

Tsunami™ Multipoint: Optimal Reliability through Active Interference Rejection and Defensive Countermeasures

As ISPs and enterprises increase deployments of wireless connections, the potential for interference among systems operating at or near the same frequency in an unlicensed band grows. This has become particularly evident in the 2.4 GHz band used by 802.11b wireless LANs, portable telephones, Bluetooth devices, and microwave ovens. To combat current and potential interference, service providers must undertake careful deployment planning and, in some cases, negotiations with other occupants of the frequency band.

Tsunami Multipoint has been designed to counteract interference using a variety of measures. To safeguard against interference even further, Proxim has introduced Tsunami Multipoint A.I.R. Tsunami Multipoint A.I.R. combines Tsunami Multipoint's integrated defensive countermeasures with Proxim's patented Active Interference Rejection (A.I.R.) technology. The A.I.R. technology safeguards wireless access networks against interference in real time, enabling stable, consistent service deployment.

Active Interference Rejection Technology

The Active Interference Rejection technology found in Tsunami Multipoint A.I.R. provides two levels of real-time interference protection to the Base Station Unit: adaptive circular polarization cancellation and spatial cancellation. Combined, these interference rejection technologies can eliminate 99.5% to 99.9% of an interfering signal using real-time signal processing techniques. For the service provider, this translates into an upper hand in negotiating with a competing system, since the competing system will probably cease to operate before the Tsunami Multipoint system.

Adaptive Circular Polarization Cancellation

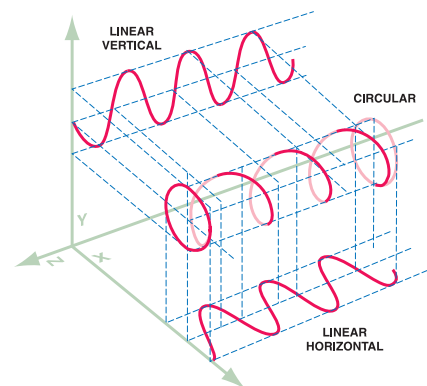
For any wireless link to function properly, the antennas at both ends must use the same type of polarization and be set for the same polarization orientation:

- Linear, vertical
- Linear, horizontal
- Circular, left-hand
- Circular, right-hand

The vast majority of wireless systems, including the Proxim Tsunami point-to-point bridges, use linear polarization. Tsunami Multipoint and Tsunami Multipoint A.I.R., on the other hand, use circular polarization because of its superior multipath characteristics. Tsunami Multipoint A.I.R. uses multiple antenna elements to discern the horizontal and vertical components of the circular polarized signal.

Since the horizontal and vertical elements can each distinguish a linear polarized signal as well, the Tsunami Multipoint A.I.R. units reject linear polarization transmissions - vertical and horizontal - without dropping any Subscriber Units in the sector.

The A.I.R. technology is even more effective against an orthogonal polarization from reflected signals. For example, a left-circular polarized signal is rejected where the cross polarization property of the antenna is utilized in addition to the integrated signal canceller. Numerically, Tsunami Multipoint's adaptive circular polarization typically provides more than 20 dB of rejection against a linear interferer and against a reversed polarized signal.

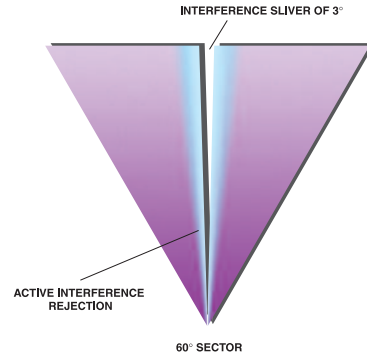


Spatial Cancellation

To protect against interference from systems in the same band with the same polarization, the A.I.R. technology provides a secondary layer of interference rejection: real-time spatial interference rejection of 3 dB (typically), which can be used against the same polarization as the Base Station Unit.

Within the 60-degree beam width of the Base Station Unit, the A.I.R. technology performs calculations over 100 times per second, detecting and rejecting unwanted signals by blocking transmission in small geographical subsections (“slivers”) of the sector.

By pinpointing the exact location of the interfering signals, this technology provides highly granular interference rejection in slivers as narrow as three degrees (with one sliver per 60-degree sector). Because the spatial interference rejection of Tsunami Multipoint A.I.R. operates and adapts automatically, in real-time, slivers are blocked only while there is a source of interference present, protecting the Base Station Unit and limiting service outages for inadvertently dropped Subscriber Units within the blocked area.



Self-managing, real-time interference rejection protects Base Station Units against unwanted signals, ensuring consistent availability of network services.

Tsunami Multipoint Defensive Countermeasures

To proactively protect against current and future sources of interference, Tsunami Multipoint offers integrated defensive countermeasures including directional antennas and a variety of frequency channel plans.

Directional Antennas Optimize Performance & Thwart Potential Interference

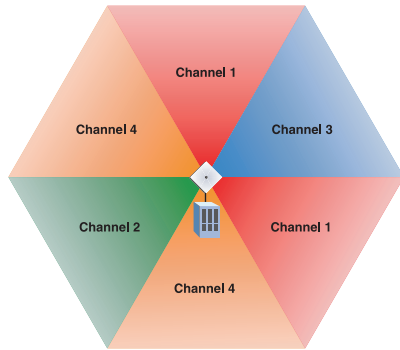
Antennas frequently play a key role in reducing the potential for interference. They come in a variety of configurations that have different performance characteristics in the areas of gain and directionality. In radio parlance, gain refers to the antenna’s ability to increase the transmitted and received signal, and directionality refers to its ability to focus on a specific aperture for transmitting and receiving signals. Antennas that transmit/receive in all directions are known as omni-directional, while those that transmit/receive in one specific direction are categorized as directional.

Antennas also vary in beam width, which is the aperture to which they can “see” signals. Larger antennas typically provide narrower beam widths and can diminish interference from nearby transmitters by:

- Focusing RF energy from the intended source
- Reducing the power of interfering sources not directly aligned to the antenna

Tsunami Multipoint uses directional antennas that transmit and receive a relatively narrow beam width of radio energy, improving system performance by reducing the likelihood that surrounding RF clutter will interfere with reception.

Base Station Units	Subscriber Units
Flat-panel antenna	Flat-panel antenna
60-degree beam width	10-degree beam width
6-degree elevation	10-degree elevation



Each Tsunami Multipoint Base Station Unit provides a 60° circular polarization antenna, allowing for 360° coverage with deployment of six Base Station Units.

Multiple Frequency Channels Bypass Interference

Tsunami Multipoint offers 11 different frequency channels that have been organized into 4-channel, 5-channel, and 6-channel frequency plans to provide a flexible tool for overcoming present and future interference. Four non-overlapping 20 MHz channels can be used to avoid existing traffic in the 5.8 GHz frequency band. If one part of the 5.8 GHz spectrum is occupied when Tsunami Multipoint is initially deployed, another frequency channel can be selected to bypass the interfering signal. If interference arises after deployment, another frequency channel plan can be selected to “steer around” the impacted channel.

Planning Ahead with Tsunami Multipoint

Even in areas where no interference exists today, the possibility that another network will be installed nearby is an important consideration when planning to deploy, expand, or upgrade a wireless system. Tsunami Multipoint systems provide maximum network reliability with defensive countermeasures and self-managing interference rejection technologies that protect against both current and future sources of interference.



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