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Foreword

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This document was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 14, *Space systems and operations*.

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Space systems — Acoustic testing

1 Scope

This document provides guidance for test providers and interested parties to implement acoustic tests of aerospace systems, subsystems, modules and units for applicable spacecraft programs. This document specifies a framework to meet test and process requirements and acts as a supplement to ISO 15864.

The acoustic test system, the technical requirements and the procedures for acoustic tests in reverberant chambers are described. Furthermore, the criteria for the manual test interruption and evaluation are also described.

The technical requirements in this document can be tailored to fulfil the objectives of tests.

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.

ISO 15864:2004, *Space systems — General test methods for space craft, subsystems and units*

ISO 14620, *Space systems — Safety requirements*

3 Terms and definitions

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

ISO and IEC maintain terminological 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
acoustic reverberation chamber
acoustic chamber built in hard and highly reflective surface walls such that the sound field therein becomes diffused

3.2
diffuse sound field
sound field that has uniform energy density in a given region so that all directions of energy flux at all parts of the region are equally probable

3.3
sound pressure
p
root mean square value of instantaneous sound pressure over a given time interval, unless specified otherwise

Note 1 to entry: Normally given in Pa.

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3.4
sound pressure level
SPL
L_p
expressed by

$$L_p = 20 \lg \left(p / p_0 \right)$$

where

p is root mean square value of instantaneous *sound pressure* (3.3) over a given time interval (Pa);

p_0 is reference pressure at threshold (Pa), p_0 = 20 µPa.

3.5
overall sound pressure level
OASPL
value computed from *one-third-octave* (3.13) or octave band sound pressure levels, L_i

$$L_g = 10 \lg \sum_{i=1}^{m} 10^{L_i/10}$$

where

L_g is the overall sound pressure level in dB;

L_i is the *sound pressure level* (3.5) in one-third-octave or octave band;

m is the number of one-third-octave or octave bands.

3.6
bandwidth
difference between the nominal upper and lower cut-off frequencies

3.7
centre frequency
geometric mean of the nominal cut-off frequencies of a pass-band

Note 1 to entry: The definition of *octave* (3.12) and third-octave bands preferred centre frequency values refers to ISO 266.

3.8
cut-off frequency of acoustic horn
frequency below which an acoustic horn becomes increasingly ineffective

3.9
measurement point
specific points spatially distributed in the sound field at which *sound pressure levels* (3.4) are measured during test

3.10
control point
measurement points (3.9), spatially distributed inside the reverberant chamber, whose signals are used for the sound pressure level test control

3.11
multipoint control
control achieved by using the average of the signals at the *control points* (3.10)

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3.12
octave
1/1 Oct
interval between two *centre frequencies* (3.7) which have a ratio equal to 2

3.13
one-third-octave
1/3 Oct
interval between *centre frequencies* (3.7) which have a ratio equal to $2^{1/3}$

3.14
test level tolerances
allowance of superior limit and inferior limit of a test level

3.15
closed-loop control
feedback control
system where the output acts upon the process in such a way as to reduce the difference between the measured value and the desired set-point value to zero

[SOURCE: ISO 16484-2:2004, 3.41]

3.16
open-loop control
control action not using any automatic means of deviations from the target value

3.17
statistical DOF
number of independent variables in an estimate of some quantity

3.18
root mean square
RMS
<of a time varying quantity> obtained by squaring the amplitude at each instant, obtaining the average of the squared values over the interval of interest and then taking the square root of this average

3.19
power spectral density
PSD
measure of the distribution of the energy (squared amplitude) of the signal as a function of frequency

3.20
broadband reverberant field
includes signals over a relative large frequency range of 22,5 Hz ~ 10 000 Hz (1/3 oct)

4 Abbreviated terms

All abbreviated terms in Table 1 are applied to this document.

Table 1 — Abbreviated terms

Oct	Octave
DOF	Degree of freedom
PSD	Power spectral density
RMS	Root mean square
SPL	Sound pressure level
OASPL	Overall sound pressure level

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