

C34240.90–D0

Nokia FlexiHopper (Plus) Product Doc, Rel. 2.7

Nokia FlexiHopper (Plus) 2.7 antennas, alignment units and electrical specifications

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The product is marked with the CE marking and Notified Body number according to the Directive 1999/5/EC.



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Nokia FlexiHopper (Plus) 2.7 antennas, alignment units and electrical specifications

1

Summary of changes to Nokia FlexiHopper (Plus) 2.7 antennas, alignment units and electrical specifications

1.1 Changes in documentation between release C2.5 and release 2.7

- Table *Antenna adjustment ranges, weight, and pole diameter* updated: alignment bracket and mounting unit information removed.
- Information about Circulator has been removed.
- Information on radiation pattern envelope has been removed.
- The following chapters contain updated technical data:
 - Electrical specifications for Nokia FlexiHopper (Plus) antennas
 - Adjustment, dimensions, and installation options
 - Directional coupler for 1-antenna HSB
 - Wind load
- All figures in *Adjustment, dimensions, and installation options* have been updated.

2

Overview of Nokia FlexiHopper (Plus) antennas, alignment units and electrical specifications

The *Nokia FlexiHopper (Plus) 2.7 Antennas, Alignment Units and Electrical Specifications* includes the technical specifications for the antennas and alignment units used with Nokia FlexiHopper 4E1, Nokia FlexiHopper and FlexiHopper Plus radios as well as the electrical specifications for the antennas. The technical specifications for Nokia FlexiHopper 4E1, Nokia FlexiHopper and FlexiHopper Plus radios and the indoor units used with the radios can be found in *Product Description for Nokia FlexiHopper (Plus) 2.7*.

The *Nokia FlexiHopper (Plus) 2.7 Antennas, Alignment Units and Electrical Specifications* covers Nokia FlexiHopper 4E1, Nokia FlexiHopper and Nokia FlexiHopper Plus. In this document, the products are referred to as *Nokia FlexiHopper* and *Nokia FlexiHopper Plus* according to the modulation in use. The name *Nokia FlexiHopper (Plus)* refers to both products.

FlexiHopper Antennas are available in eight sizes: 20, 30, 60, 90, 120, 180, 240 and 300 cm. The polarisation of the antenna can be easily changed by rotating the outdoor unit and the antenna feeder through 90°.

The Nokia FlexiHopper (Plus) Outdoor Unit is directly connected to a small (20, 30, or 60 cm) single antenna by using the FlexiHopper Alignment Unit or to a larger single antenna (90, 120, or 180 cm) by using a snap-on-adaptor. No waveguides are needed. The alignment is carried out by using a ratchet or a battery-operated screwdriver.

Larger antennas (240 cm and 300 cm) are installed separately. The connection from the radio to the antenna is made using a flexible waveguide.

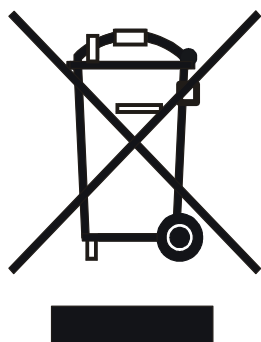
RoHS compliance

Nokia FlexiHopper (Plus) complies with the European Union RoHS Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

The directive applies to the use of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE) in electrical and electronic equipment put on the market after 1 July 2006.

WEEE

Product collection and disposal within the European Union



Do not dispose of the product as unsorted municipal waste. The crossed-out wheeled bin means that at the end of the product's life it must be taken to separate collection.

Note: this is applicable only within the European Union (see WEEE Directive 2002/96/EC)

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3

Electrical specifications for Nokia FlexiHopper (Plus) antennas

3.1 Overview of electrical specifications for Nokia FlexiHopper (Plus) antennas

The following abbreviations are used:

- Gain: dBi (dB over an isotropic radiator)
- Low: Value in the low band end
- Middle: Value in the middle band
- High: Value in the high band end
- BW: 3 dB beam width
- F/B: Front to back ratio (180 ± 40 degrees value compared to main beam gain)
- XPD: Cross polarisation discrimination at main beam
- Isolation: Attenuation between ports of dual-polarised antenna
- RL: Return loss
- RPE: Radiation pattern envelope (0 to 180 degrees)
- Co-polar HH: Response of H-pol antenna to H-pol signal
- Co-polar VV: Response of V-pol antenna to V-pol signal
- X-polar HV: Response of H-pol antenna to V-pol signal
- X-polar VH: Response of V-pol antenna to H-pol signal

3.2 Electrical specifications for antennas at 7-8 GHz

Table 1. Electrical specifications for Nokia FlexiHopper 60 cm antenna at 7-8 GHz

Frequency / Size		(7-8 GHz); 7100-8500 MHz/ 60 cm (2 ft)									
Type, item		Single T55071.02, Dual T55071.52									
Gain		Low 30.7/ Middle 32.0/ High 32.6 dBi (min 30.7/ max 32.6 dBi)									
BW (-3 dB)		4.1 deg									
F/B		57 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R1 C3									
Co-Polar								X-Polar			
				Main Beam (dB to dBi by adding 32.0 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
0.0	32.0	0.0	32.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.5	31.8	0.5	31.8	0.5	-0.2	0.5	-0.2	1.5	0.0	2.5	0.0
1.0	31.4	1.0	31.4	1.0	-0.6	1.0	-0.6	5.0	-3.0	5.0	-3.0
1.5	30.7	1.5	30.7	1.5	-1.3	1.5	-1.3	15.0	-20.0	15.0	-18.0
2.1	29.0	2.1	29.0	2.1	-3.0	2.1	-3.0	35.0	-24.0	60.0	-25.0
2.5	28.5	2.5	28.0	2.5	-3.5	2.5	-4.0	50.0	-24.0	80.0	-30.0
3.0	26.9	3.0	26.0	3.0	-5.1	3.0	-6.0	80.0	-30.0	180.0	-30.0
3.5	25.0	3.5	23.5	3.5	-7.0	3.5	-8.5	180.0	-30.0		
4.0	22.6	4.0	20.2	4.0	-9.4	4.0	-11.8				
4.5	19.8	4.5	15.4	4.5	-12.2	4.5	-16.6				
5.0	18.0	5.0	14.0	5.0	-14.0	5.0	-18.0				
10.0	11.0	10.0	9.0								
20.0	4.0	20.0	5.0								
27.0	2.0	27.0	0.0								
40.0	-2.0	45.0	-1.0								
52.0	-2.0	52.0	-1.0								
60.0	-5.0	65.0	-7.0								
80.0	-18.0	90.0	-26.0								

Table 1. Electrical specifications for Nokia FlexiHopper 60 cm antenna at 7-8 GHz (cont.)

100.0	-26.0	180.0	-26.0								
180.0	-26.0										

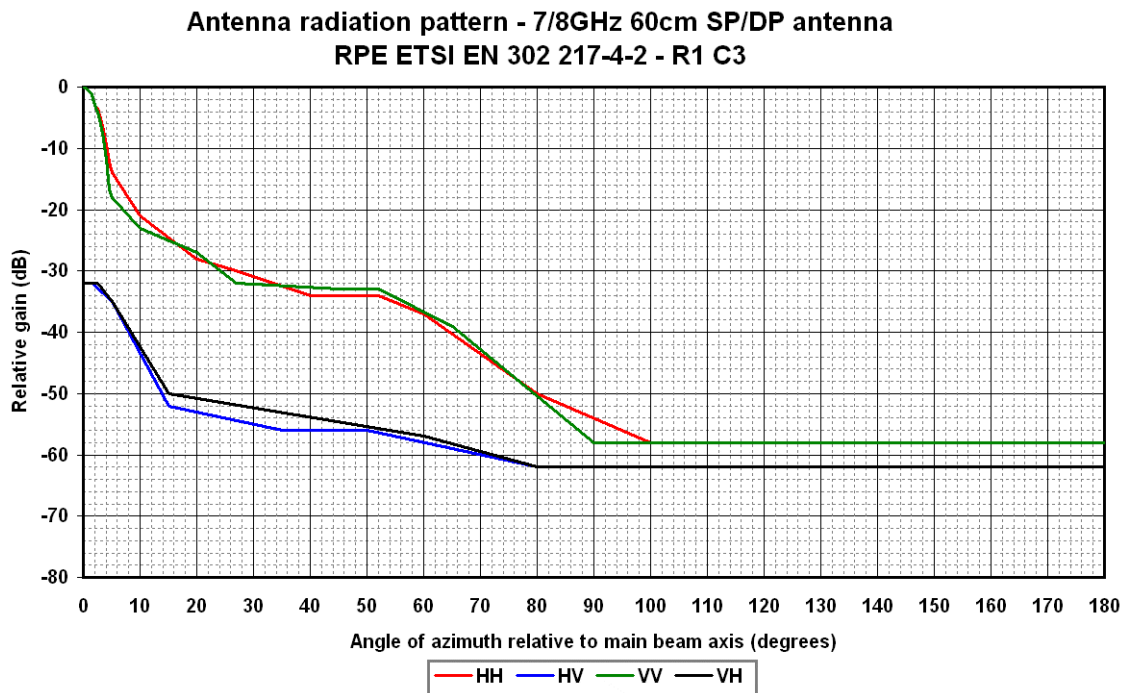


Figure 1. Antenna radiation pattern for 7-8 GHz, 60 cm antenna

Table 2. Electrical specifications for Nokia FlexiHopper 120 cm antenna at 7-8 GHz, single

Frequency / Size	(7-8 GHz); 7100-8500 MHz/ 120 cm (4 ft)
Type, item	Single T55071.15
Gain	Low 36.3/ Middle 37.0/ High 37.8 dBi (min 36.2/ max 37.9 dBi)
BW (-3 dB)	2.3 deg
F/B	63 dB
XPD/Isolation	30 dB/ 35 dB (Dual)
RL	17.7 dB

Table 2. Electrical specifications for Nokia FlexiHopper 120 cm antenna at 7-8 GHz, single (cont.)

RPE ETSI EN 302 217-4-2				R1 C3							
Co-Polar								X-Polar			
				Main Beam (dB to dBi by adding 37.0 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
0.0	37.0	0.0	37.0	0.0	0.0	0.0	0.0	0.0	7.0	0.0	7.0
1.0	34.5	0.5	36.3	1.0	-2.5	0.5	-0.7	1.0	7.0	1.0	7.0
1.2	33.7	1.0	34.2	1.2	-3.3	1.0	-2.8	6.0	-4.1	11.0	-9.4
1.5	31.0	1.2	33.2	1.5	-6.0	1.2	-3.8	20.0	-13.1	50.5	-18.1
2.0	25.7	1.5	30.5	2.0	-11.3	1.5	-6.5	60.0	-20.5	80.0	-29.2
5.0	18.5	2.0	25.0	5.0	-18.5	2.0	-12.0	180.0	-30.1	180.0	-30.1
8.0	15.8	5.0	18.8			5.0	-18.2				
20.0	4.6	8.0	14.4								
55.0	-2.5	15.0	5.0								
75.0	-11.0	35.0	1.6								
102.0	-26.0	52.1	1.6								
180.0	-26.0	70.0	-7.0								
		90.0	-26.0								
		180.0	-26.0								

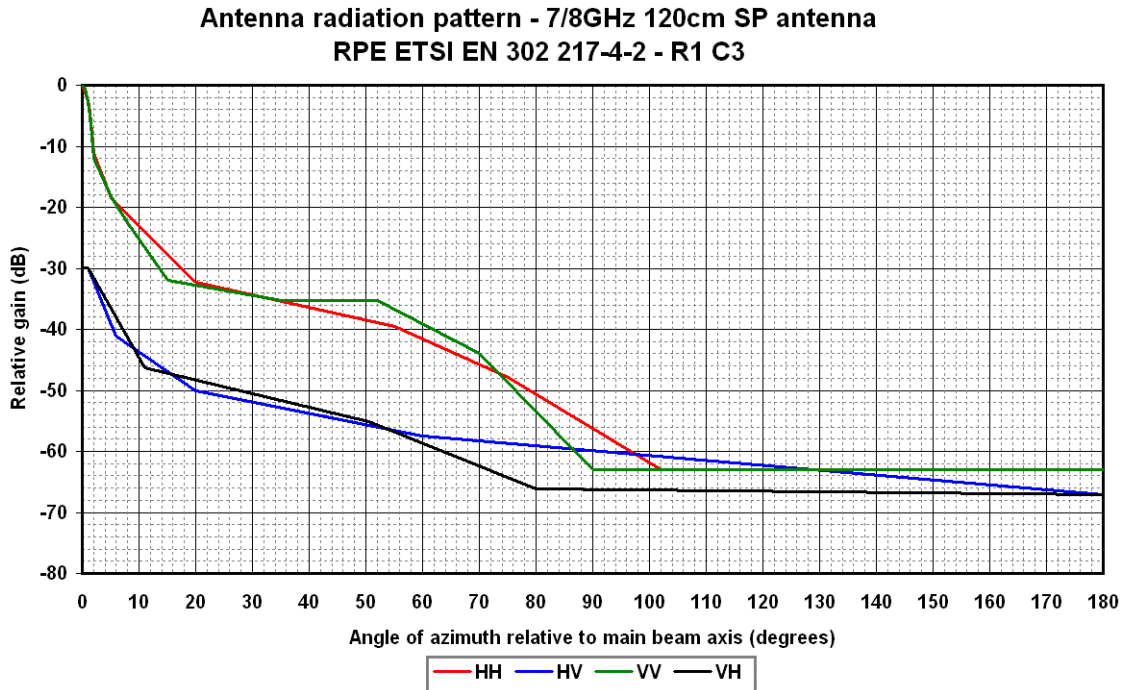


Figure 2. Antenna radiation pattern for 7-8 GHz, 120 cm antenna, single

Table 3. Electrical specifications for Nokia FlexiHopper 120 cm antenna at 7-8 GHz, dual

Frequency / Size		(7-8 GHz); 7100-8500 MHz/ 120 cm (4 ft)			
Type, item		Dual T55071.65			
Gain		Low 36.4/ Middle 37.0/ High 37.9 dBi (min 36.4/ max 37.9 dBi)			
BW (-3 dB)		2.3 deg			
F/B		63 dB			
XPD/Isolation		30 dB			
RL		17.7 dB			
RPE ETSI EN 302 217-4-2		R1 C3			
Co-Polar				X-Polar	
(dBi to dB by using 38.2 dBi)		Main Beam (dB to dBi by adding 37.0 dBi)			
HH	VV	HH	VV	HV	VH

Table 3. Electrical specifications for Nokia FlexiHopper 120 cm antenna at 7-8 GHz, dual (cont.)

deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
0,0	37,0	0,0	37,0	0,0	0,0	0,0	0,0	0,0	7,0	0,0	7,0
0,5	36,4	0,5	36,4	0,5	-0,6	0,5	-0,6	1,0	7,0	1,0	7,0
1,0	34,6	1,0	34,5	1,0	-2,4	1,0	-2,5	5,0	-3,0	5,0	-3,0
1,2	34,0	1,2	34,0	1,2	-3,0	1,2	-3,0	20,0	-23,0	20,0	-21,0
1,5	31,0	1,5	31,0	1,5	-6,0	1,5	-6,0	60,0	-31,0	45,0	-21,0
2,0	25,0	2,0	25,0	2,0	-12,0	2,0	-12,0	180,0	-31,0	60,0	-25,0
4,0	25,0	4,0	25,0	4,0	-12,0	4,0	-12,0			80,0	-31,0
5,0	19,0	5,0	19,0	5,0	-18,0	5,0	-18,0			180,0	-31,0
8,0	13,0	8,0	13,0								
20,0	0,0	15,0	5,0								
55,0	-2,5	24,0	2,0								
60,0	-4,0	35,0	1,0								
75,0	-13,0	40,0	0,0								
95,0	-26,0	50,0	-1,0								
180,0	-26,0	70,0	-7,0								
		90,0	-26,0								
		180,0	-26,0								

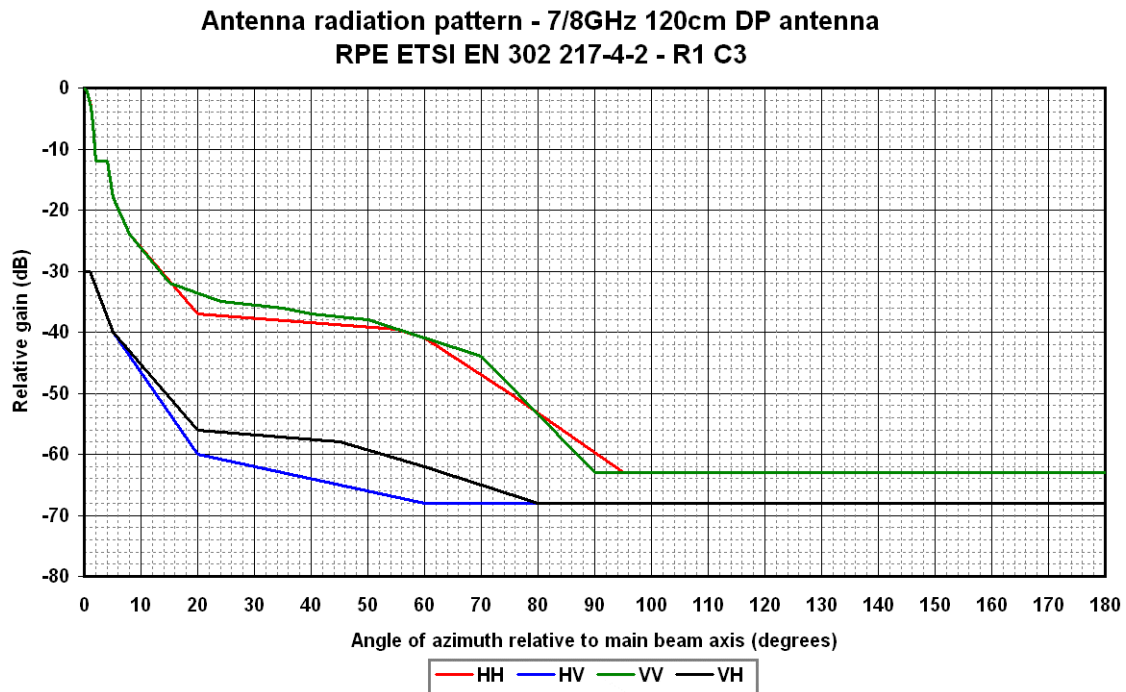


Figure 3. Antenna radiation pattern for 7-8 GHz, 120 cm antenna, dual

Table 4. Electrical specifications for Nokia FlexiHopper 180 cm antenna at 7-8 GHz

Frequency / Size		(7-8 GHz); 7100-8500 MHz/ 180 cm (6 ft)									
Type, item		Single T55071.16/ Dual T55071.66									
Gain		Low 39.8/ Middle 40.6/ High 41.3 dBi (min 39.8/ max 41.3 dBi)									
BW (-3 dB)		1.6 deg									
F/B		68 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R1 C3									
Co-Polar						X-Polar					
						Main Beam (dB to dBi by adding 40.6 dBi)					
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi

Table 4. Electrical specifications for Nokia FlexiHopper 180 cm antenna at 7-8 GHz (cont.)

0.0	40.6	0.0	40.6	0.0	0.0	0.0	0.0	0.0	8.6	0.0	8.6
0.5	39.5	0.5	39.5	0.5	-1.1	0.5	-1.1	1.5	8.6	2.0	8.6
0.8	37.6	0.8	37.6	0.8	-3.0	0.8	-3.0	5.0	-5.4	5.0	-5.4
1.0	35.4	1.0	35.5	1.0	-5.2	1.0	-5.1	10.0	-12.4	10.0	-12.4
1.5	28.1	1.5	26.8	1.5	-12.5	1.5	-13.8	40.0	-24.4	20.0	-19.4
3.0	28.1	2.0	24.6	3.0	-12.5	2.0	-16.0	65.0	-24.4	65.0	-21.4
5.0	14.6	3.5	23.6	5.0	-26.0	3.5	-17.0	70.0	-28.4	70.0	-28.4
10.0	5.6	5.0	12.6			5.0	-28.0	180.0	-28.4	180.0	-28.4
20.0	1.6	10.0	5.6								
60.0	-3.4	20.0	0.6								
70.0	-6.4	60.0	-3.4								
95.0	-27.4	70.0	-7.4								
180.0	-27.4	95.0	-27.4								
		180.0	-27.4								

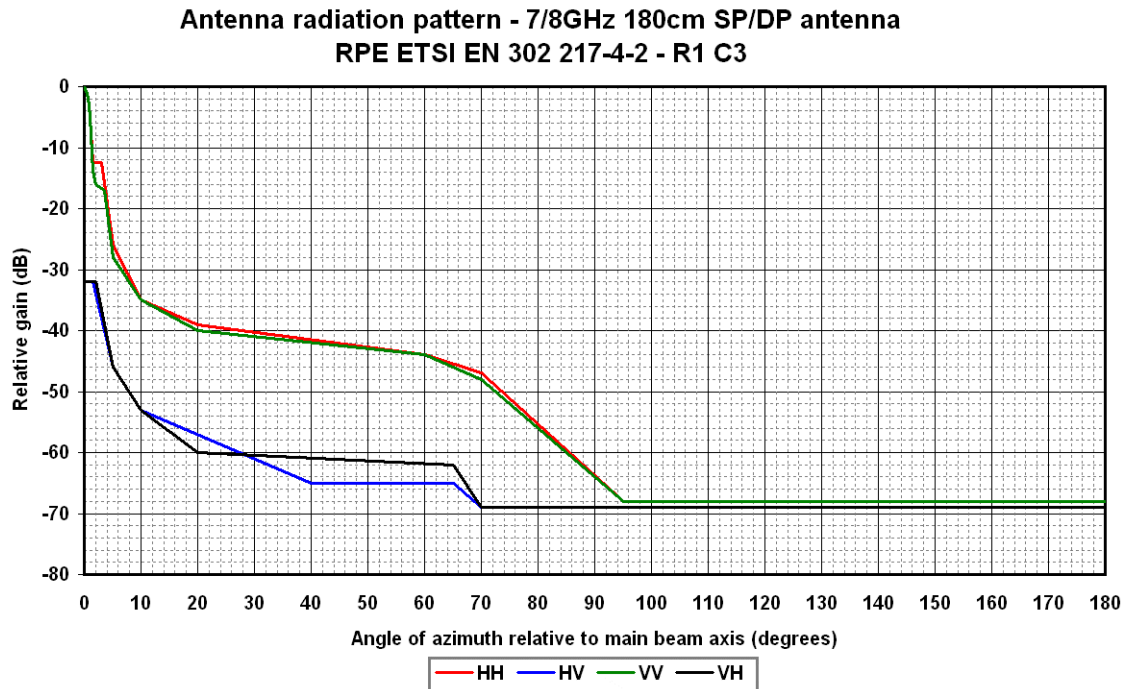


Figure 4. Antenna radiation pattern for 7-8 GHz, 180 cm antenna

Table 5. Electrical specifications for Nokia FlexiHopper 240 cm antenna at 7-8 GHz

Frequency / Size		(7-8 GHz); 7100-8500 MHz/ 240 cm (8 ft)			
Type, item		Single T55071.24 (one-piece reflector) T55071.90 (split reflector) / Dual T55071.74			
Gain		Low 42.2/ Middle 43.0/ High 43.7 dBi (min 42.1/ max 44.4 dBi)			
BW (-3 dB)		1.1 deg			
F/B		67 dB			
XPD/Isolation		30 dB/ 35 dB (Dual)			
RL		20 dB			
RPE ETSI EN 300 833 V1.4.1		R1 C2, C3			
Co-Polar			X-Polar		
			Main Beam (dB to dBi by adding 44.4 dBi)		
HH	VV	HH	VV	HV	VH

Table 5. Electrical specifications for Nokia FlexiHopper 240 cm antenna at 7-8 GHz (cont.)

deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
5	16.5	5	20.5	0	0	0	0	0	14	0	14
7.5	12.5	10	13	0.2	-0.2	0.2	-0.2	2	7.5	2	7.5
11	12.5	15	6	0.3	-0.7	0.3	-0.8	5	1.5	5	-0.5
15	7.5	25	4.5	0.5	-1.7	0.5	-1.8	10	1.5	15	-7.7
25	4.5	60	-4	0.6	-2.9	0.6	-3.1	30	-10	45	-13.5
50	-1	95	-24.4	0.8	-4.6	0.8	-4.8	90	-24.5	70	-18
60	-1.5	180	-24.4	0.9	-6.5	1	-6.7	180	-24.5	90	-24.5
100	-23.5			1.1	-8.8	1.1	-8.8			180	-24.5
180	-23.5			1.1	-10.1	1.2	-10				
				1.4	-15	1.5	-14.9				
				3	-20	2	-21				
				5	-31	5	-23				

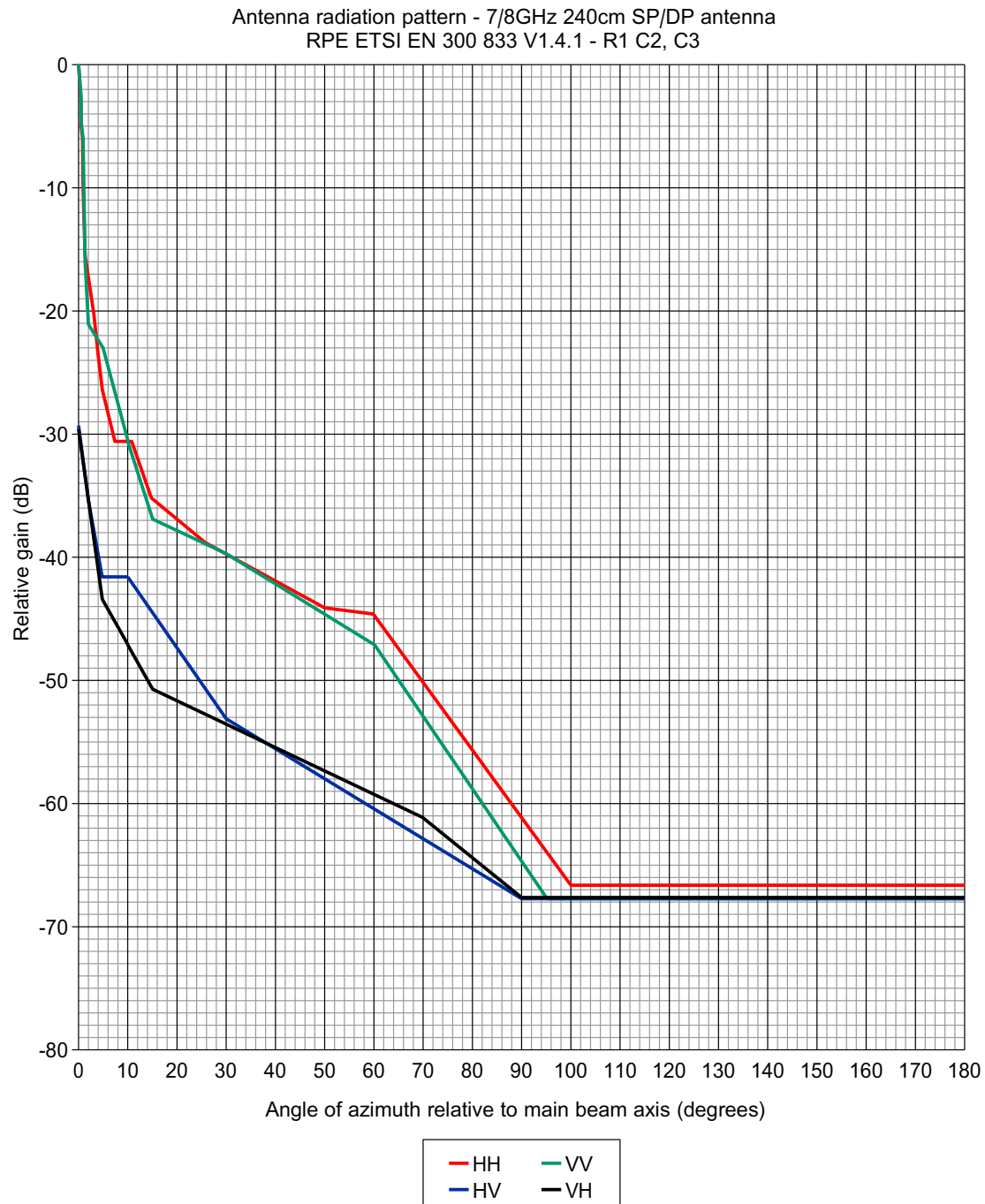


Figure 5. Antenna radiation pattern for 7-8 GHz, 240 cm antenna

Table 6. Electrical specifications for Nokia FlexiHopper 300 cm antenna at 7-8 GHz, single

Frequency / Size		(7-8 GHz); 7100-8500 MHz/ 300 cm (10 ft)									
Type, item		Single T55071.30 (split reflector)									
Gain		Low 44.4/ Middle 45.2/ High 45.9 dBi (min 44.2/ max 46.1 dBi)									
BW (-3 dB)		0.9 deg									
F/B		70 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R1 C2, C3									
Co-Polar						X-Polar					
				Main Beam (dB to dBi by adding 45.2 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
0.0	45.2	0.0	45.2	0.0	0.0	0.0	0.0	0.0	15.3	0.0	15.3
0.3	44.4	0.3	44.4	0.3	-0.8	0.3	-0.8	1.0	15.3	1.0	15.3
0.5	42.8	0.4	43.5	0.5	-2.4	0.4	-1.7	5.0	7.3	5.0	7.3
1.3	31.2	1.3	31.8	1.3	-14.0	1.3	-13.4	10.0	-4.7	10.0	-4.7
3.0	22.9	2.5	24.0	3.0	-22.3	2.5	-21.2	15.0	-7.7	20.0	-7.7
5.0	13.8	5.0	14.9	5.0	-31.5	5.0	-30.3	20.0	-7.7	60.0	-10.7
15.0	10.3	15.0	10.3					25.0	-7.7	100.5	-24.7
50.0	-1.4	40.0	-0.7					100.0	-24.7	180.0	-24.7
70.0	-2.7	60.0	-2.0					180.0	-24.7		
100.0	-24.7	101.5	-24.7								
180.0	-24.7	180.0	-24.7								

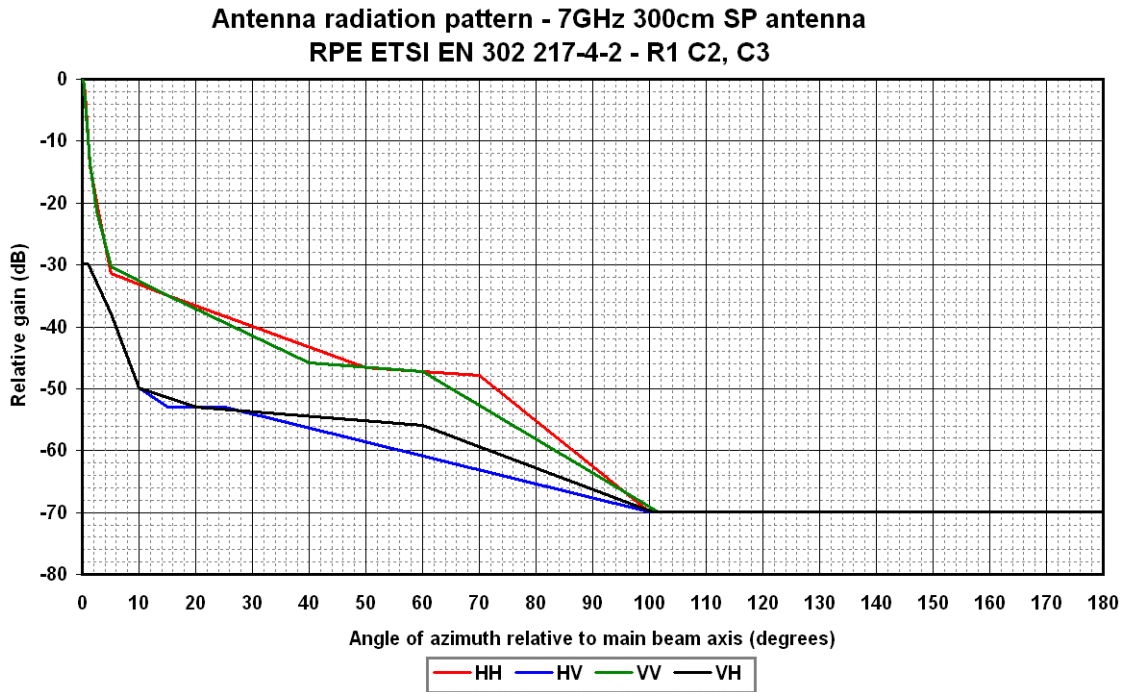


Figure 6. Antenna radiation pattern for 7-8 GHz, 300 cm antenna, single

Table 7. Electrical specifications for Nokia FlexiHopper 300 cm antenna at 7-8 GHz, dual

Frequency / Size		(7-8 GHz); 7100-8500 MHz/ 300 cm (10 ft)									
Type, item		Dual T55071.80 (split reflector)									
Gain		Low 44.2/ Middle 45.0/ High 45.7 dBi (min 44.1/ max 45.9 dBi)									
BW (-3 dB)		0.9 deg									
F/B		67 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R1 C2, C3									
Co-Polar						X-Polar					
						Main Beam (dB to dBi by adding 45.0 dBi)					
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi

Table 7. Electrical specifications for Nokia FlexiHopper 300 cm antenna at 7-8 GHz, dual (cont.)

