GRAVITATIONAL WAVE TRACK IN THE EARTH'S ELECTROMAGNETIC FIELD

L.V. Grunskaya, V.V. Dorochzkov, V.V. Isakevich

Vladimir State University, Vladimir, Russia
grunsk-m2@vpti.vladimir.su

ABSTRACT. At present the idea of the extracting of the frequencies in the earth's electromagnetic field spectra corresponding to the gravitational radiation frequencies of the double star systems is based equally with the traditional approaches to solve the task of gravitational wave fields recording. In the theoretical plan of this task solving the known possible mechanisms of the electromagnetic fields of the ELF range in the Earth-ionosphere cavity being affected with the gravitational wave radiation of the astrophysical source were analyzed and the two-level model of the excitation oscillations in the near by earth's layer with the gravitational wave field is suggested. The catalogues of the spectra allowing to extract the frequencies associated with the global geodynamic processes and to analyze the type of the spectrum near by the frequencies of the astrophysical sources are arisen from the long- term continuos records of the earth's electromagnetic field with the multiple-response receiving complex of 1997 and 1998 enlisting the correlation and spectral analyses methods and the up-to-date ones of the simulation of the non-linear dynamical processes. The addition of the known methods of the direct recording of the gravitational wave radiation of the astrophysical objects to the suggested electromagnetic phenomena are very useful on account of the theoretically predicted low intensity gravitational wave radiation for the solving of the fundamental problem of the modern physics- the gravitational wave detection.

Key words: Gravitational wave, Electromagnetic field.

Intoduction

There has been realizing experimental investigation s of the Earth electromagnetic field in the ELF range (below 30 Hz) at the Department of Physics in the Vladimir State University since 1972. The ELF range electromagnetic fields are used for the investigation of ionosphere, magnetosphere, underground and underwater radio connection. The experimental results of the long-term watching of the Earth field can be used for the electromagnetic spectrum analysis near by the gravitational wave radiation frequencies of the binary star systems with the ELF radiation. Among the models of the electrical variations excitation in the Earth surface layer by the gravitational wave field one can extract the following model: a gravitational wave effects the Earth's crust and excitates ELF mechanical variations in it. These variations are passed to the Earth electrical field. The own frequencies of the Earth mechanical variations coincide with the gravitational wave radiation range of the binary star systems.

Recording Complex

The work provides using of broad possibilities of the unique experimental Vladimir University's base for making fundamental physical researches. The measuring ELF range complex consists of the surface and underground receiving channels located on the area of 4 hectares. The level of the measured fields is from $0,1mV/m$ to $100V/m$. The calibration system provides reliable functioning of the receiving complex. Recording of the Earth field electrical component is carried out synchronously in the continuous mode by all channels. The complex allows to record ELF range signals with some background interference to get daily and seasonal fluctuation, the law of the ELF range field distribution. Meteorological parameters are measured in the same way. The results are recorded by an electronic computer.

Experimental Data Processing

The received spectra analysis was done according to 3 directions. The first is the frequency analysis of the daily Earth rotation and harmonics of this frequency. The second is the analysis of the tide phenomena on the Earth which frequency display is in the ELF range. And the last is the frequency analysis of the gravitational wave radiation of the binary star systems.

Arising from continuous recordings of the electrical component of the Earth field with correlative and spec-

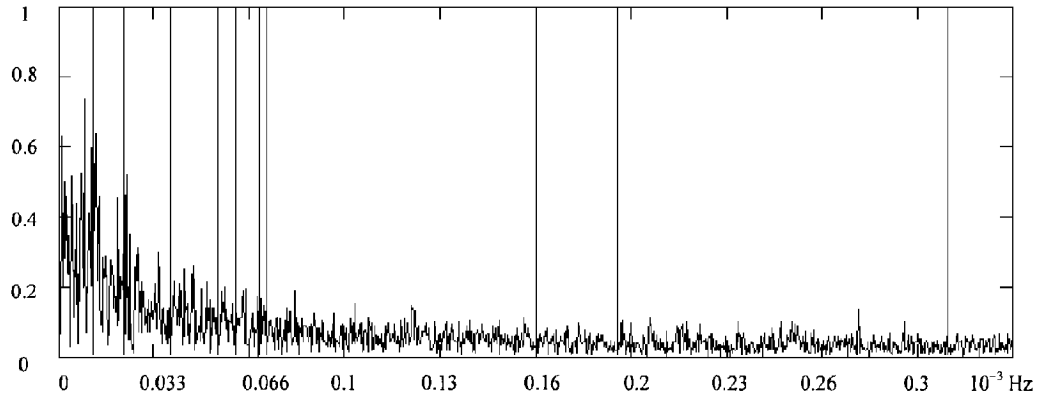

Figure 1: Common spectrum

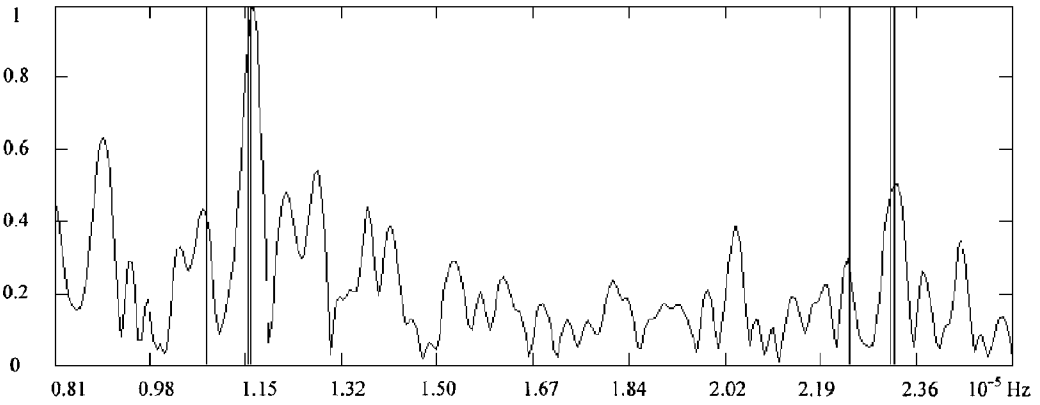

Figure 2: Tide effects' spectrum

tral analysis, the spectra- catalogues have been got allowing to extract frequencies connected with the global geodynamic processes and astrophysical sources frequencies. The duration of the continuous recording for two months in 1998 and a month in 1997 allows to get resolving according at a frequency $10 - 7Hz$. The total spectrum in the radiation range of the binary star systems is given in the fig.1 (lines show the frequencies of the sources). The total spectrum in the range of the tide phenomena is given in the fig.2 (lines show the tide frequencies). The harmonics of the Earth rotation frequency was extract up to ten members based on experimental results. Seven tide waves were analyzed and the closest spectral components according to the experiments of 1997 and 1998 were extracted. The spectra catalogues allowed to evaluate a probability of the pseudoalarm. The probability of the pseudoalarm of the tide effects is $0,07\%$. The probability of the pseudoalarm of the diurnal Earth rotation frequency is $0,1\%$. The probability of the pseudoalarm of the binary star systems frequencies is 8% in 1998. According to the results for tow years (1997 and 1998) could show the repetition of the signals near by the frequencies of the sources $J1012+5307, J1915+1606, J0024-7204J$. At present only the base of these investigations was done but preliminary results are optimistically enough.

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