

**Electromagnetic compatibility
and Radio spectrum Matters (ERM);
Radio equipment to be used in the 76 GHz to 77 GHz band;
System Reference Document for Short-Range Radar
to be fitted on road infrastructure**



Reference

DTR/ERM-RM-006

Keywords

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ETSI

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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

1 Scope

The present document applies to radars operating on the 76 GHz to 77 GHz band.

It defines their possible use for road infrastructure.

The goal of the present document is to require the modification of:

- ERC/DEC/(92)02 [2]
- ERC/REC 70-03 [3]

In order to replace the comments relative to the 76 – 77 GHz band from "vehicular systems" or "vehicle radar systems" to " vehicle or road to vehicles systems" or any equivalent sentence.

NOTE: The current version of EN 301 091 [1] already includes requirements about fixed and mobile applications and therefore already covers the infrastructure application as described in the present document.

2 References

For the purposes of this Technical Report (TR) the following references apply:

- [1] EN 301 091 (V1.1.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Technical characteristics and test methods for radar equipment operating in the 76 GHz to 77 GHz band.
- [2] ERC/DEC/(92)02: "ERC Decision of 22 October 1992 on the frequency bands to be designated for the coordinated introduction of Road Transport Telematic Systems".
- [3] ERC/REC 70-03: "Relating to the use of Short Range Devices (SRD)".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions applies:

Road infrastructure: all the equipments linked to the analysis of the traffic on the roads (urban area as well as highways or trunk roads)

3.2 Abbreviations

ACC	Adaptive Cruise Control
EIRP	Effective Isotropic Radiated Power

4 Executive summary /Main conclusions

The present document describes to possible use of ACC radar fully compliant with EN 301 091 [1] on road infrastructure for application as:

- Vehicle counting / traffic flow monitoring
- Traffic jam or accident detection
- Vehicle speed measurement
- Vehicle detection for traffic light activation

The expected equipment rate of such radar on road infrastructure is expected to be in France more than some thousands per year within 5 years.

Despite this application is already compatible with EN 301 091 which allows the mobile and fixed applications, it is necessary to update the decisions:

- ERC/DEC/(92)02 [2]
- CEPT/ERC/REC 70-03 [3]

In order to replace the comments relative to the 76 GHz to 77 GHz band from "vehicular systems" or "vehicle radar systems" to "vehicle or road to vehicles systems" or any equivalent sentence.

Annex A: Detailed market information

A.1 Range of applications

The radars are expected to be used to perform the following functions (non exhaustive list given as an example):

- Vehicle speed measurement
- Vehicle counting
- Inter vehicle range measurement
- Vehicle classification
- Traffic jam detection
- Lane occupation rate
- Wrong way driving detection
- Vehicle tracking

The radars sensors may be installed in urban zones, on motorways, major or trunk roads, in tunnels or below bridges.

The installation height can be up to height meters approximately, most of time on the top of a mast or attached to a road sign.

The radar beam is oriented toward the ground in such a way that it can cover the driving lanes.

The following figures illustrate some possible configurations for the radar installation.

