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Date: 23rd June 2025

For the attention of: Shri Akhilesh Kumar Trivedi, Advisor (Networks, Spectrum and Licensing), TRAI

From: Acconeer AB
Västra Varvsgatan 19 SE-211 77 Malmö Sweden

Subject: Feedback and recommendations for the ongoing public consultation paper No. 05/2025 on Assignment of the Microwave Spectrum in 6 GHz (lower), 7 GHz, 13 GHz, 15 GHz, 18 GHz, 21 GHz Bands, E-Band, and V-Band

Dear Mr. Shri Akhilesh Kumar Trivedi,

It is with great respect that we, Acconeer AB ("Acconeer") submits this letter to formally comment on Consultation Paper on Assignment of the Microwave Spectrum in 6 GHz (lower), 7 GHz, 13 GHz, 15 GHz, 18 GHz, 21 GHz Bands, E-Band, and **V-Band**, dated 28th May 2025.

Acconeer's proposal to TRAI is to kindly consider following:

1. To open 57-64GHz band ideally according to US FCC 15.255 standard, but limited to 57-64GHz, for general use (both indoor and outdoor) as it is the most recent regulatory update that meets the needs of emerging technology such as low power SRD pulsed coherent radar systems.
2. To permit the entire band of 57-64GHz for license free general use basis taking into consideration current market demand of varied use cases and applications.
3. To allow bandwidth of 7GHz (OBW 57-64GHz). Operating Bandwidth (OBW) should be evaluated as -10 dBc, as in FCC 15.255(c)(3) for pulsed radar.

Detailed answers to consultation paper questions No. 29, 30, 31, 32, 33 & 34 that gave basis to the above proposal summary, as well as detailed reasoning to each of these can be found on pages 6 to 8 of this letter.

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Acconeer company introduction.

Acconeer is a radar sensor development company located in Malmö, Sweden. Acconeer was formed in 2011 to develop innovative technologies based on research pioneered at Lund University and was listed on Nasdaq First North in 2017. Acconeer is a leader in developing small, power-efficient and cost-efficient radar systems that will enable a safer and more sustainable future.

Acconeer has developed an innovative 60 GHz pulsed coherent radar sensor which has the benefits of being produced in a compact integrated form factor (i.e., 5x5x0.8 mm) while consuming low amounts of power. Using the 60 GHz band allows Acconeer's radar sensor to detect extremely small variations in the local environment, such as the vital signs of a human being, while using small antennas that allow for the integration of the sensor into small form factors.

Acconeer's radar system can be used in a large variety of applications such as fixed systems that detect the presence of humans inside buildings and vehicles, and mobile, battery-operated devices such as cell phones, laptops, smart watches, and robots. Due to its low power consumption, Acconeer's radar sensor is ideally suited to various Internet-of-Things ("IoT") applications requiring detection of the presence of objects or the distance to objects where cabling is not feasible and long battery life is important. Battery operation and low power consumption are often the primary concerns of the customer and the public, including for the purpose of minimizing a system's environmental footprint.

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Examples of 60GHz products and their applications with references of deployment in Europe and the rest of the World.

60GHz pulsed radar operating in the 57-64GHz band can provide a very cost efficient, low power consumption solution for different kinds of applications. Examples of such applications are as follows:

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

- 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.
- 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 de-sired by OEMs.
- The US Federal Communications Commission recently adopted new rules for the 60GHz 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 up-date 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 the57–64 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 µs 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"*
- Deployment examples: 60GHz interior radar system Volvo Cars [EU], EX90 and Polestar 3.
    - https://www.media.volvocars.com/global/en-gb/media/pressre-leases/304451/world-first-interior-radar-system-from-volvo-cars-helps-you-ensure-that-no-one-is-left-behind

Gesture control for vehicle access.

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- 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.
- 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.
- Deployment done by Volvo Cars [EU] and General Motors [US].

Obstacle detection.

- 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 mowers, robot vaccum cleaner and vehicle door/trunk opener to prevent damage hitting object or injuring humans and pets.
- Deployment examples:
    - Sony (obstacle detection, Poiq robot) [Japan]
    - Zuchetti (obstacle detection, lawn mower). [EU]

Object classification.

- 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.
- 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

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pulsed radar technology addresses these issues, delivering accurate detection at low power consumption.

- Deployment example, lawn mower application:
  - Zuchetti (grass/no grass classification) [EU]
- Deployment examples, parking spot detection application:
  - IoT Solution [EU]
  - Libellium [EU]
  - Hancom [Asia, Korea]
  - NHR [Asia, Taiwan]
  - Frogparking [Australia]

Level measurement.

- 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.
- 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]

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Comments on TRAI's public consultation paper questions Nos. 29, 30, 31, 32, 33 and 34.

Question 29: Whether it is feasible to allow low power indoor consumer device-to-consumer device usages on a license-exempt basis in the V-band in parallel to the use of the spectrum by telecom service providers for the establishment of terrestrial networks in a part or full V-band? Kindly provide a detailed response with justification and international scenario.

a. 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 indoors, 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.
b. 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 of15.255 US regulation.

