

Reduced Acquisition System to Read 288 channels of the Front End Card of T2K experiment

Applicated to read gazeous detectors.

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Abstract

*The document explains to users how to install different drivers and software to control the FEC board based on the stuc daughter card. **Cautious must be taken during the driver installation. Otherwise, the PC could be reinstalled completely.***

It gives all information how the software works out in the DAQ T2K application. The software technology is based on XML and UDP/IP protocol. A command server run all the time during the processing of the system. A second software sends commands to the server to control the FEC board and its application to read out detectors channels.

The Fem_Stuc system is deployed uniquely under windows XP operating system.

Document Status Sheet

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1. INTRODUCTION

Fem_STUC system is part of the T2K nd280 collaboration. The intent is to read out 288 channels from a gaseous detector. The vocation is not to have great performance in terms of speed but to help designers to test detectors.

The system consists of a mother board called FEMR_STUC with a daughter board called STUC. The two board's aim is to control and read out data coming from the FEC board. The FEC board consists of four AFTER chips (288 channels) and an internal pulse generator to test and calibrate electronic channels. A high speed ADC makes the digitization stored in a memory inside FEMR_STUC board.

The link between FEM_STUC system and the PC is via an USB interface. Why USB? USB is easily controlled in modern computing and so having an acquisition system with USB is an advantage when your job is to do measurement instead of building instrumental system.

The Front End Board is very sensitive to all bad EMC environment. So a shield must be applied to the board. Several holes exist on the PCB to ease the mechanic design. (see picture). The shields is not a deliverable of the set FEM_STUC. *You must provide depending of your mechanical constraint your own shield.*

2. STUC DRIVER INSTALLATION

DO NOT PLUG THE STUC CARD ON A PC BEFORE HAVING INSTALLED DRIVERS CORRECTLY. OTHERWISE, THE RE-INSTALLATION OF THE OPERATING SYSTEM COULD BE MANDATORY

The STUC probe is working only with Windows XP. No test has been done on Vista system. The delivered CD contains all necessary files to install the Fem_Stuc application. You must at first install STUC driver and at second time, you could install Fem_Stuc software to control the hardware.

List of directories :

STUCV4Package contains all information and software concerning the STUC board and the associated drivers and software.

→ Copy the directory STUC4Package into the c:/ root.

You will notice 7 directories inside.

- μ C CypressFx2 contains the embedded software to STUC. Two files exists.
 - Stuc2.hex: standard program for STUC.
 - Eeprom.hex : Programme to use STUC without USB (not useful for Fem_STUC application)
- FPGA_Files contains svf files and vhd files for the firmware
 - Program Files contains svf files ready to use
 - VHDL_Files contains intrinsic program to develop new application with the stuc hardware.

- Install contains drivers for the cypress component. (see below)
- Library contains two files to add STUC functions to your home made software application
- Projects contain all executables and sources for the command_server application to the Fem_STUC.
- CVI_DRV contains all drivers to make interface with STUC working.

