

IEEE P802.3bn Work Items for May 2014

Status: S = baseline starting point, B = baseline proposal, D = in draft, N/A = not applicable, <blank> = no status

Downstream PHY Layer

Item	Status	Notes / Comment / References
Downstream TX Block Diagram	D	
Reconciliation	N/A	No changes
1.6 Gb/s at MAC / PLS service interface in 192 MHz, in baseline channel conditions		TD#40: remein 3bn 07 0313.pdf (needs analysis)
PCS (transmitting):		
64B/66B Encoder / Decoder	D	TD#20 (65b); TD#46: hajduczenia 3bn 04 0513.pdf TD#50 (continuous vector, no split);
FEC and Data Detector		TD#4 (LDPC); TD#47: prodan 3bn 01 0513.pdf ; TD#94: hajduczenia 3bn 01a 0913.pdf
o LDPC	D	TD#81: prodan 3bn 01a 0713.pdf ; TD#95 (FDD codes for Node+N, N≥0)
o MTTFPA	D	TD#82 (objective); TD#93: prodan 3bn 02a 0913.pdf
NCP generation	S	TD#51 (PHY LINK Codeword Pointer)
Scrambler		
Gearbox	S	TD#117 (boyd 3bn 03 0114.pdf)
IDLE Delete	S	TD#118 (boyd 3bn 03 0114.pdf)
PCS (receiving):		
NCP processing		
PCS / PMA Service Interface		
PMA:		
OFDM Numerology	D	TD#2 (OFDM); TD#6 (multiple modulation orders); TD#7 (192 MHz, 10.24 MHz); TD#9 (Scaling); TD#30 (granularity of Fc); TD#31 (upper bound to 5GHz) TD#35 (minimum contiguous 24 MHz); TD#72 (FDD RF Spectrum); TD#74: rahman saif 3bn 01 0713.pdf ; TD#78: solomon 3bn 02b 0713.pdf ; TD#89 (FDD 5 to 234 MHz);
Symbol Mapper	S	TD#110: laubach 3bn 04c 1113.pdf
o Constellation Mapping	D	TD#103: prodan 3bn 02 1113.pdf shen_3bn_01_140226_Constellation.pdf (comment resolution)
- Interleaving - o Time - o Frequency (Rich, Avi)	S	TD#110: laubach 3bn 04c 1113.pdf T.B.D. for frequency interleaving

• Pilot Insertion (Avi, Christian, Jin)	S	TD#29: pietsch 3bn 01 0313.pdf , kliger 3bn 01 0313.pdf ;
o Pilot structure	S	TD#60: kliger 3bn 02 0513.pdf pietsch 3bn 01 0313.pdf ; TD#67: kliger 3bn 02 0513.pdf ; TD#79: kliger 3bn 02a 0713.pdf TD#110: laubach 3bn 04c 1113.pdf
• IFFT / IDFT	S	TD#110: laubach 3bn 04c 1113.pdf
• Cyclic Prefix and Windowing	S	TD#23: montreuil 01a 0113.pdf ; TD#63: pietsch 3bn 02 0313.pdf ; TD#110: laubach 3bn 04c 1113.pdf
• Subcarrier Configuration o QAM Mapping	S	TD#103: prodan 3bn 02 1113.pdf TD#110: laubach 3bn 04c 1113.pdf
• Bit Loading		
• Pilot Map	S	TD#110: laubach 3bn 04c 1113.pdf
• PMA Other		
o Exclusion Rules	S	TD#5 (exclusions); TD#14 (placement); TD#55 (m, m+1, ...); TD#56 (internal, band edge); TD#57 (2 band-edge); TD#58 (minimum internal 1MHz); TD#59 (fixed number internal in 192 MHz); TD#69 (start, integer number sub-carriers); TD#70 (mapping to sub-carriers); TD#71 (at most 16); TD#110: laubach 3bn 04c 1113.pdf
o Cycle Structure and Initialization		NCP, scrambler init coupled to PHY LINK cycle
o Multiple OFDM Channels (Mark, Avi, ...)		TD#8 (higher capacity)
PMA / PMD Service Interface	D	TD#127 D0.4 Bulk
PMD:		
• Electrical Input / Output	D	TD#104: rahman saif 3bn 02 1113.pdf
• Fidelity	D	
• MDI	D	
Other:		
• Channel Model	D	TD#15: howald 01a 0113.pdf
• CNU and CLT Receive Direction:		
• Rx Idle Deletion	D	TD#42 (Like 10G-EPON)
• Rx Idle Insertion	D	TD#43 (Like 10G-EPON with changes); TD#48: hajduczenia 3bn 01 0513.pdf
• CNU and CLT Transmit Direction:		
• Tx Idle Insertion	B	TD#44 (Like 10G-EPON with changes); TD#49: garavaglia 3bn 02a 0513.pdf See Clause 103.2.2
• Tx Idle Deletion	D	TD#45 (Like 10G-EPON with changes); TD#48: hajduczenia 3bn 01 0513.pdf
• Downstream PHY Block Diagram	D	TD#91: kliger 3bn 01a 0913.pdf
• Subcarrier Clocking, Accuracy	S	TD#110: laubach 3bn 04c 1113.pdf

