External Antennas Specifications

This appendix provides specifications for optional third-party external antennas for WipLL devices operating in the 900 MHz and 700 MHz bands.

H.1. WipLL 900 MHz

H.1.1. BSR (at Base Station)

Airspan offers the following optional third-party external antennas for BSR devices operating in the 900 MHz band:

- Panel 35°/ 18.6 dBi
- Panel 120°/16 dBi
- Panel 62°/16 dBi
- Panel 90°/17 dBi
- Omni-Directional 360°/12 dBi (3° Lobe Tilt)
- Omni-Directional 360°/12 dBi (5° Lobe Tilt)
- Sector (65°/15.5 dBi)
- Omni-directional (11 dBi)

H.1.1.1. Panel 35°/ 18.6 dBi

The Panel 35°/ 18.6 dBi antenna's radiation pattern and physical design is shown in the figure below.

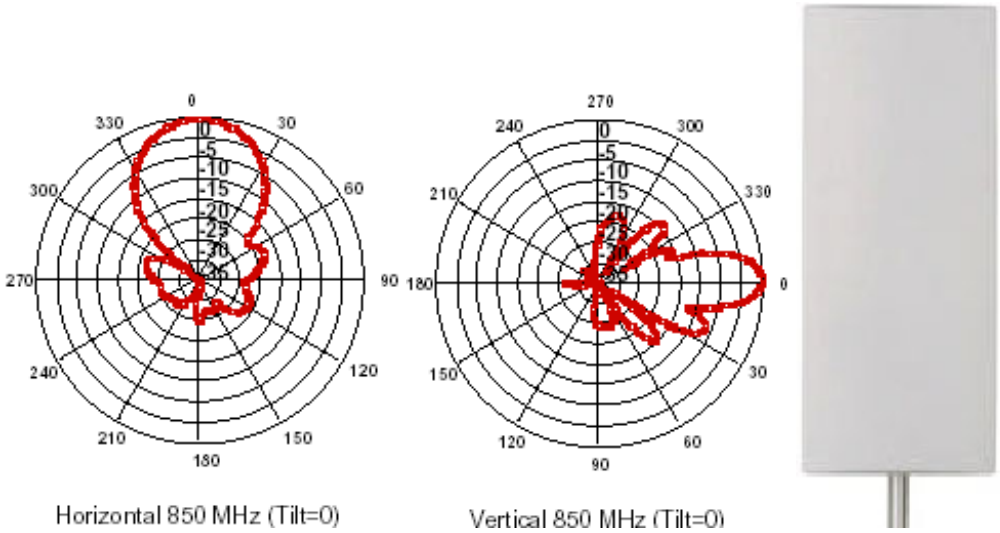

Figure H-1: Panel 35°/ 18.6 dBi antenna radiation pattern

The table below lists the Panel 35°/ 18.6 dBi antenna specifications.

Table H-1: Panel 35°/ 18.6 dBi antenna specifications

Electrical specifications	
Frequency range	870 – 960 MHz
Polarization	Vertical
Gain (dBd/dBi)	16.5/18.6
Azimuth BW	35°
Elevation BW	14.5°
Beam Tilt	0°
USLS (dB)	>18
Front-to-Back Ratio (dB)	25
VSWR	<1.33:1

Electrical specifications	
IM Suppression – Two 20 Watt Carriers	-150 dBc
Impedance	50 Ω
Max. Input Power	500 Watts
Lightening Protection	DC Ground
Mechanical specifications	
Weight	17.5 lbs (7.9 kg)
Dimensions (LxWxD)	48.5 x 18.5 x 5 in. (1232 x 470 x 127 mm)
Max. Wind Area	5.3 ft^2 (0.49 m^2)
Max. Wind Load (at 100 mph)	213 lbf (947 N)
Max. Wind Speed	125 mph (201 km/h)
Radiator Material	Aluminum
Radome Material	ABS, UV Resistant
Mounting Hardware Material	Galvanized Steel
Connector Type	7/16 DIN (Back)
Color	Light gray
Standard Mounting Hardware	DB380 Pipe Mount Kit, included
Downtilt Mounting Hardware	DB5083, optional

H.1.1.2. Panel 120°/16 dBi

The Panel 120°/16 dBi antenna's radiation pattern and physical design is shown in the figure below.

