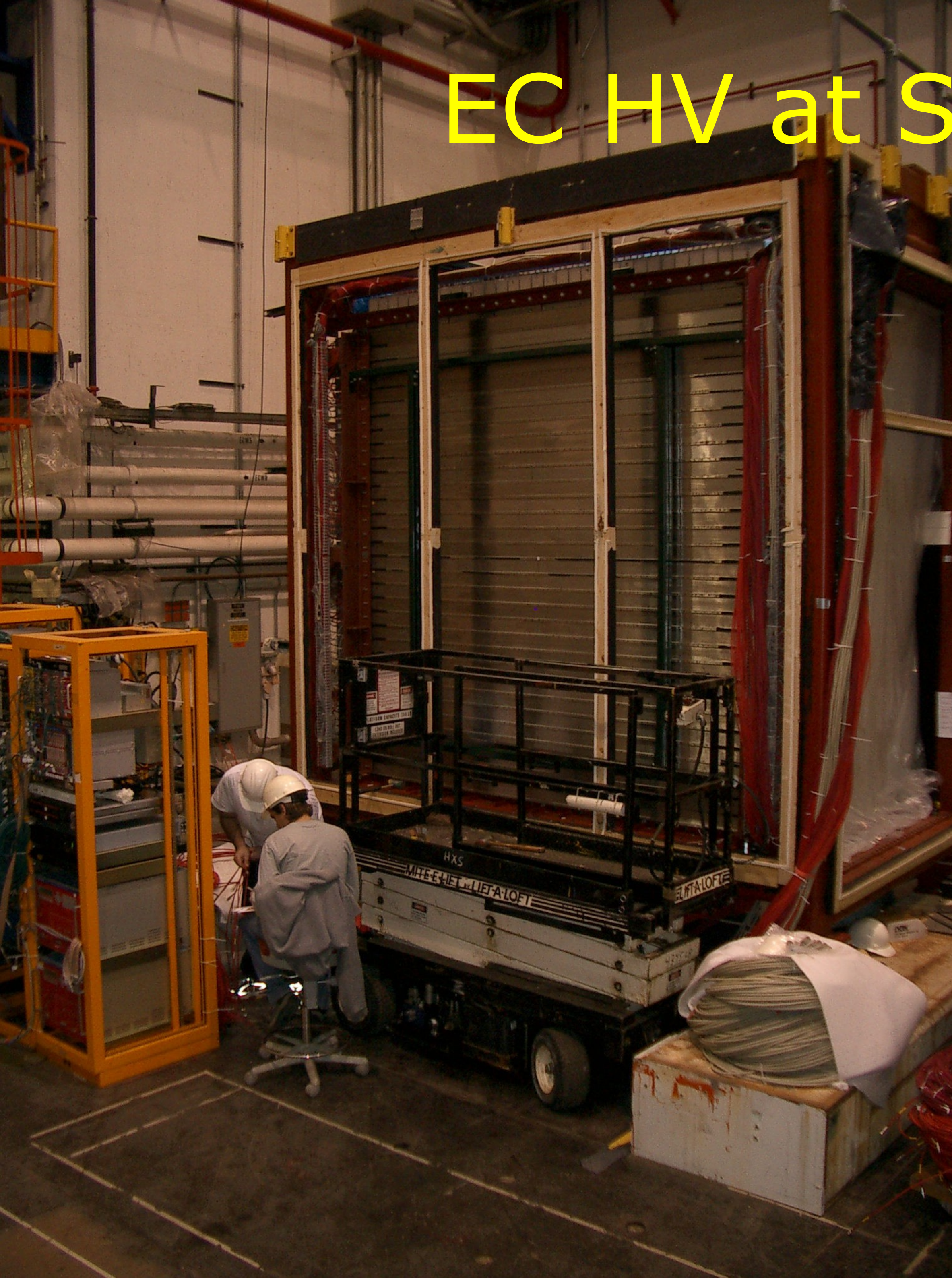
EC HV at SciBooNE



L. Ludovici
20/02/2007

"HV Review"