• Acquisition (moved to PHY Link)	S	
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Upstream PHY

Item	Status	Notes / Comment / References
Upstream TX Block Diagram	D	TD#107: kliger 3bn 01a 1113.pdf TD#125: laubach 3bn 02 0314.pdf
Reconciliation	N/A	No changes
Upstream OFDM (Super) Frame		
• OFDM frames, Data vs PHY Link, probes		
PCS:		
• Rate Adaptation		
• 64B/66B Encoder / Decoder	D	TD#20 (65b); TD#46: hajduczenia 3bn 04 0513.pdf ; TD#50 (continuous vector, no split);
• FEC Encoder and Data Detector:		TD#47: prodan 3bn 01 0513.pdf
o FEC Codewords	D	TD#81: prodan 3bn 01a 0713.pdf ; TD#92: shen 3bn 01 0913.pdf ; TD#95 (FDD codes for Node+N, N≥0)
o Codeword Builder (Rich)	B	TD#103: prodan 3bn 01 1113.pdf
o MTTFPA	D	TD#82 (objective); TD#93: prodan 3bn 02a 0913.pdf
• Scrambler		
• Gearbox		
PCS / PMA Service Interface		
PMA:		
• OFDM Numerology		TD#3 (OFDMA); TD#9 (scaling); TD#17 (25 kHz and 50 kHz spacing); TD#24 (192 MHz and exclusions); TD#30 (granularity of Fc); TD#31 (upper bound to 5GHz); TD#72 (FDD RF Spectrum); TD#74: rahman saif 3bn 01 0713.pdf ; TD#78: solomon 3bn 02b 0713.pdf ; TD#89 (FDD 5 to 234 MHz);
• Symbol Mapper		
o Constellation Mapping	D	TD#103: prodan 3bn 02 1113.pdf
• Interleaving		
o Pilot Pattern (Avi, others)	S	TD#61: pietsch 3bn 01 0513.pdf kliger 3bn 01 0313.pdf pietsch 3bn 01 0513.pdf
o Interleaver (Duane, Avi)		
• Pilot and Marker Insertion		
• IFFT / IDFT		?same as downstream?
• Pre-Equalization		TD#64: montreuil 01 0512.pdf kliger 01a 0912.pdf
• Cyclic Prefix and Windowing		TD#23: montreuil 01a 0113.pdf ;

• OFDM (Super) Frame Configuration and Bit Loading		
o Superframe structure		
o Burst Structure / Resource Blocks	S	TD#61: pietsch 3bn 01 0513.pdf kliger 3bn 01 0313.pdf pietsch 3bn 01 0513.pdf TD#124 (8, 12, and 16 symbols) TD#80: kliger 3bn 03 0713.pdf
o Burst Markers	B	TD#25 (start / stop markers); TD#28 (marker definition); TD#97: rahman syed 3bn 01 0913.pdf ; TD#109: rahman syed 3bn 01 1113.pdf TD#126: montreuil 3bn 01b 0314.pdf
• Framing Timing		
• Probe Generator		
• PMA Other		
o Exclusion Rules		TD#5 (exclusions); TD#14 (placement); TD#24 (192 MHz and exclusions); TD#55 (m, m+1, ...); TD#56 (internal, band edge); TD#57 (2 band-edge); TD#58 (minimum internal 1MHz); TD#59 (fixed number internal in 192 MHz); TD#69 (start, integer number sub-carriers);
o Multiple OFDM Channels (Mark, Avi, ...)		TD#8 (higher capacity)
o 1D-to-2D subcarrier assignment, etc.	S	TD#121 (boyd 3bn 02 0114.pdf)
PMA / PMD Service Interface	D	TD#127 D0.4 Bulk
PMD:		
• Electrical Input / Output		
• Fidelity		
• MDI		
Other:		
• Channel Model	D	See Annex 100A

MPCP

Item	Status	Notes / Comment / References
MPCP:		
• Rate Adaptation	D	
• FEC Adaptation / Impact (Duane)	D	
• Gate / Report calculation changes	D	
MPCP Interoperation:		
• MAC Discovery and registration verification ()		
• tqSize, OctetsRemaining, PHY_DATA_SIZE & PHY_OVERHEAD_SIZE, fecOffset, packet_initiate_delay, CheckGrantSize, PMD_OverheadT	D	TD#112: remein 3bn 06 1113.pdf

