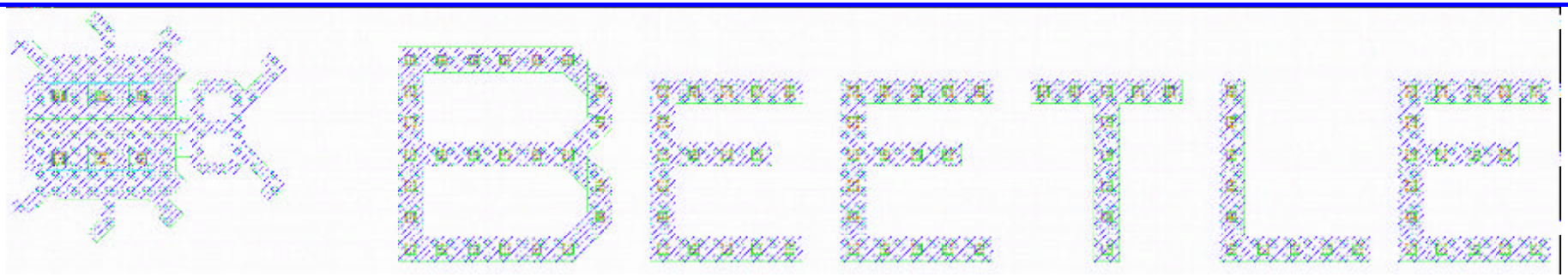

Status and Plans

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Jo van den Brand[1], Martin Feuerstack-Raible[6], Neville Harnew[3], Werner Hofmann[2]
Eddy Jans[1], Sander Klous[1], Karl-Tasso Knöpfle[2], Sven Löchner[2], Michael Schmelling[2]
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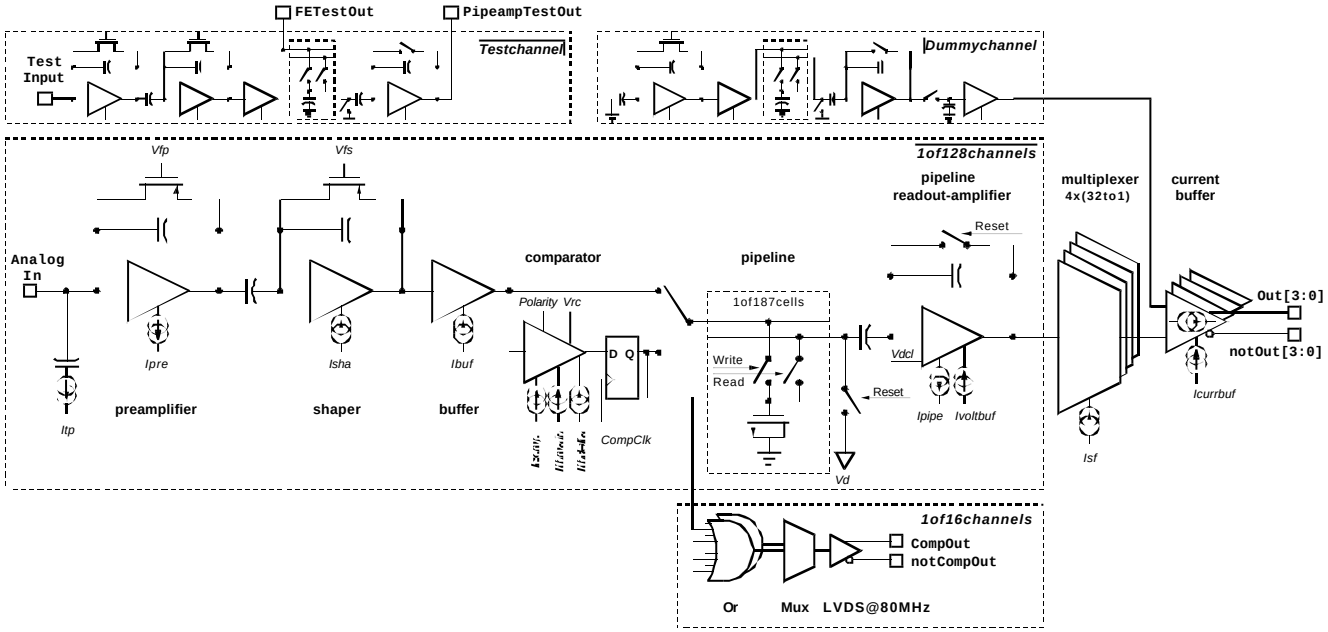
[6]now at Fujitsu Mikroelektronik, Dreieich-Buchschlag, Germany

Beetle: Block Schematics (I)



Features:

- 128 input channels
- CSA/Shaper with 25ns peaking time
- 40 MHz sampling (LHC clock)
- 128 discriminators with switchable polarity
- analogue memory for 160 sampling steps
- buffer for 16 triggered events

➔ 4 µs max. latency

➔ 900ns/event readout speed

- internal DACs for bias settings
- test pulse injector with adjustable amplitude
- setup/slow control via I^2C interface

