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First Results of DOSTEL as active part of the MATROSHKA Facility

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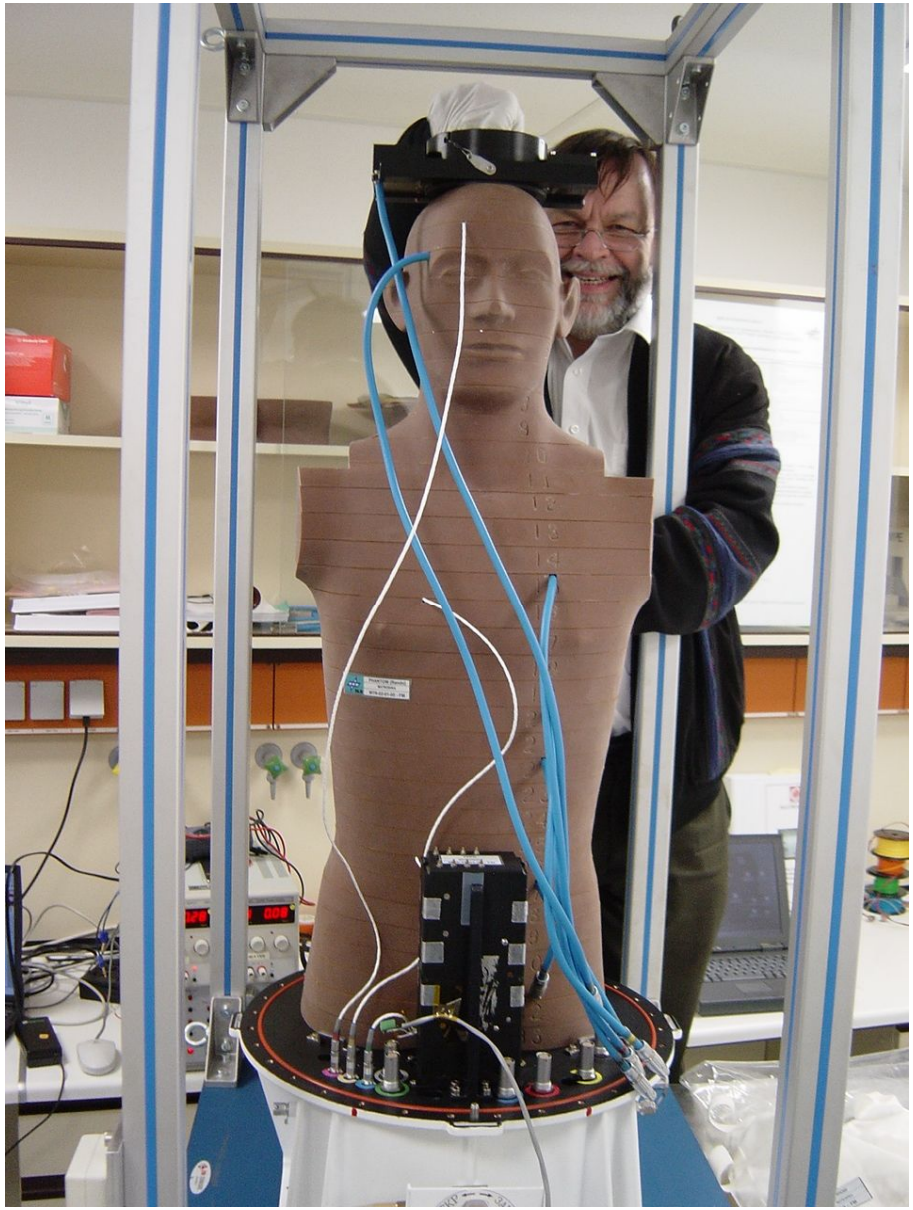
MATROSHKA DOSTEL

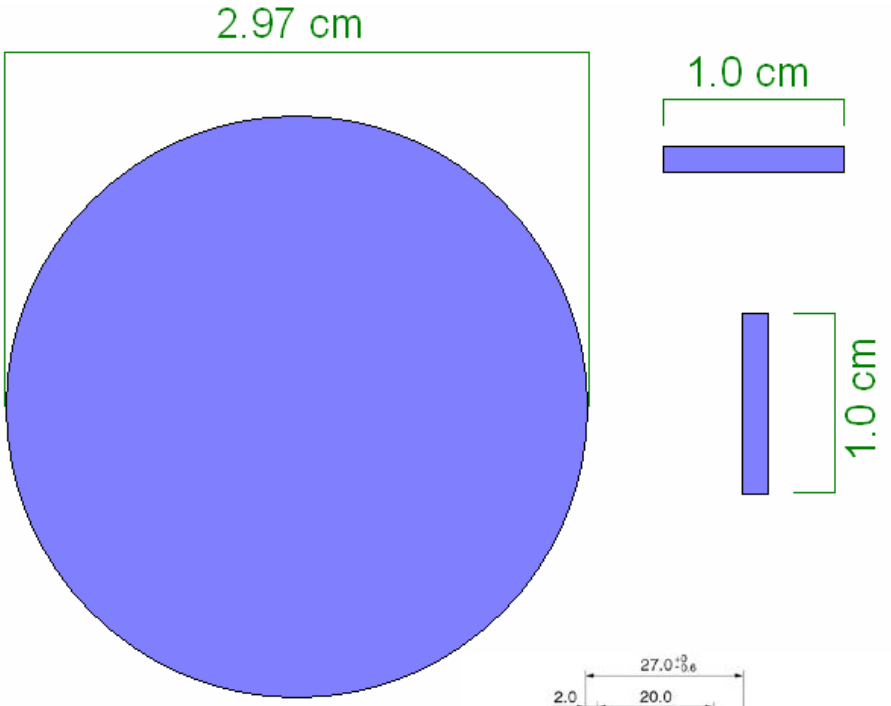
- Introduction to MATROSHKA DOSTEL design
- DOSTEL data
- First results

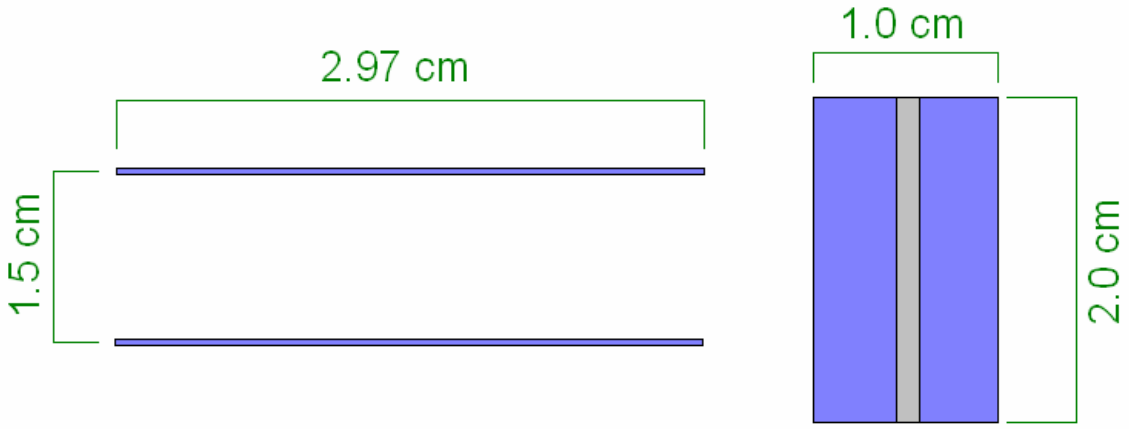
DOSTEL Detector Head

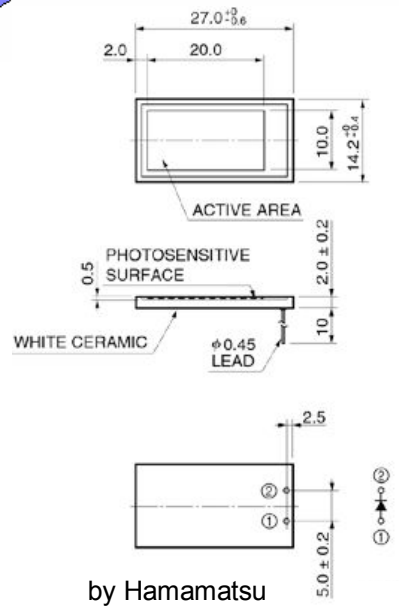


DOSTEL Detector Head

The DOSTEL Detecor Head consists two circular PIPS detectors by Canberra. These two are forming a telescope. Two perpendicular mounted Hamamatsu PIN-diodes are used as ‚stand-alone' dosimeters. The active area of the PIPS detectors is 6.93 cm², the PIN-diodes have an active area of 2.31 cm² each.

