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Thank you for the opportunity to submit our comments for the TRAI Press Release No. 109/2023 dated 20th Oct 2023

We have answered the questions 45, 46 & 47 later in this document.

Examples of 60GHz products and applications and their references of their deployment to Europe and rest of the countries.

Vehicle In-Cabin Passenger Detection - Child Presence Detection (CPD)

- o Detect the presence of a child left in a vehicle to prevent pediatric vehicular heat-stroke. Note that 60GHz mmWave systems can differentiate between a child and an object left on the seat, reducing the likelihood of false alarms. In addition, 60GHz mmWave radar can detect micro-movements like breathing patterns and heart rates, neither of which can be accurately captured by cameras or in-seat sensors alone.
- o Among the NCAPs, Euro NCAP is currently the most active in adopting new items. Starting to awarding points from 2022 for CPD systems. Implementing many changes in Euro NCAP has resulted in other NCAPs from countries that are not considered advanced automobile nations and have a strong tendency to follow Euro NCAP making changes of their own, which hinders the standardization that is desired by OEMs.
- o The US Federal Communications Commission recently adopted new rules for the 60 GHz spectrum band that will facilitate the use of short-range radar systems which can help to prevent the deaths or injuries of children and companion animals who have unknowingly been left in or entered vehicles.
 - On November 10th 2022 an [industry agreement](#)⁽⁵⁾ between Acconeer and Intel, Meta, Qualcomm was reached for pulsed radar operation for update of 15.255 rules. § 15.255 Operation within the band 57–71 GHz: <https://www.ecfr.gov/current/title-47/section-15.255>
 - *“For pulsed field disturbance sensors/radars operating in the 57–64 GHz band that have a maximum pulse duration of 6 ns, the average EIRP shall not exceed 13 dBm and the transmit duty cycle shall not exceed 10% during any 0.3 μs time window. In*

addition, the average integrated EIRP within the frequency band 61.5–64.0 GHz shall not exceed 5 dBm in any 0.3 μ s time window. Peak emissions shall not exceed 20 dB above the maximum permitted average emission limit applicable to the equipment under test. The radar bandwidth is the frequency band bounded by the points that are 10 dB below the highest radiated emission, as based on the complete transmission system including the antenna.”

- o Deployment examples: Ongoing for 60GHz interior radar system Volvo Cars [EU], EX90 and Polestar 3.
 - <https://www.media.volvocars.com/global/en-gb/media/pressreleases/304451/world-first-interior-radar-system-from-volvo-cars-helps-you-ensure-that-no-one-is-left-behind>

Gesture control for vehicle access

- o Recognition of foot movement to open a car trunk or when opening or closing a sliding door when the vehicle is stationary. High robustness can be achieved because of the millimeter accuracy provided by 60GHz radar, allowing for precise recognition of multiple gestures and the discrimination of false movements. The bandwidth of 57-64GHz allows for the use of machine learning to identify gestures with high accuracy.
- o While other sensors may also be used for this purpose (such as capacitive systems), pulse radar can perform the function more robustly because of the millimeter accuracy provided by 60 GHz pulsed radar, allowing for precise recognition of multiple gestures and the discrimination of false movements, while consuming small amounts of power.
- o Deployment done by Volvo Cars [EU] and General Motors [US].

Obstacle detection

- o The navigation systems used today by domestic robots such as vacuum cleaner robots, toy robots, or social robots rely on camera, infrared or ultrasonic based sensors. 60GHz pulsed radar can accurately determine the location of transparent, soft and dark materials which can be a challenge with other technologies that may be sensitive to ambient light and sound conditions as well as dusty environments. Radar do not need lens or open aperture to operate which may become clogged and dirty, thereby losing the ability to perform. Obstacle detection used in robotics such as robot lawn movers, robot vacuum cleaner and vehicle door/trunk opener to prevent damage hitting object or injuring humans and pets.
- o Deployment examples:
 - Sony (obstacle detection, Poiq robot) [Japan]
 - Zuchetti (obstacle detection, lawn mover). [EU]

Object classification

- o The high bandwidth of radar in the 57-64GHz band enables the use of machine learning to solve complex use cases. For example, machine learning can perform object and material classification, allowing for cleaning and lawn mower robots to detect the surface on which they are operating. This permits cleaning robots to optimize their settings based on the surface and for lawn mower robots to stay within the lawn by detecting when they are entering a non-grassy surface.
- o Object classification also used for smart cities parking space occupancy to identify if a parking spot is vacant or not. Radar can in this environment operate in ambient lighting and various sound conditions and dirty environments. Also robust against electromagnetic field which is a problem when it comes to magnetometer sensors. A parking sensor that relies on 60GHz pulsed radar for detection can operate in ambient lighting and various sound conditions and in dirty environments. In addition, these systems need to be able to run on battery for several years and need to be able to discriminate cars from other objects (e.g., grocery carts) to avoid false detections. The 60GHz pulsed radar technology addresses these issues, delivering accurate detection at low power consumption.
- o Deployment example, lawn mower application:
 - Zuchetti (grass/no grass classification) [EU]
- o Deployment examples, parking spot detection application:
 - IoT Solution [EU]
 - Libellium [EU]
 - Hancor [Asia, Korea]
 - NHR [Asia, Taiwan]
 - Frogparking [Australia]

