

SVD meeting, KEK,
Sept. 28, 2001

VA1, VA1TA testing for single event effects - status report

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- Test set-up, motivation
- Test set-up calibration
- Status and plans

SEE testing with lasers

Relate hadron induced effects to laser pulses

- several studies have involved laser beams to pin down the positions of problematic elements (low threshold) in the chip
- a good correlation was found of thresholds determined in heavy ion and laser induced SEE
- a typical low threshold element has a threshold at about 1-10 pJ

Test set-up in Ljubljana

Goals:

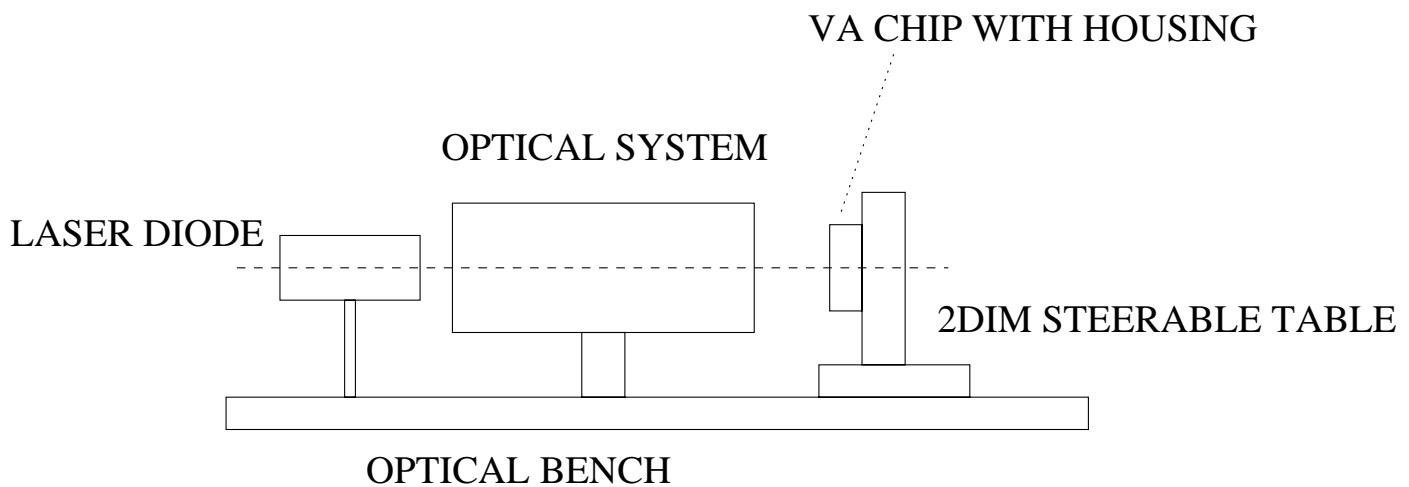
- set up a test stand for VA1/VA1TA read-out chips with VA-DAQ and a PC with full LabView software
- test with medium strong laser close to expected SEE threshold, 2d scan over the chip surface
- test with a strong laser: vary intensity, 2d scan
- normalisation to Belle environment: in the same test set-up compare VA1/VA1TA with VA (known SEE rate in Belle)

People involved

- Belle: S. Korpar, P. Križan, M. Starič, K. Koselj
- laser and optical system design, testing: M. Zavrtanik
- VA/TA read-out: A. Studen (Compton Camera project)
- high power laser: help in operation from the solid state lab

Test set-up: components

- VA-DAQ system
- PC with full development LabView system
- 2d computer steerable table
- laser
- optical system for focusing
- optical bench



