

Space Link Services Area Report

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22nd October 2018 Version 0.4
(As presented @ CESG Meeting)

SLS Area Report

B. Meeting Demographics

Webex participants in red

Agency	5.01 - SLS - RF and Modulation & 5.02 Space Link Coding and Synchronization Working Groups	5.01 - SLS - RF and Modulation Working Group	5.02 - SLS - Space Link Coding and Synchronization Working Group	5.03 - SLS - Multispectral and Hyperspectral Data Compression Working Group	5.04 - SLS - Space Link Protocols Working Group	5.09 - SLS - Space Data Link Security Working Group	5.10 - SLS - Optical Communications Working Group
CNES	2	2	3	4	1	2	3
CNSA	3	4	1	3			5
DLR	1	2	2		2	1	7
ESA	7	7	5	5	4	4	5
JAXA				5			5
NASA	8	8	11	5	8	7	16
ROSCOSMOS	7	7	7		3		
UKSA					1	1	
Other (EUMETSAT & South Korea)	1	1	1		1		1
Total	29	31	30	22 +1	19	15	42
Meeting Duration	0.5	1.0	1.0	2.5	1.0	2.0	2.5
Agency Diversity	7	7	7	5	7	5	7

Webex participants TBC (and to be detailed) → +1 UKSA for SDLS

Space Link Services Area Executive Summary 1/2

RF & Modulation (RFM) Working Group:

- Achievements
 - WG approved editorial revisions of 401.0-B Recommendations (2.4.18) and (2.4.23)
 - WG agreed on new Recommendation (2.1.9) to eventually go agency review along with Rec. (2.6.13)
 - Completed RID dispositions for Recommendation (2.4.17A), (2.4.22A/B), (2.4.24), and (3.1.7) Pink Sheets

Coding & Synchronization (C&S) Working Group:

- Achievements
 - Before Meeting: 130.11-G (SCCC) Green Book completed and queued for publication & 431.1 (VCM protocol) Blue Book queued to start Agency Review.
 - Agreed final WG edits to 211.2-B (Prox-1 C&S) & Resolution to start Agency Review.
 - Agreed way forward for “AOS Uplink with concepts paper to be submitted soon
 - Planned concept papers to update 130.1-G (TM C&S) Green Book to add parallel encoders for (O)QPSK modulation & to add longer randomizer for high data-rate telemetry to 130.0-B (TM C&S) Blue Book
 - Presented progress for DVB-S2x Orange Book for SCCC-X (future) Orange Book.

Space Link Protocols (SLP) Working Group:

- Achievements
 - USLP Blue Book PUBLISHED
 - WG Consensus for eventual publication of CCSDS 700.1-G USLP Green Book after final cross-check with Blue Book
 - Further refinement of Space Packet Protocol (SPP) achieved within the SPP Revisions Project
 - Overview of Space Communication Protocols GB update continues (for SPP revision etc.)

Space Link Services Area Executive Summary 2/2

Space Data Link Security (SDLS) Working Group:

- Achievements
 - SDLS Extended Procedures (355.1): Disposition of all RIDs of Agency Review. No issues. Draft BB in progress.
 - SDLS Extended Procedures green book (350.11) : review contributions, 85% complete.

Multispectral & Hyperspectral Data Compression (MHDC) Working Group:

- Achievements
 - “Low-Complexity Lossless & Near-Lossless Multispectral & Hyperspectral Image Compression” (123.0-B-2) completed RID resolution
 - “Lossless Data Compression” (121.0-B) resolution to begin Issue 3 revision

Optical Communications (OPT) Working Group:

- Achievements
 - HPE “Coding and Synchronization Layer” Red Book Agency Review RIDs dispositioned (Two draft Blue Books ready for publication waiting prototypes).
 - Resolution to start Optical Communications Physical Layer Issue 2 to add **O3K**
 - Reviewed draft MB “Atmospheric Characterization and Forecasting for Optical Link Operations”
 - Reviewed the draft High Data Rate 1550 nm Orange Book
 - Before Meeting: High Data Rate 1064 nm Orange Book completed and queued for publication.