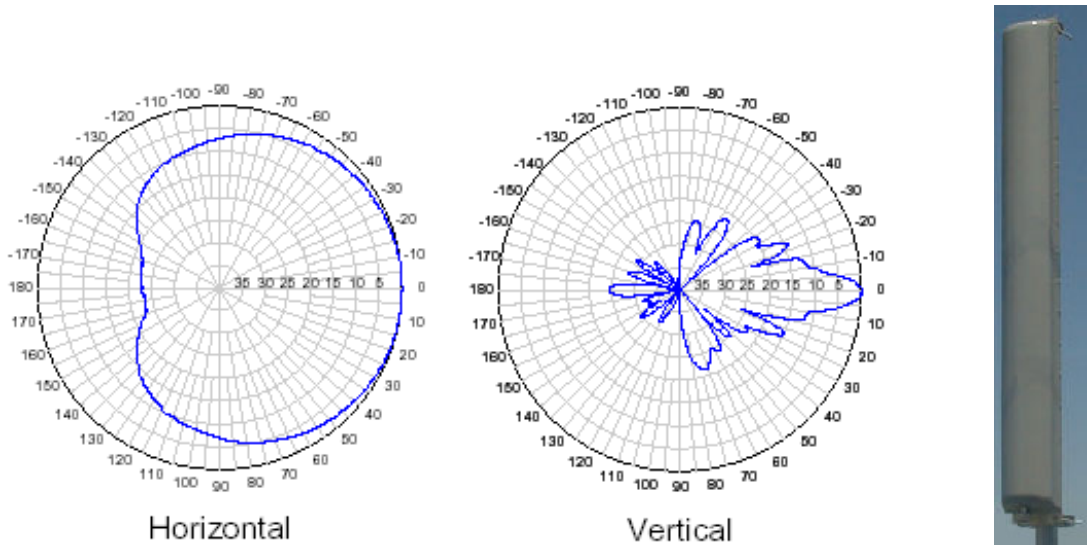

Figure H-2: Panel 120°/16 dBi antenna radiation pattern (at mid-band)

The table below lists the Panel 120°/16 dBi antenna specifications.

Table H-2: Panel 120°/16 dBi antenna specifications

Electrical specifications	
Frequency range	806 – 960 MHz
Polarization	Vertical
Gain	16 dBi
Half-power beam width	• H-plane: 120° • E-plane: 7°
Impedance	50Ω
VSWR	<1.4:1
Max. Power	500 W (limited by connector only)
Lobe Tilt	1.25°
Null Fill	25%
Connector	N, NE (elongated N connector), DIN, EDIN (elongated DIN connector)
Lightning Protection	Direct ground
Mechanical specifications	

Electrical specifications	
Wind area	0.73 m^2 (7.87 ft^2)
Weight	14 kg (31 lbs)
Wind load at 50 m/s	1140 N (256 lbs)
Depth	160 mm (6.3 in.)
Width	295 mm (11.6 in.)
Length	2450 mm (96.5 in.)

H.1.1.3. Panel 62°/16 dBi

The Panel 62°/16 dBi antenna's radiation pattern and physical design is shown in the figure below.

