УДК 537.591 **Dr. sc. V.F. Sokurov**

DISTRIBUTION VLF OF RADIATION IN GROUND LAYER

Relativistic particles create ионизационный a column with time of a life about(near) 10^{-3} s [3] at movement through an atmosphere of the Earth.

The regular vertically directed component of intensity of an electric field of the Earth creates an electric current in a column of ionization due to acceleration of ions of nitrogen and oxygen. The density of a current is defined under the formula:

$$j = \frac{e^2 En}{2M} t,$$

e - a charge e^-; E - the potential enclosed to an ionic column; M - weight of an ion; n - concentration of plasma in a column of ionization;

t - time of a life of a column.

Current of ions in a column of ionization:

$$I_э = \int \frac{e^2 Ent}{2M} \pi r dr \; I_э = \int \frac{e^2 Ent}{2M} \pi r dr,$$

r - distance from an axis of a downpour.

Concentration of plasma in a column of ionization is defined by spatial distribution of particles EAS[4]:

$$n = I \int_0^T f(x,t,\theta) dx,$$

I - factor of linear ionization (I = 80 sm $^{-1}$) [4]; f (x) - function of spatial distribution of particles EAS (FSD); t - depth of an atmosphere; θ - an antiaircraft corner of a downpour.

Function of spatial distribution [2]:

$$f(x,t,\theta) = \frac{1}{2\pi r_0^2} \frac{(1+x)^{1-b}}{\lambda + x} N(E_0, t, \theta),$$

Where N - full number of particles at a level of supervision [3]. The plasma cord with a current represents the elementary vibrator.

The data of researches of the centers молниевых the categories located at coast of Africa [5] have been analysed.

Experimentally measured functions (dependences of amplitude on frequency for various distances) have been transformed into functions of dependence of amplitude from distance for various frequencies.

Thus smooth curves are received. The received smooth curves are well approximated by parametrical expression:

$$B(X) = \frac{K}{(1+X)^l\,(1+X)^b}.$$

Calculations have shown, that by optimization of four parameters (To, b, l, D_0) two of them, l and D_0, poorly influence change of function. Therefore they have been fixed with values l = 1,5 and D_0 = 2000. Approximations for two other parameters have been received:

$$b(f) = (11{,}0 \pm 0{,}6)e^{(6{,}8\pm0{,}4)10\left(1-\frac{lgf+92{,}6}{92{,}9}+\frac{\ln(lgf+92{,}6)}{92{,}9}\right)}$$

$$K(f) = (114{,}0 \pm 6{,}0)e^{(4{,}3\pm0{,}2)10\left(1-\frac{lgf+92{,}6}{93{,}3}+\frac{\ln(lgf+92{,}6)}{93{,}3}\right)}$$

Thus, in an analytical kind function of distribution for two parameters - and frequencies can be presented distances [5]:

$$B(f,D) = \frac{K(f)}{(1{,}5+X)^l\,(1+X)^{b(f)}},\ x = D/D_0;\ D_0 = 2000.$$

The adjustment multiplier has been entered.

$$K(f) = 8{,}5e^{-2{,}1\cdot 10\cdot\left(1-\frac{lgf+50}{50{,}6}+\frac{\ln(lgf+50)}{50{,}6}\right)}.$$

Then integrated function of distribution VLF-излучения will look like:

B''(f,D)=K(f)B(f,D).

Results of modelling have allowed to interpret the data received at registration атмосфериков in a VLF-range.

The primary power spectrum has been incorporated in mathematical model. It has allowed simultaneously at selection of amplitudes атмосфериков to fix energy of the primary particle generated the given signal.

The factor of communication(connection) between intensity of an electric field атмосфериков and energy of space beams has been found:

$$E_0 = 2{,}35 \cdot E^{0{,}71} eV \ .$$

In a result the power spectrum of primary particles is received.

Conclusion: in a considered(an examined) dynamic range than 10000 km are possible to carry out Reception of VLF-pulses on distance more. Hence, space beams с primary energy $E_0 > 10^{18}$eV can be.

Are registered at hit of a primary particle in any point of a surface of the Earth.

The literature

1. Suga K., Kakimoto F., Nishi K. Radio Signals from very Large Showers. Proc. 19th ICCR, 1985, v. 7, p. 268-271.

2.Гусев А. Н., Сокуров В. Ф., Черныш Г. Н. Моделирование потока электромагнитного излучения ОНЧ диапазона в высоких широтах. В кн.: VII школа -семинар по ОНЧ излучениям. Якутск: изд. ЯФ СО АП СССР, 1985, с.

3. Сокуров В.Ф. Экспериментальные исследования радиационных процессов в атмосфере Земли. Москва."Международный журнал экспериментального образования" №9 2011, стр. 56-57.

4.Сокуров В.Ф. Поля и частицы. Монография. Таганрог. Изд. ТГПИ.2011.196 с.

5. Sokurov V.F. Space radiation in an atmosphere and circumter raneous space. «LAP LAMBERT AcademicPublishing», Германия. 2012. 265 с.