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Multiple frequency MR implantable coil system for in vivo studies of bioartificial pancreas at 11.1 T

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National High Magnetic Field Laboratory, U Florida, Gainesville — Bioartificial
pancreatic macroconstructs may deliver insulin secreting cells for blood glucose reg-
ulation. Non-invasively monitoring in vivo is key to understanding its function and
efficacy. Initial NMR imaging & spectroscopy showed great promise with surface
coils at 4.7 T. Sensitivity limitations restrict measurements so we developed an
inductively-coupled multiple-frequency coil system for 11.1 T. This system contains
an implantable loop-gap resonator, inductively coupled to an external coil, resonat-
ing at 471 MHz for $^1$H and optimized for $^{31}$P at 191 MHz. This system has a
sensitivity gain of $\sim 5.2 \pm 2.3$ over a surface coil. Images were acquired for both
frequencies. Ongoing work focuses on: 1) a receive-only coil system, 2) adding a
third resonance (443 MHz for $^{19}$F), and 3) developing coating material and embed-
ding the implantable coil in the macroconstruct. This system will be characterized
in vitro prior to its use in vivo.

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