

PulseLarsen Antennas is pleased to bring you the new, improved Antenna SourceBook (ASB), Volume 13. The goal of the ASB is to provide you with a “go to” source for all your antenna needs.

As the demand for wireless connectivity flourishes Pulse/ Larsen is here with the needed solutions. We offer a unique far-reaching understanding of antenna and RF technology and have become the partner of choice for leading industry innovators. Pulse offers excellent value and outstanding quality products delivered from our high-volume production facilities. We offer a wide array of antennas covering 2G/ 3G/ 4G/5G , LTE, MiMo applications, WiFi, 2.4GHz, 5GHz, Zigbee, Bluetooth, GPS/ Glonass/ Beidou /

Compass/ Galileo, any ISM frequency bands (169, 315, 433, 450, 868, 915, 2.4GHz), UHF, VHF, FM, DSRC, V2X, UWB and other applications.

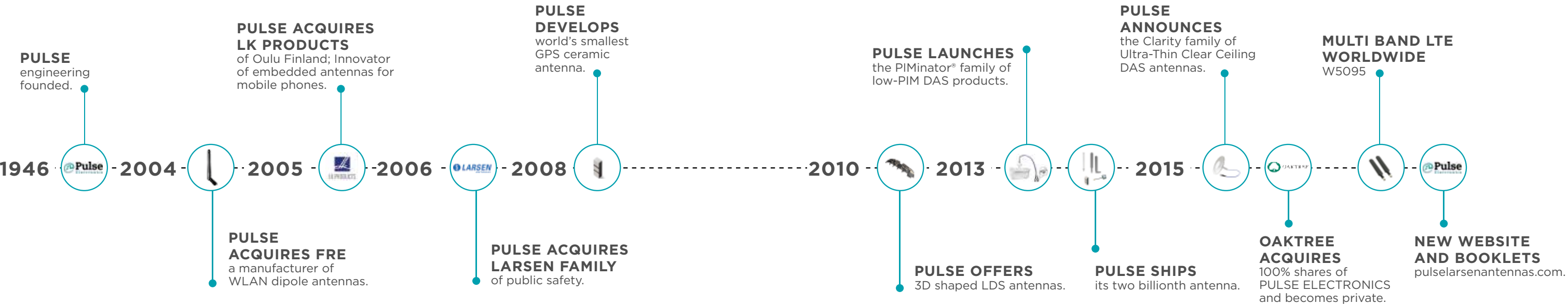
You can rely on PulseLarsen to be your trusted antenna partner. We have been in the antenna business over 50 years and have exceeded over 2 Billion antennas shipped during that time. We supply consistent high-quality products by owning and fully controlling our own factories in both China and the United States. On the following pages you will find our more popular antennas. For an up-to-the-minute view of our offering visit our website at www.pulselarsenantennas.com.

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Pulse continues as an Innovative Leader!



