TELEMETERING STANDARDS COORDINATION COMMITTEE

TSCC

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TSCC Fall 2017
Chair Report

October 23, 2017
Bally's
Las Vegas, NV

TSCC Membership

- **Academia (1)**
  - Dr. Michael Marcellin

- **Government (4)**
  - Mark Bender
  - ~~Filiberto Macias~~ ***
  - Myron Moodie
  - Mark Buckley
  - Tab Wilcox

- **Industry (9)**
  - Scott Brierley
  - Diarmuid Corry
  - Lee Eccles ***
  - Brad Fleury
  - Wayne Klein
  - Steve Nicolo
  - Sergio Penna
  - Joe Sulewski
  - Gilles Freud

- **Ex-Officios**
  - Dr. Michael W. Marcellin (IFT Rep)

- **Members Emeritus**
  - Merv MacMedan
  - Erwin (Terry) Straehley

Agenda

- **13:00   Call to Order S. Nicolo**
- **13:00   Attendance and determination of Quorum W. Klein**
- **13:05   Review and Approve Agenda   S. Nicolo**
- **13:10   Officer Reports**
- Chair   **S. Nicolo**
- Action Item Review   **S. Nicolo**
-
- Secretary-Treasurer   **W. Klein**
- Approval and review of last Minutes
- Financial Status

Agenda (Continued)

- **13:30**   **Committee Reports**
-                Nominating Committee   **D. Corry**
-                        New nominations/follow-up on members
-                        Changes Since Last meeting
-                Radio Frequency   **S. Brierley**
-                Data Multiplex   **B. Fleury**
-                Networking and Protocols   **D. Corry**
-                Transducers   **L. Eccles**
-                Coding/Data Compression   **S. Nicolo**
-                Recorder / Reproducer   **M. Buckley**
-                ETSC Report   **G. Freaud**

Agenda (Continued)

- **14:30** **Website status** **B. Baggerman**
- **14:40** **Old Business** **S. Nicolo**
  - Lawrence Rough Award
- **15:00** **New Business** **All**
- RF Vendors Group **J. Pappas**
- IRIG 218 Interoperability Meeting (Thurs noon) **S. Nicolo**
- Discussion on time and place for Spring meeting **S. Nicolo**
-
- **15:30** **Adjourn** **All**

Voting

- For Member Terms voting will occur at next meeting

Open Actions

- Work on Committee Membership – Looking for government members (ALL)
- **Steve Nicolo -ACTIONS**
  - - Action: Steve N. to submit for IFT funding request.
    - STATUS: CLOSED: Request submitted and $1,000 received
  - - Action: Steve N. to submit room invoice to Wayne Klein.
    - STATUS: CLOSED: Invoice submitted and closed
  - - Action: Steve N to send out notice and determine interest level in RF Working group meeting at ITC.
    - STATUS: STATUS: CLOSED: There will be a TMoIP interoperability meeting Thursday at noon in place of RF Working Group meeting.
  - - Action: Steve N. to request room at ITC for RF working group.
    - STATUS: STATUS: CLOSED: Johnny Papas requested a room for TMoIP Interoperability meeting that will be held in place of RF meeting. Room was provided.
  - - Action: Steve N. to request room at ITC for TSCC meeting.
    - STATUS: STATUS: CLOSED:
  - - Action: Steve N. to promote the submission of standards based papers to ITC.
    - STATUS: STATUS: CLOSED: Paper was selected this year

Open Actions

- **Diarmuid Corry**
  - Action: Diarmuid C. to look into what can be done to add more members from Academia and Government.
    - STATUS: Ongoing effort of Nominating Committee
- **Shawn Perry.**
  - Action: Shawn Perry to look into setting up industry day for TMoIP interoperability.
    - STATUS: First Meeting will be held Thursday 10/25.
- **Mark McWhorter.**
  - Action: Mark McWhorter to submit marked up IRIG 118 standard for TSCC internal review.
    - STATUS: OPEN
- **Bob Weaver.**
  - Action: Bob Weaver to provide copy of sign-in sheet to chair.
    - STATUS: CLOSED
- **All Committee and subcommittee chairs**
  - Action: Update mail lists and update members.

