Common Mode and Common Mode to Differential conversion specifications in P802.3bj Draft 2.0

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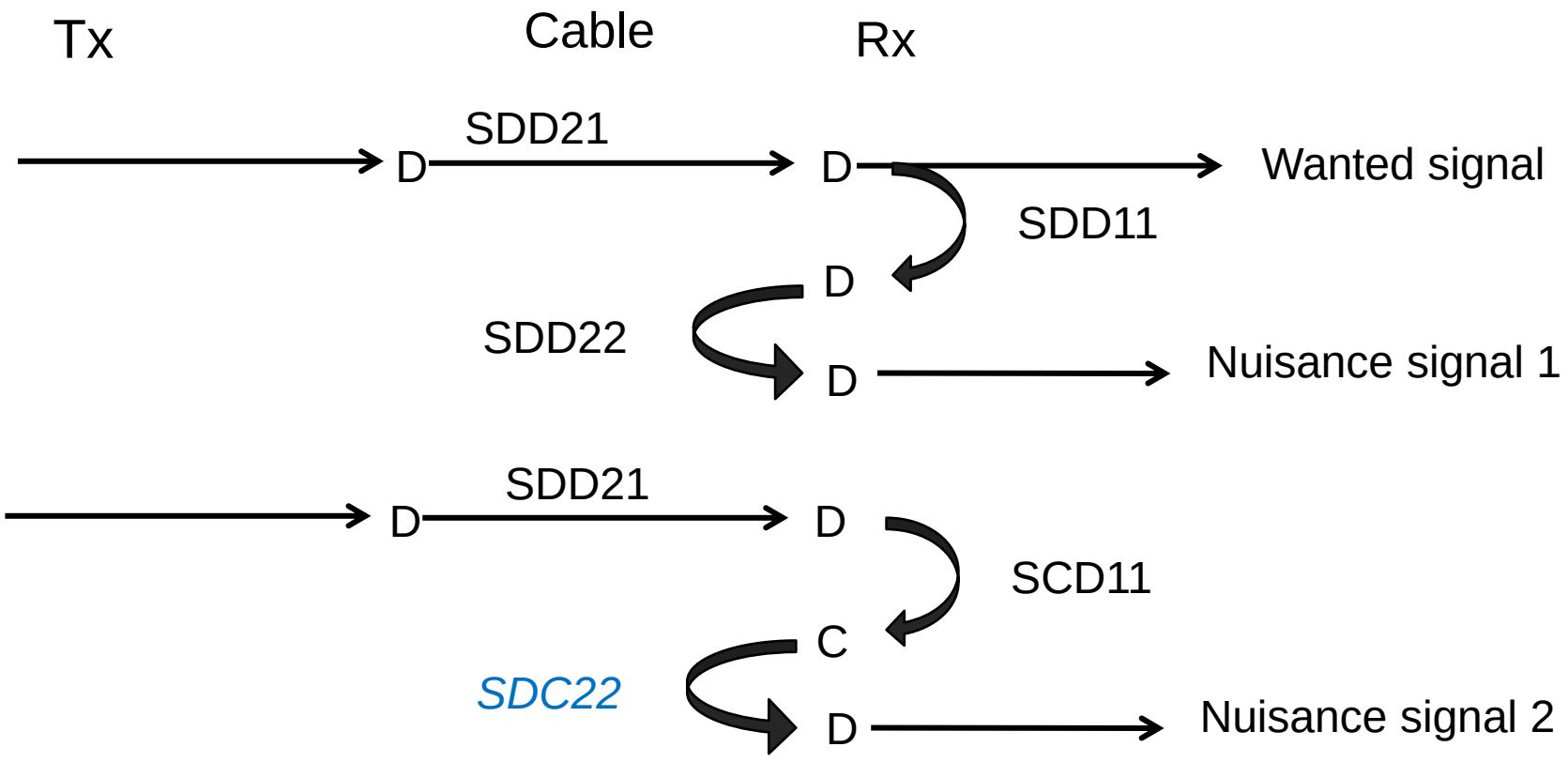
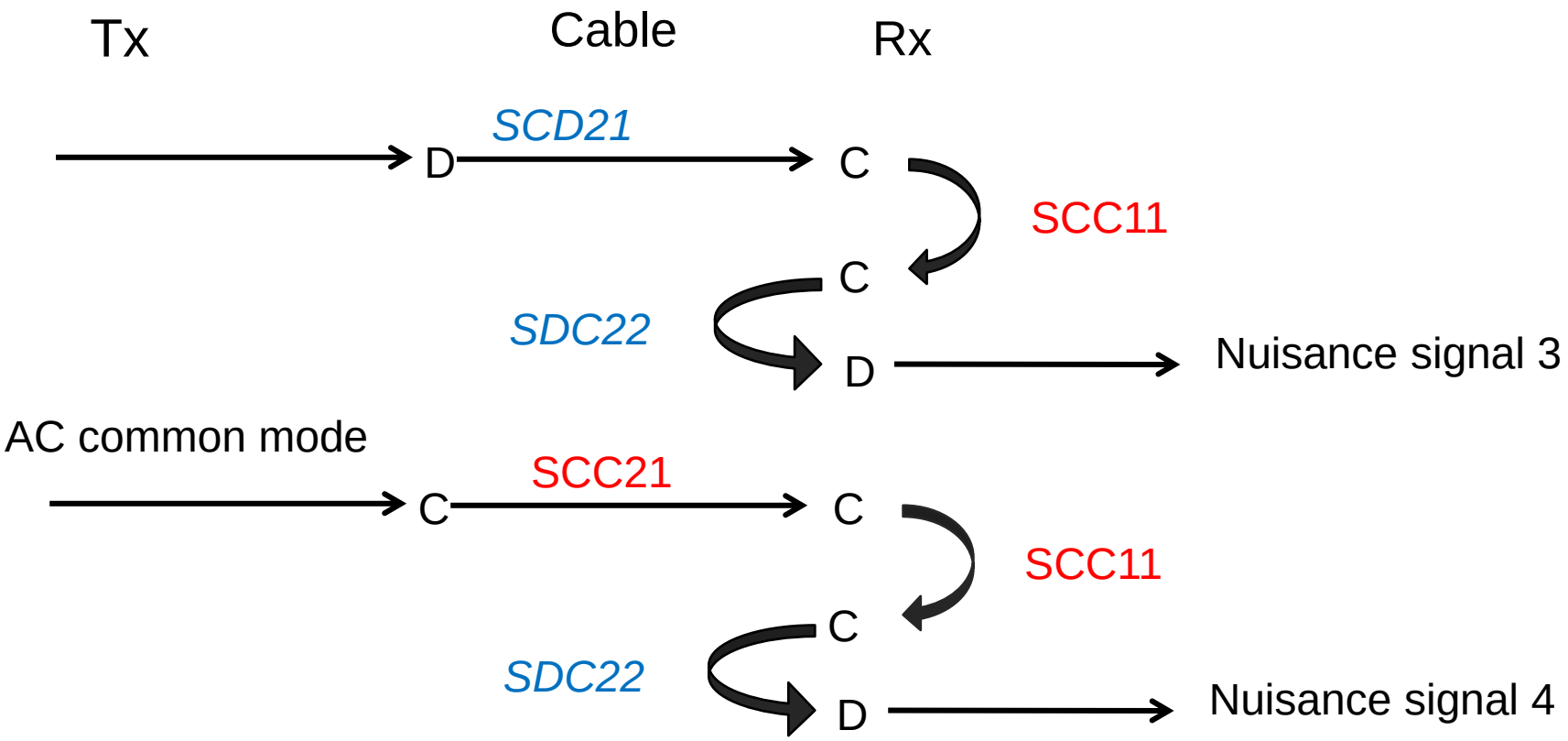
Introduction

