



4.9GHz Point to Point Wireless Backhaul Solution Overview

Public Safety Wireless Backhaul Solution

PTP 49400

Motorola's PTP 49400 Wireless Backhaul Solution is ideal for:

- Replacing T1 Links (reduce high monthly costs)
- Backhauling Video Surveillance Cameras or 4.9GHz
- Connecting Remote Locations (public safety locations not easily reachable via wired connections)
- Backhauling a 4.9GHz MOTOMESH hot-spot or coverage network

Based off the widely deployed, existing 5.7GHz products

Ship Date October 1st, 2006



Connectorized
(Used when
external antennas
are required)

Integrated
(14" integrated
antenna)



Indoor unit provides power over Ethernet unit to outdoor units

PTP 49400 Strengths



Unique Architecture

Robust feature set

High availability & reliability

- Multiple-input Multiple-output (MIMO)
- Intelligent OFDM (i-OFDM)
- Adaptive Modulation
- Spatial Diversity capable
- Optional 128bit AES encryption

Easy to Deploy

Low CAPEX and OPEX

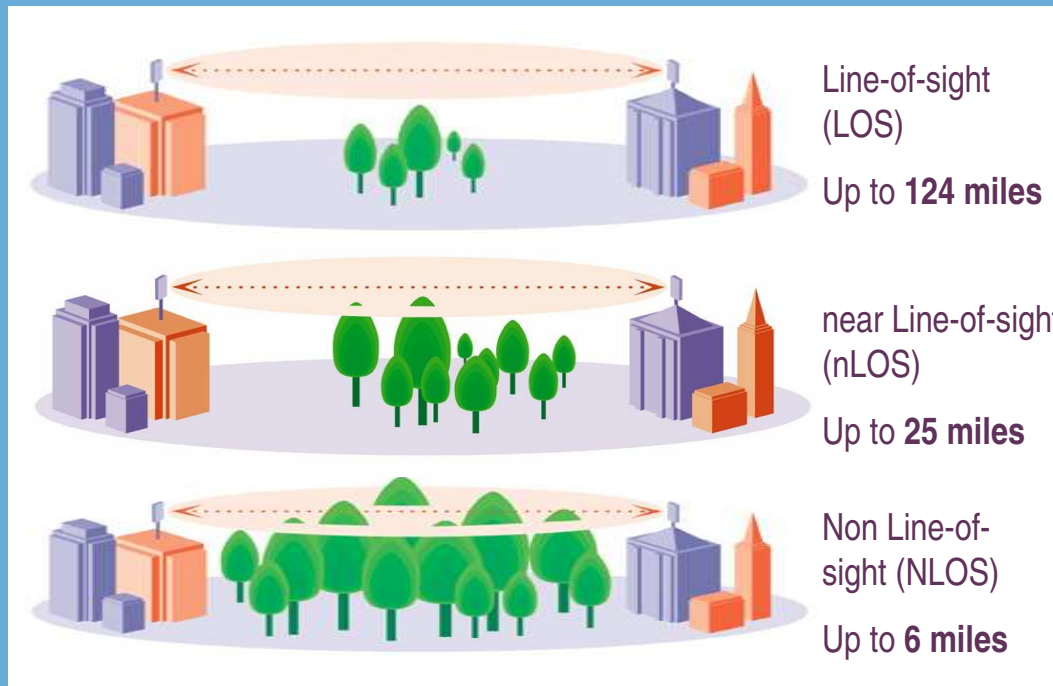
- Cat. 5 cable from IDU to ODU
- Audible tone for alignment
- Small footprint on tower and hut
- Native-IP
- SNMP & Browser management

“Best in Class OFDM Radio”
with industry’s Highest System Gain

Product Overview

Establish a wireless connection over hills, around buildings, through trees and over water!

Robust design capable of handling any of the following scenarios:



nLOS / NLOS & Long Range LOS enables connectivity to locations previously inaccessible.

Enables placement of devices, such as video cameras or hotspots, in locations where they are most needed, regardless of obstructions or long distances.

