DAILY DISTRIBUTION OF HIGH IONIZATION COSMIC RAY COMPONENT ON THE "DOCH-4M" TELESCOPE

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- **As a result of 5 year monitoring of high ionization cosmic ray component (25.07.01-08.02.06) on the vertical scintillation telescope "Doch-4M" with "living" time exposition more then 1200 days the large season variations were observed. Using the same material the daily variations of cosmic rays with tenfold specific ionization in telescope are studied. There are results both summary daily distribution of the events selected by the telescope for five years and so daily distributions selected by seasons and by special Jupiter version of its nature in the 3-month Jupiter opposition. Another kinds of selections concerning their daily distribution were analyzed too.**

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Introduction

After a hypothesis on new stable heavy hadrons existence in cosmic rays had been proposed [1] the first results on the discovery of new stable heavy charged particles (erzions) were obtained in 1999 on the telescope "DOCH-4" in MADI [2-5]. Later on to check for the discovery of new particles in cosmic rays the telescope was automated, modernized and was working as a computer-aided telescope "DOCH-4M" on the Kurchatov Institute territory from July 2001 to February 2006. So for five years of the telescope continuous work the richest amplitude data (about 5000000 events from CsI and NaI crystals with digital impulse form) were stored. This material was obtained from the charged high ionization cosmic ray component with summary "living" time T_{Σ} ~1220 days for the different arrival angles ($0°<\theta<60°$) from the vertical to South. For five years of the telescope continuous work in the modes mentioned above the daily [6-7] and the season variations of event counting in the range of high ionization registration were observed [9-12].

The installation and its operating modes

The telescope "DOCH-4M" construction (Fig. 1) is the same as the construction of telescope "DOCH-4" operated in MADI in 1999 [2-5]. This is a vertical coaxial scintillation telescope consisting of a thin CsI crystal (∅63x0,35 мм^2) above and a thick NaI crystal (∅150x100 мм^2) below. "DOCH-4M" is distinguished by a new automatic amplitude registration of CsI and NaI coincident signals by their digitalization. By the means of the built-in PC dual-channel AD converter (LA-n10) the sampled signals are output on PC.
In the following operating modes of "DOCH-4M" standard polystyrene plastic scintillation detectors were added to the dual-crystal telescope. Amplitudes in CsI and NaI crystals of the telescope are normalized on the amplitude of due muon signal (1m) set for the 10th converter channel by amplification.

