

# Wave Enhance AT-322

## Antenna Specification

### SmartLink and Sidewalk FSK operating in 902-928MHz band

(Proprietary sub-GHz protocol, SRD multi-band radio,)

**Type of antenna:** shared fixed internal antenna;

**Antenna gain:** 1.5 dBi

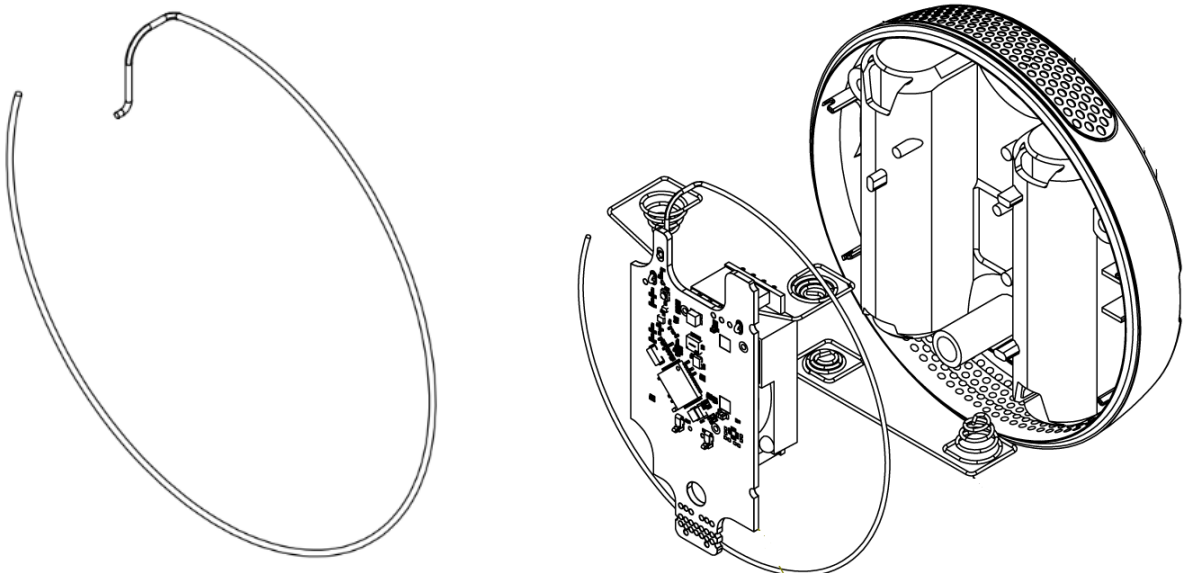
### Bluetooth operating in 2402~2480MHz band

