

CLAIMS

What is claimed is:

1. A multimode antenna structure comprising:
a plurality of antenna ports;
a plurality of antenna elements, each operatively coupled to a different one of the plurality of antenna ports; and
one or more coupling elements for electrically coupling to other antenna elements of the plurality of antenna elements, wherein electrical currents on one antenna element of the plurality of antenna elements substantially bypass the plurality of antenna ports coupled to the other antenna elements such that an antenna mode excited by one of the plurality of antenna ports is substantially electrically isolated from a mode excited by another one of the plurality of antenna ports at a signal frequency range.
2. The multimode antenna structure of claim 1, wherein the electrical currents flow to the other antenna elements of the plurality of antenna elements.
3. The multimode antenna structure of claim 1, wherein at least one antenna element of the plurality of antenna elements comprises branches of different lengths to create resonance at different frequencies.
4. The multimode antenna structure of claim 1, wherein the antenna mode excited by the one of the plurality of antenna ports is substantially electrically isolated from the mode excited by the other one of the plurality of antenna ports at the signal frequency range without using a decoupling network at the plurality of antenna ports.
5. The multimode antenna structure of claim 1, wherein the plurality of antenna elements are arranged about a periphery of the multimode antenna structure.

6. The multimode antenna structure of claim 1, wherein the plurality of antenna elements are coupled with a common counterpoise.
7. The multimode antenna structure of claim 6, wherein the plurality of antenna elements comprises an odd number of antenna elements, and wherein the common counterpoise comprises a hollow conductive cylinder.
8. The multimode antenna structure of claim 7, wherein the plurality of coupling elements comprise a conductive ring on a periphery of a cylinder and connecting the plurality of antenna elements in a symmetrical configuration on the periphery of the cylinder.
9. The multimode antenna structure of claim 1, wherein at least one of the plurality of coupling elements has a configuration to provide a given electrical length.
10. The multimode antenna structure of claim 1, further comprising an inductive trace coupled to at least one antenna element of the plurality of antenna elements at a location spaced apart from a respective antenna port of the plurality of antenna ports.
11. The multimode antenna structure of claim 1, further comprising a plurality of coplanar conductive tabs, each connected to a respective antenna element of the plurality of antenna elements, for providing connection points to the antenna structure.

12. A multimode antenna structure comprising:
 - a plurality of antenna ports;
 - a plurality of antenna elements, each operatively coupled to a different one of the plurality of antenna ports; and
 - a coupling element electrically coupling the plurality of antenna elements to a common point, wherein electrical currents on one antenna element of the plurality of antenna elements substantially bypass an antenna port of the plurality of antenna ports coupled to another antenna element such that an antenna mode excited by the antenna port of the plurality of antenna ports is substantially electrically isolated from a mode excited by another antenna port of the plurality of antenna ports at a signal frequency range.

13. The multimode antenna structure of claim 12, wherein at least one antenna element of the plurality of antenna elements comprises branches of different lengths.

14. The multimode antenna structure of claim 12, wherein the plurality of antenna elements are arranged about a periphery of the multimode antenna structure.

15. The multimode antenna structure of claim 12, further comprising a common counterpoise, wherein the plurality of antenna elements are coupled with the common counterpoise.

16. The multimode antenna structure of claim 15, wherein the plurality of antenna elements comprises an even number of antenna elements arranged in a cylinder, wherein the common point is on a longitudinal axis of the cylinder, and wherein the counterpoise comprises a hollow conductive cylinder.

17. An antenna comprising:
 - a plurality of antenna ports;
 - a plurality of antenna elements, each operatively coupled to a different one of the plurality of antenna ports, at least one antenna element of the plurality of antenna elements comprising upper and lower planar sections that are spaced apart; and
 - one or more coupling elements, each electrically coupling to neighboring antenna elements of the plurality of antenna elements at one of the planar sections such that the plurality of antenna elements form a radiating structure, wherein electrical currents in one antenna element of the plurality of antenna elements substantially bypass one antenna port of the plurality of antenna ports coupled to a neighboring antenna element, wherein the electrical currents in the one antenna element and the neighboring antenna element have a magnitude such that an antenna mode excited by the one antenna port is substantially electrically isolated from a mode excited by another antenna port of the plurality of antenna ports at a signal frequency range.

18. The antenna of claim 17, wherein at least one antenna element of the plurality of antenna elements comprises branches of different lengths.

19. The antenna of claim 17, wherein at least one of the coupling elements has a configuration to provide a given electrical length.

20. The antenna of claim 17, wherein the antenna mode excited by the one antenna port is substantially electrically isolated from the mode excited by the other antenna port of the plurality of antenna ports at the signal frequency range without using a decoupling network at the plurality of antenna ports.