Using ScTP Patch Cords for Mitigating Alien Crosstalk

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SYSTIMAX SOLUTIONS

Introduction

- One of the 10GBASE-T Objectives (51.1.1) is to “Meet CISPR/FCC Class A EMI requirements”.
- In the past we have said that EMI requirements are outside the scope of our standard.
- Since it is a stated objective at the very least we should not recommend a practice that could cause a PHY to fail this objective.

Comment

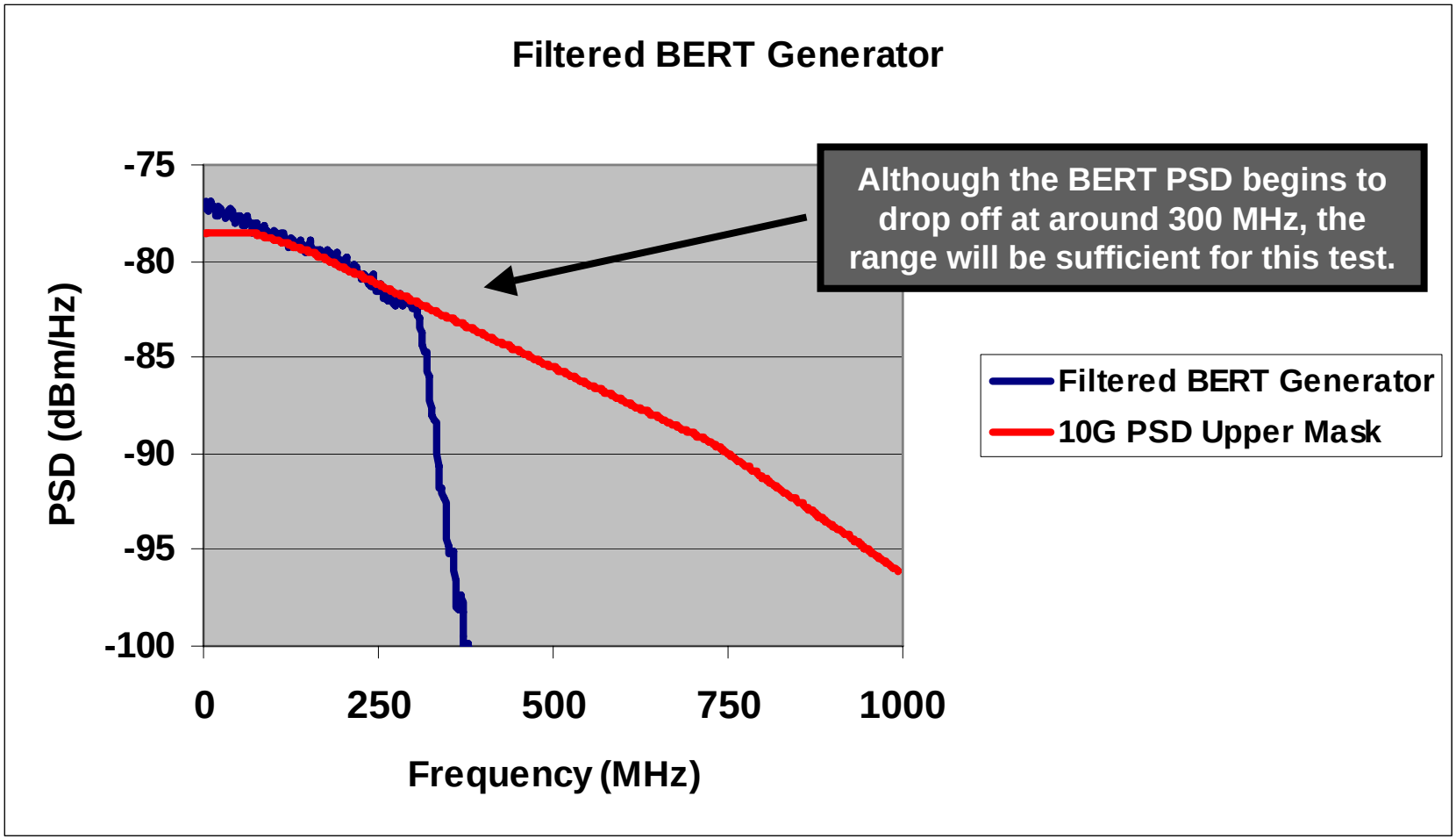
- **Annex 55B, sub clause 55.B.1.3, recommends various ways to mitigate alien crosstalk including the use of shielded patch cords.**
- **This may improve the alien NEXT but can cause other problems.**
- **My comment to the draft is to remove this recommendation and this presentation will show the reasons why.**

Test

- A set of EMI tests was set up using three different UTP solutions on typical switch wiring configurations in an EMI chamber.
- Two of the solutions use ScTP patch cords in place of the UTP patch cord.
- Each pair of the individual cables was connected thru a balun to the tracking generator of the EMI receiver and the resulting field was measured with the antenna, Test 1.
- To simulate actual 10GBASE-T traffic a BERT generator was then connected thru a balun to each pair of the individual cables and the resulting field was measured with the antenna and compared to CISPR/FCC Class A EMI requirements, Test 2.
  - The output of the BERT generator is filtered to better match the 10GBASE-T upper PSD mask, next slide.
- The first slide of the measurement illustrates the result for each pair for Test 1. In the remaining slides the results are compared by using the power sum from the individual pairs on each cable.