RFM WG Executive Summary

Achievements for this meeting cycle:

- WG approved editorial revisions of 401.0-B Recommendations (2.4.18) and (2.4.23)
- WG agreed on new Recommendation (2.1.9) on uplink multicarrier transmissions for MSPA, which will be submitted for agency review at the next meeting along with Rec. (2.6.13)
- Completed RID dispositions for Recommendation (2.4.17A), (2.4.22A/B), (2.4.24), and (3.1.7) Pink Sheets

Working Group Status: **Good progress**

- Discussed revisions to draft Recommendation (2.6.13) on flexible turn-around ratios in support of MSPA policy Recommendation (3.1.7); expected to be ready for agency review at the Spring 2019 meeting
- Discussed updates to draft Recommendation (2.3.7) on earth station reference frequency stability; expected to be ready for agency review by Spring 2019 meeting
- Discussed new draft Recommendation 2.6.14 on 22/26 GHz turnaround ratios

Interaction with other WGs:

- Joint meeting with C&S WG: DVB-S2X, SCCC-X, VCM BB, and longer length pseudo-randomizer for high data rate applications discussed
- Discussions on wideband PN modulation for DDOR are pending additional inputs from the DDOR WG

Problems and Issues:

- None

RFM WG Executive Summary

Resolutions agreed upon this meeting:

- Resolution for publication of editorial revisions to 401.0-B Recommendations (2.4.18) and (2.4.23)
- Resolution for publication of revised Recommendation (2.4.17A) on modulations for 8 GHz SRS band,
- Resolution for publication of new Recommendation (2.4.24) on telemetry ranging
- Resolution for publication of revised Recommendations (2.4.22A) and (2.4.22B) on GMSK+PN ranging
- Resolution for publication of new 401.0-B Recommendation (3.1.7) on MSPA

Further Resolutions anticipated in the next 6 months:

- None

Planning:

SLS RFM	401.0	Evolutions of CCSDS recommendations for RF & Modulation systems, part 1	Progress continues	Start date 10/15/2008 End date 12/30/2020
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SLS-RFM Summary of 401.0-B Recommendations

CCSDS Recommendation	Title	Status / Comments
401.0-B (2.4.17A)	MODULATION METHODS FOR HIGH SYMBOL RATE TRANSMISSIONS, SPACE RESEARCH, SPACE-TO-EARTH, CATEGORY A	Disposition of RIDs completed; ready for publication
401.0-B (2.4.18)	MODULATION METHODS AT HIGH SYMBOL RATE TRANSMISSIONS, EARTH EXPLORATION SATELLITES (EES) 8 GHZ BAND, SPACE-TO-EARTH	WG approved minor editorial revisions; ready for publication
401.0-B (2.4.22A/B)	MODULATION METHODS FOR SIMULTANEOUS TRANSMISSION OF HIGH SYMBOL RATE TELEMETRY AND PN RANGING, SPACE RESEARCH, SPACE-TO-EARTH, CATEGORY A/B	Disposition of RIDs completed; ready for publication
401.0-B (2.4.23)	MODULATION METHODS AT HIGH SYMBOL RATE TRANSMISSIONS, EARTH EXPLORATION SATELLITES (EES) 25.5-27.0 GHZ BAND, SPACE-TO-EARTH	WG approved minor editorial revisions; ready for publication
401.0-B (2.4.24)	TELEMETRY RANGING, SPACE RESEARCH, SPACE-TO-EARTH, CATEGORY A/B	Disposition of RIDs completed; ready for publication
401.0-B (3.1.7)	METHODS FOR SPACE RESEARCH EARTH STATION SUPPORT OF MULTIPLE SPACECRAFT PER APERTURE	No RIDs received; ready for publication

C&S Executive Summary

Achievements for this meeting cycle:

- Before Meeting: 130.11-G (SCCC) Green Book completed and queued for publication
- Before Meeting: 431.1 (VCM protocol) Blue Book queued to start Agency Review. Final WG edits presented in Berlin.
- Agreed final WG edits to 211.2-B (Prox-1 C&S) Blue Book, and interoperability test results. Resolution to start Agency Review.
- Agreed way forward for “AOS Uplink”: concept paper will follow for “Coding profiles for fixed-length frames Uplink” and harmonization edits for the 3 Coding books (TM [to be renamed], SCCC, DVB).
- Planned concept paper to update 130.1-G (TM C&S) Green Book to add parallel encoders for (O)QPSK modulation
- Planned concept paper to add longer randomizer for high data-rate telemetry to 130.0-B (TM C&S) Blue Book
- Presented progress for DVB-S2x Orange Book, which adds high-order modulations to the current 131.3-B (DVB-S2).
- Presented progress on SCCC-X, which adds higher-order modulations to the current 131.2-B (SCCC) Blue Book.
Planned concept paper to develop an Orange Book.

