SLOVENSKI STANDARD
oSIST prEN IEC 62433-4:2026

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Modeliranje integriranih vezij (IC) za elektromagnetno združljivost (EMC) - 4. del: Modeli integriranih vezij za vedenjsko simulacijo RF odpornosti - Modeliranje odpornosti integriranih vezij proti prevajanim motnjam (ICIM-CI)

EMC IC modelling - Part 4: Models of integrated circuits for RF immunity behavioural simulation - Conducted immunity modelling (ICIM-CI)

EMV-IC-Modellierung - Teil 4: Modelle integrierter Schaltungen für die Simulation des Verhaltens der HF-Störfestigkeit - Modellierung der Störfestigkeit gegen leitungsgeführte Störungen (ICIM-CI)

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Modèles de circuits intégrés pour la CEM - Partie 4: Modèles de circuits intégrés pour la simulation du comportement d'immunité aux radiofréquences - Modélisation de l'immunité conduite (ICIM-CI)

Ta slovenski standard je istoveten z: **prEN IEC 62433-4:2026**

ICS:

31.200	Integrirana vezja, mikroelektronika	Integrated circuits. Microelectronics
33.100.20	Imunost	Immunity

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47A/1231/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER: **IEC 62433-4 ED2**	
DATE OF CIRCULATION: **2026-10-30**	CLOSING DATE FOR VOTING: **2027-01-22**
SUPERSEDES DOCUMENTS: **47A/1213/CD, 47A/1221/CC**	

IEC SC 47A : INTEGRATED CIRCUITS	
SECRETARIAT: Japan	SECRETARY: Mr Yoshinori FUKUBA
OF INTEREST TO THE FOLLOWING COMMITTEES:	HORIZONTAL FUNCTION(S):
ASPECTS CONCERNED: Electromagnetic Compatibility	
☒ SUBMITTED FOR CENELEC PARALLEL VOTING **Attention IEC-CENELEC parallel voting** The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting. The CENELEC members are invited to vote through the CENELEC online voting system.	☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

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TITLE:

EMC IC modelling - Part 4: Models of integrated circuits for RF immunity behavioural simulation - Conducted immunity modelling (ICIM-CI)

PROPOSED STABILITY DATE: 2032

NOTE FROM TC/SC OFFICERS:

All comments on 47A/1213/CD have been reviewed and resolved in 47A/1221/CC. SC47A has decided to proceed to the CDV stage.

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EMC IC modelling - Part 4: Models of integrated circuits for RF immunity behavioural simulation - Conducted immunity modelling (ICIM-CI)

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IEC 62433-4 has been prepared by subcommittee 47A: Integrated circuits, of IEC technical committee 47: Semiconductor devices. It is an International Standard.

This second edition cancels and replaces the first edition published in 2016. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) removal of annexes on preliminary definitions for XML representation and XML encoding rules;

b) simplification of XML parts in the main body;

c) addition of informative Annex D and Annex F with examples.

The text of this International Standard is based on the following documents:

Draft	Report on voting
47A/XX/FDIS	47A/XX/RVD

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

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The language used for the development of this International Standard is English [change language if necessary].

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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INTRODUCTION

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1 Scope

This part of IEC 62433 specifies a flow for deriving a macro-model to allow the simulation of the conducted immunity levels of an integrated circuit (IC). This model is commonly called integrated circuit immunity model - conducted immunity, ICIM-CI. It is intended to be used for predicting the levels of immunity to conducted radio frequency (RF) disturbances applied on IC pins.

In order to evaluate the immunity threshold of an electronic device, this macro-model will be inserted into an electrical circuit simulation tool.

This macro-model can be used to model both analogue and digital ICs (input/output, digital core and supply). This macro-model does not take into account the non-linear effects of the IC.

The added value of ICIM-CI is that it could also be used for immunity prediction at board and system level through simulations.

This part of IEC 62433 has two main subparts:

– the electrical description of ICIM-CI macro-model elements;
– the representation of ICIM-CI macro-model elements in XML-based CIML schema, according to encoding scheme defined in IEC 62433-1, to enable a more generic, interoperable and simulation-orientated format for immunity analysis.

2 Normative references

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The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

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IEC 60050-131, *International Electrotechnical Vocabulary (IEV) - Part 131: Circuit theory*

IEC 60050-161, *International Electrotechnical Vocabulary (IEV) - Part 161: Electromagnetic compatibility*

IEC 62132-1, *Integrated circuits - Measurement of electromagnetic immunity - Part 1: General conditions and definitions*

IEC 62132-4, *Integrated circuits - Measurement of electromagnetic immunity 150 kHz to 1 GHz - Part 4: Direct RF power injection method*

IEC 62433-1, *EMC IC modelling - Part 1: General modelling framework*

IEC 62433-2, *EMC IC modelling - Part 2: Models of integrated circuits for EMI behavioural simulation - Conducted emissions modelling (ICEM-CE)*

CISPR 17, *Methods of measurement of the suppression characteristics of passive EMC filtering devices*

3 Terms, definitions, abbreviated terms and conventions

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-131, IEC 60050-161 and IEC 62433-1, and the following, apply.