0,0	45,0	0,0	45,0	0,0	0,0	0,0	0,0	0,0	15,1	0,0	15,1
0,2	44,5	0,2	44,5	0,2	-0,5	0,2	-0,5	1,5	15,1	1,5	15,1
0,4	42,6	0,4	42,6	0,4	-2,4	0,4	-2,4	5,0	7,1	5,0	7,1
1,3	27,4	1,3	27,4	1,3	-17,6	1,3	-17,6	10,0	-3,1	10,0	-3,1
3,0	23,8	3,0	23,2	3,0	-21,2	3,0	-21,9	15,0	-7,9	15,0	-7,1
5,0	23,8	5,0	15,4	5,0	-28,9	5,0	-29,6	30,0	-7,9	40,0	-8,9
15,0	11,1	15,0	11,1					60,0	-10,9	80,0	-12,9
40,0	-0,9	40,0	-0,9					100,0	-23,1	100,0	-23,1
60,0	-2,2	60,0	-2,2					180,0	-23,1	180,0	-23,1
80,0	-7,6	80,0	-7,6								
100,0	-22,1	100,0	-22,1								
180,0	-22,1	180,0	-22,1								

Antenna radiation pattern - 7GHz 300cm DP antenna
RPE ETSI EN 302 217-4-2 - R1 C2, C3



Figure 7. Antenna radiation pattern for 7-8 GHz, 300 cm antenna, dual

3.3 Electrical specifications for antennas at 13 GHz

Table 8. Electrical specifications for Nokia FlexiHopper 30 cm antenna at 13 GHz

Frequency / Size		(13 GHz); 12750-13250 MHz/ 30 cm (1 ft)									
Type, item		Single T55072.01									
Gain		Low 30.8/ Middle 30.9/ High 31.0 dBi (min 30.8/ max 31.0 dBi)									
BW (-3 dB)		4.72 deg									
F/B		53 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R1 C2									
Co-Polar								X-Polar			
				Main Beam (dB to dBi by adding 30.9 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dBi	deg	dBi	deg	dBi	deg	dBi
0.0	30.9	0.0	30.9	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.9
0.5	30.8	1.0	30.6	0.5	-0.1	1.0	-0.3	4.0	0.9	4.0	0.9
1.0	30.6	1.5	30.2	1.0	-0.3	1.5	-0.7	6.0	-5.1	6.0	-5.1
1.5	29.9	2.0	28.9	1.5	-1.0	2.0	-2.0	10.5	-9.1	15.0	-17.1
2.0	29.1	2.5	27.7	2.0	-1.8	2.5	-3.2	13.5	-13.1	28.5	-17.1
2.5	28.0	3.0	25.9	2.5	-2.9	3.0	-5.0	15.0	-13.1	60.0	-25.1
3.0	26.4	3.5	23.9	3.0	-4.5	3.5	-7.0	28.5	-17.1	180.0	-25.1
3.5	24.9	4.0	21.7	3.5	-6.0	4.0	-9.2	45.0	-17.1		
4.0	22.9	4.5	18.7	4.0	-8.0	4.5	-12.2	60.0	-25.1		
4.5	20.4	5.0	14.9	4.5	-10.5	5.0	-16.0	180.0	-25.1		
5.0	17.6	5.3	12.9	5.0	-13.3						
5.5	14.9	9.0	12.9								
6.0	12.9	11.0	10.9								
9.0	12.9	15.0	6.9								
12.0	8.9	18.0	3.9								
15.0	6.9	28.5	3.9								
17.5	1.9	30.0	1.9								
30.0	1.9	45.0	1.9								

Table 8. Electrical specifications for Nokia FlexiHopper 30 cm antenna at 13 GHz (cont.)

32.5	-1.1	65.0	-9.1								
37.5	-1.1	75.0	-13.1								
45.0	-7.1	90.0	-19.1								
50.0	-7.1	100.0	-23.1								
60.0	-7.1	180.0	-23.1								
67.5	-7.1										
100.0	-22.1										
180.0	-22.1										

Antenna radiation pattern - 13GHz 30cm SP antenna
RPE ETSI EN 302 217-4-2 - R1 C2

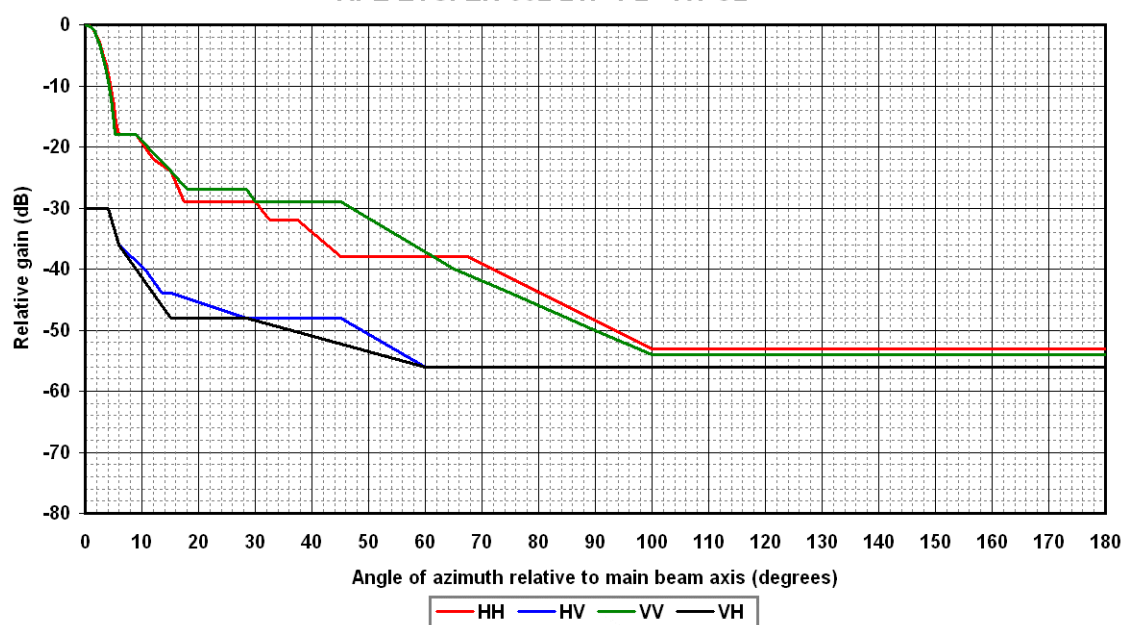


Figure 8. Antenna radiation pattern for 13 GHz, 30 cm antenna

Table 9. Electrical specifications for Nokia FlexiHopper 60 cm antenna at 13 GHz, Single

Frequency / Size	(13 GHz); 12750-13250 MHz/ 60 cm (2 ft)
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Table 9. Electrical specifications for Nokia FlexiHopper 60 cm antenna at 13 GHz, Single (cont.)

Type, item		Single T55072.02									
Gain		Low 36.4/ Middle 36.6/ High 36.9 dBi (min 36.3/ max 36.7 dBi)									
BW (-3 dB)		2.4 deg									
F/B		62 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R1 C3									
Co-Polar								X-Polar			
				Main Beam (dB to dBi by adding 36.6 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
0.0	36.6	0.0	36.6	0.0	0.0	0.0	0.0	0.0	6.7	0.0	6.7
0.5	35.8	0.5	35.8	0.5	-0.8	0.5	-0.9	1.0	6.7	1.0	6.7
1.0	33.5	1.0	33.5	1.0	-3.1	1.0	-3.1	5.0	-3.5	5.0	-3.5
1.5	29.1	1.5	28.6	1.5	-7.5	1.5	-8.0	10.0	-13.5	20.0	-18.5
5.0	15.9	3.5	21.6	5.0	-20.8	3.5	-15.1	20.0	-20.2	60.0	-28.0
10.0	7.7	5.0	16.1			5.0	-20.5	60.0	-27.5	80.0	-31.5
15.0	5.7	10.0	6.7					80.0	-31.5	180.0	-31.5
20.0	0.5	40.0	-1.5					180.0	-31.5		
45.0	-2.5	55.0	-4.5								
60.0	-7.8	95.5	-27.5								
97.0	-26.1	180.0	-27.5								
180.0	-27.5										

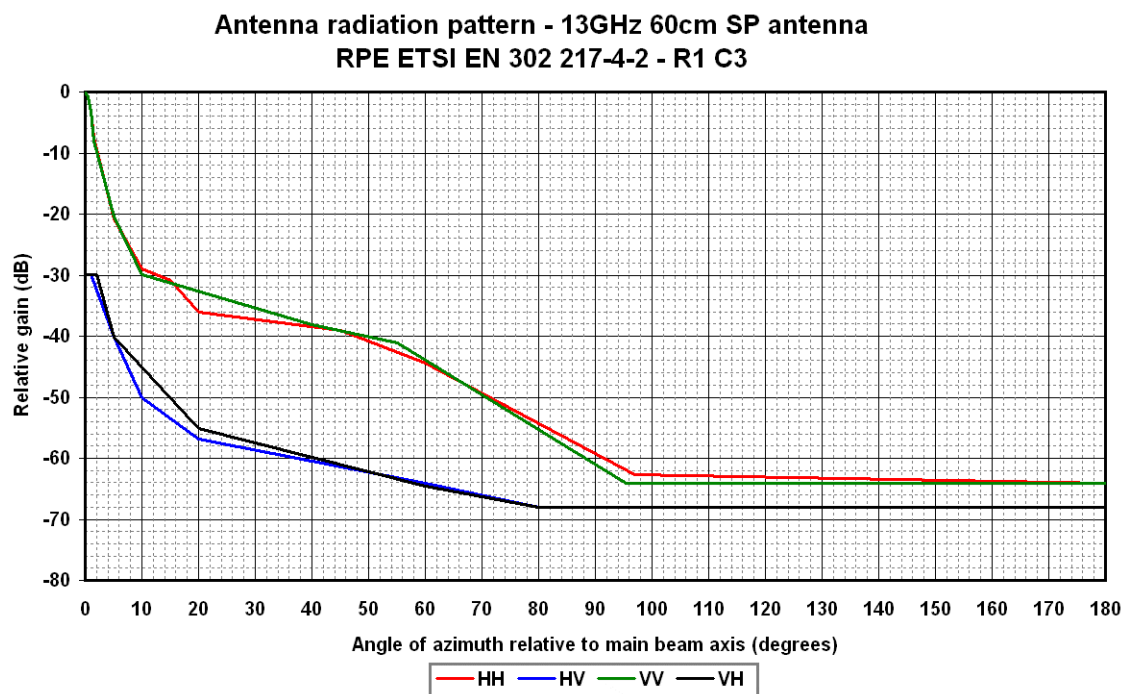


Figure 9. Antenna radiation pattern for 13 GHz, 60 cm antenna, Single

Table 10. Electrical specifications for Nokia FlexiHopper 60 cm antenna at 13 GHz, Dual

Frequency / Size		(13 GHz); 12750-13250 MHz/ 60 cm (2 ft)							
Type, item		Dual T55072.52							
Gain		Low 36.3/ Middle 36.5/ High 36.7 dBi (min 36.3/ max 36.7 dBi)							
BW (-3 dB)		2 deg							
F/B		64 dB							
XPD/Isolation		30 dB							
RL		17.7 dB							
RPE ETSI EN 302 217-4-2		R1 C3							
Co-Polar						X-Polar			
						Main Beam (dB to dBi by adding 36.5 dBi)			
HH		VV		HH		VV		HV	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi

Table 10. Electrical specifications for Nokia FlexiHopper 60 cm antenna at 13 GHz, Dual (cont.)

0.0	36.5	0.0	36.5	0.0	0.0	0.0	0.0	0.0	4.5	0.0	4.5
0.5	35.7	0.5	35.6	0.5	-0.8	0.5	-0.9	1.0	4.5	2.0	4.5
1.0	33.5	1.0	33.5	1.0	-3.0	1.0	-3.0	5.0	-3.5	5.0	-3.5
1.5	28.5	1.5	27.5	1.5	-8.0	1.5	-9.0	10.0	-13.5	20.0	-18.5
5.0	16.5	2.5	21.5	5.0	-20.0	2.5	-15.0	20.0	-23.5	60.0	-28.5
10.0	4.5	3.5	21.5			3.5	-15.0	60.0	-27.5	80.0	-31.5
15.0	4.5	5.0	16.5			5.0	-20.0	80.0	-31.5	180.0	-31.5
20.0	0.5	10.0	6.5					180.0	-31.5		
45.0	-2.5	40.0	-1.5								
60.0	-8.5	55.0	-4.5								
100.0	-27.5	95.0	-27.5								
180.0	-27.5	180.0	-27.5								

Antenna radiation pattern - 13GHz 60cm DP antenna
RPE ETSI EN 302 217-4-2 - R1 C3



Figure 10. Antenna radiation pattern for 13 GHz, 60 cm antenna, Dual

Table 11. Electrical specifications for Nokia FlexiHopper 90 cm antenna at 13 GHz

Frequency / Size		(13 GHz); 12750-13250 MHz/ 90 cm (3 ft)									
Type, item		Single T55072.09									
Gain		Low 39.3/ Middle 39.5/ High 39.6 dBi (min 39.3/ max 39.6 dBi)									
BW (-3 dB)		1.9 deg									
F/B		66 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R1 C3									
Co-Polar								X-Polar			
				Main Beam (dB to dBi by adding 39.0 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
0.0	39.5	0.0	39.5	0.0	0.0	0.0	0.0	0.0	7.5	0.0	7.5
0.5	38.5	0.5	38.5	0.5	-1.0	0.5	-1.0	2.0	7.5	2.0	7.5
0.9	36.5	0.9	36.5	0.9	-3.0	0.9	-3.0	5.0	-0.5	5.0	-0.5
1.5	31.5	1.5	31.5	1.5	-8.0	1.5	-8.0	10.0	-10.5	10.0	-10.5
2.5	24.5	2.5	24.5	2.5	-15.0	2.5	-15.0	20.0	-20.5	20.0	-17.5
3.5	24.5	3.5	24.5	3.5	-15.0	3.5	-15.0	60.0	-23.5	40.0	-25.5
5.0	17.5	5.0	17.5	5.0	-22.0	5.0	-22.0	80.0	-30.5	80.0	-30.5
10.0	6.5	15.0	6.5					180.0	-30.5	180.0	-30.5
40.0	0.5	50.0	-0.5								
50.0	-0.5	72.0	-10.5								
100.0	-26.5	95.0	-26.5								
180.0	-26.5	180.0	-26.5								

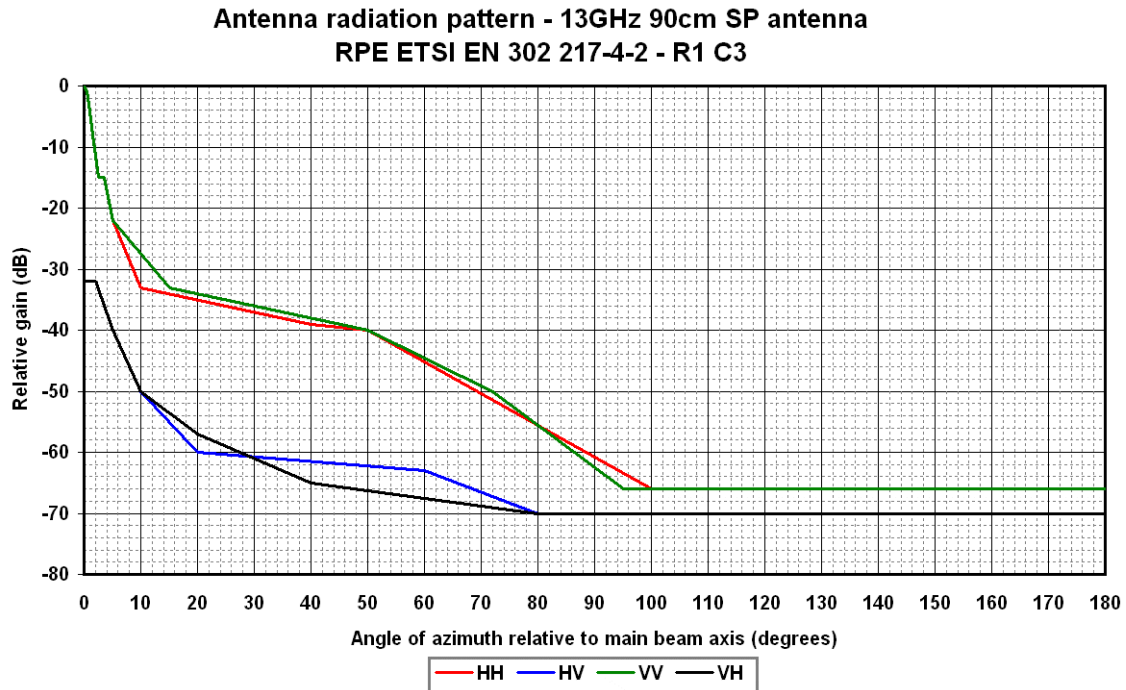


Figure 11. Antenna radiation pattern for 13 GHz, 90 cm antenna

Table 12. Electrical specifications for Nokia FlexiHopper 120 cm antenna at 13 GHz, single

Frequency / Size		(13 GHz); 12750-13250 MHz/ 120 cm (4 ft)									
Type, item		Single T55072.15									
Gain		Low 41.4/ Middle 41.7/ High 42.2 dBi (min 41.2/ max 42.5 dBi)									
BW (-3 dB)		1.4 deg									
F/B		67 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R1 C3									
Co-Polar						X-Polar					
						Main Beam (dB to dBi by adding 41.7 dBi)					
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi

Table 12. Electrical specifications for Nokia FlexiHopper 120 cm antenna at 13 GHz, single (cont.)

0.0	41.7	0.0	41.7	0.0	0.0	0.0	0.0	0.0	11.5	0.0	11.5
0.5	39.9	0.5	39.9	0.5	-1.8	0.5	-1.8	1.5	11.5	1.5	11.5
0.7	38.4	0.7	38.4	0.7	-3.3	0.7	-3.3	5.0	-8.2	5.0	-8.2
1.5	28.7	1.0	34.4	1.5	-13.0	1.0	-7.3	23.0	-18.5	24.5	-16.5
2.0	26.7	1.5	25.9	2.0	-15.0	1.5	-15.8	60.7	-20.0	50.0	-18.7
5.0	11.2	3.0	21.4	5.0	-30.5	3.0	-20.3	80.0	-28.2	80.0	-28.2
12.0	5.7	5.0	8.8			5.0	-32.9	180.0	-28.2	180.0	-28.2
20.0	1.8	9.5	8.8								
35.0	-1.2	15.5	3.8								
60.0	-4.2	20.0	3.8								
95.0	-25.2	42.5	0.8								
180.0	-25.2	65.0	-4.2								
		95.0	-25.2								
		180.0	-25.2								

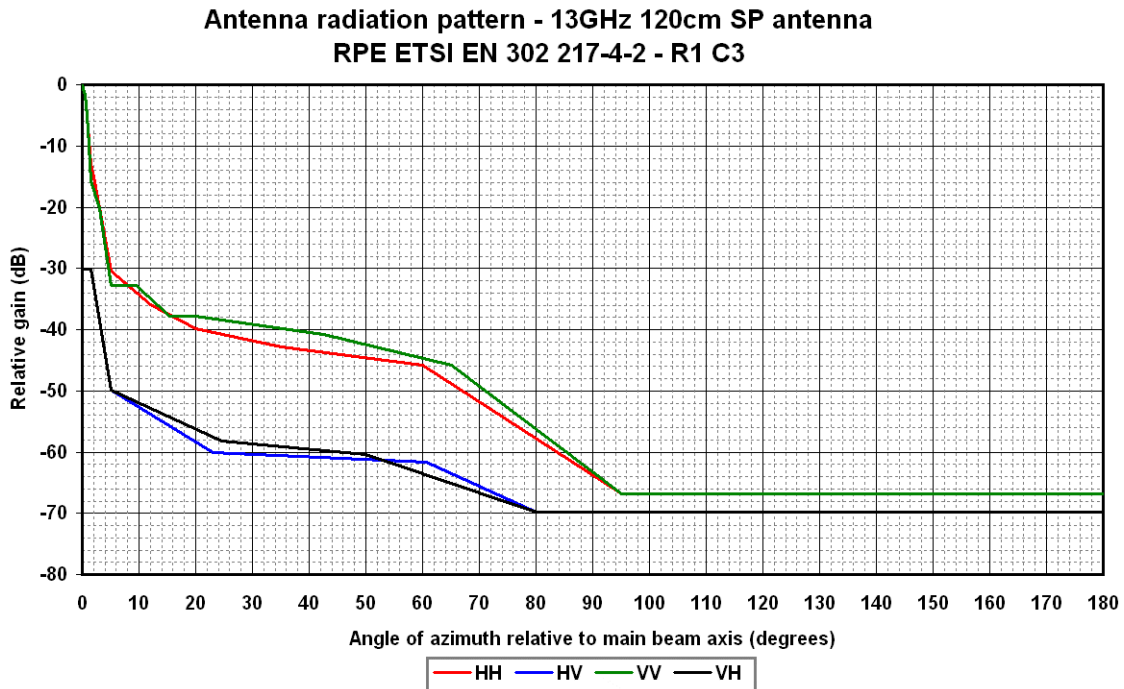


Figure 12. Antenna radiation pattern for 13 GHz, 120 cm antenna, single

Table 13. Electrical specifications for Nokia FlexiHopper 120 cm antenna at 13 GHz, dual

Frequency / Size		(13 GHz); 12750-13250 MHz/ 120 cm (4 ft)									
Type, item		Dual T55072.65									
Gain		Low 41.5/ Middle 41.8/ High 42.5 dBi (min 41.5/ max 42.5 dBi)									
BW (-3 dB)		1.4 deg									
F/B		67 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R1 C3									
Co-Polar								X-Polar			
								Main Beam (dB to dBi by adding 41.8 dBi)			
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dBi	deg	dBi	deg	dBi	deg	dBi

Table 13. Electrical specifications for Nokia FlexiHopper 120 cm antenna at 13 GHz, dual (cont.)

0.0	41.8	0.0	41.8	0.0	0.0	0.0	0.0	0.0	9.8	0.0	9.8
0.5	40.2	0.5	40.2	0.5	-1.6	0.5	-1.6	1.5	9.8	1.5	9.8
0.7	38.8	0.7	38.8	0.7	-3.0	0.7	-3.0	5.0	-8.2	5.0	-8.2
1.0	36.8	1.0	34.8	1.0	-5.0	1.0	-7.0	10.0	-16.2	10.0	-18.2
1.5	28.8	1.5	23.8	1.5	-13.0	1.5	-18.0	20.0	-22.2	20.0	-21.2
2.0	24.8	3.0	23.8	2.0	-17.0	3.0	-18.0	50.0	-26.2	50.0	-22.2
3.0	24.8	5.0	8.8	3.0	-17.0	5.0	-33.0	80.0	-28.2	80.0	-28.2
5.0	8.8	10.0	8.8	5.0	-33.0			180.0	-28.2	180.0	-28.2
12.0	3.8	15.0	3.8								
20.0	1.8	20.0	3.8								
35.0	-1.2	50.0	-0.2								
60.0	-4.2	65.0	-4.2								
90.0	-25.2	90.0	-25.2								
180.0	-25.2	180.0	-25.2								

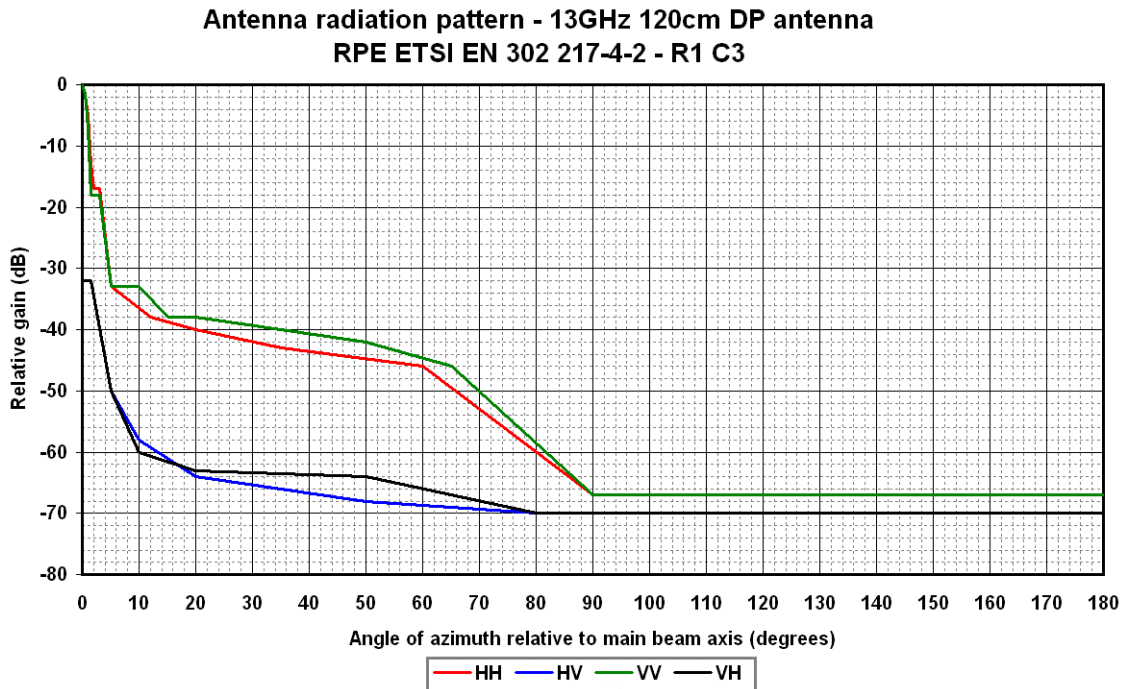


Figure 13. Antenna radiation pattern for 13 GHz, 120 cm antenna, dual

Table 14. Electrical specifications for Nokia FlexiHopper 180 cm antenna at 13 GHz

Frequency / Size		(13 GHz); 12750-13250 MHz/ 180 cm (6 ft)									
Type, item		Single T55072.16, Dual T55072.66									
Gain		Low 45.1/ Middle 45.3/ High 45.6 dBi (min 45.1/ max 45.6 dBi)									
BW (-3 dB)		0.9 deg									
F/B		72 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R1 C3									
Co-Polar								X-Polar			
								Main Beam (dB to dBi by adding 45.3 dBi)			
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi

Table 14. Electrical specifications for Nokia FlexiHopper 180 cm antenna at 13 GHz (cont.)

