WHAT IS CLAIMED IS:

1. An instrument landing system, ILS, comprising:

a plurality of antennas;

a plurality of antenna radio units, ARUs, that each operates to generate a modulated RF signal provided to a different one of the plurality of antennas for transmission; and

a central processing unit operates to control the ARUs to adjust synchronization between the modulated RF signal provided by the ARUs to the plurality of antennas for transmission.

2. The ILS of Claim 1, wherein the central processing unit operates to control the ARUs to adjust synchronization of carrier frequency and phase between the modulated RF signals provided by the ARUs to the plurality of antennas for transmission.

3. The ILS of Claim 2, wherein the central processing unit operates to control the ARUs to adjust synchronization of carrier phase spread to have not more than a threshold RF deviation between the modulated RF signals provided by the ARUs to the plurality of antennas for transmission.

4. The ILS of any of Claims 1 to 3, wherein each of the ARUs is directly connected to an antenna of the plurality of antennas to provide one of the modulated RF signals to only one of the plurality of antennas for transmission.

5. The ILS of Claim 4, wherein each of the ARUs comprises a local RF oscillator circuit that operates to phase lock to a reference oscillator signal provided by the central processing unit.

6. The ILS of Claim 5, wherein the central processing unit is connected through a plurality of cables each to different ones of the ARUs to provide signals through the cables for the ARUs to generate the modulated RF signals, wherein the central processing unit operates to measure cable signaling delays between the central unit and each of the ARUs, and to adjust synchronization between the modulated RF signal provided by the ARUs to the plurality of antennas for transmission based on the measurements of the cable signaling delays.

7. The ILS of Claim 6, wherein the central processing unit operates to measure the cable signaling delays between the central processing unit and each of the ARUs based on comparison of phasing between the reference oscillator signal and signals of each of the local RF oscillator circuits.

8. The ILS of any of Claims 1 to 7, wherein each of the ARUs comprises a local RF oscillator circuit that is driven by a Temperature Compensated Crystal Oscillator, TCXO, internal to each of the ARUs, which is controlled by a phase locked loop, PLL, locked to a synchronization signal broadcasted by the central unit from a TCXO internal to the central unit, wherein periodically the central processing unit operates to stop the TCXO of one ARU for a defined time slot duration during which the TCXO of the one ARU is frozen in a hold state, and while the TCXO of the one ARU is frozen the central unit operates to measure phase difference between the TCXO internal to the central processing unit and a signal from the TCXO internal to the one ARU sent through a cable to the central processing unit.

9. The ILS of any of Claims 1 to 8, wherein each of the ARUs comprises a local RF oscillator circuit that operates to output a deterministic fractional multiplication of a carrier frequency that is locked to a common TCXO broadcast by the central processing unit.

10. The ILS of any of Claims 1 to 9, wherein each of the ARUs comprise:

a transmitter circuit operative to transmit a modulated RF signal;

a transmitter synchronization circuit operative to control synchronization of the modulated RF signal transmitted by the transmitter circuit;

a receiver circuit operative to receive a modulated RF signal; and

a receiver synchronization circuit operative to control synchronization of the modulated RF signal received by the receiver circuit.

11. The ILS of Claim 10, wherein the central processing unit is operative to adjust synchronization of carrier frequency and phase between the transmitter circuits within each of the ARUs.

12. The ILS of any of Claims 1 to 11, wherein each of the ARUs are software defined radios operative to generate a modulated radio frequency signal at a programmable carrier frequency and programmable configuration values.

13. The ILS of Claim 12, wherein the programmable configuration values comprise at least one of RF power, RF phase, modulation depths, and phases.

14. The ILS of any of Claims 1 to 13, wherein each of the ARUs comprises a local RF oscillator circuit that is driven by a Temperature Compensated Crystal Oscillator, TCXO, internal to each of the ARUs, which is controlled by a phase locked loop, PLL, locked to a synchronization signal broadcasted by the central unit from a TCXO internal to the central unit, wherein periodically the central processing unit operates to stop the TCXO of one ARU for a defined time slot duration during which the TCXO of the one ARU is frozen in a hold state, and while the TCXO of the one ARU is frozen the central processing unit operates to measure phase difference between the TCXO internal to the central processing unit and a signal from the TCXO internal to the one ARU sent through a cable to the central processing unit.

15. The ILS of any of Claims 1 to 14, wherein:

each of the ARUs comprises a local RF oscillator circuit;

the central processing unit provides each of the ARUs two frequency signals, the signals being provided through cables each of which respectively connects the central processing unit to a different one of the ARUs, the central processing unit combining the two frequency signals to provide an operating frequency signal at the central processing unit;

each of the ARUs mixes the two frequency signals together to obtain the operating frequency signal which is then divided by two to generate return signals that are provided back to the control unit through the respective cable;

for each for each of the ARUs, the control unit receives the return signals from the ARU and compares phase of the return signals from the ARU to the operating frequency signal at the central processing unit and adjusts synchronization of the ARU based on the phase comparison.

16. The ILS of any of Claims 1 to 15, wherein:

the plurality of antennas comprise a glide path array of antennas and a localizer array of antennas; and

each antenna of the glide path array and each antenna of the localizer array is driven by a different one of the ARUs.

