Supporting Material – TQM Related Comments (259, 260) for 800GBASE-LR1, 800GBASE-ER1-20, 800GBASE-ER1

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Introduction

- The following presentation addresses the following comments
  - **Comment #259** (SC 185.9) - This subclause "Transmitter quality metric (TQM) test setup and calculation" is incomplete and there is an editors note requesting contributions to help complete
  - **Comment #260** (SC 187.9) - This subclause "Transmitter quality metric (TQM) test setup and calculation" is incomplete and there is an editors note requesting contributions to help complete.

- This presentation will provide a proposed recommendation to address these comments.

- This presentation builds upon
  - "Leveraging IEEE P802.3cw Specification Approach for IEEE P802.3dj" (https://www.ieee802.org/3/dj/public/24_07/dambrosia_3dj_01_2407.pdf)
  - "Reference Receiver Design for Transmitter Constellation Closure (TCC) as a Transmitter Quality Metric (TQM) for coherent transmitters" (https://www.ieee802.org/3/dj/public/24_07/fan_3dj_02a_2407.pdf)
  - SG15-LS125, Liaison Statement – "LS/r on B400G work and EVM"
  - SG15-TD214/WP2 – "Transmitter Quality Metric (TQM) and Reference Receiver for 800G" (https://www.ieee802.org/3/private/liaison_docs/itu/Att-TD214-WP2.pdf, Note – Password needed)
  - "Transmit Quality Metric approach for Coherent Specifications" (https://www.ieee802.org/3/dj/public/24_05/maniloff_3dj_02_2405.pdf)
 - IEEE P802.3cw D3.0

Recommendations for Both Comments

1. Utilize the document structure proposed in dambrosia_3dj_01_2407.pdf.
   - Calculate TQM Calculation for 800GBASE-LR1, 800GBASE-ER1-20, 800GBAS-ER1, as per SG15-LS125 / SG15-TD214/WP2 and maniloff_3dj_02_2405.pdf:
     a) TQM = ΔRSNRtx, Tx-only RSNR penalty (Renamed as "Extended TCC") in dB (*normative* with a maximum specification)
     b) SNRtx, ECtx in dB (*informative*)
2. Proposed Figures & associated text where appropriate
   a) TQM Test Setup – See Page 4
   b) Calibrated coherent detector Front End – See Page 5
   c) Coherent Detector Front-end – See Page 6
      a) Address IQ offset in coherent detector front-end (reference IEEE P802.3cw D3.0 "IQ offset per polarization")
   d) Offline Digital Signal processing – See Page 7
3. Implement with editorial license
4. Continued liaisons with ITU-T on TQM development efforts recommended.

TQM Test Setup
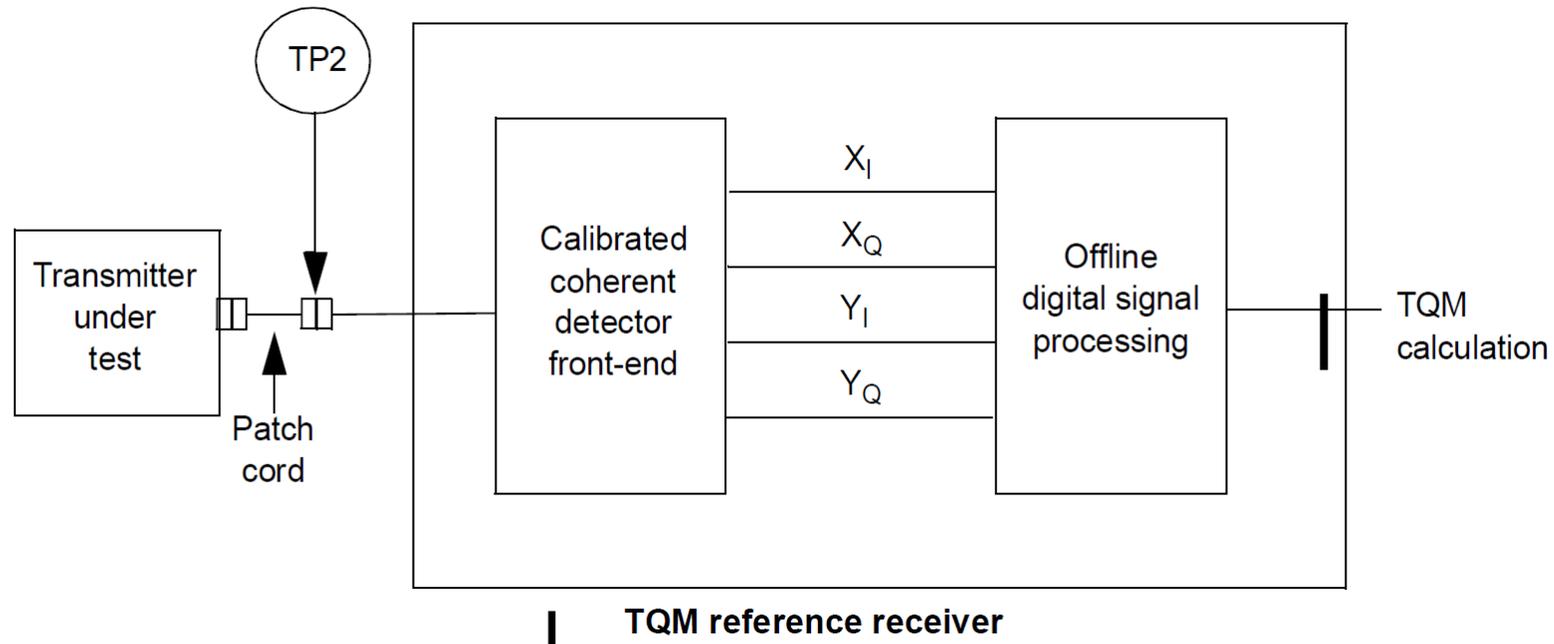
Calibrated Coherent Detector Front-End

