# SPD-ECAL preparation for Beam test

- ECAL SPD prototypes 2018-2020

  - Cell size = 55x55 mm$^2$ with different Sampling:
    - 1.5 mm Scint. + 0.3 mm Pb – 220 Layers ~ 12X$_0$
    - 1.5 mm Scint.+0.5 mm Pb – 180 Layers ~ 16X$_0$
  - This options have the Moliere radius about
    6 and 4 cm respectively

# SPD-ECAL for Beam test

- Test Beam requirements:
  1. Type – electrons, positrons, gammas
  2. Energies – 50-8000 MeV
  3. Intensity – 10-10000 particles per second
  4. Momentum Resolution – 2-3%
  5. Tracking system with accuracy about 1 mm
  6. Possible Mixed hadron beam with Cherenkov counters for electrons selection

# Main goal for ECAL Beam testing

1. Energy resolution for electrons, positrons and gammas
2. Space (coordinate) resolution for e and ɣ
3. Possible multi clusters events selection
4. Prove of linear response in E-range 50-8000 MeV
5. Time resolution estimation

# Modules of 2018 – 220 Layers
# Sc=1.5,  Pb = 0.3 mm, Total Length ~660 mm

# Modules of 2020 – 180 Layers
# Sc=1.5,  Pb = 0.5 mm, Total Length ~ 560 mm

# Trigger counters for beam selection



Oleg Gavrishuk  and  Valery Chmill

# Scintillation Hodoscopes with coordinate resolution about 4 mm



Oleg Gavrishuk and Valery Chmill

# ECAL Readout and Trigger Logic

Electronic for SPD ECAL based of:

1. ADC-64 – 12–14-bit digitizer, 64 MHz – 64 channel
2. 16 channels Front END card with Power control for SiPMs
3. SiPM boards with integrated temperature sensor
4. NIM crate with NIM logic modules have to be used for Beam trigger preparation
5. One PC for data acqusition  and storage
6. AFI ([https://afi.jinr.ru/](https://afi.jinr.ru/)) software for DAQ under Centos-7

# 64 channel Wave form digitizer – general purposes ADC-64s2 –  produced in https://afi.jinr.ru/ADC64
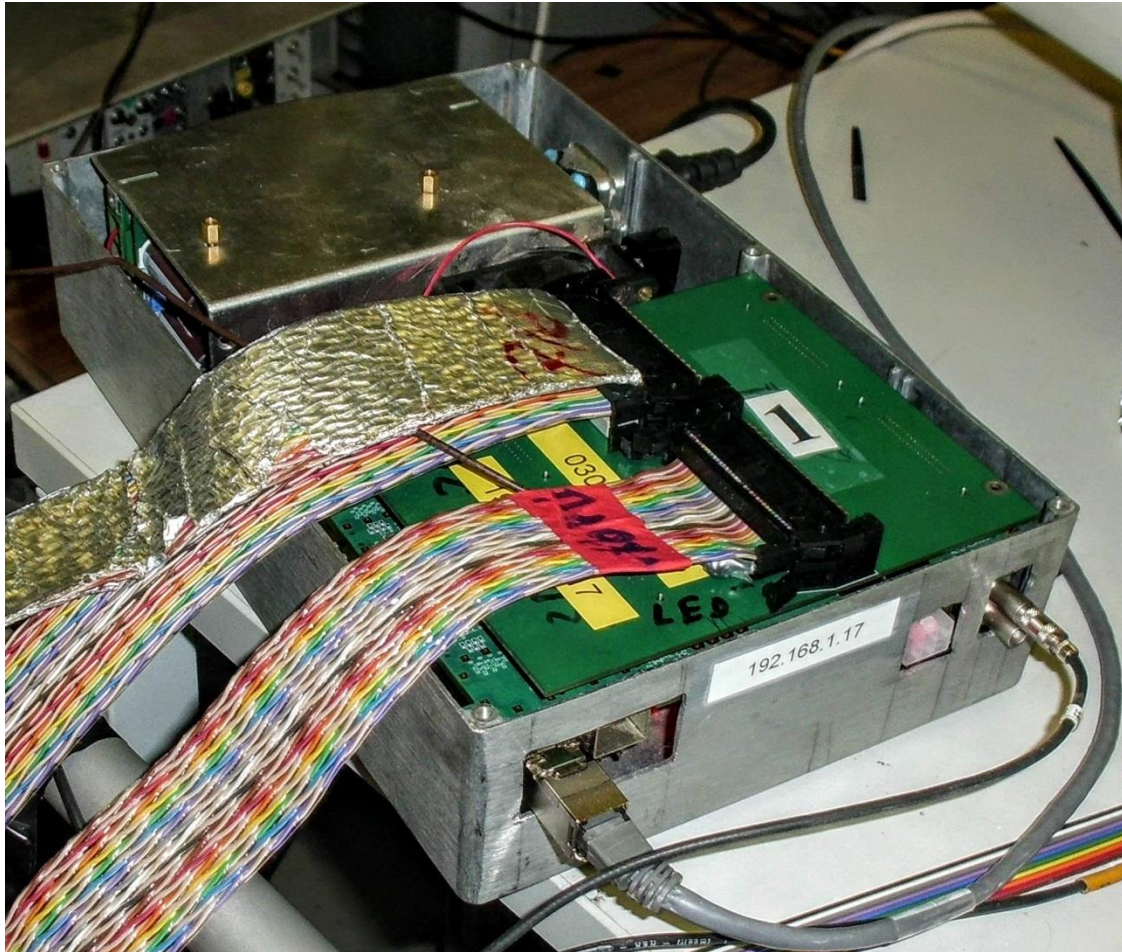