- This presentation is related to comments 184, 186, 187,230, 236, 238 (details described later).
- It shows that a number of additional specifications are required to limit the generation of nuisance signals that will interfere with the wanted signal. The proposed additional specifications are in *blue Italics*.
- Signals that pass through the cable 3 times have not been described because they will be highly attenuated and the additional specifications will also control these.
- Generally we want to have any single nuisance signals more than 20dB lower than the wanted signal and achieving this in a single specification is difficult so having two control specifications is good.

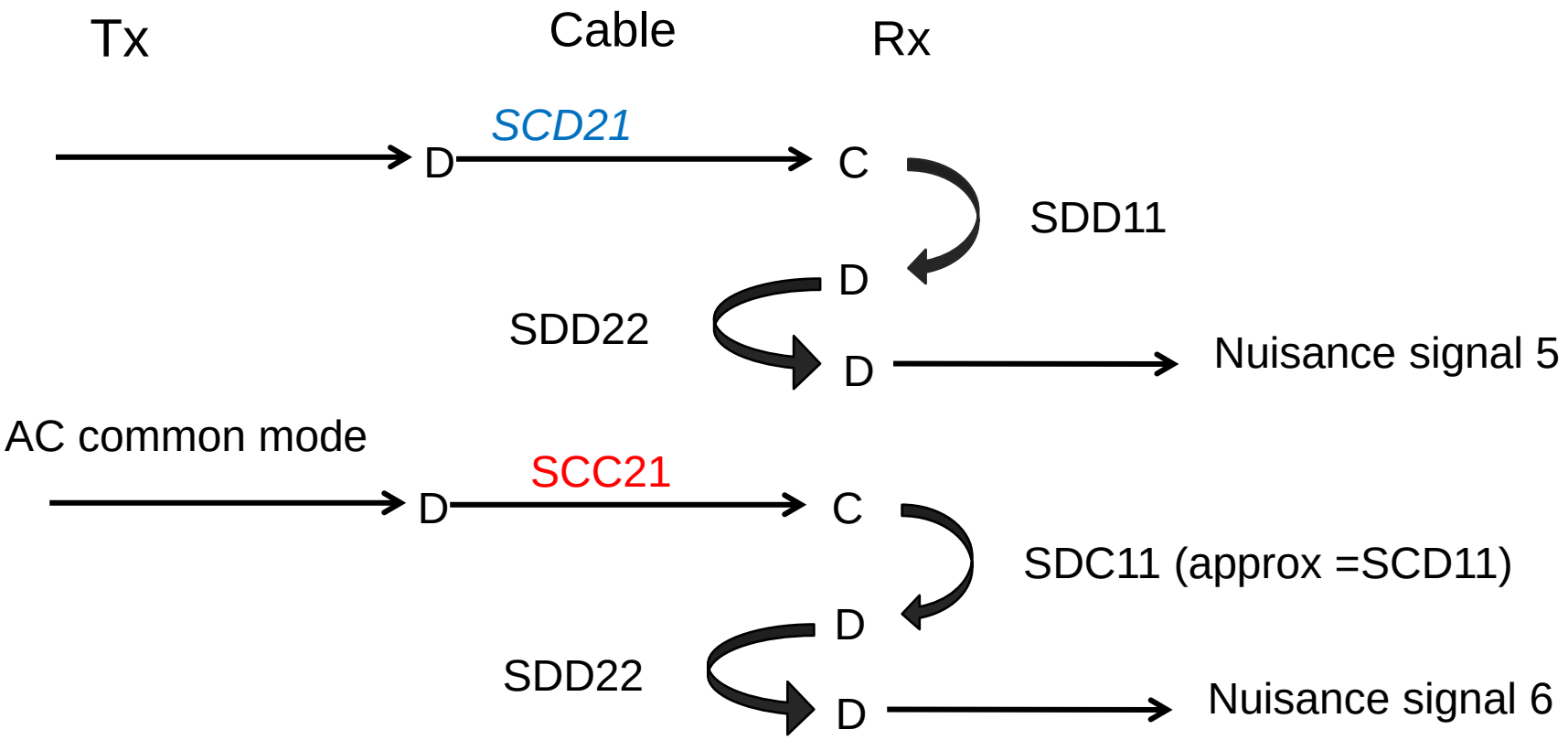
Methods of Generating Nuisance signals
RED or Blue indicate no spec in Draft 2.0



