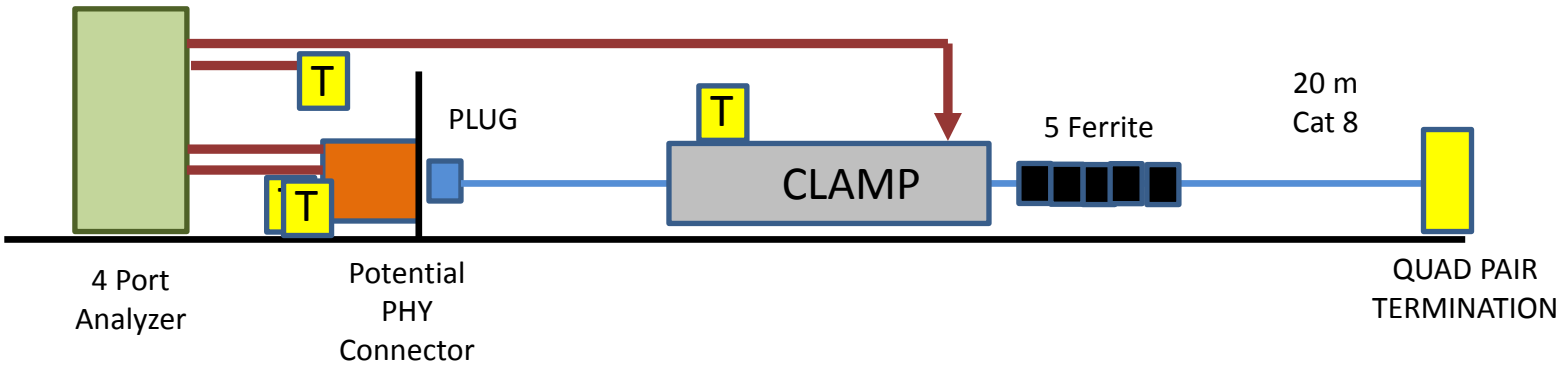
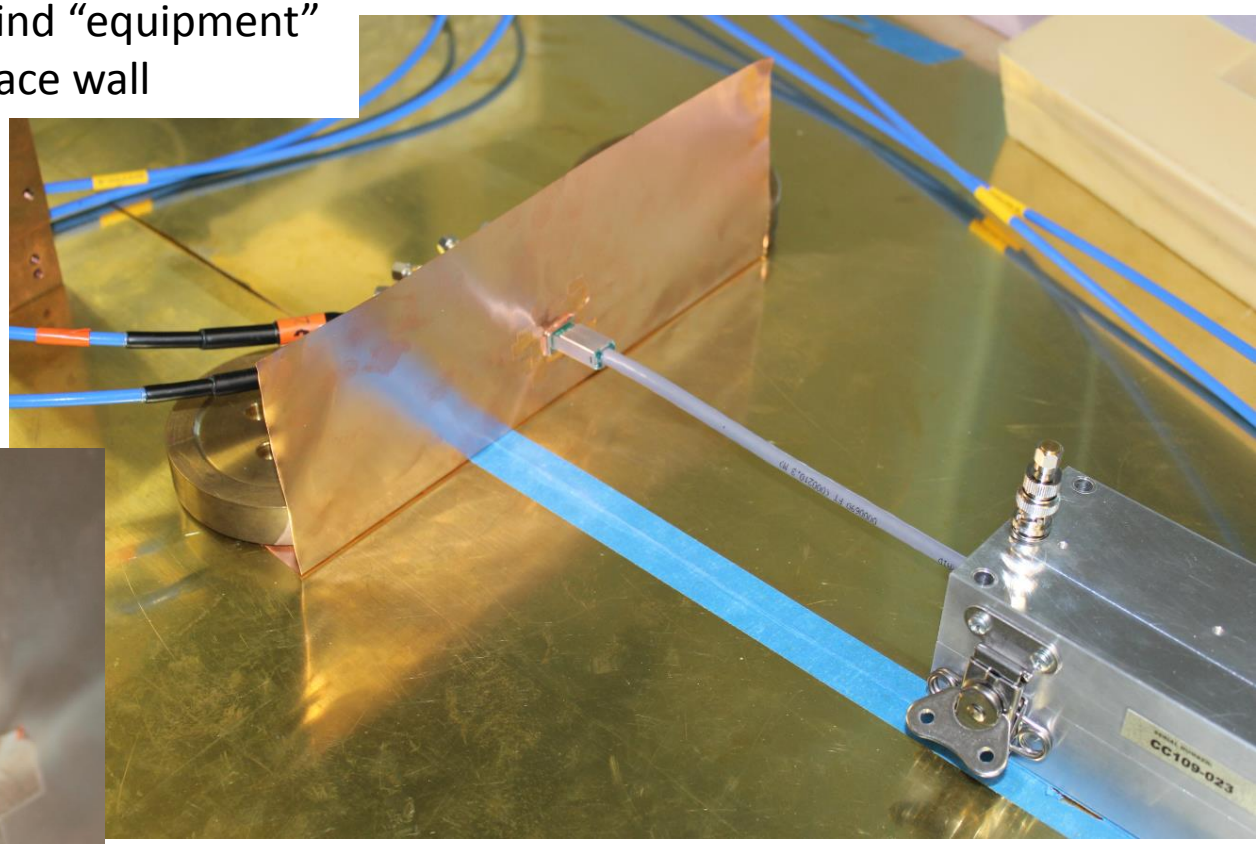
Annex 40B Clamp experiment to assess EMC performance

