

News from



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Beetle 1.1: Test Results

- ☺ Chip is programmable via I²C
- ☺ All on-chip registers can be read back via I²C
- ☺ All readout modes (32→4, 64→2 and 128→1) work
- ☺ Pipeline address (column number) shows correct values and levels
- ☺ Control logic circuits work correct:
 - ☺ WriteMon and TrigMon circulate with the programmed distance
 - ☺ A trigger reduces this distance by one clock cycle
 - ☺ FifoFull becomes active after 16 consecutive triggers
 - ☺ Internal test pulse generator works

- ☺ Pulse Shapes
- ☺ Baseline and control Voltages
- ☺ Comparators
- ☹ Binary Readout

Not yet tested:

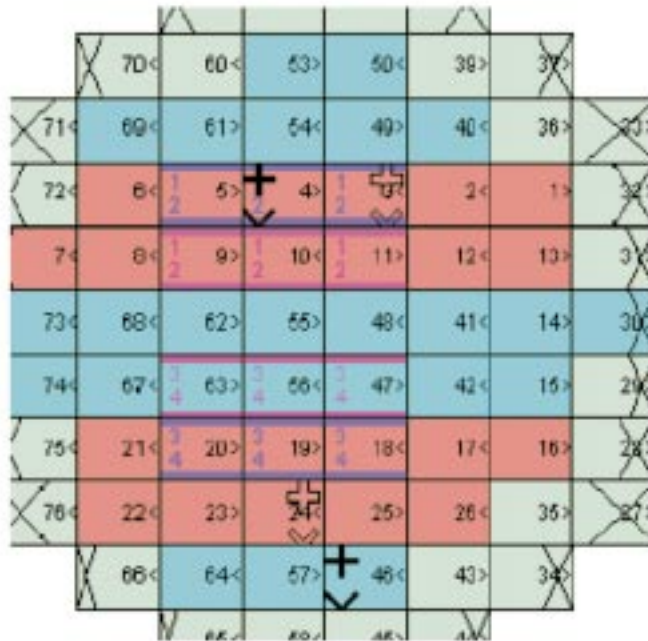
- ☹ Noise
- ☹ Comparator threshold

Striping of MPW4

The minimum L_{eff} has been varied across the wafer:

There are strips with -3σ , -1.5σ , 0 , $+1.5\sigma$ and $+3\sigma$

Chips cannot be assigned to those L_{eff} groups



Mapping des stripes en PC sur le produit MPW4 (63F5354) :