Product Overview

Key Features

High Bandwidth

- 35 Mbps
- 17Mbps (license key only to upgrade to 35)

Secure

- Proprietary over-the-air interface
- Optional FIPS-197 compliant AES (license key enabled)

QoS

- VLAN tagging of high priority traffic (802.1p)

Interfaces

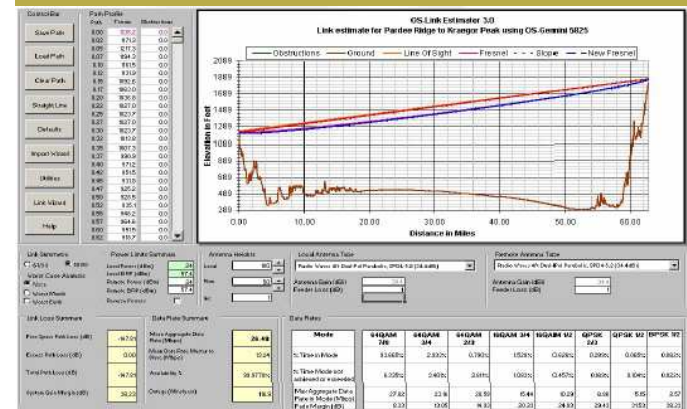
- Integrated Ethernet Interface (10/100baseT)
- T1 Interface via external T1 MUX

Specs

- Frequency Range 4945 – 4985 MHz
- 10MHz channel width

Rapid Deployment

- iDFS (intelligent Dynamic Frequency Selection) self selects clear channel
- Audio Alignment – beeps when optimal alignment is reached
- Precise & Easy to Use Link Estimate Tool



Case Study – Urban Non Line-of-Sight

Based on the 5.7GHz product



Application: Connecting Remote Locations in Downtown
Site 1: 25 story building
Site 2: 30 story building
Obstacles: 25 to 40 story building clusters & a river
Range: 2 miles NLOS
Data Rate: 28 Mbps @ 99.99% availability



Case Study – Long LOS over Water

Based on the 5.7GHz product

Application: Connecting VERY Remote Locations,
2 schools on different islands in the
US Virgin Islands

Site 1: St. Thomas School

Site 2: St. Croix School

Challenges: Caribbean Sea

Range: 43 miles

Data Rate: 28 Mbps @ 99.999% availability



Other Case Studies

Video Surveillance for 2005 Presidential Inauguration & Top Secret Military Mission

- Used to backhaul security video equipment strategically placed on Pennsylvania Ave. to a security headquarters location outside Washington D.C.
- Many obstacles that prevented direct LOS to video camera were not an issue, allowing the customer to place cameras exactly where needed.



