## CLAIMS

What is claimed is:

1. A multi-beam communication system, comprising:
    a first antenna assembly within an array of antenna assemblies;
    the first antenna assembly has a first set of RF elements oriented to produce a first beam state, and a second set of RF elements oriented to produce a second beam state;
    wherein the first set of RF elements comprise a first set of output sectors, and the second set of RF elements comprise a second set of output sectors; and
    wherein a controller is configured to selectively activate the first beam state and the second beam state.

2. The multi-beam communication system of claim 1, wherein the first beam state further comprises a first beam set, and wherein the second beam state comprises a second beam set.

3. The multi-beam communication system of claim 1, wherein the first set of output sectors at least partially overlaps the second set of output sectors.

4. The multi-beam communication system of claim 3, wherein the first set of output sectors does not overlap the second set of output sectors.

5. The multi-beam communication system of claim 1, wherein the selective activation of the controller is function of a wireless network protocol.

6. The multi-beam communication system of claim 1, wherein the first antenna assembly further comprises a first RF lens.

7. The multi-beam communication system of claim 6, further comprising a second RF lens having a third set of RF elements oriented to produce a third set of output sectors, and a fourth set of RF elements oriented to produce a fourth set of output sectors.

8. The multi-beam communication system of claim 6, wherein at least some of the beam states operate simultaneously, within 0.5 to 30 GHz.

9. The multi-beam communication system of claim 1, wherein the controller is further configured to selectively activate the first beam state independently from the second beam state.

10. The multi-beam communication system of claim 1, wherein the controller is further configured to combine at least the first beam state and the second beam state into a combined beam state, and wherein the combined beam state is configured for 120 degrees of coverage.

11. The multi-beam communication system of claim 1, wherein the controller is further configured to selectively activate the first beam state and the second beam state as a function of time

12. The multi-beam communication system of claim 6, wherein the first RF lens is configured such that selective activation of the first beam state alters the first output beam with respect to at least one of a beam frequency range, beamwidth, a beam-direction, a beam polarization, a beam gain, and a beam sidelobe level.

13. The multi-beam communication system of claim 1, further comprising a second antenna assembly within the array of antenna assemblies;

the second antenna assembly has a third set of RF elements oriented to produce a third beam state, and a fourth set of RF elements oriented to produce a fourth beam state;

wherein the third set of RF elements comprise a third set of output sectors, and the fourth set of RF elements comprise a fourth set of output sectors; and

wherein the controller is configured to selectively activate the third beam state and the fourth beam state.

14. The multi-beam communication system of claim 13, wherein the third beam state further comprises a third beam set, and wherein the third beam state comprises a third beam set.

15. The multi-beam communication system of claim 13, wherein the third beam state is the same as the first beam state.

16. The multi-beam communication system of claim 13, wherein the third beam state is different from the first beam state.