



## Worldwide radar regulation - Case Studies

76GHz帯小電力ミリ波レーダー高度化作業班  
コンチネンタル・オートモーティブ株式会社  
橋本直樹  
2022年4月1日

# Agenda



- 
- 1 USA
  - 2 China
  - 3 EU
  - 4 Summary
-

- › According to FCC Report and Order – ET Docket No. 15-26, FCC did follow the analysis of industry not considering the relevance possible inference in between radio astronomy and automotive radar. Automotive radar is even considered to be a primary service in the overall 76-81 GHz band.

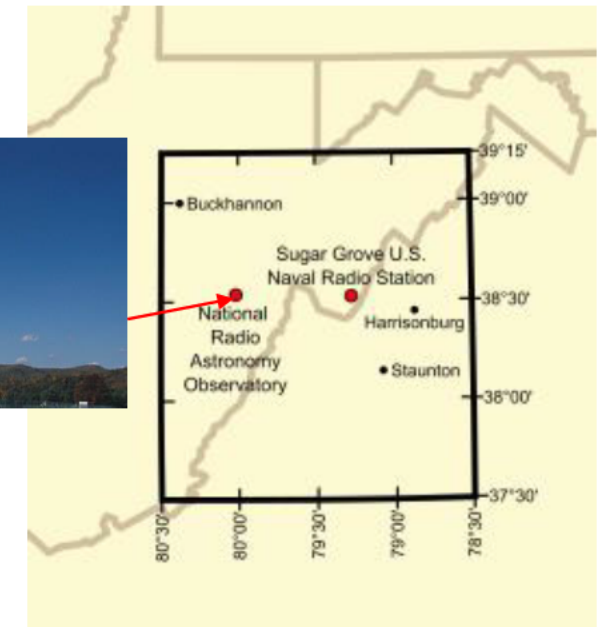
## I. INTRODUCTION

- › In this Report and Order, we establish a flexible and streamlined regulatory framework for radar applications that will operate within the 76-81 GHz band.
- › Doing so also harmonizes our rules with international efforts to create a global allocation for vehicular radars, while promoting efficient use of spectrum by consolidating such radars into a single band.
- › **These actions will encourage development of new and innovative radar applications that can provide important public benefits, while also ensuring that the authorized radar operations can coexist with one another and incumbent uses.**

<https://www.fcc.gov/document/fcc-unlocks-new-airwaves-vehicular-radar-use>

There are 12 RAS facilities in the United States that currently observe in the 76-81 GHz band: the Arizona Radio Observatory, with facilities on Kitt Peak, and the National Radio Astronomy Observatory at Green Bank, West Virginia, as well as the ten VLBA stations.

The National Radio Quiet Zone (NRQZ) was established by the Federal Communications Commission (FCC) in Docket No. 11745 (November 19, 1958)



<https://science.nrao.edu/facilities/gbt/interference-protection/nrqz/#description>

### III. DISCUSSION

- › We address the interference concerns raised by amateur and radio astronomy constituents, evaluate the compatibility of radar applications with those incumbent operations in the 76-81 GHz band, and modify the emissions limits for the amateur services to ensure that the potential for harmful interference to vehicular radar operations in the 76-81 GHz band is negligible.
- › The National Radio Astronomy Observatory (NRAO) and the National Academy of Sciences' Committee on Radio Frequencies (CORF) support upgrading the secondary RAS allocation in the 77.5-78 GHz band to primary status.
- › Bosch argues that it is unnecessary to make any changes to the RAS allocations in the 76-81 GHz band, stating there have been no reports of harmful interference to the RAS in the U.S. or Europe since 1999 when vehicular radar operations began operating in the 76-77 GHz band, and studies indicate that 76-81 GHz band vehicular radars are compatible with RAS operations in the band.
- › Bosch states that NRAO's vehicular radar interference scenario is unlikely because the roads near radio astronomy observatories do not lead directly towards an observatory's antenna, and vehicular radars' downward antenna orientation will significantly mitigate any potential interference to RAS operations.

## Framework and rules defined by “Report and Order – ET Docket No. 15-26”:

- › Establish a comprehensive and consistent set of rules and policies for the 76-81 GHz band which provide a technical framework that ensures radars are compatible with each other and with incumbent users.
- › Permit vehicular radar operations nationwide.
- › Amend or maintain the U.S. Table of Frequency Allocations to allow for continued shared use with other services in the band including the Radiolocation Service, the Amateur Service, Amateur-Satellite Service, Radio Astronomy Service and Space Research Service.
- › **The United States declined to adopt a requirement for an automatic or manual on/off switch and coordination zones for vehicular radars.**

# China



- › In China, the 76-77 GHz allocation based on 50 dBm EIRIP / 55 dBm Peak was not under discussion during the drafting of the new regulation in 2021.
- › With regards to radio astronomy protection there are no mechanism by automotive radar required to protect the related service.
- › According to rules it is left up to the local authorities to implement the related protection zones.



- › Article 7 of the “Interim Provisions on Automotive Radar Radio Management”
- › In order to protect the radio astronomy service working in the same frequency band, vehicles equipped with radar could not run into interference protective area of radio astronomical stations.
- › The radio management agencies of related provinces, municipalities and municipalities directly under the central government should join with the local governments to take the above mentioned interference protective area as the one of evidences for establishing electronic magnetic environmental protective area of the local radio astronomical stations.

