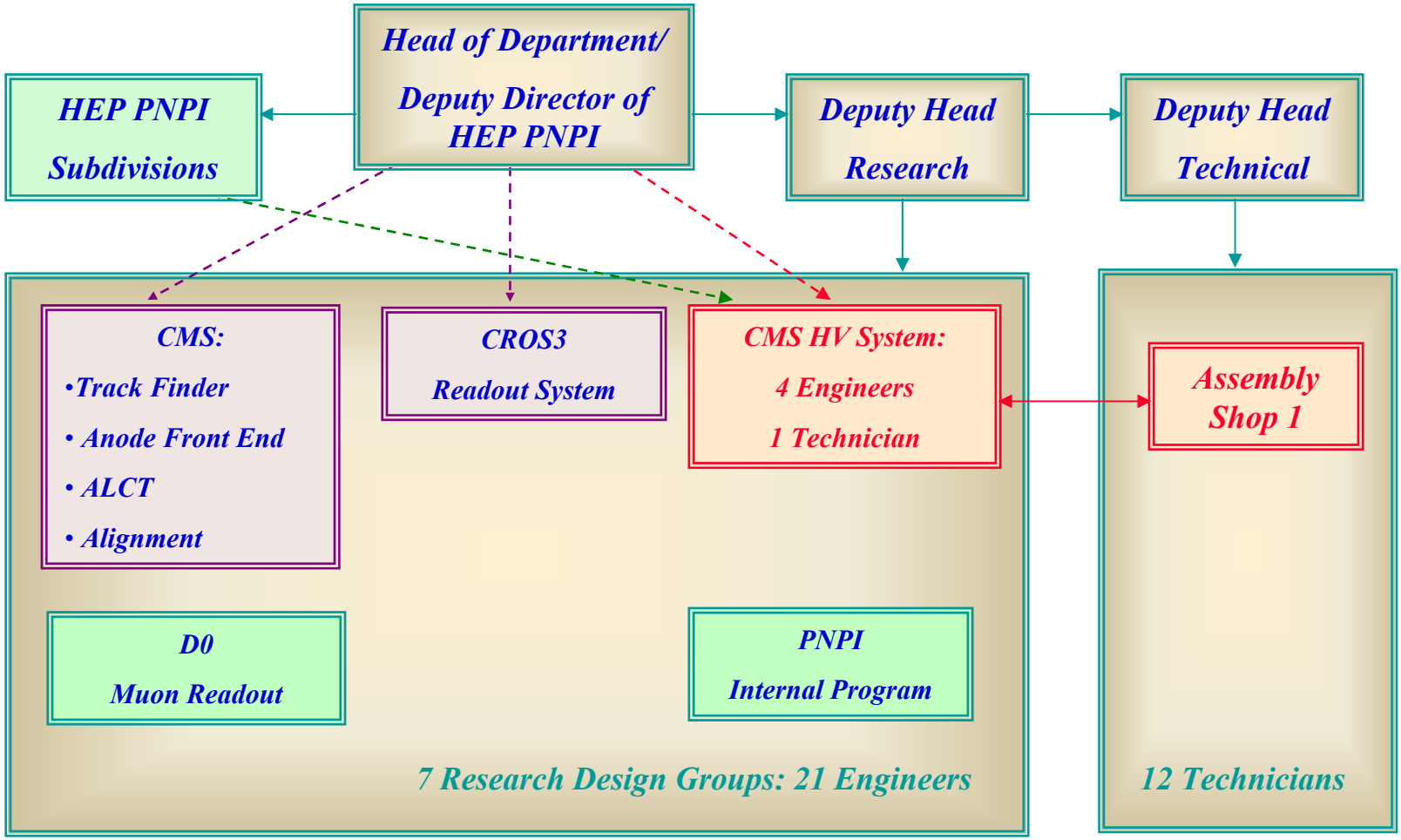
# PNPI Electronics Department
# 2003/ 2004

