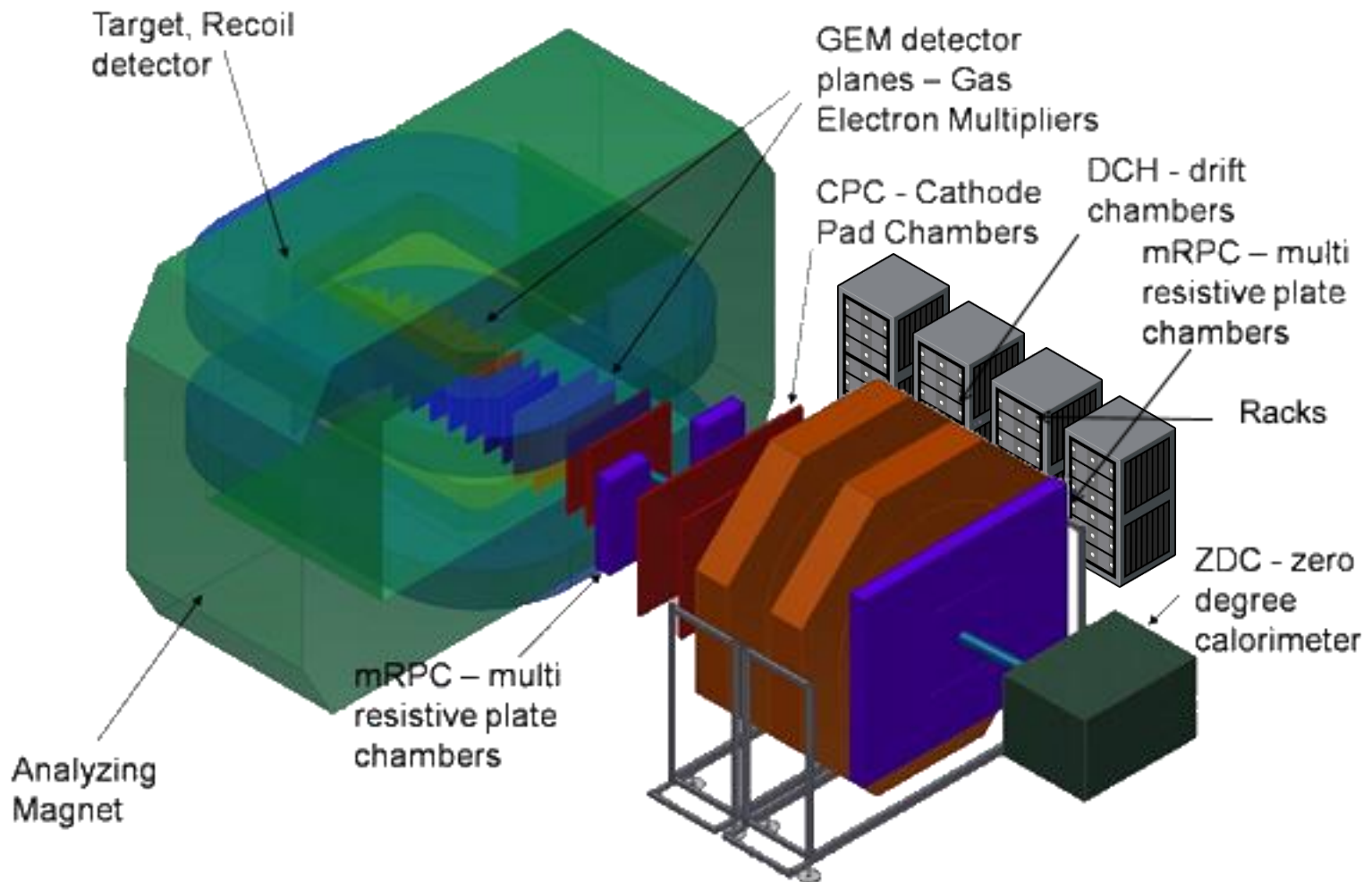


BM@N SLOW CONTROL SYSTEM

V. Shutov  
P. Chumakov  
R. Nagdasev  
D. Egorov

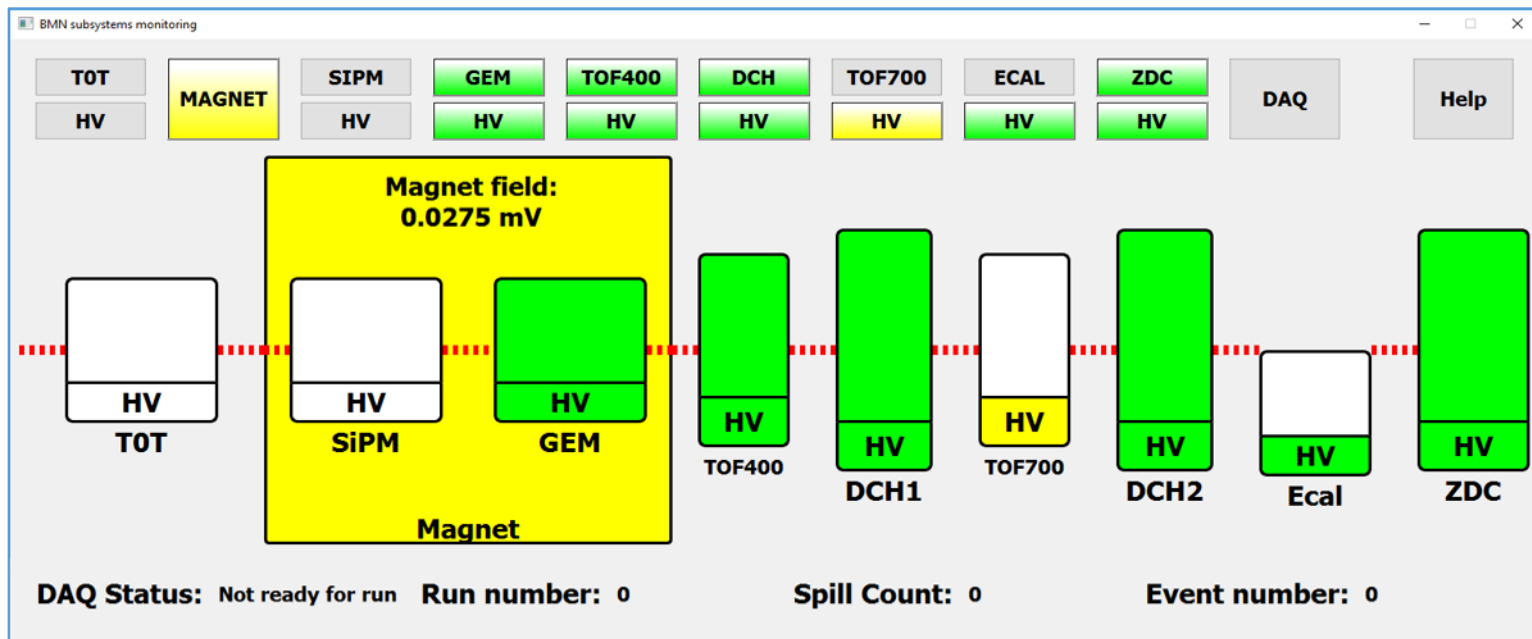
# BARYONIC MATTER AT NUCLOTRON EXPERIMENT



# STATUS MONITORING OF BMN SUBSYSTEMS