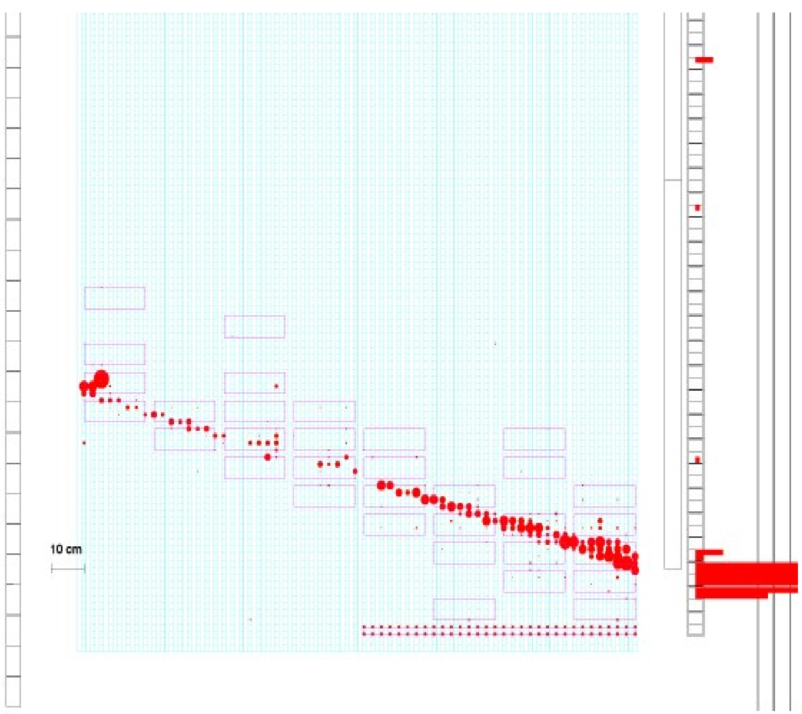
EC detector
HV System
Monitoring
Documentation
Maintenance

EC Physics Goals

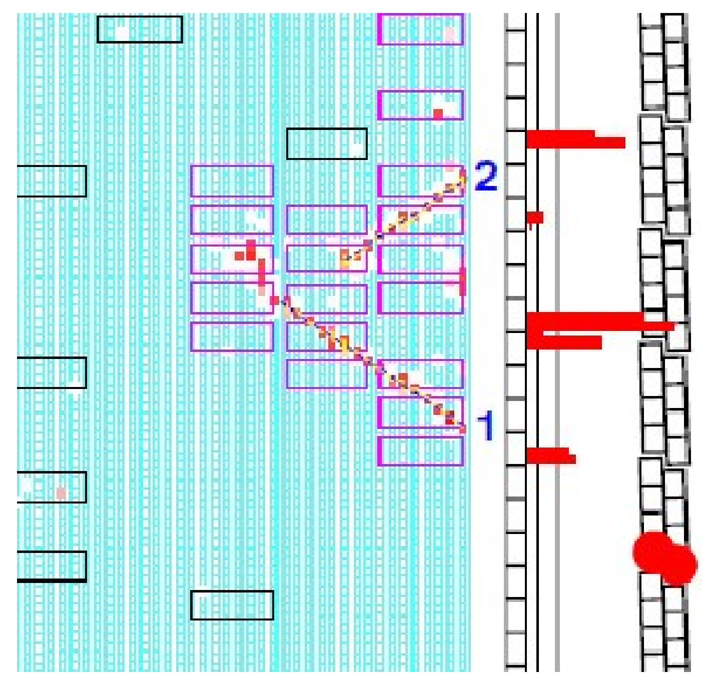
longitudinal energy flow containment

electrons and photons final states

ν_e QE candidate



π_0 CC candidate



EC Motivations

Physics capabilities

Longitudinal containment (85% at 3GeV)

Energy reconstruction (14%/$\sqrt{E(GeV)}$)

