

INTERNATIONAL STANDARD



Surface acoustic wave (SAW) and bulk acoustic wave (BAW) duplexers of assessed quality –
Part 1: Generic specification

Document Preview

[IEC 62604-1:2022](#)

<https://standards.iteh.ai/catalog/standards/iec/efda35b9-03c1-4476-9023-ad0de266b9bc/iec-62604-1-2022>





THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2022 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

International Standards
standards.iteh.ai)
Document Preview

[IEC 62604-1:2022](https://standards.iteh.ai/catalog/standards/iec/efda35b9-03e1-4476-9023-ad0de266b9bc/iec-62604-1-2022)

<https://standards.iteh.ai/catalog/standards/iec/efda35b9-03e1-4476-9023-ad0de266b9bc/iec-62604-1-2022>



IEC 62604-1

Edition 2.0 2022-07
REDLINE VERSION

INTERNATIONAL STANDARD



Surface acoustic wave (SAW) and bulk acoustic wave (BAW) duplexers of
assessed quality –
Part 1: Generic specification

Document Preview

[IEC 62604-1:2022](https://standards.iteh.ai/iec/efda35b9-03c1-4476-9023-ad0de266b9bc/iec-62604-1-2022)

<https://standards.iteh.ai/catalog/standards/iec/efda35b9-03c1-4476-9023-ad0de266b9bc/iec-62604-1-2022>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 31.140

ISBN 978-2-8322-3982-7

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	5
1 Scope.....	7
2 Normative references	7
3 Terms, definitions, units and graphical symbols.....	9
3.1 Terms and definitions.....	9
3.1.1 General terms.....	9
3.1.2 Response characteristics related terms	11
3.1.3 SAW and BAW duplexers related terms	15
3.2 Units and graphical symbols	17
4 Order of precedence of documents.....	18
5 Preferred values for ratings and characteristics	18
5.1 General.....	18
5.2 Nominal frequency bands.....	18
5.3 Operating temperature ranges, in degrees Celsius (°C)	18
5.4 Climatic category	19
5.5 Bump severity	19
5.6 Vibration severity	19
5.7 Shock severity	20
5.8 Fine leak rate.....	20
6 Marking	20
6.1 Duplexer marking.....	20
6.2 Package marking	20
7 Quality assessment procedures	20
7.1 General.....	20
7.2 Primary stage of manufacture	21
7.3 Structurally similar components	21
7.4 Subcontracting.....	21
7.5 Incorporated components.....	21
7.6 Manufacturer's approval.....	21
7.7 Approval procedures.....	21
7.7.1 General	21
7.7.2 Capability approval	21
7.7.3 Qualification approval	22
7.8 Procedures for capability approval	22
7.8.1 General	22
7.8.2 Eligibility for capability approval.....	22
7.8.3 Application for capability approval	22
7.8.4 Granting of capability approval	22
7.8.5 Capability manual	22
7.9 Procedures for qualification approval	22
7.9.1 General	22
7.9.2 Eligibility for qualification approval.....	22
7.9.3 Application for qualification approval	22
7.9.4 Granting of qualification approval	23
7.9.5 Quality conformance inspection	23
7.10 Test procedures.....	23