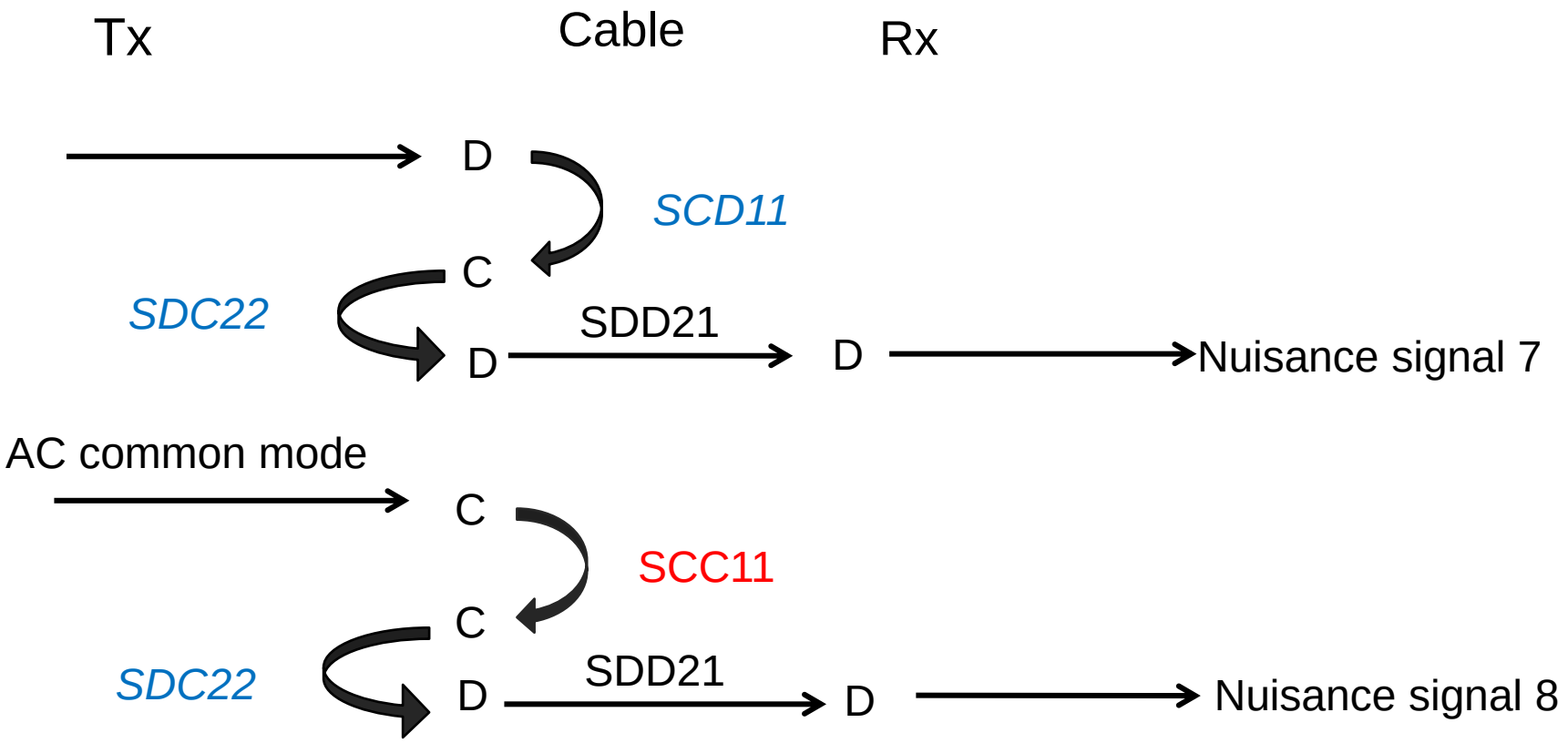
Methods of Generating Nuisance signals cont.