0.0	45.3	0.0	45.3	0.0	0.0	0.0	0.0	0.0	13.3	0.0	13.3
0.5	42.3	0.5	42.3	0.5	-3.0	0.5	-3.0	1.0	13.3	1.0	13.3
1.0	32.3	1.0	30.3	1.0	-13.0	1.0	-15.0	3.0	5.3	5.0	-4.7
2.0	30.3	2.0	30.3	2.0	-15.0	2.0	-15.0	5.0	-5.7	10.0	-18.7
3.0	16.3	5.0	9.3	3.0	-29.0	5.0	-36.0	10.0	-18.7	30.0	-22.7
3.5	9.3	15.0	0.3	3.5	-36.0			25.0	-20.7	95.0	-27.7
5.0	9.3	30.0	-0.7	5.0	-36.0			60.0	-22.7	180.0	-27.7
15.0	0.3	50.0	-1.7					95.0	-27.7		
60.0	-4.7	60.0	-4.7					180.0	-27.7		
90.0	-25.7	70.0	-10.7								
95.0	-26.7	95.0	-26.7								
180.0	-26.7	180.0	-26.7								

Antenna radiation pattern - 13GHz 180cm SP/DP antenna
RPE ETSI EN 302 217-4-2 - R1 C3

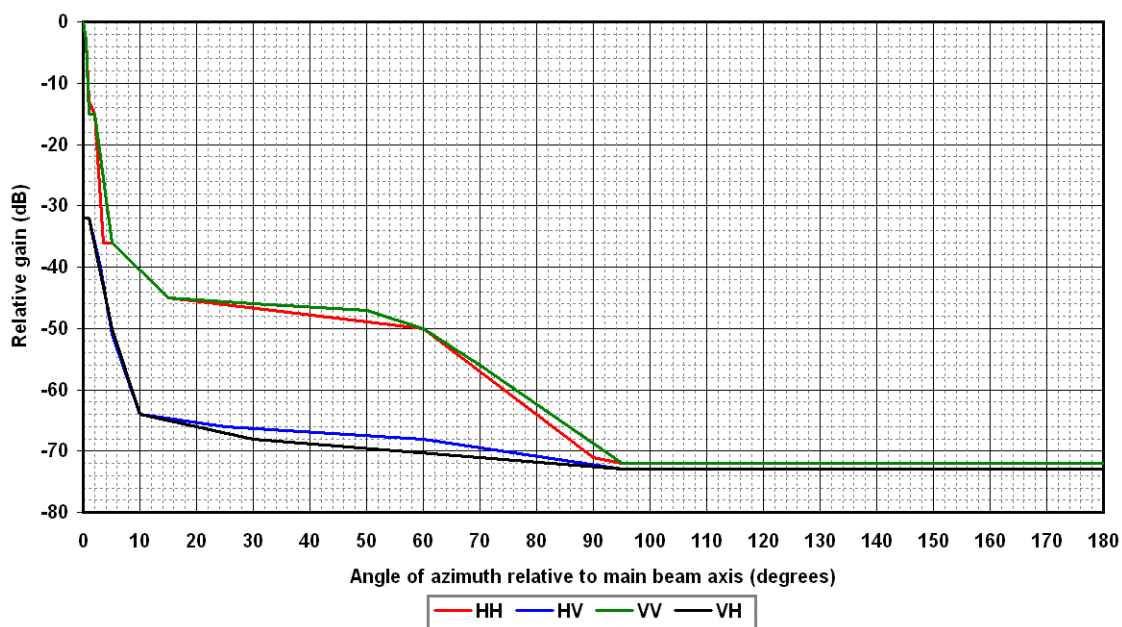


Figure 14. Antenna radiation pattern for 13 GHz, 180 cm antenna

Table 15. Electrical specifications for Nokia FlexiHopper 240 cm antenna at 13 GHz, single

Frequency / Size		(13 GHz); 12750-13250 MHz/ 240 cm (8 ft)									
Type, item		Single T55072.90 (split reflector)									
Gain		Low 47.6/ Middle 47.7/ High 47.8 dBi (min 47.6/ max 47.9 dBi)									
BW (-3 dB)		0.7 deg									
F/B		71 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R1 C3									
Co-Polar								X-Polar			
				Main Beam (dB to dBi by adding 47.7 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
0.0	47.7	0.0	47.7	0.0	0.0	0.0	0.0	0.0	19.7	0.0	19.7
0.5	42.6	0.5	42.6	0.5	-5.1	0.5	-5.1	1.0	19.7	1.0	19.7
1.0	32.9	1.0	32.9	1.0	-14.8	1.0	-14.8	5.0	3.6	5.0	3.6
1.5	25.0	1.5	25.0	1.5	-22.7	1.5	-22.7	15.0	-5.3	15.0	-5.3
3.0	21.6	3.0	21.6	3.0	-26.1	3.0	-26.1	40.0	-11.3	40.0	-11.3
5.0	13.7	5.0	13.7	5.0	-34.0	5.0	-34.0	80.0	-24.3	80.0	-24.3
10.0	15.7	10.0	15.7					180.0	-24.3	180.0	-24.3
15.0	9.7	15.0	9.7								
35.0	2.7	35.0	2.7								
65.0	-4.3	65.0	-4.3								
110.0	-23.3	110.0	-23.3								
180.0	-23.3	180.0	-23.3								

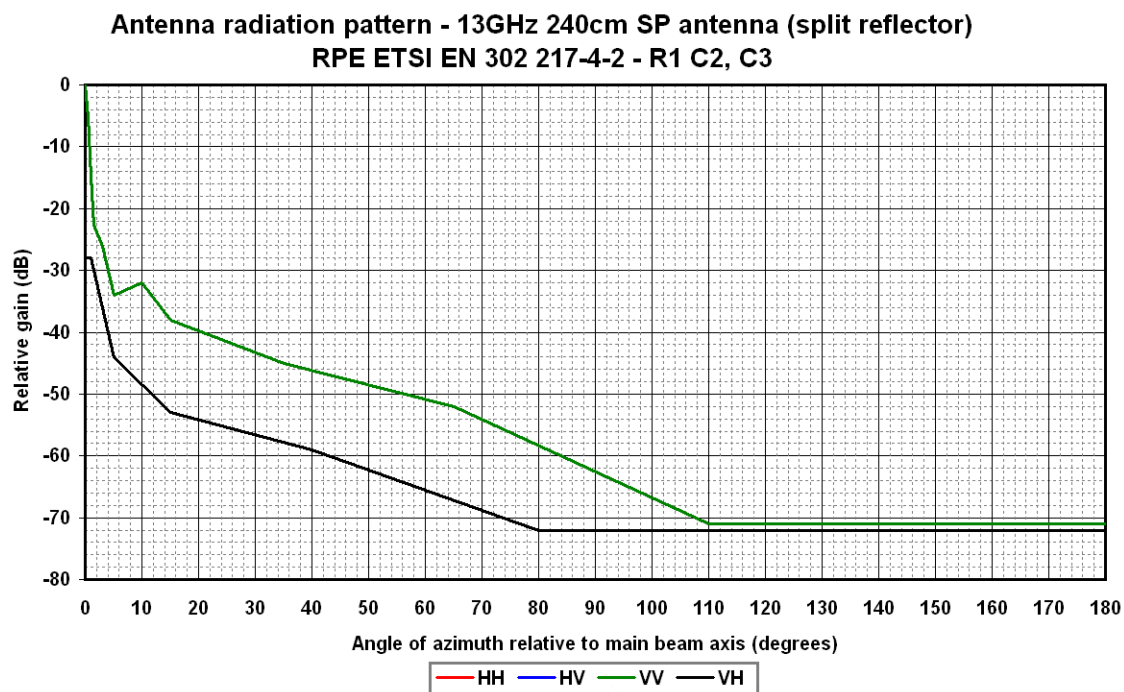


Figure 15. Antenna radiation pattern for 13 GHz, 240 cm antenna, single

Table 16. Electrical specifications for Nokia FlexiHopper 240 cm antenna at 13 GHz, dual

Frequency / Size				(13 GHz); 12750-13250 MHz/ 240 cm (8 ft)							
Type, item				Dual T55072.74							
Gain				Low 47.6/ Middle 47.7/ High 47.8 dBi (min 47.6/ max 47.8 dBi)							
BW (-3 dB)				0.7 deg							
F/B				71 dB							
XPD/Isolation/ Isolation				30 dB							
RL				17.7 dB							
RPE ETSI EN 302 217-4-2				R1 C2. C3							
Co-Polar								X-Polar			
				Main Beam: dB to dBi by adding 47.7 dBi							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi

Table 16. Electrical specifications for Nokia FlexiHopper 240 cm antenna at 13 GHz, dual (cont.)

0.0	47.7	0.0	47.7	0.0	0.0	0.0	0.0	0.0	19.7	0.0	19.7
0.5	42.4	0.5	42.4	0.5	-5.3	0.5	-5.3	1.0	19.7	1.0	19.7
1.0	35.2	1.0	35.2	1.0	-12.5	1.0	-12.5	5.0	-2.3	5.0	-2.3
1.5	27.2	1.5	27.2	1.5	-20.5	1.5	-20.5	15.0	-8.3	15.0	-8.3
3.0	22.0	3.0	22.0	3.0	-25.7	3.0	-25.7	40.0	-13.3	40.0	-13.3
5.0	11.7	5.0	11.7	5.0	-36.0	5.0	-36.0	80.0	-24.3	80.0	-24.3
10.0	8.7	10.0	8.7					180.0	-24.3	180.0	-24.3
15.0	5.7	15.0	5.7								
35.0	1.7	35.0	1.7								
65.0	-4.3	65.0	-4.3								
110.0	-23.3	110.0	-23.3								
180.0	-23.3	180.0	-23.3								

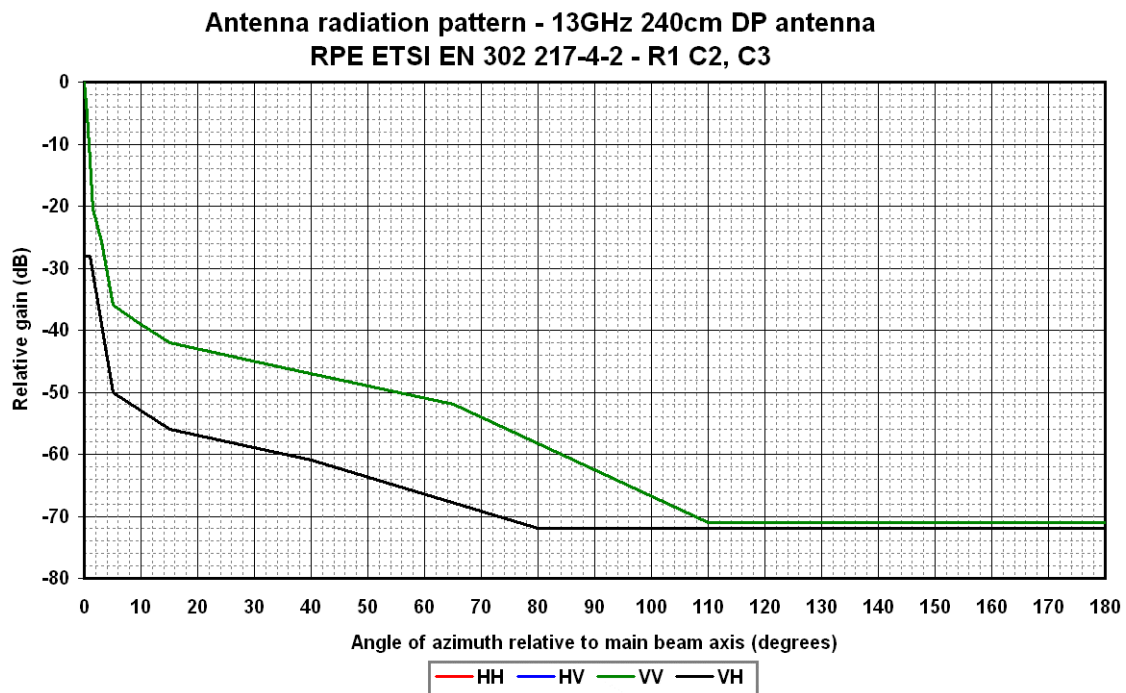


Figure 16. Antenna radiation pattern for 13 GHz, 240 cm antenna, dual

3.4 Electrical specifications for antennas at 15 GHz

Table 17. Electrical specifications for Nokia FlexiHopper (Plus) 30 cm antenna at 15 GHz

Frequency / Size		(15 GHz); 14400-15350 MHz/ 30 cm (1 ft)									
Type, item		Single T55073.01									
Gain		Low 31.7/ Middle 32.0/ High 32.3 dBi (min 31.7/ max 32.3 dBi)									
BW (-3 dB)		3.9 deg									
F/B		54 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R2 C2									
Co-Polar						X-Polar					
				Main Beam (dB to dBi by adding 32.0 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
0.0	32.0	0.0	32.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.5	31.6	0.5	31.6	0.5	-0.4	0.5	-0.4	4.0	0.0	4.0	0.0
1.0	31.0	1.0	31.0	1.0	-1.0	1.0	-1.0	5.0	-3.0	5.0	-3.0
1.5	30.0	1.5	30.0	1.5	-2.0	1.5	-2.0	20.0	-18.0	20.0	-18.0
2.0	29.0	2.0	29.0	2.0	-3.0	2.0	-3.0	80.0	-24.0	40.0	-24.0
2.0	28.5	2.0	28.5	2.0	-3.5	2.0	-3.5	180.0	-24.0	-24.0	-24.0
2.5	26.5	2.5	26.5	2.5	-5.5	2.5	-5.5				
3.0	24.0	3.0	24.0	3.0	-8.0	3.0	-8.0				
3.5	22.0	3.5	22.0	3.5	-10.0	3.5	-10.0				
4.5	20.0	4.0	18.0	4.5	-12.0	4.0	-14.0				
5.0	18.0	5.0	18.0	5.0	-14.0	5.0	-14.0				
8.5	16.5	35.0	-3.0								
20.0	4.0	54.0	-3.0								
60.0	-7.0	85.0	-22.0								
100.0	-22.0	180.0	-22.0								
180.0	-22.0										

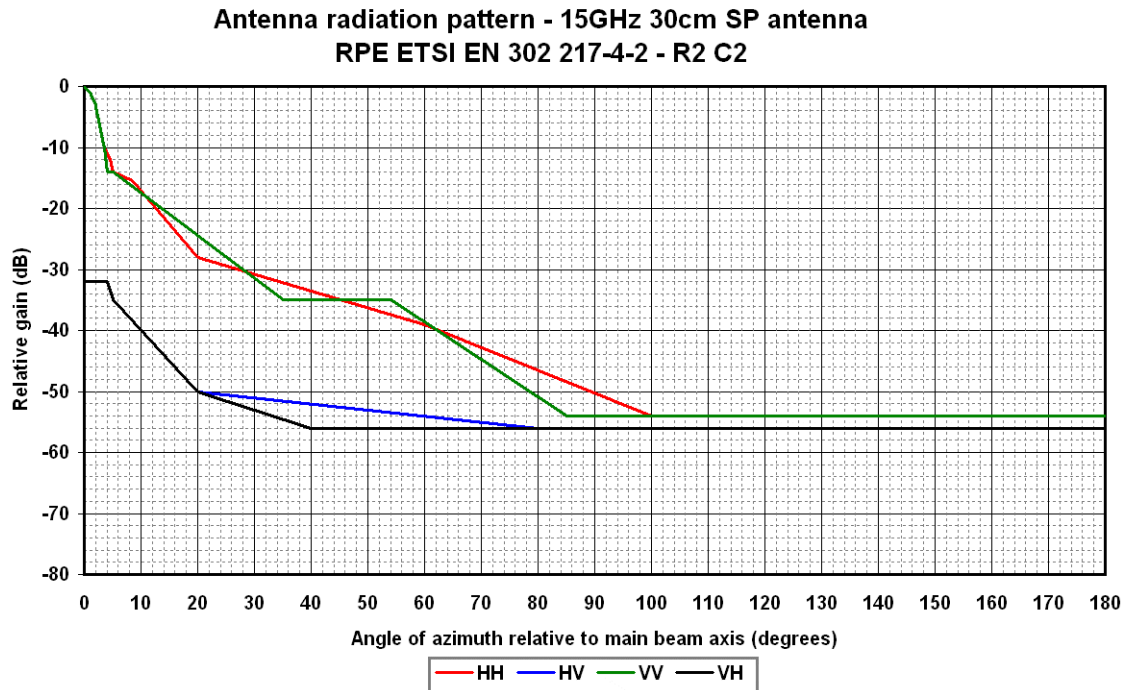


Figure 17. Antenna radiation pattern for 15 GHz, 30 cm antenna

Table 18. Electrical specifications for Nokia FlexiHopper (Plus) 60 cm antenna at 15 GHz, single

Frequency / Size		(15 GHz); 14400 - 15350 MHz/ 60 cm (2 ft)			
Type, item		Single T55073.02			
Gain		Low 37.3/ Middle 37.5/ High 37.7 dBi (min 37.1/ max 37.9 dBi)			
BW (-3 dB)		2.2 deg			
F/B		65 dB			
XPD/Isolation		30 dB			
RL		17.7 dB			
RPE ETSI EN 302 217-4-2		R2 C3			
Co-Polar				X-Polar	
		Main Beam (dB to dBi by adding 37.5 dBi)			
HH	VV	HH	VV	HV	VH

Table 18. Electrical specifications for Nokia FlexiHopper (Plus) 60 cm antenna at 15 GHz, single (cont.)

deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
0.0	37.5	0.0	37.5	0.0	0.0	0.0	0.0	0.0	7.3	0.0	7.3
0.5	36.4	0.5	36.4	0.5	-1.2	0.5	-1.2	1.5	7.3	1.5	7.3
0.7	35.2	0.7	35.2	0.7	-2.3	0.7	-2.3	5.0	-8.7	5.0	-7.7
1.5	27.0	1.5	26.0	1.5	-10.5	1.5	-11.5	10.0	-14.7	10.0	-12.0
3.0	22.5	3.5	22.0	3.0	-15.0	3.0	-15.6	40.0	-24.3	40.0	-24.3
5.0	14.8	5.0	14.0	5.0	-22.8	5.0	-23.5	61.0	-32.3	57.5	-26.2
7.0	12.3	15.5	5.8					180.0	-32.3	71.0	-32.3
10.0	8.3	60.0	-8.7							180.0	-32.3
20.0	0.5	65.0	-8.7								
50.0	-3.1	100.0	-28.7								
65.0	-8.5	180.0	-28.7								
100.0	-28.7										
180.0	-28.7										

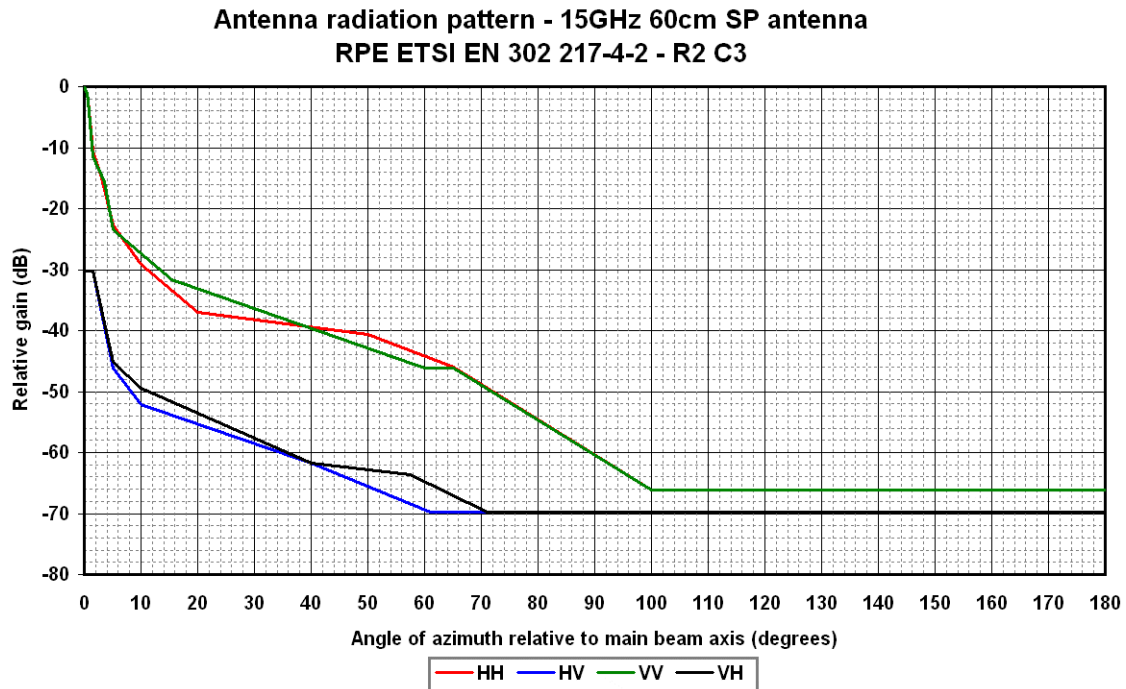


Figure 18. Antenna radiation pattern for 15 GHz, 60 cm antenna, single

Table 19. Electrical specifications for Nokia FlexiHopper (Plus) 60 cm antenna at 15 GHz, dual

Frequency / Size		(15 GHz); 14400 - 15350 MHz/ 60 cm (2 ft)									
Type, item		Dual T55073.02									
Gain		Low 37.4/ Middle 37.7/ High 37.9 dBi (min 37.4/ max 37.9 dBi)									
BW (-3 dB)		2.2 deg									
F/B		65 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R2 C3									
Co-Polar								X-Polar			
				Main Beam (dB to dBi by adding 37.7 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dBi	deg	dBi	deg	dBi	deg	dBi

Table 19. Electrical specifications for Nokia FlexiHopper (Plus) 60 cm antenna at 15 GHz, dual (cont.)

0.0	37.7	0.0	37.7	0.0	0.0	0.0	0.0	0.0	5.7	0.0	5.7
0.5	36.2	0.5	36.2	0.5	-1.5	0.5	-1.5	1.5	5.7	1.5	5.7
0.7	34.7	0.7	34.7	0.7	-3.0	0.7	-3.0	5.0	-10.3	5.0	-10.3
1.5	23.7	1.5	21.7	1.5	-14.0	1.5	-16.0	10.0	-24.3	10.0	-22.3
3.0	23.7	3.5	21.7	3.0	-14.0	3.5	-16.0	40.0	-24.3	40.0	-24.3
5.0	13.7	5.0	11.7	5.0	-24.0	5.0	-26.0	60.0	-32.3	60.0	-32.3
7.0	2.7	15.0	-2.3					180.0	-32.3	180.0	-32.3
10.0	2.7	60.0	-9.3								
20.0	-6.3	65.0	-11.3								
40.0	-8.3	100.0	-30.3								
50.0	-12.3	180.0	-30.3								
65.0	-12.3										
76.0	-18.3										
80.0	-19.3										
100.0	-30.3										
180.0	-30.3										

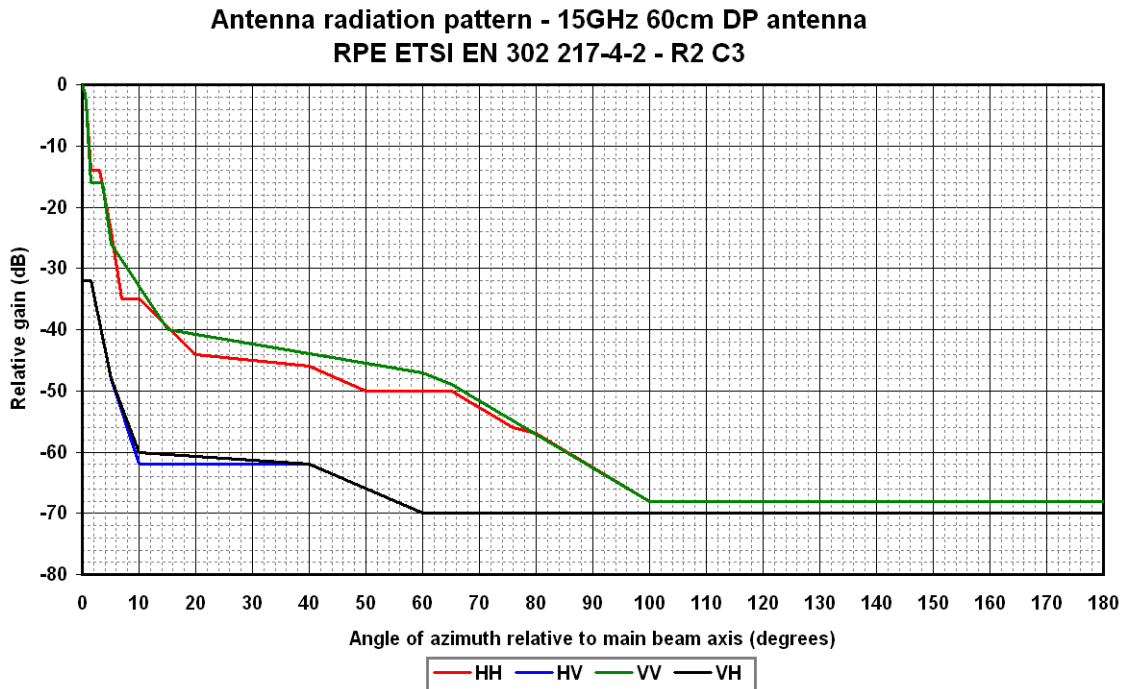


Figure 19. Antenna radiation pattern for 15 GHz, 60 cm antenna, dual

Table 20. Electrical specifications for Nokia FlexiHopper (Plus) 120 cm antenna at 15 GHz, single

Frequency / Size		(15 GHz); 14400 - 15350 MHz/ 120 cm (4 ft)									
Type, item		Single T55073.15									
Gain		Low 42.7/ Middle 42.6/ High 43.0 dBi (min 42.2/ max 43.2 dBi)									
BW (-3 dB)		1.2 deg									
F/B		72 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R2 C3									
Co-Polar								X-Polar			
								Main Beam (dB to dBi by adding 42.6 dBi)			
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dBi	deg	dBi	deg	dBi	deg	dBi

Table 20. Electrical specifications for Nokia FlexiHopper (Plus) 120 cm antenna at 15 GHz, single (cont.)

0.0	42.6	0.0	42.6	0.0	0.0	0.0	0.0	0.0	12.7	0.0	12.7
0.5	40.4	0.5	40.4	0.5	-2.3	0.5	-2.3	1.2	12.7	1.2	12.7
1.0	34.4	0.6	39.4	1.0	-8.3	0.6	-3.3	5.0	-7.3	5.0	-4.3
1.5	26.4	1.0	33.4	1.5	-16.3	1.0	-9.3	20.0	-16.0	20.0	-12.9
3.0	21.9	1.5	26.1	3.0	-20.8	1.5	-16.5	40.0	-17.1	90.0	-32.3
5.0	13.1	3.0	22.6	5.0	-29.5	3.0	-20.0	90.0	-32.3	180.0	-32.3
9.3	7.9	5.0	12.9			5.0	-29.8	180.0	-32.3		
20.0	2.4	20.0	3.5								
40.0	-1.6	30.0	-0.8								
60.0	-6.6	60.0	-4.8								
70.0	-11.2	96.0	-29.3								
95.0	-29.3	180.0	-29.3								
180.0	-29.3										

Antenna radiation pattern - 15GHz 120cm SP antenna
RPE ETSI EN 302 217-4-2 - R2 C3



Figure 20. Antenna radiation pattern for 15 GHz, 120 cm antenna, single

Table 21. Electrical specifications for Nokia FlexiHopper (Plus) 120 cm antenna at 15 GHz, dual

Frequency / Size		(15 GHz); 14400 - 15350 MHz/ 120 cm (4 ft)									
Type, item		Dual T55073.65									
Gain		Low 42.6/ Middle 42.7/ High 43.2 dBi (min 42.6/ max 43.2 dBi)									
BW (-3 dB)		1.2 deg									
F/B		72 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R2 C3									
Co-Polar								X-Polar			
				Main Beam (dB to dBi by adding 42.7 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dBi	deg	dBi	deg	dBi	deg	dBi
0.0	42.7	0.0	42.7	0.0	0.0	0.0	0.0	0.0	12.7	0.0	12.7
0.5	40.7	0.5	40.7	0.5	-2.0	0.5	-2.0	1.5	12.7	1.5	12.7
0.6	39.7	0.6	39.7	0.6	-3.0	0.6	-3.0	5.0	-7.3	5.0	-7.3
1.0	35.7	1.0	33.7	1.0	-7.0	1.0	-9.0	20.0	-19.3	20.0	-17.3
1.5	25.7	1.5	22.7	1.5	-17.0	1.5	-20.0	40.0	-19.3	90.0	-32.3
3.0	25.7	3.5	22.7	3.0	-17.0	3.5	-20.0	90.0	-32.3	180.0	-32.3
5.0	12.7	5.0	12.7	5.0	-30.0	5.0	-30.0	180.0	-32.3		
10.0	5.7	20.0	-0.8								
20.0	-2.3	30.0	-0.8								
40.0	-3.8	50.0	-2.8								
60.0	-7.3	60.0	-4.8								
70.0	-11.3	95.0	-29.3								
95.0	-29.3	180.0	-29.3								
180.0	-29.3										

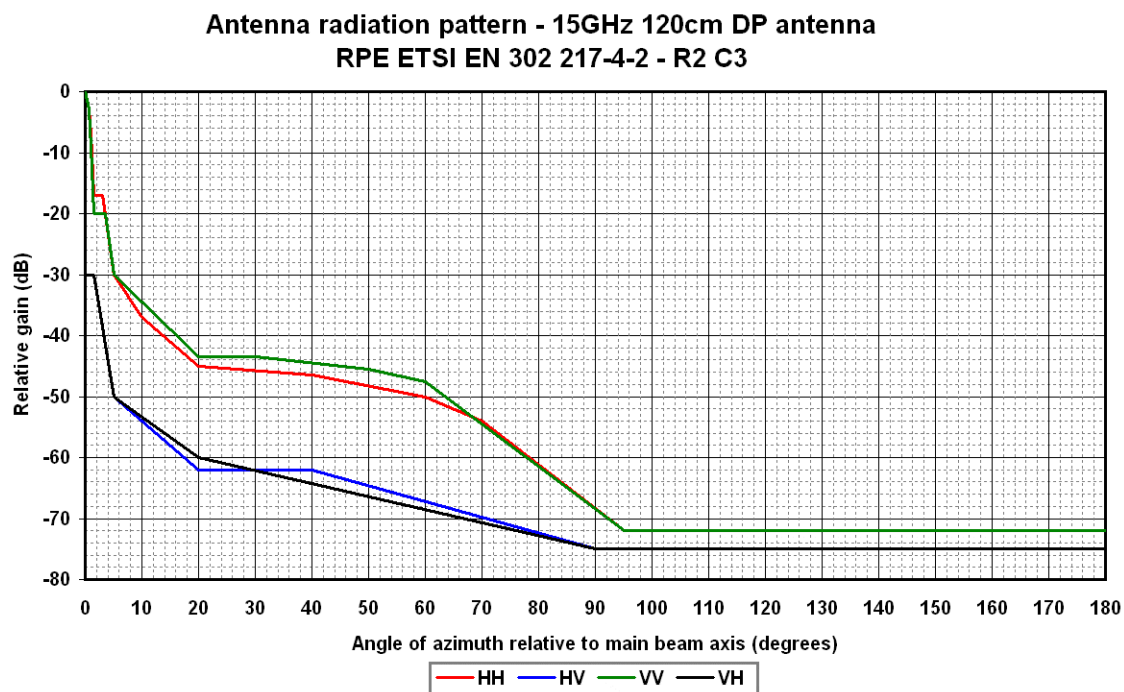


Figure 21. Antenna radiation pattern for 15 GHz, 120 cm antenna, dual

Table 22. Electrical specifications for Nokia FlexiHopper (Plus) 180 cm antenna at 15 GHz

Frequency / Size		(15 GHz); 14400 - 15350 MHz/ 180 cm (6 ft)									
Type, item		Single T55073.16, Dual T55073.65									
Gain		Low 46.1/ Middle 46.4/ High 46.6 dBi (min 46.1/ max 46.6 dBi)									
BW (-3 dB)		0.8 deg									
F/B		74 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R2 C3									
Co-Polar								X-Polar			
								Main Beam (dB to dBi by adding 46.4 dBi)			
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi

Table 22. Electrical specifications for Nokia FlexiHopper (Plus) 180 cm antenna at 15 GHz (cont.)