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App.	Type	Pulse Part number	Frequency Range (MHz)	RL Min. (dB)	Peak Gain (dBi)		RF Performance Efficiency (%)		Antenna DIM. (LxWxH,mm)	ME Requirements		Note
					Peak	Band edges	Peak	Band edges		GC-area (L x W,mm)	Evaluation Board Size (L x W,mm)	
868MHz (868MHz-870MHz)	Ceramic chip	W3000	868-870	-15	-1.4	-1.5	30	29	7 x 1.6 x 1.6	20 x 9.50	40 x 20	Vertical, tuned by stripline on PCB
		W3013	868-870	-11	1.5	1.4	65	64	10 x 3.2 x 4.0	10.80 x 8.25	80 x 37	Center edge
		W3016	868-870	-19	-2.2	-2.5	25	23	10 x 3.2 x 4.0	11.50 x 7	25 x 25	Corner, Small GC-area and PCB
915MHz (902MHz-928MHz)	Helical	W3117	869-894	-9	0	-1.3	56	40	12.4 x 8 x 2.5	8 x 40	100 x 40	Horizontal, Center top
		W3118A	869-894	-9	0	-1.4	52	38	2.5 x 8 x 8	6 x 11	100 x 40	Vertical, Corner
		W3012	902-928	-6	2	0.5	70	50	10 x 3.2 x 4	10.80 x 8.25	100 x 37	Center edge
915MHz (902MHz-928MHz)	Ceramic chip	W3014	880-960	-7	-0.5	-1	45	40	10 x 3.2 x 1.5	40 x 16	96 x 40	Center Top
		W3112A	902-928	-10	0.9	-0.3	67	50	2.5 x 8 x 8	6 x 11	100 x 40	Vertical, Corner
		W3113	902-928	-10	0.8	-0.3	66	51	12.4 x 8 x 2.5	8 x 40	100 x 40	Horizontal, Center top
Combo 868/915MHz and 2.4GHz	Direct PCB	W3331	863-928	-6	1.7	0.9	64	53	45 x 10 x 0.8	45 x 4.5	119 x 102	Corner, Small GC-area and PCB, Dual feeds
			2400-2500	-12	4	1.5	85	69				
		W3333	863-928	-8	2.4	1.8	75	-	40 x 15 x 0.8	40 x 4.5	119 x 102	Corner, Small GC-area and PCB, Dual feeds
			2400-2500	-12	4.5	3.0	85	66				
433MHz	Ceramic chip	W3015	433 +/- 1	-10	1.6	-	78	-	10 x 3.2 x 4.0	10.60 x 14	200 x 37	Center edge
		W3127	433-435	-15	-2.9	-	-	-	35.35 x 9.90	8 x 40	100 x 40	Center Top
315 MHz	Helical	W3126	315	-10	-5	-	-	-	35.35 x 9.90	8 x 40	100 x 40	Center Top
169 MHz	Helical	W3100	169MHz	-10	-4	-	55	-	91 x 9.8	-	95 x 45	coil on free space

Note: 1. ISM application for 902MHz-928MHz band (center frequency 915MHz). 2. Applications from ECA chart for 862MHz-890MHz. (a) Alarms: 868.6-869.7MHz, (b) RFID: 865-868MHz, (c) Tracking, tracing, and data acquisition: 870-875.6MHz, and (d) Wireless audio/ multimedia: 863-865MHz. 3. "Stock" Stocked parts are typically available from Pulse distribution partners immediately.

App.	Type	Pulse Part Number	Operating Frequency (MHz)	RF Performance					Antenna DIM. (LxWxH,mm)	ME Requirements		Note
				RL Min. (dB)	Peak Gain (dBi)		Efficiency (%)			GC-area (L x W,mm)	Evaluation Board Size (L x W,mm)	
Single WiFi, BT, Zigbee	Ceramic chip	W3000	2400-2483.5	-18	2.5	2.1	65	55	7x1.6x1.6	6.00x11.00	40x11	3 Matching components Horiz. mount
				-12	2.2	1.5	53	45		6.00x20.00	30x20	
		W3001		-6	1.5	0.5	75	60	10x3.2x4.0	10.80x6.25	80x37	On Ground solution
		W3008		-8	1.7	0.7	70	55	3.2x1.6x1.1	4.00x4.25	80x37	
		W3008C		-11	2.2	1.9	75	70	3.2x1.6x1.1	4.00x6.25	80x37	
		W3043		-12	4		70		3.2x1.6x1.1	12x20	37x20	Small PCB size
		W3092		-6	2	0	60	43	2x1.2x0.55	8x2.5	110x55	Small antenna size
Dual WiFi	Helical	W3108		-8	1.5		50		5.0x2.5x5.5	7.50x5.50	100x40	Vertical SMD @ Corner
		W3006	2400-2483.5	-8	3.2	2.7	70	65	10x3.2x1.5	11.60x6.00	80x37	
			5150-5850	-10	4.2	3.0	80	70				
		W3078	2400-2483.5	-10	1.7	1.0	65	55	3.2x1.6x1.1	11.15x6.40	80x37	@ Corner
			4950-5850	-6	4.3	3.7	80	55				
		W3079	2400-2483.5	-13	2.5	1.3	72	60	3.2x1.6x1.1	11x6	80x37	Center
			4950-5850	-8	5.7	3.3	78	55				
Combo GPS+WiFi or ISM 868/915 + WiFi	Ceramic chip	W3056	2400-2483.5	-8	3.2	2.5	80	70	10x3.2x1.5	10.80x6.25 (Notch)	100x40	Single feed and 2.4GHz WiFi
			1575.42+ 10	-10	2.5	1.5	75	65				
		W3064C	2400-2483.5	-11	-0.7	-1.7	80	70	10x3.2x1.5	10.80x6.40 (Divided)	96x45	Dual feed and 2.4GHz WiFi
			1575.42 + 10	-15		-2.0	70	60				
			2400-2483.5	-11	2.5	1.5	85	80	10x3.2x1.5	17.80x6.45	70x35	Dual feed and Dual WiFi + GPS/Glonass/Beidou
			4950-5850	-6	3.5	1.0	70	50				
		W3095										
			1559-1610.5	-10	1.5	0.8	75	60				
			863-928	-8	1.5	0.8	67	55	10x3.2x2	4.6x3.95	120x50	Center, Dual feed
		W3320	2400-2500	-6	3.4	1.4	61	45				

