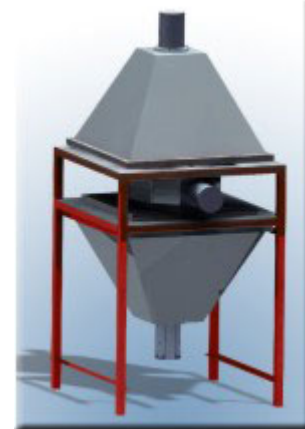


# SEVAN particle detector network located at Middle-Low latitudes for Solar Physics and Space Weather research



**A.Chilingarian, G.Hovsepyan, K.Arakelyan, S.Abovyan,  
S.Chilingarian, V.Danielyan, K.Avakyan, D.Pokhsraryan,  
A.Reymers, S.Tserunyan, A.Yegikyan**

***Alikhanyan Physics Institute, Yerevan, Armenia***

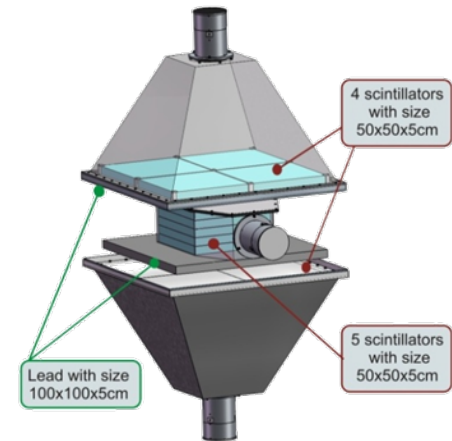




# Space Environmental Viewing and Analysis Network (SEVAN)

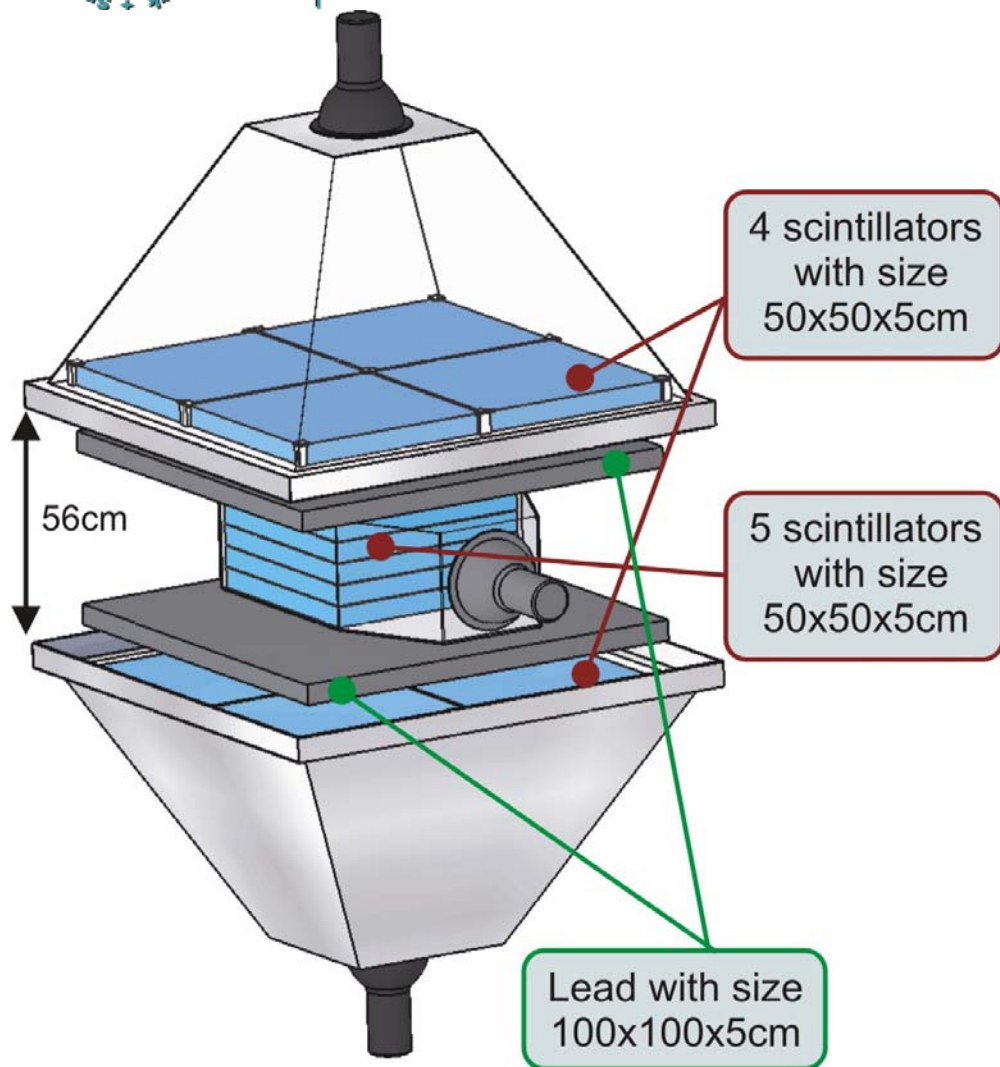


A network of middle to low latitude particle detectors called SEVAN (Space Environmental Viewing and Analysis Network) is planned in the framework of the International Heliophysical Year (IHY), to improve fundamental research of the Solar accelerators and Space Weather conditions.



[www.aragats.am](http://www.aragats.am)

