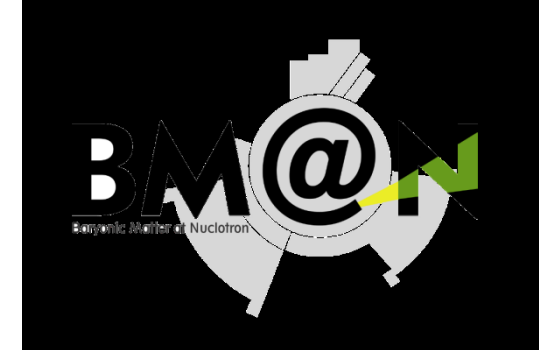




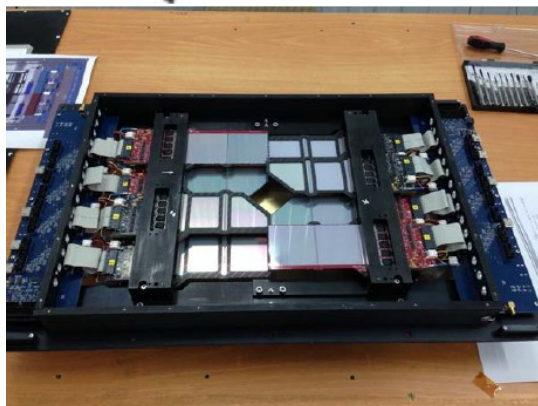
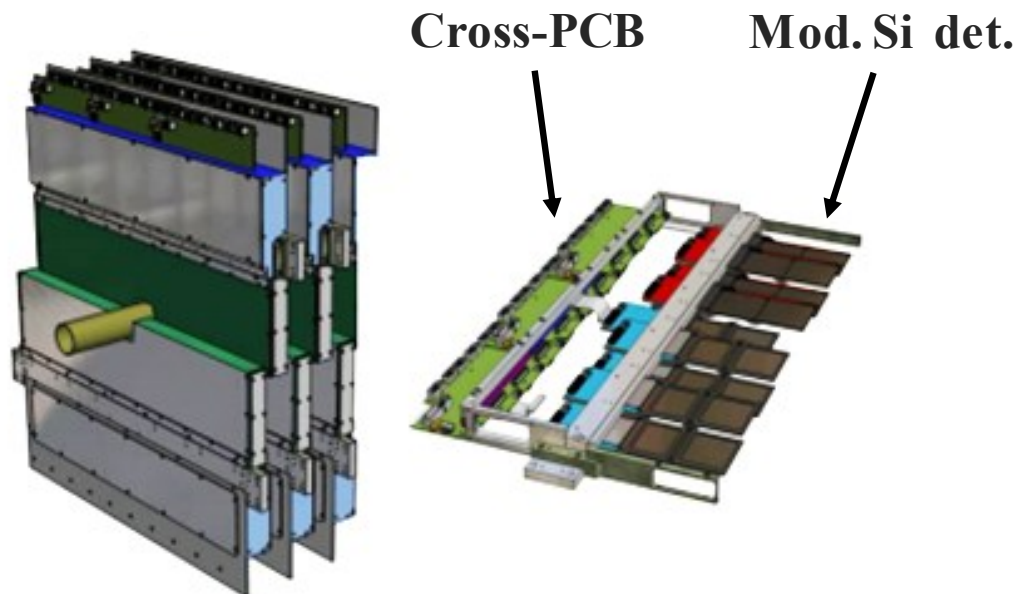
5th Collaboration Meeting of the BM@N  
Experiment at the NICA Facility



***Performance of power supply for BM@N Si-  
subsystems (Forward Tracker and Beam-Si)***

***Yu. Kopylov on behalf of Forward Silicon Detectors  
team***

# *Forward Silicon Detectors*



	Double Cross-PCB	Triple Cross-PCB	Total mod. Si det.
<b>Forward Si det. #1</b>	2	2	10
<b>Forward Si det. #2</b>	2	4	14
<b>Forward Si det. #3</b>	6	-/-	18

