

## Recommendations from the Silicon Group for the operation of the CDF Silicon detector in the near future

During the last 6 months the CDF Silicon system experienced 14 new failures. The symptoms are well confined and identified while the sources are yet to be understood and still under investigation (Si Task Force).

Table 1 lists the failures in chronological order. The failures can be divided into two separate categories: the DOIM failure and the DVDD jumper failure.

Ladder	Date	Type	Run	L1A rate	Torture
SB4W9L4	03/18/2002	Jumper	<a href="#">141190</a>	3.4 KHz	NO
SB0W2L2	03/24/2002	Jumper	<a href="#">141571</a>	3.5 KHz	NO
SB5W5L0	05/08/2002	Jumper	<a href="#">144562</a>	16 KHz	YES
SB3W8L0	05/08/2002	Jumper	<a href="#">144562</a>	16 KHz	YES
SB5W4L2	06/16/2002	DOIM	<a href="#">146652</a>	17 KHz	YES
IB1W1L4	06/27/2002	DOIM	<a href="#">147267</a>	16 KHz	YES
SB4W10L4	06/27/2002	Jumper	<a href="#">147267</a>	16 KHz	YES
SB0W3L3*	09/03/2002	Jumper	<a href="#">150948</a>	5-7 KHz	YES
SB5W7L0*	09/03/2002	Jumper	<a href="#">150948</a>	5-7 KHz	YES
SB0W7L4*	09/03/2002	Jumper	<a href="#">150948</a>	5-7 KHz	YES
SB5W3L1*	09/03/2002	Jumper	<a href="#">150948</a>	5-7 KHz	YES
SB2W9L0	09/15/2002	Jumper	<a href="#">151557</a>	3-4 KHz	NO
SB0W4L4*	09/27/2002	Jumper	<a href="#">152125</a>	3-4 KHz	NO
SB1W3L4	10/5/2002	Jumper	<a href="#">152515</a>	7-8 KHz	NO

**Table 1: List of failures in chronological order. Ladders with a \* have shown specific symptoms on the data being readout before the failure.**

Both types are consistent with the loss of electrical continuity on a power line. There are now 3 lines of investigation that are being pursued:

- Current surges through the power line (and GND)
- Aging and consequent breakage of the power line (electron migration)
- Aging and consequent breakage of the wire-bonds due to mechanical stress induced by Lorentz forces. (Current in a magnetic field)

An immediate action that can be taken in order to reduce the risk of new occurrences is to minimize the current consumption on the line that is breaking.

While this is hard for the DOIM it can easily be accomplished for the DVDD jumper by not reading out the Z information from SVXII ladders. This can be done without any hardware change but only by downloading a new bitstream of settings to the SVX3d chips in the SVX2 detector.

This has already been tried on the bench and the results are presented on figure 1 and 2.

The current consumption through the DVDD jumper connection is reduced by more than 60 % once the new bitstream is downloaded.

For the failure of 5 of these ladders (the one with a \* in table 1) the data recorded right before the failure were marked with specific symptoms. As a consequence the operating procedures in CDF have been changed in such a way that the silicon online monitoring tools have the capability to spot online the specific symptoms and request to run Control

a Re-initialization of the SVX3d chips (this is done by HRR and does not have a significant impact on the efficiency of data taking).

In order to see the impact of the new operating procedures we will implement the minimization of the current consumption only if a new failure occurs.

These results have already been discussed with the CDF Physics Coordinator (Tony Liss) and we found common agreement for the plan of action.

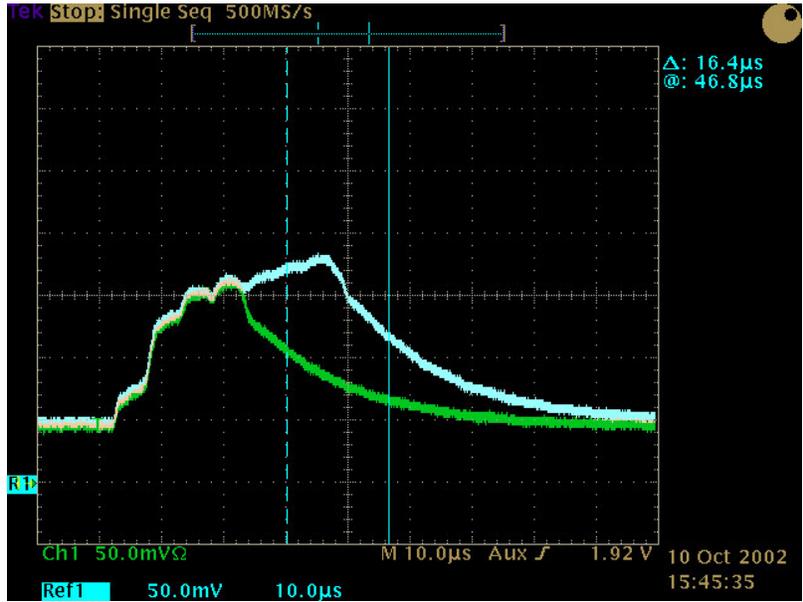


Figure 1 DVDD current versus time for a layer 1 ladder in read-all mode. The light gray trace is the current consumption when all 6 chips (3 PHI and 3 Z) are read out while the green trace is the current consumption when only the 3 PHI chips are readout.

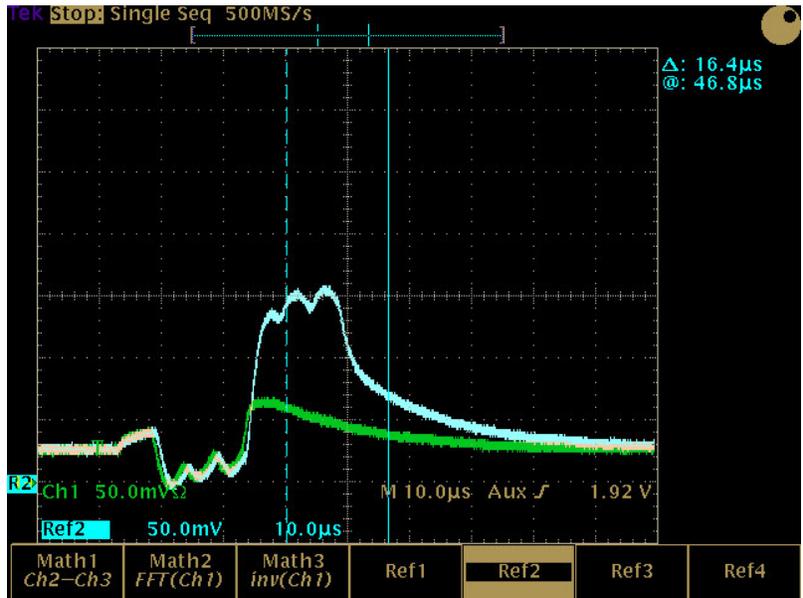


Figure 2 DVDD current versus time for a layer 1 ladder in read-all mode. The current is now measured through the replaced jumper connection. The light gray trace is the current consumption when all 6 chips are read out while the green trace is the current consumption when only the 3 PHI chips are readout.