Development of new cosmic radiation detectors at NPI

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Modified Liulin



Modified Liulin

MDU status

Liulin - 4

HEYCO.





Modified Liulin

MDU status

Liulin - 4

Candy Detector



Flying Dosimetry Unit



Motivation for modification of the Liulin





Hamamatsu S2744-08

Hamamatsu S2744-09



Diode was replaced.

NOVES

Liulin was exposed to Am-241, Cf-252, Pu-239 in vacuum like conditions.

Measured spectra



Calibration curves of Liulins



Verification measurements onboard aircraft

Liulin	Calibration @	Diode	D _{Si} [μGy]
MDU2	NPI	S2744-09	5.24
MDU1	HIMAC	S2744-08	5.28

Candy detector - Design goals

- LET spectrometer
- Lightweight (Silicone detector)
- Low power consumption (e.g. pulse length spectra, ...)
- Low noise
- (Low cost)





http://www.mlab.cz/Modules/Sensors/PCRD02A/DOC/PCRD02A.cs.pdf

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Detectors (Si PIN Diode)





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BPW 34 S
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First Measurements





First Measurements



Pra

14

Czech Republic

Brno

16

Katowiceo Kraków

18

ahope 20 Rzeszow

22

Lviv

24

50

26

First measurements



Next steps

Heavy Ion Medical Accelerator in Chiha (HIMAC) stably supporting charged particle therapy

A compact therapy machine The NIRS completed research and development on a compact carbon therapy machine is Gurma University has adopted our proposal and will start construction of a new therapy fi in FY 2006. The NIRS is giving technical support to this project at Gurma University.



We have three treatm in order to use the HI time efficiently. These equipped with a ve Sine (room A), beam line (ro vertical and t beam lines (r

Terrestrial gamma-ray flashes

Lightnings TGF up to 0.1 Sv, up to 40 MeV estimate by Dwyer et al. 2010 TNF up to 0.01 Sv within 1km MC simulations by Drozdov and Grigoriev 2013



Proposal for TGF measurements



1. Ground stations

2. Flying Dosimetry Unit FDU (4-10km)

- Unmanned Aircraft Vehicle
- Scintillation detectors



3. Monitors on satellites (gamma cameras)

Material testing for FDU





Source	Material 1	Material 2	Detektor
¹³⁷ Cs	-5.8%	-7.7%	Timepix
AmF	1.1%	1.8%	Timepix
	1.1%	5.1%	LB 123 N



Conclusions

- Modified Liulin:
 - energy deposition calibration using the radionuclide sources was enabled using the diode with no epoxy layer
- Candy Detector:
 - Low power consumption (low bias voltage, pulse length scored, low noise)
 - Cost effective spectrometer
- Terrestrial Gamma-ray Flashes
 - Three level measurements were proposed

Why the new dosimeter units are needed?

Liška