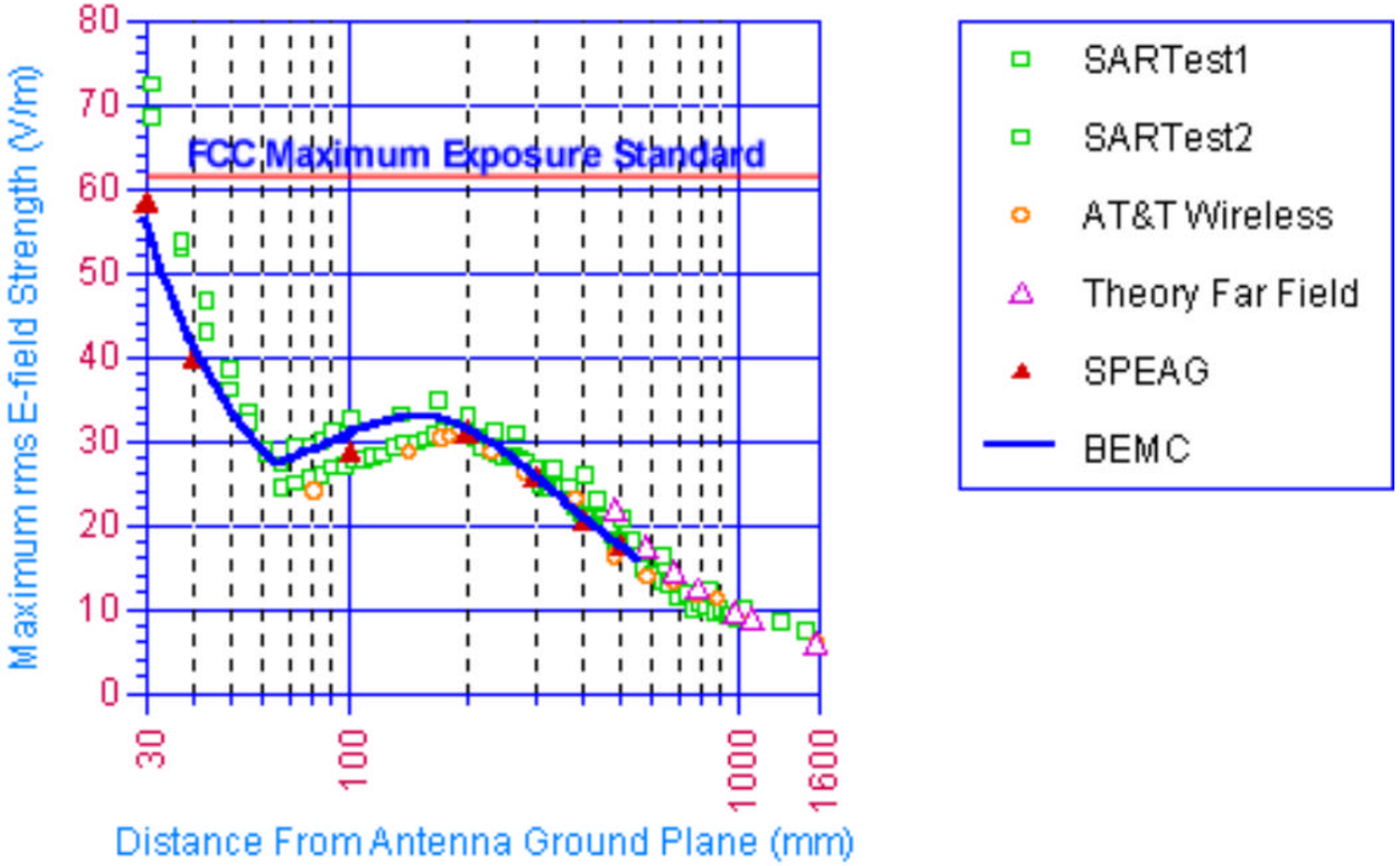

Figure 5.20. Comparison of FDTD derived values of electric field strength by BEMC, measured values by SARTest (SARTest1 lowest and SARTest2 highest), measured values by SPEAG, measured values at AT&T Wireless Services laboratory and calculated values by theoretical far field equation from AT&T RU antenna.