electron vs (muon or pion) ID

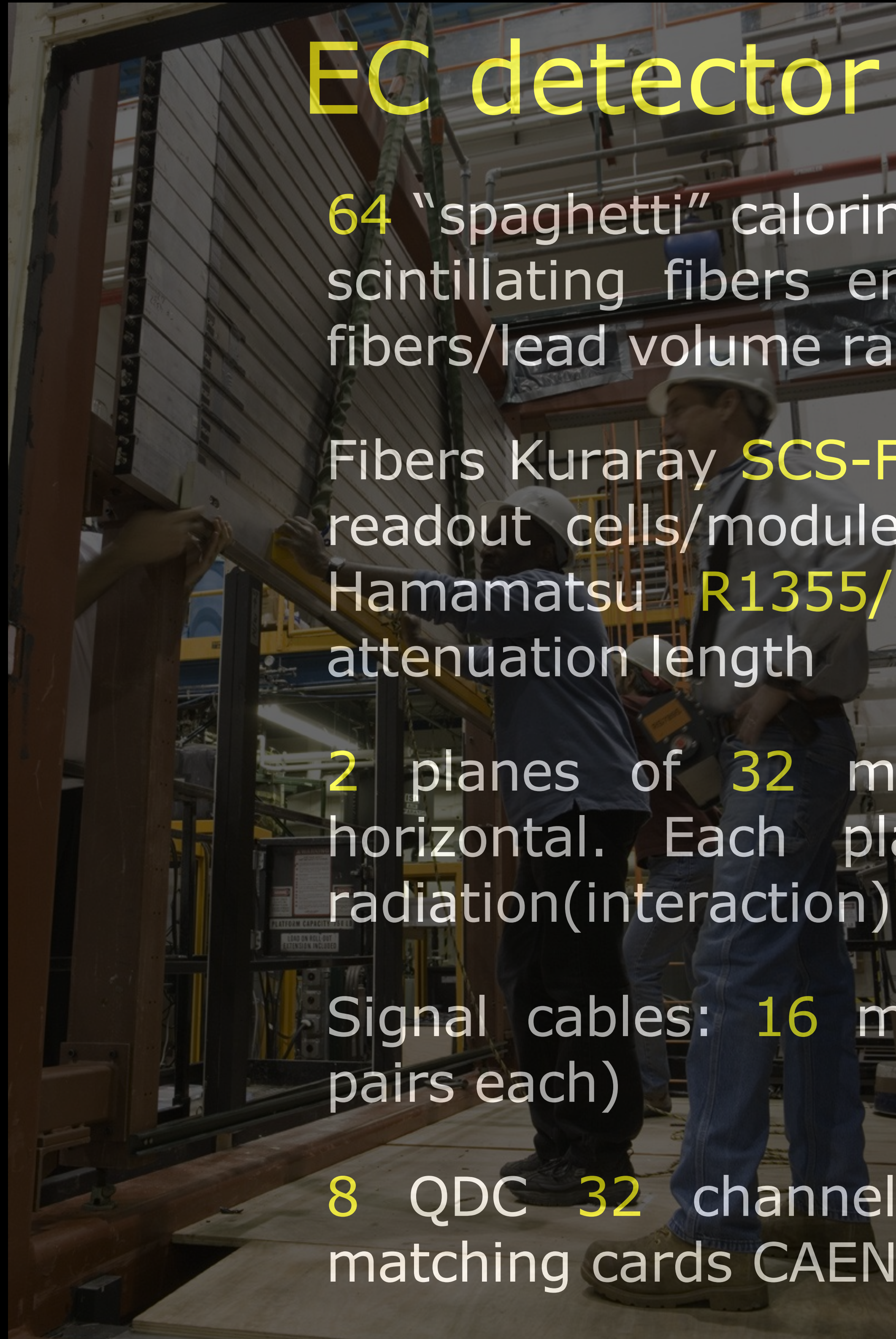
π^o reconstruction

Physics output

ν_e energy spectrum

π^o statistics and spectrum

Enhance PID and event classification



EC detector in Numbers

64 "spaghetti" calorimeter modules (4x8cm^{2}x265cm): scintillating fibers embedded in a lead matrix, 1:4 fibers/lead volume ratio

Fibers Kuraray SCS-F81 in a 4x4cm^2 bundle to give 2 readout cells/modules read both sides by 256 PMT Hamamatsu R1355/SM (green extended), 500cm attenuation length

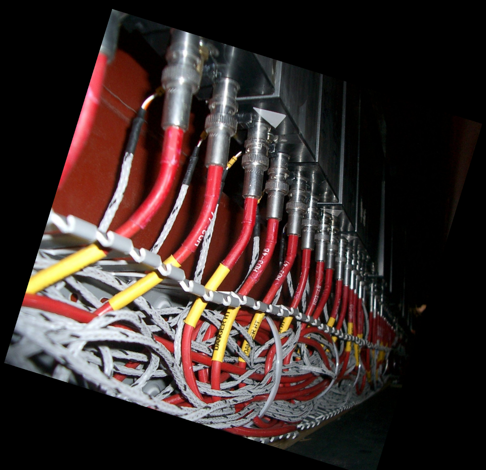
2 planes of 32 modules: one vertical and one horizontal. Each plane corresponds to 5.5(0.19) radiation(interaction) lenghts

Signal cables: 16 multipolar cables (16 differential pairs each)

8 QDC 32 channels CAEN V792, 16 impedence matching cards CAEN A992 (custom design)

HV System Layout

128(horiz)+128(vert) PMTs
Hamamatsu R1355/SM



430-470 μA
@1700-1900V

Standard HV Cables ~22m long

2 SY527 CAEN crates
each with eight 16channels boards

Caenet-PCI A1303

Monitoring PC (WInXP)
in the Control Room

Client HV monitor

additional clients can
run in parallel

Socket communication

Client /Server

PC (WinXP)
driver
C&M softw. server
local DataBase

CAEN SY527 Features

Local/Remote parameters control: Voltages&Currents (2values), Ramp-up, Ramp-down, Trip-off

Local/Remote controllable parameters: Voltages, Currents, Channel status, General status