Working Group Status: **Good progress**

Interaction with other WGs

- Most of the topics discussed (e.g. VCM, extension of SCCC/DVB-S2, randomizer) were topics of common C&S/RFM interest
- Proximity-1 update discussed with SLP WG

Problems and Issues:

- none



C&S Executive Summary

Resolutions agreed upon this meeting:

- Initiate Agency Review of Prox-1 coding Pink Book/Sheets

Further Resolutions anticipated in the next 6 months:

- Initiate project to update of the 130.1-G (TM Coding) to add parallel encoders for (O)QPSK
- Initiate project to update 131.0-B (TM Coding) to add longer randomizer
- Initiate project to write SCCC-X Orange Book
- Initiate project to write “Coding profiles for fixed-length frames uplink” Blue Book
- Initiate three projects to update and harmonize the 3 Coding books wrt fixed length frames uplink:
 - 131.0-B TM coding (to be renamed) [possibly together with longer randomizer],
 - 131.2-B SCCC, and
 - 131.3-B DVB.

C&S Planning

Planning:

Area and WG name	CCSDS Ref Nr	Document Title	Status / Comments	Start and / or Target Publication Date
SLS C&S	130.11	TM Channel Coding for SCCC, Green Book	Secretariat processing for publication	Target: Feb. 2019
SLS C&S	230.1-G-3	TC Channel Coding, Green Book	WG contributions underway	Target: Fall 2019
SLS C&S	131.6	DVB-S2x Orange Book	WG development underway	Target: Dec. 2019
SLS C&S	211.2-B-2	Prox-1 Coding and Sync	WG resolution to start Agency Review	Target: Dec. 2019
SLS C&S	431.1	Variable Code and Modulation (VCM) Systems for CCSDS	Converted from Magenta to Blue Agency review to start	Target: Spring 2020

C&S Upcoming New Work Items

Area and WG name	CCSDS Ref Nr	Document Title	Target Start / Publication Date	Resources Needed (total, Editor, Proto 1, Proto 2)				Comments Rationale What if not started?
SLS C&S	130.1-G	TM Sync and Channel Coding Rationale	Jan 2019 / Dec 2019	2 WM	2 WM NASA	N/A	N/A	Add parallel encoders for (O)QPSK
SLS C&S	TBD	Coding profiles for fixed-length frames Uplink	Fall 2018 / Fall 2021	2019 1.5 WM	1.5 WM NASA	N/A	N/A	Profiles document to recommend combinations of codes and protocols (No need for prototypes expected)
				2020 1 WM	1 WM NASA	N/A	N/A	
				2021 0.5 WM	0.5 WM NASA	N/A	N/A	
SLS C&S	131.0-B	TM Sync and Channel Coding	Fall 2018 / Spring 2020	2019 3 WM 2020 Zero	1 WM NASA	1 WM NASA	1 WM ESA TBC	Add longer randomizer for high data rates for spectral compliance
SLS C&S	TBD	SCCC-X Orange Book	Dec 2018 / Dec 2019	3 WM	3 WM ESA	N/A	N/A	Add higher-order modulations
SLS C&S	131.x-B	3 book for TM Sync and Channel Coding	Fall 2018 Spring 2020	2019 1.5 WM 2020 Zero	1.5 WM	N/A	N/A	Harmonize the books for fixed length frames uplink, add USLP, etc.