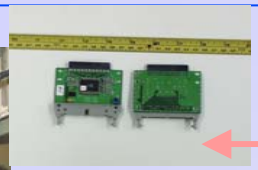
*Victor Golovtsov*

December 2003

# Electronics Department Structure



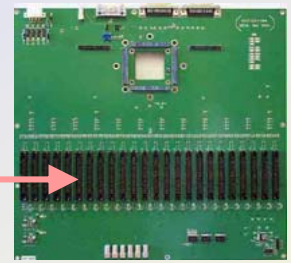
# Main Research Design Groups 2003

***Front-End (CMS)*** *– N. Bondar, A. Golyash*

***ALCT(CMS)*** *– V. Iatsura, M. Kan, G. Zhmakin*

***Track Finder (CMS)*** *– V. Golovtsov, L. Uvarov*



***EMU High Voltage System (CMS):***

*S. Volkov, V. Lazarev,S. Bondarev, L. Sergeev, N. Isaev*

***Alignment (CMS)****: V. Sknar, E. Orischin*

***Muon Readout(D0):***

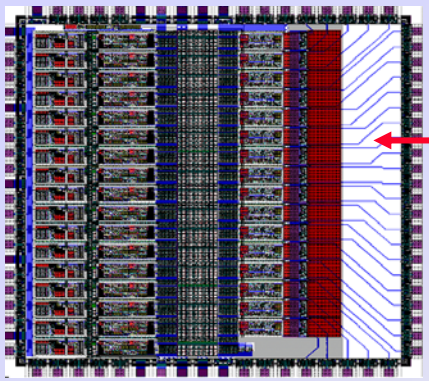
*P. Neoustroev, L. Uvarov, S.Uvarov*

***CROS3:***

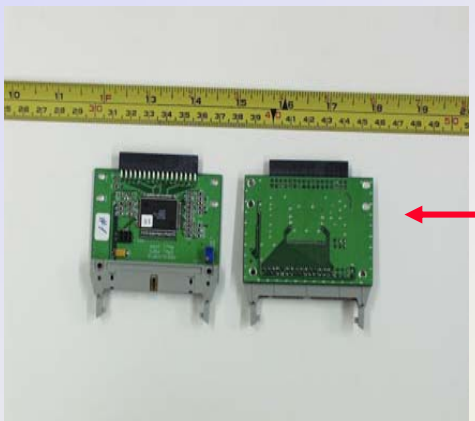
*V. Golovtsov, N. Bondar, V. Iatsura, E. Nikolaev, E. Lobachyev*

# CSC Anode Front-End

***Front-End for the anode signals of the cathode strip chambers (CSC) of the EMU CMS has been designed.***



***CMP16_g - ASIC 16-channel amplifier -shaper-discriminator: optimized for the input impedance up to 200 pF; power dissipation ~30 mW/channel; time resolution ~ 2 ns***

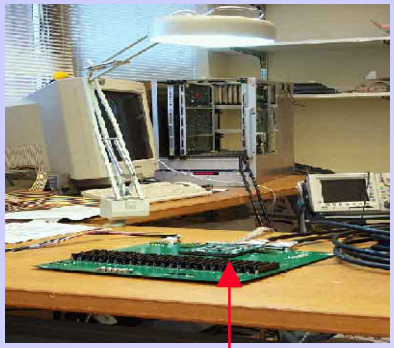


***16 channel Anode Front-End Board AD_16 was designed with CMP_g on it.***

***12,000 AFEB already were fabricated, tested and distributed into 4 sites for installation on the chambers***

***Related link:*** **www.pnpi.spb.ru/ofve/red/products/Front-end_en.html**

# ALCT- Anode Local Charged Tracks



*ALCT 384 on the Test Station*

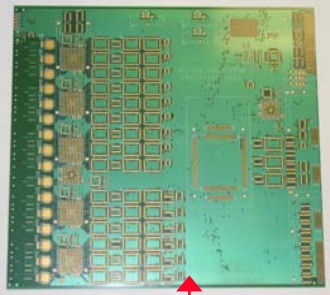
***ALCT – Anode Local Charged Tracks finding board. It is a part of the Cathode Strip Chambers (CSC) Local Trigger electronics of the EMU CMS***

***The ALCT board receives at 40 MHz the anode signals from the CSC and attempts to find hit patterns in the six-layer chamber using a multiple-layer coincidence timing technique, and then to identify the location and quality of the best two muon tracks transiting the chamber. Result from the muon pattern-finder logic are formatted into Local Charged-Track data frames for each muon found.***

***All boards already were fabricated, tested and distributed into 4 sites for installation on the chambers.***

*Related link:* **www-collider.physics.ucla.edu/cms/trigger/wirelct.html#GENDESC**

# Track Finder



*Sector Processor*

*Second Prototype*

***The Track Finder** of the CSC EMU CMS is implemented as 12 sector processors, which identify up to three best muons in 60 degree azimuthal sectors. The purpose of the CSC track-finding processor is to link trigger primitives (track segments) from individual muon stations into complete tracks, measure the transverse momentum pt form the sagitta induced by the magnetic bending and report the number and quality of the tracks to the Level-1 global trigger.*