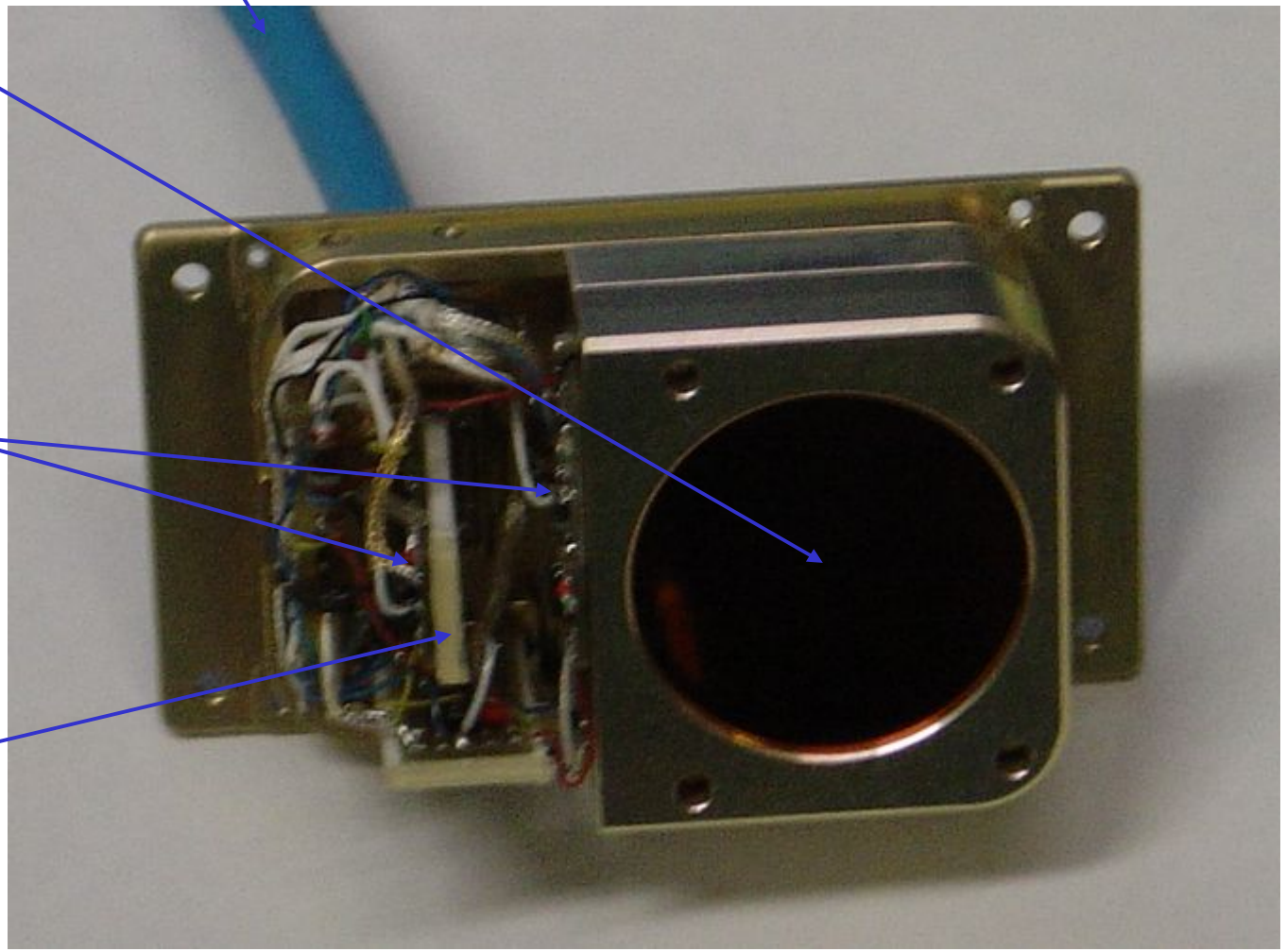






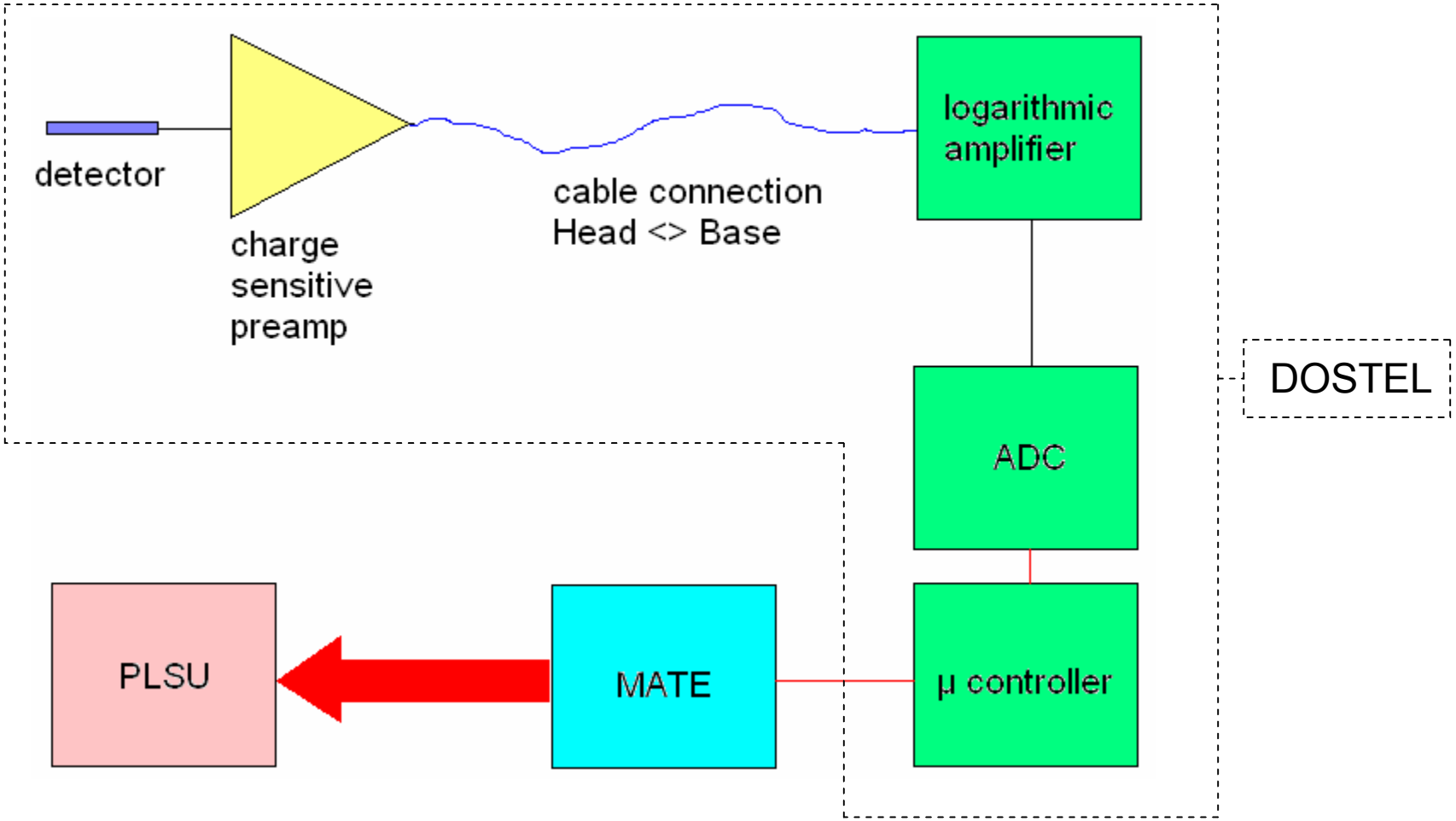
by Hamamatsu

DOSTEL Detector Head



DOSTEL Detector Head

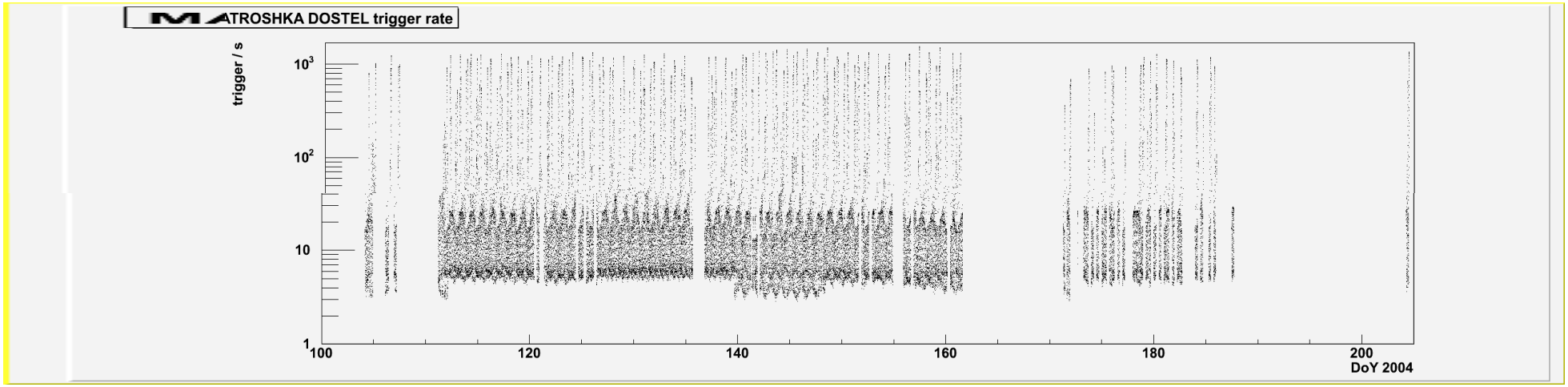
Block Diagram of DOSTEL Electronics



MATROSHKA DOSTEL Data

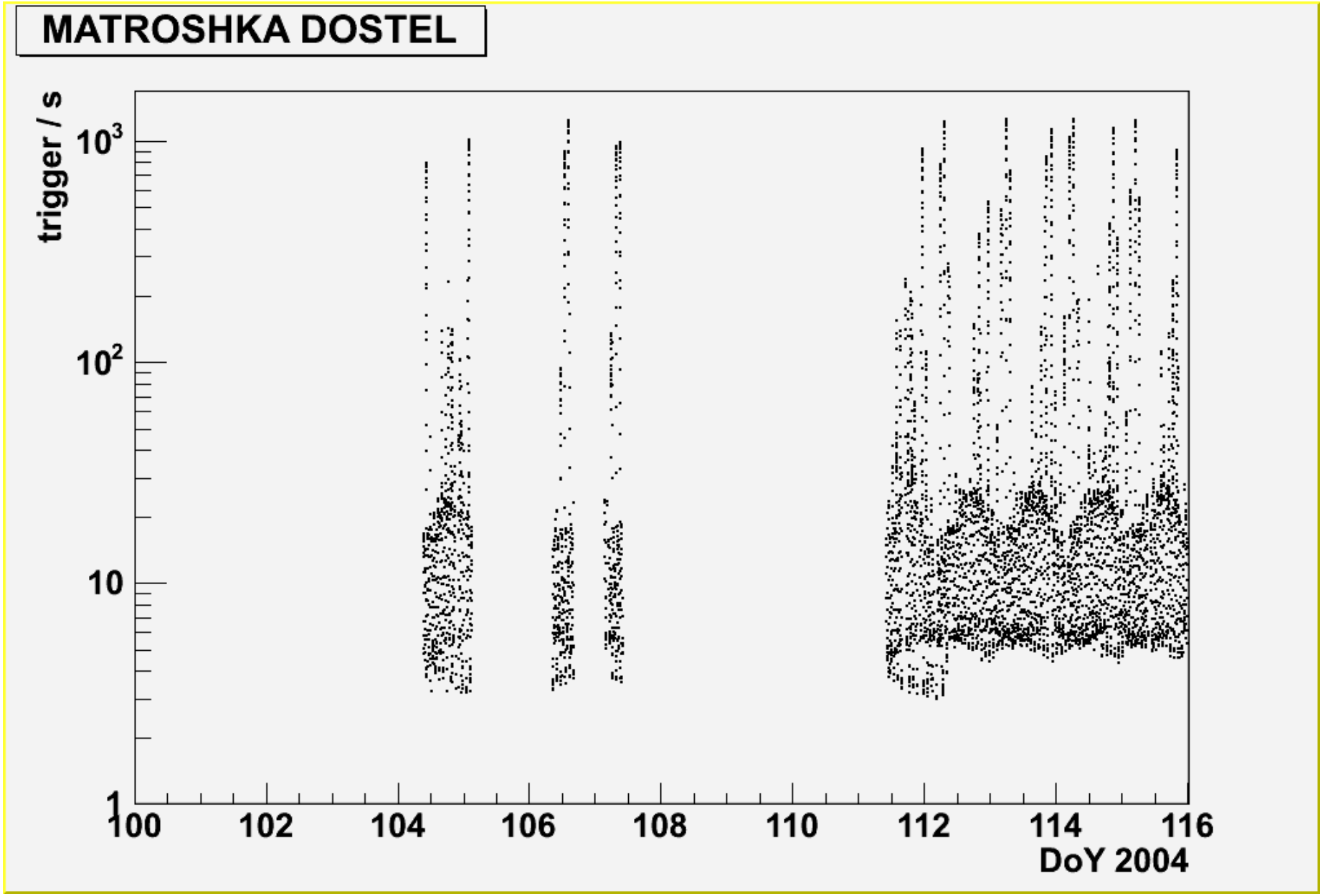
- MATROSHKA DOSTEL can provide trigger rate profiles and energy deposit spectra
- The energy spectra can be used to obtain LET-Spectra because of the pathlength limitation due to its telescope geometry
- The LET spectra can be used to get information such as average quality factors which leads to dose equivalent

Overview of MATROSHKA DOSTELs Trigger Rate

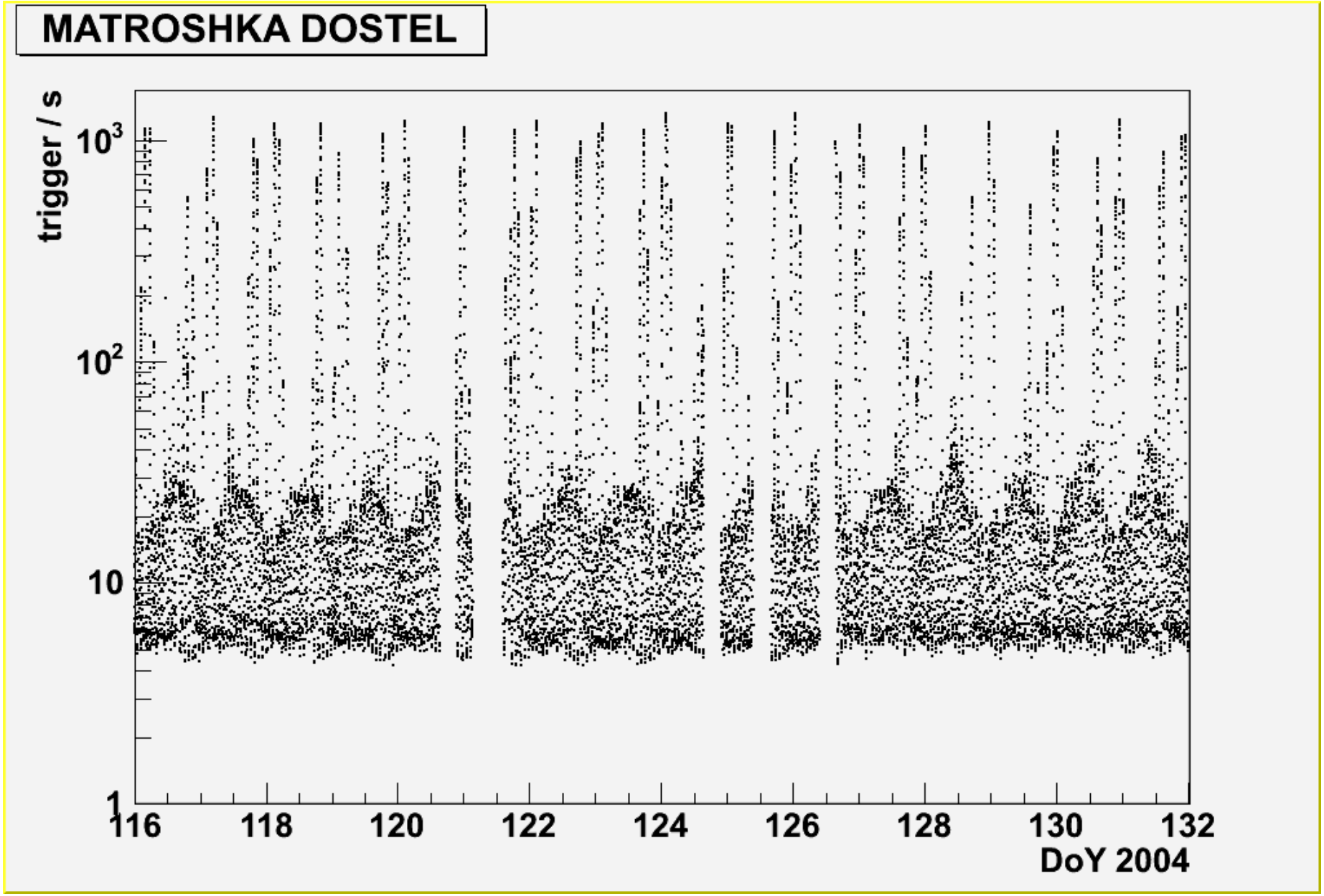


At the time when any of the detectors receives a signal, the signal processing will be initiated. The count rate of these events is shown in the picture. One can also see the active time of DOSTEL or the time we got data for respectively.