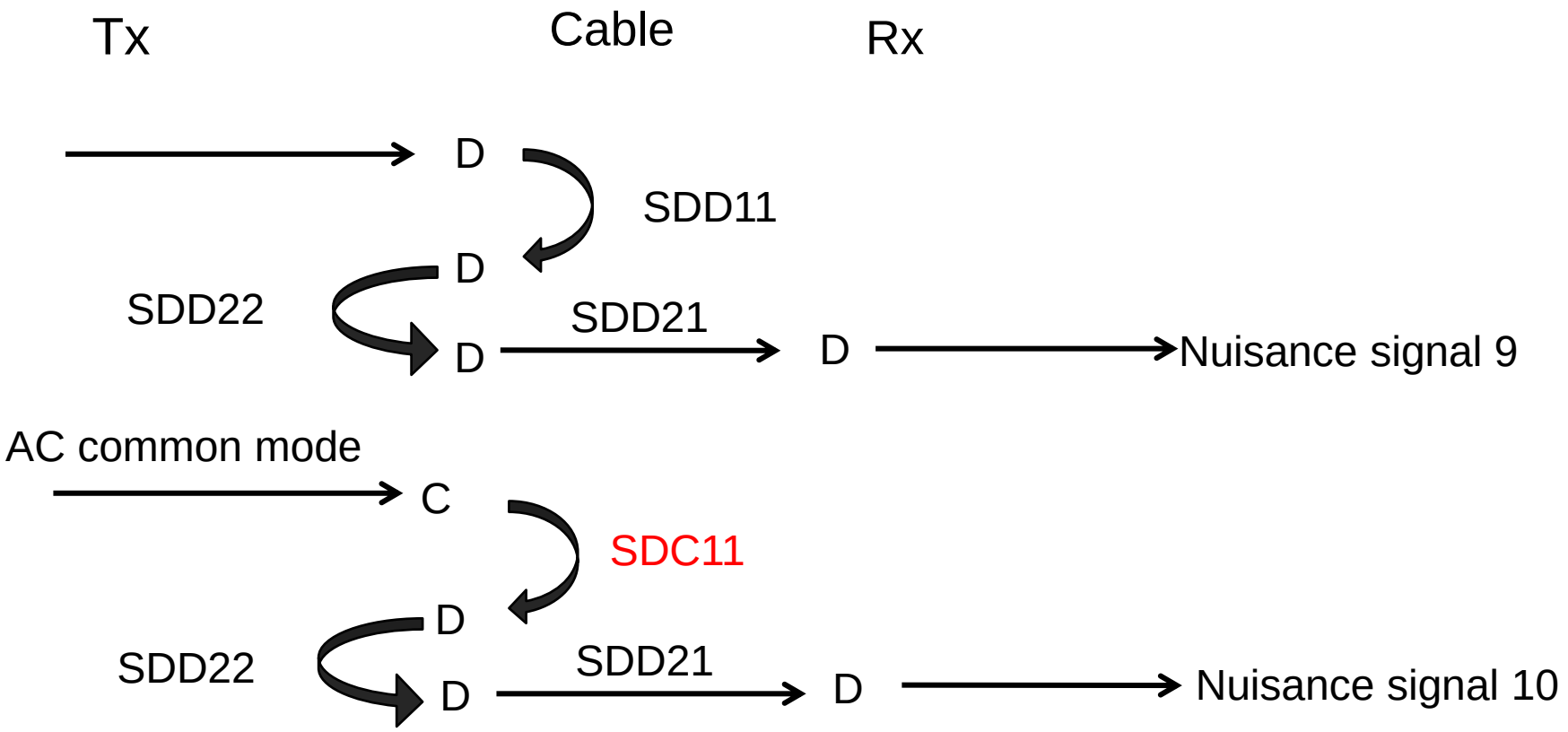
Methods of Generating Nuisance signals cont.



Methods of Generating Nuisance signals Cont



Methods of Generating Nuisance signals Cont



Proposed solution summary

- Add SDC22 specification to the host Tx. Suggest make 3db more relaxed than SCD11 for host Rx. (comment 186)
- Add SCD11/22 specifications for the cable. Suggest make these the same as the SCD11 specification of the host.
- Add SCD21 specification for the cable suggest SDD21 – 10 dB. (i.e. 10 dB lower signal than the through loss.) (comment 186 but better proposed solution)

