# Warsaw ELHEP Group LLRF Control, TESLA DESY

Visit of the ELHEP (Electronics for High Energy Physics) Group from Warsaw University of Technology (WUT), Institute of Electronic Systems (IES) and Warsaw University, Institute of Experimental Physics (UW.IEP) to TESLA/DESY/Hamburg; 9-22 September 2002

A list of involved persons: Desy/Tesla Host and Task Leader: dr S.Simrock; DESY Liaison: dr Z.Gołębiewski; ELHEP Members: Dr R.S.Romaniuk – Group Coordinator, Dr K.T.Pozniak, Dr W. Zabołotny, Mr I.M.Kudła, Mr K.Kierzkowski, Local Members of the ELHEP Group at DESY: Mr Z.Łuszczak, Mr.T.Jeżyński, Mr T.Czarski

# Visit Summary

#### Introduction

A general agreement was signed a year ago between DESY and Warsaw University of Technology concerning the participation of scientists from WUT in TTF. Institute of Electronics Systems (IES) was made a representative of WUT in this cooperation. The IES, in cooperation with Institute of Experimental Physics of Warsaw University, has formed a dedicated ELHEP group of experts, scientists, engineers and physicists, technicians and students (M.Sc., Ph.D.) with their work specialties (physics, electronics, IT science and practices) chosen to undertake relevant problems of HEP experiments. The Group now consists of around 30 members, 10 senior researchers and 20 young scientists. Senior members of the Group have long lasting experience in HEP electronics, for example in ZEUS and CMS experiments.

### 1. Personal resources assigned for Tesla Project

The ELHEP Group offers its experience for Tesla Project (TP). ELHEP would make its best to try to increase its personal presence in the development of the LLRF Control System for Tesla. The need for as much as 20 persons was initially expressed by TP. ELHEP would try to address some of these needs for experts acquainted to some extent with relevant problems. Now three permanent persons are preparing for TP. Next 3-4 persons from the Group are preparing to come to DESY soon for some time. It is not excluded that some of these persons may stay then in DESY TP for longer. The ELHEP members working in DESY will be strongly backed in some of their tasks by experienced Group members in Warsaw. Occasionally, if needed, the Group senior members form Warsaw will visit DESY to support practical activity at the TTF experiment site.

List of persons:

Permanent TP members in DESY:

- 1. Dipl.Ing.Tomasz Jeżyński (LLRF)
- 2. Dipl.Ing.Tomasz Czarski (LLRF and cavity modeling, Matlab)
- 3. Dipl.Ing.Zbigniew Łuszczak (data quality management –DQM, system databases), for some period, part time with VETO Detector

Permanent team extension (during approx. next 6 months)

- 1. Dipl.Ing.Zbigniew Rutkowski (J-TAG, boundary scan)
- 2. Ing.Mariusz Ptak (optical multi gigabit links)
- 3. Dipl.Ing.Tomasz Nakielski (VHDL design, system diagnostics)
- 4. TBD (Dipl.Ing.Michał Radtke) (downconverter)
- 5. Ph.D., Student of prof.J.Dobrowolski (RF signal distribution system)

6. Further team extension would be considered depending on the initial cooperation results up to 10-12 permanent persons during a year (Dipl.Ing. Rafał Sałański, Ing. Przemysław, Szamocki,...)

Senior members in Warsaw to visit DESY every two months

- 1. Dr Ryszard S.Romaniuk (electrooptics, communications, GOL, system design and testing, ELHEP coordination)
- 2. Dr Krzysztof T. Poźniak (VHDL, FPGA, measurements, system design and testing)
- 3. Dr habil. Grzegorz Wrochna (system design)
- 4. Dr Wojciech Zabołotny (VHDL, FPGA, system design and testing)
- 5. Dipl.Ing. Maciej Kudła (VHDL, FPGA, system design and testing)
- 7. Dipl. Phys.Michał Pietrusiński (object oriented programming and databases)
- 6. Dipl.Techn.Krzysztof Kierzkowski (PCB design and testing)
- 7. Up to next 3-5 persons to be defined in next 6 months (analog electronics, floating point electronics, micorwaves, etc.)

### 2. Technical resources

To perform efficiently its tasks the Group needs some basic material resources in DESY and in Warsaw. The DESY needs were initially defined as: laboratory space and equipment. A separate steady laboratory room (rooms) able to accommodate up to twenty-few people seems to be necessary. Now a temporary solution was assumed and the Group (now 8 persons) is using a laboratory facility adjacent to Tesla Control Room in building 28.

A list of needs, purchases, borrows and things necessary to start new laboratory and work facility of the ELHEP Group was initially discussed and defined. Some of the needs are just being realized.

The Warsaw needs of the Group will be addressed mainly from the local resources. The IES assigned special laboratory space (200m<sup>2</sup>) dedicated exclusively for ELHEP Group. However, especially during the initial period of the Group formation and stabilization, some advanced electronic measurement equipment borrows and electronic parts flow will be necessary from DESY.

# 3. LLRF Control and Data Readout Tasks

- 1. Control Loop modeling and realization (including cavity simulation)
  - a. High Definition Language and Xilinx/Altera
  - b. Control demonstrations at the TTF
  - c. Test board supplemented with analog multiplexer to serve 8 cavities
  - d. Multi-board set-up (development tool-kit)
  - e. Decision on dedicated test board design and fabrication
- 2. Readout and Data Acquisition
  - a. Electro Optical Sampling
  - b. Cavity Probe Signals (efficient calculations during dead-time of the system)

### 4. TESLA International Infrastructure

- 1. Publications, conferences, education
  - a. Annual conference of ELHEP
  - b. Special Journal Issues on Tesla
  - c. Tesla lectures

Dr S.Simrock, DESY

Dr R.S.Romaniuk, IES WUT