Cable Discharge AdHoc meeting, held Tuesday 13th March 01
Unconfirmed minutes

Meeting commenced approx 7.15pm

Geoff Thomson Called the meeting to order, gave a brief overview of the purpose of the meeting, and read the minutes of the last meeting. The status of the actions from that meeting was:
1) David will establish a reflector and post the minutes of this
meeting. - done
2) Terry/Chris will contact TIA with regards to obtaining information
about static charge build up and discharge on cables. - done
3) Terry will provide data on cable charge vs humidity and cable type - done
4) Dan will provide data on test methods and results performed at HP. – not done

Terry Cobb gave a presentation: "Cabling ESD Study"
The material for this was taken from a study done several years ago by Lucent. It used Human body model measurements, using off the shelf probes. Method – one pair is charged while the others are tied to ground or floated, but little difference observed whether floated or tied to ground. Current waveforms shown for cable discharge. Results shown for different humidities – lower the humidity, the higher the current out. Results also shown for different cable types (different manufacturers, Cat5 and Cat6, corrected for humidity of 50% - little difference between different cables except for cat5e cable which showed significantly higher current discharge than the other cables in the case where unused pairs were grounded.

Geoff Thompson questioned whether 50% humidity was a valid condition for comparing discharge from different cable types.

Kevin Brown – want to understand methodology – do you apply charge then wait for 4 Hours ?
Terry Cobb – Apply Charge using Human Body model, wait 4 Hours then discharge

Bill Quackenbush – Any Metallic contact
Terry – No

? – is it discharged into a 100 Ohm load ?
Terry – not sure – it was a matched load using an inductive current measuring device, probably 50 Ohms.

Rick Brooks – what is cable resting on
Terry – there is a fixture for the whole thing supporting the cable above a ground plane – providing a stable, consistent model.

? – is charge in one wire wrt ground
Terry – no, charge is in one pair wrt ground. Wires of the pair tied together at opposite end.

Terry – (wrt variations in the voltage discharge for different cable types) only 1 KV difference found between all cable types and all humidities.

Terry – Guidelines for equipment – class 3 equipment has to meet 8KV – Human body model discharge

Alan Flatman – Voltage is applied capacitively.

Geoff Thompson – what is radius of probe ?
Alan – very small – mechanical baby finger

Bill Quackenbush – is it Human Body charge
Terry – yes

Geoff Thompson – Better test than none at all, but charging of cables is a different case to Human body model.

Alan Flatman – EMC tests (EFT/ESD) that simulate these conditions don't couple this level of energy into the cable, so not a realistic case

Terry Cobb – All cards (equipment) should pass 8KV discharge, or they will be damaged by static.

Steve Levy – (wrt PHY's) Typically we are not reducing discharge withstand .

Bill Quackenbush – Our equipment has been through (passed) these tests and seen damage in the field. can put equipment through the tests and problems probably won't be seen.

Terry Cobb – with our equipment tests we found if it passed Human body model at 15KV, and equipment OK, then there was no problem in the field.

Rick Brooks – what about other charging mechanisms: cable pulling, Tribocharge, slow charge ?
Terry – don't believe there will be significant difference.

Geoff Thompson – why haven't we seen this before ?
Chris Diminico – we have – upto 15 years ago at least. We used to use 2 KV surge arrestors.

Steve Levy – Do you have any voltage profiles for this ?
Terry – No

Steve Levy – people have equipment that would pass human body model test, but that has (subsequently) failed with static damage.

Alan Flatman – 15KV is an abnormal test level – not typical of normal office equipment

Kevin Brown – what is the cause of the cable charge – is it cable pulling, then once discharged its gone, or does it charge over (say) 2 years anyway ? Can it be solved by cable installation technique to discharge cable ?
Terry – don't know
Chris Diminico – lost of scenarios have been looked into – even air blowing over a cable can charge it; a cable connected to a metallic conductor can charge over time; could also have something to do with the types of cable raceways. We are trying to get the cable people to help with solving this problem in order to avoid the problem of white papers being published advising people not to use Cat6 cable. Lets find out what's really happening with device failures.

Terry – agree with Chris, has also asked cabling people for numbers to help create a model

Some debate ensured about what a standard is: interoperability or "operable". Need to prevent "fragile" test.

Geoff Thompson - we need a real world test

Chris Diminico – we could wait and see what TIA will do, but interactive work such as defining loads, pulse, etc would help

Geoff Thompson – we need a piece of test equipment that is equivalent to the worst case field condition. Need some measurement of the phenomenon, is it differential mode, etc. Then step 2 – what gets coupled between pins, and semiconductor device

Chris Diminico – push investigation to use something with our preferred load characteristic, need a cabling Model

Geoff Thompson – Cable model already in standard
? – may not be a realistic model for cable discharge
Chris Diminico – need primarily a capacitive cable model

Rick Brooks – Have done some spice modelling of problem – and realised main problem is differential. The model showed several hundred volts pin-pin for differential. Any common mode charge is always less of a problem – eg one pin contacts, if other not in contact, no discharge path

More debate about the Human Body Model, with Terry the main proponent, and most others arguing against.

Terry – does anyone have anything they can contribute / measure

Rick Brooks – had done some 15KV ESD testing with for DTE power, but couldn't get testprobe (mechanical finger) near RJ45 pins, it discharged on RJ45 shield instead.

Chris Diminico – For decent measurements, need fixed ground plane reference – c.f. Terry's presentation.

Steve Levy – need series impedance model – how fast it discharges.

Chris Diminico – Model breaks down quickly in these circumstances – can't easily take account of twists in cable.

Finally, Action items were discussed, and the following Action items were recorded. Meeting Adjourned @ 8.50pm.

Actions
Rick Brooks – to provide Quantitative details for his spice model: Discharge impedance, Diff voltage, duration, etc.

Rick Brooks – to send a Text file of his Spice Deck for modelling discharge to the reflector, also explanatory block diagrams. (issue transformer Model is linear one – need non linear model).

Henry Hinchs – (volunteered by Terry and Chris in his absence) to provide transformer model / details for non-linear behaviour of transformer (during cable discharge).

Scott Fritz – to provide front end model of PHY (Generic).

Chris Diminico – to do minutes for next meeting.

Participants

Name	Company	Name	Company
Geoff Thompson	Nortel	Wayne Walters	Xilinx
Michel Bohbot	Nordx	Rick Brooks	Nortel
Alan Flatman		Steve Carlson	ESTA
Terry Cobb	Lucent	Hon Wah Chin	Owl Systems
John Kincaid	Belden	Scott Fritz	TDK Semiconductor
Thomas Jorgessen	Intel	Steve Levy	TDK Semiconductor
Bill Quackenbush	Cisco	Robert Muir	Intel
Anand Injeti	ST Microelectronics	Rich Graham	Enterasys
Naresh Raman	LSI Logic	Ralph Andersson	TDK Semiconductor
Kevin Brown	Broadcom	Martin Wagner	Corning
Chris Diminico	CDT Corporation	Bob Noseworthy	UNH IOL