</sup> Comments of the Cellular telecommunications & Internet Association (“CTIA Comments”) at 12.

<sup>8</sup> Comments of the Telecommunications Industry Association at 6.

<sup>9</sup> Comments of the Wi-Fi Alliance at 2, 4.

<sup>10</sup> Motorola Comments at 13, 14.

<sup>11</sup> Comments of IEEE 802.11 at 6.

- Sprint’s studies conclude that two of the three monitoring approaches discussed in the *NOI* are not workable at all as applied to mobile services bands and the third approach would not be effective in mobile services downlink (base-to-mobile) bands.<sup>12</sup>

These concerns over the general interference temperature concept became more pronounced as parties consider the impact on specific bands. In its comments, Motorola stated that implementing the interference temperature in frequency bands used by land mobile services is particularly challenging and not appropriate for the foreseeable future.<sup>13</sup> Motorola especially urged the Commission to exempt from consideration any frequency band used by public safety agencies.<sup>14</sup> As reflected below, there was wide support expressed in the comments for these positions.

- New York State notes that the ability to intelligently time-share Public Safety spectrum with other services is not a capability that appears to be practically deployable without some degradation of public safety operations, either in terms of interference, or call blocking.<sup>15</sup>
- Qualcomm shows that even a slight increase in the noise temperature in a licensed band would substantially impair the service provided by licensees who have deployed Code Division Multiple Access (CDMA) technology, resulting in a substantially reduced coverage area of each cell and a decreased battery life in each wireless phone.<sup>16</sup>
- V-Comm notes that both CDMA spread-spectrum and GSM frequency hopping systems used in today’s cellular and PCS spectrum allocations are designed to utilize the full set of spectrum frequencies at every cell site. While this allows the cellular and PCS providers to provide a highly efficient communications system within their limited spectrum allocations, it leaves very little or no “white space” in the frequency, spatial or time domains for opportunistic cognitive radio unlicensed devices.<sup>17</sup>

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<sup>12</sup> Sprint Corporation Comments at iii, 22-32.

<sup>13</sup> Motorola Comments at 7.

<sup>14</sup> *Id.*

<sup>15</sup> New York State Comments at 19.

<sup>16</sup> Comments of Qualcomm Incorporated at 9-11.

<sup>17</sup> Comments of V-Comm LLC at 44.

- Verizon Wireless cites technical studies that show that even seemingly low levels of interference would have “disastrous” consequences to CDMA customers; reducing coverage by as much as 32 percent in urban markets and reducing cell site capacity by as much as 61 percent.<sup>18</sup>
- Summarizing the concern of all CMRS carriers, CTIA concludes that introduction of an interference temperature based system in CMRS spectrum would have troubling effects on spectrum efficiency and service quality while raising accountability and enforcement issues that appear intractable.<sup>19</sup>

These comments only partially reflect the broad consensus in the record that the Commission’s consideration of the interference temperature metric is premature given the existing state of technology. This view applies even more strongly to the proposals in the *Notice of Proposed Rule Making*, which is considering immediate implementation of the policy in the 6525-6700 MHz, 12.75-13.15 GHz, and 13.2125-13.25 GHz bands. In its opening comments, Motorola stated that the Commission’s proposals should be deferred as they rely on work conducted for the 5 GHz band that is not directly applicable to the fixed services bands under consideration.<sup>20</sup> In support of this statement, Motorola submitted a technical study that demonstrates that applying the 5 GHz parameters to 6 GHz operations results in more than 60 dB greater interference.<sup>21</sup> Other commenters expressed similar concerns:

- The IEEE 802.11 Committee urges “caution” in moving forward in releasing these bands for unlicensed use as it is concerned that the interference issues related to fixed service operations may not have been fully examined.<sup>22</sup>
- Cingular and BellSouth recommend that the FCC should not move forward with the *NPRM* as the definition of interference temperature is not yet settled.<sup>23</sup>

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<sup>18</sup> Comments of Verizon Wireless at 11.

<sup>19</sup> CTIA Comments at ii.

<sup>20</sup> Motorola Comments at 15.

<sup>21</sup> *Id.* at Appendix B.

<sup>22</sup> Comments of IEEE 802.11 at 7.

<sup>23</sup> Comments, Cingular Wireless LLC and BellSouth Corporation at 44.

- Sprint demonstrates that transmit power control (“TPC”) and dynamic frequency selection (“DFS”) are technically infeasible methods for implementing the interference temperature concept in fixed point-to-point radio networks.<sup>24</sup>
- The United Telecommunication Council (“UTC”) urges the FCC to avoid tests in the 6 GHz band due to fact that they are heavily used for critical infrastructure applications.<sup>25</sup>

The record in this proceeding is overwhelming clear: FCC consideration of the interference temperature metric is premature given the technical difficulties associated with implementation, the potentially severe consequences on existing services, and the limited, if any, resulting benefits. While Motorola appreciates the Commission’s efforts to explore new ideas for managing the spectrum, our expectation is that more tangible benefits will arise through the thoughtful promotion of cognitive radios.<sup>26</sup>

Respectfully submitted,

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<sup>24</sup> Sprint Corporation Comments at 38-44.

<sup>25</sup> Comments of the United Telecom Council at 9.

<sup>26</sup> See Comments of Motorola, Inc., ET Docket No. 03-108, submitted May 3, 2004.