ePMP 4500C &
High Performance
Horn Antennas

Product Brochure

Choosing the best AP for a deployment scenario and selecting the best antenna options with ePMP 4500 use cases:

One of the key attributes of the ePMP 4000 Series platform is that it can economically scale from low-density micro-POP environments up to high-density traditional 4-sector deployments. With ePMP 4000 Series, operators can select the best AP for their specific requirements.

Traditionally WISPs deployed towers with four sectors each covering 90 degrees. As horn antenna technology has evolved, WISPs are benefiting from extra flexibility that these antennas can offer.

Cambium Networks along with RF elements have introduced a series of new solutions that give WISPs more flexibility than ever before. Horn antenna solutions along with connectorized Access Points allow for split sector deployments, improved elevations and ultimately allows WISPs to tailor the solution to maximize the return on investment.

Which Access Points are available in the ePMP 4000 Series?

| PLATFORM	ARCHITECTURE	ANTENNA	CAPACITY	WHERE TO USE
ePMP 4500	Integrated	8x8 Integrated	4 Gbps	Large scale 4-sector towers with ABAB channel re-use
ePMP 4500C	8x8 Connectorized	Up to 4 Horns	4 Gbps	Deploy up to 4 horns for great F/B isolation and narrow sidelobes
ePMP 4500L	2x2 Connectorized	Horn or Sector	1.2 Gbps	Small sectors using horns or sector to target sub-divisions and outlying villages

ePMP 4500 **ePMP 4500C** **ePMP 4500L**

Deployment Scenarios

ePMP 4500C allows great flexibility from single 8x8 sector deployment, 2 sector 4x4 sector deployment or up to four of 2x2 Sectors. For each of the scenarios, WISPs can use 3rd party antenna to fulfill their performance requirements. Out of many antenna options on the market, High performance Horn antennas provide the best performance and the most diverse beam options.

Deployment Examples with High Performance Horn Antennas

Below examples provide a brief view on wide range of deployment flexibility options. Note that these are just selected combinations that WISPs can use with ePMP 4500C. The flexibility of deployment scenarios with ePMP 4500C is unmatched.
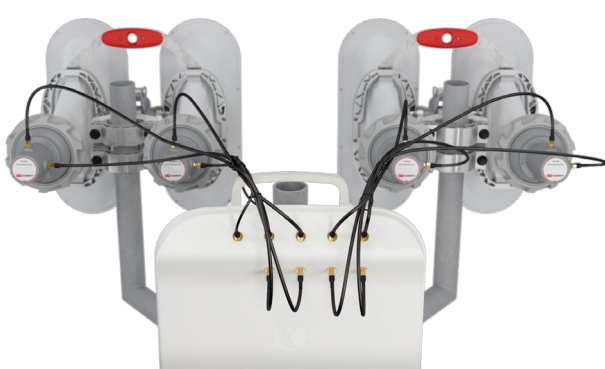
SINGLE SECTOR MODE

8x8 Single Sector
- Using dual 4x4 Horn Array in 8x8 mode
- Large scale deployments with channel re-use
- High density of clients
- High package requirements
- 90°, 60° or 45° azimuth beam width sector coverage with up to 4 Gbps throughput

SPLIT SECTOR MODE

Two 4x4 Horn Sectors
- Deploying two of 4x4 Horn Array in Split Sector mode
- High throughput requirements
- Medium density of clients
- Any combination of 90°, 60° and 45° azimuth beam width of 4x4 Horn Arrays provides wide flexibility in building of the specific coverage

Up to four of 2x2 Horn Sectors
- Deploying up to four of 2x2 Horns in Split Sector mode
- Targeting sub-divisions, villages, areas with rugged mountain terrain
- 12 different choices of beams with 2x2 Horns providing unmatched flexibility in building the desired network coverage

**TWO ePMP 4500 VS
ONE ePMP 4500C WITH 4X4 HORNS ON 2 SECTORS**

|	ePMP 4500 Integrated	ePMP 4500C & RFE 4x4 Horns on 2 Sectors
Type	Two Sectors	Horns
Price	$ $ $ $	$ $ $
Capacity/Sector	4 Gbps	2 Gbps
Azimuth Beamwidth	60°	60°
Elevation Beamwidth	5.5°	16°
Tx Power	34 dBm	33 dBm
Antenna Gain	17 dBi	16 dBi
Front to Rear Ratio	32 dB	30 dB
Weight	14.66 Kg	22.6 Kg
Dimension	643 x 487 x 157 mm 25.3 x 19.2 x 6.2 inch	940 x 560 x 500 mm 35.4 x 22 x 19.7 inch
Environmental	IP67	IP67
Temperature	-40° C to 55° C	-40° C to 55° C
V/H Adjustment	-10° to +5°	± 20
Port to Port Isolation	20 dB	n/a
Wind Survival	200 km/hr	160 km/hr

WISP BENEFIT

| ePMP 4500 Integrated	ePMP 4500C & RFE 4x4 Horns on 2 Sectors
Weight (Lighter) Easier Deployment	*Elevation Beamwidth* Mountain coverage and Easier Deployment
Integrated Easier Deployment	*Side Lobes* Less Noise
Integrated No Cables, less space	*Narrower Azimuth Beamwidth* Less Noise
Capacity Can offer better packages to end users	*Azimuth Beamwidth* Flexibility on Beamwidth and Gain
Spectrum Analyzer on each Sector	*Split Sector support* Depolyment Flexibility in Splitting sectors in future
	One Radio Potentially Lower tower rental
	Price Lower cost per sector

SPLIT SECTOR MODE WITH TWO 4x4 HORN ARRAYS

With ePMP 4500C deployed with two 4x4 Horn Sectors in split sector mode, ePMP 4500C radio can effectively cover two sectors with moderate to high throughput requirements, or with moderate to high density of subscribers. Any of the following SKUs can be used to cover each of the two sectors.

	RF elements Product SKU	Gain (dBi)	Frequency Range (MHz)	VSWR Typical	Beam Efficiency (%)	Front-to-Back (dB)
90° Array	AH90-4x4-SMA	16	5180 - 6000	1.5	90	30
60° Array	AH60-4x4-SMA	17	5180 - 6000	1.5	95	27
45° Array	AH45-4x4-SMA	17	5150 - 6400	1.5	90	30
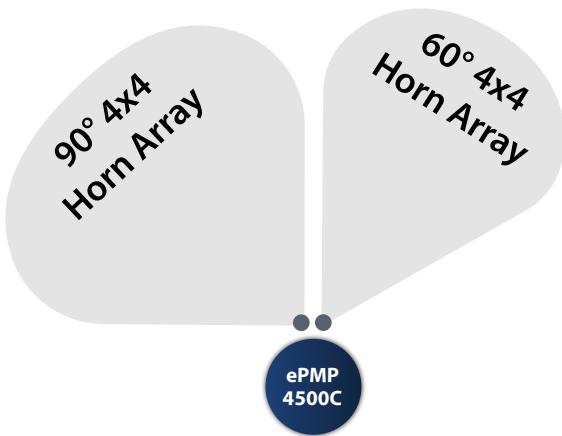
Example shows ePMP 4500C with two RF elements Asymmetrical 4x4 Horn Array covering one 90° and one 60° sector.
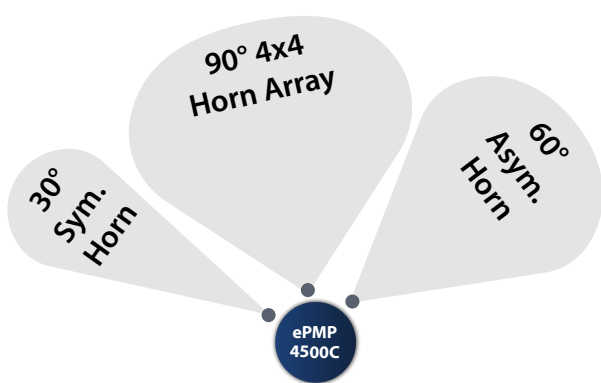SKUs: AH90-4x4-SMA, AH60-4x4-SMA
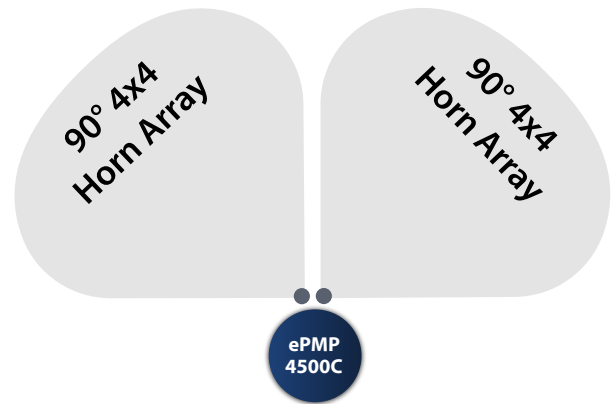
Example shows ePMP 4500C with two RF elements Asymmetrical 4x4 Horn Array covering two diferent 90° sector areas.
SKUs: AH90-4x4-SMA

SPLIT SECTOR MODE WITH CLUSTER OF 2x2 HORNS AND 4x4 HORN ARRAYS

With ePMP 4500C deployed with multiple Horn Sectors in split sector mode, ePMP 4500C radio can effectively cover up to 4 sectors with medium to high throughput requirements, while keeping the tower footprint and complexity under control. The choice of antennas is extremely wide to provide a solution for every coverage pattern and every throughput demand. When planning the coverage, a 4x4 Array can be used for higher capacity demanding areas, while 2x2 Horns can serve areas with less density or throughput requirements. Any combination of the following SKUs can be used as soon as they require 8 or less radio chains in total.

		RF elements Product SKU	Gain (dBi)	Frequency Range (MHz)	VSWR Typical	Beam Efficiency (%)	Front-to-Back (dB)
4x4 Asymmetrical Horn Array Antennas	**90° Array**	AH90-4x4-SMA	16	5180 - 6000	1.5	90	30
	60° Array	AH60-4x4-SMA	17	5180 - 6000	1.5	95	27
	45° Array	AH45-4x4-SMA	17	5150 - 6400	1.5	90	30
Asymmetrical Horn Antennas	**90°**	AH90-TP	16	5180 - 6000	1.5	90	30
	60°	AH60-TP	17	5180 - 6000	1.5	95	27
	30°	AH2030-TP	20.5	5180 - 6000	1.5	95	35
Symmetrical Horn Antennas	**30°**	HG3-TP-S30	18.4	5180 - 6775	1.5	94	37
	40°	HG3-TP-S40	16.2	5180 - 6400	1.5	93	35
	50°	HG3-TP-S50	14.3	5180 - 6400	1.5	92	33
	60°	HG3-TP-S60	13.2	5180 - 6400	1.5	90	32
	70°	HG3-TP-S70	11.5	5180 - 6400	1.5	94	30
	80°	HG3-TP-S80	10.4	5180 - 6400	1.5	94	29
	90°	HG3-TP-S90	9.6	5180 - 6400	1.5	92	28
	UltraHorn™ TP	UH-TP-5-24	24	5180 - 6775	1.5	99	40

Example shows ePMP 4500C with three RF elements Antennas. One Asymmetrical 4x4 Horn Array covering 90° sector. One 2x2 60° Asymmetrical Horn covering 60° Sector and one 2x2 30° Symmetrical Horn covering 30° Sector. SKUs: HG3-TP-S30, AH90-4x4-SMA, AH60-TP
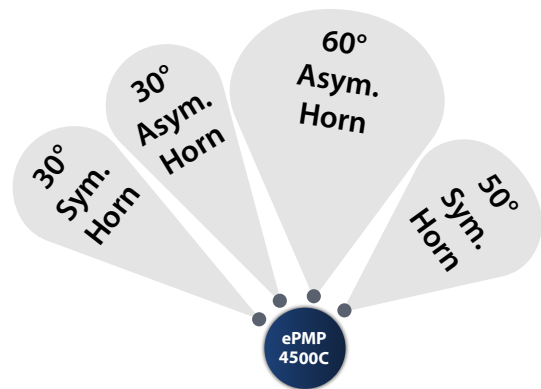
Example shows ePMP 4500C with four of RF elements 2x2 Horn Antennas covering four different areas (sectors). SKUs: HG3-TP-S30, AH2030-TP, AH60-TP, HG3-TP-S50

	ePMP 4500L WITH 2X2 HORNS VS ePMP 4500C WITH 2X2 HORNS ON 4 SECTORS		EPMP 4500 VS EPMP 4500C WITH FOUR 2X2 HORNS ON 1 SECTOR	
	4x ePMP 4500L & 4x RFE 2x2 Horns	1x ePMP 4500C & 4x RFE 2x2 Horns	ePMP 4500 Integrated	ePMP 4500C & RFE 8x8 Horns
Type	Horns	Horns	Sectored Antenna	Horns
Price	$ $ $ $	$ $ $+	$ $ $	$ $ $+
Capacity/Sector	1.2 GB	1+ GB	Up to 4 Gbps	Up to 4 Gbps
Azimuth Beamwidth	60°	60°	90°	90°, 60° and 45°
Elevation Beamwidth	16°	16°	5.5°	16°
Tx Power	32 dBm	33 dBm	34 dBm	33 dBm
Antenna Gain	16 dBi	16 dBi	17 dBi	16 dBi
Front to Rear Ratio	30 dB	30 dB	32 dB	30 dB
Weight	22.6 Kg	22.6 Kg	16.66 Kg	22.8 Kg
Dimension	500 x 560 x 500 mm 19.7 x 22 x 19.7 inch	500 x 560 x 500 mm 19.7 x 22 x 19.7 inch	643 x 487 x 157 mm 25.3 x 19.2 x 6.2 inch	940 x 560 x 500 mm 35.4 x 22 x 19.7 inch
Environmental	IP55	IP55	IP67	IP55
Temperature	-40° C to 55° C	-40° C to 55° C	-40° C to 55° C	-40° C to 55° C
V/H Adjustment	± 20	± 20	-10° to +5°	± 20
Port to Port Isolation	n/a	n/a	20 dB	n/a
Wind Survival	160 km/hr	160 km/hr	200 km/hr	160 km/hr

WISP BENEFIT

| 4x ePMP 4500L & 4x RFE 2x2 Horns	1x ePMP 4500C & 4x RFE 2x2 Horns	ePMP 4500 Integrated	ePMP 4500C & RFE 8x8 Horns
Multi Radios Distributed Capacity	One Radio Potentially Lower tower rental	Weight (Lighter) Easier Deployment	Elevation Beamwidth Mountain coverage and Easier Deployment
Spectrum Analyzer per radio Automated Spectrum Analysis in all direction vs real time	One Channel use	Integrated Easier Deployment	Side Lobes Less Noise
Can use two channel		Integrated No Cables, less space	Narrower Azimuth Less Noise
Spectrum Analyzer on each direction		Enviromental IP67 Withstand harsher conditions	Beamwidth Less Noise
		Azimuth Beamwidth Flexibility on Beamwidth and Gain	Azimuth Beamwidth Flexibility on Beamwidth and Gain
		Gain Flexibility on Beamwidth and Gain	Gain Flexibility on Beamwidth and Gain
		Split Sector support Depolyment Flexibility in Splitting sectors in future	Split Sector support Depolyment Flexibility in Splitting sectors in future
		Null Fill Less Noise	

Deployment Scenarios with RF elements High Performance Horn Antennas

With ePMP 4500C, WISPs have a great flexibility in choosing the right deployment scenario. ePMP 4500C allows for multiple modes: 8x8, Split sector (either two of 4x4 Sectors or up to four of 2x2 Sectors). For each of the scenarios, WISPs can use RF elements Horn antenna to fulfill their performance requirements and provide the most diverse beam options.

SINGLE SECTOR MODE WITH TWO 4x4 HORN ARRAYS

With ePMP 4500C deployed with two identical 4x4 Horn Array Antennas in single sector mode, ePMP 4500C radio can effectively cover one sector with extremely high throughput requirements. The choice of antennas include 90°, 60° and 45° 4x4 Horn Arrays. By mounting two identical in the same direction in azimuth and elevation, ePMP 4500C radio in single sector mode, will consider them as an 8x8 Horn Array. This ability to choose an high performance horn antenna array in 8x8 high density high throughput deployments adds an ultimate optionality into ePMP 4500 product line.

	Product SKU	Gain (dBi)	Frequency Range (MHz)	VSWR Typical	Beam Efficiency (%)	Front-to-Back (dB)
90° Array	AH90-4x4-SMA	16	5180 - 6000	1.5	90	30
60° Array	AH60-4x4-SMA	17	5180 - 6000	1.5	95	27
45° Array	AH45-4x4-SMA	17	5150 - 6400	1.5	90	30

Two 90° 4x4 Horn Array working as 8x8 Array
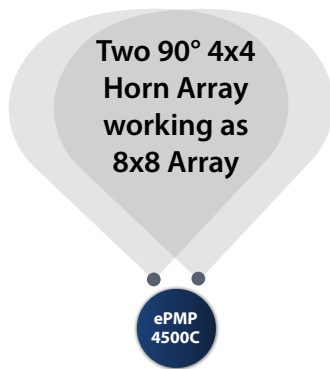
ePMP 4500C

Example shows ePMP 4500C with two RF elements 90° Asymmetrical 4x4 Horn Arrays covering one 90° sector working as 8x8 Horn Array.
SKUs: AH90-4x4-SMA

Two 45° 4x4 Horn Array working as 8x8 Array
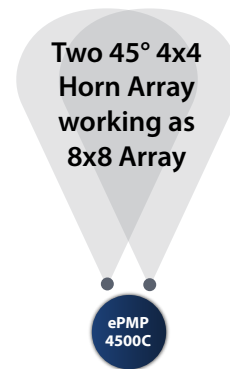
ePMP 4500C

Example shows ePMP 4500C with two RF elements 45° Asymmetrical 4x4 Horn Arrays covering one 45° sector working as 8x8 Horn Array.
SKUs: AH45-4x4-SMA

The Most Versatile ePMP Access Point Radio

ePMP 4500C Fixed Wireless Access Point Radio

Cambium Networks' ePMP product line has set the standard for high performance, scalability and reliability in harsh interference environments, all at a compelling price. The ePMP 4500 Access Point series is the fourth generation based on 802.11ax technology. ePMP 4500 Access Points series interoperate with Force 4500 Subscriber Modules. A sophisticated scheduling and QoS engine combined with TDD synchronization allows the ePMP 4500 Access Point series to deliver consistently high-quality service plans to a large number of end users.

ePMP 4500C High Performance 5 GHz AP

The ePMP 4500C *delivers up to 4 Gbps* of throughput per sector. It features *8x8 MU-MIMO* for both Uplink and Downlink, so the 5 GHz ePMP 4500C can transmit to four Force 400 SM's at the same time. This effectively *quadruples capacity* of 2x2 systems and in the process, increases link budgets by 6 dB with downlink beamforming. The ePMP 4500C features coaxial antenna ports, allowing the end user the flexibility to install their own antennas or high performance horns. ePMP 4500C is a *highly flexible platform* allowing for 8x8 or various Split Sector Modes.

