NEW DESIGN ANTENNA GSM900/1800/UMTS FOR SENSOR NETWORKS ON HIGH VOLTAGE LINE

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Abstract:
In this paper, we present a new design antenna of technology other than conventional microwave antenna. This antenna GSM900 MHz/1800MHz/UMTS for new smart sensor networks to high-voltage line in the middle intense électromatignétique is called "Patch Antenna". He has a very compact and very insensitive to its environment. Its design allows it to integrate on the PCB. Its simulation is performed with the software "Advanced Design Simulation (ADS). Its circuit board is done. Comparing the values of its characteristics obtained by simulation and measurement is satisfactory.

Keywords: microstrip antenna, power line, Smarts grids.

1-Introduction: Microstrip antennas are widely used especially for wireless communication applications. They have several advantages including: less bulky, low cost, lightweight, thin, conformable. On a fundamental level, a patch antenna has a low yield and low bandwidth. It is rare to find an antenna that responds to both radiation characteristics and an environment compatible with the needs of current and future systems. So a compromise must be made between these characteristics in order to use the least bad antenna. In this paper, we propose a miniature antenna for multiband operation GSM900/1800/UMTS intelligent networks of sensors on high-voltage line. A series of simulations in ADS has been carried out to optimize the physical parameters of the antenna and thus adapt to the desired resonance frequency, and input impedance. A prototype antenna has been realized and measured.

2-Design procedure:

We use as a dielectric, substrate known FR4époxy permittivity 4.4 and thickness 1.6mm.

For an efficient radiator, a practical width that leads to good radiation efficiencies is:

$$W_{(mm)} = \frac{300}{2 * f_r} * \sqrt{\frac{2}{\varepsilon_r + 1}}$$

The effective dielectric constant with W/h >1 is given

$$\varepsilon_{eff} = \frac{\varepsilon_r + 1}{2} + \frac{\varepsilon_r - 1}{2}\left(1 + 12\frac{h}{w}\right)^{-0.5}$$

The extension along length is given by:

$$\Delta_L = 0.412 * h * \frac{(\varepsilon_{eff} + 0.3)(0.264 + \frac{W}{h})}{(\varepsilon_{eff} - 0.258)(0.8 + \frac{W}{h})}$$

The length of the patch is given by:

$$L_{(mm)} = \frac{\lambda_g}{2} - 2\Delta_L$$

The dimensions of antenna are optimized: W1 = 78mm, L1 = 79mm.

Table 1: dimensions of antenna

L_1	W_1	W_2	H
79 mm	78 mm	3 mm	1.6 mm

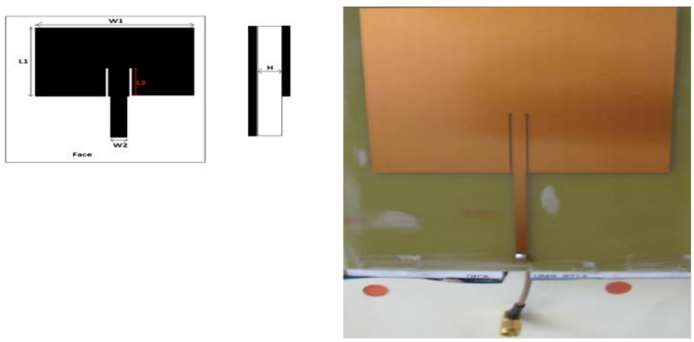

Figure 1: antenna design

3-Results:

After a series of simulation and optimization of antenna characteristics studied and printed circuit is made in the laboratory. Measurements were made on a vector network analyzer. These are the measures of reflection coefficient S11. The results of simulation and measurement are represented by the curves shown respectively on Figure 2 and Figure 3.

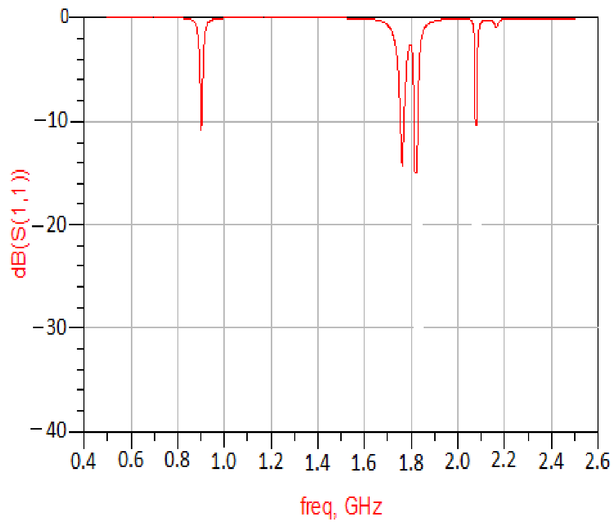

Figure 2: Variation of S11 (Simulation)

We get peaks in the frequency bands GSM900/DCS1800 / UMTS, with amplitude of the reflection coefficient below -10 dB.

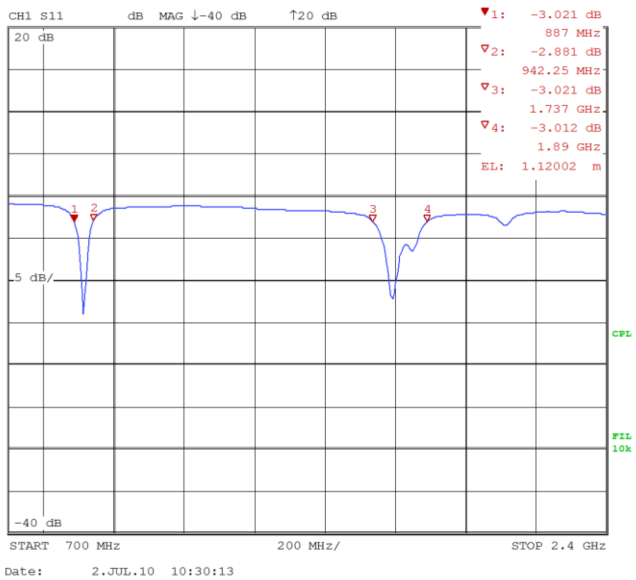

Figure 3: Variation of S11 (Measure)

The fig 2 and 2 show the results of simulations and measurements obtained. It is evident from these graphs that the amplitude coefficient S11 looks the same in simulation and experimental measurement. It value at 900MHz is-10dB in simulation and experimental measure-12dB. The error is negligible compared to the values of S11 at this frequency.

Power radiated(Watts)	Effective angle (degré)	Directivity (dB)	Gain (dB)
0.0187983	117.3250	7.88161	7.08997

Table 2: Characteristics of the antenna

The parameters of the antenna justify its effectiveness, with a gain slightly greater than 7dB

4-CONCLUSION:

The results obtained in different tests of this antenna are very satisfactory. Traces of its reflexion coefficient S11 theoretical and experimental are almost identical. Their slight difference is due to be made in simulation does not account for losses related material. This new product is promising. It is stable in the presence of metallic materials close to its environment. It can save at any Usage requirements in place at the level of integration and design awards. It can also be easily produced in industrial chain.

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