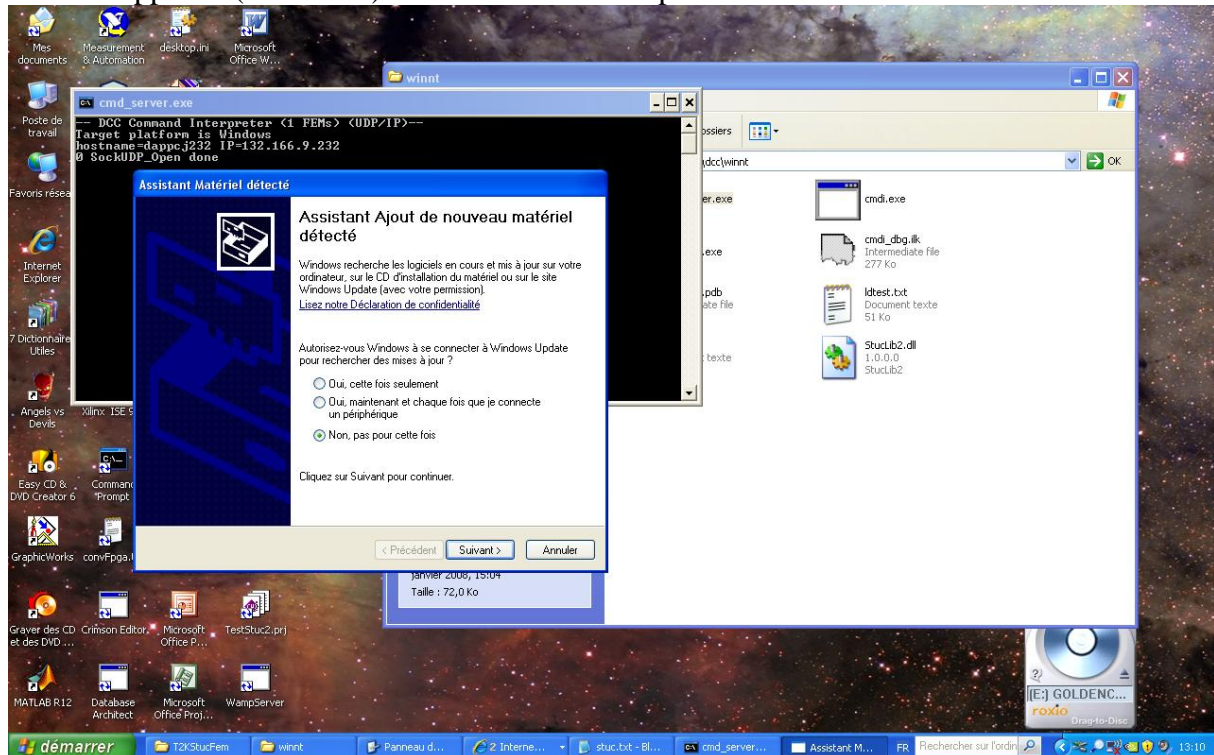
STUC PROBE INSTALLATION

In Install directory, four files has to be copied at the right place as explained below .

1- you must place files as followed :

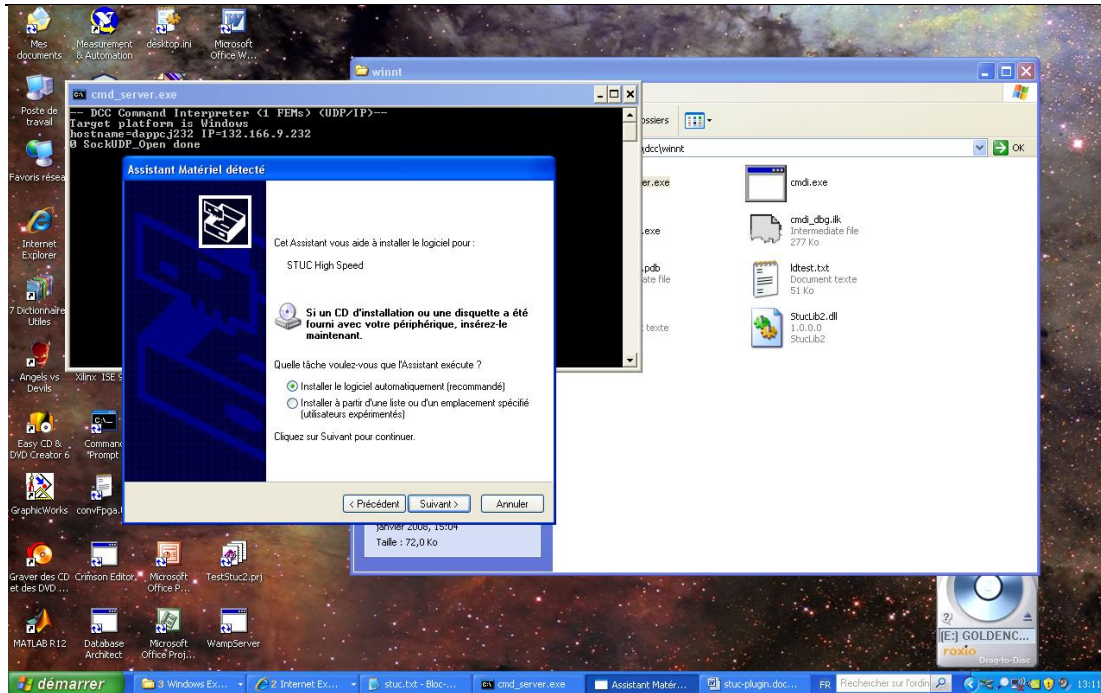
- "ezmon.sys" into C:\WINNT\system32\drivers
- "ezusb.sys" into C:\WINNT\system32\drivers
- "ezusbw2k.inf" into C:\WINNT\inf
- "ezusbw2k.PNF" into C:\WINNT\inf