	Number of cables
High voltage cables	16
Low voltage power cables	4

# Electrical equipment for «Forward Silicon Detectors and Beam tracker» in the BM@N experiment

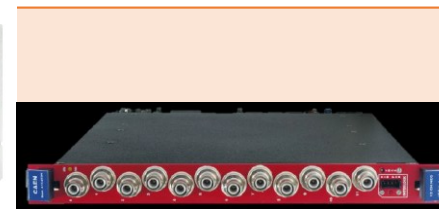


**Fug NTN 350-6.5**

*Low voltage power supply (FuG company)*



**CAEN SY5527LC**

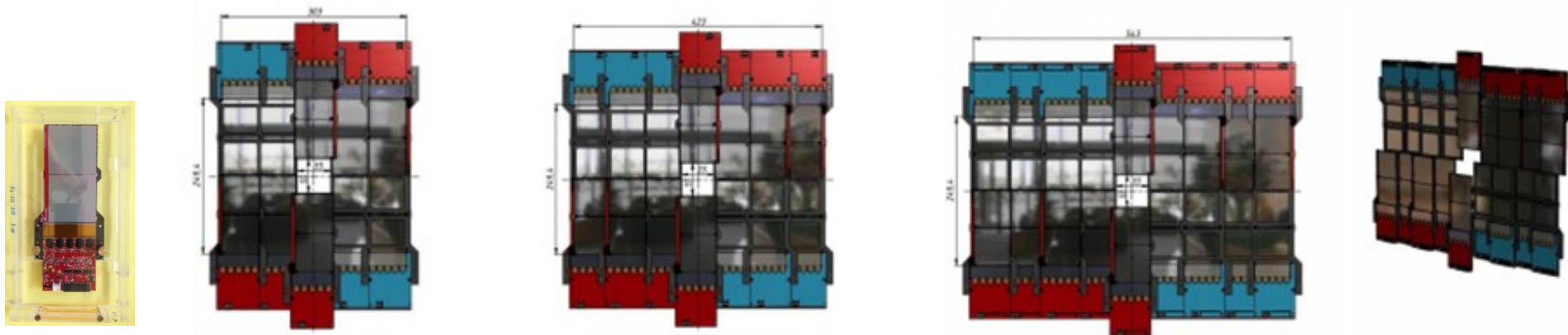


**A1540DP**

*High voltage source (CAEN company)*

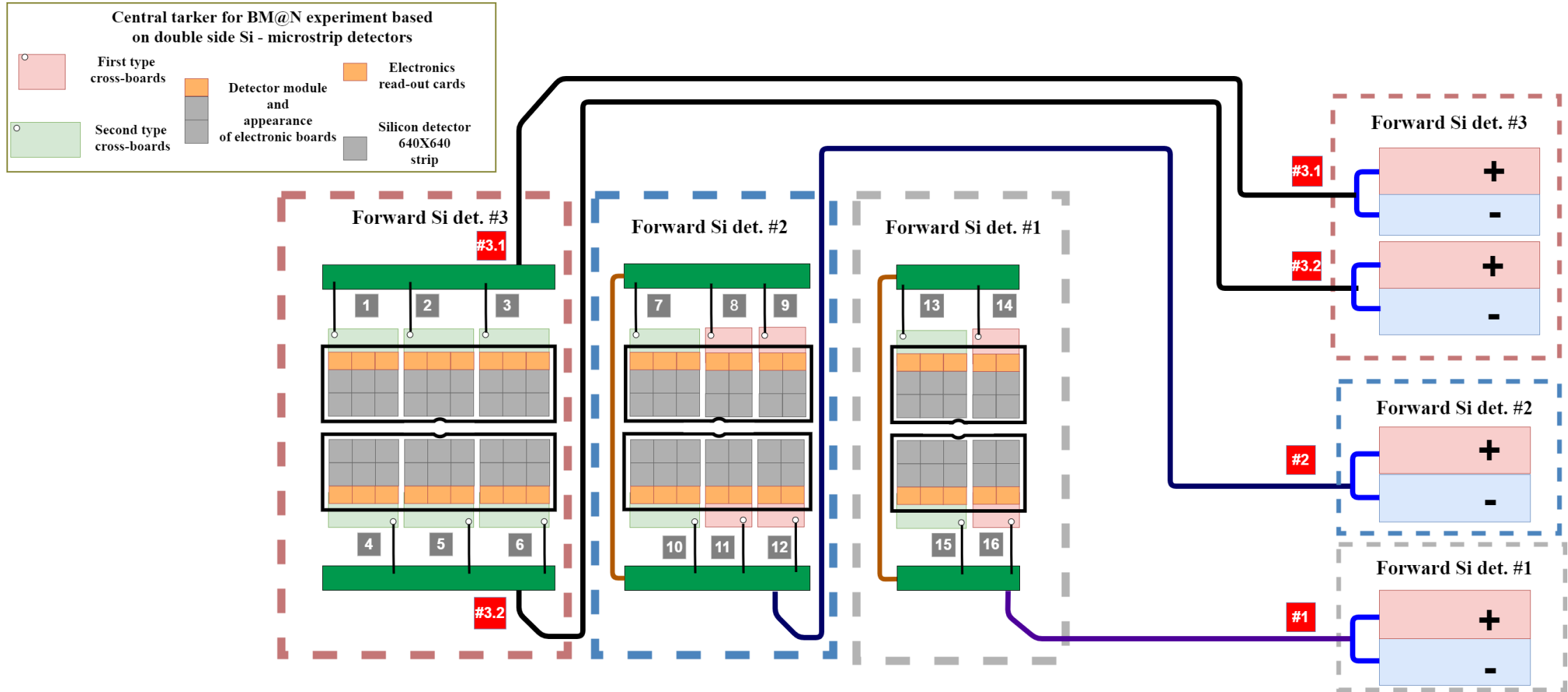
	Equipment name	Appointment	Nominal power consumption, W	Output power consumption, W	Efficiency	Maximum current, A	Maximum voltage, V	Electrical power	Standard / Dimension	Availability of appliances
1.	Fug NTN 350-6.5	Low voltage power supply	350	195	56%	30	6,5	230±10% V / 47-53 Hz	19"3U	+
The total maximum consumption of blocks 10 pcs., W			3500	1950						
2.	CAEN SY5527LC A1540DP	High voltage source	700	400 (SY5527LC) 3,6 (A1540DP)	57% ( SY5527LC)	$1 \times 10^{-3}$	100	220 V / 50 Hz	19"4U	+
The total maximum consumption of blocks 1 pcs., W			700	3,6						
Maximum power consumption of the entire system, W			4200	1953,6						

