SAS-2 MiniSAS Channel Characteristics with Return Pin Removal (08-292r0)

Barry Olawsky

Hewlett Packard

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Potential Issue

- The 08-280r0 SAS-2.2 “Active Copper Cables for SAS-2.x, Part 3” proposes substituting power sense and power for the ground (signal return) pins B10 and B13
- While an active cable may compensate for the degradation of the channel and additional crosstalk with signal amplification a passive cable can not
- This study takes a cursorily look at the changes in channel insertion loss, NEXT and FEXT of an internal miniSAS connector/cable interface when the ground plane connection to pin B18 is severed and then both pins B15 and 18. No additional capacitance is added. Only the capacitance of the connector footprint pads (for B15 and 18) link the connector return pin to the other ground planes on the board.

S21 for Transmit Pairs 3 and 4

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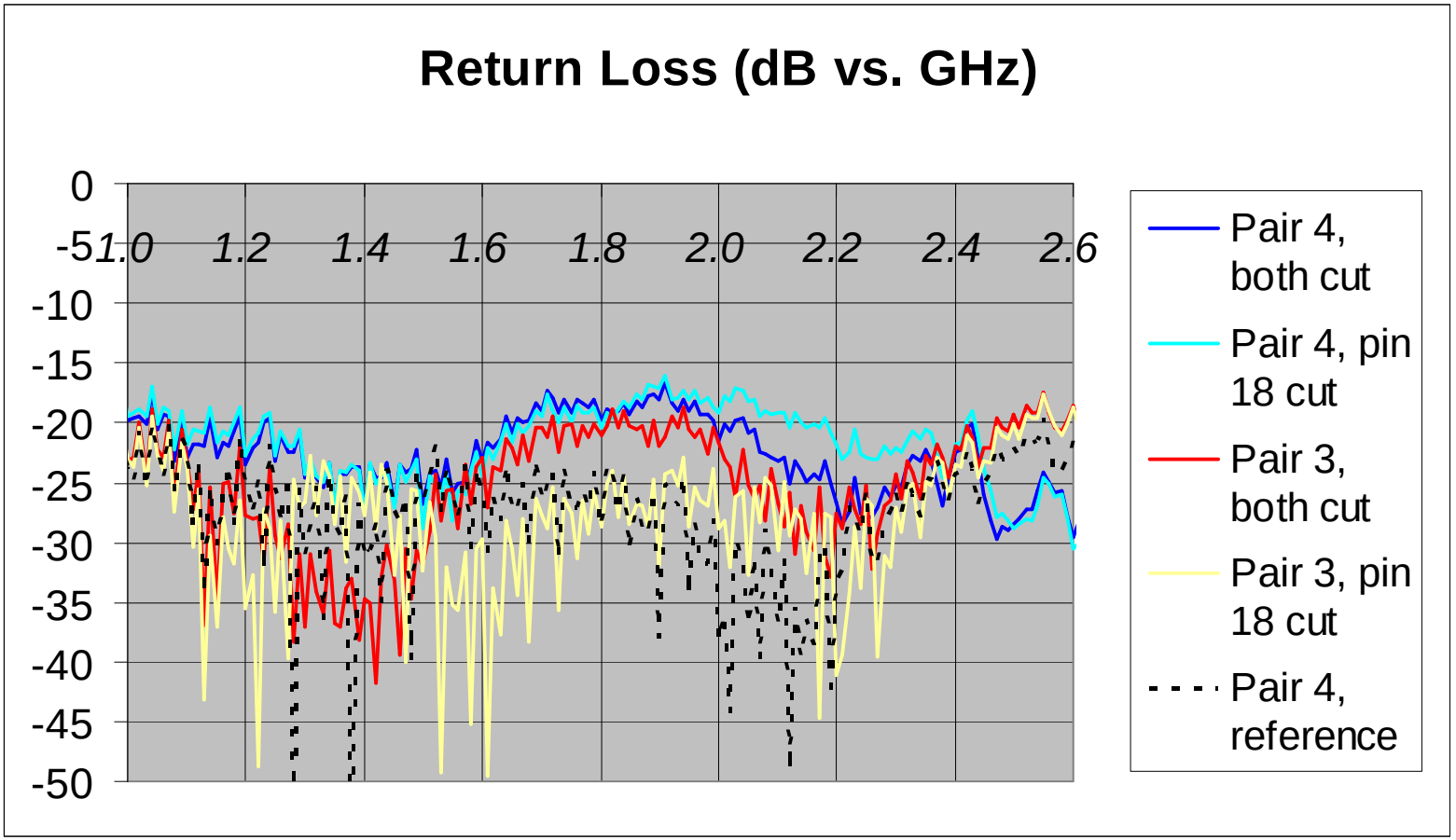
Notes

- Channel deterioration appears to be worse with both B15 and B18 severed.
- Under 6GHz, the additional channel attenuation peaked at less than 1dB
- Pairs three and four appeared to deteriorate a similar amount even though pair four is isolated when both B15 and B18 are removed
- Other effects of test boards have not been de-embedded from the measurement