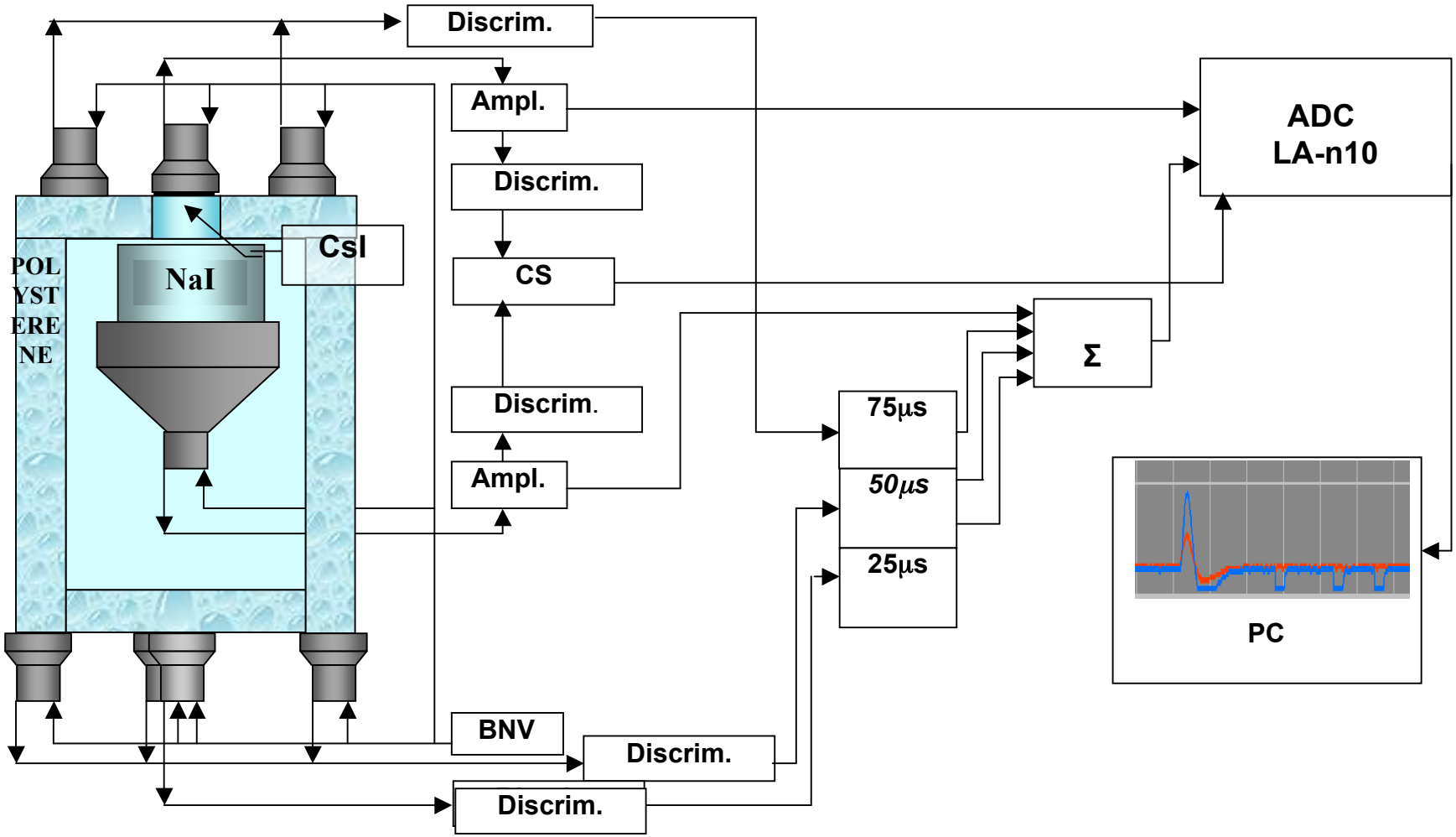

Fig. 1. The block scheme of the "DOCH-4M" installation

- At preliminary adjustment and at the subsequent regular control over telescope stability the spectrums of cosmic muon amplitudes in CsI and NaI crystals within the chosen area of channels of the amplitudes analyzer (AA) by their change by means of high supply voltage of a photomultipliers of corresponding crystals are removed.
- Besides the control over stability of CsI and NaI crystals work is provided by the constant control over the crystals intensities.
- For this purpose the discriminators thresholds were established at a level of 1,5 m on sharp part of the amplitudes spectrum of the crystals so that at 10% change of the crystals operating intensities to feel the change of its path amplification at a level of 3%.
- For every year long operation of installation the intensities changes in all registration channels were within the limits of several percents ($\Delta J/J<10$ %) and this is determined our stability level on the intensity with corresponding stability level on the amplitude - $\delta A = (\Delta A/A) < 3$ %.

Results

As for massive Erzions search we were interesting only in high signals amplitudes from CsI and NaI crystals caused by high ionized nonrelativistic charged particles at the collected data post processing the events with amplitude in both crystals exceeding ~ 10-fold amplitude of relativistic cosmic muons (10m) were selected.

Before we had obtained the statistically valid proof (7,3 σ) of the big season variations for the high ionized cosmic ray component with amplitude of A~30% [9-12] for all the period concerned (2001-2006).

But before that time we had obtained the first preliminary results on such strong (A~50%) daily variation of the high ionized cosmic ray component on the telescope "DOCH-4a" tilted on 18° [6-7] (Fig. 2).

As it seen from Fig. 2 for a half-year long telescope operation (25.07.01-11.01.02) with high statistics (4,3 σ) the event excess (108-53=55) were observed for the morning time (6:00–12:00) & evening time (18:00–24:00) compared to the daily & night time (53).

