

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE  
COMITÉ INTERNATIONAL SPÉCIAL DES PERTURBATIONS RADIOÉLECTRIQUES

BASIC EMC PUBLICATION  
PUBLICATION FONDAMENTALE EN CEM

AMENDMENT 1  
AMENDEMENT 1

**Specification for radio disturbance and immunity measuring apparatus and methods –  
Part 2-3: Methods of measurement of disturbances and immunity – Radiated  
disturbance measurements**

**Spécifications des méthodes et des appareils de mesure des perturbations  
radioélectriques et de l'immunité aux perturbations radioélectriques –  
Partie 2-3: Méthodes de mesure des perturbations et de l'immunité – Mesures  
des perturbations rayonnées**



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## FOREWORD

This amendment has been prepared by CISPR subcommittee A: Radio-interference measurements and statistical methods, in cooperation with CISPR subcommittee D: Electromagnetic disturbances related to electric/electronic equipment on vehicles and internal combustion engine powered devices, of IEC technical committee CISPR: International special committee on radio interference.

The text of this amendment is based on the following documents:

Enquiry draft	Report on voting
CISPR/A/878/CDV	CISPR/A/894/RVC

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

## INTRODUCTION

The recent addition of FFT-based measuring instrumentation in CISPR 16-1-1 necessitates the addition of related specifications for the test methods covered in CISPR 16-2-3. Those new specifications are introduced in this amendment.

### 3 Terms and definitions

#### 3.18 measuring receiver

*Replace the existing definition by the following new definition:*

instrument such as a tunable voltmeter, an EMI receiver, a spectrum analyzer or an FFT-based measuring instrument, with or without preselection, that complies with CISPR 16-1-1

*Add, after the existing definition 3.24.5, the following new terms and definitions 3.25 and 3.26:*

#### 3.25 measurement

process of experimentally obtaining one or more quantity values that can reasonably be attributed to a quantity

[2.1 of ISO/IEC Guide 99:2007][8]<sup>1</sup>

### 3.26

#### test

technical operation that consists of the determination of one or more characteristics of a given product, process or service according to a specified procedure

NOTE A test is carried out to measure or classify a characteristic or a property of an item by applying to the item a set of environmental and operating conditions and/or requirements.

[IEC 60050-151:2001, 151-16-13][9]

## 6.1 General

*Delete the existing item c) from the list.*

### 6.2.1 General

*Replace the second sentence of this subclause by the following new sentence:*

Should the ambient noise level exceed the required level, it shall be recorded in the test report.

*Add, after the existing Subclause 6.5.2, the following new Subclause 6.5.3:*

#### 6.5.3 Measurement of the duration of disturbance

The duration of a disturbance must be known in order to measure it correctly and to determine if it is discontinuous. The duration of a disturbance may be measured in one of the following ways:

- through the connection of an oscilloscope to a measuring receiver's IF output to allow monitoring of the disturbance in the time-domain;
- through the tuning of either an EMI receiver or a spectrum analyzer to the disturbance frequency without frequency scanning (i.e. 'zero-span' mode) to allow monitoring of the disturbance in the time-domain; or
- through the use of the time-domain output of an FFT-based measuring receiver.

Guidance for the determination of the appropriate measurement time can be found in 8.3.

### 6.6.2 Minimum measurement times

*Replace the existing first sentence of the first paragraph of this subclause by the following two new sentences:*

The minimum measurement (dwell) times are given in Table 7. The minimum measurement (dwell) times for scanning receivers and FFT-based measuring instruments in Table 1 and the scan times for spectrum analyzers in Table 2 apply to CW signals.

*Add, immediately before the existing Table 1, the following new Table 7:*

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<sup>1</sup> Figures in square brackets refer to the Bibliography.