2- Plug the STUC usb connector in one input of the computer. A wizard material assistant window appears. (see below). Let tick off NO and press NEXT.



3- A new second window appears, indicating the driver for the new Cypress USB component (initial driver for the STUC probe). Let tick off YES, ONLY THIS TIME and press NEXT (see below). The STUC probe is installed.

At the first start of the Command_server client software, a identical windows appears showing STUC-HIGH SPEED driver. Let tick off YES, ONLY THIS TIME.



STUC PROBE LIBRARY INSTALLATION

In the CVI_DRV directory, you will notice three others directories. Each name of directory indicates where to copy all containing files in the computer system. Hence :

- All files in PROG_FILES_COMFILES_MERGE_MODULE must be copied into the path:
C:/Program Files/Common Files/ Merge Modules
- All files in WINNT_SYSTEM32_DRIVERS must be copied into the path:
C:/WINNT/System32/Drivers
- All files in WINNT_SYSTEM32 must be copied into the path:
C:/WINNT/System32

Reboot your PC !!!

Now you are ready to use Fem_STUC applications software.

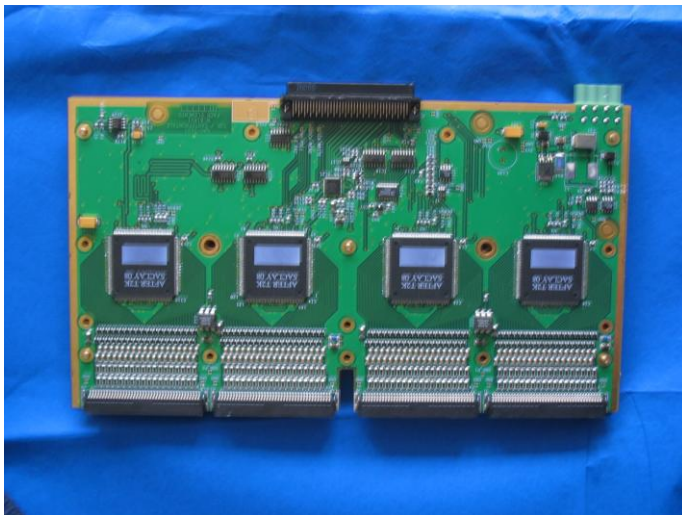
3. HARWARE DESCRIPTION

As said previously, the system consists of a Fem_STUC (see below) system and a computer to acquire data. The Fem_Stuc system is constituted of :