0.0	46.4	0.0	46.4	0.0	0.0	0.0	0.0	0.0	14.4	0.0	14.4
0.4	43.4	0.4	43.4	0.4	-3.0	0.4	-3.0	1.0	14.4	1.0	14.4
0.5	41.9	0.5	41.9	0.5	-4.5	0.5	-4.5	5.0	-5.6	5.0	-5.1
1.0	29.4	1.0	31.4	1.0	-17.0	1.0	-15.0	10.0	-18.6	10.0	-17.1
2.0	29.4	2.0	31.4	2.0	-17.0	2.0	-15.0	60.0	-23.6	55.0	-21.6
5.0	7.4	5.0	7.4	5.0	-39.0	5.0	-39.0	70.0	-33.6	70.0	-33.6
18.0	-3.1	10.0	2.4					180.0	-33.6	180.0	-33.6
50.0	-3.1	30.0	-3.1								
60.0	-5.1	50.0	-3.1								
90.0	-29.6	60.0	-5.1								
180.0	-29.6	70.0	-12.1								
		90.0	-29.6								
		180.0	-29.6								

Antenna radiation pattern - 15GHz 180cm SP/DP antenna
RPE ETSI EN 302 217-4-2 - R2 C3

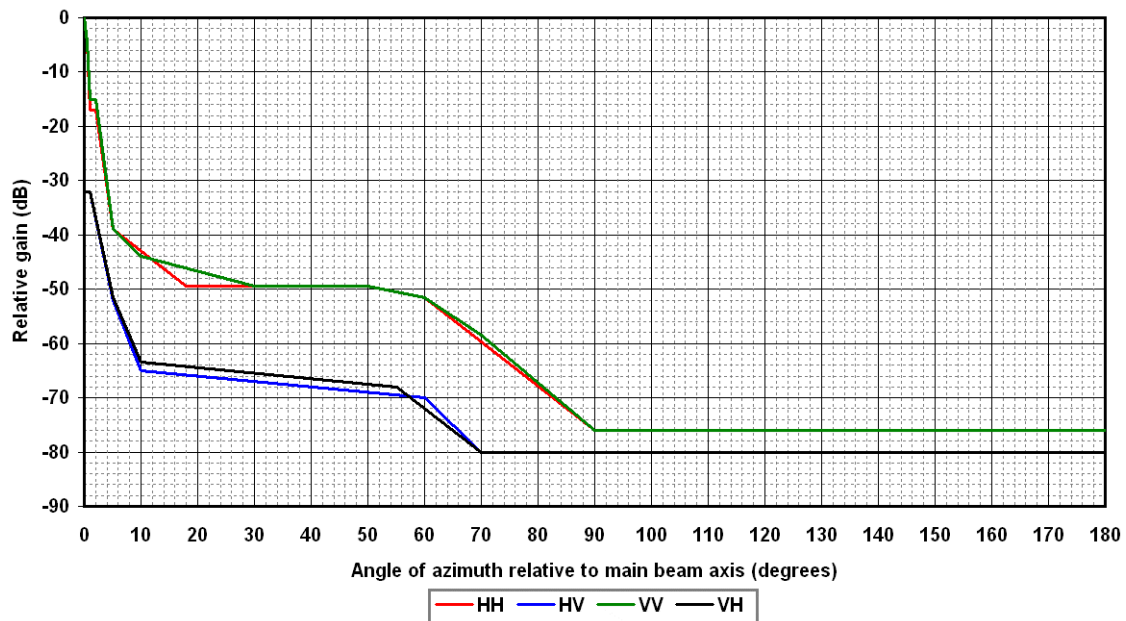


Figure 22. Antenna radiation pattern for 15 GHz, 180 cm antenna

Table 23. Electrical specifications for Nokia FlexiHopper (Plus) 240 cm antenna (split reflector) at 15 GHz, single

Frequency / Size		(15 GHz); 14400 - 15350 MHz/ 240 cm (8 ft)									
Type, item		Single T55073.24 (split reflector)									
Gain		Low 48.4/ Middle 48.6/ High 49.0 dBi (min 48.3/ max 49.1 dBi)									
BW (-3 dB)		0.6 deg									
F/B		73 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R2 C3									
Co-Polar						X-Polar					
				Main Beam (dB to dBi by adding 48.6 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
0.0	48.6	0.0	48.6	0.0	0.0	0.0	0.0	0.0	18.5	0.0	18.5
0.5	41.3	0.5	41.3	0.5	-7.3	0.5	-7.3	0.5	18.5	0.5	18.5
0.7	35.2	0.7	35.2	0.7	-13.5	0.7	-13.5	3.0	8.7	3.0	8.7
1.5	28.8	1.5	28.8	1.5	-19.8	1.5	-19.8	5.0	6.5	5.0	6.5
3.0	25.6	3.0	25.6	3.0	-23.0	3.0	-23.0	10.0	-2.5	10.0	-2.5
5.0	16.6	5.0	16.6	5.0	-32.0	5.0	-32.0	80.0	-24.5	80.0	-24.5
10.0	12.5	10.0	12.5					180.0	-24.5	180.0	-24.5
35.0	1.3	35.0	1.3								
60.0	-6.0	60.0	-6.0								
95.0	-24.5	95.0	-24.5								
180.0	-24.5	180.0	-24.5								

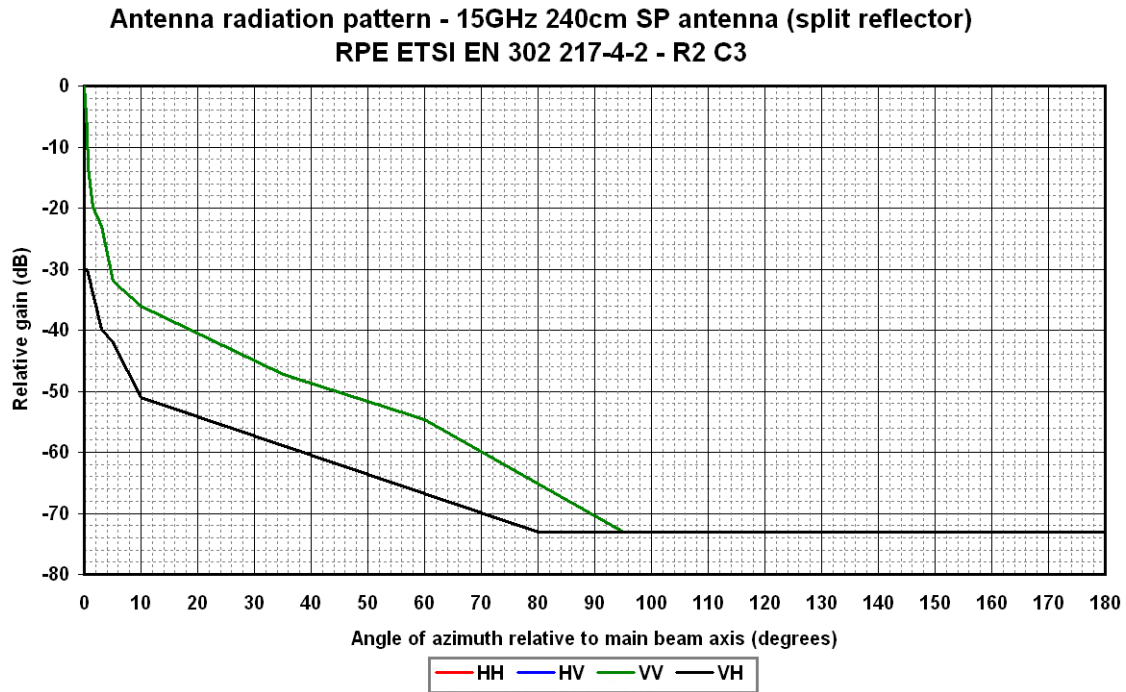


Figure 23. Antenna radiation pattern for 15 GHz, 240 cm antenna, single

Table 24. Electrical specifications for Nokia FlexiHopper (Plus) 240 cm antenna at 15 GHz, dual

Frequency / Size		(15 GHz); 14400 - 15350 MHz/ 240 cm (8 ft)									
Type, item		Dual T55073.74									
Gain		Low 48.4/ Middle 48.7/ High 49.1 dBi (min 48.4/ max 49.1 dBi)									
BW (-3 dB)		0.6 deg									
F/B		78 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R2 C3									
Co-Polar						X-Polar					
						Main Beam (dB to dBi by adding 48.7 dBi)					
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi

Table 24. Electrical specifications for Nokia FlexiHopper (Plus) 240 cm antenna at 15 GHz, dual (cont.)

0.0	48.7	0.0	48.7	0.0	0.0	0.0	0.0	0.0	16.7	0.0	16.7
0.5	40.2	0.5	40.2	0.5	-8.5	0.5	-8.5	0.5	16.7	0.5	16.7
0.7	33.7	0.7	33.7	0.7	-15.0	0.7	-15.0	3.0	8.7	3.0	8.7
1.5	33.7	1.5	33.7	1.5	-15.0	1.5	-15.0	5.0	-4.3	5.0	-4.3
3.0	28.7	3.0	28.7	3.0	-20.0	3.0	-20.0	10.0	-14.3	10.0	-14.3
5.0	14.7	5.0	14.7	5.0	-34.0	5.0	-34.0	80.0	-31.3	80.0	-31.3
10.0	6.7	10.0	6.7					180.0	-31.3	180.0	-31.3
35.0	-1.3	35.0	-1.3								
60.0	-7.3	60.0	-7.3								
95.0	-29.3	95.0	-29.3								
180.0	-29.3	180.0	-29.3								

Antenna radiation pattern - 15GHz 240cm DP antenna
RPE ETSI EN 302 217-4-2 - R2 C3

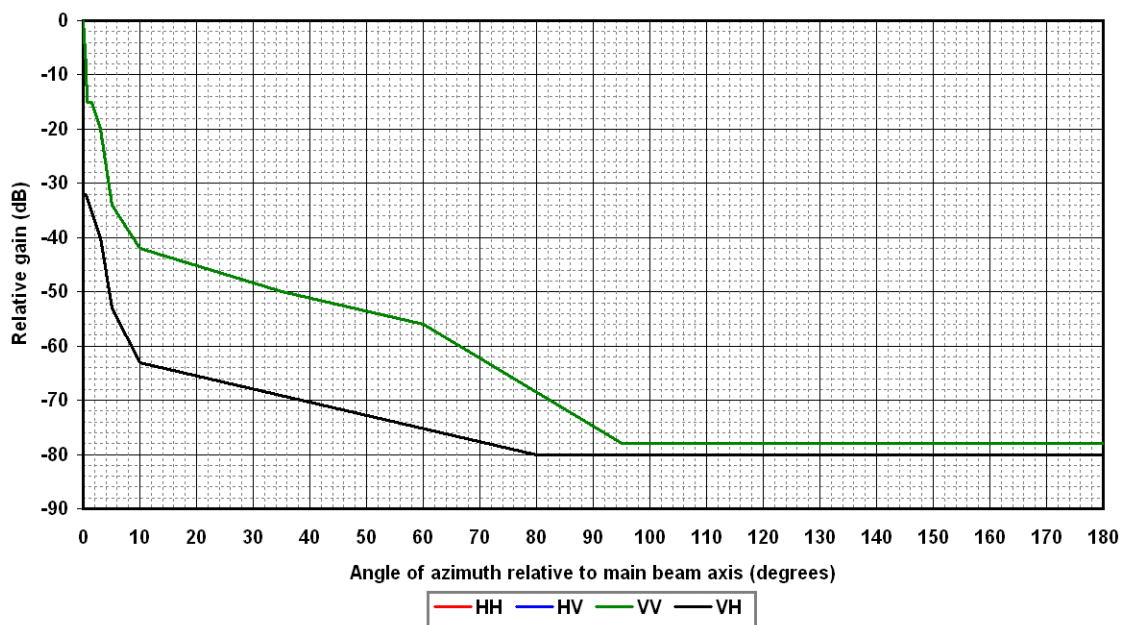


Figure 24. Antenna radiation pattern for 15 GHz, 240 cm antenna, dual

3.5 Electrical specifications for antennas at 18 GHz

Table 25. Electrical specifications for Nokia FlexiHopper 30 cm antenna at 18 GHz

Frequency / Size		(18 GHz); 17700 - 19700 MHz/ 30 cm (1 ft)									
Type, item		Single T55074.01/ Dual T55074.51									
Gain		Low 33.9/ Middle 34.7/ High 34.8 dBi (min 33.9/ max 34.8 dBi)									
BW (-3 dB)		3.1 deg									
F/B		55 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R2 C2									
Co-Polar								X-Polar			
				Main Beam (dB to dBi by adding 34.7 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
0.0	34.7	0.0	34.7	0.0	0.0	0.0	0.0	0.0	2.7	0.0	2.7
0.5	34.6	0.5	34.6	0.5	-0.1	0.5	-0.1	1.6	2.7	3.0	2.7
1.0	33.8	1.0	33.8	1.0	-0.9	1.0	-0.9	5.0	-5.3	5.0	-2.3
1.5	32.2	1.5	32.2	1.5	-2.5	1.5	-2.5	20.0	-15.3	20.0	-20.3
1.6	31.7	1.6	31.7	1.6	-3.0	1.6	-3.0	60.0	-25.3	60.0	-25.3
2.0	29.6	2.0	29.6	2.0	-5.1	2.0	-5.1	180.0	-25.3	180.0	-25.3
2.5	24.7	2.5	26.7	2.5	-10.0	2.5	-8.0				
4.5	24.7	3.0	22.7	4.5	-10.0	3.0	-12.0				
5.0	23.7	5.0	22.7	5.0	-11.0	5.0	-12.0				
10.0	12.7	15.0	5.7								
20.0	1.7	30.0	-3.3								
60.0	0.7	50.0	-4.3								
90.0	-20.3	60.0	-6.3								
105.0	-25.3	100.0	-25.3								
160.0	-25.3	160.0	-25.3								
170.0	-20.3	170.0	-20.3								
180.0	-20.3	180.0	-20.3								

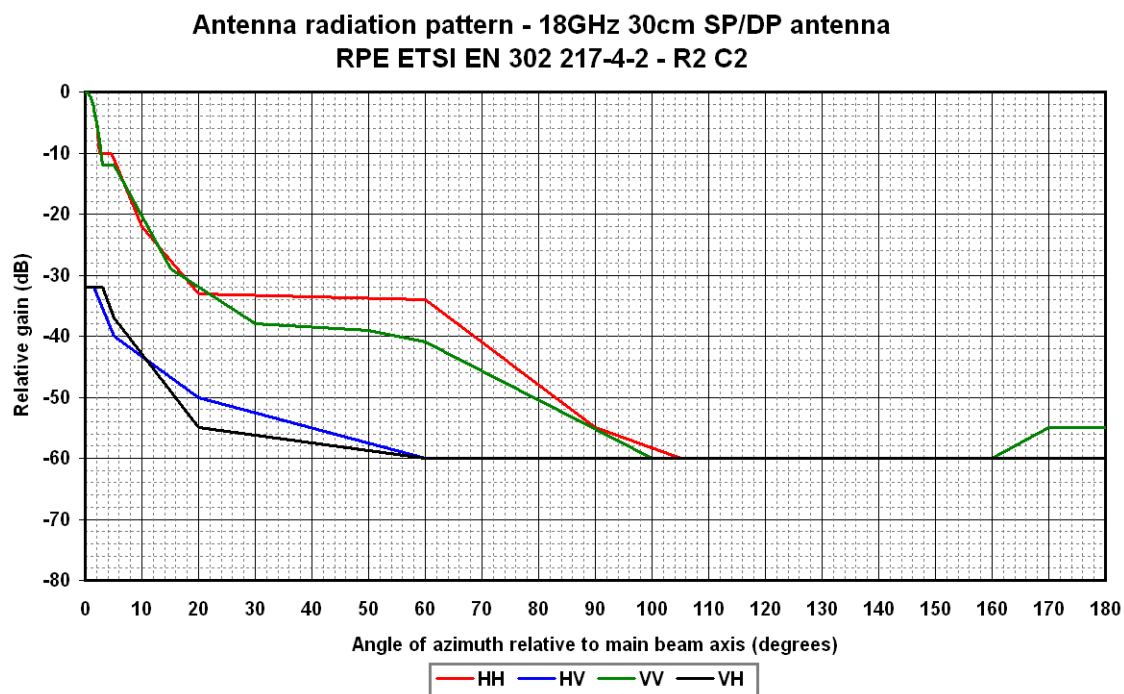


Figure 25. Antenna radiation pattern for 18 GHz, 30 cm antenna

Table 26. Electrical specifications for Nokia FlexiHopper 60 cm antenna at 18 GHz, single

Frequency / Size		(18 GHz); 17700 - 19700 MHz/ 60 cm (2 ft)							
Type, item		Single T55074.02							
Gain		Low 38.9/ Middle 39.4/ High 39.9 dBi (min 38.5/ max 40.3 dBi)							
BW (-3 dB)		1.8 deg							
F/B		68 dB							
XPD/Isolation		30 dB							
RL		17.7 dB							
RPE ETSI EN 302 217-4-2		R2 C3							
Co-Polar						X-Polar			
						Main Beam (dB to dBi by adding 39.4 dBi)			
HH		VV		HH		VV		HV	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi

Table 26. Electrical specifications for Nokia FlexiHopper 60 cm antenna at 18 GHz, single (cont.)

0.0	39.4	0.0	39.4	0.0	0.0	0.0	0.0	0.0	9.0	0.0	9.0
0.5	37.9	0.5	37.9	0.5	-1.5	0.5	-1.5	1.0	9.0	1.5	9.0
0.9	36.2	0.9	36.2	0.9	-3.3	0.9	-3.3	5.0	-0.3	5.0	-0.3
1.0	34.9	1.0	34.9	1.0	-4.5	1.0	-4.5	20.0	-15.2	20.0	-15.3
1.5	29.2	1.5	27.7	1.5	-10.3	1.5	-11.8	60.0	-23.6	55.5	-22.0
4.0	21.2	3.0	23.6	4.0	-18.3	3.0	-15.9	90.0	-32.2	90.0	-32.2
5.0	15.9	5.0	17.8	5.0	-23.6	5.0	-21.6	180.0	-32.2	180.0	-32.2
10.0	9.1	10.0	8.5								
25.0	1.8	30.0	-2.2								
40.0	-1.2	60.0	-5.2								
60.0	-4.2	90.0	-28.2								
90.0	-28.2	180.0	-28.2								
180.0	-28.2										

Antenna radiation pattern - 18GHz 60cm SP antenna
RPE ETSI EN 302 217-4-2 - R2 C3



Figure 26. Antenna radiation pattern for 18 GHz, 60 cm antenna, single

Table 27. Electrical specifications for Nokia FlexiHopper 60 cm antenna at 18 GHz, dual

Frequency / Size		(18 GHz); 17700 - 19700 MHz/ 60 cm (2 ft)									
Type, item		Dual T55074.52									
Gain		Low 39.2/ Middle 39.8/ High 40.3 dBi (min 39.2/ max 40.3 dBi)									
BW (-3 dB)		1.7 deg									
F/B		68 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R2 C3									
Co-Polar								X-Polar			
				Main Beam (dB to dBi by adding 39.8 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
0.0	39.8	0.0	39.8	0.0	0.0	0.0	0.0	0.0	7.8	0.0	7.8
0.5	37.8	0.5	37.8	0.5	-2.0	0.5	-2.0	1.0	7.8	1.5	7.8
0.9	36.8	0.9	36.8	0.9	-3.0	0.9	-3.0	5.0	-5.2	5.0	-5.2
1.0	34.8	1.0	34.8	1.0	-5.0	1.0	-5.0	20.0	-15.2	20.0	-20.2
1.5	27.8	1.5	24.8	1.5	-12.0	1.5	-15.0	60.0	-25.2	60.0	-25.2
3.0	27.8	3.0	24.8	3.0	-12.0	3.0	-15.0	90.0	-32.2	90.0	-32.2
4.0	21.8	5.0	17.8	4.0	-18.0	5.0	-22.0	180.0	-32.2	180.0	-32.2
5.0	17.8	10.0	7.8	5.0	-22.0						
10.0	8.8	30.0	-2.2								
25.0	1.8	60.0	-5.2								
40.0	-1.2	90.0	-28.2								
60.0	-4.2	180.0	-28.2								
90.0	-28.2										
180.0	-28.2										

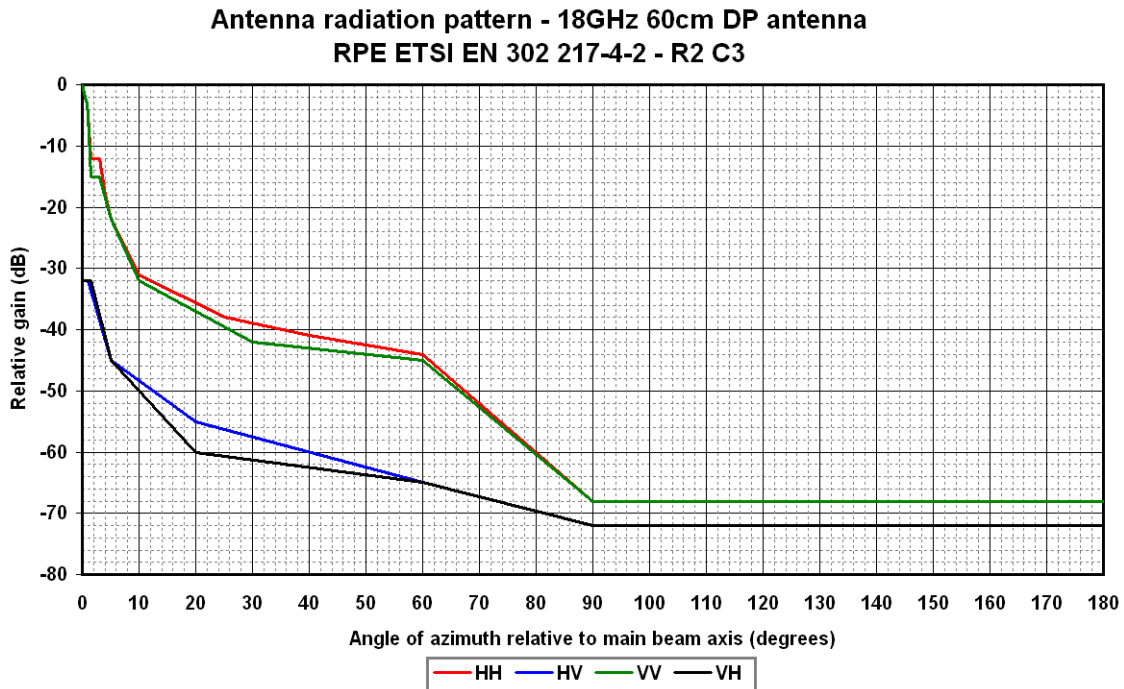


Figure 27. Antenna radiation pattern for 18 GHz, 60 cm antenna, dual

Table 28. Electrical specifications for Nokia FlexiHopper 120 cm antenna at 18 GHz

Frequency / Size		(18 GHz); 17700 - 19700 MHz/ 120 cm (4 ft)									
Type, item		Single T55074.15, Dual T55074.65									
Gain		Low 44.3/ Middle 44.6/ High 44.9 dBi (min 44.3/ max 44.9 dBi)									
BW (-3 dB)		1.0 deg									
F/B		73 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R2 C3									
Co-Polar								X-Polar			
				Main Beam (dB to dBi by adding 44.6 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dBi	deg	dBi	deg	dBi	deg	dBi

Table 28. Electrical specifications for Nokia FlexiHopper 120 cm antenna at 18 GHz (cont.)

0.0	44.6	0.0	44.6	0.0	0.0	0.0	0.0	0.0	14.6	0.0	14.6
0.5	41.6	0.5	41.6	0.5	-3.0	0.5	-3.0	2.0	14.6	2.0	14.6
1.5	30.6	1.5	29.6	1.5	-14.0	1.5	-15.0	5.0	-4.4	5.0	-4.0
2.0	30.6	3.0	29.6	2.0	-14.0	3.0	-15.0	10.0	-16.4	10.0	-16.4
4.0	17.6	5.0	11.6	4.0	-27.0	5.0	-33.0	15.0	-20.4	15.0	-21.4
5.0	11.6	6.5	11.6	5.0	-33.0	6.5	-33.0	70.0	-25.0	70.0	-25.0
10.0	4.6	10.0	3.6					80.0	-32.0	80.0	-32.0
20.0	-0.4	15.0	0.6					180.0	-32.0	180.0	-32.0
35.0	-0.4	20.0	-5.4								
60.0	-5.4	55.0	-5.4								
80.0	-24.4	70.0	-11.4								
90.0	-28.4	80.0	-24.4								
180.0	-28.4	90.0	-28.4								
		180.0	-28.4								

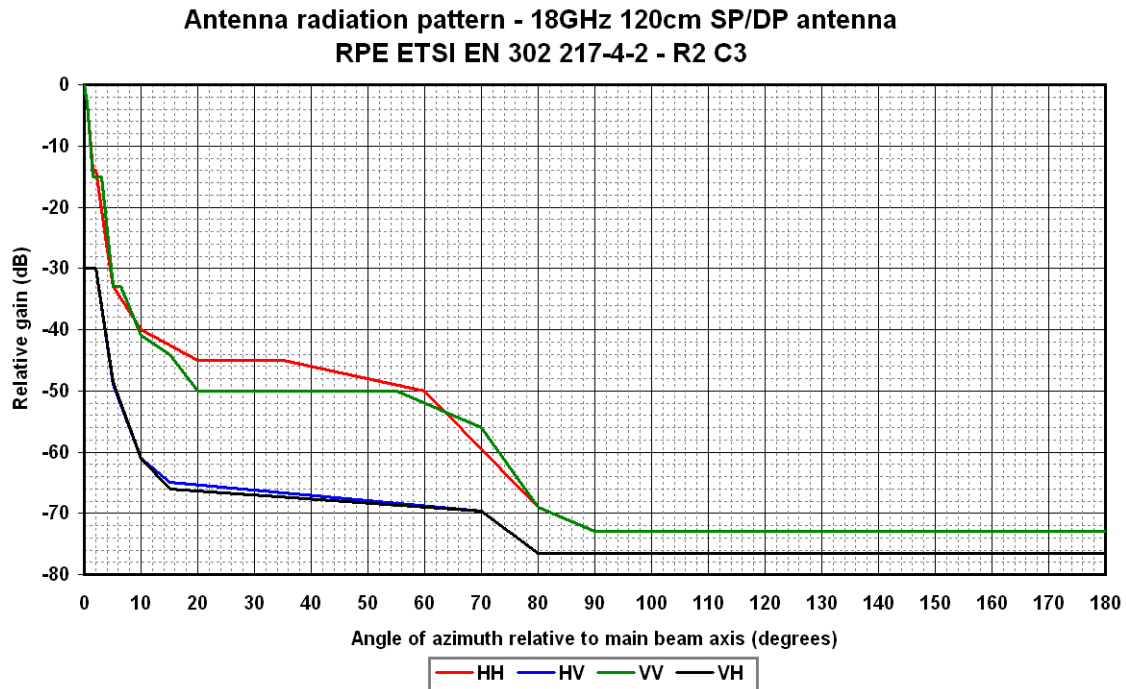


Figure 28. Antenna radiation pattern for 18 GHz, 120 cm antenna

Table 29. Electrical specifications for Nokia FlexiHopper 180 cm antenna at 18 GHz

Frequency / Size		(18 GHz); 17700 - 19700 MHz/ 180 cm (6 ft)									
Type, item		Single T55074.16, Dual T55074.66									
Gain		Low 48.0/ Middle 48.5/ High 48.9 dBi (min 48.0/ max 48.9 dBi)									
BW (-3 dB)		0.6 deg									
F/B		77 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R2 C3									
Co-Polar								X-Polar			
				Main Beam (dB to dBi by adding 48.5 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dBi	deg	dBi	deg	dBi	deg	dBi

Table 29. Electrical specifications for Nokia FlexiHopper 180 cm antenna at 18 GHz (cont.)

0.0	48.5	0.0	48.5	0.0	0.0	0.0	0.0	0.0	18.5	0.0	18.5
0.3	45.5	0.3	45.5	0.3	-3.0	0.3	-3.0	0.5	18.5	0.5	18.5
0.5	39.5	0.5	40.5	0.5	-9.0	0.5	-8.0	5.0	-0.5	5.0	-0.5
1.0	36.5	1.0	33.5	1.0	-12.0	1.0	-15.0	10.0	-12.5	10.0	-12.5
1.5	26.5	1.5	23.5	1.5	-22.0	1.5	-25.0	15.0	-16.5	70.0	-25.5
2.5	26.5	2.5	23.5	2.5	-22.0	2.5	-25.0	50.0	-20.5	80.0	-31.5
5.0	13.5	5.0	8.5	5.0	-35.0	5.0	-40.0	70.0	-25.5	180.0	-31.5
10.0	5.5	9.0	8.5					80.0	-31.5		
15.0	0.5	15.0	1.0					180.0	-31.5		
25.0	-3.0	20.0	-3.0								
60.0	-5.0	48.0	-4.5								
70.0	-12.0	60.0	-5.0								
80.0	-28.5	70.0	-11.5								
180.0	-28.5	80.0	-28.5								
		180.0	-28.5								

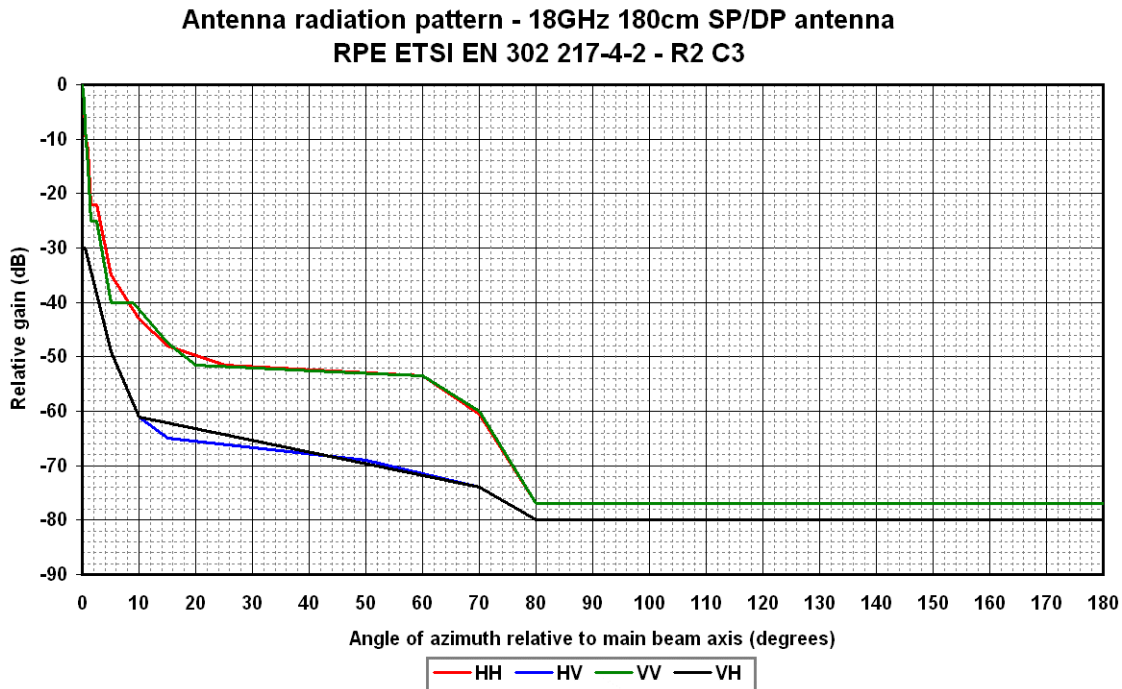


Figure 29. Antenna radiation pattern for 18 GHz, 180 cm antenna

3.6 Electrical specifications for antennas at 23 GHz

Table 30. Electrical specifications for Nokia FlexiHopper (Plus) 20 cm antenna at 23 GHz

Frequency / Size	(23 GHz); 21200 - 23600 MHz/ 20 cm (Square)	
Type, item	Single T55075.03	
Gain	Low 30.5/ Middle 31.0/ High 31.5 dBi (min 30.3/ max 31.7 dBi)	
BW (-3 dB)	4.5 deg	
F/B	56 dB	
XPD/Isolation	30 dB	
RL	17.7 dB	
RPE ETSI EN 300 833 V1.4.1	R3 C3	
Co-Polar	X-Polar	

Table 30. Electrical specifications for Nokia FlexiHopper (Plus) 20 cm antenna at 23 GHz (cont.)

