ICR w/ PISI Analysis

Howard Baumer - Broadcom

ICRt (PSYS=1.94), PISI difference
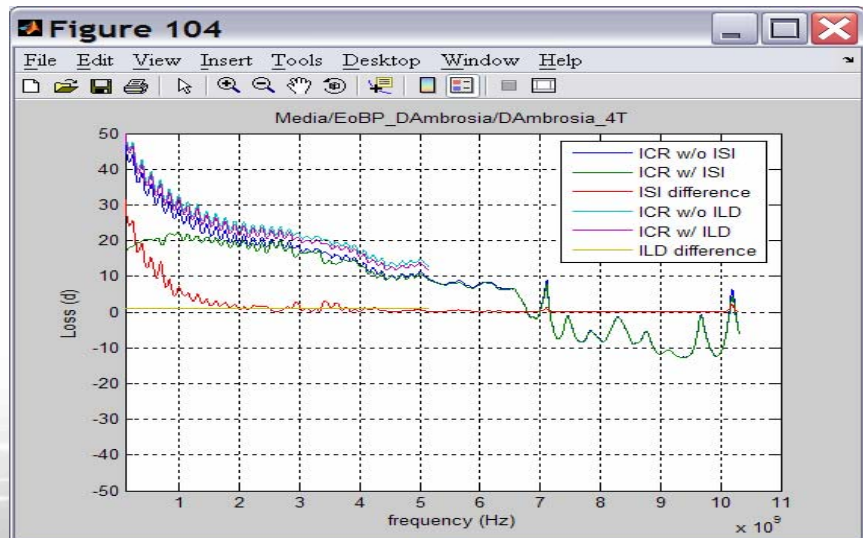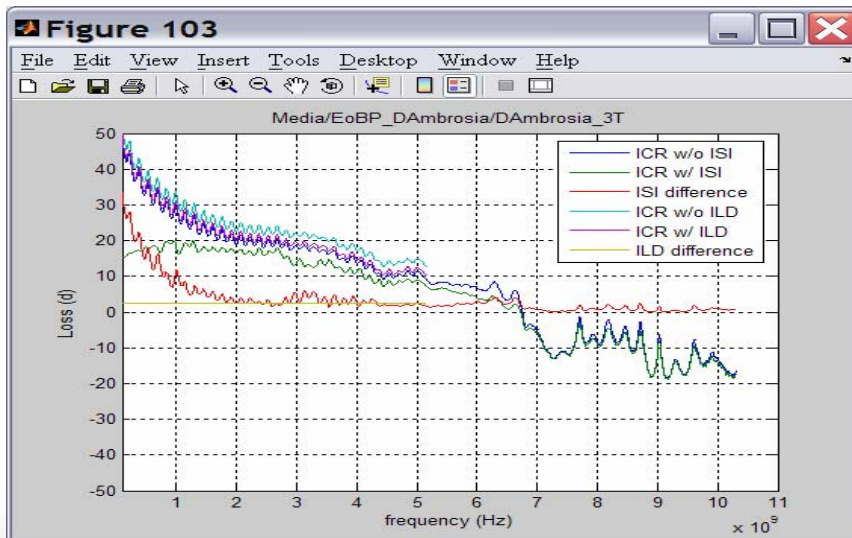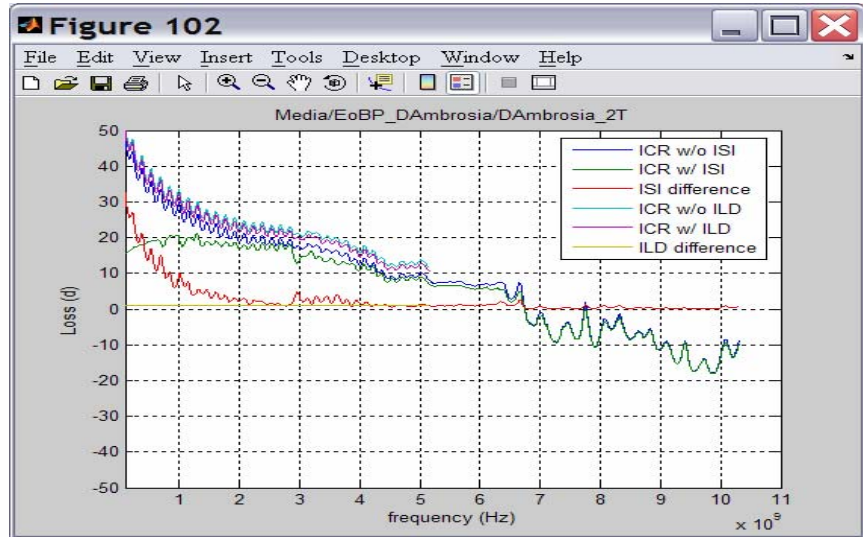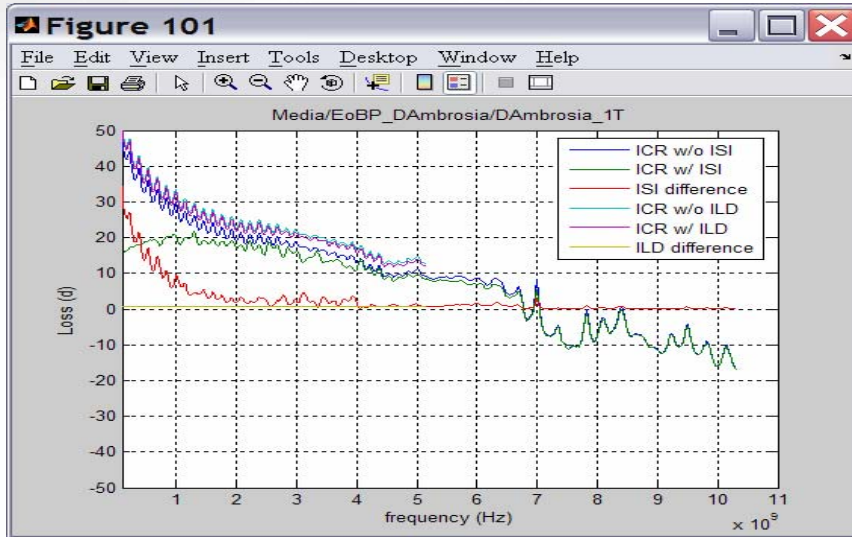
ICRt (PSYS=1.94), PISI difference