Temporary Installations

Optimum rapid field deployment in non-line-of-sight environments

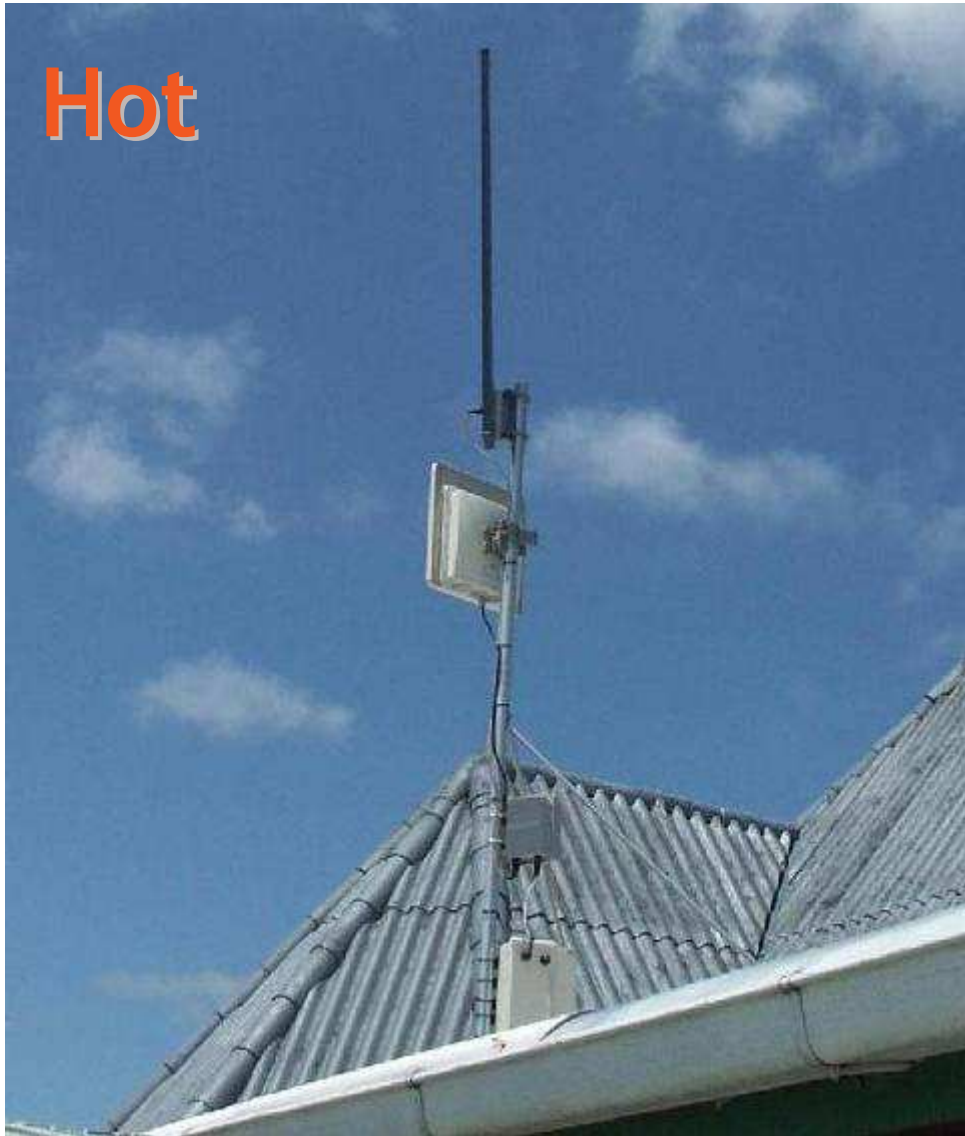


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Robust



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Pricing

Hardware Types

- Connectorized & Integrated are the same price

Ordering Options MSRP

- Full (33 Mbps) \$11,995
- Lite (16.5 Mbps) \$7,200 (license key to upgrade to 35)
- Both options include 2 radios & 2 indoor power units

Additional Items

- License key activated AES ~ \$2,399
- External T1 MUX ~ \$2,500

External Antennas

- Varying sized antennas ranging from \$500 to \$3,000 sold separately

Mgmt. Web Interface

- Each radio can be managed via an internal web interface (no additional cost)
- SNMP MIBs are also available for integration with NMS (no additional cost)

Attributes	Value	Units
Target MAC Address	00:04:56:00:01:88	
Master Slave Mode	<input checked="" type="radio"/> Master <input type="radio"/> Slave	
Link Mode Optimisation	<input checked="" type="radio"/> IP Traffic <input type="radio"/> TDM Traffic	
Max Transmit Power	25	dBm
Ranging Mode	<input checked="" type="radio"/> Auto 0-25 miles <input type="radio"/> Auto 0-62 miles <input type="radio"/> Auto 0-125 miles <input type="radio"/> Target Range	
Target Range	0.0	miles
Spectrum Management Control	<input checked="" type="radio"/> DFS <input type="radio"/> Fixed Frequency <input type="radio"/> WIMAX	
Lower Center Frequency	5742	MHz
Installation Tones	<input type="radio"/> Disabled <input checked="" type="radio"/> Enabled	
<input type="button" value="Submit Wireless Configuration"/> <input type="button" value="Reset Form"/>		
<< Back Next >>		

