# TP3 Specifications for CR4/CR10

IEEE P802.3ba

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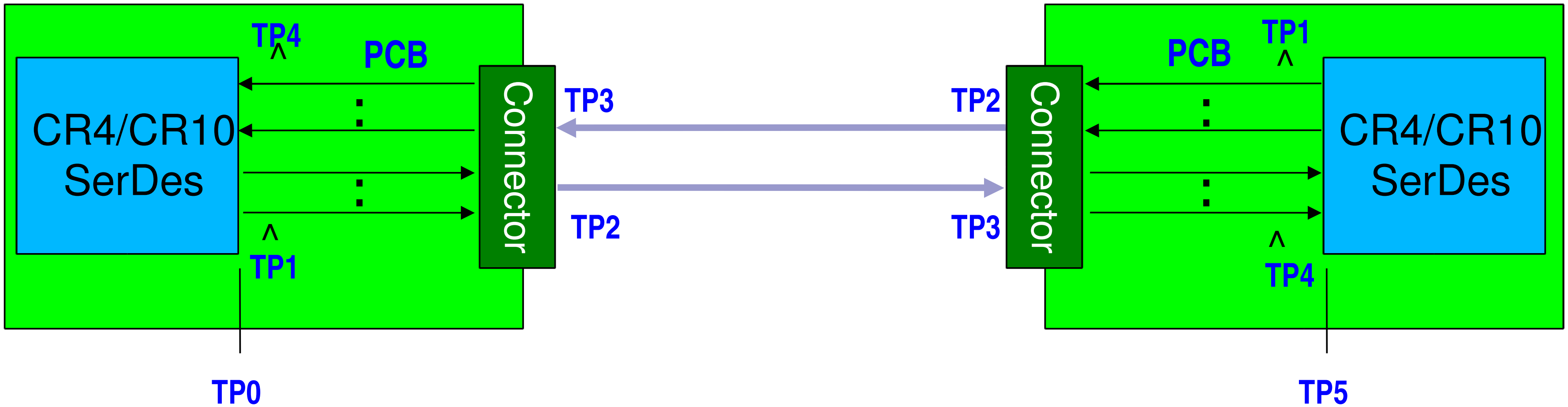
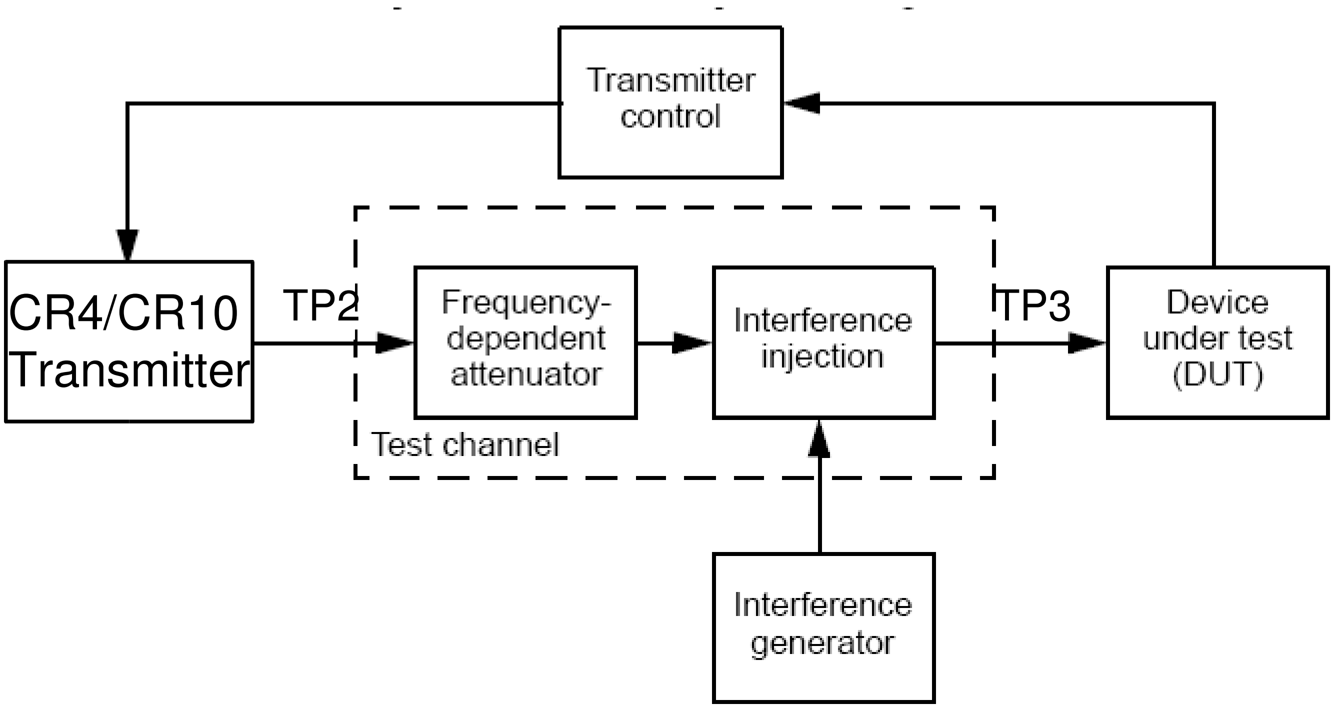
# CR4/CR10 Link Block Diagram and Issues