- Add proposed table consisting of parameter values for post calibration residuals
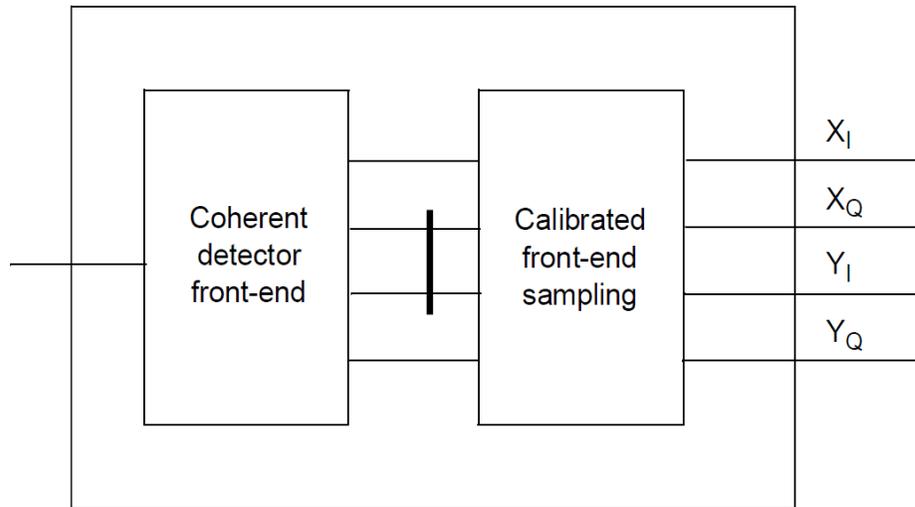
Description	Value	Unit
X-Y gain error (max)	0.2	dB
X-Y skew (max)	0.5	ps
I-Q phase error for X (max)	2	degree
I-Q gain error for X (max)	0.2	dB
I-Q skew for X (max)	0.2	ps
I-Q DC offset for X (max)	-26	dB
I-Q instantaneous offset for X (max)	-20	dB
I-Q phase error for Y (max)	2	degree
I-Q gain error for Y (max)	0.2	dB
I-Q skew for Y (max)	0.2	ps
I-Q DC offset for Y (max)	-26	dB
I-Q instantaneous offset for Y (max)	-20	dB
Bandwidth mismatch [X,Y:I,Q] (max)	1	GHz
Carrier frequency offset (max)	0.1	GHz

