



DPC: 24/30495217 DC

BSI Group Headquarters

389 Chiswick High Road London W4 4AL

Tel: +44 (0)20 8996 9000

Fax: +44 (0)20 8996 7400

www.bsigroup.com

Date: 03 December 2024

Origin: International

Latest date for receipt of comments: 26 January 2025

Project No. 2024/01817

Responsible committee: ACE/68 Space systems and operations

Interested committees:

Title: Draft BS ISO 14303 Space systems — Launch-vehicle-to-spacecraft interfaces.

Please notify admin.start@bsigroup.com if you are aware of any keywords that might assist in clarifying or identifying the standard or of the content of this standard:

- i) has any issues related to 3rd party IPR, patent or copyright
- ii) affects other national standard(s)
- iii) requires additional national guidance or information

WARNING: THIS IS A DRAFT AND MUST NOT BE REGARDED OR USED AS A BRITISH STANDARD. THIS DRAFT IS NOT CURRENT BEYOND 26 January 2025

This draft is issued to allow comments from interested parties; all comments will be given consideration prior to publication. No acknowledgement will normally be sent. **See overleaf for information on the submission of comments.**

No copying is allowed, in any form, without prior written permission from BSI except as permitted under the Copyright, Designs and Patent Act 1988 or for circulation within a nominating organization for briefing purposes. Electronic circulation is limited to dissemination by e-mail within such an organization by committee members.

Further copies of this draft may be purchased from BSI Shop <http://shop.bsigroup.com> or from BSI Customer Services, Tel: +44(0) 20 8996 9001 or email cservices@bsigroup.com. British, International and foreign standards are also available from BSI Customer Services.

Information on the co-operating organizations represented on the committees referenced above may be obtained from <https://standardsdevelopment.bsigroup.com/>.

E-mail: admin.start@bsigroup.com

Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
------------------	------------------------

1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



DRAFT International Standard

ISO/DIS 14303

Space systems — Launch-vehicle-to-spacecraft interfaces

Systèmes spatiaux — Interfaces entre le lanceur spatial et le véhicule spatial

ICS: 49.140

ISO/TC 20/SC 14

Secretariat: **ANSI**

Voting begins on:
2024-12-03

Voting terminates on:
2025-02-25

This document is circulated as received from the committee secretariat.

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENTS AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

Reference number
ISO/DIS 14303:2024(en)

Full document details: 24/30495217 DC

© ISO 2024  **Documents**
Document Sharing Hub



COPYRIGHT PROTECTED DOCUMENT

© ISO 2024

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword	vi
Introduction	vii
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Abbreviated terms	2
5 Mechanical interfaces	2
5.1 General	2
5.2 Mechanical configurations	3
5.3 SC characteristics	3
5.3.1 SC fundamental natural frequency	3
5.3.2 SC mass properties	3
5.4 Usable volume	3
5.5 PLA interface	3
5.5.1 General	3
5.5.2 LV-supplied PLA	3
5.5.3 SC-supplied PLA	4
5.5.4 Separation actuators	4
5.6 Umbilical connectors and microswitches	5
5.7 Fluid connections	5
5.8 Encapsulated SC access	5
6 Electrical interfaces	5
6.1 General	5
6.2 Umbilical connectors	5
6.3 Umbilical links	6
6.4 Electrical commands dedicated to SC	6
6.4.1 General	6
6.4.2 Pyrotechnic commands	6
6.4.3 Dry loop command	7
6.4.4 LV-generated SC electrical commands	7
6.5 Separation status transmission	7
6.6 In-flight telemetry	8
6.7 Power supply	8
6.8 Earth potential (ground) continuity	8
7 RF/electromagnetic interface	8
7.1 General	8
7.2 RF telemetry and command link	8
7.3 LV-generated electromagnetic environment	9
7.4 SC-generated electromagnetic environment	9
8 Mission performance	9
8.1 General	9
8.2 Geosynchronous transfer orbit (GTO)	10
8.2.1 Performance	10
8.2.2 LV injection accuracies	10
8.2.3 Launch windows	10
8.3 Elliptical orbits	11
8.3.1 Performance	11
8.3.2 LV injection accuracies	11
8.3.3 Launch windows	11
8.4 Sun synchronous orbits (SSOs)	11
8.4.1 Performance	11
8.4.2 LV injection accuracies	11

