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15th November 2023

**Comments/Answers to questions of Consultation Paper No.22/2023 of TRAI
(Consultation Paper on Assignment of Spectrum in E&V Bands, and
Spectrum for Microwave Access (MWA) & Microwave Backbone (MWB))**

TO: Mr./Ms. Shri Akhilesh Kumar Trivedi,
Advisor (Networks, Spectrum and Licensing),
TRAI, India
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Dear Mr./Ms. Shri Akhilesh Kumar Trivedi,

It is with great respect that ALPS ALPINE submits this letter to formally comment on / answer to question 45,46 and 47 of *Consultation Paper on Assignment of Spectrum in E&V Bands, and Spectrum for Microwave Access (MWA) & Microwave Backbone (MWB)* dated 27th September 2023.

BACKGROUND

1. About ALPS ALPINE

ALPS ALPINE is a leading manufacturer of electronic components and automotive infotainment systems since its founding in 1948 and has R&D, production and sales bases located in Japan and across the globe- in the Americas, Europe, India, Southeast Asia, Greater China, and Korea, etc.

2. About the V-band low power devices of ALPS ALPINE

ALPS ALPINE has strong interest on innovative V-band(57-60GHz) broadband motion sensor (or 57-64GHz broadband low power short range radar sensor, hereinafter referred to as 60GHz SENSORS) technology and plans to market products in the India using related technology. These products are developed mainly for safety, security, auto-control applications to improve quality-of-life of human being and have high public benefits. Concretely, the typical products under mass production plan will operate in the V-band and are designed to focus on the automotive market and will be installed in the ceiling within the vehicle to realize in-cabin passenger monitoring function and/or be installed on the body of the vehicle to help people realize hand-free gesture operation to open trunk and door. These products will be supplied to important global automotive manufacture and marketed worldwide including India. Therefore, ALPS ALPINE would like to take this opportunity to comment on / answer to question 45,46 and 47 of CP No22/2023 of TRAI as below:

3. Comments and Answers of ALPS ALPINE

Q45. *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: In the most industrialized countries like EU countries, US and Japan, the V-band (57-64 GHz in EU and Japan, 57-71 GHz in US) is available on a license exempt basis for both indoor and outdoor SRD (lower power short range devices) usage. Much

co-existence studies have been done and one can find the documents in OET 21-264¹/ FCC NPRM (New Proposal of Rulemaking) of 47CFR §15.255 and in Report² of 60GHz low power radar sensor rulemaking of Japan. Studies show it is possible to allow low power radar sensor usages on licensed-exempt basis in V-band(57-64GHz), in parallel to use of the licensed existing in-band/out-band system, by suitable technical condition setting. The V-band in/outdoor devices have great public interest and potential significant socio-economic gains, especially in case of radar sensor applications. So, the usage should not be limited to in-door application and should not be limited to consumer device to device communication applications. ALPS ALPINE respectively request India government permit the V-band to open to all low power general use SRD devices, including radar sensors.

Q46. *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 carriers, which should be considered for license exemption with justification.

Answer: In case of radar sensor applications the continuous instant bandwidth impacts the distance resolution between two objects directly. The performance of both FMCW radar and Pulse modulation Radar depends on the instant bandwidth. So, to permit the radar sensors to use the entire band is most important. On the otherwise, in case of communication applications, the channel width is less than 2.16GHz (WiGig case). So, our suggestion is to permit entire band for radar sensor application, while part of the band for communication application.

(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, and in Japan the license exempt applications are allowed for both indoor and outdoor case. The V-band should open to all low power SRD application. It's better do not limit the application to in-door use. But for a better co-existence performance, to define use and to make different technical condition for different use is a reasonable solution.

¹ [ECFS – Filing Search Results \(fcc.gov\)](#)

² Report of 60GHz low power system [000730378.pdf \(soumu.go.jp\)](#)

(c) What technical parameters should be prescribed including EIRP limits? Suggestions may kindly be made with supporting justification and international scenario.