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3.1.1
section
XML element placed one level below the root element or within another section and that contains one or more XML elements, but no value

3.1.2
parent
keyword which is one level above another keyword

3.1.3
child
keyword which is one level below another keyword

3.1.4
external terminal
terminal of an integrated circuit macro-model which interfaces the model to the external environment of the integrated circuit

Note 1 to entry: Power supply pins and input/output pins.

Note 2 to entry: In this part of IEC 62433, a terminal is considered external by default unless otherwise stated.

3.1.5
internal terminal
terminal of an integrated circuit macro-model's component which interfaces the component to other components of the integrated circuit macro-model

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3.1.6
parser
tool for syntactic analysis of data that is encoded in a specified format

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3.1.7
CIML
conducted immunity markup language
data exchange format for conducted immunity macro-model

3.1.8
CIMLBase
conducted immunity markup language base
abstract type from which all CIML (3.1.7) model components are directly or indirectly derived in the conducted immunity macro-model definition

3.1.9
DI
disturbance input
input terminal for the injection of RF disturbances

Note 1 to entry: It could be any pin of IC, an input, supply or an output.

3.1.10
DO
disturbance output
terminal whose load influences the impedance of DI (3.1.9) terminal, and/or the transfer characteristics of PDN (3.1.13), and that outputs a part of the disturbance received on the DI (3.1.9) terminals

3.1.11
OO
observable output
output terminal where the immunity criteria are monitored during the test

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3.1.12
GND
ground terminal
terminal that is used as reference for return path

3.1.13
PDN
passive distribution network
component of an IC model that represents the characteristics of propagation path of electromagnetic noises such as power distribution network

3.1.14
IB
immunity behaviour
block that describes the internal immunity characteristics of the IC

3.1.15
IBC
inter-block coupling
network of passive elements that presents a coupling effect between circuit blocks within an IC

3.1.16
VNA
vector network analyzer
instrument to measure complex network parameters such as *S*-, *Y*- or *Z*- parameters in the frequency domain

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3.1.17
RFIP
radio frequency injection probe
probe for injecting RF disturbances into a pin of an IC, allowing the measurement of voltage and the determination of IC pin impedance and current

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3.2 Abbreviated terms

CIM	Conducted immunity model
ESD	Electrostatic discharge
SPICE	Simulation program with integrated circuit emphasis
XML	Extensible markup language
DUT	Device under test
DPI	Direct RF power injection

3.3 Conventions

For the sake of clarity, but with some exceptions, the writing conventions of XML have been used in text and tables.

4 Philosophy

Integrated circuits contain more and more gates, the integration density of technologies is increasing and supply voltages are becoming lower. The reduction of distance between on-chip signals, die geometry size reduction and the increase of unwanted currents in parasitic structures, such as isolation capacitances, often leads to increased internal crosstalk. Consequently, the immunity of integrated circuits is becoming more and more critical.

Due to this increased risk of lower IC immunity, the use of models and simulation tools is required to optimize the immunity characteristics of both the IC and the application.

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This part of IEC 62433 describes such macro-models for simulating immunity characteristics at the IC level. The model, called ICIM-CI, will be used to predict electromagnetic immunity at the application level. This model is based on files describing the PDN and the IB containing data on electromagnetic disturbances leading to a variation of one or more observable signals. The PDN is considered to be linear, whereas the inherent non-linearity of the IC is taken into account in the IB. The validity and justification for this assumption are illustrated in 8.2 (see Figure 22). Users of the model should apply a failure criterion to the observable signal depending on their requirements.

ICIM-CI model data is arranged in a decipherable nested manner using XML format. The objective of this exchange format, called CIML, is to enable simple and practical universal access to the ICIM-CI model. The preliminary definitions for XML representation are given in IEC 62433-1.

5 ICIM-CI model description

5.1 General

The internal structure of an IC can be broken down into two parts:

a) passive parts (parasitic elements of pins, bondwires and tracks, ESD protection), which conduct the disturbances from the external environment to the internal IC blocks,

b) active parts (CPU core, clock system, memory, analogue blocks); these internal blocks are sensitive to the incoming disturbances.

The ICIM-CI model consists of a set of data describing these two sub-models:

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– PDN: the passive distribution network is a multi-port circuit. It is composed of four different terminals:
  - DI: terminals to which disturbances are applied;
  - DO: terminals that can influence the impedance of the DI terminals and consequently receive a part of the disturbance applied on the DI terminals;
  - GND: one or more ground terminals (such as digital ground, analogue ground);
  - internal terminals: terminals that can influence the impedance of the DI terminals and are internal to the IC (at chip-level).

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– IB: the immunity behaviour component that describes the response of the IC to the applied disturbances (referenced to one ground terminal of the PDN). The immunity criterion is set on OO terminals. Depending on the configuration of the IC, the OO terminals can be either associated to the various DI and/or DO terminals or remain unassociated.

NOTE 1 DI, DO, OO and GND terminals are external terminals and are interfaced at pin level. These pins connect to the external environment of the IC.

NOTE 2 OO terminals connect the PDN to the IB. Although these terminals are external on the IC and are used to obtain the IB by monitoring the immunity criterion, they are represented internally as virtual nodes within the PDN of the ICIM-CI macro-model.

Figure 1 represents an example of the ICIM-CI model structure.

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