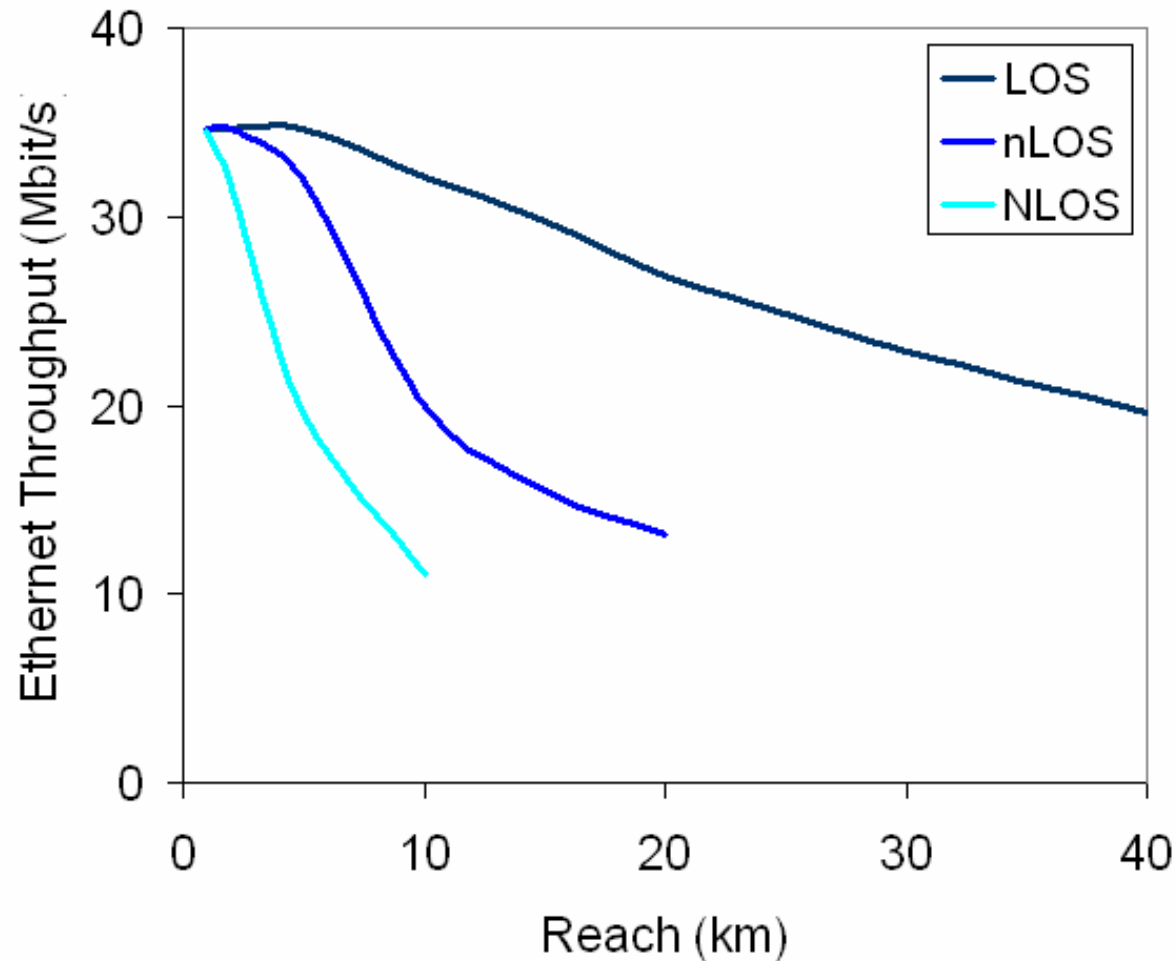
BACKUP SLIDES

Detailed Specification

Radio Technology			
Frequency bands	4940-4990 MHz		
Channel raster	4945, 50, 55, 60, 65, 70, 75, 80, 85 MHz i-DFS or manual		
Channel bandwidth	10MHz		
Data rate (ethernet)	Up to 35Mbit/s		
Transmit power	Adaptive between -10 and 23 dBm		
EIRP (integrated)	≤45dBm		
Receive sensitivity	Between -97 and -74 dBm		
System gain (integrated)	Between 164 and 137 dB		
Modulation modes	Dynamic, 8 modes between BPSK and 64QAM 7/8		
Max range	200km		
Error correction	FEC, ARQ		
Security and encryption	128bit AES, FIPS-197		
Ethernet Bridging & E1/T1			
Protocol	IEEE 802.3		
Packet prioritisation	802.1p		
Ethernet interface	10/100baseT auto MDI/MDIX		
Latency	5ms typical		
E1/T1	Via external MUX		
Management and installation			
LED indicators	Power, Ethernet link status and activity		
System management	Web or SNMP		
Installation	Built-in audio assistance for link optimisation		
Physical			
Power source	90-240VAC, 50-60Hz / 36-60VDC		
Power consumption	40W typ.		
Operating temperature	-40 / +60 °C		
Dimensions	ODU	14.5" x 14.5" x 3.75"	12.1 lbs
	PIDU	9.75" x 1.5" x 3"	1.9 lbs
Environmental & Regulatory			
Protection and safety	UL60950, IEC60950, EN60950, CSA-C22.2 No.60950		
Radio	FCC Part 90		