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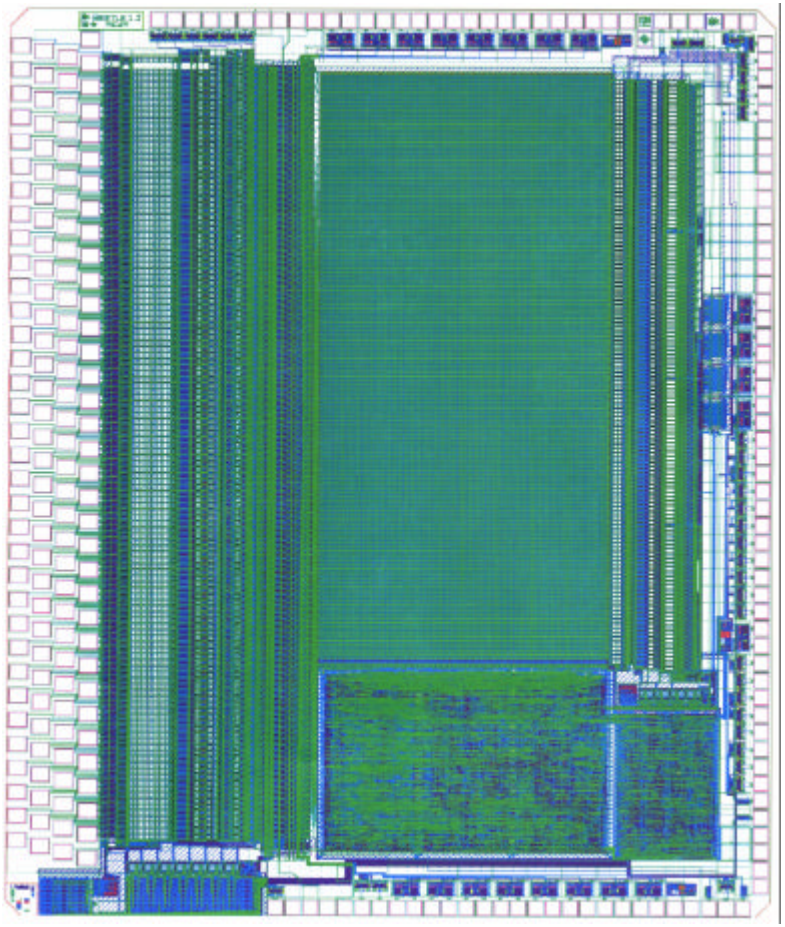
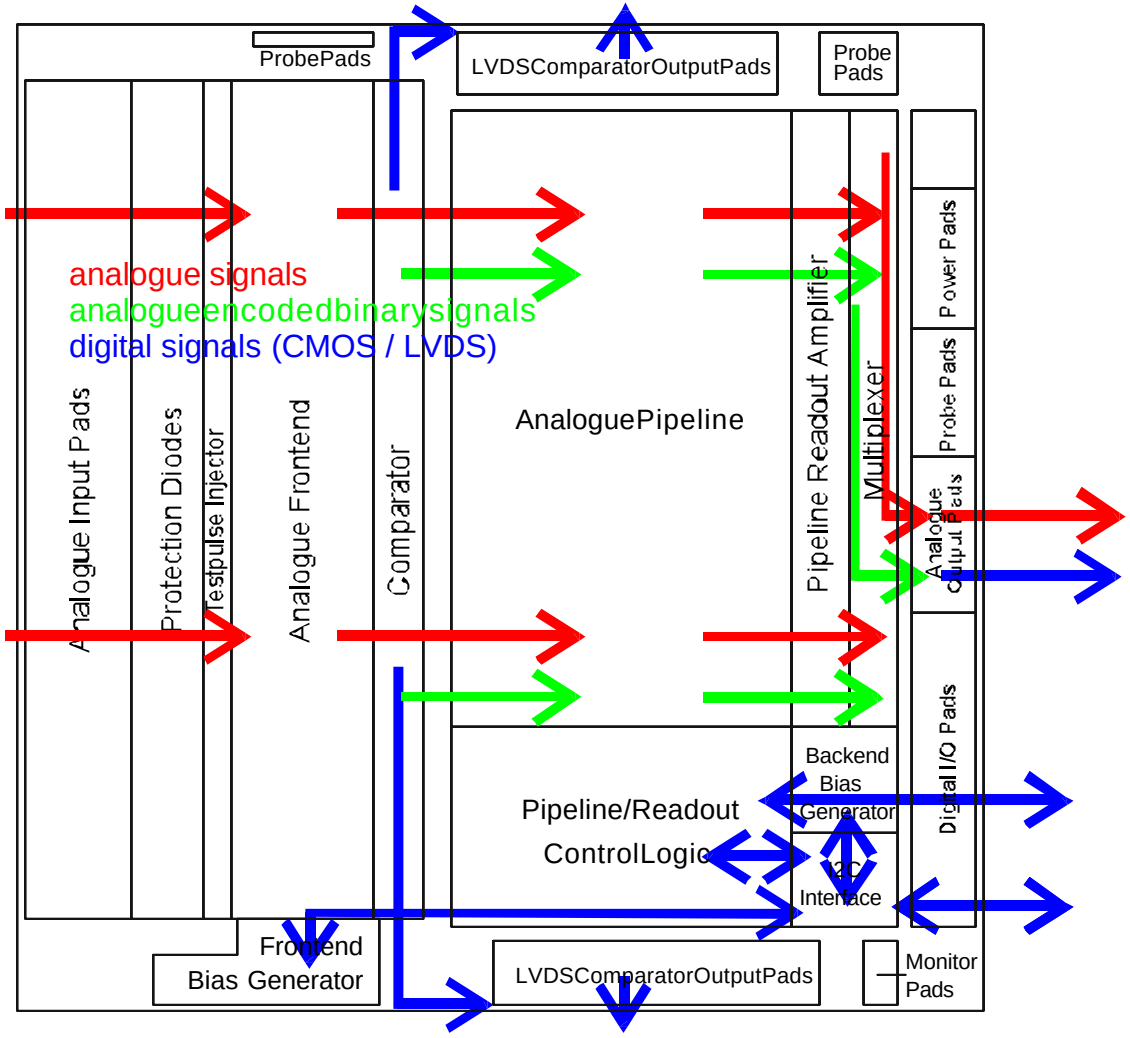
Beetle: Block Schematics (II)





