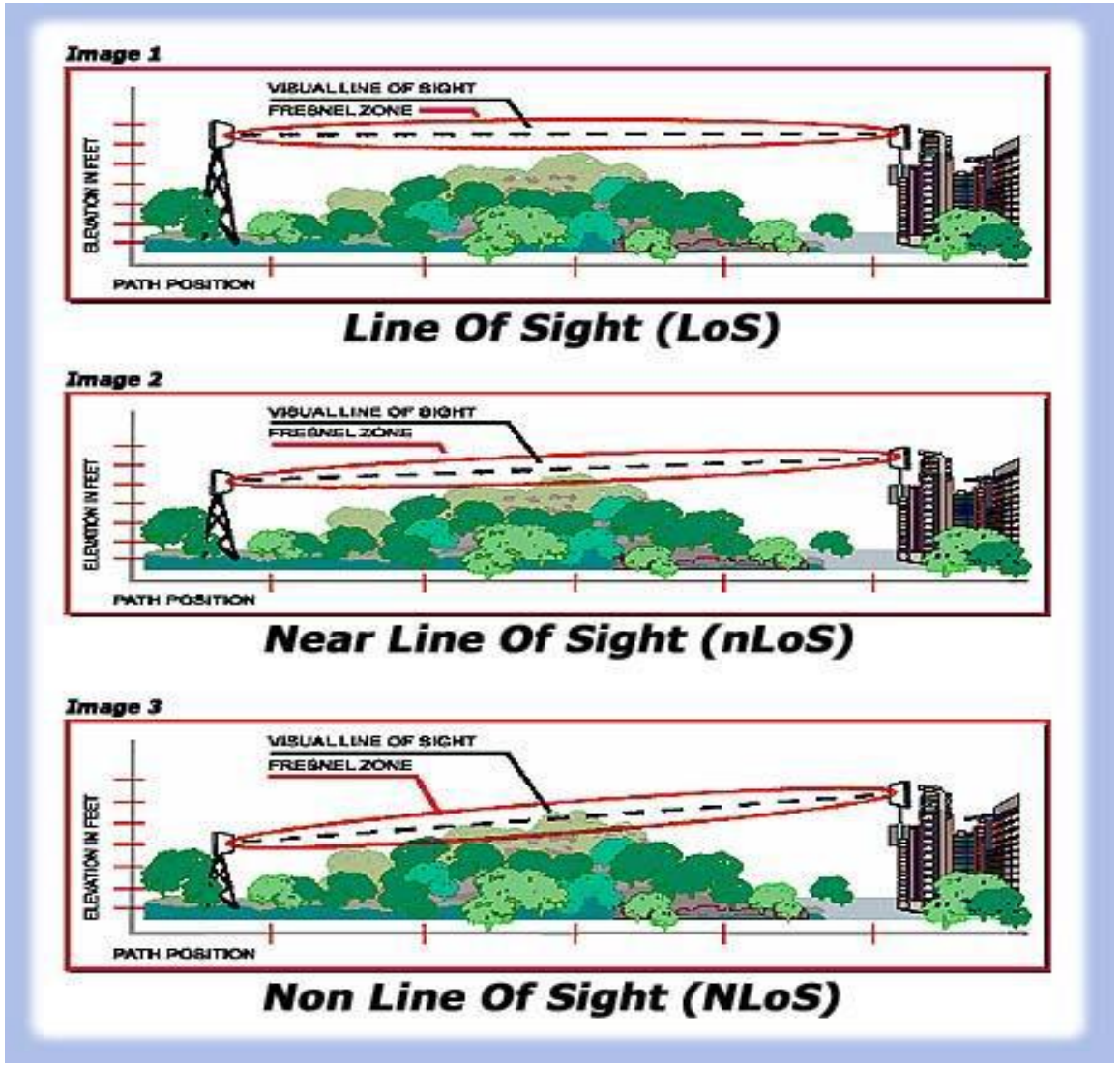
Fresnel Zone



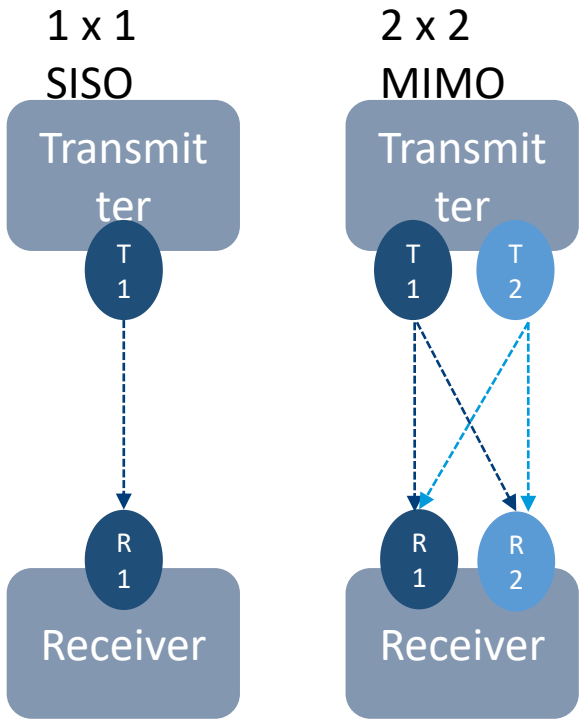
Recommended to have clear Line of Sight for optimum performance

Modulation & Coding Scheme (MCS)

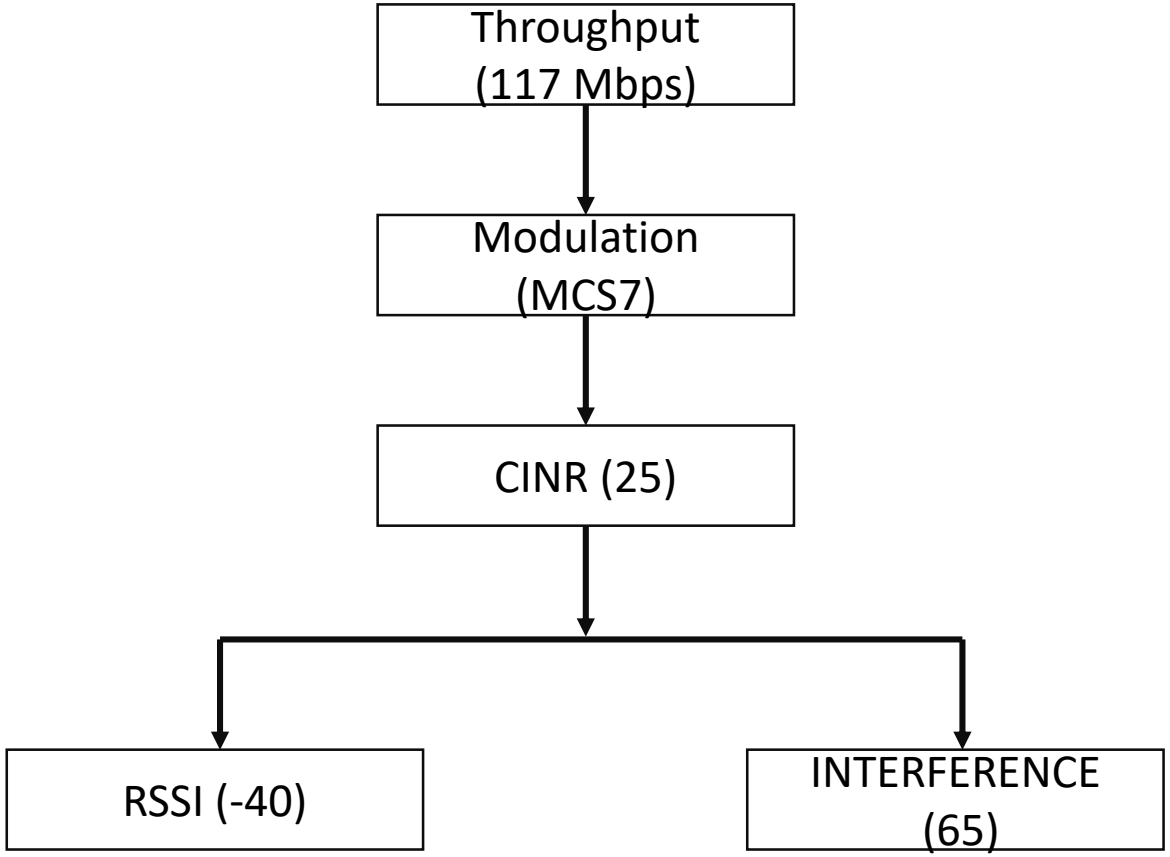
CBW(MHz)	Modulation & FEC			Throughput	Rx sensitivityl	CINR
20	QPSK- 1/2	SS	**MCS1**	**11**	**-87**	8
20	QPSK -3/4	SS	**MCS2**	**17**	**-85**	10
20	16QAM - 1/2	SS	**MCS3**	**23**	**-83**	12
20	16 QAM -3/4	SS	**MCS4**	**35**	**-80**	15
20	64 QAM 2/3	SS	**MCS5**	**47**	**-76**	19
20	64 QAM 3/4	SS	**MCS6**	**53**	**-75**	20
20	64 QAM 5/6	SS	**MCS7**	**59**	**-73**	22
20	256 QAM3/4	SS	**MCS8**	**70**	**-69**	26
20	256 QAM 5/6	SS	**MCS9**	**75**	**-67**	28
20	QPSK- 1/2	DS	**MCS1**	**22**	**-85**	10
20	QPSK -3/4	DS	**MCS2**	**33**	**-83**	12
20	16QAM - 1/2	DS	**MCS3**	**45**	**-80**	15
20	16 QAM -3/4	DS	**MCS4**	**70**	**-78**	17
20	64 QAM 2/3	DS	**MCS5**	**94**	**-73**	22
20	64 QAM 3/4	DS	**MCS6**	**106**	**-72**	23
20	64 QAM 5/6	DS	**MCS7**	**117**	**-70**	25
20	256 QAM3/4	DS	**MCS8**	**140**	**-66**	29
20	256 QAM 5/6	DS	**MCS9**	**150**	**-64**	31

Note: Cambium all radios are minimum 2 X 2 MIMO i.e. 2 Transmit and 2 Receive Antenna

Modulation and Coding Scheme (MCS) Index Values can be used in conjunction with channel width values to allow you to instantly calculate the available data rate of your wireless hardware.



Estimating Throughput



Key terminologies

- **Received Signal Strength Indicator(RSSI)** is the value of the signal (usually expressed in dBm for receiver levels in wireless systems) that is received at the receiver end.
- **Noise Floor:** is the measure of the signal created from the sum of all the noise sources and unwanted signals within a measurement system, where noise is defined as any signal other than the one being monitored.
- **Channel Width** is representing how much data can pass through and at what speed.(Ex: 10 /20/40/80 MHz)
- **Uplink** Information available at AP/Master
- **Downlink** Information available at SM/Salve

- **Receiver sensitivity** is a measure of the ability of a receiver to demodulate and get information from a weak signal. We quantify sensitivity as the lowest signal power level from which we can get useful information.
- **Carrier to Interference and Noise Ratio (CINR)** is the ratio of the Carrier strength (dBm) at the receiver to sum of interference and the noise (dBm) floor.
- **EIRP** Describes the amount of power that a theoretically perfect isotropic antenna would emit to produce the peak power density observed in the direction of maximum antenna gain

  EIRP (in dBm) = Transmit (Tx) power of the Radio (in dBm) + Gain of the Antenna (in dBi) - Cable loss (in dB)

Unlicensed 5GHz Band & India Specific Guidelines

As per new GSR 1048(E) dated Oct 2018, total **605 MHz** spectrum allowed to use with below EIRP limits in India