				Main Beam (dB to dBi by adding 31.7 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
5	19	5	19	0	0	0	0	0	1	0	1
10	12	10	12	1	-0.5	1	-0.5	2.25	1	2.25	1
30	0	35	-3	2.25	-3	2.25	-3	4	0	4	0
35	-5	50	-3	4.5	-12	4	-12	5	-5	5	-5
60	-5	70	-12	5	-12	5	-12	10	-10	10	-10
90	-25	90	-25					40	-20	20	-14
180	-25	180	-25					70	-25	45	-14
								100	-33	70	-25
								180	-33	100	-33
										180	-33

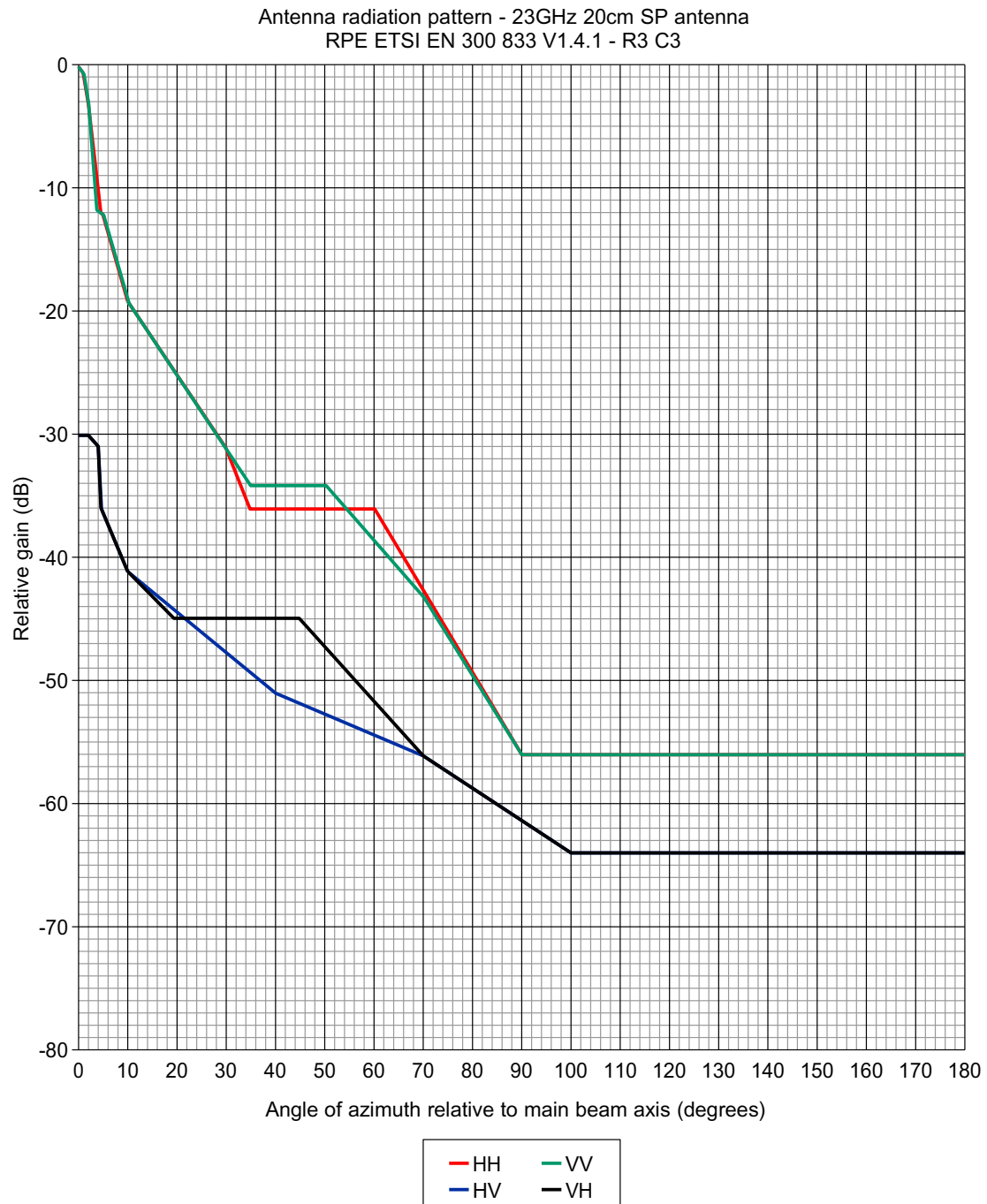


Figure 30. Antenna radiation pattern for 23 GHz, 20 cm antenna

Table 31. Electrical specifications for Nokia FlexiHopper (Plus) 30 cm antenna at 23 GHz

Frequency / Size		(23 GHz); 21200 - 23600 MHz/ 30 cm (1 ft)									
Type, item		Single T55075.01/ Dual T55075.51									
Gain		Low 35.7/ Middle 36.04/ High 36.5 dBi (min 35.7/ max 36.5 dBi)									
BW (-3 dB)		2.6 deg									
F/B		62 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R3 C3									
Co-Polar						X-Polar					
				Main Beam (dB to dBi by adding 36.0 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
0.0	36.0	0.0	36.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	4.0
0.5	35.0	0.5	35.0	0.5	-1.0	0.5	-1.0	1.3	4.0	1.3	4.0
1.3	33.0	1.3	33.0	1.3	-3.0	1.3	-3.0	5.0	-14.0	5.0	-14.0
1.5	30.0	1.5	30.0	1.5	-6.0	1.5	-6.0	20.0	-19.0	20.0	-20.0
2.0	26.0	2.0	26.0	2.0	-10.0	2.0	-10.0	35.0	-21.0	50.0	-24.0
3.0	19.0	3.0	21.0	3.0	-17.0	3.0	-15.0	80.0	-34.0	90.0	-34.0
4.5	19.0	4.5	21.0	4.5	-17.0	4.5	-15.0	180.0	-34.0	180.0	-34.0
5.0	18.0	5.0	18.0	5.0	-18.0	5.0	-18.0				
10.0	9.0	10.0	9.0								
15.0	3.0	20.0	-1.0								
25.0	0.0	32.0	-2.0								
40.0	-3.0	55.0	-8.0								
53.0	-4.0	90.0	-26.0								
90.0	-26.0	180.0	-26.0								
180.0	-26.0										

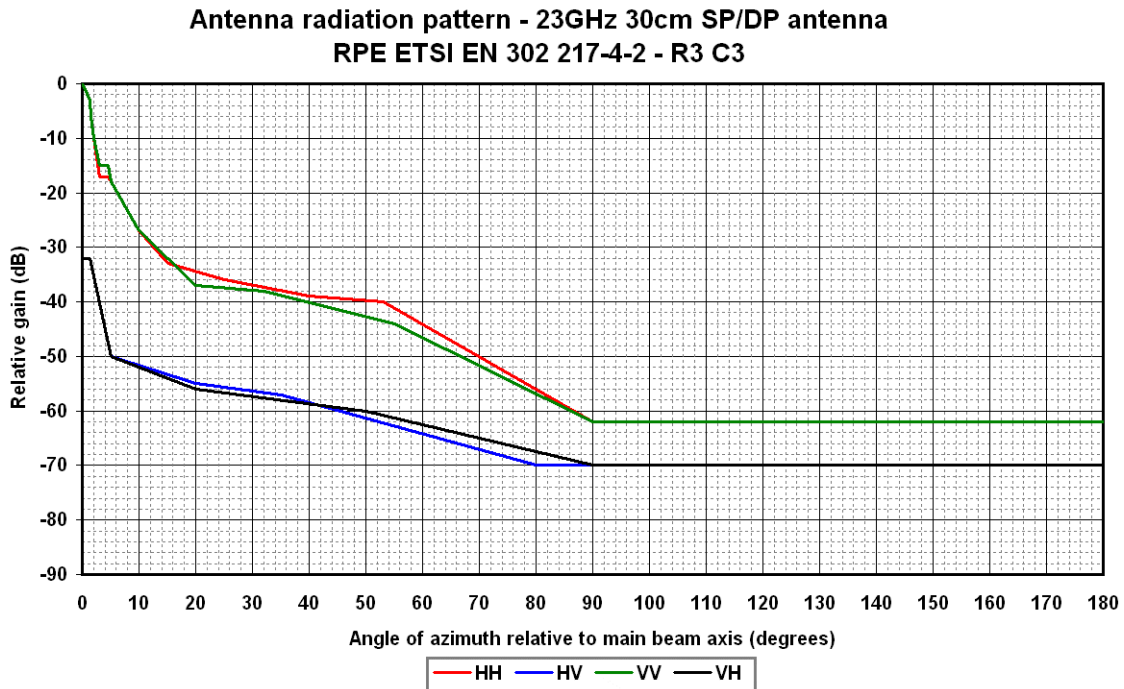


Figure 31. Antenna radiation pattern for 23 GHz, 30 cm antenna

Table 32. Electrical specifications for Nokia FlexiHopper (Plus) 60 cm antenna at 23 GHz, single

Frequency / Size		(23 GHz); 21200 - 23600 MHz/ 60 cm (2 ft)									
Type, item		Single T55075.02									
Gain		Low 40.6/ Middle 41.1/ High 41.6 dBi (min 40.5/ max 41.7 dBi)									
BW (-3 dB)		1.5 deg									
F/B		66 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R3 C3									
Co-Polar								X-Polar			
								Main Beam (dB to dBi by adding 41.1 dBi)			
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dBi	deg	dBi	deg	dBi	deg	dBi

Table 32. Electrical specifications for Nokia FlexiHopper (Plus) 60 cm antenna at 23 GHz, single (cont.)

0.0	41.1	0.0	41.1	0.0	0.0	0.0	0.0	0.0	11.0	0.0	11.0
0.5	39.6	0.5	39.6	0.5	-1.5	0.5	-1.5	1.0	11.0	1.0	11.0
0.8	37.6	0.8	37.6	0.8	-3.5	0.8	-3.5	2.5	1.0	2.0	1.3
1.0	35.3	1.0	35.3	1.0	-5.8	1.0	-5.8	5.0	-5.7	5.0	-5.9
1.5	27.8	1.5	27.8	1.5	-13.3	1.5	-13.3	15.0	-21.0	11.0	-18.2
3.5	20.1	3.5	21.9	3.5	-20.9	3.5	-19.2	30.0	-21.0	35.0	-22.1
5.0	11.5	5.0	12.3	5.0	-29.6	5.0	-28.8	60.0	-31.4	70.0	-29.6
15.0	8.0	15.0	3.0					180.0	-32.0	80.0	-31.4
25.0	-1.0	20.0	3.0							180.0	-31.4
45.0	-1.0	30.0	-1.5								
70.0	-10.0	45.0	-3.5								
95.0	-24.9	90.0	-24.9								
180.0	-24.9	180.0	-24.9								

Antenna radiation pattern - 23GHz 60cm SP antenna
RPE ETSI EN 302 217-4-2 - R3 C3

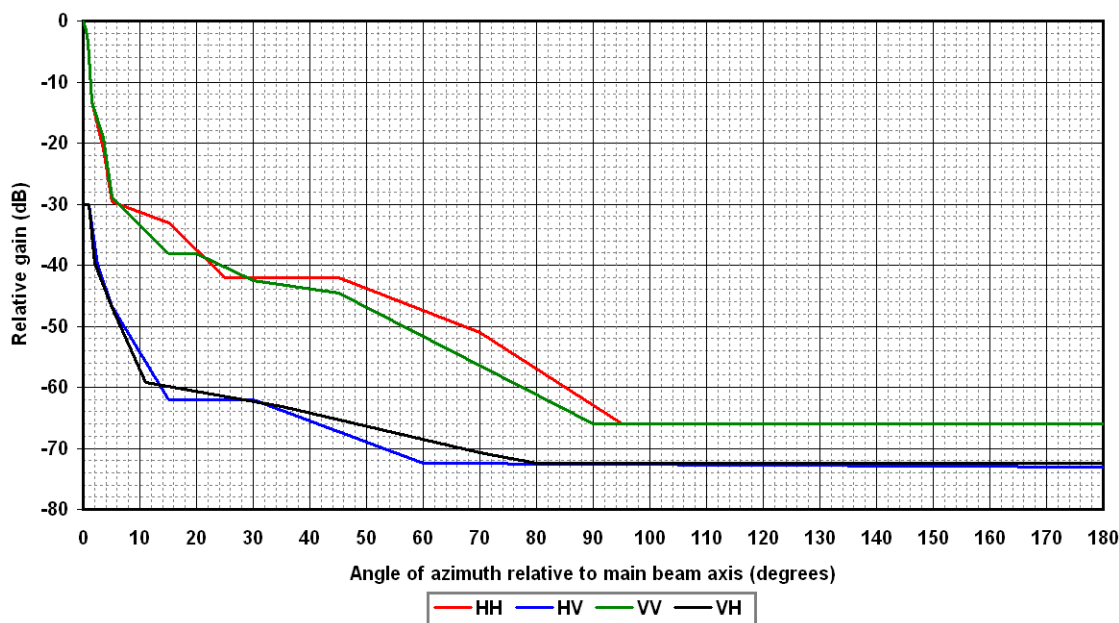


Figure 32. Antenna radiation pattern for 23 GHz, 60 cm antenna, single

Table 33. Electrical specifications for Nokia FlexiHopper (Plus) 60 cm antenna at 23 GHz, dual

Frequency / Size		(23 GHz); 21200 - 23600 MHz/ 60 cm (2 ft)									
Type, item		Dual T55075.52									
Gain		Low 40.7/ Middle 41.1/ High 41.7 dBi (min 40.7/ max 41.7 dBi)									
BW (-3 dB)		1.5 deg									
F/B		66 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R3 C3									
Co-Polar								X-Polar			
				Main Beam (dB to dBi by adding 41.1 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
0.0	41.1	0.0	41.1	0.0	0.0	0.0	0.0	0.0	9.1	0.0	9.1
0.5	39.6	0.5	39.6	0.5	-1.5	0.5	-1.5	1.0	9.1	1.0	9.1
0.8	38.1	0.8	38.1	0.8	-3.0	0.8	-3.0	2.0	1.3	2.0	1.3
1.0	36.0	1.0	36.0	1.0	-5.1	1.0	-5.1	5.0	-5.7	5.0	-5.9
1.5	29.1	1.5	29.1	1.5	-12.0	1.5	-12.0	15.0	-22.5	10.0	-18.0
2.0	26.1	2.0	25.1	2.0	-15.0	2.0	-16.0	25.0	-22.5	35.0	-24.0
3.0	26.1	3.0	25.1	3.0	-15.0	3.0	-16.0	30.0	-24.5	45.0	-24.0
3.5	19.1	3.5	20.9	3.5	-22.0	3.5	-20.2	45.0	-24.5	70.0	-29.6
4.0	11.1	5.0	9.5	4.0	-30.0	5.0	-31.6	50.0	-27.5	80.0	-31.4
5.0	8.0	15.0	0.0	5.0	-33.1			60.0	-31.4	180.0	-31.4
15.0	8.0	20.0	0.0					80.0	-31.4		
20.0	-1.9	30.0	-3.5					90.0	-36.4		
25.0	-6.0	45.0	-3.5					180.0	-36.4		
45.0	-6.0	90.0	-24.9								
70.0	-10.0	180.0	-24.9								
90.0	-24.9										
180.0	-24.9										

Antenna radiation pattern - 23GHz 60cm DP antenna
RPE ETSI EN 302 217-4-2 - R3 C3

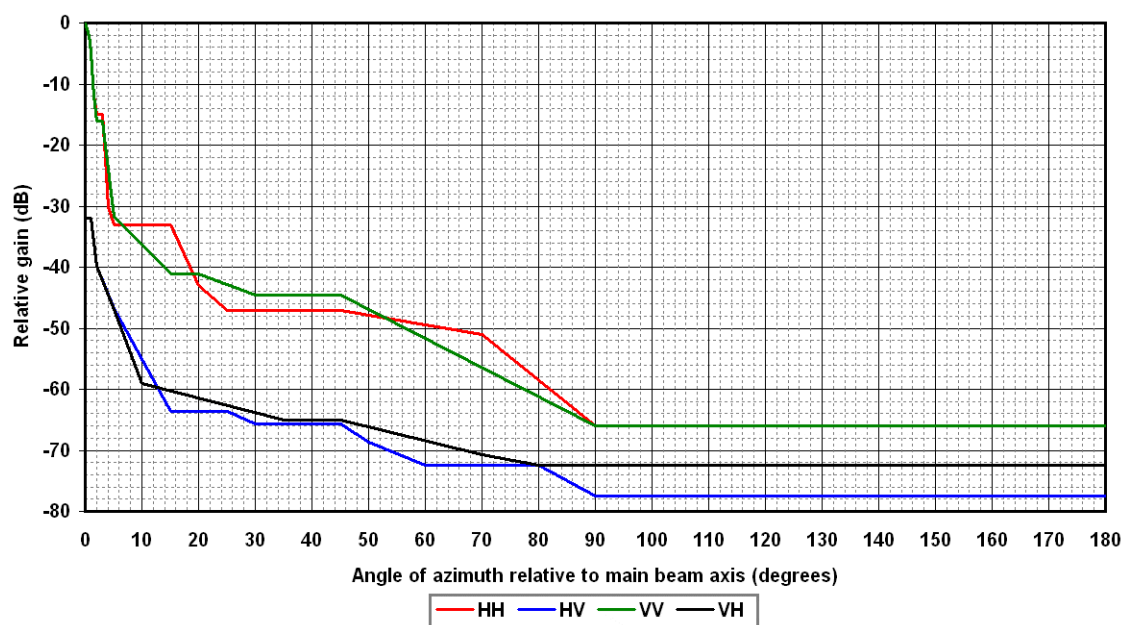


Figure 33. Antenna radiation pattern for 23 GHz, 60 cm antenna, dual

Table 34. Electrical specifications for Nokia FlexiHopper (Plus) 90 cm antenna at 23 GHz

Frequency / Size		(23 GHz); 21200 - 23600 MHz/ 90 cm (3 ft)							
Type, item		Single T55075.09							
Gain		Low 43.5/ Middle 43.9/ High 44.4 dBi (min 43.5/ max 44.4 dBi)							
BW (-3 dB)		1.1 deg							
F/B		71 dB							
XPD/Isolation		30 dB							
RL		17.7 dB							
RPE ETSI EN 302 217-4-2		R3 C3							
Co-Polar						X-Polar			
						Main Beam (dB to dBi by adding 43.9 dBi)			
HH		VV		HH		VV		HV	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi

Table 34. Electrical specifications for Nokia FlexiHopper (Plus) 90 cm antenna at 23 GHz (cont.)

0.0	43.9	0.0	43.9	0.0	0.0	0.0	0.0	0.0	11.9	0.0	11.9
0.6	40.9	0.6	40.9	0.6	-3.0	0.6	-3.0	1.5	11.9	1.5	11.9
1.0	34.9	1.5	31.9	1.0	-9.0	1.5	-12.0	5.0	-7.1	5.0	-7.1
1.5	30.9	3.0	18.9	1.5	-13.0	3.0	-25.0	10.0	-15.1	20.0	-12.1
3.5	18.9	5.0	13.9	3.5	-25.0	5.0	-30.0	30.0	-18.1	50.0	-26.1
5.0	13.9	7.5	7.9	5.0	-30.0			50.0	-26.1	65.0	-31.1
7.5	5.9	10.0	7.9					60.0	-31.1	180.0	-31.1
10.0	5.9	15.0	2.9					180.0	-31.1		
14.5	3.9	20.0	2.9								
25.0	2.9	35.0	0.9								
65.0	-8.1	65.0	-10.1								
80.0	-18.1	95.0	-27.1								
95.0	-27.1	180.0	-27.1								
180.0	-27.1										

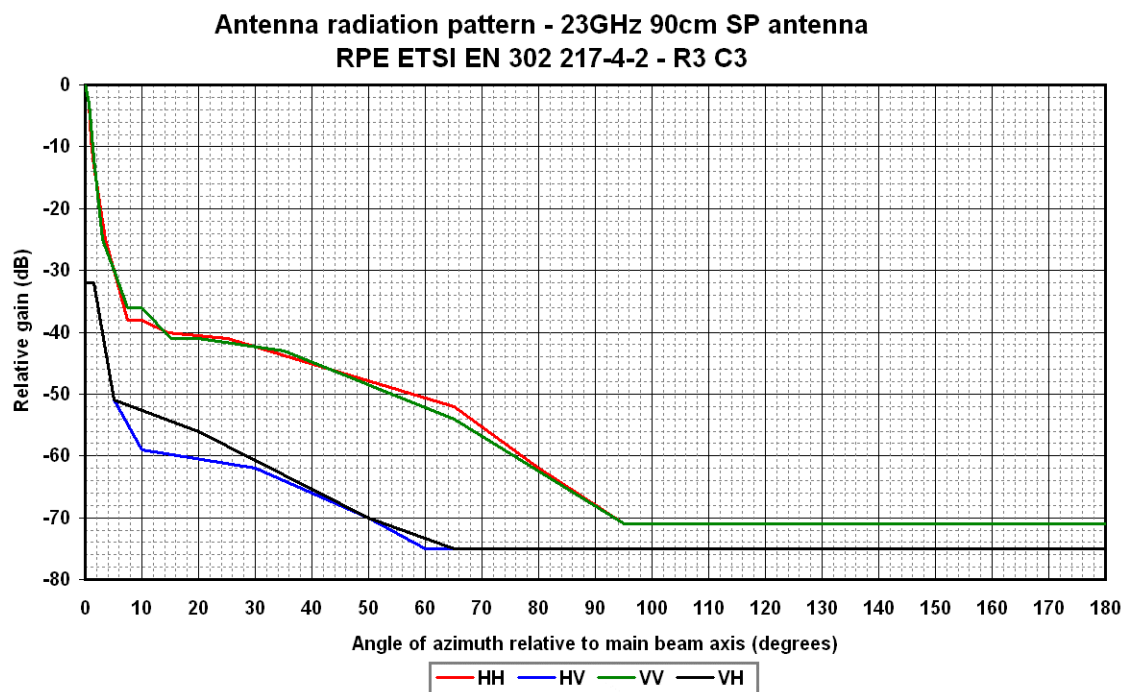


Figure 34. Antenna radiation pattern for 23 GHz, 90 cm antenna

Table 35. Electrical specifications for Nokia FlexiHopper (Plus) 120 cm antenna at 23 GHz

Frequency / Size		(23 GHz); 21200 - 23600 MHz/ 120 cm (4 ft)									
Type, item		Single T55075.15, Dual T55075.65									
Gain		Low 45.5/ Middle 46.0/ High 46.5 dBi (min 45.5/ max 46.5 dBi)									
BW (-3 dB)		0.8 deg									
F/B		73 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R3 C3									
Co-Polar						X-Polar					
						Main Beam (dB to dBi by adding 46.0dBi)					
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi

Table 35. Electrical specifications for Nokia FlexiHopper (Plus) 120 cm antenna at 23 GHz (cont.)

0.0	46.0	0.0	46.0	0.0	0.0	0.0	0.0	0.0	16.0	0.0	16.0
0.2	45.0	0.2	45.0	0.2	-1.0	0.2	-1.0	0.5	16.0	0.5	16.0
0.4	43.0	0.4	43.0	0.4	-3.0	0.4	-3.0	5.0	-7.0	5.0	-7.0
0.5	40.0	0.5	40.0	0.5	-6.0	0.5	-6.0	10.0	-14.0	10.0	-16.0
1.5	30.0	1.5	30.0	1.5	-16.0	1.5	-16.0	30.0	-18.0	20.0	-19.0
2.5	30.0	2.5	30.0	2.5	-16.0	2.5	-16.0	40.5	-22.0	80.0	-31.0
5.0	10.0	5.0	10.0	5.0	-36.0	5.0	-36.0	50.0	-22.0	180.0	-31.0
12.0	-3.0	15.0	-1.0					70.0	-25.0		
20.0	-3.0	20.0	-3.0					80.0	-31.0		
30.0	-8.0	30.0	-3.0					180.0	-31.0		
60.0	-8.0	54.0	-5.0								
70.0	-10.0	60.0	-10.0								
90.0	-27.0	75.0	-16.0								
180.0	-27.0	90.0	-27.0								
		180.0	-27.0								

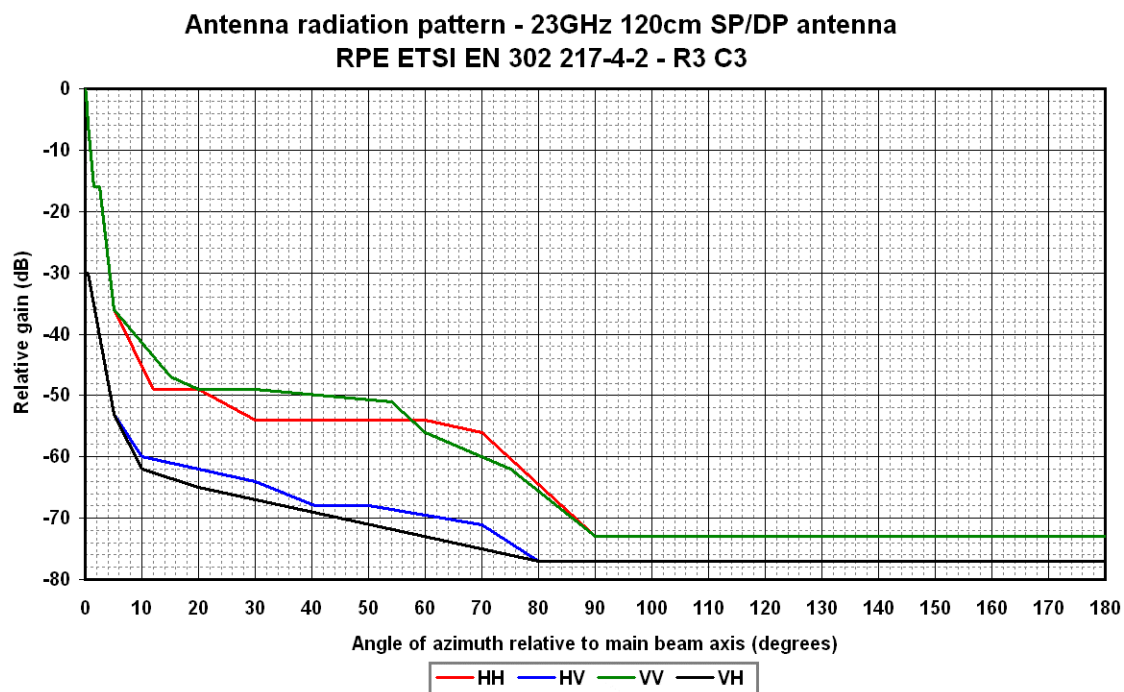


Figure 35. Antenna radiation pattern for 23 GHz, 120 cm antenna

Table 36. Electrical specifications for Nokia FlexiHopper (Plus) 180 cm antenna at 23 GHz

Frequency / Size		(23 GHz); 21200 - 23600 MHz/ 180 cm (6 ft)									
Type, item		Single T55075.16/ Dual T55075.66									
Gain		Low 49.1 Middle 49.5/ High 50.0 dBi (min 49.1/ max 50.0 dBi)									
BW (-3 dB)		0.5 deg									
F/B		79 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R3 C3									
Co-Polar								X-Polar			
								Main Beam (dB to dBi by adding 49.5)			
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi

Table 36. Electrical specifications for Nokia FlexiHopper (Plus) 180 cm antenna at 23 GHz (cont.)

0.0	49.5	0.0	49.5	0.0	0.0	0.0	0.0	0.0	19.5	0.0	19.5
0.2	48.5	0.2	48.5	0.2	-1.0	0.2	-1.0	1.0	19.5	1.0	19.5
0.3	46.5	0.3	46.5	0.3	-3.0	0.3	-3.0	5.0	-8.5	5.0	-8.5
1.0	34.5	1.0	34.5	1.0	-15.0	1.0	-15.0	10.0	-10.5	15.0	-13.5
2.5	34.5	5.0	13.5	2.5	-15.0	5.0	-36.0	70.0	-24.5	40.0	-18.5
5.0	14.5	10.0	6.5	5.0	-35.0			80.0	-31.5	60.0	-22.5
10.0	2.5	15.0	4.5					180.0	-31.5	80.0	-31.5
20.0	1.5	20.0	3.5							180.0	-31.5
40.0	-3.5	25.0	0.0								
60.0	-6.0	30.0	0.0								
80.0	-20.5	55.0	-3.0								
100.0	-29.5	70.0	-10.5								
180.0	-29.5	100.0	-29.5								
		180.0	-29.5								

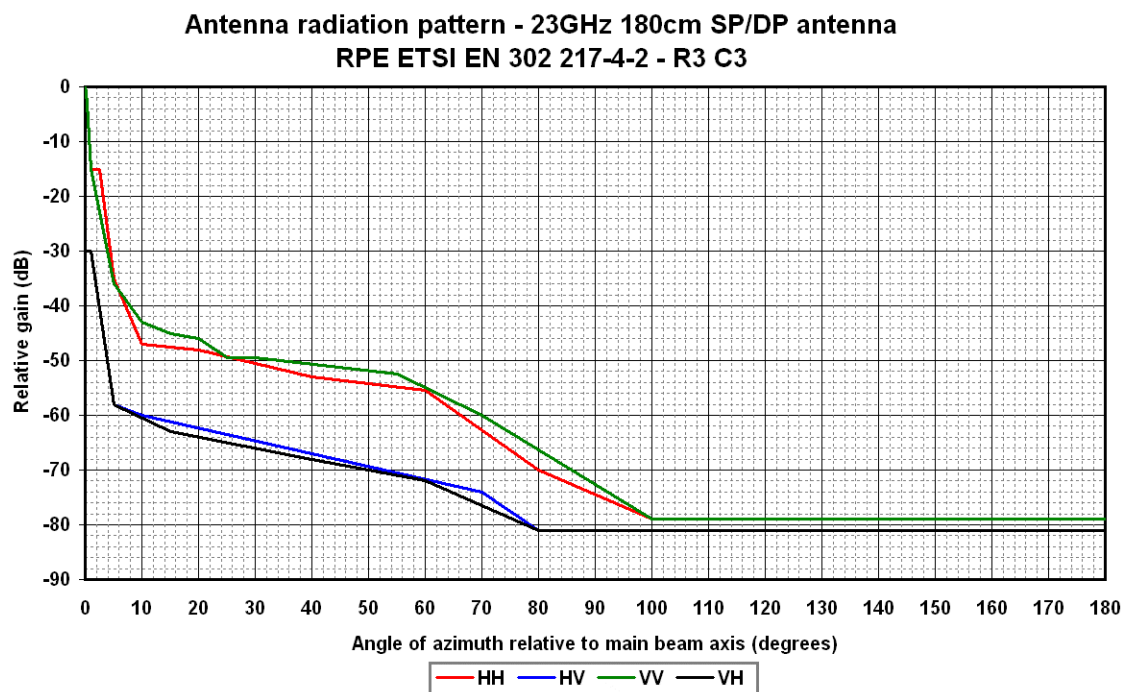


Figure 36. Antenna radiation pattern for 23 GHz, 180 cm antenna

3.7 Electrical specifications for antennas at 26 GHz

Table 37. Electrical specifications for Nokia FlexiHopper 20 cm antenna at 26 GHz

Frequency / Size	(26 GHz); 24250 - 26500 MHz/ 20 cm (Square)	
Type, item	Single T55076.03	
Gain	Low 31.9/ Middle 32.3/ High 32.6 dBi (min 31.7/ max 32.8 dBi)	
BW (-3 dB)	4.1 deg	
F/B	58 dB	
XPD/Isolation	30 dB	
RL	17.7 dB	
RPE ETSI EN 300 833 V1.4.1	R4 C2	
Co-Polar	X-Polar	

Table 37. Electrical specifications for Nokia FlexiHopper 20 cm antenna at 26 GHz (cont.)

