======= Mesh City Wireless LLC========

Broadband Antenna

Background: The typical limitation of any wireless system is that the Antenna is very much frequency dependent. This necessitated the use of different antennae for different frequencies. With the expansion of the 802.11 standards to address the growing demand of wireless applications, the frequency spectrum expanded as well to address issues such as interference, penetration, and range and bandwidth deliverability. The introduction of the MIMO technology through the introduction of the 802.11n even complicated the issue further. The growth of the part numbers in a typical antenna catalogue is getting to be a nightmare for the typical network engineer.

Besides, with the demand growing, the topology of the earth resembles an antenna farm to accommodate the frequencies that are being used and applied. The tower structures are becoming cost prohibitive to accommodate these giant antennas that are being used to achieve the gain to attain the required range.

Our engineers tasked themselves to address both the frequency and size issues associated with the current antenna design. After years of research and complicated mathematical and physical analyses, they finally computed a very unique and complex shape that truly resulted in an antenna that is truly frequency agnostic. The shape and performance associated with it was so unique that the USPTO granted a patent for the resulting BROADBAND ANTENNA. The designers also took in to account the manufacturability of the Antenna by using the printed circuit board configuration which lends itself to mass production using the popular and easily available FR4 substrate.

Using the basic element as a building block, various antenna arrays could be built to increase the gain, range and beam spread to accommodate specific coverage and bandwidth requirements. As a result, in addition to obtaining patent protection for the basic element, there are currently patents pending for the various arrays that have been created for different broadband and Cellular applications.

Frequency Spectrum Band:

Currently, two different element designs exists to address two different frequency bands:

Frequency Band	Frequency Range	Application
Band 1	650 MHz to 2100 MHz	Cellular: GSM/CDMA/LTE
Band 2	2000 MHz to 7000 MHz	Wi-Fi/Wi-Max/LTE

Within the specified band multiple frequencies could be transmitted through the same antenna element simultaneously without loss of gain, making the antenna truly frequency agnostic.

Broad Band Antenna Performance Summary

	Single Element	4 Element	8 Element	16X4= 64 Array Cellular Antenna
Maximum Gain	+5.0 dBil	+11 dBil	+13 dBil	+24 dBil
3dB Beam Width Azimuth Plane	160 Degree (V) 120 Degree (H)	160 Degree(V) 120 Degree (H)	160 Degree (V) 120 Degree (H)	160 Degree (V) 120 Degree (H)
3 dB Beam Width Elevation Plane	120 Degree (V) 160 Degree (H)	30 Degree (V) 70 Degree (H)	15 Degree (V) 35 Degree (H)	7 Degrees (V) 35 Degree (H)
Input Impedance	50 Ohms	50 Ohms	50 Ohms	50 Ohms
VSWR	1.3:1	1.3:1	1.3:1	1.3:1
Polarization	Vertical (V)	Vertical (V)	Vertical (V)	Vertical (V)
Linear	Horizontal (H) Dual Linear (V/H)	Horizontal (H) Dual Linear (V/H)	Horizontal (H) Dual Linear (V/H)	Horizontal (H) Dual Linear (V/H)
Physical Size 650MHz-2100 MHz	7 inch X 3 inch x 4 inch	28 inch X 3 inch X 4 inch	56” inch X 3 inch X 4 Inch	72 inch X 23 inch X 6 inch
Physical Size 2GHz to 7GHz	2 inch X 2 Inch X 2 Inch	8inch X 2 Inch X 2 Inch	16 inch X 2 Inch X 2 Inch	N/A

- **What does it all mean?**
    - The only antenna in the market that operates from 650MHz to 2100 MHz without loss of gain or other transmitting properties
    - The only antenna in the market that operates from 2000MHz to 7000MHz without loss of gain or other transmitting properties
    - The only antenna in the market where the required gain and return loss could be accomplished by stacking the elements while still maintaining the frequency bandwidth from 650 MHz -2100 MHz or 2000 MHz to 7000 MHz
    - Reduction of Size of the Antenna by 40% for the same performance characteristics
    - Frequency and size advantages enable the sharing of the antenna by multiple operators
    - Reduction of infrastructure cost on deployment (cabling, power and towers) due to sharing for reasons stated above
    - The PC board design lends itself to mass production.
    - Patented Design
    - Basic design is currently used by US DOD on various applications
    - Increased efficiency of transmission associated with large channel width
    - Rather large gain numbers could be achieved whereas for the same gain, the envelope size will be prohibitive in a conventional design
    - The only antenna that operates under very low power for the same range of transmission
    - It's energy efficiency qualifies it to be a true Green product

- **What does it mean to the Operators?**
    - Whether CDMA, GSM or LTE: the same antenna performs equally well.

- Do not have to stock several varieties of Antennas, since the same antenna operates, equally well across all cellular frequencies and across all transmission protocols.
- Since the Antenna envelope size and the weight are small compared to the conventional antenna, the wind load on the tower is reduced considerably resulting in lower operating cost
- Since the same antenna can transmit multiple frequencies, operators do not have to compete for height on the tower.
- Due to the increased efficiency of the antenna, power consumption is reduced by almost 40 percentages
- Since the gain could be increased or decreased by simple stacking or de-stacking of the elements, the operator can easily design the network around the antenna for urban or rural applications
- The lower size of the antenna lends itself for more operators to share the tower lowering the nation's infrastructure cost.