WHAT IS CLAIMED IS:

1. A method of calibrating an antenna system comprising an antenna array of at least first and second antennas, the method comprising:

prior to a handover period in which communication with the antenna system is handed over from a first communication system to a second communication system, forming a first beam for the communication with the first communication system through the first and second antennas;

during a first portion of the handover period: forming a second beam for the communication with the first communication system using the first antenna while deactivating the second antenna for external communication, and calibrating the second antenna;

during a second portion of the handover period: activating the second antenna for a handed over communication with the second communication system by forming a third beam using the second antenna while the first antenna maintains its communication with the first communication system via the second beam; and

after the handover period, forming a fourth beam for the communication with the second communication system ~~though~~ through both the first and second antennas.

2. The method of claim 1, further comprising:

during a third portion of the handover period, deactivating the first antenna for the communication with the first communication system, and calibrating the first antenna.

3. The method of claim 1, wherein the first and second communication systems are located in different directions with respect to the antenna array, and the third beam is formed to point in a different direction than the first beam.

4. The method of claim 1, wherein each of the first and second communication systems is a satellite.

5. The method of claim ~~1~~ 2, wherein:

each of the first and second antennas is a phased array comprising a plurality of antenna elements coupled to a plurality of amplifiers and a plurality of phase shifters; and

said calibrating the first and second antennas comprises calibrating respective phase shifts of the phase shifters and / or respective gains of the amplifiers.

6. The method of claim 5, wherein the plurality of antenna elements are further coupled to a plurality of variable delay lines, and said calibrating the first and second antennas further comprises adjusting delays the variable delay lines.

7. The method of claim 5, wherein said deactivating the second antenna comprises turning off the plurality of amplifiers within the second antenna.

8. The method of claim 1, further comprising:

prior to the handover period and after the handover period, outputting a single receive beam signal to a single, first demodulator; and

during the second portion of the handover period, outputting a first receive beam signal corresponding to a receive signal from the first communication system to the first demodulator and outputting a second receive beam signal corresponding to a receive signal from the second communication system to a second demodulator.

9. The method of claim 8, further comprising:

prior to the handover period and after the handover period, controlling a cross-coupled switch to cross-couple a first receive signal from the first antenna and a second receive signal from the second antenna towards the first demodulator; and

during the second portion of the handover period, controlling the cross-coupled switch to prevent cross-coupling of the first and second receive signals, and

routing the first receive signal towards the first demodulator and the second receive signal towards the second demodulator.

10. An antenna system comprising:

an antenna array comprising first and second antennas;

a calibration circuit;

a cross-coupled switch coupled to the first and second antennas; and

a controller configured to:

prior to a handover period in which communication with the antenna system is handed over from a first communication system to a second communication system: control a switching state of the cross-coupled switch to cause it to output signals communicated with the first communication system through a first beam formed using both the first and second antennas;

during a first portion of the handover period: control the switching state of the cross-coupled switch to cause it to output signals communicated between the antenna system and the first communication system through a second beam formed using the first antenna while deactivating the second antenna for external communication, and command the calibration circuit to perform a calibration procedure on the second antenna;

during a second portion of the handover period: activate the second antenna for a handed over communication with the second communication system by controlling the second antenna to form a third beam while controlling the first antenna to maintain its communication with the first communication system via the second beam; and

after the handover period, controlling the first and second antennas to collectively form a fourth beam for the communication with the second communication system.

11. The antenna system of claim 10, wherein the first and second communication systems are first and second satellites, respectively.

12. The antenna system of claim 10, wherein during a ~~second~~ third portion of the handover period, the controller further controls the switching of the cross-coupled switch to output signals communicated between the antenna system and the second communication system through a third beam formed using the second antenna while deactivating the first antenna, and cooperates with the calibration circuit to calibrate the first antenna.

13. The antenna system of claim 10, wherein the controller is further configured to deactivate the calibration circuit for calibration operations during all periods of communication between the antenna system and any external communication system except for handover periods.

14. The antenna system of claim 10, wherein each of the first and second antennas is a phased array comprising a plurality of antenna elements coupled to a plurality of amplifiers and a plurality of phase shifters, and the controller cooperates with the calibration circuit to calibrate the first and second antennas by calibrating respective phase shifts of the phase shifters and / or respective gains of the amplifiers.

15. The antenna system of claim 10, wherein at least one of the first and second antennas is further coupled to, or includes, a plurality of variable delay lines, and the controller cooperates with the calibration circuit to calibrate the first and second antennas by calibrating respective delays of the delay lines.