*NOTE: 1. Recommended minimum GND dimensions of PIFA type and Monopole's are roughly 40x20mm and 30x20mm (or

App. Type	Pulse Part number	Operating Frequency (MHz)	RF Performance						ME Requirements				Note	
			RL Min. (dB)	RHCP Gain (dBic)		Linear Gain (dBi)		Efficiency (%) / (dB)		Antenna DIM. (LxWxH,mm)	GC-area (L x W,mm)	Evaluation Board Size (L x W,mm)		
				Peak	Band edges	Peak	Band edges	Peak	Band edges					
GPS Only	Ceramic chip	1575.42 +/-10	-15	-3.9	-4.1	0.3	0	50/-3	45/-3.5	7 x 1.6 x 1.6	6 x 20	30 x 20	3 Matching components	
			-12	-3.5	-3.9	0.1	-0.2	50/-3	45/-3.5		6 x 11	40 x 11		
	W3009		-11	0.2	-0.6	3	2.3	83/-0.8	70/-1.5	10 x 3.2 x 4.0	10.80 x 6.25	80 x 37	On Ground shunt 3.3pF	
	W3011		-12	0.85	0.5	3.4	3	85/-0.7	80/-1	3.2 x 1.6 x 1.1	4.00 x 4.25	80 x 37	w/o matching	
	W3099		-14	3.5	-	-	-	-	-	25 x 25 x 4	-	70 x 70	AR: 3, V01; A	
	W3213		-13	-1.5	-	-	-	-	-	13 x 13 x 4	-	30 x 30	AR: 3, V02; C	
GPS, Glonass, & Beidou	Helical	1559-1591 1575.42 +/-10 and 1598-1610	-16	-2.1	-2.4	1.3	0.7	47/-3.3	43/-3.7	5.0 x 2.5 x 5.5	7.50 x 5.50	100 x 40	Vertical SMD, @ Corner	
	Ceramic chip		-18	-0.2		2.4	1.5	70/-1.55	65/-1.9	7 x 1.6 x 1.6	6 x 10	80 x 37	3 Matching components, Horiz. Mount + @Corner @ Position1 shunt 3.3pF	
			-12	1	0	3	2.2	75/-1.25	70/-1.5					
	W3010		-12	1.5	0.4	3	1.8	70/-1.55	50/-3.0	10 x 3.2 x 2	10.80 x 6.25	80 x 37	@ Position2 shunt2.2pF	
	W3011A		-16	1	-0.4	3.7	2.5	88/-0.6	70/-1.5	3.2 x 1.6 x 1.1	4.00 x 6.25	80 x 37	Shunt 1.8pF	
	W3062A		-10	0	-0.5	2.5	2.0	80/-1	60/-2.1	7 x 1.6 x 1.6	7.80 x 5.25	80 x 37	Shunt 2.2pF	
WiFi and GPS Combo	Patch	2400-2483.5 1575.42+ 10	-7	-2	-	-	-	60	50	13 x 13 x 5	-	50 x 50	Shunt 1.5pF V02; C	
	Ceramic chip		-8	-	-	3.2	2.5	80	70	10 x 3.2 x 1.5	10.80 x 6.25 (Notch)	100 x 40	Single feed and 2.4GHz +GPS	
			-10			2.5	1.5	75	65					
			-11	-	-	-0.7	-1.7	80	70	10 x 3.2 x 1.5	10.80 x 6.40 (Divided)	96 x 45	Dual feed and 2.4GHz +GPS	
	W3064C		-15				-2.0	70	60					
	Ceramic chip		-10	-	-	2.7	1.5	85	80	10 x 3.2 x 1.5	17.80 x 6.45	80 x 50	Dual feed and Dual WiFi + GPS/Glonass/Beidou	
	W3095	-6	-	-	3.7	1.0	73	53						
	1559-1610.5	-8			1.7	0.7	75	62						