TELEMETERING STANDARDS COORDINATION COMMITTEE
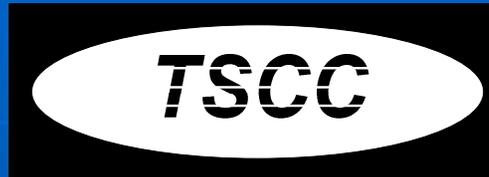
TSCC

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TSCC Fall 2017 Treasurer Report

October 23, 2017 (13:00 MST)
Bally's Hotel and Convention (Palace 1 Room)
Las Vegas, NV
(Same week as ITC Show: Las Vegas, NV)

Treasurer Report
for the Period 3/21/17 thru 10/22/17

- INCOME
  - Received April 2017 $ 1000.00

- EXPENDITURES $ (71.80)
  - Confluence Billing
  - Pending: 2017 Award Plaques (awaiting final invoice)

- Net Increase (Decrease) in Cash $ 928.20

- Beginning Cash Balance $ 1789.45

- Ending Cash Balance $ 2717.65

  - Note(s): TSCC account # : xxxxxx2632

Nominating Sub-Committee Membership

- **Current Nominating Subcommittee Membership**
  - Diarmuid Corry (chair) – Continuity Consulting
  - Stephen Nicolo – GDP Space Systems
  - Scott Brierley - United Launch Alliance
  - Wayne Klein – Apogee Labs

Sub-Committee Focus

- The nominating sub-committee shall propose TSCC members and officers for approval by the membership.

- Prospective TSCC members and officers can be nominated by the TSCC membership or by a nominating subcommittee.

- All nominations must be approved by a membership vote.

13

TSCC Membership Rules

- The TSCC shall have 16 members.
- Adequate representation shall always exist from the diverse groups constituting the telemetry community
- Representatives of government and commercial entities shall each constitute a minimum of one-third (1/3) of the regular TSCC Membership
- The remaining one-third (1/3)may include, but is not limited to those in commercial, governmental, and academic organizations
- Membership by representatives of non-US entities shall not exceed 25% of the total regular membership

TSCC Membership Terms

- TSCC Membership Terms are for five years
  - Terms are staggered so that the terms of 20% (rounded to the nearest integer) of the regular membership end each year
  - Members may be re-nominated for additional terms by the nominating sub-committee.

- Expirations – Fall 2017:
  - Diarmuid Corry - Retiring
  - Wayne Klein

Membership Changes

- Voting on Members:
  - Phil Ellenbrock (for Lee Eccles)

- Voting on Alternates:
  - None

- Alternates still needed for:
  - Mark Bender

- Retiring members:
  - Diarmuid Corry – 12/31/2017 (Industry)
  - Fil Macais – 09/30/2017 (Government)

Membership Breakdown

Target Membership

33%   34%

33%
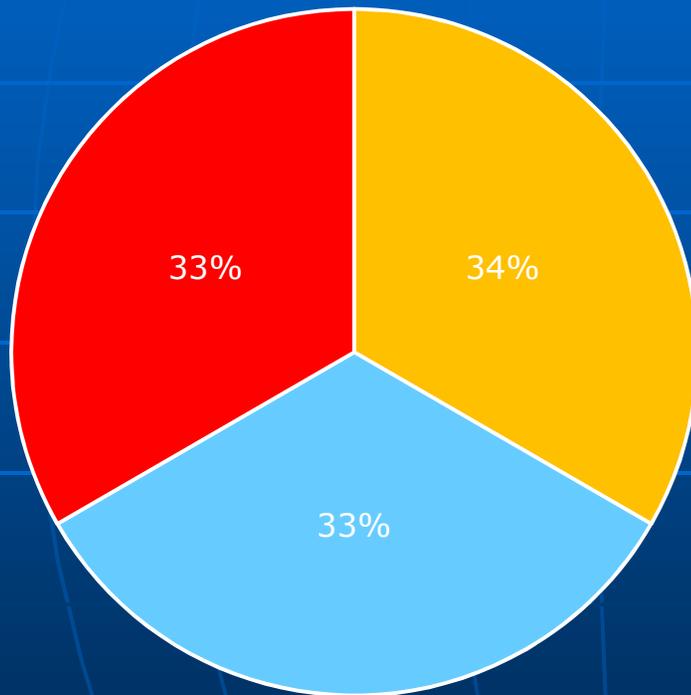
- Government
- Industry
- Academic/Commercial/Government