5.3 Antenna Magnetic Field Calculations and Measurements

Figure 5.21 illustrates a color contour graph of the calculated near-zone magnetic field (H-field) along the plane denoted by G at the surface of the radome, 31-mm from the surface of the ground plane. The color legend is scaled in dB with 0 dB corresponding to the maximum calculated H-field strength of 0.1236 A/m occurring near the lower right patch of the antenna at the location marked with a black plus sign. The calculated H-field distribution closely agrees with values measured by SPEAG shown in Figure 2.4 on page 13 of Appendix A for a 30-mm distance from the ground plane. This worst case calculated H-field is 2.4 dB below the FCC MPL of 0.163 A/m.

Figure 5.22 illustrates the graph of the calculated total H-field distribution and Figures 5.23, 5.24 and 5.25 illustrate the graphs of the respective x, y and z, H-field components at 40-mm from the antenna ground plane. The SPEAG measurements for these fields are illustrated in Figures 2.3 and 2.5 of Appendix A for 1 watt input power. The field distributions appear similar to the calculated values when the magnitude of the fields are normalized to the same input power and the directions of the field components are expressed in the same terms. Table 5.2 indicates that the values compare favorably within the measurement accuracy stated by the authors of Appendices A and B.

Table 5.2. Comparison from Different Laboratories of Maximum Calculated and Measured H-Field Strengths (A/m) in Plane Parallel to and 40-mm From Front of ATTWS RU Antenna Ground Plane with 79.62 mW Input Power at 1.92 GHz.

Laboratory	Total	Vertical field	Horizontal field	Normal field
BEMC (FDTD)	0.1105	0.0168	0.0999	0.0441
SPEAG (Measured)	0.1077	0.0244	0.1067	0.0625

Figures 5.26 through 5.31 illustrate the respective color plots of the magnetic field (H-field) distribution in the yz planes for increasing values x away from the antenna. The planes correspond to those labeled I through K, M, N and P shown in Figures 3.1, 3.2 and 3.3. The legend for each of these plots and all remaining plots in this section is set to allow the color red to represent all field strengths at or greater than the value (0.163 A/m or 1 mW/cm^2 equivalent power density) allowed by the FCC MPL. The three vertical red lines play the same role as described for the E-field plots. Figure 5.26 illustrates that the maximum magnitude of the H-field distribution just within 5.0 cm distance from the radome (new minimum measurement distance recently approved by the IEEE SCC-28) is 0.06834 A/m which is 7.55 dB below the ANSI/IEEE and FCC MPLs. Figure 5.29 illustrates that the maximum magnitude of the H-filed distribution just within 20-cm

distance from the radome (current minimum measurement distance allowed by the ANSI/IEEE and the FCC) is 0.07986 A/m, which is 6.2 dB below the MPLs. Figures 5.32 through 5.34 illustrate the respective color plots of the H-field distribution in the xy planes identified by A, B and C and Figures 5.35 through 5.37 illustrate the respective color plots of the H-field distribution in the xz plane identified by D, E and F.

The FDTD derived E-field data from the graphs discussed above are compared to the measurements made by SPEAG (given in Appendix A) in Figure 54. The graph in Figure 5.38 shows the BEMC FDTD derived values as a solid blue line while the SPEAG measurements are shown as red delta symbols. The results show excellent agreement within 0.22 dB. At all distances of 20 cm or more from the antenna radome the H-fields are 5.5 dB or more below the ANSI/IEEE and FCC MPLs.

In the near field region of the antenna the H-field distribution is different than that of the E-field distribution but the distributions become identical with increasing distance from the source. Thus in the far field the measurement or calculation of either the electric field or the magnetic field will provide the proper power density but both must be quantified in the near zone of the antenna to insure that the maximum equivalent power density is properly characterized.

