
**Space data and information transfer
systems — Pseudo-Noise (PN)
Ranging Systems**

*Systèmes de transfert des informations et données spatiales —
Systèmes de mesure du pseudo-bruit*

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The Consultative Committee for Space Data Systems

Recommendation for Space Data System Standards

PSEUDO-NOISE (PN) RANGING SYSTEMS

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RECOMMENDED STANDARD

CCSDS 414.1-B-2

BLUE BOOK
February 2014

AUTHORITY

Issue:	Recommended Standard, Issue 2
Date:	February 2014
Location:	Washington, DC, USA

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.

This document is published and maintained by:

CCSDS Secretariat
Space Communications and Navigation Office, 7L70
Space Operations Mission Directorate
NASA Headquarters
Washington, DC 20546-0001, USA

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DOCUMENT CONTROL

Document	Title	Date	Status
CCSDS 414.1-B-1	Pseudo-Noise (PN) Ranging Systems, Recommended Standard, Issue 1	March 2009	Original issue, superseded
CCSDS 414.1-B-2	Pseudo-Noise (PN) Ranging Systems, Recommended Standard, Issue 2	February 2014	Current issue

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1 INTRODUCTION

1.1 PURPOSE

The purpose of this document is to provide a Recommendation for Space Data System Standards in the area of transparent¹ and regenerative Pseudo-Noise (PN) ranging systems. The PN ranging system is used to measure the round-trip light time between a ground station and a spacecraft. Regenerative ranging is primarily relevant for low Signal-to-Noise Ratio (SNR) cases like those seen in deep space missions; transparent ranging is more suitable for high SNR cases or when high accuracy ranging is not required.

1.2 SCOPE

This Recommended Standard defines both transparent and regenerative PN ranging systems for non-data relay satellite users. The specification for PN code components and generation, on-board spacecraft regenerative/transparent processing, ground station processing, and uplink and downlink signal modulation are defined in this document. This Recommended Standard does not specify a) individual implementations or products, b) implementation of service interfaces within real systems, or c) the management activities required to configure and control the protocol.

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1.3 APPLICABILITY

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 Standard, they must be implemented when this document is used as a basis for cross support. Where options are allowed or implied, implementation of these options is subject to specific bilateral cross support agreements between the Agencies involved.

1.4 RATIONALE

The CCSDS believes it is important to document the rationale underlying the recommendations chosen, so that future evaluations of proposed changes or improvements will not lose sight of previous decisions. Concept and rationale behind the decisions that formed the basis for this Recommended Standard are found in the CCSDS Pseudo-Noise Ranging Systems Green Book (reference [C1]).

¹ The term '*transparent ranging*' is used in this standard to mean non-regenerative ranging or turn-around ranging.