CLAIMS

What is claimed is:

1. An antenna structure, comprising:

a first antenna module comprising:

a first plurality of antenna ports;

a first plurality of antenna elements, wherein each of the first plurality of antenna elements is coupled to a different one of the first plurality of antenna ports; and

a second antenna module comprising:

a second plurality of antenna ports;

a second plurality of antenna elements, wherein each of the second plurality of antenna elements is coupled to a different one of the second plurality of antenna ports;

wherein the first antenna module operates in a plurality of frequency bands, and wherein the first plurality of antenna elements are configured to have a first reduced radio frequency (RF) signal correlation between the first plurality of antenna ports;

wherein the second antenna module operates in the plurality of frequency bands, wherein the second plurality of antenna elements are configured to have a second reduced RF signal correlation between the second plurality of antenna ports; and

wherein the first antenna module and the second antenna module are utilized in a multiple-input and multiple-output (MIMO) communication session that combines at least a portion of spectrum between the plurality of bands.

2. The antenna structure of claim 1, wherein the first reduced RF signal correlation corresponds to a reduced far-field antenna pattern correlation.

3. The antenna structure of claim 1, wherein the second reduced RF signal correlation corresponds to a reduced far-field antenna pattern correlation.

4. The antenna structure of claim 1, wherein the first plurality of antenna elements are configured to have the first reduced RF signal correlation between the first plurality of antenna ports when common mode currents and differential mode currents of the first plurality of antenna elements are combined.

5. The antenna structure of claim 1, wherein the second plurality of antenna elements are configured to have the second reduced RF signal correlation between the first plurality of antenna ports when common mode currents and differential mode currents of the second plurality of antenna elements are combined.

6. The antenna structure of claim 1, wherein the MIMO communication session is utilized for simultaneous MIMO communications between a first communication system and a second communication system by assigning a first portion of spectrum from the plurality of bands to the first communication system and a second portion of spectrum from the plurality of bands to the second communication system.

7. The antenna structure of claim 6, wherein the antenna structure is utilized by a first communication device, wherein the first communication device is communicatively coupled to the first communication system and the second communication system, wherein a second communication device is communicatively coupled to the first communication system, and wherein the first communication device provides the second communication device a communication bridge to the second communication system by way of the first communication system, or the first communication device serves as a repeater between the first communication system and the second communication system for retransmitting communication data provided by the second communication device by way of the first communication system.

8. The antenna structure of claim 6, wherein the first communication system comprises a macro cellular base station, wherein the second communication system comprises a small cell communication system.

9. The antenna structure of claim 8, wherein the small cell communication system comprise one of a micro cellular base station, a pico cell, a femto cell, or a wireless fidelity access point.

10. The antenna structure of claim 1, wherein the first antenna module comprises one or more coupling elements electrically coupling the first plurality of antenna elements such that electrical currents on one antenna element of the first plurality of antenna elements flow to a neighboring antenna element of the first plurality of antenna elements and bypass at least in part one of the first plurality of antenna ports coupled to the neighboring antenna element, the electrical currents flowing through the one antenna element and the neighboring antenna element being of similar magnitude, such that an antenna mode excited by the one of the first plurality of antenna ports increases electrical isolation from a mode excited by another of the plurality of antenna elements at a given signal frequency range.

11. The antenna structure of claim 1, wherein the second antenna module comprises one or more coupling elements electrically coupling the second plurality of antenna elements such that electrical currents on one antenna element of the second plurality of antenna elements flow to a neighboring antenna element of the second plurality of antenna elements and bypass at least in part one of the second plurality of antenna ports coupled to the neighboring antenna element, the electrical currents flowing through the one antenna element and the neighboring antenna element being of similar magnitude, such that an antenna mode excited by the one of the plurality of antenna ports increases electrical isolation from a mode excited by another of the second plurality of antenna elements at a given signal frequency range.

12. The antenna structure of claim 1, wherein the first antenna module and the second antenna module are coupled to a plurality of radio frequency (RF) receiver circuits and a plurality of RF transmitter circuits.

13. The antenna structure of claim 1, wherein a controller shares information with a communication system descriptive of the first antenna module and the second antenna module, and wherein the communication system utilizes the information to configure communications with a communication device utilizing the first antenna module and the second antenna module for engaging in the MIMO communications.

14. The antenna structure of claim 1, wherein the first antenna module and the second antenna module are utilized by a portable communication device.

15. The antenna structure of claim 1, comprising a controller that performs operations comprising:

detecting a frequency offset of one of the first antenna module, the second antenna module, or a combination thereof; and

adjusting an operating frequency of one of the first antenna module, the second antenna module, or a combination thereof to mitigate the frequency offset of one of the first antenna module, the second antenna module, or a combination thereof.

16. A communication device, comprising:

a first antenna module comprising:

a first plurality of antenna ports;

a first plurality of antenna elements, wherein each of the first plurality of antenna elements is coupled to a different one of the first plurality of antenna ports;

wherein the first antenna module operates in a plurality of frequency bands;

a second antenna module comprising:

a second plurality of antenna ports;

a second plurality of antenna elements, wherein each of the second plurality of antenna elements is coupled to a different one of the second plurality of antenna ports;

wherein the second antenna module operates in the plurality of frequency bands;

a memory to store instructions; and

a processor coupled to the memory and the first antenna module and the second antenna module, wherein responsive to executing the instructions, the processer performs operations comprising configuring the first antenna module and the second antenna module to enable a multiple-input and multiple-output (MIMO) communication session that combines at least a portion of spectrum between the plurality of bands.

17. The communication device of claim 16, wherein the first plurality of antenna elements are configured to have a first reduced radio frequency (RF) signal correlation between the first plurality of antenna ports, and wherein the second plurality of antenna elements are configured to have a second reduced RF signal correlation between the second plurality of antenna ports.

18. A machine-readable storage device, comprising instructions, wherein responsive to a circuit executing the instructions, the circuit performs operations comprising:

receiving a request to initiate a multiple-input and multiple-output (MIMO) communication session; and

configuring a first antenna module and a second antenna module of a communication device to enable the MIMO communication session, wherein the MIMO communication session combines at least a portion of spectrum between a plurality of bands shared by the first antenna module and the second antenna module.

19. The machine-readable storage device of claim 18, wherein the first antenna module comprises:

a first plurality of antenna ports; and

a first plurality of antenna elements, wherein each of the first plurality of antenna elements is coupled to a different one of the first plurality of antenna ports.

20. The machine-readable storage device of claim 18, wherein the second antenna module comprises:

a second plurality of antenna ports; and

a second plurality of antenna elements, wherein each of the second plurality of antenna elements is coupled to a different one of the second plurality of antenna ports.