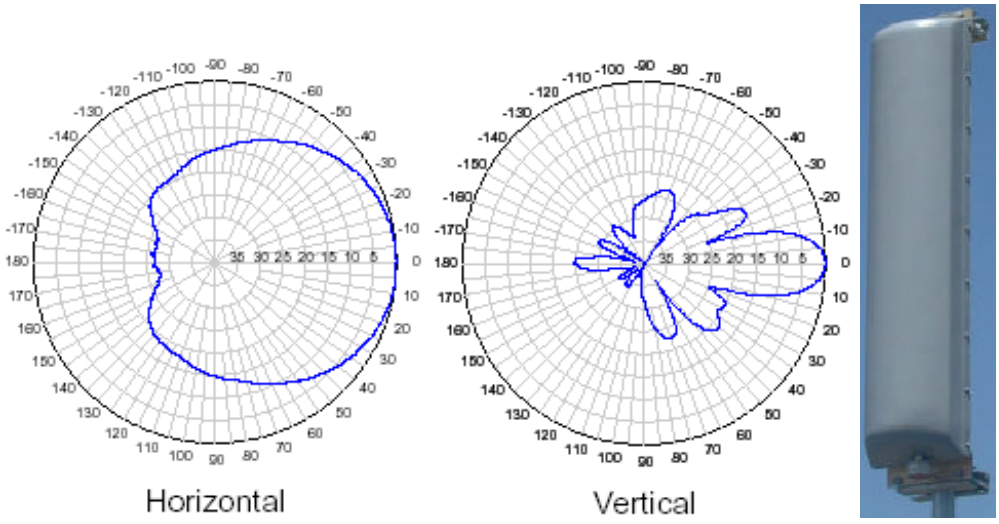

Figure H-3: Panel 62°/16 dBi antenna radiation pattern (at mid-band)

The table below lists the Panel 62°/16 dBi antenna specifications.

Table H-3: Panel 62°/16 dBi antenna specifications

Electrical specifications	
Frequency range	806 – 960 MHz
Polarization	Vertical
Gain	16 dBi
Half-power beam width	• H-plane: 62° • E-plane: 14°
Impedance	50Ω
VSWR	<1.4:1
Max. Power	500 W (limited by connector only)
Lobe Tilt	1.25°
Null Fill	5%
Connector	N, NE (elongated N connector), DIN, EDIN (elongated DIN connector)
Lightning Protection	Direct ground
Mechanical specifications	
Wind area	0.36 m^2 (3.9 ft^2)
Weight	6.5 kg (14.3 lbs)
Wind load at 50 m/s	560 N (126 lbs)
Depth	160 mm (6.3 in.)
Width	295 mm (11.6 in.)
Length	1225 mm (48.2 in.)

H.1.1.4. Panel 90°/17 dBi

The Panel 90°/17 dBi antenna's radiation pattern and physical design is shown in the figure below.

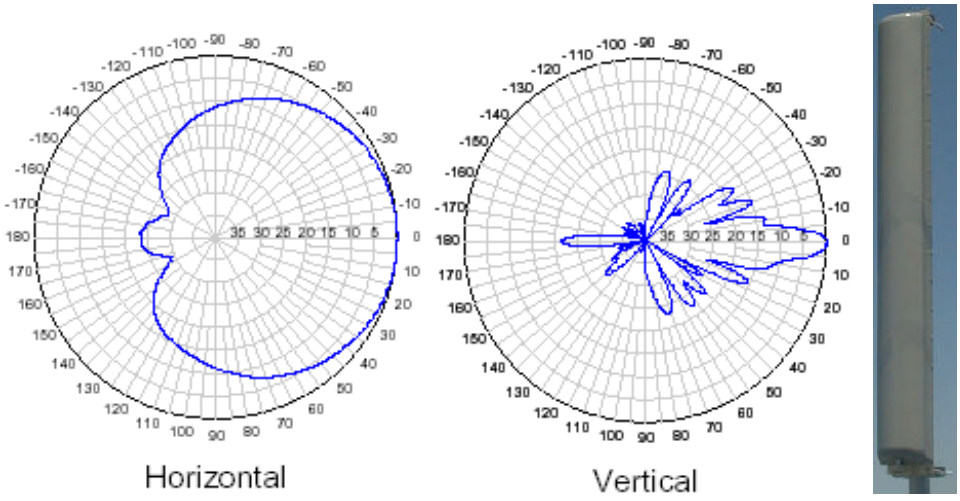

Figure H-4: Panel 90°/17 dBi antenna radiation pattern (at mid-band)

The table below lists the Panel 90°/17 dBi antenna specifications.

Table H-4: Panel 90°/17 dBi antenna specifications

Electrical specifications	
Frequency range	806 – 960 MHz
Polarization	Vertical
Gain	17 dBi
Half-power beam width	• H-plane: 90° • E-plane: 7°
Impedance	50Ω
VSWR	<1.4:1
Max. Power	500 W (limited by connector only)
Lobe Tilt	1.25°
Null Fill	25%
Connector	N, NE (elongated N connector), DIN, EDIN (elongated DIN connector)
Lightning Protection	Direct ground
Mechanical specifications	
Wind area	0.73 m^2 (7.87 ft^2)
Weight	14 kg (31 lbs)
Wind load at 50 m/s	1140 N (256 lbs)
Depth	160 mm (6.3 in.)
Width	295 mm (11.6 in.)
Length	2450 mm (96.5 in.)

