Title:

Field Nose, a Frequency Selective and Isotropic System for Long-Term EMF Measurements and Monitoring

Corresponding topics:

Safety Measurement Techniques for EMF

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Abstract:

Field Nose, a frequency selective and isotropic measurement system designed for short- and long term EMF measurements as well as for monitoring and scientific studies is presented. The measurement procedure of the Field Nose system is described and an overview to rigorous, frequency selective uncertainty analysis is given. The system is compared to other EMF-measurement devices and procedures like field probes, directive antenna measurements and the sweeping method. Furthermore an example of a measurement campaign using Field Nose with 6 antennas is presented.

Introduction:

The judgement on possible hazards from human exposure to radio frequency electromagnetic fields is done according to EMF limits derived from scientific investigations of biological effects. To ensure these limits to the population, a more or less continuous measuring of existing fields could be useful, especially nearby potential emitters or at critical locations like schools or hospitals. In opposite to classical environmental pollution of water or air, the total stress of EMF may become more essential because of new respectively more intensive use of EMF-based communication equipment like GSM, UMTS, DECT, W-LAN or Bluetooth. To keep an eye on this trend, isotropic, high sensitive, reproducibility, easy to use and portable measurement systems are necessary.

Work Content:

Four different measurement techniques applied for EMF measurements will be described and compared considering technical and practical features according Table 1.

Method / Features	Field Probe	Directive Antenna	Screening Method (Field Nose)	Sweeping Method (PCD Antenna)
Frequency selective	--	++	++	++
Sensitivity	--	++	+	+
Isotropic behaviour	++	--	+	o/+
Time efficient measurements	++	--	+	++
Reproducibility	++	+	++	-
Remote controlling	+	--	+	--
Long-term measurements	+	-	++	--
Monitoring	++	o	+	+
Uncertainty calculation	++	+	++	-

Table 1: Comparison of EMF-measurement methods

Regarding the results of our comparisons, we focus in the detailed description of systems to the Field Nose, because this one has the possibility to overcome most disadvantages. The system is based on the well known and tested Add3D method and works according the dot matrix screening method. The Add3D system is added with an automatic rotator, a microcontroller (PC) and a software package especially developed for advanced EMF measurement applications, data evaluation and visualisation. Features like sliding average calculation, online alarm generation or data transfer and system configuration via LAN enables monitoring functionality. We also present the frequency selective results of an uncertainty calculation of that system based on numerical simulations and high-precision measurements.

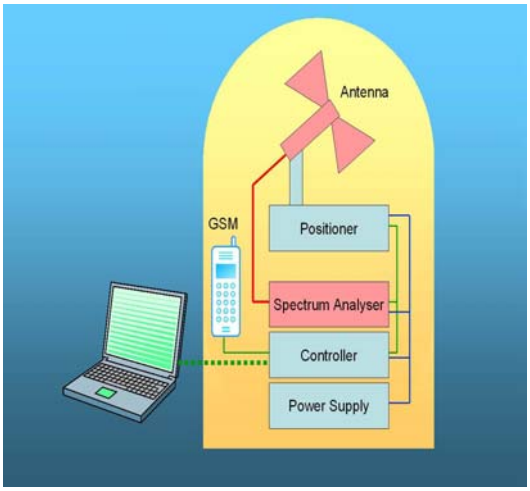

Figure 1: Field Nose System

To demonstrate the practical work with the Field Nose system we present also some results of a long-term measurement performed at Seibersdorf. Therefore we placed 6 antennas in a room with direct view to a GSM base station at a distance of 120 meters over a period of 2 weeks. Main reason of these investigations was to study the field distribution versus time and place and to find out, if the weather influences the received signals. Therefore we also monitored meteorological data with another system. The measurement setup and the antenna signals can be seen in Figure 2 and Figure 3.