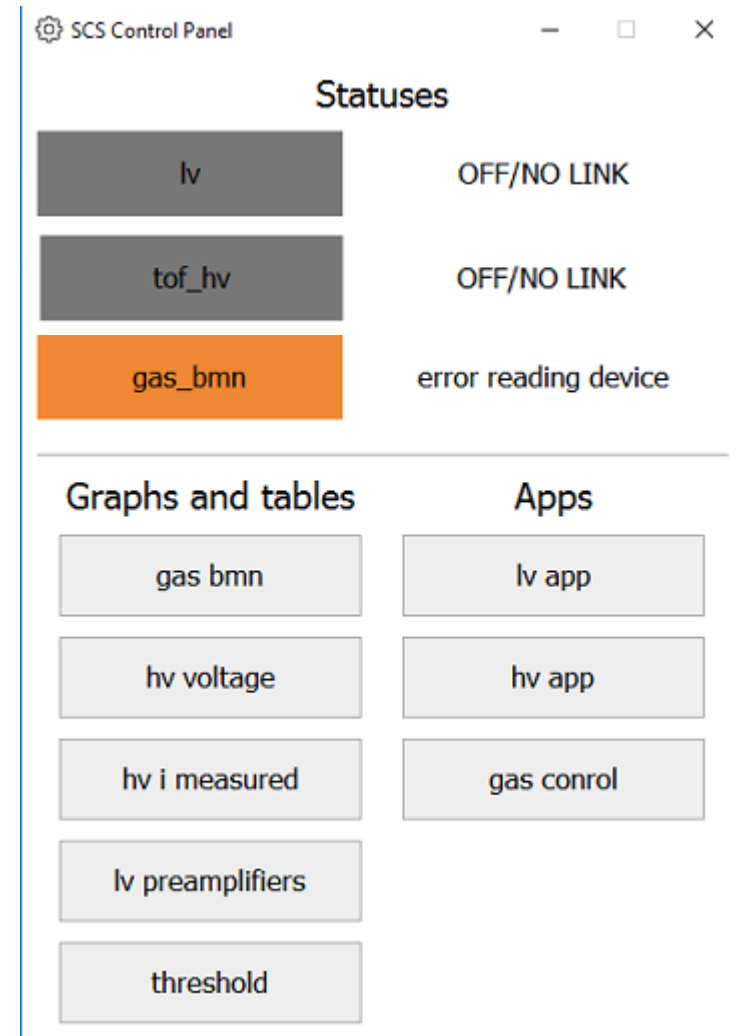
Desktop application, that displays status of all subdetectors' equipment, which is controlled by SCS. The color of detector show hardware state according to its priority (OFF>ALARM>WARNING>ON).