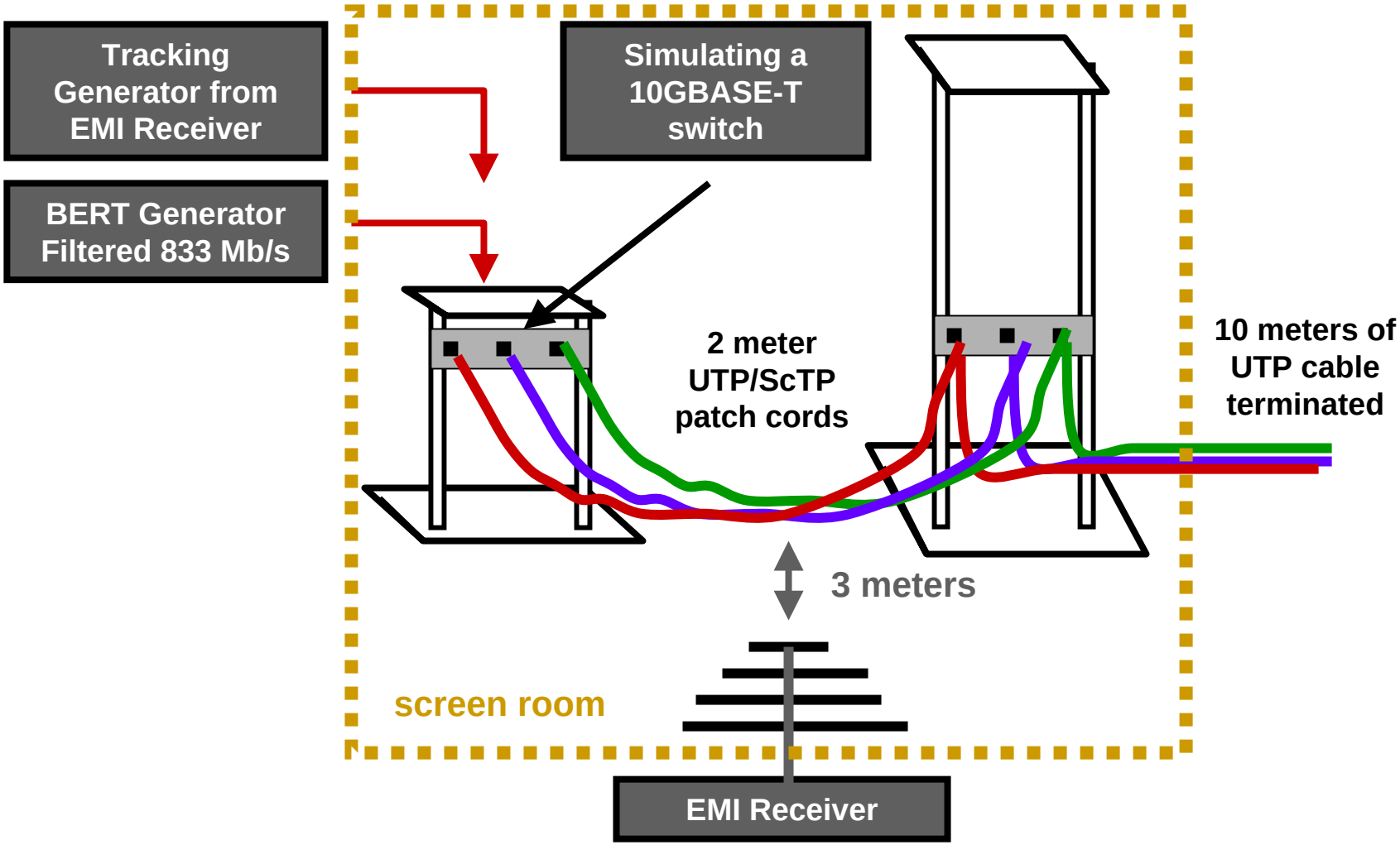
Filtered BERT Generator

833 Mb/s

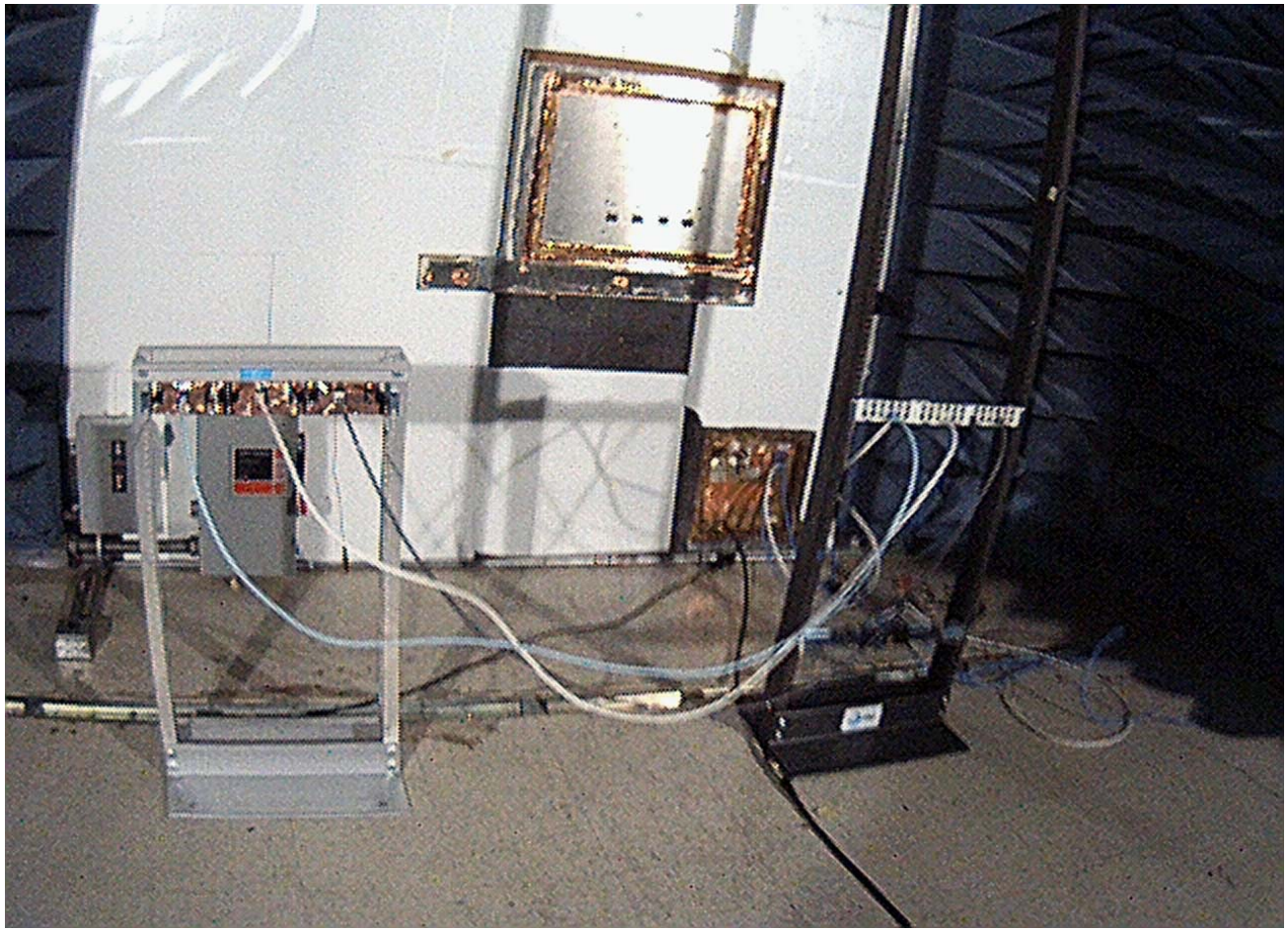


Test 1 Set Up

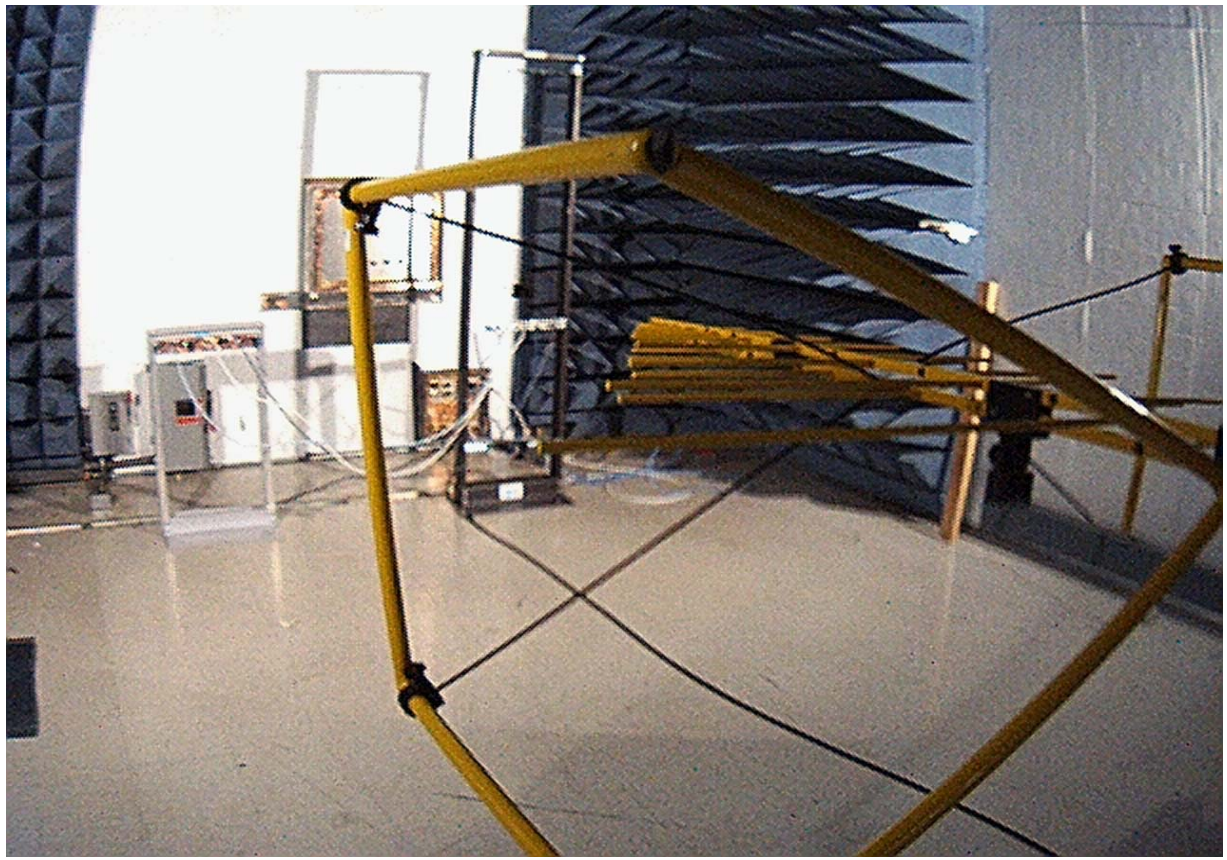