Expo en DUV sur Micrascan : Notch right

Field size : 20.038*26.756mm

Chips per field : 2*1

chip size : 19.90*13.00mm

Chips per wafer : 92

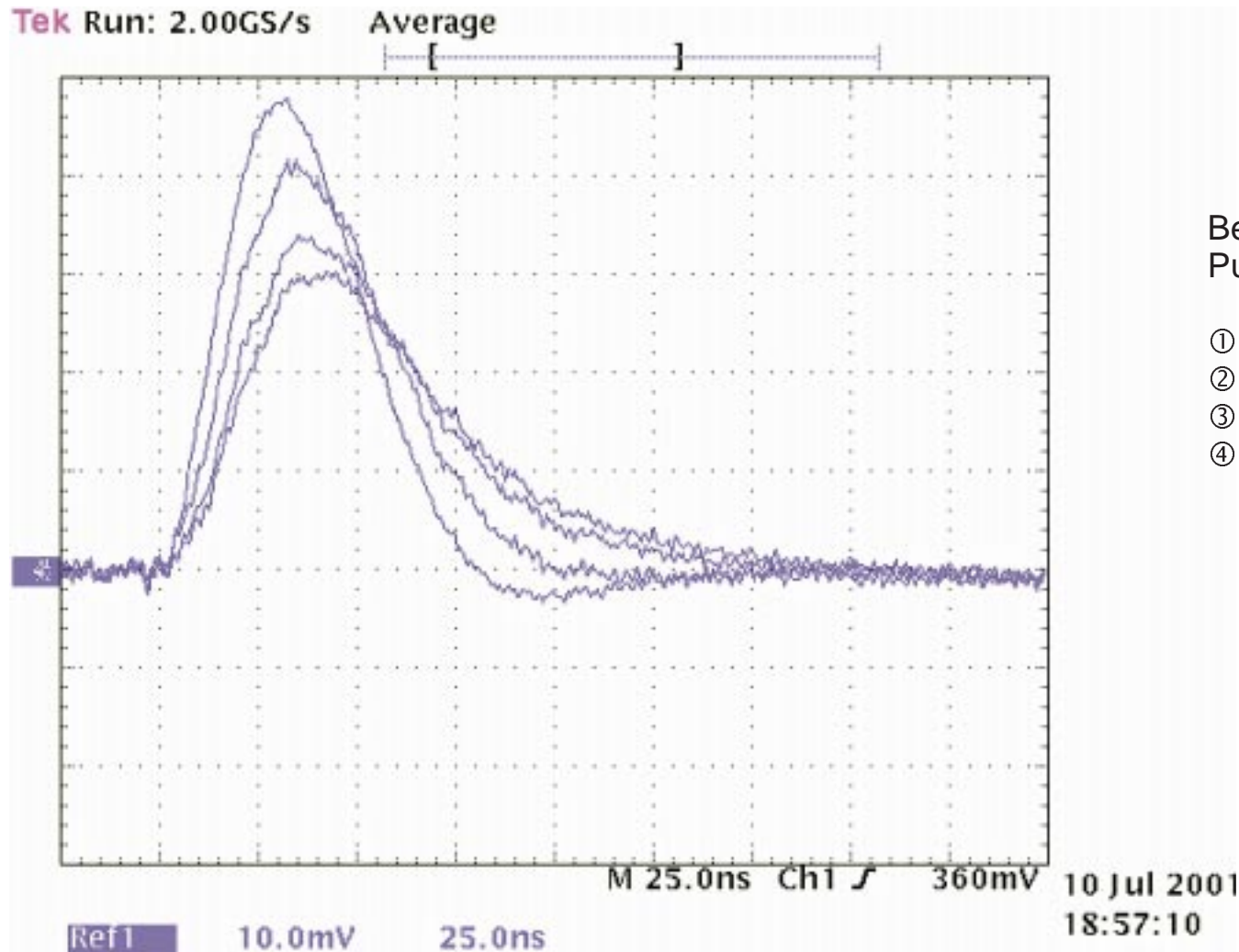
Field 1-6 : 85% of nominal dose

Field 7-13 : 92%

Field 16-21 : 115%

Field 22-26 : 125%

Beetle1.1: Pulse Shapes I



Beetle 1.1
Pulse shapes of the test channel:

