



RTPGE Feasibility Consideration on EMC

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IEEE 802.3 RTPGE Study Group – July 2012 Plenary

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Outline

- **Overview**
- **Immunity**
- **Immunity to Interference**
- **Emission**
- **Conclusions**

Overview

- **Purpose of this presentation:**
- **Discuss the external noise or interference effect on the feasibility of Reduced Twisted Pair Gigabit**
- **EMC model will be an important part of the consideration on the channel modeling**

EMC

- **Electromagnetic Susceptibility**
 - Immunity test, for example, direct power injection/RF immunity test
- **Electromagnetic Interference**
 - Emission test, For example, conducted emission measurement

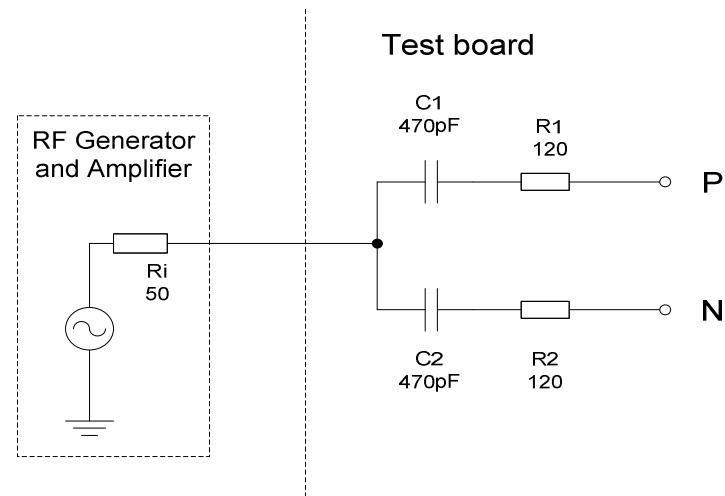
Immunity

- **Strong interference**
 - High power radiation: e.g. Radar, TV power station, etc.
 - Hard to do modeling on the interferences
- **Test Standards**
 - E.g. IEC61967, IEC62132
 - E.g. ISO11452, ISO7637
 - Simplified test as follows:

