

40 GHz APLC VS Keysight and R&S



APLC single and multi-channel models



The APPLCxx is a series of phase-coherent, single or multi-channel, ultra-fast switching and ultra-low phase noise signal generators with a frequency range up to 12, 20, 40, and 54 GHz. It is ideally suited for a wide range of applications, where good signal quality, accurate and wide output power ranges, and very stable phase coherence among all channels are required. Excellent phase noise is combined with good spurious, harmonic rejection and optionally leading-edge switching speed of 15 μ s.



Model	APLC40	E8257D	N5183B	SMA100B
Frequency range and Max. power				
Frequency range	10 MHz to 40 GHz from 9 kHz optional 9K	250 kHz to 40 GHz	9 kHz to 40 GHz	8 kHz to 40 GHz
Number of channels	1-4	1	1	1
Min. power	-20 dBm, -120 dBm option PE2	-20 dBm, -120 dBm option 1E1	-20 dBm, -120 dBm option 1E1	-120 dBm
Max. power (typ.)	Std PE2	Std 1EU 1E1 1EU+1E1	Std 1EA	Std B35 K36 B36S
1 GHz	20 +19	11 22 10 20	+18 +23	16 27 30 35
5 GHz	+22 +20	11 22 10 20	+18 +20	16 25 25 28
10 GHz	+22 +20	11 21 11 20	+18 +20	16 24 27 28
20 GHz	+22 +19	11 20 9 20	+15 +19	15 23 25 25
25 GHz	+23 +19	11 20 9 20	+13 +20	15 22 27 31
30 GHz	+22 +18	11 18 9 17	+13 +20	15 22 27 31
35 GHz	+22 +18	11 18 9 17	+11 +17	15 21 26 31
40 GHz	+23 +18	11 17 9 16	+11 +18	15 20 23 29



Model	APLC40	E8257D	N5183B	SMA100B
Frequency switching speed	500 μ s, 15 μ s option FS (5 μ s typical.)	9 ms, 9 ms, 24 ms- only typical values	5 ms, 1.15 ms (UNZ)	2.5 ms, 5 ms B711
Aging	1 ppm, 0.03 ppm, 0.02 ppm options LN and LN+	0.03 ppm	0.1 ppm	1 ppm, 0.1 ppm, 0.03 ppm
Phase noise level 10 GHz, dBc/Hz	Std LN, LN+	Std UNX UNY HY2	Std UNY	Std B709 B710 B711
Synthesiser typ.	VCO	YIG	VCO	YIG
10 Hz	- -85	- -72 -76 -76	- -82	- -63 -83 -83
1 kHz	-122 -122	- -109 -107 -115	- -116	- -108 -119 -120
20 kHz	-131 -131	-113 -114 -126 -128	-116 -129	-120 -120 -125 -132
100 kHz	-133 -133	- -115 -125 -128	- -126	- -118 -123 -134
1 MHz	-131 -131	- - - -137	- -	- -124 -130 -146
Amplitude noise at 10 GHz, dBc/Hz				
1 kHz	-130	-135	-135	-135
20 kHz	-140	-140	-140	-141
100 kHz	-150	-142	-140	-145
1 MHz	-160	-148	-150	-152
10 MHz	-165	-155	-160	-160



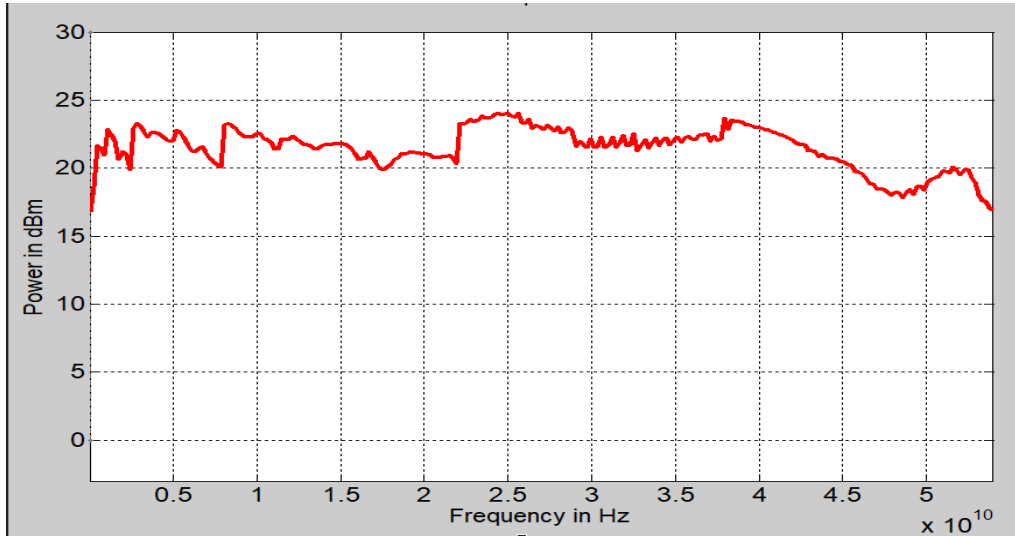
Model	APLC40	E8257D	N5183B	SMA100B
Harmonics	-40 dBc, f>6 GHz -50 dBc	-55 dBc	-55 dBc	-55 dBc
Sub-Harmonics, dBc				
f<11.3 GHz	-70 dBc	None	-67 dBc	-85, -95 B711
f>11.3 GHz	-55 dBc	-60 dBc, -50 dBc	-53 dBc	-60
Non-Harmonics, dBc				
5 GHz	-80 (-90 typ.)	-62 (-70 typ.), -74 UNY	-60 -80 (-88 typ.) UNY	-80 -88 B711
10 GHz	-74 (-84 typ.)	-62 (-70 typ.), -64 UNY	-69 -74 (-80 typ.) UNY	-74 -82 B711
20 GHz	-68 (-80 typ.)	-56 (-64 typ.), -64 UNY	-63 -68 (-65 typ.) UNY	-68 -76 B711
40 GHz	-65 (-70 typ.)	-50 (-58 typ.), -58 UNY	-57 -62 (-68 typ) UNY	-62 -70 B711
Pulse modulation	Option MOD	Option UNW	Option UNW	Option
Pulse width	15 ns	20 ns	20 ns	20ns, rise fall 20 ns
ON/OFF ratio	80 dB, typical 100	80 dB (UNW)	>80 dB typ	> 80 dB
Rise/Fall time	5 ns (3 ns. Typ)	10 ns (6 ns typ.)	10 ns, 7 ns (typ)	10 ns, 5 ns typ



