

WHAT IS CLAIMED IS:

1. A method of imaging a slab having at least two slices with a single-sided magnetic imaging apparatus, wherein an inherent gradient magnetic field extends from the magnetic imaging apparatus into a field of view, the method comprising:
 - transmitting a frequency sweep excitation pulse comprising a low-to-high frequency sweep;
 - phase encoding during the frequency sweep excitation pulse; and
 - tuning the amount of phase accumulated during the frequency sweep excitation pulse from adjacent slices in the slab.
2. The method of Claim 1, wherein the adjacent slices comprise a proximal slice and a distal slice, wherein the proximal slice is positioned closer to the magnetic imaging apparatus than the distal slice, and wherein a target in the distal slice is excited before a target in the proximal slice.
3. The method of Claim 2, wherein the method is configured to compensate for the inherent gradient magnetic field such that the target in the distal slice accumulates the same phase as the target in the proximal slice.
4. The method of Claim 1, wherein a different amount of phase is applied to different frequencies in the frequency sweep.
5. The method of Claim 1, wherein the phase encoding during the frequency sweep excitation pulse prevents an echo from drifting outside of an acquisition window.
6. The method of Claim 1, wherein high resolution images are collected with the single-sided magnetic imaging apparatus without *k*-space truncation.
7. The method of Claim 1, wherein the magnetic field strength in the field of view is less than 1 Tesla.
8. The method of Claim 1, wherein the inhomogeneity of the magnetic field is between 200 ppm and 200,000 ppm.
9. A magnetic imaging apparatus, comprising:
 - a permanent magnet;
 - a gradient coil set;
 - an electromagnet;
 - a radio frequency coil, wherein an inherent gradient magnetic field extends from the magnetic imaging apparatus relative to a first axis into the field of view, wherein the first axis is perpendicular to the permanent magnet; and

a control circuit configured for imaging a slab having at least two slices, wherein the imaging comprises:

- transmitting a frequency sweep excitation pulse comprising a low-to-high frequency sweep;
- phase encoding during the frequency sweep excitation pulse; and
- tuning the amount of phase accumulated during the frequency sweep excitation pulse from adjacent slices in the slab.

10. The magnetic imaging apparatus of Claim 9, wherein the adjacent slices comprise a proximal slice and a distal slice, wherein the proximal slice is positioned closer to the magnetic imaging apparatus than the distal slice, and wherein a target in the distal slice is excited before a target in the proximal slice.

11. The magnetic imaging apparatus of Claim 9, wherein a different amount of phase is applied to different frequencies.

12. The magnetic imaging apparatus of Claim 11, wherein the target in the distal slice accumulates the same phase as the target in the proximal slice.

13. The magnetic imaging apparatus of Claim 9, wherein the phase encoding during the frequency sweep excitation pulse prevents an echo from drifting outside of an acquisition window.

14. The magnetic imaging apparatus of Claim 9, wherein high resolution images are collected with the single-sided magnetic imaging apparatus without *k*-space truncation.

15. The magnetic imaging apparatus of Claim 9, wherein magnetic field strength in the field of view is less than 1 Tesla.

16. The magnetic imaging apparatus of Claim 9, wherein the inhomogeneity of the magnetic field is between 200 ppm and 200,000 ppm.

17. The magnetic imaging apparatus of Claim 9, wherein the radio frequency coil comprises a radio frequency transmission coil and a radio frequency reception coil.