				Main Beam (dB to dBi by adding 32.8 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
5	20	5	20	0	0	0	0	0	2.3	0	2.3
6	15.8	6	18.8	0.5	-0.2	0.5	-0.2	1.3	2.3	1.3	2.3
8	15.8	7	15	1	-0.8	1	-0.8	5	-5	5	-5
20	3	10	15	2	-2.9	2	-2.9	10	-5	20	-14
60	-4	20	4	4	-12.5	4	-12.5	15	-9	70	-24
80	-14.5	60	-4	5	-12.5	5	-12.5	70	-25	90	-33
90	-25.2	80	-14.5					90	-33	180	-33
180	-25.2	90	-25.2					180	-33		
		180	-25.2								

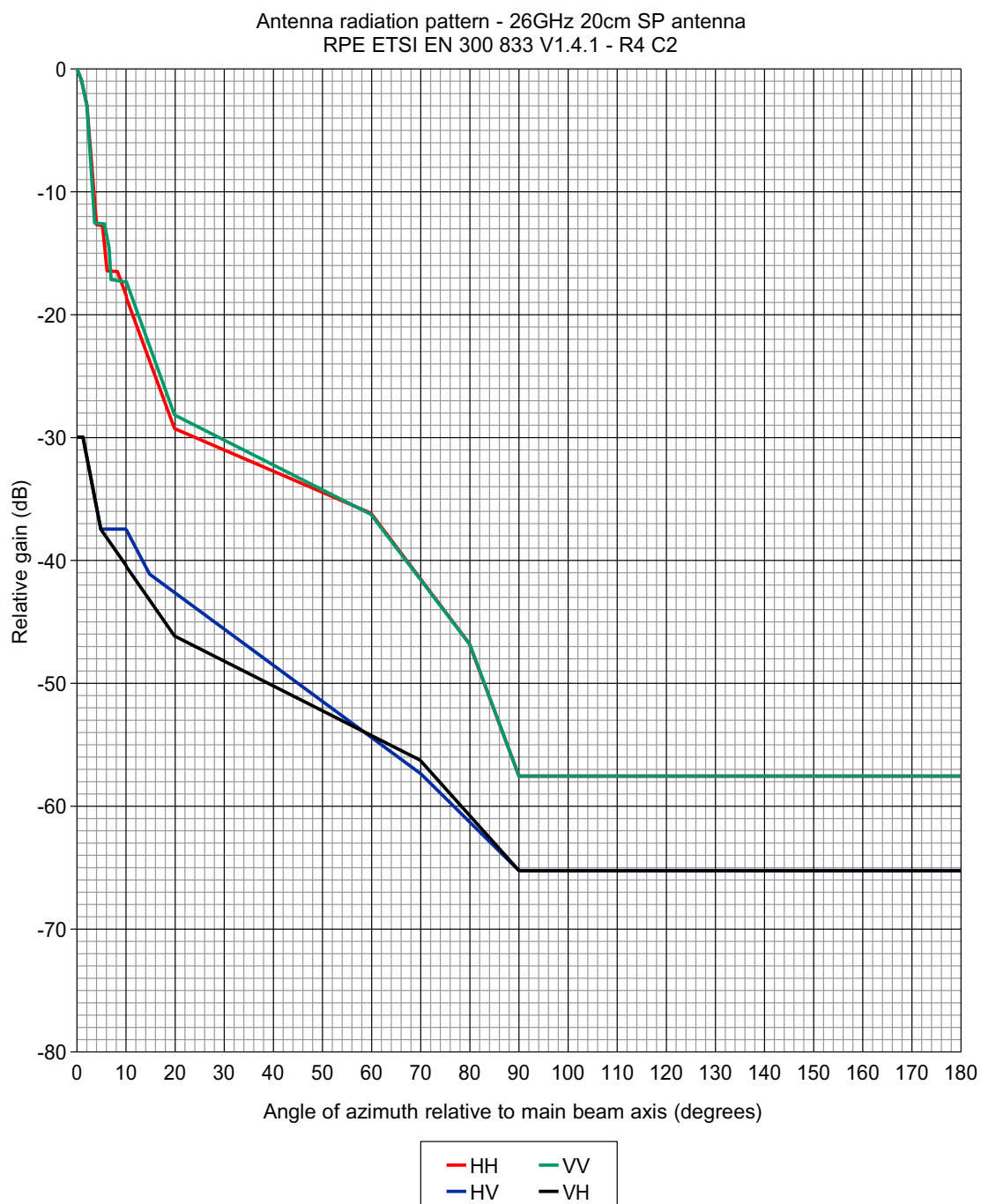


Figure 37. Antenna radiation pattern for 26 GHz, 20 cm antenna

Table 38. Electrical specifications for Nokia FlexiHopper 30 cm antenna at 26 GHz

Frequency / Size		(26 GHz); 24250 - 26500 MHz/ 30 cm (1 ft)									
Type, item		Single T55076.01/ Dual T55076.51									
Gain		Low 37.3/ Middle 37.7/ High 38.0 dBi (min 37.3/ max 38.0 dBi)									
BW (-3 dB)		2.3 deg									
F/B		63 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R4 C2									
Co-Polar								X-Polar			
				Main Beam (dB to dBi by adding 37.7 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
0.0	37.7	0.0	37.7	0.0	0.0	0.0	0.0	0.0	5.7	0.0	5.7
1.2	34.7	1.2	34.7	1.2	-3.0	1.2	-3.0	3.5	5.7	3.5	5.7
3.0	19.7	2.5	22.7	3.0	-18.0	2.5	-15.0	5.0	-3.3	5.0	-3.3
4.0	19.7	4.0	19.7	4.0	-18.0	4.0	-18.0	20.0	-20.3	15.0	-20.3
5.0	17.7	5.0	17.7	5.0	-20.0	5.0	-20.0	80.0	-28.3	25.0	-20.3
20.0	-1.3	8.0	15.7					180.0	-28.3	35.0	-24.3
25.0	-1.3	15.0	4.7							50.0	-24.3
40.0	-4.3	20.0	4.7							60.0	-28.3
45.0	-6.3	25.0	1.7							180.0	-28.3
60.0	-8.3	35.0	-2.3								
100.0	-25.3	50.0	-2.3								
180.0	-25.3	60.0	-6.3								
		100.0	-25.3								
		180.0	-25.3								

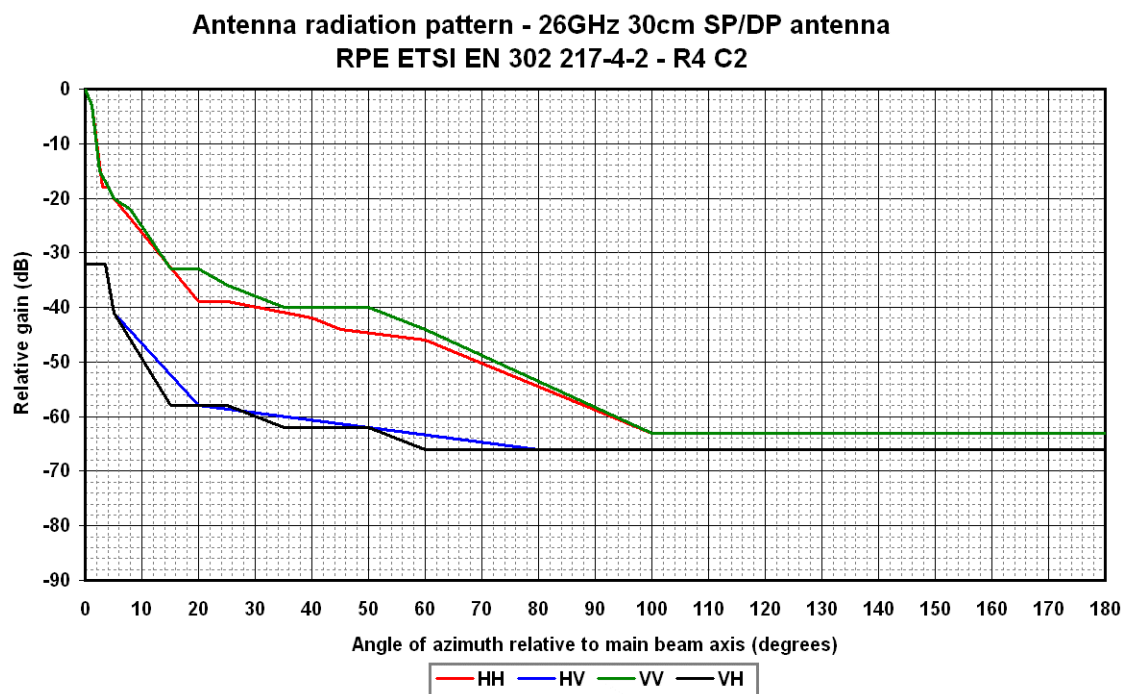


Figure 38. Antenna radiation pattern for 26 GHz, 30 cm antenna

Table 39. Electrical specifications for Nokia FlexiHopper 60 cm antenna at 26 GHz, single

Frequency / Size		(26 GHz); 24250 - 26500 MHz/ 60 cm (2 ft)							
Type, item		Single T55076.02							
Gain		Low 41.4/ Middle 41.8/ High 42.2 dBi (min 41.3/ max 42.3 dBi)							
BW (-3 dB)		1.3 deg							
F/B		68 dB							
XPD/Isolation		30 dB							
RL		17.7 dB							
RPE ETSI EN 302 217-4-2		R4 C2							
Co-Polar						X-Polar			
		Main Beam (dB to dBi by adding 41.8 dBi)							
HH		VV		HH		VV		HV	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi
								deg	dBi

Table 39. Electrical specifications for Nokia FlexiHopper 60 cm antenna at 26 GHz, single (cont.)

0.0	41.8	0.0	41.8	0.0	0.0	0.0	0.0	0.0	11.8	0.0	11.8
0.5	40.3	0.5	40.3	0.5	-1.5	0.5	-1.5	1.5	11.8	1.5	11.8
0.7	38.8	0.7	38.8	0.7	-3.0	0.7	-3.0	5.0	-5.0	5.0	-6.2
1.5	27.8	1.5	26.8	1.5	-14.0	1.5	-15.0	10.0	-18.6	10.0	-15.2
3.0	24.8	3.5	25.8	3.0	-17.0	3.5	-16.0	37.1	-20.2	40.0	-20.2
5.0	15.3	5.0	14.4	5.0	-26.5	5.0	-27.4	60.0	-28.2	60.0	-28.2
8.5	6.8	15.0	3.1					180.0	-28.2	180.0	-28.2
20.0	2.8	30.4	-0.6								
40.0	-1.9	60.0	-5.2								
64.5	-8.2	100.0	-26.2								
76.0	-14.2	180.0	-26.2								
100.0	-26.2										
180.0	-26.2										

Antenna radiation pattern - 26GHz 60cm SP antenna
RPE ETSI EN 302 217-4-2 - R4 C2

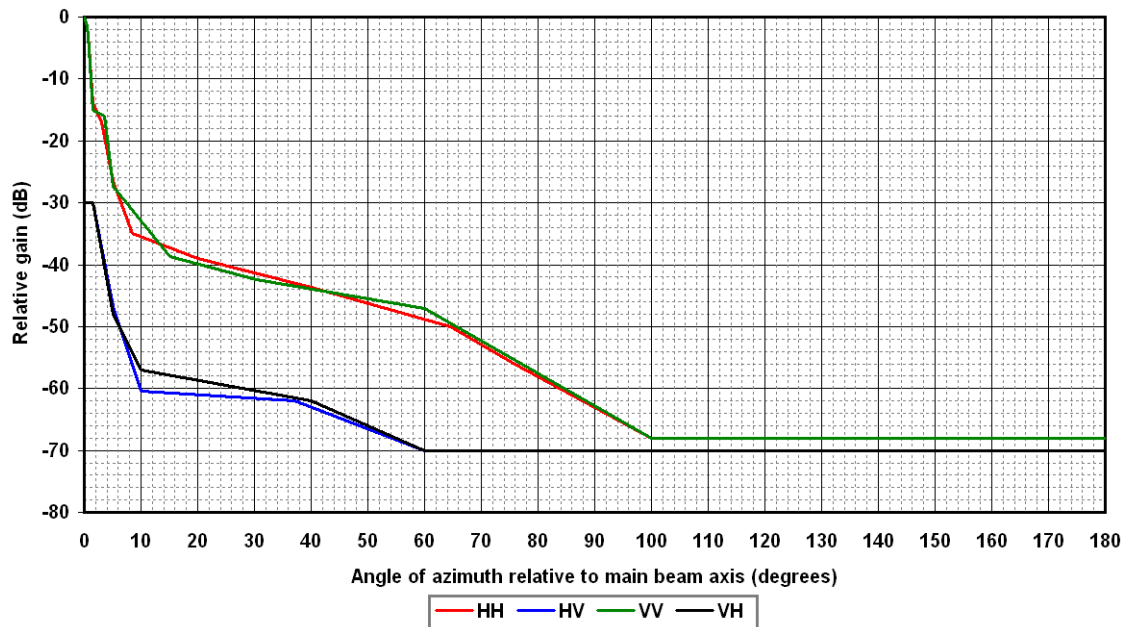


Figure 39. Antenna radiation pattern for 26 GHz, 60 cm antenna, single

Table 40. Electrical specifications for Nokia FlexiHopper 60 cm antenna at 26 GHz, dual

Frequency / Size		(26 GHz); 24250 - 26500 MHz/ 60 cm (2 ft)									
Type, item		Dual T55077.52									
Gain		Low 41.5/ Middle 41.8/ High 42.1 dBi (min 41.5/ max 42.1 dBi)									
BW (-3 dB)		1.3 deg									
F/B		68 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R4 C2									
Co-Polar								X-Polar			
				Main Beam (dB to dBi by adding 41.8 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
0.0	41.8	0.0	41.8	0.0	0.0	0.0	0.0	0.0	9.8	0.0	9.8
0.5	40.3	0.5	40.3	0.5	-1.5	0.5	-1.5	1.5	9.8	1.5	9.8
0.7	38.8	0.7	38.8	0.7	-3.0	0.7	-3.0	5.0	-6.2	5.0	-6.2
1.5	27.8	1.5	25.8	1.5	-14.0	1.5	-16.0	10.0	-20.2	10.0	-20.2
3.0	27.8	3.5	25.8	3.0	-14.0	3.5	-16.0	40.0	-20.2	40.0	-20.2
5.0	16.3	5.0	15.8	5.0	-25.5	5.0	-26.0	60.0	-28.2	60.0	-28.2
7.0	6.8	15.0	1.8					180.0	-28.2	180.0	-28.2
10.0	6.8	60.0	-5.2								
20.0	-2.2	65.0	-7.2								
40.0	-4.2	100.0	-26.2								
50.0	-8.2	180.0	-26.2								
65.0	-8.2										
76.0	-14.2										
80.0	-15.2										
100.0	-26.2										
180.0	-26.2										

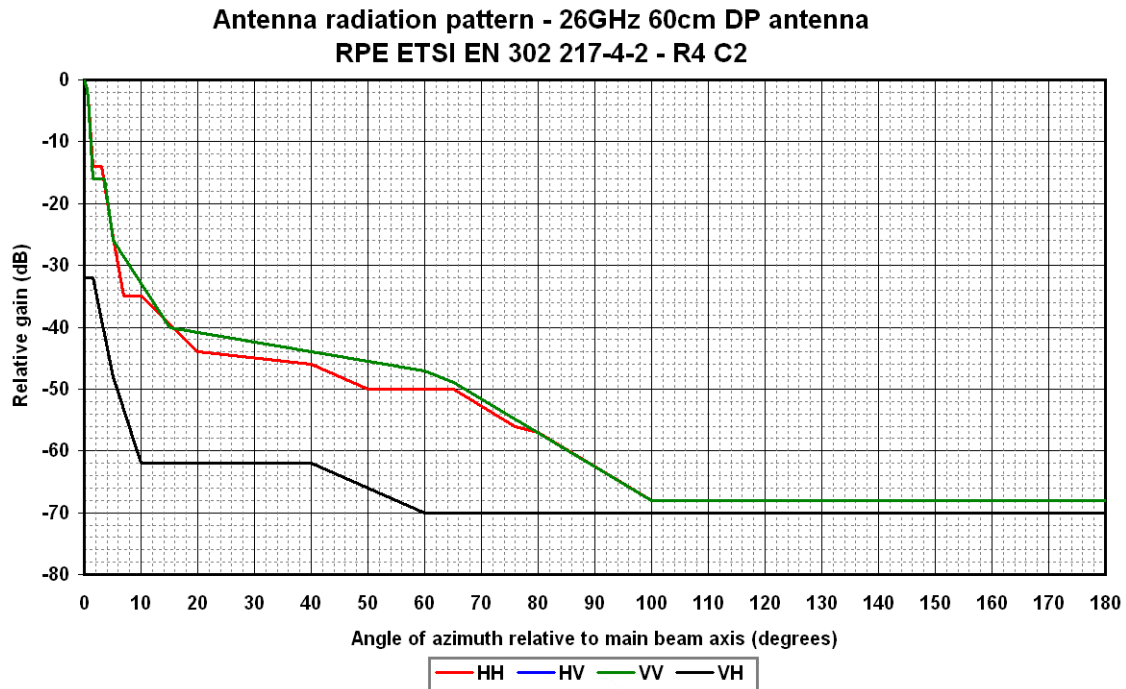


Figure 40. Antenna radiation pattern for 26 GHz, 60 cm antenna, dual

Table 41. Electrical specifications for Nokia FlexiHopper 120 cm antenna at 26 GHz

Frequency / Size		(26 GHz); 24250 - 26500 MHz/ 120 cm (4 ft)									
Type, item		Single T55076.15, Dual T55076.65									
Gain		Low 46.7/ Middle 47.1/ High 47.4 dBi (min 46.7/ max 47.4 dBi)									
BW (-3 dB)		0.7 deg									
F/B		74 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R4 C2									
Co-Polar								X-Polar			
				Main Beam (dB to dBi by adding 47.1 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dBi	deg	dBi	deg	dBi	deg	dBi

Table 41. Electrical specifications for Nokia FlexiHopper 120 cm antenna at 26 GHz (cont.)

0.0	47.1	0.0	47.1	0.0	0.0	0.0	0.0	0.0	15.1	0.0	15.1
0.4	44.1	0.4	44.1	0.4	-3.0	0.4	-3.0	1.0	15.1	1.0	15.1
1.5	27.1	1.5	31.1	1.5	-20.0	1.5	-16.0	5.0	-5.9	5.0	-6.9
2.5	27.1	2.5	31.1	2.5	-20.0	2.5	-16.0	15.0	-13.9	15.0	-17.9
5.0	11.6	5.0	11.6	5.0	-35.5	5.0	-35.5	40.0	-17.9	40.0	-17.9
10.0	4.1	10.0	5.6					80.0	-26.9	80.0	-26.9
15.0	2.6	15.0	2.6					180.0	-26.9	180.0	-26.9
20.0	2.6	25.0	0.6								
25.0	-1.9	60.0	-2.9								
45.0	-1.9	70.0	-7.9								
70.0	-8.9	80.0	-22.9								
80.0	-22.9	100.0	-26.9								
100.0	-26.9	180.0	-26.9								
180.0	-26.9										

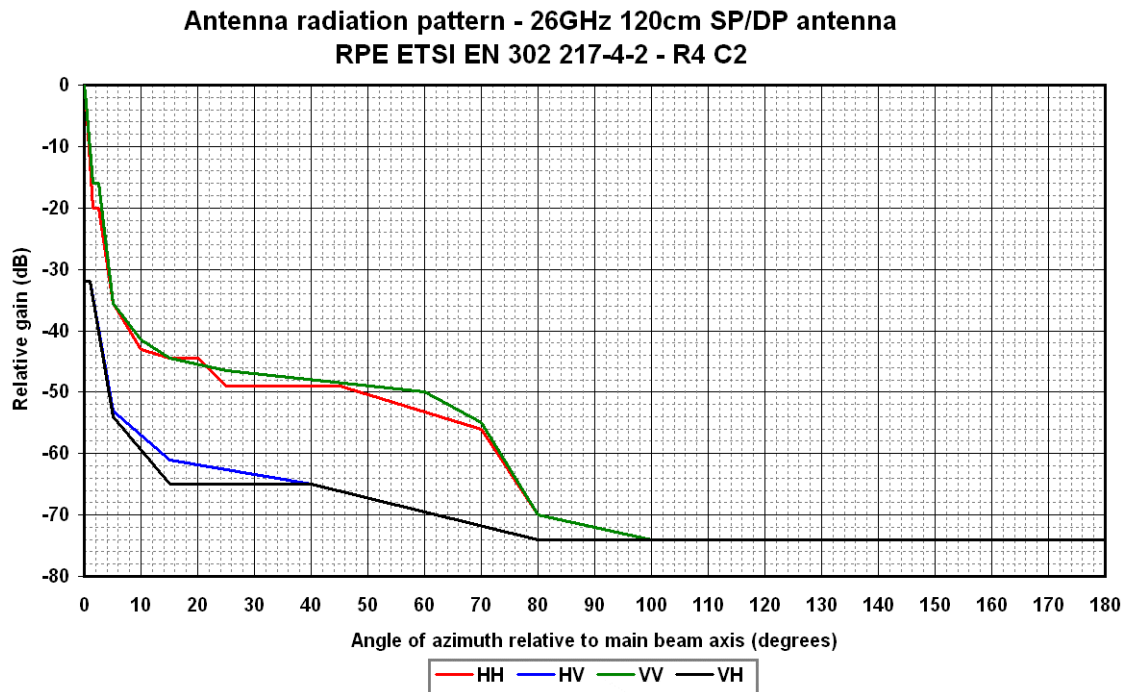


Figure 41. Antenna radiation pattern for 26 GHz, 120 cm antenna

3.8 Electrical specifications for antennas at 28 GHz

Table 42. Electrical specifications for Nokia FlexiHopper (Plus) 30 cm antenna at 28 GHz

Frequency / Size	(28 GHz); 27500-29500 MHz/ 30 cm (1 ft)	
Type, item	Single T55077.01 / Dual T55077.51	
Gain	Low 37.1/ Middle 37.4/ High 37.8 dBi (min 37.1/ max 37.8 dBi)	
BW (-3 dB)	2.1 deg	
F/B	62 dB	
XPD/Isolation	30 dB	
RL	17.7 dB	
RPE ETSI EN 302 217-4-2	R4 C2	
Co-Polar		X-Polar

Table 42. Electrical specifications for Nokia FlexiHopper (Plus) 30 cm antenna at 28 GHz (cont.)

				Main Beam (dB to dBi by adding 37.4 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
0.0	37.4	0.0	37.4	0.0	0.0	0.0	0.0	0.0	5.4	0.0	5.4
1.1	34.4	1.1	34.4	1.1	-3.0	1.1	-3.0	1.1	5.4	1.1	5.4
2.5	20.4	2.5	21.4	2.5	-17.0	2.5	-16.0	5.0	-3.6	5.0	-5.6
4.5	20.4	4.5	21.4	4.5	-17.0	4.5	-16.0	10.0	-12.6	10.0	-12.6
5.0	18.4	5.0	19.4	5.0	-19.0	5.0	-18.0	20.0	-17.6	30.0	-22.6
6.0	15.4	15.0	7.4					40.0	-20.6	70.0	-27.6
7.5	14.4	20.0	2.4					60.0	-22.6	180.0	-27.6
15.0	3.4	35.0	2.4					80.0	-27.6		
20.0	-2.6	45.0	-1.6					180.0	-27.6		
35.0	-2.6	55.0	-2.6								
40.0	-3.6	90.0	-24.6								
55.0	-3.6	180.0	-24.6								
90.0	-24.6										
180.0	-24.6										

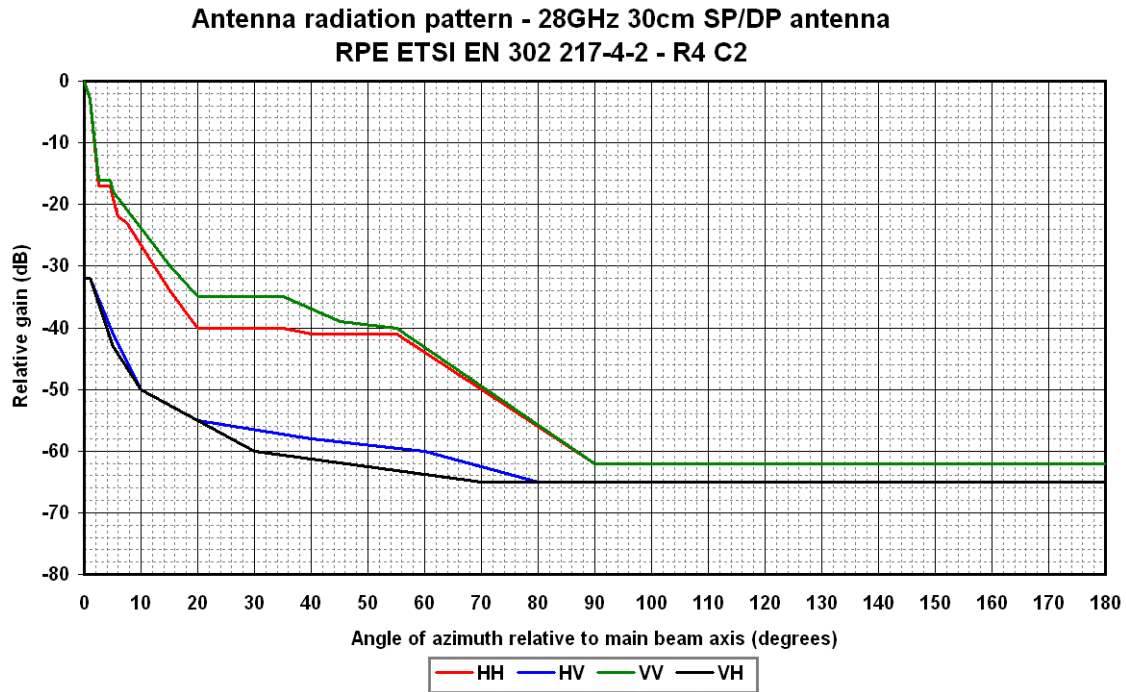


Figure 42. Antenna radiation pattern for 28 GHz, 30 cm antenna

Table 43. Electrical specifications for Nokia FlexiHopper (Plus) 60 cm antenna at 28 GHz

Frequency / Size		(28 GHz); 27500-29500 MHz/ 60 cm (2 ft)									
Type, item		Single T55077.02/ Dual T55077.52									
Gain		Low 42.1/ Middle 42.4/ High 42.7 dBi (min 37.1/ max 37.8 dBi)									
BW (-3 dB)		1.3 deg									
F/B		66 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R4 C2									
Co-Polar						X-Polar					
						Main Beam (dB to dBi by adding 43.0 dBi)					
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi

Table 43. Electrical specifications for Nokia FlexiHopper (Plus) 60 cm antenna at 28 GHz (cont.)

0.0	42.4	0.0	42.4	0.0	0.0	0.0	0.0	0.0	10.4	0.0	10.4
0.7	39.4	0.7	39.4	0.7	-3.0	0.7	-3.0	0.7	10.4	0.7	10.4
2.0	24.4	2.0	24.4	2.0	-18.0	2.0	-18.0	5.0	-7.6	5.0	-7.6
2.5	24.4	3.0	24.4	2.5	-18.0	3.0	-18.0	10.0	-14.6	20.0	-17.6
5.0	12.4	5.0	17.4	5.0	-30.0	5.0	-25.0	20.0	-20.6	60.0	-25.6
10.0	5.4	15.0	2.4					40.0	-22.6	180.0	-25.6
15.0	5.4	30.0	-0.6					60.0	-25.6		
17.0	1.4	40.0	-2.6					180.0	-25.6		
22.0	1.4	55.0	-2.6								
25.0	-2.6	60.0	-3.6								
50.0	-3.6	68.0	-7.6								
65.0	-7.6	90.0	-23.6								
90.0	-23.6	180.0	-23.6								
180.0	-23.6										

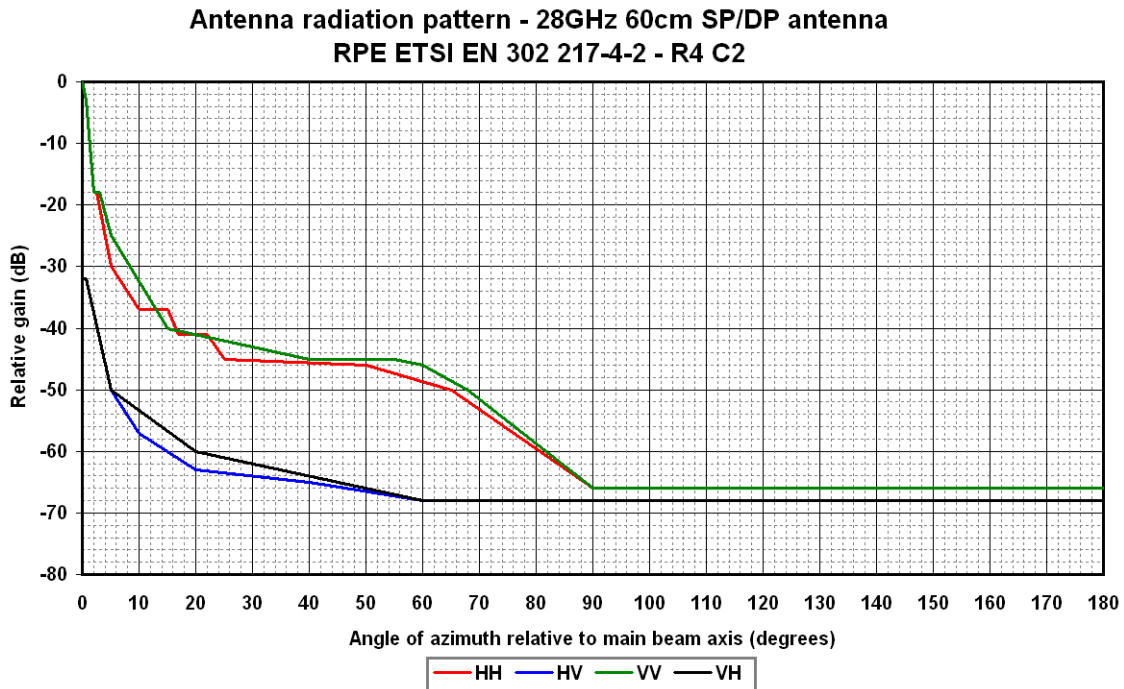


Figure 43. Antenna radiation pattern for 28 GHz, 60 cm antenna

Table 44. Electrical specifications for Nokia FlexiHopper (Plus) 120 cm antenna at 28 GHz

Frequency / Size		(28 GHz); 27500-29500 MHz/ 120 cm (4 ft)									
Type, item		Single T55077.15/ Dual T55077.65									
Gain		Low 47.4/ Middle 47.8/ High 48.1 dBi (min 47.4/ max 48.1 dBi)									
BW (-3 dB)		0.6 deg									
F/B		75 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R4 C2									
Co-Polar								X-Polar			
				Main Beam (dB to dBi by adding 47.8 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dBi	deg	dBi	deg	dBi	deg	dBi

Table 44. Electrical specifications for Nokia FlexiHopper (Plus) 120 cm antenna at 28 GHz (cont.)