1. 64 MHz – sampling frequency
2. 12-14 – bit per sample
3. White Rabbit provides sub-nanosecond synchronization accuracy.
4. Can operate in Streamer mode – Trigger less DAQ
5. Air cooling
6. **Do Not operate** in Magnetic Field
7. Power ~ 50 W

# 16 channels Front End – card Produced in http://hvsys.ru/en
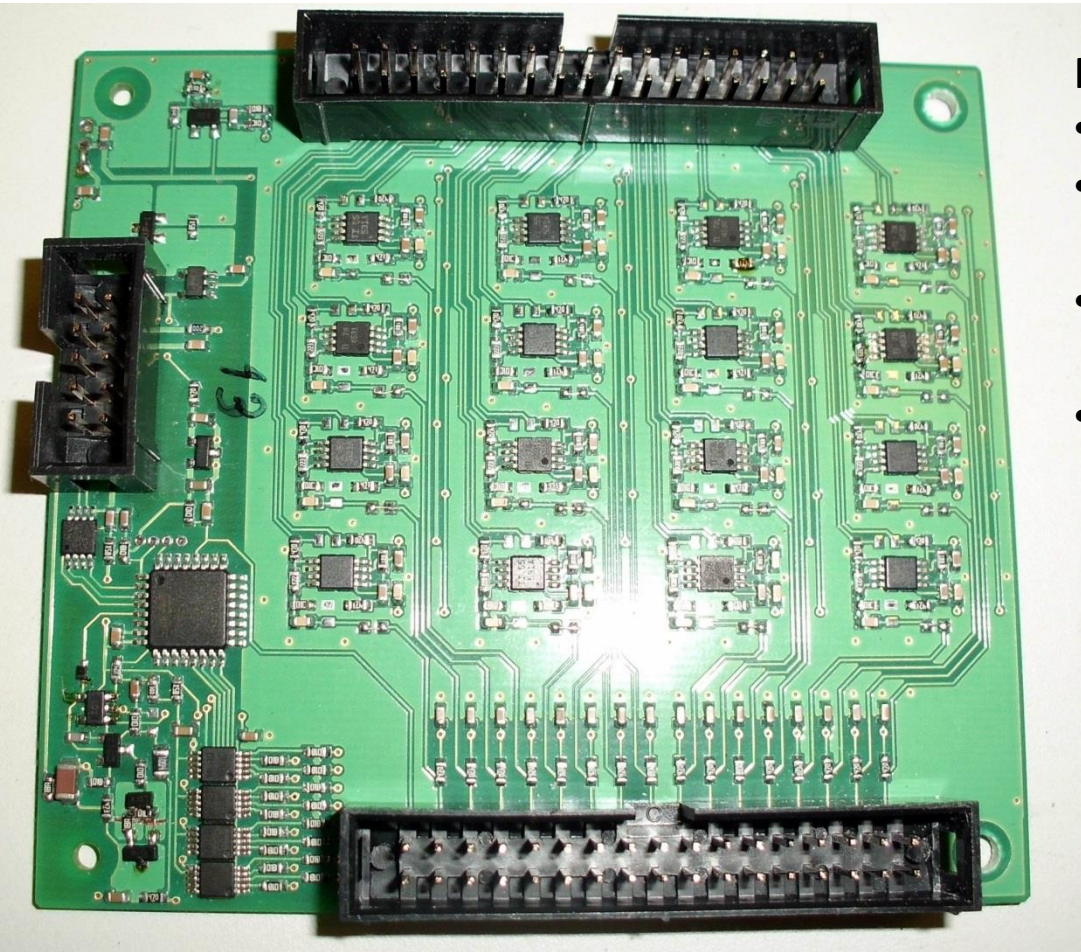


Purpose:
- HV control for SiPM
- Temperature compensation of HV done by software
- Signal amplification and shaping up to 300 ns for digitization by ADC64
- Power: ~ 1 W per 16 ch. board