- **D1.2 Specifications defines from TP0, TP2, and TP5 but TP3 is missing!**
- **In CR4/CR10 unlike KR the most critical parameters for interoperability are TP2 and TP3**
  - **TP0 and TP5 are not sufficient for interoperability for an open external interface when not one OEM controls the overall link.**
- **Without TP3 specification CR4/CR10 will have significant interoperability in the field.**



# Proposed CR4/CR10 Interference Test Setup

- **Just replace KR frequency dependent attenuator with 10 m cable impulse response or worst case cable**




CR4/CR10 **-Interference tolerance test setup**

# Receive Characteristics at TP3

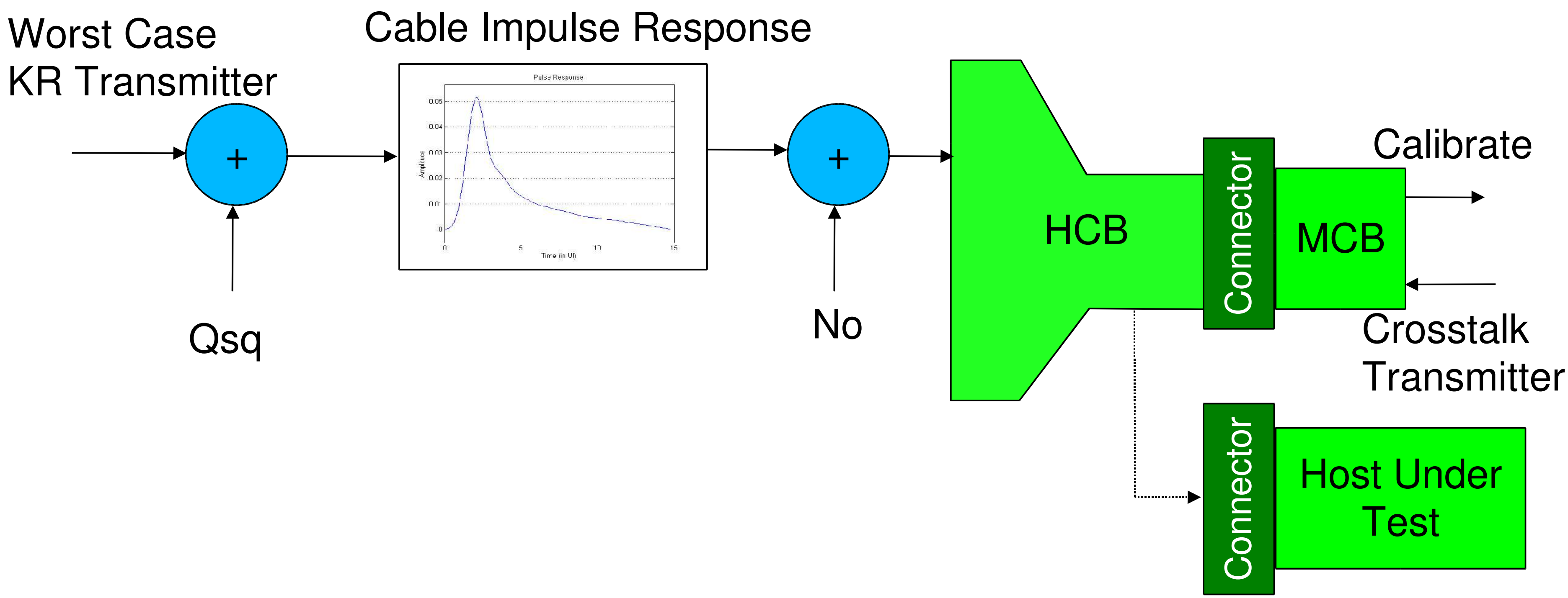
- **Starting with KR interference tolerance table**
  - **$m_{TC}$ removed since the impulse response for the frequency dependent attenuator provided or suitable length of cable will be used.**
  - **Minimum KR receive waveform v2 added consistent with TP2 and the cable loss**
  - **Amplitude of broadband noise was calucated for shortest cable and longest cable using 4 NEXT and 3 FEXT.**