# Power consumption of Forward Silicon detector

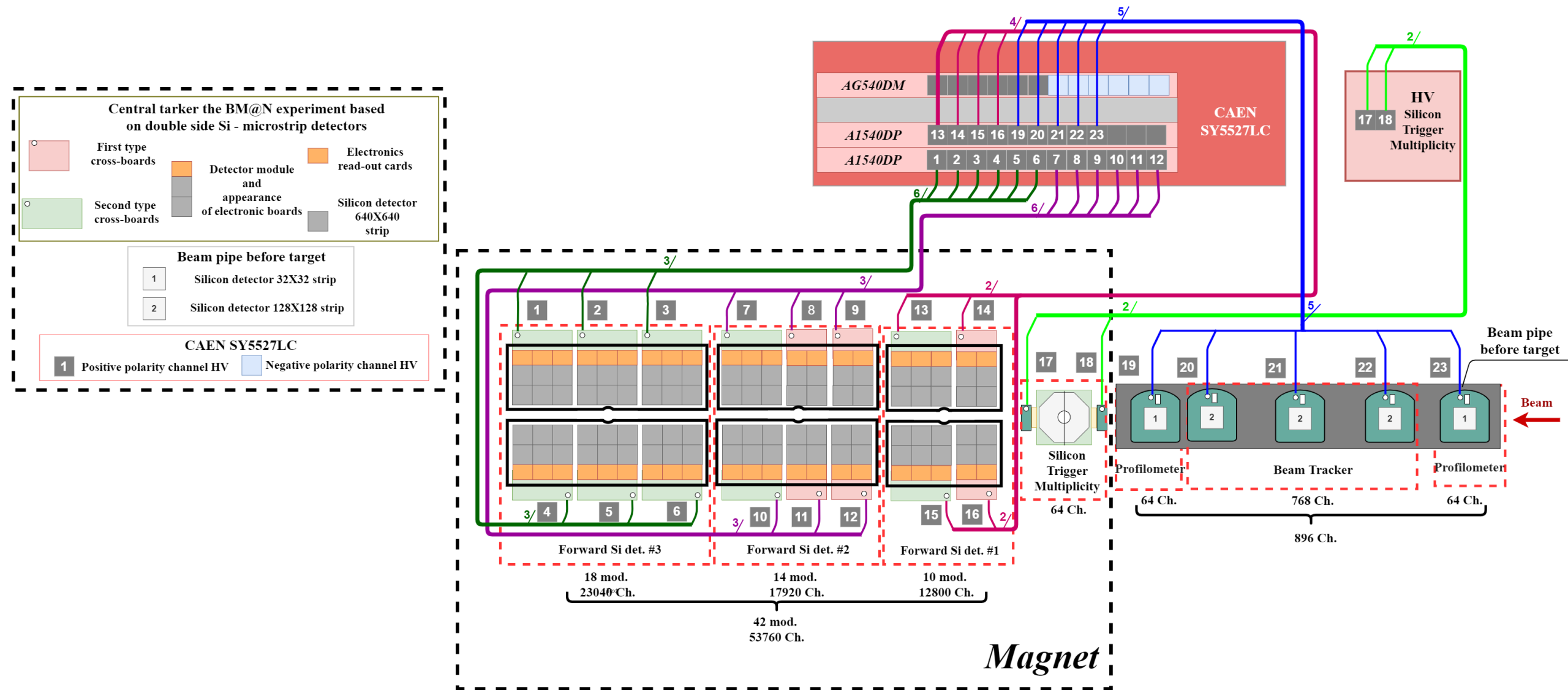


	<i>Mod. Si det.</i>	<i>Forward Si det. #1</i>		<i>Forward Si det. #2</i>		<i>Forward Si det. #3</i>			
<i>Number of modules</i>	<i>1</i>	<i>10</i>		<i>14</i>		<i>18</i>		<i>9</i>	
-	<i>1,79 A</i>	<i>17,9 A</i>	<i>2,24 V</i>	<i>25,06 A</i>	<i>5,32 V</i>	<i>32,22 A</i>	<i>7,05 V</i>	<i>16,11</i>	<i>3,52</i>