H.1.1.5. Omni-Directional 360°/12 dBi (3° Lobe Tilt)

The Omni-Directional 360°/12 dBi (3° Lobe Tilt) antenna's radiation pattern and physical design is shown in the figure below.

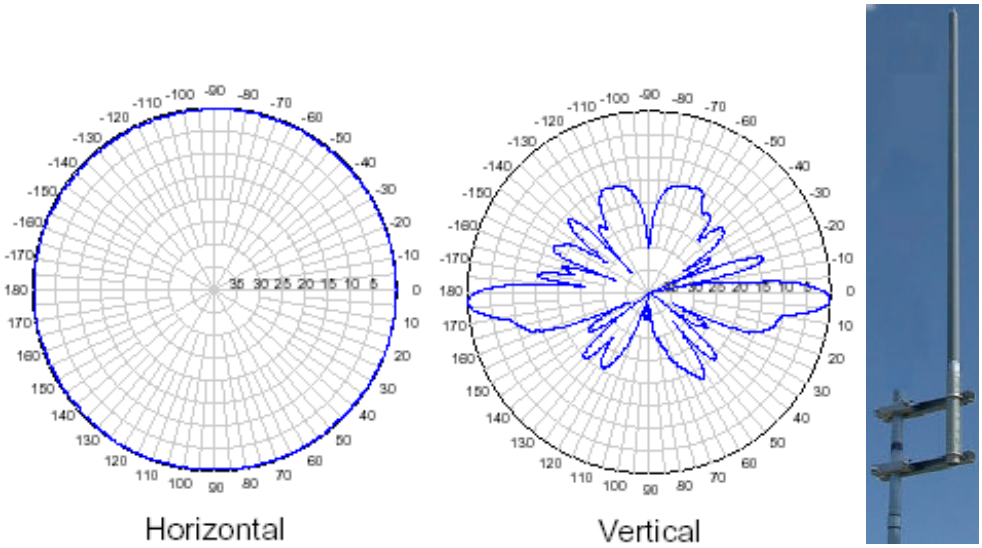

Figure H-5: Omni-Directional 360°/12 dBi (3° Lobe Tilt) radiation pattern (at mid-band)

The table below lists the Omni-Directional 360°/12 dBi (3° Lobe Tilt) antenna specifications.

Table H-5: Omni-Directional 360°/12 dBi (3° Lobe Tilt) antenna specifications

Electrical specifications	
Frequency range	870 – 960 MHz
Polarization	Vertical
Gain	12 dBi
Half-power beam width	• H-plane: 360° • E-plane: 7°
Impedance	50Ω
VSWR	<1.43:1
Max. Power	500 W (limited by connector only)
Lobe Tilt	3°
Null Fill	25%
Connector	N, NE (elongated N connector), DIN, EDIN (elongated DIN connector)
Lightning Protection	Direct ground
Mechanical specifications	
Wind area	0.2 m^2 (2.4 ft^2)
Weight	12 kg (26.5 lbs)
Wind load at 50 m/s	351 N (79 lbs)
Length: • Overall • Radome	 • 3393 mm (134 in.) • 2893 (114 in.)
Diameter	∅65 mm (2.6 in.)

H.1.1.6. Omni-Directional 360°/12 dBi (5° Lobe Tilt)

The Omni-Directional 360°/12 dBi (5° Lobe Tilt) antenna's radiation pattern and physical design is shown in the figure below.