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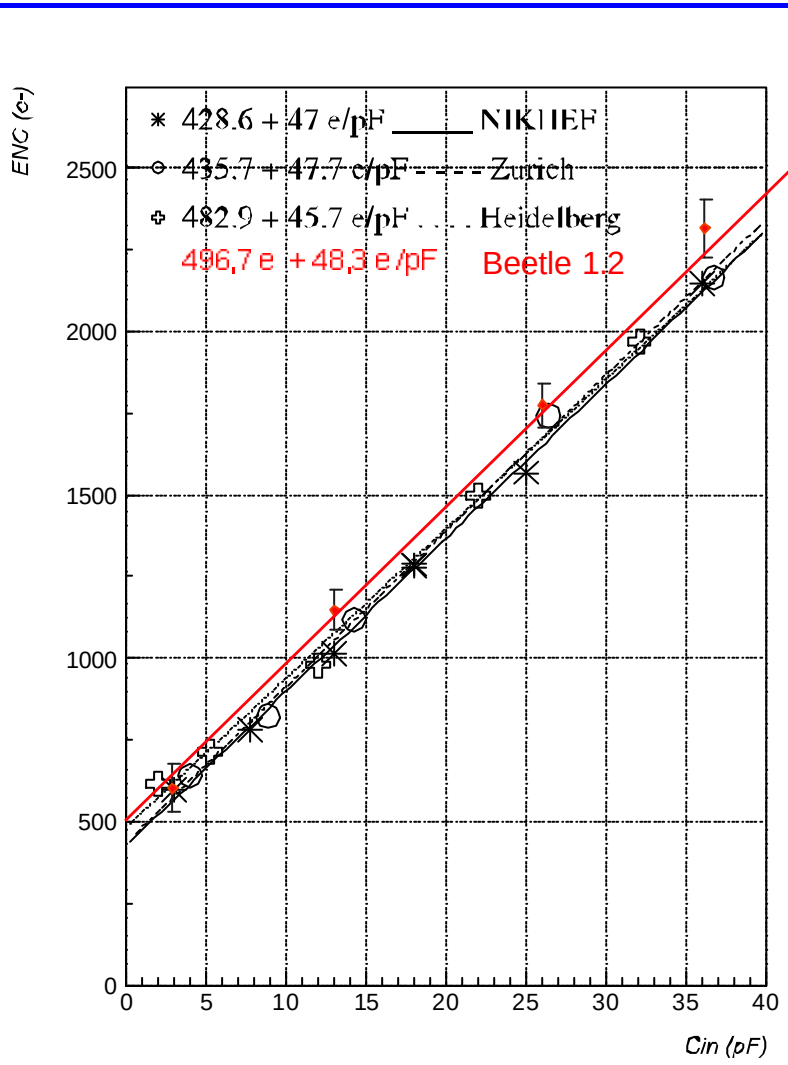
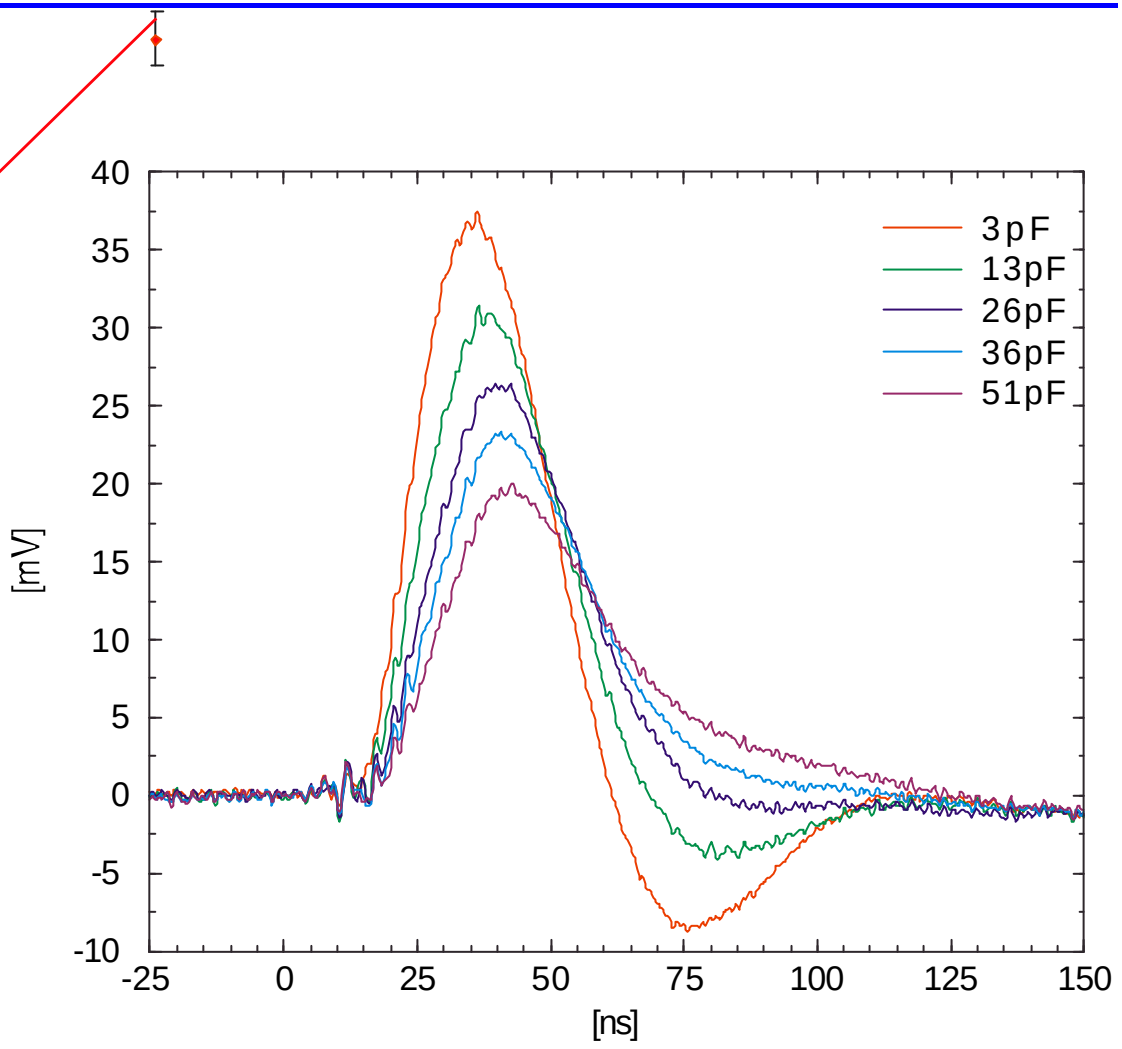
Beetle: Pulse Shape & Noise





