Testing of Radiated Emissions for IEEE Std 1394-1995 A/V Cable.

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1 Scope

The intent of this document is to describe the concerns of the 1394 A/V cable as they relate to radiated emissions. Emission measurements will be made under a minimum system configuration consisting of a Sony® VAIO PC and a Sony® Camcorder. The intent of the measurements is to get an idea of the severity of radiated emissions caused by common mode speed signaling and noise on a motherboard s logic ground plane coupling through the shield of a 1394 A/V cable. Though there aren t any motherboards currently in the market that incorporate the connector, there are 1394 Host Adapters that do. Radiated emissions associated with speed signaling will not be tested until there is a 200Mb/s or above device that utilizes the 1394 A/V cable. The radiation emission measurements will be conducted in a 3-meter semi-anechoic chamber. Emission measurements will first be conducted with the PC as a stand-alone device consisting only of the PC, monitor, keyboard, and mouse. This is known as base-lining the system. We expect this measurement to be below the FCC requirements since each component has under-went FCC certification. Subsequent measurements will be conducted under multiple 1394 topologies discussed later in this document.

2 1394 A/V Cable verses Six Pin 1394 Cable

Figure 1 (next page) shows the 1394 A/V cable environment. Notice that the grounding tabs of the connector shell are attached to the logic ground plane for both the PC side of the system as well as the device side. This is atypical of the power configuration described in Annex A of the 1394.1995 specification for nodes that source power. Figure A2 of Annex A shows the cable shield connected to the external enclosure, which effectively isolates it from any logic ground. Figure 2 [1]depicts this configuration. The internal ground wire connects to the logic ground while the shield connects to the chassis of the PC.

2.1 EMI concerns associated with the 4-pin 1394 A/V cable

For the 6-pin cable environment, the chassis ground isolation for the cable shield confines ground currents to the inner-conductor ground, which allows the shield to effectively suppress radiated emissions. Since there isn t an inner-conductor on the 1394 A/V cable, common mode speed signals, or a noisy ground plane which is typically found in PCs will cause a current to flow through the shield resulting in radiated emissions.

[1] In Figure 2, the shield isolation circuit is assumed though it isn t shown. The shield isolation circuit consists of a resistor capacitor parallel combination between the shield and chassis ground. See section 4.2.1.4.8 of the IEEE1394.1995 August 30 1996 release.

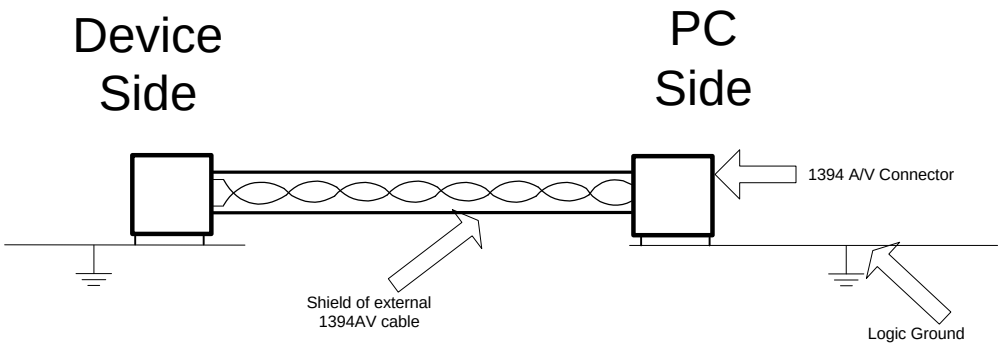

Figure 1 1394 A/V Cable environment

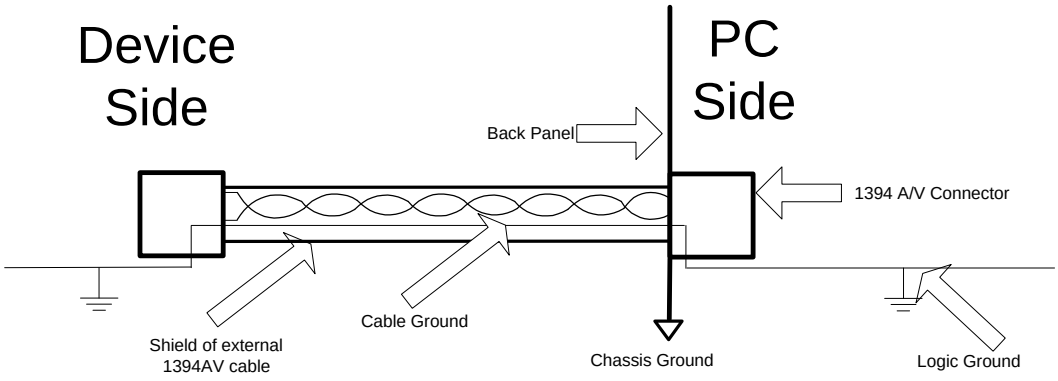

Figure 2 1394 6-pin cable environment

3 System configurations and 1394 topologies

This section identifies the system configurations, and 1394 topologies we are interested in testing against. A system configuration consists of the PC and all its internal add-in peripherals.