Local Control Access: LCD and 21 keys keyboard

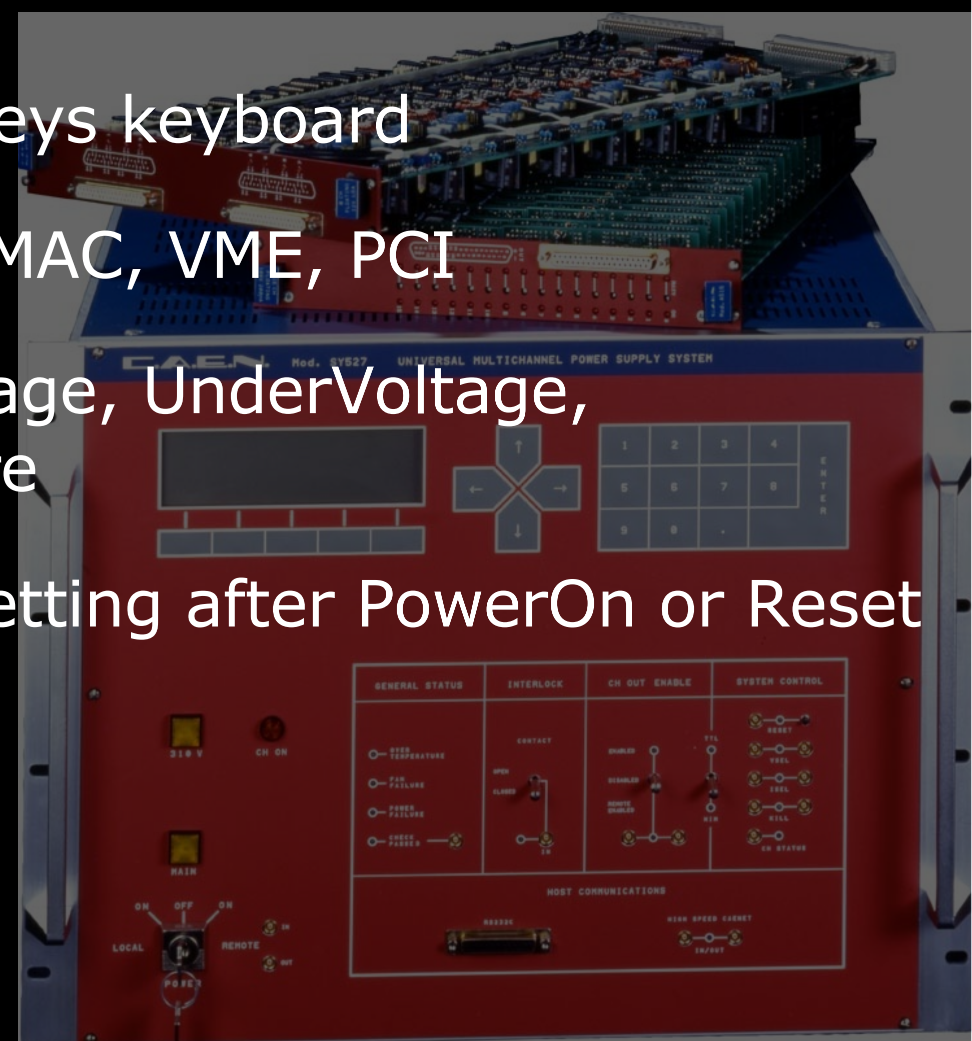
Remote Control Access: RS232, CAMAC, VME, PCI

Alarm management: Trip, OverVoltage, UnderVoltage, OverTemp., FanFailure, PowerFailure

Automatic recovery of all channel setting after PowerOn or Reset

Vmax,Imax hardware protection

Can operate both at 220V or 110V



EC HV Racks Configuration

2 mainframes SY527

http://www.caen.it/nuclear/product.php?mod=SY527

16 cards A734N

http://www.caen.it/nuclear/product.php?mod=A734

Max output 3000V, 3mA/channel

Control & Monitoring Software

As CM software we use SMACS, originally developed in Rome for the CDF-TOF

Easy configuration

Compact and hierarchycal representation of HV status, deep enough for experts but easy as well for “casual” shifters

Flexible alarm level and alarm parameters configuration (overvoltage, undervoltage, overcurrent, lowcurrent, failure)

Support of (multiples) remote monitoring clients

Hardware simulation

Abstraction layer for mixed HV environment

Scalability

Control Software (Server)