Downstream PHY Link

Item	Status	Notes / Comment / References
• Performance study		
PHY LINK Framing		TD#38 (PHY Link framing)
• Preamble	D	TD#76: montreuil_3bn_01_0713.pdf
• PHY Link Frame	D	
PHY LINK Messages and Protocol		
• Content	D	TD#77: kliger_3bn_01b_0713.pdf
• Protocol	D	
• PHY Discovery	D	TD#119 (remein_3bn_05_0114.pdf)
PHY LINK Insertions:		
• NCP	D	
• Timestamp MB	D	
• EE MB		(no work done – evaluate)
• Trigger MB		(PNM, evaluate PHY impact only (not mgmt.))
PHY LINK Numerology:		
• 16 QAM fixed	D	TD#11 (16 QAM)
• CP and sub-carrier spacing same as data channel (Duane, acquisition)		TD#13 (same CP/sub-carrier spacing) (requirement to be added against D0.5)
• 400 KHz wide without continuous pilots.	D	TD#39 (as described)
• PHY LINK Placement 3MHz either side	D	TD#62 (3 MHz either side)
PHY Link Receiver		
• CNU auto-detect CP / windowing		TD#12 (CP)
FEC		
• Definitions	D	TD#36 (ECC); TD#75: shen_3bn_01_0713.pdf TD#120 (shen_3bn_01_0114.docx)
• Use	D	
Scrambler	D	
Time Interleaving	D	(needs detail / attention / update)
Symbol Mapper	D	(needs attention / update)

Upstream PHY Link

Item	Status	Notes / Comment / References
Upstream (super) frame		
• OFDMA frames, PHY Link signals		
• Frame configuration		
PHY LINK Signals / Messages:		
• Messages / Content	D	TD#77: kliger 3bn 01b 0713.pdf
o Protocol	D	
• PHY Discovery	D	
o Fixed preamble		
• Fine ranging	S	(only FEC)
o Fixed preamble		
FEC		
• Definitions	D	TD#36 (ECC); TD#75: shen 3bn 01 0713.pdf TD#105: shen 3bn 01 1113.pdf TD#120 (shen 3bn 01 0114.docx)
• Use	D	
Scrambler	D	(assumption same as downstream)
Symbol Mapper	D	
Wide Band Probing	D	TD#66: montreuil 3bn 01a 0513.pdf ; TD#98: rahman syed 3bn 01 0313.pdf ; TD#106: rahman syed 3bn 02 1113.pdf
• MPCP impact / coordination		Needs concept, tied with framing

PHY Link Other

Item	Status	Notes / Comment / References
PHY LINK Starting Point	D	TD#53: boyd 3bn 02 0513.pdf
PHY LINK Baseline Work	D	TD#99: remein 3bn 03a 0913.pdf ; TD#113: remein 3bn 07 1113.pdf remein 3bn 08 1113.pdf
PHY LINK Transparency, shall not add jitter or latency to the data		TD#21 (transparency);
• No additional buffering		TD#37 (repeat of TD#21 with buffering)
PHY Link and procedures: (Avi, Duane, Jin)		
• “Bring up” through auto-negotiation to Linked	D	(beginnings, needs additional detail)
• “Ranging” and symbol synchronization (Bill, Leo, Avi, Hesham)	D	(not complete, high level only)
PHY Link acquisition:		
• “Lock” and acquisition	D	(needs some work)
• “Lost sync” and recovery / reset procedures		

System Issues

Item	Status	Notes / Comment / References
Clocking / jitter		
Time Synchronization (Bill)		
MDIO registers to report on subcarrier or subcarrier group, signal parameters including quality.		TD#34 (MDIO registers to report...) TD#116 (MIDO register baseline material) (some initial work in draft)
Exclusion Bands Configuration		
By MDIO	D	TD#32 (Exclusion bands configured by MDIO) (clause 45 registers) TD#33 (Exclusion bands configured by PHY LINK)
Performance Analysis:		
Baseline Channel Conditions	D	TD#18: remein_3bn_07_0313.pdf
Exemplar Channel Conditions	N/A	TD#54: howald_3bn_02_0313.pdf (not needed in draft)
EPoC Delay evaluation		TD#41: garavaglia_02_0912.pdf
Error analysis		
Jitter		
Power Saving, study support for configurable mechanism. (Adopt SIEPON and apply to EPoC as appropriate.)		TD#1: hajduczenia_05a_0912.pdf

Proactive Network Management

Item	Status	Notes / Comment / References
Below is based on currivan_3bn_01_1113.pdf		Need to update/sync with any changes since then.
CNU Downstream Performance Metrics		
Per Data Channel:		
Uncorrectable codewords (CRC-40 fail)	D	FecCodeWordFail
Total number of data FEC codewords	D	FecCodeWordCount, FecCodeWordSuccess
RxMER: Per subcarrier ratio of average power of the equalized QAM constellation to the average error-vector power. For Continuous Pilots, difference between the equalized receive pilot value and the known correct pilot value.		Need to look at specifically what to put in EPoC PHY draft to support this.
Codeword error ratio versus time (seconds): Ratio of number of uncorrectable codewords to total number of codewords in each one-second interval for a rolling 10-minute period (600 values)		Need to look at specifically what to put in EPoC PHY draft to support this.
Codeword error ratio versus. time (minutes): Ratio of number of uncorrectable codewords to total number of codewords in each one-minute interval for a rolling 24-hour period (1440 values).		Need to look at specifically what to put in EPoC PHY draft to support this.