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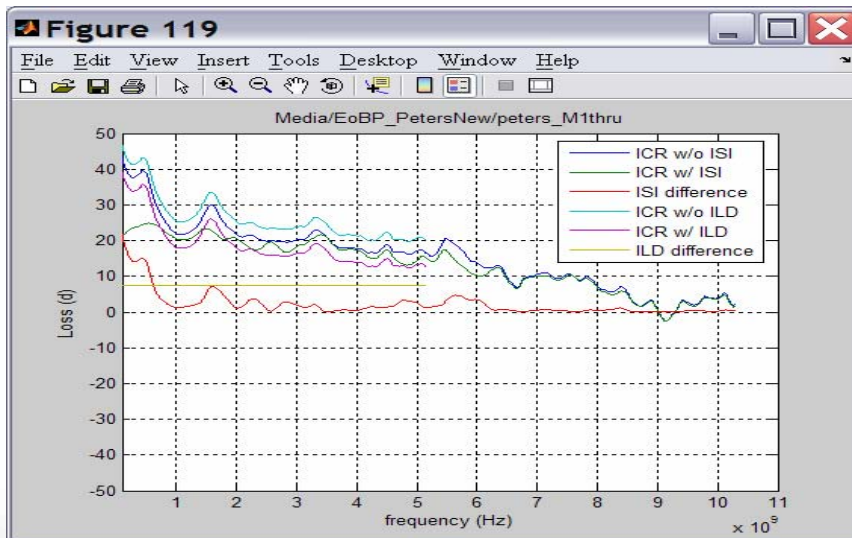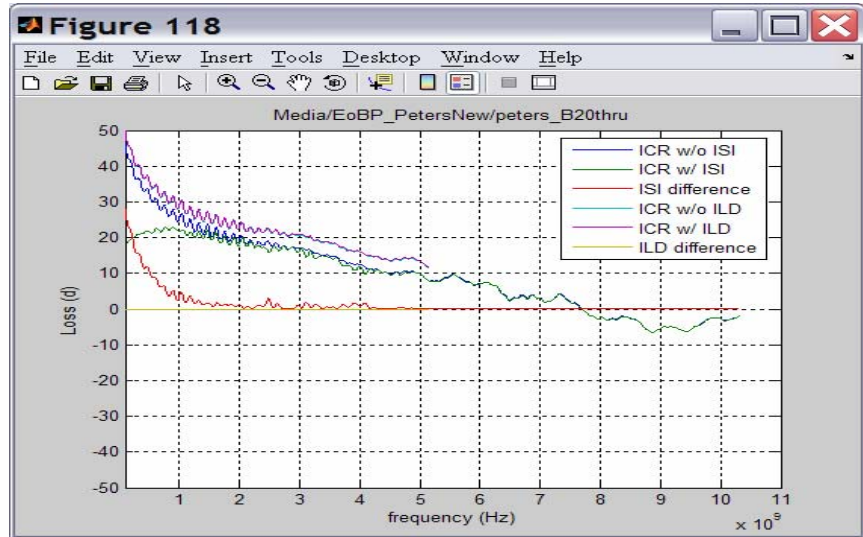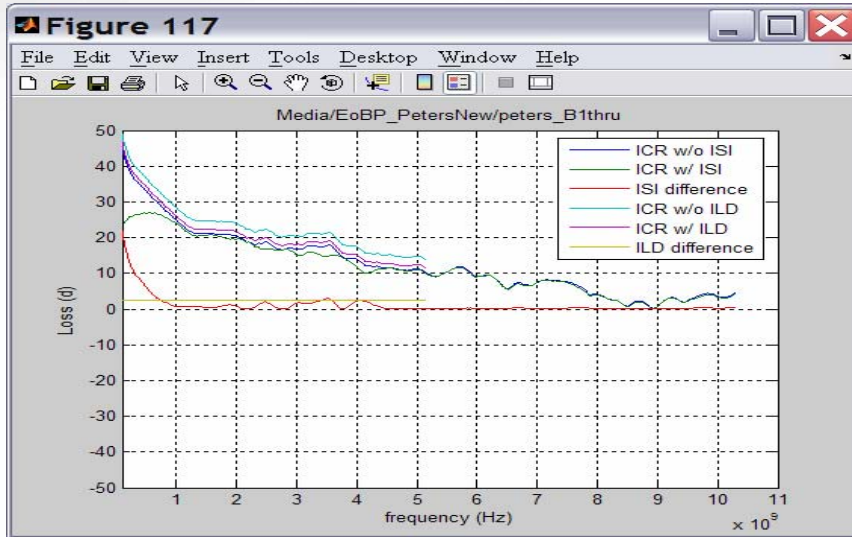
Current KX4 recommendations