# Construction of the SEVAN basic unit

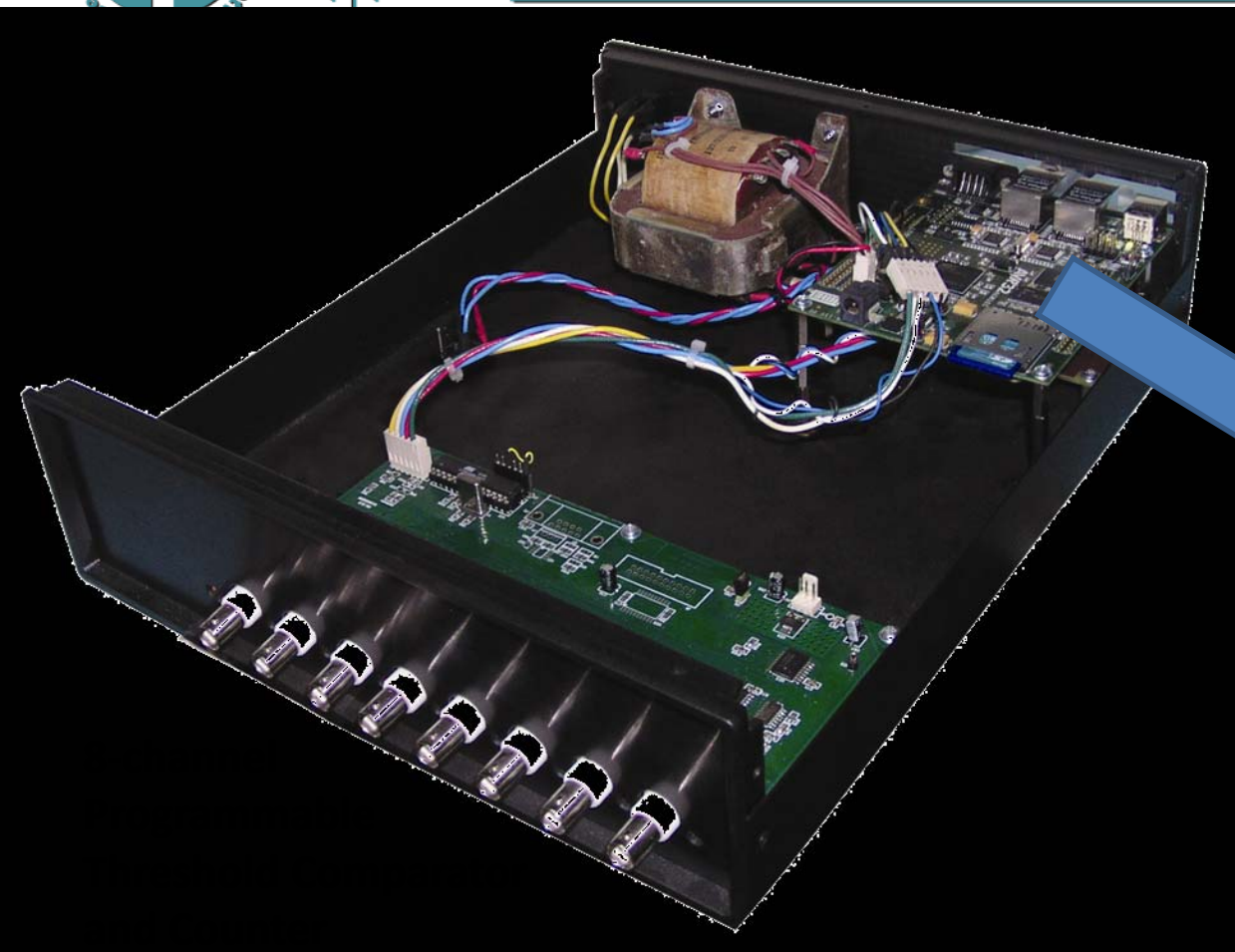


**100 – traversal of the low energy charged particle ( $\sim < 200 \text{ MeV}$ );**

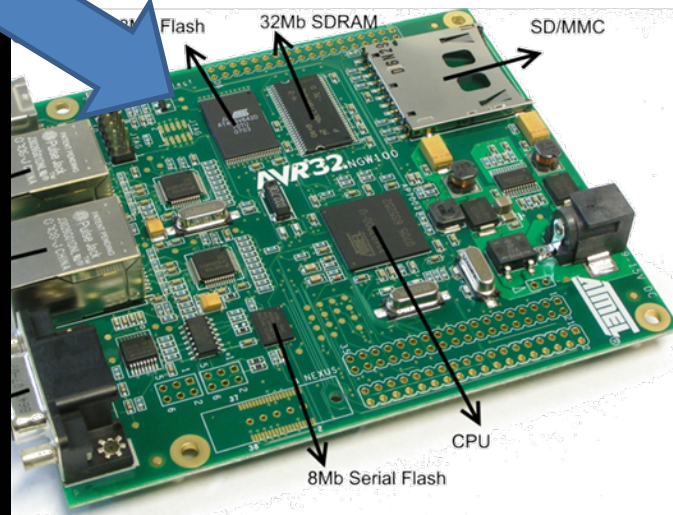
**010 – traversal of the neutral particle;**

**111 & 101 – traversal of the high energy muon ( $\sim > 250 \text{ MeV}$ );**





**Atmel  
Tiny Little AVR32  
Board (NGW 100)**



**Electronics for the Space Environmental Viewing and Analysis Network (SEVAN)**  
K.Arakelyan, S. Abovyan, A.Chilingarian, V.Danielyan, D. Pokhsraryan.



# Partners of the SEVAN



[www.aragats.am](http://www.aragats.am)

