Antenna Pattern Measurement

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Abstract— Wireless systems, especially require antennas and wireless system integration and requirements. They include operation near the human body effect, operation in a multi path and fading environment, extremely small antenna size, receiver diversity, multi frequency operation, radiation pattern performance and adaptive antenna techniques. Unique quality factors, in contrast to the classical ones, are also introduced such as parameters of total radiation efficiency, mean effective gain and correlation coefficience.

1. 3D ANTENNA MEASUREMENT SYSTEM

The mobile phone under test of far-field range testing has been the plan at the Cellular Telecommunications & Internet Association (CTIA) certification program test requirements for performing radiated power and receiver performance measurement. In this paper [1], facilities of antenna pattern measurement have recently commissioned a spherical far-field measurement system [2]. The low profile far-field spherical scan system provides significant advantages over the older far-field testing including elimination of problem of simple theta (θ) and phi (ϕ) rotary axis with indoor far-field range testing, complete measurement characterization of the antenna, and improved accuracy. This paper will discuss the antenna and wireless system integration tested, spherical antenna measurement for far-field system, and the results being achieved. The frequency response of half wavelength dipole and 3D antenna scanning are shown in Figure 1 and Figure 2. And 3D measurement data is shown in Figure 3. Based on 3D measured parameters (directivity, gain, and efficiency) are shown in Table 1.

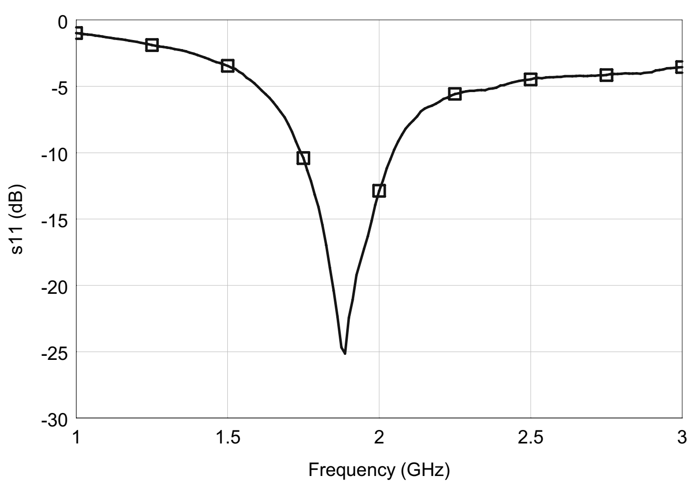

Figure 1: Measured data of half-wavelength dipole antenna.

Table 1.

Frequency (MHz)	Directivity (dBi)	Gain (dBi)	Efficiency (%)
1880	2.99	1.82	76.37

Table 2.

Frequency (MHz)	XPR (dB)	MEG (dBi)
1880	−11.47	−1.76

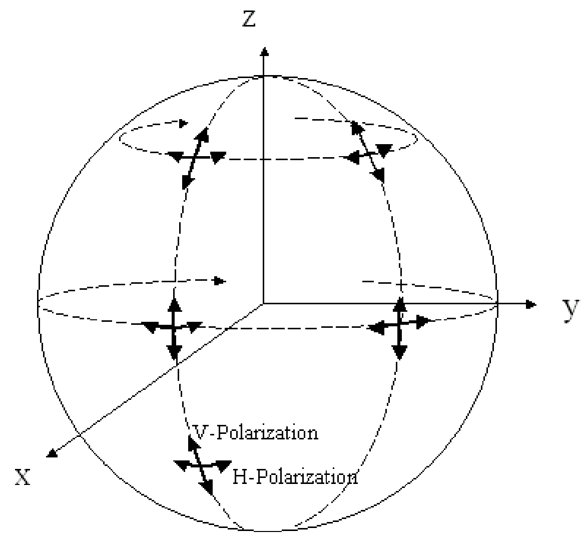

Figure 2. Spherical coordinates and field scanning.

