

**Estimate of change of an electric field strength on the extremities of the
superlong conducting hairlines used for initiation of lightnings**
Lightning Detection Technologies

A.Kh.Adzhiev, I.Kh. Mashukov, Kh.Kh.Mashukov

RosHydromet, Federal State Budgetary Institution «High-mountain Geophysical
Institute», Russia, 360030, Nalchik, Lenina st., 2, hazret53@rambler.ru

Methods of the active actions (AA) on clouds for the purpose of change of rainfall intensity, preventing of falling of the hailstones, adjustment of an electrical state of clouds are known. These methods in the core base on depositing in clouds of various chemical compounds. But at the same time, practical AA for the purpose of adjustment of electrical activity of thunderstorm clouds had no sufficient evolution, and there are in a phase of research works now. The expedient of initiation of lightnings by depositing in a cloud at certain altitude, by means of modernized antihailstones rockets, the superlong conducting threads gained by metal spraying on kevlar is used also.

Let's view a problem about electric field magnification on the extremities of the electro-conducting threads (ECT), being in the exterior electric field created by an electrical charge of a cloud. Guessing this field uniform, it is possible to demonstrate that if ECT to approximate an ellipsoid of revolution the electric field strength on spin axis E_{1z} is related to intensity of exterior electric field E_z a relation:

$$E_{1z} = E_z \frac{2e^3 \frac{a}{|z|}}{\left(\ln \frac{1+e}{1-e} - 2e\right) \cdot \left(\frac{z^2}{a^2} - e^2\right)}, e = \sqrt{1 - \frac{b^2}{a^2}} \quad (1)$$

For ellipsoid strongly drawn out along a major axis ($b \ll a$) it is had instead of (1) approximate expression:

$$E_{1z} = E_z \frac{\frac{a}{|z|}}{\left(\ln \frac{2a}{b} - 1\right) \cdot \left(\frac{z^2}{a^2} - 1 + \frac{b^2}{a^2}\right)} \quad (2)$$

Let's view this expression at z , close to extremities ECT. Let $z = a(1 + \varepsilon)$, $\varepsilon \ll 1$. Substituting this expression in (2), we will gain:

$$E_{1z} = E_z \frac{1}{\left(\ln \frac{2a}{b} - 1\right) \cdot \left(2\varepsilon + \frac{b^2}{a^2}\right)} \quad (3)$$

The estimate of the member b^2/a^2 entering in a denominator of expression (3) at $b = 0,12$ mm and length of a major axis a , equal 50 m, 100 m, 200 m, 500 m, 1000 m, yield quantities $5,76 \times 10^{-12}$; $4,4 \times 10^{-12}$; $3,6 \times 10^{-13}$; $5,76 \times 10^{-14}$; $1,44 \times 10^{-14}$. Therefore, if $\varepsilon = 0$ enormous quantities of magnification of a field near to extremities ECT $\approx 10^{12} - 10^{13}$ are gained. Such magnification of a field should be hindered by a corona discharge which one can originate on extremities ECT.

The carried out calculations by formula (4) have demonstrated that at changes of length ECT from 10 m to 1000 m the field intensity can be boosted at $10^3 - 10^4$ times near to the ellipsoid extremities. There of near of ECT there will be the requirements indispensable for initiation lightning discharge.

Thus, we come to a conclusion that superlong electro-conducting threads (ECT), introduced to a cloud at certain level at the applicable phase of evolution, can minister "provocateurs" artificial lightning discharges.