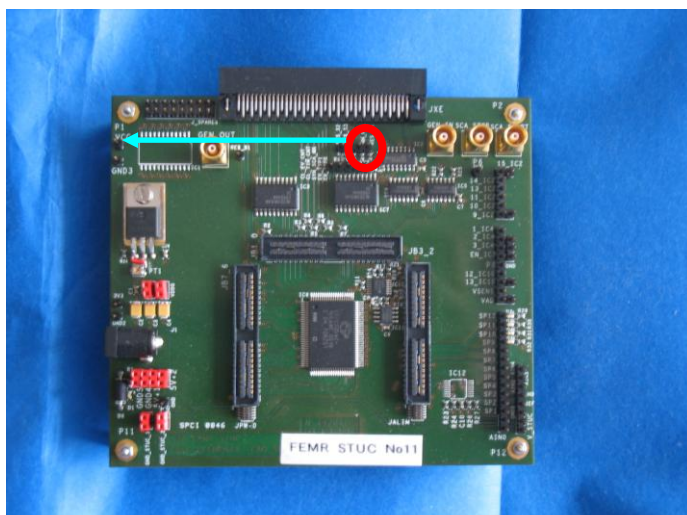
- Front End Board (FEC) embedded four AFTER circuit to handle 288 electronic channel to read out pads from a gaseous detector.
- A FEMR_STUC with the STUC probe to control and manage the usb link to the computer.



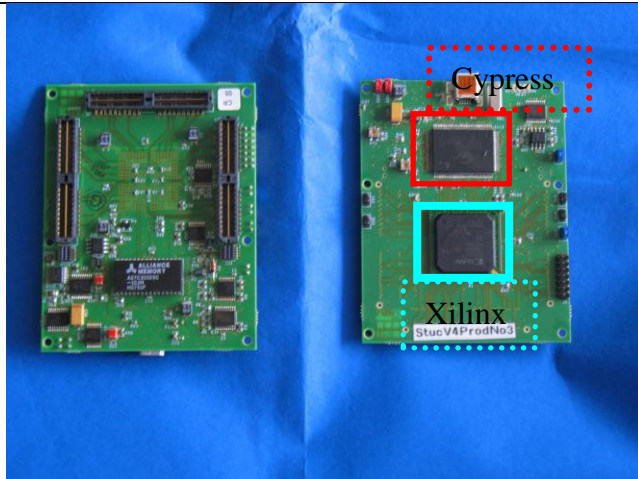
FEM_STUC SYSTEM



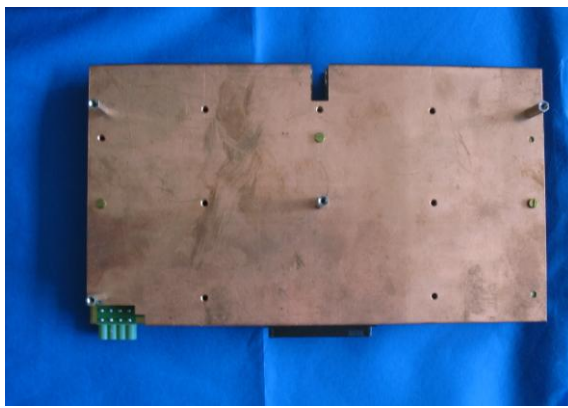
Front End Board (FEC) with 4 AFTER Chip. The board could be tested and calibrated via an internal pulser, leaded by the FEMR_STUC board.



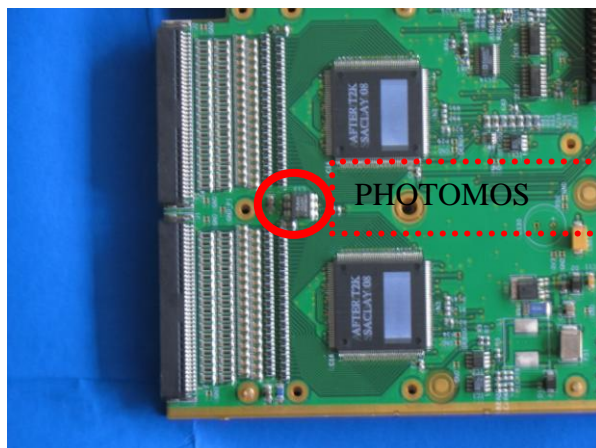
FEMR_STUC. You must plug MM_POL and RES_S4 to VCC to switch on the photomos.