NOTE: 1. Recommended minimum GND dimensions of PIFA type and Monopole are roughly 40x20mm and 30x20mm (or 40x11mm), respectively. Need to construct matching values to optimize antenna performance on surrounding mechanics and materials. 2. Pulse offers very unique GPS+WiFi combo antennas on single ceramic

App	Type	Pulse Part Number	Frequency Range (MHz)	RL Min. (dB)	RF Performance		Efficiency (%)		ME Requirements			Note				
					Peak Gain (dBi)				Antenna DIM. (LxWxH,mm)	GC-area (L x W,mm)	Evaluation Board Size (L x W,mm)					
					Peak	Band edges	Peak	Band Edges								
LTE	Composite	W3796	698-960	-6	1.5 (Avg. peak gain)		65 (Avg.)		40 x 7 x 3	40.6 x 15	120 x 40.6	- Top mount: Horizontal - Matching: SE3.3nH+SH0.7pF; SH6.8nH				
			1427.9-1660.9	-5.5	2 (Avg. peak gain)		55 (Avg.)									
			1695-2200	-6	5.5 (Avg. peak gain)		75 (Avg.)									
			2300-2700	-6	5 (Avg. peak gain)		70 (Avg.)									
Penta Band		W3544A	824-960	-3.7	0.5	1.8	65	44	7.65 x 26 x 3	21x33.5 (W3544A)	110 x 50	1. Corner mount (vertical). 2.matching: *SE12nH				
			1710-1880	-4.6	2.9	2.3	74	45								
			1850-1990	-8.6	2.4	1.7	74	64								
			1920-2170	-5.6	2.2	1.1	68	60								
		W3544B	824-960	-6.5	1	-0.7	70	53	7.65 x 26 x 3	50 x 18 (W3544B)	110 x 50	1. Top mount (Horizontal) 2.matching: 10nH				
			1710-1880	-5.7	2.7	1.7	77	59								
			1850-1990	-9.3	2	1	77	69								
			1920-2170	-5	1.8	0.2	71	58								
Quad band (US)	Ceramic	W3073	824-894	-4.7	0.4	-2.6	51	28	10 x 3.2 x 4	40 x 10	105 x 40	1. Matching: SE10nH+ SE12nH+SH12nH. 2.Tuning strip on PCB.				
			1710-1880	-3.5	2.3	0.7	59	40								
			1850-1990	-5.9	2.5	1.6	59	54								
			1920-2170	-3.3	2.2	0.9	58	46								
		W3073	880-960	-3.8	1	-1.8	60	34	10 x 3.2 x 4	40 x 10	105 x 40	1. Matching: *SE10nH+ *SE10nH+ *SH15nH. 2.Tuning strip on PCB.				
			1710-1880	-4.9	2.9	2	70	54								
			1850-1990	-8	2.9	2.5	71	62								
			1920-2170	-4.4	2.8	2.3	67	59								
Dual band (EU)		W3070	880-960	-5.1	1.2	-0.4	65	47	10 x 3.2 x 2	40 x 10	95 x 40	Matching: *SE18nH+ *SE10nH				
			1710-1880	-5.7	2.5	1.5	60	50								