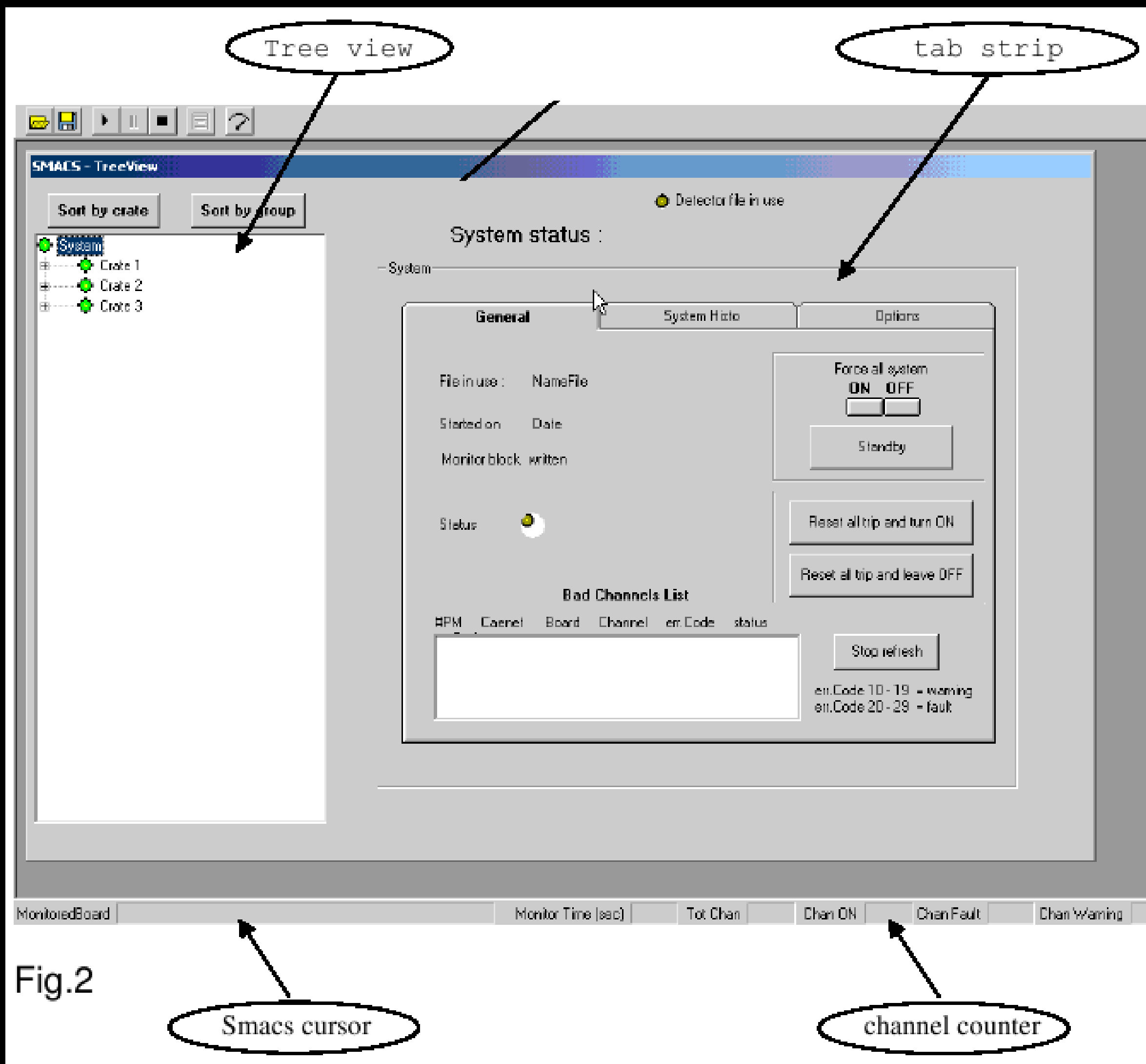


Fig.2

The server perform cyclic read out of the HV system to get status, voltages, currents, ecc.

In case of alarm, a suitable response action can be programmed.