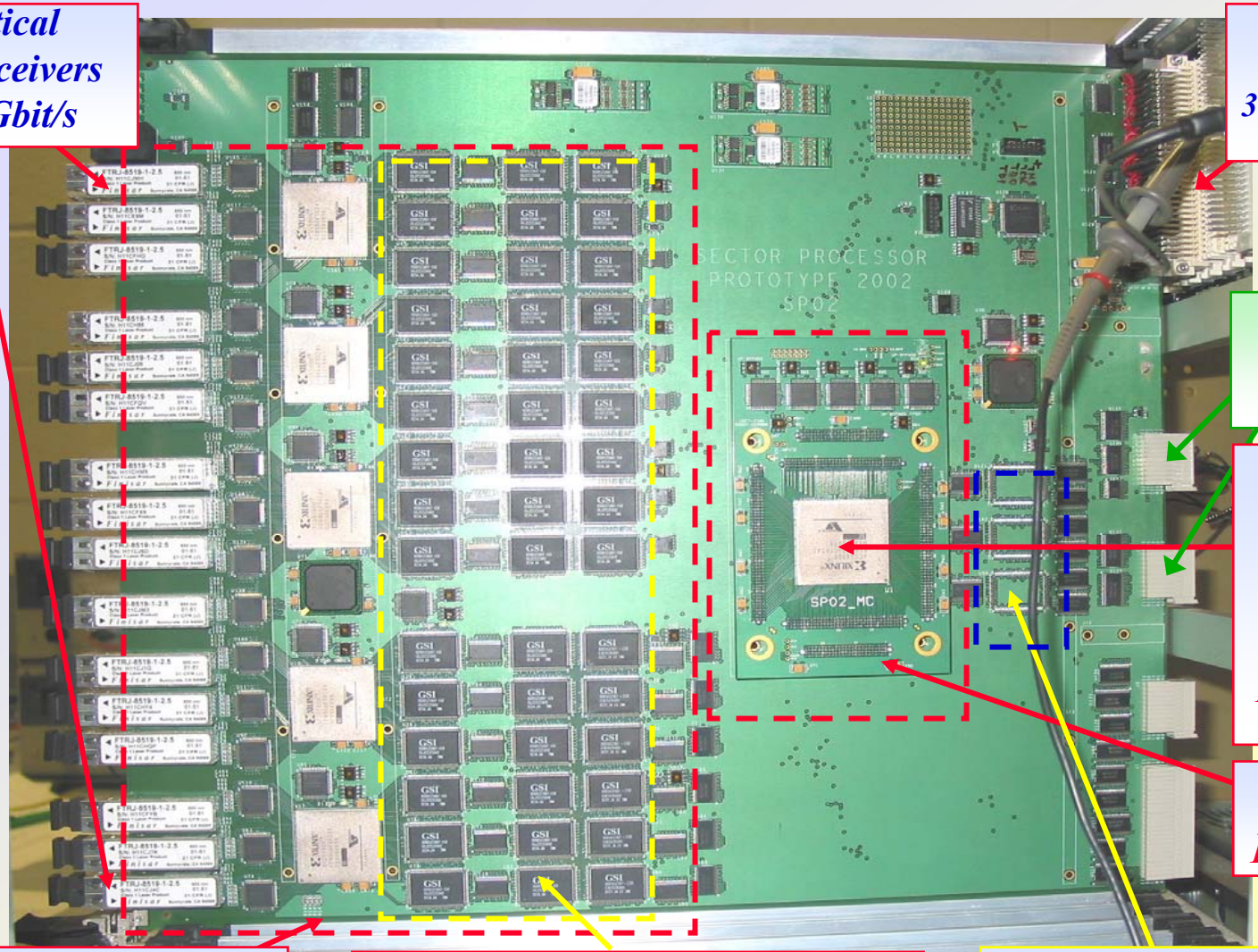
***The second prototype of the processor has been fabricated in 2002 and tested in 2003***