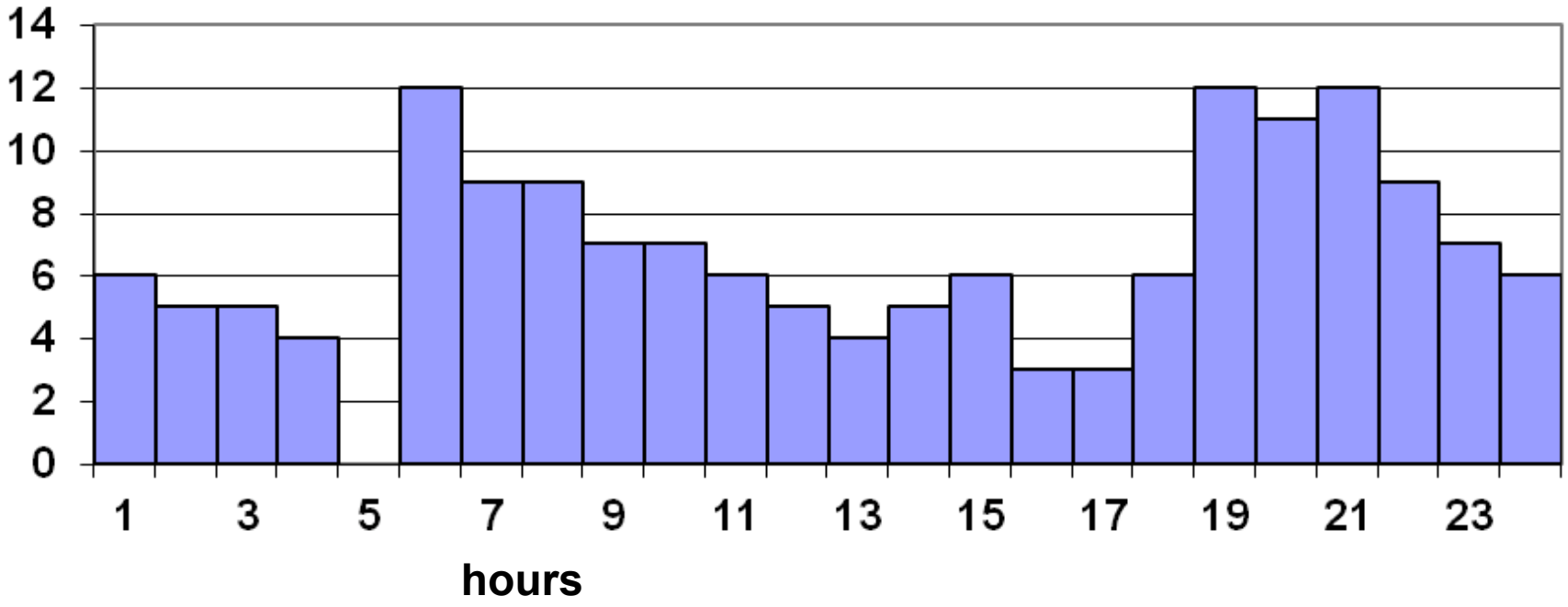

Fig. 2. Daily distribution of selected events (161) with 10m threshold obtained on the "DOCH-4a" for (25.07.01-11.01.02) by hours (T=143,8 days).

In this work to study the event excess nature both the time range of daily variations research for the whole period (2001 – 2006) and the range of various time selections were widened.

In Fig. 3 there is the summary daily distribution using hourly and 6-hourly intervals for this period.