Also value from hall sensor and information from DAQ system are presented in the application window.



# CONTROL PANEL FOR SUBDETECTORS

It can monitor states of devices, which belong to subdetector, and execute different applications, such as graphs, tables and control software.

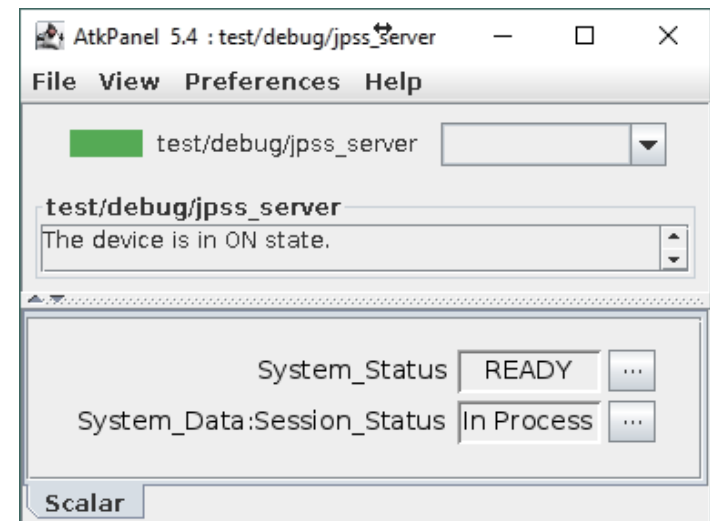


# TRIGGER UNIT MONITORING

Due to subdetector policy and their hardware complexity, SCS does not have direct access to devices.

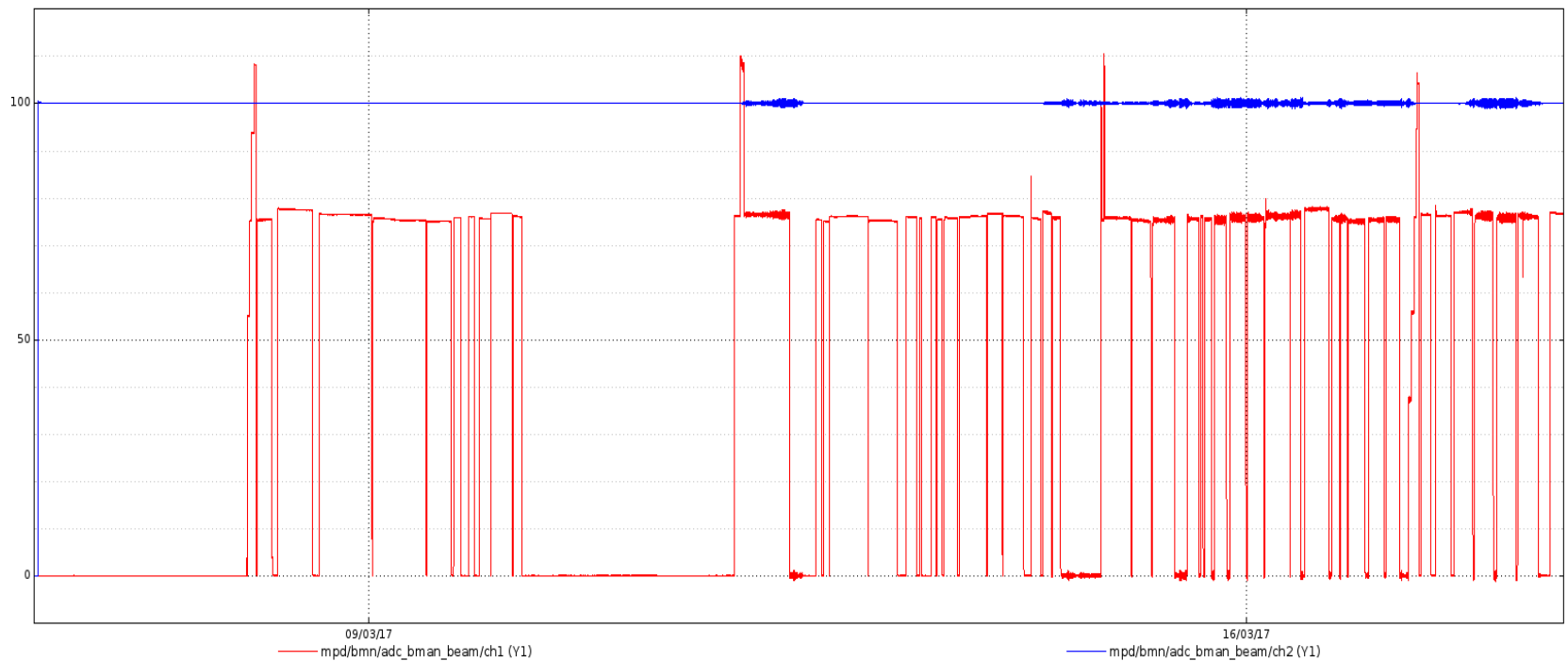
All required data is sent in JSON format (which is standard for data exchange in BMN SCS) through TCP-socket server, and handled by our JSON Parsing Tango server, which converts received data to Tango attributes.

```
{  
  "System_Status": "READY",  
  "System_Data": {  
    "Session_Status": "In Process",  
    "Last_Results": [0.1, 1.3, 7.22, 1, 0],  
    "Main_Callibrator_Offset": {  
      "Periodic_Polarization": 4,  
      "Continuous_Execution": 14.3  
    }  
  }  
}
```



