CLAIMS:

1. A transponder system, comprising: a first antenna array and a second antenna array each including a plurality of antenna elements arranged in a predetermined geometry of said plurality of antenna elements, the plurality of antenna elements of the first antenna array being respectively interconnected with corresponding antenna elements of the plurality of antenna elements of the second antenna array by respective connection lines to form a plurality of receiving-transmitting pairs of antenna elements, each of said receiving-transmitting pairs being configured to receive an input electromagnetic signal by one antenna element thereof and transmit a corresponding output electromagnetic signal by a corresponding antenna element thereof, thereby enabling collective collection of an input electromagnetic waveform, by one of said first and second antenna arrays and collective transmission of a corresponding output electromagnetic waveform by another one of said first and second antenna arrays; whereby the respective connection lines have substantially similar length and electrical properties thereby providing that a direction of propagation of the corresponding output signal waveform is relative to direction of propagation of the collected signal waveform; at least one of said first and second antenna arrays being selectively and changeably rotatable with respect to the other about at least one predetermined rotation axis to thereby enable selected angular shift in direction of propagation of the output signal waveform with respect to direction of propagation of the collected signal waveform; wherein said transponder system is formed by analog circuitry comprising said connection lines of the substantially similar length and electrical properties, thereby obviating a need for processing the received input electromagnetic signals associated with said collective receipt of the input signal waveform for forming the transmitted output electromagnetic signals associated with the collective transmission of the corresponding output signal waveform with said angular shift with respect to direction of propagation of the collected signal waveform.

2. The transponder of claim 1, wherein each antenna element of the first antenna array is connected to a corresponding antenna element of the second array in accordance with sequential location of the antenna elements within the first and second arrays to form said receiving-transmitting pairs.

3. The transponder of claim 1, wherein said first and second antenna arrays are configured with substantially similar geometries.

4. The transponder of claim 1, wherein said first and second antenna arrays have linear geometries.

5. The transponder of claim 1, wherein said first and second antenna arrays have two-dimensional geometries.

6. The transponder of claim 1, further comprising an actuation module connected to said at least one rotatable antenna array and configured to enable controllable rotation of said rotatable antenna array about said at least one predetermined rotation axis.

7. The transponder of claim 6, further comprising a control unit connected to said actuation module and configured for receiving data indicative of a desired angular shift between direction of propagation of the output signal wavefront with respect to direction of propagation of the collected signal waveform, and for operating said actuation module to vary a relative angle between said first and second antenna arrays for providing said angular shift.

8. The transponder of claim 7, wherein said control unit comprises a wireless communication module configured to receive appropriate control signals indicative of said angular shift, said control unit being responsive to said appropriate control signals to operate said actuation module accordingly to thereby enable remote variation of said relative angle between said first and second antenna arrays.

9. The transponder of claim 1, further comprising a plurality of signal amplifiers respectively associated with said connection lines and configured to amplify signals passing between the associated antenna elements of the corresponding receiving-transmitting pair.

10. The transponder of claim 9, wherein said plurality of signal amplifiers are configured to provide substantially similar signal amplification.

11. The transponder of claim 1, wherein said plurality of antenna elements comprises antenna elements configured to receive and transmit electromagnetic radiation with two or more different polarization orientations.

12. The transponder of claim 1, further comprising an isolation system configured to reduce cross talk between antenna elements of said first and second antenna arrays.

13. The transponder of claim 12, further comprising a plurality of signal amplifiers respectively associated with said connection lines and wherein said isolation system is

configured to suppress said cross talk by a factor greater than signal amplification provided by said signal amplifiers.

14. The transponder of claim 12, wherein said isolation system comprises at least one of the following: (a) one or more parasitic antennas; (b) an electromagnetic isolation layer; (c) one or more frequency dividers/multipliers configured to change the frequency of the transmitted signals relative to the frequency of the received signals in accordance with the antenna elements' spacings of said first and second antenna arrays; or (d) one or more filters configured to filter out frequency components associated with the received signals while transfer frequency components are associated with the transmitted signals in accordance with antenna elements' spacing of said first and second antenna arrays.

15. The transponder of claim 1, wherein said first and second antenna arrays have substantially similar spacing between their antenna elements.

