

© Copyright SEK. Reproduction in any form without permission is prohibited.

Metodstandard för fastställande av överensstämmelse med grundläggande begränsningar och referensnivåer avseende allmänhetens exponering för radiofrekventa elektromagnetiska fält vid idrifttagande av fast radiotransmissionsutrustning (110 MHz - 40 GHz) i trådlösa telekommunikationsnätverk

Basic standard to demonstrate the compliance of fixed equipment for radio transmission (110 MHz - 40 GHz) intended for use in wireless telecommunication networks with the basic restrictions or the reference levels related to general public exposure to radio frequency electromagnetic fields, when put into service

Som svensk standard gäller europastandarden EN 50400:2006. Den svenska standarden innehåller den officiella engelska språkversionen av EN 50400:2006.

Nationellt förord

Tidigare fastställd svensk standard SS 447 06 10, utgåva 1, 2003, gäller ej fr o m 2009-01-01.

De avsnitt i SS 447 06 10-1, utgåva 1, 2005, som behandlar mätproceduren gäller ej fr o m 2009-01-01. Övriga avsnitt i SS 447 06 10-1 avses ersättas av en kommande SS-EN 50492.

Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a säkerhet, prestanda, dokumentation, utförande och skötsel av elprodukter, elanläggningar och metoder. Genom att utforma sådana standarder blir säkerhetskraven tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

SEK är Sveriges röst i standardiseringssarbetet inom elområdet

Svenska Elektriska Kommissionen, SEK, svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringssarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringssverksamhet och medlemsavgift till IEC och CENELEC.

Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

SEK

Box 1284
164 29 Kista
Tel 08-444 14 00
www.sekom.se

**Basic standard to demonstrate the compliance of fixed equipment
for radio transmission (110 MHz - 40 GHz)
intended for use in wireless telecommunication networks
with the basic restrictions or the reference levels
related to general public exposure to radio frequency
electromagnetic fields, when put into service**

Norme de base pour démontrer la conformité des équipements fixes de transmission radio (110 MHz - 40 GHz), destinés à une utilisation dans les réseaux de communication sans fil, aux restrictions de base ou aux niveaux de référence relatives à l'exposition des personnes aux champs électromagnétiques de fréquence radio, lors de leur mise en service

Grundnorm zum Nachweis der Übereinstimmung von stationären Einrichtungen für Funkübertragungen (110 MHz bis 40 GHz), die zur Verwendung in schnurlosen Telekommunikationsnetzen vorgesehen sind, bei ihrer Inbetriebnahme mit den Basisgrenzwerten oder den Referenzwerten bezüglich der Exposition der Allgemeinbevölkerung gegenüber hochfrequenten elektromagnetischen Feldern

This European Standard was approved by CENELEC on 2005-12-06. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

This European Standard was prepared by Technical Committee CENELEC TC 106X, Electromagnetic fields in the human environment.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50400 on 2005-12-06.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2007-01-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2009-01-01

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association.

Contents

1	Scope.....	6
2	Normative references	6
3	Physical quantities, units and constants	6
3.1	Quantities.....	6
3.2	Constants.....	7
4	Terms and definitions	7
5	General process	12
5.1	Alternative routes to determine the total exposure ratio where the general public has access	12
5.2	General method.....	12
5.2.1	Description of the general method	12
5.2.2	Comprehensive total exposure ratio assessment	14
5.3	Pre-analysis method.....	15
6	Determination of domains and relevant sources	16
6.1	Principle of relevance	16
6.2	Determination of domains.....	16
6.2.1	Relevant domain.....	16
6.2.2	Scatter domain	16
6.2.3	Domain of investigation	17
6.3	Determination of relevant sources	17
7	Calculation specifications	18
7.1	General	18
7.2	Calculation methods	19
7.2.1	Definition of equivalent free space conditions	19
7.2.2	Calculation methods in equivalent free space conditions	19
7.2.3	Calculation methods when equivalent free space conditions do not apply..	19
7.3	Summation of exposure ratio estimated using calculation	22
8	Measurement specifications	22
8.1	General requirement	22
8.2	Exposure ratio measurement.....	23
8.2.1	Basic requirements	23
8.2.2	Conditions for the use of broadband measurements	23
8.2.3	Conditions for the use of frequency selective measurement.....	24
8.3	Summation of exposure ratios estimated using measurement.....	24
8.4	Uncertainty.....	24
9	TER assessment	25
10	Exposure assessment report	26
	Annex A (informative) Examples of pre-analysis design guidelines	27
A.1	Purpose	27
A.2	Installations designed inclusive of a specified exposure ratio allowance for other radio sources	27
A.3	Combined compliance boundaries	28
A.4	Installation designed so that a minimum build height is maintained at all distances from the antenna less than the compliance boundary distance.....	33
A.5	Equipment Under Test with less than 10 W average EIRP	34