SLS-SLP Executive Summary

Achievements for this meeting cycle:

- USLP Blue Book PUBLISHED
- WG Consensus achieved to craft Resolution for Publication of CCSDS 700.1-G USLP Green Book Issue 1 once final cross-check with Blue book completed
- Further refinement of Space Packet Protocol (SPP) achieved within the SPP Revisions Project
- Overview of Space Communication Protocols GB updated with latest refinements of SPP

Working Group Status: **Good progress**

- Good: Progress made in advancing USLP GB to Issue 1;
- New Project involving the removal of the Space Packet from Encapsulation Service identified

Interaction with other WGs

- Pink Sheets generated to add USLP frame into Prox-1 C&S blue book discussed with C&S WG – SLS-C&S Resolution to start Agency Review
- With SDLS for adding Frame Security Report in TM and AOS Operation Control Field

Problems and Issues:

- None

SLS-SLP Executive Summary

Resolutions agreed upon this meeting

- None

Further Resolutions anticipated in the next 6 months:

- Publication of Issue 1 of CCSDS 700.1-G, USLP Green Book
- New Project for removal of the Space Packet from Encapsulation Service

Planning:

SLS SLP	732.1	Unified Space Data Link Protocol	USLP Publication APPROVED	Target date: Nov. 2018
SLS SLP	700.1	Unified Space Data Link Protocol Green Book	GB affected by edits from Fall 2018 Meeting	Target date: Spring 2019
SLS SLP	133.0	Space Packet Protocol	Revision continued at Fall 2018 Meeting	Target date: Summer 2019
SLS SLP	130.0	Overview of Space Communications Protocols, Issue 4	Progress at Fall 2018 Meeting. Will depend on SPP Revision.	Target date: Spring 2020

SLP Upcoming New Work Items

Area and WG name	CCSDS Ref Nr	Document Title	Target Start / Publication Date	Resources Needed (total, Editor, Proto 1, Proto 2)					Comments Rationale What if not started?
SLS SLP	133.1	Encapsulation Service	January 2019 / December 2019	2019	6 WM (No prototypes as features removed and no new feature added)	NASA 6 WM (Editor)	N/A	N/A	Removal of Space Packet from Encapsulation Service (Simplifies interfaces of both Space Packet and Encapsulation Packet to CCSDS protocols)

SLS-SEA-SDLS Executive Summary

Achievements for this meeting cycle:

- Before Meeting: SDLS Core protocol green book (350.5) : publication (June 2018)
- SDLS Extended Procedures (355.1-B): Document finalized and submitted to Agency Review #1 (August 2018)
- SDLS Extended Procedures Green Book (350.11): inputs from contributing agencies.

Working Group Status: **Good progress**

- SDLS Extended Procedures red-1 (355.1) : Disposition of all RIDS generated in Agency Review #1. No significant technical change introduced as a result of dispositions. Draft blue book will be prepared while final round of interoperability testing is performed. Resolution to publish blue book expected around January 2019.
- Review all contributions to SDLS Extended procedures green book (350.11). Document 85% complete.

Interaction with other WGs:

- With SLP for adding Frame Security Report in TM and AOS Operation Control Field

Problems and Issues: None

SLS-SEA-SDLS Executive Summary

Resolutions agreed upon at this meeting:

- None

Further Resolutions anticipated in the next 6 months:

- Resolution to publish SDLS Extended Procedures blue book (355.1-B-1)

Planning:

Area and WG name	CCSDS Ref Nr	Document Title	Status / Comments	Start and / or Target Publication Date
SLS SDLS	355.1	SDLS Extended Procedures	All RIDs from agency Review #1 dispositioned. No significant technical change. Final blue book draft to be produced. Interoperability testing to be completed with final version of the document.	WG Resolution in January 2019 for BB publication in June 2019
SLS SDLS	350.11	SDLS Extended Procedures Green Book	Drafting on-going. 85% complete	Target date for publication : 30/06/2019.

SLS-MHDC Executive Summary

Achievements this meeting cycle:

- CCSDS-123.0-B-2 “Low-Complexity Lossless & Near-Lossless Multispectral & Hyperspectral Image Compression”:
 - Resolved RIDs; delivered marked-up Pink Book & RID resolutions
 - Delivered cross-verification Yellow Book (May, 2018)
 - RID resolution includes a very minor change in the encoding of image metadata in the header. Cross-verification of test cases exercising this change to be run in the next 2 weeks.
- CCSDS-121.0-B Lossless Data Compression (reconfirmation review):
 - Will need a new Issue; revisions to address an identified shortcoming fall outside the scope of a Corrigendum. Reviewed draft text for Issue 3 to solve the problems
 - Small project -- expect request for Agency Review before Spring 2019 meeting

Working Group Status: **Good progress**

- CCSDS-123.0-B-2: expect publication request in a few weeks
- CCSDS-120.2-G (GB for CCSDS-123.0-B-2)
 - Reviewed substantially revised draft. Writing assignments made to produce next draft.
- CCSDS-124.0-B telemetry housekeeping compression
 - Reviewed first draft. Significant revisions proposed and real-time edits made.
- CCSDS-120.0-G-3 (GB for CCSDS-121.0-B-3, addressing reconfirmation review of Issue 2)
 - Agreed on list of items to be addressed in this revision. New Issue needed.

