

INTERNATIONAL STANDARD



**Process management for avionics – Atmospheric radiation effects –
Part 1: Accommodation of atmospheric radiation effects via single event effects
within avionics electronic equipment**



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within avionics electronic equipment**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE

ICS 03.100.50; 31.020; 49.060

ISBN 978-2-83220-099-5

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CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references	8
3 Terms and definitions	9
4 Abbreviations and acronyms.....	16
5 Radiation environment of the atmosphere.....	18
5.1 Radiation generation	18
5.2 Effect of secondary particles on avionics	18
5.3 Atmospheric neutrons.....	18
5.3.1 General	18
5.3.2 Energy spectrum of atmospheric neutrons	19
5.3.3 Altitude variation of atmospheric neutrons	20
5.3.4 Latitude variation of atmospheric neutrons	21
5.3.5 Thermal neutrons within aircraft.....	23
5.4 Secondary protons	23
5.5 Other particles.....	24
5.6 Solar enhancements.....	25
5.7 High altitudes greater than 60 000 feet (18 290 m)	25
6 Effects of atmospheric radiation on avionics.....	26
6.1 Types of radiation effects	26
6.2 Single event effects (SEE).....	26
6.2.1 General	26
6.2.2 Single event upset (SEU)	27
6.2.3 Multiple bit upset (MBU) and multiple cell upset (MCU)	27
6.2.4 Single effect transients (SET)	29
6.2.5 Single event latch-up (SEL)	29
6.2.6 Single event functional interrupt (SEFI)	30
6.2.7 Single event burnout (SEB)	30
6.2.8 Single event gate rupture (SEGR)	30
6.2.9 Single event induced hard error (SHE)	31
6.2.10 SEE potential risks based on future technology	31
6.3 Total ionising dose (TID)	31
6.4 Displacement damage	32
7 Guidance for system designs.....	33
7.1 Overview	33
7.2 System design.....	36
7.3 Hardware considerations	37
7.4 Parts characterisation and control	38
7.4.1 Rigour and discipline	38
7.4.2 Level A systems	38
7.4.3 Level B	39
7.4.4 Level C	39
7.4.5 Levels D and E	40
8 Determination of avionics single event effects rates	40

8.1	Main single event effects	40
8.2	Single event effects with lower event rates	40
8.2.1	Single event burnout (SEB) and single event gate rupture (SEGR)	40
8.2.2	Single event transient (SET)	41
8.2.3	Single event hard error (SHE)	41
8.2.4	Single event latch-up (SEL)	41
8.3	Single event effects with higher event rates – Single event upset data	42
8.3.1	General	42
8.3.2	SEU cross-section	42
8.3.3	Proton and neutron beams for measuring SEU cross-sections	42
8.3.4	SEU per bit cross-section trends in SRAMs	46
8.3.5	SEU per bit cross-section trends and other SEE in DRAMs	47
8.4	Calculating SEE rates in avionics	49
8.5	Calculation of availability of full redundancy	50
8.5.1	General	50
8.5.2	SEU with mitigation and SET	50
8.5.3	Firm errors and faults	51
9	Considerations for SEE compliance	51
9.1	Compliance	51
9.2	Confirm the radiation environment for the avionics application	51
9.3	Identify system development assurance level	51
9.4	Assess preliminary electronic equipment design for SEE	51
9.4.1	Identify SEE-sensitive electronic components	51
9.4.2	Quantify SEE rates	51
9.5	Verify that the system development assurance level requirements are met for SEE	51
9.5.1	Combine SEE rates for entire system	51
9.5.2	Management of parts control and dependability	52
9.6	Corrective actions	52
Annex A (informative)	Thermal neutron assessment	53
Annex B (informative)	Methods of calculating SEE rates in avionics electronics	54
Annex C (informative)	Review of test facility availability	60
Annex D (informative)	Tabular description of variation of atmospheric neutron flux with altitude and latitude	68
Annex E (informative)	Consideration of effects at higher altitudes	69
Annex F (informative)	Prediction of SEE rates for ions	74
Annex G (informative)	Late news as of 2011 on SEE cross-sections applicable to the atmospheric neutron environment	77
Bibliography	88

