# SLOVENSKI STANDARD
# SIST EN 50492:2009/A1:2014

**01-maj-2014**

**Osnovni standard za terensko merjenje jakosti elektromagnetnega polja v zvezi z izpostavljenostjo ljudi v okolici baznih postaj - Dopolnilo A1**

Basic standard for the in-situ measurement of electromagnetic field strength related to human exposure in the vicinity of base stations

Grundnorm für die Messung der elektromagnetischen Feldstärke am Aufstell- und Betriebsort von Basisstationen in Bezug auf die Sicherheit von in ihrer Nähe befindlichen Personen



Norme de base pour la mesure du champ électromagnétique sur site, en relation avec l’exposition du corps humain à proximité des stations de base



**Ta slovenski standard je istoveten z:** **EN 50492:2008/A1:2014**

**ICS:**

| | | |
|---|---|---|
| 17.220.20 | Merjenje električnih in magnetnih veličin | Measurement of electrical and magnetic quantities |
| 33.070.01 | Mobilni servisi na splošno | Mobile services in general |

**SIST EN 50492:2009/A1:2014** **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN 50492/A1

March 2014

ICS 17.220.20; 33.070.01

English version

# Basic standard for the in-situ measurement of electromagnetic field strength related to human exposure in the vicinity of base stations

Norme de base pour la mesure du champ électromagnétique sur site, en relation avec l'exposition du corps humain à proximité des stations de base

Grundnorm für die Messung der elektromagnetischen Feldstärke am Aufstell- und Betriebsort von Basisstationen in Bezug auf die Sicherheit von in ihrer Nähe befindlichen Personen



This amendment A1 modifies the European Standard EN 50492:2008; it was approved by CENELEC on 2014-01-06. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment 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 CEN-CENELEC Management Centre or to any CENELEC member.

This amendment 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 CEN-CENELEC Management Centre has the same status as the official versions.

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

CENELEC

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

**CEN-CENELEC Management Centre: Avenue Marnix 17, B - 1000 Brussels**



Ref. No. EN 50492:2008/A1:2014 E

# Foreword

This document (EN 50492:2008/A1:2014) has been prepared by CLC/TC 106X, "Electromagnetic fields in the human environment".

The following dates are fixed:

| | | |
|---|---|---|
| • latest date by which this document h as to be implemented at national level by publication of an identical national standard or by endorsement | (dop) | 2015-01-06 |
| • latest date by which the national standards conflicting with this document have to be withdrawn | (dow) | 2017-01-06 |

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

## Table of Contents

***Add**:*



***Add** to the table of figures*





***Add** to the table of tables*

## 10 Assessment of the field strength at maximum traffic of a cellular network

***Replace** the last paragraph:*

"For WiFi the measurements and extrapolation shall take into account the specificity of this signal related to the variation of the time occupation (technical parameters such as channel occupancy etc are described in Annex J)."

*by*

"For Wifi and LTE the measurements and extrapolation shall take into account the specificity of these signals related to time occupation (technical parameters are described in Annex J and Annex L)."

***Add** Annex L:*

# Annex L
(informative)

# FDD LTE measurements

## L.1 General

Annex L describes methods to measure and extrapolate LTE (MIMO 2x2 and MIMO 2x1) exposure level (FDD LTE [1]). This annex is not an exhaustive summary of existing methods, and other measurement methods for LTE have been published [2]. The proposed methods require classical radiofrequency (RF) measurement instruments: a basic spectrum analyser or a dedicated decoder and an isotropic antenna.

LTE emissions consist of specific signals at specific time-frequency allocations [3] [4]. This kind of dynamic time-frequency allocation is known as Orthogonal Frequency Division Multiple Access (OFDMA). See Figure L.1.

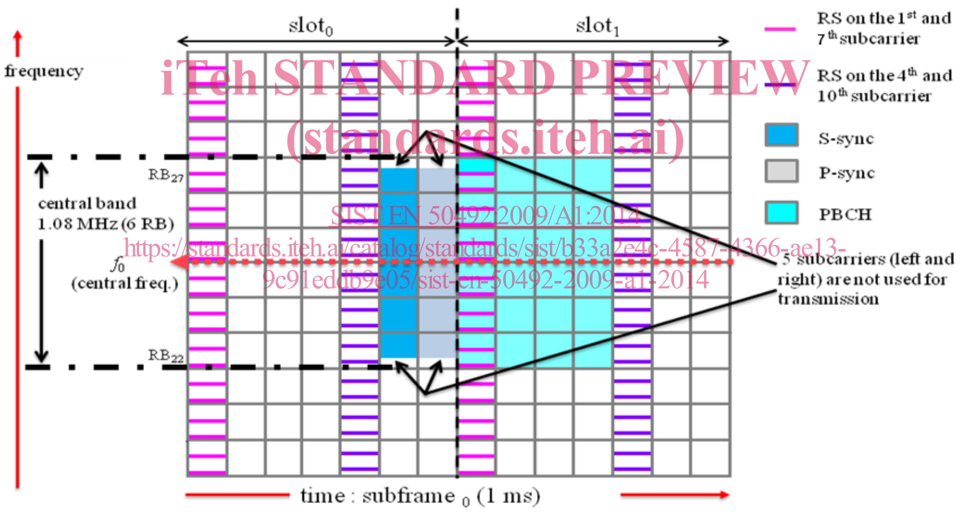




**Figure L.1 - LTE time-frequency plan**

As for other telecommunication signals, LTE signals are subject to time variations because of traffic variations and random fluctuations of the propagation medium. The extrapolation to the maximum traffic should be based on the measurement of a time independent channel or signal. Due to the LTE specifications, the power of each time-frequency unitary element [1] (66,7 µs, 15 kHz) in the LTE downlink signal is scalable from one kind of transmitted data to another. In addition, LTE downlink spectrum is totally flexible and may vary from 1,4 MHz to 20 MHz, and inside the spectrum, the power level may vary from one channel to another.