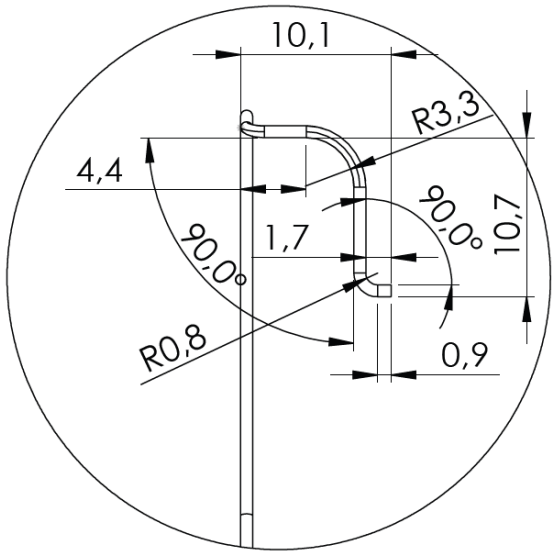
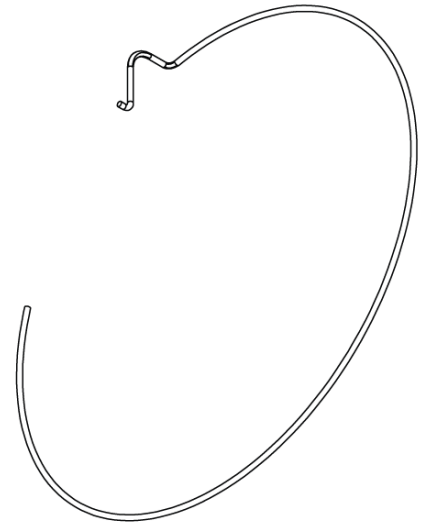
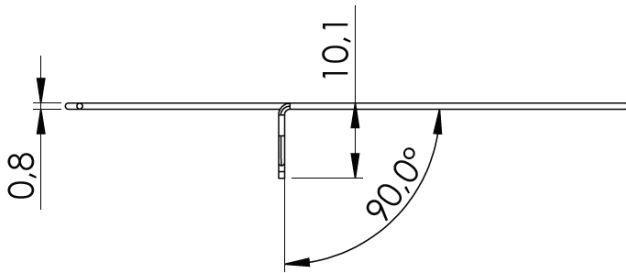
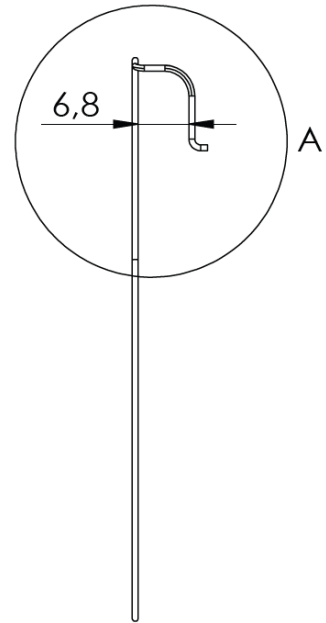
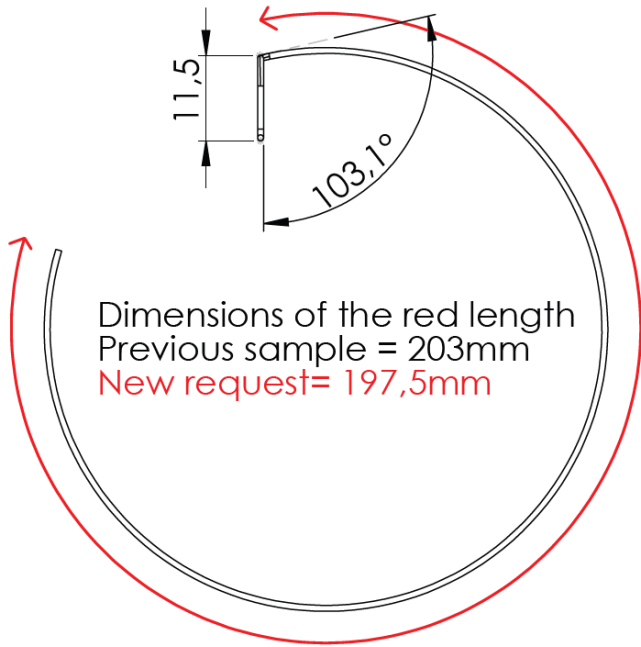
**Type of antenna:** shared fixed internal antenna;

**Antenna gain:** 3.6 dBi

Device	AT-322	
	322	
	915 MHz	2440 MHz
Conducted (dBm)	12.00	4.45
TRP (dBm)	10.13	3.55
Peak EIRP (dBm)	13.48	8.00
Directivity (dBm)	3.34	4.45
Efficiency (dB)	-1.87	-0.90
Gain (dBi)	1.48	3.55

Shared fixed internal antenna is an integrated  $5/8$  lambda wire antenna that is soldered onto the board and slotted in around the perimeter of the product housing.





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Good soldering is mandatory

915MHz

			dBm	
		Conducted	12	
		Calculated from mW:		
		TRP (mW)	10.31	
		TRP (dBm)	10.13	
		Peak EIRP (dBm)	13.48	
		Directivity (dBm)	3.34	
		Efficiency (dB)	-1.87	
		Gain (dBi)	1.48	

