LLRF Meeting

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Radiation Experiments

Main goals

1. Develope calibrated measurement system for Neutron/Gamma radiation.
2. Evaluation of radiation level in Linac II and comparing to what is expected in TESLA/X-FEL.
3. Determine SEU in electronics representive for TESLA LLRF.
4. Determine total ionizing dose effect (permanent damage, leakage current).
5. Determine radiation effects on different types of electronics.
6. Develope redundancy concepts or shielding against radiation.
7. Predict performance and life-time of electronics in TESLA linac.

Experimental setup for tests in Linac II

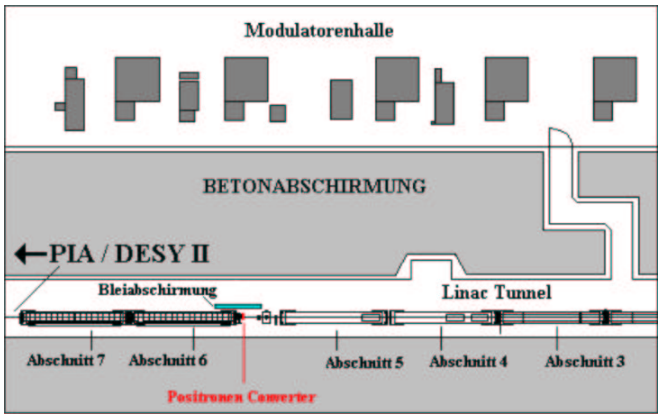

Figure 1: Tunnel of Linac II

The beam energy of Linac II is about 450 MeV.

TLDs irradiation test

TLDs SR 104 (Thermo Luminescent Dosimeter 100) was placed in various positions for 24 hours.

Place	Dose [SV]
0m from converter	102.3
0.5m from converter	117.9
1m from converter	113
2m from converter	149
4m from converter	32.5
8m from converter	4.9
12m from converter	1.9
16m from converter	1.2

Figure 2: Results of TLDs test

LED diodes irradiation tests

Test system

All diodes were placed on the shielding near electron-position converter.

System for measuring light output of LED diodes:

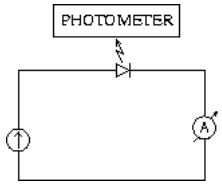

Figure 3: LEDs test system

No.	Start time	Stop time	Linac II working time [min]	PIA avarage beam current [mA]
1	24.07.2003 @ 10:47	29.07.2003 @ 14:00	1560	6.6
2	04.08.2003 @ 16:40	11.08.2003 @ 11:50	5191	15.8
3	11.08.2003 @ 12:02	18.08.2003 @ 10:37	2043	13.8
4	18.08.2003 @ 10:43	22.08.2003 @ 13:15	2955	27.7

Figure 4: Informations about irradiation runs

The approximately Linac II beam current can be counted from the formula: (PIA avarage beam current) / 13.

Results

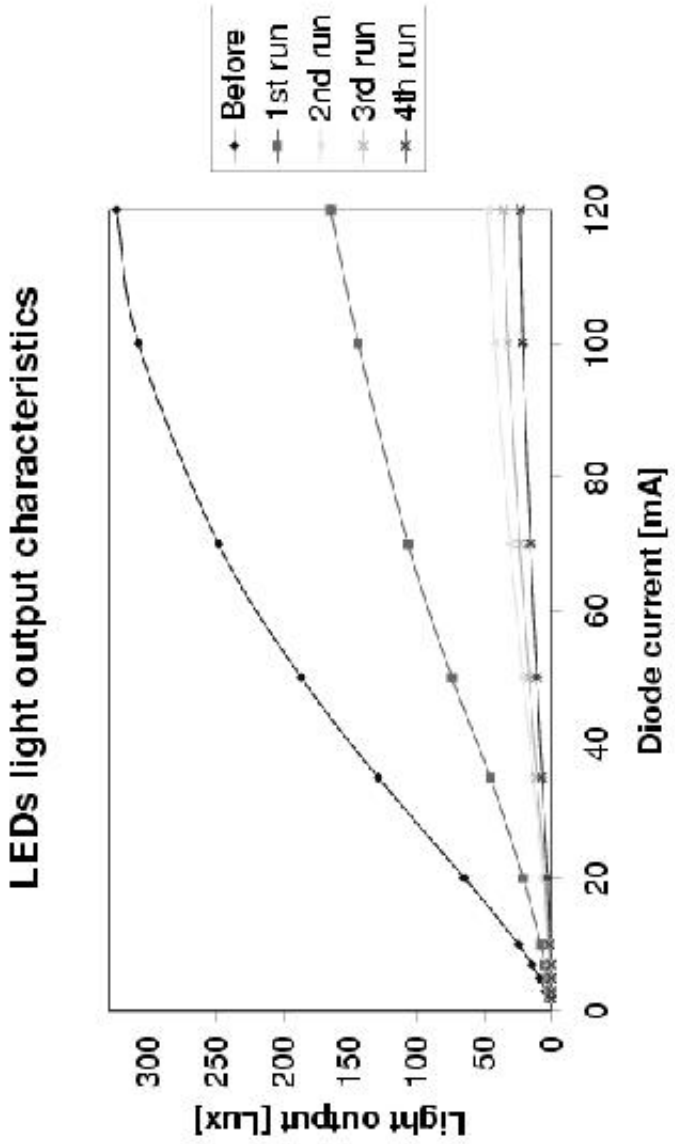

Figure 5: LEDs light emission characteristics

Tasks

1. Calibration of LEDs at the National Superconducting Cyclotron Laboratory (Michigan State University, USA).
2. Develope system for automatic measurements of LEDs and optical fibre lightness.

Device for automatic measurements of LEDs and optical fibre lightness

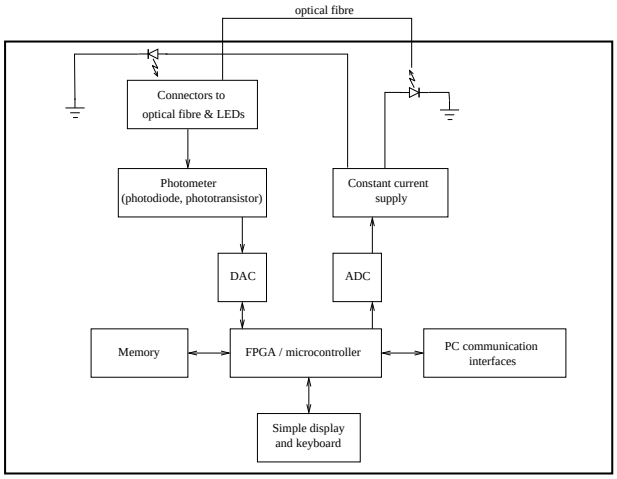

Figure 6: Block diagram of proposed device

FPGA board irradiation tests

Objectives

1. FPGA configuration memory tests.
2. Tests of logic layer of the FPGA chip.
3. Test of other components on development FPGA board (DDR, PROM memories, interfaces, buffers, voltage regulators).
4. Tests of shieldings for FPGA boards.
5. Tests of radiation hardened FPGA projects.

First results

Only test of FPGA configuration memory completed.
Board was placed 18 meters from converter for 43 days.
Avarage number of static SEUs 6.7 per day.

CCD and CMOS cameras irradiation tests (Arkadiusz Kalicki)

