

# IEEE 802.3 NGMMF Study Group Teleconference

Robert Lingle Jr., Acting Chair

IEEE 802.3 Next-gen 200G & 400G PHYs over fewer MMF Pairs Study Group

Employer & Affiliation: OFS

December 18, 2017

# Web Meeting & Call-in Information

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# Agenda

- Please record attendance with employer & affiliation to Mabud mchoudhury@ofsoptics.com
- IEEE 802 Participation
- Pre-PAR Patent Policy
- Approval of agenda & minutes of 12/5 teleconference
- Tutorial on cost discussions with Q&A - David Law, Chair of 802.3
- Preparation for the Geneva Interim – discussion led by Robert
- Walk-on items

# Participation in IEEE 802 Meetings

**Participation in any IEEE 802 meeting (Sponsor, Sponsor subgroup, Working Group, Working Group subgroup, etc.) is on an individual basis**

- **Participants in the IEEE standards development individual process shall act based on their qualifications and experience. ([https://standards.ieee.org/develop/policies/bylaws/sb\\_bylaws.pdf](https://standards.ieee.org/develop/policies/bylaws/sb_bylaws.pdf) section 5.2.1)**
- **IEEE 802 Working Group membership is by individual; “Working Group members shall participate in the consensus process in a manner consistent with their professional expert opinion as individuals, and not as organizational representatives”. (subclause 4.2.1 “Establishment”, of the IEEE 802 LMSC Working Group Policies and Procedures)**
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- **All IEEE-SA standards meetings shall be conducted in compliance with all applicable laws, including antitrust and competition laws.**
- **Don't discuss the interpretation, validity, or essentiality of patents/patent claims.**
- **Don't discuss specific license rates, terms, or conditions.**
  - Relative costs, including licensing costs of essential patent claims, of different technical approaches may be discussed in standards development meetings.
    - Technical considerations remain primary focus
- **Don't discuss or engage in the fixing of product prices, allocation of customers, or division of sales markets.**
- **Don't discuss the status or substance of ongoing or threatened litigation.**
- **Don't be silent if inappropriate topics are discussed... do formally object.**

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If you have questions, contact the IEEE-SA Standards Board Patent Committee Administrator at [patcom@ieee.org](mailto:patcom@ieee.org) or visit <http://standards.ieee.org/about/sasb/patcom/index.html>

See *IEEE-SA Standards Board Operations Manual*, clause 5.3.10 and “Promoting Competition and Innovation: What You Need to Know about the IEEE Standards Association's Antitrust and Competition Policy” for more details.

This slide set is available  
at <https://development.standards.ieee.org/myproject/Public/mytools/mob/preparslides.ppt>

# IEEE 802.3 NGMMF SG Information

- Robert Lingle Jr., Acting Chair
- Home Page - <http://www.ieee802.org/3/NGMMF/index.html>
- Reflector Information - <http://www.ieee802.org/3/NGMMF/reflector.html>

# Tutorial on relative cost presentations in 802.3 meetings – David Law

- [http://ieee802.org/3/100GNGOPTX/public/may12/lindsay\\_01\\_0512\\_optx.pdf](http://ieee802.org/3/100GNGOPTX/public/may12/lindsay_01_0512_optx.pdf)
- Please bring your questions for David!

# Preparation for Geneva Interim

# Boilerplate Objectives

- There are some objectives that are typically adopted for a project
- Examples
  - Support full-duplex operation only
  - Preserve the Ethernet frame format utilizing the Ethernet MAC
  - Preserve the minimum and Maximum FrameSize of current Ethernet standard
  - Provide appropriate support for OTN
  - Specify optional Energy Efficient Ethernet (EEE) capability
  - Support a BER of better than or equal to  $10^{-13}$  at the MAC/PLS service interface (or the frame loss ratio equivalent)
    - NOTE the lower BER target value of  $10^{-13}$  was adopted for 200Gb/s and 400 Gb/s Ethernet in 802.3bs and 802.3cd, whereas  $10^{-12}$  has been used for 100 Gb/s and lower speeds