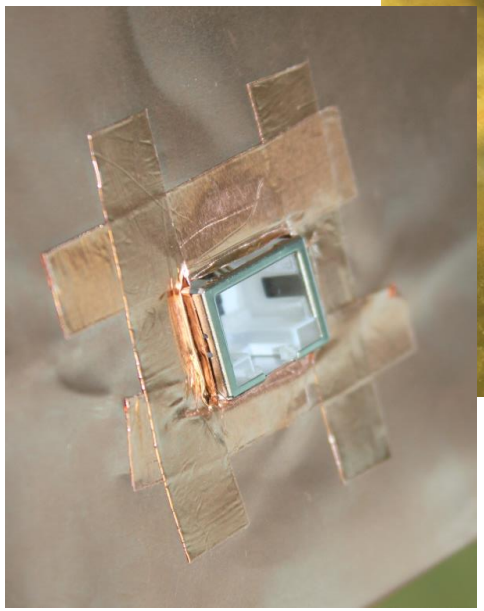


- Plug terminated Cat 8 cables are mated with a mock up PHY port
- The clamp induces shield energy that is substantially blocked by the shield wall of the PHY port

- The plug and jack mating interface allows some level of “interference energy” into the PHY port

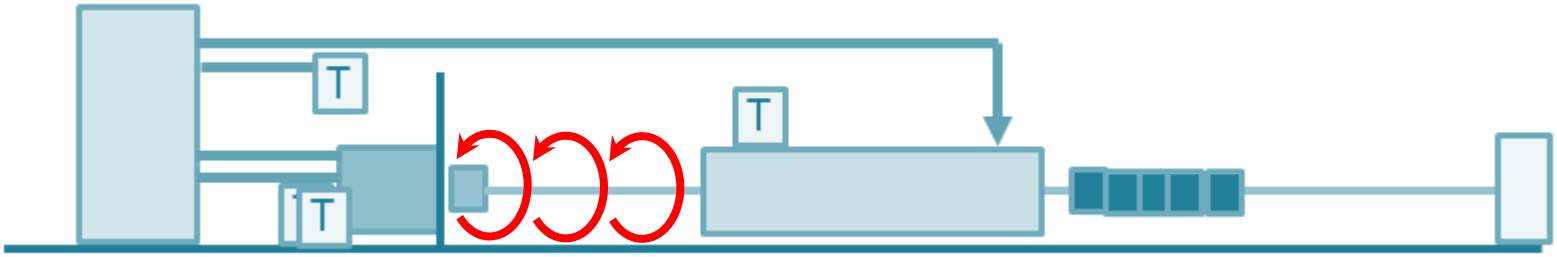
PHY jack behind “equipment” shielded surface wall





