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1: KATHLEEN MELDE: Publications

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To further reduce the cross-polar level, a concept of dielectric feed was developed, which electromagnetically resembles the aperture feed. The increase of the cross-polar discrimination was 2. Introduction When a good separation of the two polarizations is required in a patch antenna element, as is the case in mobile basestations utilizing polarization diversity and in radio channel sounding, it is necessary to use a half-wave patch antenna [l]. A probe feed was chosen because of the simplicity of construction. When using probe feed, the probe should be as short as possible. However, to have a wide bandwidth, a thick patch antenna has to be used [2], which typically leads to a long pr0be. A way to increase the bandwidth without extending the probe is to add resonators, for example by adding another patch on top of the main patch, to form a stacked patch antenna. The goal of this study was to maximize theXPD of the dual polarized stacked patch antenna with probe feed. The research was camed out by making FDTD simulations and building prototypes. Antenna structure The antenna is made of two half-wave patches on top of each other above the ground plate, Figure 1. The patches are made of 0. The ground plate dimensions are lOOxl00 d. Dielectric feed The antenna probe feed is essentially the center conductor of the coaxial cable where the outer conductor is cut at the level of the ground. Furthermore, in our design the capacitor is physically so large that it reduces the length of the probe, thus reducing the cross- polarization. In other words, the idea of the matching capacitor was developed to a dielectric coupling system, electrically resembling the aperture coupled feed [4]. The basic structure is the stacked patch antenna, and the feed connector is same, but the probe is as short as possible, and a substrate with metal on top and bottom surfaces forms the feeder dielectric feed, or feeder capacitor. I 2- I Connection for the ver- Substrate capacitor between lower patch and probe Connection for the hori- zontal feed Figure 2. Half-wave stacked antenna with dieleclric feed. The activefeed is in y-axis in the radiation pattemplots Therefre the E-plane is in yz-plane, and the H-plane is in xz- plane. The angle is the deviationfiom the z-axis, and the angle ispositive towards thepositive y- direction in E-plane and towards the positive x-direction in H-plane. Thefigure is a cross-section cut along the central y-line, the groundplate only partially shown. The green lines and dots represent the insulator in the capacitor in z- and x-axis, e, , length of capacitor edge 2 mm. The grid is 1 mm. The dielectric feed was implemented by dielectric plate placed between the lower plate of the antenna and the top of the center of the coaxial cable. The dimensions ofthe plate are 10x10x1. The high permittivity is possible in the simulations. The low permittivity in the prototype was determined by the available material. The dimensions of the lower patch were 64x64 m d in the simulation, because that produced the same impedance match as the 66x66 mxd patch in the prototype. This is within the step size in the simulations using 1 mm voxel cube because due to the symmetrical structure the step size in the horizontal dimensions is 2 mm. Figure S Measured reflection coefficient. Measured impedance on Smith chart. From Figure 6 one can conclude that the matching of the double resonance is not perfect, because the loop does not go around the center of the Smith chart, and bandwidth can be increased if necessary. Figure 7 and Figure 8 show the radiation patterns of the antenna in E-plane and H- plane. The gain is 6. Measured radiation pattern in H- plane Dielectric feeds. The prototype with dielectric feed inFigure 8 is 3. The probe-fed prototype in Figure 9 is 2 dB better than the simulated one in Figure 1 1. The dielectric feed decreases the maximum cross-polar level by 1 dB in the theoretical simulation for two otherwise similar antennasFigure 10 and Figure Simulated radiation pattern in H- plane. Dielectric feed, and the other feed is terminated with a load The maximum cross-polarized level is dB below copolar level of the boresight direction. Measured radiation pattern in H- plane, ordinary probe feed. The otherfeed is terminated with a load. The maximum cross-polarized level is dB below copolar level of the boresight direction. XPD dB between Clariok --csolrr

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Figure Simulated radiation pattern in H-plane, ordinaryprobefeed. The otherfeed is terminated with a load The maximum cross-polarized level is 41 dB below copolar level of the boresight direction. Conclusion A probe-fed half-wave patch antenna was modified by using a dielectric feed replacing part of the probe. The dielectric feed increases the cross-polar discrimination 2. The simulation predicts the behavior of the antenna reasonably well. Artech House, , p.