Annex B (informative) Simplified procedure to determine scatter domain and relevant domain boundaries	36
B.1 Introduction	36
B.2 Analysis	36
Annex C (informative) Calculations under non-equivalent free space conditions	38
C.1 Introduction	38
C.2 Determination if an object is a significant reflector.....	39
C.3 Determination of power density multiplication factor in several domains	39
C.3.1 No line of sight from the radio source to the point of investigation	39
C.3.2 Reflecting surface to the side of the direct path from radio source to point of investigation	40
C.3.3 Reflecting surface below the direct path from source to point of investigation	40
C.3.4 Point of investigation between the radio source and reflecting surface.....	41
C.3.5 Radio source between reflecting surface and the point of investigation.....	42
C.3.6 Power density multiplication factor for use in summing multiple bands.....	42
C.4 Establishing total exposure ratio from a set of transmissions on different frequencies	42
Annex D (informative) Selection of points of investigation for distant radio sources.....	44
D.1 Objective.....	44
D.2 Principles	44
D.3 Establish δr with respect to distance to radio source	44
D.3.1 Consider change of field strength with distance	44
D.3.2 Consider variation of field strength due to antenna directivity	45
D.3.3 Example 1	45
D.3.4 Example 2	46
D.4 Selecting points of investigation	46
Annex E (informative) A-deviations	47

Figures

Figure 1 – Alternative routes to determine the total exposure ratio where the general public has access	12
Figure 2 – Overview of the general method to estimate the total exposure ratio	13
Figure 3 – Borders of a restricted area located in the domain of investigation	14
Figure 4 – Location of the three assessments for each point of investigation	15
Figure 5 – Representation of the relevant domain, domain of investigation, scatter domain and the compliance boundary surrounding the antenna.....	17
Figure 6 – Calculation methodology	18
Figure 7 – Configurations used to identify positions of reflectors.....	20
Figure 8 – Establishing the PDMF	21
Figure A.1 – Compliance boundary extension due to proximity of other RF sources	29
Figure A.2 – Compliance boundaries merging due to proximity of other RF sources.....	29
Figure A.3 – Combined compliance boundaries around antennas on a head frame.	30
Figure A.4 – Significant parameters relating to antenna positioning and orientation	33
Figure B.1 – Relative field and exposure ratio relationships near an emitting antenna	36
Figure C.1 – Relative magnitude of reflected ray for polarisation normal and parallel to reflecting surface	39

Figure D.1 - Change of field strength with distance	44
Figure D.2 - Variation of field strength due to antenna directivity	45

Tables

Table 1 – Maximum sampling step versus frequency.....	14
Table 2 – Uncertainty assessment	25
Table A.1 – Table of figures showing minimum distances separation multipliers	32
Table A.2 – Values for the compliance boundary factor and exposure ratios	35

1 Scope

This basic standard applies to Base Stations as defined in Clause 4, operating in the frequency range 110 MHz to 40 GHz.

The objective of this basic standard is to specify, for such equipment and when it is put into service in its operational environment, the methods to assess the value of the Total Exposure Ratio or to establish whether the Total Exposure Ratio is less than or equal to one in relevant areas where the general public has access.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Council Recommendation 1999/519/EC of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz)
(Official Journal L 199 of 30 July 1999)

EN 50383, Basic standard for the calculation and measurement of electromagnetic field strength and SAR related to human exposure from radio base stations and fixed terminal stations for wireless telecommunication systems (110 MHz - 40 GHz)

EN ISO/IEC 17025:2000, General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:1999)

ISO "Guide to the expression of uncertainty in measurement": Ed.1 1995

International Commission on Non-Ionizing Radiation Protection (1998), Guidelines for limiting exposure in time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz)
Health physics 74, 494-522

