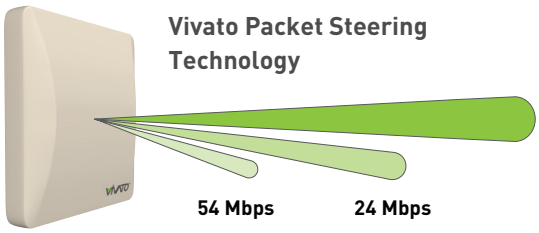
Vivato Technology Overview

Vivato is a provider of extended-range Wi-Fi network infrastructure solutions.

The company delivers extended range, Wi-Fi network infrastructure systems and multi-functional client platforms combined with standards based solutions to the global mobile workforce. Vivato focuses on providing synergies between the mobile client and the wireless infrastructure, yielding a systems level approach, addressing multiple market segments with mobile computing, communications and application solutions. Customers in a wide range of markets including military, homeland security, hospitality integrated public safety, municipal, transportation and logistics will benefit from true systems level solutions, addressing the harshest and most demanding mobile application environments. The Vivato VT2210 is best utilized for broad outdoor coverage. The VT2210 delivers extended range WiFi coverage using a phased array antenna and patented Packet Steering Technology™. The phase array antenna directs the active radio more effectively then an omnidirectional antenna. An Isotropic antenna is a theoretical antenna. The antenna is a point in space, and the RF energy propagates equally in all directions, giving a perfectly spherical coverage pattern.

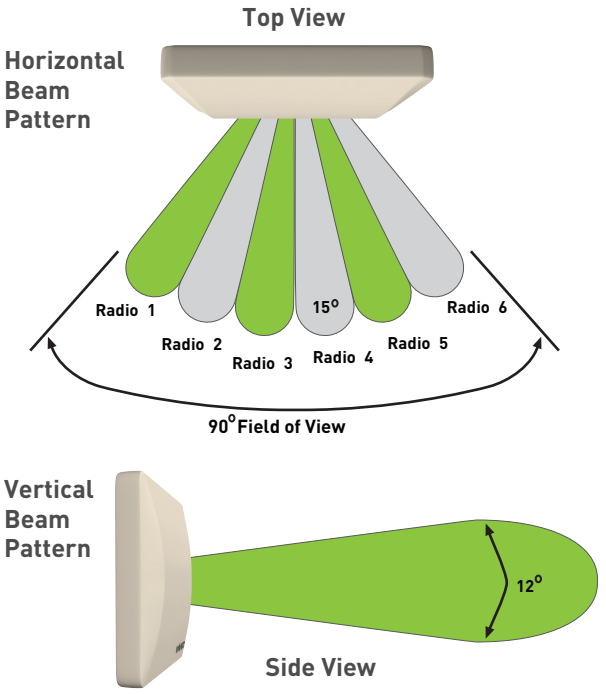
This is the antenna that all other antennas are measured against. For functional use an antenna is modified to propagate in certain directions, the antenna achieves what is known as "gain". This gain is measured in decibels (dB). When compared against an Isotropic antenna, the gain is measured in dBi – with the "i" indicating that it is being measured against the theoretical Isotropic antenna.



As an antenna achieves gain, and propagates in certain directions, it will propagate less in other directions. This is because the power being fed into the antenna does not change; the power output of the radio driving the antenna is always constant. A phase array antenna does not change the power output, only the direction in which the power is sent (in the form of radio waves). As the gain on an antenna increases, so does the directionality of the antenna.

The VT2210 base station can cover from four to ten times the range and up to 25 times the coverage with its Packet Steering Technology compared to omni-directional antenna solutions. The Vivato VT2210 Wi-Fi Base Station uniquely utilizes 6 Wi-Fi radios operating at 200mw each, which are coupled to a passive 8x8 slot Phase Array antenna with 21dBi gain. To be clear, the 200mw Wi-Fi radio is applied to the passive antenna with no additional injected power.

The slot array antenna simply focuses each radio's beam more accurately. The beam tracks the client across 6 pointing directions, one for each radio, across the 90° span, to optimize the communications path to the client. Using the patented Packet Steering Technology each antenna beam is very narrowly focused delivering a beam pattern which is 15 degrees horizontal by 12 degrees vertical, limiting the amount of extraneous RF noise. The EIRP from multiple channels will not be cumulative because each radio is aimed in a different direction and each radio operates independently and coordinated to produce a "Virtual Point-to-Point" mode of operation.