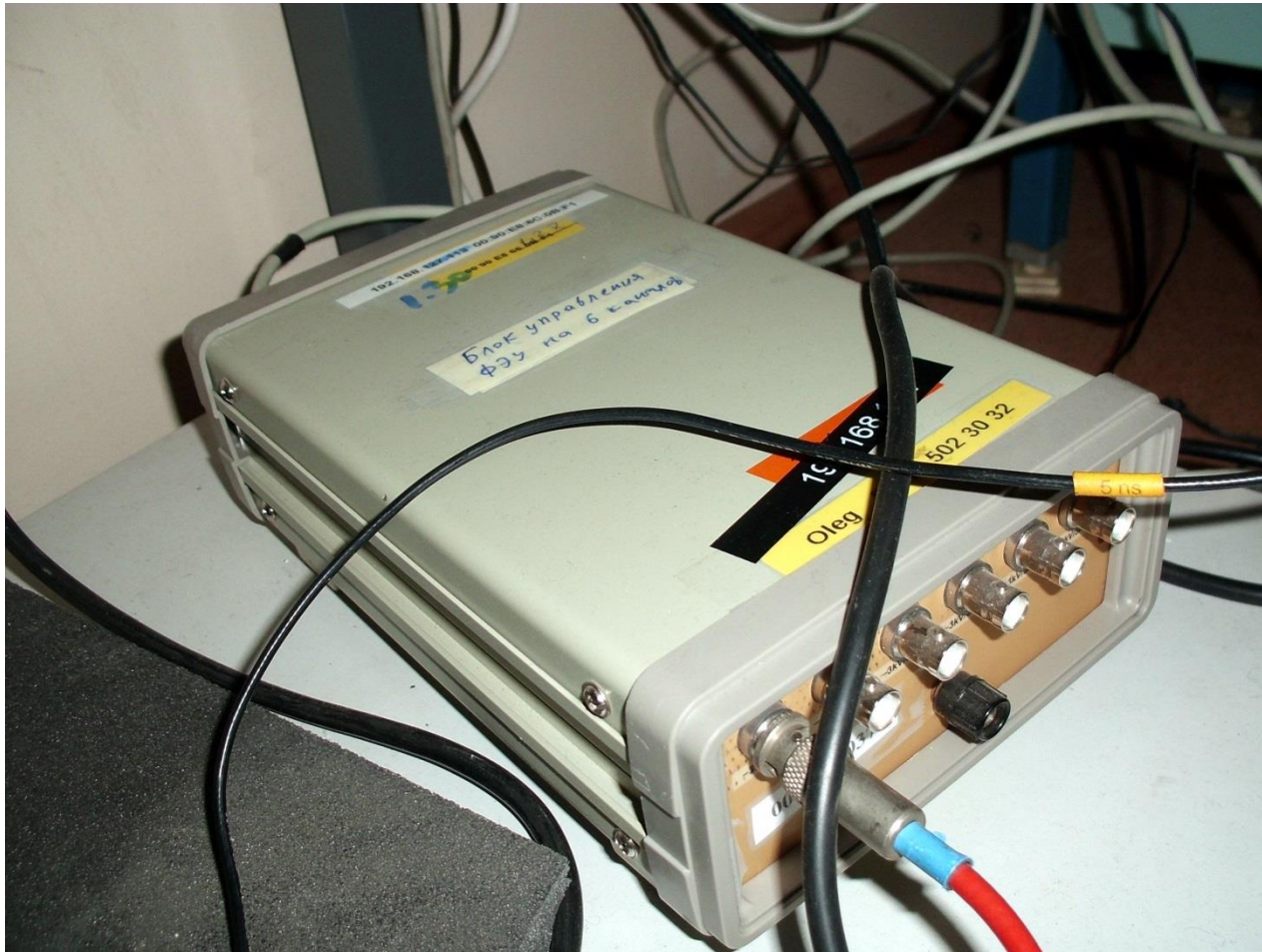# Control unit for SiPM HV



HV control:
- Can operate with 128 Front End Card:
- Ethernet control
- RS 485 interface
- Power ~150 W
- AC  220 V

# HV Power Unit for PM

Oleg Gavrishuk and Valery Chmill

# Addition Equipment

1. Table for calorimeter installation in beam:
   1. Height : about 2 meters – for beam pipe ?
   2. Space: 100 cm ,  length 50 cm
   3. Load: 50 kg

   Thank you for your attention!

Oleg Gavrishuk  and  Valery Chmill