Throughput & Reach

Integrated Antenna



Link Estimator should be used to plan every path before you deploy

Link Planning

Rapid download of path profile from website
Upload to OS Link Estimator

Quickly establish link performance

Easy selection of antenna, mast heights to meet operational needs

Known link performance when you install

Location can now be entered in a number of new formats in addition to the decimal format. These are:-

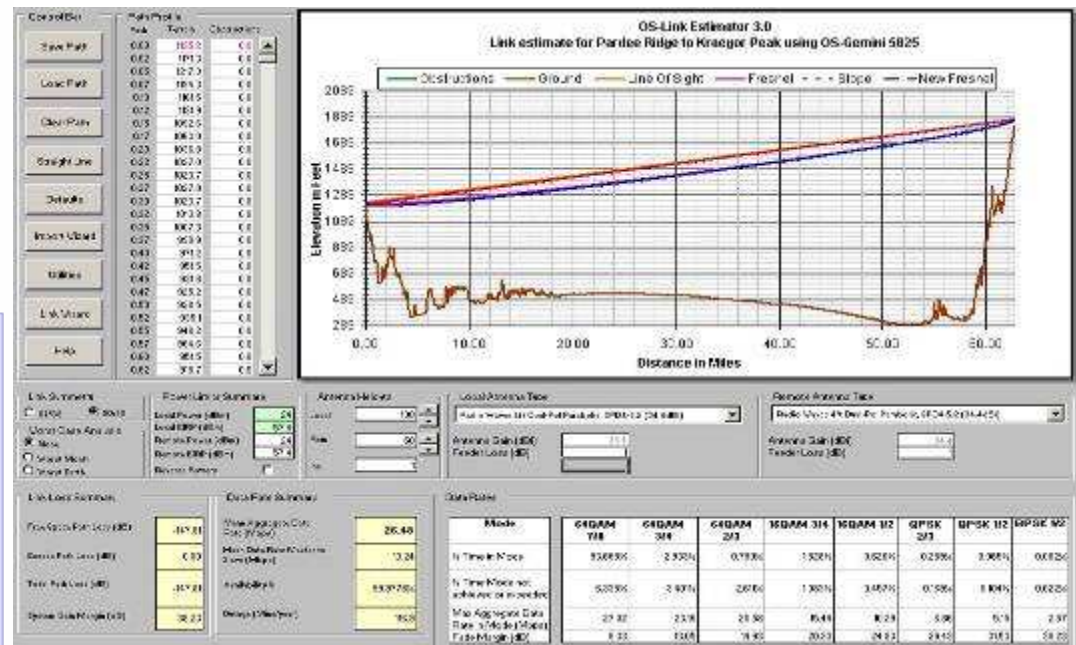
- 'ddd:mm:ss.sP' eg. 50:33:20.6N,
- 'ddd:mm.mmmP' eg. 50:33.339N, and
- 'ddd.ddddP' eg 50.55345N.

where d=degrees, m=minutes, s=seconds and P=point of compass as one of the letters 'NnSsEeWw'. The geodetic reference for this data is the [WGS84 EGM96 geoid](#).

Latitude and Longitude of the target local and remote locations can be found from many places on the web including [www.multimap.co.uk](#). However, the best method of determining the local and remote site positions is using a GPS.

The Length units can be in Miles or Kilometers and the Height units can be in Meters or Feet. Once chosen here, these values will be used in the Link Estimator. The Height of the Local and Remote antennas Above Ground Level (AGL) can be specified here and modified in the Link Estimator. (Hover help is available for many items on the form.)