Figure 1 – Energy spectrum of atmospheric neutrons at 40 000 feet (12 160 m), latitude 45 degrees	19
Figure 2 – Model of the atmospheric neutron flux variation with altitude (see Annex D)	21
Figure 3 – Distribution of vertical rigidity cut-offs around the world	22
Figure 4 – Model of atmospheric neutron flux variation with latitude	22
Figure 5 – Energy spectrum of protons within the atmosphere	24
Figure 6 – System safety assessment process	34
Figure 7 – SEE in relation to system and LRU effect	36

Figure 8 – Variation of RAM SEU cross-section as function of neutron/proton energy	44
Figure 9 – Neutron and proton SEU bit cross-section data	45
Figure 10 – SEU cross-section in SRAMs as function of manufacture date	47
Figure 11 – SEU cross-section in DRAMs as function of manufacture date	48
Figure E.1 – Integral linear energy transfer spectra in silicon at 100 000 feet (30 480 m) for cut-off rigidities (R) from 0 GV to 17 GV	70
Figure E.2 – Integral linear energy transfer spectra in silicon at 75 000 feet (22 860 m) for cut-off rigidities (R) from 0 to 17 GV	70
Figure E.3 – Integral linear energy transfer spectra in silicon at 55 000 feet (16 760 m) for cut-off rigidities (R) from 0 GV to 17 GV	71
Figure E.4 – The influence of solar modulation on integral linear energy transfer spectra in silicon at 150 000 feet (45 720 m) for cut-off rigidities (R) of 0 GV and 8 GV	71
Figure E.5 – The influence of solar modulation on integral linear energy transfer spectra in silicon at 55 000 feet (16 760 m) for cut-off rigidities (R) of 0 GV and 8 GV	72
Figure E.6 – Calculated contributions from neutrons, protons and heavy ions to the SEU rates of the Hitachi-A 4Mbit SRAM as a function of altitude at a cut-off –rigidity (R) of 0 GV	73
Figure E.7 – Calculated contributions from neutrons, protons and heavy ions to the SEU rates of the Hitachi-A 4Mbit SRAM as a function of altitude at a cut-off rigidity (R) of 8 GV	73
Figure F.1 – Example differential LET spectrum	75
Figure F.2 – Example integral chord length distribution for isotropic particle environment	75
Figure G.1 – Variation of the high energy neutron SEU cross-section per bit as a function of device feature size for SRAMs and SRAM arrays in microprocessors and FPGAs	79
Figure G.2 – Variation of the high energy neutron SEU cross-section per bit as a function of device feature size for DRAMs	80
Figure G.3 – Variation of the high energy neutron SEU cross-section per device as a function of device feature size for NOR and NAND type flash memories	81
Figure G.4 – Variation of the MCU/SBU percentage as a function of feature size based on data from many researchers in SRAMs [43, 45]	82
Figure G.5 – Variation of the high energy neutron SEFI cross-section in DRAMs as a function of device feature size	83
Figure G.6 – Variation of the high energy neutron SEFI cross-section in microprocessors and FPGAs as a function of device feature size	84
Figure G.7 – Variation of the high energy neutron single event latch-up (SEL) cross- section in CMOS devices (SRAMs, processors) as a function of device feature size	85
Figure G.8 – Single event burnout (SEB) cross-section in power devices (400 V – 1 200 V) as a function of drain-source voltage (V_{DS})	86
Table 1 – Nomenclature cross reference	35
Table B.1 – Sources of high energy proton or neutron SEU cross-section data	55
Table B.2 – Some models for the use of heavy ion SEE data to calculate proton SEE data	56
Table D.1 – Variation of 1 MeV to 10 MeV neutron flux in the atmosphere with altitude	68
Table D.2 – Variation of 1 MeV to 10 MeV neutron flux in the atmosphere with latitude	68
Table G.1 – Information relevant to neutron-induced SET	86

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**PROCESS MANAGEMENT FOR AVIONICS –
ATMOSPHERIC RADIATION EFFECTS –****Part 1: Accommodation of atmospheric radiation effects via
single event effects within avionics electronic equipment**

FOREWORD

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IEC 62396-1 has been prepared by IEC technical committee 107: Process management for avionics.