Simulating an Interconnect



Test 1 Set Up

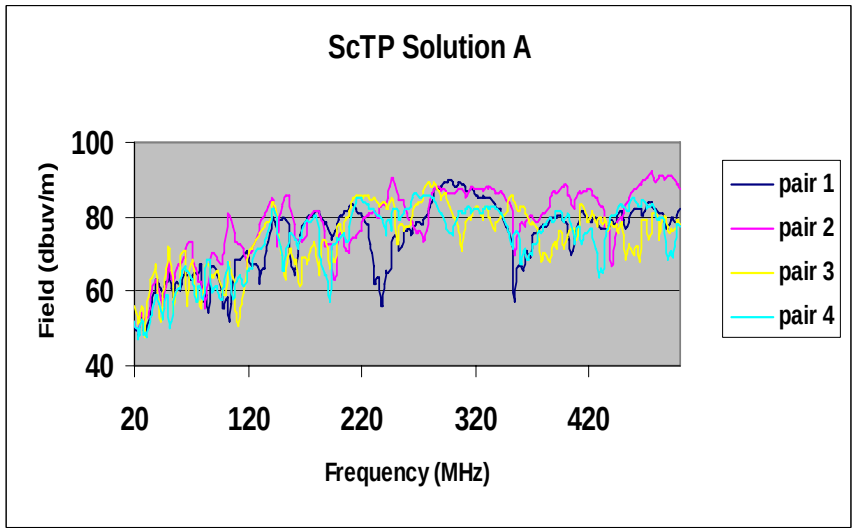


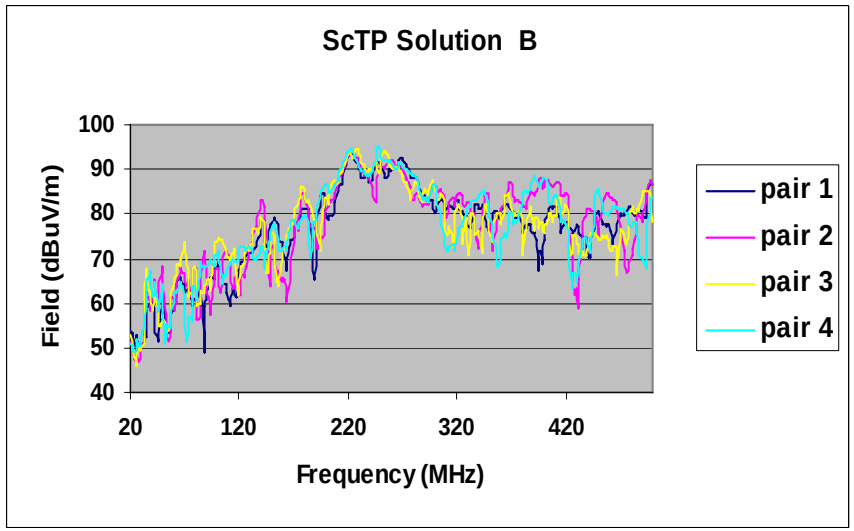
Test 1 Set Up