**COSMIC RAY DIVISION**  
Alikhanyan Physics Institute,  
Alikhanyan Brothers 2,  
Yerevan 375036, Armenia







# Geophysical characteristics of possible SEVAN sites.



	Station	Latitude	Longitude	Altitude[m]	R <sub>c</sub> (GV)
<b>Germany</b>	(Greifswald)	54.5N	13.23E	6	2.34
<b>Slovakia</b>	(Lomnický štít)	49.2N	20.22E	2634	3.88
<b>Croatia</b>	(Zagreb)	45.82N	15.97E	120	4.89
<b>Bulgaria</b>	(Musala)	42.1N	23.35E	2430	6.19
<b>Armenia</b>	(Aragats1)	40.25N	44.15E	3200	7.1
<b>Armenia</b>	(Aragats2)	40.25N	44.15E	2000	7.1
<b>Israel</b>	(Hermon)	33.18N	35.47E	2025	10.39
<b>Costa Rica</b>	(San Jose)	10.0N	84.0W	1.2	10.99
<b>China</b>	(Tibet)	30.11N	90.53E	4300	13.86
<b>India</b>	(Delhi)	28.61N	77.23E	239	14.14
<b>Indonesia</b>	(Jakarta)	6.11S	106.45E	8	16.03

[www.aragats.am](http://www.aragats.am)



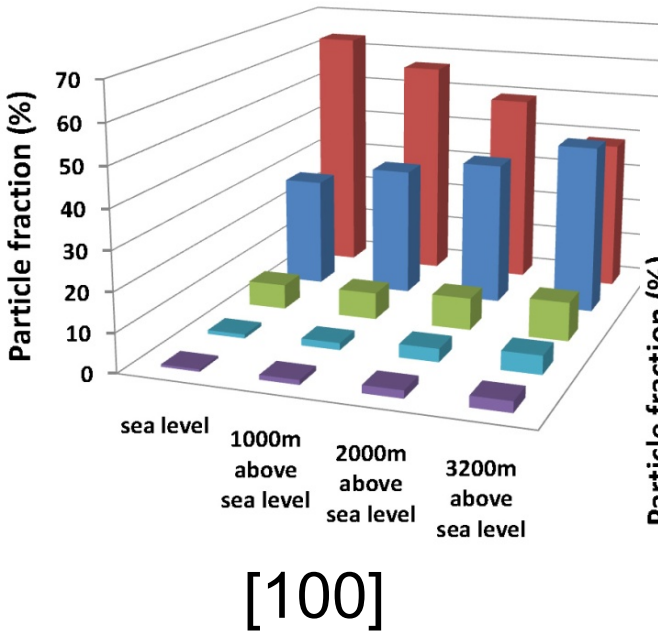
# SEVAN basic unit located at Yerevan and NorAmberd, Armenia.