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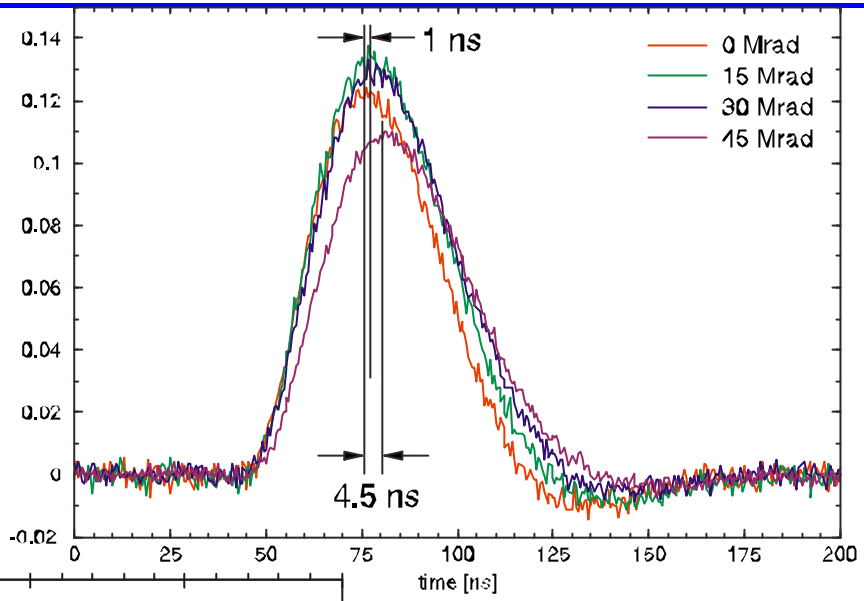
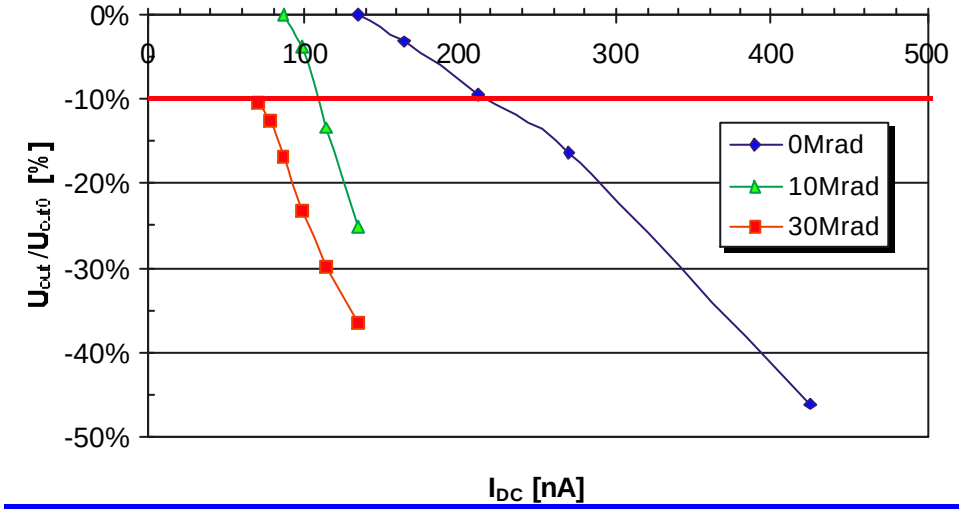
Beetle: Radiation Hardness