MATROSHKA DOSTEL Data



MATROSHKA DOSTEL Data



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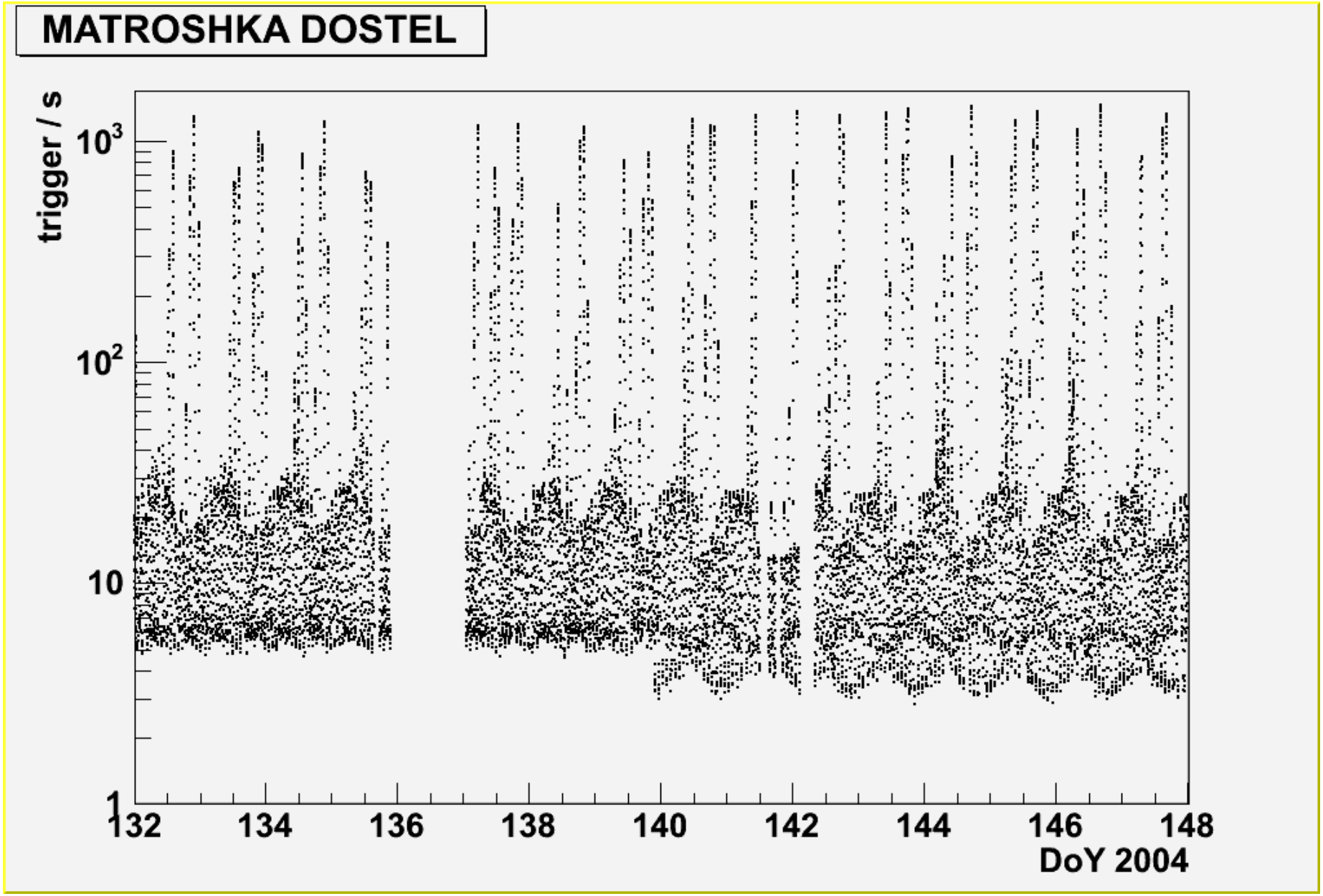

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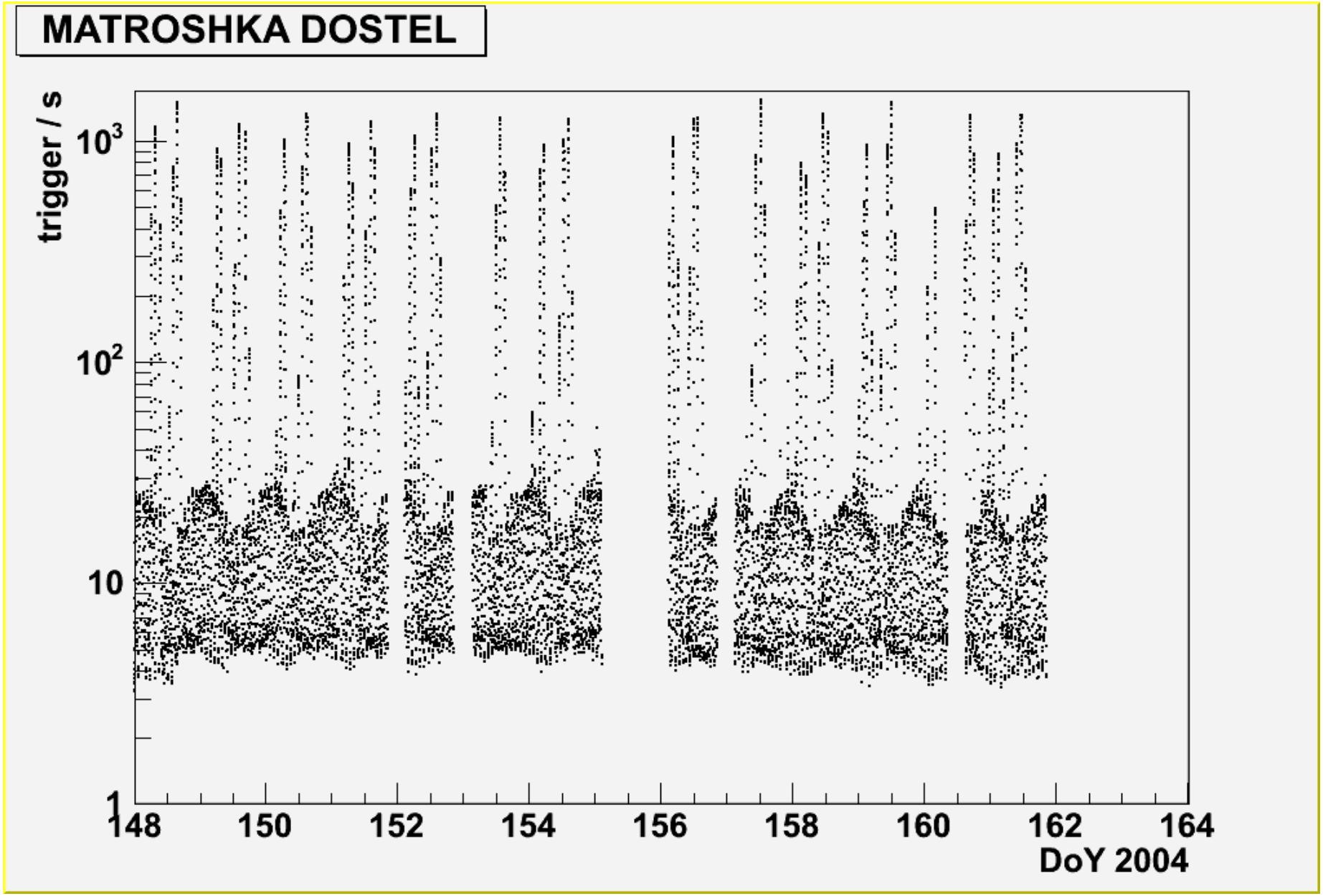
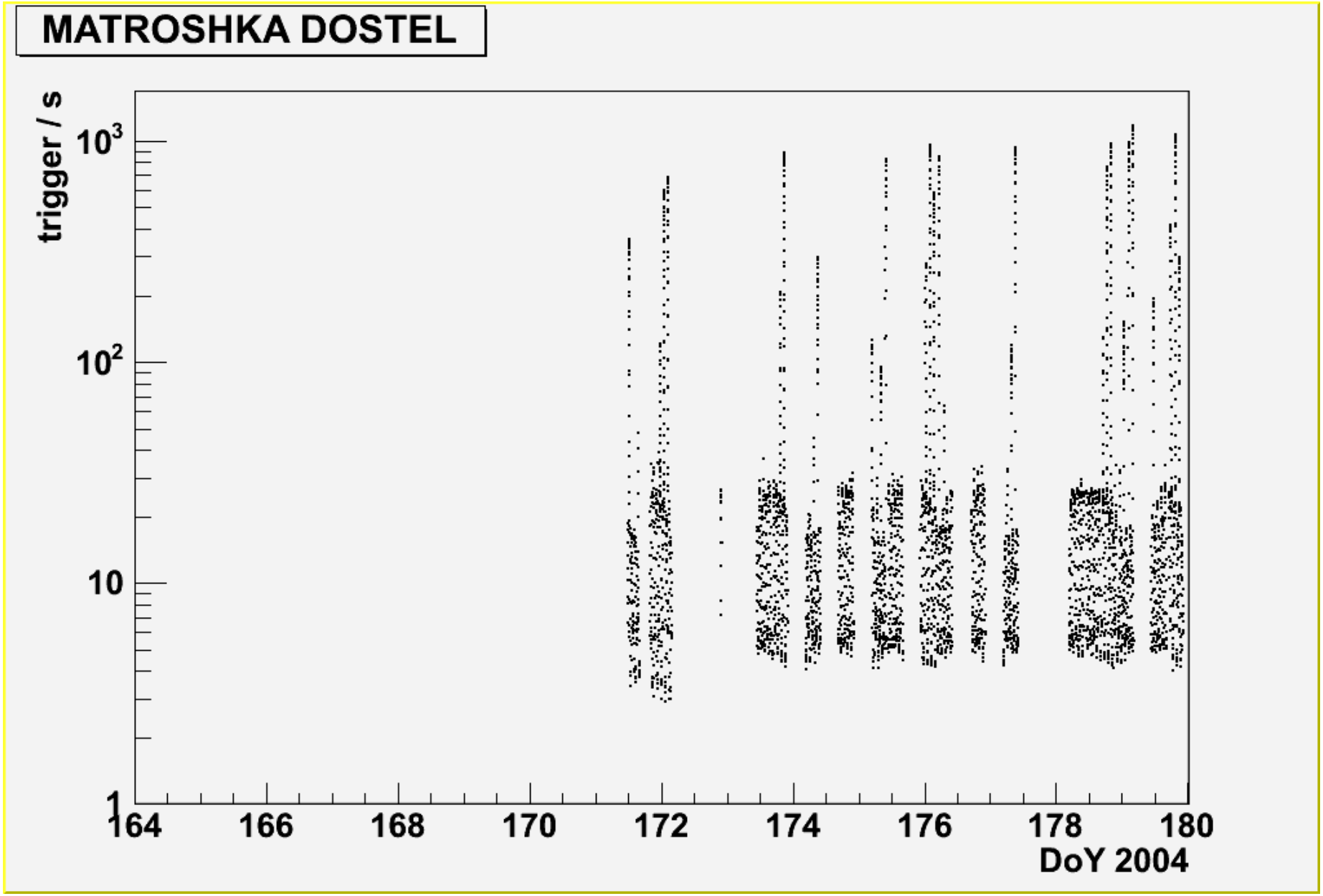