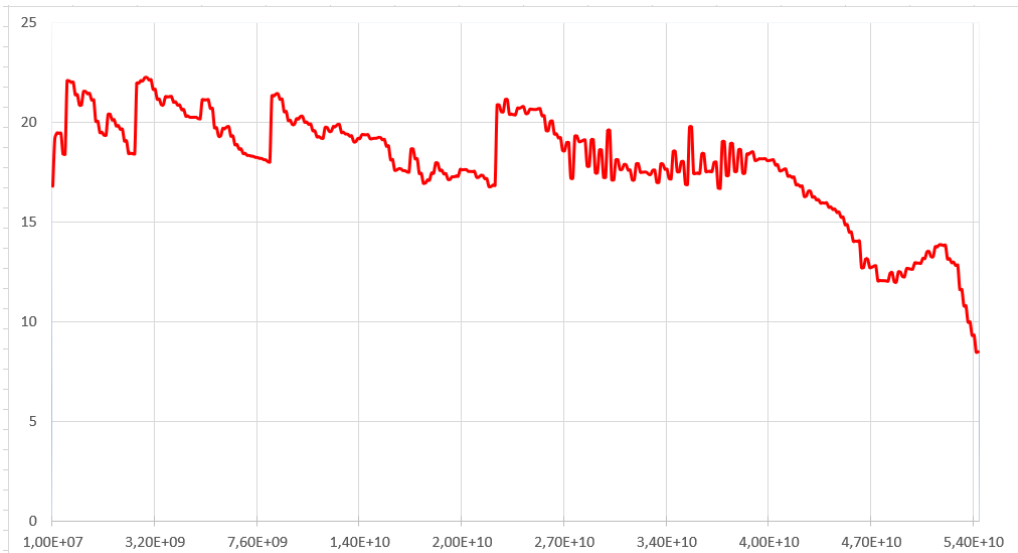
Model	APLC40	E8257D	N5183B	SMA100B
Analog Modulations	AM,FM,PM option MOD	AM,FM,PM option UNT	AM,FM,PM option UNT	AM,FM,PM option K720
Ramp modulation	No	Yes	No	Yes
Operation from an external battery	Yes	No	No	No
Power consumption	80 W	450 W	280 W	380 W

Max. power APLC vs Keysight E8257D

AnaPico APLC w/o attenuator

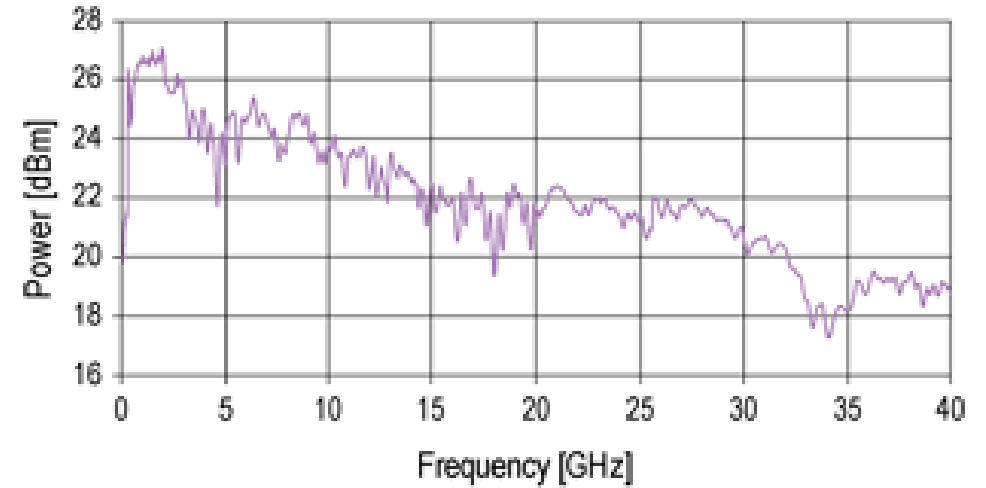


AnaPico APLC with attenuator PE2

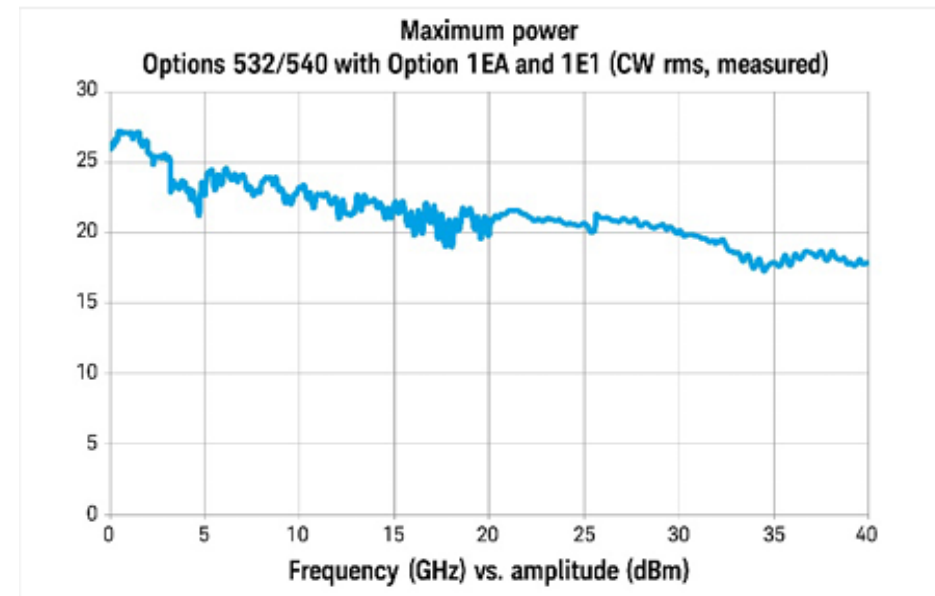


Keysight E8257D attenuator+amplifier

Option 532/540 with Options 1EU, 1E1 (measured)