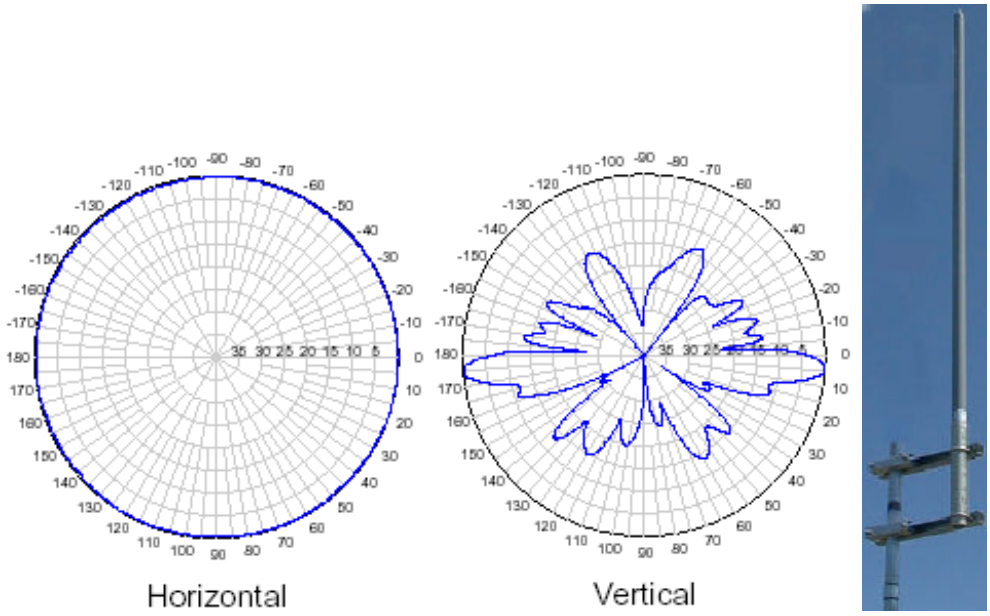

Figure H-6: Omni-Directional 360°/12 dBi (5° Lobe Tilt) radiation pattern (at mid-band)

The table below lists the Omni-Directional 360°/12 dBi (5° Lobe Tilt) antenna specifications.

Table H-6: Omni-Directional 360°/12 dBi (5° Lobe Tilt) antenna specifications

Electrical specifications	
Frequency range	870 – 960 MHz
Polarization	Vertical
Gain	12 dBi
Half-power beam width	• H-plane: 360° • E-plane: 7°
Impedance	50Ω
VSWR	<1.43:1
Max. Power	500 W (limited by connector only)
Lobe Tilt	5°
Null Fill	25%
Connector	N, NE (elongated N connector), DIN, EDIN (elongated DIN connector)
Lightning Protection	Direct ground
Mechanical specifications	
Wind area	0.2 m^2 (2.4 ft^2)
Weight	12 kg (26.5 lbs)
Wind load at 50 m/s	351 N (79 lbs)
Length: • Overall • Radome	 • 3393 mm (134 in.) • 2893 (114 in.)
Diameter	∅65 mm (2.6 in.)

H.1.1.7. Sector Antenna (65°/15.5 dBi)

This antenna is designed for best non-line of sight performance with Airspan's BSR operating in the 900 MHz band. Advanced features include: high gain and mechanical down tilt.

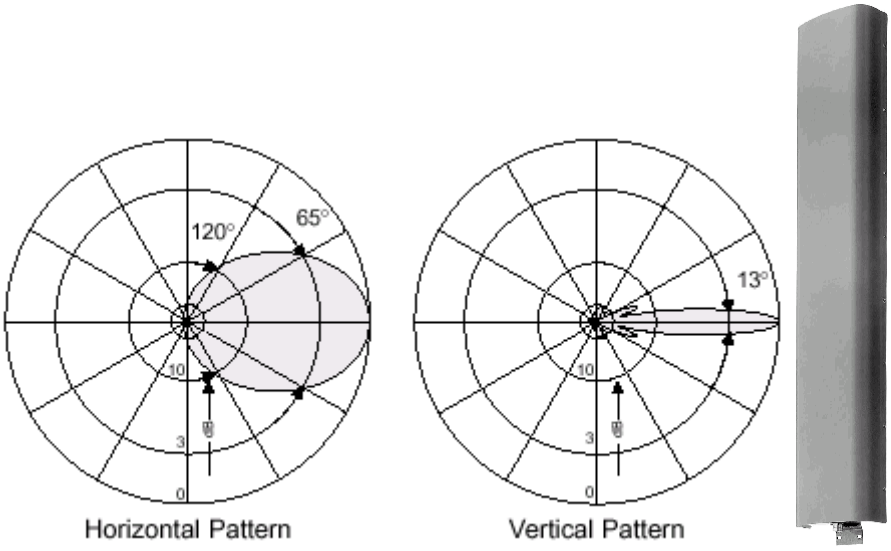

Figure H-7: Sector antenna radiation pattern

The table below lists the Sector antenna specifications.

