

WHAT IS CLAIMED IS:

1. A single-sided magnetic imaging apparatus, comprising:
 - a permanent magnet, wherein a Z axis is defined through the permanent magnetic into a field of view;
 - an electromagnet;
 - a gradient coil set;
 - a radio frequency transmission coil;
 - a radio frequency reception coil, and
 - a power source, wherein the power source is configured to generate an electromagnetic field in the field of view along the Z axis, wherein the electromagnetic field comprises a field gradient in the field of view, and wherein a tuning of the radio frequency transmission coil is configured to target a location within the field gradient in the field of view.
2. The single-sided magnetic imaging apparatus of Claim 1, wherein the tuning of the radio frequency transmission coil comprises repositioning the radio frequency transmission coil along the Z axis.
3. The single-sided magnetic imaging apparatus of Claim 1, wherein the tuning of the radio frequency transmission coil comprises adjusting a current supplied to the radio frequency reception coil.
4. The single-sided magnetic imaging apparatus of Claim 1, wherein the tuning of the radio frequency transmission coil comprises relocating at least one electronic component selected from a group consisting of a varactor, a pin diode, a capacitor, an inductor, a MEMS switch, a solid state relay, and a mechanical relay.
5. The single-sided magnetic imaging apparatus of Claim 1, wherein the radio frequency reception coil comprises a coil printed on a disposable substrate.
6. The single-sided magnetic imaging apparatus of Claim 1, wherein the radio frequency reception coil comprises an array of radio frequency reception coils.
7. The single-sided magnetic imaging apparatus of Claim 6, wherein the array of radio frequency reception coils comprise a first coil and a second coil, and wherein the first coil and the second coil are decoupled.
8. The single-sided magnetic imaging apparatus of Claim 6, wherein the array of radio frequency reception coils comprise a first coil and a second coil, and wherein the first coil and the second coil are positioned to receive signals from different directions.
9. The single-sided magnetic imaging apparatus of Claim 8, wherein the first coil and the second coil comprise different geometries.

10. The single-sided magnetic imaging apparatus of Claim 6, wherein the array of radio frequency reception coils comprise a first coil and a second coil, and wherein the first coil and the second coil are longitudinally-staggered along the Z axis.
11. The single-sided magnetic imaging apparatus of Claim 10, wherein the first coil and the second coil partially overlap.
12. The single-sided magnetic imaging apparatus of Claim 10, wherein the first coil and the second coil are tuned to different frequencies.
13. The single-sided magnetic imaging apparatus of Claim 10, wherein the first coil is tuned to correspond to a first frequency of the field gradient field at the location along the Z axis, and wherein the second coil is tuned to match a second frequency of the field gradient at a second location along the Z axis.
14. The single-sided magnetic imaging apparatus of Claim 1, further comprising a housing comprising a concave outer surface, wherein the permanent magnet is positioned within the housing, and wherein the field of view is external to the housing and offset from the concave outer surface.
15. A method of tuning a single-sided magnetic imaging apparatus comprising a permanent magnet, an electromagnet, a gradient coil set, a radio frequency transmission coil, a radio frequency reception coil and a power source configured to generate an electromagnetic field in a region of interest, the method of tuning comprising:
accessing a field gradient in the electromagnetic field; and
adjusting a parameter of the radio frequency reception coil to target an imaging location within the field gradient.
16. The method of Claim 15, wherein adjusting a parameter of the radio frequency reception coil to target an imaging location within the field gradient comprises repositioning the radio frequency transmission coil.
17. The method of Claim 15, wherein adjusting a parameter of the radio frequency reception coil to target an imaging location within the field gradient comprises adjusting a current supplied to the radio frequency reception coil.
18. The method of Claim 15, wherein adjusting a parameter of the radio frequency reception coil to target an imaging location within the field gradient comprises relocating at least one electronic component selected from a group consisting of a varactor, a pin diode, a capacitor, an inductor, a MEMS switch, a solid state relay, and a mechanical relay.
19. The method of Claim 15, wherein adjusting a parameter of the radio frequency reception coil to target an imaging location within the field gradient comprises tuning the radio frequency reception coil to a predefined frequency based on the target anatomy.

20. The method of Claim 15, wherein the magnetic imaging apparatus comprises an array of radio frequency reception coils, and wherein the method of turning further comprises adjusting the coils in the array of radio frequency coils to different frequencies.