0.0	47.8	0.0	47.8	0.0	0.0	0.0	0.0	0.0	17.8	0.0	17.8
0.3	44.8	0.3	44.8	0.3	-3.0	0.3	-3.0	0.5	17.8	0.5	17.8
0.5	40.8	0.5	38.8	0.5	-7.0	0.5	-9.0	5.0	-3.2	5.0	-3.2
1.0	31.8	1.0	30.8	1.0	-16.0	1.0	-17.0	20.0	-14.2	10.0	-12.2
1.5	31.8	2.0	17.8	1.5	-16.0	2.0	-30.0	40.0	-20.2	20.0	-16.2
2.0	17.8	5.0	15.8	2.0	-30.0	5.0	-32.0	60.0	-22.2	40.0	-19.2
2.5	12.8	7.0	7.8	2.5	-35.0			90.0	-29.2	80.0	-29.2
5.0	12.8	15.0	6.8	5.0	-35.0			180.0	-29.2	180.0	-29.2
7.0	5.8	17.5	3.8								
10.0	5.8	25.0	3.8								
20.0	1.3	30.0	1.8								
35.0	0.8	37.0	1.8								
40.0	-1.2	40.0	0.8								
45.0	-1.2	50.0	0.3								
60.0	-4.2	52.0	-0.7								
68.0	-7.2	55.0	-1.2								
70.0	-9.2	60.0	-4.2								
90.0	-27.2	71.0	-11.2								
180.0	-27.2	90.0	-27.2								
		180.0	-27.2								

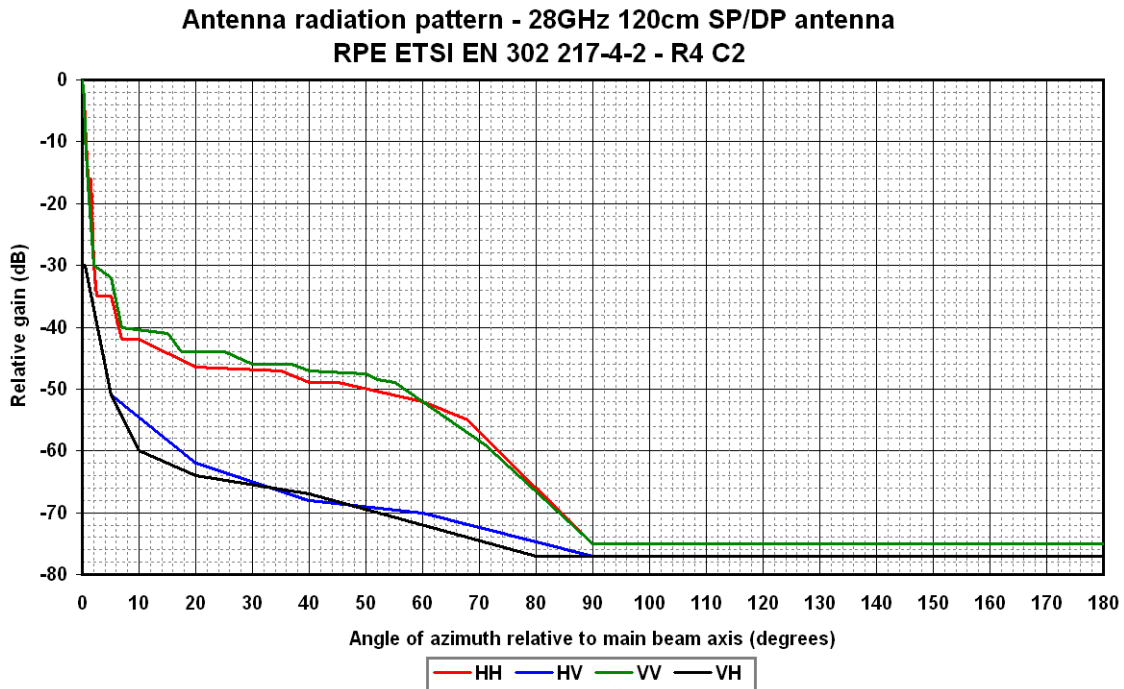


Figure 44. Antenna radiation pattern for 28 GHz, 120 cm antenna

3.9 Electrical specifications for antennas at 32 GHz

Table 45. Electrical specifications for Nokia FlexiHopper (Plus) 20 cm antenna at 32 GHz

Frequency / Size	(32 GHz); 31800-33400 MHz/ 20 cm (Square)	
Type, item	Single T55079.03	
Gain	Low 33.4/ Middle 33.8/ High 34.2 dBi	
BW (-3 dB)	3.3 deg	
F/B	60 dB	
XPD/Isolation	30 dB	
RL	17.7 dB	
RPE ETSI EN 300 833 V1.4.1	R5 C2	
Co-Polar	X-Polar	

Table 45. Electrical specifications for Nokia FlexiHopper (Plus) 20 cm antenna at 32 GHz (cont.)

				Main Beam (dB to dBi by adding 34.2 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
5	18.3	5	20.8	0	0	0	0	0	3.8	0	3.8
15	5.8	15	5.8	0.8	-1	0.8	-1	3	3.8	3	3.8
25	5.8	40	-6.2	1.65	-3	1.65	-3	5	-6.2	5	1.8
30	-2.2	55	-10.2	3.5	-15	3.5	-13	10	-11.2	10	-2.2
55	-3.2	90	-26.2					20	-12.2	15	-11.2
90	-24.2	180	-26.2					40	-21.2	40	-13.2
140	-26.2							50	-26.2	50	-21.2
180	-26.2							180	-26.2	60	-22.2
										80	-26.2
										180	-26.2

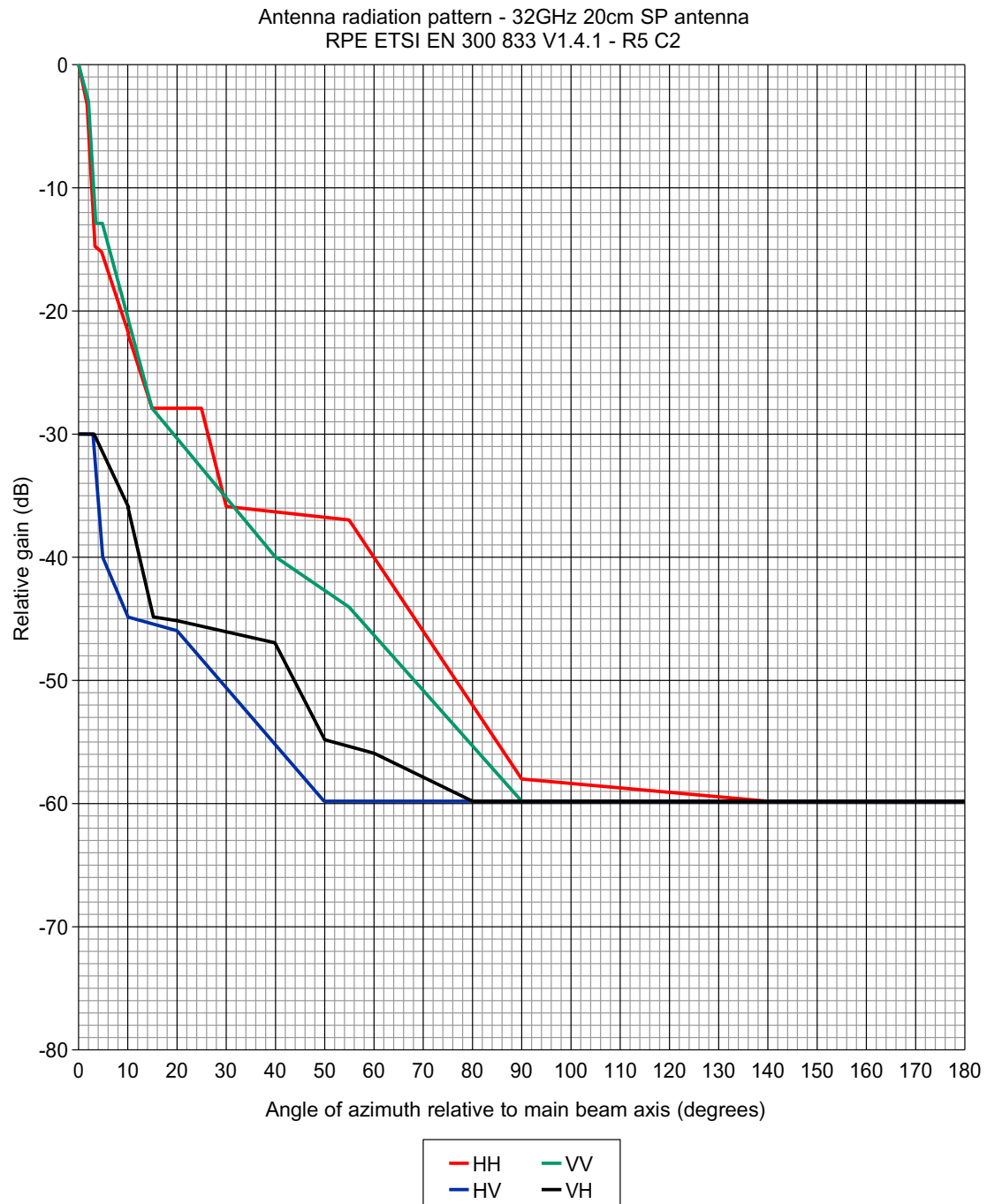


Figure 45. Antenna radiation pattern for 32 GHz, 20 cm antenna

Table 46. Electrical specifications for Nokia FlexiHopper (Plus) 30 cm antenna at 32 GHz

Frequency / Size		(32 GHz); 31800 - 33400 MHz/ 30 cm (1 ft)									
Type, item		Single T55079.01/ Dual T55079.51									
Gain		Low 37.7/ Middle 38.0/ High 38.2 dBi (min 37.7/ max 38.2 dBi)									
BW (-3 dB)		2.0 deg									
F/B		60 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R5 C3ab									
Co-Polar						X-Polar					
				Main Beam (dB to dBi by adding 38.0 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
0.0	38.0	0.0	38.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	8.0
1.0	35.0	1.0	35.0	1.0	-3.0	1.0	-3.0	2.5	8.0	2.5	8.0
1.5	28.0	2.5	28.0	1.5	-10.0	2.5	-10.0	5.0	-5.0	5.0	-5.0
3.0	27.0	4.0	18.0	3.0	-11.0	4.0	-20.0	15.0	-16.0	10.0	-13.0
5.0	15.0	5.0	15.0	5.0	-23.0	5.0	-23.0	60.0	-22.0	50.0	-22.0
10.0	7.0	7.0	7.0					180.0	-22.0	180.0	-22.0
15.0	5.0	10.0	7.0								
20.0	-3.0	14.0	4.5								
60.0	-8.0	17.0	-3.5								
85.0	-20.0	33.0	-5.5								
90.0	-22.0	39.0	-8.0								
180.0	-22.0	60.0	-10.0								
		70.0	-13.0								
		80.0	-22.0								
		180.0	-22.0								

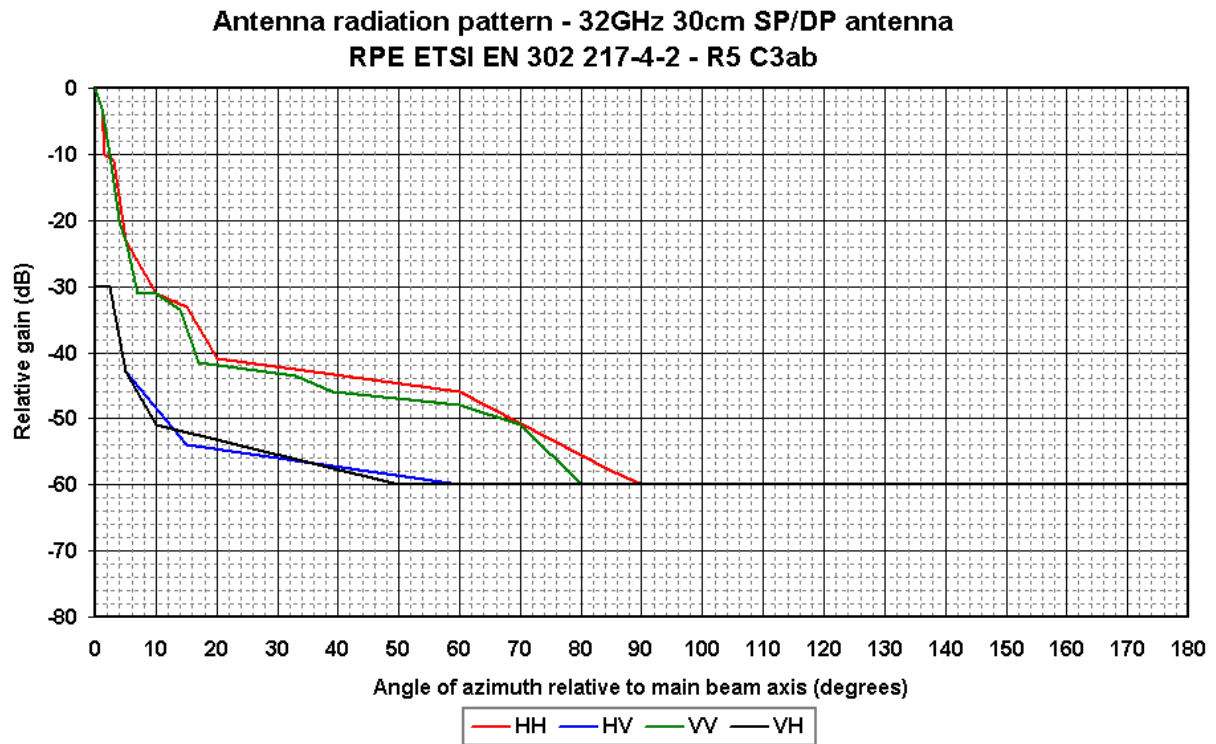


Figure 46. Antenna radiation pattern for 32 GHz, 30 cm antenna

Table 47. Electrical specifications for Nokia FlexiHopper (Plus) 60 cm antenna at 32 GHz

Frequency / Size	(32 GHz); 31800 - 33400 MHz/ 60 cm (2 ft)	
Type, item	Single T55079.02/ Dual T55079.52	
Gain	Low 42.7/ Middle 43.0/ High 43.2 dBi (min 42.7/ max 43.2 dBi)	
BW (-3 dB)	1.1 deg	
F/B	63 dB	
XPD/Isolation	30 dB	
RL	17.7 dB	
RPE ETSI EN 302 217-4-2	R5 C3ab	
Co-Polar	X-Polar	

Table 47. Electrical specifications for Nokia FlexiHopper (Plus) 60 cm antenna at 32 GHz (cont.)

				Main Beam (dB to dBi by adding 43.0 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
0.0	43.0	0.0	43.0	0.0	0.0	0.0	0.0	0.0	13.0	0.0	13.0
0.6	40.0	0.6	40.0	0.6	-3.0	0.6	-3.0	2.5	13.0	2.5	13.0
3.0	23.0	2.5	23.0	3.0	-20.0	2.5	-20.0	5.0	-5.0	5.0	-5.0
5.0	13.0	5.0	13.0	5.0	-30.0	5.0	-30.0	15.0	-17.0	15.0	-17.0
10.0	3.0	10.0	6.0					60.0	-20.0	60.0	-20.0
20.0	0.0	17.0	1.0					180.0	-20.0	180.0	-20.0
25.0	-1.0	30.0	-4.5								
55.0	-2.0	40.0	-7.0								
60.0	-3.0	60.0	-9.5								
75.0	-8.0	80.0	-20.0								
90.0	-20.0	180.0	-20.0								
180.0	-20.0										

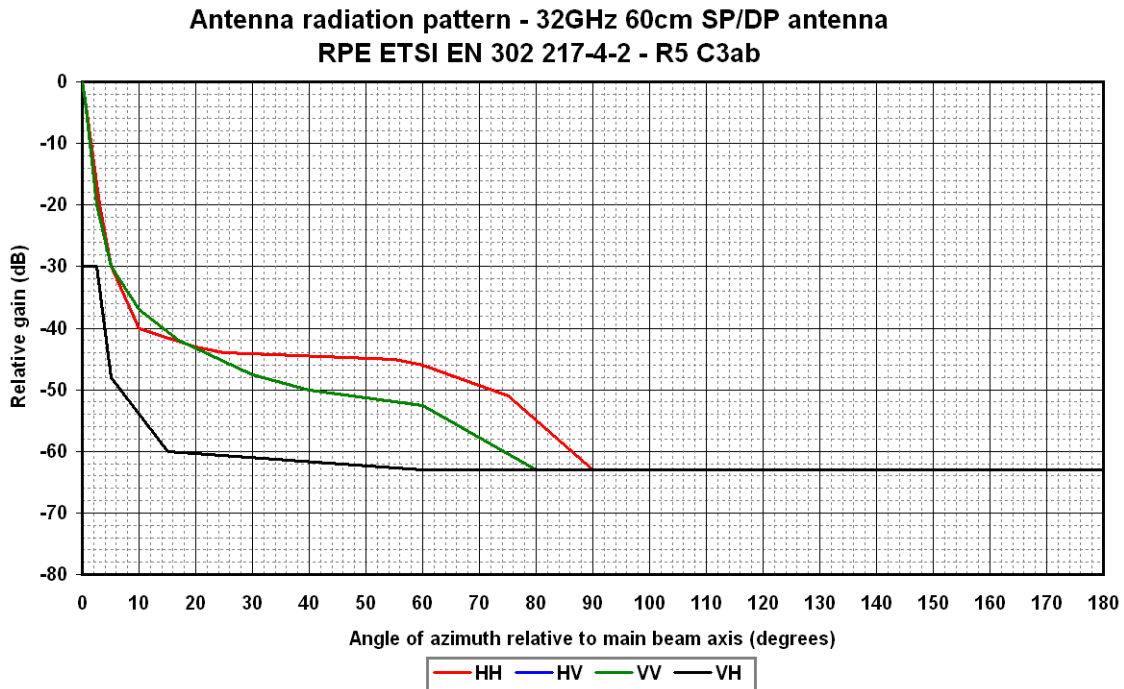


Figure 47. Antenna radiation pattern for 32 GHz, 60 cm antenna

3.10 Electrical specifications for antennas at 38 GHz

Table 48. Electrical specifications for Nokia FlexiHopper (Plus) 20 cm antenna at 38 GHz

Frequency / Size	(38 GHz); 37000 - 39500 MHz/ 20 cm (Square)	
Type, item	Single T55078.03	
Gain	Low 34.4/ Middle 35.0/ High 35.4 dBi (min 34.2/ max 35.6 dBi)	
BW (-3 dB)	2.7 deg	
F/B	56 dB	
XPD/Isolation	30 dB	
RL	17.7 dB	
RPE ETSI EN 300 833 V1.4.1	R5 C2, C3a	
Co-Polar	X-Polar	

Table 48. Electrical specifications for Nokia FlexiHopper (Plus) 20 cm antenna at 38 GHz (cont.)

				Main Beam (dB to dBi by adding 35.6 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
5	23	5	13	0	0	0	0	0	5	0	5
10	8	14	5	0.5	-0.5	0.5	-0.5	1.35	5	5	0
17	4	18	0	1.5	-3.6	1.5	-3.6	5	1	10	-5
30	3.5	25	-3	3.5	-12	2	-6	10	-5	30	-15
40	0	30	-8	5	-12	3	-15	50	-15	50	-15
52	-2	55	-9			4	-15	80	-20	80	-20
90	-18	65	-13			5	-22	180	-20	180	-20
180	-20	75	-20								
		180	-20								

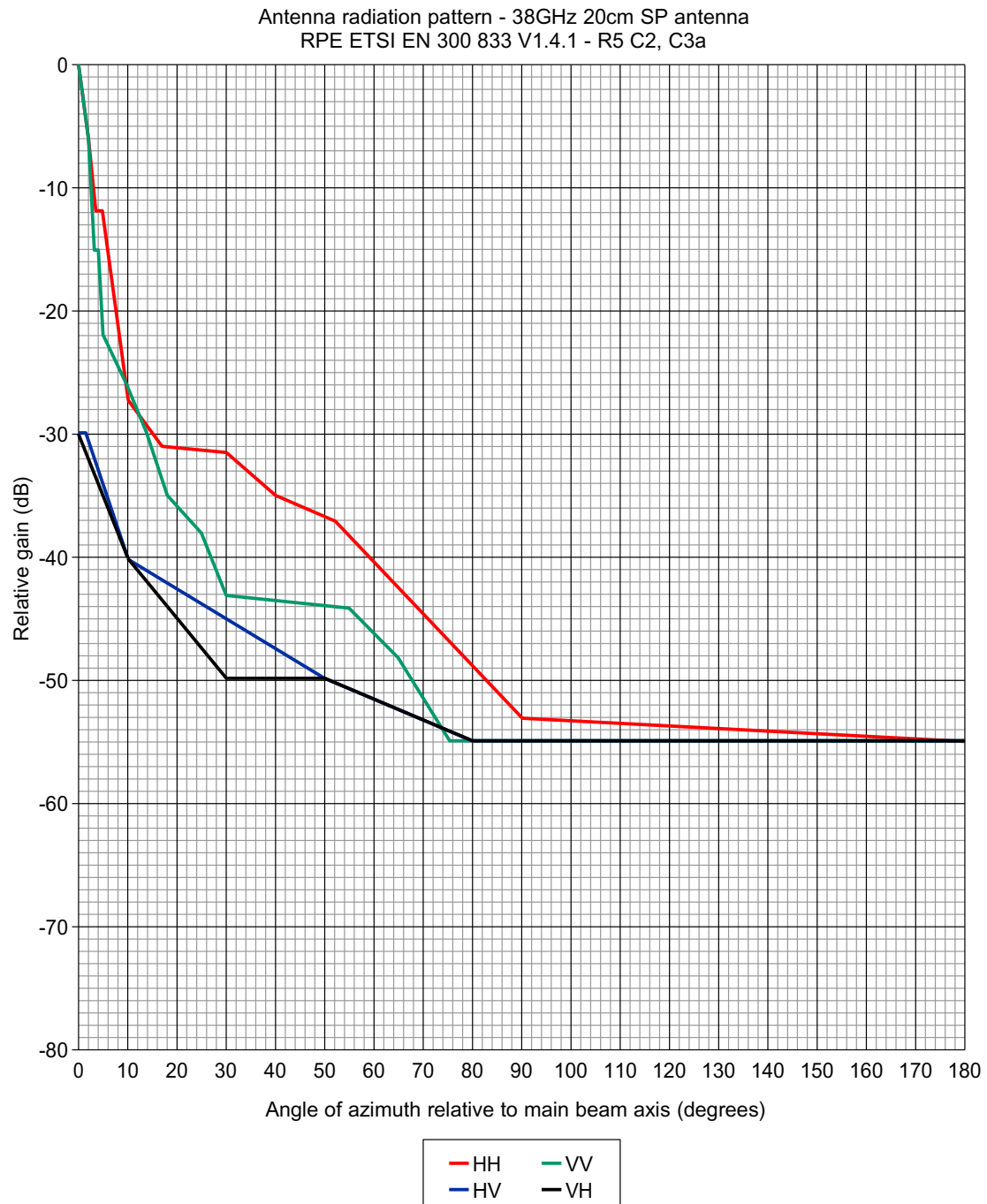


Figure 48. Antenna radiation pattern for 38 GHz, 20 cm antenna

Table 49. Electrical specifications for Nokia FlexiHopper (Plus) 30 cm antenna at 38 GHz

Frequency / Size		(38 GHz); 37000 - 39500 MHz/ 30 cm (1 ft)									
Type, item		Single T55078.01/ Dual T55078.51									
Gain		Low 39.2/ Middle 39.4/ High 39.7 dBi (min 39.2/ max 39.7 dBi)									
BW (-3 dB)		1.7 deg									
F/B		64 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R5 C3abc)									
Co-Polar						X-Polar					
				Main Beam (dB to dBi by adding 39.4 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
0.0	39.4	0.0	39.4	0.0	0.0	0.0	0.0	0.0	9.4	0.0	9.4
0.9	36.4	0.9	36.4	0.9	-3.0	0.9	-3.0	1.0	9.4	1.0	9.4
2.0	23.4	1.5	25.4	2.0	-16.0	1.5	-14.0	5.0	-5.6	5.0	-5.6
3.5	23.4	2.5	22.4	3.5	-16.0	2.5	-17.0	10.0	-12.6	10.0	-18.6
5.0	13.9	3.5	22.4	5.0	-25.5	3.5	-17.0	20.0	-20.6	15.0	-20.6
6.5	9.4	5.0	9.4			5.0	-30.0	62.0	-22.6	40.0	-22.6
8.0	9.4	8.0	7.4					80.0	-26.6	80.0	-26.6
9.0	3.4	9.0	2.4					180.0	-26.6	180.0	-26.6
12.0	3.4	13.0	1.4								
15.0	-1.6	14.0	-1.6								
25.0	-1.6	18.0	-1.6								
65.0	-10.6	20.0	-2.6								
80.0	-20.6	25.0	-3.6								
90.0	-24.6	26.0	-5.6								
180.0	-24.6	30.0	-5.6								
		31.0	-6.6								
		35.0	-6.6								
		36.0	-8.6								
		42.0	-8.6								
		45.0	-10.6								

Table 49. Electrical specifications for Nokia FlexiHopper (Plus) 30 cm antenna at 38 GHz (cont.)

		51.5	-11.1								
		57.0	-14.6								
		62.0	-14.6								
		70.0	-20.6								
		80.0	-24.6								
		180.0	-24.6								

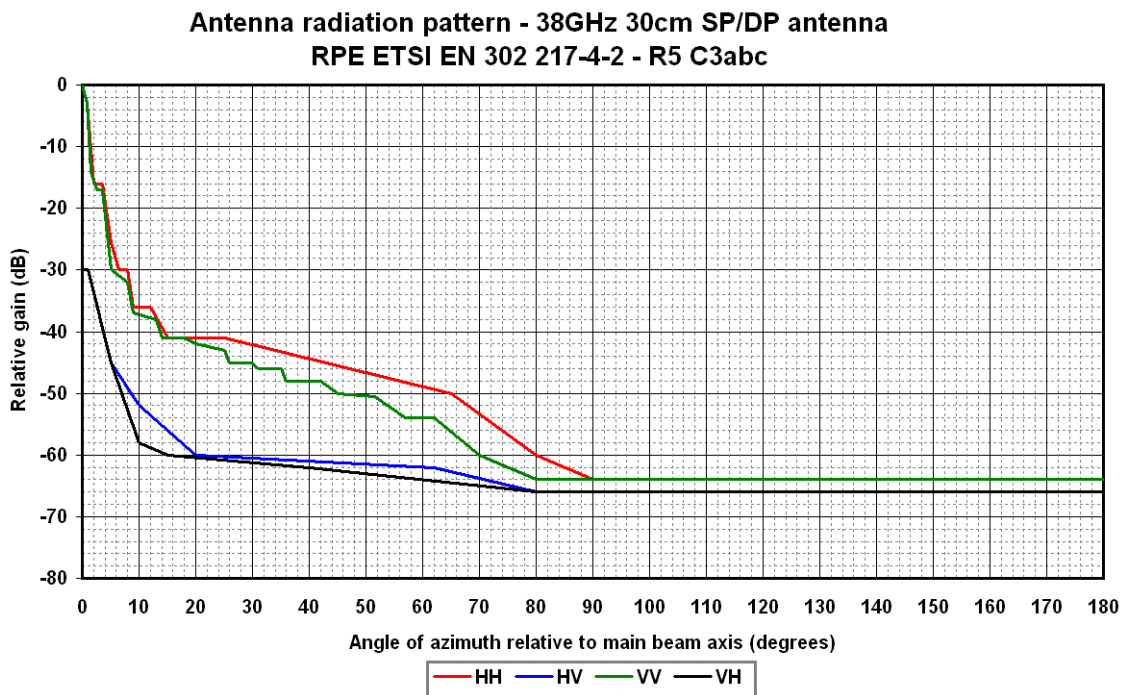


Figure 49. Antenna radiation pattern for 38 GHz, 30 cm antenna

Table 50. Electrical specifications for Nokia FlexiHopper (Plus) 60 cm antenna at 38 GHz, single

Frequency / Size	(38 GHz); 37000 - 39500 MHz/ 60 cm (2 ft)
Type, item	Single T55078.02
Gain	Low 44.6/ Middle 44.9/ High 45.2 dBi (min 44.5/ max 45.3 dBi)

Table 50. Electrical specifications for Nokia FlexiHopper (Plus) 60 cm antenna at 38 GHz, single (cont.)

