

Blue Danube Labs

Product and Testing Description

Blue Danube Labs (BDL) is developing a phased array active antenna system to be used as part of a Remote Radio Head (RRH). The system will be used for mobile cellular systems utilizing LTE technology. The initial array will be used for technology verification and demonstrations. It is designed to operate in the PCS and AWS frequency bands. The array is capable of forming 1 – 4 beams and moving these beams in the vertical and azimuth directions. Figure 1 shows a picture of the concept with four beams that would radiate across a typical 120 degree sector.

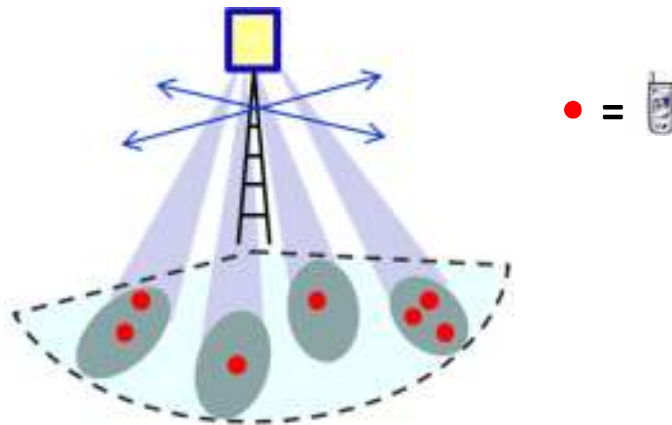


Figure 1

The initial array will utilize 96 dipole antennas that are vertically polarized. The highest power into each dipole is .6 watts and the maximum input power to the array is approximately 60 watts. Figure 2 shows a high level architecture picture of the 96 antenna element system. Behind each antenna element there will be an active front end radio which consists of a power amplifier (transmit), a low noise amplifier (receive), a duplexer, a filter, and a custom integrated circuit to control synchronization, phase, and magnitude of each beam. There will be an IF stage (Intermediate Frequency) for each beam and the system will be controlled by an FPGA (Field Programmable Gate Array) and microcontroller.