MATROSHKA DOSTEL Data



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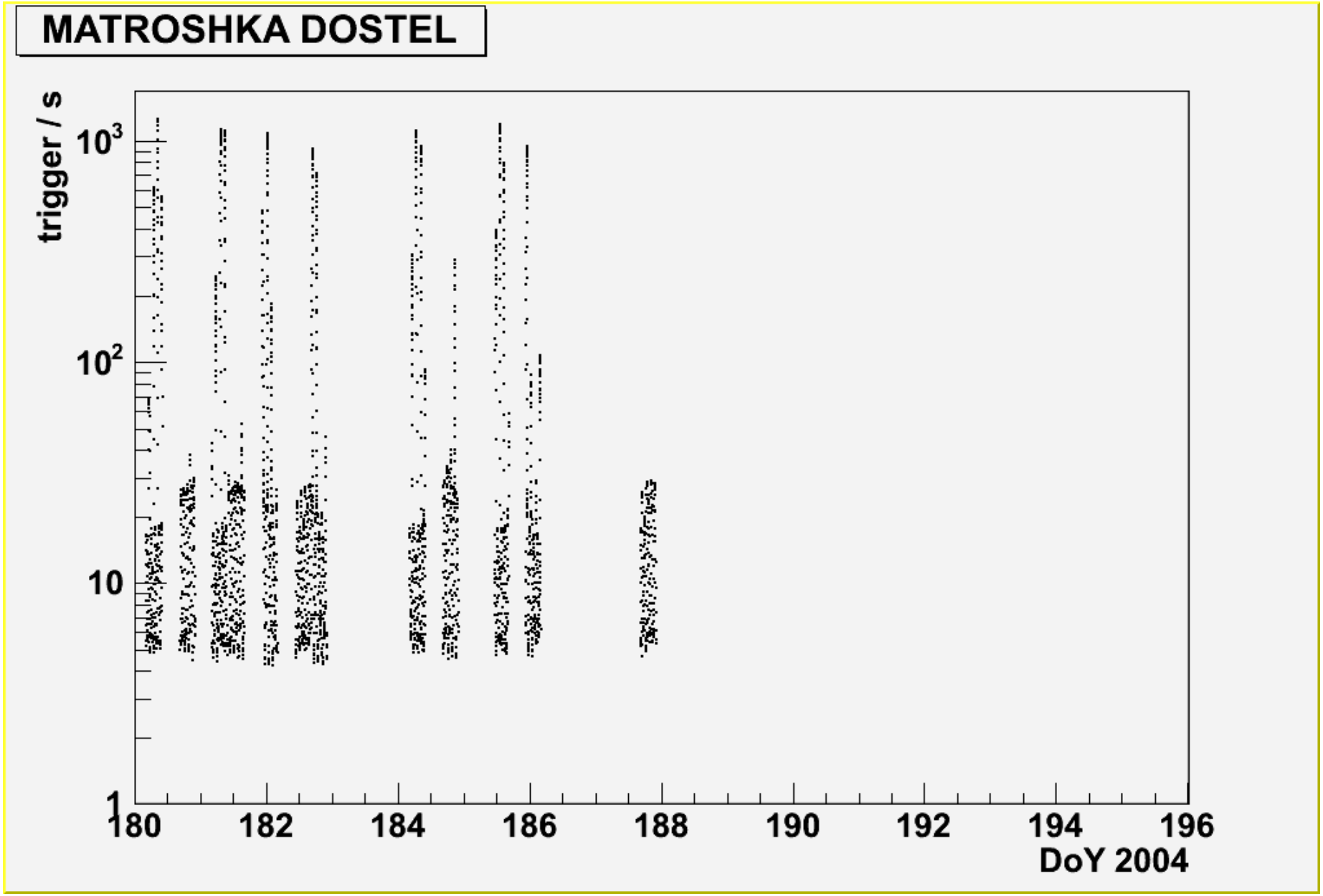

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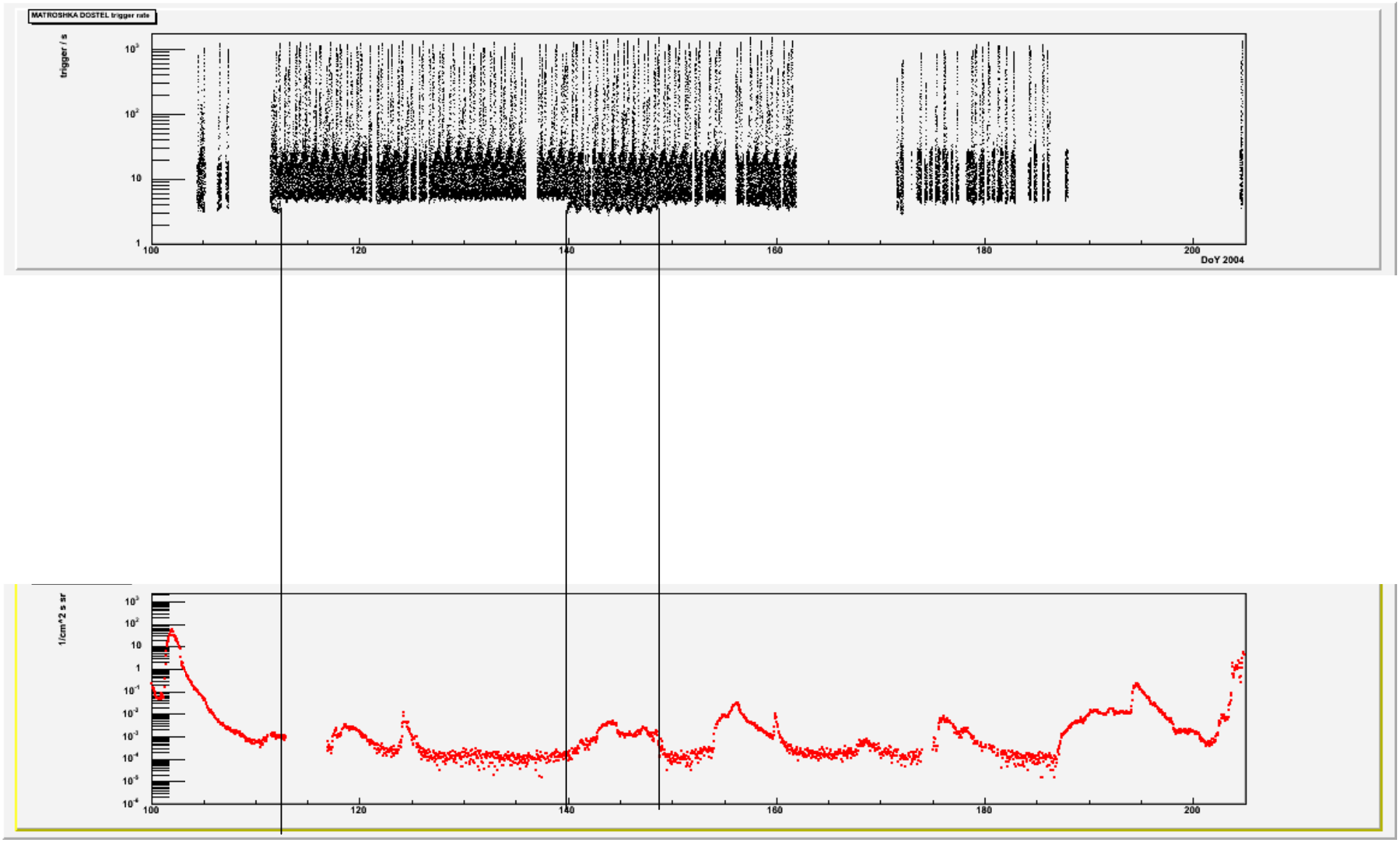
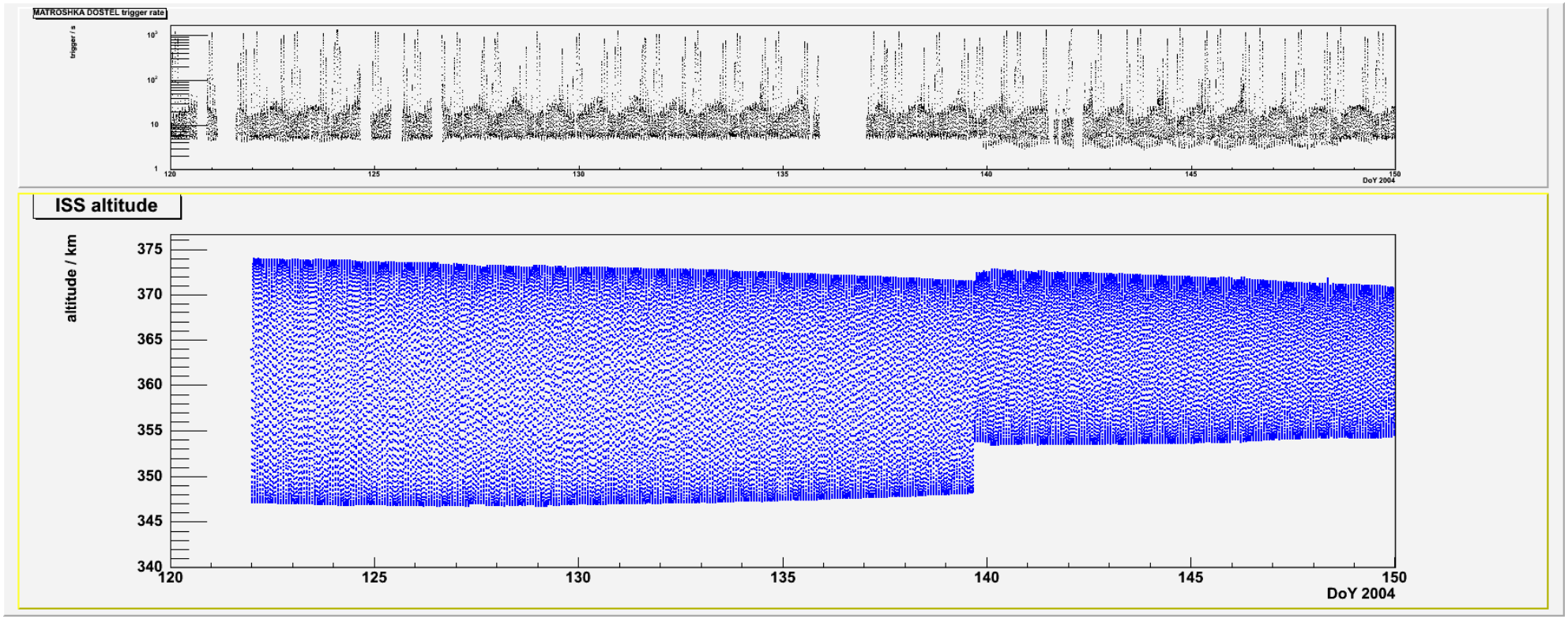
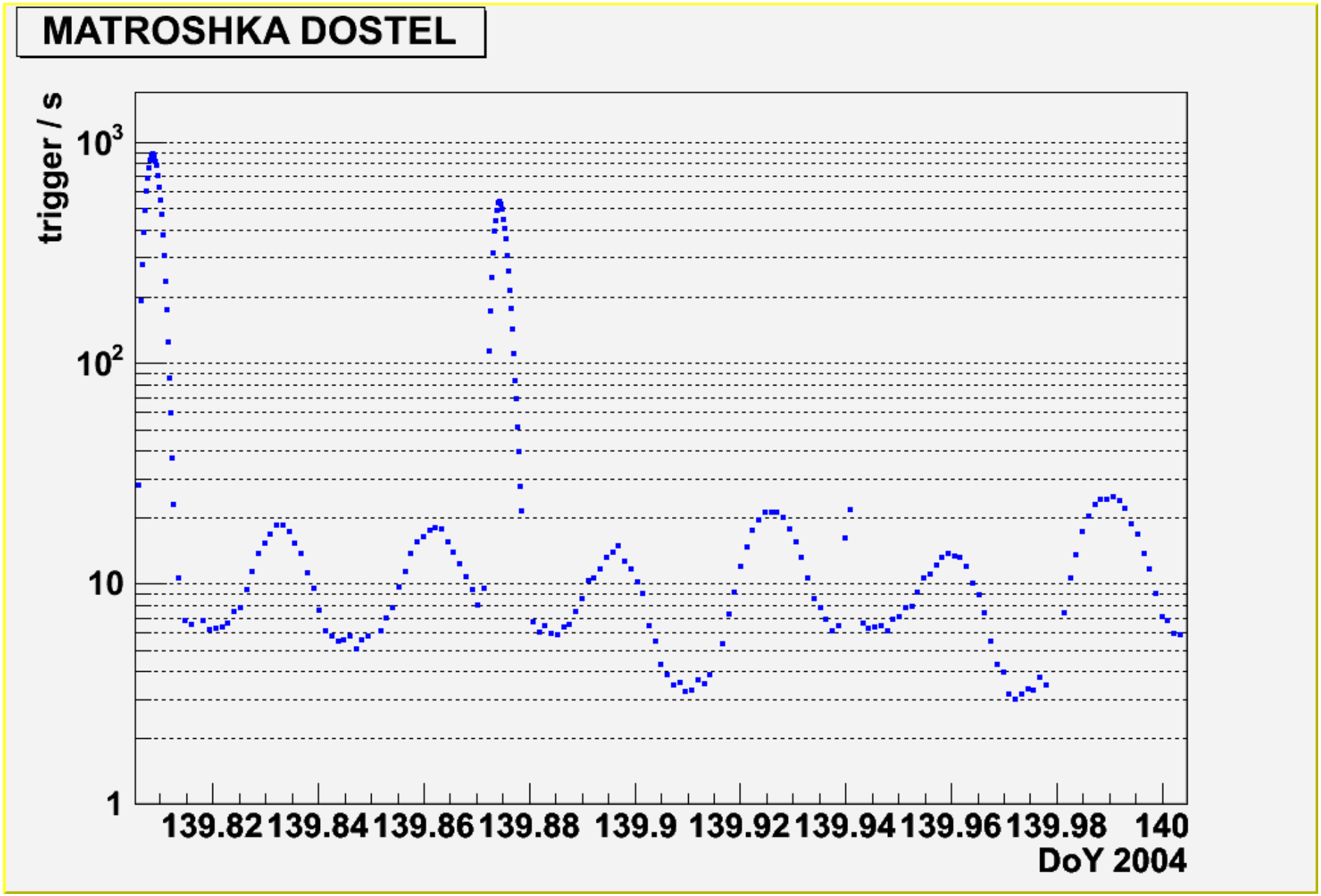
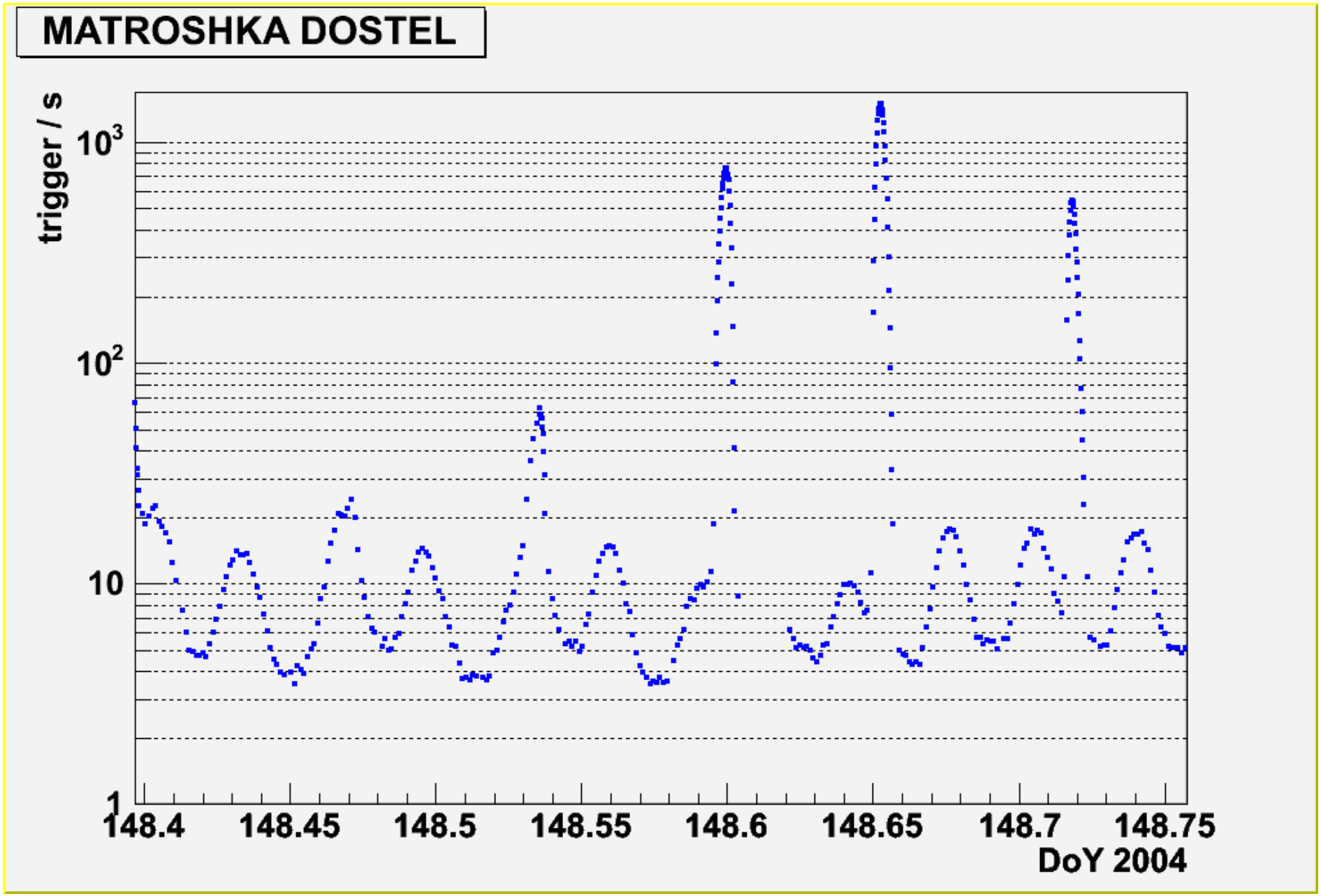
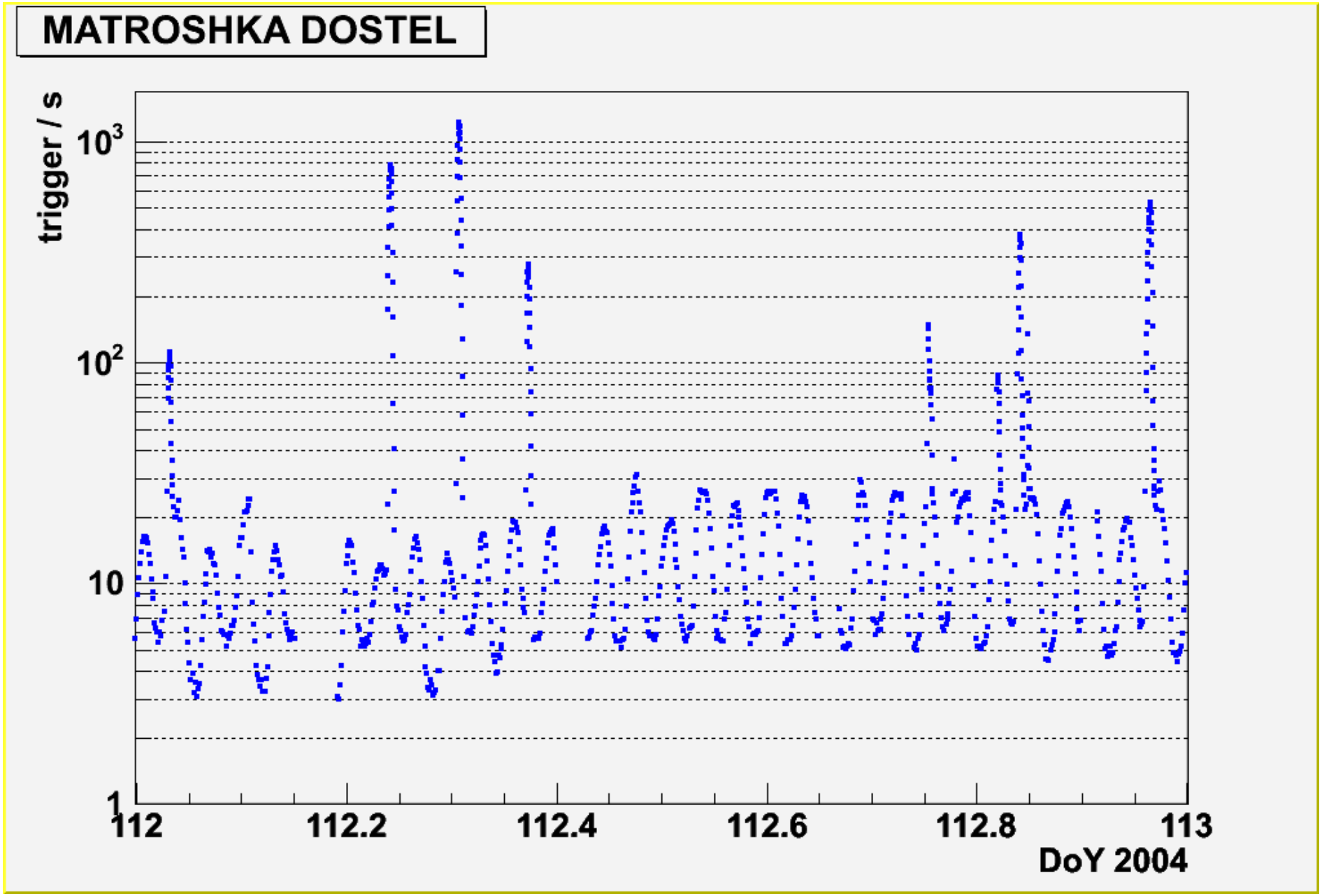


