CLAIMS

What is claimed is:

1. A method, comprising:

determining, by a circuit, a magnitude difference between a first signal supplied to an antenna and a second signal radiated by the antenna;

determining, by the circuit, a phase difference between the first signal supplied to the antenna and the second signal radiated by the antenna;

detecting, by the circuit, an offset in an operating frequency of the antenna based on the magnitude difference and the phase difference; and

adjusting, by the circuit, the operating frequency of the antenna to mitigate the offset in the operating frequency of the antenna.

2. The method of claim 1, wherein the detecting of the offset in the operating frequency comprises determining the offset according to a reactive profile of the antenna and the phase difference, wherein the reactive profile is obtained from a look-up table.

3. The method of claim 1, wherein the frequency of the antenna is adjusted by modifying an electrical length of the antenna.

4. The method of claim 1, wherein the magnitude difference and the phase difference are proportional to the offset in the operating frequency of the antenna.

5. The method of claim 1, further comprising measuring the first signal from a probe.

6. The method of claim 5, wherein the probe comprises a directional coupler.

7. The method of claim 1, further comprising measuring the second signal from a near field probe that detects radiated energy from the antenna.

8. The method of claim 1, wherein the antenna comprises an aperture tuner to adjust a resonant frequency range of the antenna, and wherein the adjusting of the operating frequency of the antenna is performed by supplying a signal to the aperture tuner.

9. The method of claim 8, wherein the aperture tuner comprises a switchable array of reactive elements to adjust the resonant frequency range of the antenna.

10. The method of claim 8, wherein the aperture tuner comprises one of a variable capacitor, a variable inductor, or a combination thereof.

11. An antenna structure, comprising:

a first antenna element;

a first aperture tuner for adjusting an operating frequency of the antenna element;

a probe; and

a first near field sensor for sensing radiated energy from the first antenna element, wherein the first near field sensor and the first aperture tuner are coupled to a circuit that performs operations comprising:

measuring from the first near field sensor a first phase and a first magnitude of radiated energy by the first antenna element;

measuring from the probe a second phase and a second magnitude of a first signal supplied to the first antenna element;

comparing the first and the second phases to generate a phase differential;

comparing the first and the second magnitudes to generate a magnitude differential;

detecting a change in an operating frequency of the first antenna element based on the phase and magnitude differentials; and

controlling the first aperture tuner to adjust the operating frequency of the first antenna element according to the phase and magnitude differentials.

12. The antenna structure of claim 11, wherein the probe comprises a directional coupler coupled to a path that supplies the first signal to the first antenna element.

13. The antenna structure of claim 11, wherein the detecting of the change in the operating frequency of the first antenna element comprises determining the change in the operating frequency of the first antenna according to a reactive profile of the antenna.

14. The antenna structure of claim 13, further comprising retrieving the reactive profile from a look-up table indexed according the operating frequency of the first antenna element.

15. The antenna structure of claim 11, wherein the magnitude differential and the phase differential are proportional to the change in the operating frequency of the first antenna element.

16. The antenna structure of claim 11, wherein the first antenna element is adjusted by modifying an electrical length of the antenna element using the first aperture tuner.

17. The antenna structure of claim 11, further comprising a second antenna element.

18. The antenna structure of claim 17, wherein the first antenna element is coupled to the second antenna element by way of a coupling element, and wherein the coupling element causes differential currents and common mode currents flowing through the first antenna element and the second antenna element to combine in a manner that increases signal isolation between a first port of the first antenna element and a second port of the second antenna element.

19. The antenna structure of claim 17, further comprising:

a second near field sensor; and

a second aperture tuner, wherein the second antenna element is coupled to the second near field sensor and the second aperture tuner, and wherein the operations further comprise:

measuring from the second near field sensor a third phase and a third magnitude of radiated energy by the second antenna element;

measuring from the probe a fourth phase and a fourth magnitude of a second signal supplied to the second antenna element;

comparing the third and the fourth phases to generate a second phase differential;

comparing the third and the fourth magnitudes to generate a second magnitude differential;

detecting a change in a second operating frequency of the second antenna element based on the second phase and second magnitude differentials; and

controlling the second aperture tuner to adjust the second operating frequency of the second antenna element according to the second phase and the second magnitude differentials.

20. The antenna structure of claim 17, wherein the first antenna element and the second antenna element are configured for one of a multiple-input and multiple-output (MIMO) or a diversity antenna configuration.

21. A communication device, comprising:

an antenna structure;

a near field sensor;

a probe; and

a circuit coupled to the near field sensor and probe, wherein the circuit performs operations comprising:

measuring from the near field sensor a first signal representing radiated energy from the antenna structure;

measuring from the probe a second signal supplied to the antenna structure;

determining a phase differential from a first phase of the first signal and a second phase of the second signal;

determining a magnitude differential from a first magnitude of the first signal and a second magnitude of the second signal;

detecting a frequency offset of the antenna structure based on the phase and magnitude differentials; and

adjusting an operating frequency of the antenna structure to mitigate the frequency offset.

22. The communication device of claim 21, wherein the operating frequency of the antenna structure is adjusted by modifying an electrical length of the antenna structure.

23. The communication device of claim 22, wherein the electrical length is modified with one of a first device having tunable capacitance, a second device having a tunable inductance, or a combination thereof.

24. The communication device of claim 21, wherein the probe comprises a directional coupler coupled to a signal path of the signal.

25. The communication device of claim 21, wherein the communication device comprises one of a cellular telephone or a wireless access point.