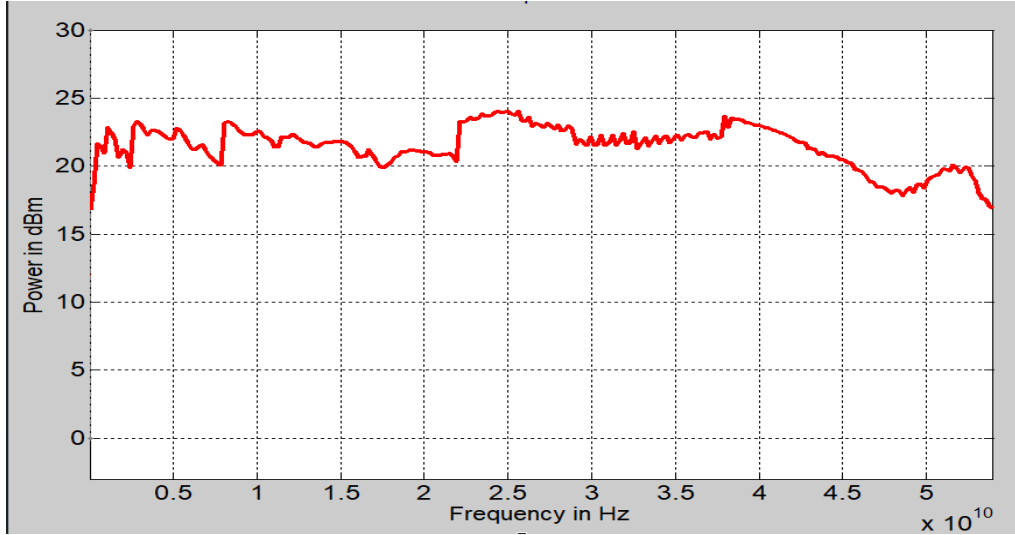


Keysight N5183B attenuator+amplifier

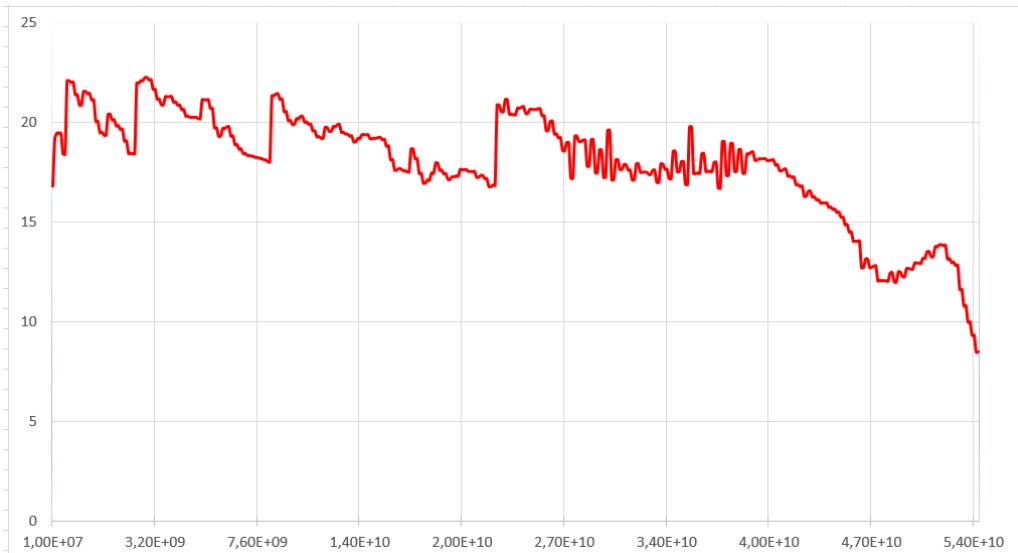


Max. power APLC vs Keysight E8257D

