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Standards

Irish Standard  
I.S. EN 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

**I.S. EN IEC 63155:2020**

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## National Foreword

I.S. EN IEC 63155:2020 is the adopted Irish version of the European Document EN 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

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EUROPEAN STANDARD

**EN IEC 63155**

NORME EUROPÉENNE

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June 2020

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English Version

**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)**

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)

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

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Comité Européen de Normalisation Electrotechnique  
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**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

**EN IEC 63155:2020 (E)****European foreword**

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IEC 60862-1:2015	NOTE	Harmonized as EN 60862-1:2015 (not modified)
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IEC 62575-2:2012	NOTE	Harmonized as EN 62575-2:2012 (not modified)
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# **INTERNATIONAL STANDARD**

## **NORME INTERNATIONALE**



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

**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)**



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**IEC 63155**

Edition 1.0 2020-04

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE



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

**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)**

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

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49/1339/FDIS	49/1342/RVD

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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]

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