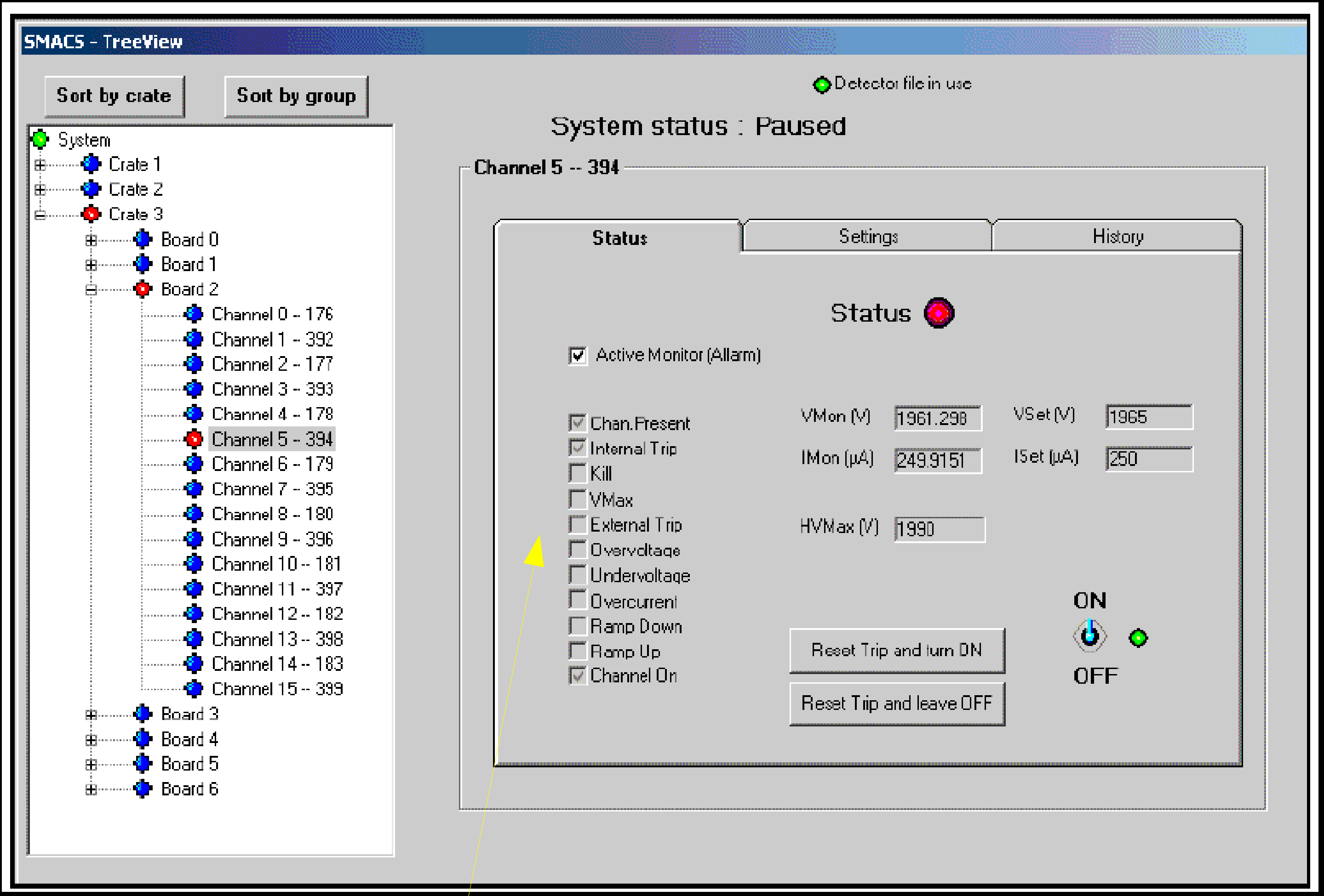
All "HV Events" are logged in a local DB

A tree browser allow navigation of the HV channels. A led represents the status of each channel

Selecting a channel from the browser, the status voltage, current and their time plots are accessible through tabs

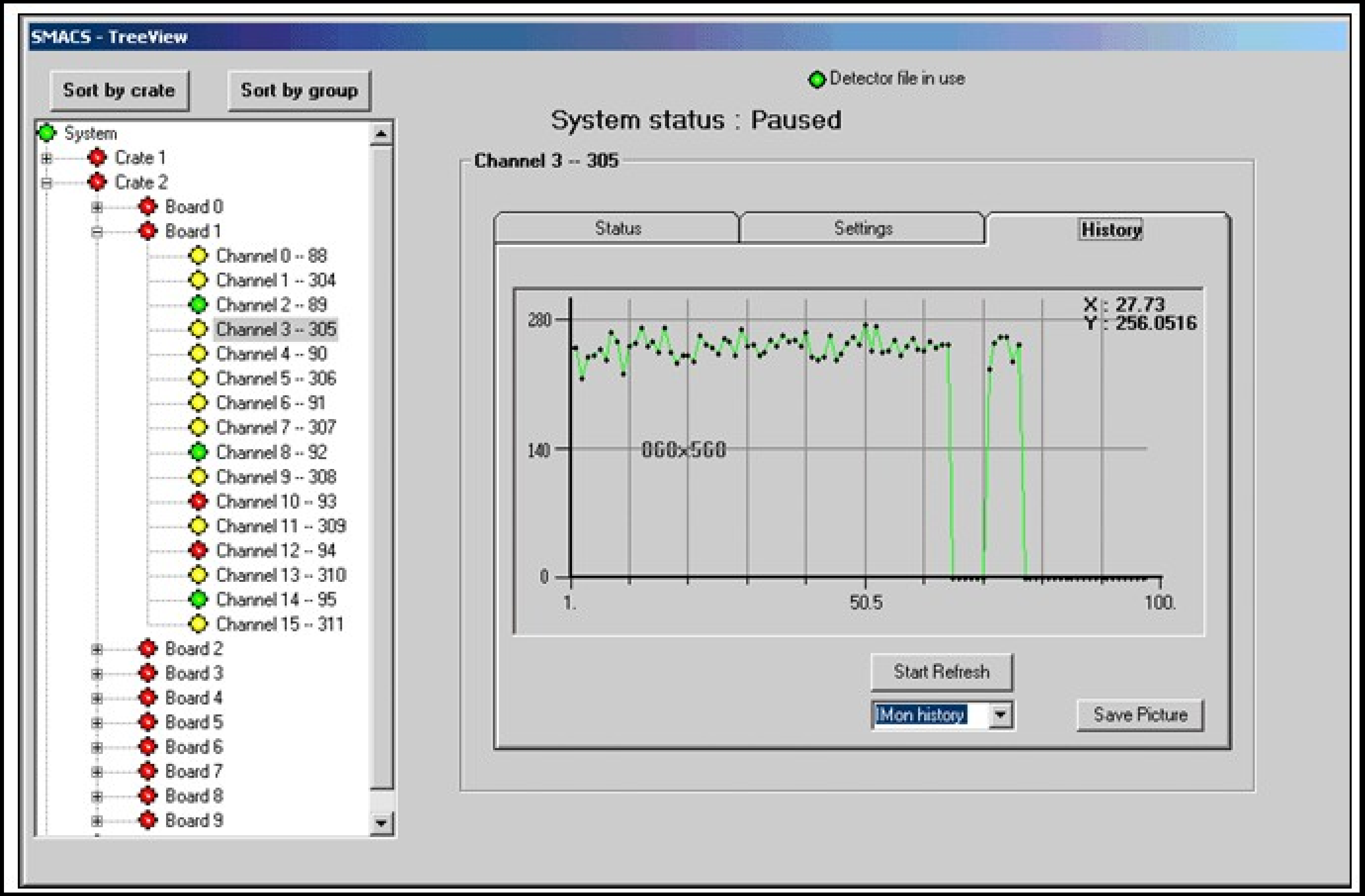
Individual channel settings can be changed interactively