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App.	Pulse Part number	Operating Frequency (MHz)	RF Performance				Antenna Dimension (mm)	Overall Dimension (mm)	ME Requirements		
			Antenna Element	LNA					Connector type	Coaxial Cable (Length; Diameter)	
			VSWR	Gain (dB)	NF (dB)	Current (mA)	VCC (Vdc)				
GNSS (GPS, Glonass, BeiDou, and Galileo)	GPSGB1315	1561 +/- 2MHz 1575.42 +/- 10MHz and 1602.5 +/- 4 MHz	2	15 +/- 2	< 2.4	< 6	3.3-5 + -0.5	13x13x5	16x17x8.15	IPEX MHF	L:100; D:1.13
	GPSGB1330		2	30 +/- 2	< 2.4	< 6	3.3-5 + -0.5	13x13x5	16x17x8.15	IPEX MHF	L:100; D:1.13
	GPSGB2515		2	15 +/- 2	< 2.4	< 6	3.3-5 + -0.5	25x25x4	30x30x8	IPEX MHF	L:100; D:1.13
	GPSGB230		2	30 +/- 2	< 2.4	< 6	3.3-5 + -0.5	25x25x4	30x30x8	IPEX MHF	L:100; D:1.13

Note: 1. Further detailed specs such as ‘Out of band rejection’ of LNA can be found on a datasheet.



TS16949

PulseLarsen Antennas: TS16949

PulseLarsen also provides TS16949 GPS Patches for the Tier 1 automotive business as follows:

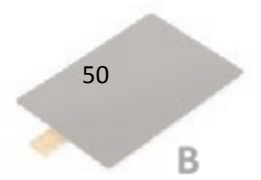
W3223: Center Pin, 25x25x4mm

W3224: Surface Mount, 18x18x4 mm

W3225: Surface Mount, 25x25x4mm



INTERNAL ACTIVE
GPS MODULES
STARTING ON PAGE 27.

App.	Type	Pulse Part number	Frequency (MHz)	RF Performance						Mechanical Requirements			Note	
				With matching network			Without matching network (Bare coil)			Package type	Dimension (in/mm)			
NFC	Flex only	W7001	13.56	40	33	50/80	100		0.9	1.55	49	A	0.98 x 0.98 x 0.005 (25 x 25 x 0.12)	Without a GND near antenna
	Flex with Ferrite	W3579	13.56	40	28	50/80	42		1.6	3.60	37.8	B	1.38 x 1.97 x 0.012 (50 x 50 x 0.30)	On GND solution
		W7013	13.56	20	25	50/80	71.5		1.05	2.70	33	C	1.18 x 0.98 x 0.014 (30 x 25 x 0.36)	
	Flex with twisted pair cable + connector	W7000	13.56	-	 36	 50	 75.5		 1.27	 2.20	49	F	1.69 x 1.34 x 0.005 (43x 34 x 0.11)	Adhesive tape under coil included
	Wire loop on plastic carrier	W7002	13.56	40	35	50/80	89		0.65	0.95	57	D	3.72 x 2.24 x 0.14 (94.6 x 56.8 x 3.65)	Optimized for metal proximity within the device
		W5100	13.56	-	-	50	65.9		0.95	-	44	E	1.57 x 1.57 x 0.05 (40 x 40 x 1.2)	Test setup over 80x80 mm metal GP
	Trace on PCB		2400-2483.5	RL Min. (dB): -8		Peak Gain in free space: -1dBi		Peak Gain on Metal: 1dBi		-				
	W5101	13.56	-	-	50	57.6		1.13	-	46	E	1.77 x 1.77 x 0.05 (45 x 45 x 1.2)	Test setup over 80x80 mm metal GP	
		2400-2483.5	RL Min. (dB): -8		Peak Gain in free space: 0.5dBi		Peak Gain on Metal: 1.5dBi		-					
WiFi and NFC combo	Trace on PCB	W5101	2400-2483.5	RL Min. (dB): -8		Peak Gain in free space: 0.5dBi		Peak Gain on Metal: 1.5dBi		-		E	1.77 x 1.77 x 0.05 (45 x 45 x 1.2)	Test setup over 80x80 mm metal GP

NOTE: 1. Wire assembly option: Picoblade connector with wire. 2. "Stock" Stocked parts are typically available from Pulse distribution partners immediately.