Table H-7: Sector antenna specifications

Electrical specifications	
Frequency range	870 –960 MHz
Polarization	Vertical
Gain	15.5 dBi
Half-power beam width	• H-plane: 65° • E-plane: 13°
Front-to-back ratio	>25 dB
Impedance	50 .
VSWR	<1.3
Intermodulation IM3 (2 x 43 dBm carrier)	<–150 dBc
Max. Power	500 W (at 50 °C ambient temperature)
Mechanical specifications	
Input	7-16 female
Connector position	Bottom
Weight	6 kg
Wind load	• Frontal: 220 N (at 150 km/h) • Lateral: 140 N (at 150 km/h) • Rear side: 490 N (at 150 km/h)
Max. wind velocity	200 km/h
Packing size	1422 x 272 x 160 mm
Height/width/depth	1294 /258 /103 mm

H.1.1.8. Omni-Directional Antenna (11 dBi)

This antenna is designed for best non-line of sight performance with Airspan's BSR operating in the 900 MHz band.

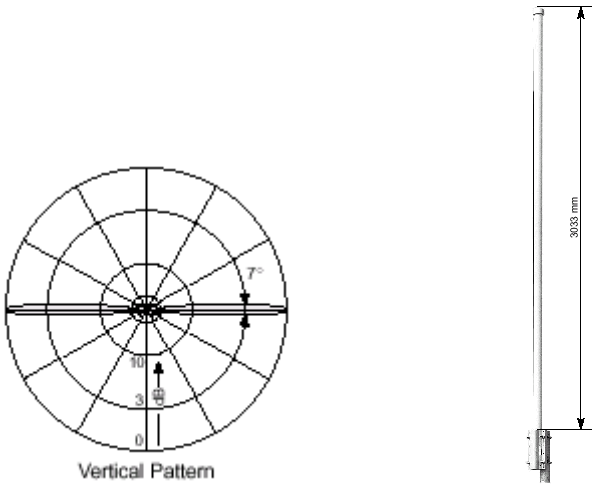

Figure H-8: Omni-directional antenna radiation pattern

The table below lists the Omni-directional antenna specifications.

Table H-8: Omni-directional antenna specifications

Electrical specifications		
Frequency range	870 – 960 MHz	
Polarization	Vertical	
Gain	11 dBi	
Impedance	50Ω	
VSWR	<1.5	
Intermodulation IM3 (2 x 43 dBm carrier)	<–150 dBc	
Max. Power	500W (at 50 °C ambient temperature)	
Mechanical specifications		
Model Type	**736 347**	**736 348**
Input	7-16 female	7-16 female
Connector position	Bottom	Top
Weight	8 kg	
Radome diameter	51 mm	
Wind load	210 N (at 150 km/h)	
Max. wind velocity	200 km/h	
Packing size	3316 x 148 x 112 mm	
Height/width/depth	3033 mm	3022 mm

H.1.2. IDR (at Subscriber Site)

Airspan offers one of the following optional third-party external antennas for the IDR device operating in the 900 MHz band:

- 10 dBi Panel antenna
- 6.5 dBi Panel antenna

H.1.2.1. 10 dBi Panel

The following table lists the 10-dBi Panel antenna specifications.