**Table 7 – Minimum measurement times for the four CISPR bands**

	Frequency band	Minimum measurement time $T_m$
A	9 kHz to 150 kHz	10,00 ms
B	0,15 MHz to 30 MHz	0,50 ms
C and D	30 MHz to 1 000 MHz	0,06 ms
E	1 GHz to 18 GHz	0,01 ms

Add, after the existing Subclause 6.6.5, the following new Subclause 6.6.6:

**6.6.6 Timing considerations using FFT-based instruments**

FFT-based measuring instruments may combine the parallel calculation at  $N$  frequencies and a stepped scan. For this purpose the frequency range of interest is subdivided into a number of segments  $N_{seg}$  that are scanned sequentially. The procedure is shown in Figure 20 for three segments. The total scan time for the frequency range of interest  $T_{scan}$  is calculated as:

$$T_{scan} = T_m N_{seg} \tag{18}$$

where

$T_m$  is the measurement time for each segment, and

$N_{seg}$  is the number of segments.

FFT-based measuring instruments may also provide methods to improve the frequency resolution across a given frequency range. In general, an FFT-based measuring instrument will have a fixed frequency step  $f_{step\ FFT}$  that is determined by the number of frequencies of the FFT. Increased frequency resolution is achieved by performing repeat calculations over a given frequency range. For each repeat calculation, the lowest frequency is incremented by a frequency step,  $f_{step\ final}$ .

Hence the first calculation over the given frequency range considers the following frequencies:

$$\begin{aligned} &f_{min}, \\ &f_{min} + f_{step\ FFT}, \\ &f_{min} + 2f_{step\ FFT}, \\ &f_{min} + 3f_{step\ FFT} \dots \end{aligned}$$

The second calculation over the given frequency range considers the following frequencies:

$$\begin{aligned} &f_{min} + f_{step\ final}, \\ &f_{min} + f_{step\ final} + f_{step\ FFT}, \\ &f_{min} + f_{step\ final} + 2f_{step\ FFT}, \\ &f_{min} + f_{step\ final} + 3f_{step\ FFT} \dots \end{aligned}$$

This procedure, applied for a step ratio of 3, is displayed on Figure 21.

The scan time  $T_{scan}$  is calculated as:

$$T_{scan} = T_m \frac{f_{step\ FFT}}{f_{step\ final}} \tag{19}$$

where

$T_m$  is the measurement time, and

$\frac{f_{\text{step FFT}}}{f_{\text{step final}}}$  is the step ratio.

For a system that combines both methods the scan time  $T_{\text{scan}}$  is calculated as:

$$T_{\text{scan}} = T_m N_{\text{seg}} \frac{f_{\text{step FFT}}}{f_{\text{step final}}} \quad (20)$$

NOTE 1 FFT-based measuring instruments may combine both methods, the stepped scan as well as a method to improve the frequency resolution.

NOTE 2 Additional background information is currently in preparation for CISPR 16-3<sup>2</sup>.

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<sup>2</sup> A CISPR/TR 16-3 is to be published to replace CISPR 16-3:2003 and its amendments.

