To: T10 Technical Committee
From: Kevin Marks
Date: November 6, 2006
Subject: T10/06-483r0 – SAS-2 : EMI Considerations for SAS-2

Revision History

Revision 0 (8/16/06) – Initial proposal

Related Documents

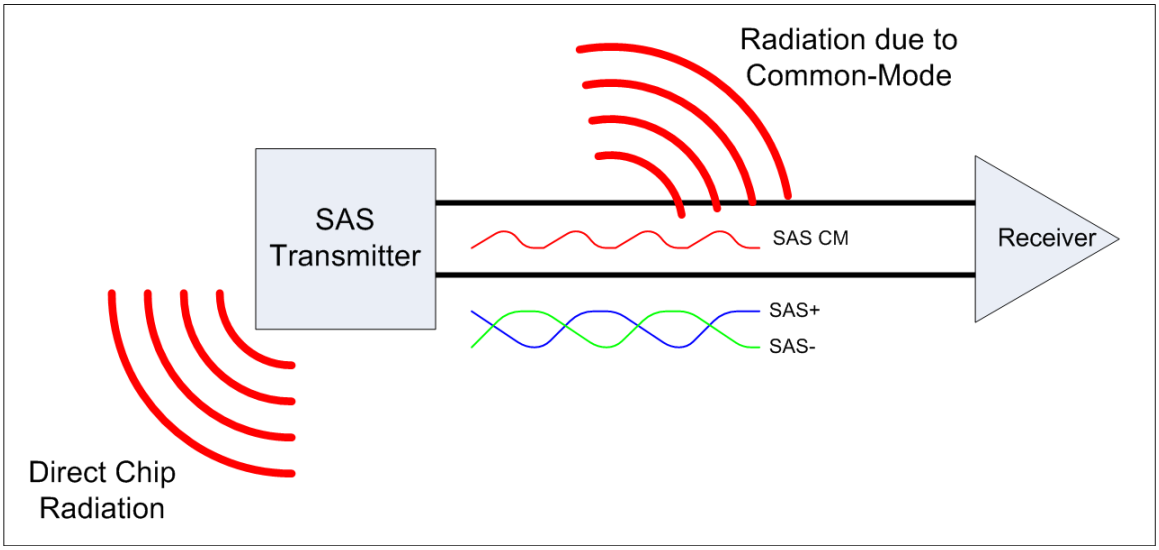
Serial Attached SCSI - 2 (T10/1760-D – SAS-2r06)

Overview

Sources of EMI

1. Radiated signals generated by chip and coupled equally to both lines.
2. A $V_{(offset)}$ from signal ground created in the driver circuit and the common ground.
3. A ground differential created between the transmitting and receiving locations.
4. Inadequate consideration given during physical CAD layout of the SAS TX and RX subsystems.

It is Dell's believe that the most cost effective path to resolution lies in attacking source 1) and/or 2)



Common-Mode Radiation

- Cause
  - Caused by an imbalance between the halves of the Differential Pair. The imbalance can be due to:
    - Driver Asymmetry
    - Amplitude Asymmetry
    - Phase delay
- Qualification
  - Measurement of Common-Mode voltage in the frequency domain

Direct Chip Radiation

- Cause
  - High Frequency energy on the chip is large compared to system/circuit board.
  - Chip and Heat-Sink act as antenna for EMI

- Qualification
  - Need to be able to measure the radiated energy from the IC itself to frequencies as high as 3rd harmonic of data rate (18GHz for 6GB/s SAS-2)
  - The Society of Automotive Engineers (SAE) developed a method to measure direct chip radiation: SAE J1752; however there are limitations in frequency. Investigate limitations and work to overcome.

Next Steps

- Measurement of Common-Mode Voltage in Frequency domain of existing parts.
- Correlation of CMV measurements to EMC Radiation
- Investigation of SAE J1752 and applicability to SAS