

**TELEMETERING STANDARDS COORDINATION COMMITTEE**



**SPONSORED BY  
INTERNATIONAL FOUNDATION FOR TELEMETERING**

# TSCC Spring 2017

March 21, 2017 (5-8:30pm)  
Holliday Inn  
350 E Port Hueneme Rd, Port Hueneme, CA  
(Same week as RCC Meeting: Point Mugu)

# TSCC Membership

- Academia (1)
  - Dr. Michael Marcellin
- Government (5)
  - Mark Bender
  - Filiberto Macias
  - Myron Moodie
  - Mark Buckley
  - Tab Wilcox
- Industry (8)
  - 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

- 17:30 Call to Order S. Nicolo
- 17:40 Attendance and determination of Quorum W. Klein
- 17:45 Review and Approve Agenda S. Nicolo
- xx:xx Review of new members & alternate proposals D. Corry
- 17:50 Vote on members S. Nicolo
- 18:00 Officer Reports
- 
- Secretary-Treasurer W. Klein
- Approval and review of last Minutes
- Financial Status
- Action Item Review S. Nicolo



# Agenda (Continued)

- **19:20**      **Website status**      **B. Baggerman**
  
- **19:25**      **Old Business**      **S. Nicolo**
- **19:35**      **New Business**      **S. Nicolo**
  - 1>TSCC Future activities
    - Presentation at ITEA RCC Meeting
  - 2>Discuss and decide on Fall Meeting (ITC)
  - 3>Standards Paper Award
  
- **20:00**      **Adjourn**      **All**

# Voting

- New TSCC Chair Steve Nicolo
- New Nominating Committee Chair Diarmuid Corry
- Required Votes
  - Nominating Committee Members (Currently S. Brierley, S. Nicolo, W. Klein)
  - Treasurer (Currently W. Klein)

# Open Actions

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

TELEMETERING STANDARDS COORDINATION COMMITTEE



SPONSORED BY  
INTERNATIONAL FOUNDATION FOR TELEMETERING

# “TSCC Spring 2017 Treasurer Report”

March 21, 2017 (5-8:30pm)  
Holliday Inn  
350 E Port Hueneme Rd, Port Hueneme, CA  
(Same week as RCC Meeting: Point Mugu)



# Treasurer Report

## for the Period 11/6/16 thru 3/21/17

■ INCOME		
• No funding received this period	\$	0.00
■ EXPENDITURES	\$	0.00
■ Net Increase (Decrease) in Cash	\$	0.00
■ Beginning Cash Balance	\$	1789.45
■ Ending Cash Balance	\$	1789.45

- Note(s): TSCC account #: xxxxxx2632

TELEMETERING STANDARDS COORDINATION COMMITTEE



SPONSORED BY  
INTERNATIONAL FOUNDATION FOR TELEMETERING

**“TSCC Spring 2017  
*Nominating  
Subcommittee Report*”**

# Nominating Sub-Committee Membership

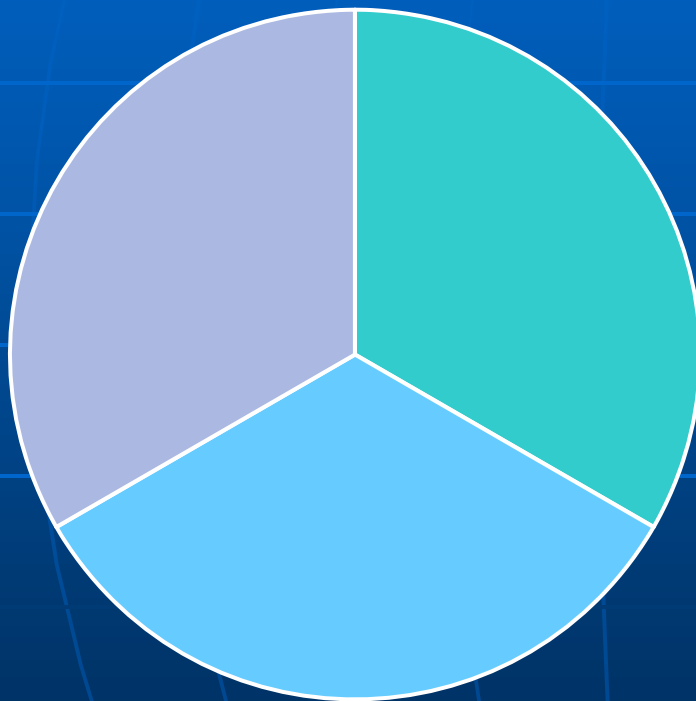
- Current Nominating Subcommittee Membership
  - Diarmuid Corry (chair) – Continuity Consulting
  - Stephen Nicolo – GDP Space Systems
  - Scott Brierley - United Launch Alliance
  - Wayne Klein – Apogee Labs