Lasers with optical system

Medium power

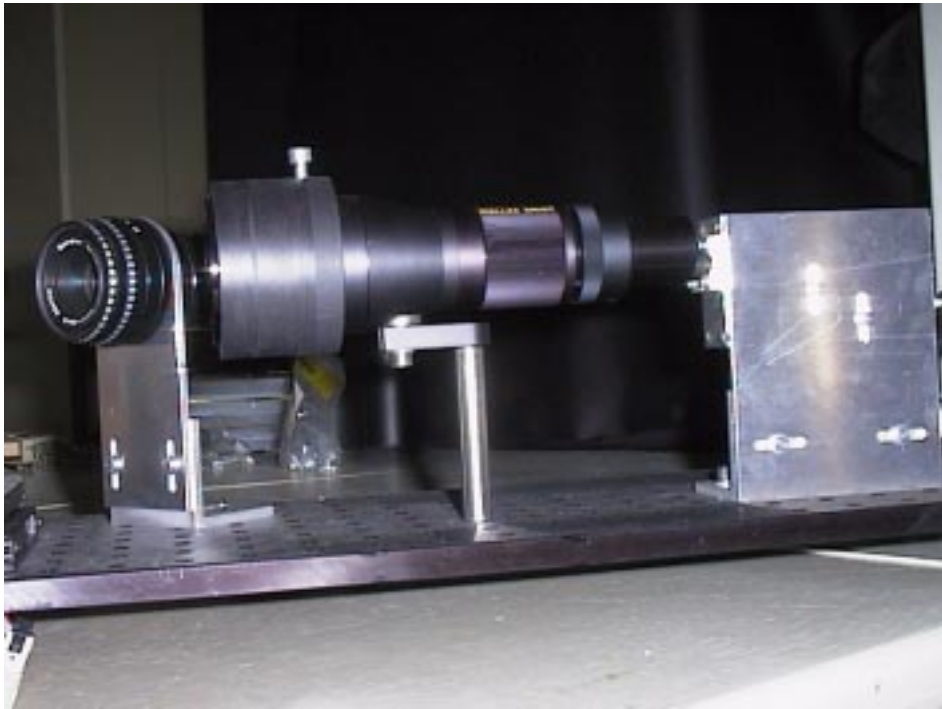
- laser diode (triggerable, pulse width ≈ 1 ns, pulse energy a few pJ)
- laser diode is an astigmatic source (divergence 8×29 degrees FWHM) \rightarrow needs an optical system to arrive at a circular spot of μm size \rightarrow slide
- optical system: collimator, astigmatic corrector, beam expander, focusing system \rightarrow slide
- expected focus spot size: width $1.5 \mu\text{m}$ (FWHM), depth $2 \mu\text{m}$ (FWHM)

High power

- sapphire-Ti laser, $\lambda = 850$ nm
- 0.1 ps pulse width, 10 nJ pulse energy at 80 MHz pulse frequency, more energy/pulse at lower pulse frequency (needed anyway)
- system of attenuators to tune the pulse power
- optical system: same beam expander, focusing system as above
- in the solid physics department, get shared beam time, move 2d table with chip, and the VADAQ + PC