Actual Membership

1, 6%

1, 6%

5, 32%

9, 56%
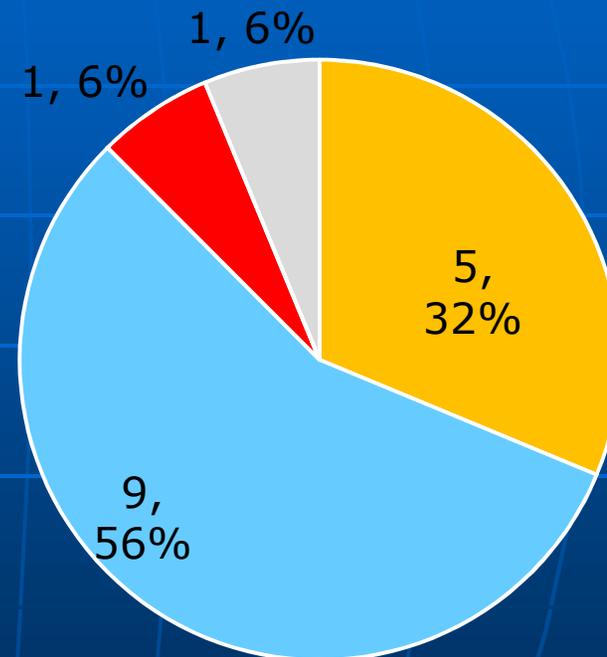
- Government
- Industry
- Academic/Commercial/Government
- Vacant

17

TSCC Membership

- **Academia (1)**
  - Dr. Michael Marcellin

- **Government (5)**
  - Mark Bender
  - Myron Moodie
  - Mark Buckley
  - Tab Wilcox
  - Al Gabalden

- **Industry (8)**
  - Scott Brierley
  - Diarmuid Corry
  - Phil Ellerbock (for Lee Eccles – pending)
  - Brad Fleury
  - Wayne Klein
  - Steve Nicolo
  - Sergio Penna
  - Joe Sulewski
  - Gilles Freud

- **Ex-Officios**
  - Cliff Aggen (IFT Rep)

- **Members Emeritus**
  - Merv MacMedan
  - Erwin (Terry) Straehley

Future Membership Slots

- We have 15 full members. One open position now, one extra position open from 01/01/2018
- One new members need to be Gov't or academic in order to maintain our approx 33% split between industry, academic and government.
- Possible Government Nominees:
  - Jack Salisbury
  - Kevin Bossoletti
  - Scott Kujiraoka

Members Emeritus

- The TSCC may elect an individual as a "Member Emeritus" in recognition of their contribution to the Committee works.

- Lee Eccles (ret., formerly Boeing) has been nominated as Member Emeritus

- The nomination has the unanimous support of the officers of the TSCC

- A Member Emeritus is entitled to attend all TSCC meetings

20

TSCC Officers

- Officers shall serve for a two year term of office
  - The term of office shall begin at the start of the TSCC Year in even calendar years
  - Traditionally the Vice-Chair succeeds to the Chair's position to fulfill a two year term as Chair
  - The Secretary-Treasurer may be re-elected
  - **Officer Terms up December 31, 2018**
- Current Officers:
  - Chair – Steve Nicolo
  - Vice-Chair - Vacant
  - Secretary-Treasurer – Wayne Klein
- Subcommittee Chairs
  - All positions full

Open Actions

- Two open positions to be filled
- Need vice-chair
- Will need chairs for nominating committee and Networks and Protocols committees
  - Diarmuid Corry will serve until new chairs appointed.