Clamp driven PHY port mockup

The bulk of the induced energy and field strength is in the 20 cm region directly in front of the PHY connection



This is in many ways similar to a chamber EMC test where the radiating antennae is directly in front of the equipment port

(Comparable tests yet to be done)

6 Test Sets for analysis

(no source power adjustment is applied : clamp drive end = 0 dB)

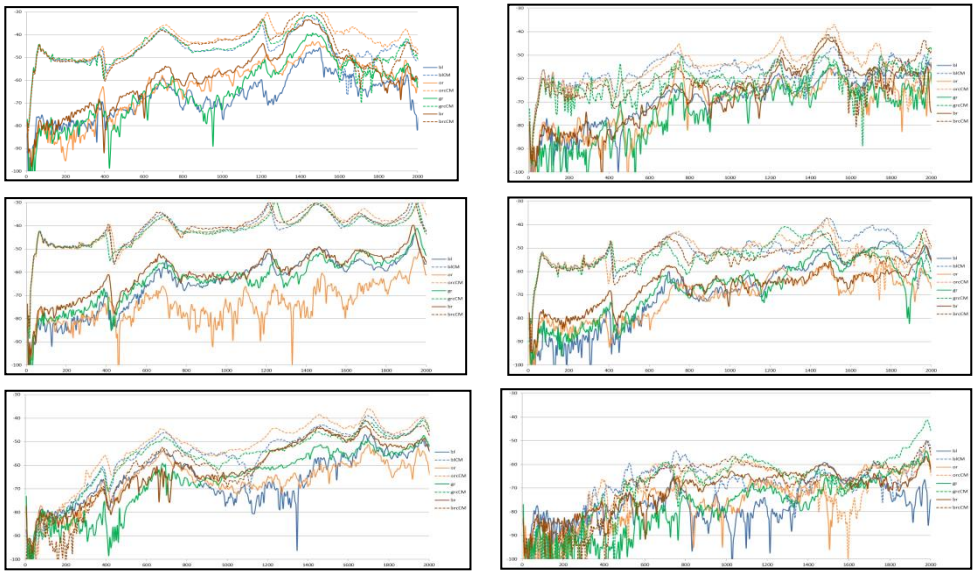
Cat 8 Plug 1

Cat 8 Plug 2
(Used in Broadcom Corporation RADIATED IMMUNITY TEST Presentation San Antonio, November, 2014)

