**Before the**
**Federal Communications Commission**
**Washington, D.C. 20554**

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| In the Matter of | ) | |
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| Revision of Parts 2 and 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) devices in the 5 GHz band | ) | ET Docket No. 03-122 |
| | ) | RM - 10371 |
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# COMMENTS OF INTEL CORPORATION

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## INTRODUCTION AND SUMMARY

Intel Corp. (Intel) hereby submits this comment in response to the Notice of Proposed Rulemaking in the above-referenced proceeding. Intel is the world's largest semiconductor manufacturer and a leader in technical innovation. Intel is also a leading manufacturer of communications and networking chips and equipment.

Intel commends the FCC for initiating this important rulemaking to permit unlicensed National Information Infrastructure (U-NII) devices in the 5.470-5.725 part of the 5 GHz band. By implementing an important resolution of the Final Acts of the WRC-03,[1] the proposed rules will provide an additional 255 MHz of spectrum for use by unlicensed devices.

In this filing Intel makes recommendations regarding two issues raised in this rulemaking:

- **Dynamic Frequency Selection (DFS).** The Commission has correctly concluded that for systems where multiple devices operate under a central controller only the central controller is required to have DFS capability; and

- **Transmit Power Control (TPC).** The proposed TPC rules are complete and no fixed trigger mechanism should be mandated.

**DYNAMIC FREQUENCY SELECTION**

As recognized by the Commission, wireless networks can be designed with multiple slave devices operating under the control of a central controller. Alternatively, they can be designed to operate in an "ad-hoc" fashion without such a controller.

Intel supports the Commission's tentative conclusion that where systems with multiple devices operate under a central controller, only the central controller is required to have full DFS capability. This approach will reduce cost and power consumption by mobile devices. On the other hand, where remote devices are not under the control of a master device,, e.g., in the case of architectures such as mesh networks such devices should be required to have DFS to meet the WRC resolutions.

Regarding identification of remote units that operate only under the control of a central controller, the proposed rules and existing certification process are adequate. Manufacturers need to identify whether or not a device is capable of operating independently or under control of a master and comply with the proposed rules regarding Channel Availability Check Time and Channel Move Time accordingly.

**TRANSMIT POWER CONTROL**

In addition to DFS, the Commission proposes to require a transmit power control mechanism in the 5.470-5.725 GHz band to further reduce the potential impact on EESS and

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[1] http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-237420A1.doc

SRS operations. The goal, consistent with the WRC-03, is "to provide, on average, a mitigation factor of at least 3 dB on the maximum average output power of the systems."[2]

TPC is a capability that can achieve, among other things, a reduction in overall emissions, but Intel believes that mandating a fixed trigger mechanism and level could undermine innovation in the air-interfaces employed in wireless devices including 802.11a & b. Such regulation could reduce spectrum efficiency and potentially increase overall emissions.

By adapting the data rate to channel conditions systems can maximize network efficiency by minimizing the time of transmission. Just as wire-line modems adjust their baud rate depending on the quality of the wired-link, today's protocols for wireless data communication employ "multi-rate" schemes to adjust bit rate based on channel conditions. For instance the IEEE 802.11a standard has a range of possible data rates from 6 to 54 Mbps. For 802.11b the set of possible data rates is 1, 2, 5.5, and 11 Mbps.

If the Commission were to mandate a fixed trigger mechanism such as BER, it could adversely impact this capability and reduce spectrum efficiency. While potentially limiting peak power, TPC regulation could raise emissions by requiring devices to operate for longer periods in order to deliver a given body of data. A fixed trigger mechanism could impede innovation, particularly new protocol development and its associated spectrum efficiencies.

Moreover, such regulation is not necessary. As the Commission correctly notes:

> Because TPC equipped devices adjust their transmit power to the minimum necessary to achieve the desired performance, the average interference power from a large number of devices is reduced, the power consumption is minimized and network capacity is increased.[3]

[2] See Final Acts of WRC-03 (Provisional), RESOLUTION [COM5/16] (WRC-03). Resolves #7
[3] See NPRM @10

Battery life is a critical and highly competitive parameter for laptop computers and other mobile devices. Computers employ many power saving mechanisms. For instance Intel has invested hundreds of millions of dollars developing technology such as SpeedStep® to minimize CPU power consumption for extended battery life.[4] Such capabilities are invoked automatically when a laptop is removed from line power source, or directly by the user. Likewise a mandated TPC capability will be a strong incentive to develop products that reduce their power consumption in response to reduced transmit power.

Accordingly, Intel believes that the TPC rules, as proposed by the Commission, are adequate and no fixed trigger mechanism should be mandated**.** The benefits of power savings and increased network capacity will lead to the optimal use of TPC capability. This approach also has strong international support. It is the approach currently proposed by the European

4 In 2000, Intel developed and released its Intel SpeedStep® technology for select Pentium® III processors. The first version of this technology adjusted the speed of the processor depending on power source: AC — full performance, DC — reduced performance and longer battery life. The technology has evolved to include demand-based performance. That is, a mobile processor with Intel SpeedStep® technology automatically adjusts its speed depending on what applications the user is running. When less demanding applications are run, the processor "steps-down" to a lower power state, conserving battery life. See PC Energy-Efficiency Trends and Technologies;

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Telecommunications Standards Institute (ETSI), in ETSI Final draft ETSI EN 301 893 V1.2.2 (2003-06) standard (currently in the approval process by the Member States of the European Union).[5]

Respectfully submitted,

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http://www.intel.com/ebusiness/pdf/prod/related_mobile/ar024103.pdf?iid=ipp_battery+rel_trendswp&

[5] Broadband Radio Access Networks (BRAN); 5 GHz high performance RLAN; Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive