

Warsaw ELHEP Group

Research Visit Summary at DESY, TESLA 22 March -06 April 2003

Warsaw University of Technology Institute of Electronic Systems

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DESY, Hamburg, 05.04.2003

Warsaw ELHEP Group for TESLA Test Facility

Institute of Electronic Systems (ISE), Warsaw University of Technology Institute of Experimental Physics (IFD), Warsaw University

VISIT SUMMARY in DESY/TESLA on 22 March -06 April 2003

Persons:

R.Romaniuk (22 March-06 Apr.), K.Pozniak (22 March-06 Apr.), W.Zabolotny (29 March-06 Apr.), T.Czarski (22 March.-13 April), P.Rutkowski (15 March-13 April), T.Jezynski (permanent stay-paid by - half Tesla – half BAC/ZEUS), Z.Luszczak (permanent stay –paid by Zeus/BAC), M.Kudla (23 March –30 April), K.Kierzkowski (23 March – 30 March paid by Tesla, 31 March -6 April paid by Zeus).

General purpose of visit

prepare equipment to be ready for liniac operation (all persons involved) preparations of hardware for first trial to mount equipment at the liniac (all)

General Tasks:

Tesla Cavity Simulator and Controller

Hardware and software development program Preparations for hardware implementation in VME crates Initial tests of radiation hardness of electronics for TTF tests of cavity simulator integration with cavity controller preparing Xilinx development boards for tunnell installations set-up of all necessary auxiliary equipment further Xilinx development boards and software tests **ESGARD Joint Research Program** CARE financed by UE within FP6 (JRP - SRFCAV and SRFTECH); Participation of ISE in ESGARD within DESY group Consultations with dr S.Simrock on ELHEP participation in ESGARD-CARE-SRFCAV; Risk assessment in SRFTECH program

Internal meetings by ELHEP

The following meetings were held by the group (TTF Controlroom, bldg. 28, Hall 3): 1. Radiation tests at Liniac II, program document preparation, S.Simrock, R.Romaniuk, D.Rybka, discussion

2. Preparation of requirements for third generation of LLRF cavity control system using FPGA, S.Simrock, R.Romaniuk

3 Cavity simulator and controller, development stages of fpga/VHDL Implementation (Tomasz Czarski, Wojtek Zabolotny with support of his colleagues)

DESY Summer Student Program 2003

Candidate documentation consultations with Ms Andrea Schrader; tel.4453, 1C/378 Three students from ELHEP.ISE to be considered: Piotr Pucyk, M.Kasprowicz and Michal Husejko

Video Conference facilities for ELHEP Warsaw Laboratory

Facilitate cooperation between Warsaw Tesla Laboratory and DESY/TESLA Enable participation of Warsaw ELHEP Laboratory in VC on LLRF&C Systems The VC was tested between DESY and ELHEP Warsaw and next multiconference additionally with Jefferson Lab, Los Alamos and DESY using ISDN connection. Discussion about purchase of cheap equipment consisting of echo-canceling microphone and enhanced web camera. Estimated costs 1500 Euro. Participation in regular Video Conferences of the LLFR Group Regular participation of ELHEP via ISDN is difficult because of high telephone connection costs with USA. IP VC version has to be implemented.

Not yet resolved

TESLA LLRFC System database

Meeting with dr Kay Rehlich and dr S.Simrock, R.Romaniuk and Zbigniew Luszczak. Dr S.Simrock prepared LLRF database concept document. Z.Luszczak of ELHEP is considered as a person participating in database preparations and development. Not resolved yet

New Publications

Three new papers and technical notes are under preparation concerning cavity simulator and controller in MatLab and FPGA/VHDL. 1- DSP procesor; 2-Test set up; 3-Modelling and step connection model in MatLab/FPGA

TESLA Reports 2003

Three Tesla Reports are considered for publications, being extended versions of prepared papers; http://tesla.desy.de/new_pages/Reports/2003

Radiation hardness investigations of LLRF electronics for TTF II

Persons participating: Reinhard Brinkman, Hans Weise, Stefan Simrock, Ryszard Romaniuk and four members of ELHEP Group; Subject: Using Liniac II as a test bed for gamma radiation influence on LLRF electronics for TTF II

Decisions: Additional person from ELHEP to be possibly involved in the program; Needed hardware, software and experimental set-up to be assessed; Experimental program details to be established by S.Simrock and R.Romaniuk.

Consultations with Involved people dr Hans Weise (tel.3950, 30B/568) and Joerg Herrmann (MIN Gruppe LINIAC II, tel. 3782, 24/122), radiation experts: Klaus Peter Klimek D3 1C/276 tel.3373, Albrecht Leuchner D3 1C/279, tel 2043

Participation in preparation of experiments on radiation hardness of electronics in LINIAC II Assembling of parts of experimental set-up. Experiment operator would be Mr Dominik Rybka, a student from ELHEP

Tesla Cavity Simulator and Controller

Hardware and software development program

The tasks which are under realization now:

1. Tests of FPGA cavity controller

preparing of laboratory set-up for tests of cavity controller and cavity simulator,

set up enables control, setting parameters of cavity controller

testing of cavity controller with analog cavity simulator

integration of Mat-Lab with hardware cavity controller at step-like work mode;

2. Design and testing of FPGA cavity simulator

Design of digital model under Xilinx core generator was performed.: main parameters - 64bits of accuracy at 40MHz clock

The model is now confined by compilation problems (2Gbit memory bottleneck)

New version of cavity simulator is under development. The model bases more on VHDL.

Model design is shifted from Xilinx core generator to own VHDL solutions. The aim is to minimize the size of the design.

TESLA DOOCS

The Distributed Object Oriented Control System http://tesla.desy.de/doocs/ Participation of ELHEP in DOOCS System Connection of LLRF TTF electronics by Elhep to DOOCS System ELHEP FPGA/MatLab/VHDL server: data flow, display, measurements, utilities, hardware resources, software libraries, code base Not yet resolved

New test board design

Xilinx development board would be used for the next couple months. There is a need to consider dedicated test board containing FPGA chip and PC chip. The requirements for this board just started to be discussed.

Contributions of individual members of ELHEP Group

Tomasz Czarski: cavity controller modeling, trials to combine MatLab model with hardware, cavity simulator, step model integration with hardware

Krzysztof Pozniak: VHDL internal interface, hardware set-up and internal interface advancements

Dominik Rybka: radiation tests program for FPGA control boards; preparations for a seminar on radiation tests of Tesla electronics at LINIAC II

Maciej Kudla: hardware set-up, VHDL, presented a two part seminar/tutorial on VHDL programming and designed system for CMS detector;

Krzysztof Kierzkowski: hardware set-up, design of prototype test

board

Wojciech Zabolotny: MatLab/FPGA model of cavity simulator, cavity controller checks and tests with simulator

Piotr Rutkowski: C++, software for TTF electronics

Tomasz Jezynski: laboratory set-up, hardware tests; diagnostic system for Bac detector – the system may be adapted in case of need for TTF purposes. The system features channel calibrations, efficiency mapping, configuration, graphical visualization.

Ryszard Romaniuk: Esgard/Care/ programs, Cavity controller modeling, hardware set-up, own test board

design, preparations for radiation tests...)

Zbigniew Luszczak: LLRF database, GUI interface, Database software

BacNavigator+BacViewer, now available on zwalab5.desy.de may be adapted in the future for TTF purposes. This software is modular and reconfigurable and allows to view all detector resources

Suggested Plans of ELHEP Group for the nearest future

Pre-next-visit activities (in Warsaw):

Further design of simulator

Compillable and synthesizable model of cavity simulator

Hardware for Warsaw ELHEP laboratory needed

New cavity simulator is under consideration, done under pure VHDL. Comparison with

MatLab model would then be possible.

Decision on own test board design

The board should consist of:

mother control board – control small Xilinx or Altera chip (Spartan, Acex, Cyclon, etc.) two daughters boards per one control board - possessing fast Xilinx Virtex or Altera Stratix with DSP modules, and additional components like - SRAM memory, multichannel DAC, ADC, fiber optic Gbit data links, etc, and ETRAX PC.

Full development costs of two test boards at ITR/Warsaw are approx. 5kEuro. VME crate is needed to test the own development boards

Suggested visit of dr S.Simrock to Elhep Warsaw on 21-25 May 2003

Visiting of Elhep laboratory at ISE.WUT. New laboratory space under preparation Participation in IEEE-SPIE sponsored WILGA Symposium on Electronics for High Energy Physics.

Suggested visit of a few Elhep members to TTF on 07-29 June or 23 June – 13 July 2003

Tests of cavity simulator Integration with cavity controller Preparing Xilinx development boards for tunnel installations, auxiliary equipment, fitting of voltages, supplies, packages, VME crate Xilinx developments board and software tests

Hardware tests on liniac (XDB). Option: Laboratory (and on site) tests of own development board

Other activities:

Special issue of ELEKTRONIKA Monthly on Tesla FEL or on LLRF for Tesla, not yet resolved WILGA Symposium on Electronics for High Energy Physics Experiments, 22-25 May 2003

/compiled by dr R.S.Romaniuk/

Appendices

- S.Simrock, Requirements for 3rd Generation RF (FPGA) first document draft beginning
- 2. S.Simrock, Task List; RF Hardware
- 3. S.Simrock, R.Romaniuk, Radiation Tests for Electronics in TESLA Tunnel first document draft beginning
- 4. R.Romaniuk, D.Rybka, Radiation tsets of Xilinx Spartan II-E chip document
- 5. D.Rybka, Proposal for irradiation tests of Xilinx Spartan II-E presentation
- 6. D.Rybka, Irradiation tests of FPGA circuits for RPC muon trigger in CMS experiment presentation
- 7. T.Garvey (co-ordinator), JRA2 in the CARE proposal; Super-conducting radiofrequency technology, SRFTECH, ESGARD, FPVI; Draft 25.03.03
- 8. Correspondence
- 9. Specification of Xilinx development board with Spartan to be purchased for TESLA tunnel radiation tests
- 10. T.Czarski et al, Initial draft of next paper on step model of Cavity controller