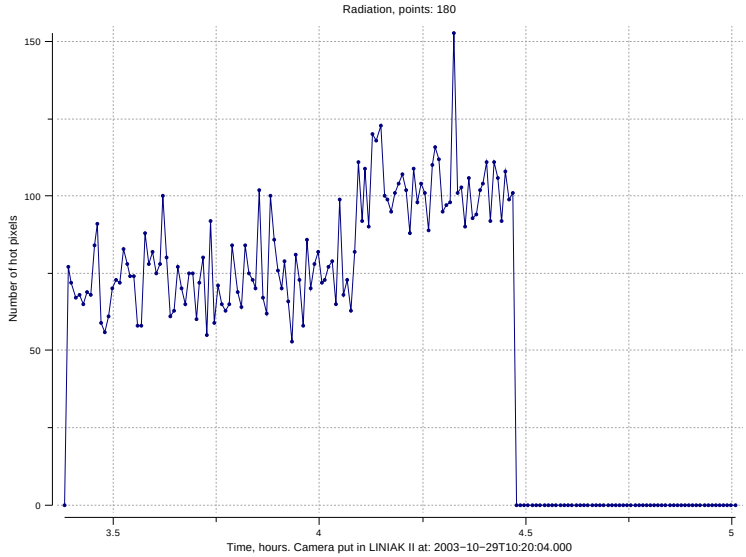

Figure 7: Number of hot pixels, CCD camera beginning of experiment

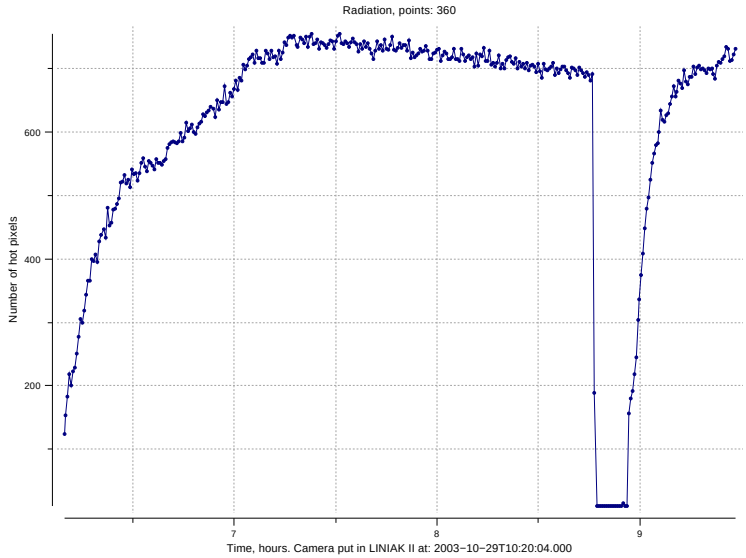

Figure 8: Number of hot pixels, CCD camera after 6 hours in Linac II tunnel

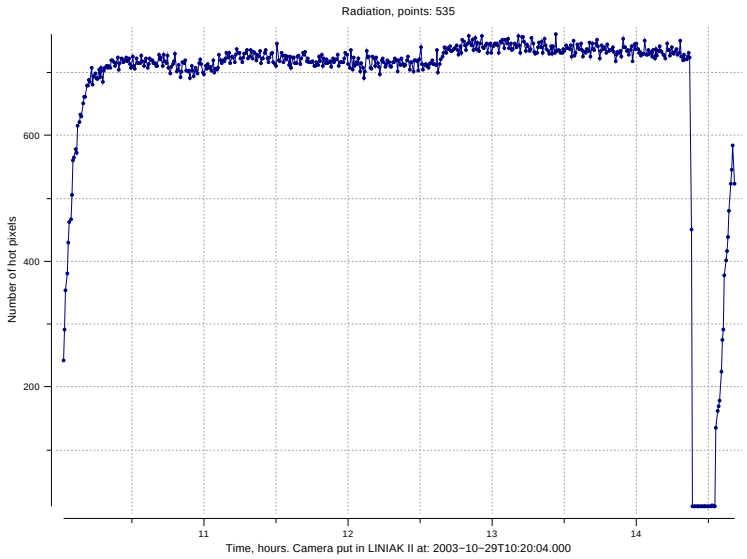

Figure 9: Number of hot pixels, CCD camera after 10 hours in Linac II tunnel

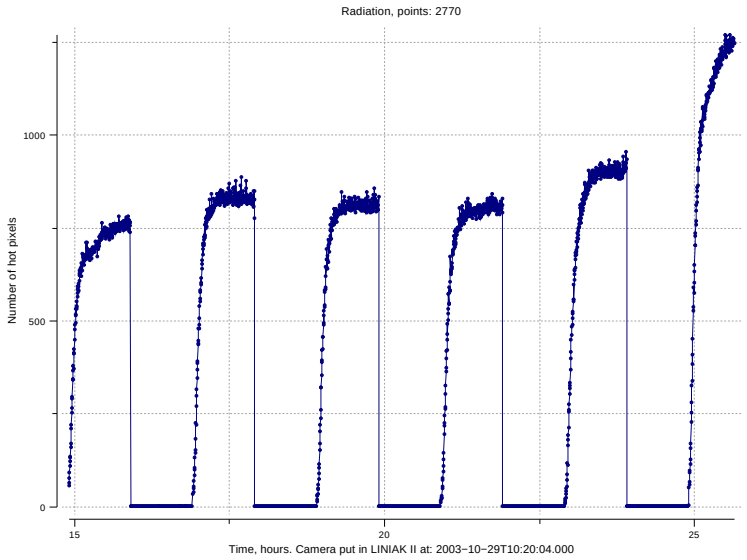

Figure 10: Number of hot pixels, CCD camera during the night

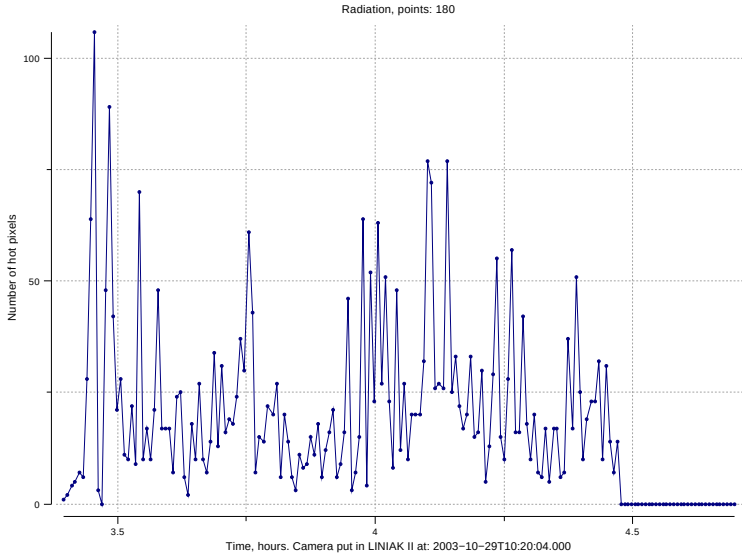

Figure 11: Number of hot pixels, CMOS camera after 3 hours in Linac II tunnel

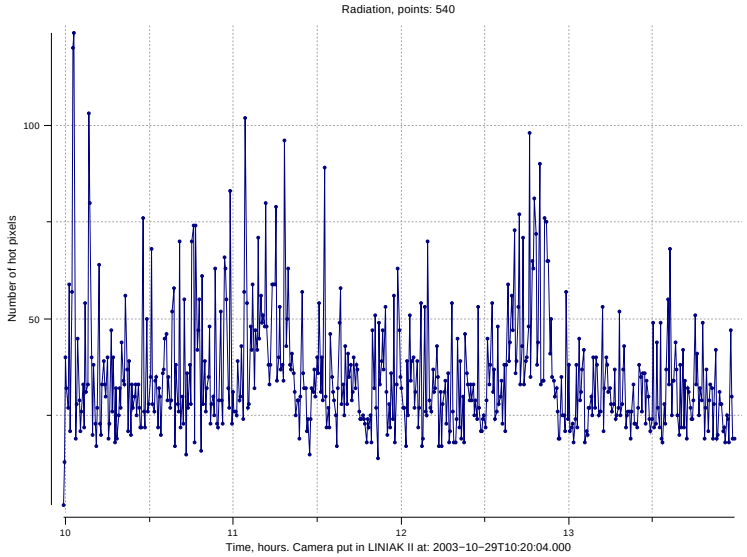