7.11	Screening requirements	23
7.12	Rework and repair work	23
7.12.1	Rework	23
7.12.2	Repair work	23
7.13	Certified records of released lots	23
7.14	Validity of release	23
7.15	Release for delivery	23
7.16	Unchecked parameters	23
8	Test and measurement procedures	24
8.1	General	24
8.2	Test and measurement conditions	24
8.2.1	Standard conditions for testing	24
8.2.2	Precision of measurement	24
8.2.3	Precautions	24
8.2.4	Alternative test methods	24
8.3	Visual inspection	25
8.3.1	General	25
8.3.2	Visual test A	25
8.3.3	Visual test B	25
8.4	Dimensions test	25
8.5	Electrical test procedures	25
8.5.1	S-parameters measurement	25
8.5.2	Intermodulation distortion measurement	27
8.5.3	Insulation resistance	27
8.5.4	Voltage proof	27
8.6	Mechanical and environmental test procedures	27
8.6.1	Sealing tests (non-destructive)	27
8.6.2	Soldering (solderability and resistance to soldering heat) (destructive)	28
8.6.3	Rapid change of temperature: severe shock by liquid immersion (non-destructive)	28
8.6.4	Rapid change of temperature with prescribed time of transition (non-destructive)	28
8.6.5	Bump (destructive)	28
8.6.6	Vibration (destructive)	29
8.6.7	Shock (destructive)	29
8.6.8	Free fall (destructive)	29
8.6.9	Acceleration, steady state (non-destructive)	30
8.6.10	Low air pressure (non-destructive)	30
8.6.11	Dry heat (non-destructive)	30
8.6.12	Damp heat, cyclic (destructive)	30
8.6.13	Cold (non-destructive)	30
8.6.14	Climatic sequence (destructive)	30
8.6.15	Damp heat, steady state (destructive)	31
8.6.16	Salt mist cyclic (destructive)	31
8.6.17	Immersion in cleaning solvents (non-destructive)	31
8.6.18	Flammability test (destructive)	31
8.6.19	Electrostatic discharge (ESD) sensitivity test (destructive)	31
8.7	Endurance test procedure	32
	Bibliography	33

Figure 1 – FBAR configuration 10
Figure 2 – SMR configuration..... 11
Figure 3 – Frequency response of SAW and BAW duplexers 17
Figure 4 – *S*-parameters measurement..... 26

Table 1 – Frequency allocation of typical UMTS bands 18

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[IEC 62604-1:2022](#)

<https://standards.iteh.ai/catalog/standards/iec/efda35b9-03c1-4476-9023-ad0de266b9bc/iec-62604-1-2022>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SURFACE ACOUSTIC WAVE (SAW) AND
BULK ACOUSTIC WAVE (BAW) DUPLEXERS
OF ASSESSED QUALITY –****Part 1: Generic specification**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 62604-1:2015. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 62604-1 has been prepared by IEC technical committee 49: Piezoelectric, dielectric and electrostatic devices and associated materials for frequency control, selection and detection. It is an International Standard.

This second edition cancels and replaces the first edition published in 2015. This edition constitutes a technical revision.

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

- the term "multiplexer" has been added to Clause 3.

NOTE In this document, SAW and BAW duplexers are treated simultaneously because both duplexers are used in the same manner especially in mobile phones and have the same requirements of characteristics, test method and so on.

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

Draft	Report on voting
49/1360/CDV	49/1375/RVC

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

The language used for the development of this International Standard is English.

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.

A list of all parts in the IEC 62604 series, published under the general title *Surface acoustic wave (SAW) and bulk acoustic wave (BAW) duplexers of assessed quality*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under 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.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

SURFACE ACOUSTIC WAVE (SAW) AND BULK ACOUSTIC WAVE (BAW) DUPLEXERS OF ASSESSED QUALITY –

Part 1: Generic specification

1 Scope

This part of IEC 62604 specifies the methods of test and general requirements for SAW and BAW duplexers of assessed quality using either capability approval or qualification approval procedures.

2 Normative references

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.

IEC 60027 (all parts), *Letter symbols to be used in electrical technology*

~~IEC 60050 (all parts), *International Electrotechnical Vocabulary* (available at www.electropedia.org)~~

IEC 60050-561, *International electrotechnical vocabulary – Part 561: Piezoelectric, dielectric and electrostatic devices and associated materials for frequency control, selection and detection*

<https://standards.iteh.ai/catalog/standards/iec/efda35b9-03e1-4476-9023-ad0de266b9bc/iec-62604-1-2022>

<https://standards.iteh.ai/catalog/standards/iec/efda35b9-03e1-4476-9023-ad0de266b9bc/iec-62604-1-2022>

IEC 60068-1:2013, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-1, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-6, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-7, *Basic environmental testing procedures – Part 2-7: Tests – Test Ga and guidance: Acceleration, steady state*

IEC 60068-2-13, *Basic environmental testing procedures – Part 2-13: Tests – Test M: Low air pressure*

IEC 60068-2-14, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-17:1994, *Basic environmental testing procedures – Part 2-17: Tests – Test Q: Sealing*