Level measurement

- o Some industries, such as the process industry, agriculture, the petroleum industry, waste & water recycling, etc., need to determine the levels of liquids and solids in tanks for inventory and overflow protection. For these purposes, non-contact solutions are preferred, especially those which can be mounted outside the tank to measure through the container. Also as need for overflow protection to determine water level and velocity in wells and sewer system.
- o Deployment examples:
 - Metaspheare [EU]
 - Telchina [China]
 - Packwise [EU]
 - Hosiden [Japan]
 - Tussock [Australia]
 - LevelCon [US]

Structure integrity measurement (displacement measurement)

- 60GHz radar measuring movements of construction such as buildings, highways, bridges and railway displacement. Measuring distance with high accuracy from fixed reference to target structure to detect controlled or accidental movements. 60GHz radar can also be used for predictive maintenance of machinery by remote detection of movements and vibration with high accuracy.
- Deployment examples
 - Kyowa (concrete structure integrity application) [Japan]

60GHz pulsed radar operating in the 57-64GHz band can provide a very cost efficient, low power consumption solution for these kind of applications.

Answers to questions 45, 46 and 47

- **Question 45:** Whether it is feasible to allow low powered indoor consumer device-to-consumer device usages on license-exempt basis in V-band (57-64 GHz), in parallel to use of the auction acquired spectrum by telecom service providers for establishment of terrestrial and/ or satellite-based telecom networks? If yes, whether it should be permitted? Kindly justify your response.
 - **Answer:** Both in EU and US the 57-64 GHz band (57-71 GHz in US) are available on a license exempt base, please see the [15.255 for US](#)⁽¹⁾ and [EN 305 550 v2.1.0](#)⁽²⁾ , [EN 305 550-2 v1.2.1](#)⁽³⁾ for EU. Usage cannot be limited to indoor, as is evident by the listed use cases and the fact that both FCC and EU allow general use. We see benefits by adopting regulation towards EU or US because these two main international standards are recognized in most countries. Here we would like to propose the US standard (limited to 57-64 GHz) as this has the most recent update, with efforts from a number a large companies such as Acconeer, Amazon.com Services LLC, Continental Corporation, Garmin International Inc, Google LLC, IEE Sensing Inc, Infineon Technologies American Corp, Texas Instruments Incorporated, Vayaar Imaging Ltd together with Intel Corporation, Meta Platforms Inc, and Qualcomm Incorporated.
 - V-band (57-64 GHz) pulsed radar usage in parallel with use of the auction acquired spectrum by telecom is no problem as long as they comply to the limitations for communication devices in 15.255 for US as accepted by Intel, Meta and Qualcomm in the update of 15.255 US regulation.
- **Question 46:** In case it is decided to allow low powered indoor consumer device-to-consumer device usages on license-exempt basis in V-band (57-64 GHz),
- (a) Whether it should be permitted in entire band or part of the band? Kindly provide detailed response including the frequency 112 carriers, which should be considered for license exemption with justification.
 - **Answer:** Addressed use cases requires high resolution (i.e. bandwidth), therefore the entire band, 57-64 GHz, must be utilized. Note that co-existence study was part of [Acconeer comment](#)⁽⁴⁾ to the US FCC Notice of Proposed Rulemaking (NPRM), systems that operate in the 57-71 GHz band – pulsed radar, and radar relying on 802.11ad/ay protocol.
- (b) Whether there is a need to define such indoor use? If yes, what should be the definition for such indoor use?
 - **Answer:** In both US and EU these license exempt applications are allowed for both indoor and outdoor.
- (c) What technical parameters should be prescribed including EIRP limits? Suggestions may kindly be made with supporting justification and international scenario.
 - **Answer:** Pulsed radar Operating Bandwidth (OBW) should be evaluated as -10 dBc, as in 15.255 US.

- **Question 47:** Any other suggestions relevant to assignment of spectrum in E-band (71-76/81-86 GHz) and V-band (57-64 GHz) may kindly be made with detailed justification.
 - Answer: Our recommendation is to adopt the V-band (57-64GHz) either to the EU or US standard (the US standard but limited to 57-64 GHz). Here we would like to propose the US standard as also mentioned in the response to question45.

Similar to DoT specifications for WLANs GSR 1043E, we recommend India adopting the FCC rules and limits as per FCC Pt 15.255 for the V-band instead of the Draft ETSI EN standard EN305550.

Instead of prescribing the EN test report we recommend to adopt the FCC test report based on A121 and as well refer to the US standard 15.255 I.e. Attached is the link to FCC regulation:
<https://www.ecfr.gov/current/title-47/section-15.255>

References:

- (1) FCC 15.255 Operation within the band 57-71 GHz: <https://www.ecfr.gov/current/title-47/section-15.255>
- (2) ETSI EN305 550 v2.1.0,: Short Range Devices (SRD); Radio equipment to be used in the 40 GHz to 246 GHz frequency range; Harmonised Standard for access to radio spectrum: https://www.etsi.org/deliver/etsi_en/305500_305599/305550/02.01.00_20/en_305550v020100a.pdf
- (3) ETSI EN 305 550-2 v1.2.1, Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment to be used in the 40 GHz to 246 GHz frequency range; Part 2: Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive: https://www.etsi.org/deliver/etsi_en/305500_305599/30555002/01.02.01_60/en_30555002v010201p.pdf
- (4) Acconeer comments to US NPRM, co-existency study: <https://www.fcc.gov/ecfs/document/109201878526039/1>
- (5) November 10th 2022, industry agreement between Acconeer and Intel, Meta, Qualcomm: <https://www.fcc.gov/ecfs/document/11103018918572/1>



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