FCI Electronics

Test Proposal for Hippi 6400 Cable Assemblies

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Background

The Hippi cable assembly has multiple pairs (24 quad pairs), is high speed (~500 Mbps per differential pair) and has passive equalization in the longer lengths (>20? meters). The speed and complexity of the assembly requires significant, robust EMI shielding to allow host systems to meet domestic and international EMI requirements. System level testing has been performed demonstrating that host systems can meet FCC Class A requirements using the assembly, however component level shielding characterization of the assembly has not been performed. A measure of the shielding performance is required so that alternate cable assemblies can be compared.

This proposal details a test procedure, sample requirements and fixturing in order to determine the cable assembly shielding performance of the Hippi cable assembly. It also explores the impact on shielding of migrating Hippi 6400 to PCI bracket implementation.

Approach

The general approach toward the shielding assessment is to compare an unshielded ground referenced twisted pair with the shielded Hippi cable. The unshielded twisted pair serves as a reference from which shielding performance is determined. Recognize that all cable-shielding tests suffer from a relative lack of precision and 3 dB of variation is not uncommon unless the exact same fixturing and setup are adhered to. As such, performance variations of less than roughly 3 dB are deemed insignificant.

Several different types of cable assemblies have been developed which have varying degrees of shielding performance. They are:

- Type A cable assemblies rely on the Micropax connector for shield termination.
- Type B cable assemblies have a supplemental backshell and extensive receptacle hardware for shield termination.
- Type C cable assemblies refers to a Hippi 6400 cable assembly which has a connector form factor which does not preclude interfacing with a PCI bracket.

As type C cable assemblies do not exist, type B cables will be evaluated with a PCI bracket approach. As the type B receptacle and backshell will not fit on a PCI bracket, a lab mockup PCI bracket will have to be used. In this way an understanding of the limitations (if any) of using a PCI bracket approach can be acquired.

Test Setup

The test setup for the reference measurement is shown in Figure 1. An unshielded twisted pair is used and connects to signal pins of the Micropax connector. The Micropax connector is used so that the same fixturing, which is used for the cable assembly measurement, is used for the reference measurement. The mismatch between the signal generator output and the 100 ohm twisted pair cable will have little (<3 dB) effect on the measured shielding performance. The transfer impedance of the absorbing clamp is not required to perform this test as it appears in the sample and reference measurement.

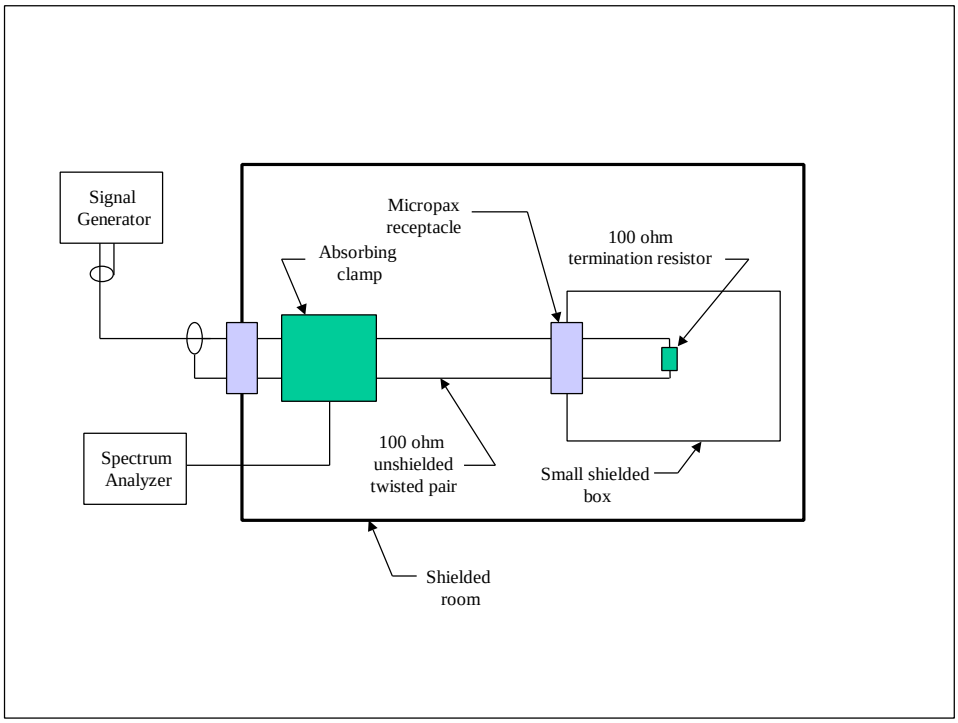

Figure 1. Reference Test Setup (30 MHz-1 GHz)

The test setup used for the Hippi cable assembly measurement is shown in Figure 2. The significant difference here is that the twisted pairs are driven relative to the outer shield. Several (3) pairs are excited out of the total number of pairs. The pairs are not excited differentially rather they are driven in common. The Micropax receptacle termination to the shielded room and to the small shielded box must be in accordance with system level implementation. To ensure this, typical customer hardware and mounting brackets will be used. In the case of cable type C (PCI compliant) testing, PCI brackets must be used. Typical and best case PCI bracket to chassis connections will be used.