Interaction with other WGs None

Problems and Issues: None

SLS-MHDC Executive Summary

Resolutions agreed upon this meeting

- Start new project for Issue 3 of CCSDS-121.0-B “Lossless Data Compression” Blue Book
- Start new project for Issue 4 of CCSDS-120.0-G “Lossless Data Compression” Green Book

Further Resolutions anticipated in the next 6 months:

- Publication of Issue 2 of CCSDS-123.0-B “Low-Complexity Lossless & Near-Lossless Multispectral & Hyperspectral Image Compression”
- Agency Review of CCSDS-121.0-B-3 “Lossless Data Compression”

Planning (only approved Projects)

Project name	Document Nr	Document Title	Status / Comments	Start and / or Target Publication Date
SLS MHDC	123.0	Low-Complexity Near-Lossless Multispectral & Hyperspectral Image Compression (Issue 2)	RID resolution complete	Start date 11/2015 End date 1/2019
SLS-MHDC	124.0	Robust Compression of Fixed-Length Housekeeping Data Packets	First draft White Book reviewed	Start: 4/2018 End: 5/2020
SLS MHDC	120.3	Spectral Pre-Processing Transform for Multispectral & Hyperspectral Image Compression	WG development complete. Awaiting publication.	Start date 05/2016 End date 5/2019
SLS-MHDC	120.2	Low-Complexity Lossless & Near-Lossless Multispectral & Hyperspectral Image Compression (Issue 2)	Supporting 123.0-B Issue 2. Identified sections in need of work; made writing assignments	Start: 4/2018 End: 4/2020

SLS-MHDC Upcoming New Work Items

Area and WG name	CCSDS Ref Nr	Document Title	Target Start / Publication Date	Resources Needed (total, Editor, Proto 1, Proto 2)				Comments Rationale What if not started?
SLS-MHDC	121.0	Lossless Data Compression (Issue 3)	Start Jan 2019, Publication Nov 2019	3 WM All in 2019	ESA 1 WM (editor)	ESA 1 WM (prototype)	NASA 1 WM (prototype)	Adds optional header structure to produce output as a file, fixes ambiguities
SLS-MHDC	120.0	Lossless Data Compression (Issue 4)	Start Jan 2019, Publication Dec 2019	2 WM All in 2019	ESA 1 WM NASA 1 WM (editor)	N/A	N/A	Addressing reconfirmation review of CCSDS-121.0-B.

Optical Communications Working Group

Executive Summary

Achievements

- HPE “Coding and Synchronization Layer” Red Book Agency Review RIDs dispositioned and book updated (Two draft Blue Books ready for publication waiting prototypes).
- Resolution to start Optical Communications Physical Layer Issue 2 to add **O3K**
- Reviewed the draft O3K Physical Layer input
- Started discussion on O3K Coding and Synchronization
- Reviewed draft MB “Atmospheric Characterization and Forecasting for Optical Link Operations”
- Before Meeting: High Data Rate 1064 nm Orange Book completed and queued for publication polls.
- Reviewed the draft High Data Rate 1550 nm Orange Book

Working Group Status: **Good progress**

Other Accomplishments:

- Agreed NASA will provide two independent prototypes (JPL & MIT) for HPE; ESA still to confirm starting 3rd one
- Consensus to focus on HPE for Issue 1 of Optical Communications Green Book
- Reviewed recent developments in optical communications across the various space agencies

Optical Communications Working Group

Executive Summary

Resolutions agreed upon this meeting

- Start new CWE Project for “**Optical Communications Physical Layer Issue 2**” to accommodate O3K. Concept paper in progress.

