



80/341/FDIS

FINAL DRAFT INTERNATIONAL STANDARD  
PROJET FINAL DE NORME INTERNATIONALE

Project number IEC 60936-1 Amend.1 Ed.1 Numéro de projet			
IEC/TC or SC CEI/CE ou SC TC 80	Secretariat / Secrétariat United Kingdom		
<input checked="" type="checkbox"/> Submitted for parallel voting in CENELEC Soumis au vote parallèle au CENELEC	Distributed on / Diffusé le 2002-03-22	Voting terminates on / Vote clos le 2002-05-24	
Also of interest to the following committees Intéresse également les comités suivants		Supersedes document Remplace le document 80/301/CDV - 80/333/RVC	
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

Title

Amendment 1 to IEC 60936-1 Ed. 1

Titre

**ATTENTION  
VOTE PARALLÈLE  
CEI - CENELEC**

L'attention des Comités nationaux de la CEI, membres du CENELEC, est attirée sur le fait que ce projet final de Norme internationale est soumis au vote parallèle. Un bulletin de vote séparé pour le vote CENELEC leur sera envoyé par le Secrétariat Central du CENELEC.

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**ATTENTION  
IEC - CENELEC  
PARALLEL VOTING**

The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this final Draft International Standard (DIS) is submitted for parallel voting. A separate form for CENELEC voting will be sent to them by the CENELEC Central Secretariat.

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## Annex D (normative)

### Unwanted emissions of radar systems – Methods of measurement and required results

#### D.1 Introduction

ITU-R has now developed a new recommendation for out-of-band (OOB) emission limits (D.6.d)) This recommendation is associated with the following recommendations:

- a) OOB emissions falling into an adjacent allocated band (OAB) (D.6.f));
- b) boundary between OOB and spurious emissions (D.6.e));
- c) spurious emissions – SM.329 (D.6.c)).

Spurious emission limits have been incorporated into the Radio Regulations, in terms of level, but not in terms of frequency range. There is no intention at present of a similar treatment for either the OOB or OAB limits.

It has been agreed that within the ITU WRC – 2003 Agenda Item 1.8.1, the boundary between OOB and spurious emissions will be defined for all radio services and incorporated into Appendix S3 of the Radio Regulations. As this will not occur until after the date of 1 January 2003 (the date at which the new spurious limits apply for new radar installations), there is a need for this standard to define the boundary conditions based upon the text contained in the recommendation ITU-R SM [Boundary] (D.6.e)).

The purpose of this annex is to define how the requirements of Appendix S3 of the Radio Regulations and these new ITU Recommendations concerned with unwanted emissions are to be implemented with regard to marine radars. This includes the requirements, method of measurement, the results to be obtained and the interpretation of the measurement results.

#### D.2 Requirements

The requirements are defined in Appendix S3 of the Radio Regulations and the recommendations listed above in D.1.

The boundary between the OOB and spurious domains and the OOB mask are defined in the OOB recommendation – Annex 8 in the following manner –

- a) (Boundary and mask) – “the mask rolls off at 20 dB per decade from the 40 dB bandwidth to the spurious level specified in Appendix S3 of the Radio Regulations. The  $B_{-40}$  dB bandwidth can be offset from the frequency of maximum emission level, but the necessary bandwidth (See 1.52 of the Radio Regulations) should be contained completely within the allocated band”.
- b) (Exclusions) – “the OOB limits are not applicable inside exclusive Radiodetermination and or Earth Exploration Satellite (EES) and Space research service bands.”

These requirements are illustrated in Figures D.1 and D.2.

The OOB masks shown in Figures D.1 and D.2 are calculated using the transmitted pulse width and rise time.

The necessary bandwidth and the  $-40$  dB bandwidth are generally centred about the operating frequency but may be offset to take account of spectrum asymmetry.

#### D.4.1 Selection of pulse widths

The ITU-R Recommendation on OOB (D.6.d)) applies to complex and simple radars with user-selectable pulse waveforms. For a particular radar, the pulse length and rise time for a number of representative pulses (including the shortest and longest pulses) shall be measured and the corresponding

$B_{40}$  bandwidths calculated. The widest calculated  $B_{40}$  bandwidth shall then be used to create the OOB mask to be applied to that radar. Emission measurements only need to be carried out for the pulse length setting producing the widest calculated  $B_{40}$  bandwidth.

#### D.4.2 Measurement in azimuth and elevation – antennas

For marine radars that are essentially surface search radars, there is no requirement to make measurements in the vertical plane.

For measurements in the azimuth plane, the antenna may be either rotating or the measurement system may be aligned to the antenna bore sight and measurements in azimuth taken at appropriate antenna angles where the directions of unwanted emissions are known. Both techniques are admissible and the particular choice shall be made by agreement between the manufacturer and the test authority.