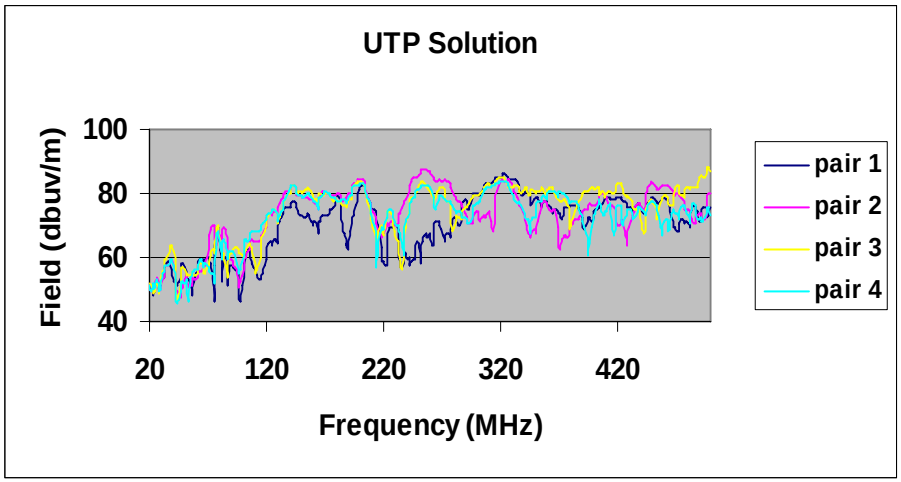


Test 1 Tracking Generator

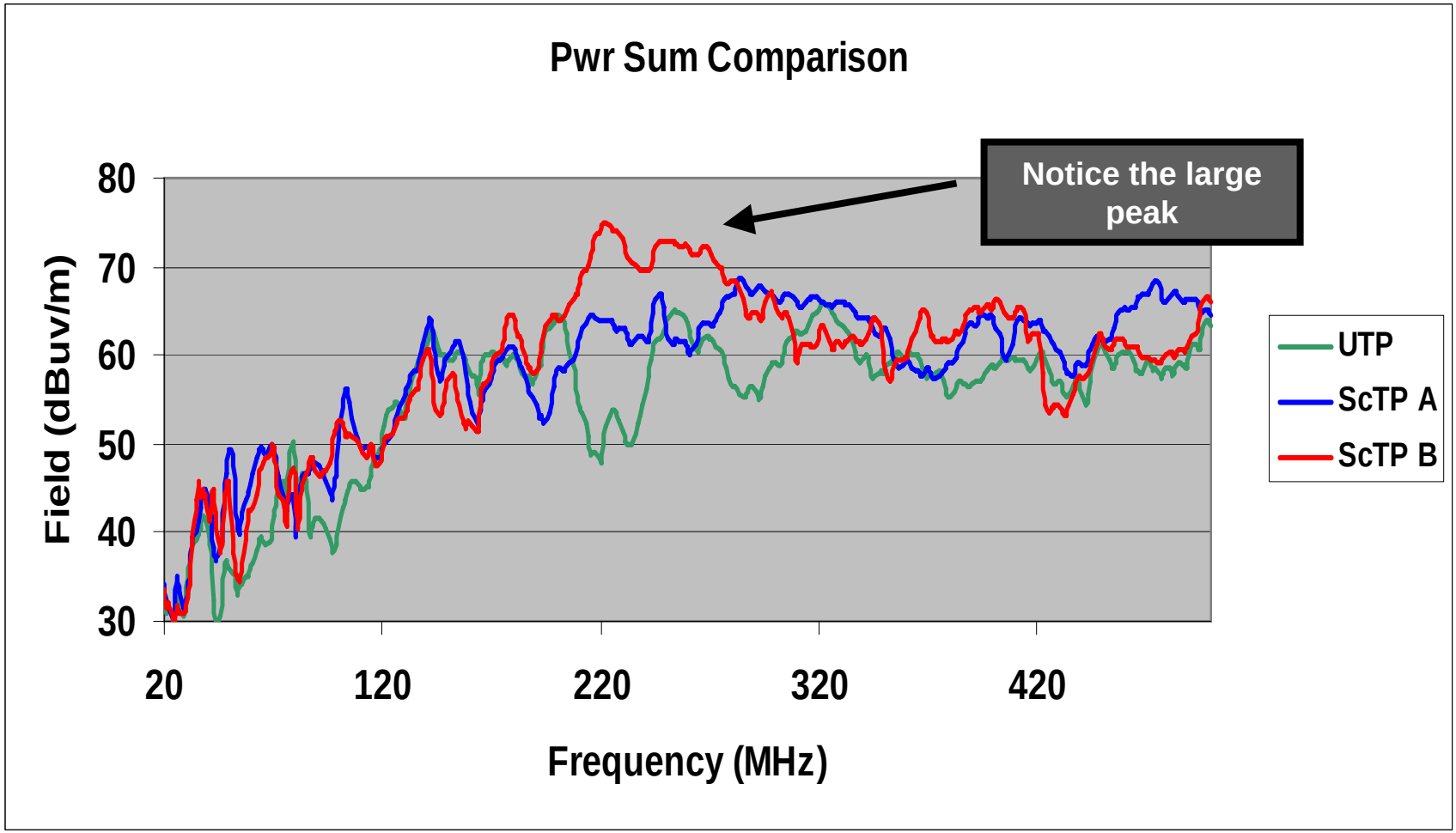
Individual pairs





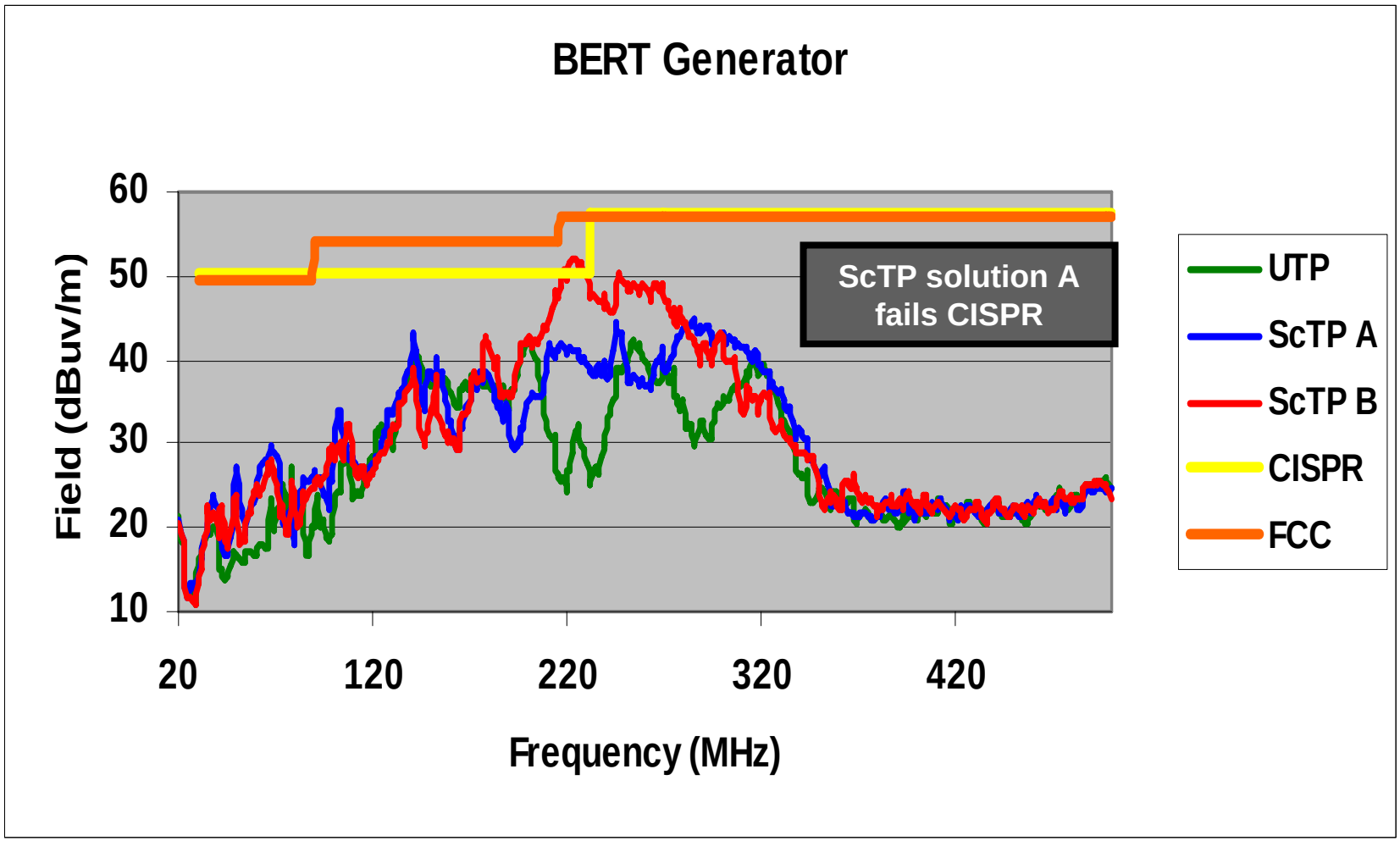