***The processing time is 175 ns***

***The mass-production of the Processor will be started in Sep. 2004***

***Related link:*** **www.pnpi.spb.ru/ofve/red/products/Track-Finder_en.html**

# Track Finder Processor (Second Prototype)




*Optical Transceivers 1.6 Gbit/s*

*VME 3U Connector*

*Custom Backplane Connectors*

*SP FPGA: Xilinx XC2V4000 ~ 800 I/O ~ 4 Million Logic Gates*

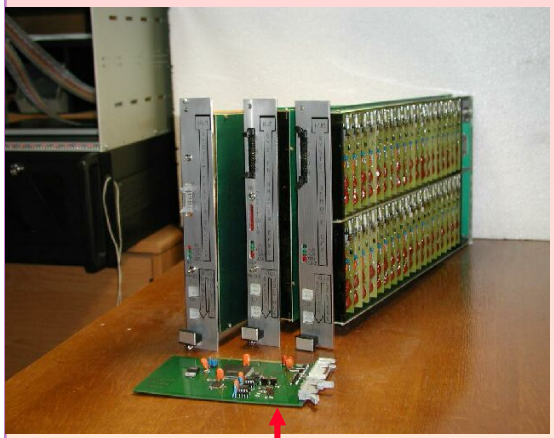
*Sector Processor*

*3 Sector Receivers*

*Phi, Eta Look-up Table ~ 64 Mb*

*Pt Look-up Table 12 Mb*

# CMS EMU HV System



*EMU HV System Modules*

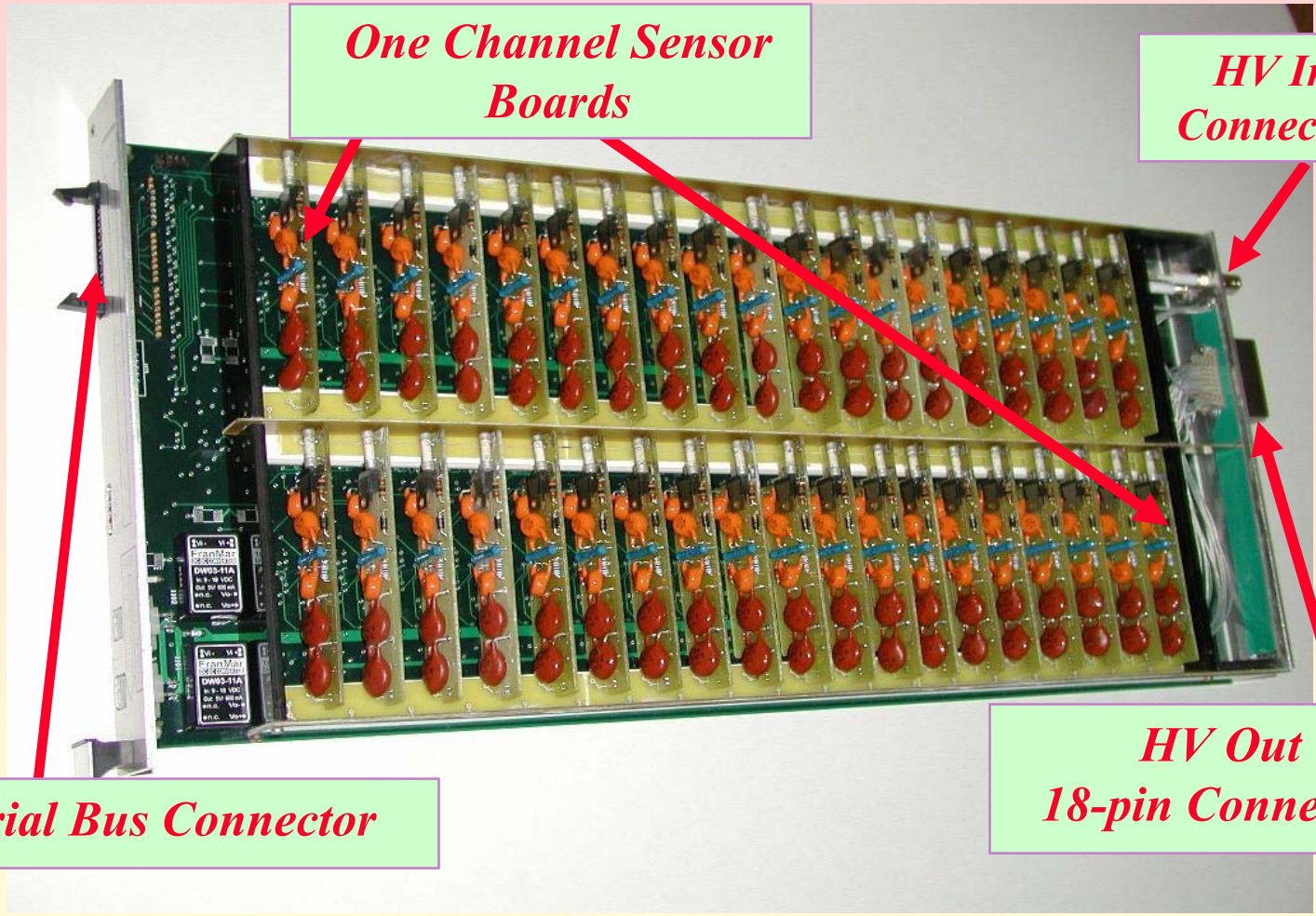
***The purpose of the System is to regulate and distribute high voltage between planes and segments of the Cathode Strip Chambers and to monitor individual current and voltage of each of 10,000 segment.***
***The specific feature of the HV System is fan-out HV from single HV Master Supply Card up to 324 outputs by Distribute Remote Cards located close to Detector.***