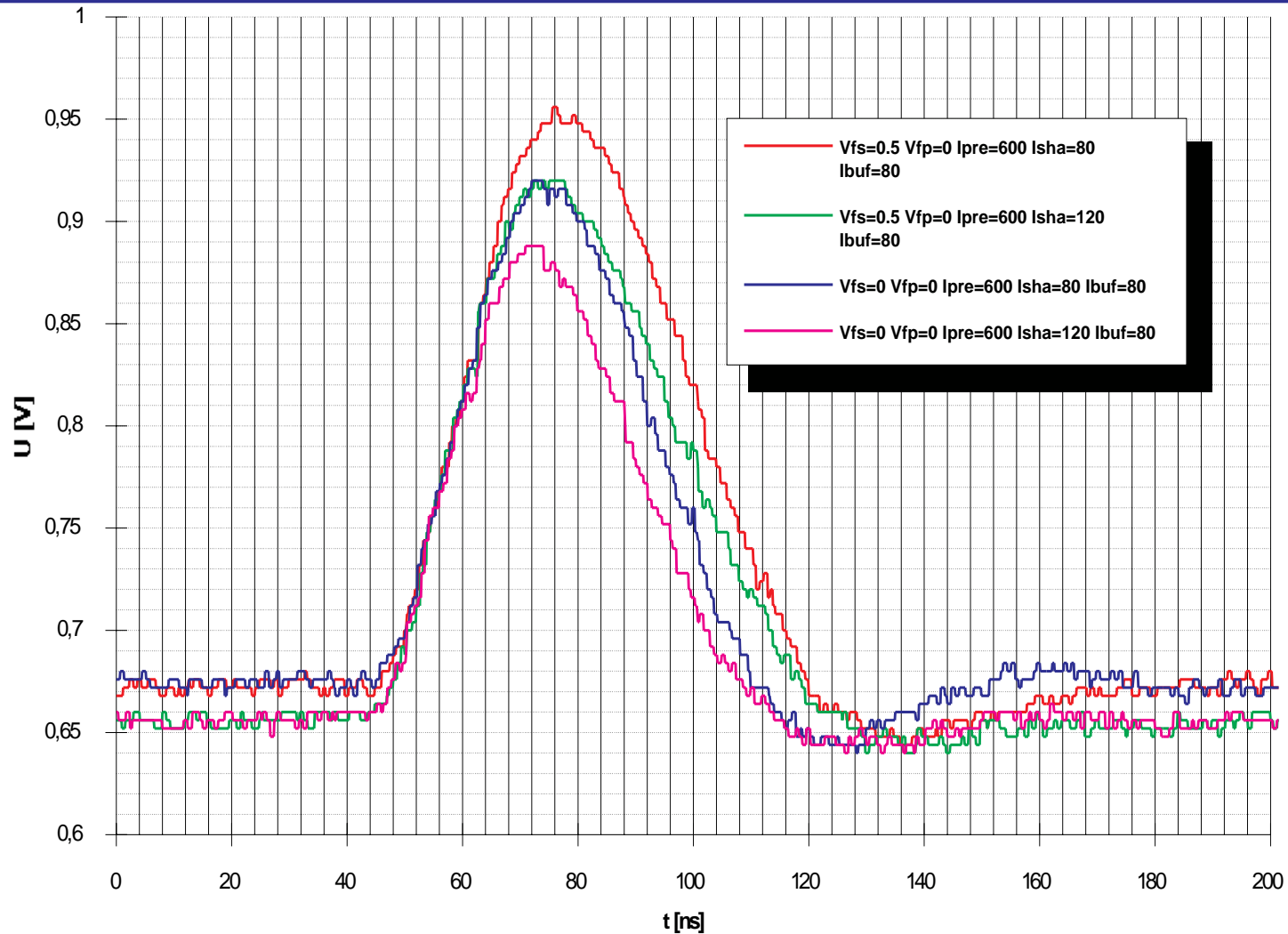
- ① 3pf (highest amplitude)
- ② 12.5pf
- ③ 24.6pf
- ④ 32.3pf (lowest amplitude)