Two types of measurements are specified: the assessment of instantaneous LTE exposure levels and the assessment of maximum LTE exposure by extrapolation. For the instantaneous LTE exposure assessment a basic spectrum analyser and suitable measurement probes are used. For the maximum LTE exposure two types of reproducible methods of electromagnetic field (EMF) exposure assessment of LTE signals, depending on the used measurement instrument, are described: one method, using a dedicated decoder, similar to existing methods that are based on pilot signals (see Clause 8) and another method using a basic spectrum analyser.

If no frequency information about the present LTE channels is available the LTE downlink bandwidth should first be determined using a spectrum analyser in frequency mode and a peak detector. In this way the frequency information and LTE bandwidth can best be determined.

## L.2 Maximum LTE exposure

### L.2.1 Introduction

In L.2, two methods to assess the maximum exposure level are described. Both methods are acceptable but, in case of selective fading, the method using dedicated decoder is recommended.

### L.2.2 Method using a dedicated decoder

As extrapolation method, the reference signal RS is measured and extrapolated to the maximum value with an extrapolation factor. The influence of the traffic load and output power of the base station on in-situ RS, S-SYNC, P-SYNC, PBCH signals [1] are lower than 1 dB for all power and traffic load settings, showing that these signal levels can be used for the extrapolation method. For this method, dedicated LTE equipment or LTE analysers are needed.
To estimate the maximum exposure level ($E_{max}$) of the LTE signal at each measurement location, Formula (L.1) is used:



$$E_{\max} = \sqrt{\frac{n_{\mathrm{RS}}}{BF}} \times \sqrt{E^2{}_{\mathrm{RS\_PORT1}} + E^2{}_{\mathrm{RS\_PORT2}}} \qquad \text{(L.1)}$$

where

$E_{max}$ is maximum exposure level in V/m

$E_{RS\_PORT1}$ is the measured electric field values of the reference signal RS for antenna port 1 in V/m,

$E_{RS\_POR2}$ is the measured electric field values of the reference signal RS for antenna port 2 in V/m,

$n_{RS}$ is the ratio of the maximum total output power at the base station to the power of the reference signal RS at the base station

BF is the power boosting factor (see Figure L.2).

$E_{RS\_ANT1}$ *and* $E_{RS\_ANT2}$ are the measured electric field values of the reference signal RS for each antenna port, $n_{RS}$ the ratio of the maximum total output power at the base station to the power of the reference signal RS at the base station and BF is the power boosting factor (see Figure L.2). $n_{RS}$ corresponds to the number of subcarriers and is provided by the network operator or can be calculated theoretically (assuming that the power of the RS subcarriers are at the same power level as the other subcarriers, see Table L.1).

**Table L.1 - Theoretical extrapolation factor, $n_{RS}$ as function of the bandwidth, assuming that all subcarriers are at the same power level.**

| Bandwidth [MHz] | Total number of resource blocks (12 subcarriers per symbol) | $n_{RS}$ =Maximum total output power/$P_{RS}$ | $n_{RS}$ [dB] |
|---|---|---|---|
| 1,4 | 6 | 72 | 18,57 |
| 3 | 15 | 180 | 22,55 |
| 5 | 25 | 300 | 24,77 |
| 10 | 50 | 600 | 27,78 |
| 15 | 75 | 900 | 29,54 |
| 20 | 100 | 1200 | 30,79 |

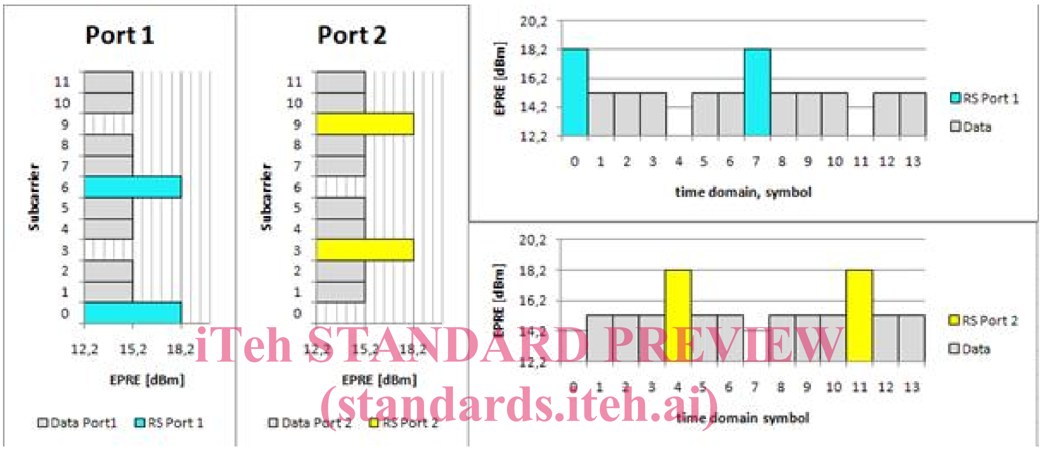




**Figure L.2 - Illustration of the boosting factor BF, specific to each network operator**



### L.2.3 Method using a basic spectrum analyser

Using a basic spectrum analyser, the power of the reference signals (RS) cannot be detected since these signals are not permanent signals.

To overcome this issue and avoid requirements of previous knowledge on band occupation or service characteristics, the broadcast channel (PBCH) [3] power can be measured. PBCH is transmitted with same characteristics regardless of configuration or service bandwidth and always spans about 1 MHz over the LTE signal center frequency $f_0$ (Figure L.3).