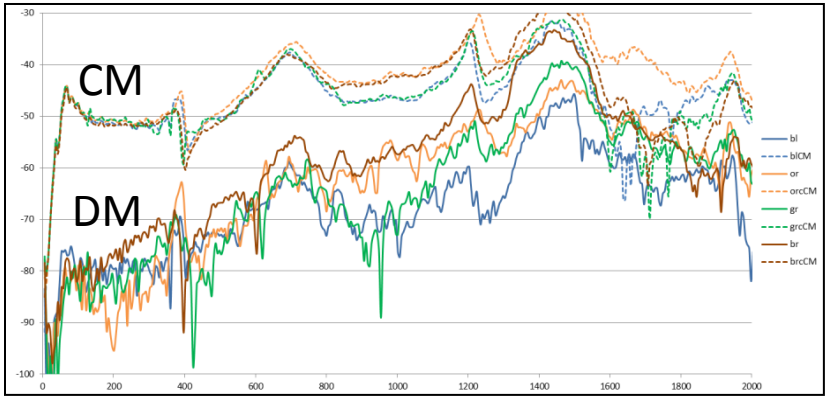
Pre-production
Cat 8 as PHY Jack

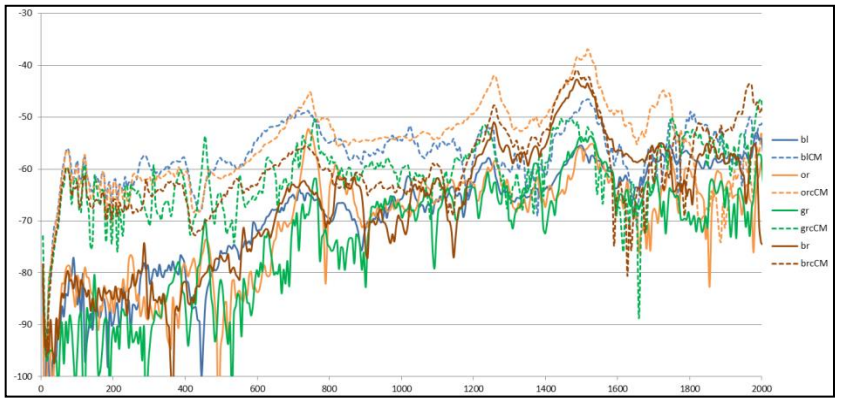
Production
Cat 6A as PHY Jack
(Used in Broadcom Corporation RADIATED IMMUNITY TEST Presentation San Antonio, November, 2014)

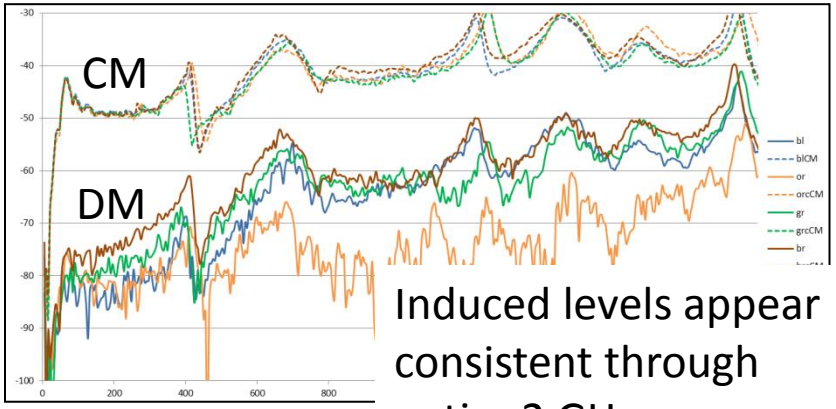
Prototype
Cat 8 PHY Jack
with magnetics



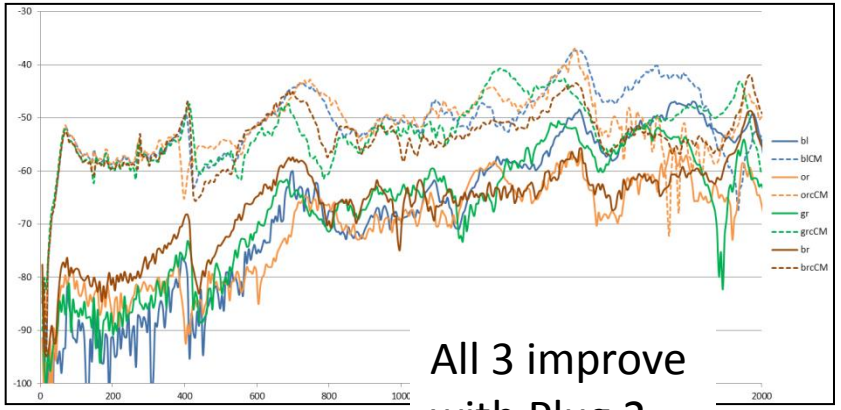
This is a KEY to the measured coupling levels that are shown on next slide