Simplified BDL RRH Panel Architecture

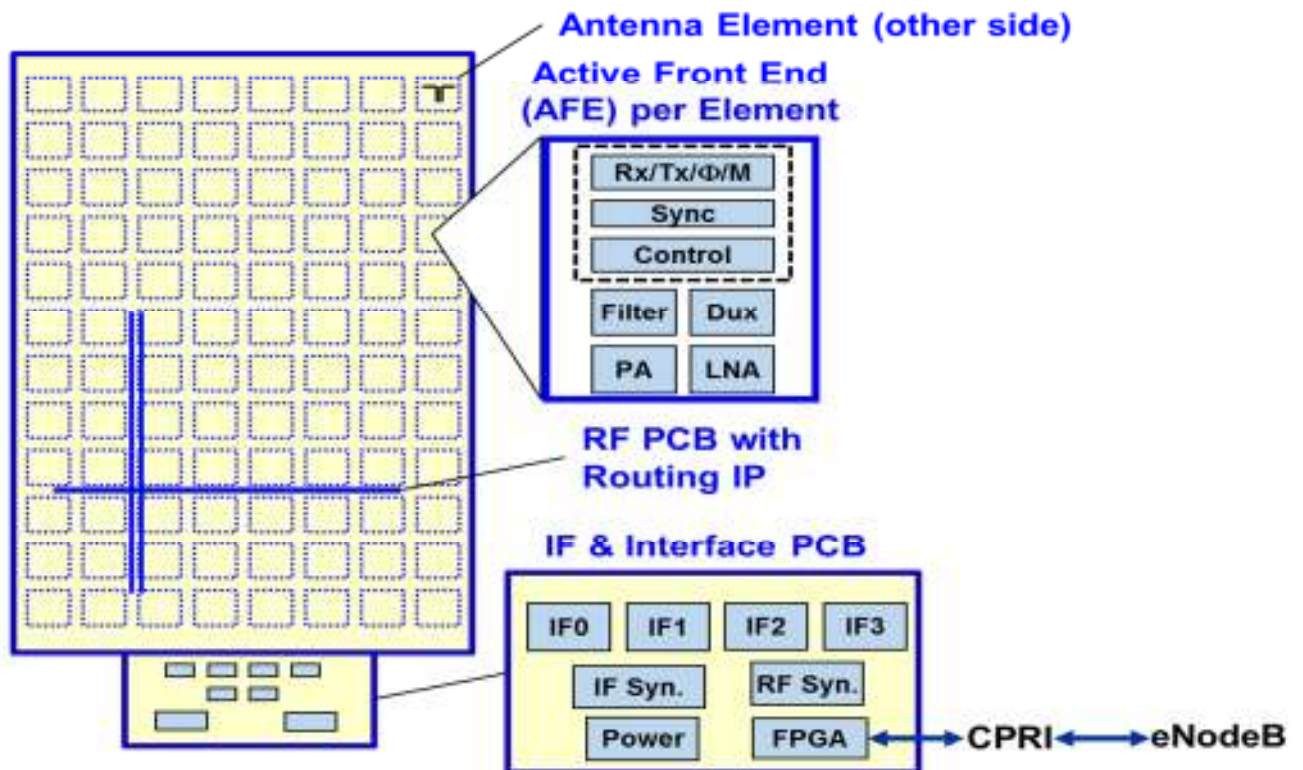


Figure 2

Figure 3 shows the antenna side of the system. There are 8 antenna elements in the horizontal dimension and 12 elements in the vertical dimension. With 96 antenna elements, the narrowest beam this array can create will be 6 degrees in the vertical and 14 degrees in the horizontal. This equates to a 25 dbi antenna gain. The typical operation of this array will be with 2-4 beams active and power tapering on some elements to control beam side lobes. However, we will test the array with only one beam active and full power to this one beam with no power tapering. The total effective radiated power of this single beam is 14.2kw ERP and is the maximum ERP the array could produce in any configuration. The typical operation with 4 beams and power tapering will be an ERP of 780 watts peak per beam.



Figure 3

BDL plans to test this array in five locations. One location is in our lab and on the roof of our office building in New Jersey. Two other locations are on towers at Picatinny Arsenal - a military base in New Jersey. The final two locations are on the roof of a telecom building in Virginia and a nearby cellular tower in Virginia. The roof mounts will be one to two meters above the roof wall. The tower mounts will be at various heights on the tower as space is available. The experimental license application showed the highest potential location on each tower.

For testing the receive path (uplink) of the array, we will use a mobile transmitter with a 250mw ERP. This is shown in Figure 4. This transmitter will be less than 2 meters above ground and will be moved throughout the fixed station service area and at certain locations outside the normal coverage area.

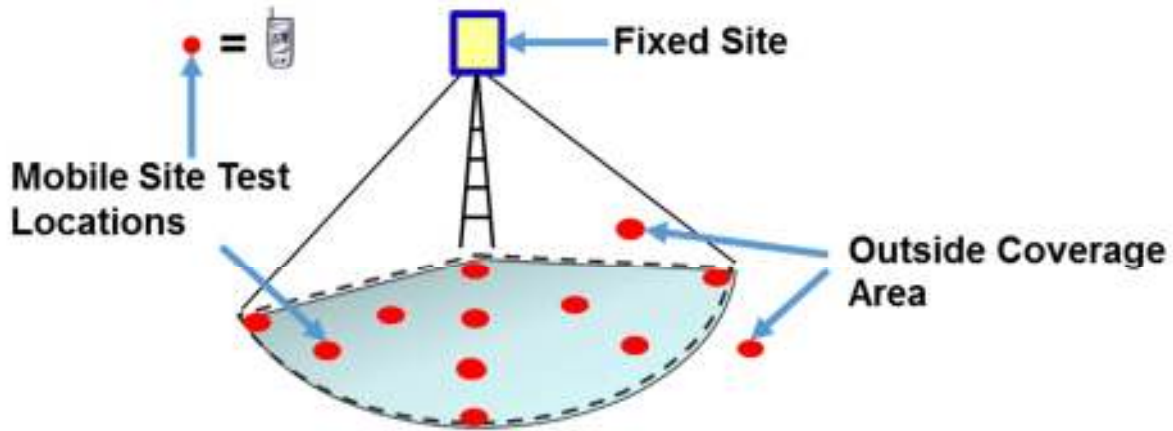


Figure 4

The plan at this point is to test at one fixed location at a time. After this testing is completed, the pair of sites on Picatinny Arsenal may be used simultaneously for testing and following that, the two in Virginia may be used simultaneously for testing.