**Table 72–10—10GBASE-KR interference tolerance parameters**

| Parameter | Test 1(0.5 m) | Test 1(10 m) | Units |
|---|---|---|---|
| Target BER | $10^{-12}$ | $10^{-12}$ | |
| minimum KR receive waveform “v2” b | 250 | 150 | mV |
| Amplitude of broadband noise (min. RMS) | ~~5.2~~ 4.0 | ~~12~~ 2.4 | mV |
| Applied transition time (20%–80%, min.) | 47 | 47 | ps |
| Applied Sinusoidal jitter (min. peak-to-peak) | 0.115 | 0.115 | UI |
| Applied random jitter (min. peak-to-peak)[b] | 0.130 | 0.130 | UI |
| Applied Duty Cycle Distortion (min. peak-to-peak) | 0.035 | 0.035 | UI |

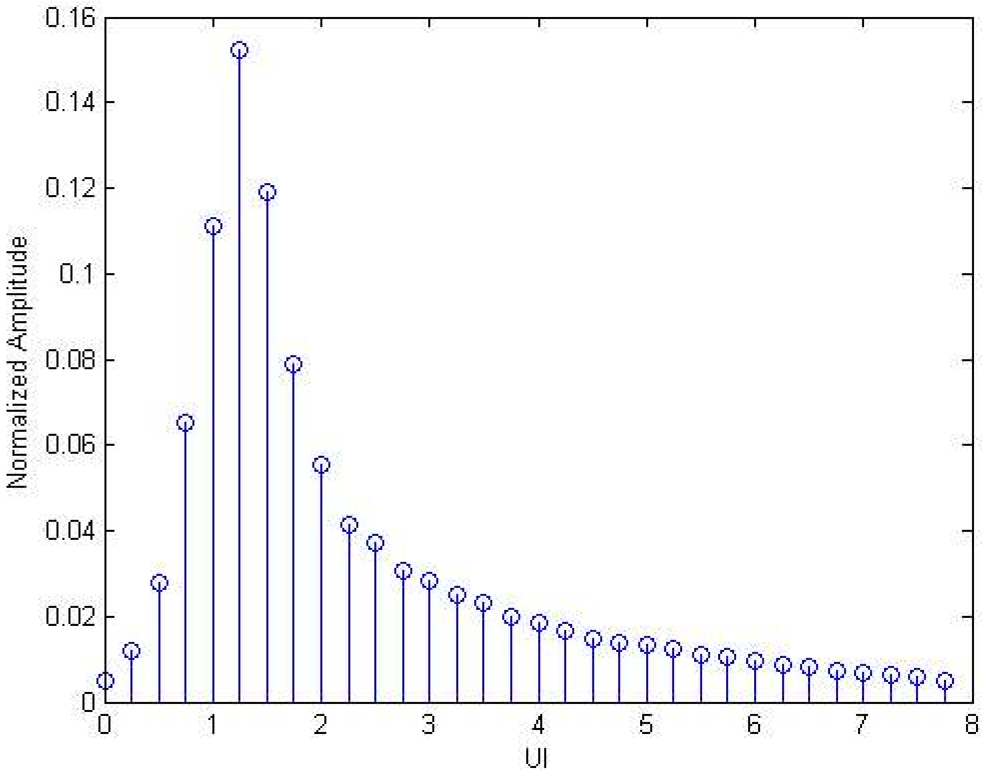
# Block Diagram of TP3 Tester

- **Step 1 – transmitter is set to the min Qsq=55.6 with crosstalk transmitter operating, measure MCB output and adjust No(noise) as needed.**
- **Step 2 – Plug the HCB in to the host under test while the host transmitter is operating.**



# 10 m Cable Impulse Response

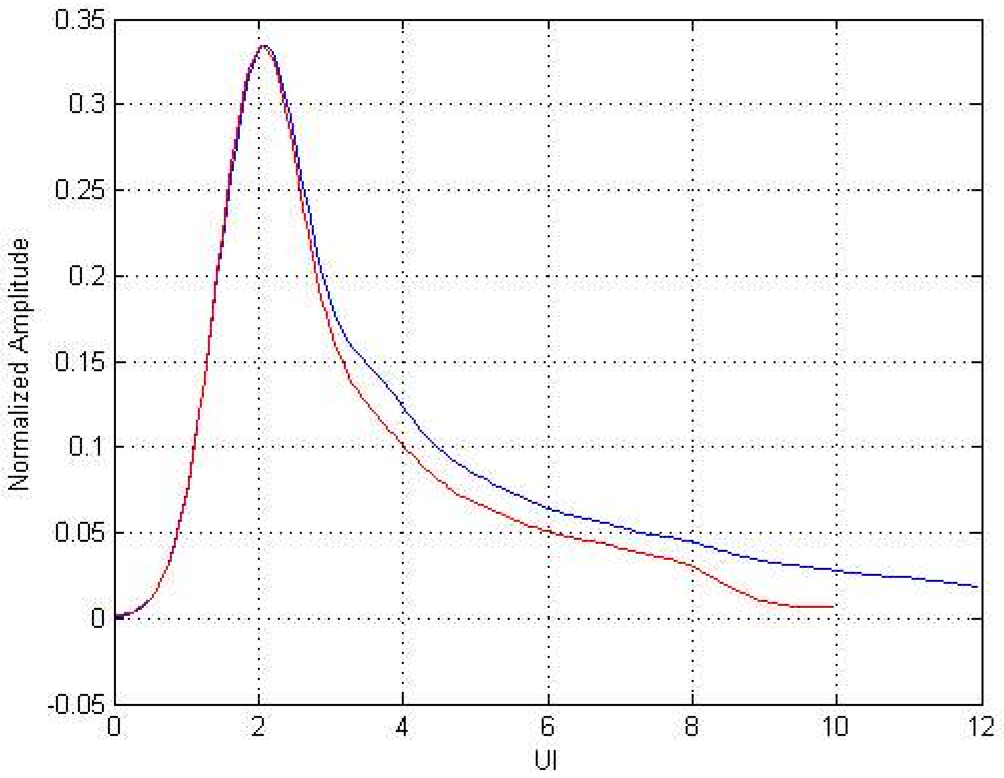
- **MCB and connector removed from one end of the cable to eliminate double counting one connector.**