Sub Committee Membership

- Scott Brierley, Chairman
- Removed a number of members that have lost Contact with
- Members:
  - Johnny Pappas
  - Mark Bender
  - Mark Dapore
  - Brad Fleury
  - Lloyd Lautzenhiser
  - Bill McNatt
  - Rich Siegal
  - Brad Oney
  - James Carwell

Sub-Committee Focus

- RF Subcommittee reviews standards dealing with the Radio Frequency (RF) telemetry link
- Current standards
  - RCC IRIG-106
  - RCC IRIG-118
  - RCC RF Handbook
  - CCSDS-401
  - CCSDS-411
  - SGLS
  - STDN
  - 1451.5

Significant Activity

- RF Vendors Working Group meeting was held after the Spring TSCC meeting
  - Thanks to Johnny Pappas and Lorin Klein for organizing the RF Vendor working group

Significant Activity

- Working group activity following Spring TSCC meeting:
  - Tom Young, from Edwards AFB informed the group of activities he is involved with related to the Spectrum Efficient Technology (SET) and the Test Resource Management Center(TRMC) programs.
  - Kip Temple, (new chairman of the RCC RF Systems Committee) will addressed the group and informed us of current and future activities in his Group.

Significant Activity

- Description of the working group as provided by Johnny Pappas:
  - This meeting will serve as the kick off meeting for the RF Vendors Working Group and will also be a unique opportunity for a joint meeting with an extremely wide range of leading user and provider experts.
  - The recently released ITC broad announcement informs the telemetry community of the newly formed group and to encourage a wide range of participation at this meeting.
  - This meeting is open to all Government, Commercial, and Academia persons with interest in RF Standards, Test Procedures, and other RF and Spectral Relocation related issues.

Significant Activity

- Description of the working group provided by Johnny Pappas:
  - Specifically, we would like to establish a list of subjects and areas not currently addressed by existing standards, test and measurement procedures, and identify who would be interested in participating in sub committees to tackle high priority subjects related to the above topics.

Significant Activity

- Description of the working group provided by Johnny Pappas:
  - We are very excited about the formation of the RF Vendors group.
  - This group will provide a unique mix of experts, from a wide range of RF related disciplines with a desire and willingness to work jointly with the Government, Vendors, and Academia.
  - I believe the enthusiasm I have received to date directly exhibits the aspirations and desires for working collectively to accelerate the advancement of RF Systems from both a user and provider perspective.

Proposed Subjects for RF Vendor Working Group

- Standardization
  - Additional and Standardized formats for DQE And DQM
  - Antenna, SCU, Receiver Interface standardization
  - TMOIP Format 218 Upgrade
  - Common API for Receivers and Antenna
  - Measuring Mission Metrics
  - New Waveforms COFDM
  - C band tracking performance
  - Low cost telemetry uplink
  - Other ways to do similar function as STC
  - RF over IP
  - Simple Retransmission Control Standardization
  - Standarized Parmetrics
  - Standard Parameters for Value of Data
  - Methods to RF Transmit Async Data
  - Method to transmit Out of Band Data
  - RF over fiber

Proposed Subjects for RF Vendor Working Group

- **Test Methods**
  - Test Methods for DQM and DQE
  - 118 Standards not designed for modern procedures
  - Test Adaptive Equalization
  - Standard library of waveforms to aid testing
  - Test methods for Best Source Selection
  - Test Methods 118
  - Diversity Combiner Test Methods
  - Latency Measurements

- **General**
  - Standardization of Software Security Requirements
  - Library of Error Correction Snippets
  - Proper Modulation Transmitting
  - Library of Demodulators

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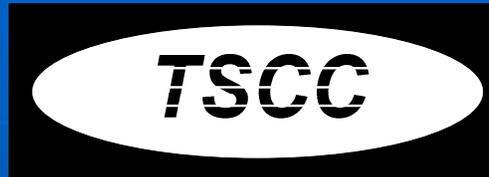
TSCC