Test 1 Tracking Generator
Power Sum



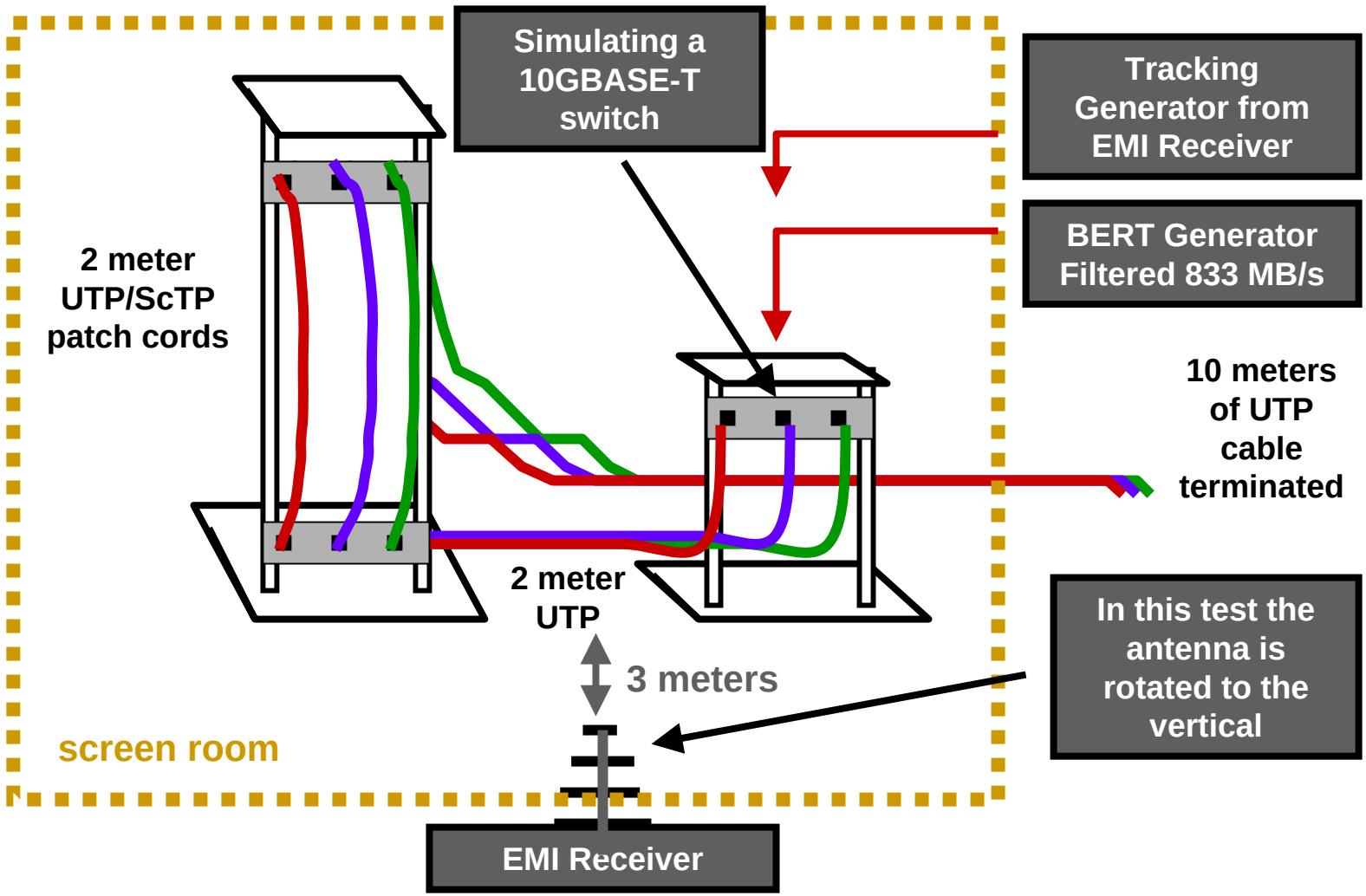
Test 1 BERT Generator

Power Sum



Test 2 Set Up

Simulating a cross connect