STUC PROBE with the cypress μ controller and the Xilinx embedded firmware. Three connectors is necessary to plug its 200 pins.



Example of a shield for the FEC card. The mechanical structure could also include the FEMR_STUC board.

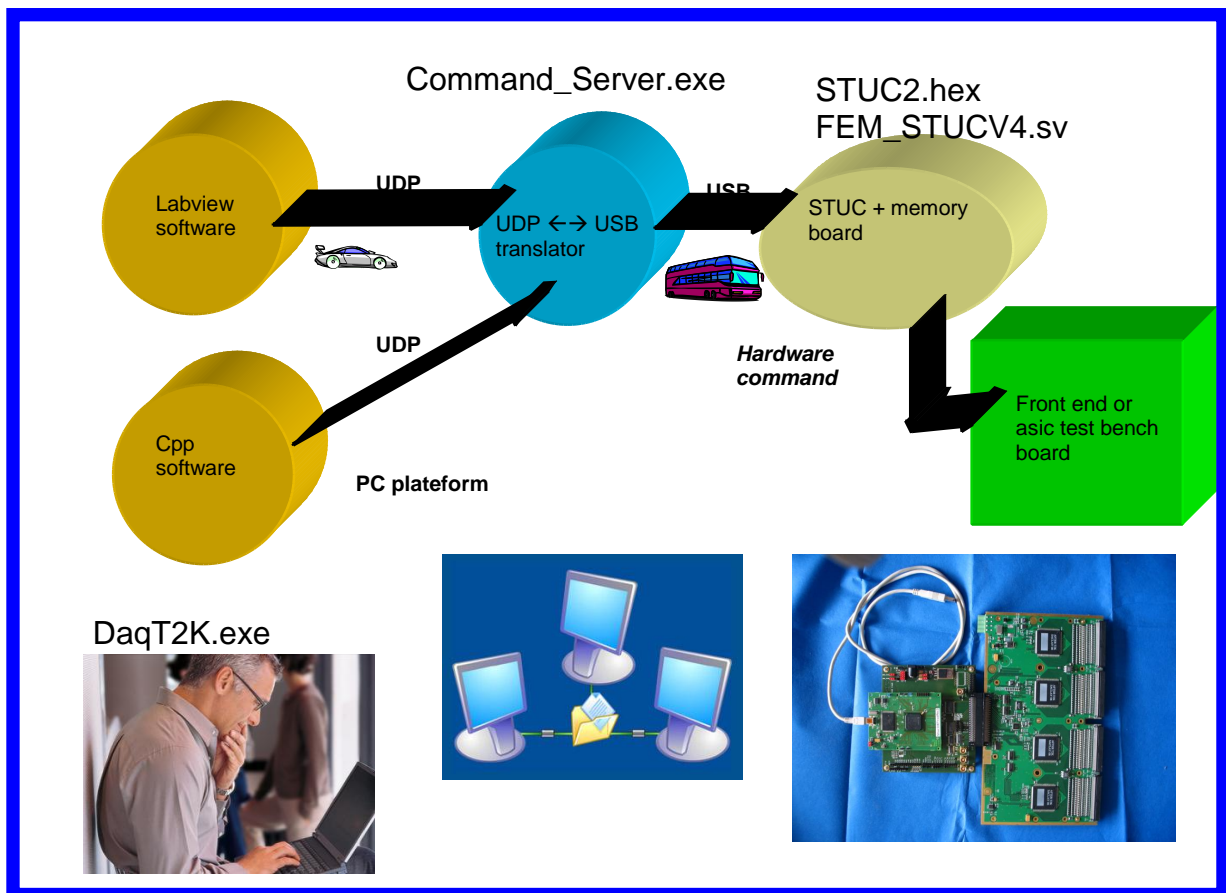


View of the front end asic and its protection against sparks.