# MAGNET FIELD MONITORING

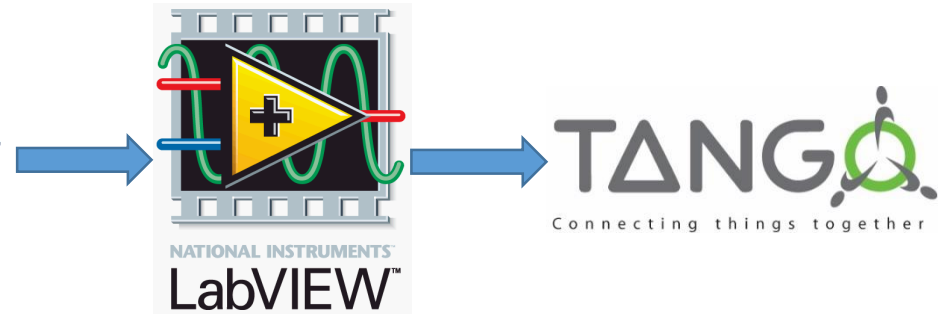
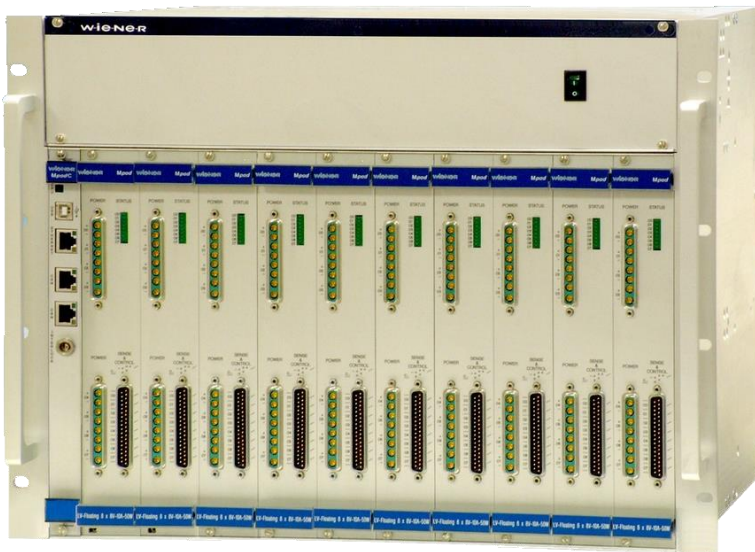
Hall sensor measurements are read by ADC, implemented in BMN SCS.



# GEM, DCH AND SI TRACKER HIGH VOLTAGE AND LOW VOLTAGE

These detectors are using the same high voltage and low voltage hardware, made by Wiener, and software, that is written in Labview.

Tango has bindings for Labview, so it's easily implemented into existing Slow Control System.



# TOF400 AND TOF700 HV

Both detectors are using HVSys high voltage modules, with existing software.

Implemented TCP-socket server send information on request about module to Tango JSON Parsing server.

Ch=21 - 12000V 0.1mA Umin=1258 Umax=12276

Опасно, Высокое Напряжение! High Voltage Danger!