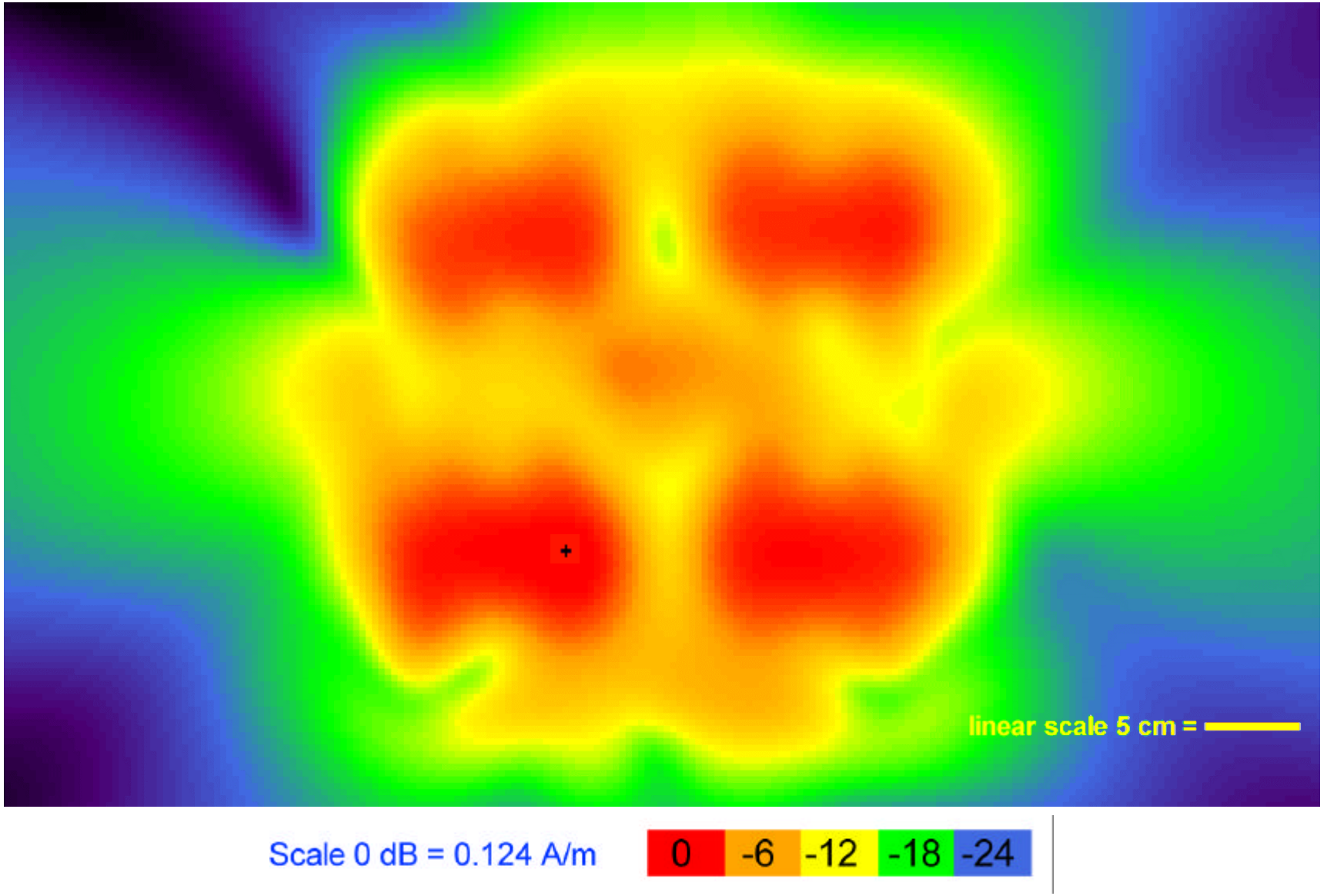

Figure 5.21. FDTD derived H-field at surface of radome of AT&T RU antenna in y-z plane (Scan G, 31 mm from ground plane of antenna, maximum H-field denoted by black plus sign).