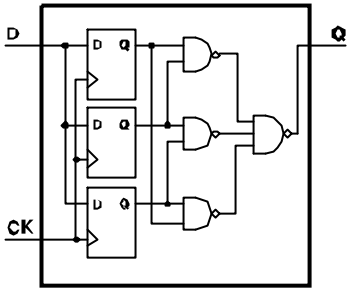
TID Effects



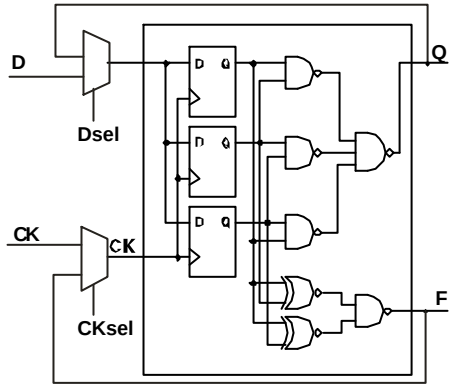


SEU Protection

Statemachines



Static registers



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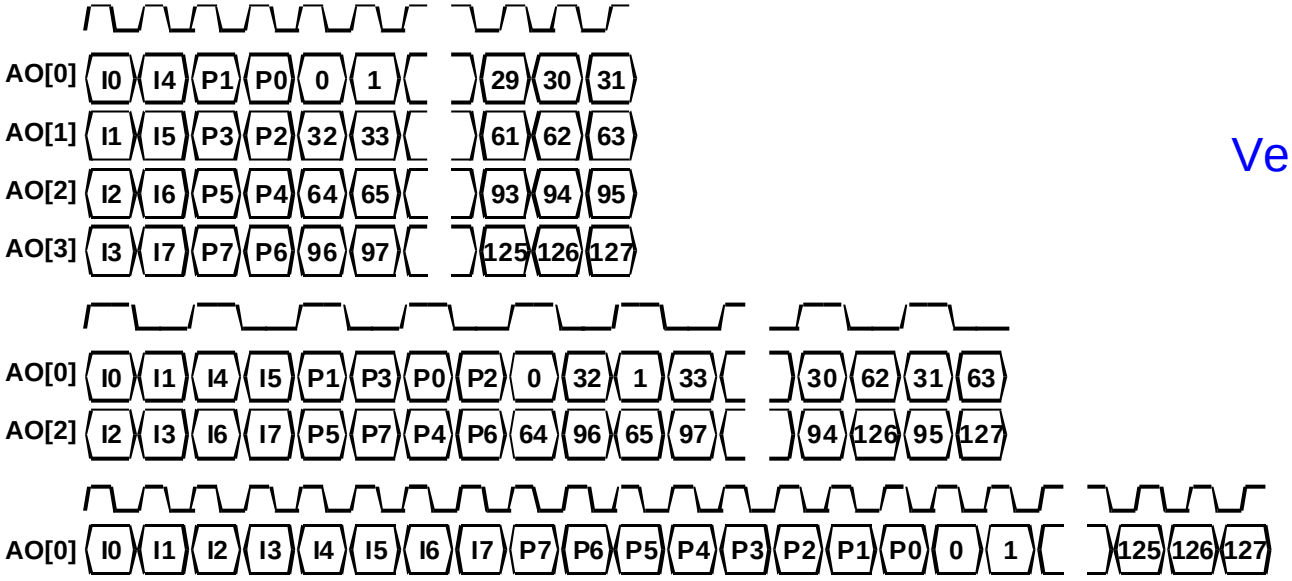
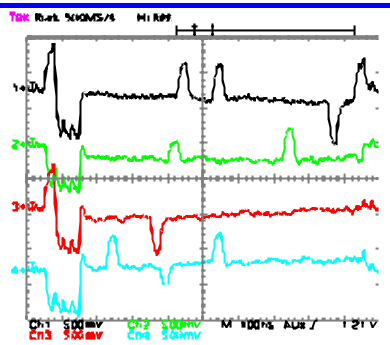
Beetle: Readout Modes

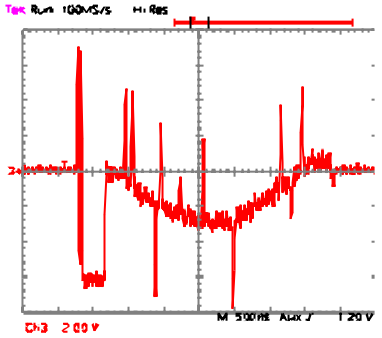


VeLo/ST



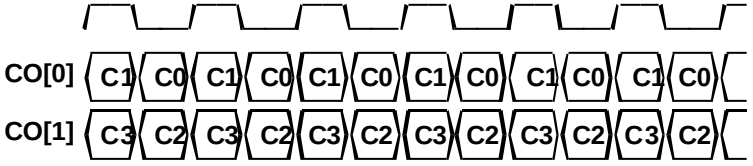
RICH

Lab



Bit	Description
I0	Start Bit: Always 1
I1	(even) parity of pipeline column number (PCN)
I2	ActiveEDC: indicates active error correction logic (EDC)
I3	parity of *CompChTh* register
I4	parity of *CompMask* register
I5	parity of *TPSelect* register
I6-I7	2 LSB of *SEUcounter* register
P0-P7	Pipeline column number (PCN)

Comparator
(Veto counters, prompt binary readout)