• Ending time of rolling period		Need to look at specifically what to put in EPoC PHY draft to support this.
PHY Link:		
• Uncorrectable codewords (CRC-40 fail)		
• Total number of PHY Link codewords		
CLT Upstream Performance Metrics		
Per Data Channel:		
• Uncorrectable codewords (CRC-40 fail)		
• Total number of data FEC codewords		
• Provide the following FEC summaries over a period of up to 10 minutes for any single upstream user		Need to look at specifically what to put in EPoC PHY draft to support this.
o Total number of seconds		Need to look at specifically what to put in EPoC PHY draft to support this.
o Number of errored seconds (seconds during which at least one unreliable codeword occurred)		Need to look at specifically what to put in EPoC PHY draft to support this.
o Count of codeword errors (uncorrectable codewords) in each 1-second interval		Need to look at specifically what to put in EPoC PHY draft to support this.
o Start and stop time of summary		Need to look at specifically what to put in EPoC PHY draft to support this.
PHY Link:		
• Uncorrectable codewords (CRC-40 fail)		
• Total number of PHY Link codewords		
Other		
• Downstream PHY Link support for Trigger administration		Need work to partition what is in the PHY versus what is in the D3.1 trigger “system” and then what needs to go into other CableLabs specifications.

Objectives

Status: M = met in Task Force draft

Item	Status	Notes / Comment / References
Specify a PHY to support subscriber access networks capable of supporting burst mode and continuous mode operation using the EPON protocol and operating on point-to-multipoint RF distribution plants comprised of either amplified or passive coaxial media.		Evaluate when TF draft is "complete". Note: continuous mode for downstream, burst mode upstream, no changes should be needed.
Maintain compatibility with 1G-EPON and 10G-EPON, as currently defined in IEEE Std. 802.3 with minimal augmentation to MPCP and/or OAM if needed to support the new PHY.		Evaluate when TF draft is "complete".
Define required plant configurations and conditions within an overall coaxial network operating model.		DS electrical / fidelity and channel model done. Waiting on US for both.
Provide a physical layer specification that is capable of:		
A baseline data rate of 1 Gb/s at the MAC/PLS service interface when transmitting in 120 MHz, or less, of assigned spectrum under defined baseline plant conditions;		Needs analysis.
A data rate lower than the baseline data rate when transmitting in less than 120 MHz of assigned spectrum or under poorer than defined plant conditions;		Needs analysis.
A data rate higher than the 1Gb/s baseline data rate and up to 10 Gb/s when transmitting in assigned spectrum and <i>in</i> channel conditions that permit.		Waiting on multiple OFDM channel architecture.
PHY to support symmetric and asymmetric data rate operation.	M	
PHY to support symmetric and asymmetric spectrum assignment for bidirectional transmission.	M	
PHY to support independent configuration of upstream and downstream transmission operating parameters.	M	
PHY to operate in the cable spectrum assigned for its operation without causing harmful interference to any signals or services carried in the remainder of the cable spectrum.		DS electrical / fidelity / spurious done. Waiting on US.
PHY to have:		
a downstream frame error ratio better than 10^{-6} at the MAC/PLS service interface;		Done with FEC analysis?
an upstream frame error ratio better than 5×10^{-5} at the MAC/PLS service interface.		Done with FEC analysis?
Define Energy Efficient Ethernet operation for EPON Protocol over Coax PHYs.		Awaiting any draft text on EEE or power saving options for EPoC.
Mean Time To False Packet Acceptance at least equal to 1.4×10^{10} years.	M	

PAR

Item	Status	Notes / Comment / References
5.2.b.: The project is to amend IEEE Std 802.3 to add physical layer specifications and management parameters for symmetric and/or asymmetric operation of up to 10 Gb/s on point-to-multipoint Radio Frequency (RF) distribution plants comprising either amplified or passive coaxial media. It also extends the operation of Ethernet Passive Optical Networks (EPON) protocols, such as MultiPoint Control Protocol (MPCP) and Operation Administration and Management (OAM).		
8.1: The amendment will comply with IEEE Std 802, IEEE Std 802.1D, and IEEE Std 802.1Q.		