Beetle1.1: Pulse Shapes II

Comparison of NIKHEF and Heidelberg measurements

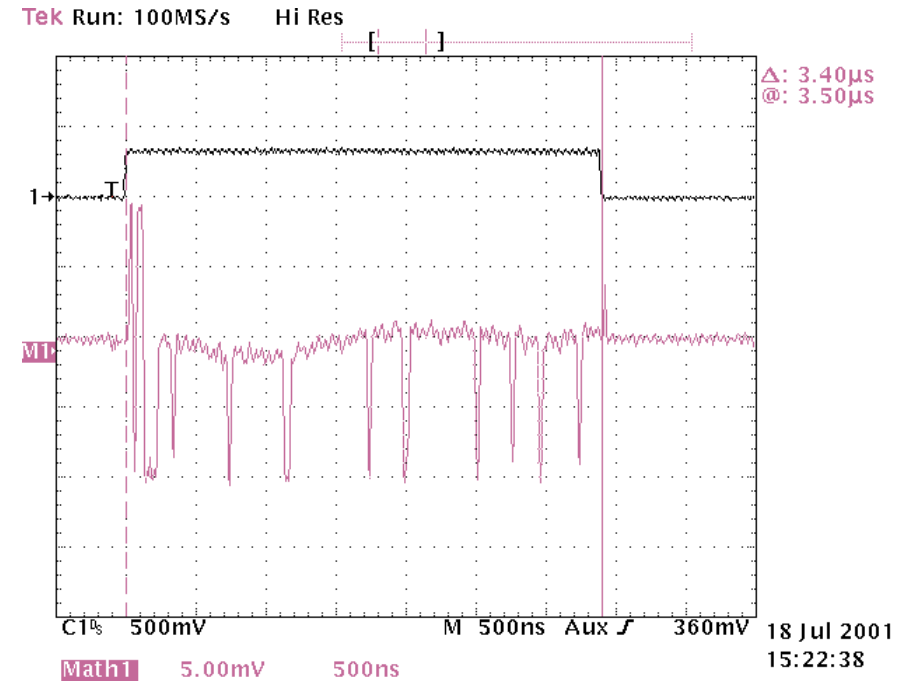
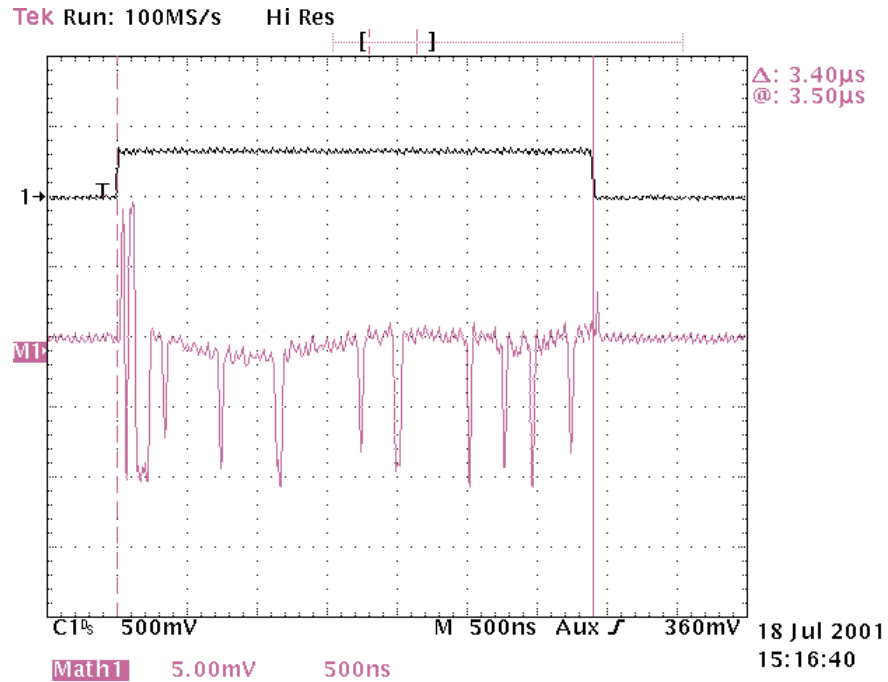
| FE parameters | | | | | BeetleCO10 (NIKHEF) | | | Beetle11: test channel (Heidelberg) | | | |
|---------------|-------------|--------------------|--------------------|--------------------|-----------------------|-------------------|---------------|-------------------------------------|-----------------------|-------------------|---------------|
| Vfs [mV] | Vfp [mV] | Ipre [μ A] | Isha [μ A] | Ibuf [μ A] | $t_R^{10/90}$ [ns] | spill-over [%] | Vpeak [mV] | $t_R^{0/100}$ [ns] | $t_R^{10/90}$ [ns] | spill-over [%] | Vpeak [mV] |
| 0 | 0 | 425 | 87.5 | 200 | 14.5 | 27.4 | 20.8 | 26.5 | 19.0 | 31 | 17 |
| 0 | 0 | 500 | 50 | 200 | 16.0 | 18.3 | 22.7 | 29.5 | 22 | 35.5 | 18 |
| 0 | 0 | 500 | 163 | 200 | 15.0 | 28.8 | 19.1 | 24 | 17.2 | 39.2 | 15.8 |
| 0 | 375 | 500 | 87.5 | 125 | 16.5 | 29.1 | 19.5 | 26.0 | 19.2 | 30.8 | 16.2 |
| 0 | 375 | 500 | 87.5 | 200 | 14.5 | 21.2 | 20.8 | 25.5 | 19.7 | 33.7 | 16.6 |
| 0 | 1125 | 500 | 50 | 200 | 17 | 20.1 | 18.8 | 30 | 22.0 | 37.7 | 12.2 |
| 0 | 1125 | 500 | 87.5 | 200 | 14.5 | 25.6 | 17.5 | 25.0 | 19.2 | 32 | 11.8 |
| 0 | 1500 | 500 | 87.5 | 200 | 16.0 | 22.4 | 18.1 | 25.2 | 18.7 | 32.8 | 11.6 |