IEC 60068-2-27, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-30, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60068-2-31, *Environmental testing – Part 2-31: Tests – Test Ec: Rough handling shocks, primarily for equipment-type specimens*

IEC 60068-2-45, *Basic environmental testing procedures – Part 2-45: Tests – Test XA and guidance: Immersion in cleaning solvents*

IEC 60068-2-52, *Environmental testing – Part 2-52: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution)*

IEC 60068-2-58, *Environmental testing – Part 2-58: Tests – Test Td: Test methods for solderability, resistance to dissolution of metallization and to soldering heat of surface mounting devices (SMD)*

IEC 60068-2-64, *Environmental testing – Part 2-64: Tests – Test Fh: Vibration, broadband random and guidance*

IEC 60068-2-78, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60122-1, *Quartz crystal units of assessed quality – Part 1: Generic specification*

IEC 60617, *Graphical symbols for diagrams* (available at <http://std.iec.ch/iec60617>)

IEC 60642, *Piezoelectric ceramic resonators and resonator units for frequency control and selection – Chapter I: Standard values and conditions – Chapter II: Measuring and test conditions*

IEC 60695-11-5, *Fire hazard testing – Part 11-5: Test flames – Needle-flame test method – Apparatus, confirmatory test arrangement and guidance*

IEC 60749-28⁴, *Semiconductor devices – Mechanical and climatic test methods – Part 28: Electrostatic discharge (ESD) sensitivity testing – ~~direct contact~~ – Charged device model (DC-CDM) – device level*

IEC 61000-4-2, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61340-3-1², *Electrostatics – Part 3-1: Methods for simulation of electrostatic effects – Human body model (HBM) electrostatic discharge test waveforms*

IEC 61340-3-2¹, *Electrostatics – Part 3-2: Methods for simulation of electrostatic effects – Machine model (MM) electrostatic discharge test waveforms*

IEC 62761, *Guidelines for the measurement method of nonlinearity for surface acoustic wave (SAW) and bulk acoustic wave (BAW) devices in radio frequency (RF)*

IEC 80000 (all parts), *Quantities and units*

ISO 80000 (all parts), *Quantities and units*

⁴ ~~To be published.~~

² Withdrawn

3 Terms, definitions, units and graphical symbols

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1.1 General terms

3.1.1.1

surface acoustic wave

SAW

acoustic wave, propagating along a surface of an elastic material, whose amplitude decays exponentially with the depth

[SOURCE: ~~IEC 60862-1:2003, 2.2.1.1, modified~~ — In the definition, "elastic substrate" has been replaced with "elastic material" and "substrate depth" has been replaced with "the depth". IEC 60862-1:2015, 3.1.1.1]

3.1.1.2

surface acoustic wave filter

SAW filter

filter characterized by one or more surface acoustic wave transmission line or resonant elements, where the surface acoustic wave is usually generated by an interdigital transducer and propagates along a material surface

[SOURCE: ~~IEC 60862-1:2003, 2.2.1.2, modified~~ IEC 60862-1:2015, 3.1.1.2]

3.1.1.3

bulk acoustic wave

BAW

acoustic wave, propagating inside an elastic material and then traversing the entire thickness of the bulk

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

3.1.1.4

bulk acoustic wave filter

BAW filter

filter characterized by a bulk acoustic wave which is usually generated by a pair of electrodes and propagates along a thickness direction