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TSCC Fall 2017 Data Multiplexing Subcommittee

**Brad Fleury
Edge Consulting and Sales**

Committee Members

- Brad Fleury – Director Edge consulting and sales

- Alternate – Rob Trepa, Director Edge Consulting and Sales

Sub-Committee Standards

- **Current standards**
  - IRIG-106 -15 / 17
  - Telemetry App's Handbook.
    - TMATS use cases, complete but updates are made as needed
    - RCC XML handbook for IHAL and DDML XML

Sub Committee Membership

Jon Morgan – RCC lead EAFB
Joe Sulewski – L-3 Communications
Nick Duran - Smartronix (TBD)
Joe Merritt – RT Logic
Jack Sheldon
Erwin Straehley
Duane Wheaton

Sub-Committee Focus

- Minimal activity since spring meeting
- IRIG-106 – 15 / 17
- Pink Sheets circulating for IRIG 106
  - TG-147 – no major changes, just clarifications to XML testing
- "Chapter 7" recording impacts to TMATS and recording largely implemented in 106-15

Open Actions

■ Support RCC ongoing efforts:
- TMATS Handbook releases
- IRIG standards

■ Support RCC –TG Datamultiplex telecons and RCC meetings.

Sub Committee Membership

- **Diarmuid Corry, Chair – Curtiss-Wright Controls, Avionics and Electronics**
  - Ben Abbot, Southwest Research Institute
  - Myron Moodie, Southwest Research Institute
  - Wayne Klein, Apogee Labs
  - Fil Macias, White Sands Missile Range
  - William Malatesta, NAVAIR
  - Steve Nicolo, GDP Space Systems
  - Robert Weaver, Apogee Labs
  - Chris Dehmelt, L3 Telemetry – East
  - Joe Sulewski, L3 Telemetry
  - Malcolm Weir, Ampex
  - Sergio Penna, Embraer
  - Dave Buckley, Curtiss-Wright Controls
  - Carl Reinwald, CSRA

Sub-Committee Focus I

- Standards Activity:

  - iNET Suite:

    - IRIG 106 Chapters 21-28 Released
      - Included in IRIG-106-17

    - Active MDL changes being discussed

Sub-Committee Focus II

- **Standards Activity:**
  - IRIG106-Ch7
    - IP over PCM
    - No feedback from TSCC: released
- **Standards Activity:**
  - IEEE1588 (PTPv3)
    - Still in review – draft in 2018, publication in 2019
    - Best source for preview is White Rabbit Standardization: https://www.ohwr.org/projects/wr-std/wiki

  - TMoIP (RCC 218)
    - Active Discussions
    - Special meeting scheduled:
    - Thursday, October 26, at 12pm in Skyview 1

Sub-Committee Focus IV

- Have not been notified of significant activity on any of the following standards of interest:
    - RTP, TCP, UDP, SNMP, FTP, IGMP, etc. etc.

Open Actions

- None

Membership

- **Stephen Nicolo, Chair**.
  - John Carlson – GDP Space Systems
  - Bob Mayer – GDP Space Systems
  - Michael Marcellin- Univ. of Arizona
  - George Nelson - Delta Digital Video
  - Gary Thom - Delta Information System
  - Ed Snyder – GDP Space Systems

Sub-Committee Focus

- Data Compression and Coding
- Error Correction
- Current standards – updates
  - IRIG 106- iNet

Significant Activity

- IRIG 106-15: Forward Error Correction (FEC) Codes
  - LDPC Codes were added in Appendix R
    - Codes were CCSDS LDPC Codes
- Video Compression
  - H.264: Mature and used widely in commercial and government applications
    - Last updated in 2014
    - A new version was approved in 2016
  - H.265: New standard offering bandwdidth saving up to 50% over H.264. It was generally developed for higher resolution applications (i.e. 4K)

Significant Activity

- Previous Reports: iNET was rolled into IRIG 106 Chapters 21 thru 28. Preliminary Pink Sheets for Chapters 21 through 28 were reviewed last report for sections applicable to TSCC Coding and Data Compression Subcommittee.