LV= 11.5(V) BV=101(V) T=33(C)  
Controller status - OK

CONFIGURATION

Save Configuration Load Configuration Show current settings

Exit All HV OFF All HV ON

Copy active cell voltage settings to ALL cells

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40

HV GENERATOR

ON OFF status - 0001 OK Ch=21

VOLTAGE SETTINGS

U (V) 1258 1258 Measured U (V) 1266

CURRENT LIMIT SETTINGS

I<sub>max</sub> (μA) 1.97 2.0 Measured I (μA) I=0.3 I<sub>fine</sub>=0.205

PARAMETERS SETTINGS

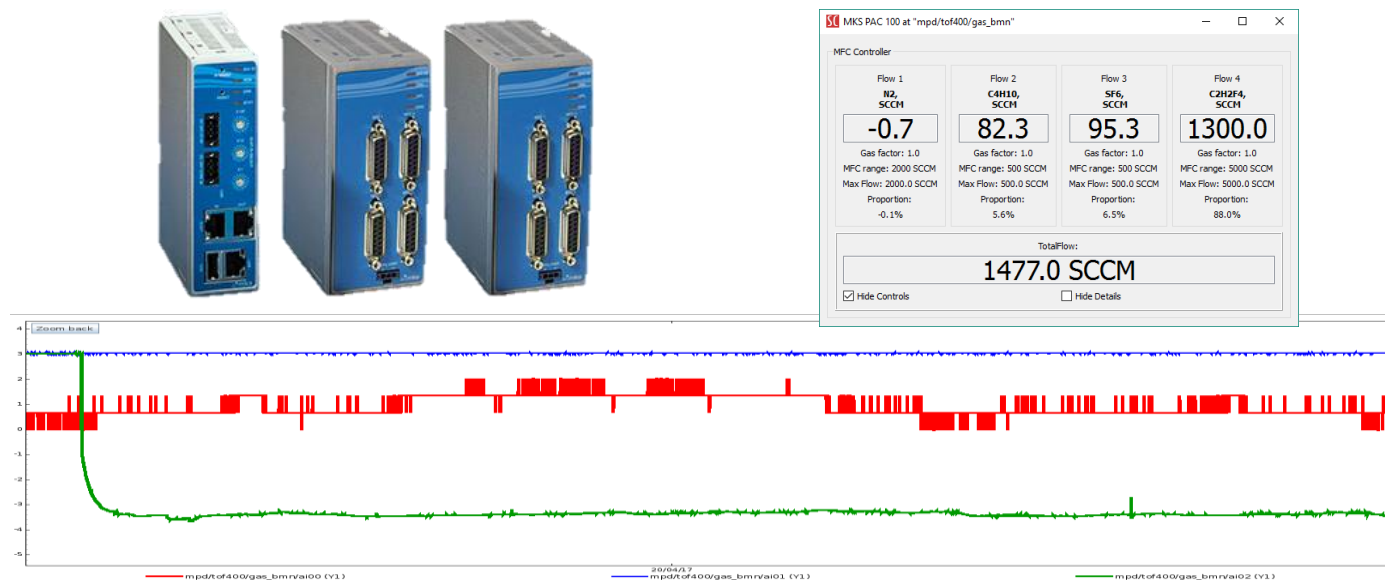
Ustdby (V)	↑ RampUP (V/s)	↓ RampDN (V/s)	Prot.Del.(s)
1258 1258	30 30	50 50	0.0 0.0



# TOF400 GAS CONTROL

Gas control application is used to control and monitor gas flow of system based on MKS PAC-100 modules.

- Displays current gas flows;
- Lets user set gas flow for each channel;
- Displays additional information about system properties.



# TOF400 GAS BALLOON MONITORING

Scales with RS-232 interface is using for weight measurement of gas containers for TOF detectors.

Device server calculates remaining time for the container, according to the current flow, which it gets from device server on a previous slide.



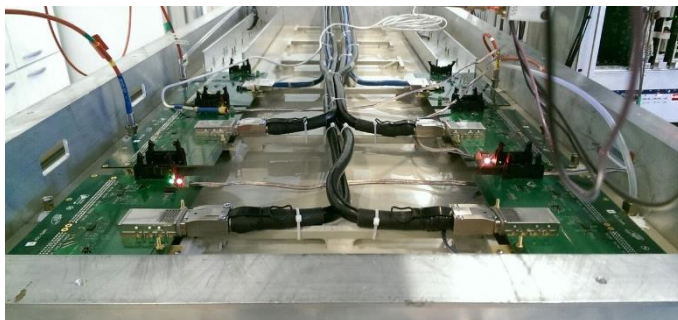
days_left	5.24 days remain	...
weight	6.96 kg	...

# TOF400 PREAMPLIFIER CONTROL AND MONITORING

This application monitors preamplifiers' parameters, like power voltage, thresholds, temperature, and can control its' DAC.