Compliance boards (test fixtures) need to be better than product

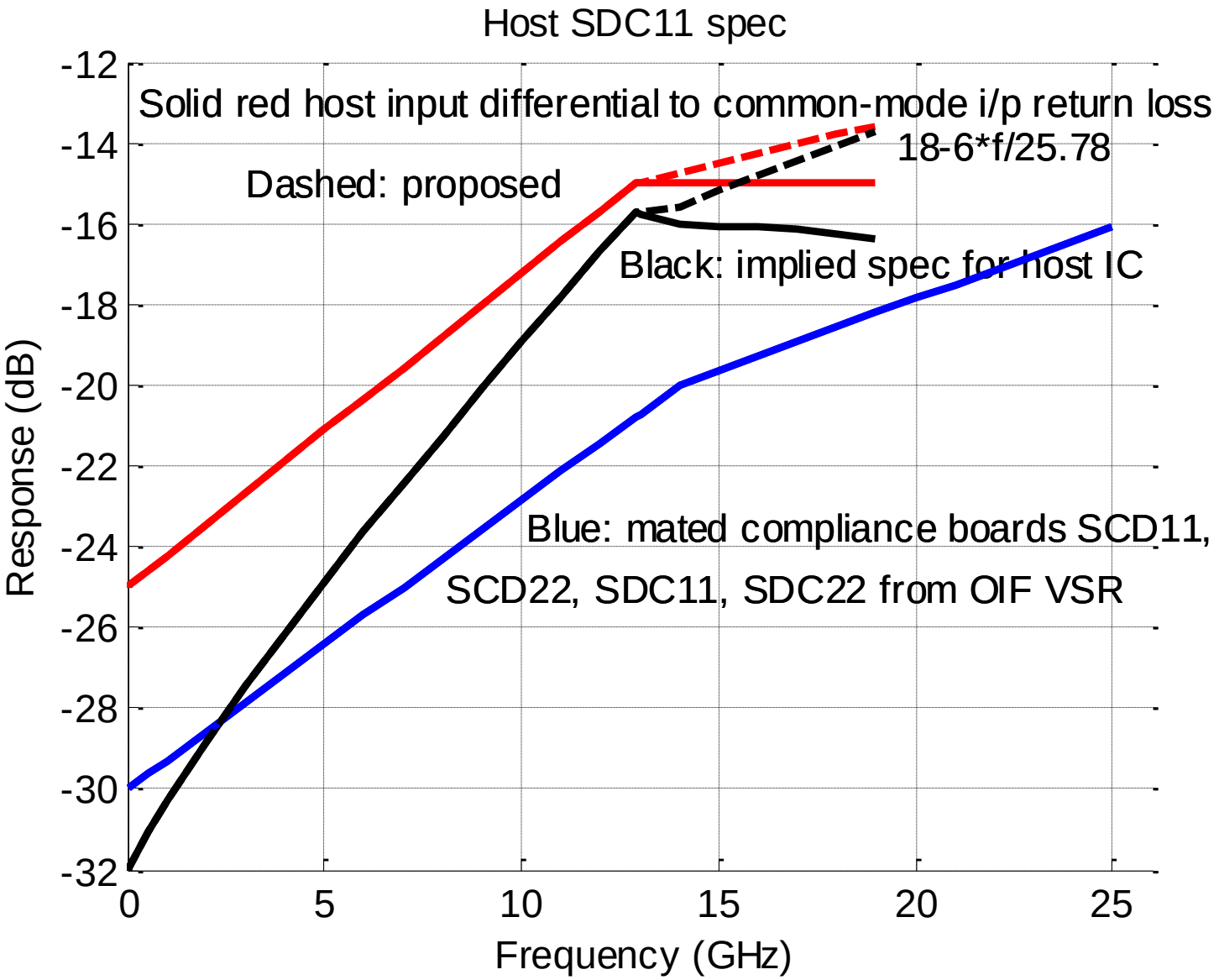
- Draft 2.0 has a spec for host input differential to common-mode return loss
  - 92.8.4.2, Eqn 92-6 (and a conflict in Table 92-8 that should be resolved. (comment 184 and 238)
- OIF VSR has a specification for the compliance board (TP2 or TP3 test fixture) below which was based on measurements of compliance boards. Recommend we add this to 802.3bj. (comment 187 and 236)

HCB-MCB SCD11,SCD22 and SDC11,SDC22 ≤ -30+(5/7)f dB for f < 14 GHz (13-11)

HCB-MCB SCD11,SCD22 and SDC11,SDC22 ≤ -25+(5/14)f dB for 14 GHz < f < 28.1 GHz

- However Host Eqn 92-6 must have a specification significantly relaxed compared with that of the Compliance Board
  - Product has to fit in the difference between the two specs
  - Therefore propose that Eqn 92-6 above Nyquist is changed from 15 to 18 - 6*f/25.78 (comments 187)

Graphical representation of SDC11 specs



Something has to absorb common mode energy

- Propose add a common mode return loss specification to the host Tx of 2 dB from 200 MHz to 19 GHz (comment 230)
- Propose add a common mode return loss specification for the cable of 2 dB from 200 MHz to 19GHz (comment 230)

Comment 184

Cl **92** *SC* **92.8.4** *P* **179** *L* **25** # 184

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Comment Type **T** *Comment Status* **X**

There is a contradiction in the document. The summary table 92-8 has different values for the Differential to Common-mode input return loss than the referenced subsection 92.8.4.2.

