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Design of High Quality Factor RF Coil Using Superconducting Bulk

Takanori Fujita[1], Naoto Sekiya[1]

University of Yamanashi[1]

It is main problem that improvement of the power transfer efficiency of Wireless Power Transfer (WPT) system. The power transfer efficiency depends on the quality factors of the transmitting and receiving coils. However, it is difficult to improve the quality factors of them due to the limitation of conductivity of the normal conductor such as copper used for the coils. To overcome this problem, we designed a high-quality factor coil using the superconducting bulk. Figure 1(a) shows the structure of superconducting bulk simulated with 3D electromagnetic simulator. Figure 1(b) shows the quality factor of the coil versus the gap between lines with each line width. The resonant frequency is 40 MHz. The quality factor of the superconducting bulk coil is 30 times higher than that of the copper coil when gap between lines and line width are 1.5 mm and 1.5 mm.

We also simulated the coil quality factor with dielectric supporting material because the superconducting bulk coil can't maintain the spiral coil structure without it. We will show the detail of the preliminary experiments using superconducting bulk coil at the conference.

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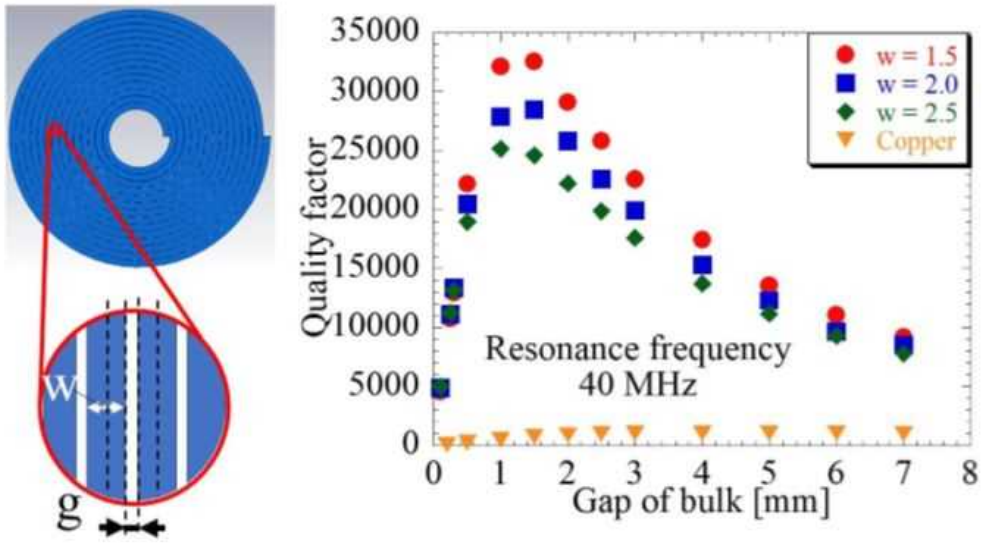

Figure 1. (a) Structure of superconducting bulk coil,
(b) Quality factor dependences on gap between lines with each line width

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