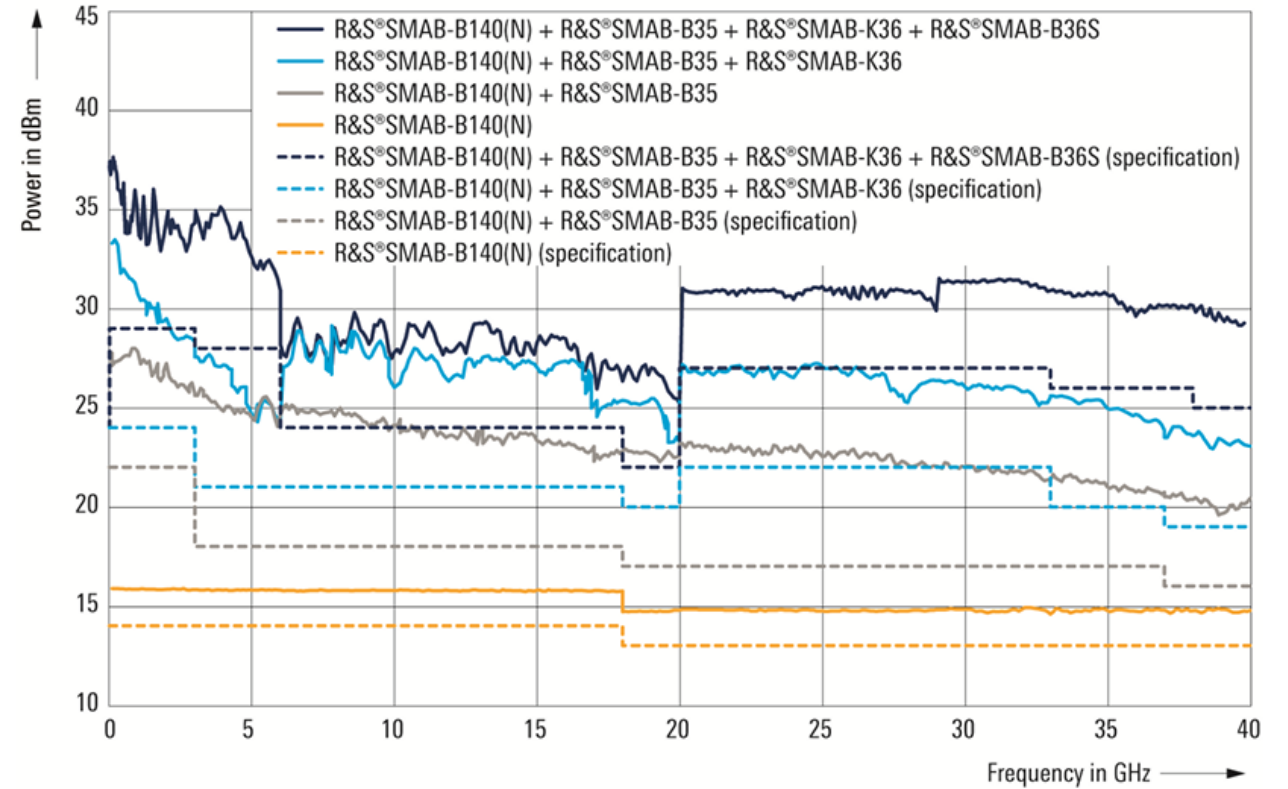
AnaPico APLC w/o attenuator



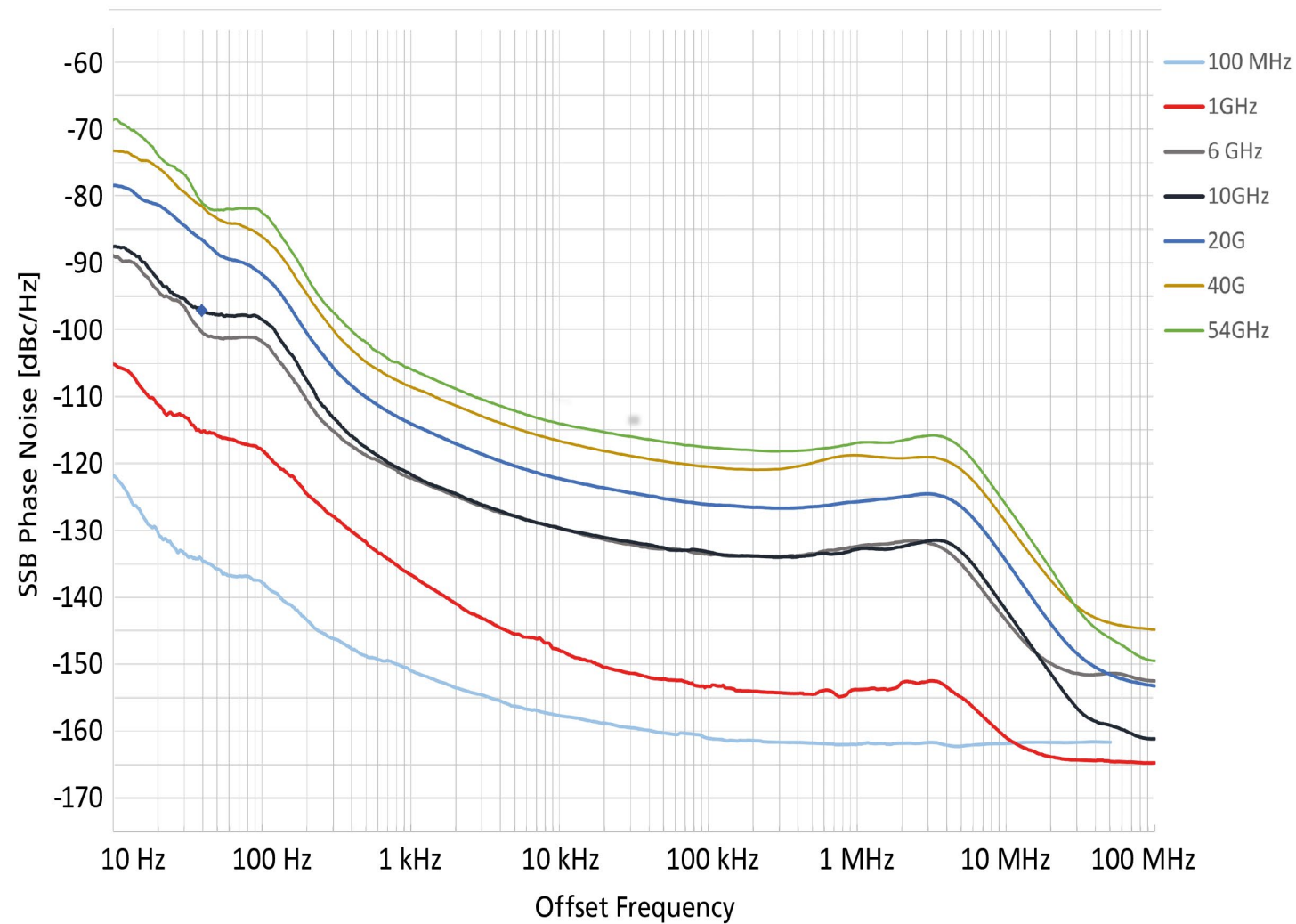
AnaPico APLC with attenuator PE2