SuggestedRemedy

Change the value to "(Equation 92-6)

Comment 186

Cl **92** *SC* **92.8.3** *P* **172** *L* **15** # 186

Dudek, Mike QLogic

Comment Type **TR** *Comment Status* **X**

There is a potential source of interfering signal that could cause high error rates that is not controlled. There is an allowed common mode output amplitude from the Tx. Also the cable is allowed to convert an uncontrolled amount of differential energy into common mode energy. The Rx has no common mode return loss specification so 100% of the energy can be reflected to the Tx, where 100% of this reflected common mode energy can be converted to interfering differential energy.

SuggestedRemedy

Add a cable specification for differential to common mode conversion (SCD21) of 10dB to section 92.10. Also add a specification for Common mode to differential conversion reflection for the Tx output (SDC22) to table 92-6 and a subsection to describe it. Suggested limit would be 3dB more relaxed than equation 92-6.

Comment 187

Cl **92** *SC* **92.8.4.2** *P* **180** *L* **3** # 187

Dudek, Mike QLogic

Comment Type **TR** *Comment Status* **X**

There is no specification for the mated compliance board common mode to differential return loss despite there being a specification for this for the receiver. With a realistic specification (that adopted by OIF VSR) at high frequencies the host product specification for the common mode to differential conversion is too close to that of the mated compliance boards making the specification almost impossible to meet. I will bring a presentation showing the effect to the Victoria meeting.

SuggestedRemedy

Add a specification for the mated compliance board common mode to differential return loss. Specification to be minimimum 30-5/7*f dB for 0.01<f<14 GHz and 25-5/14*f dB for 14<f<25 GHz. Change the product specification in equation 92-6 above 12.89Ghz from 12dB flat to -18 + 6/25.78*f which matches the specification OIF adopted for VSR at their last meeting.

Comment 230

Cl **92** *SC* **92.8** *P* **171** *L* **8** # 230

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Comment Type **TR** *Comment Status* **X**

The following items are needed for a viable spec (technical completeness):
Host common-mode output return loss
Absorbs common-mode energy
Host mixed-mode output return loss or termination mismatch
Limits conversion of reflected common-mode signal into interfering differential signal
Cable common-mode return loss
Absorbs common-mode energy
Integrated Common-Mode Conversion Noise or differential to common mode through loss
Limits conversion into common mode that would otherwise exceed the AC common-mode output voltage spec and the AC common-mode tolerance of the receiver, and could cause EMI - relevant to low loss cables in particular
These items are present in the InfiniBand FDR spec. Comparison with 40GBASE-CR4 and 100GBASE-CR10 may be interesting but does not justify gaps in this spec.

SuggestedRemedy

Add specs:
Host common-mode output return loss, -2 dB, 50 MHz to 20 GHz
Host common mode to differential output return loss, 16-1.22f, 50 MHz to 20 GHz
Cable common-mode return loss, -2 dB, 50 MHz to 20 GHz
Integrated Common-mode Conversion Noise, 40 mV.
Integrated Common-mode Conversion Noise is defined analogously to Integrated Crosstalk Noise. If that isn't clear enough, see the InfiniBand FDR spec, part of InfiniBand Architecture Specification Volume 2 Release 1.3.

Comment 236

Cl **92** *SC* **92.11.3** *P* **196** *L* **22** # 236

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Comment Type **TR** *Comment Status* **X**

We need mated compliance board Sdc11, Sdc22, Scd11, Scd22 specs that are at least 2.5 to 3 dB better than the host receiver differential to common-mode input return loss spec in 92.8.4.2. At the moment we have just through conversion: Sdc21, Sdc12, Scd21, Scd12 (or some of them - not clear what "common-mode conversion loss" means exactly).

SuggestedRemedy

Add mated compliance board Sdc11, Sdc22, Scd11, Scd22 specs that are at least 2.5 to 3 dB better than the host receiver differential to common-mode input return loss spec.
Expect a presentation.

Comment 238

Cl **92** *SC* **92.8.4.2** *P* **180** *L* **2** # 238

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Comment Type **TR** *Comment Status* **X**

The receiver differential to common-mode input return loss spec in eqn 92-6 doesn't agree with Table 92-8, Receiver characteristics at TP3 summary.

SuggestedRemedy

Correct whichever one is wrong.