3.1 System Configurations

The first two system configurations listed below will be used against all 1394 topologies. Each configuration will be base-lined to allow ease in identifying components in a 1394 topology that fail FCC radiated emissions limits. Configuration 3.1.3, which includes a SCSI controller, will be used to determine how 1394 A/V emissions compare with external SCSI.

3.1.1 Sony® VAIO with 200MHz Intel Pentium Processor

- Adaptec AHA® 8940 1394 Host Adapter.

3.1.2 Sony® VAIO with 200MHz Intel Pentium Processor

- Sony® DVBK-1000 Still Image Capture Board

3.1.3 Sony® VAIO with 200 MHz Intel Pentium

- An Adaptec® SCSI Controller.

3.2 1394 Topologies

The following subsections identify the various 1394 topologies we are interested in testing.

3.2.1 Sony® DCR-PC7 Camcorder to System Configuration 3.1.1

This typical 1394 topology will be used to test the emissions of the 4-pin to 6-pin 1394 A/V cable. Since this camcorder only supports 100Mbs data rate, this test will give us an idea of the severity of the emissions associated with ground plane noise coupled on to the cable shield.

3.2.2 Sony® DCR-PC7 Camcorder connected to System Configuration 3.1.2

This test is the same as the test described above. The only difference is the cable. which is the 4-pin to 4-pin version that connects to the Sony(R) DVBK-1000 Host Adapter.

3.2.3 Loop Antenna Configuration

The final configuration shown in Figure 3 (next page) involves connecting a hybrid combination of three 1394 devices and an audio receiver. The loop antenna created by this valid combination will cause a stronger radiation pattern.

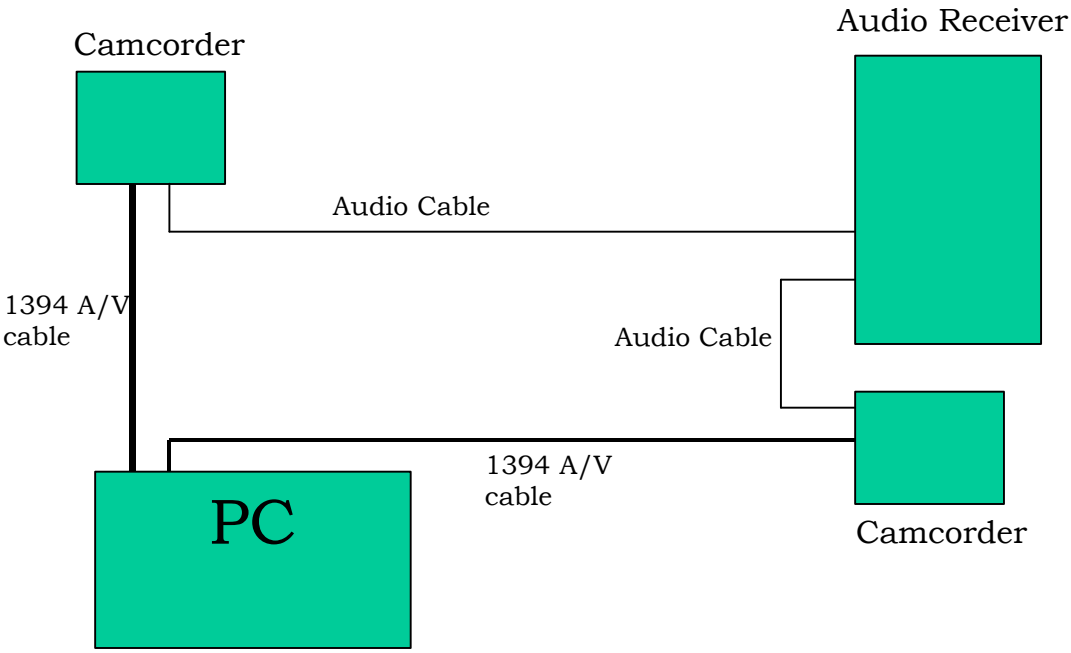

Figure 3 Loop Antenna Configuration