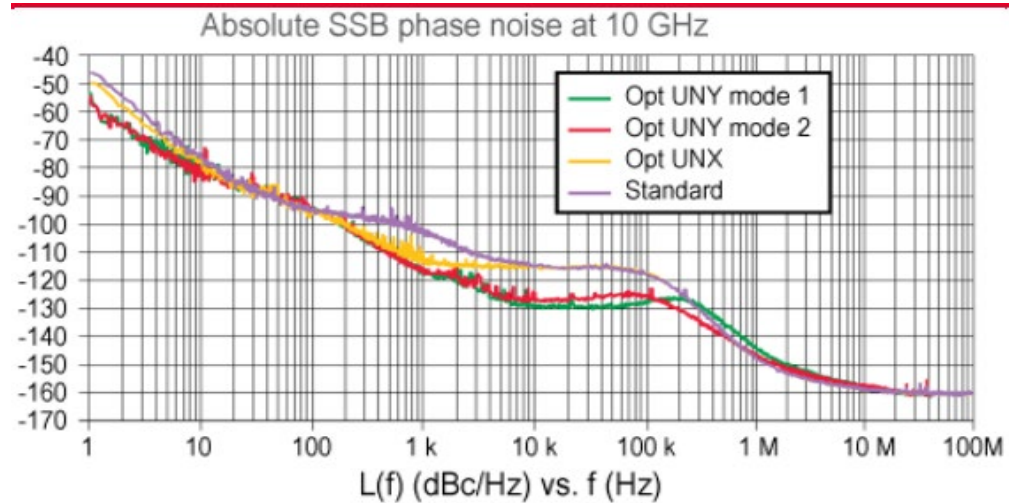
R&S SMA100B



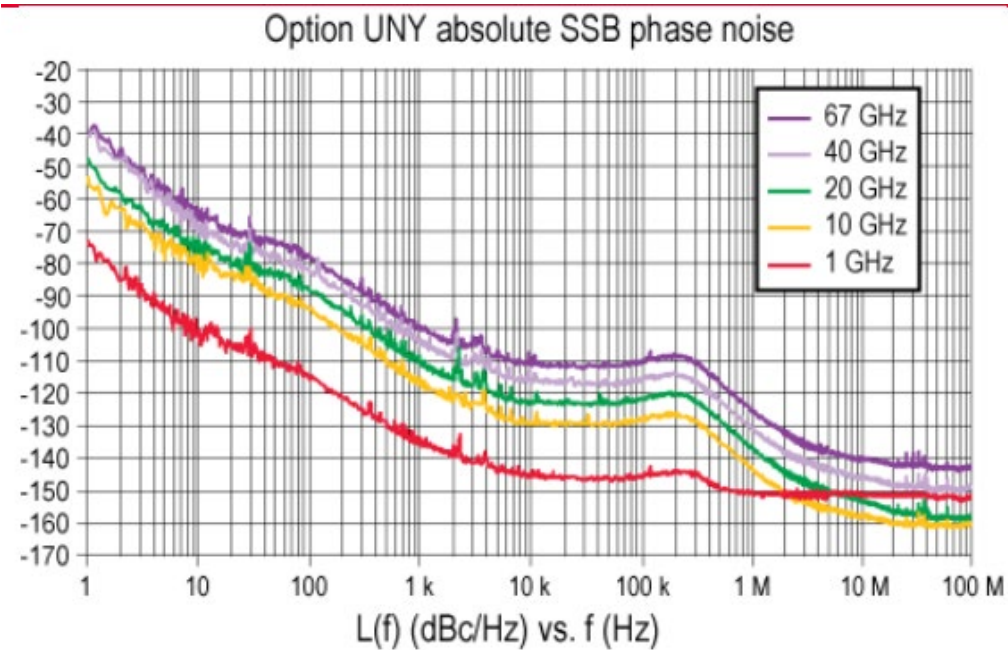
SSB Phase noise APLC vs Keysight E8257D