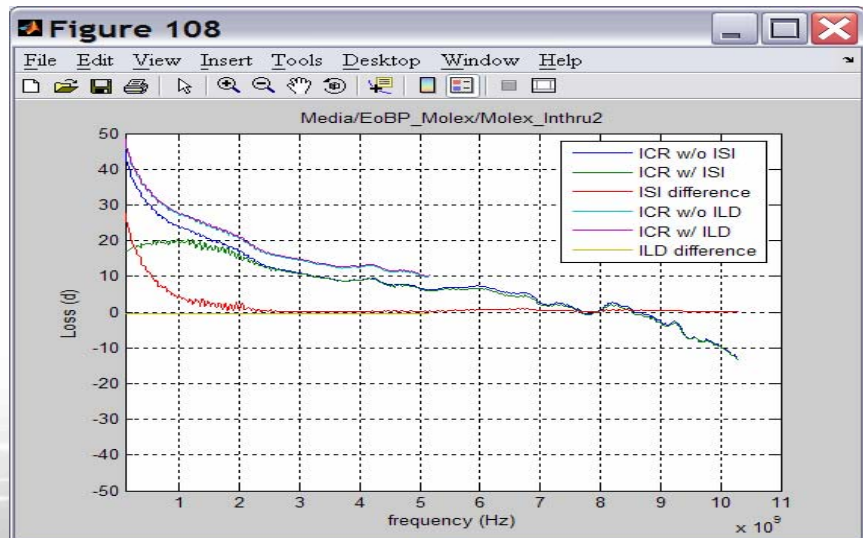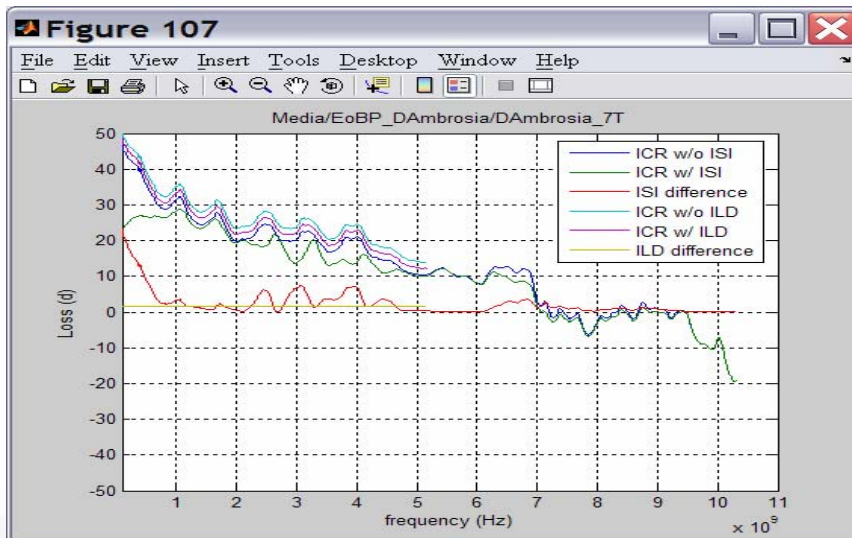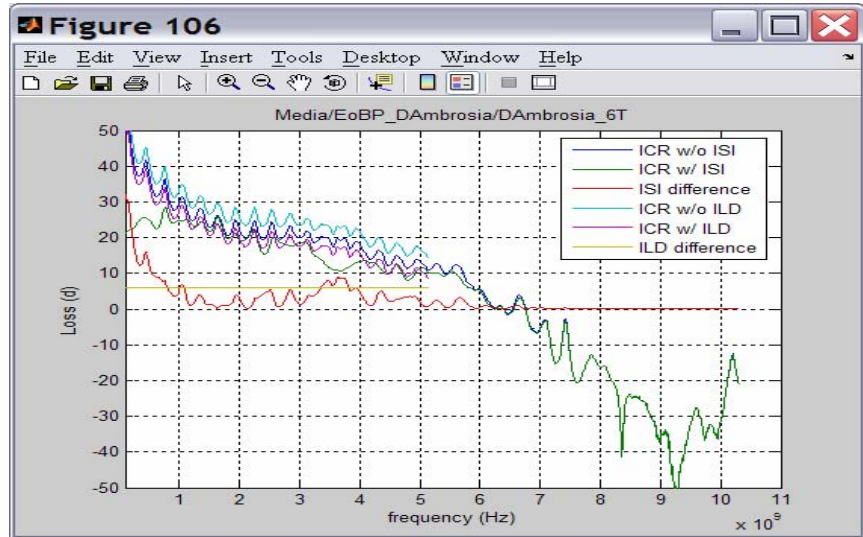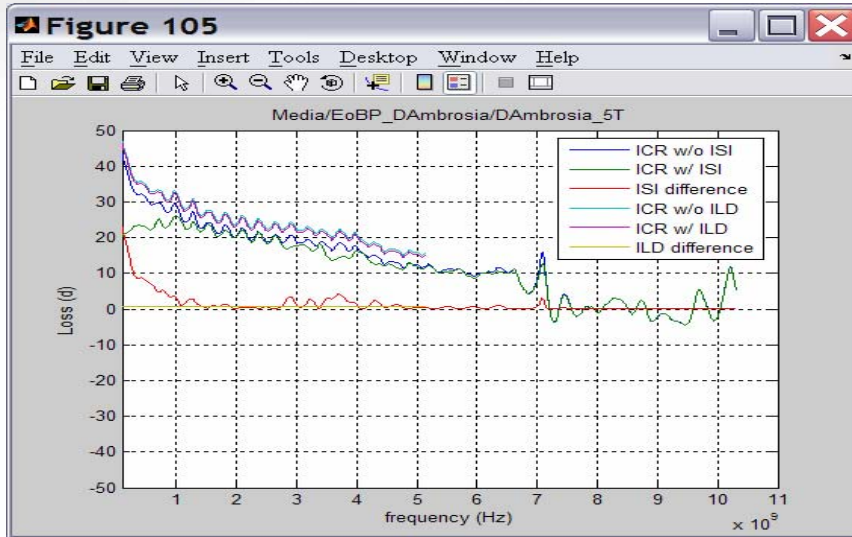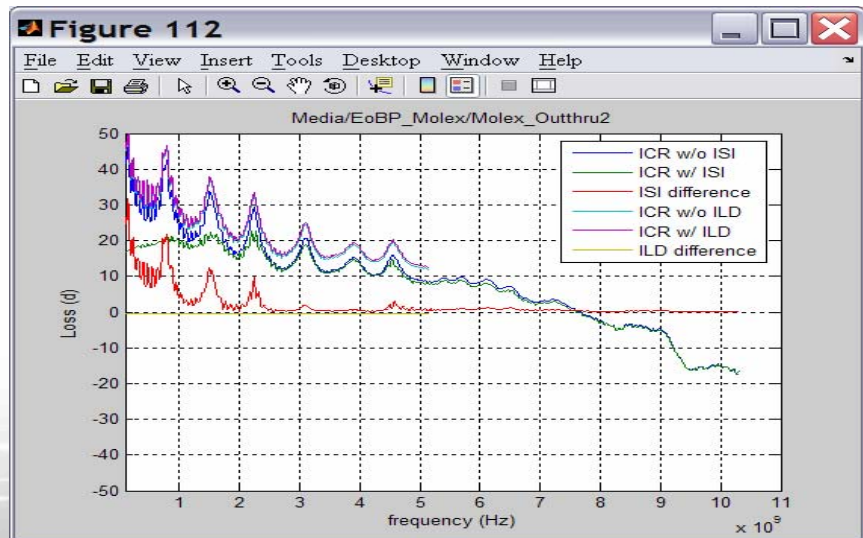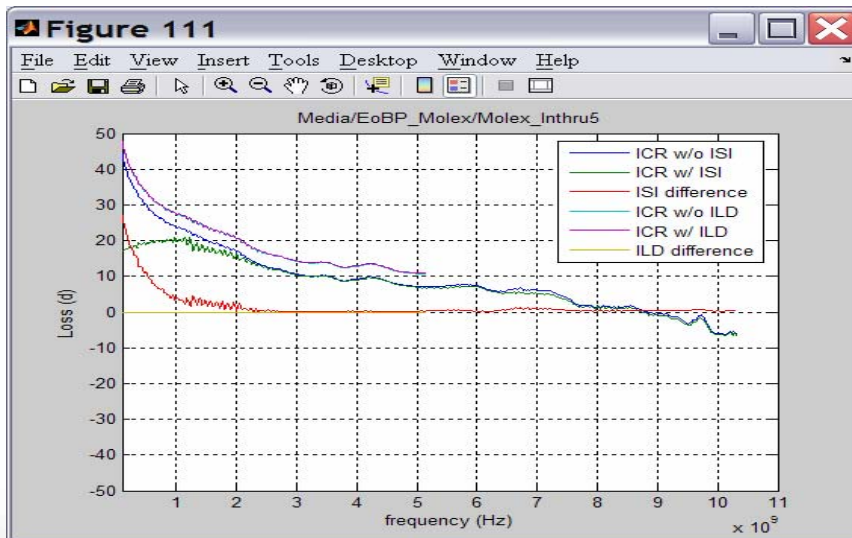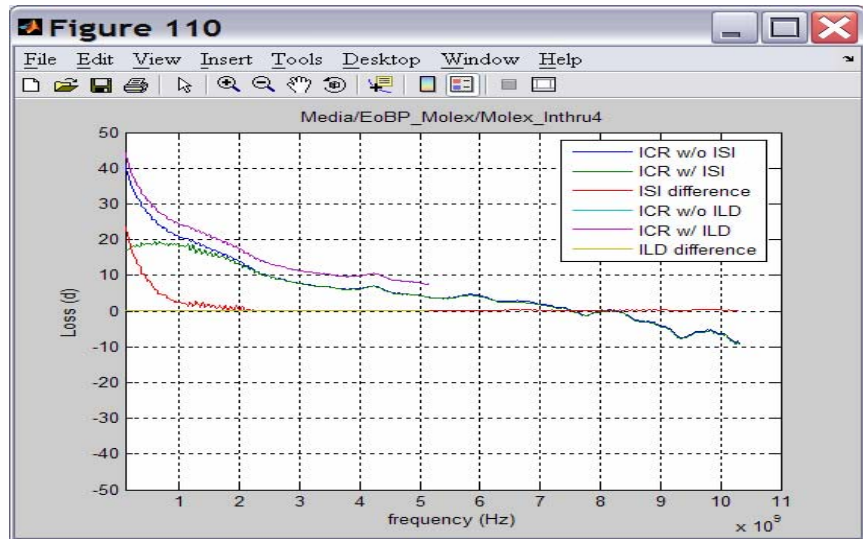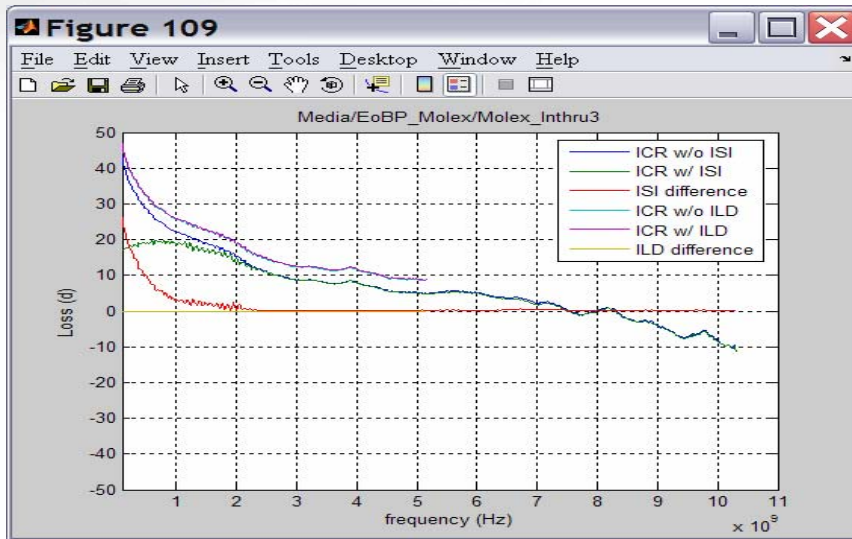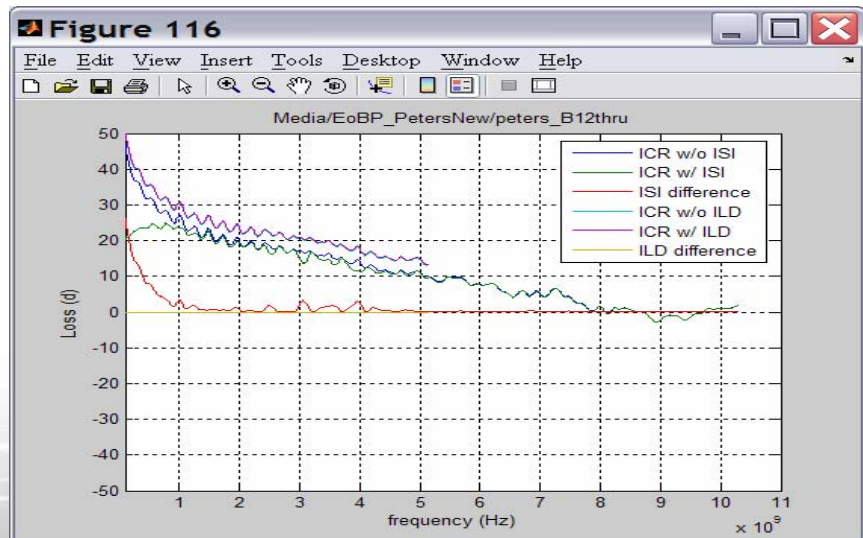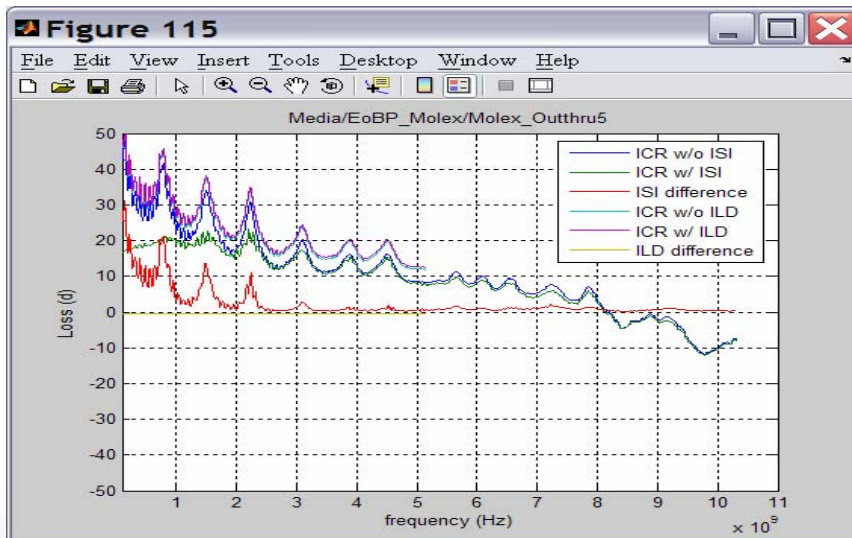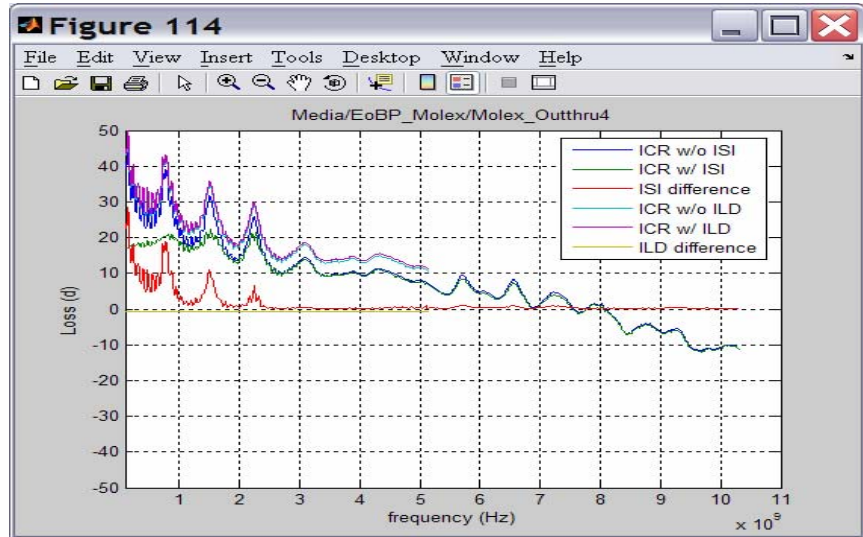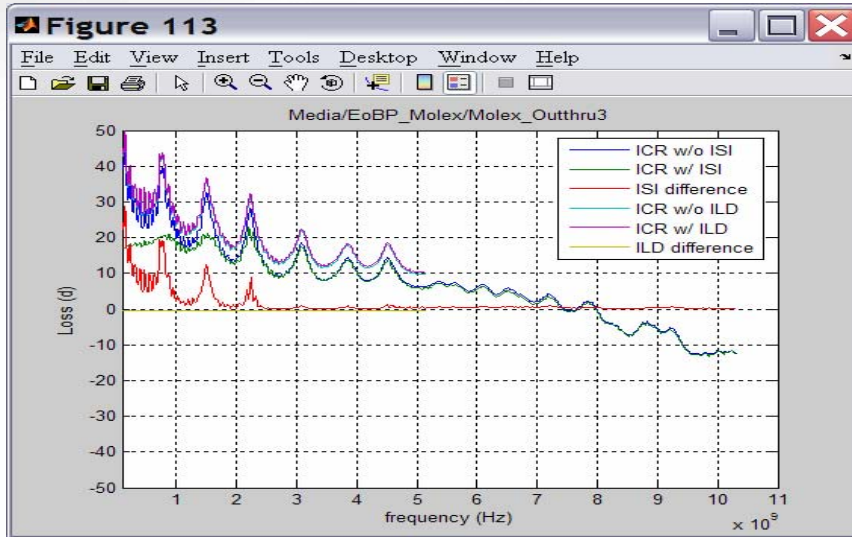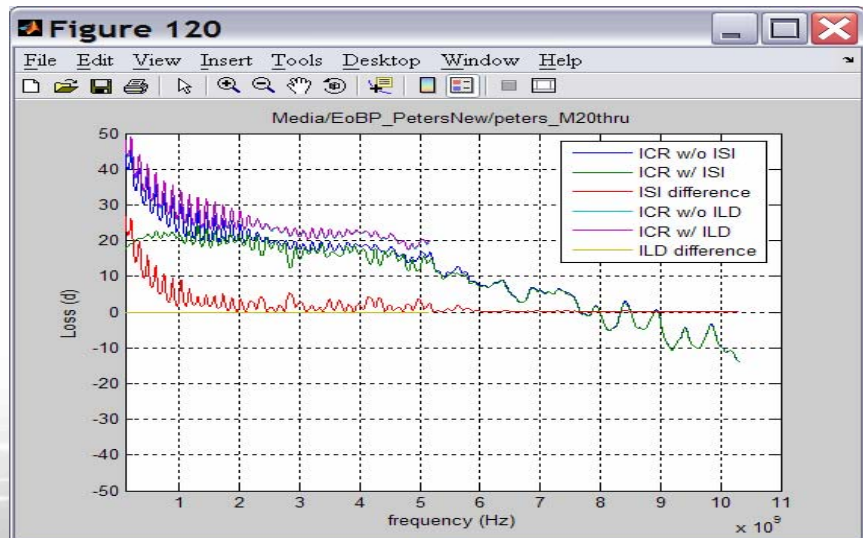| Channel	Amax	IL	ILD	RL	ICRf	ICRt	ICRn