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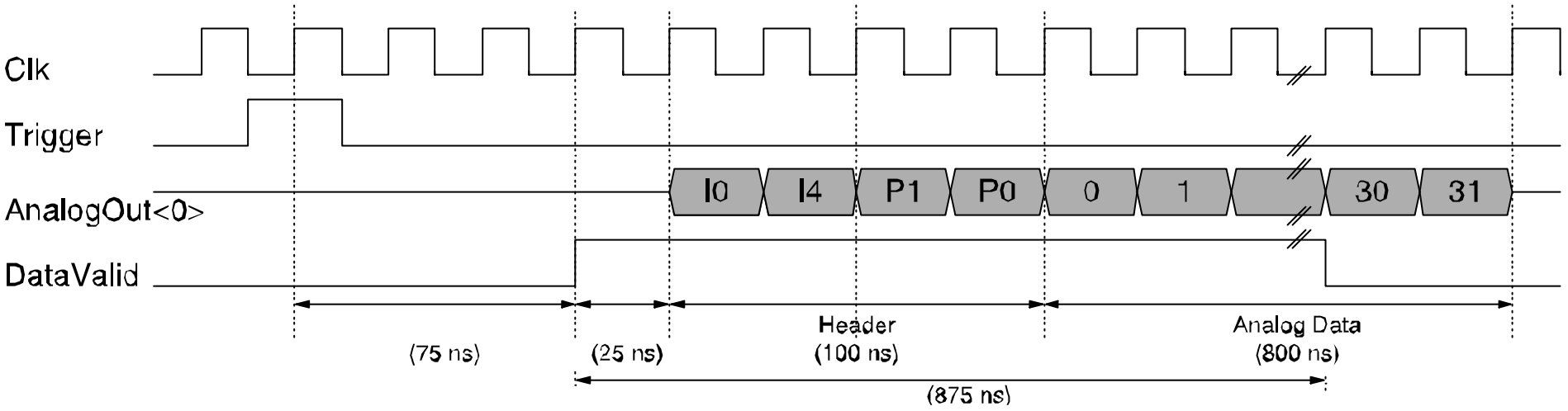
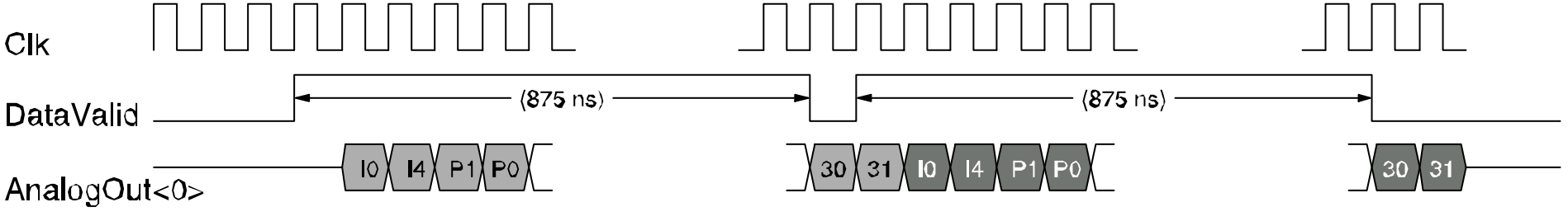
Beetle: Readoout Timing