+	<i>1,086 A</i>	<i>10,87 A</i>	<i>3,66 V</i>	<i>15,21 A</i>	<i>3,26 V</i>	<i>19,53 A</i>	<i>4,27V</i>	<i>9,77</i>	<i>2,14</i>
<i>length of cable</i>		<i>15 m</i>		<i>15,5 m</i>		<i>16 m</i>			

# Low Voltage connection scheme



# High Voltage connection scheme

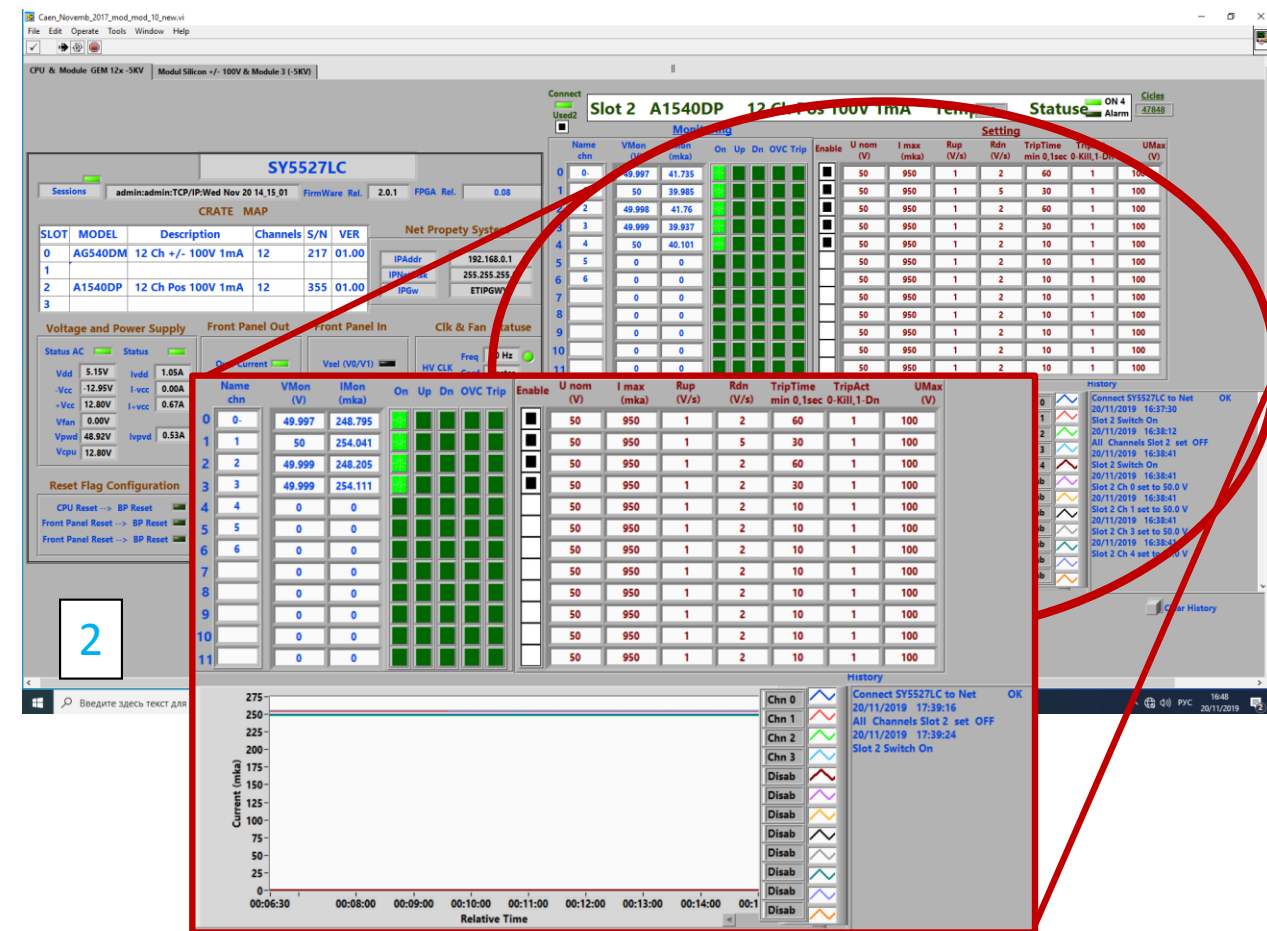
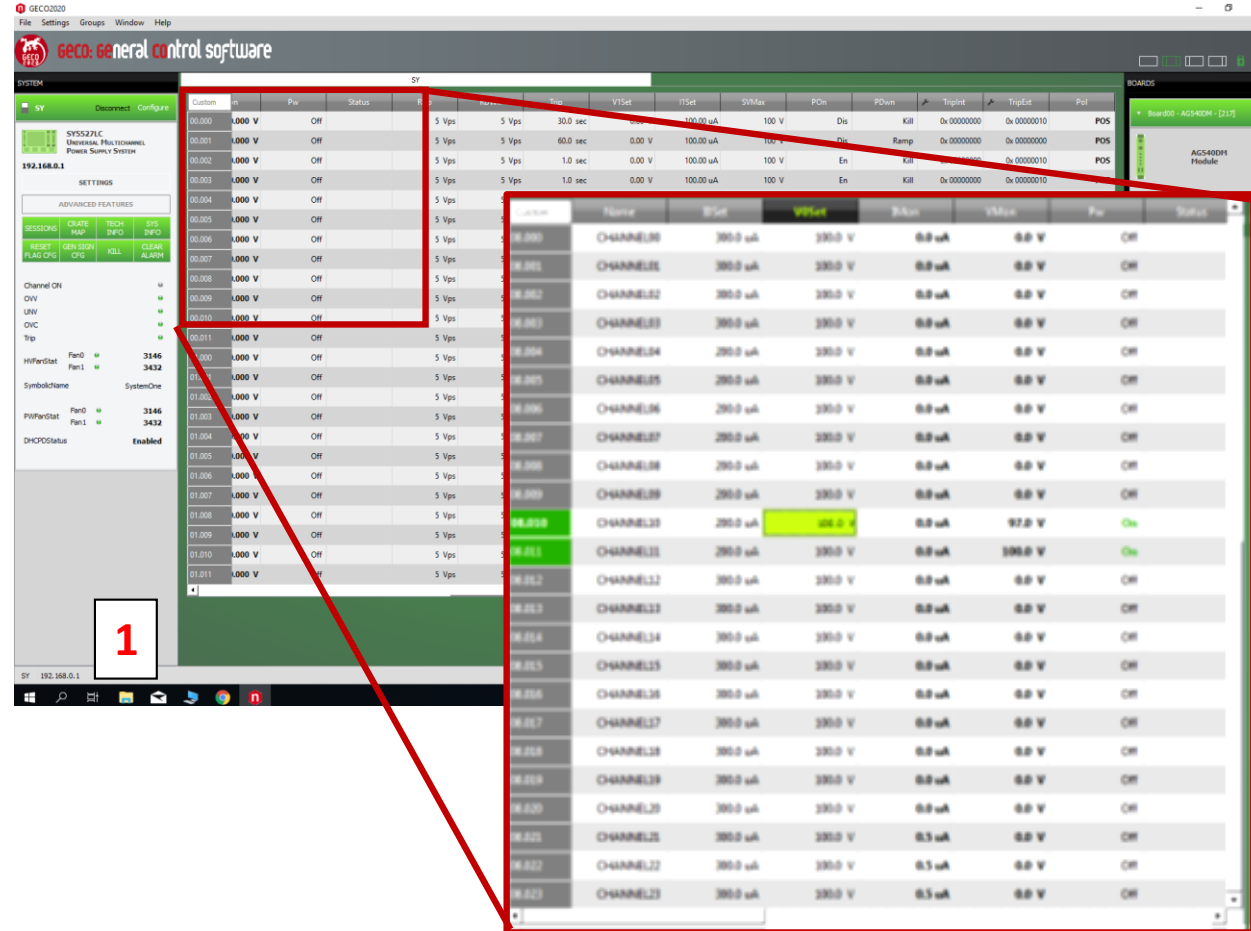