# MMF objectives in recent projects

- 802.3bs - Provide physical layer specifications which support 400 Gb/s operation over at least 100m of MMF  
([http://www.ieee802.org/3/bs/Objectives\\_16\\_0317.pdf](http://www.ieee802.org/3/bs/Objectives_16_0317.pdf))
- 802.3cd - Define single-lane 50 Gb/s PHYs for operation over
  - MMF with lengths up to at least 100m
- 802.3cd - Define a two-lane 100 Gb/s PHY for operation over
  - MMF with lengths up to at least 100m
- 802.3cd - Define 200 Gb/s PHYs for operation over
  - MMF with lengths up to at least 100m  
([http://www.ieee802.org/3/cd/P802d3cd\\_objectives\\_v4.pdf](http://www.ieee802.org/3/cd/P802d3cd_objectives_v4.pdf))

# Possible specific objectives for this project

- [Language for an objective that states the PMDs defined in the project will be able to use previously defined PCS & FEC from 802.3bs]
- Define a 200Gb/s PHY for operation over fewer than 4 pairs of MMF with channel lengths up to at least 100 m.
- Provide physical layer specifications which support 200Gb/s operation over fewer than 4 pairs of MMF with channel lengths up to at least 100 m.
- Define a 400Gb/s PHY for operation over fewer than 16 pairs of MMF with channel lengths up to at least 100 m.
- Provide physical layer specifications which support 400Gb/s operation over fewer than 16 pairs of MMF with channel lengths up to at least 100 m.

# Contributions for January Interim

This is a contribution-driven process! Participants must support the objectives in which they believe by making (preferably consensus) contributions.

- Objectives
- PAR & CSD responses
- A request for presentation time is due by January 4<sup>th</sup> (I think).

Next call is 11am Eastern, Thursday January 11<sup>th</sup>

- Further discussion of contributions supporting the objectives & CSD responses
- Reviewing draft contributions for Geneva

# Contributions needed and/or anticipated

Purpose of contribution	Comments
Present draft PAR	
Present draft CSD responses	
Document the applicability of the “boilerplate” objectives to this project	
Establish that existing PCS/FEC clauses for 50G lanes support 200 & 400 Gb/s PMDs operating over fewer fiber pairs	Mark Gustlin began a draft
Establish TF for 200GBASE-SR1.4	
Demonstrate BMP, EF, DI, C for 200GBASE-SR1.4	
Deny BMP, EF for 200GBASE-SR1.4	Anticipated
Establish TF for 400GBASE-SR4.2	Anticipate 2 contributions
Demonstrate BMP, EF, DI, C for 400GBASE-SR4.2	
Demonstrate EF, BMP, EF, DI, C for 400GBASE-SR8	
Demonstrate BMP for 400GBASE-SR4	
Document plans outside IEEE 802 standards to determine bandwidth limits for OM3 & OM4 MMF at wavelengths away from 850nm	

TF=technical feasibility; BMP=broad market potential; EF=economic feasibility; DI=distinct identity; C=compatibility

# Back Up Material from Previous Telecons

# The MMF PMD landscape by fiber count, Baud rate, and modulation format

Technology (per fiber)	1 fiber pair	2 fiber pairs	4 fiber pairs	8 fiber pairs	16 fiber pairs
25G- $\lambda$ NRZ	25G-SR		100G-SR4		400G-SR16
50G- $\lambda$ NRZ				400G-SR8	
50G- $\lambda$ PAM4	50G-SR	100G-SR2	200G-SR4	400G-SR8	
100G- $\lambda$ PAM4	200G-SR1.2	200G-SR2	400G-SR4	The module types shown in red would be formally within the scope of the SG, but many would lack technical feasibility or broad market potential	
2x50G- $\lambda$ PAM4		200G-SR2.2	400G-SR4.2		
4x25G- $\lambda$ NRZ		200G-SR2.4	400G-SR4.4		
4x50G- $\lambda$ PAM4	200G-SR1.4	400G-SR2.4			