Question 30: In case it is decided to allow low power indoor consumer device-to-device usages on a license-exempt basis in the V-band (57-64/66 GHz), -

c. Should it be permitted in the entire V-band or only in a portion of the V-band? If it should be permitted only in a portion of the V-band, please specify the frequency range.
   - Answer: Addressed use cases require 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.
d. In case it is decided to permit low power indoor consumer device-to-device usages on a license-exempt basis in the entire V-band, whether the 57-64 GHz range, or the 57-66 GHz range should be considered for such usages?
   - Answer: In both US and EU these license exempt applications are allowed for both indoor and outdoor.
e. What should be the carrier size/ channel bandwidth?

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- Answer: Bandwidth of 7GHz (OBW 57-64GHz). Operating Bandwidth (OBW) should be evaluated as -10 dBc, as in FCC 15.255(c)(3) for pulsed radar.

f. What should be the definition of indoor usage?
   - Answer: "indoor usage" from a regulatory perspective primarily refers to the conditions and activities within enclosed built environments that are subject to rules and guidelines design to protect the health and safety. No such regulatory constraints exist in both US and EU i.e. 60GHz low power license exempt applications are allowed for both indoor and outdoor.

g. What technical parameters should be prescribed, including EIRP limits for low power indoor consumer device-to-device usages?
   - Answer: Our recommendation is to adopt the V-band (57-64GHz) to either 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 question 29.

Question 31: Whether there is a need for permitting "outdoor" usages of V-band on a license-exempt basis? Kindly provide a detailed response with justification and international scenario.

h. Answer: There are several important "outdoor" usages of V-band (57-64GHz) on a license exempt basis such as e.g.:
   - Gesture control for vehicle access: recognition of foot movement to open a car trunk or when opening or closing a sliding door when the vehicle is stationary, using 60GHz radar.
   - Robotics obstacle detection using 60GHz radar sensor.
   - Robotics lawn mower object classification: grass/no grass detection, using 60GHz radar.
   - Smart city parking spot detection using 60GHz radar.
   - Level measurement: remote tank level application, sewage system level/flow measurement, waste bin level measurement, using 60GHz radar.
   - Human presence detection: Door access systems, using 60GHz radar.
   - Structure integrity measurement (displacement measurement): movements of construction such as buildings, highways, bridges, railway, using 60GHz radar.
   - Among others….

Question 32: If the response to the Q31 is in the affirmative, whether it is feasible to allow outdoor usages on a license-exempt basis in the V-band in parallel to the use of the spectrum by telecom service providers for the establishment of terrestrial networks in a part or full V-band? Kindly provide a detailed response with justification and international scenario.

i. Answer: In both US and EU these license exempt applications are allowed for both indoor and outdoor i.e. FCC and EU allow general use, 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.

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j. 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.

Question 33: In case it is decided to allow outdoor usages on a license exempt basis in the V-band (57-64/ 66 GHz), -

k. Should it be permitted in the entire V-band or only in a portion of the V-band? If it should be permitted only in a portion of the V-band, please specify the frequency range.
   - Answer: Our recommendation is to adopt the V-band (57-64GHz) to either 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 question 29.

l. In case it is decided to permit outdoor usages on a license-exempt basis in the entire V-band, whether the 57-64 GHz range, or the 57-66 GHz range should be considered for such usages?
   - Answer: Please see the answer given in Q33a.

m. What should be the carrier size/ channel bandwidth?
   - Answer: OBW: 7GHz. The bandwidth of 7GHz allows for mm accuracy, high range resolution, and use of machine learning to identify gestures with high accuracy.

n. What technical parameters should be prescribed, including EIRP limits for low power indoor consumer device-to-device usages?
   - Answer: Please see the answer given in Q29.

Question 34: Any other suggestions relevant to the assignment of the spectrum in E-band (71-76/ 81-86 GHz) and V-band (57-64/66 GHz) may kindly be made with detailed justifications.

o. Answer: Our recommendation is to adopt the V-band (57-64GHz) to either the EU or US standard (the US standard but limited to 57-64 GHz). Here we would like to propose the US FCC 15.255 standard as also mentioned in the response to Q29.

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To conclude, Acconeer has found a large and growing interest in the demand of 57-64 GHz Short Range Pulse Radar technology in multiple key industries such as Robots, Consumer electronics, Internet of Things, Industrial and Agriculture, Healthcare and fitness, and Automotive.

Many large manufacturers are already using this technology widely across the world, whereby demand for new products operating in the afore mentioned band continues to grow.

Such a wide use case and tremendous interest from large global manufacturers will no doubt, in our opinion, bring sizable contribution to Indian economy and will make it easier to bring innovative products to the market. Therefore, we strongly recommend opening the 57-64GHz band as per the proposal stated above at the TRAI's earliest convenience.

References used by Acconeer:

(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 to246 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); ShortRange 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/docu-ment/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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