Immunity to RF Disturbances

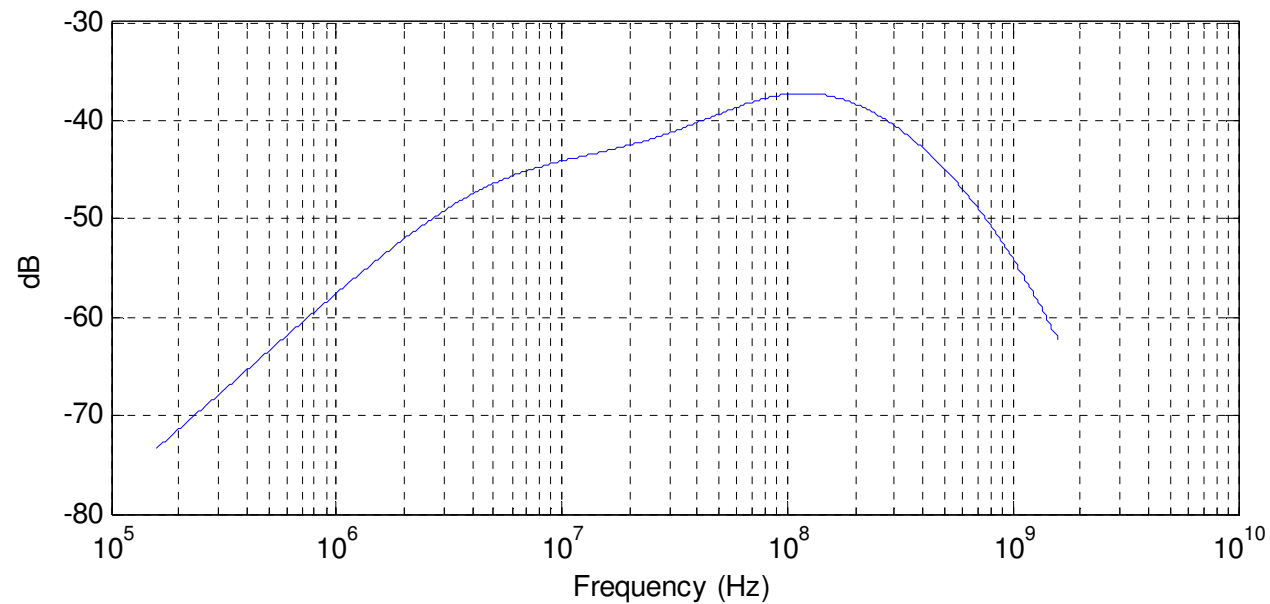
-Test configuration

- **DPI test (direct power injection/RF immunity) at Ethernet link pins**



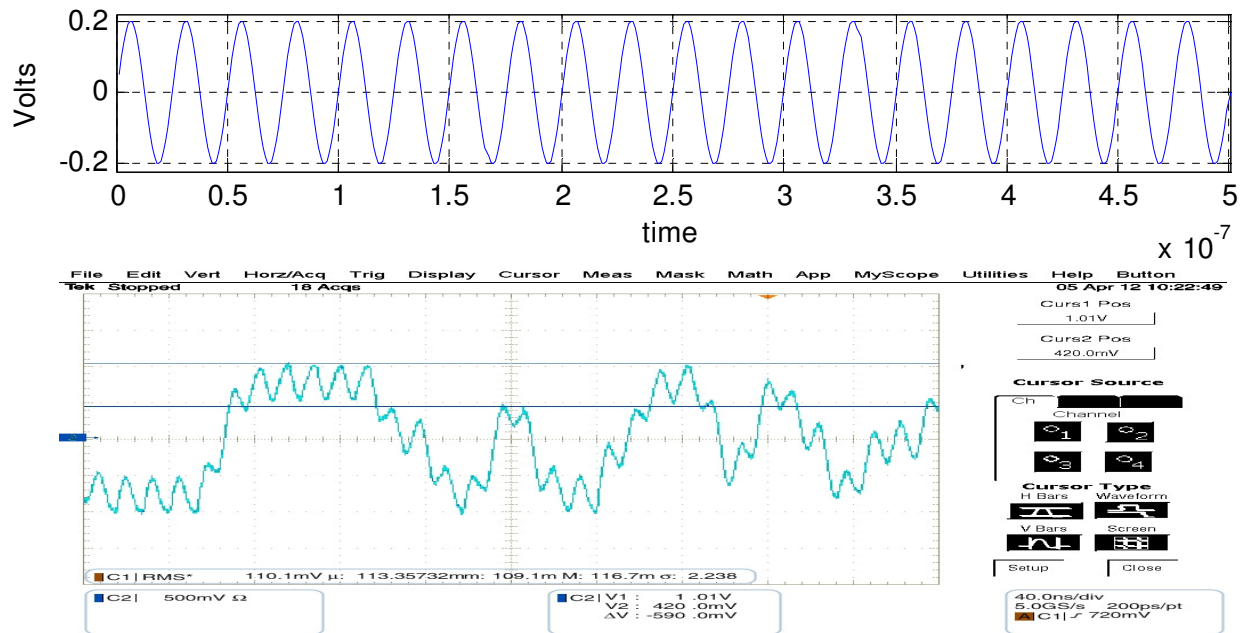
The Interference Frequency Response

- Based on the DPI test network, the simulation frequency response of the common mode interference to the differential receiver input, 2.5% asymmetry of R1 and R2



DPI Interference

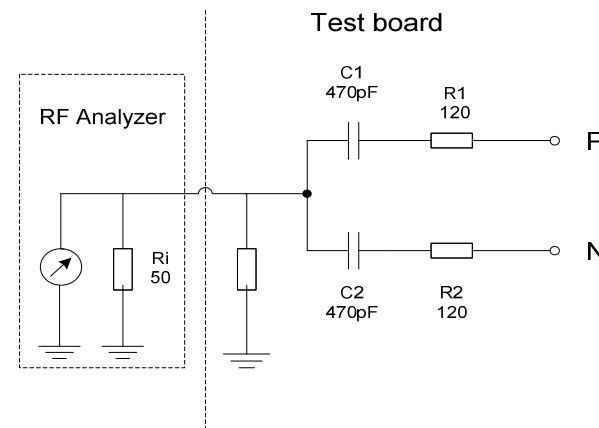
Strong Interference(39dBm) is applied
The interference shown at the receiver input



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Emission

- **Conducted emission measuring network: Based on the similar network to the immunity**
- **With 2.5% asymmetry of R1 and R2, for example, the emission noise level should be below 33dBuV(45mV) @40MHz with $\pm 1V$ of MLT3 signal**
- **Emission requirements limiting the signal power may be used in the RTPGE**



Conclusion

- **Immunity:**
 - Due to strong interference(400mV peak to peak @40MHz), high power transmitted signal (for multi-level signaling with enough SNR within a low bandwidth) or wide bandwidth (to increase the symbol rate @ PAM4, for example) are required
 - However, high symbol rate requires better insertion loss performance for cables
- **Emission:**
 - Stringent emission requirements limit the power may be used to improve the SNR with strong interference

Conclusion

-continued

- **EMC**
 - **EMC issue has very strong impact on the selection of cable, baud rate, pair number, PCS encoding/decoding, etc. (with a limited signal power and strong interference, less pairs -> more bandwidth -> better cabling or more pairs -> less bandwidth)**

Discussion

- **Would the better cabling (cables, connectors, transformers) lower the asymmetry requirement?**
- **How much could be lower for the asymmetry requirements?**
 - All related to EMC and signaling and cabling, etc.

- **Thank You!**