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

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In the Matter of

Revision of Part 15 of the FCC's  
Rules Regarding Ultra-Wideband  
Transmission Systems

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) ET Docket No. 98-153  
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FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

To: The Commission

Comments of Endress + Hauser GmbH & Co.

Endress + Hauser GmbH & Co. ("Endress Hauser"), by its attorneys and pursuant to section 1.419 of the rules and regulations of the Federal Communications Commission ("FCC" or "Commission")<sup>1</sup>, hereby submits its comments in response to the *Notice of Proposed Rule Making* ("NPRM"), released on May 11, 2000, in the above-captioned proceeding. As set forth more fully below, Endress Hauser urges the Commission to revise Part 15 of its rules to permit the rapid and full deployment of advanced ultra-wideband devices ("UWB devices").

I.

BACKGROUND.

Endress Hauser is a leading manufacturer of Part 15, unlicensed radar level measurement systems. The company's state-of-the-art radio frequency ("RF") products are

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<sup>1</sup> 47 C.F.R. § 1.419 (1999).

employed at industrial sites throughout the United States.<sup>2</sup> Endress Hauser submitted comments in the *Notice of Inquiry*<sup>3</sup>(“*NOI*”) preceding this *NPRM*. As discussed in its comments in the *NOI*, Endress Hauser urges the Commission to treat UWB devices, particularly radar level measurement systems such as those produced by Endress Hauser, as unlicensed intentional radiators with certain Part 15 restrictions. In response to the *NPRM*, Endress Hauser suggests modification to the FCC’s Part 15 regulations, in the manner indicated herein, to allow for the development of UWB devices free from unduly restrictive regulations.

## II.

### SUMMARY.

Endress Hauser agrees with the FCC that UWB devices operating both above and below 2 GHz should operate on an unlicensed basis. The potential use of UWB devices by businesses and individuals makes it unrealistic and burdensome for both the Commission and manufacturers to require licensing of the end users of these devices. Further, requiring users to obtain licenses to operate UWB devices would most likely increase the cost of the devices to consumers thus stifling the advancement and use of the technology. Therefore, Endress Hauser supports the Commission’s proposal to allow the operation of UWB devices, subject to Part 15 of the FCC’s rules, on an unlicensed basis.

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<sup>2</sup> The *NPRM* incorrectly suggests that only three UWB systems have been authorized by the Commission – and only based on waivers. *NPRM* at n.21. In fact, Endress Hauser has already received Part 15 “certification” approvals for the use of its UWB devices.

<sup>3</sup> ET Docket No. 98-153, 63 Fed. Reg. 50184 (Sept. 21, 1998).

III.  
DISCUSSION.

*UWB Definition*

In the *NPRM*, the FCC tentatively defines UWB devices as those devices “where the fractional bandwidth is greater than 0.25 or occupies 1.5 GHz or more of spectrum,” measured at a -10dB signal strength. When determining the bandwidth of these devices, the FCC proposes to take into account the devices’ antenna.<sup>4</sup> Endress Hauser supports the Commission’s proposed definition of UWB devices.<sup>5</sup> Endress Hauser manufactures radar level measurement systems that operate with bandwidths ranging from 0.7 GHz to 10 GHz bandwidth with 5.8 GHz, 6.3 GHz, 24 GHz or 76 GHz center frequencies. Radar level measurements systems are low power devices that measure stored fluids or solids under extreme conditions such as extreme heat or cold or pressure. Also, because Endress Hauser’s UWB devices are manufactured and shipped with a custom antenna, it is essential that the FCC take into account the antenna used with the UWB device to calculate bandwidth.

The FCC also proposes a conservative approach with respect to devices that use modulation type emissions other than pulsed emissions. In particular, the Commission offers the example of linear sweep FM that could be used to produce UWB systems.<sup>6</sup> The Commission concludes that this rule making proceeding should be limited to pulsed emissions

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<sup>4</sup> *NPRM* at ¶ 21.

<sup>5</sup> In its comments, Saab Marine Electronics AB, claims that the FCC should modify the definition to 0.17 or 1.0 GHz of spectrum because the FCC had upwardly adjusted the -20dB bandwidth to -10dB. Saab comments at 2; see also Valeo Schalter und Sensoren GmbH comments at 4. Endress Hauser does not have a preference between these two alternatives..

<sup>6</sup> Id.

because not enough information is available to propose limits and measurements for systems using linear sweep FM technology.<sup>7</sup> Endress Hauser agrees that linear sweep FM should not be included in the definition of UWB. Frequency Modulated Continuous Wave (“FMCW”) systems emit continuous emissions because a center frequency is shifted very slowly across a narrow bandwidth. The cumulative impact of this linear sweep could result in possible background noise, making it very dissimilar from true UWB systems.<sup>8</sup>

### *Frequency Bands of Operation*

Endress Hauser agrees with the Commission’s proposal to not impose restrictions on UWB devices operating above 2 GHz.<sup>9</sup> As discussed previously, Endress Hauser’s radar level measurement systems operate above 5 GHz. These devices do not cause harmful interference to other users of the spectrum due to the low transmission power.<sup>10</sup> Because the pulsed signal energy is spread over an ultra-wide bandwidth, the spectral power density is extremely low and is equivalent to background noise. Thus, Endress Hauser’s radar level measurement systems have an extremely low potential of causing harmful interference to other users of the radio spectrum and restrictions by the FCC on these devices would only hinder their use and development.

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<sup>7</sup> Id.

<sup>8</sup> See also Endress Hauser *NOI* Comments at 2, 5.