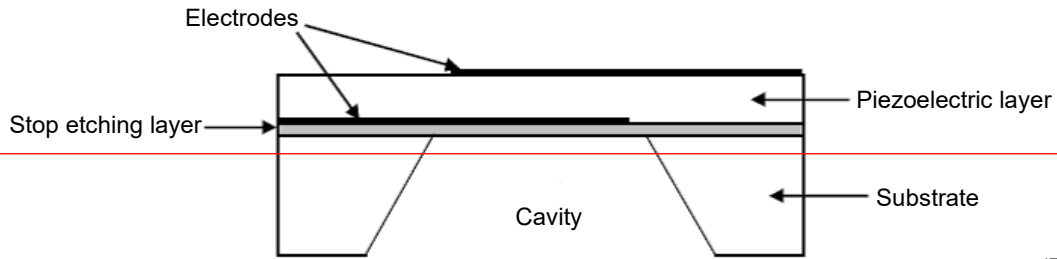
3.1.1.5

film bulk acoustic resonator

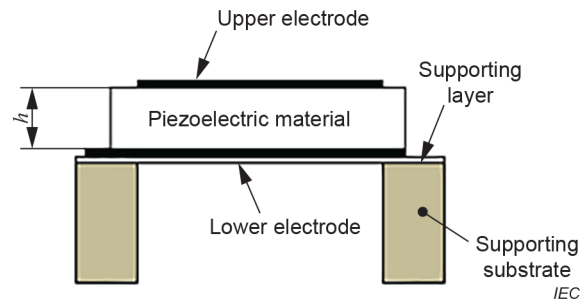
FBAR

thin film BAW resonator consisting of a piezoelectric layer sandwiched between two electrode layers with stress-free top and bottom surface 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.