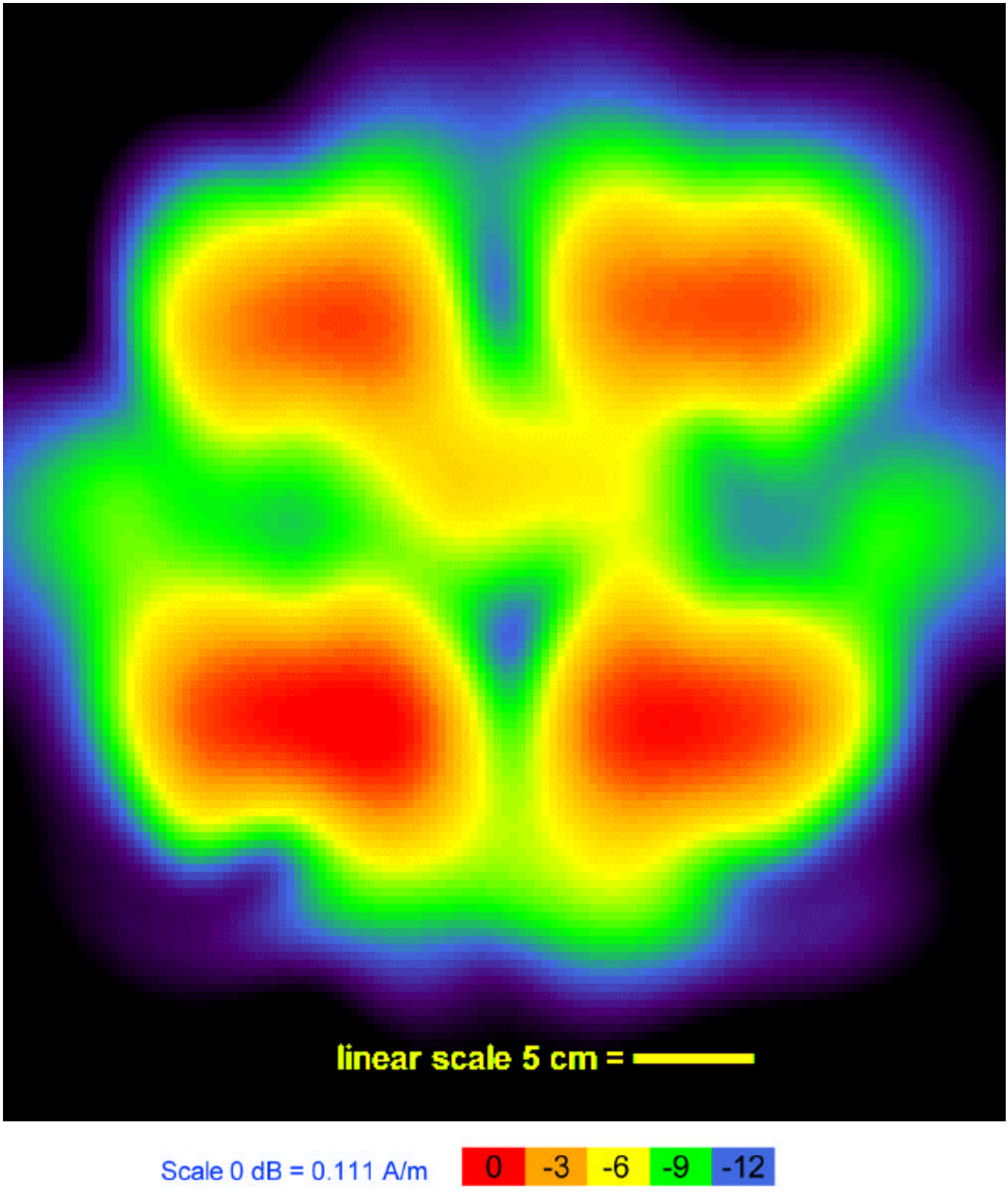

Figure 5.22. FDTD derived total H-field of AT&T RU antenna in y-z plane (Scan H, 40 mm from ground plane of antenna for comparison with measured data).

