

# Series 8540C Universal Power Meters

## B.2.1 Modulation Power Sensors

**Table B-1: Power Sensor Selection Guide**

Model	Freq. Range/ Power Range	Max. Power	Power Linearity <sup>4</sup> (Freq >8 GHz)	RF Conn	Length	Dia.	Wgt	VSWR
<b>Modulation Sensors</b>								
80601A <sup>9</sup>	10 MHz to 18 GHz -67 to +20 dBm, CW -60 to +20 dBm, Modulation	+23 dBm (200 mW)	-67 to -20 dBm ±0.00 dB -20 to +20 dBm ±0.05 dB/ 10 dB	Type N(m) 50Ω	114.5 mm (5.39 in)	32 mm (1.62 in)	0.23 kg (0.4 lb)	1.12:0.01 - 2 GHz 1.22:2 - 12.4 GHz 1.29:12.4 - 18 GHz
80401A	10 MHz to 18 GHz -67 to +20 dBm, CW -60 to +20 dBm, Modulation	+23 dBm (200 mW)	-67 to -20 dBm ±0.00 dB -20 to +20 dBm: ±0.05 dB/ 10 dB	Type N(m) 50Ω	114.5mm (4.5 in)	32 mm (1.25 in)	0.18 kg (0.4 lb)	1.12:0.01 - 2 GHz 1.22:2 - 12.4 GHz 1.29:12.4 - 18 GHz
80402A	10 MHz to 18 GHz -67 to +20 dBm, CW -60 to +20 dBm, Modulation	+23 dBm (200 mW)	-67 to -20 dBm ±0.00 dB -20 to +20 dBm ±0.05 dB/ 10 dB	APC-7 50Ω				
80410A	10 MHz to 18 GHz -64 to +26 dBm, CW -57 to +26 dBm, Modulation	+29 dBm (800 mW)	-60 to -14 dBm ±0.00 dB -14 to + 26 dBm ±0.05 dB/ 10 dB	Type K(m) <sup>1</sup> 50Ω	127 mm (5.0 in)	32 mm (1.25 in)	0.23 kg (0.5 lb)	1.13:0.01 - 2 GHz 1.16:2 - 12 GHz 1.23:12 - 18 GHz
80420A	10 MHz to 18 GHz -60 to +30 dBm, CW -53 to +30 dBm, Modulation	+30 dBm (1 W)	-60 to -10 dBm ±0.00 dB -10 to +30 dBm ±0.05 dB/ 10 dB					1.11:0.01 - 2 GHz 1.12:2 - 12 GHz 1.18:12 - 18 GHz
80421A	10 MHz to 18 GHz -50 to +37 dBm, CW -43 to +37 dBm, Modulation	+37 dBm (5 W)	-47 to +0 dBm ±0.00 dB 0 to +37 dBm ±0.05 dB/ 10 dB					1.20:0.011 - 6 GHz 1.25:6 - 12.4 GHz 1.35:12.4 - 18 GHz
80422A	10 MHz to 18 GHz -40 to +44 dBm, CW -33 to +44 dBm, Modulation	+44 dBm (25 W)	-37 to +10 dBm ±0.00 dB +10 to +44 dBm ±0.05 dB/ 10 dB	Type N(m) 50Ω	230 mm (9.0 in)	104 mm (4.1 in)	0.3 kg (0.6 lb)	1.20:0.01 - 6 GHz 1.30:6 - 12.4 GHz 1.40:12.4 - 18 GHz
80425A	10 MHz to 18 GHz -40 to +47 dBm, CW -33 to +47 dBm, Modulation	+47 dBm (50 W)	-34 to +10 dBm ±0.00 dB +10 to +47 dBm ±0.05 dB/ 10 dB					1.25:0.01 - 6 GHz 1.35:6 - 12.4 GHz 1.45:12.4 - 18 GHz
<b>Standard CW Sensors</b>								
80301A	10 MHz to 18 GHz -70 to +20 dBm	+23 dBm (200 mW)	-70 to -20 dBm ±0.00 dB -20 to +20 dBm ±0.05 dB/ 10 dB	Type N(m) 50Ω	114.5 mm (4.5 in)	32 mm (1.25 in)	0.18 kg (0.4 lb)	1.12:0.01 - 2 GHz 1.22:2 - 12.4 GHz 1.29:12.4 - 18 GHz
80302A	10 MHz to 18 GHz -70 to +20 dBm	+23 dBm (200 mW)		APC-7 50Ω				
80303A	10 MHz to 26.5 GHz -70 to +20 dBm	+23 dBm (200 mW)	-70 to +20 dBm ±0.00 dB -20 to +20 dBm ±0.1 dB/ 10dB	Type K(m) <sup>1</sup> 50Ω				
80304A	10 MHz to 40 GHz -70 to 0 dBm	+23 dBm (200 mW)	-70 to -20 dBm ±0.00 dB -20 to 0 dBm ±0.2 dB/ 10 dB		1.12:0.01 - 2 GHz 1.22:2 - 12.4 GHz 1.38:12.4 - 18 GHz 1.43:18 - 26.5 GHz 1.92:26.5 - 40 GHz			
<b>Low VSWR CW Sensors</b>								
80310A	10 MHz to 18 GHz -64 to +26 dBm	+29 dBm (800 mW)	-64 to -14 dBm ±0.00 dB -14 to + 26 dBm ±0.05 dB/ 10 dB	Type K(m) <sup>1</sup> 50Ω	127mm (5.0 in)	32 mm (1.25 in)	0.23 kg (0.5lb)	1.13:0.01 - 2 GHz 1.15:2 - 12 GHz 1.23:12 - 18 GHz 1.29:18 - 26.5 GHz 1.50:26.5 - 40 GHz
80313A	10 MHz to 26.5 GHz -64 to +26 dBm		-64 to -14 dBm ±0.00 dB -14 to + 26 dBm ±0.1 dB/ 10 dB					
80314A	10 MHz to 40 GHz -64 to +6 dBm		-64 to -14 dBm ±0.00 dB -14 to + 6 dBm ±0.2 dB/ 10 dB					