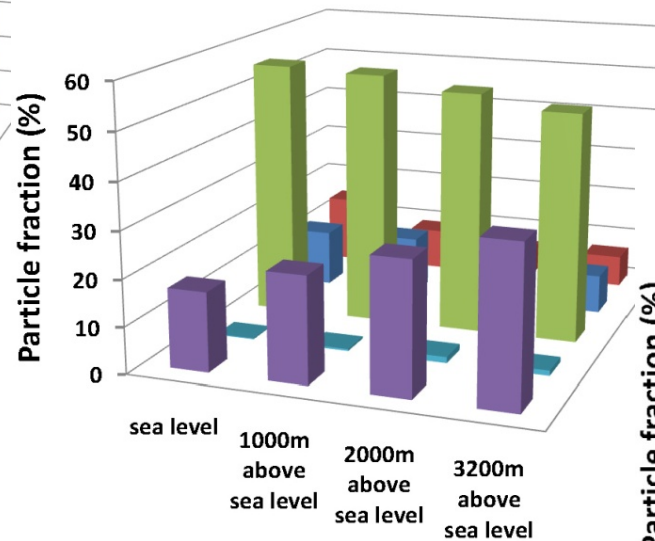


# Fraction of the particles detected by the SEVAN basic unit

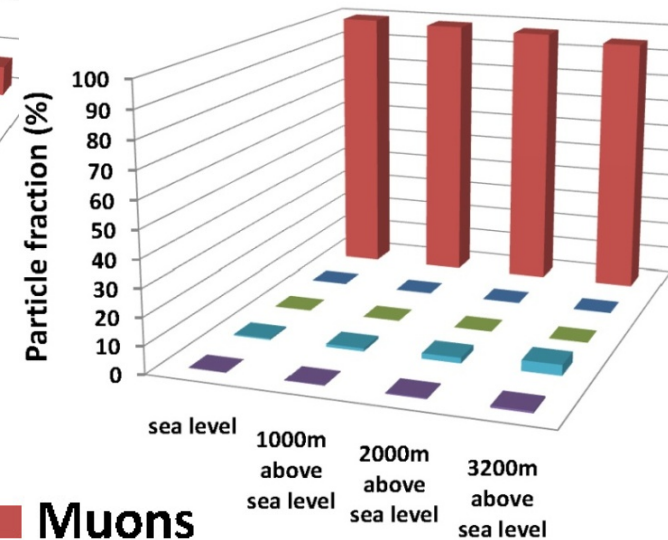
## Low Energy Charged Particles



## [010] Neutral Particles



## [101]&[111] High Energy Muons



■ Neutrons ■ Protons ■ Gamma ■ Electrons ■ Muons



# Experimental and simulated count rates of the SEVAN basic unit



**One Minute Count rates of the secondary fluxes detected by SEVAN module.**

	Yerevan (1000m)		NorAmberd(2000m)	
Type of Secondary particle	Measured count rate	simulated count rate	Measured count rate	simulated count rate
Low energy charged particles	$8862 \pm 108$	7202	$11593 \pm 161$	10220
Neutral particles	$363 \pm 19$	359	$690 \pm 27$	795
