A Q-switch system for an MRI RF coil operating at 2.5 MHz.

Nicholas R. Payne, Lionel M. Broche and David J. Lurie
Aberdeen Biomedical Imaging Centre, University of Aberdeen, AB25 2ZD, Scotland, UK

Radio frequency (RF) coils are often desired to have a high Q-factor due to the related increase in signal-to-noise ratio. However, at low frequencies there are two factors which limit the usefulness of an ever higher Q-factor: the bandwidth of the coil and the ring-down time after an RF pulse. Ring-down time is a measure of the period between the end of an RF pulse and when the energy storage in the RF coil has dissipated to the level of noise. This proves particularly problematic for low-frequency, high-Q coils as it prevents the measurement of short-lived signals. To address this issue a Q-switch circuit was designed to function at low frequency and reduce the dead-time of an RF coil following an RF pulse by briefly changing its Q-factor to a low value. The resulting reduction in coil dead-time allows signal to be detected earlier and RF pulses to be spaced closer together. MOSFETs are used in the design to isolate RF voltages from the DC control system and the circuit can be inductively coupled to any RF coil. The device was found to reduce the duration of coil ringing by a factor of five.

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