IEEE P802.3bn Work Items for July 2014

Status: S = baseline starting point, B = baseline proposal, D = in draft, "D" = Editors to create draft text, 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 (first look Mark)	S	TD#51 (PHY LINK Codeword Pointer)
• Scrambler (Leo)		TD#128: montreuil_3bn_01a_0514.pdf
• Gearbox	S	TD#117 (boyd_3bn_03_0114.pdf)
• IDLE Delete	S	TD#118 (boyd_3bn_03_0114.pdf)
~~**PCS (receiving):**~~		
~~• NCP processing~~		Leave to implementer – don't put in spec.
PCS / PMA Service Interface (Mark)		
PMA:		
• Symbol Mapper	D	TD#110: laubach_3bn_04c_1113.pdf TD#132: Draft 0.5 Comment Approved Responses`
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)	D	TD#110: laubach_3bn_04c_1113.pdf TD#132: Draft 0.5 Comment Approved Responses Frequency interleaving text is preliminary.

• Pilot Insertion (Avi, Christian, Jin)	D	TD#29: pietsch_3bn_01_0313.pdf, kliger_3bn_01_0313.pdf; TD#132: Draft 0.5 Comment Approved Responses
o Pilot structure	D	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 TD#132: Draft 0.5 Comment Approved Responses
• IFFT / IDFT	D	TD#110: laubach_3bn_04c_1113.pdf TD#132: Draft 0.5 Comment Approved Responses
• Cyclic Prefix and Windowing	D	TD#23: montreuil_01a_0113.pdf; TD#63: pietsch_3bn_02_0313.pdf; TD#110: laubach_3bn_04c_1113.pdf TD#132: Draft 0.5 Comment Approved Responses
• Subcarrier Configuration o QAM Mapping • Bit Loading	D	TD#103: prodan_3bn_02_1113.pdf TD#110: laubach_3bn_04c_1113.pdf TD#132: Draft 0.5 Comment Approved Responses
• Pilot Map	D	TD#110: laubach_3bn_04c_1113.pdf TD#132: Draft 0.5 Comment Approved Responses
• PMA Other		
o Exclusion Rules (Duane)	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 (Duane)		NCP, scrambler init coupled to PHY LINK cycle
o Multiple OFDM Channels (Mark)		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:		
• 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);
• 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 (Jin)	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	D	TD#110: laubach_3bn_04c_1113.pdf

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	"D"	
PCS:		
• Rate Adaptation (Jin)		
• 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	"D"	TD#128: montreuil_3bn_01a_0514.pdf
• Gearbox		Is this the similar to DS?
PCS / PMA Service Interface (Mark)		
PMA:		
• Symbol Mapper		
o Constellation Mapping	D	TD#103: prodan_3bn_02_1113.pdf
• Interleaving		
o Pilot Pattern (Avi, others)	"D"	TD#61: pietsch_3bn_01_0513.pdf kliger_3bn_01_0313.pdf pietsch_3bn_01_0513.pdf

o Interleaver (Rich, proposal)		
• Pilot and Marker Insertion	"D"	TD#131: montreuil_3bn_05a_0514.pdf
• IFFT / IDFT	D	?same as downstream?
• Pre-Equalization	D	TD#64: montreuil_01_0512.pdf kliger_01a_0912.pdf
• Cyclic Prefix and Windowing	D	TD#23: montreuil_01a_0113.pdf;
• OFDM (Super) Frame Configuration and Bit Loading		
o Superframe structure	"D"	
o Burst Structure / Resource Blocks	"D"	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	"D"	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 (Avi)	B	TD#129: montreuil_3bn_02a_0514.pdf
• PMA Other		
o Exclusion Rules (Duane)		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 OFDMA Channels (Mark, Avi, …)~~		TD#8 (higher capacity) TD#X D0.6 comment resolution -> 1 upstream channel
o 1D-to-2D subcarrier assignment, etc. (Mark and others)	S	TD#121 (boyd_3bn_02_0114.pdf)
PMA / PMD Service Interface	D	TD#127 D0.4 Bulk
PMD:		
• Electrical Input / Output (Mark, Tom)		
• Fidelity (Mark, Tom)		
• MDI (Mark, Tom)		
Other:		
• OFDM Numerology	D	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);
• 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 ( )		Not sure there is anything to do here
• 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	There is just the bearest mention of NPC
• Timestamp MB	D	
• EE MB		(no work done – evaluate)
• Trigger MB		(PNM, evaluate PHY impact only (not mgmt.)) Do we need this for EPoC? "would be nice"
PHY LINK Numerology:		
• 16 QAM fixed	D	TD#11 (16 QAM)
• CP and sub-carrier spacing same as data channel (Duane, acquisition)	D	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	D	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	TD#128: montreuil_3bn_01a_0514.pdf
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	"D"	
• Frame configuration	"D"	
PHY LINK Signals / Messages:		
• Messages / Content	D	TD#77: kliger_3bn_01b_0713.pdf
o Protocol	D	
• PHY Discovery	D	
o Fixed preamble	D	TD#130: montreuil_3bn_03a_0514.pdf
• Fine ranging	D	(only FEC)
o Fixed preamble	D	
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) TD#128: montreuil_3bn_01a_0514.pdf
Symbol Mapper	D	
Wide Band Probing	D "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~~	~~"D"~~	~~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	D	TD#21 (transparency);
• No additional buffering	D	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)

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. (Hesham)		TD#34 (MDIO registers to report…) TD#116 (MDIO 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)
"Lost sync" and recovery / reset procedures (Duane)		
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		CL 64.2.2.1 (1G), CL 77.2.2.1 (10G) 103.2.2.1 8 TQ down, 12 TQ up
Power Saving, study support for configurable mechanism. (Adopt SIEPON and apply to EPoC as appropriate.)		TD#1: hajduczenia_05a_0912.pdf Can we eliminate the EE MB in the PHY Link section above?

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. (Hesham)		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) (Hesham)		Need to look at specifically what to put in EPoC PHY draft to support this. This should be a higher layer function and not part of the PHY
• Codeword error ratio versus. time		Need to look at specifically what to put in

(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). (Hesham)		EPoC PHY draft to support this. This should be a higher layer function and not part of the PHY
• Ending time of rolling period (Hesham)		Need to look at specifically what to put in EPoC PHY draft to support this. This should be a higher layer function and not part of the PHY
PHY Link:		
• Uncorrectable codewords (CRC-32 fail) (Mark)		
• Total number of PHY Link codewords (Mark)		
CLT Upstream Performance Metrics		
Per Data Channel:		
• Uncorrectable codewords (CRC-40 fail) (Mark)		
• Total number of data FEC codewords (Mark)		
• Provide the following FEC summaries over a period of up to 10 minutes for any single upstream user (Hesham)		Need to look at specifically what to put in EPoC PHY draft to support this. This should be a higher layer function and not part of the PHY
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-32 fail) (Mark)		
• Total number of PHY Link codewords (Mark)		
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 *in* 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 $5x10^{-5}$ 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 savsing 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.		