BS ISO 19923:2017

BSI Standards Publication

# Space environment (natural and artificial) — Plasma environments for generation of worst case electrical potential differences for spacecraft

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# National foreword

This British Standard is the UK implementation of ISO 19923:2017.

The UK participation in its preparation was entrusted to Technical Committee ACE/68, Space systems and operations.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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# Space environment (natural and artificial) — Plasma environments for generation of worst case electrical potential differences for spacecraft

*Environnement spatial (naturel et artificiel) — Environnements plasmatiques pour la génération de différences de potentiel électrique les plus défavorables pour les véhicules spatiaux*

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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 environment (natural and artificial) — Plasma environments for generation of worst case electrical potential differences for spacecraft

## 1 Scope

This document specifies space plasma environments that lead to the generation of the worst-case surface potential differences for spacecraft. It also specifies how to estimate worst-case potential differences by using the simulation codes provided.

This document includes plasma energy and density in GEO, PEO, and MEO. This document does not include descriptions of plasma energy and density in LEO because large surface charging in LEO is likely to be due to high-voltage power generation by instrumentation of the spacecraft.

This document deals with external surface charging of spacecraft only.

## 2 Normative references

There are no normative references in this document.

## 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**
**double Maxwellian distribution**
electron and proton distribution functions in GEO fitted with two temperatures

Note 1 to entry: Maxwellian distribution is as follows[12]:

$$f(v)=\left(\frac{m}{2\pi}\right)^{3/2}\left[\frac{n_1}{(kT_1)^{3/2}}\exp\left(-\frac{mv^2}{2kT_1}\right)+\frac{n_2}{(kT_2)^{3/2}}\exp\left(-\frac{mv^2}{2kT_2}\right)\right]$$

where

| | |
|---|---|
| $m$ | is the mass of particle; |
| $k$ | is the Boltzmann constant 1,380 648 52 × $10^{-23}$ J/K; |
| $n_1$, $n_2$ | are the number density of particle; |
| $T_1$, $T_2$ | are the temperature of particle. |

**3.2**
**differential voltage**
**differential potential**
potential difference between any two points in spacecraft, especially the insulator surface and the spacecraft body, during differential charging

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