Figure 12: Number of hot pixels, CMOS camera after 10 hours in Linac II tunnel

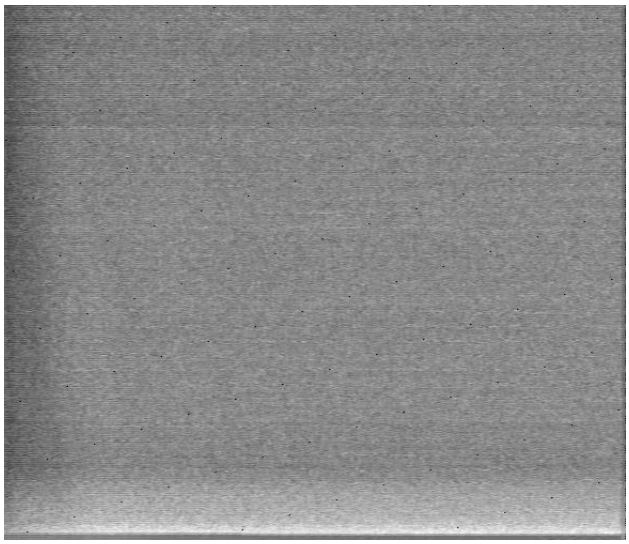

Figure 13: Snapshot from CCD camera at beginning at experiment

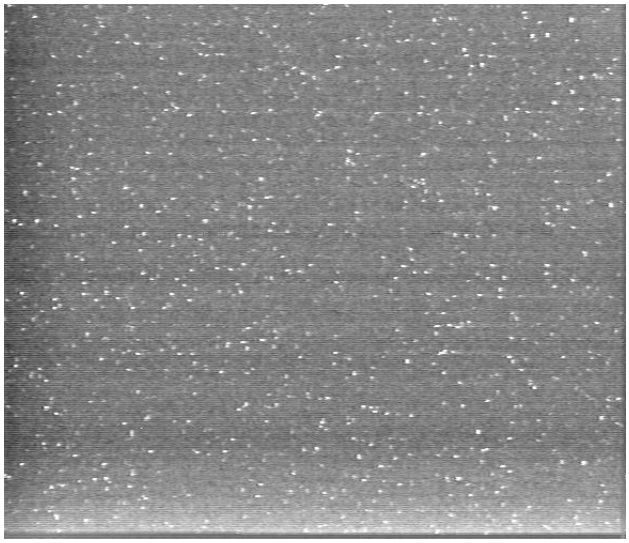

Figure 14: Snapshot from CCD camera at the end of experiment

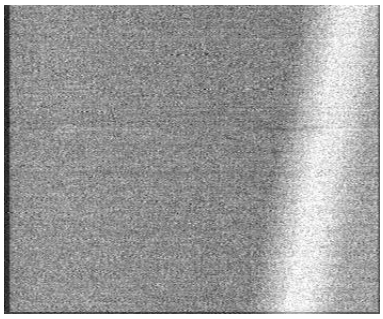

Figure 15: Snapshot from CMOS camera at beginning of experiment

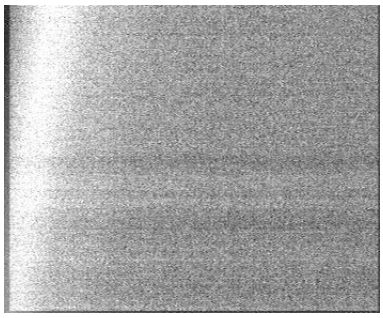

Figure 16: Snapshot from CMOS camera at the end of experiment

Other ELHEP activities - current status

DOOCS FPGA server (Piotr Pucyk)

1. Porting communication modules from windows to solaris (eliminating intermediate windows tcp server).
2. Developing some internal server interfaces.
3. Developing and testing the access to the fpga via lpt port.

VME board with embedded PC computer (Piotr Roszkowski)

Main advanteges of architecture

1. Fast, parallel boards configuration.
2. Boards are independed from VME bus controler and other boards.
3. Full board control without VME bus controler.
4. Boards can work outside VME cassette.

Tasks

1. Implementation of JTAG driver for embedded Linux.
    - Driving JTAG lines is completed.
    - JTAG algorithms in progress.
2. Develope new test board with Etrax on chip PC computer with the newest EtLinux and Linux Kernel.