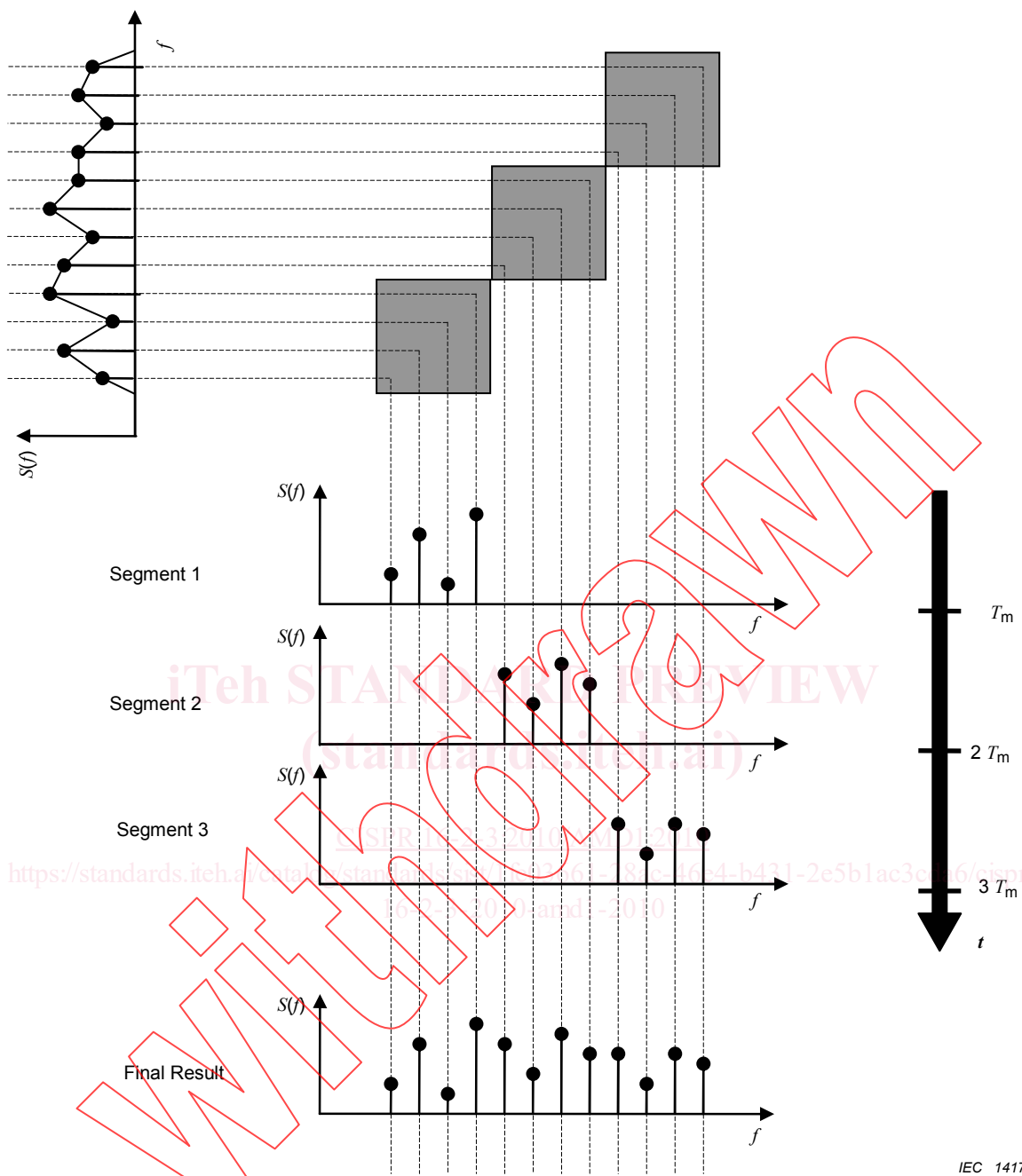
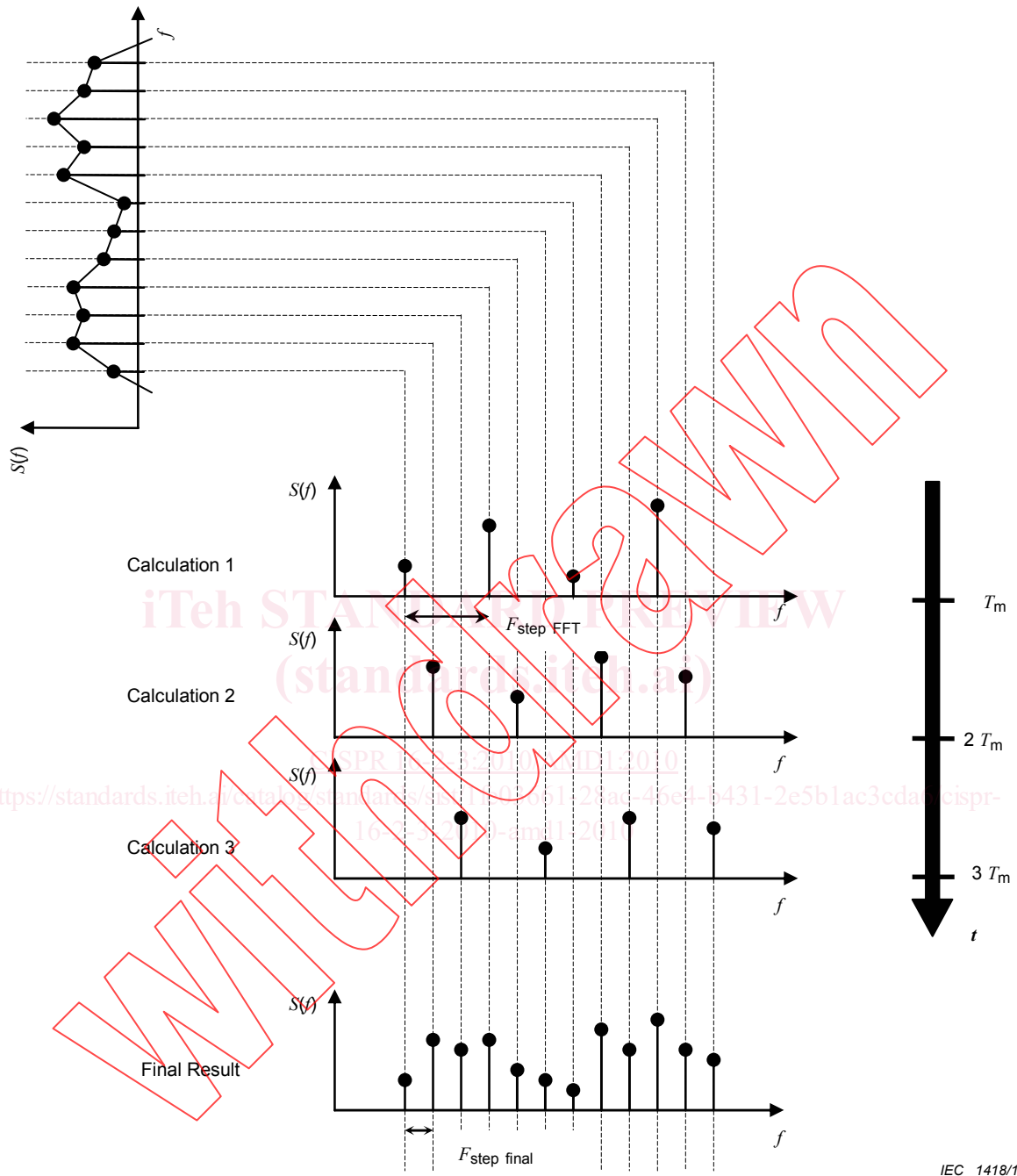