The Base Station constantly monitors the 6 radios for inbound client transmissions to determine the best path and then associates the client to a particular WLAN interface. This information is utilized by the Base Station to determine which WLAN interface to use to send traffic. To the client, the VT2210 Base Station appears as 6 individual WLANs. The client can roam across these WLANs just as it would roam across coverage cells provided by 6 separate APs in a typical WLAN environment.

Although the reference to EIRP used to measure the effective power rating is based on the theoretical isotropic model, the RF transmissions pattern for Vivato is within a narrow RF energy lobe extending from the phased array antenna in the direction of one of the 6 sectors. Omni-directional transmissions send RF energy in all directions, more realistically within a donut shaped pattern emanating from the antenna. It is important to note that the Vivato system more effectively delivers the RF energy to the intended target and decreases the contributed noise in the 2.4GHz spectrum when compared to omni or sectorized antenna transmissions.

As a result Vivato has received approval from the FCC for point-to-point communications in the 2.4GHz spectrum. Since the Vivato base station only transmits to one receiver at a time it is considered by the FCC to meet the definition for special consideration for beam forming, beam steering point-to-point communications.

The FCC further agreed that the point-to-point steered-beam interpretation applies to the 2.4 GHz ISM (Industrial, Scientific and Medical) band since it is allowed in the U-NII (Unlicensed National Information Infrastructure) band.

FCC Part 15 Rules – Power Phased Array Advantage

The Federal Communications Commission (FCC) has regulations that define the emission characteristics of all unlicensed-band products. Applying the regulations to Wi-Fi devices, emission characteristics include aspects of transmitter power and allowable antenna gain. To obtain a large coverage area, one needs adequate power levels applied to the client and Wi-Fi Base Station antennas, and preferably, antenna gain at one or both ends of the link. In addition, there is a strong desire to provide symmetric uplink and downlink performance. These considerations greatly affect the design of a good Wi-Fi WMAN system. Good uplink coverage is ideally obtained with the use a high gain Wi-Fi Base Station antenna, because battery life and other aspects of the client device usually limit the client transmitter power. Downlink coverage, however, is usually limited by the FCC Regulations, which limit the maximum transmit power that may be applied to an antenna of a given gain. Wi-Fi communication systems work best when there is a symmetric link. For example, it is important to provide adequate downlink signal strength, if the client uplink signal strength is sufficient. If the same antennas are used in transmit and receive, then this symmetric condition is met when the client transmitter power level and the Wi-Fi Base Station transmitter power level are equal.

The FCC's Part 15 rules allow for the use of Point-to-Point and Point-to-Multipoint deployments. The Point-to-Point regulations allow higher field strength than the Point-to-Multipoint rules. The Point-to-Point regulations, however, require that the power to the transmitter be reduced by an amount that depends on the transmitter antenna gain. Wi-Fi APs and client devices typically operate under the Point-to-Multipoint rules. Under these rules higher gain antennas can be added to these devices as long as the limit of 4W (Watts) EIRP is not exceeded. Typical client devices operate from 10mW to 100mW of transmitter power for battery life, safety and other considerations.

The Vivato Wi-Fi Base Station, on the other hand, is authorized and operated under Point-to-Point rules while servicing standard Wi-Fi clients. When designing the Wi-Fi Base Station, Vivato's engineers were able to achieve symmetric range improvements of 5 to 10 times that of standard APs with an antenna gain of 24dBi and transmitter power no greater than that found in a standard client resulting in an EIRP of 20W.

The combination of this extended range and the phased array's ability to electronically synthesize multiple high gain antennas covering a 90 degree field of view makes the Vivato Wi-Fi Base Station an ideal solution for the needs of a Wi-Fi WMAN deployment.

Vivato was awarded FCC Part 15c; FCC test report for Vivato Base Station is available upon request.

FCC IDENTIFIER: QLNVSH24SWP
Name of Grantee: Vivato, Inc.
Equipment Class: Digital Transmission System
Notes: Wi Fi Base Station, Indoor Unit / Outdoor Unit
Grant Notes FCC Rule Parts Frequency Output
Range (MHZ) Watts
15C 2412.0 2462.0 0.200

Reference Information regarding Phased Array, Directional Energy available on the FCC web site:
http://www.fcc.gov/oet/ea/presentations/files/may05/Smart_Antenna_Systems_JD.pdf
http://www.fcc.gov/oet/presentations/files/feb05/Emission_Test_Procedures_SM.pdf