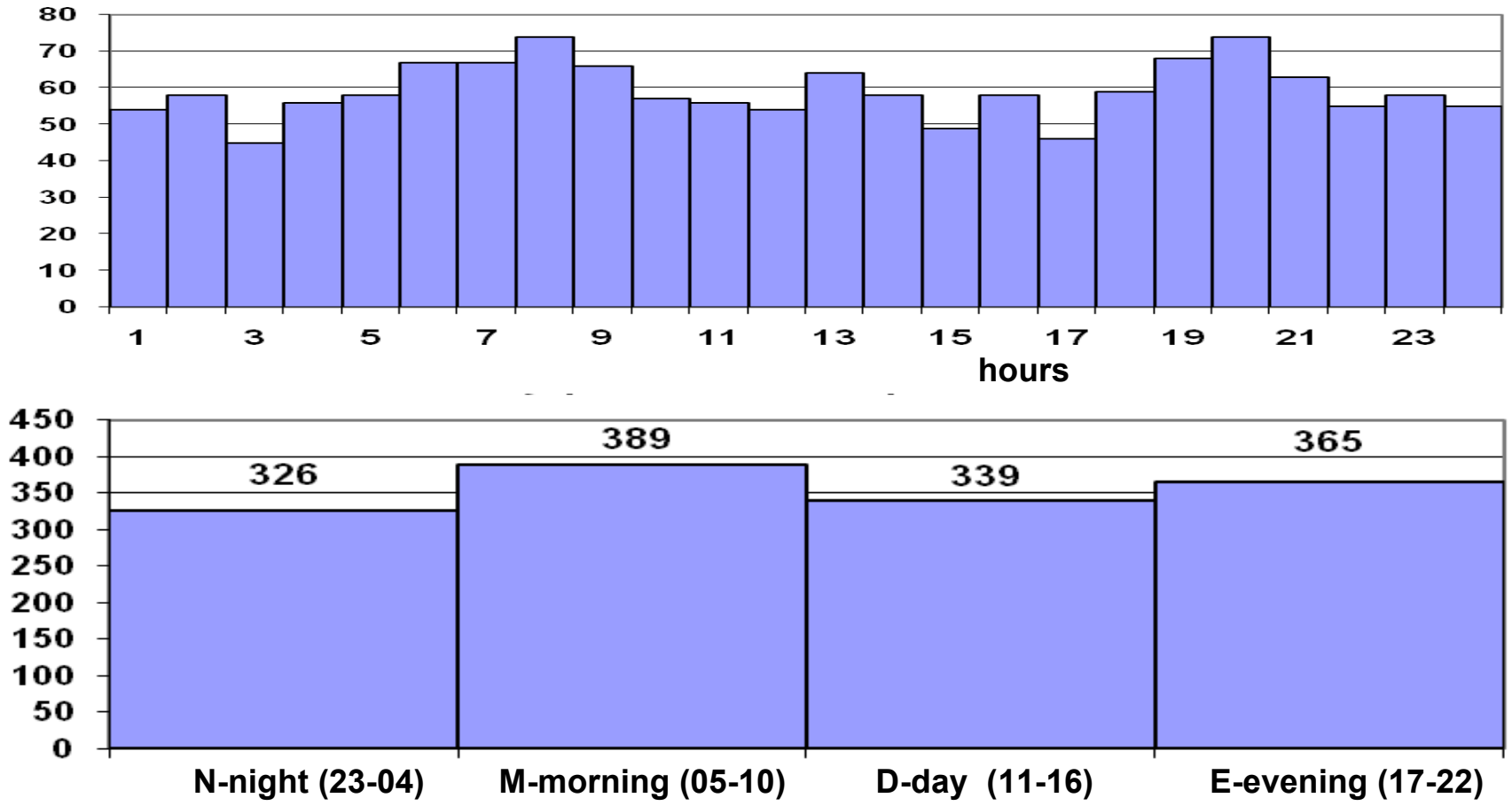

Fig. 3. Summary selected events with 10m threshold obtained on the "DOCH-4m" for 5 years operating (2001-2006) by seasons. Δ=(M+E)-(D+N)=(389+365)-(339+326)=(754-665)=(89 +/- 37.5) (1.9 σ)

As it seen from Fig. 3 there is small event excess in the morning & evening time compared to the daily & night time due to essential deficiency in statistics (1.9 σ).

To analyze the season cause of this excess the daily distributions for different seasons summarized by years of telescope work were built.

These distributions are presented in Fig. 4. Though there is no the statistically significant excess but there is a tendency of the events excess in spring in the morning peak and in autumn in the evening peak.

As the season variations of our events gave the essential intensity increase in spring during 2001-2005 (just Jupiter was in opposition at that time) the events for three months of Jupiter-Earth opposition with one-month advance of this period were selected to analyze the daily distributions (Fig. 5).

From the results of daily distribution it is seen that there is the statistically significant excess (3,5 σ) of events in the morning and in the evening intervals over the night and the day ones.