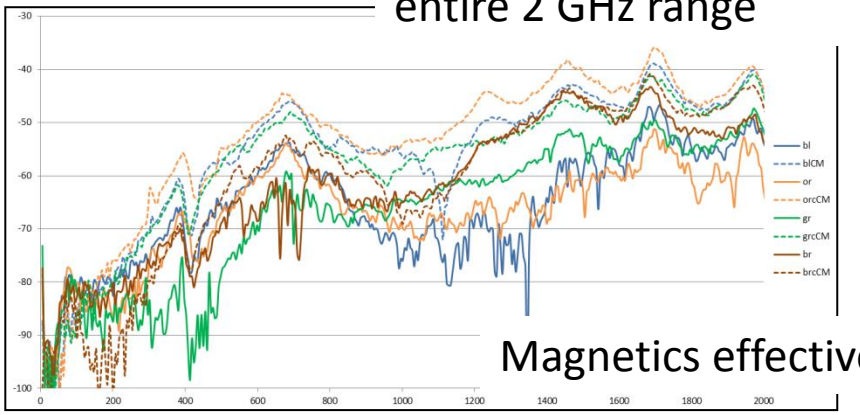


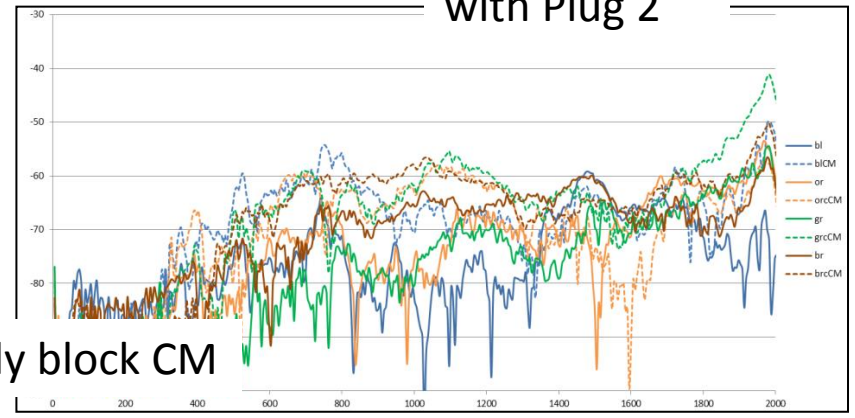


Induced levels appear consistent through entire 2 GHz range



All 3 improve with Plug 2





Magnetics effectively block CM

(All scales the same -30 to -100 dB, measured to 2 GHz)

Takeaway

- We now have a better understanding of the interference mechanism of shielded systems in the frequency range up to 2 GHz.
- The clamp provides a useful and sensitive method of testing the shielding performance of the system.
- Clamp induced energy appears to be representative of what an external field would induce in shielded cabling, and is functionally consistent across the frequency range of interest.
- The clamp appears suitable for the original proposed application of an interference test and alternative to shielded room measurements (Adriaenssens IEEEclamp-1998-07-converted.pdf).

Proposals

1. Further shielded room comparisons and source adjustment criteria to refine the test levels.

2. Update with the following:

113.5.4.3 Rejection of External EM Fields

When the cabling system is subjected to electromagnetic fields, currents are generated in the shield which may be converted to interference. This specification is provided to limit the sensitivity of the PMA receiver to external EM fields picked up by the cabling system. It provides an assessment method of the electromagnetic performance of the link segment and the PHY, including the MDI.

A test can be made using the cable clamp test defined in 40.6.1.3.3. A 6 dBm sine wave source from 80 MHz to 2000 MHz can be used to generate an external electromagnetic field and corresponding shield current. A system integrating a 40GBASE-T PHY may perform this test.

Operational requirements of the transceiver during the test are determined by the manufacturer.