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Monitoring of electromagnetic environment at the civil aviation aerodromes

The results of the field measurements of electromagnetic radiation levels on the territory of the Odessa airfield are analyzed. It was established that it is necessary to develop and implement the system of electromagnetic monitoring, which will enable the detection of the sources of electromagnetic pollution at the facility.

The environmental situation in the impact areas of civil aviation airports and personnel safety are paid a lot of attention. But most studies deal with the aviation noise and jet engines emissions [1, 2].

The issues of electromagnetic safety of workers and the population at the adjoining territories are almost not considered. Individual works include analysis of the data of aeronautical radio objects sanitary passports and verification of their correctness by calculations [3].

The feature of many airfields in Ukraine is the exploitation of obsolete equipment, which, due to physical wear, can generate electromagnetic fields of unpredictable amplitudes and distribution areas. In addition, the national standard on electromagnetic security was amended [4]. The maximum permissible level of electromagnetic radiation of ultrahigh frequencies is increased from 2.5 μ *W/Sm*^{2} to 10 μ *W/Sm*^{2}. In addition, the compulsory sanitary passports for radio civil aviation facilities were canceled.

This requires the instrumental control of the levels of electromagnetic radiation of all radio engineering objects of the airfields and the identification of areas that are dangerous to humans.

We have conducted field measurements of the tensions of electric and magnetic fields up to frequencies of 300 MHz and density of energy fluxes for frequencies over 300 MHz in the Municipal Enterprise "Odessa International Airport". The measurements have been carried out with the calibrated meter of the levels of electromagnetic radiation PO-31. The limit of the permissible error of measurement for all parameters does not exceed 2.7 *dB*. The control has been carried out in the premises where the equipment is located and in the area near the antennas.

The following data have been obtained in the instrument room of the central control point of the landing system:

E = 1.4 – 1.6 *V/m*

H is below the limit of the device sensitivity

W = 0.2 μ *W/Sm* ^{2}

At the territory of instrument room and neighbor at the beacon (Lo) there have been:

E = 1.5 – 2.1 *V/m*

H is below the limit of the device sensitivity
W = 0.15 $\mu W/Sm^2$

At the same time, under the feeder of the transmitter the value is E = 80 *V/m,* under the antenna E = 55-60 *V / m.*

These figures exceed the maximum permissible level (15 *V/m*) several times, so the excess zones are fenced and equipped with warning signs of danger.

At the similar objects with similar equipment near the other end of the runway, the following data have been obtained:

- the instrument room and on the territory

E = 1.6 – 1.2 *V/m*
H = 0.20 – 0.22 *A/m*
W = 0.3 $\mu W/Sm^2$

- under the feeder E = 1.6-1.2 *V/m*, under the antenna E = 32 – 38 *V/m* .

As one can see, the data on the same equipment is significantly different, therefore, to ensure safe conditions for people to stay, it is necessary to monitor the levels of electrical fields continuously.

Some discrepancies have been observed around glide path radio beacons:

- at the first:

E = 1.6 – 2.0 *V/m*
H is below the sensitivity limit

- at the second:

E = 1.5 – 2.1 *V/m*
H = 0.26 *A / m*

Moreover, in this case, there has been a brief increase in the intensity of the electric field to 3.3-5.0 *V/m*, which exceeds the maximum permissible level (3 *V/m*).

It should be noted that these short-term increases in the levels of electromagnetic radiation have been observed repeatedly, and the time of their occurrence is different. So, it is rather hard to identify the source. The standard method for detecting the source of electromagnetic field and its contribution to the electromagnetic background involves the sequential switching on and off of the equipment. But under the conditions of the airport with a round-the-clock mode it is impossible. It is advisable to develop and implement the system of electromagnetic monitoring, which will provide an opportunity to identify the predominant field sources at the site.

The main problem is the availability of necessary devices designed to record the levels of narrow range fields in the high-frequency region of the spectrum.

According to the passport documentation, all emitters operate at a certain frequency with some variance. To obtain reliable data, it is necessary to measure the field level within this variance.

It should also take into account the influence of external sources on the electromagnetic environment in the airport - power lines, mobile communication stations, etc. Previous measurements in the vicinity of the airport "Kherson" have shown that such influence may be substantial.

Taking into account the absence and cancellation of sanitary passports for radio objects in Ukraine, the analysis of the electromagnetic environment in the airports is only possible based on field measurements.

Excess of the maximum permissible levels of electromagnetic fields near the airport equipment is observed episodically, which complicates the search for their sources.

To obtain reliable data on the electromagnetic environment at the airport, it is recommended to create the monitoring system, providing the receipt and accumulation of quantitative data with their subsequent analysis.

The technical support of electromagnetic monitoring must include devices to record high-frequency radiation of a narrow range.

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