SCSI signal modeling study group (SSM)
September 09, 1999
Manchester, NH

Subject: Approved minutes for the July 29, 1999 SSM study group

This was the second meeting to address the general subject of modeling for parallel SCSI. Paul Aloisi led the meeting in the absence of Dean Wallace. Bill Ham of Compaq took these minutes. There was a good attendance from a broad spectrum of the industry. Hitachi cable (Zane Daggett) hosted the meeting.

1. Introduction

Paul Aloisi opened the meeting and conducted the introductions and reviewed the meeting purpose.

2. Attendance

The following folks were present:

Martin Ogbuokiri, Molex
Larry Barnes, LSI Logic
Jie Fan, Madison cable
Johnathan Fasig, Western Digital
Jackie Sylvia, Hitichi cable
Tariq Abou-Jeyab, Adaptec
Paul Aloisi, Unitrode
Bill Ham, Compaq
Ivan Chan, Quantum
Andrew Bishop, Quantum
John Ellis FCI/Berg
Farbod Falakfarsa, Quantum
Nicholaos Limberopoulos, C&M
Ken Plourde, Tempflex

3. Agenda development

The agenda shown was that used.

4. Presentations

4.1 Host bus adapter model Tariq Abou-Jeyab, Adaptec

The following material was presented:

the elements to consider are:

- Internal connector
- External connector
- ASIC chip
- Terminator
- Board construction

There was a discussion of the basic purpose of this simulation effort. This discussion reiterated the need for continuing communication and definition of terms and concepts.

One area of consideration is the definition of the term “IBIS”. IBIS is a behavioral type of specification limited to chip input and outputs and terminators. Connectors are being considered for an IBIS. IBIS does not include transmission lines or PCB’s.

For behavioral specifications the SCSI modeling study group will use only IBIS specification methodology for chip input, output, and terminator.

For circuit type specifications no specific position was taken but it was generally agreed that something like SPICE will be used. This topic will be addressed later.

The details of the board construction to consider. Tariq suggested that the microstrip and the stripline constructions be considered as the basic options within the PCB. The details of these models are a primary part of the simulation requirements. These are the only likely constructions to consider.

4.2 References useful for modeling and simulation (Jonathan Fasig, Western Digital)

Jonathan produced three useful lists of references;

- Signal integrity publications
- On line bookstores and publishers
- Other related online resources

Action Item: Jonathan to send the lists electronically to Bill Ham for posting.

4.3 Difference between simulated and measured TDR traces (Martin Obbuokiri, Molex)

Martin presented real data from a connector and an attempt to simulate the same measurement using a discrete lumped circuit model. There was approximately a 3x difference between the measured and calculated results in terms of the time extent of the connector. The amplitude features however agreed within 4% (peak to peak only).

Action item: Martin to supply a block diagram of the simulation process used to do the simulation.

Recommendations:

- Use only peak to peak results to validate the simulated results
- Ignore the timing features of the results
- Do not use the average (over time) impedance values since the synchronization between the simulation and the measurements.

Better agreement could be obtained if the multiple reflection due to the discontinuities in the test fixture and the connector were included in the model. Presently it requires special expertise to use the SPICE tool for simulating multiple reflections due to the need to input many details of the physical test environment.

4.4 Transmission line coupling parameters (Larry Barnes, LSI Logic)

Larry presented the results of a comprehensive simulation relating to the intensity of backwards cross talk as a function of distance from a conductor. This model was a first cut at understanding the issue. Two issues that need to be added to this approach are using differential signals and including ground lines were they exist in SCSI.

One major result of this work was a very rapidly decreasing coupling with spacing. Another possible result was an extended residual inductive coupling. This is probably due to the way the ground returns were specified in the model. If the extended residual inductive coupling is truly significant it could indicate more cross talk but that conclusion needs to be validated.

5. Output of group

The effort will produce three types of output: (1) reports to the SCSI working group, (2) a document containing the technical details (exact type of document is TBD), and (3) a web based repository for specific models.

Larry Barnes, LSI Logic, agreed to be the editor for the document.

6. SFF backplane

Bill H noted this activity is still planned but not yet started.

7. Components to be modeled

7.1 Cable assemblies

Cable assemblies consist of: media, connectors, and transition region between pure media and connector termination.

7.1.1 Cable media (bulk cable)

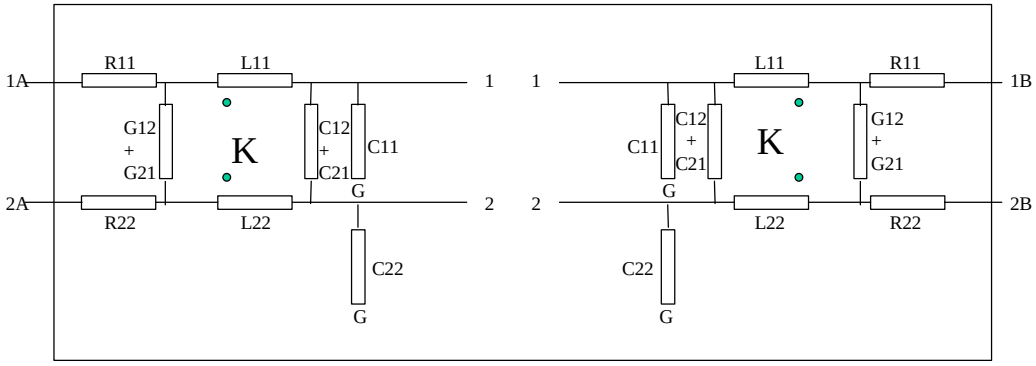
Discussed at June meeting.