MATROSHKA DOSTEL Data

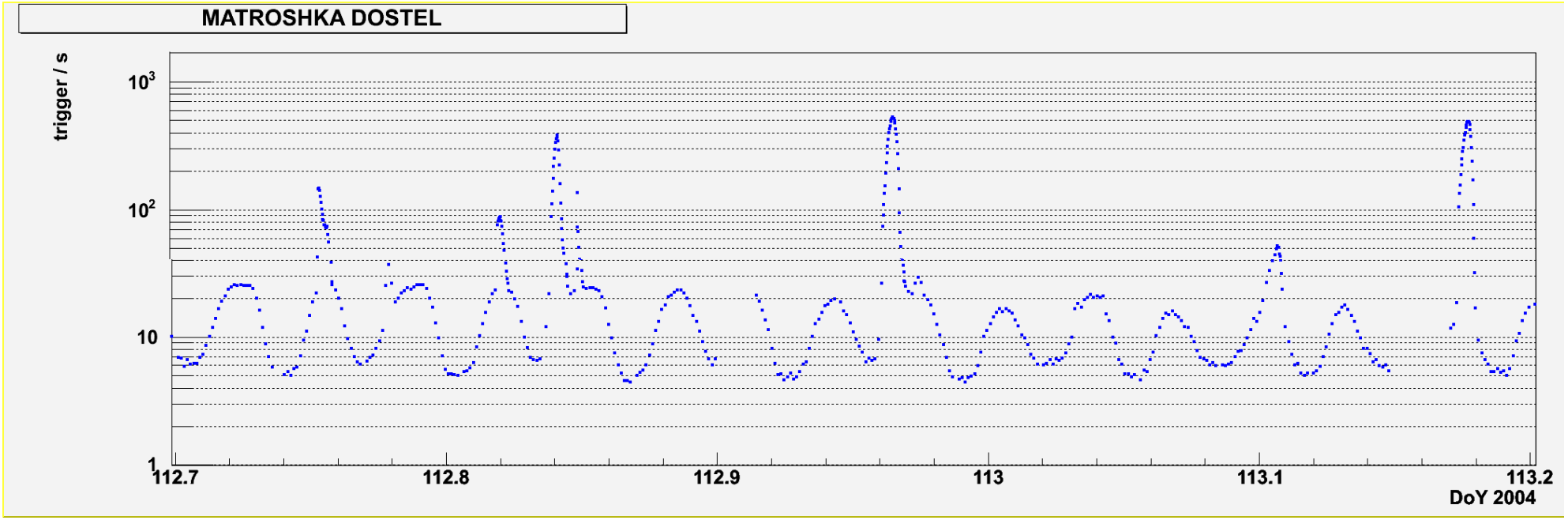



MATROSHKA DOSTEL
trigger / s
10^3
10^2
10
1
139.82
139.84
139.86
139.88
139.9
139.92
139.94
139.96
139.98
140
DoY 2004


MATROSHKA DOSTEL
trigger / s
10³
10²
10
1
148.4
148.45
148.5
148.55
148.6
148.65
148.7
148.75
DoY 2004


MATROSHKA DOSTEL
trigger / s
10^3
10^2
10
1
112
112.2
112.4
112.6
112.8
113
DoY 2004

MATROSHKA DOSTEL Data



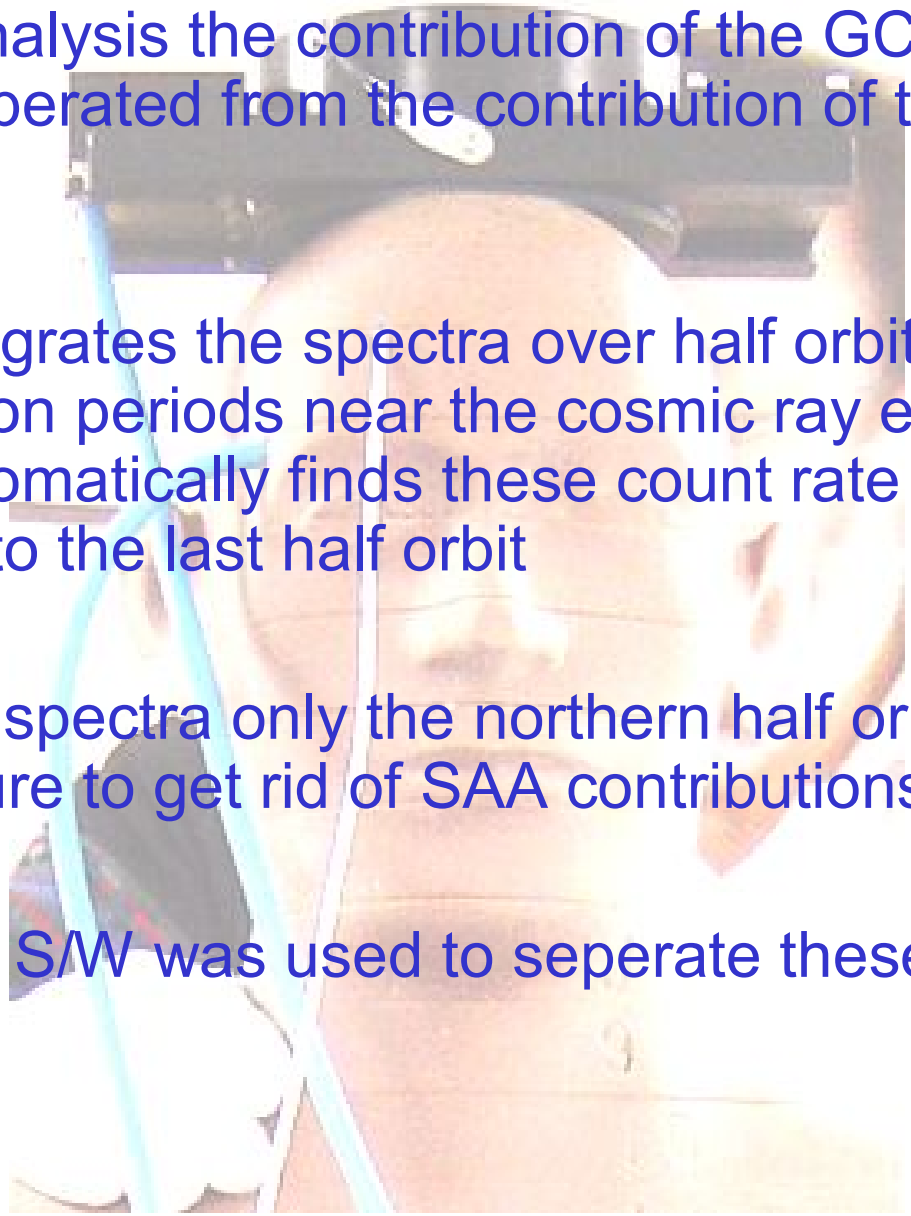
MATROSHKA DOSTEL
Data Analysis

- For further analysis the contribution of the GCR component should be seperated from the contribution of the SAA component