Planning:

Area and WG name	CCSDS Ref Nr	Document Title	Status / Comments	Start and / or Target Publication Date
SLS OPT	141.1	Atmospheric Characterization and forecasting for Optical Link Operations	Draft contents discussed at Fall 2018 Technical Meeting	Start date 01/01/2018 End date 03/30/2021
SLS OPT	142.0	Optical Communications Coding & Synchronization	Dispositions of Agency review RIDs incorporated. Working on interoperable prototypes.	Start date 12/28/2013 End date 12/01/2019
SLS OPT	141.0	Optical Communications Physical Layer	Working on interoperable prototypes.	Start date 12/28/2013 End date 12/01/2019
SLS OPT	140.0	Optical Communications Concepts and Terminologies	Agreed to start work at Fall 2018 Technical Meeting. Focus on HPE Scenario.	Start date 12/01/2018 End date 01/01/2021
SLS OPT	141.10	Optical High Data Rate (HDR) Communication - 1550 nm	Draft contents discussed at Fall 2018 meeting	Start date 04/30/2017 End date 01/01/2020
SLS OPT	141.11	Optical High Data Rate (HDR) Communication - 1064 nm	Waiting for CESG CMC Polls for publication	Start date 03/30/2017 End date 06/30/2019

Optical Communications Working Group

Upcoming New Work Items

Area and WG name	CCSDS Ref Nr	Document Title	Target Start / Publication Date	Resources Needed (total, Editor, Proto 1, Proto 2)				Comments Rationale What if not started?
SLS OPT	141.0-B-2	Optical Communications Physical Layer (Issue 2)	Dec 2018/Dec 2020	2019	NASA 0.5 WM DLR-IKN 2 WM	0	0	Optical On-Off keying is a form of low complexity optical communications that is needed by all SLS-OPT members.
				2020	NASA 0.5 WM DLR-IKN 2 WM	DLR-IKN 3WM	TBD	

Space Link Services Approved Project Status #1

SLS RFM	401.0	Evolutions of CCSDS recommendations for RF & Modulation systems, part 1	Progress continues	Start date 10/15/2008 End date 12/30/2020
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Area and WG name	CCSDS Ref Nr	Document Title	Status / Comments	Start and / or Target Publication Date
SLS C&S	130.11	TM Channel Coding for SCCC, Green Book	Secretariat processing for publication	Target: Feb. 2019
SLS C&S	230.1-G-3	TC Channel Coding, Green Book	WG contributions underway	Target: Fall 2019
SLS C&S	131.6	DVB-S2x Orange Book	WG development underway	Target: Dec. 2019
SLS C&S	211.2-B-2	Prox-1 Coding and Sync	WG resolution to start Agency Review	Target: Dec. 2019
SLS C&S	431.1	Variable Code and Modulation (VCM) Systems for CCSDS	Converted from Magenta to Blue Agency review to start	Target: Spring 2020

Space Link Services Approved Project Status #2

SLS SLP	732.1	Unified Space Data Link Protocol	USLP Publication APPROVED	Target date: Nov. 2018
SLS SLP	700.1	Unified Space Data Link Protocol Green Book	GB affected by edits from Fall 2018 Meeting	Target date: Spring 2019
SLS SLP	133.0	Space Packet Protocol	Revision continued at Fall 2018 Meeting	Target date: Summer 2019
SLS SLP	130.0	Overview of Space Communications Protocols, Issue 4	Progress at Fall 2018 Meeting. Will depend on SPP Revision.	Target date: Spring 2020

Area and WG name	CCSDS Ref Nr	Document Title	Status / Comments	Start and / or Target Publication Date
SLS SDLS	355.1	SDLS Extended Procedures	All RIDs from agency Review #1 dispositioned. No significant technical change. Final blue book draft to be produced. Interoperability testing to be completed with final version of the document.	WG Resolution in January 2019 for BB publication in June 2019
SLS SDLS	350.11	SDLS Extended Procedures Green Book	Drafting on-going. 85% complete	Target date for publication : 30/06/2019.

