CCSDS SLS-RFM WG MEETING

Cleveland (United States), 4-8 April 2016

AGENDA (Issue 1, 29 March 2016)

Radio Frequency and Modulation WG

Date		Item	Comments / Input Papers
April 6 – p.m.	1	Action items review	Minutes of meeting
	2	New recommendations OFDM-Based LEO Satellite-Ground Payload Data Transmission W. Xiong, J. Li, Y. Huang, Z. Wang	SLS-RFM_16-02
	2.1	HR TLM and PN ranging GB SLS-RFM_16-03 GMSK-PN RG GB - 413.1-G-0 - Mar2016.pdf G. Sessler, E. Vassallo, M. Visintin	SLS-RFM_16-03
	2.2	TLM ranging SLS-RFM_16-06-Telemetry-Ranging-v01.pptx J. Hamkins	SLS-RFM_16-06
April 7 - a.m.	3.	Existing recommendations REC 2.4.23 - 26 GHz EESS	
	3.1	REC 2.5.6B - DDOR (with DDOR WG) M. Mercolino, J. Border	SLS-RFM_16-04
	3.2	REC 2.4.18 - 8 GHz EESS SLS-RFM_16-01 Proposed Changes to Draft Recommendation 2.4.18.pdf	SLS-RFM_16-01
	3.3	RFI and modulations ~~SLS-RFM_16-7~~ (Throughput Analysis under RFI).pdf D. Olsen	SLS-RFM_16-07 (was SLS-RFM_13-23)
April 7 - p.m.	3.4	Preliminary IOAG views on CCSDS modulations (Jon Hamkins)	
	4	Charter discussion	
April 8 – a. m.		**Joint meeting with C&S/SLP/OPT** CodeAndModWG.Report.v0.6forApproval	SLS-RFM_16-05
April 8 – p. m.		**SLS Plenary**	

Action Items from ~~Spring~~ Fall 2015

AI		AI Description	Actionee	Date Due
AI_15-04		Review the Oct-2015 GMSK+PN RNG GB plus the carrier jitter section and provide comments	All	(1)
AI_15-05	Done 4/2016	Align rec 2.4.18 with the changes agreed at the meeting for rec. 2.4.23, and restructure the recommendation whereby the recommends would refer to two normative annexes	J.L. Gerner J.L. Isler	(2)
AI_15-06		Indicate if the filter for (O)QPSK in rec 2.4.18 can be restricted to SSRC as in SCCC/DVB-S2 or an analog implementation can be left in as well	All	(1)
AI_15-07	Done 4/2016	Review rec 2.4.18 after changes per AI_15-05	All	(1)
AI_15-08		Provide concept paper for telemetry-based ranging system	J. Hamkins	(1)

(1) **2 weeks prior** to Spring 2016 meeting. All inputs have to be announced **4 weeks** prior to the meeting.
(2) By **December 11, 2015.**

Action Items from ~~Fall~~ Spring 2016~~5~~

AI		AI Description	Actionee	Date Due
AI_16-01		Review current version of the GMSK-PN Green Book within a month and publish if no further comments.	Dennis Lee, Enrico Vassallo	June 2016
AI_16-02		???	~~all~~	~~(1)~~
AI_16-03				
AI_16-04				
AI_16-05				

(1) **2 weeks prior** to Fall 2016 meeting. All inputs have to be announced **4 weeks** prior to the meeting.
(2) By

Charter Discussion
OFDMA
Spread Spectrum for RFI mitigation.

Wednesday April 06 PM

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Thursday April 07 AM

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Minutes of the meeting, Wednesday, April 06, 2016, PM session

Orthogonal Frequency Division Multiplexing (OFDM) presentation - Chinese Space Agency studying use of Orthogonal Frequency Division Modulation to achieve bandwidth efficiency. Compared to single carrier modulation, OFDM is twice as bandwidth efficient. Use is for high rate LEO down links but Doppler can be issue. Pilots are used to estimate time and frequency shift. Cyclic prefix and postfix is used to help mitigate multi path. CSA will continue studying technique using higher order modulation with amplifier distortion. May also provide details on synchronization in later studies.

GMSK-PN Green Book - ESA made a large revision based on new data relative to theoretical BPSK. The revision was presented in detail and the current version is considered by authors to be complete. Authors ask others to review the new edition. An action on Dennis Lee, NASA, and Enrico Vassallo, ESA, to review the current version within a month and publish if no further comments.

Telemetry Ranging - JPL delivered a concept paper for telemetry ranging. They presented a brief summary of the technique and some technical details were referenced to a new JPL publication. JPL proposes the technique is added as a work product to charter.

Minutes of the meeting, Thursday, April 07, 2016, AM session (all items completed, no pm session)

Interference mitigation via spread spectrum
AeroSpace RFI mitigation presentation – Review of presentation from 2013 from Aerospace Corporation. To mitigate an RF interferer, this paper studies the use of CDMA. Basically by power compensating through the reduction of data-rate, any interferer can be mitigated without using CDMA. With CDMA, it is far less necessary to reduce data rate in an interference environment. Aerospace requested that the working group take up the technique as a working item in the charter. We suggested that the Aerospace representative present a paper to compare their suggestion to the current CCSDS CDMA standard, CCSDS 415.1-B-1 CDMA Sept 2011.pdf.

DDOR
Currently nominally +/- 4 MHz and +/- 20 MHz tones are used. The actual tone frequency is coherent with the down link frequency so it is not exactly 4 or 20 MHz. Generally the higher tone is ~ 19 MHz. DOR is used primarily in the X band but also in the 32 GHz Ka-band. The ratio of these two tones is 5. The lower tone with longer wave length is used to resolve ambiguity. Future missions are smaller and get less DSN antenna time and will need improved methods for resolving ambiguity. The DDOR working group has suggested that recommendation 2.5.6 B be amended to add a lower tones of approximately 1 MHz. The higher to lowest ratio would then be ~ 20, while the ratio can be as high as about 50 since $1/100^{th}$ of a cycle that can be resolved. The action is on the Jim Border to formalize a draft of the change in one month, in order to distribute to WG members to review and comment. Necessary telecons will be scheduled to discuss details prior to next meeting. If the WG is in agreement, a pink sheet will be distributed for agency review. Massimo Bertinelli suggested providing the JPL spectrum managers with a copy of the proposal as well.

High Order Modulation (HOM) in the X band
Rec 2.4-18 – CNES provided updates for their action to update this recommendation. CNES made minor changes to the draft revision for EESS at 8GHz. However, no further action will be taken by the WG at this time, since these modifications could receive further revisions proposals at the next RFM meeting after the SFCG meeting of June 2016. SFCG is studying the impact of

higher-order modulations on the power flux density of missions using OQPSK and is expected to report in June of this year. ESA mentioned the possibility to introduce 64-APSK in the Rec 2.4-18, depending on on-going considerations and SFCG 2016 results.

Data rates in the Prox-1 green book erroneously omitted the 512 Kbps data rate. 512 Kbps is in the Prox-1 blue book. Matt Cosby made a short presentation suggestion we correct the green book. This will likely be handled by the editor with no additional action.