MODEL OF PHASE-LOCKED ANTENNA ON THE BROAD BAND PLANAR ANTENNAS

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Abstract

The electronic equipment consists of a considerable quantity of the elements; one of the most important is the antenna system. If it is necessary to receive the good directional properties and to have a capability effectively to operate polar pattern
the antenna system the phased antenna array, as a rule, are used. When work with small and by power average levels are widely used micro strip antenna as radiating units of phase-locked antenna , owing to low mass dimensional and cost parameters[1, 2].

Besides all advantages classical planar antennas possesses, one serious lack - owing to resonance character planar antennas and array from them are narrow-band, the relative band of operational frequencies of such antennas make shares and units of percent. If wider working frequency band (20 % and above) on change to classical cross-section radiating units broad-band and ultra broadband printed antennas of longitudinal radiation and as mixed versions of a construction of longitudinal and cross-section radiating units [1, 3] come is required.

I. INTRODUCTION

Creation by the phased antennas array from a preset directivity pattern on base micro strip antennas was the purpose of my research. This antenna array should work in a broad band of frequencies from 980 to 1215 MHz and have SWR (standing wave ratio) no more than 2 in the given range. Polar pattern the phased antennas array should look like presented on fig. 1.

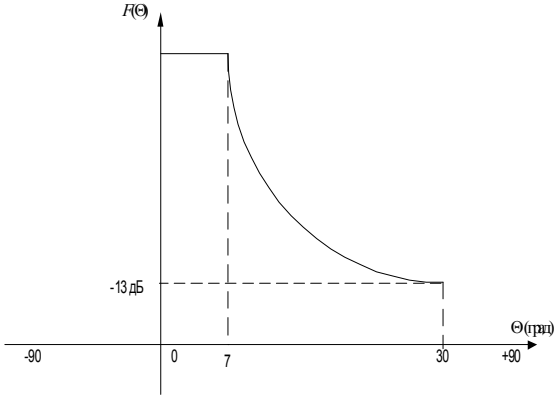

Fig. 1.Polar pattern the phased antennas

II. MODELING PLANAR ANTENNAS

At the first stage it was necessary to solve a question of construction micro strip antennas. As it is possible to note a bandwidth of operational frequencies makes 25 % that has demanded use of broad-band radiating units. For modeling of a construction of the given radiating units program HFSS 12 has been used. HFSS (High Frequency Structure Simulator) is a powerful software package which calculates multimode S-parameters and electromagnetic fields for three-dimensional passive structure of any form.

HFSS realizes power of a method of final elements (finite element method FEM), using methods of type of an automatic adaptive generating and division of cells, a method of final elements for vectors of a field and the adaptive development (Adaptive Lanczos Pade Sweep, ALPS). HFSS automatically calculates multiple adaptive solutions to criterion of convergence determined by the user. Solutions for a field, found of equations Maxwell, precisely predict all dispersion characteristics, existing types of waves, and transformations of types of waves, losses in materials and on radiations.

As a starting point the dipole-radiating unit (fig. 2) for WLAN wireless networks of 2.4 GHz working on frequency [5] has been taken. It has a wide band of operational frequencies of an order of 800 MHz (SWR <2).

The given radiating unit has been modified (the geometrical dimensions) are increased and by that the operational frequency has displaced and there was 1080 MHz, thus a band of operational frequencies (SWR <2) has made about 300 MHz (fig. 3).