Keysight E8257D-10GHz-UNX-UNY

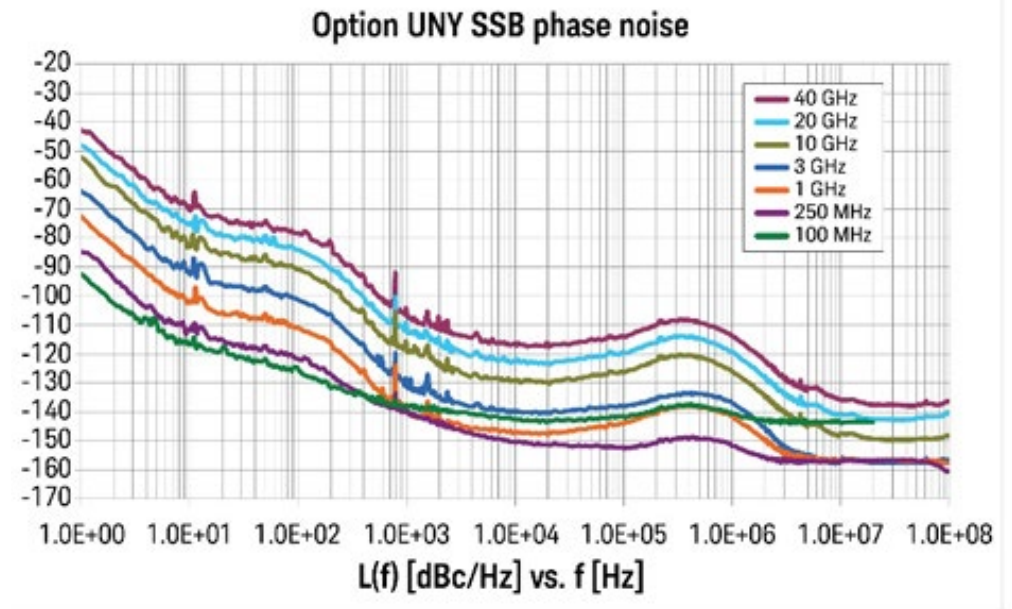
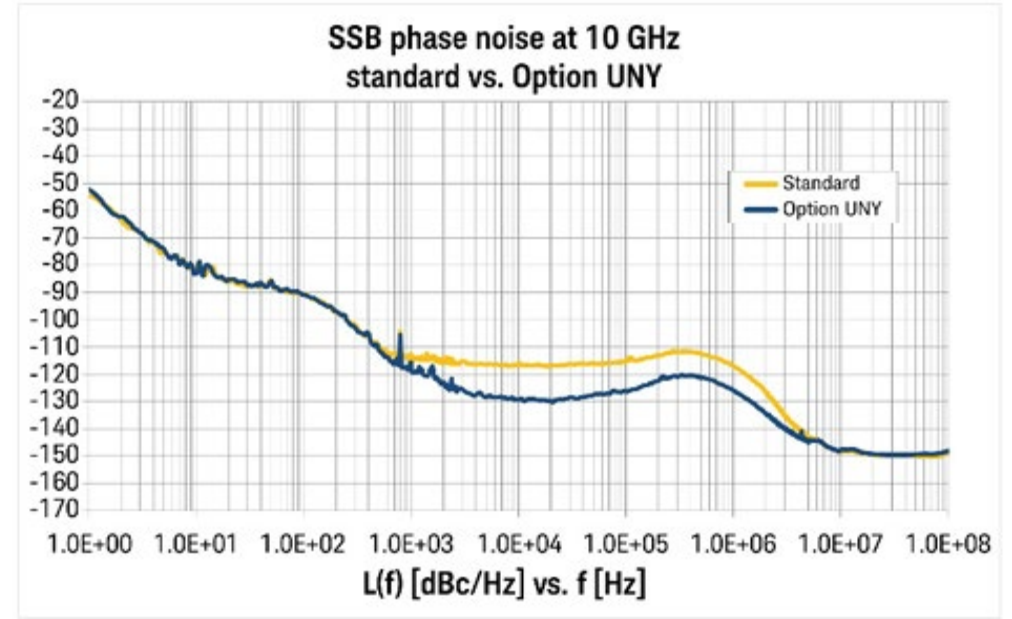
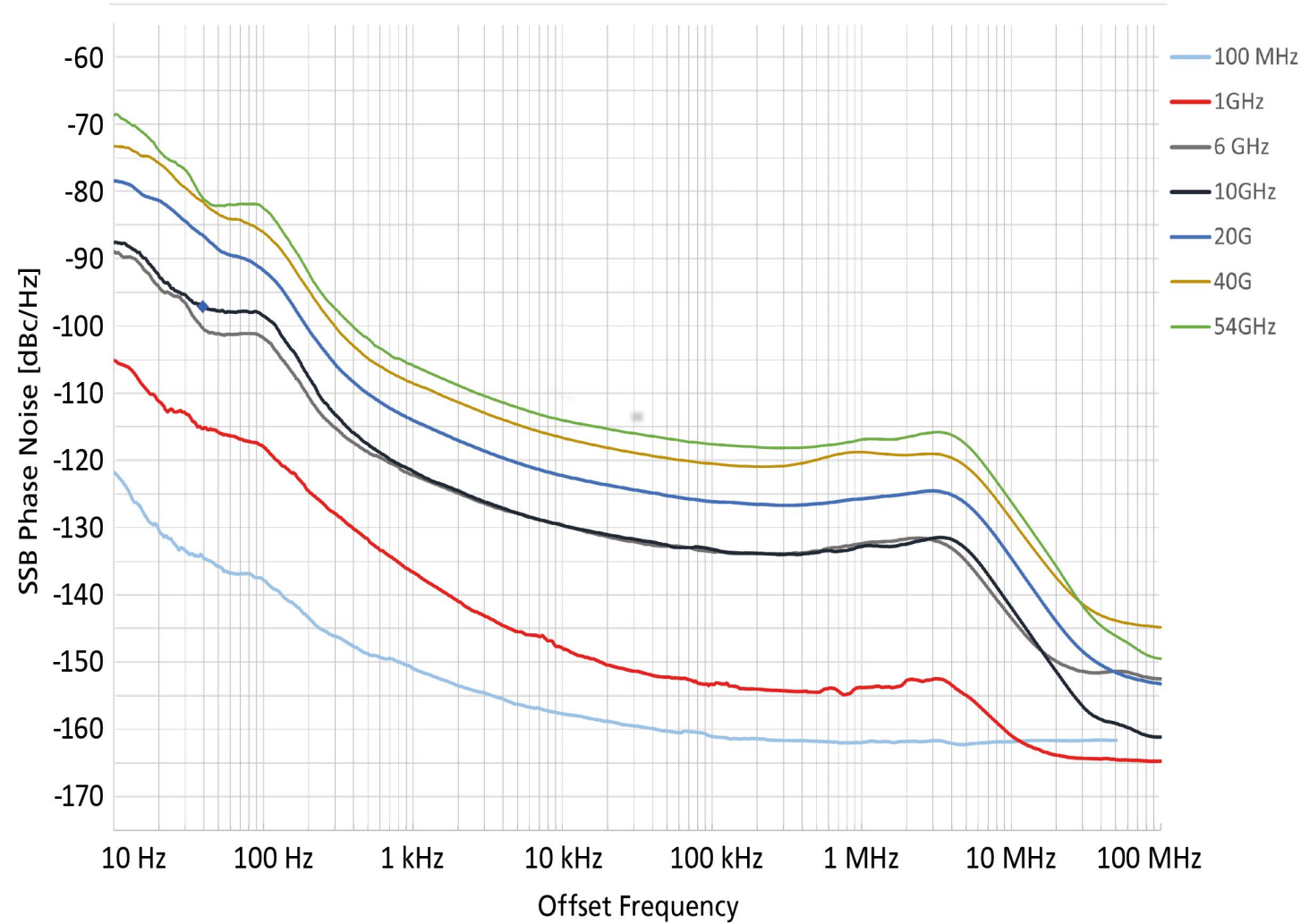