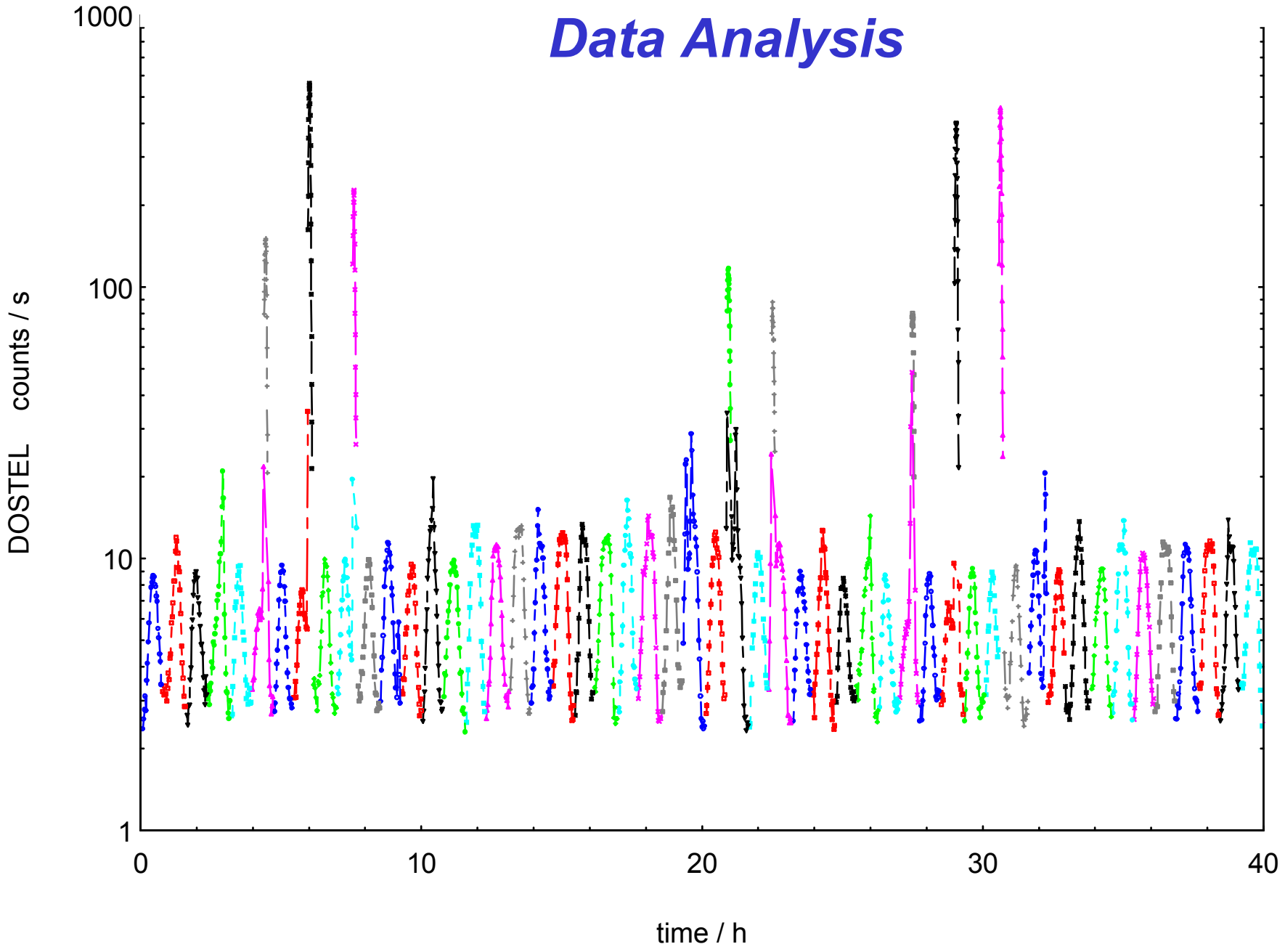
- DOSTEL integrates the spectra over half orbits starting new integration periods near the cosmic ray equator. DOSTEL automatically finds these count rate minima by comparision to the last half orbit

- For the GCR spectra only the northern half orbits where used to be sure to get rid of SAA contributions

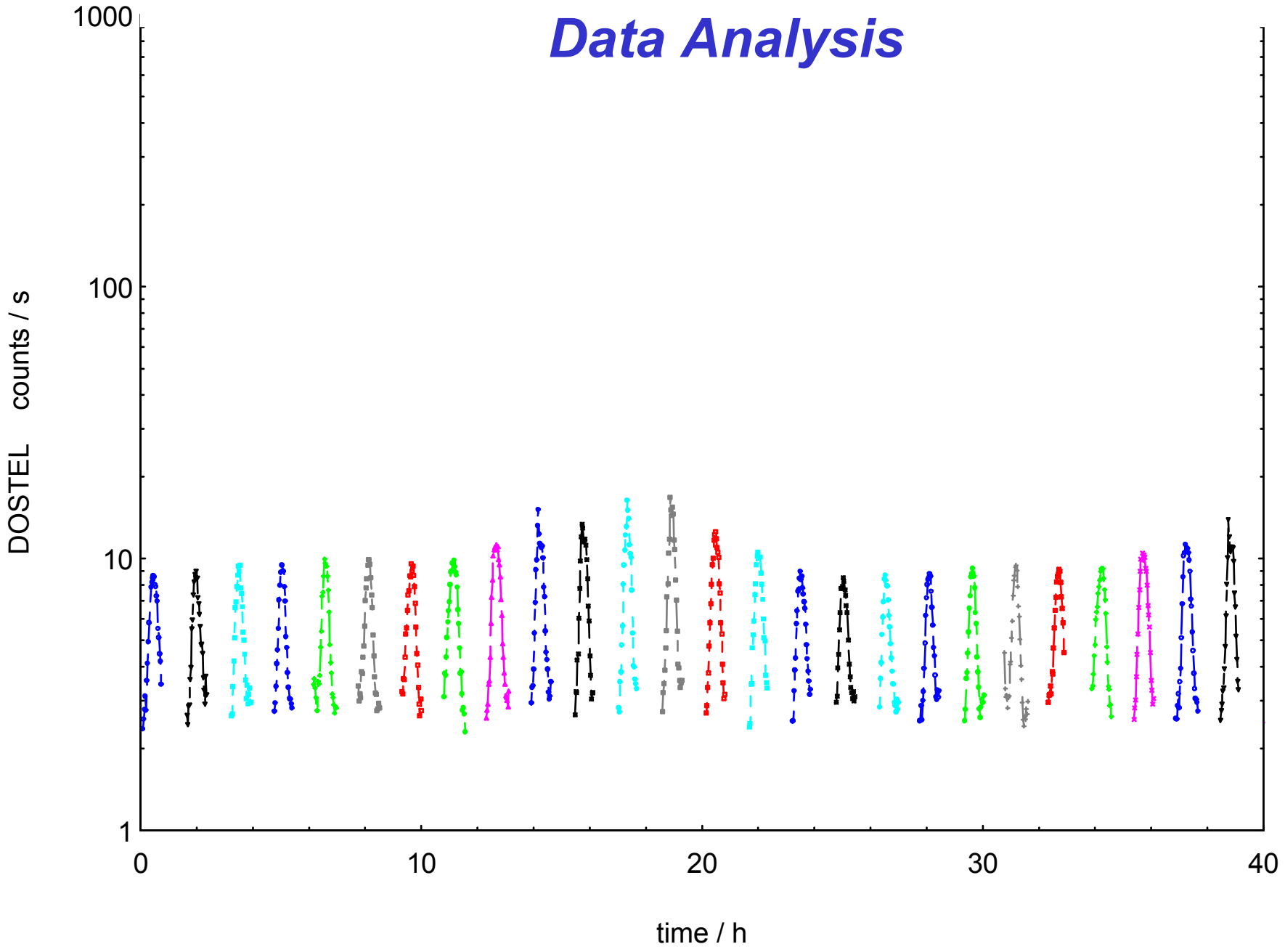
- An automatic S/W was used to seperate these northern half orbits