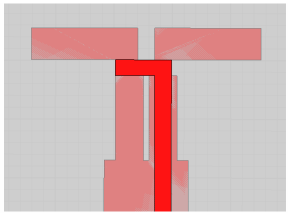

Fig. 2 Geometrical configuration of a radiating unit

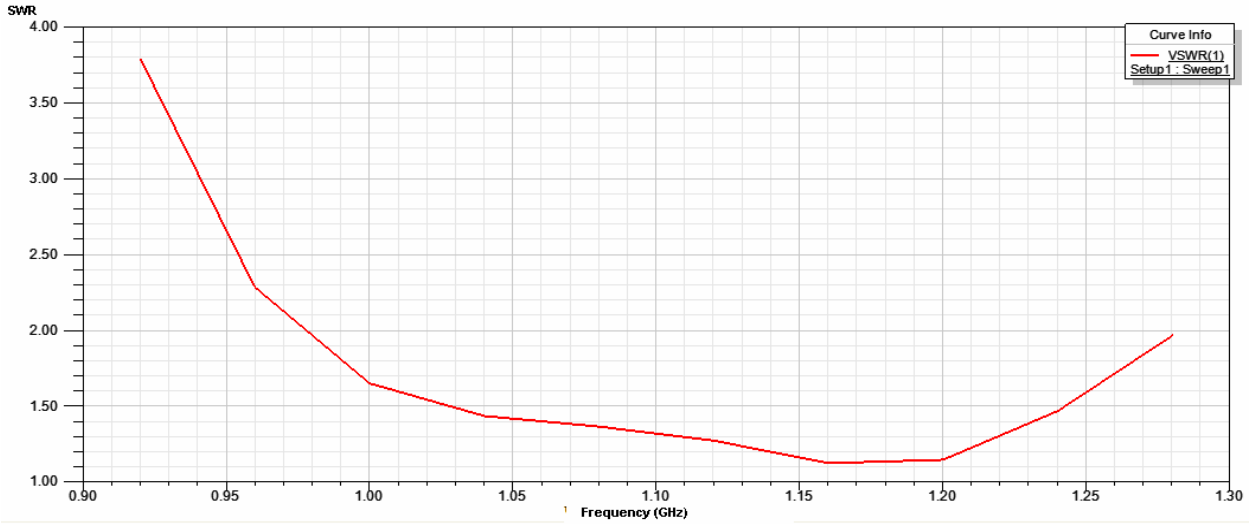

Fig. 3. SWR a radiating unit

III. MATHEMATICAL MODEL OF THE ANTENNA SYSTEM

After the radiating unit c has been received by demanded characteristics, we will transfer to construction of polar pattern the phased antennas array. Quantity of radiating units of polar pattern equally 8, between them makes distance 0.7λ. For obtaining of demanded distribution it is necessary to synthesize polar pattern, and to determine necessary phase and peak distributions for each radiating unit. C this purpose had been constructed mathematical model of the antenna system in the environment of MATHCAD 14. For obtaining of phase and peak distribution method Fudvorda-Lousona which allows calculating peak and phasing distributions necessary for obtaining demanded polar pattern [4] has been realized. Following distributions (fig. 4 and fig. 5) have been received.

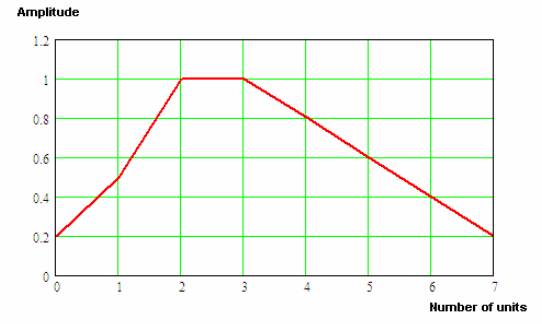

Fig. 4. Amplitude distribution

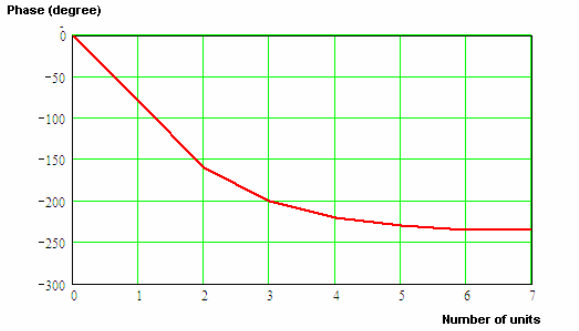

Fig. 5. Phase distribution

IV MODEL PHASE-LOCKED ANTENNA

Further the received distributions we will substitute in model of the antenna array designed in HFSS. I.e. each radiating unit feed proceeding from the received before phase and peak distributions, everyone corresponding amplitude and a phase.

Received polar pattern it is presented in fig. 6. IT is presented in polar co-ordinate system. Proceeding from the received results it is possible to tell, that was, will reach positive result: the broad-band planar radiating unit c by a range of operational frequencies from 980 to 1215 MHz is made (SWR <2) on which basis it has been made phase locked array polar pattern which corresponds to the set.

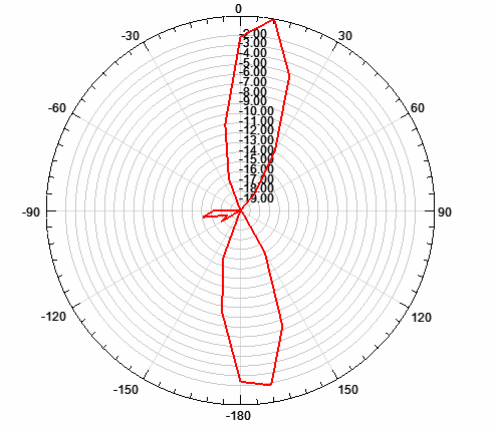

Fig. 6. Antenna pattern

V. CONCLUSION

Proceeding from the received results it is possible to tell, that was, will reach positive result: the broad-band planar radiating unit c by a range of operational frequencies from 980 to 1215 MHz is made (SWR <2) on which basis it has been made phase locked array polar pattern which corresponds to the set.

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