X 20

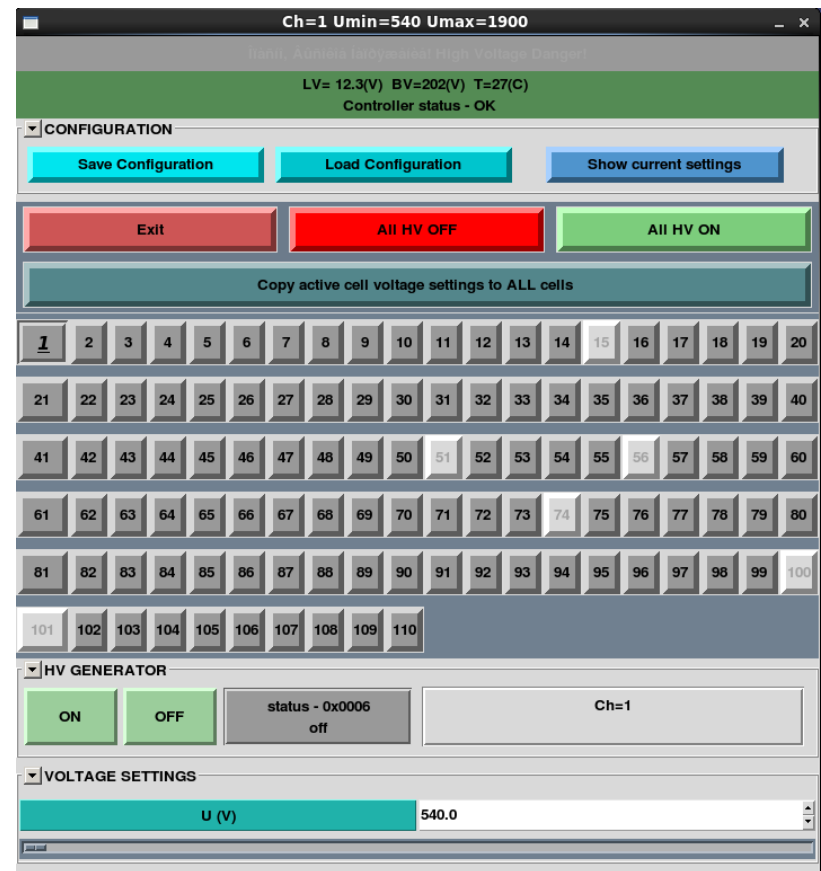
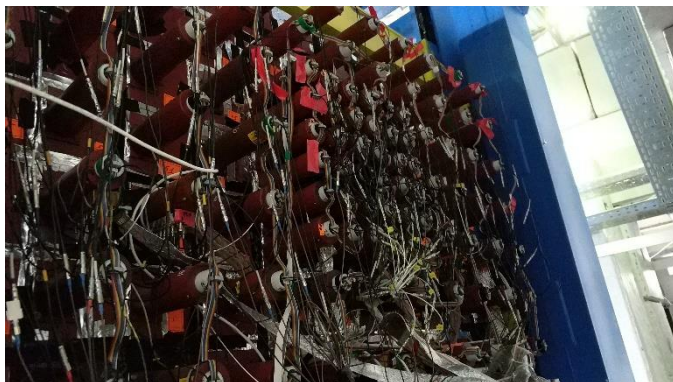
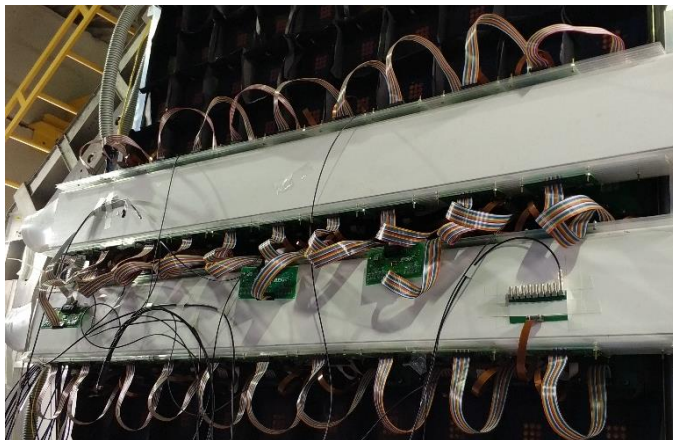


python							
box1		box2					
	V+, mV	V-, mV	Vdelta, mV	Vpower, mV	DAC, mV	Tboard, °C	Tgas, °C
1	1946	1741	1624	3248	2775	45	44
2	1693	1637	1544	3287	0	41	36
3	1687	1737	1735	3293	0	43	43
4	1940	1649	1627	3220	0	48	46
5	1914	1588	1615	3265	0	46	38
6	1993	1985	1741	3235	0	50	44
7	1754	1906	1731	3204	0	40	47
8	1777	1836	1860	3272	0	38	48
9	1915	1909	1655	3222	0	37	37
10	1864	1969	1703	3295	0	46	49
11	1855	1578	1841	3268	0	50	46
12	1610	1751	1908	3206	0	49	49
13	1976	1686	1611	3286	0	39	48
14	1693	1898	1787	3250	0	44	47
15	1788	1847	1517	3252	0	49	44
16	1503	1645	1761	3207	0	46	36
17	1711	1785	1990	3268	0	42	35
18	1746	1559	1676	3256	0	38	47
19	1788	1579	1829	3256	0	40	36
20	1514	1566	1641	3296	0	49	46



# ECAL AND ZDC HV

Both detectors are using HVSys high voltage modules, with existing software. Implemented TCP-socket server send information on request about module to Tango JSON Parsing server.



# NETWORK SWITCH MONITORING

Poe switch control the client application to control power over Ethernet (PoE) on a switch (particularly HP J9574A).

- Monitors power status on each port;
- Lets user enable, disable and reset power at selected switch ports;
- Supports multiple devices.