Figure 20 – FFT scan in segments





**Figure 21 – Frequency resolution enhanced by FFT-based measuring instrument**

**7.5.4 Specifications for EUT set-up in common emissions/immunity test setup**

*In the first bullet of the eighth paragraph, replace the existing third sentence as follows:*

However, in case of conflicting requirements, the layout and maximum cable lengths defined in the product emission standard shall be used.

#### 7.6.6.2.1 General measurement procedure

*In the last sentence of the first paragraph, delete the existing phrase “in case of dispute.”*

#### 8.5 Emission maximization and final measurement

*Add, after the last paragraph of this subclause, a new note as follows:*

NOTE The final measurement may be performed at several frequencies in parallel using FFT-based measurement instrumentation.

*Add, after the existing Subclause 8.6, the following new Subclause 8.7:*

#### 8.7 Emission measurement strategies with FFT-based measuring instruments

Depending on the implementation, FFT-based measuring instruments may perform weighted measurements significantly faster than the tunable selective voltmeters. A weighted measurement over the frequency range of interest may then be faster than a measurement consisting of a prescan and final scan performed with a superheterodyne receiver as described in 8.2.

#### Bibliography

*Add the following new references after the existing list:*

- [8] ISO/IEC Guide 99:2007, *International vocabulary of metrology – Basic and general concepts and associated terms (VIM)*
- [9] IEC 60050-151:2001, *International Electrotechnical Vocabulary (IEV) – Part 151: Electrical and magnetic devices*

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