Channel Browser



STATUS bits

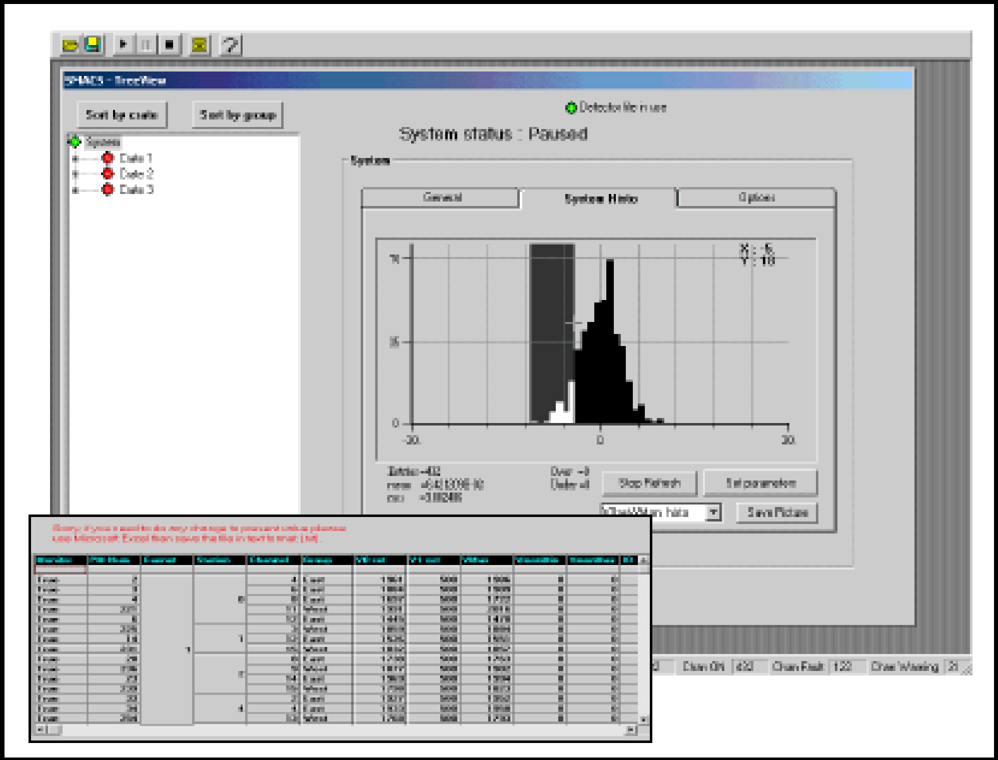
Short Term History



VMon and IMon versus time

Useful to debug problematic channels
Sampling rate user defined
Switched on upon request

Expert Histos and Plots



Built at each reading cycle:

V0set – V0Mon	histo
IMon	histo
VMon/IMon	histo
VMon vs Channel	plot
IMon vs Channel	plot
VMon/Imon vs Channel	plot

