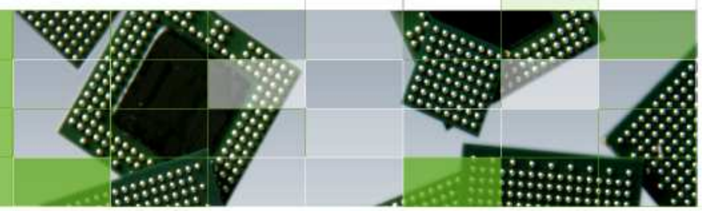

Calculation of THRU to XTALK power ratios using an integral method

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Introduction

- This slide package presents a set of calculations based on the method proposed in mellitz_01_0106.
- The calculations also take into consideration the band limiting effects of the transmitter and receiver and the frequency shaping of the transmitter FFE.

Assumptions

- THRU and XTALK channels proposed by Charles Moore of Avago
  - THRU = modITTC23withCoupler.s4p
  - XTALK =
    - Molex/1m_OUTBOUND_FEXT/sj5k5g4h4_SPARS.s4p (molex out5 fext4)
    - Tyco/Case5/Case5DS1310N2D13L6.s4p (tyco case6 next2)
    - Intel/peters_01_0605_T1_next5.s4p (intel_0605 t1 next5)
- Three frequency shaping scenarios
  - no Tx FFE and no Rx or Tx band limiting
    - PSD of PRBS is sinc function
  - Tx FFE using nominal coefficient values and no Rx/Tx band limiting
    - Tx coefficients = [-0.05,0.675,-0.275]
  - Tx FFE using nominal coefficient values with Rx/Tx band limiting
    - Tx: 9 GHz, 2^{nd} order butterworth, lowpass
    - Tx: 7.5 GHz, 2^{nd} order butterworth, lowpass

Results

- For each of the three XTALK channels, the Power Ratio (or SNR) was calculated for each of the three calculation scenarios listed on previous slides.
- For all three calculation scenarios, the Molex XTALK channel resulted in at least 5 dB worse power ratio compared with the Tyco and Intel XTALK channels.
- The Tyco and Intel XTALK channels consistently resulted in very similar power ratios.

	no Tx FFE no BL SNR1	Tx FFE no BL SNR2	Tx FFE BL SNR3
molex out5 fext4	31.1	24.7	25.0
tyco case5 next2	37.7	31.2	33.0
intel_0605 t1 next5	36.7	30.3	32.7