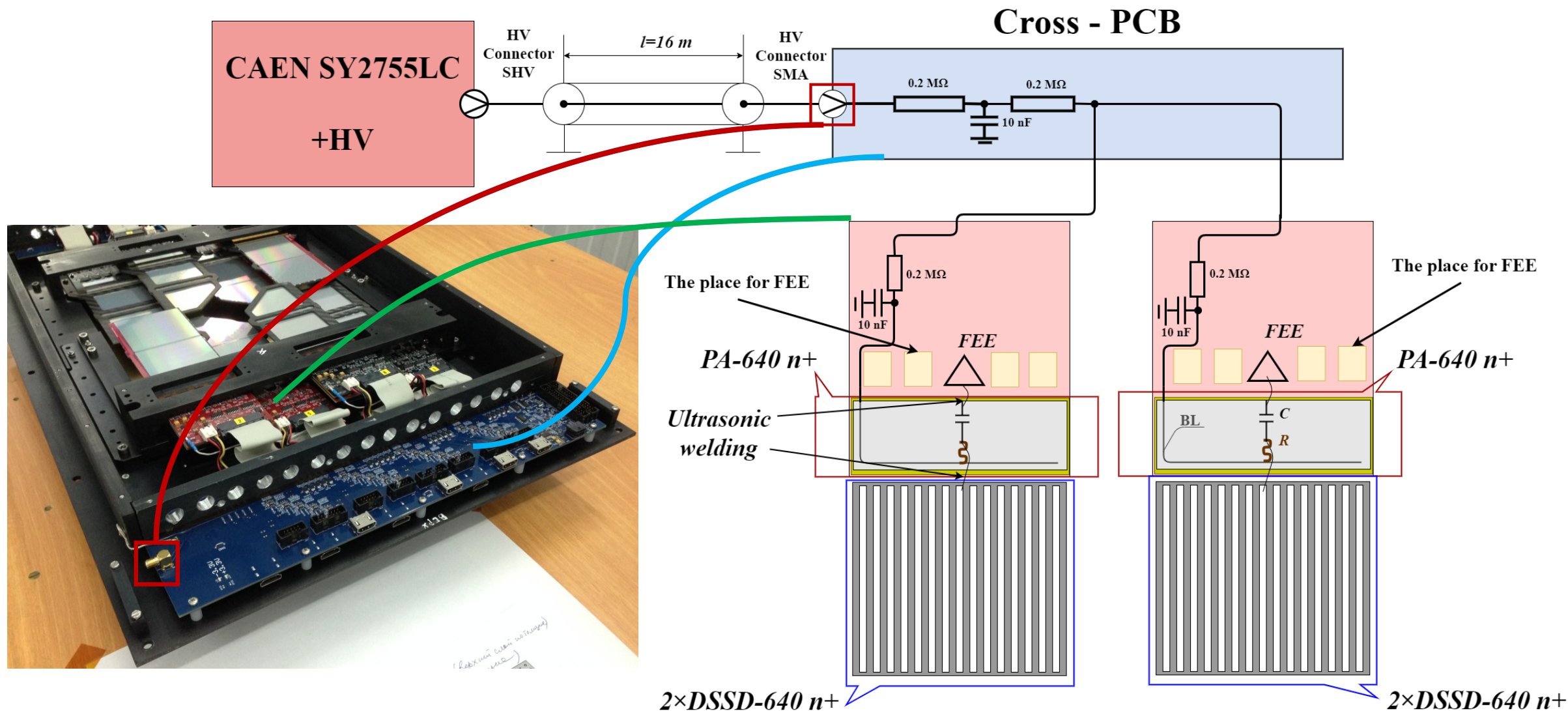
# Slow Control Software

*CAEN SY 2755LC is controlled by the software:*

*1- GECO 2020 (firms. CAEN) or 2- software written in LabVIEW (author Makankin AM).*