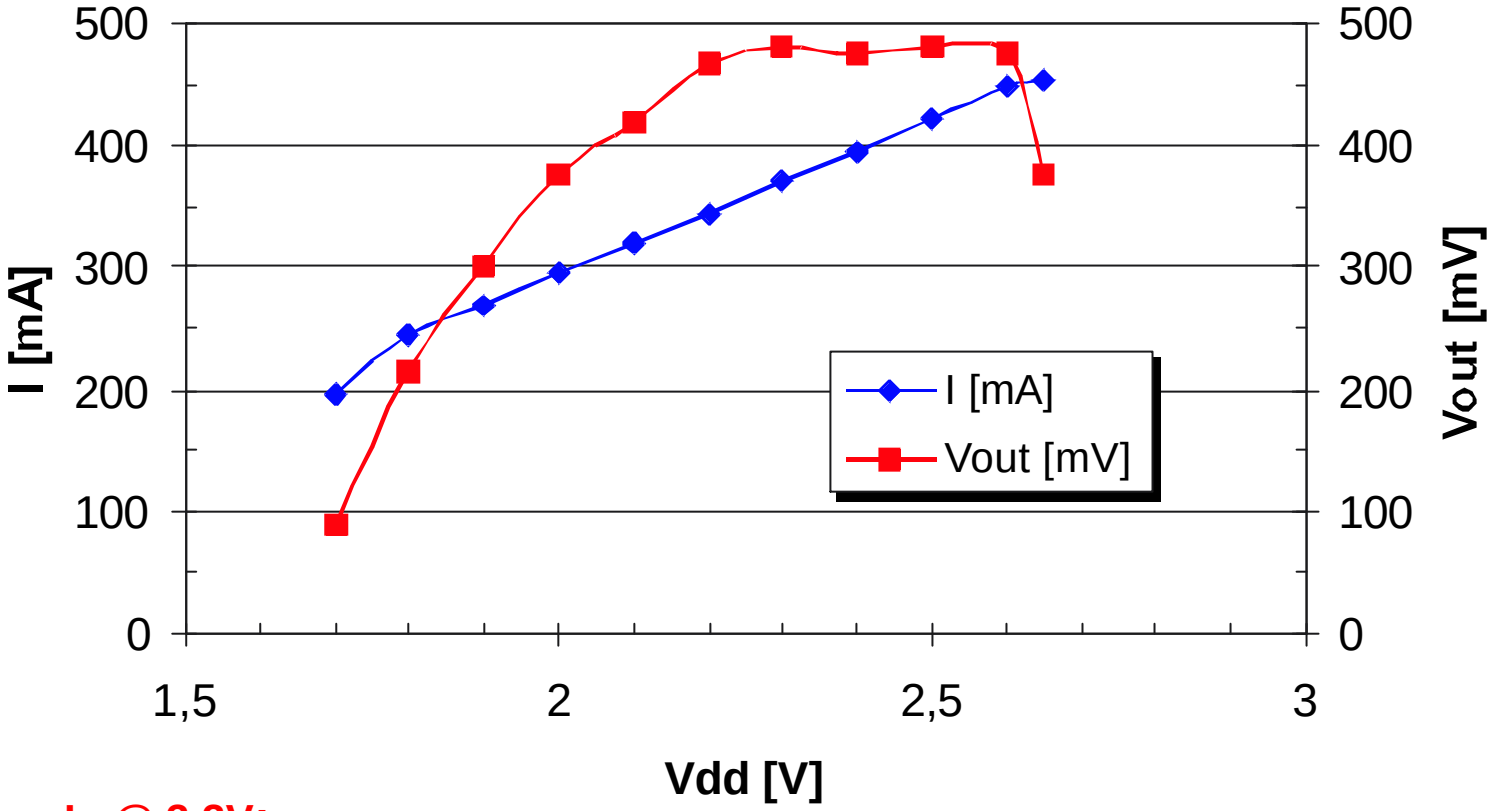
Single Readout



Consecutive Readout



Overvoltage Problem



IBM recommends Burn-In @ 3.3V:

- Irreversible gain reduction by 20% going from 2.6V to 2.7V
- Output driver with probable reasons:

➔ excessive current density (1 node in output driver)

➔ external short (Receiver stage, hint from Zurich group)

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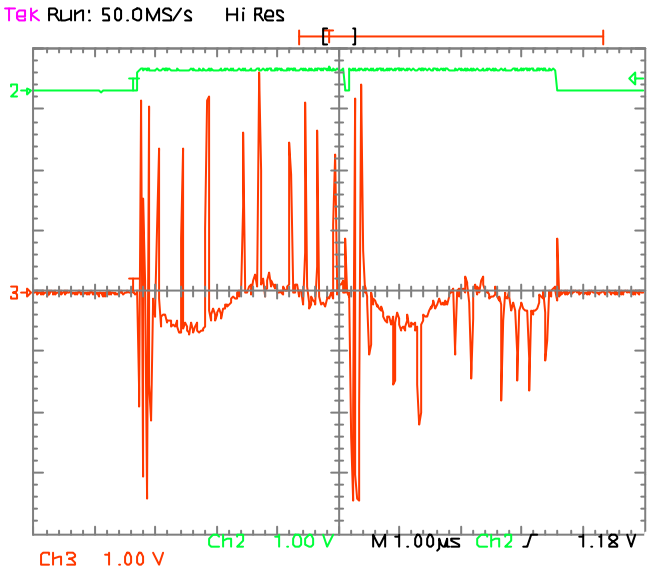
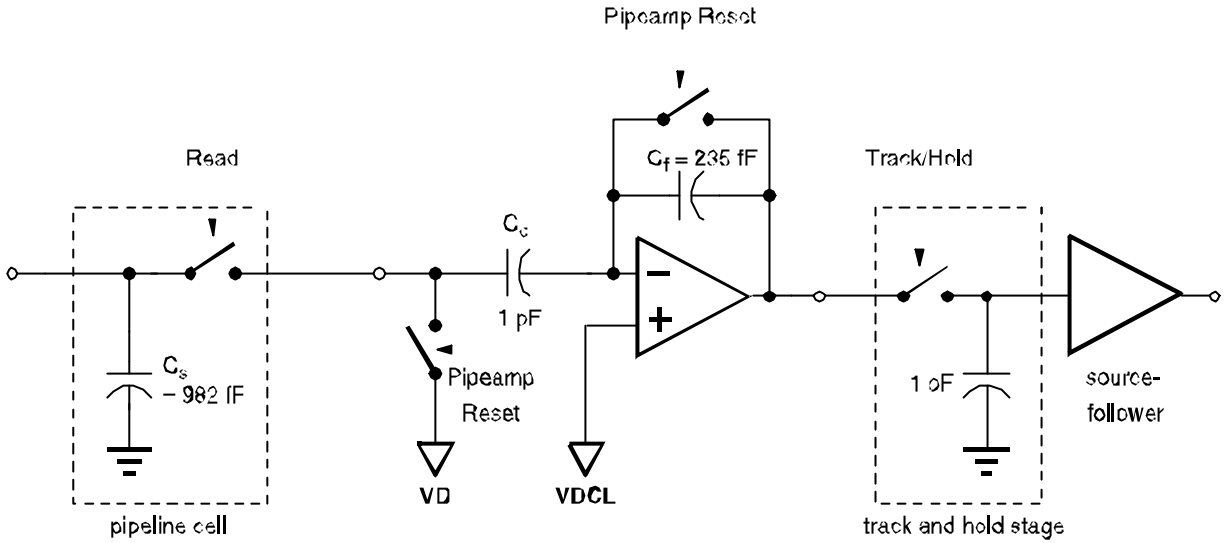
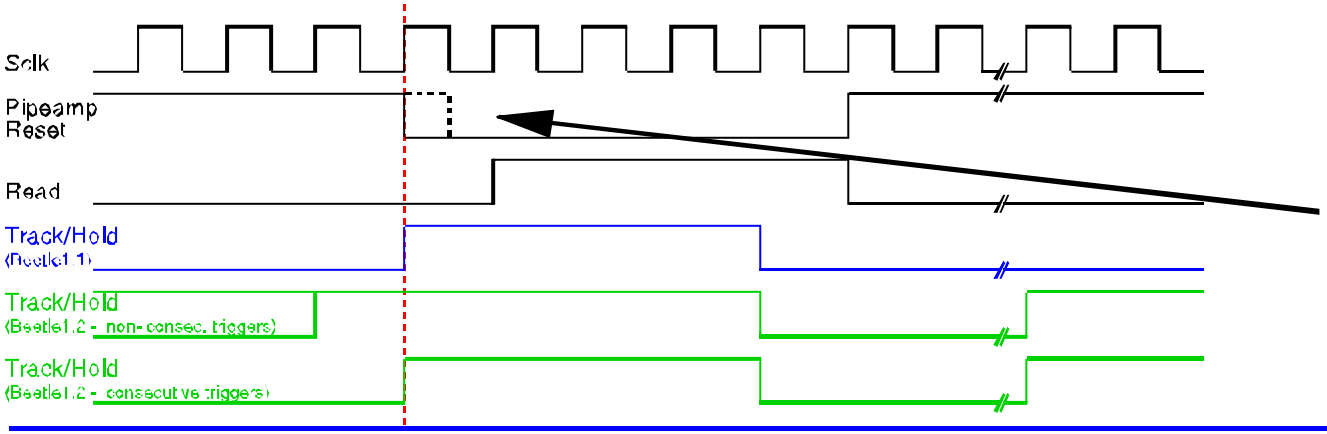
Sticky Charge Effect

