DMILL Configuration Controller

I. Introduction/Overview

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DMILL Config PRR, January 30, 2003
DMILL Configuration Controller

- Config was designed by LAL/Nevis collaboration to provide interface between SPAC Slave and the various devices on the FEB which need to be configured
  - Design effort led by Ph. Cros during his visit from LAL to Nevis
- The design was reviewed in June 2000
- First (and final) design was submitted as part of MPW 511 in Sept. 2000
- A total of 40 packaged prototypes have been received and tested, from two different sets of wafers
  - First 20 devices were delivered in March 2001 and came from original wafers, which suffered from a via misalignment problem detected by the foundry
  - Second set of 20 devices were delivered in May 2001 and came from “backup wafers” processed by foundry without the via problem
  - As it turned out, both sets of devices were functional

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Connects to SPAC Slave using SPAC Parallel Interface at 5 MHz

Configures various FEB devices via private buses

Config die measures 31 mm² (pin limited)

Config is packaged in 100 pin PQFP
Implementation of the configuration controller

\[ \text{Nb_of_pins} = 17 + 23 + 8 + 8 + 16 + \text{n_of_th} = 72 + \text{n_of_th} \]
Config Testing Results

- Config has been successfully tested on “1/4 Digital FEB”, where many of the various custom digital ASICs for the FEB were first integrated.

- For more than 1 year, the Config has been used successfully on the final FEB prototypes, where all functionality has been exercised.

- For chip acceptance and radiation testing, a separate, socketed test jig has been developed:
  - Same jig and setup can be used for functional acceptance testing and for radiation testing.
  - Functional tests of the 40 prototypes produced a yield of $\frac{37}{40} = 92.5\%$.
  - A total of 12 devices were irradiated with 158 MeV protons and demonstrated to be sufficiently tolerant to TID, NIEL and SEU.
  - See presentation from Stefan Simion for details.
FEB Prototype

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Config Production Plans

- Nevis is responsible for the production testing
- Config chips will be packaged in 100 pin PQFP with identical pinout to that used so far for the prototypes
- Packaged chips will each be labelled with a unique serial number
- Production Config chips will be functionally tested using same test jig and procedure as used for prototypes
  - A record will be kept of tests which are failed by Rejected chips
- Production quantity:
  - One Config chip is required for each of the 1627 FEBs to be produced
  - In addition, must provide 8% spare chips ⇒ 1760 functional chips needed
  - Assuming 80% yield, need to package and test 2200 Config chips
  - All of the production testing can be performed within a few days