SLOVENSKI STANDARD
SIST EN IEC 63155:2020

01-oktober-2020

Smernice za metodo merjenja trajanja energije površinskega zvočnega vala (SAW) in prostorskega zvočnega vala (BAW) v napravah pri radiofrekvenčnih (RF) aplikacijah (IEC 63155:2020)

Guidelines for the measurement method of power durability for surface acoustic wave (SAW) and bulk acoustic wave (BAW) devices in radio frequency (RF) applications (IEC 63155:2020)

Leitlinien für das Verfahren zur Messung der Leistungsfestigkeit von Oberflächenwellen (OFW)- und Volumenwellen (BAW)-Bauelementen in Hochfrequenz (HF)-Anwendungen (IEC 63155:2020)

Lignes directrices relatives à la méthode de mesure de la durabilité de puissance des appareils à ondes acoustiques de surface (OAS) et des appareils à ondes acoustiques de volume (OAV) dans les applications de radiofréquence (RF) (IEC 63155:2020)

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EUROPEAN STANDARD

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EN IEC 63155

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English Version

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 49/1339/FDIS, future edition 1 of IEC 63155, prepared by IEC/TC 49 "Piezoelectric, dielectric and electrostatic devices and associated materials for frequency control, selection and detection" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 63155:2020.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2021-03-01
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2023-05-29

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Endorsement notice

The text of the International Standard IEC 63155:2020 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60862-1:2015	NOTE	Harmonized as EN 60862-1:2015 (not modified)
IEC 62047-7:2011	NOTE	Harmonized as EN 62047-7:2011 (not modified)
IEC 62575-1:2015	NOTE	Harmonized as EN 62575-1:2016 (not modified)
IEC 62575-2:2012	NOTE	Harmonized as EN 62575-2:2012 (not modified)
IEC 62604-1:2015	NOTE	Harmonized as EN 62604-1:2015 (not modified)
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INTERNATIONAL STANDARD

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colour inside

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GUIDELINES FOR THE MEASUREMENT METHOD OF POWER DURABILITY FOR SURFACE ACOUSTIC WAVE (SAW) AND BULK ACOUSTIC WAVE (BAW) DEVICES IN RADIO FREQUENCY (RF) APPLICATIONS

FOREWORD

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International Standard IEC 63155 has been prepared by IEC technical committee 49: Piezoelectric, dielectric and electrostatic devices and associated materials for frequency control, selection and detection.

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

FDIS	Report on voting
49/1339/FDIS	49/1342/RVD

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

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

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

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

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INTRODUCTION

Radio frequency (RF) surface acoustic wave (SAW) and bulk acoustic wave (BAW) devices are now widely used in various communication systems owing to their features such as small size, light weight, little or no need for tuning, high stability and high reliability.

One of the most important applications of the devices is the antenna duplexer in mobile communication devices which separates incoming receiving (Rx) signals from base-stations and outgoing transmitting (Tx) signals in the frequency domain. It is known that acoustic vibration can accelerate destruction of electrode metals in the inter-digital transducers (IDTs) employed, which results in device failure. Thus, the device life time (time to failure, TF) is dependent on not only the chip temperature but also on input power level and frequency of the applied radio frequency signal. It should be noted that chip temperature can be somewhat different from the environmental temperature because the input power level of Tx signals in the above-mentioned applications is about 1 W at maximum, and heat generation due to power consumption is not negligible.

The requisite TF of the SAW/BAW duplexers is usually specified by input power level, exposure frequency range and environmental temperature. Nevertheless, TF measurement under given specifications is not realistic because the requisite TF is too long (could be up to many years). Accelerated life time testing is applied to shorten the TF. TF is measured in more severe situations, namely at higher power and/or higher ambient temperature. TF under given specifications is estimated by extrapolation based on the Arrhenius model including the inverse power law. Although the model explains the variation of the TF with respect to input power level and temperature well, the parameters appearing in the model need to be determined experimentally, and its procedures have not been well established. Therefore, measurement methods will be specifically established for TF estimation of RF SAW/BAW devices.

This document has been compiled in response to a generally expressed desire on the part of both users and manufacturers for general information on testing condition guidance of RF SAW/BAW filters, so that the filters may be used to their best advantage. To this end, general and fundamental characteristics have been explained in this document.

GUIDELINES FOR THE MEASUREMENT METHOD OF POWER DURABILITY FOR SURFACE ACOUSTIC WAVE (SAW) AND BULK ACOUSTIC WAVE (BAW) DEVICES IN RADIO FREQUENCY (RF) APPLICATIONS

1 Scope

This document defines the measurement method for the determination of the durability of radio frequency (RF) surface acoustic wave (SAW) and bulk acoustic wave (BAW) devices, such as filters and duplexers, with respect to high power RF signals, which are used in telecommunications, measuring equipment, radar systems and consumer products. RF BAW devices include two types: those based on the film bulk acoustic resonator (FBAR) technology and those based on the solidly mounted resonator (SMR) technology.

This document includes basic properties of failure of RF SAW/BAW devices, and guidelines to set up the measurement system and to establish the procedure to estimate the time to failure (TF). Since TF is mainly governed by the RF power applied in the devices, discussions are focused on the power durability.

It is not the aim of this document to explain the theory, or to attempt to cover all the eventualities which can arise in practical circumstances. This document draws attention to some of the more fundamental questions which will need to be considered by the user before he/she places an order for an RF SAW/BAW device for a new application. Such a procedure will be the user's means of preventing unsatisfactory performance related to premature device failure resulting from high-power exposure of RF SAW/BAW devices.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

3.1 General terms

3.1.1
BAW
bulk acoustic wave
acoustic wave, propagating between the top and bottom surface of a piezoelectric structure and then traversing the entire thickness of the piezoelectric bulk

Note 1 to entry: The wave is excited by metal electrodes attached to both sides of the piezoelectric layer.

[SOURCE: IEC 62575-1:2015, 3.1.1]

3.1.2
BAW filter
bulk acoustic wave filter
filter characterised by a bulk acoustic wave which is usually generated by a pair of electrodes and propagates along a thin film thickness direction

[SOURCE: IEC 62575-1:2015, 3.1.2]

3.1.3
cut-off frequency
frequency of the pass band at which the relative attenuation reaches a specified value

[SOURCE: IEC 60862-1:2015, 3.1.2.4, modified – The reference to Figure 1 has been deleted.]

3.1.4
duplexer
device used in the frequency division duplex system, which enables the system to receive and transmit signal through a common antenna simultaneously

[SOURCE: IEC 62761:2014, 3.1.5]

3.1.5
film bulk acoustic resonator
FBAR
thin film BAW resonator consisting of a piezoelectric layer sandwiched between two electrode layers with stress-free top and bottom surfaces supported mechanically at the edge on a substrate with cavity structure as shown in Figure 1 or membrane structure as an example

Note 1 to entry: This note applies to the French language only.

[SOURCE: IEC 62575-1:2015, 3.1.3, modified – Figure 1 c) has been added.]