

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

**In the Matter of** )  
 )  
**Revision of Part 15 of the Commission’s Rules** ) **ET Docket No. 98-153**  
**Regarding Ultra-Wideband Transmission** )  
**Systems**

**TO: The Commission**

**REPLY COMMENTS OF KOHLER CO.**

Kohler Co., a worldwide leader in plumbing and power systems, hereby submits its reply comments in the above-captioned matter.

**SUMMARY**

Kohler supports the proposal to bifurcate the rulemaking and proceed with the authorization of those ultra-wideband (“UWB”) devices that are the least likely to cause interference to other users. Kohler opposes the proposals made by some commentors to: 1) establish a separate limit on antenna gain; 2) to regulate specific pulse shapes; 3) not to use the –10 dB points for determining bandwidth; and 4) to require a direct connection between the UWB transmitter and the measurement mixer in order to measure the peak envelope of the signal. Finally, Kohler opposes creating of a novel licensing scheme for UWB devices in lieu of basing their regulation on Part 15 of the Commission’s Rules.

## DISCUSSION

### **1. Proposals to split rulemaking**

There are a number of commentors<sup>1</sup> who propose dividing the rulemaking into parts, with the initial focus being on lower powered devices and applications. This is a good way to test the various operating scenarios of UWB devices, and Kohler supports bifurcating the proceeding. Kohler would support any of the proposed demarcations for the first phase. Those proposals would expedite consideration for devices that are:

- Less than the limits on average field strength set forth in Section 15.209 of the Commission's Rules at all frequencies;
- At least 12 dB under the Section 15.209 limits on average field strength below 3.0 GHz;
- Less than the Section 15.209 limits on peak power below 3.0 GHz;
- Less than 500 mV/m at 3m absolute peak field strength (+18.8 dBm peak EIRP); or
- Restricted to indoor operations.

The proposed Kohler sensor operates with a center frequency of 5.8 GHz, a -10 dB bandwidth of 800 MHz, radiates -47.3 dBm/MHz at the peak frequency and an absolute peak field strength of +7 dBm, is not networked or synchronized with any other devices, and is not mobile or used outdoors. There are numerous commercial sensor technology applications that are viable using parameters like these.

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<sup>1</sup> Comments along these lines were made by Endress+Hauser (comments filed September 12, 2000, p. 4), Boeing (comments filed September 12, 2000, p. 10), Zircon (comments filed September 12, 2000, p. 5) and several others.

## **2. Limits on Antenna Gain**

MSSI suggested that no more than +6 dBi antenna gain be allowed with UWB devices.<sup>2</sup> Kohler agrees that there must be limits on the peak radiated intensity in a given direction, but it does not agree with a separate limit on antenna gain. The proposed rules state the emission limits in terms of field strength in the direction and polarization with the maximum emission, and stated in this way, constrain the product of antenna gain, radiation efficiency and input power. Kohler believes this is the appropriate way to limit the emissions from UWB devices, as it is for most other Part 15 devices.

Kohler's proposed device does not use a high-gain antenna because of size constraints, but other applications that can benefit from higher-gain antennas should be allowed to do so. For the same field strength in the maximal direction, a high-gain antenna will have lower emissions away from the main beam than a low-gain antenna, and reduced potential for interference in general.

## **3. Pulse Shapes**

It is clear from the comments that a wide variety of different pulse shapes are being considered. Kohler believes that the rules should not regulate pulse shape. Instead, the rules should regulate those characteristics that cause interference to existing (narrowband) spectrum users, including the power spectral density and peak pulse energy, and possibly the pulse repetition rate, rather than specific pulse characteristics in the time domain. Regulating specific pulse shapes rather than those characteristics of the

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<sup>2</sup> MSSI comments dated September 12, 2000, p.14.

emissions that affect narrowband users can have unintended consequences which result in greater interference.

For example, Kohler's proposed device uses a carrier burst with an approximately gaussian envelope, which has the lowest edge rates consistent with its sensing function. If regulations are adopted based around a specific pulse shape, such as a gaussian monocycle, such regulations could force carrier-based systems to use higher envelope edge rates than are needed. This will result in greater interference to narrowband systems at frequencies far removed from the carrier than if the regulations simply set appropriate limits on average and peak emitted field strength as a function of frequency.