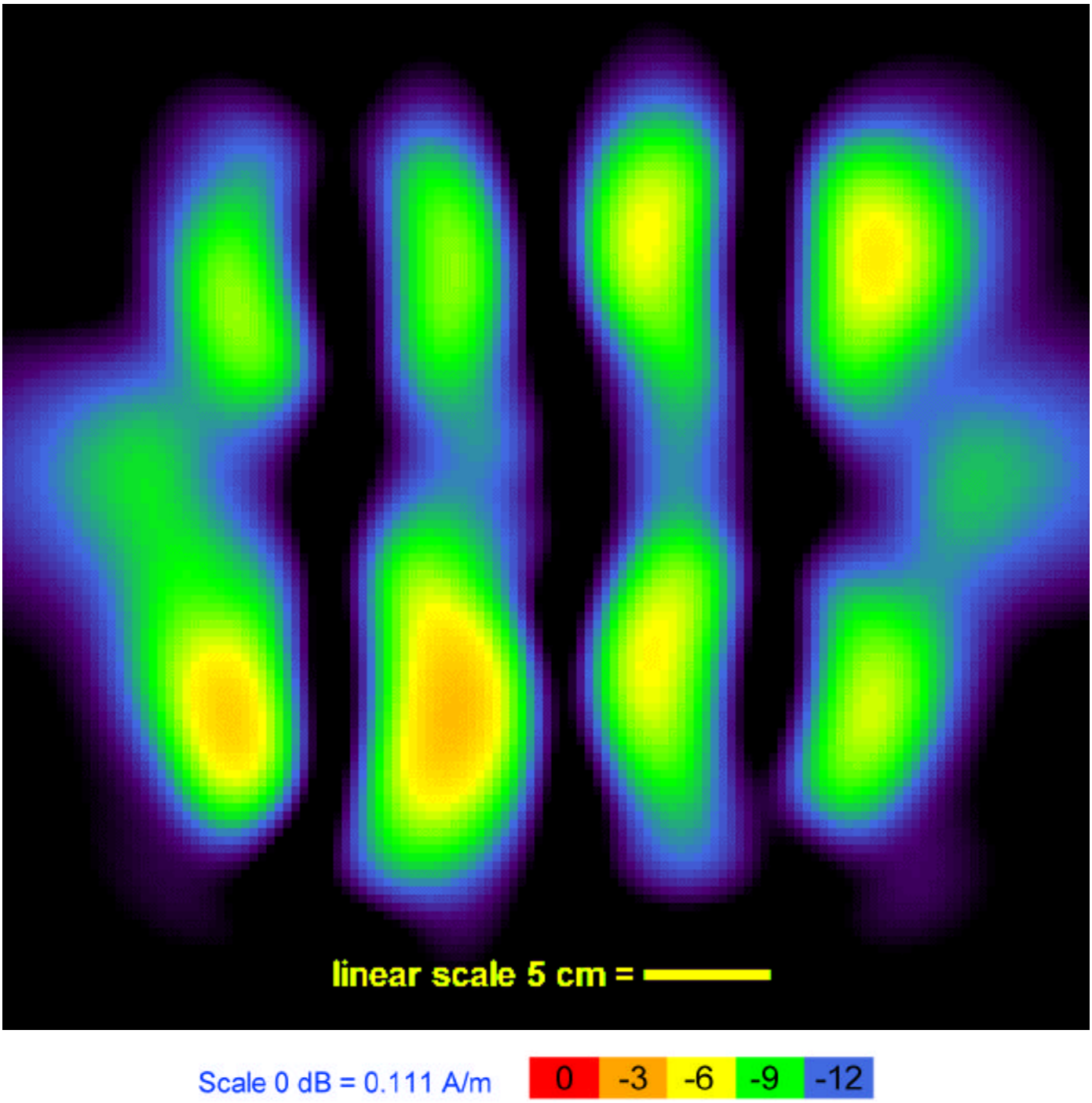

Figure 5.23. FDTD derived x component of H-field at of AT&T RU antenna in z-y plane (Scan H, 40 mm from ground plane of antenna for comparison with measured data).