***The System Parameters:***
***I monitor on each output channel with 2nA precision***
***U monitor on each output channel with ± 1V precision***
***HV level regulation within 4000V with ± 1V precision***

***2003: Pre-production prototype built and tested***

***2004-2005: 10,000 channel system mass-production at PNPI***

# EMU HV 36-Channel Remote Distributor




*Related Link: www.pnpi.spb.ru/ofve/red/products/HVM_en.html*

# EMU CMS Alignment System

*The Alignment System is based on the need to locate each of the 360 Endcap Cathode Strip Chamber (CSC) with respect to the CMS Tracking System with accuracy ~200μm.*

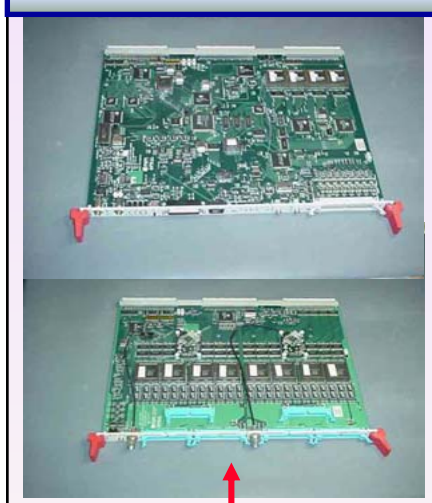
*The System monitors the position of the Tracker using laser sources and transparent 2D CMOS CCD sensors.*

*The date control is provided by DSP-processors. The readout (DCOPS) then translates data to the Host DAQ*

*2003 – mass-production of the system is over at Fermilab*
*2004- Integration at CERN and software development*

*Related Link: www.pnpi.spb.ru/ofve/red/products/Alignment_en.html*

# D0 Muon Readout



*Readout System Modules: MDC – Digitizing Card MDRC – Readout Controller*

*The D0 Muon Readout electronics is intended for use in Forward Muon Tracking Detector of D0 Experiment at Fermilab.*

*About 50,000 channels of mini-drift tubes are supposed*

*System performs 18.8 ns/bin measurement of drift time*

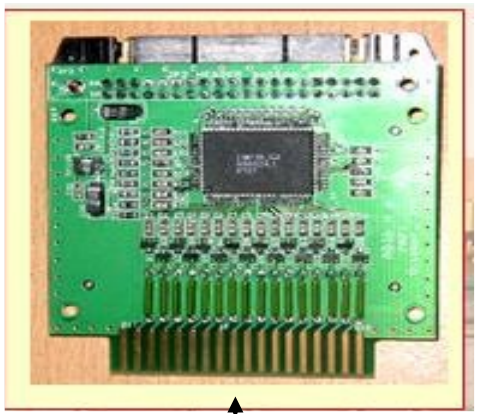
*24 9U VME crates, about 300 9U VME Modules*

*Three years on the beam position with excellent reliability*

*2003-2004 – work in shifts, system software development*

*Related Link: www.pnpi.spb.ru/ofve/red/products/D0_en.html*

# CROS3 Readout System



*AD_16M – 16 –channel Amplifier Shaper Discriminator Card*

*New!*

*Complete On-Chamber Multiwire Coordinate Detector System*

*Programmable Threshold, Delay, Gate*

*Time distribution measurement for hit wire within gate with up to 2.5 ns precision*

*High density, low power packaging*

*Interfaces to PCI and Ethernet*

*40 MHz Readout*

*Reduced cabling*

*2004 – pre-production of the 768 channel system*

# CROS3 Readout System Configuration