8x8 MU-MIMO UPLINK & DOWNLINK   **OFDMA**   **1024 QAM**

- **4 Gbps per sector**
- **120 SMs per Sector**
- **8x8 MU-MIMO Uplink & Downlink**
- **TDD with GPS Synchronization**
- **Up to 1024 QAM**
- **Single User Beam-steering**
- **Smart QoS**
- **Split Sector Modes**
- **Flexibility with 3rd Party Antennas**

Key Features

- **8x8 MU-MIMO UL & DL**
- **OFDMA**
- **4 Gbps**
- **1024 QAM**
- **DPI (with Smart QoS)**
- **ePTP & WLR mode**
- **TDD mode**

- **Split sector capability**
- **AC/DC power**
- **SFP+**
- **IP67**
- **Backward compatibility**
- **Flexibility using 3rd party antenna**

For a complete set of technical specifications please check the Product Datasheet LINK

WISP Benefits

ePMP 4500C is a highly flexible AP radio platform. It provides up to 4 Gbps of throughput and enables up to 120 SMs connected with high service packages. Better latency and better performance with small packets together with Smart QoS improve customer experience.

WISPs have a great flexibility with the deployment scenario (8x8 or Split Sector Modes) and antenna choices.

Backwards compatibility, focus on reliability and 3 year manufacturer warranty add an extra layer of investment protection.

	PERFORMANCE	SCALABILITY	LOW TCO
8x8 MU-MIMO	✓	✓	✓
UPLINK MU-MIMO	✓	✓	✓
OFDMA	✓	✓	✓
HIGHER MODULATION / LONG SYMBOLS	✓		✓
WIDER CHANNELS	✓	✓	✓
TDD SYNC	✓	✓	✓
BACKWARD COMPATIBILITY			✓
3Y WARRANTY			✓
SMART QoS	✓	✓	✓

New Technologies

8x8 MU-MIMO Uplink & Downlink

ePMP 4500C has 8 chains that provides 8x8 MU-MIMO with single user TX beamforming, which means that AP can send traffic to 4 SM simultaneously and achieve 4x more throughput (or Total access point capacity). This applies to both Uplink (UL) and Downlink (DL)!

MU-MIMO technology utilizes diversity in space. When multiple clients are trying to access the medium at the same time, the AP uses RF multipath to send frames to multiple clients at the same time instance. With ePMP 4500C, the groups of clients are now bigger (up to 8 clients in a group) instead of a maximum of four clients in one group for 802.11ac ePMP radios. In contrast, MU-MIMO on the uplink is a new feature in 802.11ax that will roll out in the next phase of the standard.

Beamforming on the 8x8 antenna array provides narrower beams than previous ePMP 3000, resulting in lesser interference for neighbors and higher multi-user grouping probability. 6dB beamforming gain provides better link budget for stable connections.

Up to 120 Clients per AP

Group 1	Group 2
Up to 4 Clients simultaneously	Up to 4 Clients simultaneously

Group 3	Group 4
Up to 4 Clients simultaneously	Up to 4 Clients simultaneously

Uplink & Downlink

8x8 MU-MIMO ePMP 4500C

Up to 4 Gbps per AP

1024 QAM Modulation

ePMP 4500C delivers up to 1024 QAM that allow for gigabit speeds to the client. QAM increases the no. of symbols, which means more data bits are transmitted per symbol. For precise explanation what Quadrature-Amplitude modulation is and how it works check LINK
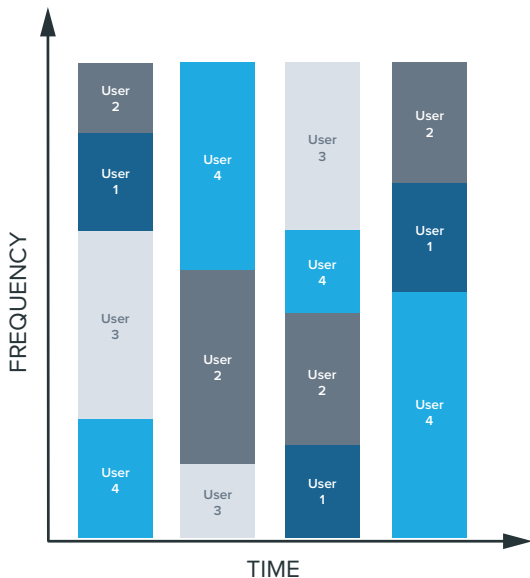
Uplink & Downlink OFDMA with Longer OFDM Symbol