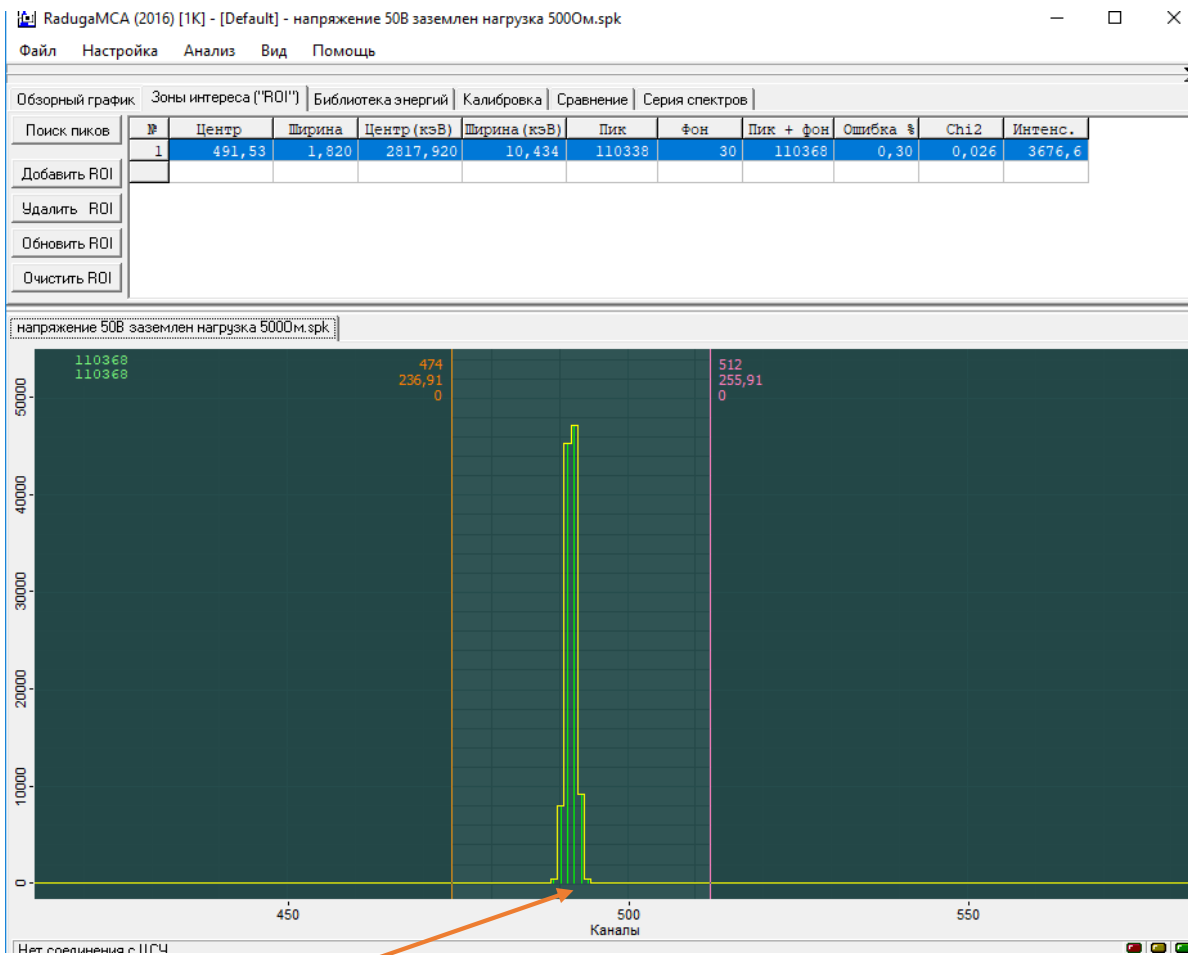


# The existing HV Silicon Forward Detectors circuit





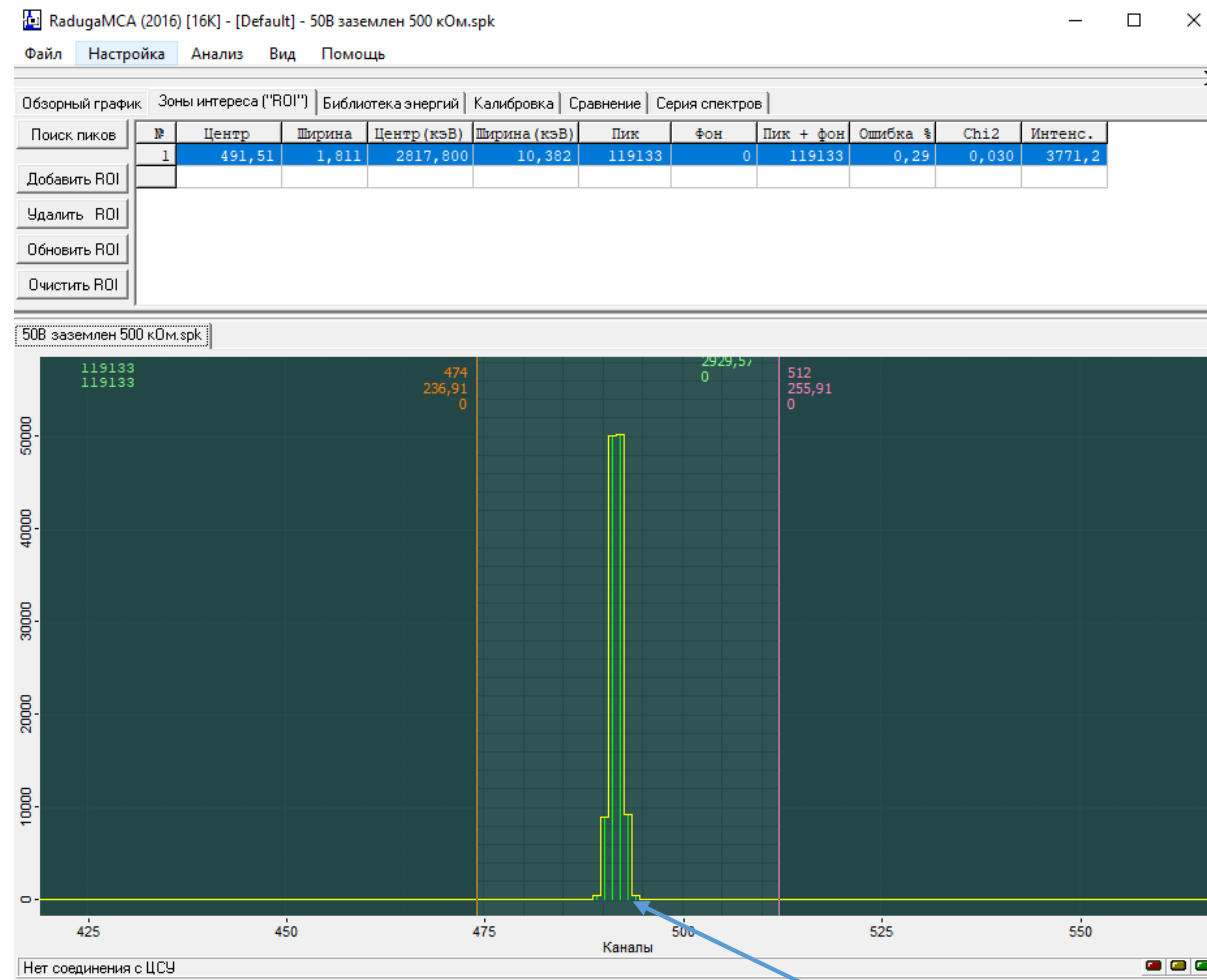
# Test signal spectrums for different types of HV-blocks (CAEN) connected to input of the spectrometer amplifier