**Table B-1: Power Sensor Selection Guide (Continued)**

Model	Freq. Range/ Power Range	Max. Power	Power Linearity <sup>4</sup> (Freq >8 GHz)	RF Conn	Length	Dia.	Wgt	VSWR
<b>1W CW Sensors</b>								
80320A	10 MHz to 18 GHz -60 to +30 dBm	+30 dBm (1 W)	-60 to -10 dBm ±0.00 dB -10 to +30 dBm ±0.05 dB/ 10 dB	Type K(m) <sup>1</sup> 50Ω	127 mm (5.0 in)	32 mm (1.25 in)	0.23 kg (0.5 lb)	1.11:0.01 - 2 GHz 1.12:2 - 12 GHz 1.18:12 - 18 GHz 1.22:18 - 26.5 GHz 1.36:26.5 - 40 GHz
80323A	10 MHz to 26.5 GHz -60 to +30 dBm		-60 to -10 dBm ±0.00 dB -10 to +30 dBm ±0.1 dB/ 10 dB					
80324A	10 MHz to 40 GHz -60 to +10 dBm		-60 to -10 dBm ±0.00 dB -10 to +10 dBm ±0.2 dB/ 10 dB					
<b>5W CW Sensor<sup>2</sup></b>								
80321A	10 MHz to 18 GHz -50 to +37 dBm	+37 dBm (5 W)	-50 to +0 dBm ±0.00 dB 0 to +37 dBm ±0.05 dB/ 10 dB	Type N(m) 50Ω	150 mm (5.9 in)	32 mm (1.25 in)	0.23 kg (0.5 lb)	1.20:0.01 - 2 GHz 1.25:6 - 12.4 GHz 1.35:12.4 - 18 GHz
<b>25W CW Sensor<sup>3</sup></b>								
80322A	10 MHz to 18 GHz -40 to +44 dBm	+44 dBm (25 W)	-40 to +10 dBm ±0.00 dB +10 to +44 dBm ±0.05 dB/ 10 dB	Type N(m) 50Ω	230 mm (9.0 in)	104 mm (4.1 in)	0.3 kg (0.6 lb)	1.20:0.01 - 2 GHz 1.30:6 - 12.4 GHz 1.40:12.4 - 18 GHz
<b>50W CW Sensor<sup>3</sup></b>								
80325A	10 MHz to 18 GHz -40 to +47 dBm	+47 dBm (50 W)	-40 to +10 dBm ±0.00 dB +10 to +47 dBm ±0.05 dB/ 10 dB	Type N(m) 50Ω	230mm (9.0 in)	104 mm (4.1 in)	0.3 kg (0.6 lb)	1.25:0.01 - 2 GHz 1.35:6 - 12.4 GHz 1.45:12.4 - 18 GHz
<b>True RMS Sensors (-30 to +20 dBm)</b>								
80330A 80333A 80334A	10 MHz to 18 GHz 10 MHz to 26.5 GHz 10 MHz to 40 GHz	+33 dBm (2 W)	-30 to +20 dBm ±0.00 dB	Type K(m) <sup>1</sup> 50Ω	152.5 mm (6.0 in)	32 mm 1.25 in)	0.27 kg (0.6 lb)	1.12:0.01 - 12 GHz 1.15:12 - 18 GHz 1.18:18 - 26.5 GHz 1.29:26.5 - 40 GHz
<b>80340 Series Peak Power Sensors (-30 to +20 dBm)</b>								
80340A	50 MHz to 18 GHz	+23 dBm (200 mW)	-30 to -20 dBm ±0.13 dB 0 to +20 dBm	Type N(m) <sup>1</sup> 50Ω	146 mm (5.75 in)	37 mm (1.44 in)	0.3 kg (0.6lb)	1.12:0.01 - 2 GHz 1.22:2 - 12.4 GHz 1.37:12.4 - 18 GHz
80343A 80344A	50MHz to 26.5 to 40 GHz      50 MHz		0 to +20 dBm ±0.13 dB ±0.01 dB/dB	Type K(m) <sup>1</sup> 50Ω				