#### **4. UWB Measurement Points and Definition**

In the NPRM, the FCC noted that determining the bandwidth of UWB devices by measuring at the -20 dB points could be problematic, since many of the envisioned devices operate at such low power that the -20 dB points are below the noise floor of traditional EMC analysis equipment. It was suggested that the -10 dB points be used instead. Kohler agrees with the use of the -10 dB points, provided the definition of a UWB device is changed to account for the narrower bandwidth that will be measured.

In reply, the National Business Aviation Association comments that the -10 dB points are inappropriate for measurement of the bandwidths used by UWB systems,<sup>3</sup> because this leaves a significant amount of power unregulated outside these points, and possibly spread to far-removed frequencies.

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<sup>3</sup> National Business Aviation Association comments, filed September 12, 2000, p. 5.

Kohler submits that a better way to accomplish the same goal would be to make the measurement points depend on the peak radiated power spectral density. For low-power devices, there is very little total power beyond the -10 dB points, because the total power is very low. For higher-power devices, measurement at the -20 dB points is feasible. Kohler would support a revision of the proposal to require measurement at the lowest points possible in the range -10 to -20 dB, with appropriate adjustments to regulated quantities that depend on these measurements.

### **5. Peak Measurement Method**

Comments from Lucent<sup>4</sup> suggest a method for measuring the peak envelope of the UWB signal, which seems to require a direct connection between the UWB transmitter and the measurement mixer. To make accurate peak measurements, reflections at that connection would need to be controlled.

There are a number of proposed UWB systems, including Kohler's, which use integral antennas and do not have points in the circuit which are at a suitable impedance level for such a connection. Therefore, we oppose any measurement method that cannot be applied to systems that have integral antennas.

### **6. “Unrestricted Permit” Regulatory Approach**

Professor Jon Peha advocates creating a different scheme for licensing UWB devices than Part 15.<sup>5</sup> He advocates creating “unrestricted permits,” which would require manufacturers or importers of UWB devices to obtain permits allowing them to

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<sup>4</sup> Lucent Technologies, Inc. comments, filed September 12, 2000, p. 4.

<sup>5</sup> Comments of Professor John M. Peha dated June 30, 2000.

manufacture or import a fixed number of devices in a given year. Permittees would have to file reports setting forth the spectral and other characteristics of the devices covered by their permits.

Kohler does not believe the Commission has the legal authority to implement a scheme along the lines proposed by Professor Peha without specific Congressional authorization. Section 309(j) of the Communications Act,<sup>6</sup> authorizes the use of auctions [i]f mutually exclusive applications are accepted...for any initial license or construction permit.” The Peha proposal attempts to create mutual exclusivity by requiring the Commission to designate the number of UWB devices that could be authorized in a given year based “on the number of UWB previously deployed and the extent to which interference problems have been observed.”<sup>7</sup> This approach would not appear to comport with the language of Sec. 309(j) or the congressional intent behind it.

Kohler submits that neither the Commission nor the Congress should tamper with success. Part 15 has been a tremendous success both for consumers and for the Government. It has allowed consumers to buy an incredible array of inexpensive devices, and there has been relatively little need for Governmental policing of Part 15. The Peha proposal would create a complex regulatory scheme that would, in turn, raise the costs of these devices for consumers and discourage manufacturers from developing many new, inexpensive devices to meet the needs of consumers. Even if the legal impediments to auctions were overcome, the money raised from the Peha approach would likely be relatively insignificant. The cost to the public in terms of limiting the

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<sup>6</sup> 47 U.S.C. §309(j).

<sup>7</sup> Peha comments at 7.

types of devices that would be developed would far outweigh the financial benefit to the Treasury.

### **CONCLUSION**

The Commission should adopt rules that permit the development and deployment of ultra-wideband technology as rapidly as possible. It should also adopt the proposals made in the NPRM with few changes. Bifurcation of the rulemaking would allow the introduction of those low power UWB devices that do not present significant interference problems while allowing the Commission to satisfy itself that the proliferation of UWB devices will not create significant interference.

Kohler once again congratulates the Commission on having taken a substantial step forward by proposing rules for UWB devices and continues to support the Commission's efforts in this regard.

Respectfully submitted,

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