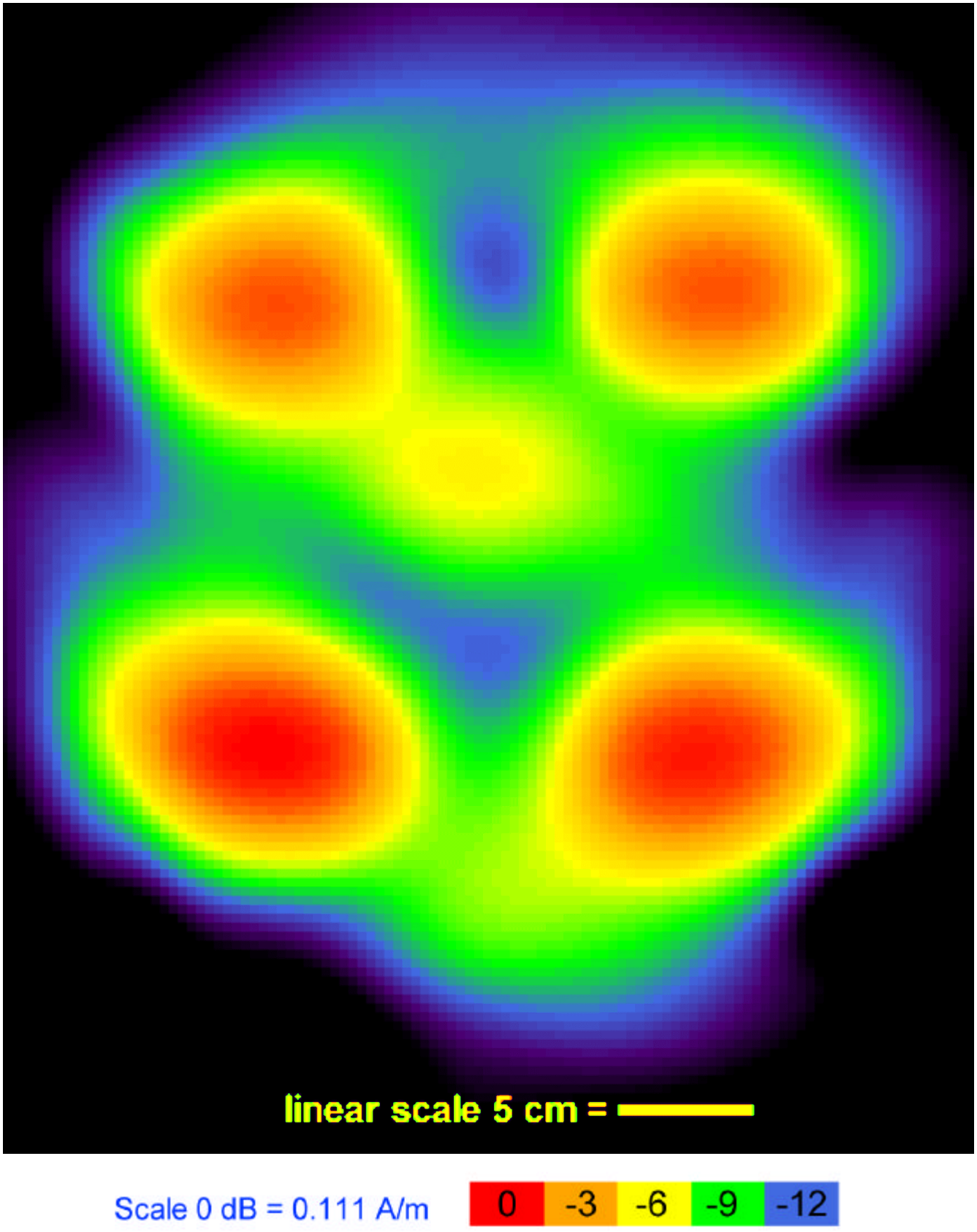

Figure 5.24. FDTD derived y component of H-field at of AT&T RU antenna in z-y plane (Scan H, 40 mm from ground plane of antenna for comparison with measured data).