---

一、位于青海省海西蒙古族藏族自治州德令哈市蓄集乡泽令沟小野马滩的射电天文台，与汽车雷达之间的干扰保护距离为26 公里。

---

二、位于上海市松江区九江公路1703 号、上海市松江区佘山镇以及北京密云区不老屯镇的射电天文台，与汽车雷达之间的干扰保护距离为3 公里。

---

三、位于新疆维吾尔自治区乌鲁木齐市乌鲁木齐县甘沟乡的射电天文台，与汽车雷达之间的干扰保护距离为5 公里。

---

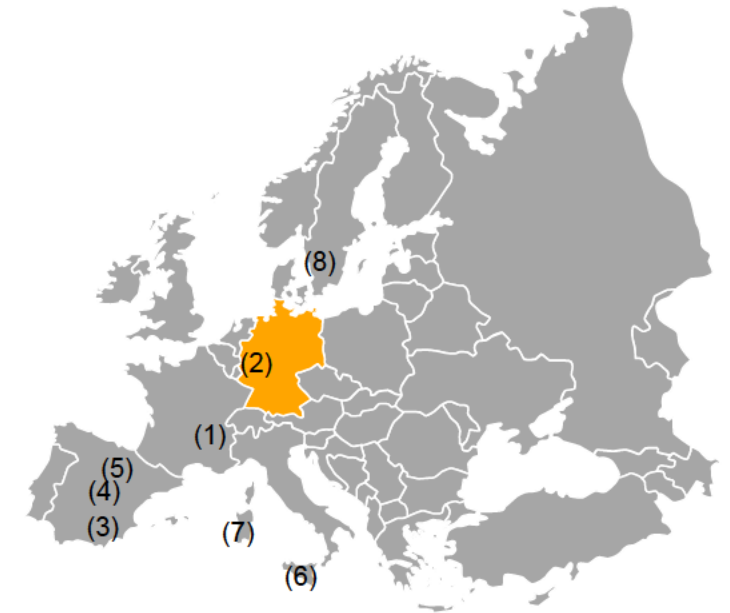
四、位于新疆维吾尔自治区昌吉回族自治州奇台县石河子村的射电天文台，与汽车雷达之间的干扰保护距离为15 公里。

---

五、位于云南普洱市景东彝族自治县哀牢山自然保护区杜鹃湖的射电天文台，与汽车雷达之间的干扰保护距离为10 公里。

- › EU law and regulation (RED, EN 301 091-1) applies; therefore, no specific rule applies to protect radio astronomy.
- › **There is not customization of vehicle radars considered or needed.**

|   | Name of Radio Observatory                        | country | Description of situation   |
|---|--|---------|--|
| 1 | NOEMA 10 m x 15 m Array, Plateau de Bure, France | France  | Isolated high mountaintop in line-of-sight to various public facilities      |
| 2 | 100 m, Effelsberg,                               | Germany | Broad flat plain exposed to nearby roads                                     |
| 3 | IRAM 30 m, Pico de Veleta                        | Spain   | Mountainside overlooking nearby ski resort, line of sight to city of Granada |
| 4 | Robledo  | Spain   | Broad flat plain exposed to roads  |
| 5 | Yebes 40 m                                       | Spain   | Broad flat plain exposed to roads  |
| 6 | Noto 32 m  | Italy   | Flat exposed plain   |
| 7 | Sardinia Radio Telescope 64 m, Sardinia          | Italy   | High exposed plain   |
| 8 | Onsala 20 m                                      | Sweden  | Waterside, forested, relatively isolated, Gotheborg 40 km N                  |



(Ref: ETSI TR 103 148 V1.1.1 (2014-06) Table E.1: ITU-R Region 1 RAS sites operating in the 76 GHz - 77 GHz frequency band )



# EU (Spain)

- › To determine the minimum distance from the observatory at which radio transmitters may be located, considering that the station operates at frequencies above 3,000 MHz, the limitations set out in Table below shall apply

(Ref: Rep. ITU-R RA.2457-0 TABLE 4)

| Interfering service                           | Apparent radiated power of the transmitter in the direction of the station to be protected (kW) | Maximum distance limitation that may be applied between the transmitting antenna and the station to be protected (km) |
|---|---|---|
| Radiolocation Space Research (Earth-to-space) | $0.001 < P \leq 1$  | 1   |
|   | $1 < P \leq 10$   | 2   |
|   | $P > 10$  | 5   |

- › To protect the frequency bands used by the observatory which are allocated to the Radio Astronomy Service on a primary basis in the National Table of Allocations in force, the intensity of the electric field in the above referenced bands will be limited to the values from Table below, when measured at the observatory, independently of where the transmitter is located

(Ref: Rep. ITU-R RA.2457-0 TABLE 5)

| Frequency band | pf <sub>d</sub> (dB(W/m <sup>2</sup> )) | Equivalent intensity of the electric field (dB(μV/m)) |
|----------------|---|---|
| 76-77.5 GHz    | -130                                    | 15.8  |



# Summary



- › None of the three regions / countries have implemented any measures on vehicle side to protect the radio astronomy service.
- › No reduction of power or any other mechanism has been implanted for 76-77 GHz.
- › Therefore, in all of three regions / countries vehicular radar can be operated without limits if complying with 50 dBm EIRP / 55 dBm Peak.