Test 2 Set Up

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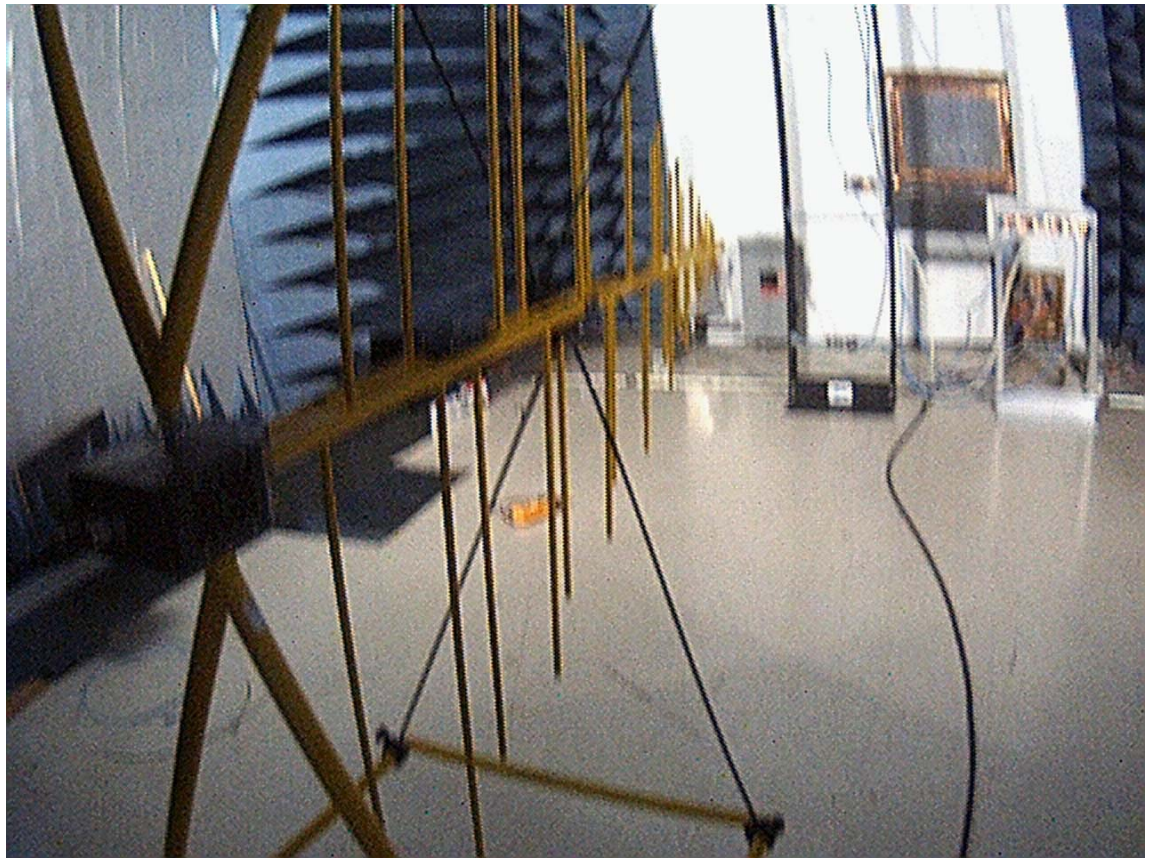
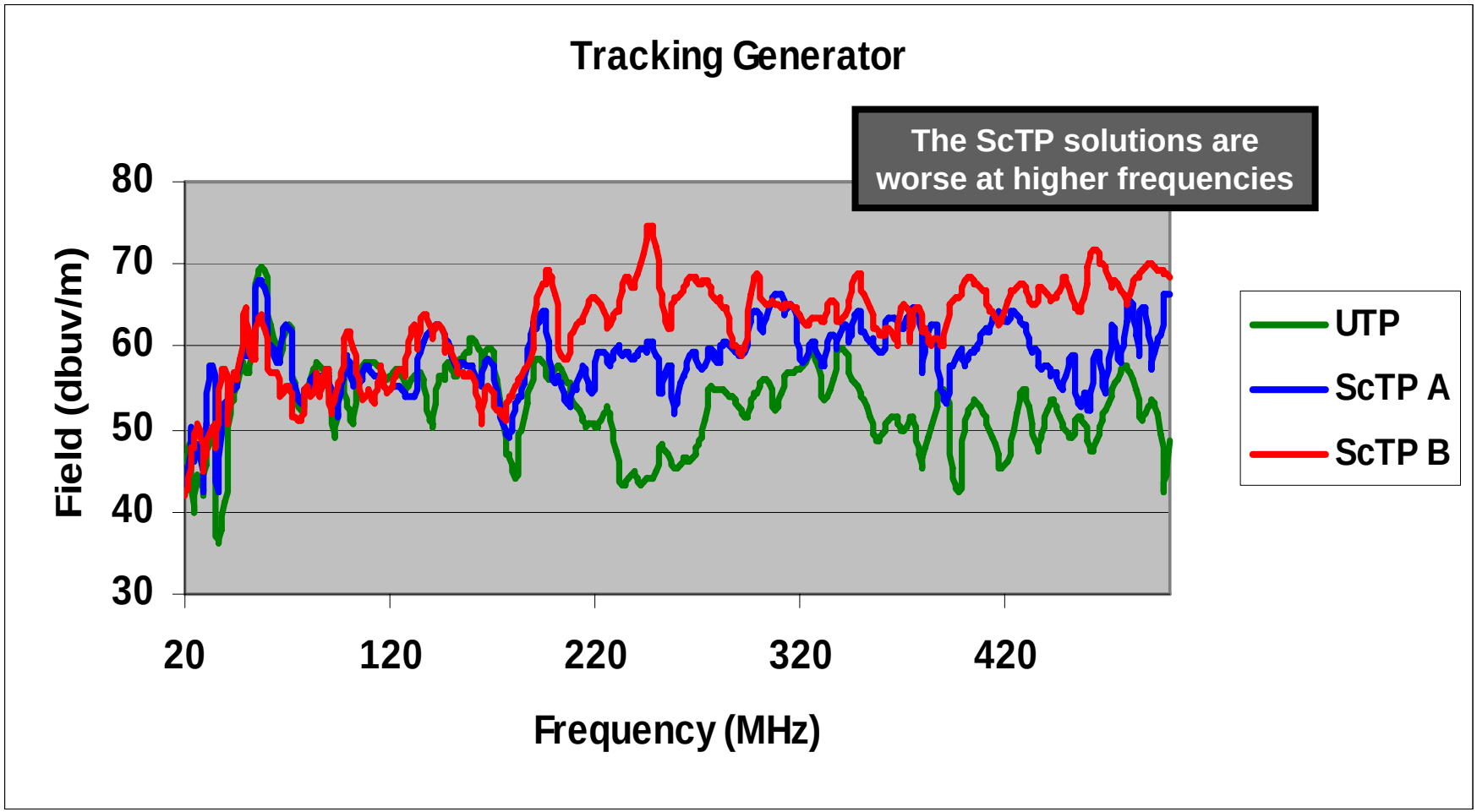