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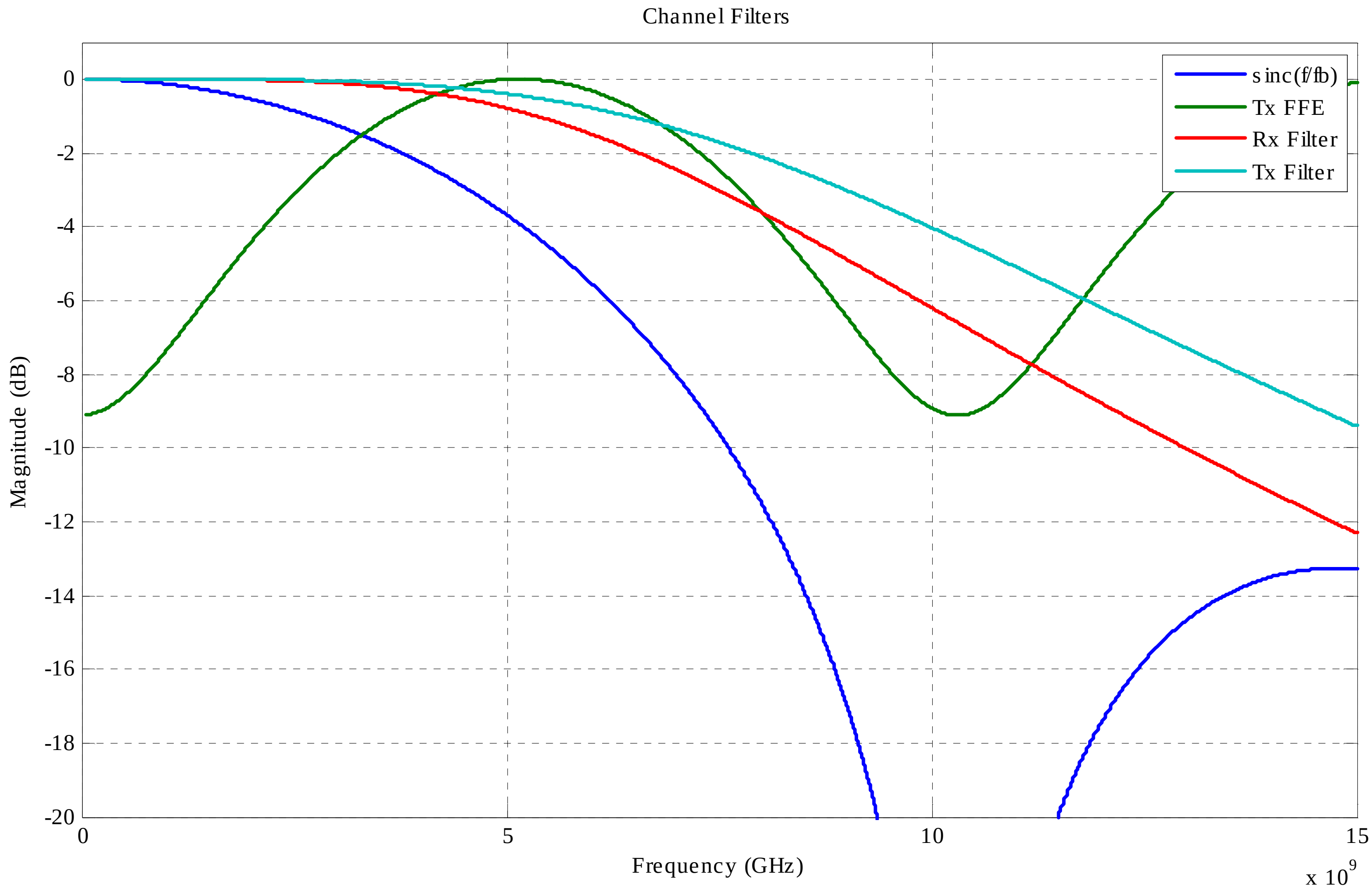
Background