POE SWITCH CONTROL

J9574A POE SWITCH CONTROL

Address: swhe-bmn-r3.he.jinr.ru  
swhe205-bmn-7 R3

	STATUS	NAME	POWER
1	SEARCHING	(none).(none)	0
2	SEARCHING	bmnn-vmedaq-2.jinr.ru	0
3	SEARCHING	bmnn-vmedaq-2.jinr.ru	0
4	SEARCHING	N/A	0
5	SEARCHING	(none).(none)	0
6	SEARCHING	bmnn-vmedaq-4.jinr.ru	0
7	SEARCHING	bmnn-vmedaq-4.jinr.ru	0
8	SEARCHING	u40ve-rc030D9A5B	0
9	SEARCHING	(none).(none)	0
10	SEARCHING	bmnn-vmedaq-1.jinr.ru	0
11	SEARCHING	bmnn-vmedaq-1.jinr.ru	0

Enable Selected Disable Selected Reset Selected Clear Selection

Address: swhe-bmn-r6.he.jinr.ru  
swhe205-bmn-10 R6

	STATUS	NAME	POWER
1	ON	ut24verc046F292C	10989
2	SEARCHING	ut24verc07A924EE	0
3	SEARCHING	N/A	0
4	SEARCHING	N/A	0
5	SEARCHING	N/A	0
6	SEARCHING	N/A	0
7	SEARCHING	N/A	0
8	SEARCHING	N/A	0
9	SEARCHING	N/A	0
10	SEARCHING	N/A	0
11	SEARCHING	N/A	0

Enable Selected Disable Selected Reset Selected Clear Selection

Address: swhe-bmn-r7.he.jinr.ru  
swhe-bmn-r7 R7

	STATUS	NAME
1	SEARCHING	N/A
2	SEARCHING	N/A
3	SEARCHING	N/A
4	SEARCHING	N/A
5	SEARCHING	N/A
6	SEARCHING	N/A
7	SEARCHING	N/A
8	SEARCHING	N/A
9	SEARCHING	N/A
10	SEARCHING	N/A
11	SEARCHING	N/A

Enable Selected Disable Selected Reset Selected

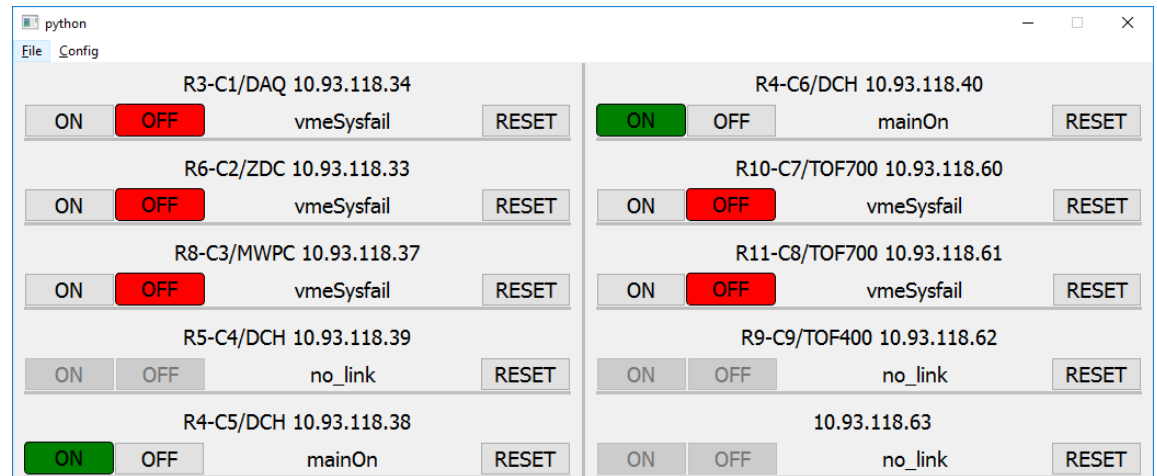
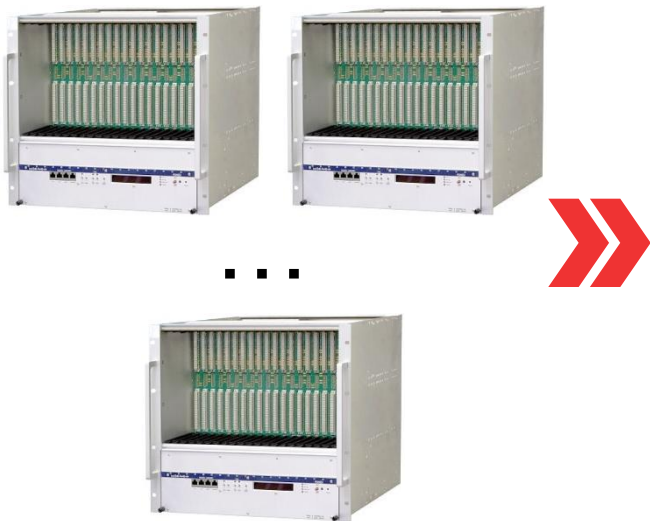
History Last updated: 2016-12-09 14:30:21

# WIENER CRATE CONTROL

Wiener Control is a desktop application that was developed for monitoring and control of crates made by Wiener company.