Existing or in-progress IEEE standard

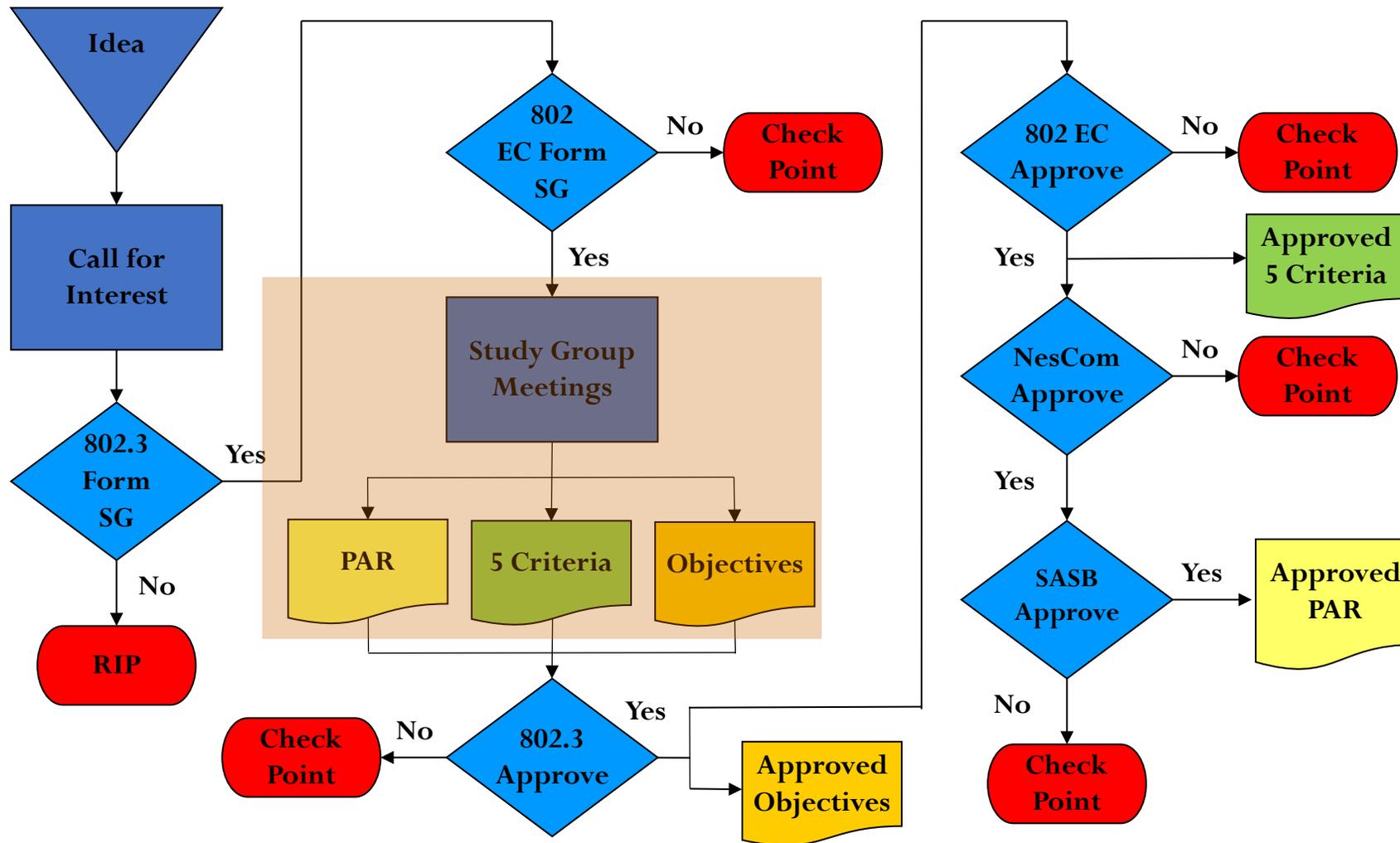
## Multi-Wavelength Nomenclature

SRm.n

m = # fiber pairs

n = # wavelengths

# Overview of IEEE 802.3 Standards Process (1/5)- Study Group Phase



Note: At "Check Point", either the activity is ended, or there may be various options that would allow reconsideration of the approval.