- Add subclauses providing definitions of noted parameters

Coherent Detector Front-end
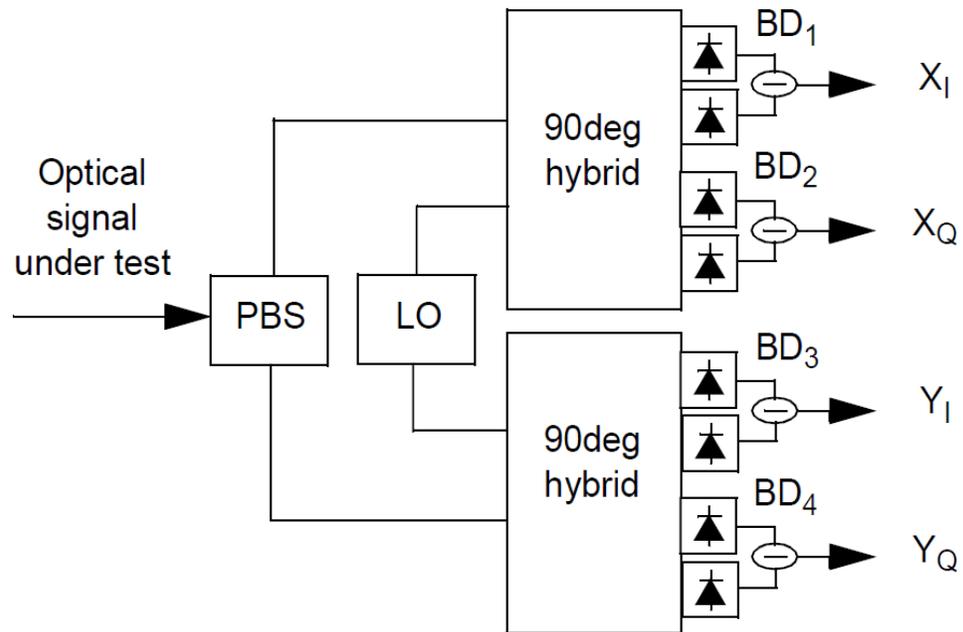
Add text:
The incoming optical signal is split into two orthogonal polarizations (x and y) by a polarization beam splitter (PBS). The two polarization components are mixed with their co-polarized components from the optical local oscillator (LO) in two 90-degree optical hybrids, followed by four balanced photo-detectors (BD_x), which convert the four components of the optical signals into their corresponding electric signals.

Add Table: Coherent detector front-end parameters

Description	Value	Unit
3-dB bandwidth (min)	65	GHz
ENOB	5	bit
Oversampling ratio	1.25	
Local oscillator linewidth (max)	30	kHz

Add subclauses providing definitions of noted parameters

Offline digital signal processing used for TQM calculation
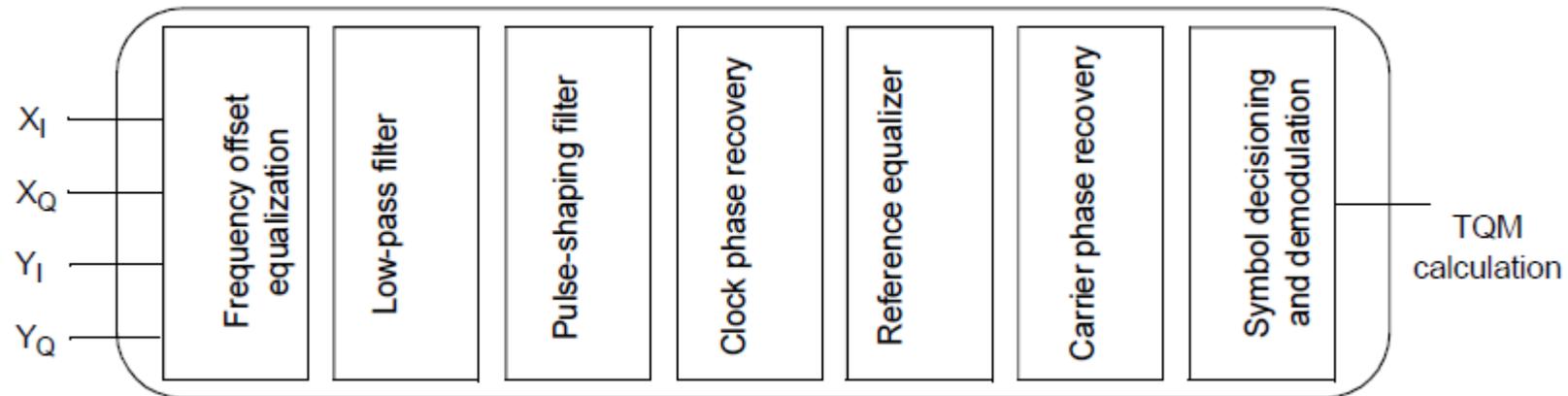
- Add subclauses providing definitions of noted steps. Leverage descriptions for each step on Page 7 of fan_3dj_02a_2407.pdf.