Notes:

1. The K connector is electrically and mechanically compatible with the APC-3.5 and SMA connectors.
2. Power coefficient equals <0.01 dB/Watt.
3. Power coefficient equals <0.015 dB/Watt.
4. For frequencies above 8 GHz, add power linearity to system linearity.
5. Peak operating range above CW maximum range is limited to <10% duty cycle.
6. Includes uncertainty of reference standard and transfer uncertainty. Directly traceable to NIST.
7. Square root of sum of the individual uncertainties squared (RSS).
8. Cal Factor numbers allow for 3% repeatability when connecting attenuator to sensor, and 3% for attenuator measurement uncertainty and mismatch of sensor/pad combination. Attenuator frequency response is added to the Sensor Cal Factors which are stored in the sensor's EEPROM.
9. The Model 80601 is compatible with the 8541C and 8542C, and later configurations.

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**Table B-2: Power Sensor Cal Factor Uncertainties**

Freq. (GHz)		Sum of Uncertainties (%) <sup>6</sup>						Probable Uncertainties (%) <sup>7</sup>					
Lower	Upper	80301A 80302A 80340 80401A 80402A 80601A <sup>9</sup>	80303A 80304A 80343 80344	80310A 80313A 80314A	80320A 80323A 80324A	80321A <sup>8</sup> 80322A <sup>8</sup> 80325A <sup>8</sup>	80330A 80333A 80334A	80301A 80302A 80340 80401A 80402A 80601A <sup>9</sup>	80303A 80304A 80343 80344	80310A 80313A 80314A	80320A 80323A 80324A	80321A <sup>8</sup> 80322A <sup>8</sup> 80325A <sup>8</sup>	80330A 80333A 80334A
0.1	1	1.61	3.06	2.98	2.96	7.61	2.95	1.04	1.64	1.58	1.58	4.54	1.58
1	2	1.95	3.51	3.58	3.57	7.95	3.55	1.20	1.73	1.73	1.73	4.67	1.73
2	4	2.44	4.42	4.33	4.29	8.44	4.27	1.33	1.93	1.91	1.91	4.89	1.90
4	6	2.67	4.74	4.67	4.63	8.67	4.60	1.41	2.03	2.02	2.02	5.01	2.01
6	8	2.86	4.94	4.87	4.82	8.86	4.80	1.52	2.08	2.07	2.07	5.12	2.06
8	12.4	3.59	6.04	5.95	5.90	9.59	5.87	1.92	2.55	2.54	2.53	5.56	2.53
12.4	18	4.09	6.86	6.76	6.69	10.09	6.64	2.11	2.83	2.80	2.79	5.89	2.78
18	26.5	—	9.27	9.43	9.28	—	9.21	—	3.63	3.68	3.62	—	3.59
26.5	40	—	15.19	14.20	13.86	—	13.66	—	6.05	5.54	5.39	—	5.30

**Notes:**

1. The K connector is electrically and mechanically compatible with the APC-3.5 and SMA connectors.
2. Power coefficient equals <0.01 dB/Watt.
3. Power coefficient equals <0.015 dB/Watt.
4. For frequencies above 8 GHz, add power linearity to system linearity.
5. Peak operating range above CW maximum range is limited to <10% duty cycle.
6. Includes uncertainty of reference standard and transfer uncertainty. Directly traceable to NIST.
7. Square root of sum of the individual uncertainties squared (RSS).
8. Cal Factor numbers allow for 3% repeatability when connecting attenuator to sensor, and 3% for attenuator measurement uncertainty and mismatch of sensor/pad combination. Attenuator frequency response is added to the Sensor Cal Factors which are stored in the sensor's EEPROM.
9. The Model 80601 is compatible with the 8541C and 8542C and later configurations.