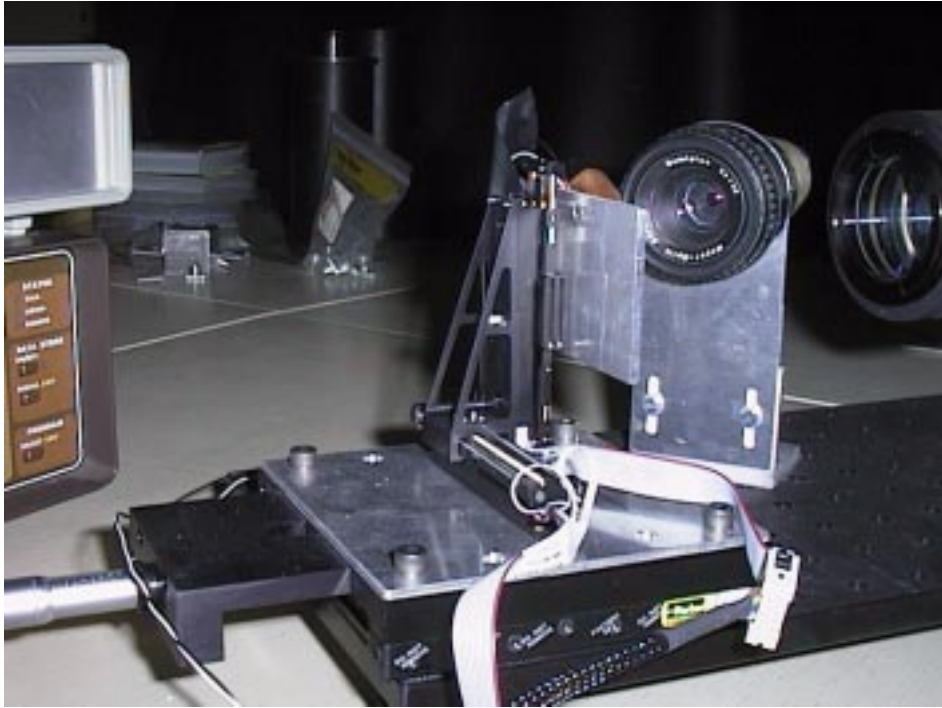
Optical system

- collimator (Melles-Griot 06 GLC 003)
- anamorphic prism pair (Melles-Griot 06 GLC 003)
- beam expander (Melles-Griot 06 GLC 003)
- focussing system (Melles-Griot 06 GLC 001)



Laser (left in Al box) and the optical system.

2d computer steerable table



Laser beam: enters from the right side, visible: exit final focus lens

Visual focusing check: a telescope in the middle

Sample support: aluminum

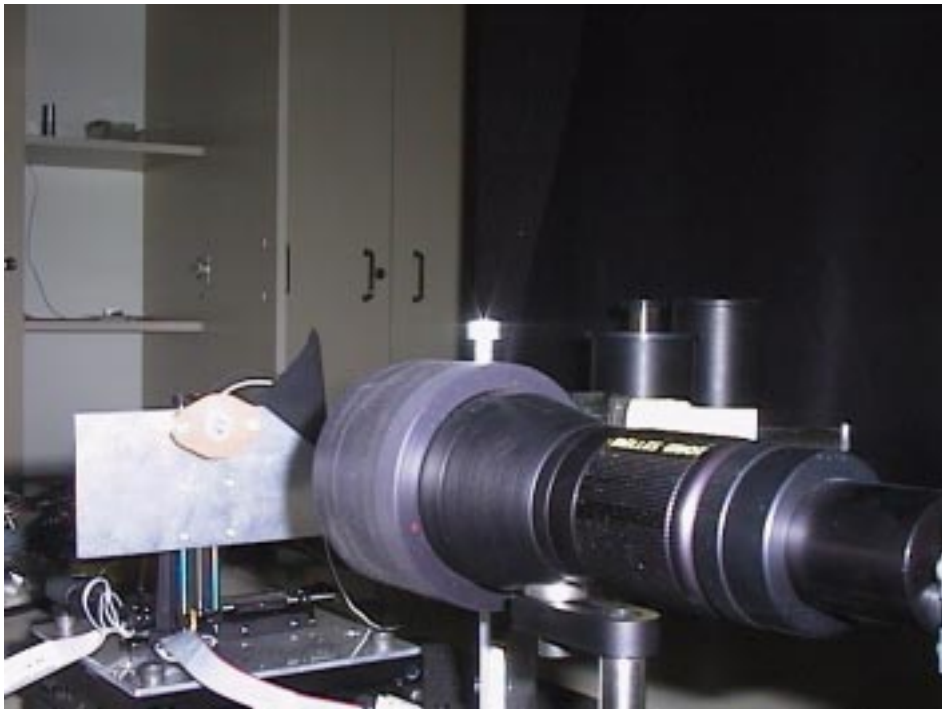
Vertical and transverse coordinate: computer controlled