	Latitude (90N to 90S)	Longitude (180E to 180W)	Antenna Height (AGL)
Local:	37:56:35.00n	121:53:24.00w	100
Remote:	38:14:50.00n	120:48:16.0w	50
Path resolution:	Number of data points: <input type="text" value="Auto"/>		
Units:	Height Units: <input type="text" value="Feet"/> Range Units: <input type="text" value="Miles"/>		
Link Name:	<input type="text" value="Long Distance Path from A to B"/>		
Filename:	<input type="text" value="a2b"/>		
Contact Name:	<input type="text" value="Jim"/>		
Company Name:	<input type="text" value="Orthogon Systems"/>		
Phone:	<input type="text" value="720-733-1873"/>		
Email Address:	<input type="text" value="demo@orthogon.us"/>		
	<input type="button" value="Send Form"/>		

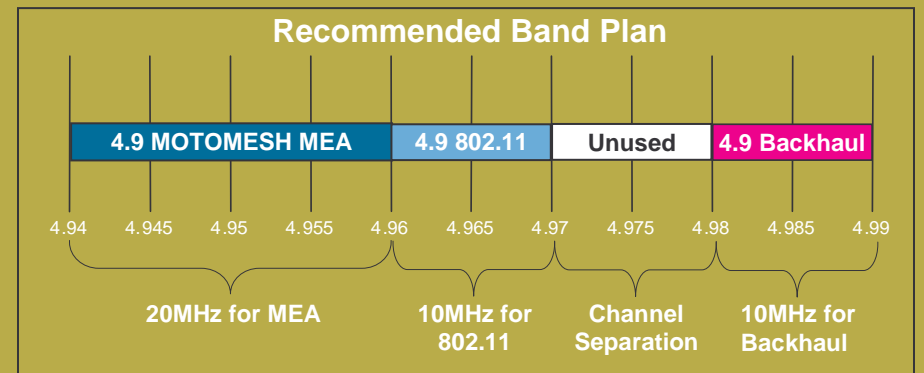


4.9 Interference Avoidance / Reduction

To avoid interference between the 4.9 backhaul & 4.9 MOTOMESH networks, the following criteria should be followed:

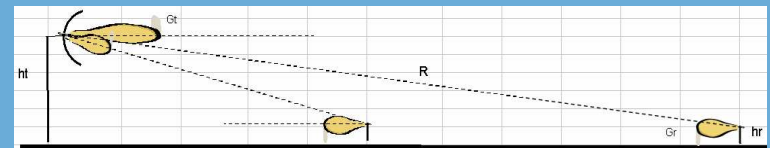
10MHz Channel Separation

- Interference can be reduced when there can be a 10MHz unused channel separating the MOTOMESH & backhaul frequencies



Vertical Separation

- When the 4.9 backhaul transmission is in the LOS of the 4.9 MOTOMESH network...
- *Preliminary* calculations have shown that a minimum of **50 feet** vertically must be attained between the 4.9 backhaul radio and the 4.9 MOTOMESH IAP that it connects, when a 10MHz channel separation is used
- When channel separation cannot be achieved, **165 feet** vertical separation is required



Adaptive Modulation

Link continually optimized for varying RF path conditions

8 Modulation Schemes

Automatically adapts to best modulation

BPSK 1/2 (3.0 Mbps)

64QAM 7/8 (42 Mbps)

Constantly monitor fading

1 to 6 dB margin used when shifting
up or down

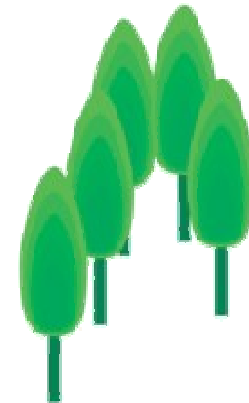
Maximum Link Stability

Dependant on

Link Loss

Receive Power above Interference and Noise floor

TDM Mode



Space Diversity

Traditionally only found in licensed radios

Combats fading due to atmospheric changes

Used for difficult paths:

- Over water (high multi-path reflections)

- Over very flat terrain (ducting)

- Deep NLoS applications

Provide a diverse redundant RF path



Security

Unique Advanced Air Interface

Proprietary Data Scrambling and Encryption.

Authentication – Nothing in the clear

Transparent Ethernet Bridge

Enables complete end-to-end network security by virtual private networks (VPN).

AES Encryption (**optional**)

128 BIT

1.25 % overhead

FIPS 197 certified

