
**Space data and information transfer
systems — Proximity-1 space link
protocol — Physical layer**

*Systèmes de transfert des informations et données spatiales —
Protocole pour liaisons spatiales de proximité 1 — Couche physique*

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This third edition of ISO 21460:2015 cancels and replaces the second edition (ISO 21460:2007), which has been technically revised.

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Recommendation for Space Data System Standards

PROXIMITY-1 SPACE LINK PROTOCOL— PHYSICAL LAYER

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RECOMMENDED STANDARD

CCSDS 211.1-B-4

BLUE BOOK
December 2013

CCSDS RECOMMENDED STANDARD FOR PROXIMITY-1 SPACE LINK PROTOCOL—
PHYSICAL LAYER**AUTHORITY**

Issue:	Recommended Standard, Issue 4
Date:	December 2013
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This document has been approved for publication by the Management Council of the Consultative Committee for Space Data Systems (CCSDS) and represents the consensus technical agreement of the participating CCSDS Member Agencies. The procedure for review and authorization of CCSDS documents is detailed in *Organization and Processes for the Consultative Committee for Space Data Systems* (CCSDS A02.1-Y-3), and the record of Agency participation in the authorization of this document can be obtained from the CCSDS Secretariat at the address below.

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CCSDS RECOMMENDED STANDARD FOR PROXIMITY-1 SPACE LINK PROTOCOL—
PHYSICAL LAYER

STATEMENT OF INTENT

The Consultative Committee for Space Data Systems (CCSDS) is an organization officially established by the management of its members. The Committee meets periodically to address data systems problems that are common to all participants, and to formulate sound technical solutions to these problems. Inasmuch as participation in the CCSDS is completely voluntary, the results of Committee actions are termed **Recommended Standards** and are not considered binding on any Agency.

This **Recommended Standard** is issued by, and represents the consensus of, the CCSDS members. Endorsement of this **Recommendation** is entirely voluntary. Endorsement, however, indicates the following understandings:

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- o Whenever a member establishes a CCSDS-related **standard**, that member will provide other CCSDS members with the following information:
 - The **standard** itself.
 - The anticipated date of initial operational capability.
 - The anticipated duration of operational service.
- o Specific service arrangements shall be made via memoranda of agreement. Neither this **Recommended Standard** nor any ensuing **standard** is a substitute for a memorandum of agreement.

No later than three years from its date of issuance, this **Recommended Standard** will be reviewed by the CCSDS to determine whether it should: (1) remain in effect without change; (2) be changed to reflect the impact of new technologies, new requirements, or new directions; or (3) be retired or canceled.

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CCSDS RECOMMENDED STANDARD FOR PROXIMITY-1 SPACE LINK PROTOCOL—
PHYSICAL LAYER**FOREWORD**

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Through the process of normal evolution, it is expected that expansion, deletion, or modification of this document may occur. This Recommended Standard is therefore subject to CCSDS document management and change control procedures, which are defined in *Organization and Processes for the Consultative Committee for Space Data Systems* (CCSDS A02.1-Y-3). Current versions of CCSDS documents are maintained at the CCSDS Web site:

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Questions relating to the contents or status of this document should be addressed to the CCSDS Secretariat at the address indicated on page i.

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CCSDS RECOMMENDED STANDARD FOR PROXIMITY-1 SPACE LINK PROTOCOL—
PHYSICAL LAYER**DOCUMENT CONTROL**

Document	Title	Date	Status
CCSDS 211.0-B-1	Proximity-1 Space Link Protocol	October 2002	Original issue, superseded
CCSDS 211.1-B-1	Proximity-1 Space Link Protocol— Physical Layer	April 2003	Superseded
CCSDS 211.1-B-2	Proximity-1 Space Link Protocol— Physical Layer	May 2004	Superseded
CCSDS 211.1-B-3	Proximity-1 Space Link Protocol— Physical Layer, Recommended Standard, Issue 3	March 2006	Superseded
CCSDS 211.1-B-4	Proximity-1 Space Link Protocol— Physical Layer, Recommended Standard, Issue 4	December 2013	Current issue: This update includes several improvements and clarifications, accomplishing better alignment and consistency with the other Proximity-1 Blue Books.

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NOTE – Changes from the current issue are too extensive to permit markup.

CCSDS RECOMMENDED STANDARD FOR PROXIMITY-1 SPACE LINK PROTOCOL—
PHYSICAL LAYER

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CCSDS RECOMMENDED STANDARD FOR PROXIMITY-1 SPACE LINK PROTOCOL—
PHYSICAL LAYER

1 INTRODUCTION

1.1 PURPOSE

The purpose of this Recommended Standard is to specify Physical Layer procedures used with the Proximity-1 Data Link Layer (references [3] and [2]). Proximity space links are defined to be short-range, bi-directional, fixed or mobile radio links, generally used to communicate among probes, landers, rovers, orbiting constellations, and orbiting relays. These links are characterized by short time delays, moderate (not weak) signals, and short, independent sessions.

1.2 SCOPE

This Recommended Standard defines the Proximity-1 Space Link Protocol Physical Layer. The specification for the channel connection process, provision for frequency bands and assignments, hailing channel, polarization, modulation, data rates, and performance requirements are defined in this document.

Currently, the Physical Layer only defines operations at UHF frequencies for the Mars environment.

The Data Link Layer is defined in the two separate CCSDS Recommended Standards entitled, *Proximity-1 Space Link Protocol—Coding and Synchronization Sublayer* (reference [2]), and *Proximity-1 Space Link Protocol—Data Link Layer* (reference [3]).

This Recommended Standard does not specify

- a) individual implementations or products;
- b) implementation of service interfaces within real systems;
- c) the methods or technologies required to perform the procedures; or
- d) the management activities required to configure and control the protocol.

1.3 APPLICABILITY

This Recommended Standard applies to the creation of Agency standards and to future data communications over space links between CCSDS Agencies in cross-support situations. It applies also to internal Agency links where no cross-support is required. It includes specification of the services and protocols for inter-Agency cross support. It is neither a specification of, nor a design for, systems that may be implemented for existing or future missions.

The Recommended Standard specified in this document is to be invoked through the normal standards programs of each CCSDS Agency and is applicable to those missions for which cross support based on capabilities described in this Recommended Standard is anticipated. Where mandatory capabilities are clearly indicated in sections of the Recommended