Table H-9: 10 dBi Panel antenna specifications

Electrical				
Frequency range	902 - 928 MHz			
Gain	10 dBi (min)			
VSWR	1.5:1 (max)			
3 dB Beamwidth (related to vertical polarization)	• Azimuth: 65 (typ) • Elevation: 55 (typ)			
Polarization	Linear (Vertical or Horizontal)			
Side lobes level	-18dB (max) @ +/-90			
Cross polarization	-14dB (max)			
F/B ratio	-20dB (max)			
Input impedance	50 (ohm)			
Input power	6W (max)			
Lightning protection	Non			
Mechanical				
Dimensions (LxWxD)	305x305x25 mm (max)			
Weight	1.5 kg (max)			
Connector	N-Type Female			
Radome	Plastic			
Base plate	Aluminum with chemical conversion coating			
Mounting kit	MT-120018			
Environmental				
Test	**Standard**	**Duration**	**Temperature**	**Notes**
Low temperature	IEC 68-2-1	72 h	-55°C	-
High temperature	IEC 68-2-2	72 h	+71°C	-
Temp. cycling	IEC 68-2-14	1 h	-45°C +70°C	3 Cycles
Vibration	IEC 60721-3-4	30 min/axis	-	Random 4M3

Shock mechanical	IEC 60721-3-4	-	-	4M3
Humidity	ETSI EN300-2-4 T4.1E	144 h	-	95%
Water tightness	IEC 529	-	-	IP67
Solar radiation	ASTM G53	1000 h	-	-
Flammability	UL 94	-	-	CLASS HB
Salt spray	IEC 68-2-11 Ka	500 h	-	-
Ice and snow	-	-	-	25mm radial
Wind speed survival **Operation**	-	-	-	220 Km/h 160 Km/h
Wind load (survival): • **Front thrust** • **Side thrust**	-	-	-	 • 26.8 kg • 2.2 kg

H.1.2.2. 6.5 dBi Panel

The following table lists the 6.5 dBi Panel antenna specifications.

Table H-10: 6.5 dBi Panel antenna specifications

Electrical	
Frequency range	902-928 MHz
Gain	6.5 dBi (min)
VSWR	1.5:1 (max)
3 dB Beamwidth • Azimuth • Elevation	 • 80° (typ) • 80° (typ)
Polarization	Linear (Vertical or Horizontal)
Cross polarization	-14dB (max)
F/B ratio	-11dB (max)
Input impedance	50 (ohm)
Input power	6W (max)
Lightning protection	NON

Mechanical				
Dimensions (LxWxD)	190x190x30 mm (max)			
Weight	0.7kg (max)			
Connector	N-Type Female			
Radome	Plastic			
Base plate	Aluminum with chemical conversion coating			
Outline drawing	RD41245600C			
Mounting kit	MT-120018/A			
Environmental				
Test	**Standard**	**Duration**	**Temperature**	**Notes**
Low temperature	IEC 68-2-1	72 h	-55°C	-
High temperature	IEC 68-2-2	72 h	+71°C	-
Temp. cycling	IEC 68-2-14	1 h	-45°C +70°C	3 Cycles
Vibration	IEC 60721-3-4	30 min/axis	-	Random 4M3
Shock mechanical	IEC 60721-3-4	-	-	4M3
Humidity	ETSI EN300-2-4 T4.1E	144 h	-	95%
Water tightness	IEC 529	-	-	IP67
Solar radiation	ASTM G53	1000 h	-	-
Flammability	UL 94	-	-	Class HB
Salt spray	IEC 68-2-11 Ka	500 h	-	-
Ice and snow	-	-	-	25mm radial
Wind speed survival **Operation**	-	-	-	220 Km/h 160 Km/h
Wind load (survival): • **Front thrust** • **Side thrust**	-	-	-	 • 10 kg • 1.6 kg

H.2. WipLL 700 MHz

The built-in antennas of all WipLL radios, except for WipLL 700 MHz, cover all frequencies in their respective frequency band. WipLL 700 MHz built-in antenna covers only Band C (i.e. 710 to 716 MHz, and 740 to 746 MHz) frequency band. Therefore, Airspan provides an external antenna for WipLL 700, allowing coverage of the entire 700 MHz band (698 to 746 MHz), including the licensed A and B bands used in USA.

For most bands, WipLL radios are compatible with a large variety of external antennas. However, WipLL 700 provides a limited variation of external antennas.

Therefore, for WipLL 700 MHz, the following antennas are provided:

- 90° panel or omni-directional (for BSR)
- 14-element yagi antenna (for SPR)

H.2.1. Antenna Specifications

Table H-11 and Table H-12: list the external antenna specifications for BSR and SPR devices operating in the 700 MHz band, respectively.