Keysight E8257D-UNY



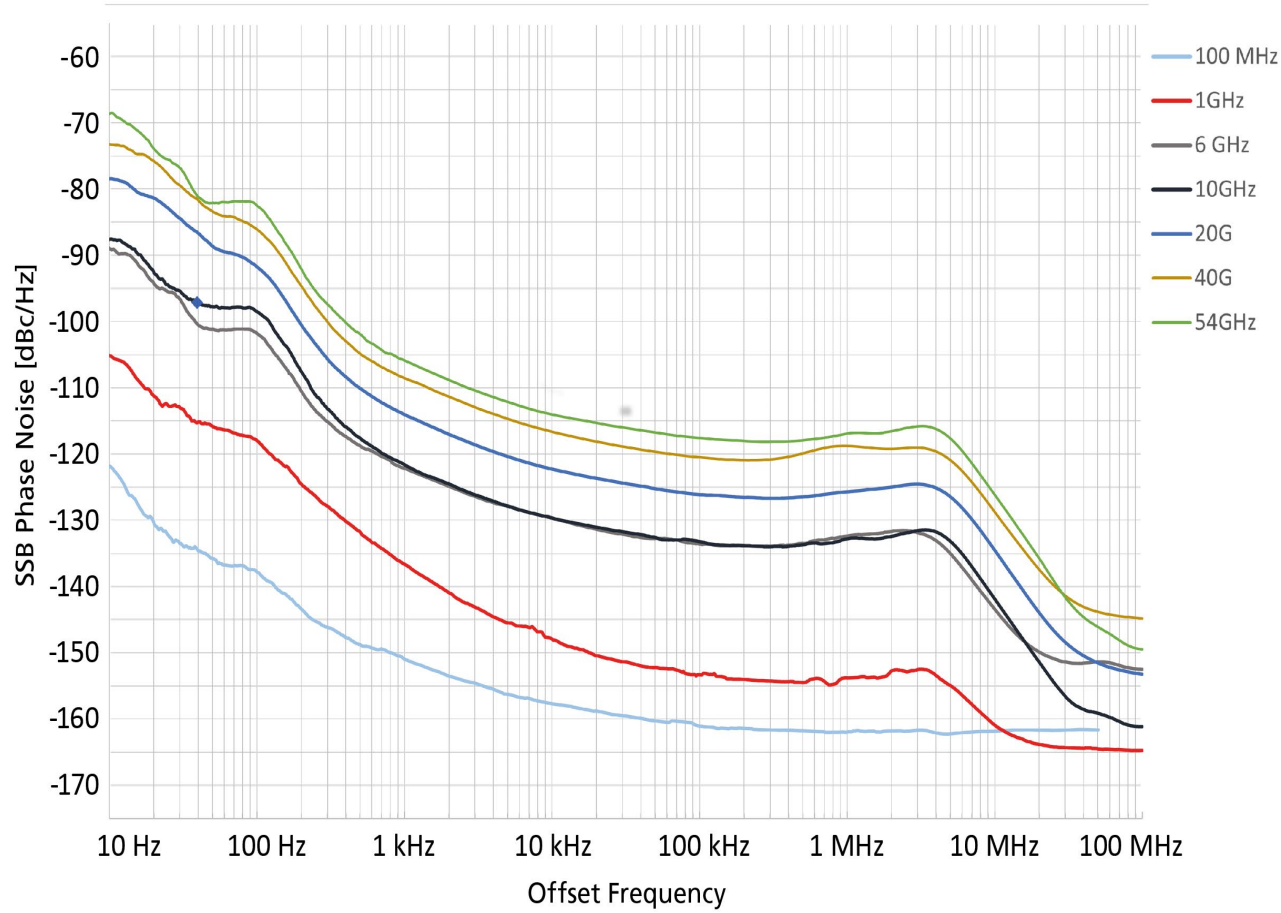
SSB Phase noise APLC vs Keysight N5183B

Keysight N5183B

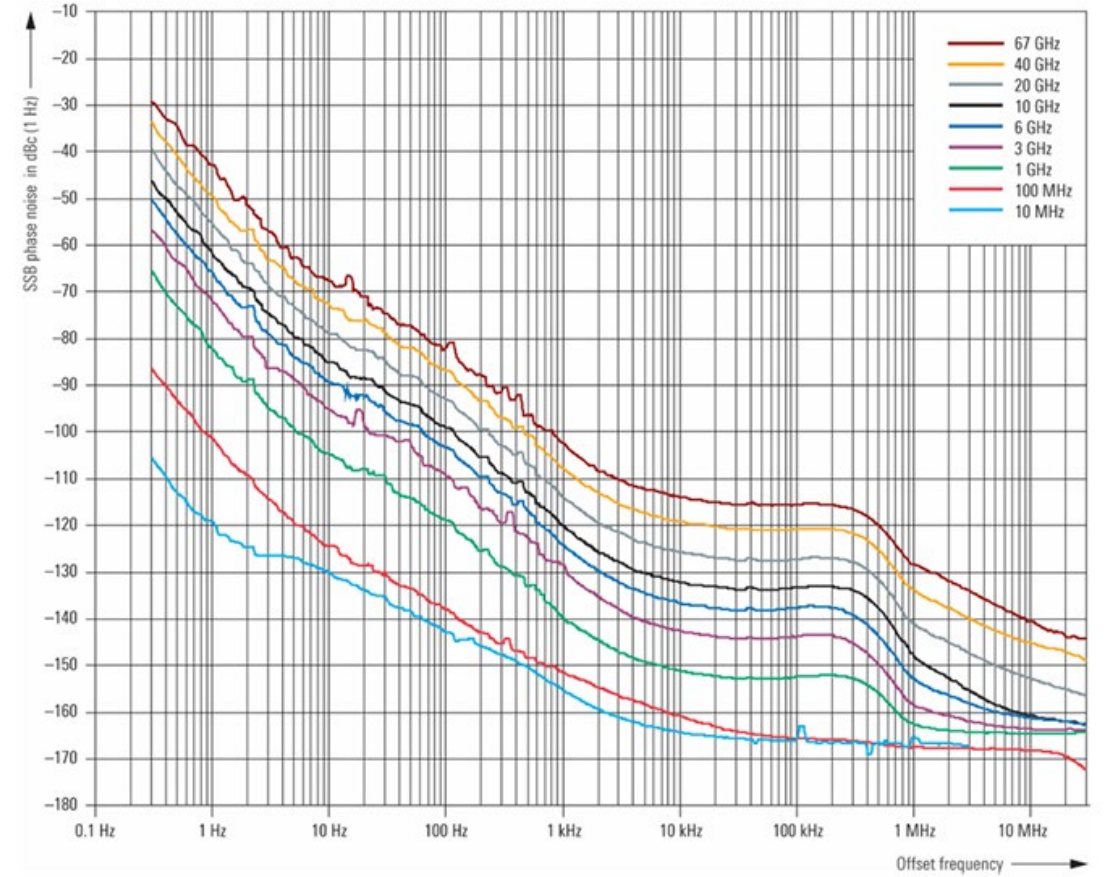


SSB Phase noise APLC vs R&S SMA100B

AnaPico APLC