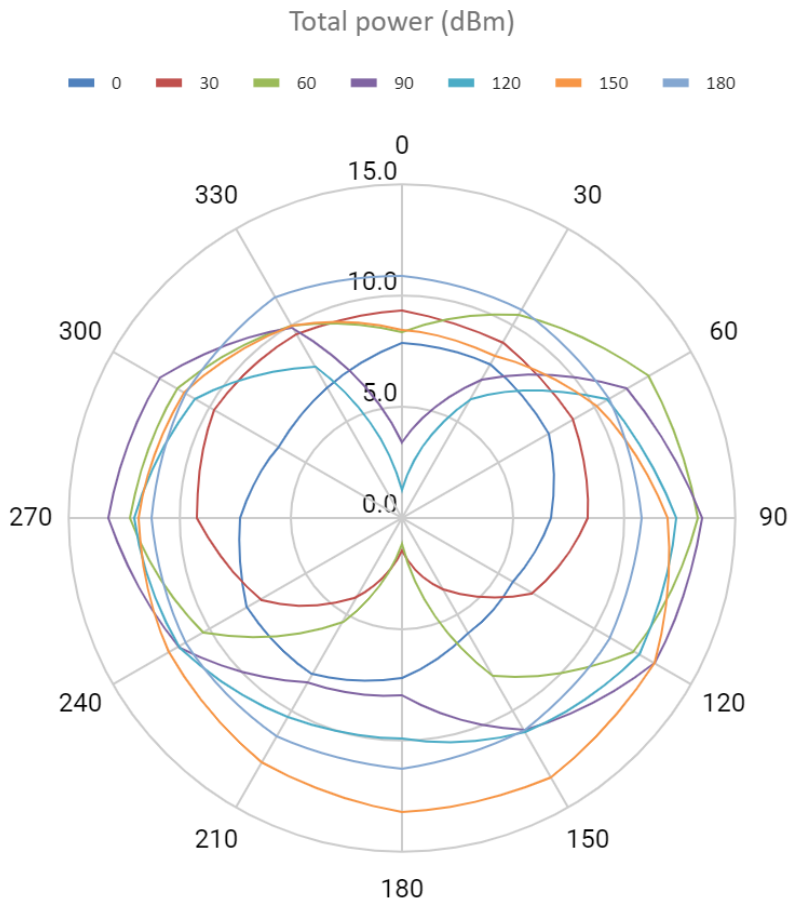
$$TPR = \frac{1}{(N_{th} N_{ph})} \sum_{i=0}^{N_{th}-1} \sum_{j=0}^{N_{ph}-1} EIRP(i, j)$$

Horiz Power (dBm)	0	30	60	90	120	150	180
0	7.70E+00	9.07E+00	8.07E+00	3.27E+00	1.22E+00	8.38E+00	1.07E+01
30	6.05E+00	7.86E+00	7.23E+00	3.47E+00	8.59E-01	6.95E+00	9.82E+00
60	1.44E+00	4.63E+00	6.05E+00	4.47E+00	3.02E-01	1.01E-01	5.62E+00
90	-1.73E+01	-1.46E+00	4.10E+00	5.86E+00	3.40E+00	-2.09E+00	-1.28E+01
120	-3.25E-02	-7.12E+00	1.66E+00	7.01E+00	7.11E+00	8.24E+00	3.77E+00
150	5.32E+00	-1.46E+00	1.76E-01	7.63E+00	9.25E+00	1.19E+01	9.43E+00
180	6.89E+00	-9.92E-02	3.58E-01	7.60E+00	9.86E+00	1.31E+01	1.11E+01
210	5.98E+00	-3.08E+00	1.16E+00	7.27E+00	9.33E+00	1.23E+01	1.03E+01
240	1.82E+00	-2.77E+01	2.58E+00	6.65E+00	7.69E+00	9.48E+00	6.42E+00
270	-1.14E+01	-4.80E-01	4.52E+00	5.73E+00	4.25E+00	3.10E+00	-7.75E+00
300	1.71E-01	5.52E+00	6.24E+00	4.80E+00	-7.81E-01	-1.81E+00	2.86E+00
330	5.55E+00	7.98E+00	7.35E+00	4.33E+00	-1.28E+00	4.74E+00	8.89E+00
360	7.70E+00	9.07E+00	8.07E+00	3.27E+00	1.22E+00	8.38E+00	1.07E+01

Vert Power (dBm)							
0	-5.32E+00	-3.85E+00	-3.78E+00	-1.31E+01	-1.60E+01	-8.43E+00	-4.57E+00
30	3.53E+00	2.82E+00	7.80E+00	4.76E+00	4.72E+00	2.94E+00	3.97E+00
60	6.46E+00	6.83E+00	1.17E+01	1.07E+01	1.02E+01	9.61E+00	9.19E+00
90	6.68E+00	7.93E+00	1.28E+01	1.26E+01	1.18E+01	1.18E+01	1.07E+01
120	4.43E+00	6.57E+00	1.16E+01	1.19E+01	1.08E+01	1.14E+01	9.86E+00
150	-2.57E+00	2.17E+00	7.42E+00	8.37E+00	6.50E+00	8.10E+00	5.84E+00
180	-4.25E+00	-3.68E+00	-6.36E+00	-3.14E+00	-6.43E+00	-1.06E+00	-3.86E+00
210	4.00E+00	3.28E+00	3.24E+00	2.52E+00	3.29E+00	1.41E+00	4.53E+00
240	6.88E+00	7.33E+00	9.56E+00	9.92E+00	9.35E+00	8.76E+00	9.55E+00
270	7.23E+00	8.72E+00	1.14E+01	1.23E+01	1.13E+01	1.13E+01	1.12E+01
300	5.21E+00	7.78E+00	1.02E+01	1.18E+01	1.04E+01	1.11E+01	1.05E+01
330	7.29E-01	4.23E+00	6.49E+00	8.45E+00	7.23E+00	8.44E+00	8.00E+00
360	-5.32E+00	-3.85E+00	-3.78E+00	-1.31E+01	-1.60E+01	-8.43E+00	-4.57E+00