<sup>9</sup> *NPRM* at ¶ 27. Much of the *NPRM* is devoted to considerations related to the possibility that Global Positioning Systems (“GPS”) receivers will suffer degraded performance from UWB devices with center frequencies below 2 GHz. Because Endress Hauser’s highly-specialized UWB devices: (i) do not operate below 5 GHz, and (ii) are only employed in industrial environments, these considerations should not delay the adoption of any FCC rules or policies intended to promote UWB technology above 5 GHz. In fact, the Commission should bifurcate this proceeding if necessary in order to permit expedited approval of those UWB devices where GPS interference is not an issue.

<sup>10</sup> See Endress Hauser *NOI* Comments at pg. 3.

The Commission discusses the definition, operating frequency, and interference potential of Ground Penetrating Radar (“GPR”). GPR is defined as devices pointed at the ground or on the ground that detect buried objects. Due to the focused output of GPRs, the FCC tentatively concludes that the interference potential to victim receivers is low because emissions in other directions by the device can be easily shielded without affecting the GPR operations.<sup>11</sup> Thus the FCC proposes to allow GPRs to operate as an UWB device in any part of the spectrum.<sup>12</sup>

Endress Hauser’s radar level measurement systems detect liquids and solids behind walls or in tanks. For instance, one series of Endress Hauser devices are designed for the continuous, non-contact level measurement of liquids, pastes and slurries that are stored in storage, buffer and processing tanks, or metallic bypass pipes and stilling wells. These devices are suitable for use in areas at risk of explosion as well as areas of extreme temperature. These devices can also be used to measure substances that change temperature or that are surrounded by inert gas or vapor. UWB devices, such as those described above, are very similar to GPRs because the devices are pointed at a particular surface to locate or measure a substance. Thus, devices like the ones made by Endress Hauser should receive the same regulatory treatment as GPRs.

The Commission states several arguments for classifying GPRs as UWB devices that may operate in any part of the spectrum. As an initial matter, the FCC claims that the risk of *interference from GPRs* is miniscule because the frequency transmission is directed into the

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<sup>11</sup> *NPRM* at ¶ 25.

<sup>12</sup> Id.

ground.<sup>13</sup> Endress Hauser's UWB devices will also produce negligible interference because the frequency output from the devices is directed toward process tanks, stilling wells or pipes. These devices are also used in the presence of hazardous materials. The opportunity for interference with other devices or radios is remote based simply on the situations where these devices will be used. Consequently, UWB devices such as these should be treated the same as GPRs.

The Commission also states that GPRs should be classified as UWB devices because emissions in other directions can be shielded without affecting the operating characteristics of the GPR.<sup>14</sup> Similar to GPRs, the devices used in Endress Hauser's radar level measurement systems are focused on a specific area. And also similar to GPRs, stray emissions in Endress Hauser's devices can also be shielded without affecting the reliability of the equipment.

Finally, the FCC notes that because GPRs operate at infrequent intervals and at a low proliferation, the potential for interference from these devices should be low.<sup>15</sup> Endress Hauser's UWB devices also operate at infrequent intervals. Furthermore, specialists in very specific situations such as chemical plants and nuclear power facilities will use these devices. The cost and highly specialized nature of these devices will not make them tools of the general public where the devices could be indiscriminately aimed or employed so as to cause interference to other spectrum users. Thus, Endress Hauser suggests that such radar level measurement systems should be afforded regulatory treatment similar to GPRs.

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<sup>13</sup> Id. at ¶ 25.

<sup>14</sup> Id.

<sup>15</sup> Id.

### *Emission Limits*

In order to protect other radio services, the FCC suggests emission limits to control harmful interference from UWB devices. The FCC proposes to regulate the peak and average emission levels above 1 GHz, which is similar to the emission level regulations of other devices in Part 15 of the rules.<sup>16</sup> Endress Hauser urges the Commission to treat UWB devices as Class A digital devices utilizing the emission limits specified FCC rule section 15.109(b).<sup>17</sup> Similar to FCC rule section 15.109(b), the field strength measurement of UWB devices should be determined at a distance of 10 meters. These emission limits have been proven to be effective in practice. Thus, Endress Hauser suggests that the FCC utilize the emission limits for Class A digital devices for UWB devices.

The Commission also asks for comment on the potential for interference due to the cumulative impact of emission from multiple UWB devices. Endress Hauser believes that the FCC should not take into consideration the cumulative impact of emissions because it has found that the probability of cumulative emissions interference is negligible. In its comments responsive to the NOI, Endress Hauser demonstrated that antenna directivity is a mitigating factor with respect to multiple co-located UWB devices.

With respect to peak emissions, the FCC proposes limits in order to reduce the potential interference from UWB devices operating above 1 GHz. In the *NPRM*, the FCC requested comment on several possible definitions of peak emissions as applied to UWB devices. The first definition is consistent with current FCC rule section 15.35(b) and defines peak emissions as peak signal strength measured over a 50 MHz bandwidth and applying a

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<sup>16</sup> Id. at ¶ 36.

<sup>17</sup> 47 C.F.R. § 15.109(b) (1999).

20db limit on the maximum permitted emission level.<sup>18</sup> Endress Hauser suggests that this definition is appropriate because the defined limits have been proved in practice.

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<sup>18</sup> 47 C.F.R. § 15.35(b) (1999).

IV.

CONCLUSION.

Based on the foregoing, Endress Hauser requests that the agency amend its rules in a manner consistent with the views expressed herein.

Respectfully submitted,

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