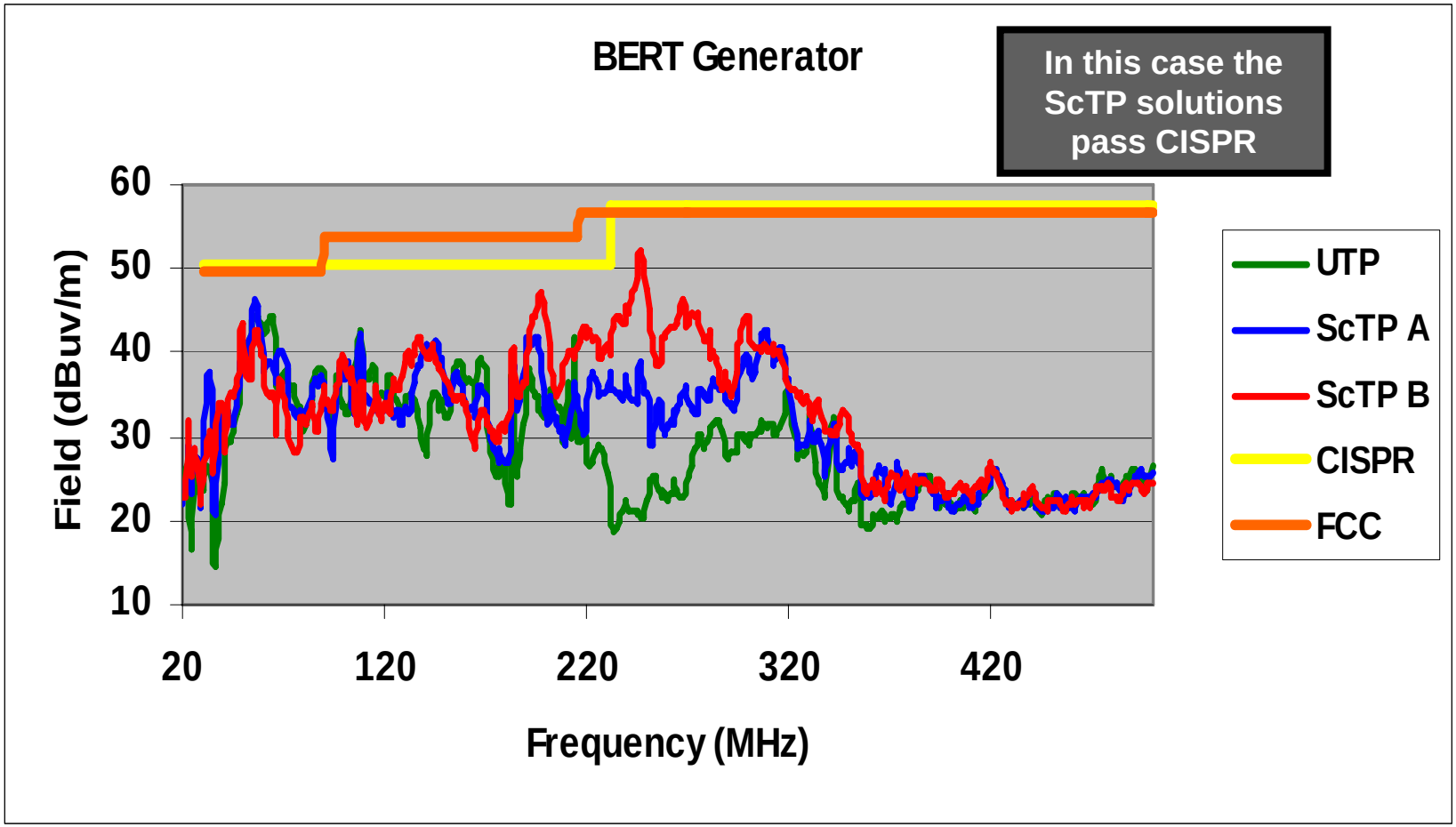
Test 2 Tracking Generator

Power Sum



Test 2 BERT Generator

Power Sum

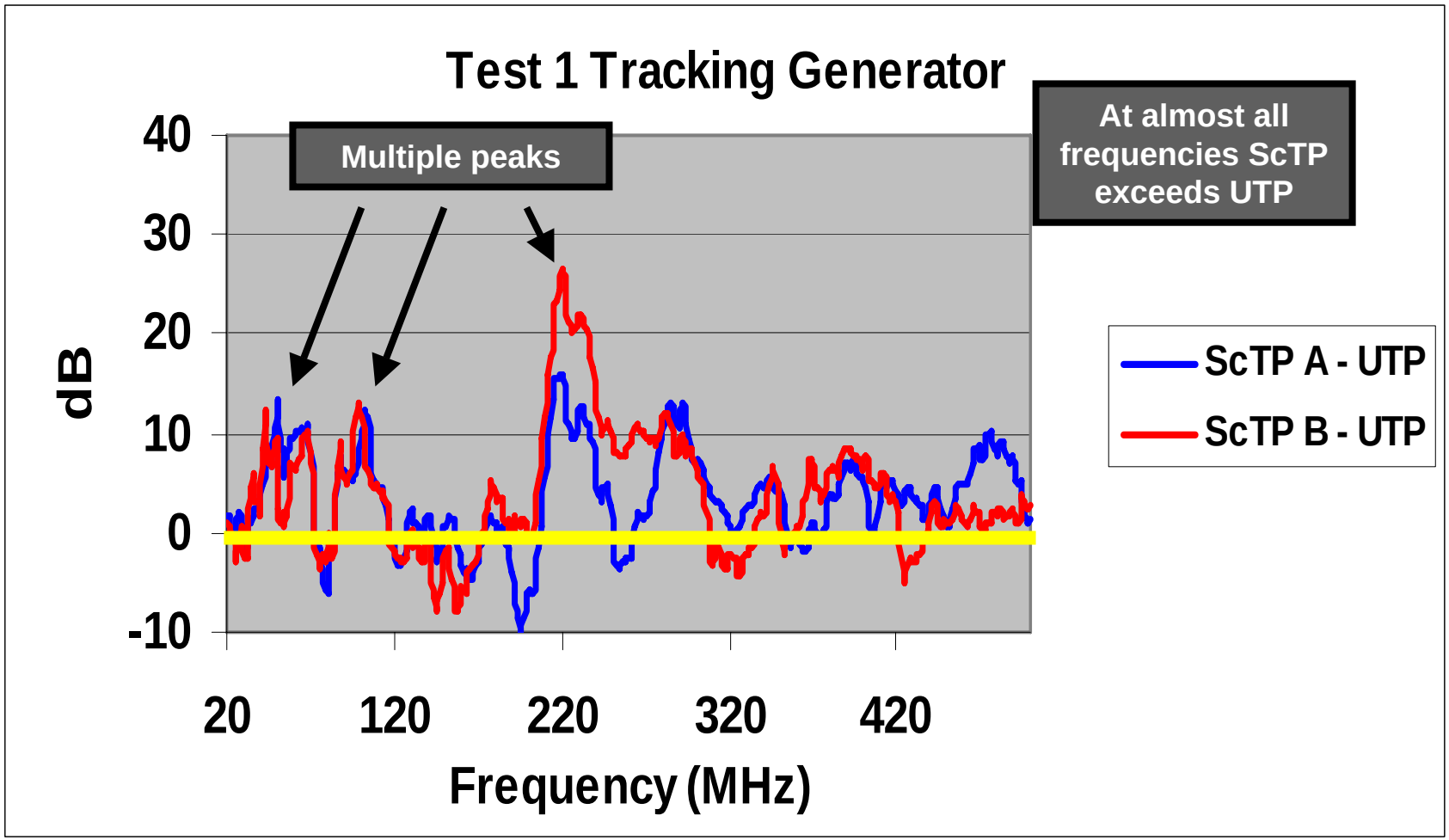


Explanation

- At the ends of the patch cord the transition from UTP and ScTP causes a large mode discontinuity.
- This creates standing waves on the shield of the patch cord.
- The patch cord becomes a good antenna which is causing the peaks you see in the plots.
- If we go back and look at the difference in dB between ScTP and UTP for the tracking generator you will see more clearly the series of peaks which is an indication of standing waves.

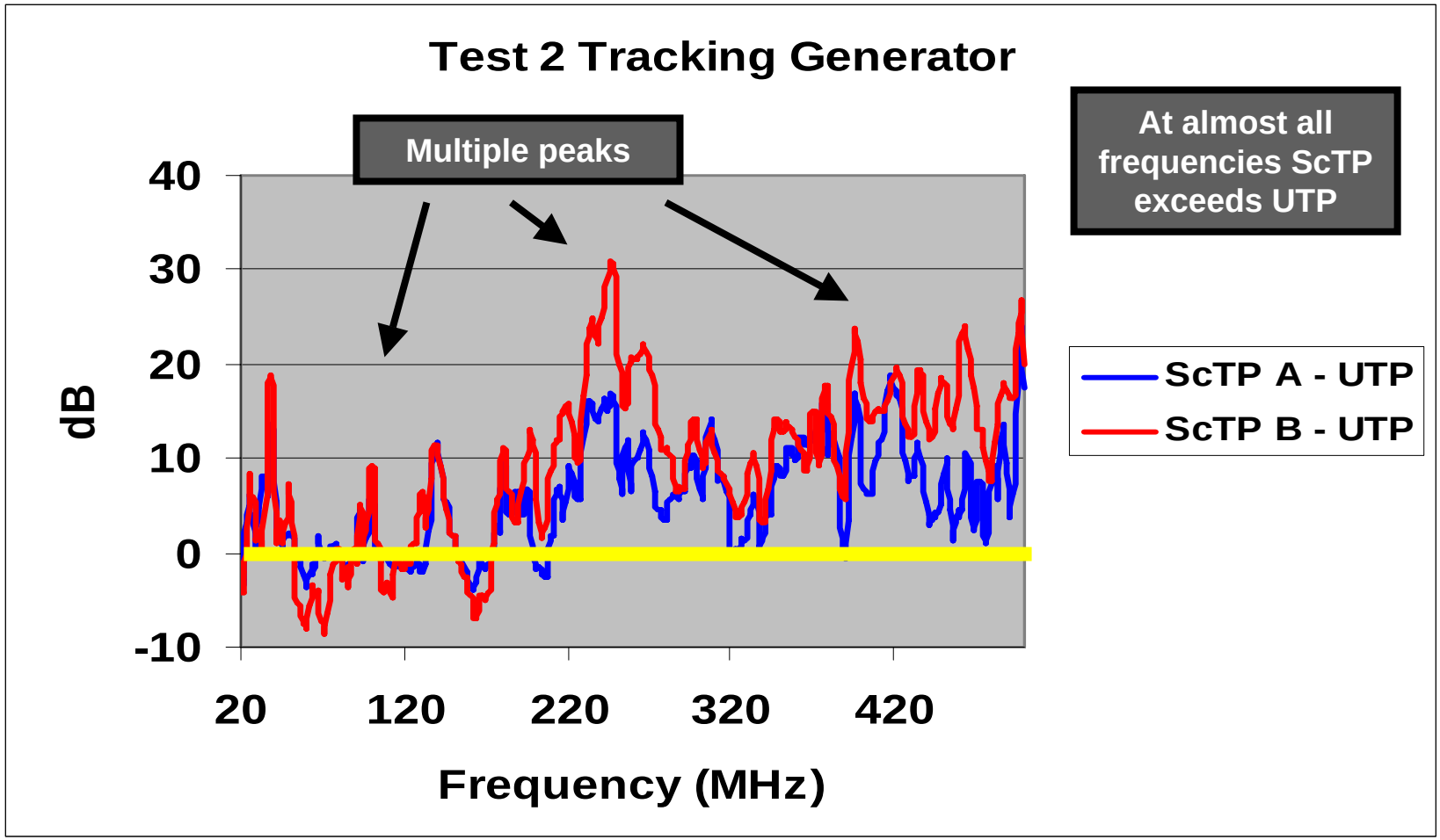
Test 1 Tracking Generator

Difference in dB between ScTP and UTP



Test 2 Tracking Generator

Difference in dB between ScTP and UTP



Conclusion

- Most experts in EMI will tell you that a badly shielded system can often be worst than no shield at all.
- This is what you see when you mix unshielded and shielded components.
- Although this was a simple example actual field conditions will probably be worse because:
  - There will be multiple patch cords at the same length in close proximity which will significantly amplify the radiated signal.
  - Laboratory baluns were used in this test, actual PHY's may have less balance.
- There is an indication that this type of mitigation is being used in new installations as a way of meeting the alien crosstalk requirements. We should discourage a practice that in the future might cause a portion of the new installations to become unusable for 10GBASE-T.