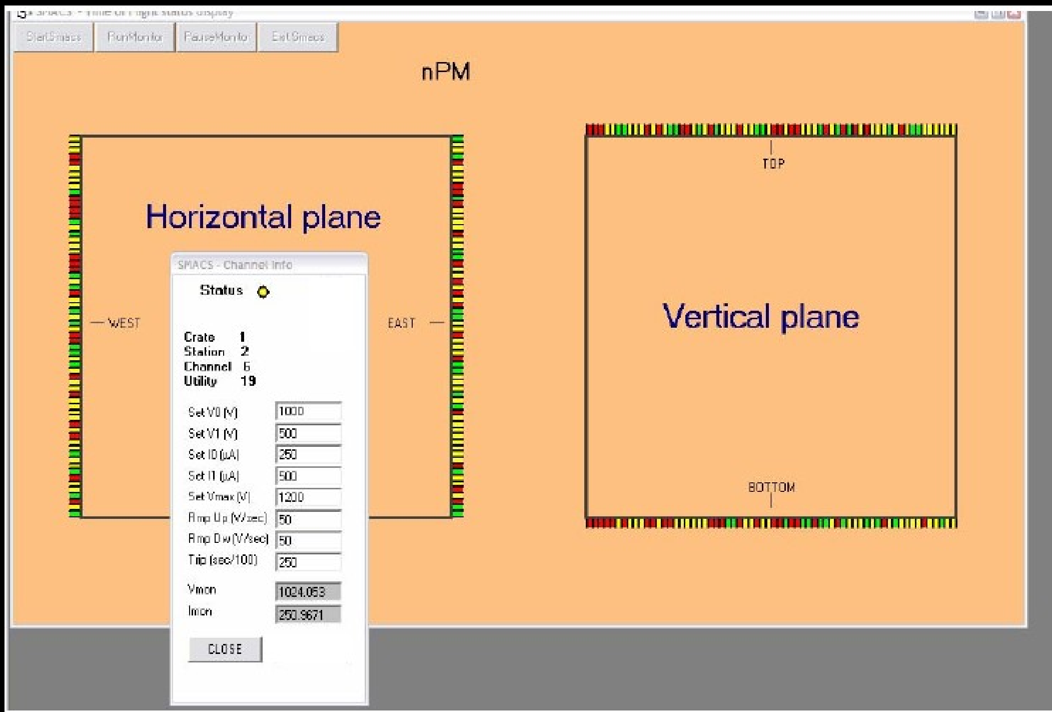
Cumulative since last reset:

Caenet error (System)	plot
Caenet error vs Chann.	plot

Histos and plots are mainly for experts;

Histos and plots parameters are configurable
Save to bitmap
Interactive access to statistical quantities
Selecting a range, the corresponding channels are shown

Online Monitoring (Client)



Client-Server communication through sockets (Winsock)

Multiple clients can run simultaneously

In normal operation the client(s) cannot modify HV settings

Geographical map of all HV channels

"One sight" overview for online shifters

Colors Green/Yellow/Red - OK/Warning/Fault

Double-Click on a channel to get status and set/monitored voltage, current

HV & SciBooNE Database

Voltage readings? Current readings? Why? Frequency, sparsification scheme? In the general DB? In an online DB?

Technically it is not an issue: in our scheme db writing can be implemented either in the client or in the server

Our calibration procedure does not make use of the HV readings

Find the right balance between polluting the database data seldom or never used and properly record online conditions

$\langle \Delta g/\Delta V \rangle = 0.3\%/V$ with large variation from PMT to PMT

HV Status and Schedule

Full system with C&M sw ready in CDF assembly hall

HV crates and boards are installed
The HV system is cabled (as well as the readout)
The HV control PC is installed (OS, driver, SMACS server)
All HV channels have been tested
Preliminary HV parameter set in local Database
The HV monitoring client is ready

Before and during the coming data taking in CDF hall

Check long term stability $\leftrightarrow$ Finalise HV parameter settings

For beam data taking

Implement collaboration agreed decision on DB policy

Documentation

Past presentations
CAEN A1303 Manual
CAEN SY527 Manual
SMACS Manual
HV cables specs

Available online from
SciBooNE at Work WebPage → Camillo's EC Page

Spares & Maintenance

Boards

We have at Fermilab 5 spare boards (16 used)

Crates

From preliminary contacts, CDF would agree to designate as common CDF/SciBooNE spare on of the two SY527 found at KTEV sometime ago. Finalize and eventually make a more formal agreement if needed.

PREP people had training in Italy as well as training at Fermilab by CAEN engineers on their HV systems. They have been giving support to the CAEN SY527 systems deployed by the CDF Collaboration

Conclusion

Rome group was supposed to provide "[...] online computers, the HV power supplies and half of the HV cables" [Internal MOU draft]

The system has been shipped, installed powered up and succesfully tested well ahead the installation schedule

The system satisfies all our requirements and is ready for data taking