OFDMA stands for Orthogonal Frequency Division Multiple Access and it basically is a multi user version of OFDM. OFDMA allows for a set of rules created for the transmission of data between more than one terminal (SM or AP).

The main benefit of OFDMA is that it allows an AP to allocate the whole channel to a single user, at a time or it may partition a channel to serve multiple users simultaneously.

OFDMA results in better frequency reuse, reduced latency, and increased efficiency.

Why Choose RF elements Horn Antennas with ePMP 4500C

RF elements Horn Antennas are golden standard for access point antenna solution in the WISP industry. They provide unique combination of performance, scalability, beam shape choice and excellent user ergonomics.

Beam Performance

RF elements Horn antennas excel in **beam performance**. With the Beam efficiency (Be) **ranging 94 - 99%**, horn antennas provide unique resistance to RF noise. Antenna gain and radiation patterns are optimised to be balanced between H and V polarization and stable over wide band. Such a unique beam performance allows for desired deployment scenarios incl. **dense co-location** of narrow sectors, **A-B-A-B frequency reuse**.
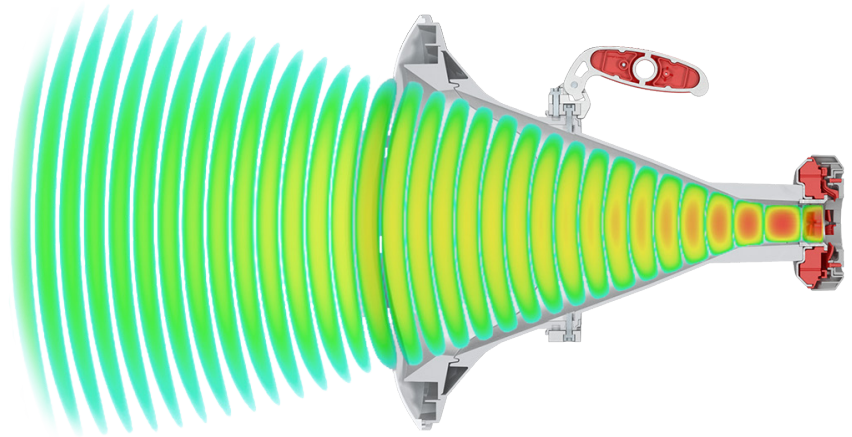
Network Scalability

RF elements Horn antennas provide unique system scalability to provide enough throughput for your network. Growing a **micro-pop** site into **heavy loaded cluster of 24+ horns** is entirely possible with RF elements Horn antennas. Even creating massive **8x8 horn arrays** is possible!

Low Tower Load and User Ergonomics

RF elements Horn antennas are well built, compact and **easy to install**. The Asymmetrical Horns have detachable mount for easy two step installation, with setting of azimuth and tilt in the bracket. The **tower load is remarkably low** for most of the horns, especially Symmetrical Horn antennas. Antennas are built of aluminum, with all hardware of surface coated stainless steel.

The Biggest Set of Tools

RF elements Horn antennas are the biggest set of access point antennas on the global market. Product families include **Award winning Asymmetrical Horn Antennas**, Symmetrical Horn Antennas, UltraHorn™ and StarterHorn™ Antennas. In 5 GHz unlicensed band, RF elements Horn antenna technology provides **13 different beam shapes** to choose from when planning your sector coverage.