Band Name	Band(MHz)	Available Channel Bandwidth(MHz)	EIRP(dBm) Vs Channel	
			20MHz/40MHz/80MHz	
			PMP	PTP
U-NNI Low	5150-5250	100	36	53
U-NNI Mid	5250-5350	100	36	53
U-NNI Mid(Extended)	5470-5725	255	30	
U-NNI Upper	5725 - 5875	150	36	47

U-NNI : Unlicensed National Information Infrastructure

Note: Please verify the correct frequency and EIRP value with Airtel Team

ePMP Force 300-25 Overview

Overview- ePMP Force 300-25

- Wide band operation support frequency range 4.910 GHz to 5.970MHz
  (Subject to local regulations permission)
- Hardware based on 802.11ac Wave 2 technology (2x2 MIMO)
- On top of that ,supports Proprietary Physical Layer Air Interface
- Support modulation up to 256QAM (DS1 to DS9) and LDPC
- Channel width of 20,40 and 80 MHz
- Support aggregate throughput 150 Mbps with 20 MHz,300 Mbps with 40 MHz channel width ,500+ with 80 MHz channel width
- TDD DL/UL Ratio : 75/25,70/30,65/35,60/40,55/45,50/50,45/55,40/60,35,65,30/70 and Flexible
- Support 10/100/1000 Mbps Ethernet Interface
- Multiple levels of QoS (Quality of Service) for voice, video and data applications

Overview- ePMP Force 300-25

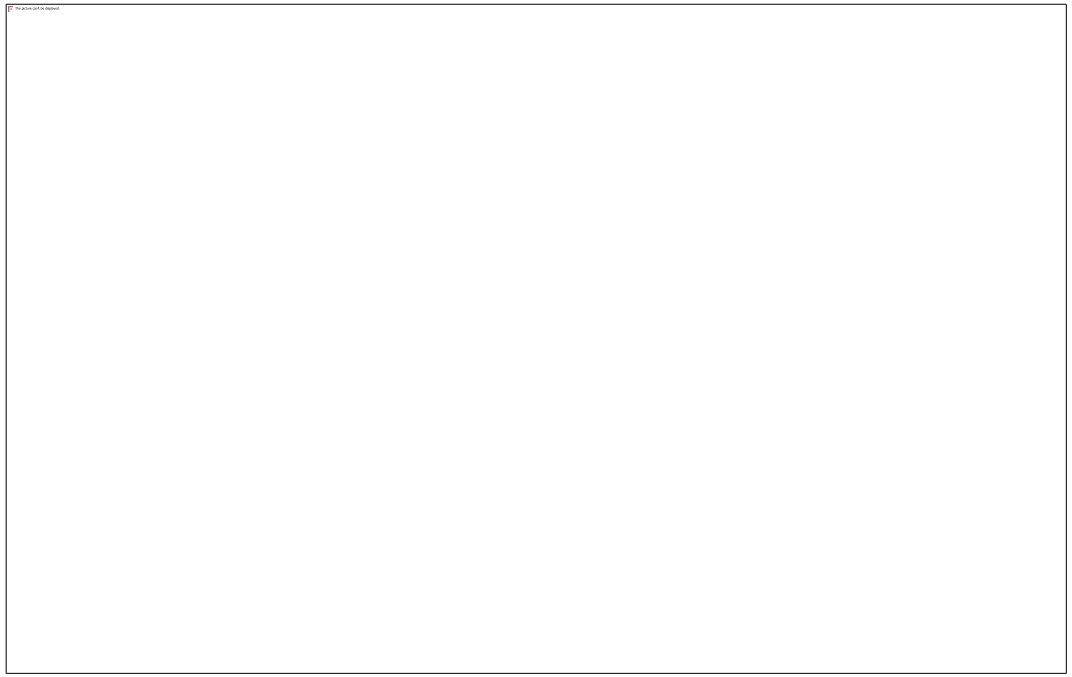
- Integrated always-on spectrum analyzer for assessing the interference
- Receiving Sensitivity MCS 0 = -89 dBm to MCS 8 (256 QAM-3/4) = -66 dBm (per chain)
- Dynamic Channel Selection (DCS) Automatically changes channels to avoid interference without dropping the link

