

**EXPLORATION OF EMISSION OF RADIO
WAVES FOR MEANS OF COMMUNICATION AND CONTROL OF
UNMANNED AERIAL VEHICLES**

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**ДОСЛІДЖЕННЯ ПОШИРЕННЯ РАДІОХВИЛЬ ДЛЯ
ЗАСОБІВ ЗВ'ЯЗКУ БЕЗПІЛОТНИХ АВІАЦІЙНИХ СИСТЕМ**

В статті досліджено поширення радіохвиль в реальних умовах для тропосферної і земної хвиль в залежності від напрямку, стану середовища, відстані та потужності випромінювача для вирішення задач перехоплення бпла. Знайдено найбільш раціональні способи розрахунку поширення радіохвиль.

There are many different methods of prognostication of the emission of radio waves, but most of them are easy, but not accurate or accurate, but too difficult. In addition, the complexity is that conditions of emission of tropospheric and terrestrial waves differ.

So, the purpose of work was to explore emission of radio waves in real conditions for tropospheric and terrestrial waves depending on direction, environment, distance and emitter power to block UAV and find the most rational ways to calculate emission of radio waves.

To achieve the goals. I have to:

1. search for known methods of emission of radio waves.
2. choose that method that will be easy and accurate enough.

3. make physical modelling of the emission of radio waves in real conditions of using UAV.

The object of study was the phenomenon of the emission of radio waves in real conditions.

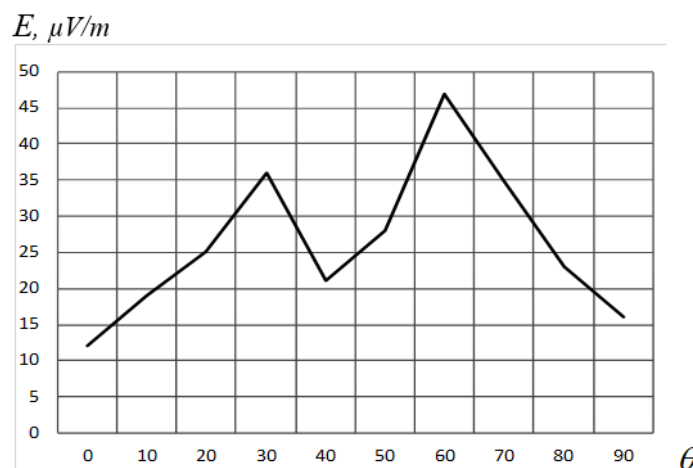
The subject of study was the method of determining the electric field strength of the radio wave, which can be used for rapid changes in UAV usage conditions.

In the course of my work, at first, I researched known methods of radio waves emission. For example, Okomura-Hata's method, COST-Hata's, Schulekyn Van-der-Pol's, Wallfish-Ikegami's, the model of perfect radio emission. I chose the last one, supplemented it with a multiplier of radio waves scattering in a standard troposphere and did theoretical calculations.

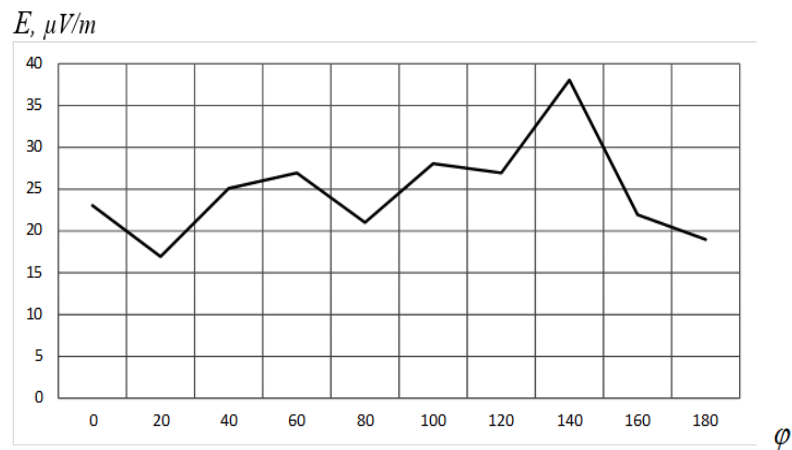
Using chosen methods, I calculated the distance of possible range of radio interception.

After this, to prove my results, I did an experiment using laboratory stand of electrodynamic model of surrounding, which is in the picture.

In the experiment I explored dependence of the intensity of the radio wave field on the direction in horizontal and vertical plane, which is shown on the graphics:



Pic 1. The electric field strength of the radiowave in vertical plane



Pic 2. The electric field strength of the radiowave in gorisontal plane

According to the results of my experiment, I found interference maxima and minima, that are the consequence of the influence of relief and subsoil. The values in the range of the maximum of radio wave field intensity show a possibility of strengthening or weakening the signal level, which impact on the distance of interception range of UAV. According to the average value, results are equal to those ones, that were done with taking electrodynamic scaling into account.

Conclusion:

1. not difficult, but accurate enough method of emission of tropospheric and terrestrial radio waves in real conditions of using UAV were analysed.
2. the experimental exploration using physical modelling of radio waves emission in real conditions of using UAV, that coincides with approximate calculation the distance of possible radio interception was done.

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