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EXAMINATION OF THE METAL PLATE EFFECT AS A COVER FOR ELECTROMAGNETIC FIELD OF MOBILE PHONE

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ABSTRACT
This paper presents the examination of the metal plate effects, as a protection against electromagnetic fields of mobile phones. A mobile phone and metal plate (dimension of 20x20 cm) are modeled in the software tool WIPL-D Pro. The intensity of the electric field in the near field is estimated. The simulation results are obtained for different characteristic positions of mobile phone in various kinds of distances from the metal plate. The analysis is performed at two characteristic frequencies, 900 MHz and 1800 MHz. It is precisely defined how many times, respectively, how many decibels it is necessary to increase the force with which mobile phone radiates, in case when cover in the form of a metal plate exists, so that the field level at the same point is the same where there is no metal plate.
Keywords: radiation, mobile phone, protection

1. INTRODUCTION
Mobile telephony is one of the most popular forms of communication in the modern world. Wireless communication systems operate at several frequencies of the electromagnetic spectrum. In the USA mobile phones work at two main frequencies 850 MHz and 1900 MHz. European mobile phones use GSM frequencies around 900 MHz and 1800 MHz [1].
Mobile phones operate at low amounts of energy; antenna radiates 600 mW for analog mobile phone and about 125mW for digital [2]. The most important recommendations that limit the exposure to electromagnetic fields are ICNIRP recommendations called "Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300 GHz)", which is accepted all over Europe and CENELEC recommendations called "Human exposure to electromagnetic fields – High frequency".
In addition to the international recommendations made by certain organizations at the international level, there are the appropriate recommendations at the national level brought forth by the state institutions. The upper limit for permissible exposure to the field in Serbia is 28 V / m for frequency 50/60 Hz, while the intensity of the field for all other frequencies is 27.5 V / m [3].
Depending on the radiation energy, radiations are divided into two great classes, ionizing and non-ionizing radiation [4]. Non-ionizing radiation, which also includes the radiation from cell phones and base stations are the electromagnetic radiation of photon energy less than 12.4 eV. These radiations have a lower frequency and a lower amount of energy from ionizing radiation. Non-ionizing radiation is electromagnetic radiation that does not have sufficient energy to cause ionization in living organisms. Source of non-ionizing radiation is a device, installation or facility that emits or may emit non-ionizing radiation. Area of non-ionizing radiation also includes radio frequency spectrum.

2. ELECTROMAGNETIC FIELD FROM A MOBILE PHONE
Mobile phones communicate with a base station during a call. Base stations are mutually spaced in such a way that each base station covers a part of the territory.
The position of the mobile phone is in most cases directly to the head during the conversation. The farther the user is from the base station, the less exposed to electromagnetic radiation he is. However,