In this paper, we systematically investigate the electromagnetic (EM) field of a stripline dipole coil element backed by various shielding plates, which are characterized by surface impedance. The initial analysis is based on a 2-D finite-element-method model, where the considered surface impedance was categorized in terms of magnitude and phase. It has been demonstrated that the shielding plate can be approximately modeled by the magnitude of a complex surface impedance if the absolute EM field distribution is considered. Additionally, as the magnitude of the surface impedance increases, the magnetic and electric fields excited by the stripline tend to distribute in a broader manner. Thus, the transversal homogeneity of the B_1 field of a stripline coil can be improved by a shielding plate with a high surface impedance, which has been verified by 3-D models based on single- and multi-coil elements. For the experimental validation, two shielding plates - a copper-plated substrate and a high-impedance surface, which exhibits a small and large surface impedance, respectively - are considered. An excellent agreement of field distributions between numerical simulation and measurement has been observed.