8.4.3	Launch windows.....	11
8.5	Low Earth orbit (LEO) missions.....	12
8.5.1	Performance.....	12
8.5.2	LV Injection accuracy.....	12
8.5.3	Launch windows.....	12
8.6	Escape missions.....	12
8.6.1	Performance.....	12
8.6.2	LV Injection accuracy.....	12
8.6.3	Launch windows.....	12
8.7	Circular Earth orbit missions.....	12
8.7.1	Performance.....	12
8.7.2	LV injection accuracy.....	13
8.7.3	Launch windows.....	13
8.8	Spacecraft orientation and separation.....	13
8.8.1	General.....	13
8.8.2	Orientation performance.....	13
9	Induced environment and load limitations.....	13
9.1	General.....	13
9.2	Mechanical environment.....	14
9.2.1	General.....	14
9.2.2	Quasi-static flight limit loads.....	14
9.2.3	Low frequency longitudinal vibration.....	14
9.2.4	Low frequency lateral vibration.....	14
9.2.5	SC centre of gravity location.....	14
9.2.6	Random vibrations.....	14
9.2.7	Acoustic noise.....	14
9.2.8	Shock.....	14
9.2.9	Line load limitations.....	14
9.3	Thermal environment.....	15
9.3.1	General.....	15
9.3.2	Air conditioning system.....	15
9.3.3	In-flight aerothermal flux.....	15
9.3.4	Aerothermal flux at fairing jettisoning.....	15
9.3.5	Thermal flux from stage separation rockets.....	15
9.4	Static pressure.....	15
9.5	Contamination and cleanliness.....	15
9.5.1	Contamination on SC (if required).....	15
9.5.2	Air cleanliness.....	16
9.6	Radio and electromagnetic environment.....	16
9.6.1	LV generated.....	16
9.6.2	SC-generated.....	16
9.6.3	Launch-range-generated.....	16
10	Verification analysis and documentation.....	16
10.1	Verification tasks.....	16
10.2	Verification analysis method.....	17
10.3	Verification analysis phases.....	17
10.3.1	Feasibility analyses.....	17
10.3.2	Preliminary analyses.....	17
10.3.3	Final analyses.....	17
10.4	Input data for analyses.....	17
10.5	Description of verification analyses.....	18
10.5.1	General.....	18
10.5.2	Trajectory and performance analysis.....	18
10.5.3	Launch window analysis.....	18
10.5.4	Pointing, separation and spacing analysis.....	18
10.5.5	Coupled loads analysis.....	18
10.5.6	Clearance analysis.....	19
10.5.7	Thermal analysis.....	19

10.5.8	Radio frequency link analysis	19
10.5.9	Electromagnetic compatibility and interference analysis	19
10.5.10	Contamination analysis — Optional	19
10.6	Safety	19
10.7	Launch readiness assessment	19
10.8	Post launch assessment	19
10.9	Documentation	20
10.9.1	SC to LV interface requirements	20
10.9.2	Verification plan for LV–SC compatibility	20
10.9.3	Interface control document	20
11	Verification tests	20
11.1	General	20
11.2	Vibration and load tests	21
11.2.1	General	21
11.2.2	Static load test	21
11.2.3	Modal survey	21
11.2.4	Sinusoidal vibration test	21
11.2.5	Acoustic test	21
11.2.6	Random vibration test	21
11.3	Pyro-shock and separation test	21
11.4	Functional interface tests	22
11.4.1	General	22
11.4.2	Electrical interface test	22
11.4.3	Mechanical compatibility test	22
11.4.4	Match mate verification	22
11.4.5	Umbilical connector pullout test — Optional	22
11.5	Launch site interface test	22
11.5.1	General	22
11.5.2	End-to-end electrical test	22
11.5.3	RF link test	22
12	Spacecraft launch preparation operations	22
12.1	General	22
12.2	Preparation and checkout	23
12.3	Hazardous operations	23
12.3.1	General	23
12.3.2	Pyrotechnic item preparation	23
12.3.3	Preparation of SPM	23
12.3.4	Operations on spacecraft	24
12.3.5	Final spacecraft assembly and checks	24
12.4	Combined operations for SC encapsulation and mating with LV	24
Annex A (informative) Usable envelopes		26
Annex B (informative) Physical interface presentations		31
Annex C (informative) Performance presentations		34
Annex D (informative) Environment presentations		39
Annex E (informative) Verification		51

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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

This second edition cancels and replaces the first edition (ISO 14303:2002), which has been technically revised.