# 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.

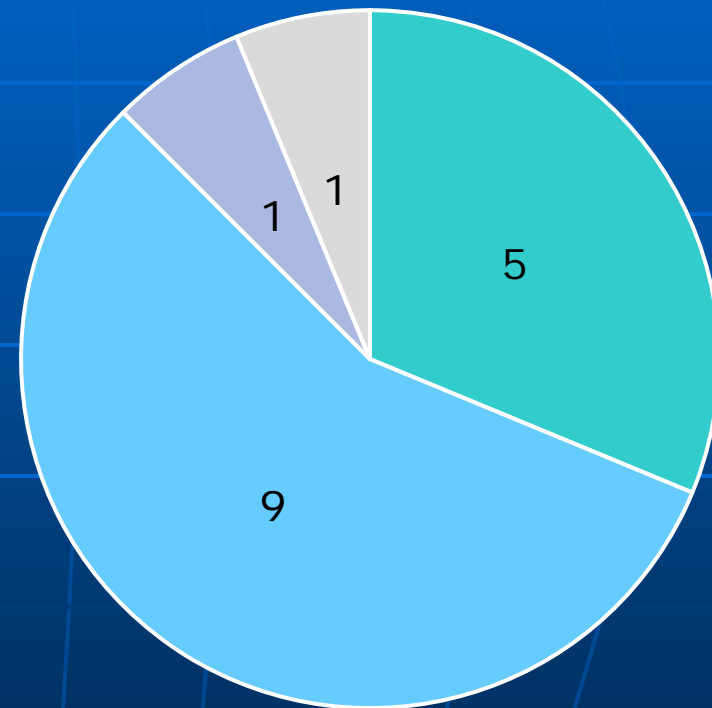
# Membership Breakdown

Target Membership



- Government
- Commercial
- Academic/Commercial/Government

Actual Membership



- Government
- Commercial
- Academic/Commercial/Government
- Vacant

# 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
  - Wayne Klein

# TSCC Membership

- Academia (1)
  - Dr. Michael Marcellin
- Government (5)
  - Mark Bender
  - Filiberto Macias
  - Myron Moodie
  - Mark Buckley
  - Tab Wilcox
- Industry (8)
  - 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

# TSCC Membership

- The Aerospace Corporation
- United Launch Alliance
- Curtiss-Wright Controls Avionics & Electronics
- Boeing Commercial Airplane Co.
- Edge Consulting
- GDP Space Systems
- China Lake
- Continuity Consulting



# TSCC Membership

- L3 Communications
- Yuma proving ground
- Apogee Labs, Inc.
- White Sands Missile Range
- AIRBUS
- Southwest Research Institute
- NAVAIR
- EMBRAER
- University of Arizona

# Future Membership Slots

- We have 15 full members. One open position
- New members need to be Gov't or academic in order to maintain our aprox 33% split between industry, academic and government.

# New Membership Vote

- Voting on Alternates:
  - None
- Alternates still needed for:
  - Mark Bender

# 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, 2016**
- Current Officers:
  - Chair – Steve Nicolo
  - Vice-Chair - Vacant
  - Secretary-Treasurer – Wayne Klein
- Subcommittee Chairs
  - All positions full

# Open Actions

- One open position. Still looking for new academic TSCC member.