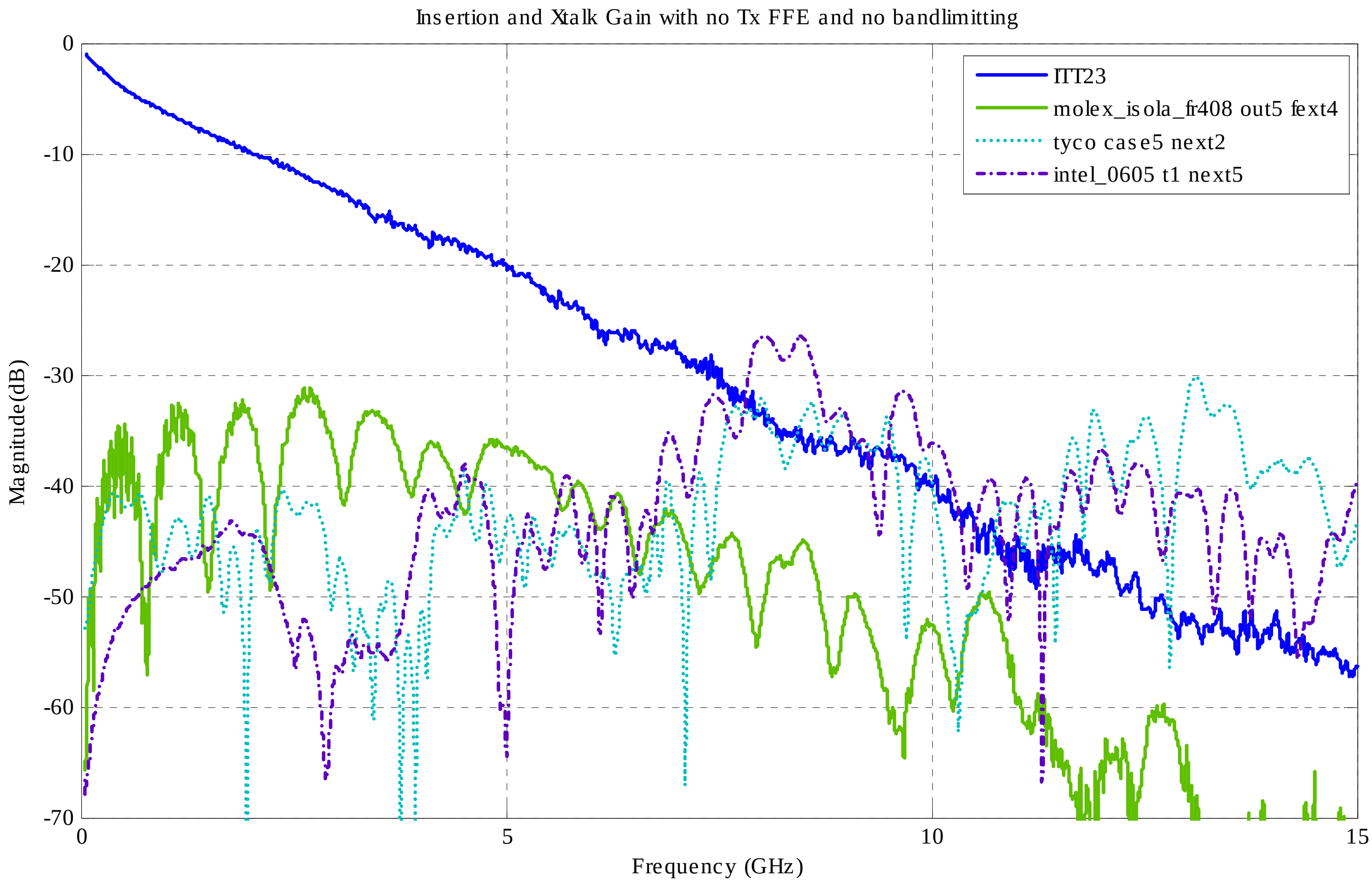
Equations

- Equation for case with no Tx FFE or band limitting
  - SNR1 = 10*log10(Pthru1 / Pxt1)
  - Pthru1 = integral((sinc(f/fb) * IL(f) * XTL(f))^2)
  - Pxt1(f) = integral((sinc(f/fb) * IL(f) * XTL(f))^2)
  - Note that constants common to both integrals have been left out.
- Equation for case with Tx FFE and no band limiting
  - SNR2 = 10*log10(Pthru2 / Pxt2)
  - Pthru2 = integral((sinc(f/fb) * IL(f) * XTL(f) * GFFE(f))^2)
  - Pxt2 = integral((sinc(f/fb) * IL(f) * XTL(f) * GFFE(f))^2 *)
  - GFFE(f) = c(1) * exp(-j*2*pi*Tb*2) + c(0) * exp(-j*(2*pi*Tb)) + c(-1)
- Equation for case with Tx FFE and band limitting
  - SNR3 = 10*log10(Pthru3 / Pxt3)
  - Pthru3 = integral((sinc(f/fb) * IL(f) * XTL(f) * GFFE(f) * GRx(f) * GTx(f))^2)
  - Pxt3 = integral((sinc(f/fb) * IL(f) * XTL(f) * GFFE(f) * GRx(f) * GTx(f))^2 *)
  - GRx(f) and GTx(f) are response of 2^{nd} order Butterworth LPF with 7.5 GHz and 9.0 GHz bandwidth, respectively.