The main changes are as follows:

- XXXXXX
- XXXXXX

[Annexes A](#) to [E](#) of this document are for information only.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

ISO 14303 together with ISO 15863 and ISO 17401 forms a set of International Standards that describes fully the process for communicating information about launch vehicle (LV) to spacecraft (SC) interfaces.

[Clauses 4](#) to [8](#) of this document identify the parameters of an LV–SC interface, while [clauses 9](#) and [10](#) define the methodology for verification of the interface by analyses, testing or both. [Clause 11](#) defines the operations performed on the SC to prepare it for launch and the joint operations performed until it is installed on the LV.

Some sections of this document may refer to elements of the LV or SC, or elements of both, that are not applicable to their design characteristics. These sections should therefore only be considered if applicable.

The annexes give examples of the typical presentation format of the various interface parameters, as appropriate.

Space systems — Launch-vehicle-to-spacecraft interfaces

1 Scope

This document specifies the interfaces between a launch vehicle (LV) and the spacecraft (SC) being launched, to provide LV and SC organizations with the necessary format for presenting the required technical data on existing and future interfaces. Its intended purpose is to minimize costs and reduce the risks from errors resulting from miscommunication. It does not limit the ability of LV or SC organizations to specify unique requirements.

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 terminology databases for use in standardization at the following addresses:

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

3.1

spacecraft system

SC system

spacecraft bus, payload and all items supplied by the SC contractor in support of the launch effort.

3.2

launch vehicle system

LV system

launch vehicle and associated launch services supplied by the launch services contractor or subcontractors or both.

3.3

separation plane

plane where launch vehicle and spacecraft separation occurs.

3.4

mating plane

interface between the spacecraft, or the spacecraft-provided payload adapter, and the launch vehicle.

3.5

payload adapter

PLA

structure that mates the spacecraft to the launch vehicle, including the SC–LV separation system.

Note 1 to entry: The PLA is a part of the LV and does not separate with the SC.

3.6 usable volume

volume available to the payload within the LV fairing or carrying structure that the static envelope of the SC may not exceed in order to ensure that there is no physical contact between the SC and the LV in a dynamic environment (see [figure A.1](#) to [A.4](#)).

4 Abbreviated terms

The following abbreviations are used in this document.

ACS	Attitude control system
CG	Centre of gravity
CLA	Coupled loads analysis
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
GSE	Ground support equipment
GTO	Geosynchronous transfer orbit
ICD	Interface control document
IRD	Interface requirements document
LEO	Low Earth orbit
LV	Launch vehicle
LVS	Launch vehicle system
MEO	Medium Earth orbit
PLA	Payload adapter
PLF	Payload fairing
RF	Radio frequency
SC	Spacecraft
SPF	Spacecraft processing facility
SPM	Solid propellant motor
SSO	Sun synchronous orbit
TBD	To be determined
TM	Telecommand

5 Mechanical interfaces

5.1 General

This clause identifies the mechanical interfaces between the SC and the LV. The methodology for verifying these interfaces is discussed in [clauses 10](#) and [11](#).

5.2 Mechanical configurations

The SC shall be mated to the LV by a payload adapter (PLA). If the LV provides the PLA, it may include a pyrotechnically activated or other adequate separation system. If the SC provides its own separation system, then a static bolted interface to the LV in accordance with [5.4](#) shall be used. During final launch processing and launch ascent, the SC shall be contained in a structure provided by the LV contractor.

5.3 SC characteristics

5.3.1 SC fundamental natural frequency

The SC's fundamental natural frequency in the longitudinal and lateral axes shall not be less than a value specified by the LV with the SC cantilevered from the mating plane.

5.3.2 SC mass properties

The SC-CG location (CG coordinates referenced in the SC coordinate system. Origin of the SC coordinate is usually the geometrical center of separation plane), and the inertia properties for the x , y and z axes (Moments of Inertia with regard to the SC axis/CG), shall be defined.

It shall include the SC propellant-tanking characteristics to be used for the LV provider's sloshing analysis (mass of propellant, center of gravity of propellant loaded tank, pendulum mass, pendulum length, pendulum attachment point, damping factor, sloshing mode natural frequency).