In both cases the maximum value of the emission occurring in the azimuth plane shall be recorded over the frequency range defined in table D.1.

Provided that all of the antennas to be used with the equipment under test are of the same type, then only the smallest (i.e. that with the largest azimuth beamwidth) need to be used to verify compliance with the unwanted emission requirements.

### D.5 Results required

#### D.5.1 Necessary bandwidth

The necessary bandwidth as calculated from the measured pulse width and rise time shall be within the allocated frequency band.

#### D.5.2 $B_{40}$ bandwidth

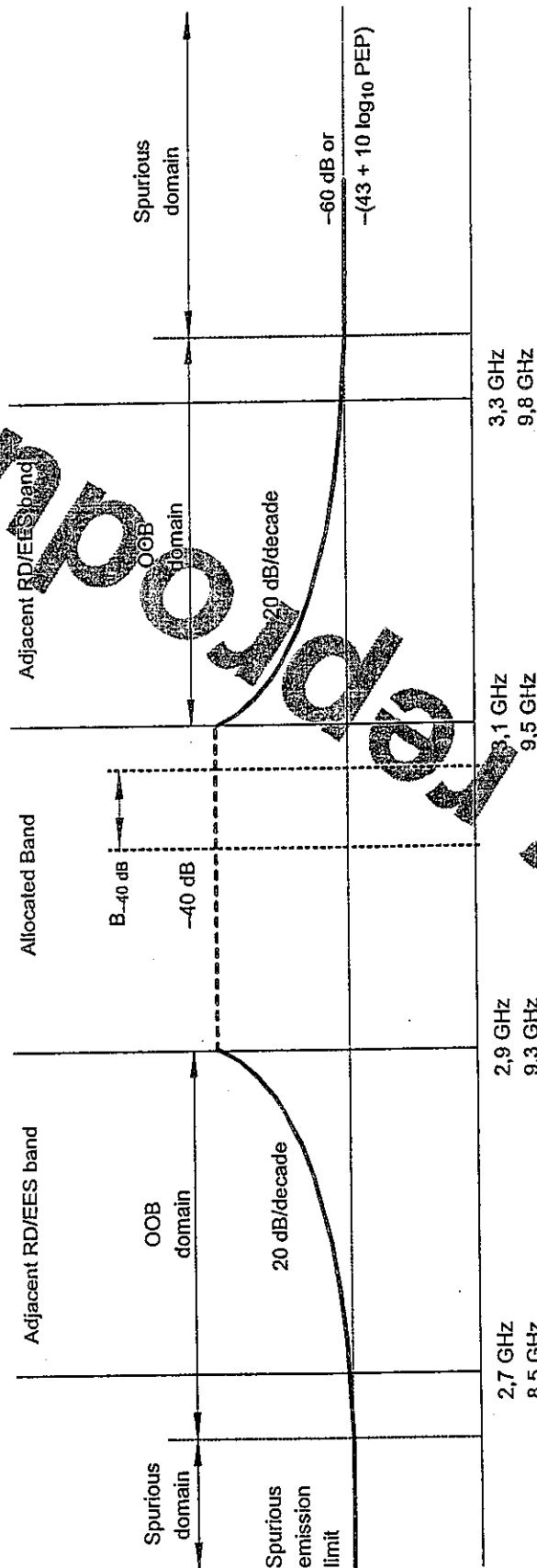
The  $B_{40}$  bandwidth shall be calculated using the methods defined in D.4.1 and in Annex 8 of reference D.6.d). This bandwidth together with the declared frequency of the pulse transmission are used to determine which of the masks illustrated in Figure D.1 or Figure D.2 shall be used for the purposes of conformity.

#### D.5.3 Emission spectrum

The emission spectrum shall be below the calculated mask, as determined by D.5.2 above, in both the OOB and spurious domains, for all appropriate frequencies over the ranges specified in table D.1. As previously indicated in D.2, the OOB emission masks limits do not apply within the allocated band or the adjacent RD/ESS bands.

The spurious emission limit applies in the spurious domain, regardless of frequency band.

Systems shall be compliant if the OOB mask of Figure D.2 is offset further into the adjacent bands to allow for spectrum asymmetries, provided that the necessary bandwidth associated with this mask is completely contained within the allocated band.



NOTE RD/EES - Radiodetermination / Earth Exploration Satellite.

NOTE OOB emission mask limits do not apply within the allocated or adjacent RD/EES bands.

Figure D.1 -  $B_{40}$  falls within the allocated band

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ISBN 2-8318-XXXX-X

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ICS 47.020.70

Typeset and printed by the IEC Central Office  
GENEVA, SWITZERLAND