Total Power (dBm)							
	0	30	60	90	120	150	180
0	7.9	9.3	8.3	3.4	1.3	8.5	10.8
30	8.0	9.0	10.5	7.2	6.2	8.4	10.8
60	7.7	8.9	12.7	11.6	10.6	10.1	10.8
90	6.7	8.4	13.3	13.5	12.4	12.0	10.7
120	5.8	6.8	12.0	13.1	12.3	13.1	10.8
150	6.0	3.7	8.2	11.0	11.1	13.4	11.0
180	7.2	1.5	1.2	8.0	10.0	13.2	11.3
210	8.1	4.2	5.3	8.5	10.3	12.6	11.3
240	8.1	7.3	10.4	11.6	11.6	12.1	11.3
270	7.3	9.2	12.2	13.2	12.1	11.9	11.3
300	6.4	9.8	11.7	12.6	10.8	11.4	11.2
330	6.8	9.5	10.0	9.9	7.8	10.0	11.5
360	7.9	9.3	8.3	3.4	1.3	8.5	10.8

Total Power (mW)								
0	6.2	8.5	6.8	2.2	1.4	7.0	12.2	
30	6.3	8.0	11.3	5.2	4.2	6.9	12.1	
60	5.8	7.7	18.8	14.5	11.5	10.2	11.9	
90	4.7	6.9	21.5	22.3	17.3	15.8	11.9	
120	3.8	4.7	16.0	20.5	17.1	20.5	12.1	
150	4.0	2.4	6.6	12.7	12.9	22.0	12.6	
180	5.3	1.4	1.3	6.2	9.9	21.0	13.4	
210	6.5	2.6	3.4	7.1	10.7	18.4	13.5	
240	6.4	5.4	10.8	14.5	14.5	16.4	13.4	
270	5.4	8.3	16.8	20.9	16.2	15.4	13.4	
300	4.4	9.6	14.8	18.2	11.9	13.7	13.2	
330	4.8	8.9	9.9	9.7	6.0	10.0	14.0	
360	6.2	8.5	6.8	2.2	1.4	7.0	12.2	



**2440MHz**

	dBm
Conducted	4.45
Calculated from mW:	
TRP (mW)	2.26
TRP (dBm)	3.55
Peak EIRP (dBm)	8.00
Directivity (dBm)	4.45
Efficiency (dB)	-0.90
Gain (dBi)	3.55

$$TPR = \frac{1}{(N_{th} N_{ph})} \sum_{i=0}^{N_{th}-1} \sum_{j=0}^{N_{ph}-1} EIRP(i, j)$$

Horiz Power (dBm)							
	0	30	60	90	120	150	180
0	3.84E+00	-8.44E-01	-1.32E+00	6.95E+00	6.42E+00	-6.71E+00	4.24E+00
30	3.39E+00	-2.47E-01	-3.04E+00	4.68E+00	4.56E+00	-5.89E+00	1.26E+00
60	8.23E-01	-8.34E-01	-3.67E+00	-4.57E-01	1.82E+00	-4.04E+00	-6.42E+00
90	-5.27E+00	-1.65E-01	1.73E+00	-2.27E+00	-1.36E+00	-4.44E-01	-7.25E+00
120	-7.28E+00	1.21E+00	4.74E+00	1.09E+00	-5.93E+00	1.28E+00	9.10E-01
150	-1.02E+00	2.75E+00	5.47E+00	1.56E+00	-1.02E+01	1.02E+00	3.94E+00
180	1.39E+00	3.60E+00	4.98E+00	9.93E-01	-7.70E+00	8.86E-01	4.10E+00
210	1.37E+00	3.11E+00	3.06E+00	-1.61E+00	-1.18E+01	-4.81E-01	1.97E+00
240	-7.50E-01	1.46E+00	-1.35E+00	-5.32E+00	-6.80E+00	-4.72E+00	-4.80E+00
270	-5.22E+00	-3.84E-01	-1.40E+01	-1.73E+00	-3.76E-01	-8.61E+00	-6.06E+00
300	-3.08E+00	-2.32E+00	-2.42E+00	4.90E+00	3.85E+00	-7.42E+00	1.72E+00
330	1.46E+00	-2.68E+00	9.71E-01	7.19E+00	5.92E+00	-5.60E+00	4.32E+00
360	3.84E+00	-8.44E-01	-1.32E+00	6.95E+00	6.42E+00	-6.71E+00	4.24E+00