  - It was determined that only Chapters 27 and 28 contain any reference to the topic of Coding and Data Compression. These references only indicate that Low Density Parity Check (LDPC) should be applied to RF MAC frames as the Forward Error Correction code.

    - **IRIG 106 Chapter 27:**
      - **27.2.1 Data Link Layer Framing**
        - Forward error correction is added to the RF MAC frames to create Low Density Parity Check (LDPC) blocks suitable for transmission over the RF link. Details of the higher levels of this protocol are covered in Chapter 28.
      - **27.4.5 Low-Density Parity-Check (LDPC)**
        - Each codeblock shall contain one 512-byte RF MAC frame or, if the RF MAC frame is not 512 bytes, padding bytes with values of zero shall be added after the FCS to fill a 512-byte codeblock before encoding. The FEC code shall be a Low-Density Parity-Check (LDPC) code as specified in CCSDS 131.1-O-2, September 2007.
      - **27.4.5.1 Encoder Implementation**
        - A reference implementation of the LDPC is available from ref [4] using the values r=2/3 and k=4096.
    - **IRIG 106 Chapter 28:**
      - **28.2.1 Data Link Layer Framing**
        - Forward error correction is added to the RF MAC frames to create LDPC blocks suitable for transmission over the RF interface. Details of the lower levels of this protocol are covered in Chapter 27.

  - Included in the IRIG 106-17 release

Significant Activity

- **IRIG 106 Chapter 10.6 will be moved to Chapter 11 in 2017. This includes video compression which will be revisited in in 2017 and 2018 for released in 106-19**

Open Actions

- Work on Committee Membership – Looking for members
- Continue to look for additional applicable specifications

TELEMETERING STANDARDS COORDINATION COMMITTEE

TSCC

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TSCC Fall 2017 Recorder & Reproducer Committee Report

October 23, 2017

ITC

Las Vegas, NV

Sub Committee Membership

- **Mark Buckley (Telspan Data), Chairman**
- **Albert Gabaldon, Alternate Chairman**
  - Balázs Bagó (Zodiac)
  - Bob Baggerman (Zodiac)
  - Paul Carrion (Calculex)
  - Chris Dehmelt (L-3 Comm Telemetry East)
  - Justin Denning
  - Paul Ferrile (ATAC)
  - Tim Gatton (~~Wideband~~)
  - Dan Green (Zodiac)
  - Eric Lamphear (Telspan Data)
  - Mike Lockard (EMC Corp)
  - Hung Mach (Boeing)
  - Doug Novak
  - Johnny Pappas (Zodiac)
  - Jason Phillips (RT Logic)
  - Christian Rueck (Databus Tools)
  - Rob Trepa (Edge Consulting)
  - Malcolm Weir (Ampex)
  - Craig Wierzbicki (TTC)
  - Rick Williams (SDS)
  - Steve Proudlock (NetAcquire)

Sub-Committee Focus

- Data Recorders, Ground and Airborne
- Standards in Place
  - IRIG 106-17 – Range Commanders Council (RCC) Telemetry Standards

    http://www.wsmr.army.mil/RCCsite/Pages/Publications.aspx
  - STANAG 4575 – North Atlantic Treaty Organization (NATO) Standard Agreement (STANAG) – NATO Advanced Data Storage Interface (NADSI) Allied Engineering Documentation Publication (AEDP)

    http://www.nato.int/STRUCTUR/AC/224/standard/4575/4575.htm
  - ANSI INCITS 175-1999 (R2004) 19mm Type ID-1 Recorded Instrumentation Digital Cassette Tape Format (revision and redesignation of ANSI X3.175-1990 (R1995)
  - MIL-STD-2179 – Helical Digital Recording Format For 19-MM Magnetic Tape Cassette Recorders/Recorders

Significant Activity

- **RCC Telemetry Group Recorder & Reproducer Committee**
  - IRIG 106-17 Chapters 6/9/10/11 Published
- **STANAG 4575, AEDP-6 Ratification**
  - Released Ed 4 to NSA for ratification and subsequent release to member nations for promulgation.