TELEMETERING STANDARDS COORDINATION COMMITTEE



SPONSORED BY  
INTERNATIONAL FOUNDATION FOR TELEMETERING

**TSCC Fall 2016**  
**RF Subcommittee Report**  
November 7, 2016

# Membership

## ■ Scott Brierley, Chair - ULA

- Mark Bender
- John Carlson
- Mark Dapore
- Brad Fleury
- Lloyd Lautzenhiser
- Eugene Law
- Fil Macias
- Warren Martin
- Bill McNatt
- Rich Siegal
- Brad Oney
- James Carwell

# Subcommittee 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

- IRIG 106 Chapter 2 Pink Sheets are out
  - Comments required NLT 25 November

# Significant Activity

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

# Significant Activity

- RF Vendors Working Group will be
  - Nov. 7, 4:00 to 6:00 pm
  - Cira Ballroom A, Renaissance Hotel & Spa, Glendale, AZ
  - |            |  |
|------------|--|
| 4:00-4:15  | TSCC RF Vendors Working Group  |
| Background |  |
| 4:15-4:30  | Introduction- Participants   |
| 4:30-4:45  | TRMC Spectrum Efficiency Activity- Tom Young                         |
| 4:45-5:00  | RCC RF Systems Committee Activity- Update-Kip Temple                 |
| 5:00-5:20  | Spectrum Relocation Integration Group Activity- Lorin Klein          |
| 5:20-5:30  | RF Vendor Working Group Collaboration Tool-Bob Baggerman             |
| 5:30-5:45  | Introduction of Subjects of Interest                                 |
| 5:45-6:00  | Go Forward Organizational Structure and Planning for Future Meetings |

# 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:
  - In addition, Tom Young, from Edwards AFB will inform 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 address the group and inform us of current and future activities in his Group.
  - We are hoping there will be good participation from individuals involved with the Spectrum Relocation Integration Group

# 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
- Standardized Parameters
- 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

**TELEMETERING STANDARDS COORDINATION COMMITTEE**



**SPONSORED BY  
INTERNATIONAL FOUNDATION FOR TELEMETERING**

# **TSCC Spring 2017 Committee Report**

**Brad Fleury  
Edge Consulting and Sales**

# Committee Members

- Brad Fleury – Director Edge consulting and sales
- Alternate – Rob Tropa, Director Edge Consulting and Sales

# Sub-Committee Standards

- Current standards
  - IRIG-106 -15 INET
  - 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

Rob Tropa

Nick Duran - Smartronix (TBD)

Jack Sheldon

Erwin Straehley

Duane Wheaton

Action: Find some new sub committee members

# Sub-Committee Focus

- Minimal activity since ITC
- IRIG-106 – 15
- Pink Sheets circulating for IRIG 106 and the handbooks
  - TG-133, TG-136, TG-139, TG-142,
- “Chapter 7” recording impacts to TMATS and recording ongoing discussions

# Open Actions

- Support RCC ongoing efforts:
  - TMATS Handbook releases
  - IRIG standards
- Support RCC –TG Datamultiplex telecons and RCC meetings.

TELEMETERING STANDARDS COORDINATION COMMITTEE



SPONSORED BY  
INTERNATIONAL FOUNDATION FOR TELEMETERING

# TSCC Fall 2017 Networks Subcommittee Report



# 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
  - Hyong Yi, Curtiss-Wright Controls, Avionics and Electronics
  - Robert Weaver, Apogee Labs
  - Chris Dehmelt, L3 Telemetry – East
  - Joe Sulewski, L3 Telemetry
  - Malcolm Weir, Ampex
  - Sergio Penna, Embraer
  - Dave Buckley, Curtiss-Wright Controls

# Sub-Committee Focus I

- Standards Activity:
  - iNET Suite:
    - IRIG 106 Chapters 21-28 Pink sheets released (formerly known as the iNET standards)
      - No feedback on last pink sheets released
      - Expect inclusion in IRIG-106-17
    - There are MDL items that still need to be addressed based on current implementations
      - Boeing-led group making presentation at this RCC

# Sub-Committee Focus II

## ■ Standards Activity:

- IRIG106-Ch7
  - IP over PCM
  - No feedback from TSCC

## ■ Standards Activity:

- IEEE1588 (PTPv3)
  - Still in review
- TMoIP (RCC 218)
  - No feedback from TSCC

# 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

TELEMETERING STANDARDS COORDINATION COMMITTEE



SPONSORED BY  
INTERNATIONAL FOUNDATION FOR TELEMETERING

# TSCC Spring 2017 Coding and Data Compression Subcommittee Report

March 21, 2017 (5-8:30pm)

Holliday Inn

350 E Port Hueneme Rd, Port Hueneme, CA  
(Same week as RCC Meeting: Point Mugu)

# 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 bandwidth saving up to 50% over H.264. It was generally developed for higher resolution applications (i.e. 4K)

# Significant Activity

- **LAST REPORT:** 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