Beetle1.1: Pulse Shapes III

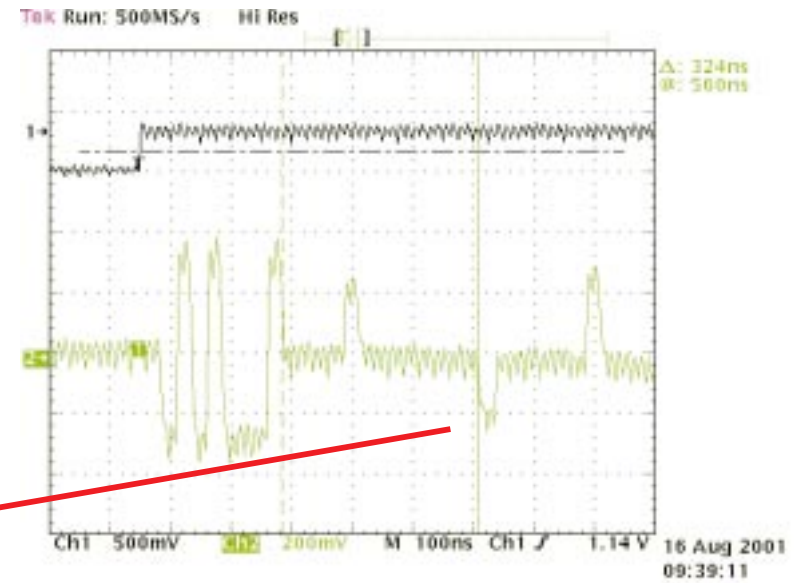
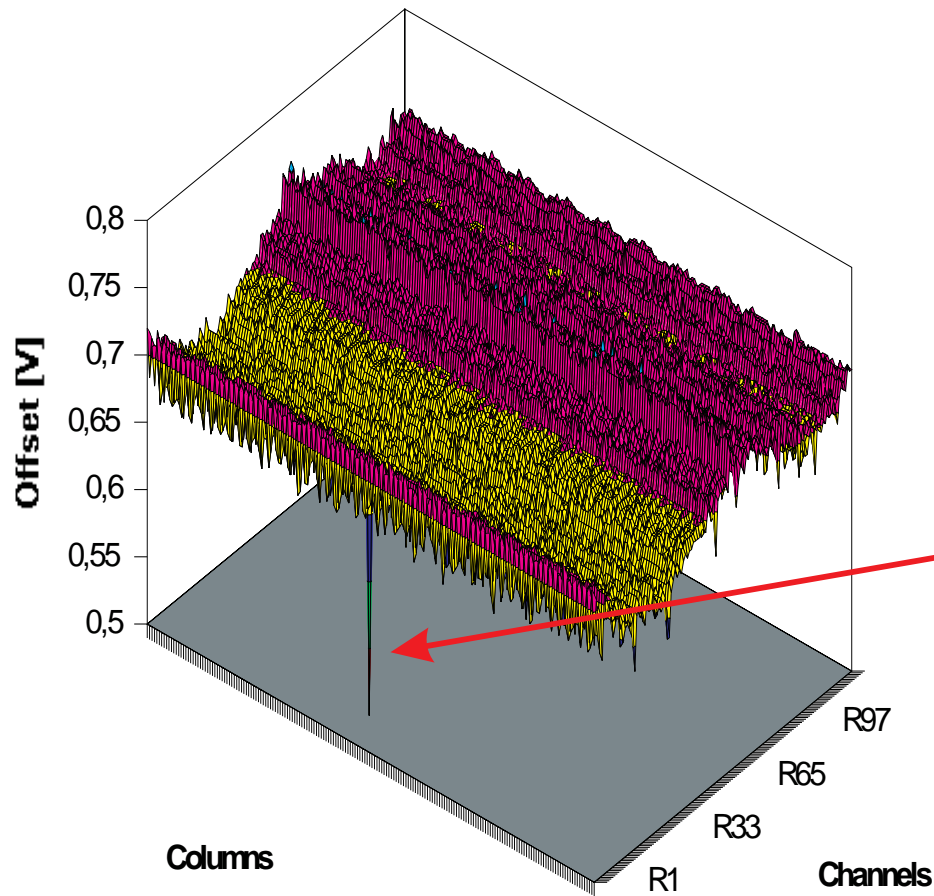