High energy muon	$4337 \pm 67$	5477	$4473 \pm 99$	5548

**Modes of the GCR Energy spectra corresponding to different species of secondary particles registered by SEVAN detector at 3200m above the sea level.**

**Layers of detector  
Located at 3200m**

**Most probable energy of GCR  
(GeV)**

**Upper Layer  
Middle 25cm layer  
Down Layer**

**11.5  
8.5  
14.5**





# Simulated enhancements detected by the SEVAN basic unit



**5min simulated enhancements in the Upper and Middle layers of the SEVAN basic unit.**

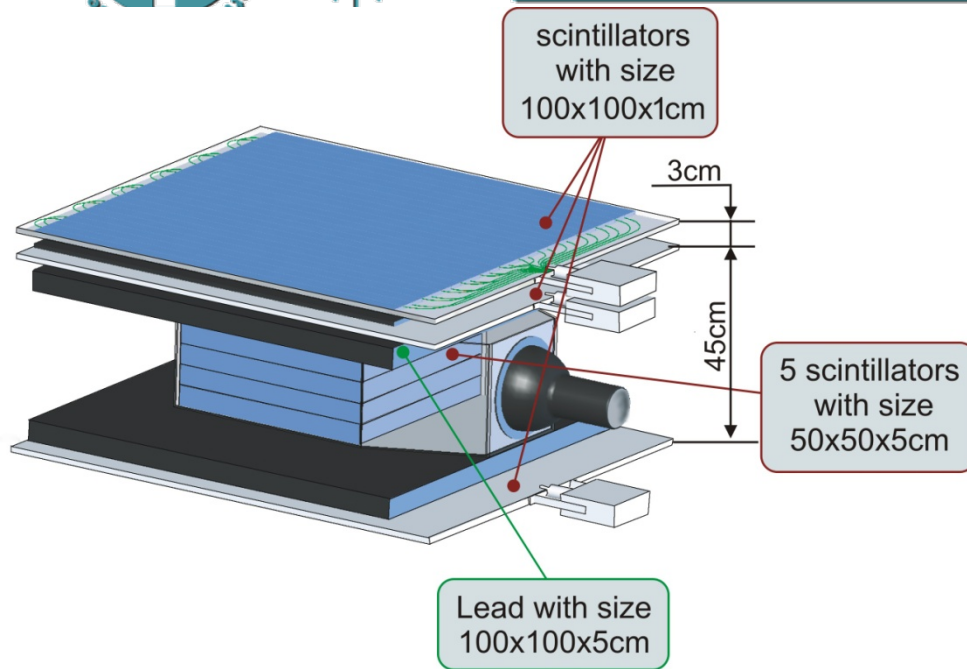
Detector Layer	Solar Protons	Solar Neutrons
Upper 5cm scintillator	$4.8\sigma$	$2.6\sigma$
Middle 25 cm scintillator	$1.7\sigma$	$6.4\sigma$