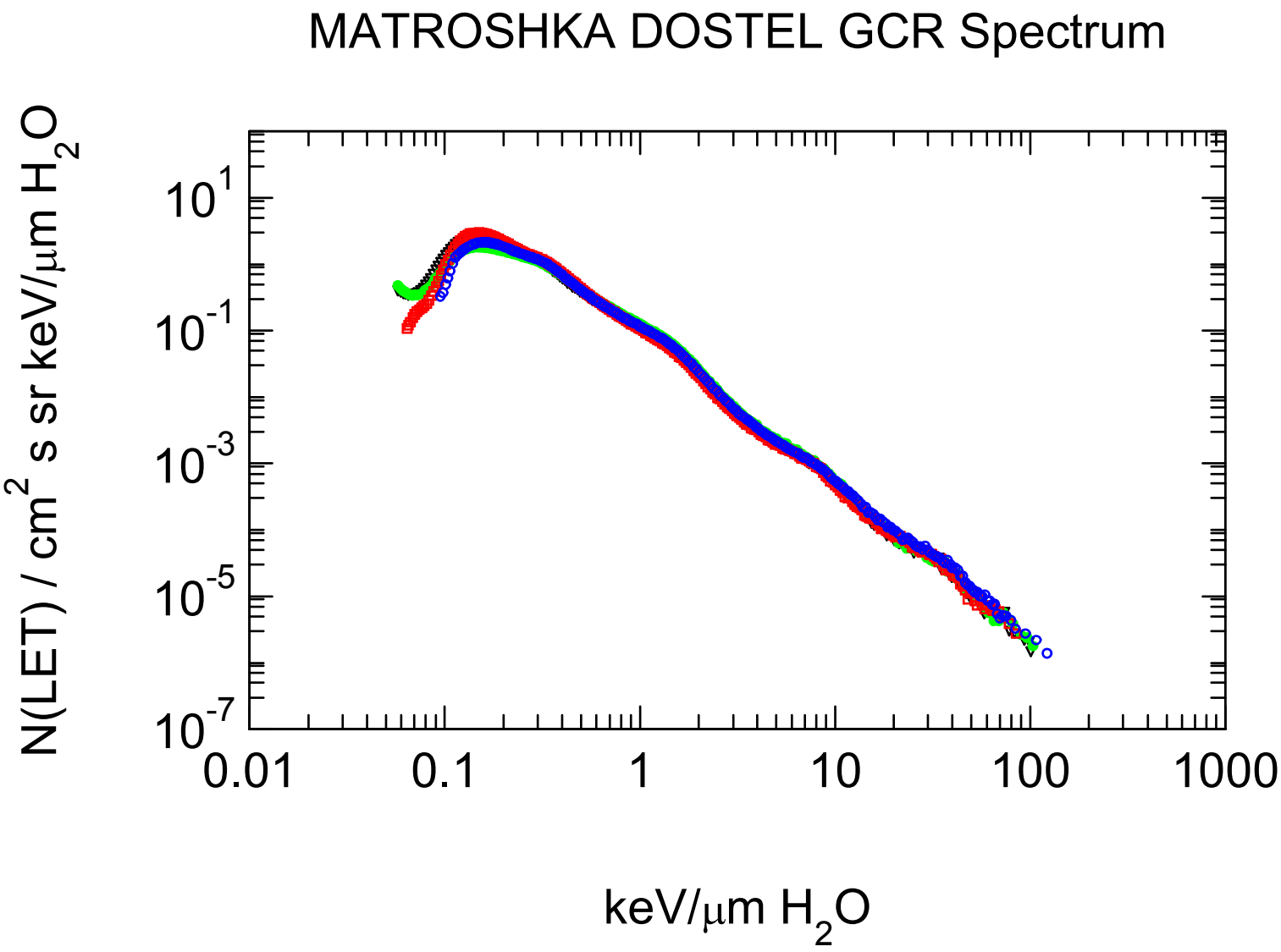
MATROSHKA DOSTEL
Data Analysis

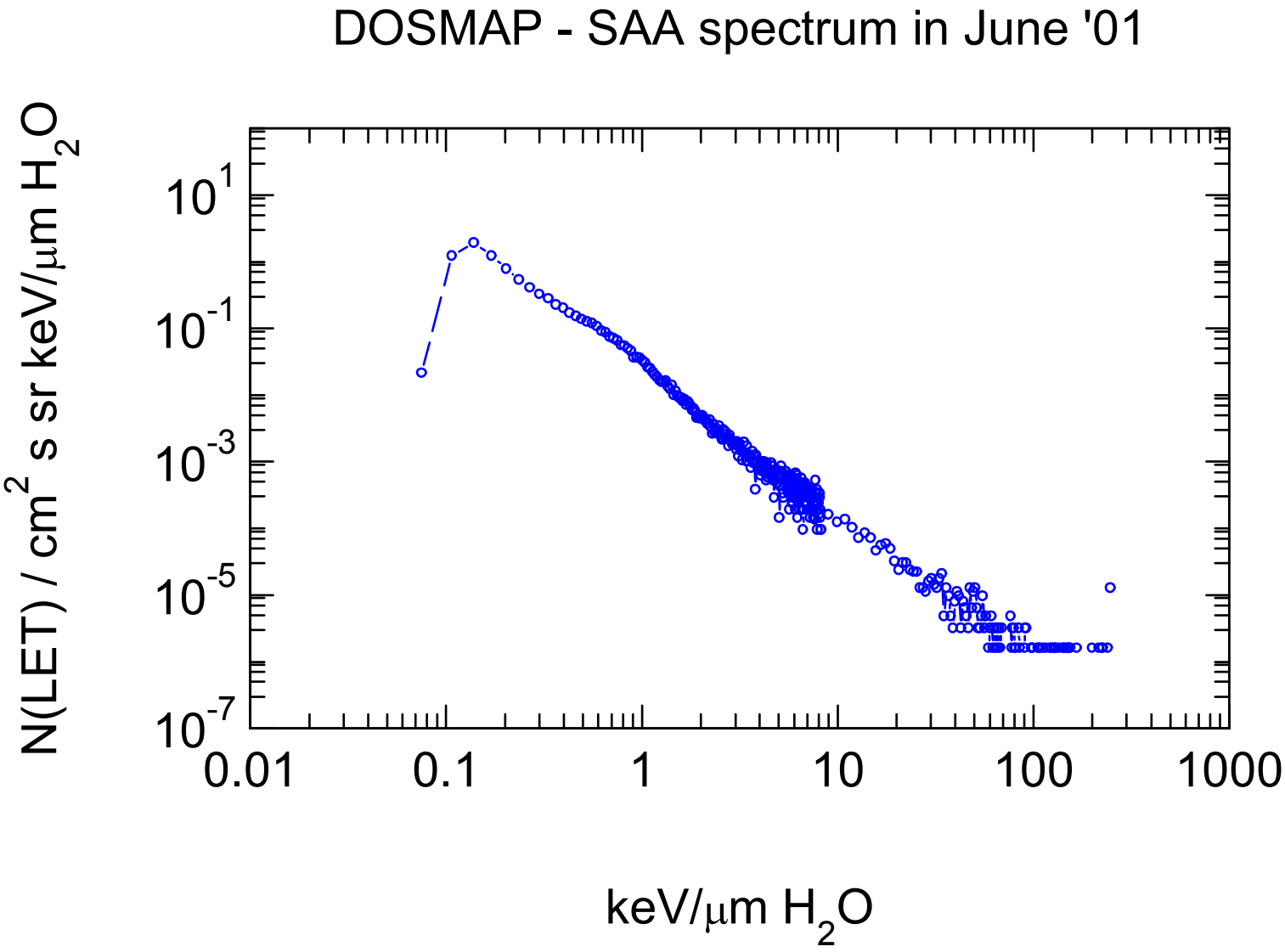


MATROSHKA DOSTEL
Data Analysis

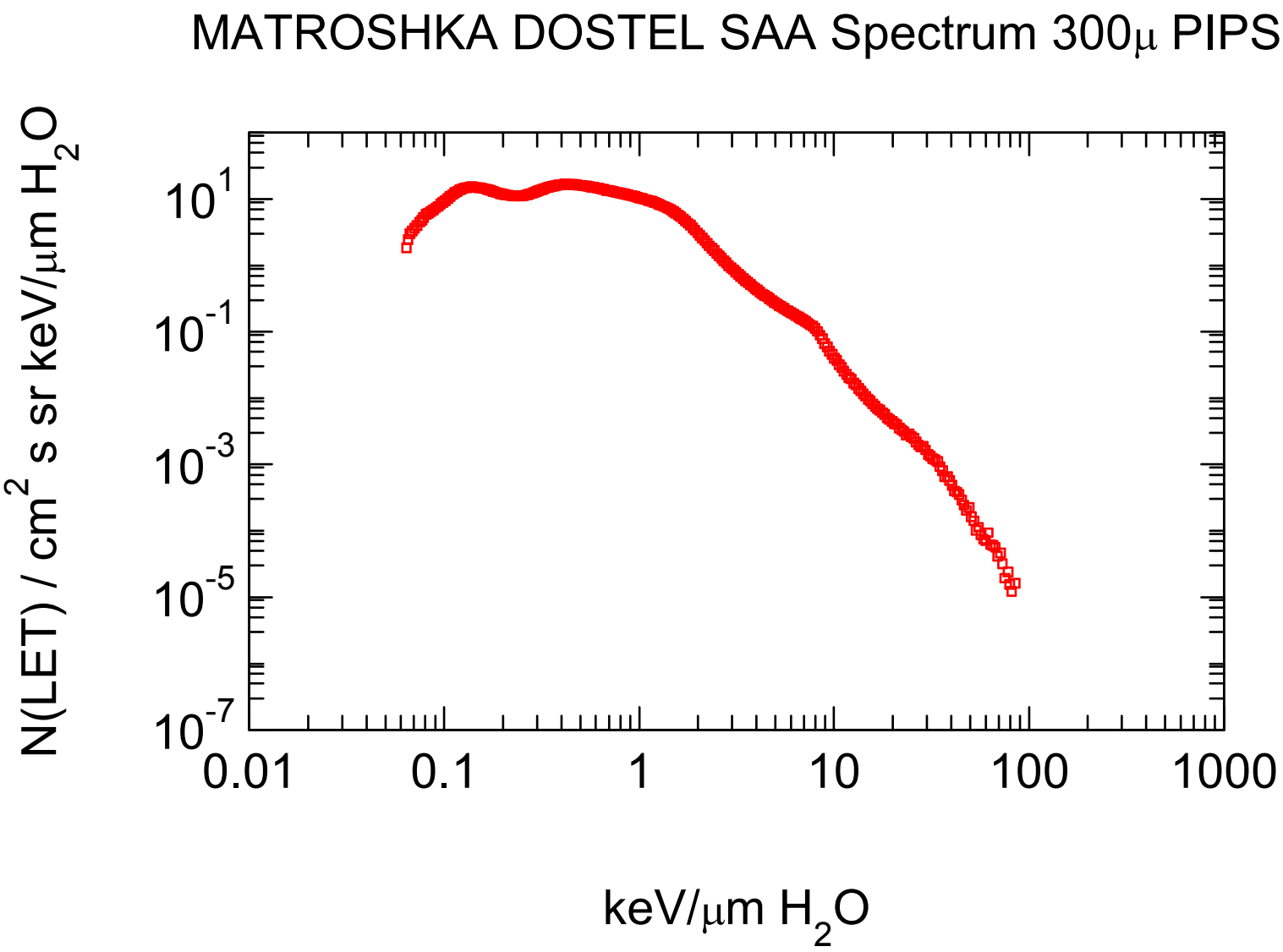


MATROSHKA DOSTEL
Data Analysis



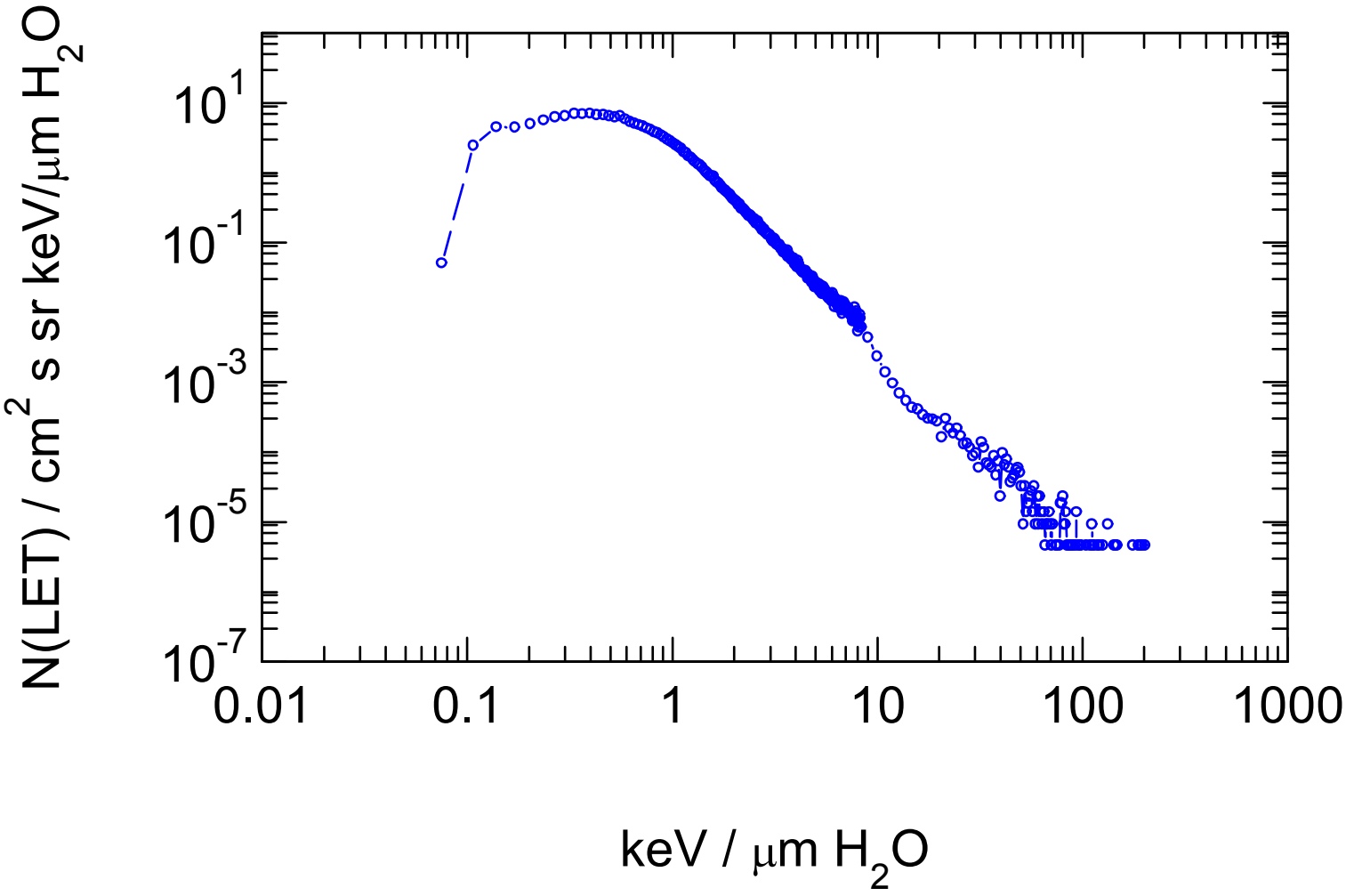

DOSMAP - SAA spectrum in June '01
N(LET) / cm2 s sr keV/µm H2O
10^1
10^-1
10^-3
10^-5
10^-7
0.01
0.1
1
10
100
1000
keV/µm H2O

MATROSHKA DOSTEL
Data Analysis



MATROSHKA DOSTEL
Data Analysis

DOSMAP SAA spectrum in June '01



MATROSHKA DOSTEL
Data Analysis

Average Dose Rate: $D = T^{-1} \int D(LET)\, dLET$

GCR component:

$\bar{D}$ = 221 µGy/d (in Si)

SAA component:

$\bar{D}$ = 201 µGy/d (in Si)