**AG540DM**

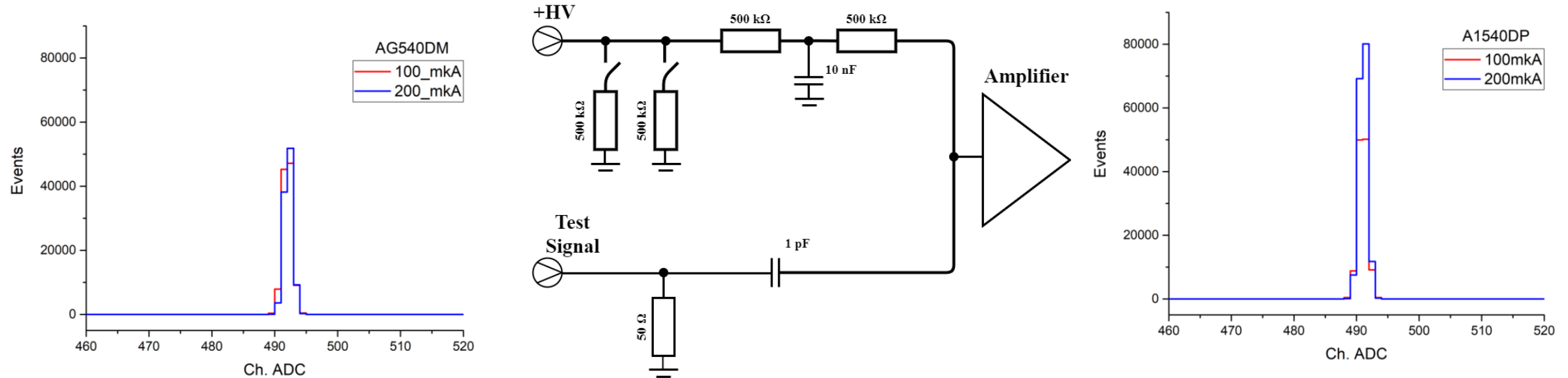
Shaping time = 1  $\mu$ s,  $I_{d(HV)}$ =100  $\mu$ A

5th Collaboration Meeting of the BM@N Experiment at the  
NICA Facility, 20 April 2020



**A1540DP**

# Preliminary measurement of the HV source contribution to FEE noise



$$1 \text{ Ch. ADC} = \frac{156 \text{ mV} \cdot 1 \text{ pF}}{491 \text{ Ch. ADC} \cdot q_e} = 1990 e$$

$$Q_{\text{test.}} = 156,8 \text{ fC} = 980\,000 e, \quad U_{\text{test.}} = 156 \text{ mV}$$

	AG540DM					A1540DP				
	FWHM + FWHM <sub>Amp</sub> , Ch. ADC	FWHM, Ch. ADC	FWHM, e	Center, Ch. ADC	Ground type	FWHM + FWHM <sub>Amp</sub> , Ch. ADC	FWHM, Ch. ADC	FWHM, e	Center, Ch. ADC	Ground type
0 $\mu\text{A}$	-/-	1,22	2437	177	Fixed	-/-	1,22	2437	177	Floating
100 $\mu\text{A}$	1,82	1,281	2561	491		1,821	1,283	2561	491	
200 $\mu\text{A}$	1,65	1,02	2050	491		1,638	1,01	2011	491	

## *Conclusion*

- LV and HV power circuits for three Forward Silicon Detectors planes were designed and tested;
- LV and HV power supply units (manufacturing by FuG and CAEN) were selected and purchased, measurements were made;
- LV and HV power contribution to the FEE noise was measured - (m.i.p. signal = 4 fC = 24 000 e / 300mkm / Si);
- Equivalent noise charge of 2 block types satisfy the requirements of Forward Silicon Detectors FEE.

**Thank you for your attention!**