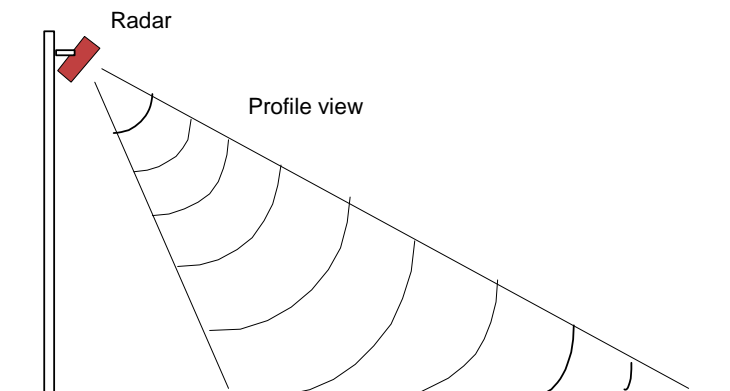


Figure 1: Radar profile view

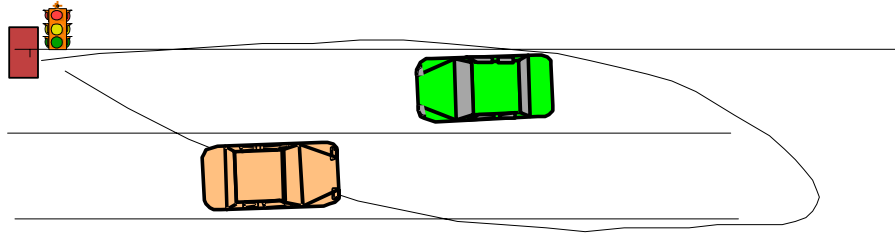


Figure 2: Radar on the edge of the road, top down view

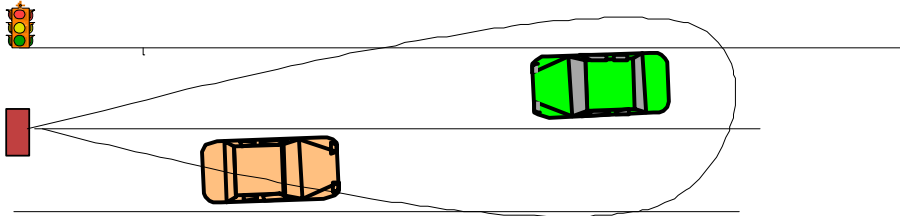


Figure 3: Radar on gantry, top down view

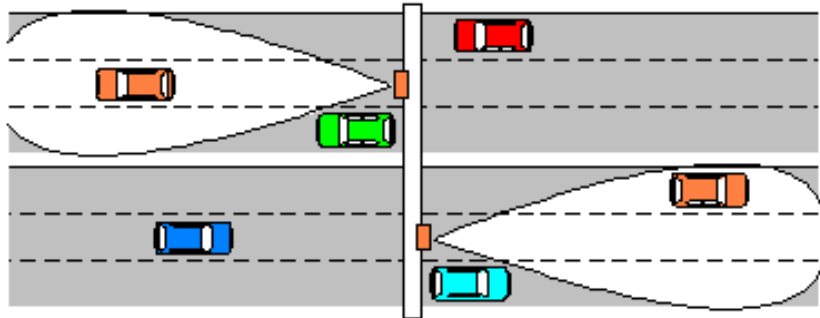


Figure 4: installation on motorway on the road edges

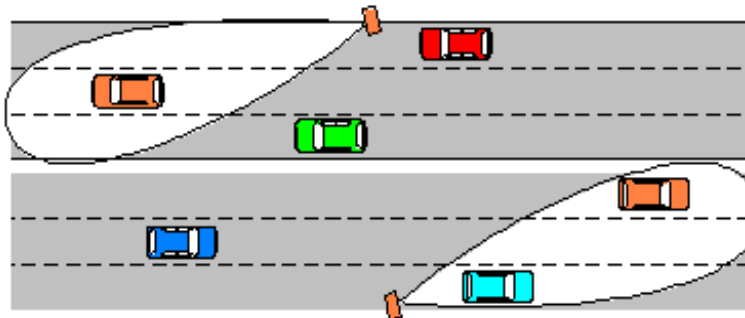


Figure 5: Installation on motor way on gantry

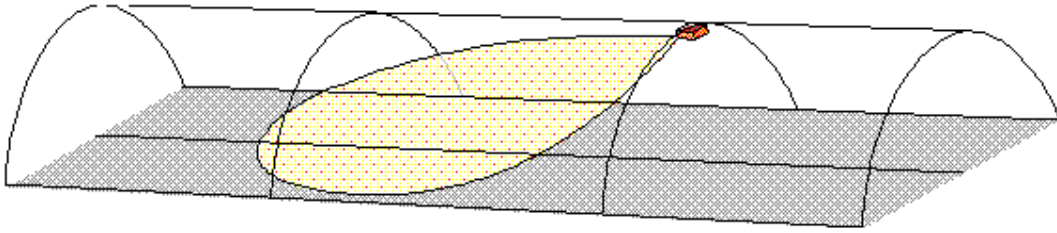


Figure 6: Installation in tunnel under the vault

A.2 Market size and value

Thanks to the development of ACC function on cars, this product entering in the mass production phase, the cost of the radar will decrease and allow to use it on road infrastructure. The radar is planned to be used as it is designed for ACC on car with light or no hardware modification and a dedicated software.

The installation rate in France for infrastructure application is expected to be some thousands of radars per year within 5 years

A.3 Traffic evaluation

The radar planned to be used for infrastructure application as described in the present document are fully compliant with the current standard EN 301 091 [1].

The expected installation rate on infrastructure is significantly less than the installation rate on cars for ACC, therefore the electromagnetic load will not be significantly increased relative to this given by the conventional use on vehicles for ACC.

Annex B: Technical information

B.1 Detailed technical description

The radar planned to be used for infrastructure application as described in the present document is an ACC dedicated radar which characteristics are approximately:

- EIRP: 40 dBm (class 1)
- Frequency range: 76-77 GHz
- - 3dB Beamwidth: 5°
- Antenna type: monopulse, fixed beam
- Wave form: FSK type (EN 301 091 [1], clause 7.4.3)
- Instrumented range: 150 m

NOTE: The here above defined radar is an example, it is not proposed to limit the application to this type of radar.

The current document relates for all type of radar fully compliant with the current version of EN 301 091 [1].

B.3 Information on current version of relevant ETSI standard

The only modification required to EN 301 091 [1], is the addition in the scope of a sentence referring to the possible use of the radar on infrastructure.

Annex C (informative or normative): Expected compatibility issues

No compatibility issue is expected because:

- the radars planned to be used on road infrastructure are fully compliant with the current version of EN 301 091 [1];
- their interference scheme with on vehicle radar is quite identical as this given from radar on vehicle to radar on vehicle which have to be processed anyway.

History

Document history		
V1.1.1	July 2001	Publication