| UI | Amp |
|---|---|
| 0 | 0.0049 |
| 0.25 | 0.0118 |
| 0.5 | 0.0277 |
| 0.75 | 0.0651 |
| 1 | 0.1109 |
| 1.25 | 0.1525 |
| 1.5 | 0.1192 |
| 1.75 | 0.0790 |
| 2 | 0.0554 |
| 2.25 | 0.0416 |
| 2.5 | 0.0374 |
| 2.75 | 0.0305 |
| 3 | 0.0281 |
| 3.25 | 0.0249 |
| 3.5 | 0.0230 |
| 3.75 | 0.0201 |
| 4 | 0.0187 |
| 4.25 | 0.0166 |
| 4.5 | 0.0148 |
| 4.75 | 0.0139 |
| 5 | 0.0132 |
| 5.25 | 0.0125 |
| 5.5 | 0.0109 |
| 5.75 | 0.0103 |
| 6 | 0.0097 |
| 6.25 | 0.0087 |
| 6.5 | 0.0080 |
| 6.75 | 0.0073 |
| 7 | 0.0068 |
| 7.25 | 0.0064 |
| 7.5 | 0.0057 |
| 7.75 | 0.0050 |

# 10m 24 AWG Cable Pulse Response

– **Blue original 10 m cable response**
– **Red recreated 10 m cable pulse response using the impulse response**



# Summary

- **TP3 tester is based on KR interference tolerance tester but the frequency dependent attenuator is replaced with a 10 m cable impulse response.**
  - **A suitable length of copper cable able is acceptable alternative.**
- **The proposed TP3 tester is compatible with KR.**
- **The pulse response of the original cable and recreated have good match with <2% penalty difference.**
- **Without TP3 specification CR4/CR10 could have significant interoperability issues in front port application with different OEMs supplying the equipment.**

# Text for the Draft Based on KR

## Introduction

A major problem in communicating across parallel copper cable is interference. The interfering signal can come from a variety of sources including the following:

a) Crosstalk from other data channels running the same kind of signals as the channel of interest. This type of interference is usually subdivided into

1) Far-end crosstalk (FEXT) coming from data traveling in the same general direction as the channel of interest.

2) Near-end crosstalk (NEXT) originating from a channel with a transmitter near the receiver of the channel of interest.

b) Self interference caused by reflections due to impedance discontinuities, stubs, etc. This is a form of intersymbol interference (ISI) that is beyond what a reasonable equalizer can compensate.

c) Alien crosstalk, which is defined to be interference from unrelated sources such as clocks, other kinds of data, power supply noise, etc.

For the channel to work, the receiver must be able to extract correct data from the lossy channel in the presences of interference. The ability of the receiver to extract data in the presence of worst case interference over shortest cable (0.5 m) and longest cable (10 m) is an important characteristic of the receiver and needs to be measured. This ability is called interference tolerance.

## 69A.2 Test setup

The interference tolerance test is performed with the setup shown in Figure 85-xyz.

# Text for the Draft Based on KR cont.

TP2 generator

The amplitude delivered by the TP2 pattern generator to the test channel shall meet total jitter, transmit waveform v2, QSQ, and vertical eye opening as given by Table 85-5.

Test channel

The test channel impulse response is given by Fig xyz and value listed in table xyz . A suitable length of cable assembly meeting characteristics of table 85-7 is acceptable alternative.

**Interference generator**

The interference generator is a broadband noise generator capable of producing white Gaussian noise with adjustable amplitude. The power spectral density shall be flat to Â±3 dB from $f_1$ to 0.5 times the signaling speed with a crest factor of no less than 6.5. The amplitude of the interference generator is adjusted for output noise levels as given by table xyz while the opposing data traffic is transmitting valid 64B/66B.

**Transmitter control**

For 10GBASE-CR4/CR10 testing, the pattern generator is controlled by transmitter control. Transmitter control responds to inputs from the receiver to adjust the equalization of the pattern generator. The receiver may communicate through its associated transmitter, using the protocol described in 72.6.10, or by other means.

**Test methodology**

For 10GBASE-CR4/CR10 testing, the pattern generator shall first be configured to transmit the training pattern defined in 72.6.10.2. During this initialization period, the DUT shall configure the pattern generator equalizer, via transmitter control, to the coefficient settings it would select using the protocol described in 72.6.10. During training, the broadband noise measured at TP3 shall have RMS amplitude less than 1 mV. The pattern generator shall be configured to transmit the test pattern defined in xyz.