IEC 62396-1 cancels and replaces IEC/TS 62396-1 published in 2006.

This International Standard includes the following technical changes with respect to the Technical Specification:

- a) Guidance has been provided on the environment for altitudes above 60 000 feet (18,3 km) and the effects on electronics are documented in Annex E and F;
- b) Annex G has been added to provide late news as of 2011 on SEE cross-sections applicable to the atmospheric neutron environment.

The text of this international standard is based on the following documents:

FDIS	Report on voting
107/176/FDIS	107/182/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 publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all the parts in the IEC 62396 series, published under the general title *Process management for avionics – Atmospheric radiation effects*, can be found on the IEC website.

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

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

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication 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.

INTRODUCTION

This industry-wide technical specification informs avionics systems designers, electronic equipment, component manufacturers and their customers of the kind of ionising radiation environment that their devices will be subjected to in aircraft, the potential effects this radiation environment can have on those devices, and some general approaches for dealing with these effects.

The same atmospheric radiation (neutrons and protons) that is responsible for the radiation exposure that crew and passengers acquire while flying is also responsible for causing the single event effects (SEE) in the avionics electronic equipment. There has been much work carried out over the last few years related to the radiation exposure of aircraft passengers and crew. A standardised industry approach on the effect of the atmospheric neutrons on electronics should be viewed as consistent with and an extension of the on-going activities related to the radiation exposure of aircraft passengers and crew.

Atmospheric radiation effects are one factor that could contribute to equipment hard and soft fault rates. From a system safety perspective, using derived fault rate values, the existing methodology described in ARP4754 (accommodation of hard and soft fault rates in general) will also accommodate atmospheric radiation effect rates.

In addition, this International Standard refers to the JEDEC Standard JESD89A, which relates to soft errors in electronics by atmospheric radiation at ground level (at altitudes less than 10 000 feet (3 040 m)).

PROCESS MANAGEMENT FOR AVIONICS – ATMOSPHERIC RADIATION EFFECTS –

Part 1: Accommodation of atmospheric radiation effects via single event effects within avionics electronic equipment

1 Scope

This part of IEC 62396 is intended to provide guidance on atmospheric radiation effects on avionics electronics used in aircraft operating at altitudes up to 60 000 feet (18,3 km). It defines the radiation environment, the effects of that environment on electronics and provides design considerations for the accommodation of those effects within avionics systems.

This International Standard is intended to help aerospace equipment manufacturers and designers to standardise their approach to single event effects in avionics by providing guidance, leading to a standard methodology.

Details of the radiation environment are provided together with identification of potential problems caused as a result of the atmospheric radiation received. Appropriate methods are given for quantifying single event effect (SEE) rates in electronic components. The overall system safety methodology should be expanded to accommodate the single event effects rates and to demonstrate the suitability of the electronics for the application at the component and system level.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC/TS 62239:2008, *Process management for avionics – Preparation of an electronic components management plan*

NOTE IEC/TS 62239-1, *Process management for avionics – Management plan – Part 1: Preparation and maintenance of an electronic components management plan* is under study and will supersede IEC/TS 62239.

IEC/TS 62396-2:2008, *Process management for avionics – Atmospheric radiation effects – Part 2: Guidelines for single event effects testing for avionics systems*

IEC/TS 62396-3, *Process management for avionics – Atmospheric radiation effects – Part 3: Optimising system design to accommodate the single event effects (SEE) of atmospheric radiation*

IEC/TS 62396-4:2008, *Process management for avionics – Atmospheric radiation effects – Part 4: Guidelines for designing with high voltage aircraft electronics and potential single event effects*

IEC/TS 62396-5, *Process management for avionics – Atmospheric radiation effects – Part 5: Guidelines for assessing thermal neutron fluxes and effects in avionics systems*