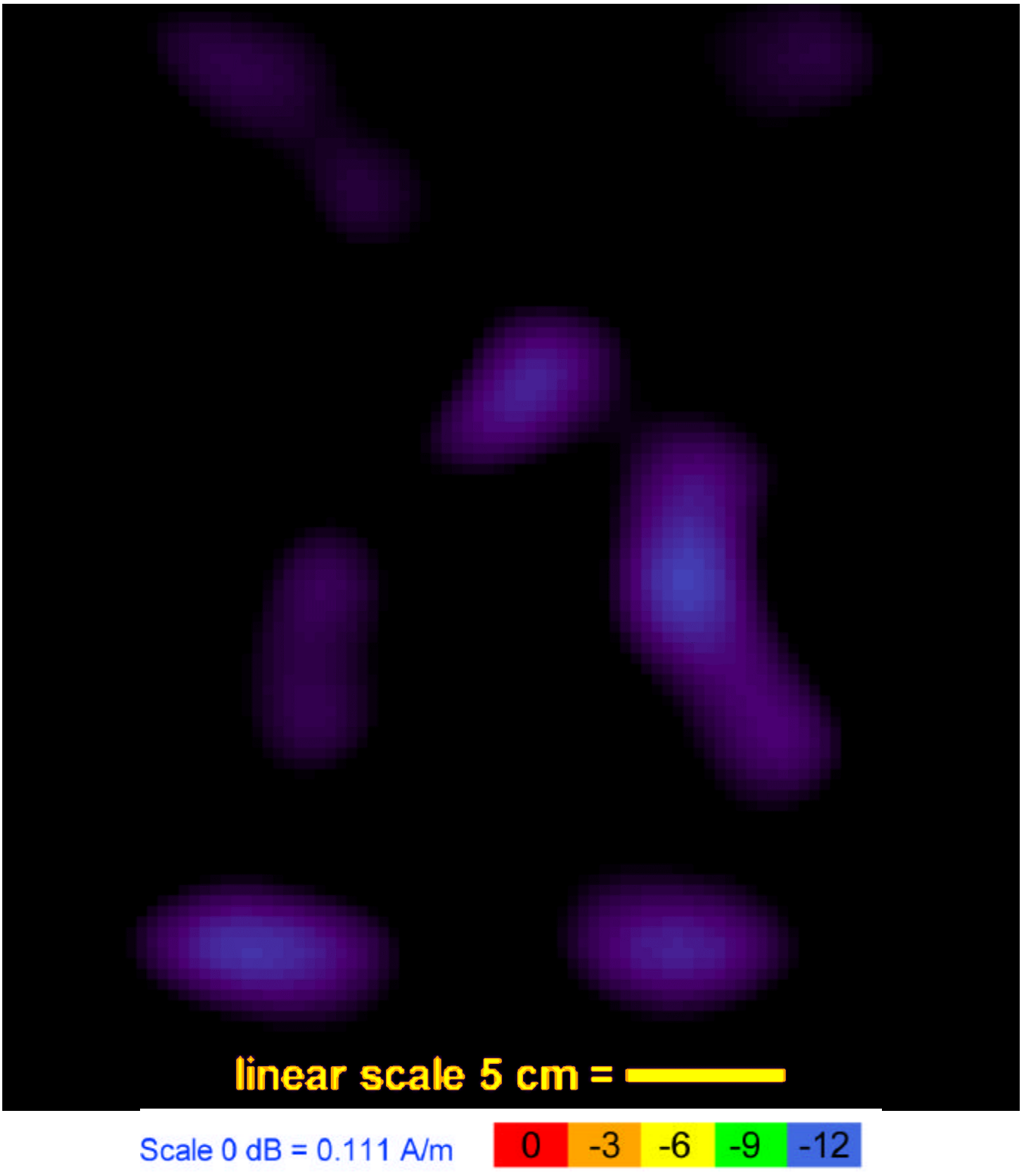

Figure 5.25. FDTD derived z component of H-field at of AT&T RU antenna in z-y plane (Scan H, 40 mm from ground plane of antenna for comparison with measured data).