Answer: The newly established FCC 47CFR §15.255(57-71GHz) is a good reference. It reflects the comments from the most important communication companies and most important radar companies of worldwide. For low power radar sensor applications only EIRP and TX-Off Time (or the Duty Cycle) is necessary for technical parameter. By the way, for broad-band low power devices, especially in case of pulse modulated low power radar sensor, the PSD (Power Spectrum Density) is very low, and it is a challenge to evaluate the OBW (Occupied Bandwidth). So, FCC rule uses -10dBc definition OBW. ALPS ALPINE suggests below technical parameter for radar sensor application, based on the concept of international harmonic.

Suggestions of Technical Parameter (Radar Sensor Application)				
Modulation		FMCW		Pulse
Use Case		ALL Radar Sensor		
Frequency Band		57.0-59.4GHz	57.0-64GHz	57.0-64.0GHz
EIRP	Peak	20dBm (indoor) 30dBm(outdoor)	20dBm	< 20dB + Maximum Permitted Average EIRP
	Average			13dBm in 0.3μs time window, <5dBm within 61.5 to 64.0GHz
TX OFF-Time (msec)		None	16.5 per 33msec	
Duty				10% , evaluated in any 0.3μs time window
Pulse Width				≤6ns
OBW				7GHz (-10dB below the highest radiated emission)

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: The V-Band (57-64 GHz) is available in Europe and the corresponding ETSI standard is today implemented in more than 66 countries worldwide. In addition, the FCC has released a new rule on 23rd August this year. ALPS ALPINE respectfully requests TRAI consider issuing a V-band rule that consistent with ETSI standards or FCC standards to make sure that all parties can contribute to worldwide harmonization to enable easy access to global markets for all companies, including India automotive companies. This will allow manufacturers greater certainty in developing innovative 60GHz SENSOR technologies in a cost-effective manner.

ALPS ALPINE would like to take this opportunity to introduce more about the application of radar sensor of V-Band as below:

The worldwide 60GHz SENSORS are mainly designed for the use case of vehicle interior detection to detect the vital signs inside of a vehicle, in such case it can protect a child from the vehicular heatstroke and can also provide the feature like intruder alarm and seat belt alarm. Some 60GHz SENSOR are designed for the use case of interactive motion-sensing to detect foot and hand gesture to open trunk and doors of the vehicle, and/or to realize other gesture control functions (like Google Soli), and even to detect obstacle around vehicle before opening trunk and doors. With its ability of high detect accuracy and strong robustness in harsh environmental conditions such as darkness, extreme bright light, wind, dust, smoke, fog, water vapor and extreme temperature, the 60GHz SENSORS have far more potential applications, such as product line sensor in challenging environments where light sensors can fail. These products may realize many new innovative functions and can bring public much benefit. Thus, in recent years the 60GHz SENSORS, with the potential to realize special function and high sensing performance, are highly expected to contribute to public with high society value.

For example, the 60GHz SENSORS with 5-7GHz bandwidth has unprecedented measurement accuracy and distance resolution and is expected to detect human body's micro movements at 1-3 meters. This ability can be used to detect breathing and heartbeat in in-cabin monitor system. Since the Hot Car Act in the United States requires all car manufacturers to install in-vehicle occupant/child monitoring products on the market in 2025, EU-NCAP in Europe will install in-vehicle child monitoring systems as a plus, in 2023 Vehicles without this system will not receive a five-star safety rating in the next few

years. Many international car manufacturers and IC vender have launched variety in-cabin monitor technologies/products based on 60GHz SENSOR technology.

In healthcare field the 60GHz SENSORS are also expected to open a new situation. The high measurement accuracy and high distance resolution characteristics 60GHz SENSORS can be effectively used in application of home-based monitoring of elderly person. Global elderly issue is one of the topics of SGDs. 60GHz SENSORS can play an important role in detecting anomalies of elderly person living alone at home, such as sudden accidents while bathing or using toilet or anomalies during sleep.