		RF Performance					Mechanical requirement				
Type		Pulse Part number	Frequency range (MHz)	RL Min. (dB)	Peak Gain (dBi)	Height (mm) straight (Bent)	Diameter(mm) Max (Min)	Package type	Connector	IP-rate	Note
ISM	Stick/Swivel	W1063	868-928	-7.5	3	195 (172)	13 (6)	B	RP-SMA		
		W1063M	902-928	-10	3	195 (172)	13 (6)	B	SMA (m)		
	Stick/ no Swivel	W5012	868-928	-8	2	179	10	A	RP-SMA		
		W5017	868-928	-8	2	179	10	A	SMA (m)	IP65	
		W5021	868-928	-8	2	171	10	G	RP-SMA (Right angle)		
	Stick/Swivel	W1010	2400-2500	-10	2	108 (86)	10 (7.8)	B	SMA(m)		
		W1030	2400-2500	-10	2	108 (86)	10 (7.8)	B	RP-SMA		
		W1027	2400-2500	-11	3.2	136 (110)	10 (6)	C	RP-SMA		
		W1037	2400-2500	-10	3.2	197 (170)	13.2 (7.4)	C	RP-SMA		
		W1038	2400-2500	-10	3.2	197 (170)	13.2 (7.4)	C	RP-SMA		Color option (Grey)
		W1059	2400-2500	-10	5	195 (154)	13 (6)	C	SMA (m)		
WIFI (2.4GHz)	Stick/ no Swivel	W5001	2400-2500	-10	1.5	128	10 (6)	G	RP-SMA (Right angle)		
		W5010	2400-2500	-10	1.5	130	10 (6)	A	RP-SMA	IP65	
		W5011	2400-2500	-10	1.5	130	10 (6)	A	SMA (m)		
		W5039	2400-2500	-10	2	94	10 (6)	F	RP-SMA	IP67	
	Stick/Swivel	W1028B	5150-5850	-9	2	136 (114)	9.2 (6)	C	RP-SMA		
		W1043	2400-2500; 5150-5850	-10	2	157 (130)	17.6 (13)	E	RP-SMA		
		W1044	2400-2500; 5150-5850	-10	2	157 (126)	17.6 (13)	E	SMA (m)		
		SPDA17RP2400/5900	2400-2500; 4900-5900	-10	0.8; 5.9	175 (150)	21.8 (13.7)	H	RP-TNC		
WIFI Dual (2.4GHz + 5GHz)	Blade/ Swivel										
	Stick/ no Swivel	W5028	2400-2500; 5150-5850	-10	0	128	10 (6)	G	RP-SMA (Right angle)	IP65	
	Blade/ Swivel	SPDA24850/1900	824-894; 1850-1990	-7.5	0; 1.5	176 (147)	21.8 (13.7)	H	SMA (m)		
		SPDA17850/1900	824-894; 1850-1990	-10	0; 1.2	176 (147)	21.8 (13.7)	H	TNC		
	Stick/ no Swivel	W1900	824-960, 1710-2170	-4;-6	0.5; 2.5	49	8	D	SMA (m) (Right angle)		
		W1902	824-960, 1710-2170	-4;-6	0.5; 2.5	49	8	D	RP-SMA (Right angle)		
		W1910	824-960, 1710-2170	-4;-6	0.5; 2.5	49	10.4	F	SMA (m)		
											Tested on ground plane (70x50mm)
2G	Blade/ Swivel	W1911	824-960, 1710-2170	-4;-6	0.5; 2.5	49					