Media/EoBP_Tyco/Tyco_1T	'Fail'	'Fail'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'
Media/EoBP_Tyco/Tyco_2T	'Fail'	'Fail'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'
Media/EoBP_Tyco/Tyco_3T	'Fail'	'Fail'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'
Media/EoBP_Tyco/Tyco_4T	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'
Media/EoBP_Tyco/Tyco_5T	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'
Media/EoBP_Tyco/Tyco_6T	'PASS'	'PASS'	'PASS'	'PASS'	'PASS'	'PASS'	'PASS'
Media/EoBP_Tyco/Tyco_7T	'PASS'	'PASS'	'PASS'	'PASS'	'PASS'	'PASS'	'PASS'
'Media/EoBP_Molex/Molex_Inthru2'	'Fail'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_Molex/Molex_Inthru3'	'Fail'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_Molex/Molex_Inthru4'	'Fail'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_Molex/Molex_Inthru5'	'Fail'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_Molex/Molex_Outthru2'	'Fail'	'PASS'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'
'Media/EoBP_Molex/Molex_Outthru3'	'Fail'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'PASS'
'Media/EoBP_Molex/Molex_Outthru4'	'Fail'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'PASS'
'Media/EoBP_Molex/Molex_Outthru5'	'Fail'	'PASS'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'
'Media/EoBP_PetersNew/peters_B12thru'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'
'Media/EoBP_PetersNew/peters_B1thru'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'
'Media/EoBP_PetersNew/peters_B20thru'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'
'Media/EoBP_PetersNew/peters_M1thru'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'
'Media/EoBP_PetersNew/peters_M20thru'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'