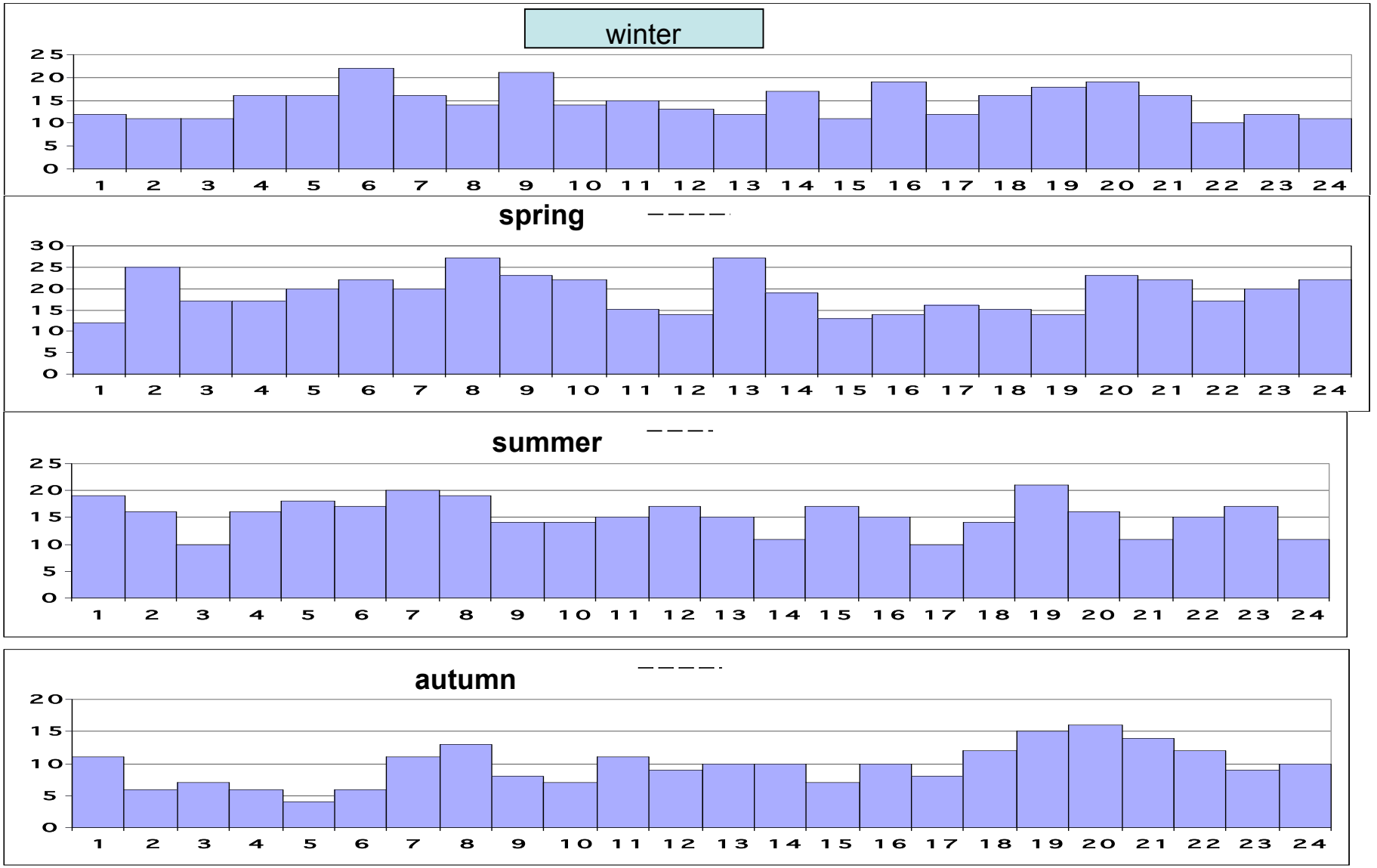

Fig. 4. Summary selected hourly events with 10m threshold obtained on the "DOCH-4m" for 5 years operating (2001-2006) by seasons.