4. SOFTWARE HARCHITECTURE

To command the FEC hardware, you must download a software for the cypress μ controller and the embedded firmware into the Xilinx. It is done inside the command_server application. This software runs on PC and does the interface between client through UDP protocol and FEM_STUC hardware through USB link. It must run all the time you want to acquire data.

Client software runs through UDP network to send instruction to the command_server application. It consists of an Unicode language to give orders to the firmware embedded on the FEM_STUC hardware.



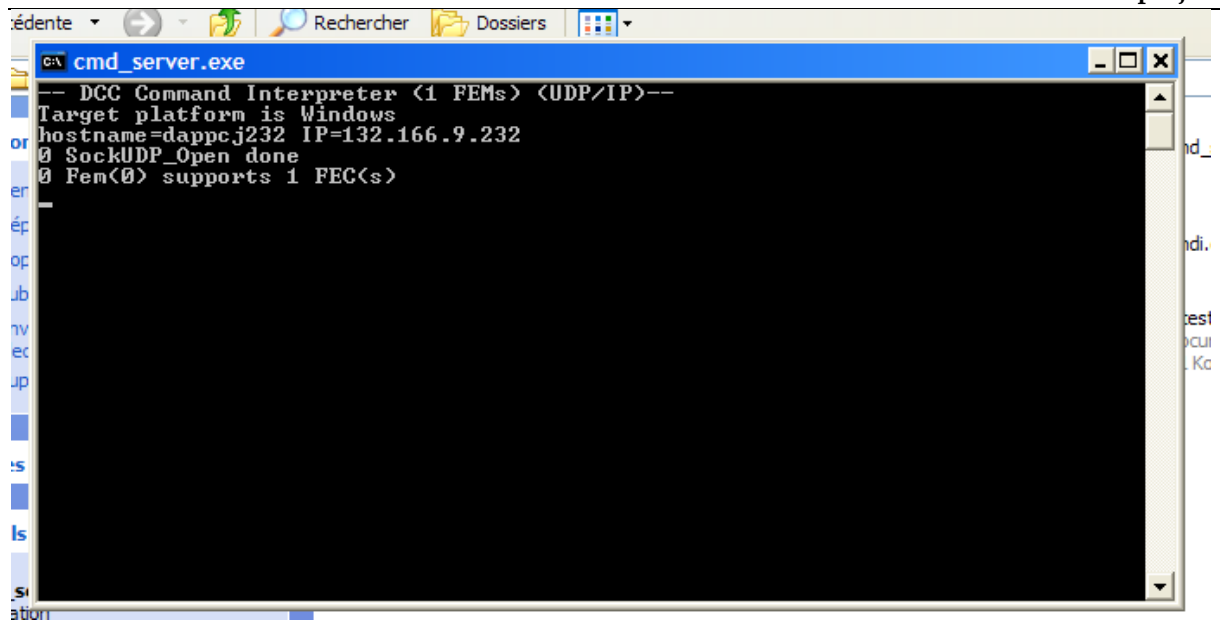
5. COMMAND SERVER USER GUIDE

You will find the software under the path :
.... Projects/bin/t2k/dcc/winnt/dcc/cmd_server.exe

The picture below gives you an example where the software downloaded all needed firmware inside STUC and recognized the hardware.

You must see before the last message "0 Fem<0> supports 1 FEC<s>" a window with a slide scale. It tracks the download of the software into the stuc probe.

Now you are ready to deploy client-application to take data.



```
cmd_server.exe
-- DCC Command Interpreter <1 FEMs> <UDP/IP>--
Target platform is Windows
hostname=dappcj232 IP=132.166.9.232
0 SockUDP_Open done
0 Fem(0) supports 1 FEC(s)
```

6. CLIENT SOFTWARE – DAQT2K-

Cf others documentation