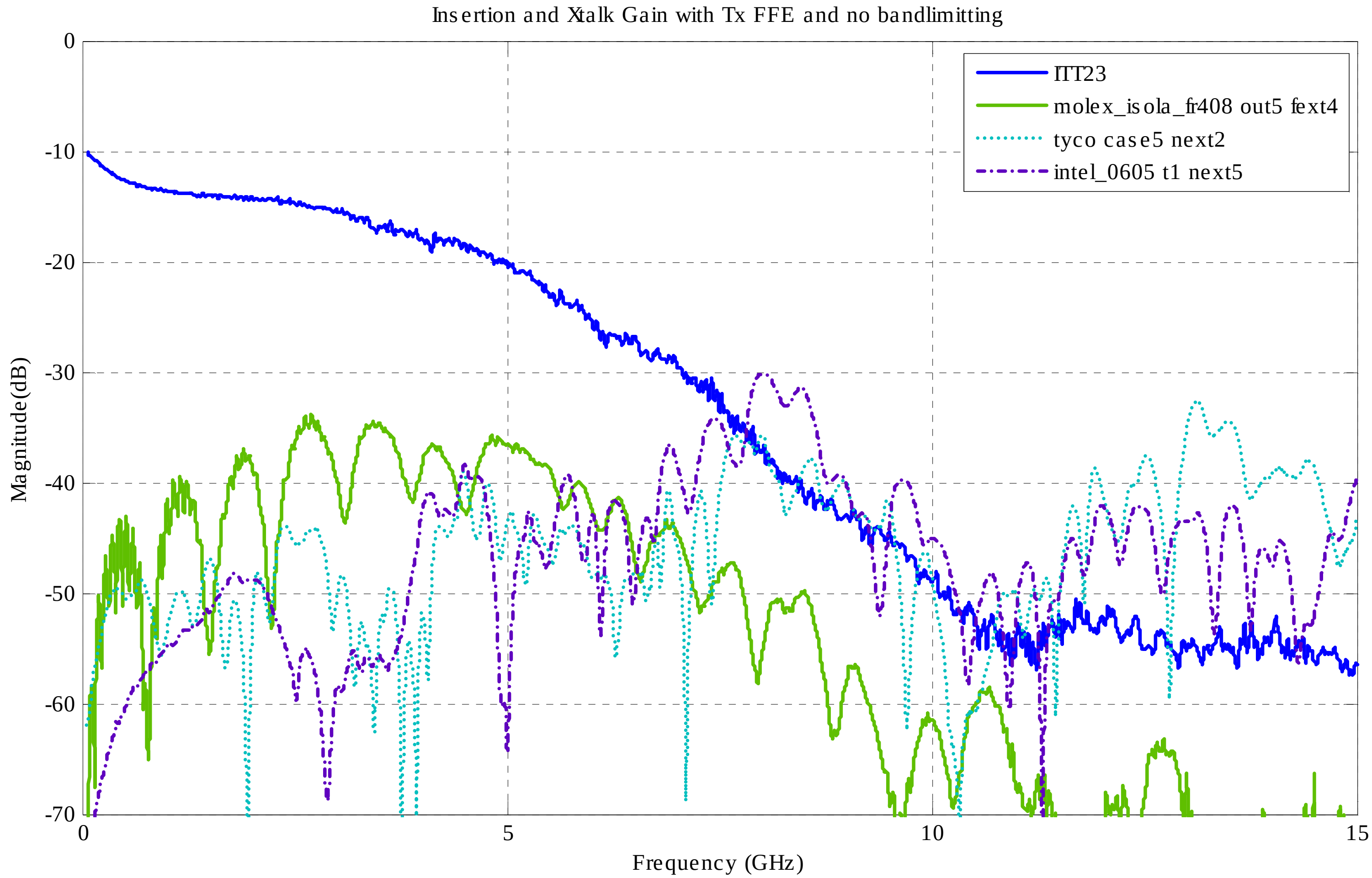
Applied responses



IL and XTALK loss with no Tx FFE and no band limiting



IL and XTALK loss with Tx FFE and no band limiting



IL and XTALK loss with Tx FFE and Rx/Tx band limiting