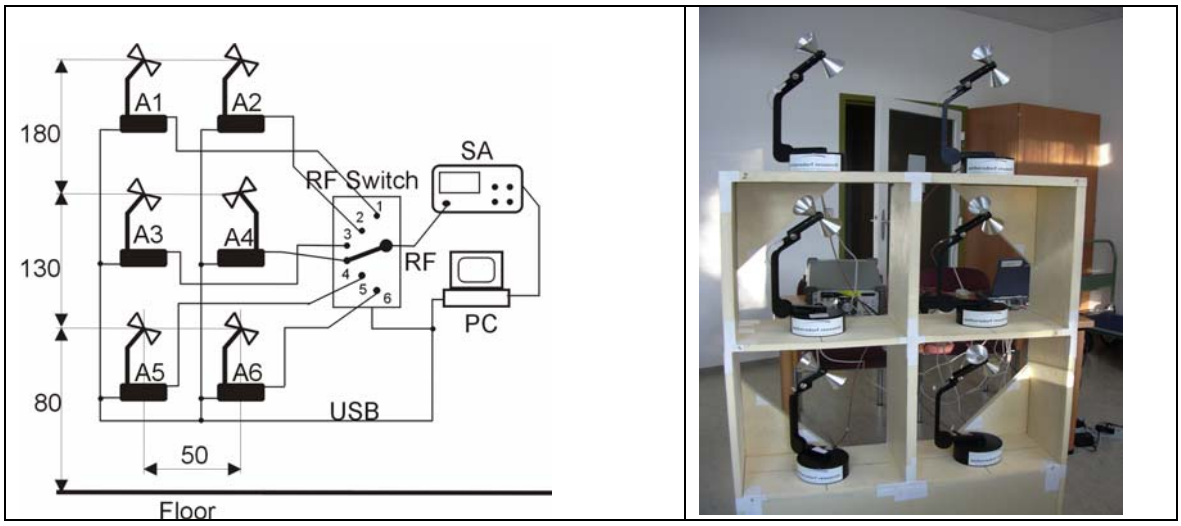

Figure 2: GSM-base station measurement setup for long-term measurement with 6 antennas. All dimensions are given in cm.

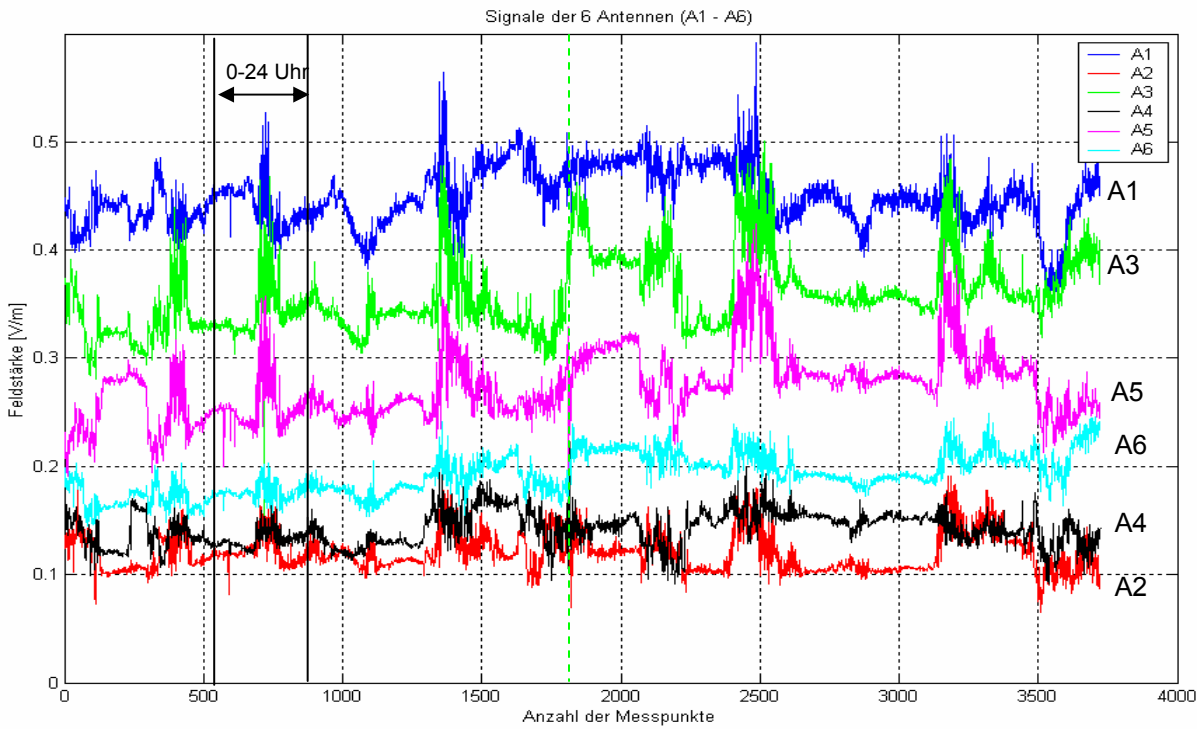

Figure 3: BCCH signals at 946,6 MHz over a time of 11 days (1 point represents 4,5 minutes) for the antennas A1 to A6.