

# Concept Paper for updating CCSDS 413.0-G-3 “Bandwidth-efficient modulations”

European Space Agency

## 1. Purpose

The purpose of the proposed work is to update the existing Green Book that documents the definition, implementation and performance about Bandwidth-efficient modulations, CCSDS 413.0-G-3.

## 2. Key Technical Features

The Green Book will include two new (sub)sections concerning:

- Description and performance of Bi-phase-L filtering, for meeting SFCG mask
- Justification for the need of a high carrier suppression (>30 dBc) when using high-order modulation

Additionally, minor technical and editorial updates will be done, for alignment of content with latest references, SFCG recommendations, and latest issues of bandwidth-efficient 401.0-B recommendations (2.4.17A, 2.4.18, 2.4.23) since its last issue in 2018.

## 3. Benefits

Since 2018, the RFM blue book 401.0-B evolved from issue 28 to issue 32 (with issue 33 planned by end of 2024). The updates concerned aspects of bandwidth-efficient modulations as GMSK, SRRC-PSK/APSK, and filtered Bi-phase-L.

Thus the benefit is to have an up-to-date alignment between blue book and green book.

## 4. Requirements of prospective missions

Spectral-efficient modulations are widely used for high-rate links in the domain of Earth Observation, Science, human/robotic exploration, and space operations applications.

## ANNEX 1 – Proposed Charter Modifications

The charters of RFM do not require any update.

## ANNEX 2 – Proposed CWE Projects

**Title:** Transfer frame slicing for TM synchronization and coding

**Document Number:** 413.0-G-4

**Document Type:** Draft informational report + CCSDS Information report (Green Book)

**Description of Document:** unchanged with respect Section 1 of 413.0-G-3 (with exception of possible minor updates to be done during activity)

**Applicable Patents:** N/A

**Patents Comments:** N/A

**Book Editor (estimated resources + Agency Volunteering):** Total resources 4 mm in ESA

**Prototype 1 (estimated resources + Agency Volunteering):** N/A

**Prototype 2 (estimated resources + Agency Volunteering):** N/A

**Expected Contributing Agencies:** ESA + Candidates?

**Expected Monitoring Agencies:** Candidates?

## Schedule

December 2024 – November 2025

**Total time to complete: 14 months**

Schedule Milestones	Forecast	Comments
Project Approved	15 December 2024	
First draft circulated to WG	April 2025	Before Spring 25 Meeting
First draft comments due	May 2025	At Spring 25 Meeting
Second draft circulated to WG	N/A	Not expected
Second draft comments due	N/A	Not expected
Final WB Submitted to AD for further processing	June 2025	After Fall 25 Meeting
Secretariat Document Processing	September 2025	
First Prototype Development	N/A	
Second Prototype Development	N/A	
First Agency review	N/A	
RID Resolution	N/A	
Second Agency Review	N/A	
CMC Approval	November 2025	Approved by CMC Poll