

ITU-R

Radiocommunication Sector of ITU

Recommendation ITU-R M.2057-1
(01/2018)

**Systems characteristics of automotive
radars operating in the frequency band
76-81 GHz for intelligent transport
systems applications**

M Series
**Mobile, radiodetermination, amateur
and related satellite services**



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Foreword

The role of the Radiocommunication Sector is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including satellite services, and carry out studies without limit of frequency range on the basis of which Recommendations are adopted.

The regulatory and policy functions of the Radiocommunication Sector are performed by World and Regional Radiocommunication Conferences and Radiocommunication Assemblies supported by Study Groups.

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Series of ITU-R Recommendations

(Also available online at <http://www.itu.int/publ/R-REC/en>)

Series	Title
BO	Satellite delivery
BR	Recording for production, archival and play-out; film for television
BS	Broadcasting service (sound)
BT	Broadcasting service (television)
F	Fixed service
M	Mobile, radiodetermination, amateur and related satellite services
P	Radiowave propagation
RA	Radio astronomy
RS	Remote sensing systems
S	Fixed-satellite service
SA	Space applications and meteorology
SF	Frequency sharing and coordination between fixed-satellite and fixed service systems
SM	Spectrum management
SNG	Satellite news gathering
TF	Time signals and frequency standards emissions
V	Vocabulary and related subjects

Note: This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.

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RECOMMENDATION ITU-R M.2057-1

Systems characteristics of automotive radars operating in the frequency band 76-81 GHz for intelligent transport systems applications

(2014-2018)

Scope

This Recommendation specifies the system characteristics of automotive radars operating under the radiolocation service in the frequency band 76-81 GHz. These technical and operational characteristics should be used in compatibility studies between automotive radars operating in the radiolocation service and systems operating in other services.

Keywords

Characteristics, protection criteria, automotive radar, intelligent transport systems

Abbreviations/Glossary

ACC	Adaptive cruise control
CA	Collision avoidance
FMCW	Frequency modulated continuous wave
ITS	Intelligent transport systems

Related ITU Recommendations and Reports

Recommendation ITU-R M.1452 – Millimetre wave vehicular collision avoidance radars and radiocommunication systems for intelligent transport system applications

The ITU Radiocommunication Assembly,

considering

- a) that antenna, signal propagation, target detection, and large bandwidth characteristics for automotive radars are needed to optimally achieve their functions in certain frequency bands;
- b) that the technical characteristics of radars operating in the radiodetermination service are determined by the needs of the system and may vary widely from band to band;
- c) that representative technical and operational characteristics of systems operating in frequency bands allocated to the radiodetermination service are necessary to determine the feasibility of introducing new types of systems;
- d) that procedures and methodologies are needed to analyse compatibility between radars operating in the radiodetermination service and systems operating in other services,

recommends

that the systems characteristics for automotive radars operating in the frequency band 76-81 GHz for intelligent transport systems (ITS) applications as described in Annex 1 should be used for sharing/compatibility studies.

Annex 1

Systems characteristics of automotive radar systems operating in the frequency band 76-81 GHz for intelligent transport system applications

1 Introduction

In the frequency band 76-81 GHz, radar systems in support of enhanced road safety are operated. Evolving demands related to automotive safety applications, including the reduction of traffic fatalities and accidents require a range resolution for automotive radar systems leading to a necessary bandwidth of up to 4 GHz.

2 Technical characteristics of automotive radar systems operating in the frequency band 76-81 GHz

Regarding functional and safety requirements, the automotive radar systems operating in the 76-81 GHz range can be separated in two categories:

- **Category 1:** adaptive cruise control (ACC) and collision avoidance (CA) radar, for measurement ranges up to 250 metres the typical technical characteristics are listed in Table 1 as Radar A. For these applications, a maximum continuous bandwidth of 1 GHz is required. Such radars are considered to add additional comfort functions for the driver, giving support for more stress-free driving.
- **Category 2:** Sensors for high resolution applications such as blind spot detection, lane-change assist and rear-traffic-crossing-alert, detection of pedestrians and bicycles in close proximity to a vehicle, for measurement ranges up to 100 metres the typical technical characteristics are listed in Table 1 as Radar B, Radar C and Radar D. For these high resolution applications, a necessary bandwidth of 4 GHz is required. Such radars directly add to the passive and active safety of a vehicle and are therefore an essential benefit towards improved traffic safety. The increased requirements for active and passive vehicle safety are already reflected in the requirements for vehicle testing. Radar E operates with a higher field of view to enable high-resolution applications such as pedestrian detection, parking-aid, and emergency braking at low speed (< 30 km/h).

The technical parameters of radiolocation radar systems operating in the frequency bands 76-77 GHz and 77-81 GHz are presented in Table 1.