Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of	)	
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Commission Staff Requests that Interested Parties Supplement the Record on Draft Interference Rules for Wireless Communications Service and Satellite Digital Audio Radio Service	))))	WT Docket No. 07-293 IB Docket No. 95-91 GEN Docket No. 90-357 RM No. 8610

To: Chief, Office of Engineering and Technology
Chief, International Bureau
Chief, Wireless Telecommunications Bureau

COMMENTS OF ERICSSON INC

Ericsson Inc ("Ericsson") submits these comments in response to the staff's April 2 Public Notice inviting comments on draft interference rules for the Wireless Communications Service ("WCS") and Satellite Digital Audio Radio Service ("SDARS").[1]

Ericsson is a world-leading provider of telecommunications equipment infrastructure and services to mobile and fixed network operators in more than 175 countries. As a global telecommunications solution provider, Ericsson is committed to the development and harmonization of worldwide standards and has participated extensively in standards-making processes through organizations such as the 3rd Generation Partnership ("3GPP") and International Telecommunication Union ("ITU").

Ericsson limits its comments to one aspect of the draft interference rules — the proposed uplink duty cycle limiting WCS mobile units to transmitting no more than 38% of the time. The

[1] Public Notice, *Commssion Staff Requests that Interested Parties Supplement the Record on Draft Interference Rules for Wireless Communications Service and Satellite Digital Audio Radio Service,* DA 10-592 (April 2, 2010); *Commission Staff Requests That Interested Parties Supplement the Record on Draft Interference Rules for Wireless Communications Service and Satellite Digital Audio Radio Service,* WT Docket 07-293 et al., *Order Extending Comment Period,* DA 10-622 (April 13, 2010).

duty cycle proposal is at odds with the principle of technology neutrality and will handicap one of the two current technologies likely to be employed in the WCS band. As the Commission is aware, the 2300-2400 MHz band has been globally identified by the ITU at its World Radio-communication Conference in year 2007 for use by mobile terrestrial service.[2] There are currently two globally standardized technologies that can readily be employed to provide broadband services in the 2.3 GHz (WCS) band: IEEE 802.16e ("WiMAX"), and time-division-duplex LTE ("TD-LTE"). The draft rules were apparently drafted from the perspective of WiMAX and, as a result, they do not take into account certain features of the standards for TD-LTE.[3] As the Commission's National Broadband Plan recently observed, "global harmonization across spectrum usage, along with international standards-setting, can reduce per-unit costs and lead to increased adoption and usage of the Internet around the world."[4]

The uplink duty cycle (*i.e.*, the percentage of time devoted to transmission from mobile devices) is a key element of time-division duplex technologies closely linked to the level of symmetry or asymmetry between the up- and downlinks. The 3GPP standards body sought to give TD-LTE network operators around the world the ability to choose uplink-downlink configurations based on the nature of traffic carried by varying the duty cycle.[5]

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[2] *See* ITU Regional Radiocommunications Seminar, *Results of WRC-07, Bringing it All Together* (April 14-18, 2008), *available at* http://www.itu.int/ITU-R/space/support/workshop/doc_presentation_en/WRC07%20results_FL.pdf.

[3] Ericsson recognizes that the current draft rules were modified from an earlier draft to eliminate a technology-specific time period for measurement of the upload duty cycle. After it was noted that the use of a 5 ms frame for measurement of the duty cycle would adversely affect technologies such as TD-LTE, which employ a 10 ms frame length, the draft rules were modified to omit any specific measurement period, consistent with technological neutrality. *See Ex parte* letter from WCS Coalition, WT Docket 07-293, filed March 31, 2010.

[4] CONNECTING AMERICA: THE NATIONAL BROADBAND PLAN 60, *available at* http://download.broadband.gov/plan/national-broadband-plan.pdf.

[5] While an asymmetric ratio favoring downlinks may be most efficient for web-surfing and email, a more symmetric ratio, or even one favoring uplinks, may be better suited for networks

(continued on next page)

As a result, in the global standard for TD-LTE there are seven different uplink-downlink configurations.[6] This range allows a network operator to configure its network to suit the nature of its users' traffic. The staff's proposal to specify a maximum duty cycle to manage interference, however, conflicts with this standards-based employment of duty cycle. As discussed below, it will preclude some of the TD-LTE uplink-downlink configuration options, thereby negatively impacting how networks using this technology are designed and used.