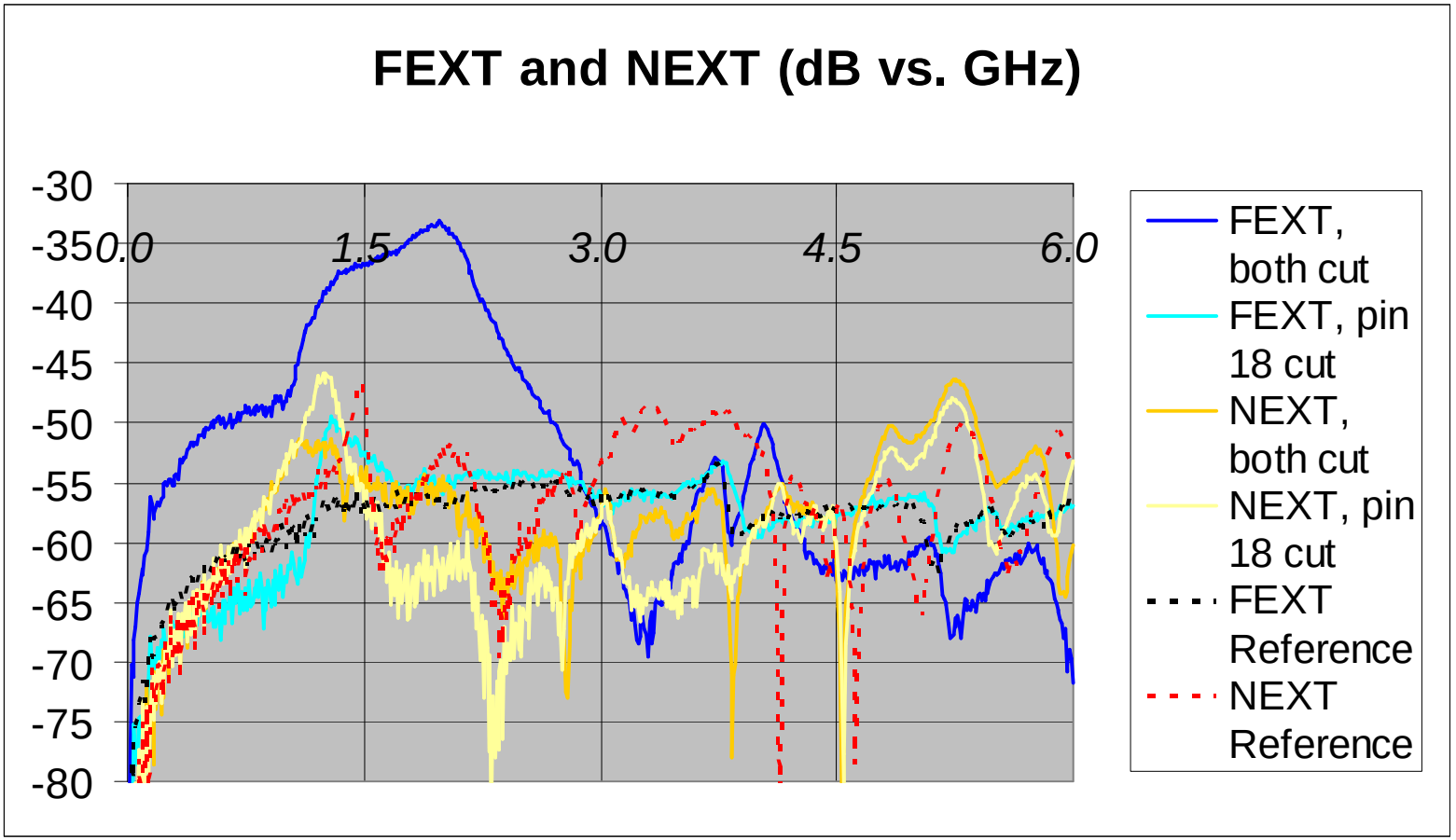
S11 for Transmit Pairs 3 and 4



Notes

- Channel deterioration appears to be negligible for pair three when B18 is severed. Dominant signal return paths for pair 3 are B15 and B12
- Under 6GHz, the return less is as much as ~7dB higher
- Other effects of test boards have not been de-embedded from the measurement

Crosstalk for TX4 Aggressor Pair



NEXT: RX4 is victim, FEXT: Far end RX3 is victim

Notes

- NEXT characteristics change with respect to frequency but it is not conclusive that severing of B15 and B18 increase the levels
- The negative effects of severing B15 and B18 are evident in the FEXT results. B15 isolates TX pairs three and four. It's unclear from the data if severing only B15 would result in FEXT levels seen when both B15 and B18 are severed.

Caveats

- Board mounted connector is the internal vertical miniSAS
- Cable used is a 4-meter 30-AWG 36-pin internal miniSAS
- Fixturing was not de-embedded
- No de-coupling capacitors used to stitch return pin to ground
- Land size minimal (only slightly larger than miniSAS pad). A much larger size coupled tightly to ground plane would likely make the return pin behave like a ground connection.

Conclusion

- Careful re-assignment of return pins may produce improved performance without the need for excessive board design effort. Although such efforts may be advisable where feasible.
- FEXT appears to be the most dominant factor and is clearly worse when an interior return pin is re-assigned
- Although the enclosed data is compromised by lack of fixture de-embedding it does demonstrate the potential effect of return pin re-assignment and how to avoid the worst case configurations
- Reassignment of return pins B1, B18, A1 or A18 appear to minimize FEXT. Selection of A1 and B1 may also be inadvisable due to their combined effect on S21.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