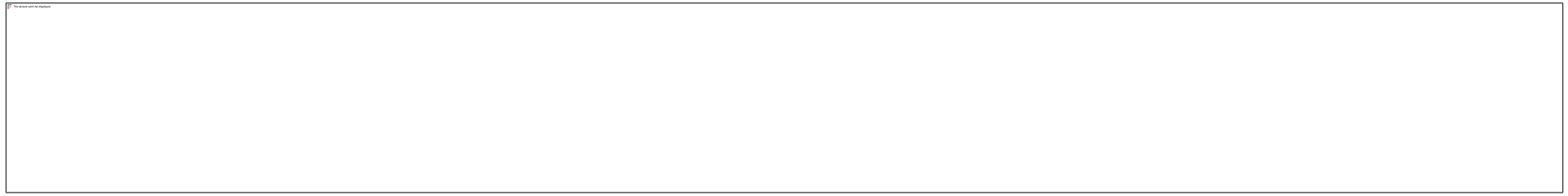
ePMP Force 300-25 Hardware Installation

PSU Description

AC PSU

DC PSU





The PSU is an indoor unit that is connected to the ODU and network terminating equipment using Cat5e cable with RJ45 connectors. It is also plugged into an AC power supply so that it can inject Power over Ethernet

Unboxing Antenna & Pole Mounting

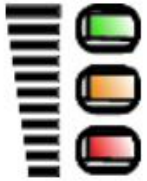
Field Installation Snaps

https://www.youtube.com/watch?v=JXPICPxrdgs

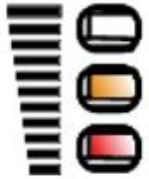
https://www.youtube.com/watch?v=CgB9qBWwwGk

LED Description

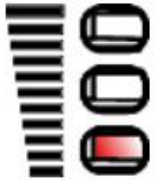
LED	Function
POWER	Green: Power is applied to the device Unlit: No power is applied to the device or improper power source
ETH	Ethernet port indicator Once lit, blinking indicates Ethernet activity Green: 10/100/1000 BaseTX link
	Radio scanning: LEDs light in an ascending sequence to indicate that the radio is scanning Radio registered: LEDs light to indicate the RSSI level at the device.



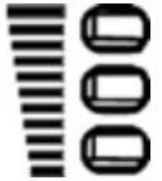
RSSI > -60 dBm



-70 dBm < RSSI ≤ -60 dBm



-80 dBm < RSSI ≤ -70 dBm



RSSI ≤ -80 dBm

Distance vs ERIP vs TX Power Vs RSSI

Distance	EIRP : 53		EIRP : 30		EIRP : 36	
	Tx Power,dB	RSL, dBm	Tx Power,dB	RSL, dBm	Tx Power,dB	RSL, dBm
Upto 0.1	9	-30	6	-34	9	-30
Upto 0.2	15	-30	6	-40	12	-34
Upto 0.4	22	-30	6	-46	12	-40
Upto 0.6	25	-30	6	-50	12	-44
Upto 0.8	28	-30	6	-52	12	-46
Upto 1	28	-31	6	-54	12	-48
Upto 1.5	28	-35	6	-58	12	-52
Upto 2	28	-37	6	-60	12	-54
Upto 2.5	28	-39	6	-62	12	-56
Upto 3	28	-41	6	-64	12	-58
Upto 3.5	28	-42	6	-65	12	-59
Upto 4	28	-43	6	-66	12	-60
Upto 4.5	28	-44	6	-67	12	-61
Upto 5	28	-45	6	-68	12	-62
Upto 5.5	28	-46	6	-69	12	-63
Upto 6	28	-47	6	-70	12	-64
Upto 6.5	28	-48	6	-71	12	-65
Upto 7	28	-48	6	-71	12	-65