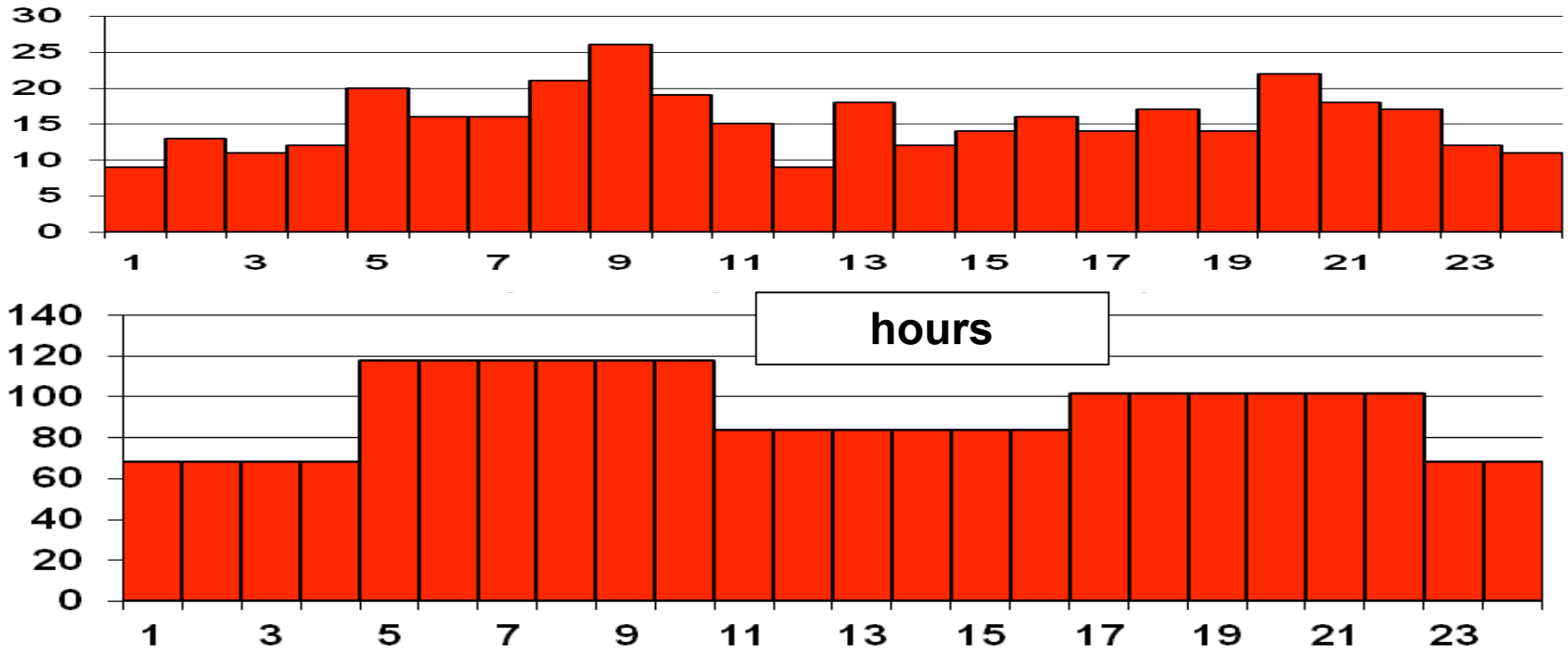

Fig. 5. Summary daily events selected with 10m threshold on the "DOCH-4m" by 3-months Jupiter-Earth opposition with one-month advance every year from Nov 2001 – Jan 2002 to Feb – Apr 2005.
Δ=(M+E)-(D+N)=(118+102)-(84+68)=(220-152)=(68 +/- 19.3) (3.5 σ)

For supplemental check of the Jupiter version for the events unselected the daily distributions were built as well.

These distributions are in Fig. 6 and they confirm the Jupiter version and the absence of the statistically significant excess of the morning and evening events.