Significant Activity
RCC Document 106-19 Chapter 10

- TSCC R&R will continue with its formal roll in pink sheet reviews

- TSCC R&R to take a "less formal" roll in CR reviews & recommendations

Significant Activity
RCC Document 106-17 Chapter 10

- 2019 Working CR's
  - CR-RR-17-000   Documents new CR numbering
  - CR-RR-17-001   (Formally CR-092) New Packet Header
  - CR-RR-17-002   (Formally CR-096) MDL Data Type
  - CR-RR-17-003   (Formally CR-097) Fix Video Formats
  - CR-RR-17-004   Distribution Statement
  - CR-RR-17-005   Document PN types (PN11, PN15)
  - CR-RR-17-006   Christian Rueck, via TSCC, comments
  - CR-RR-17-007   New CH6 Appendix (CoAP/JASON)
  - CR-RR-17-008   New CH7 Appendix (HDLC)
  - CR-RR-17-009   **(Proposed)** New Ethernet/FC Formats
  - CR-RR-17-010   **(Proposed)** Update the S-Group

Open Actions

- TSCC –
  - Review Ethernet payload identification related to range needs
  - TSCC Web site to be updated for public document access and storage
  - Validator
    - The RCC has requested the TSCC to develop a recorder validation tool (Chapter 10 Validator)
      - Software/hardware definition, procedure
      - Would include maintaining a "Golden File" of data. Any issues of TSCC maintaining files with ITF? Would be maintained on webpage.
      - We have a volunteer to lead the effort…
      - At least two versions exist…

Sub Committee Membership

■ **Committee Chair**

    Gilles Fréaud, Gerhard Mayer (A)

■ **Subcommitee Chair**
- **SC-1: RF Spectrum & Frequ. M´nt**

    J.-C. Ghnassia, Luc Falga &Sergio Penna (A)
- **SC-2: Data Acquisiton & Processing**

    Werner Lange, Christian Herbepin (A)
- **SC-3: Data Recording & Storage**

    Balasz Bagó, Pascal Morel & Steve Lyons (A)

                        (A)…Altenate chairperson

Sub-Committee Focus

- General Area of Focus

- ETSC is currently focusing on MDL standard.

- COFDM standardization for Telemetry is currently on hold.

Significant Activity

- In 2017 and up to the middle of 2018 it's the time to re-energized ETSC.

- We are currently redefining how we want to work on the standards in the frame of ETSC.

- Our goal is to be ready for ETTC 2018 in Nuremberg.

TELEMETERING STANDARDS COORDINATION COMMITTEE

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RF Vendors Working Group Report – Fall 2017

October 23, 2017

Ballys

Las Vegas, NV

Sub Committee Membership

- Johnny Pappas, Lead

  - We really are not tracking individuals as members at this time

  - The mailing list of interested individuals is currently at 80 people

Sub-Committee Focus

- We General Area of Focus
  - We have Two Main Focus Areas
    - Tasks Supporting TG RF Systems Committee
    - Prioritized Items of Interest
      - Test Methods
      - Standards
      - Other items of interest

Significant Activity

- The TSCC and the Government is sponsoring a TMOIP 218 Industry Day at International Telemetry Conference
  - Thursday, Skyview 1, 12:PM
- The TG RF Systems Committee indicated they only agreed to meet with RFVWG

Open Actions

- **Task Support the RF Systems Group**
  - Library of AMT waveforms for testing
  - Test Methods for DQM/DQE
  - Test Methods for Equalizers
  - IRIG-118 Review and update to current methods/equipment and move legacy methods to an appendix
  - Standard telemetry receiver/Antenna Control Unit Interface

- **Unfortunately I have not received any support concerning these tasks**
  - Library of Waveforms and IRIG 118 Test Methods can be worked before the fall TG meeting
  - DQM/DQE recommendations can be provided before the Spring meeting