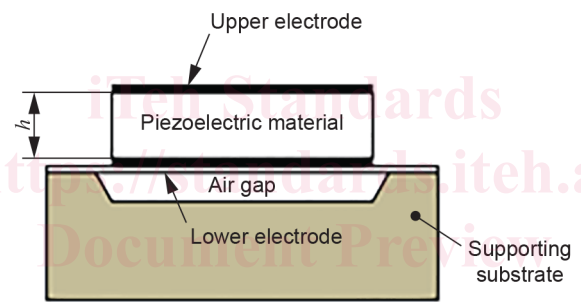


IEC



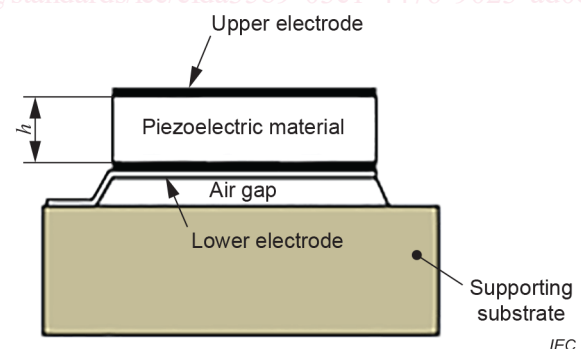
IEC

a) – Back-side etched



IEC

b) – Front-side etched



IEC

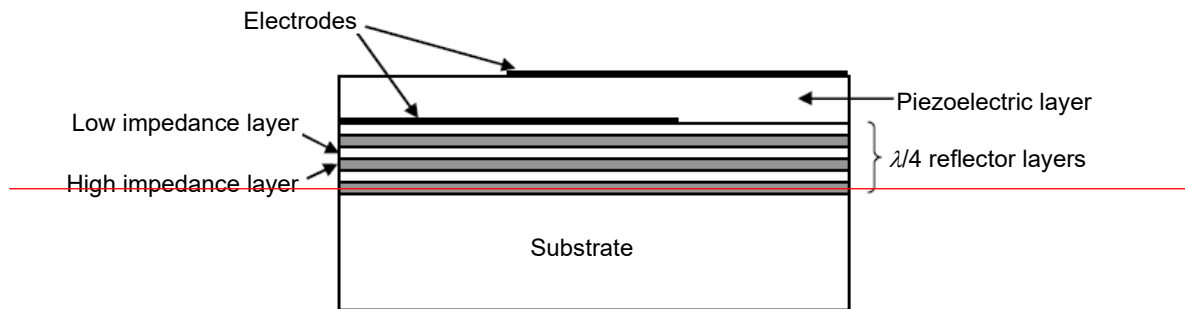
c) – Sacrificial-layer etched

Figure 1 – FBAR configuration

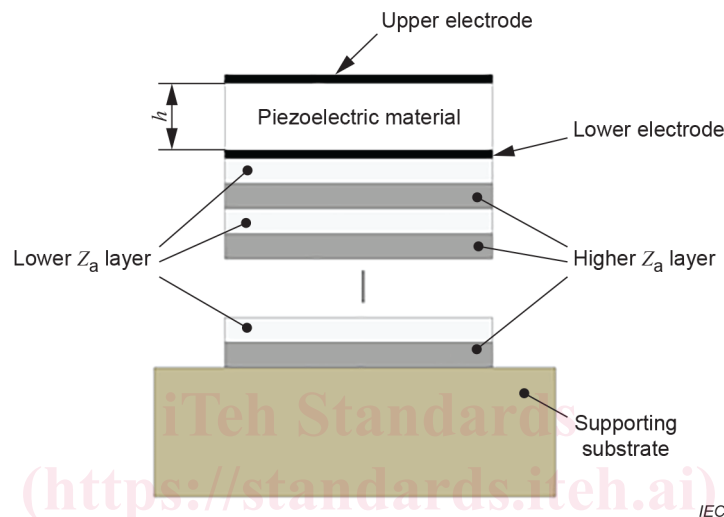
**3.1.1.6
solidly mounted resonator
SMR**

BAW resonator, supporting the electrode/piezoelectric layer/electrode structure by a sequence of additional thin films of alternately low and high acoustic impedance Z_a with quarter wavelength layer, and these layers act as acoustic reflectors and decouple the resonator acoustically from the substrate, as shown in Figure 2 as an example

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



IEC



IEC

Figure 2 – SMR configuration

3.1.2 Response characteristics related terms

3.1.2.1 reference frequency

frequency defined by the specification to which other frequencies may be referred

[SOURCE: ~~IEC 60862-1:2003, 2.2.2.3~~ IEC 60862-1:2015, 3.1.2.3]

3.1.2.2 insertion attenuation

logarithmic ratio of the power delivered directly to the load impedance before insertion of the duplexer to the power delivered to the load impedance after insertion of the duplexer

[SOURCE: ~~IEC 60862-1:2003, 2.2.2.6~~ IEC 60862-1:2015, 3.1.2.6, modified– In the definition, "filter" has been replaced with "duplexer".]

3.1.2.3 nominal insertion attenuation

insertion attenuation at a specified reference frequency

[SOURCE: ~~IEC 60862-1:2003, 2.2.2.7~~ IEC 60862-1:2015, 3.1.2.7]

3.1.2.4 relative attenuation

difference between the attenuation at a given frequency and the attenuation at the reference frequency

[SOURCE: ~~IEC 60862-1:2003, 2.2.2.8~~ IEC 60862-1:2015, 3.1.2.8]

3.1.2.5

pass band

band of frequencies in which the relative attenuation is equal to or less than a specified value

[SOURCE: ~~IEC 60862-1:2003, 2.2.2.9~~ IEC 60862-1:2015, 3.1.2.9]

3.1.2.6

pass bandwidth

separation of frequencies between which the relative attenuation is equal to or less than a specified value

[SOURCE: ~~IEC 60862-1:2003, 2.2.2.10~~ IEC 60862-1:2015, 3.1.2.10]

3.1.2.7

pass band ripple

maximum variation in attenuation characteristics within a specified pass band

[SOURCE: ~~IEC 60862-1:2003, 2.2.2.11~~ IEC 60862-1:2015, 3.1.2.11]

3.1.2.8

minimum insertion attenuation

minimum value of insertion attenuation in the pass band

[SOURCE: ~~IEC 60862-1:2003, 2.2.2.13~~ IEC 60862-1:2015, 3.1.2.13]

3.1.2.9

maximum insertion attenuation

maximum value of insertion attenuation in the pass band

[SOURCE: ~~IEC 60862-1:2003, 2.2.2.14~~ IEC 60862-1:2015, 3.1.2.14]

3.1.2.10

stop band

band of frequencies in which the relative attenuation is equal to or greater than a specified value

[SOURCE: ~~IEC 60862-1:2003, 2.2.2.15~~ IEC 60862-1:2015, 3.1.2.15]

3.1.2.11

stop bandwidth

separation of frequencies between which the relative attenuation is equal to or greater than a specified value

[SOURCE: ~~IEC 60862-1:2003, 2.2.2.16~~ IEC 60862-1:2015, 3.1.2.16]

3.1.2.12

stop band rejection

minimum relative attenuation at a specified stop band

[SOURCE: IEC 60862-1:2015, 3.1.2.17]