MATROSHKA DOSTEL
Data Analysis

Conversion from silicon to tissue dose:

$$D_{tissue} = 1.21 * D_{Si}$$

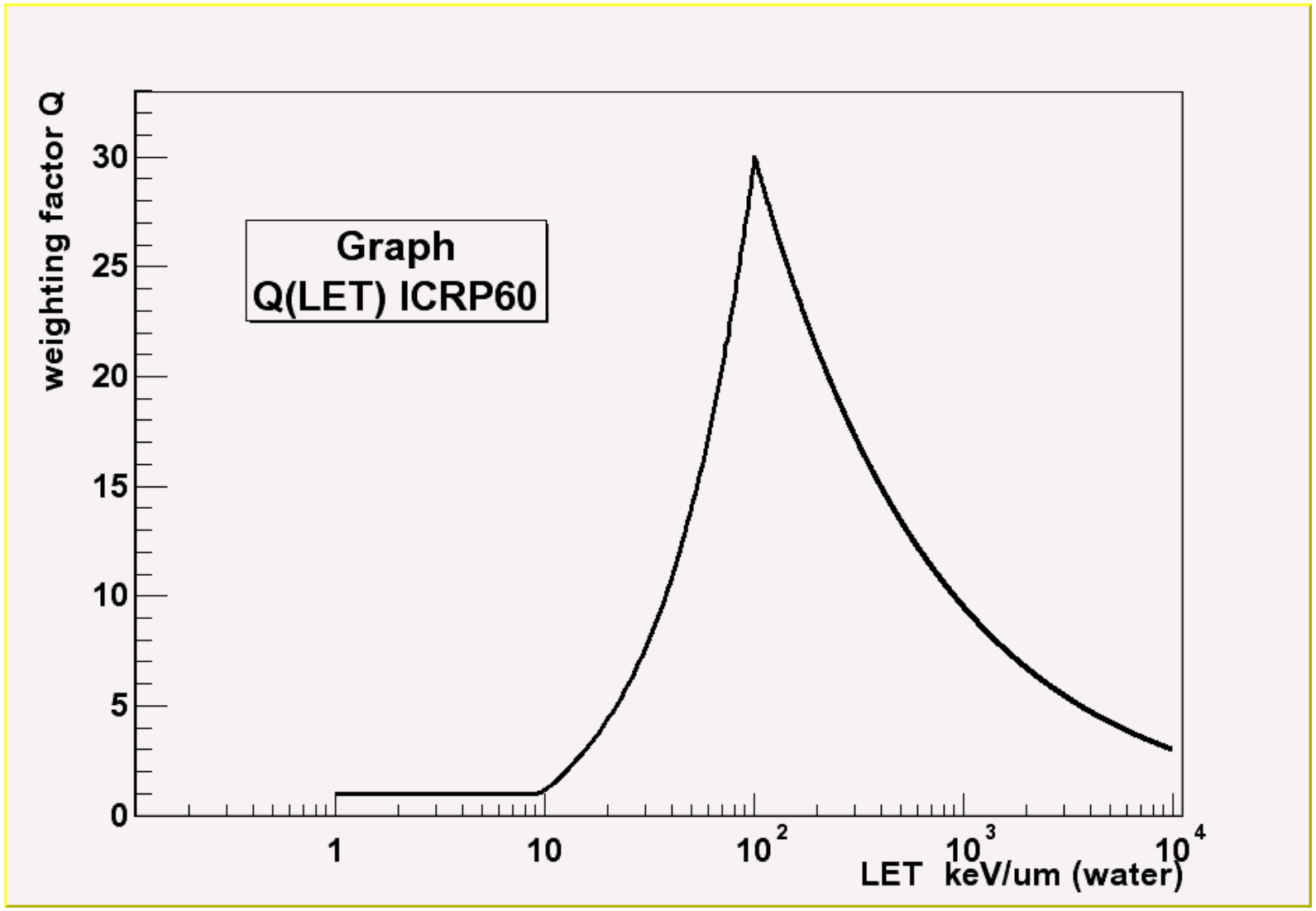
GCR component:

$\bar{D}$ = 267 µGy/d (in tissue)

SAA component:

$\bar{D}$ = 243 µGy/d (in tissue)

Mean Quality Factor



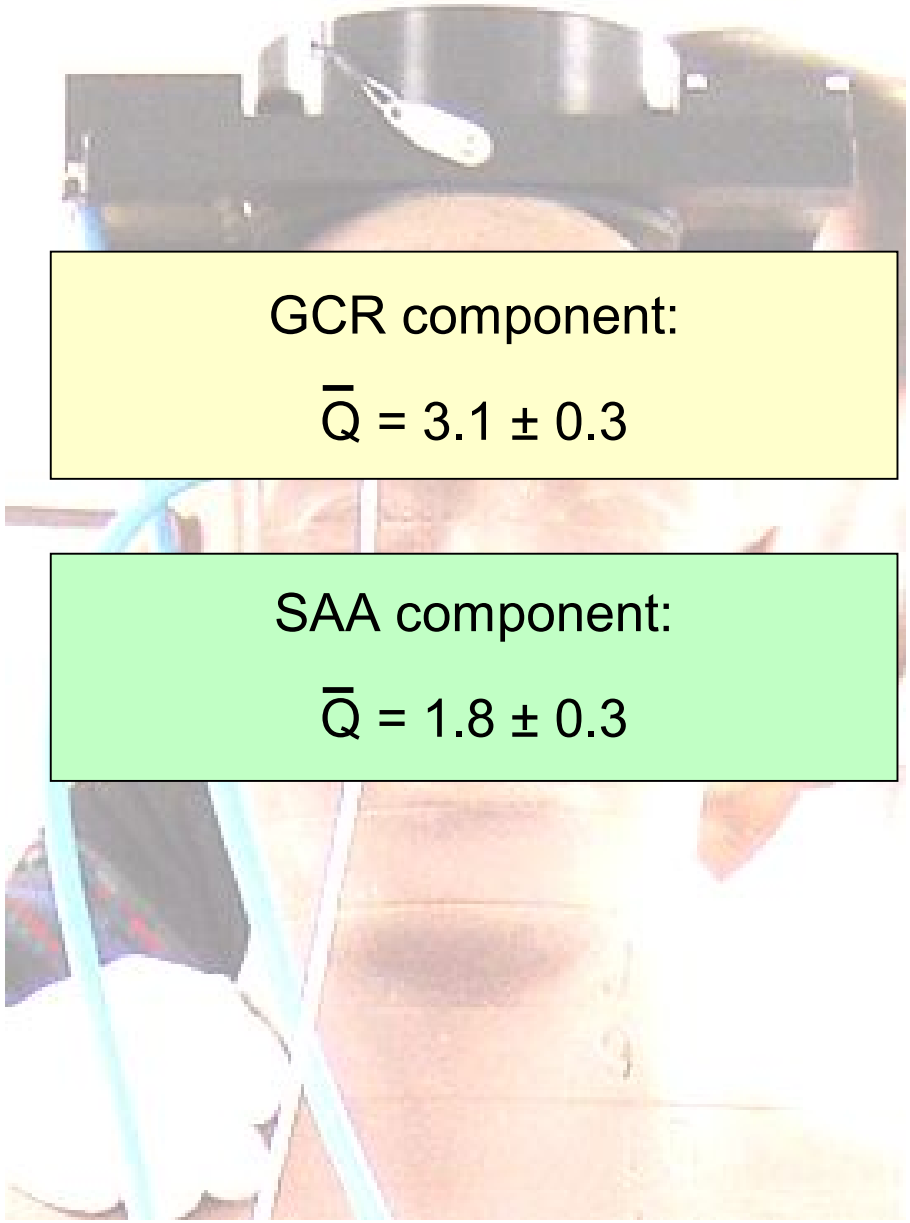
Mean Quality Factor

Total Dose: $D = \int D(LET)\, dLET$

Total Dose Equivalent: $H = \int D(LET)\, Q(LET)\, dLET$

Mean Quality Factor: $\bar{Q} = \frac{H}{D}$

Mean Quality Factor



GCR component:

$\bar{Q} = 3.1 \pm 0.3$

SAA component:

$\bar{Q} = 1.8 \pm 0.3$

Dose Equivalent

Dose Equivalent:

$H = \bar{Q} * D$

GCR component:

$\bar{D}$ = 828 µSv/d

SAA component:

$\bar{D}$ = 437 µSv/d

Dose Equivalent

GCR component:

$\bar{D}$ = 828 µSv/d

SAA component:

$\bar{D}$ = 437 µSv/d

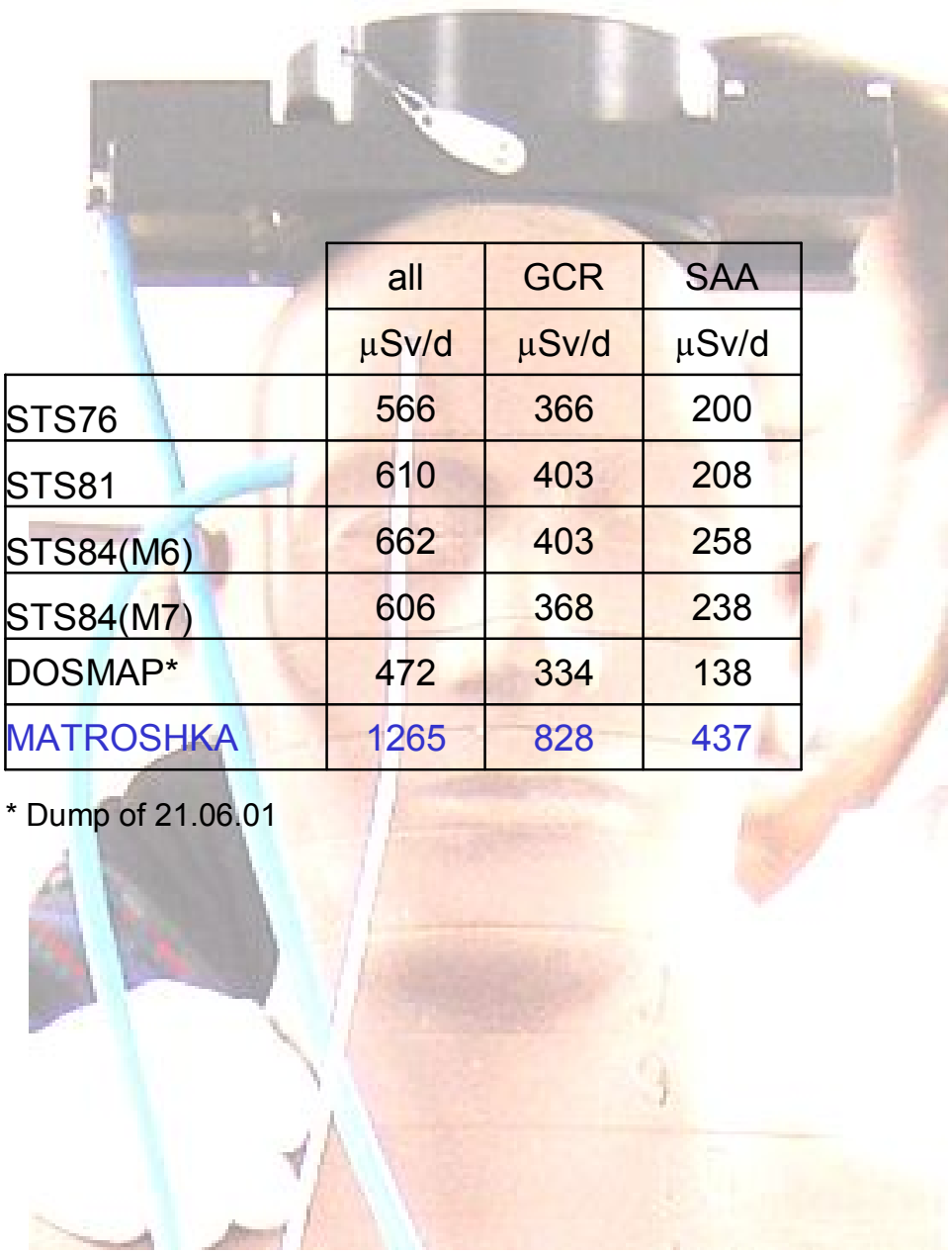
Average Dose Equivalent:

$\bar{D}$ = 1265 µSv/d

Comparison
DOSMAP ←→ MATROSHKA

GCR component: **D = 334 µSv/d**	GCR component: **$\overline{D}$ = 828 µSv/d**
SAA component: **D = 138 µSv/d**	SAA component: **$\overline{D}$ = 437 µSv/d**
Average Dose Equivalent: **$\overline{D}$ = 472 µSv/d**	Average Dose Equivalent: **$\overline{D}$ = 1265 µSv/d**

Other Comparison



	all	GCR	SAA
	µSv/d	µSv/d	µSv/d
STS76	566	366	200
STS81	610	403	208
STS84(M6)	662	403	258
STS84(M7)	606	368	238
DOSMAP*	472	334	138
MATROSHKA	1265	828	437

* Dump of 21.06.01

Acknowledgements

- Special Thanks to the ICCHIBAN Workinggroup and the HIMAC facility

- Many Thanks to ESA/ESTEC for their support

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- thank you very much for your attention!