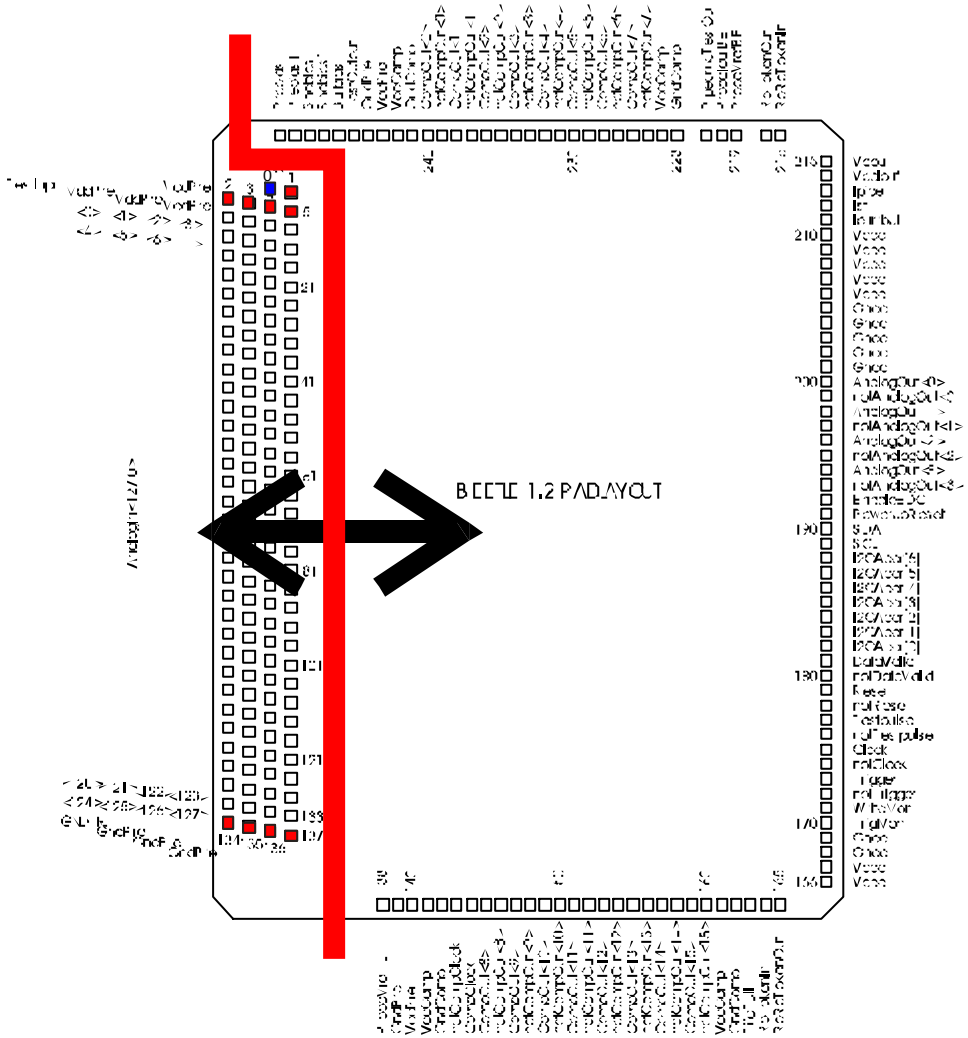






Modification in Beetle1.3

Modifications for Beetle 1.3



- Different connectivity for FE power pads
- 5V compliant I^2C interface
- Fix of “sticky charge” problem
- Fix of overvoltage problem
- Improved comparator

=> ~100µm length increase

- Beetle 1.3 submission: Q2/2003
- Beetle 1.3 production start: Q4/2003

Pad	Beetle12	Beetle13
Testpulse	2	5
Vdd	1,3,4,5	2,3
Gnd	-	0,1,4
Vdd	-	134,135
Gnd	134-137	136,137

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