**Characteristics of the particle detectors of the Space Environmental Viewing and Analysis Network (SEVAN)**

*A.Chilingarian, A.Reymers.*

[www.aragats.am](http://www.aragats.am)

# 4 layered basic unit of the SEVAN



1000 – low energy charged particle stopped in 1 cm of lead;  
 1100 – low energy charged particle stopped in 5 cm of lead;  
 0100 – low energy neutral particle mostly ( $\gamma$ -quanta) giving cascade in 1 cm of lead absorbed in 5 cm of lead  
 0110 - high energy neutral particle ( $\gamma$ -quanta or neutron) giving cascades both in 1 cm of lead and in 5 cm of lead  
 1110 – charged particle (muon) traversing 6 cm of lead;  
 1111 – traversal of high energy muon;  
 0010 – neutral particle (mostly neutron);

**Percent of different secondary particles detected by 25 cm thick scintillator in 2 versions of the SEVAN (Aragats station at 3200 above sea level).**

	Electrons	Muons	Gamma	Neutrons	Protons
3 Layered detector	6.8	16.4	40.2	35.6	1
4 Layered detector	7.4	22.3	23.7	45.3	1.3



# SEVAN home page

<http://sevan.aragats.am>





Space Environmental Viewing and Analysis Network (SEVAN)



HOME CRD DVIN SPACE EDUCATION LIBRARY GALLERY CONTACTS





**Featured News**

[SW Definition:28 Languages](#)

[SW definition Armenian](#)

[SW definition English](#)

[SW definition Russian](#)



Space Environmental Viewing and Analysis Network (SEVAN)

SEVAN (Space Environmental Viewing and Analysis Network) is a network of particle detectors located at middle and low latitudes which aims to improve fundamental research of space weather conditions and to provide short and long-term forecasts of dangerous consequences of space storms.

The network will detect changing fluxes of different species of secondary cosmic rays at different altitudes and latitudes, thus turning into a powerful integrated device used to explore solar modulation effects.

To facilitate SEVAN network creation, CRD will design and develop the basic hybrid SEVAN particle detector module and assume responsibility for all electronics and advanced data acquisition system (ADAS). CRD will also fabricate and test the SEVAN prototype module, as well as provide free scintillator slabs and photomultipliers to be installed at the host institutions.

The host institutions, in turn, will have to provide steel frame of the detector, lead filter and scintillator housing. They will also be responsible for transporting scintillator slabs from Armenia and for providing SEVAN detectors with uninterruptible internet connection and electricity.



International Heliophysical Year (IHY)

About IHY

IHY websites

IHY reports

IHY Brochure

IHY Newsletters

Home

SEVAN papers & presentations

SEVAN network detectors

SEVAN official documents

SEVAN Mechanical Charts

SEVAN electronics

SEVAN networking

© 2008 Cosmic Ray Division  
Alikhanyan Physics Institute

[www.aragats.am](http://www.aragats.am)

**COSMIC RAY DIVISION**  
Alikhanyan Physics Institute,  
Alikhanyan Brothers 2,  
Yerevan 375036, Armenia







## Conclusion



One of the major advantages of multi-particle detectors is probing of the different populations of the primary cosmic rays, initiated particle cascades in terrestrial atmosphere. With basic detector of SEVAN network we are measuring fluxes of neutrons and gammas, of low energy charged component and high energy muons. This diversity of information obtained from SEVAN network located mostly at low and middle latitudes will give possibility to estimate the energy spectra of the highest energy SCR.