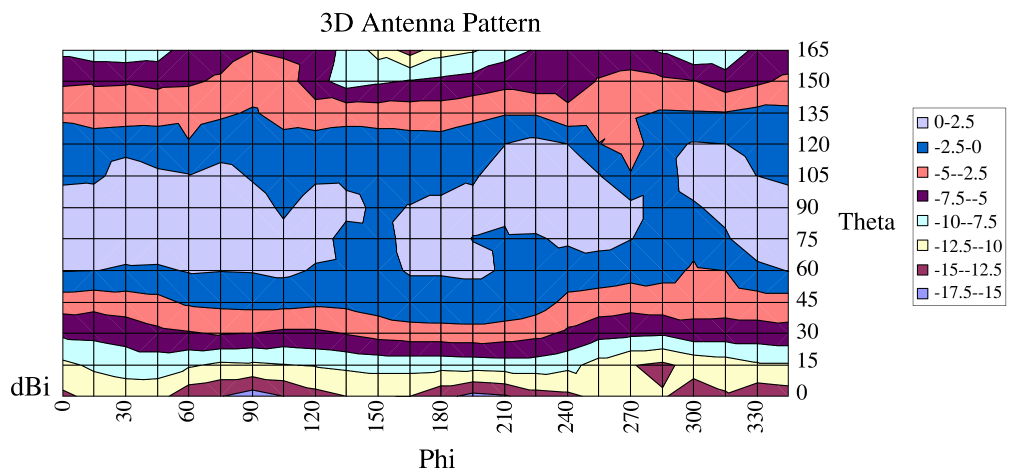

Figure 3. 3D field scanning data.

2. METHODS AND RESULTS

Based on measurement method [3] is described for analyzing the mean effective gain (MEG) of antenna in 3D far field chamber environment. The MEG of an antenna in a certain environment can be computed based on the 3D gain pattern of the mobile antenna and the average angular distribution of incident power in the environment. By using Equations (1) and (2) the expression for the MEG can be calculate [4]. And the mean incident power ratio P_V/P_H represents the cross polarization power ratio (XPR), by using Equation (3). In this paper, we present experimental results of the XPR rate at the mobile antenna in a simple dipole antenna environment at 1.88 GHz frequency. Based on response of mobile antenna, the 3D measured results of MEG and XPR are measured.

$$G_e = \frac{P_{rec}}{P_V + P_H} \tag{1}$$

$$\begin{aligned} P_{rec} &= \int_0^{2\pi}\int_0^{\pi} \{P_1 G_\theta(\theta,\phi)P_\theta(\theta,\phi) + P_2 G_\phi(\theta,\phi)P_\phi(\theta,\phi)\}\sin\theta d\theta d\phi \\ G_e &= \int_0^{2\pi}\int_0^{\pi} \left\{\frac{XPR}{1+XPR}G_\theta(\theta,\phi)P_\theta(\theta,\phi) + \frac{1}{1+XPR}G_\phi(\theta,\phi)P_\phi(\theta,\phi)\right\}\sin\theta d\theta d\phi \end{aligned} \tag{2}$$

$$XPR = \frac{P_V}{P_H} \tag{3}$$

3. CONCLUSIONS

An analysis of the mean effective gain (MEG) at 1880 MHz of a dipole antenna for mobile phone has been done. In this paper, we have been create and set the test room of phone under test of far-field range and based on the Cellular Telecommunications & Internet Association (CTIA) certification program test requirements for performing antenna performance measurement. And we considered the MEG value of the effective gain of a handset antenna. The performance of mobile handset antennas in free space and beside a MEG is evaluated with radiation pattern measurements in the 3D antenna chamber and radio channel measurements.

ACKNOWLEDGMENT

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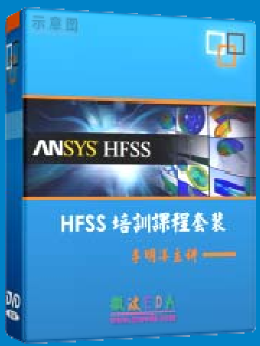

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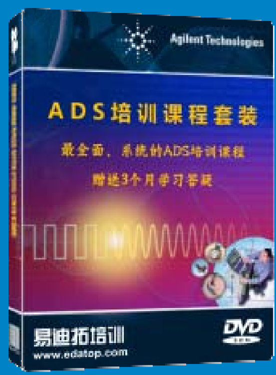

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