17. The ILS of Claim 16, wherein:

each of the ARUs are software defined radios operative to generate a modulated radio frequency signal at a programmable carrier frequency and programmable configuration values.

18. The ILS of Claim 17, wherein:

the programmable configuration values comprise at least one of RF power, RF phase, modulation depths, and phases.

19. The ILS of any of Claims 16 to 18, wherein the glide path array of antennas comprises at least four antenna elements arranged spaced apart horizontally to provide at least a four element horizontal array.

20. The ILS of Claim 19, wherein the outer pair of antennas of the glide path array are driven with carrier sideband only, SBO, signals, and the inner pair of antennas of the glide path array are driven with carrier plus sideband, CSB, signals.

21. The ILS of Claim 19, wherein the glide path array of antennas has at least 10 antenna elements arranged spaced apart horizontally to provide at least 10 element horizontal array.

22. The ILS of Claim 21, wherein the ARUs operate to drive the antennas using CSB and SBO powers and phases for each antenna that are controlled to provide a nearly flat glide path angle over an azimuth range.

23. The ILS of any of Claims 16 to 22, wherein the ARUs operate to drive the antennas with clearance signal, CLR, that is a separate carrier signal, offset 5 kHz in frequency that is modulated with 150 Hz only, which produces a pure fly-up signal, wherein the central processing unit operates to individually adjust the CLR of each of the ARUs.

24. The ILS of Claim 23, wherein the radiation pattern of the clearance signal, CLR, is shaped by control of the central processing unit so the CLR power is less than that of glide path course signal transmitted by the antennas of the glide path array for azimuth angles inside the azimuth range and greater than the glide path course signal for azimuth angle outside the azimuth range.

25. The ILS of any of Claims 16 to 24, wherein the glide path array of antennas comprises at least three antenna elements arranged spaced apart vertically.

26. The ILS of any of Claims 1 to 25, wherein the glide path array comprises one of a null-reference and m-type glide path array.

27. The ILS of any of Claims 1 to 26, wherein the glide path array comprises a non-imaging glide path array.

28. The ILS of any of Claims 1 to 27, wherein the central processing unit further operates to:

synthesize a Depth of Modulation, DDM, signal and/or a Sum Depth of Modulation, SDM, as received by an airborne aircraft based on measured RF parameters received from one or more of the individual ARUs; and

determine whether the synthesized DDM signal and/or SDM signal one of meets or exceeds a predetermined threshold based on a comparison of the DDM signal and/or SDM signal to one or more configured RF parameters of the individual ARUs.

29. The ILS of Claim 28, wherein the central processing unit further operates to cease operation of the plurality of ARUs in response to a determination that the synthesized DDM signal and/or SDM signal one of meets or exceeds a predetermined threshold.

30. The ILS of Claim 28, wherein the central processing unit further operates to continue operation of the plurality of ARUs in response to a determination that the synthesized DDM and/or SDM signal does not meet or exceed a predetermined threshold.

31. The ILS of any of Claims 1 to 27, wherein each ARU of the plurality of ARUs further operate to:

receive the modulated RF signal provided to an antenna of the plurality of antennas associated with the ARU; and

determine whether the modulated RF signal one of meets or exceeds a predetermined threshold based on a comparison of the modulated RF signal to one or more signal parameters of the ARU.

32. The ILS of Claim 31, wherein each ARU of the plurality of ARUs further operate to transmit a notification to the central processing unit including an indication that the modulated RF signal one of meets or exceeds a predetermined threshold based on a determination that the modulated RF signal one of meets or exceeds a predetermined threshold.

33. The ILS of Claim 32, wherein central processing unit further operates to determine whether to continue operation of one or more of the plurality of ARUs based on the notification.

34. The ILS of any of Claims 1 to 27, the ILS further comprising:

a monitor ARU that operates to receive RF signals radiated by the plurality of antennas.

35. The ILS of Claim 34, wherein the monitor ARU further operates to determine whether the RF signals radiated by the plurality of antennas is aligned with an expected DDM signal and/or SDM signal to be received by an airborne aircraft from the ILS system.

36. The ILS of Claim 35, wherein the monitor ARU further operates to initiate ceasing radiation of the RF signals by the plurality of antennas in response to a determination that the RF signals radiated by the plurality of antennas is not aligned with an expected DDM signal and/or SDM signal to be received by an airborne aircraft from the ILS system.

37. The ILS of Claim 35, wherein the monitor ARU further operates to initiate re-calibrating the radiation of the RF signals by the plurality of antennas in response to a determination that the RF signals radiated by the plurality of antennas deviate within a pre-

defined threshold from previous RF signals radiated during a calibration process of the ILS system.

38. The ILS of any one of Claims 1-15, wherein the cables comprise optical fiber cables, and

wherein the central processing unit further operates to control the ARUs to adjust synchronization between the modulated RF signal provided by the ARUs to the plurality of antennas for transmission using optical synchronization signals transmitted over the optical fiber cables.

39. The ILS of Claim 38, wherein the central processing unit further operates to time multiplex the synchronization signals transmitted over the optical fiber cables by modulation of the intensity of the light of the optical fiber cables.