BW (-3 dB)				0.9 deg							
F/B				66 dB							
XPD/Isolation				30 dB							
RL				17.7 dB							
RPE ETSI EN 302 217-4-2				R5 C3bc)							
Co-Polar								X-Polar			
				Main Beam (dB to dBi by adding 44.9 dBi)							
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi
0.0	44.9	0.0	44.9	0.0	0.0	0.0	0.0	0.0	15.0	0.0	15.0
0.5	40.7	0.5	40.7	0.5	-4.3	0.5	-4.0	0.5	15.0	0.5	15.0
1.0	28.7	1.0	30.4	1.0	-16.3	1.0	-14.5	5.0	-4.0	5.0	-4.0
2.0	28.1	2.0	29.8	2.0	-16.8	2.0	-15.1	20.0	-10.9	15.0	-10.5
5.0	11.4	5.0	10.1	5.0	-33.5	5.0	-34.8	40.0	-13.9	70.0	-19.2
10.0	1.7	9.0	4.6					80.0	-22.0	90.0	-21.2
22.1	-1.1	15.0	2.5					180.0	-22.0	180.0	-21.2
40.0	-2.9	19.5	-3.2								
52.0	-7.1	30.5	-5.5								
70.0	-8.8	43.5	-7.9								
90.0	-21.2	70.0	-17.5								
180.0	-21.2	85.0	-21.2								
		180.0	-21.2								

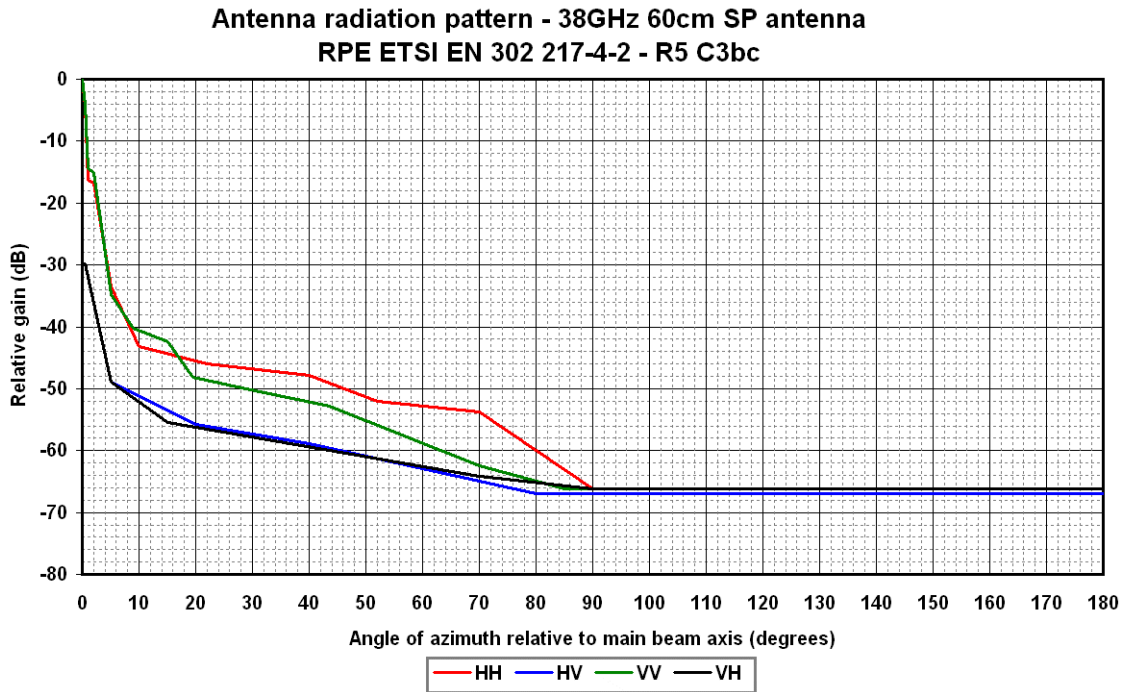


Figure 50. Antenna radiation pattern for 38 GHz, 60 cm antenna, single

Table 51. Electrical specifications for Nokia FlexiHopper (Plus) 60 cm antenna at 38 GHz, dual

Frequency / Size		(38 GHz); 37000 - 39500 MHz/ 60 cm (2 ft)									
Type, item		Dual T55078.52									
Gain		Low 44.5/ Middle 44.8/ High 45.1 dBi (min 44.5/ max 45.1 dBi)									
BW (-3 dB)		0.9 deg									
F/B		66 dB									
XPD/Isolation		30 dB									
RL		17.7 dB									
RPE ETSI EN 302 217-4-2		R5 C3abc									
Co-Polar						X-Polar					
						Main Beam (dB to dBi by adding 44.8 dBi)					
HH		VV		HH		VV		HV		VH	
deg	dBi	deg	dBi	deg	dB	deg	dB	deg	dBi	deg	dBi

Table 51. Electrical specifications for Nokia FlexiHopper (Plus) 60 cm antenna at 38 GHz, dual (cont.)

0.0	44.8	0.0	44.8	0.0	0.0	0.0	0.0	0.0	14.8	0.0	14.8
0.5	41.8	0.5	41.8	0.5	-3.0	0.5	-3.0	0.5	14.8	0.5	14.8
1.0	30.8	1.0	30.8	1.0	-14.0	1.0	-14.0	5.0	-10.2	5.0	-10.2
2.0	30.8	2.0	30.8	2.0	-14.0	2.0	-14.0	20.0	-15.2	15.0	-15.2
5.0	6.8	5.0	6.8	5.0	-38.0	5.0	-38.0	40.0	-20.2	70.0	-19.2
7.0	4.8	7.0	4.8					80.0	-23.2	90.0	-21.2
9.0	-1.2	9.0	-1.2					180.0	-23.2	180.0	-21.2
15.0	-1.2	15.0	-1.2								
17.0	-3.2	17.0	-3.2								
24.0	-3.2	24.0	-3.2								
30.0	-7.2	30.0	-7.2								
39.0	-7.2	39.0	-7.2								
42.0	-10.7	42.0	-10.7								
50.0	-11.2	50.0	-11.2								
70.0	-18.2	70.0	-18.2								
80.0	-21.2	80.0	-21.2								
180.0	-21.2	180.0	-21.2								

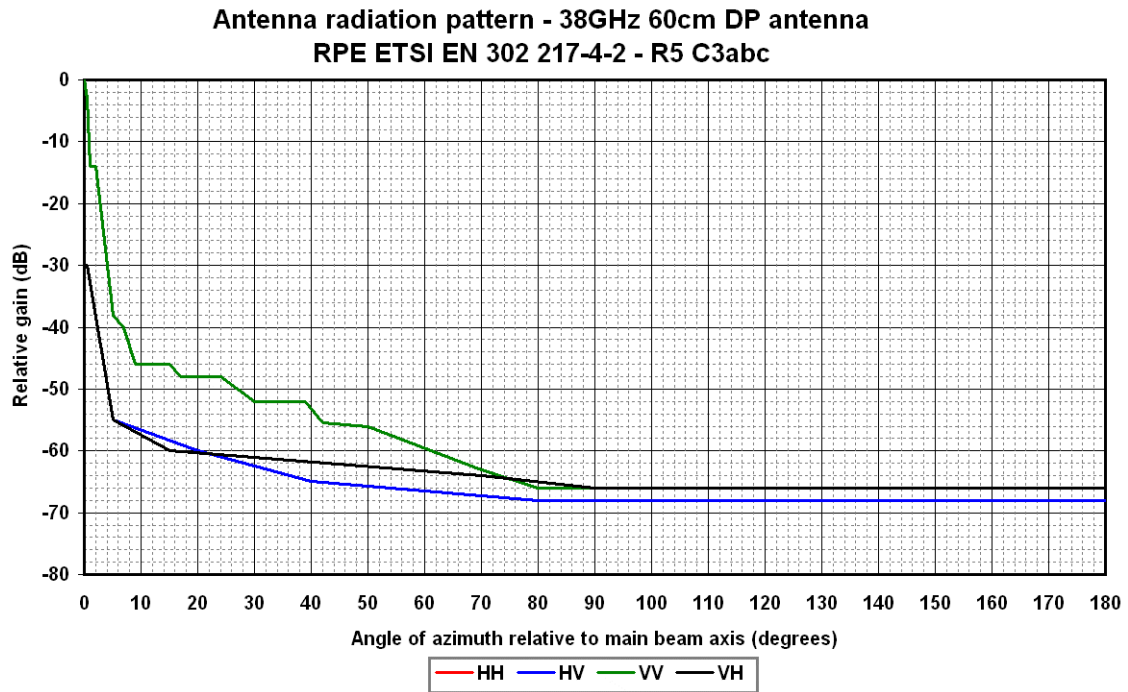


Figure 51. Antenna radiation pattern for 38 GHz, 60 cm antenna, dual



Nokia FlexiHopper (Plus) 2.7 antennas, alignment units and electrical specifications

4 Adjustment, dimensions, and installation options

Table 52. Antenna adjustment ranges, weight, and pole diameter

	Alignment unit T55050.01	Alignment unit as a part of the antenna		
Antenna size (cm)	20/30/60	90	120	180
Horizontal coarse (deg)	360	360		
Horizontal fine (deg)	-15...+15	-10...+10	-15...+15	
Vertical coarse (deg)	-25 0 +25			
Vertical fine (deg)	-45...0 -25...+25 0...+45	-10...+10		
Weight (kg)	5.2	Incl. in antenna weight		
Pole diameter (mm)	50 - 125	115		

Table 53. Antenna weights and dimensions

Antenna size (cm)	Weight without mounting (kg)	Weight with mounting (kg)	Diameter (mm)	Depth (mm)
20	2.5		256 x 246 (square)	120
30	3		390	165
60	6		690	255
90	-	32.2 - 63.1	889 - 890	485 - 655

Table 53. Antenna weights and dimensions (cont.)

Antenna size (cm)	Weight without mounting (kg)	Weight with mounting (kg)	Diameter (mm)	Depth (mm)
120	-	82 - 135	1250 - 1262	631 - 695
180	-	154 - 239	1910 - 1920	900 - 980
240	-	200 ¹⁾	2500-2616	1455 - 1475
300	-	250 ²⁾	3100 - 3170	1300 - 1645
Notes: 1) The packaged weight of a 240 cm antenna for 7 - 8 GHz is 227 - 376 kg, for 13 GHz is 376 - 461 kg, and for 15 GHz is 376 kg. 2) The packaged weight of a 300 cm antenna for 7 - 8 GHz is 261-550 kg.				

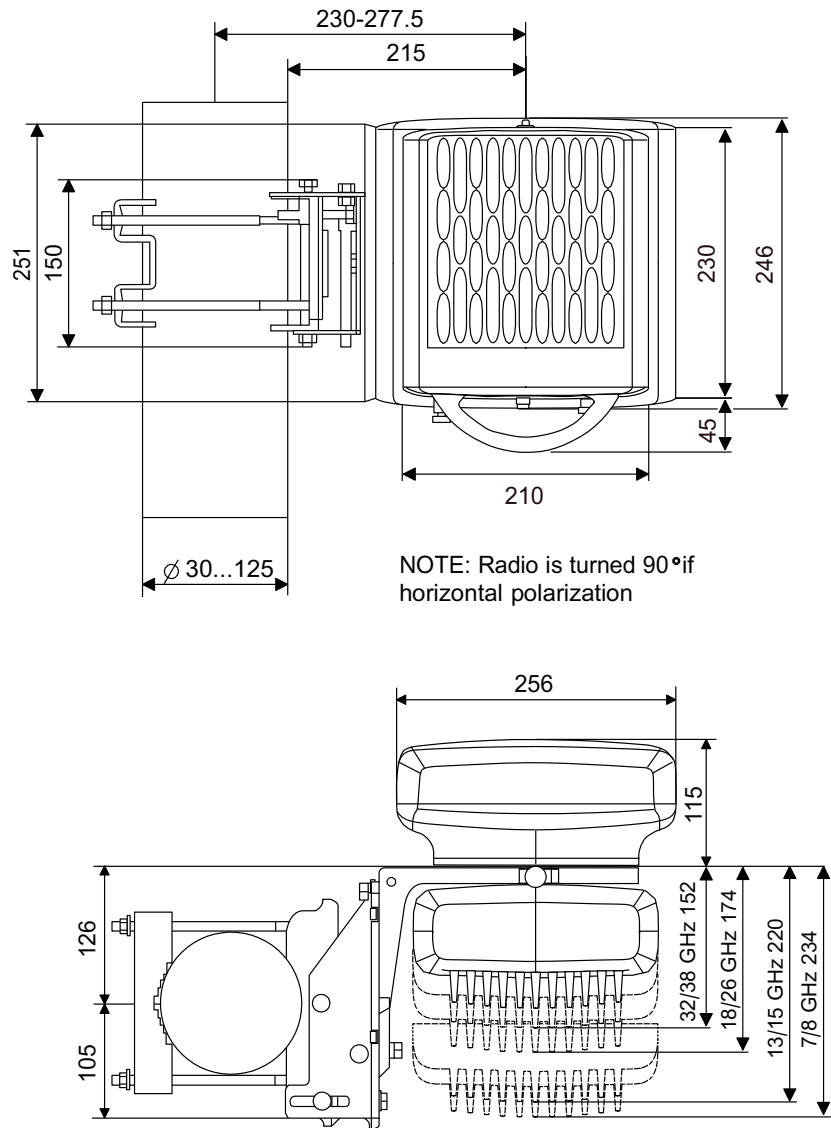


Figure 52. Outdoor unit with 20 cm square radome antenna (dimensions in mm)

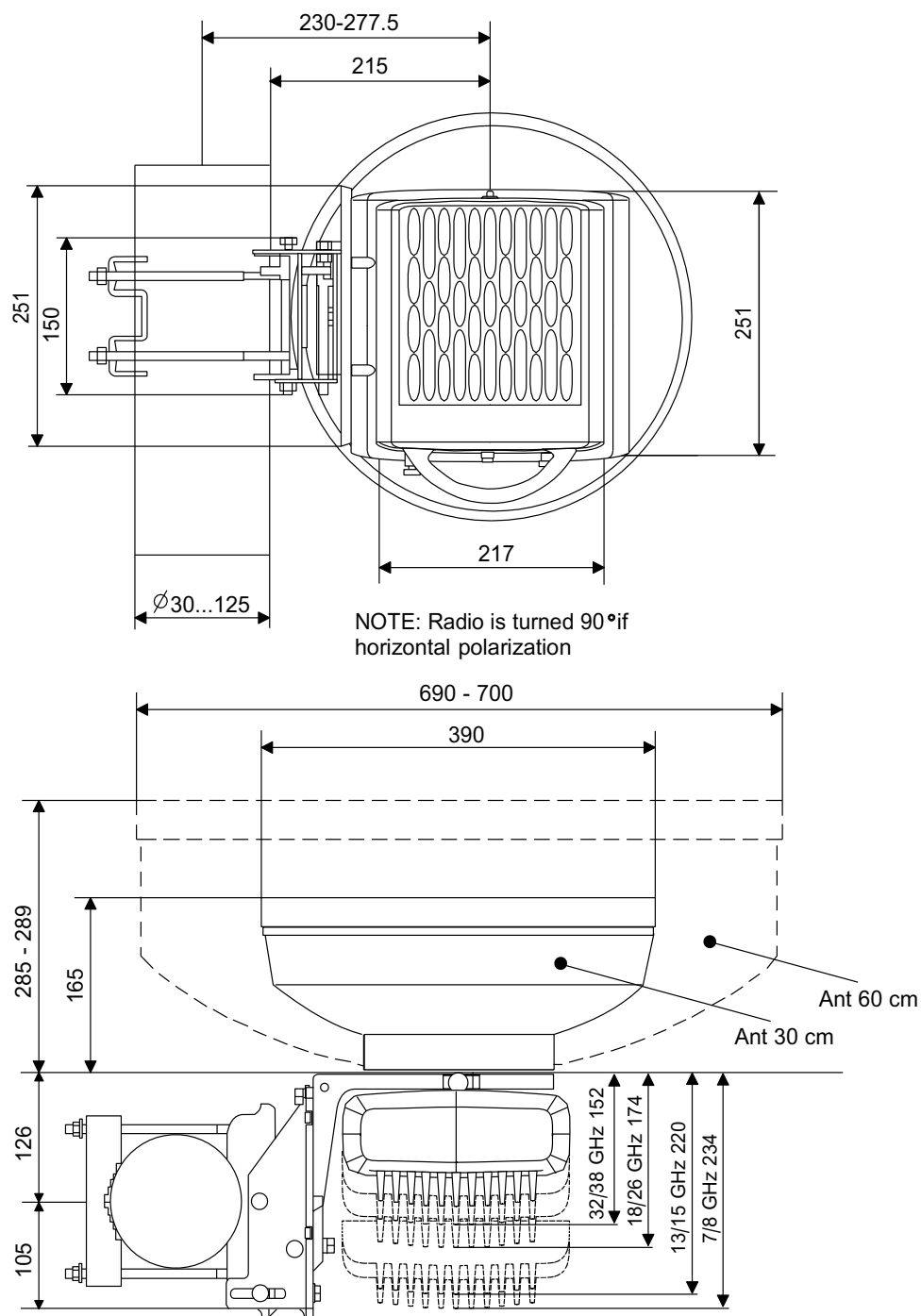


Figure 53. Outdoor unit with 30 or 60 cm antenna (dimensions in mm)

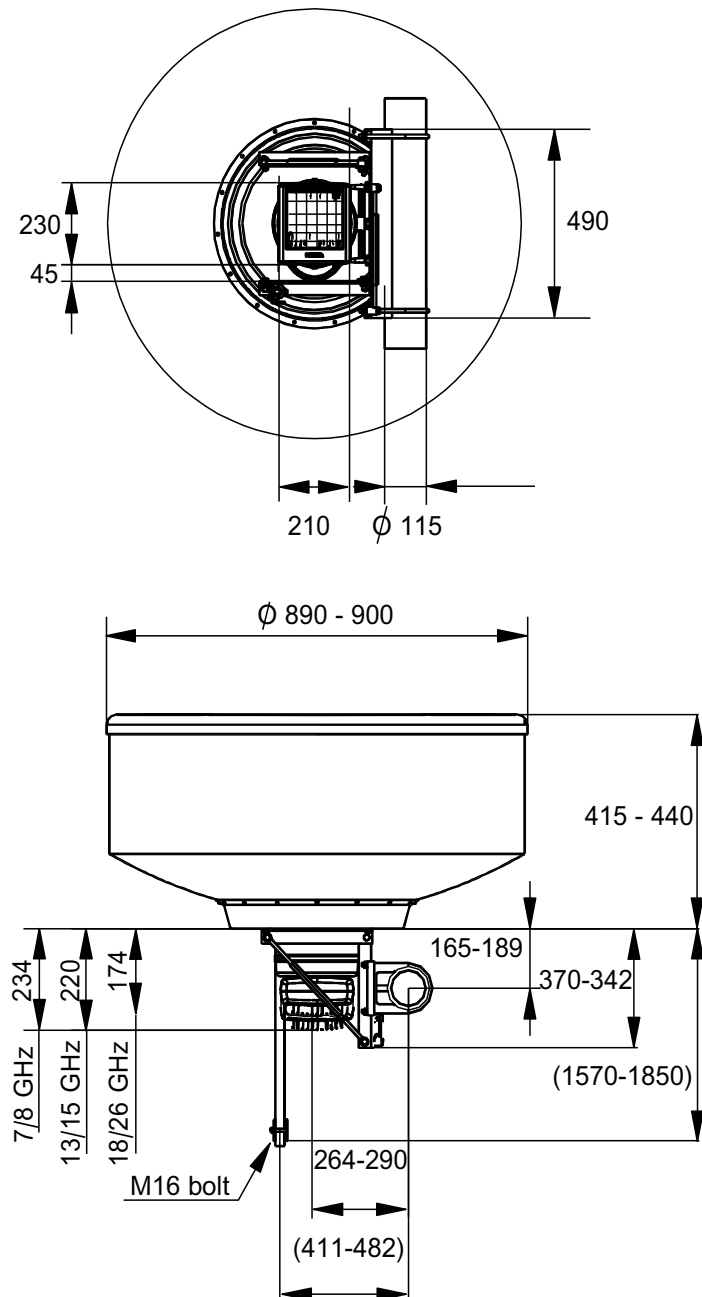


Figure 54. Outdoor unit with 90 cm antenna (dimensions in mm)

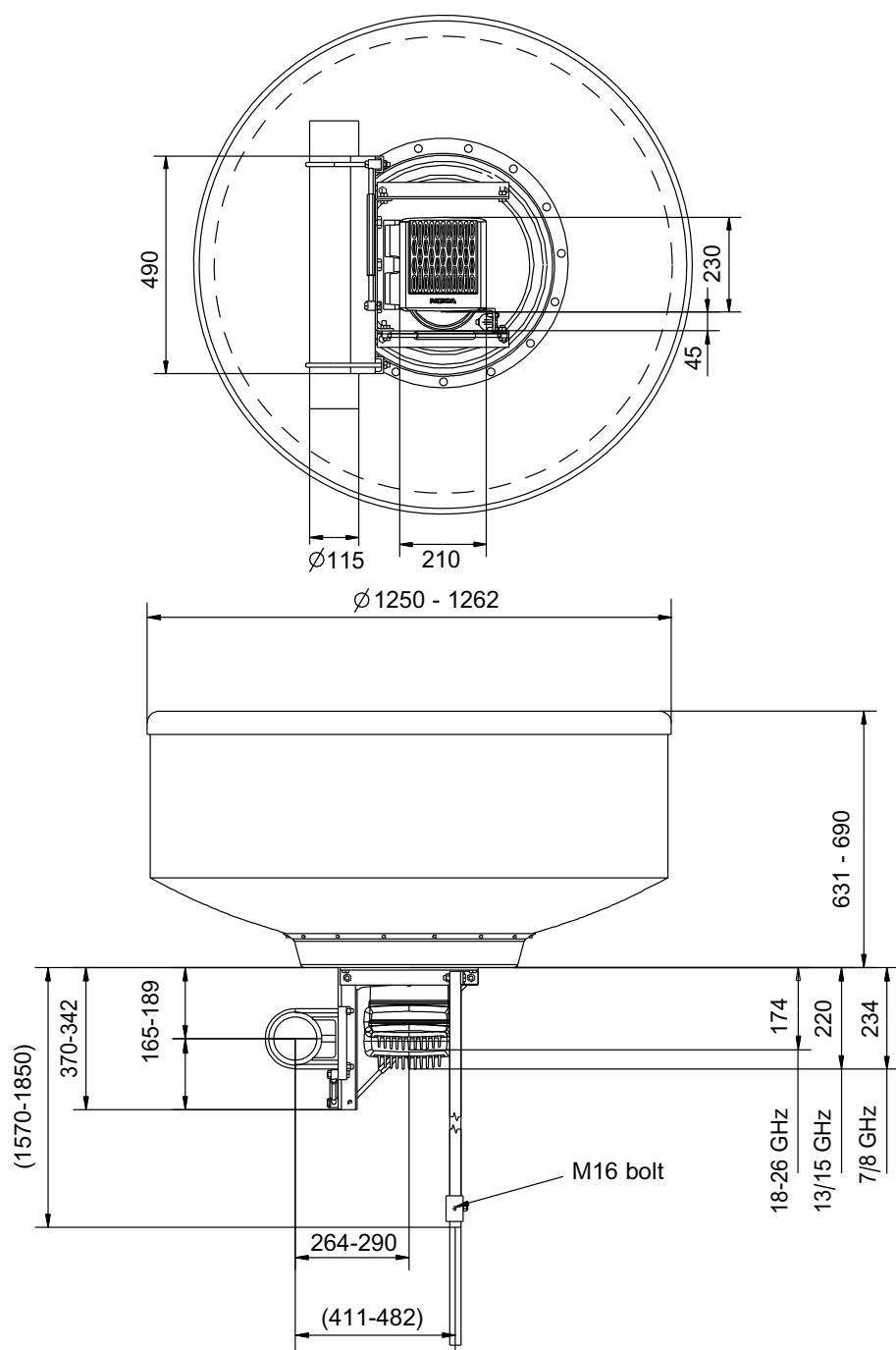


Figure 55. Outdoor unit with 120 cm antenna (dimensions in mm)

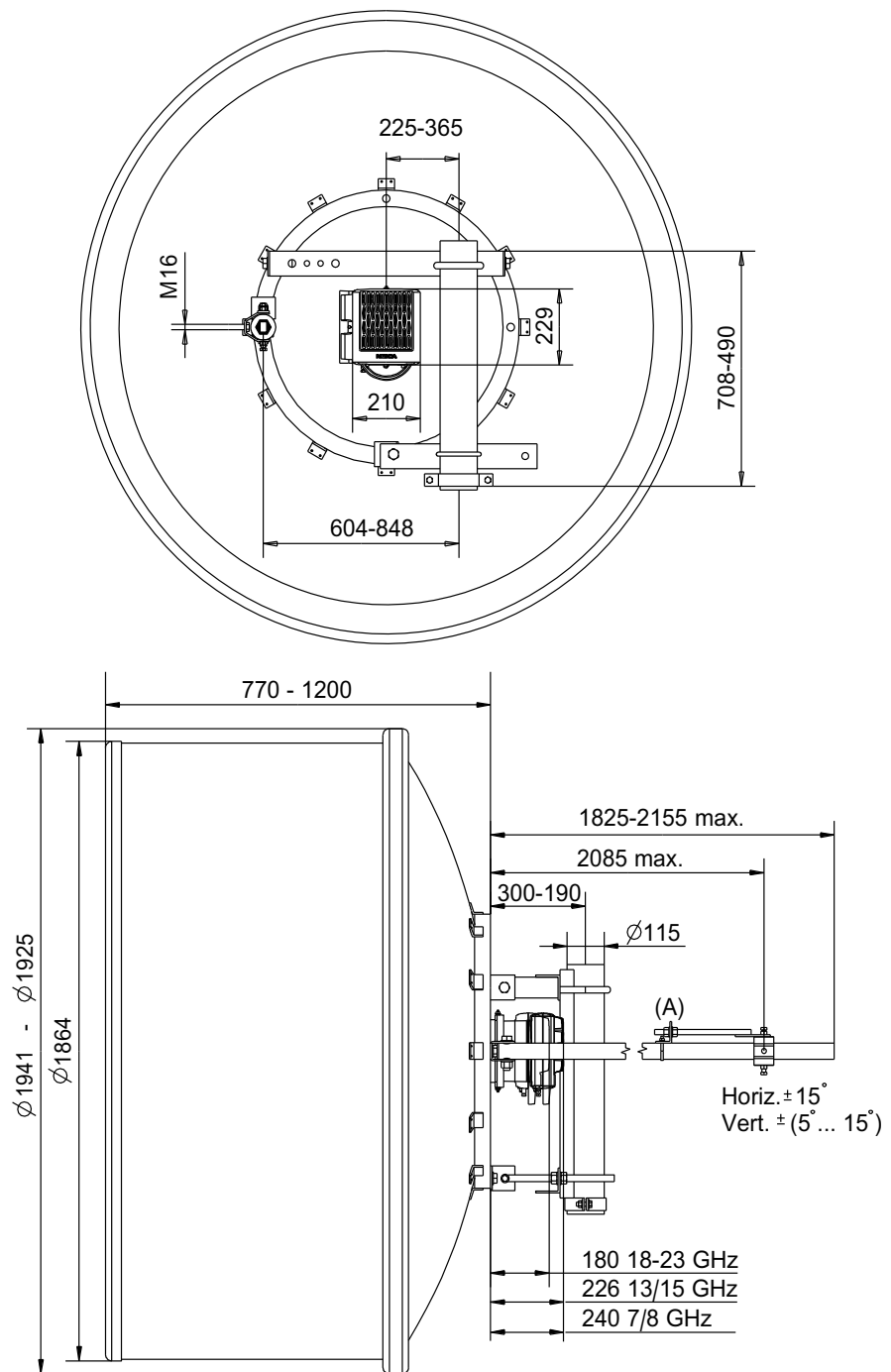


Figure 56. Outdoor unit with 180 cm antenna (dimensions in mm)

5

Directional coupler for 1-antenna HSB

Table 54. Insertion losses of the directional coupler

Frequency band	Insertion loss (radio to antenna) in dB	
	Radio 1 (Lower)	Radio 2 (Upper)
7, 8 GHz	1.4 ± 0.4	6.2 ± 0.7
13 GHz	1.4 ± 0.4	6.2 ± 0.7
15 GHz	1.4 ± 0.4	6.2 ± 0.7
18 GHz	1.5 ± 0.4	6.3 ± 0.7
23 GHz	1.5 ± 0.4	6.4 ± 0.7
26 GHz	1.5 ± 0.4	6.5 ± 0.7
28 GHz	1.7 ± 0.4	6.5 ± 0.7
32 GHz	1.7 ± 0.4	6.5 ± 0.7
38 GHz	1.8 ± 0.4	6.6 ± 0.7

1 m Flexible waveguide shall be used in only two installation setups:

- a separate antenna (radio installed separately and connected to a antenna with flexible waveguide)
- Dual polarisation antennas

Table 55. Attenuation in a flexible waveguide (1 m)

Frequency band	Attenuation max (dB)
7, 8 GHz	0.3
13 GHz	0.6
15 GHz	0.9
18 GHz	1.2

Table 55. Attenuation in a flexible waveguide (1 m) (cont.)

Frequency band	Attenuation max (dB)
23 GHz	1.4
26 GHz	1.6
28 GHz	2.0
32 GHz	2.0
38 GHz	2.2

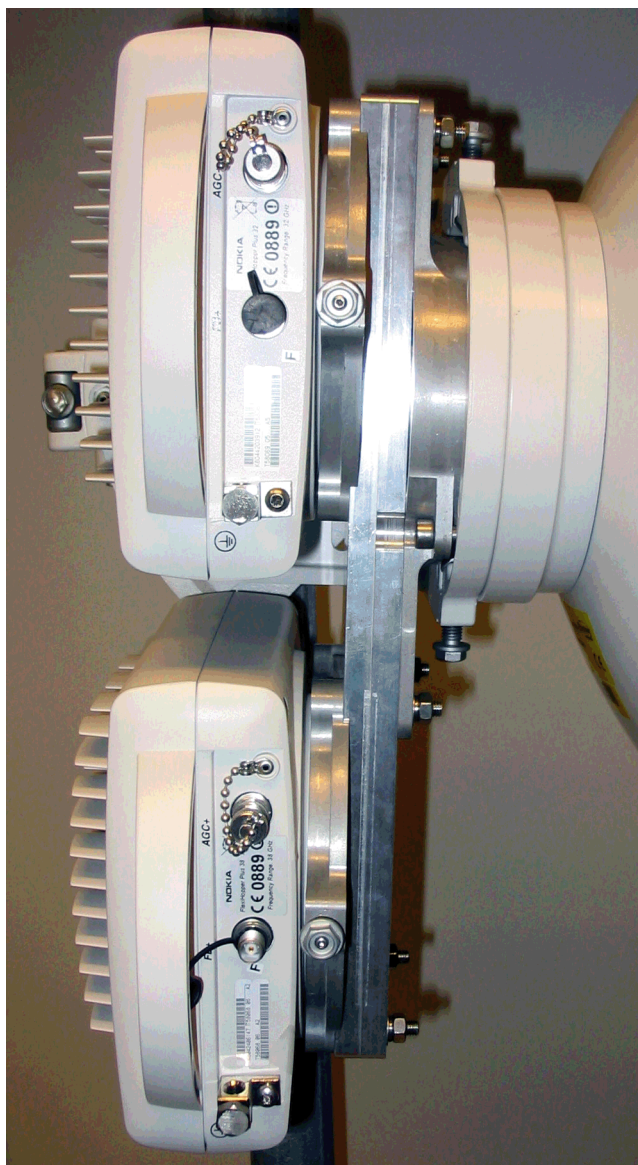


Figure 57. Nokia FlexiHopper (Plus) in 1-antenna HSB operation

Table 56. Coupler dimensions

Frequency band	Height	Width	Depth	Weight
7-8 GHz	432 mm	212 mm	81.5 mm	<6 kg

Table 56. Coupler dimensions (cont.)

Frequency band	Height	Width	Depth	Weight
13-38 GHz	432 mm	212 mm	71.5 mm	<6 kg

6 Wind load

Table 57. Wind forces and momentums affecting the installation pole

Antenna diameter (cm)	Wind velocity (m/s)	F_A (N)	F_S (N)	M_T (Nm)
20	55	170	90	46
	40	90	50	24
30	55	335	150	90
	40	177	80	48
60	55	935	446	252
	40	495	236	133
90	55	1100	490	310
	40	580	260	165
120	55	3290	1665	1055
180	55	6129	3095	2776
240	55	12380	6350	5960
300	55	19370	9590	10240
F_A is the force affecting the pole from the direction of the antenna. F_S is the force affecting the pole from the side. M_T is the maximum momentum twisting the antenna around the pole.				