In visitor counting application, 60GHz SENSORS can effectively solve privacy protection issues. Unlike the video surveillance equipment, which be widely used in shopping malls and convention centers for personnel flow monitoring and customer behavior analysis and have the risk of privacy information leakage, 60GHz SENSORS can realize the same function, greatly reduce the risk of privacy information leakage, and reduce the trouble of privacy violation.

Finally, 60GHz SENSORS can also contribute to a low-carbon society. Using 60GHz SENSORS, it can accurately detect the position of person in room, control the angle and volume of airflow of the air conditioner, and intelligently controlling the lighting system, a significant improvement of energy use efficiency can be realized.

Because of above mentioned advantages of 60GHz SENSORS, during recent years, demand for new products operating in the 57-64 GHz band has grown tremendously. In below table 1 a famous 60GHz SENSOR technology vender lists a selection of different identified use cases where 60GHz SENSORS IC and Technology venders actively helping customers develop end products. Fig.1 through Fig.3 describe how the 60GHz SENSORS to be used in some use case.

Table 1 Selection of use cases addressed by SRDs in 60 GHz

ID	Use case	Feature
A	Vehicle passenger detection	Presence detection
B	Vehicle seat belt alarm and airbag suppression	Presence detection
C	Vehicle intruder alarm	Presence detection
D	Vehicle access control	Gesture control
E	Autonomous vehicle navigation	Obstacle detection
F	Autonomous vehicle perception	Object classification
G	Infrastructure alarm system	Presence detection
H	Parking space occupancy	Object classification

I	Inventory management	Level measurement
J	Dispense control	Flow rate measurement
K	Interactive sports and gaming	Speed measurement
L	Device control	Gesture control

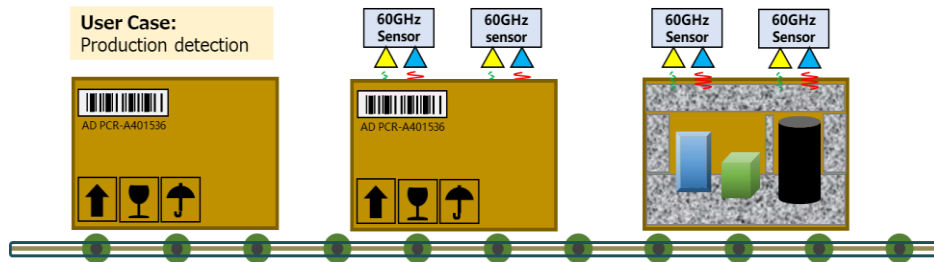


Fig.1 60GHz SENSORS use case of product line detection



Fig.2 60GHz SENSORS use case of gesture operation to open

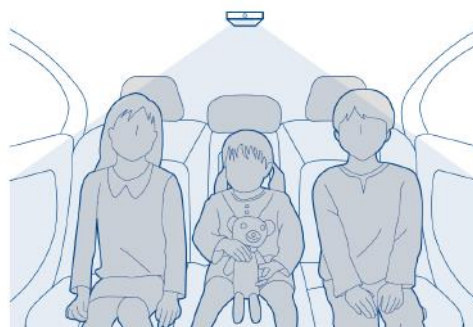
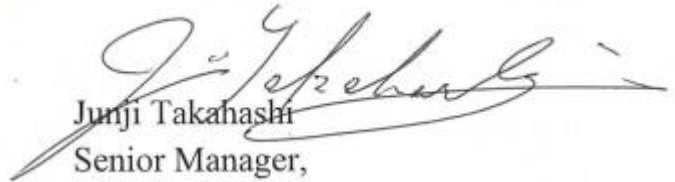


Fig.3 60GHz SENSORS use case of vehicle in-cabin monitoring

Thank you very much for the opportunity to present our comments and answers to the Consultation Paper and hope you can consider our requests.

Respectfully submitted,



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Enclosure