Coordinate along the laser beam: manual control, micrometer

Far left: Keithley current monitor, VDAQ box

Set-up testing, calibration

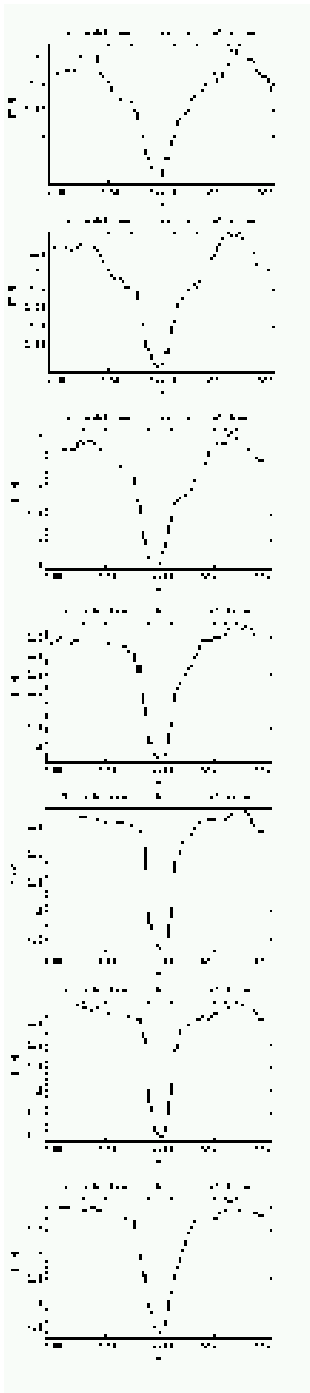
Use a diode as a test sample, scan over the surface, measure diode current as a function of the laser spot coordinate.



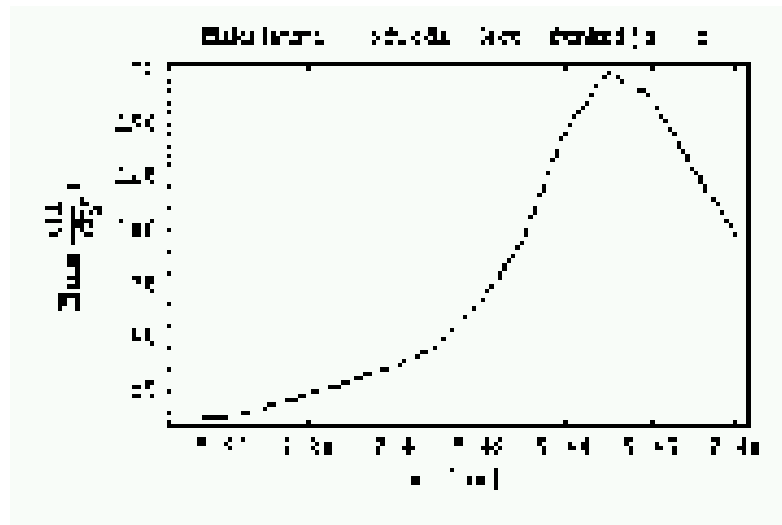
Fix a $10\ \mu\text{m}$ diameter wire on the surface of the diode, scan over it.

Vary z (coordinate along the beam), start far (about $80\ \mu\text{m}$) from focus, then move in $20\ \mu\text{m}$ steps.

The intensity profile becomes more pronounced as we get to the focus.



Looking for focus: plot maximum of the derivative dI/dx vs. z (depth), in $10 \mu\text{m}$ steps.



z range on the plot: $120 \mu\text{m}$

→ we have a procedure to find the focus

→ move to VA1 hybrid, repeat a similar procedure

Status on June 11, Vienna

- VA-DAQ system with PC: delivered (Dan), tested
- VATA chip for the Compton camera project: powered, read-out seems to work OK
- VA(prime) chip: delivered (IDEAS), mounted, powered, problems in read-out (*to* to be discussed with experts)
- laser diode + triggered power supply: assembled
- 2d table, optical bench: ordered
- optical system: ordered, delivery expected in two weeks

Status September 27

After several iterations between Ljubljana and Oslo, which took three months, partly due to a communication problem, we finally (since yesterday) have a working VADAQ and a working hybrid at hand at the same time.

Next step: attach the hybrid, find the focus, scan.