The Romanian Underground Laboratory from the Unirea Salt Mine

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The Romanian Underground Laboratory from the Unirea Salt Mine

- Location and physical description
- Current activities
 - Low background Gamma spectrometry
 - Dosimetry
 - Cosmic muon flux applications











Persons that can to be temporarily appointed form IFIN-HH:

- 2 technicians
- 6 researchers

Employees on site:

- 2 technicians
- 1 researcher





0 9500

1.123

1.296 1.469

1.642 1.816 1.989

2.162

2.335

Low background Gamma spectrometry

CANBERRA GeHP rel. efic. 22.3%





CANBERRA GeHP rel. efic. 136%





Muon detectors – Underground muon detectors









Muon detectors – Underground muon detectors









Muon detectors – The SiRO Detector

- Hamamatsu MPPC S10362-33-100C 3x3 mm²
- Heavy temperature dependency
- Old FEE: manual calibration of every SiPM bias voltage, slow high gain amplifiers, slow DAQ.



Package	Ceramic
Active Area	$3 \ge 3$ mm
Number of Elements	1
Pixel Size	$100 \ge 100 \text{ym}$
Fill Factor	78.5%
Spectral Response Range	320 to 900 nm
Peak Wavelength	440nm
Operating Voltage	$70\pm10V$
Dark Count	8000kcps
Terminal Capacitance	$320 \mathrm{pF}$
Temperature Coefficience of Reverse Voltage	$56 \mathrm{mV/deg.}$ C
Gain	2400000
Measurement Condition	Ta=25 $^{\circ}C$





Muon detectors – The SiRO Detector

Sum of all Events - Top view Sum of all Events - Top view 24 0.005 -0.005 22 20 0.004 0.004 0.005 18 0.004 16 0.003 0.003 0.003 14 0.002 12 0.001 24⁰³ 22 20 18 16 14 12 10 8 6 10 0.002 0.002 8 6 0.001 0.001 4 2 0 0 2 4 6 8 10 12 14 16 18 20 22 2 2 2 -0 18 20 22 24 16 Ó 12 2 10 14 8



Muon detectors – Work in progress

Operating parameters	MPPC S10362-33-100C	Micro FC C-series SMTPA	
		- 30050	
Active detection surface	3x3 mm	3x3 mm	
Number of pixels	900	2668	
Pixel Size	100um	50um	
Operating voltage	~75V	~25V	
Peak Wavelength	440nm	420nm	
Gain maxim	2.4 x 10 ⁶	6 x 10 ⁶	
Dark Count	8000 - 12000 kcps	300 - 860 kcps	







Muon detectors – Work in progress













Perspectives

- Investigate the background at lower levels of the Cantacuzino mine higher depth, even cleaner salt...
- Increase number of HpGe detectors
- Directional muon flux measurements and muon imaging
- Scintillator array underground ?

Thank you!

• Find new collaborators











Muon detectors – The mobile muon detector





Location	Theoretical depth	Muon flux for	Real depth	Muon flux for	Muon flux
		the theoretical depth		the real depth	
	(m)	$(m^{-2}s^{-1})$	(m)	$(m^{-2}s^{-1})$	$(m^{-2}s^{-1})$
Unirea	297	0.051	170	0.18	0.18
Mihai - main cavity	204	0.12	90	0.51	0.52
Mihai - small cavity	204	0.12	125	0.32	0.33
Cantacuzino mine - Level 5	173	0.17	165	0.19	
Cantacuzino mine - Level 6	189	0.15	173	0.17	
Cantacuzino mine - Level 7	205	0.12	181	0.16	
Cantacuzino mine - Level 8	221	0.11	189	0.15	0.19
Cantacuzino mine - Level 9	237	0.10	197	0.13	
Cantacuzino mine - Level 10	253	0.08	205	0.12	
Cantacuzino mine - Level 11	269	0.06	213	0.11	0.09