Table H-11: BSR 700 MHz external antennas

External antenna type	Parameter	Value
90° panel	Frequency Range (MHz)	698 - 746
	Gain (dBi)	14
	Beam Width H X V (degrees)	90 x 20
	Polarization	Vertical
	VSWR	< 1.4
	Impedance (ohm)	50
	Front-to-Back Ratio (dB)	> 25
Omnidirectional	Frequency Range (MHz)	698 - 746
	Gain (dB)	7.5

External antenna type	Parameter	Value
	Beam Width H X V (degrees)	360 x 20
	Polarization	Vertical
	VSWR	1.5
	Impedance (ohm)	50

Table H-12:: SPR 700 MHz external yagi antenna

Parameter	SPR 700 MHz
Frequency Range (MHz)	698 - 746
Gain (dBi)	13
Beam Width H X V (degrees)	32 x 32
Polarization	Vertical/horizontal
VSWR	< 1.8
Impedance (ohm)	50
Front-to-Back Ratio (dB)	> 15

H.2.2. RF Planning Guidelines for Band C in FCC Markets

Some operators (e.g., in the USA) have licenses for Band C (710 – 716 MHz and 740 – 746 MHz). When operating in Band C, WipLL 700 allows a maximum of four BSRs at a Base Station (according to FCC regulations). This is to reduce RF interference with other radio devices that may be operating in nearby frequencies.

With the **1 Msps** mode, the center frequencies are 711.5, 712.5, 713.5, 714.5, 741.5, 742.5, 743.5, and 744.5. Thus, the frequency allocation for four BSRs (i.e., sectors) is **711.5**, **741.5**, **714.5**, and **744.5**.

With the **1.33 Msps** mode, the center frequencies are 712, 713, 714, 742, 743, and 744. Thus, the frequency allocation for four BSRs (i.e., sectors) is **712**, **742**, **714**, and **744**.

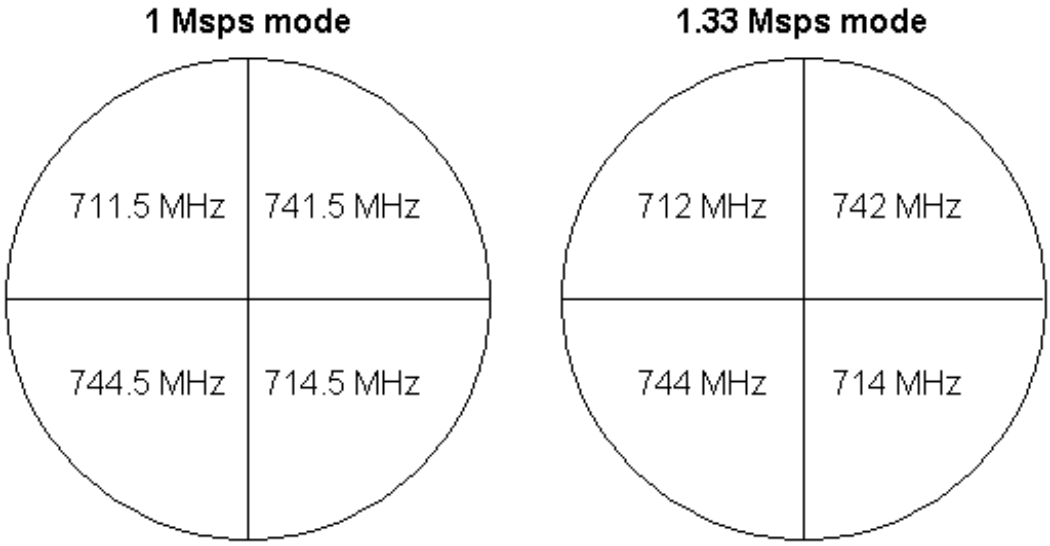

Figure H-9: Frequency allocation in a four-sector Base Station

Radio interference may occur between the BSRs operating in the upper frequency range (i.e., 742 MHz and 744 MHz) and the lower frequency range (i.e., 712 MHz and 714 MHz). To overcome this interference, a **1-meter vertical separation** is recommended between the BSRs operating in the upper frequency and the BSRs operating in the lower frequency.