Test conditions:
- ICRf is the ICR calculated with PSYS = 5.5
- ICRt is the ICR calculated with PSYS = 1.94
- ICRn is the ICR calculated with PSYS = 0

PISI KX4 recommendations

Channel	Amax	IL	ILD	RL	ICRf	ICRt	ICRn
Media/EoBP_Tyco/Tyco_1T	'Fail'	'Fail'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
Media/EoBP_Tyco/Tyco_2T	'Fail'	'Fail'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
Media/EoBP_Tyco/Tyco_3T	'Fail'	'Fail'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
Media/EoBP_Tyco/Tyco_4T	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
Media/EoBP_Tyco/Tyco_5T	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
Media/EoBP_Tyco/Tyco_6T	'PASS'	'PASS'	'PASS'	'PASS'	'PASS'	'PASS'	'PASS'
Media/EoBP_Tyco/Tyco_7T	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'
'Media/EoBP_Molex/Molex_Inthru2'	'Fail'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_Molex/Molex_Inthru3'	'Fail'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_Molex/Molex_Inthru4'	'Fail'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_Molex/Molex_Inthru5'	'Fail'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_Molex/Molex_Outthru2'	'Fail'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_Molex/Molex_Outthru3'	'Fail'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_Molex/Molex_Outthru4'	'Fail'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_Molex/Molex_Outthru5'	'Fail'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_PetersNew/peters_B12thru'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'
'Media/EoBP_PetersNew/peters_B1thru'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'
'Media/EoBP_PetersNew/peters_B20thru'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_PetersNew/peters_M1thru'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_PetersNew/peters_M20thru'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'

Test conditions:
- ICRf is the ICR calculated with PSYS = 5.5
- ICRt is the ICR calculated with PSYS = 1.94
- ICRn is the ICR calculated with PSYS = 0

