**Before the**

**FEDERAL COMMUNICATIONS COMMISSION**

**Washington, DC 20554**

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| In the Matter of Expanding Flexible Use in Mid Band Spectrum Between 3.7 and 24 GHz | ))))  | GN Docket No. 17-183 |

REPLY COMMENTS OF IEEE 802.15 Working Group

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The initial IEEE 802 response to the NOI generally supported expanding license exempt use of the mid band frequencies but raised concerns over whether effective coexistence mechanisms could be found for existing Ultra Wide Band (UWB) uses, particularly in the 6-7 GHz band, the only band with the widest global availability for UWB. The 802.15 Working Group has a number of Standards with UWB Physical (PHY) layers, and there are many manufacturers that have already deployed equipment in the license exempt band between 5.925 GHz and 7.125 GHz. This equipment operates in compliance with FCC PART 15, Subpart C Section 15.250, and/or Subpart F, depending on their characteristics. The IEEE 802.15 standards potentially impacted include IEEE Std 802.15.4a (2007), IEEE Std 802.15.6 (2012), IEEE Std 802.15.4f (2012), and soon IEEE Std 802.15.8. Use of these standards has fostered significant growth in the UWB industry.

Many companies have made massive investments in R&D for more than a decade developing products using IEEE 802.15 UWB modulations. One of the main application areas of the current UWB deployments is real-time location systems, (RTLS) which include safety and security applications. Impairment of those systems could have serious consequences.

Use-cases include but are not limited to:

* Security of infants and geriatrics in a hospital/home setting
* Safety of personnel operating in proximity to machinery
* Guidance/safety of first responders, e.g. firefighters entering smoke filled buildings
* Automotive passive entry systems based on secure proximity detection
* Position based secure access to buildings, and, position based payment systems.
* Security of inmates/staff in a prison setting
* General indoor navigation, autonomous robot guidance, factory automation, smart home
* Sports tracking

All of these devices transmit using impulse modulations in accordance with the FCC regulations and IEEE 802.15 standards. This is in contrast to IEEE 802.11 type modulations which employ continuous waveforms with detectable carrier frequencies.

Opening the 5.925 GHz and 7.125 GHz bands to IEEE 802.11 type modulations or similar higher power, broadband license exempt radio uses would create significant sources of new in-band interference. The transmissions from these devices would overwhelm the small signals utilized by the aforementioned Part 15.250 impulse radios. It will be impossible for these impulse radios to cope with this interference under most circumstances.

If IEEE 802.11 (or similar) type radios are allowed to operate, as is, in this band it would be virtually impossible for them to detect-and-avoid the deployed wideband and UWB devices. These impulse radio devices transmit at a maximum power level of -41.3 dBm/MHz. This is exactly equivalent to the maximum allowable spurious noise specification for computing equipment. This very low transmit power limit was chosen to assure that the intentional UWB transmitters generated no more interference than is allowed from non-radio computing devices. The only methodology known to detect these low power impulse radios is to include specific demodulators capable of receiving the modulations of the victim UWB radio.

Additionally, the unlicensed allocation under Part 15.250, like that of the related Subpart F, was designed to protect licensed users in that band. By recognizing that licensed users typically had channel bandwidths of 25MHz or less, the requirements of Part 15.250 (and to a greater extent Subpart F) force there to be a large discrepancy between the bandwidths of unlicensed and licensed users. This, along with the limits on peak and average EIRP spectral density, allows a useful Part 15 system to be built, while taking advantage of pulse desensitization as a natural means to protect victim receivers.

The IEEE 802.15 Working Group can only support opening up the 6 GHz to 7 GHz band to additional license-exempt use supporting IEEE 802.11 (or similar) type modulations, if there is first research resulting in the demonstration of real world effective coexistence mechanisms.