7.1.2 Connectors (on cable assemblies)

A model similar to that used for cable media was suggested. One view of this model is shown in the following figure.

A 2 WIRE CONNECTOR WITH NO SHIELD

connector half A connector half B

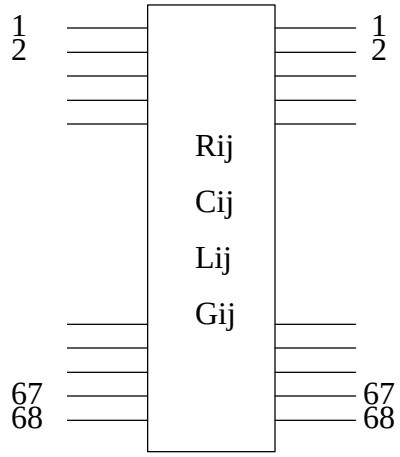


K = f(L12, L21)

The values shown are the matrix element values for the input to the simulator

Figure 1 - Architectural model for a two wire unshielded connector

A more general version is required for an actual SCSI connector having many contacts. This model would have the same general form as for cable media.



The above discussion focuses on a circuit model approach. A behavioral model may also be attractive but no direction was created in this meeting.

The integration of connector, chip, media, into a single simulation is a major point of interest for this group.

7.1.3 Transition region

The transition region is that part of the cable assembly that is between the connector itself and the undisturbed cable media. This region has not been attempted previously and no models or approaches are presently available.

It was agreed that the folks who do the cable assembly manufacture and design are the source for the parameters for this part of the interconnect.

7.2 PCB’s

Dean to provide a target board model.

Not effectively discussed at this meeting. Suggested that the following items be added: vias, discontinuities, signals over discontinuities and the like.

7.3 Connectors for non cable applications

At this point there is no difference between the between these connectors and those used for cable applications.

Molex will supply an RGL transmission line matrix (circuit type of specification) for VHDCI, SCA-2,and HD68 connectors.

7.4 Termination

Addressed in the June meeting.

7.5 Transceivers

Due to proprietary nature of transceiver design only behavioral models will be attempted.

7.5.1 Chip packages

Not discussed at this meeting

7.5.2 Access to actual measurement points

Not discussed at this meeting

8. Simulation integration strategy

This requires behavioral specifications to be converted into a circuit model.

Significant discussion on how to integrate the simulations from the different interconnect and chip elements since different simulation specification types are used for the different elements. The common approach seems to be a circuit specification approach.

This requires behavioral specifications to be converted into a circuit model. The simulation strategy currently is: IBIS models for the IO buffers and SCSI terminators and a spice model for the cable media, connectors, PCB, and cable assembly transition regions. It is possible to create circuit models from some behavioral tools and vice versa, this allows tailoring the specific simulations to the nature of the specific problem. An important goal and output for this work is a set of building blocks that everyone can use. For example, transceiver cells, package leads and bond wires etc., connectors, cable media, terminators, PCB’s and the like.

The integration of these building blocks into a simulation strategy for several parts of the SCSI bus is a second phase for the effort.

The third phase is to ensure commonality between simulation input needs and the parameters available from the component suppliers. The reverse is also important: going from simulated performance needs to parameters controllable by the component supplier. The specific action is to agree on a way to translate between needed parameters for simulation and the parameters available from physical measurement methods and specifications.

The following figure shows a graphical representation of this discussion.

SIMULATION STRATEGY

BEHAVIORAL (IBIS)	CIRCUIT (SPICEY)
CHIP INPUT / OUTPUT	CABLE MEDIA
SCSI TERMINATORS	CONNECTORS
	PCB
	CABLE ASSEMBLY
	TRANSITION REGIONS

PRESENTLY IT IS POSSIBLE TO CREATE CIRCUIT MODELS FROM SOME BEHAVIORAL TOOLS AND VICE VERSA --
THIS ALLOWS TAILORING THE SPECIFIC SIMULATONS TO THE NATURE OF THE SPECIFIC PROBLEMS

9. System configurations

Not discussed

10. Data patterns

Not discussed

11. Data rate

Not discussed

12. Verification / correlation

12.1 Physical measurement points

Not discussed at this meeting

13. Definitions:

Not discussed

14. Tools:

Not discussed

14.1 Behavioral

Not discussed

14.2 Circuit

Not discussed

15. Next meetings

Sept 01, 1999 Colorado Springs (Embassy Suites?)
Sept 29, 1999 Chicago (Lisle) at Molex plant

16. Action Items:

Martin O. to supply a block diagram of the simulation process used to do the simulation for TDR.
Status: new

Jonathan Fasig to send the lists of reference material electronically to Bill Ham for posting on the web site.
Status: new

Martin O. to supply an RGL transmission line matrix (circuit type of specification) for VHDCI, SCA-2,and HD68 connectors.
Status: new

Dean to provide a target board model.
Status: carried over

Larry Barnes to create a document framework.
Status: new

Larry Barnes to do an overview presentation of the IBIS transceiver model specification.
Status: new

Tariq to provide an IBIS transceiver model
Status: new

Ham to post the draft minutes (after review by Dean)
Status: new