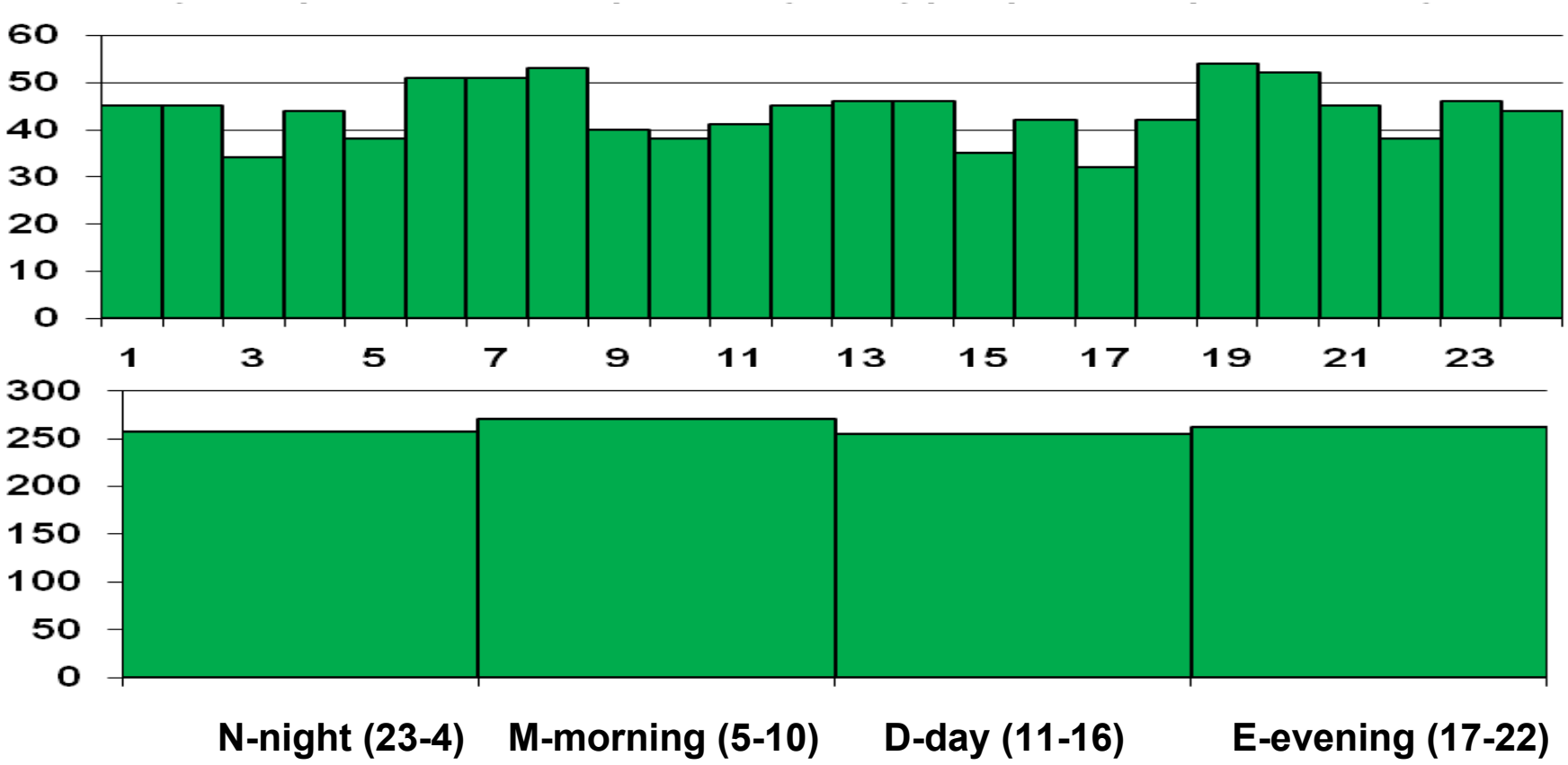

Fig. 6. Summary daily events selected with 10m threshold on the "DOCH- 4m" excluding the events of 3-months Jupiter-Earth opposition with one-month advance every year from Nov 2001 – Jan 2002 to Feb – Apr 2005.
Δ=(M+E)-(D+N)=(271+263)-(255+258)=(534-513)=(21 +/- 32.4) (0.15 σ)

Conclusions

- **The analysis result shows that for daily distribution of selected events for different time samplings there is a statistically significant (3,5 σ) excess of morning and evening events by using the Jupiter version.**
- **Coupled with the previous big season variations of the selected events not fitting in any orthodox cosmic ray theory the new results give us a new indirect confirmation of their Erzion nature of Sun, Jupiter or galactic origin from Virgin [8].**
- **To confirm this version finally it is necessary to widen the research at the similar and higher aperture telescopes in the different latitudes nearer to equator.**
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Acknowledgements

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