Space Link Services Approved Project Status #3

Area and WG name	CCSDS Ref Nr	Document Title	Status / Comments	Start and / or Target Publication Date
SLS MHDC	123.0	Low-Complexity Near-Lossless Multispectral & Hyperspectral Image Compression (Issue 2)	RID resolution complete	Start date 11/2015 End date 1/2019
SLS-MHDC	124.0	Robust Compression of Fixed-Length Housekeeping Data Packets	First draft White Book reviewed	Start: 4/2018 End: 5/2020
SLS MHDC	120.3	Spectral Pre-Processing Transform for Multispectral & Hyperspectral Image Compression	WG development complete. Awaiting publication.	Start date 05/2016 End date 5/2019
SLS-MHDC	120.2	Low-Complexity Lossless & Near-Lossless Multispectral & Hyperspectral Image Compression (Issue 2)	Supporting 123.0-B Issue 2. Identified sections in need of work; made writing assignments	Start: 4/2018 End: 4/2020

Space Link Services Approved Project Status #4

Area and WG name	CCSDS Ref Nr	Document Title	Status / Comments	Start and / or Target Publication Date
SLS OPT	141.1	Atmospheric Characterization and forecasting for Optical Link Operations	Draft contents discussed at Fall 2018 Technical Meeting	Start date 01/01/2018 End date 03/30/2021
SLS OPT	142.0	Optical Communications Coding & Synchronization	Dispositions of Agency review RIDs incorporated. Working on interoperable prototypes.	Start date 12/28/2013 End date 12/01/2019
SLS OPT	141.0	Optical Communications Physical Layer	Working on interoperable prototypes.	Start date 12/28/2013 End date 12/01/2019
SLS OPT	140.0	Optical Communications Concepts and Terminologies	Agreed to start work at Fall 2018 Technical Meeting. Focus on HPE Scenario.	Start date 12/01/2018 End date 01/01/2021
SLS OPT	141.10	Optical High Data Rate (HDR) Communication - 1550 nm	Draft contents discussed at Fall 2018 meeting	Start date 04/30/2017 End date 01/01/2020
SLS OPT	141.11	Optical High Data Rate (HDR) Communication - 1064 nm	Waiting for CESG CMC Polls for publication	Start date 03/30/2017 End date 06/30/2019

Space Link Services Upcoming New Work Items #1

Area and WG name	CCSDS Ref Nr	Document Title	Target Start / Publication Date	Resources Needed (total, Editor, Proto 1, Proto 2)				Comments Rationale What if not started?
SLS C&S	130.1-G	TM Sync and Channel Coding Rationale	Jan 2019 / Dec 2019	2 WM	2 WM NASA	N/A	N/A	Add parallel encoders for (O)QPSK
SLS C&S	TBD	Coding profiles for fixed-length frames Uplink	Fall 2018 / Fall 2021	2019 1.5 WM	1.5 WM NASA	N/A	N/A	Profiles document to recommend combinations of codes and protocols (No need for prototypes expected)
				2020 1 WM	1 WM NASA	N/A	N/A	
				2021 0.5 WM	0.5 WM NASA	N/A	N/A	
SLS C&S	131.0-B	TM Sync and Channel Coding	Fall 2018 / Spring 2020	2019 3 WM 2020 Zero	1 WM NASA	1 WM NASA	1 WM ESA TBC	Add longer randomizer for high data rates for spectral compliance
SLS C&S	TBD	SCCC-X Orange Book	Dec 2018 / Dec 2019	3 WM	3 WM ESA	N/A	N/A	Add higher-order modulations
SLS C&S	131.x-B	3 book for TM Sync and Channel Coding	Fall 2018 Spring 2020	2019 1.5 WM 2020 Zero	1.5 WM	N/A	N/A	Harmonize the books for fixed length frames uplink, add USLP, etc.

Space Link Services Upcoming New Work Items #2

Area and WG name	CCSDS Ref Nr	Document Title	Target Start / Publication Date	Resources Needed (total, Editor, Proto 1, Proto 2)					Comments Rationale What if not started?
SLS SLP	133.1	Encapsulation Service	January 2019 / December 2019	2019	6 WM (No prototypes as features removed and no new feature added)	NASA 6 WM (Editor)	N/A	N/A	Removal of Space Packet from Encapsulation Service (Simplifies interfaces of both Space Packet and Encapsulation Packet to CCSDS protocols)

Area and WG name	CCSDS Ref Nr	Document Title	Target Start / Publication Date	Resources Needed (total, Editor, Proto 1, Proto 2)				Comments Rationale What if not started?
SLS OPT	141.0-B-2	Optical Communications Physical Layer (Issue 2)	Dec 2018/Dec 2020	2019	NASA 0.5 WM DLR-IKN 2 WM	0	0	Optical On-Off keying is a form of low complexity optical communications that is needed by all SLS-OPT members.
				2020	NASA 0.5 WM DLR-IKN 2 WM	DLR-IKN 3WM	TBD	