The variety of different TD-LTE uplink-downlink configurations allow a network operator to allocate the network's capacity between uplink and downlink traffic to meet the needs of the network.[7] The uplink duty cycle of these seven configurations can readily be computed, showing that three of the seven uplink-downlink configurations for TD-LTE set forth in the

(footnote continued)
that are heavily used to transmit data (such as video, images, or telemetry) upstream from devices to servers.

[6] *See* 3rd Generation Partnership Project, *Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Channels and Modulation (Release 8)*, 3GPP TS 36.211, v. 8.4.0, at Table 4.2-2 (Sept. 2008), *available at* http://www.quintillion.co.jp/3GPP/Specs/36211-840.pdf.

[7] This is accomplished by determining the number of subframes within a frame that are devoted to uplink and downlink activity; in addition, either one or two subframes are "special" subframes (these are considered as downlink subframes when expressing a downlink-uplink ratio, because each "special" subframe has a downlink portion for data; it also has an uplink portion used only for control signaling and a guard portion). The standard provides the following table of the seven configurations, in which the subframes are labeled "U," "D," and "S," respectively:

Uplink-downlink configuration	Downlink-to-Uplink Switch-point periodicity	Subframe number									
		0	1	2	3	4	5	6	7	8	9
0	5 ms	D	S	U	U	U	D	S	U	U	U
1	5 ms	D	S	U	U	D	D	S	U	U	D
2	5 ms	D	S	U	D	D	D	S	U	D	D
3	10 ms	D	S	U	U	U	D	D	D	D	D
4	10 ms	D	S	U	U	D	D	D	D	D	D
5	10 ms	D	S	U	D	D	D	D	D	D	D
6	5 ms	D	S	U	U	U	D	S	U	U	D

3GPP TS 36.211 at Table 4.2-2. Thus, the downlink-uplink ratios range from configuration 5, at 9:1, to configuration 0, at 2:3.

global standard exceed the proposed 38% limit — configurations 0, 1, and 6.[8] These are relatively symmetrical configurations. The remaining configurations are highly asymmetrical in favor of downlink traffic, with uplink duty cycles of 11.667% to 31.667%,[9] and are not well suited to networks with symmetrical traffic or a high level of uplink traffic.

To avoid conflicts with the standards with TD-LTE and potentially other technologies, Ericsson urges the Commission not to specify any duty cycle. This will provide network operators and developers of future technological standards with the greatest flexibility to meet the needs of users. A network that can match the uplink-downlink needs of users will use spectrum more efficiently, while placing the fewest constraints on user data rates. If a large proportion of a network's traffic is uplinked (*e.g.*, video surveillance for public safety customers), a limitation on the uplink duty cycle will cause uplinked data sessions to be more congested and slower (because users will be in contention for the limited uplink slots), while at the same time reserving more transmission time for downlink activity than is warranted by the traffic. In some cases, this could also increase network deployment costs by requiring a greater number of cells to accommodate uplink traffic.

If the Commission nevertheless adopts a maximum uplink duty cycle, it should select a limit that imposes the fewest constraints on standards-based technologies. From the viewpoint of TD-LTE network design, the limit should ideally be set high enough (*i.e.*, above 63.333%) to permit the use of *all* of the current TD-LTE uplink-downlink configurations. In any event, *at an*

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[8] Configuration 0 has an uplink duty cycle of 63.333%; configuration 1 has an uplink duty cycle of 43.333%; and configuration 6 has an uplink duty cycle of 53.333%. (The duty cycles were computed by adding the time period of the uplink subframes to the uplink time during the special subframes, and dividing by the time period of a frame, using special subframe configuration 5 with extended cyclic prefix. *See* 3GPP TS 36.211 at Table 4.2-1.)

[9] Configuration 2 has an uplink duty cycle of 23.333%; configuration 3 has an uplink duty cycle of 31.667%; configuration 4 has an uplink duty cycle of 21.667%; and configuration 5 has an uplink duty cycle of 11.667%.

absolute minimum, the duty cycle should be raised above 43.333%, which corresponds to the 3:2 downlink-uplink ratio of TD-LTE configuration 1. This configuration is considered to be typical in many TDD networks and most appropriate for networks with nearly symmetrical traffic.

For the reasons discussed above, Ericsson urges the Commission not to specify any maximum uplink duty cycle and maintain global harmonization by allowing network operators to select technology standards and configurations that best meet the needs of their users. But if a duty cycle is pursued, it should be selected so as not to place unreasonable constraints on system design by precluding network configurations that are likely to be the most efficient way of accommodating common traffic patterns.

Respectfully submitted,

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