Current KX recommendations

Channel	Amax	IL	ILD	RL	ICRf	ICRt	ICRn
Media/EoBP_Tyco/Tyco_1T	'Fail'	'PASS'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'
Media/EoBP_Tyco/Tyco_2T	'Fail'	'PASS'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'
Media/EoBP_Tyco/Tyco_3T	'Fail'	'Fail'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'
Media/EoBP_Tyco/Tyco_4T	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'
Media/EoBP_Tyco/Tyco_5T	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'PASS'
Media/EoBP_Tyco/Tyco_6T	'PASS'	'PASS'	'PASS'	'PASS'	'PASS'	'PASS'	'PASS'
Media/EoBP_Tyco/Tyco_7T	'PASS'	'PASS'	'PASS'	'PASS'	'PASS'	'PASS'	'PASS'
'Media/EoBP_Molex/Molex_Inthru2'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'
'Media/EoBP_Molex/Molex_Inthru3'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'PASS'
'Media/EoBP_Molex/Molex_Inthru4'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_Molex/Molex_Inthru5'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'
'Media/EoBP_Molex/Molex_Outthru2'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'PASS'
'Media/EoBP_Molex/Molex_Outthru3'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_Molex/Molex_Outthru4'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_Molex/Molex_Outthru5'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'PASS'
'Media/EoBP_PetersNew/peters_B12thru'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'
'Media/EoBP_PetersNew/peters_B1thru'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'
'Media/EoBP_PetersNew/peters_B20thru'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'
'Media/EoBP_PetersNew/peters_M1thru'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'
'Media/EoBP_PetersNew/peters_M20thru'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'PASS'	'PASS'

Test conditions:
- ICRf is the ICR calculated with PSYS = 5.5
- ICRt is the ICR calculated with PSYS = 1.94
- ICRn is the ICR calculated with PSYS = 0

PISI KX recommendations

Channel	Amax	IL	ILD	RL	ICRf	ICRt	ICRn
Media/EoBP_Tyco/Tyco_1T	'Fail'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
Media/EoBP_Tyco/Tyco_2T	'Fail'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
Media/EoBP_Tyco/Tyco_3T	'Fail'	'Fail'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
Media/EoBP_Tyco/Tyco_4T	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
Media/EoBP_Tyco/Tyco_5T	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
Media/EoBP_Tyco/Tyco_6T	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
Media/EoBP_Tyco/Tyco_7T	'PASS'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'
'Media/EoBP_Molex/Molex_Inthru2'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_Molex/Molex_Inthru3'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_Molex/Molex_Inthru4'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_Molex/Molex_Inthru5'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_Molex/Molex_Outthru2'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_Molex/Molex_Outthru3'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_Molex/Molex_Outthru4'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_Molex/Molex_Outthru5'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_PetersNew/peters_B12thru'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_PetersNew/peters_B1thru'	'PASS'	'PASS'	'PASS'	'PASS'	'PASS'	'PASS'	'PASS'
'Media/EoBP_PetersNew/peters_B20thru'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_PetersNew/peters_M1thru'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'
'Media/EoBP_PetersNew/peters_M20thru'	'PASS'	'PASS'	'PASS'	'PASS'	'Fail'	'Fail'	'Fail'

Test conditions:
- ICRf is the ICR calculated with PSYS = 5.5
- ICRt is the ICR calculated with PSYS = 1.94
- ICRn is the ICR calculated with PSYS = 0

New Changes to Annex 69B"Residual ISI"

• Create new sub-annex "Residual ISI" after 69B.4.5 and before 69B.4.6, renumbering all subsequent sub-annexes accordingly.

69B.4.6 Residual ISI

In order to limit the noise due to self-interference and un-equalized signal at TP4, the residual ISI power spectrum is specified to meet the BER objective defined in 69.1.2.

The power spectrum of the channel residual ISI is defined as:

1. Calculate the channel impulse response, IR, by taking the inverse FFT of the measured channel insertion loss with a sampling frequency of of n times the signaling rate, where n shall be greater than or equal to 5 and where the IL is extrapolated to DC and zero filled to the sampling frequency.

2. Find Tpk where IR(Tpk) >= IR(t).

3. Define the channel residual ISI, RISI(t) = 0 for t<=TPK+5UI and RISI(t)=IR(t) for t>TPK.

4. Calculate the power spectrum of the residual ISI, PISI, by taking the FFT of the channel residual ISI, RISI.

Changes to Annex 69B

- Create sub annex "69B-xx System Configuration Penalty" starting from page 194 line 47 through page 195 line 14.
- Create sub-annex "69B-xx Insertion loss to system noise ratio" from annex 69B.4.6.4.
- Reorder subsequent sub-annexes.
- Change the first paragraph on page 194 to:
  - Insertion loss to <u>system noise</u> ratio (*ICR*) is the ratio of the insertion loss, measured from TP1 to TP4, to the total <u>system noise</u> measured at TP4. *ICR* may be computed from *IL, PSXT, PSYS and PISI* as shown in Equation (69B–18 & 69B-19).
- Add equation for PSN before Eq 69B-18, see "Define System Noise Power" slide, and renumber equations accordingly.
  - For 1000BASE-KX & 10GBASE-KX4 PISI & PSYS = 0
- Change Eq 69B-18 to: ICR = PSN - IL
- Change the paragraph on page 195 line 16 to:
  - It is recommended that *ICRfit* be greater than than or equal to *ICRmin* as defined in Equation (69B–26).
- Change Eq 69B-26 to: ICRfit(f) <= ICRmin(f) = 25.7 - 2.97e-9*f for fa <= f <= fb

Define System Noise Power

$$PSN = 10 * \log_{10}\left(10^{\left(\frac{-(PSXT - PSYS)}{10}\right)} + 10^{\left(\frac{-(Pisi)}{10}\right)}\right)$$