Space Link Services Upcoming New Work Items #3

Area and WG name	CCSDS Ref Nr	Document Title	Target Start / Publication Date	Resources Needed (total, Editor, Proto 1, Proto 2)				Comments Rationale What if not started?
SLS-MHDC	121.0	Lossless Data Compression (Issue 3)	Start Jan 2019, Publication Nov 2019	3 WM All in 2019	ESA 1 WM (editor)	ESA 1 WM (prototype)	NASA 1 WM (prototype)	Adds optional header structure to produce output as a file, fixes ambiguities
SLS-MHDC	120.0	Lossless Data Compression (Issue 4)	Start Jan 2019, Publication Dec 2019	2 WM All in 2019	ESA 1 WM NASA 1 WM (editor)	N/A	N/A	Addressing reconfirmation review of CCSDS-121.0-B.

Space Link Services Planned Resolution Summary

Resolutions agreed during these meetings

RF & Modulation (RFM) Working Group:

- Resolution for publication of editorial revisions to 401.0-B Recommendations (2.4.18) and (2.4.23)
- Resolution for publication of revised Recommendation (2.4.17A) on modulations for 8 GHz SRS band,
- Resolution for publication of new Recommendation (2.4.24) on telemetry ranging
- Resolution for publication of revised Recommendations (2.4.22A) and (2.4.22B) on GMSK+PN ranging
- Resolution for publication of new 401.0-B Recommendation (3.1.7) on MSPA review

Coding & Synchronization (C&S) Working Group:

- Initiate Agency Review of Prox-1 coding Pink Book/Sheets

Space Link Protocols (SLP) Working Group:

No resolution

Space Data Link Security (SDLS) Working Group:

No resolution

Multispectral and Hyperspectral Data Compression (MHDC) Working Group:

- Start new project for Issue 3 of CCSDS-121.0-B “Lossless Data Compression” Blue Book
- Start new project for Issue 4 of CCSDS-120.0-G “Lossless Data Compression” Green Book

Optical Communications (OPT) Working Group:

- Start new CWE Project for “Optical Communications Physical Layer Issue 2” to accommodate O3K.

Space Link Services Planned **Anticipated** Resolutions

Further Resolutions anticipated in the next 6 months

RF & Modulation (RFM) Working Group:

No resolution

Coding & Synchronization (C&S) Working Group:

- Initiate project to update of the 130.1-G (TM Coding) to add parallel encoders for (O)QPSK
- Initiate project to update 131.0-B (TM Coding) to add longer randomizer
- Initiate project to write SCCC-X Orange Book
- Initiate project to write “Coding profiles for fixed-length frames uplink” Blue Book
- Initiate three projects to update and harmonize the 3 Coding books wrt fixed length frames uplink:
 - 131.0-B TM coding (to be renamed) [possibly together with longer randomizer],
 - 131.2-B SCCC, and
 - 131.3-B DVB.

Space Link Protocols (SLP) Working Group:

- Publication of Issue 1 of CCSDS 700.1-G, USLP Green Book
- New Project for removal of the Space Packet from Encapsulation Service

Space Data Link Security (SDLS) Working Group:

- Resolution to publish SDLS Extended Procedures blue book (355.1-B-1)

Multispectral and Hyperspectral Data Compression (MHDC) Working Group:

- Publication of Issue 2 of CCSDS-123.0-B “Low-Complexity Lossless & Near-Lossless Multispectral & Hyperspectral Image Compression”
- Agency Review of CCSDS-121.0-B-3 “Lossless Data Compression”

Optical Communications (OPT) Working Group:

No resolution

The SLS part of the Strategic Plan has been evaluated by SLS WG Chairs and updated where needed before this meeting.

Document list updated as needed moving published document from *In Production* to *Existing* status and updating links to published books or CWE Projects as required.

SLS Other Items

1. CCSDS Document Status (e.g. 5 years review)
checked and reported by each WG as applicable
2. CWE Status checked: NO project Behind Schedule.
3. Policy on Glossary will be tackled when editing documents.
4. SLS Area thanks **DLR and DIN** for the excellent accommodation and hospitality provided for this Fall Meetings.