Vert Power (dBm)							
0	-1.02E+01	-1.35E+01	-1.34E+01	-1.31E+01	-8.58E+00	-9.38E+00	-8.28E+00
30	-2.28E+00	-4.74E+00	-1.27E+00	-6.28E+00	-2.35E+00	-1.45E+00	6.06E-01
60	2.17E+00	1.10E+00	3.44E+00	-8.17E-01	-1.12E-02	2.37E+00	2.99E+00
90	3.42E+00	2.99E+00	4.21E+00	-1.47E+00	7.51E-02	2.97E+00	2.54E+00
120	2.54E+00	2.63E+00	2.49E+00	-4.67E+00	-4.73E-01	2.60E-01	-8.45E-01
150	-3.68E-02	4.70E-01	-2.28E+00	-7.84E+00	-3.41E+00	-6.34E+00	-1.34E+01
180	-4.15E+00	-5.05E+00	-1.24E+01	-1.39E+01	-9.29E+00	-1.33E+01	-4.16E+00
210	-3.43E+00	-1.32E+01	-5.69E+00	-3.56E+00	-1.91E+00	-2.24E+00	2.13E+00
240	-1.67E-01	-2.17E+00	-2.44E+00	-3.24E+00	7.03E-01	1.18E+00	4.54E+00
270	1.43E+00	2.27E+00	1.35E+00	-7.23E+00	-8.13E-01	1.16E+00	4.68E+00
300	1.20E+00	3.50E+00	3.43E+00	1.78E-01	-2.40E+00	-9.65E-01	2.52E+00
330	-1.27E+00	1.44E+00	1.78E+00	3.33E-01	-4.92E+00	-7.11E+00	-1.99E+00
360	-1.02E+01	-1.35E+01	-1.34E+01	-1.31E+01	-8.58E+00	-9.38E+00	-8.28E+00

Total Power (dBm)							
	0	30	60	90	120	150	180
0	4.0	-0.6	-1.1	7.0	6.6	-4.8	4.5
30	4.4	1.1	0.9	5.0	5.4	-0.1	4.0
60	4.6	3.3	4.2	2.4	4.0	3.3	3.5
90	4.0	4.7	6.2	1.2	2.4	4.6	3.0
120	3.0	5.0	6.8	2.1	0.6	3.8	3.1
150	2.5	4.8	6.1	2.0	-2.6	1.8	4.0
180	2.5	4.2	5.1	1.1	-5.4	1.0	4.7
210	2.6	3.2	3.6	0.5	-1.5	1.7	5.1
240	2.6	3.0	1.2	-1.1	1.4	2.2	5.0
270	2.3	4.2	1.5	-0.7	2.4	1.6	5.0
300	2.6	4.5	4.4	6.2	4.8	-0.1	5.1
330	3.3	2.9	4.4	8.0	6.3	-3.3	5.2
360	4.0	-0.6	-1.1	7.0	6.6	-4.8	4.5

Total Power (mW)								
0	2.5	0.9	0.8	5.0	4.5	0.3	2.8	
30	2.8	1.3	1.2	3.2	3.4	1.0	2.5	
60	2.9	2.1	2.6	1.7	2.5	2.1	2.2	
90	2.5	3.0	4.1	1.3	1.7	2.9	2.0	
120	2.0	3.2	4.8	1.6	1.2	2.4	2.1	
150	1.8	3.0	4.1	1.6	0.6	1.5	2.5	
180	1.8	2.6	3.2	1.3	0.3	1.3	3.0	
210	1.8	2.1	2.3	1.1	0.7	1.5	3.2	
240	1.8	2.0	1.3	0.8	1.4	1.6	3.2	
270	1.7	2.6	1.4	0.9	1.7	1.4	3.2	
300	1.8	2.8	2.8	4.1	3.0	1.0	3.3	
330	2.1	1.9	2.8	6.3	4.2	0.5	3.3	
360	2.5	0.9	0.8	5.0	4.5	0.3	2.8	

