Microwave Radiation of the Earth Atmosphere, Induced by Pulsed Gamma Source

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The response of atmosphere to external action has consistently attracted the attention of researchers [1]. This is important both in terms of fundamental properties of the Earth's atmosphere, and for various applications. This is especially important for the future protection of state borders in the reception and decoding of modulated radio GPS connection, the distortion which can be attributed to a number of atmospheric phenomena. There are solar flares and their accompanying magnetic storms, bursts of cosmic gamma rays, space nuclear explosions, turbulent and convective perturbations of the upper atmosphere. For example, during the magnetic storms are intense emissions of electrons, which pass through the atmosphere and can cause damage to the electron-electron devices for power lines. We consider the generation of microwave radiation in the atmosphere induced by pulsed gamma point source (with a pulse duration of 100 ns) that is formed as a result of local explosion at the altitude $h = 0 \div 100$ km and emits 10^{22} photons with the energy $E_\gamma \cong 1 \div 3$ MeV. Due to the interaction of photons emitted to the atmosphere are formed of highly excited atoms and molecules, which emit in the long-wavelength microwave range. The amplitudes of the electric field components and the streams of microwave radiation (in a given range depending on the source and the receiver) are determined. The following results we represent in the Table, where the dependences of the intensities I, electric component amplitudes $E_{\max}$, and radiation beams on the source height $h = 20000$ км $j_r^{(a)}$ and at the Earth surface $j_r^{(b)}$ are given.

Table 1. Dependences of the intensities, electric component amplitudes, and radiation beams on the source height

h, км	I, Вт	E_{max}, В/м	$j_r^{(a)}$, Вт/м^2	$j_r^{(b)}$, Вт/м^2
0	1.7(-2)	6.2(-1)	6.4(-18)	4.3(-8)
10	1.0(-2)	4.8(-1)	3.8(-18)	1.5(-11)
20	5.3(-3)	3.5(-1)	2.0(-18)	2.0(-12)
30	4.6(-3)	3.2(-1)	1.7 (-18)	7.6 (-13)
40	4.0(-3)	3.0(-1)	1.5(-18)	3.6 (-13)
50	3.2(-3)	2.7(-1)	1.2(-18)	1.9 (-13)
60	2.8(-3)	2.5(-1)	1.1(-18)	1.2 (-13)
70	4.3(-4)	3.1(-1)	1.6(-18)	1.3 (-13)
80	6.3(-4)	3.7(-1)	2.3(-18)	1.5 (-13)
90	5.6(-4)	3.5(-1)	2.1(-18)	1.0 (-13)
100	4.3(-4)	3.1(-1)	1.6(-18)	6.5(-14)

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1. Fedorov V.F., Semenonova, T.A. Microwave bremsstrahlung on the surface of the Earth from cosmic sources of gamma radiation. Engineering. Physics **4**(80), 80-83 (2000)