16. The transponder of claim 1, wherein said first and second antenna arrays are located on a substantially parallel plane intersecting with an axis of rotation of said at least one rotatable antenna array.

17. The transponder of claim 1, wherein said first and second wherein said first and second antenna arrays have closed loop geometry within a plane perpendicular to said at least one predetermined rotation axis.

18. The transponder of claim 17, wherein said first and second antenna arrays are circular or polygonal arrays of said plurality of antenna elements.

19. The transponder of claim 17, wherein said first and second antenna arrays are concentric with respect to one another, said at least one rotation axis includes an axis intersecting with a plane defined by at least one of the first or second antenna arrays at a center of the closed loop.

20. The transponder of claim 17, wherein said first and second antenna arrays are located in substantially parallel planes.

21. A signal transmission network, comprising: two or more transponder systems, at least one transponder system of the two or more transponder systems comprises: a first antenna array and a second antenna array each including a plurality of antenna elements arranged in a predetermined geometry of said plurality of antenna elements, the plurality of antenna elements of the first antenna array being respectively interconnected with corresponding antenna elements of the plurality of antenna elements of the second

antenna array by respective connection lines to form a plurality of receiving-transmitting pairs of antenna elements, each of said receiving-transmitting pairs being configured to receive an input electromagnetic signal by one antenna element thereof and transmit a corresponding output electromagnetic signal by a corresponding antenna element thereof, thereby enabling collective collection of an input signal waveform by one of said first and second antenna array and transmission of a corresponding output signal waveform by another one of said first and second antenna arrays; wherein the respective connection lines having substantially similar length and electrical properties thereby providing that a direction of propagation of the corresponding output signal waveform is relative to direction of propagation of the collected signal waveform; at least one of said first and second antenna arrays being selectively and changeably rotatable with respect to the other about at least one predetermined rotation axis to thereby enable selected angular shift in direction of propagation of the output signal waveform with respect to direction of propagation of the collected signal waveform; and wherein said transponder system is formed by analog circuitry comprising connection lines of substantially similar length and electrical properties between the receiving-transmitting pairs of antenna elements of the first and second arrays, thereby obviating a need for processing the received input electromagnetic signals associated with said collective receipt of the input signal waveform for forming the transmitted output electromagnetic signals associated with the collective transmission of the corresponding output signal waveform; said two or more transponders being arranged at certain locations to enable establishment of a signal propagation trajectory along the signal transmission network, such a segment of said signal propagation trajectory being defined between two adjacent transponder systems; wherein control over the angular shift provided by said at least one transponder system enabling establishment of a desired signal propagation trajectory along the network.

22. The signal transmission network of claim 21, further comprising a controller connectable to said at least one transponder system and configured and operable to utilize data indicative of a desired trajectory for signal transmission along said signal transmission network, determine at least one corresponding angular shift for said at least one transponder system, and communicate operational instructions indicative of said at least one corresponding angular shift to said at least one transponder system

respectively to thereby establish said desired trajectory through the signal transmission network.

23. A transponder, comprising: a plurality of antenna elements associated with first and second antenna arrays having predetermined closed-loop geometry and spacing of said plurality of antenna elements, said closed loop geometry defining respective parallel planes of the first and second antenna arrays; wherein each antenna element of the first antenna array is connected to a corresponding antenna element of the second antenna array via a connection line to thereby form a plurality of receiving-transmitting pairs of antenna elements, such that the plurality of receiving-transmitting pairs of antenna elements are associated with a respective plurality of connection lines being of substantially similar lengths and electrical properties; wherein at least one of said first and second antenna arrays is selectively and changeably rotatable with respect to the other about at least one axis perpendicular to said planes, to thereby enable selected angular shift in a relative angle between said first and second antenna arrays; and wherein said transponder is formed by analog circuitry comprising said connection lines of the substantially similar length and electrical properties between the receiving-transmitting pairs of antenna elements of the first and second arrays, thereby obviating a need for processing the input electromagnetic signals received by antenna elements of one of said first and second antenna arrays for forming output electromagnetic signals transmitted by antenna elements of another one of said first and second antenna arrays with said selected angular shift in a relative angle between said first and second antenna arrays.