

# EMF Meters' Testing

Volodymyr Antonyuk, Eugeniusz Grudzinski, Hubert Trzaska

**Abstract** – The paper presents selected solutions of meters' testers which are used for the electromagnetic field (EMF) measurements for labor safety and environment protection purposes.

**Keywords** – EMF measurements, labor safety, environment protection, meters testing

## I. INTRODUCTION

Electromagnetic field (EMF) surveying, for labor safety and environment protection purposes, is usually performed outside of labs, in heavy industrial and climatic conditions. Thus, a basic requirement of Polish Accreditation Center, that is in position to certificate laboratories allowed to perform these measurements, is to have a possibility to check a EMF meter during the measurements. The reasons of the requirement are twofold:

- A possibility to damage a meter (probe) due to overloading it during measurements, possible damage due to transportation at local roads and astray, alternating meteorological conditions, etc.

- A possibility to mislead the measuring team due to appearance of relatively low EMF levels near high power sources (for instance in transmitting centers) and comparatively high levels near low power sources (e.g.: close to hand-held communication equipment).

In the paper are presented selected solutions of meters' testers which were designed with the authors' participation.

## II. THE OLDEST SOLUTION

Poland was one of the first countries where legal measures were introduced in order to protect population against unwanted exposure to EMF. As a result first series of selective E- and H-field meters were designed at the Technical University of Wroclaw. The meters were designated mainly for BC and TV transmitting centers. Second generation of wideband E-, H- and S-field type MEH meters was widespread through the country and abroad. At the beginning the meters were equipped with probes of sinusoidal pattern; i.e.: flat loop for H-field measurements and dipoles for E and S measurement. Theory of the near field EMF measurements was developed with cooperation with the National Bureau of Standards in Boulder, CO (presently NIST) (Grudzinski 1998) [1]. For *in situ* testing purposes of the meters a tester type USMEH was designed. A meter testing using the device is shown in Fig.1.

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Eugeniusz Grudzinski, Hubert Trzaska - Technical University of Wroclaw, Wybrzeze Wyspianskiego 27, Wroclaw, 50-370, POLAND, E-mail: eugeniusz.grudzinski@pwr.wroc.pl, hubert.trzaska@pwr.wroc.pl  
 Volodymyr. Antonyuk - Lviv Polytechnic National University, S.Bandery Str.,12 Lviv, 79013, UKRAINE, E-mail: itre@lp.edu.ua



Fig.1 USMEH-type tester (left) and MEH-type meter (right)

## III. MORE ADVANCED DESIGNS

The modernization included, among others, widened frequency ranges and probes with spherical pattern. No one manufacturer offers auxiliary devices for *in situ* meters testing. It has lead to a necessity to develop more universal testers that would allow to test different types of meters at different frequencies. For this purpose was designed several proposals of testers type UTEST-1 to 5.

## IV. PULSED EMF GENERATION

The worst situation is with non-stationary fields, for instance, near radar stations, where continuously pulsed modulated carrier generates, in a point of observation, EMF in the form of trains of pulses where shape and duration of the trains is a function of the radar antenna radiation patter and a velocity of it's rotations. For this purpose a new method of testing was proposed [2].

The concept, is identical with used in radar transmitters, where carrier wave generator is excited by a pulse generator. Here pulses from pulse generator  $PG_2$  excites generator  $PG_1$ , then excites carrier wave generator and a radiator. It allows to test a meter in conditions similar to EMF which will be measured be tested device.

## V. CONCLUSIONS

EMF surveying is usually performed in complex EM environment that leads to a possibility of the meters damage or to make a mistake by a measuring person. A series of portable EMF testers, that make it possible to verify a meter during measurements, a series of meters' testers was worked out by the authors. Different solutions for different purposes and different meters are presented in the paper.

## REFERENCES

- [1] Grudzinski E., "Generation and Measurements of the Standard Electromagnetic Field" (in Polish), TUW Printing Office 1998
- [2] E. Grudzinski, H. Trzaska, "EMF standards and exposure systems," *Noble Publ.* (in print).