



SiPM power supply unit

Eremkina Irina Engineer, LHEP, JINR

AYSS-2022 24 - 28 October, JINR, Dubna



- Introduction
- SiPM power supply unit
- SiPM power supply unit's control system
- Status and Plans



SiPM (Silicon Photomultiplier)





A SiPM die

Different doped layers of a reverse biased APD

- ✓ Compact device
- ✓ Low operating voltage (30 120V)
- ✓ Resolution Single photon detection
- ✓ Response time ~100 ps
- ✓ High gain 10^6
- ✓ High quantum efficiency 90%
- ✓ High photon detection efficiency 60%
- Immunity to magnetic field



Schematic overview of a SiPM and its readout circuit.



Power supply unit



A view of the power supply module



A functional scheme of the power supply module



Трансформаторный блок питания



Персональный компьютер с управляющим приложением



A scheme of the power supply module

4/8



- The Power Supply unit provides two options for
- generating a base voltage of 32.5 V:
- a built-in converter 12V to 35V
- an external transformer power supply 220V to 32.5V



A view of the external transformer power supply

Number of channels	16
Output voltage range, V	24 - 28
Step, mV	8
Max output current, mA	50
Voltage setting accuracy, mV	~14
Communication interfaces	USB_2.0, RS-485, Fast Ethernet



Noise from the SiPM power supply's channel



Control system

🔆 16SiPM HV PS Control		– 🗆 ×		
STRN III Communication status: OK				
Control Calibration Settings				
★ All Channels Uset, V 27,900 ♀ Set Al	II On All Off		oi (<u>main page</u>)	
1 Ch1Name Off Uset, V 27,900 ♀ Set Statu	us Ready RBS, V 27,9 Uout, V 27,8962		_	
2 Ch2Name Off Uset, V 27 900 Set Statu	Is Ready RRS V 27.9 Hout V 27.9115			
3 Ch3Name Off Uset, V				
4 Ch4Name Off Uset, V SPA IN Gonzal Communica	ation status: Not ready			
5 Ch5Name Off Uset, V				
6 Ch6Name Off Uset, V	Status: OFF			
7 Ch7Name Off Uset, V DAC	U measured DAC coefs	ADC ADC coefs		
8 Ch8Name Off Uset, V DAC counts 1	U1 measured, V A1	ADC counts 1 A2		
9 Ch9Name Off Uset, V DAC counts 2	U2 measured, V >>> B1	ADC counts2		
10 Ch10Name Off Uset, V 28766 Set	0,00000 Write	3452 Write		0
11 Ch11Name Off Uset, V				1
12 Ch12Name Off Uset, V	🐝 16SiPM HV PS Control		– 🗆 X	
13 Ch13Name Off Uset, V	Communication status: OK			
14 Ch14Name Off Uset, V	Control Calibration Settings			
15 Ch15Name Off Uset, V	COM port: Open port			
16 Ch16Name Off Uset, V	4 Close Port	tart Up Configuration file state: XXX		
	AutoOpen COM-port Summary	· · ·		
	Ini status: OK directory ASettings		Unlock	
	COM-port opened DefaultName			
	Debug Sending: 5 bytes sent		AutoClear Clear	
	Comn, Data: 00 02 01 02 FB			ettings
	Answ, Data: 00 02 05 02 59 3B DF 41 43			0
SIPMPS				
			~	

6/8



Usage







Barrel detector		
Number of channels	40	
United groups of channels	8	
SiPM	SiPM Micro FC- 60035-SMT	
Operation in magnetic field, B	0.9 T	

A view of barrel detector strip assembly with SiPMs board

MICROFC-60035-SMT-TR1 Silicon Photomultiplier (SiPM), C-Series





A view of neutron detectors

FEE board

Neutron detectors		
Quantity of detectors	5	

Status and Plans

Present status:

✓ SiPM power supply – produced and tested.

Plans:

- ✓ Produced a built-in converter 12V to 35V;
- ✓ Upgrade the SIPM power supply unit
 by increasing the number of available channels
 for new BM@N set up.



A view of the power supply unit of the BM@N setup

Thank you for your kind attention!



8/8