5.4 Usable volume

The SC shall be accommodated in the LV's usable volume, as characterized in [annex A](#), without interference. The static envelope of the SC (including manufacturing tolerance, thermal protection installation, appendices) shall not exceed the usable volume, in order to ensure that there is no physical contact between the SC and the LV in a dynamic environment (dynamic environment in flight leading to relative motion between LV structure such as fairing and the SC itself).

Protrusions outside this usable volume may be allowed by mutual agreement between SC and LV contractors.

5.5 PLA interface

5.5.1 General

The LV-SC interface shall be characterized by the following elements, for each PLA type as shown in [annex B](#), [Figures B.1](#) and [B.2](#).

5.5.2 LV-supplied PLA

The SC-LV mating surface for LV supplied PLA shall be defined by the following.

- a) LV and PLA coordinate systems and relative angular orientation.
- b) Physical configuration (including keyway location):
 - 1) material;
 - 2) coating;
 - 3) roughness;
 - 4) flatness and perpendicularity;
 - 5) stiffness of interface frame (see figure in [Annex A](#)):
 - section area (mm²);

- applicable length (millimetres);
- inertia (mm^4).

c) Clampband:

- 1) geometry;
- 2) material;
- 3) roughness;
- 4) allowable tension (newtons).

d) Other mating systems.

5.5.3 SC-supplied PLA

The SC-LV mating surface for SC-provided PLA shall be defined by the following.

a) LV and PLA coordinate systems and relative angular orientation.

b) Physical configuration:

- 1) description of bolted interfaces (number, size, location of holes, type of bolts and torque value);
- 2) material;
- 3) coating;
- 4) roughness;
- 5) flatness and perpendicularity;
- 6) stiffness of interface frame (see figure in [Annex A](#)):
 - section area (mm^2);
 - applicable length (millimetres);
 - inertia (mm^4).

5.5.4 Separation actuators

Separation actuators (springs or pushrods) shall be characterized by

- number;
- location;
- nominal stroke (millimetres);
- reduced stroke (millimetres);
- maximum force (newtons);
- energy per unit (joules).

5.6 Umbilical connectors and microswitches

The LV side of the interface shall have electrical connectors for electrical power and signals in accordance with [clause 6](#). The LV connectors shall be adjustable in two planes to provide for alignment of the connectors during SC-LV mating. The SC shall have compatible connector halves. All connectors shall be characterized by:

- supplier;
- number;
- location and mechanical interface;
- push-on load per connector (newtons);
- push-off load per connector (newtons);
- energy released by each plug (joules);
- keying index.

5.7 Fluid connections

Fluid connections shall be defined to indicate :

- location;
- size;
- fluid (gas or liquid) and flowrate;
- material;
- definition of interface;
- functional usage.

5.8 Encapsulated SC access

The LV shall provide access through the fairing or the carrying structure to the SC after encapsulation if physical access is required by the SC contractor.

A drawing shall be made with developed views of fairings and dual launch structures indicating authorized areas for access doors. The maximum number of doors authorized per SC with their corresponding size shall be defined.

6 Electrical interfaces

6.1 General

This clause identifies the parameters required to define electrical interfaces (power and signal) between the SC and LV.

6.2 Umbilical connectors

Umbilical connectors shall be defined by the following characteristics for the LV and SC sides:

- type and reference designator of connectors;
- number of pins available to the user;
- number of connectors;

- segregation between SC power and pyro-firing circuits;
- location;
- shielding;
- keying index.

6.3 Umbilical links

Umbilical links between the SC mated with the LV and the SC's electrical ground support equipment (GSE) shall be described as follows:

- a) number and type of links;
- b) limitations:
 - maximum voltage (volts);
 - maximum current (amperes);
 - power (watts);
 - maximum one-way resistance or voltage drop (ohms or volts);
- c) operating constraints:
 - number of functions activated on ground after connection to LV;
 - types of function;
- d) current at umbilical plug extraction;
- e) conformance certification:
 - end-to-end resistance (ohms);
 - line to ground insulation;
 - line-to-line insulation;
- f) insertion of components.

6.4 Electrical commands dedicated to SC

6.4.1 General

Standard and optional commands generated by the LV and dedicated to the SC shall be listed with a description of the related characteristics.