Main functions:

- Switch on/off one crate, or all at once
- Reset
- Monitor state and detailed status of crates





# UNINTERRUPTIBLE POWER SUPPLY MONITORING

Uninterruptable power supplies application shows information about power sources at BM@N:

- 1) Input and output voltage
- 2) Load
- 3) Battery info and remaining time
- 4) Additional info and load by port

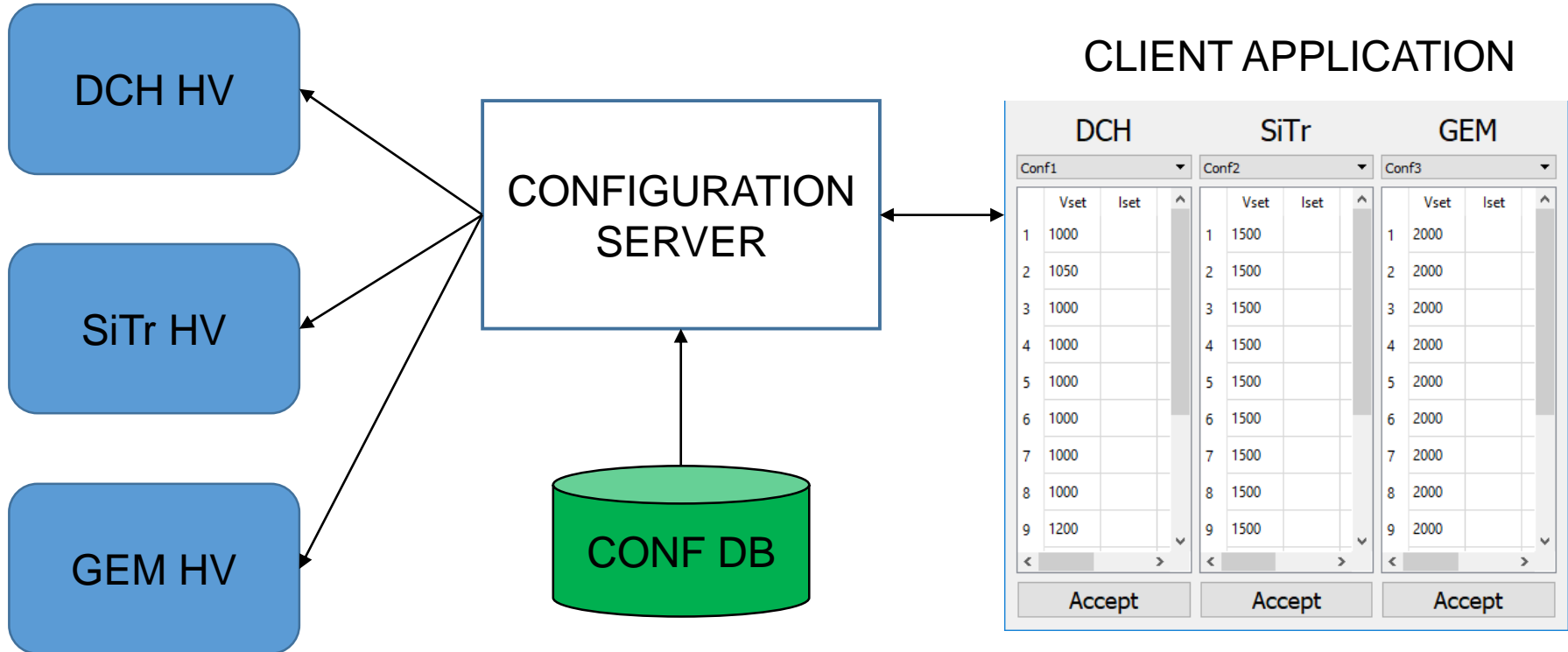


BMN UPS			
R1		R3	
Input	Output	Input	Output
XXX	XXX	224 V	230 V
XXX	XXX	50 Hz	50 Hz
Battery	Load	Battery	Load
-0.02 min	XXX	42.82 min	0 W
0%	0%	100%	25%
R6		R7	
Input	Output	Input	Output
218 V	230 V	XXX	XXX
50 Hz	50 Hz	XXX	XXX
Battery	Load	Battery	Load
17.45 min	0 W	-0.02 min	XXX
100%	57%	0%	0%
R8		A1	
Input	Output	Input	Output
XXX	XXX	220 V	230 V
XXX	XXX	50 Hz	50 Hz
Battery	Load	Battery	Load
-0.02 min	XXX	36.28 min	976 W
0%	0%	100%	27%

# HV CONFIGURATION SYSTEM

This application will load configuration for all HV channels for every subdetector.

Shift staff can choose configuration depending on their requirements or beam type.





# CONCLUSION

- The system so far successfully worked during 3 Nuclotron sessions;
- All subdetectors' groups are involved in work and their devices are implemented in BMN Slow Control System;
- User notification system and more devices are planned to be implemented.



**THANK YOU FOR  
ATTENTION**