Beetle1.1: Optimized Settings

Optimized settings for V_d and V_{dcl} result in a flat baseline

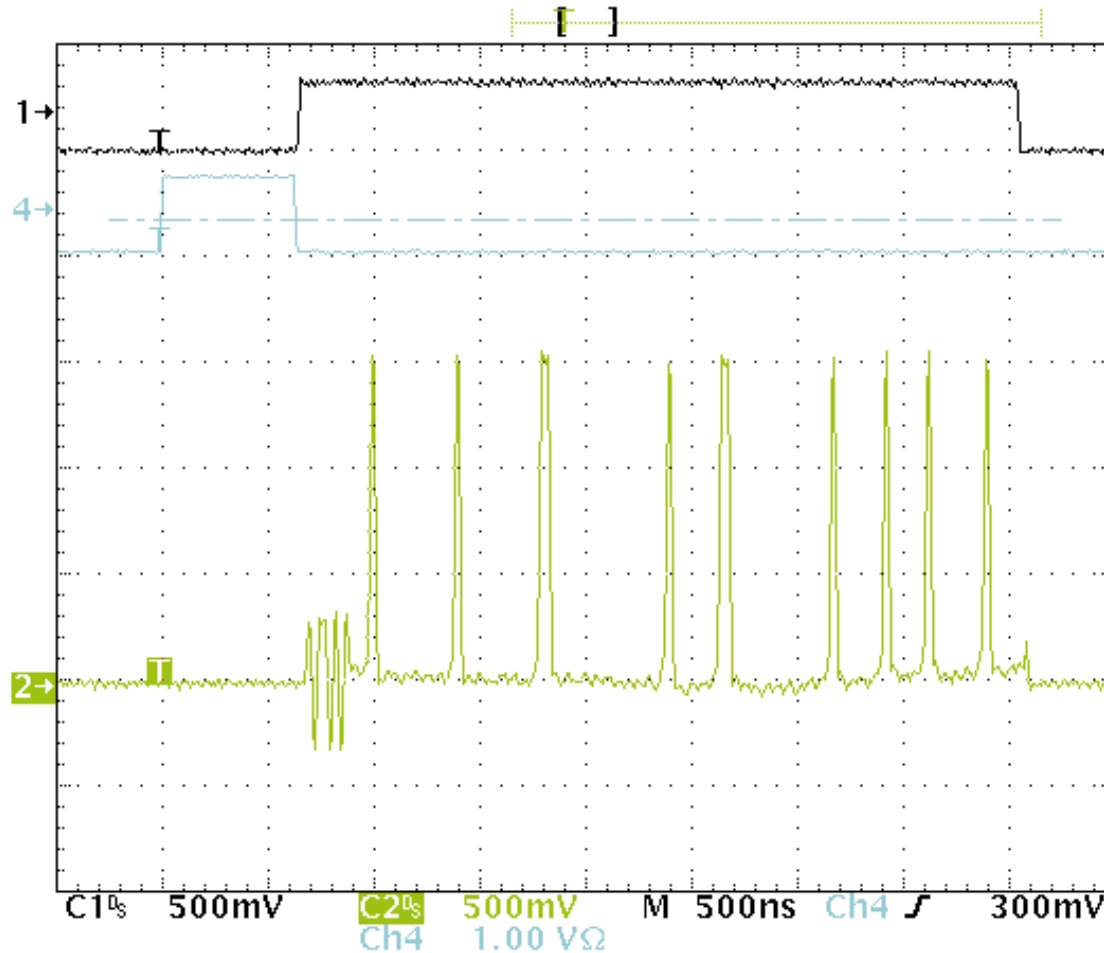


Beetle1.1: Pipeline Scan



Beetle1.1: Binary Readout

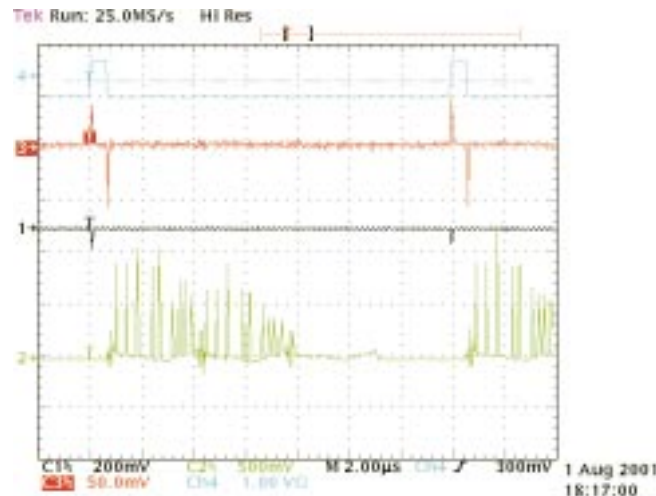
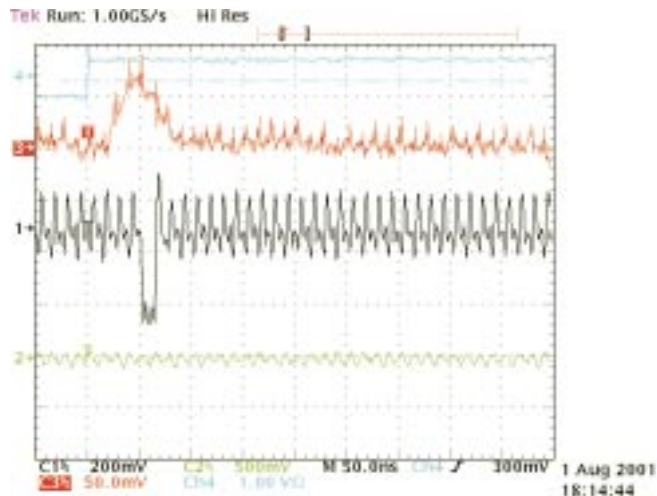
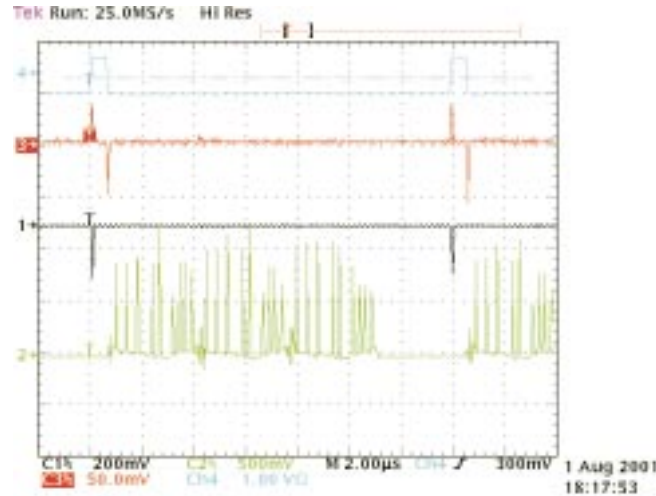
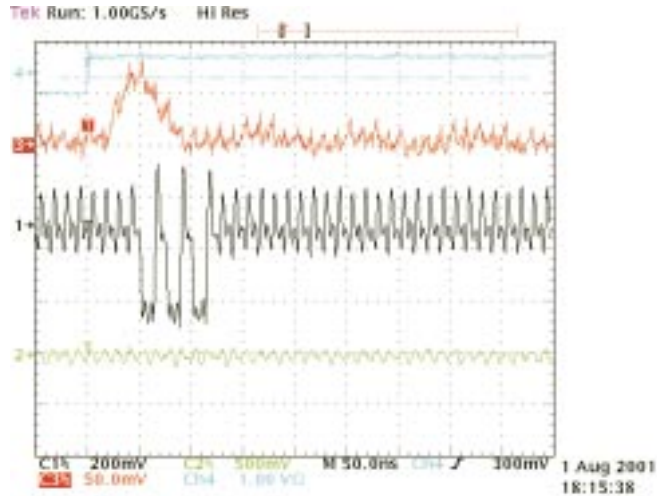
Tek Run: 100MS/s Hi Res



- ☺ Binary readout mode works
- ☺ Levels are 0 and +10 MIP (as designed)
- ☹ Phase of CompClk and Clk has to match (latched comparator output is sampled)
- ☹ but...

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Beetle1.1: Comparators



- ☺ track mode (top)
- ☹ pulse mode (bottom)
- ☺ Comparator outputs (left)
- ☹ Binary readout (right)

➔ Level shifter is too slow causes spill-over to the second BX

Beetle1.1: Outlook

Bugs found:

- Frontend too slow and too low rate capability (known)
- Voltage divider for binary readout too slow

Still to be measured:

- Noise (PCB for that purpose is ready)
- Comparator threshold and crosstalk
- New BeetleFE and BeetleSR chips (which arrived last week)