6.4.2 Pyrotechnic commands

A general description of the electrical circuit associated with pyrotechnic commands shall be made. Optionally, a schematic drawing of the corresponding electrical circuits may be included. The following characteristics shall be indicated:

- type and characteristics of the initiators used in the SC;
- time and number of commands;
- voltage (volts);
- pulse width (seconds);

- output insulation (ohms);
- characteristics of current delivered to pyro-charges (amperes);
- interval between two commands (seconds);
- insulation between wires and structure (ohms);
- protection of SC equipment;
- utilization constraints (inhibits) on the SC side.

6.4.3 Dry loop command

A general description of electrical circuits associated with dry loop commands shall be made. Optionally, a schematic drawing of the corresponding electrical circuits may be included. The following main electrical characteristics shall be indicated:

- number of commands available on-ground or in-flight;
- voltage (volts);
- resistance (ohms) or reference of the input circuit components;
- insulation of the onboard circuit;
- protection on the SC side;
- utilization constraints on the SC side
- maximum voltage and current (volts and amperes).

6.4.4 LV-generated SC electrical commands

A general description of the electrical circuits associated with LV-generated SC electrical commands shall be made. Optionally, a schematic drawing of the corresponding electrical circuits may be included. The following main electrical characteristics shall be indicated:

- number of commands available on-ground or in-flight;
- output voltage (volts);
- current (amperes);
- protection on the SC side;
- insulation between circuit and structure;
- Electromagnetic compatibility (EMC)
- compliance with international specifications;
- utilization constraints on the SC side.

6.5 Separation status transmission

The separation status shall be indicated through the LV telemetry (TM) system modes of transmission available for separation status transmission as determined by

- microswitch or microswitches,
- break wires,
- dry loop,

and others.

6.6 In-flight telemetry

A description shall be made of the type of SC data that can be transmitted to the LV ground stations via LV TM on a standard basis or as options:

- dynamic, acoustic and thermal environment at the SC interface;
- specific internal SC measurements.

6.7 Power supply

A general description of electrical circuits associated with the electrical power supply shall be made. Optionally, a schematic drawing of the corresponding electrical circuits may be included. The following main electrical characteristics shall be indicated, together with the tolerances:

- voltage (volts);
- current (amperes);
- insulation on the SC side;
- protection on the SC side;
- EMC.

6.8 Earth potential (ground) continuity

The SC requirements for electrical continuity with respect to the Earth potential (ground) shall be expressed as follows:

- location of SC reference point or points;
- maximum resistance between SC metallic elements and the closest reference point;
- maximum resistance of SC interface separation plane.

7 RF/electromagnetic interface

7.1 General

This clause identifies the interface parameters required to define the RF interface and electromagnetic interfaces between the SC and LV. SC, LV and LV range RF emissions shall be jointly evaluated to determine compatibility and possible restrictions. For the methodology for verifying these interfaces, see [clauses 10](#) and [11](#).

7.2 RF telemetry and command link

The LV contractor shall provide TM and command links between the corresponding antennae of the encapsulated SC and the SC system test equipment located in the SPF.

The link shall be enabled by RF window, pick-up antenna or other equivalent methods associated with the LV PLF. The link shall be available from the time of encapsulation of the SC on the LV until launch, except when RF transmission is limited by LV activities. The SC TM and command frequency bands shall not overlap the LV frequencies.

The following items shall be described by the LV:

- a) TM
 - Bandwidth;
 - Frequency;
 - transmitter power;
- b) command destruct receiver (CDR):
 - bandwidth;
 - frequency;
- c) radar transponder (RT):
 - bandwidth;
 - frequency;
 - peak power.

The RF window shall be characterized by

- a) material,
- b) location:
 - angular orientation;
 - station.
- c) insertion loss with frequency range.

7.3 LV-generated electromagnetic environment

The SC electromagnetic susceptibility shall be compatible with the electric and magnetic fields generated by the LV (for the LV electromagnetic environment, see [9.6.1](#)).

7.4 SC-generated electromagnetic environment

The SC-generated electric and magnetic fields shall be compatible with the electromagnetic susceptibility of the LV (for the SC electromagnetic environment, see [9.6.2](#)).

8 Mission performance

8.1 General

This clause identifies the parameters used to define the LV performance as a function of the mission. Performance figures shall be associated with the necessary propellant reserve in the LV upper stage so that the injection of the vehicle into the required orbit or orbits is ensured before depletion of the upper-stage tanks, with a probability level to be defined by the LV contractor.