

Publication

Superbalanced steady state free precession

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Steady state free precession (SSFP) signal theory is commonly derived in the limit of quasi-instantaneous radiofrequency (RF) excitation. SSFP imaging protocols, however, are frequently set up with minimal pulse repetition times and RF pulses can thus constitute a considerable amount to the actual pulse repetition time. As a result, finite RF pulse effects can lead to 10-20% signal deviation from common SSFP theory in the transient and in the steady state which may impair the accuracy of SSFP-based quantitative imaging techniques. In this article, a new and generic approach for intrinsic compensation of finite RF pulse effects is introduced. Compensation is based on balancing relaxation effects during finite RF excitation, similar to flow or motion compensation of gradient moments. RF pulse balancing, in addition to the refocusing of gradient moments with balanced SSFP, results in a superbalanced SSFP sequence free of finite RF pulse effects in the transient and in the steady state; irrespective of the RF pulse duration, flip angles, relaxation times, or off-resonances. Superbalancing of SSFP sequences can be used with all quantitative SSFP techniques where finite RF pulse effects are expected or where elongated RF pulses are used. Magn Reson Med, 2011. (c) 2011 Wiley-Liss, Inc.

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