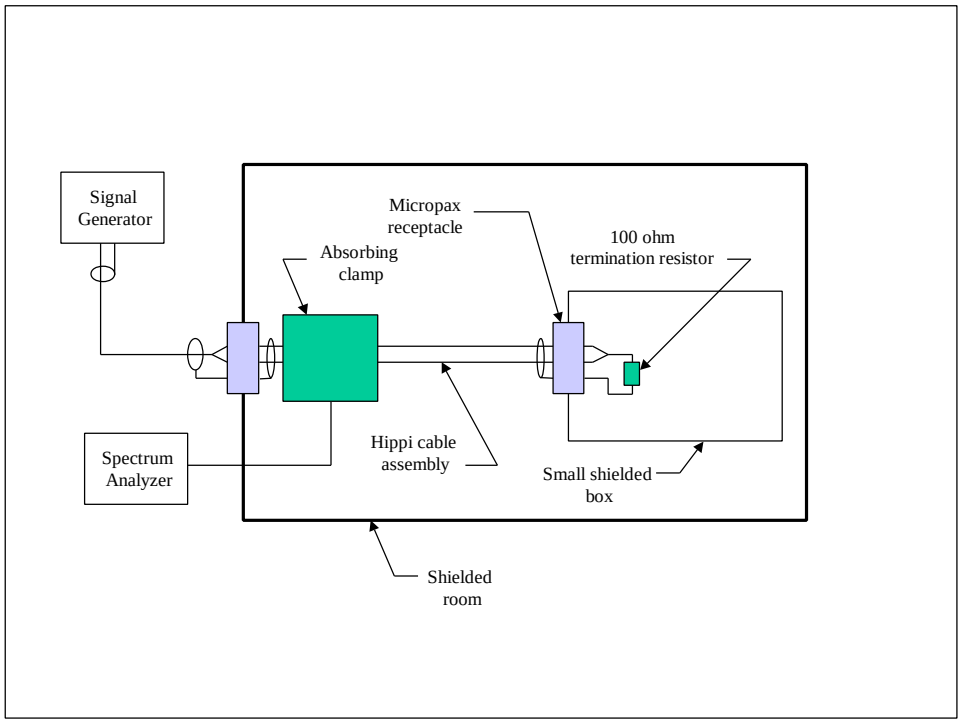

Figure 2. Cable Assembly Setup (30 MH –1 GHz)

For testing in the 1 GHz to 10 GHz range, discrete measurements will be made every 500 MHz. As the bandwidth of the absorbing clamp is limited to 1 GHz, above 1 GHz a horn antenna will be used as the sense element. Careful positioning of the antenna relative to the cable sample is required or mode stirring of the shielded room resonant cavity.

Test Procedure

The test setup documented herein is used on a routine basis at FCI. An automated (computer controlled) technique is used from 30 MHz to 1GHz while a manual technique is used from 1 to 10 GHz. The procedure is as follows:

1. Construct appropriate fixturing to mount the receptacle to the shielded box and shielded room in a system level representative configuration. The fixturing will be different depending on the cable assembly used. For the reference measurement the receptacle fixturing is not a factor, one reference measurement is all that is required.

2. Measure the unshielded reference cable (30 MHz –1 GHz). This consists of having the signal generator sweep the frequency range and the spectrum analyzer record the received signal from the absorbing clamp.
3. Measure the unshielded reference cable (1 GHz to 10 GHz). This consists of setting the signal generator to a specific frequency and recording the spectrum analyzer reading.
4. Measure the Type A Hippi cable (30 MHz –1 GHz)
5. Measure the Type A Hippi cable (1 GHz to 10 GHz)
6. Measure the Type B Hippi cable (30 MHz –1 GHz)
7. Measure the Type B Hippi cable (1 GHz to 10 GHz)
8. Measure the Type B Hippi cable with PCI bracket(30 MHz –1 GHz)
9. Measure the Type B Hippi cable with PCI bracket (1 GHz to 10 GHz)

10. Compute the shielding performance (cable assembly reading – reference reading).

Reporting Requirements

The reporting requirements are to report the shielding performance for the various cable assemblies and clearly document the shield termination technique for the measurement. As an example, it is anticipated that a very well shielded cable (Type B) will perform poorly if connected to a standard PCI bracket that has gaps along its interface to chassis.

Schedule

- Test plan complete and forwarded to committee members 1 week prior to Committee meeting in San Diego on 4/3
    - plan complete - 3-24-00
    - forward to committee - 3-27-00
- Review Plan with Committee in San Diego 4-5
- Travel to SGI and review EMI data w/ Val Mandrusov 4-6
- Acquire test samples (4-5 through 4-30)
- Develop fixtures and test cables by end of April 2000
- Testing complete by 5/15/00
- Report by 6/1/00

Sample Requirements

Type A cables (3) *(FCI to provide)*
Type A receptacles (2) *(FCI to provide)*
Type B cables (3) *(FCI to provide)*
Type B receptacles and shield termination HW *(SGI to provide)*
PCI brackets (2) *(FCI to provide)*