16. The antenna system of claim 10, wherein:

the signals outputted by the cross-coupled switch are signals received by the antenna system from the first communication system or the second communication system;

the antenna system further comprises first and second demodulators each coupled to the cross-coupled switch;

prior to and after the handover period, the controller controls switching of the cross-coupled switch to connect cross-coupling therein, and only the first demodulator demodulates the signals output by the cross-coupled switch; and

during the second portion of the handover period: the controller controls switching of the cross-coupled switch to disconnect the cross-coupling therein; only the first demodulator receives and demodulates the signals output by the cross-coupled switch corresponding to signals received from the first communication system; and only the second demodulator receives and demodulates the signals output by the cross-coupled switch corresponding to signals received from the second communication system.

17. The antenna system of claim 10, wherein the cross-coupled switch comprises:

a first directional coupler having a first input port connected to the first antenna, a first output port and a second output port;

a second directional coupler having a first input port coupled to the first output port of the first directional coupler, a second input port, and a first output port coupled to a first demodulator;

a first single pole, double throw (SPDT) switch having an input port coupled to the second input port of the second directional coupler, a first output port coupled to a termination, and a second output port;

a second SPDT switch having an input port coupled to a termination, a first output port and a second output port connected to the second output port of the first SPDT switch;

a third directional coupler having a first input port connected to the second antenna, a first output port and a second output port;

a fourth directional coupler having a first input port coupled to the first output port of the third directional coupler, a second input port, and a first output port coupled to the second demodulator;

a third SPDT switch having an input port coupled to the second input port of the fourth directional coupler, a first output port coupled to a termination, and a second output port;

a fourth SPDT switch having an input port coupled to a termination, a first output port and a second output port connected to the second output port of the third SPDT switch;

wherein,

the second output port of the first SPDT switch is coupled to the second output port of the third directional coupler; and

the second output port of the third SPDT switch is coupled to the second output port of the first directional coupler.

18. The antenna system of claim 17, further comprising a single pole multi-throw (SPMT) switch having an output port coupled to an input port of the calibration circuit, and having a plurality of input ports, wherein:

each of the first through fourth directional couplers is a 3dB hybrid coupler;

a second output port of the third directional coupler is coupled to a first input port of the SPMT switch, and a second output port of the fourth directional coupler is coupled to a second input port of the SPMT switch; and

the controller controls the SPMT switch to close a first switching path between the first input port and the output port thereof to calibrate the first antenna, and to close a second switching path between the first input port and the output port thereof to calibrate the second antenna.

19. The antenna system of claim 10, wherein:

the signals outputted by the cross-coupled switch are signals transmitted by the antenna system to the first communication system or the second communication system;

the antenna system further comprises first and second modulators each coupled to the cross-coupled switch;

during the first portion of the handover period, only the first modulator transmits modulated signals to the cross-coupled switch, and the cross-coupled switch routes the modulated signals to output ports thereof to provide the outputted signals; and

during the second portion of the handover period, both the first modulator and the second modulator transmit modulated signals to the cross-coupled switch, and the cross-coupled switch routes the modulated signals to output ports thereof to provide the outputted signals.

20. The antenna system of claim 10, wherein:

the antenna system further comprises a single pole multi throw (SPMT) switch and a radiating element coupled to a first output port of the SPMT switch;

the calibration circuit comprises an output port coupled to an input port of the SPMT switch and providing a radio frequency (RF) output signal;

the antenna system further comprises a coupler having an input port coupled to a receive path connected to the first or second antenna, a coupled port connected to a second output port of the SPMT switch, and a transmitted port coupled to an input port of the calibration circuit, wherein a return signal corresponding to the RF output signal is provided from the transmitted port to the input port of the calibration circuit.

21. The antenna system of claim 20, wherein the calibration circuit comprises a power divider having an input port that receives the return signal, a first output port and a second output port, a peak detector coupled to the first output port, a downconverter coupled to the second output port, a phase detector coupled to the downconverter, a first analog to digital converter (ADC) coupled to an output of the peak detector, and a second ADC coupled to an output of the phase detector.

22. The antenna system of claim 20, wherein the calibration circuit comprises a hybrid coupler that receives the return signal, an in-phase / quadrature phase (I/Q) demodulator coupled to the hybrid coupler, a first analog to digital converter (ADC) coupled to an I output port of the I/Q demodulator, a second ADC coupled to a Q output port of the I/Q demodulator, a local oscillator, and a coupler that couples a first portion of an LO signal output by the LO to the I/Q demodulator and couples a second portion of the LO signal to provide the RF output signal.