2: Uniform circular arrays for smart antennas â€” Arizona State University

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It presents some experimental results which verify the main numerically- predicted properties, and numerically explores the dependence of perfor- mance parameters on shape. A schematic drawing of the volume-loaded short dipole is shown in Figure 1. The figure can be thought of either as a wire construction, or as a profile for a figure of revolution structure. These are, in fact, two extreme possibilities for implementation, though other body shapes are possible and will function in a similar manner. The nature of the antenna behavior is the same in both cases. In transmitter mode, current is driven along the arms of the dipole, as indicated by the arrows. When it reaches the arm end, it spreads out and travels in a symmetrical fashion around the space enclosed by the end body. The ratio has been found to depend on body shape and arm diameter. The arrows indicate the current paths. In , we decided to develop a wire approximation to the surface shape of the math model. The second prototype was built using an octagonal cross-section end body frame. It too was quite successful and the measurements made on this model are described in the next section. Construction and Tests Both prototypes were built on PVC plastic pipe frames since the wire would not be self-supporting. The profile of the figure of revolution is described by radius and axial distance values at each corner in the half- length profile, collected in vectors. Measurements were made as the wiring was done. That is, the impedance of the terminal assembly was measured without any wire attached. The equivalent circuit here is a small series inductance and shunt capacitance. Then the framework was put up, and the impedance for a single wire going just straight out from each terminal was measured, then a half-loop put on each end, measured, then the loop completed and impedance-measured, and so on, until 8 full loops were in place at each end. This process allowed observation of the development of the series resonance, which first appeared with one complete loop at each end and then moved down in frequency as more loops were added. Table 1 shows the resonant frequency as a function of the number of loops at each end. Series-resonance frequency as a function of the number of end-body wire loops. Number of loops 1 2 4 8 Resonant Frequency, MHz It measures impedance magnitude and SWR over limited ranges, so the nature and phase of the impedance has to be inferred. Table 2 gives the reactance of the antenna after the effects of the terminal equivalent circuit are removed, and the calculated reactance for the solid figure of rotation. Reactance versus frequency, inferred from measurements for the wire antenna and calculated for the figure of revolution antenna. Performance as a Function of Shape An electrically-small dipole with end plates is essentially a capacitor in which the conduction current has a path along the arm and is then allowed to spread out over the insides of the plates, going to zero current and maximum charge at the plate edge. The structure becomes a tuned system, with inductance from the wire arm and the sharp change in current direction at the inner and outer edges of the inside face. This is illustrated in the calculated performance values given in the following tables. As wavelength is increased, it is necessary to increase the inductance to achieve resonance. Equivalently, p2, p3, and z4 are held at 1. These are examples of doing the best we can in a given three-dimensional space. Qt is the inverse of the fractional bandwidth when driven from a source whose impedance is the resonant Ro of the antenna. Ro, Qt and Xo, the resonant wavelength, are the performance parameters tabulated. The antenna is still electrically short, but tending toward the low-profile category. The basic effect is to improve bandwidth, since the volume occupied is larger than the previous cases. For many kinds of radio service, a single simple matching network will cover the entire service frequency range. The size reduction will allow the antenna to be hidden in the radio package for many applications. The lack of reactance at the resonant frequency allows impedance-matching losses to be kept low. A patent application was filed 11 October References [l] Miron, D. Applied Computational Electromagnetics Society, vol.

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3: AP-S International Symposium (Digest) (IEEE Antennas and Propagation Society)

IEEE Antennas and Propagation Society International Symposium. Digest IEEE Antennas and Propagation Society International Symposium. Digest Proceedings of IEEE Antennas and Propagation Society International Symposium and URSI National Radio Science Meeting.

4: Elongated 3D FDTD modeling using PML â€” University of Illinois at Urbana-Champaign

IEEE Antennas and Propagation Society International Symposium: digest, July , , Baltimore, Maryland Author: IEEE Antennas and Propagation Society.

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