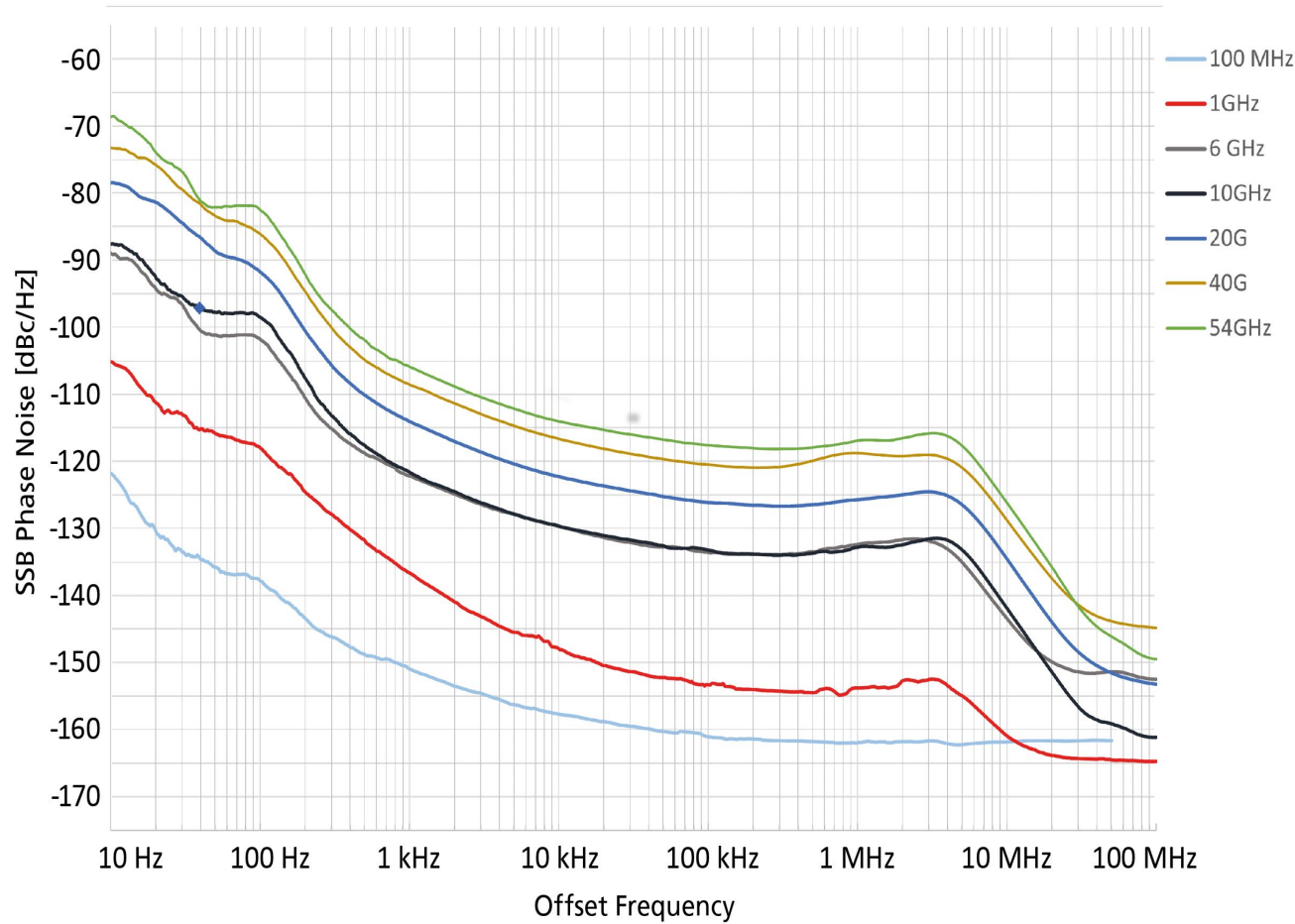
R&S SMA100B



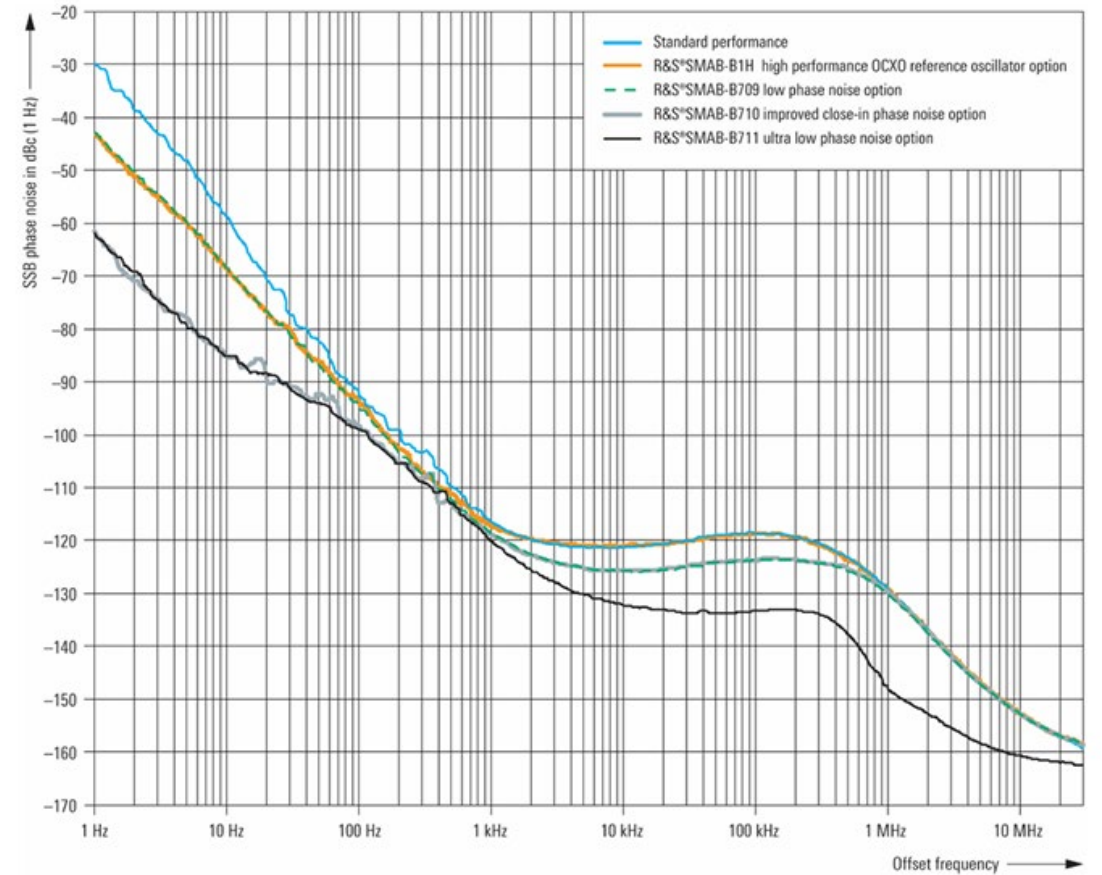
Measured SSB phase noise with the R&S[®] SMAB-B711(N) option

SSB Phase noise APLC vs R&S SMA100B

AnaPico APLC



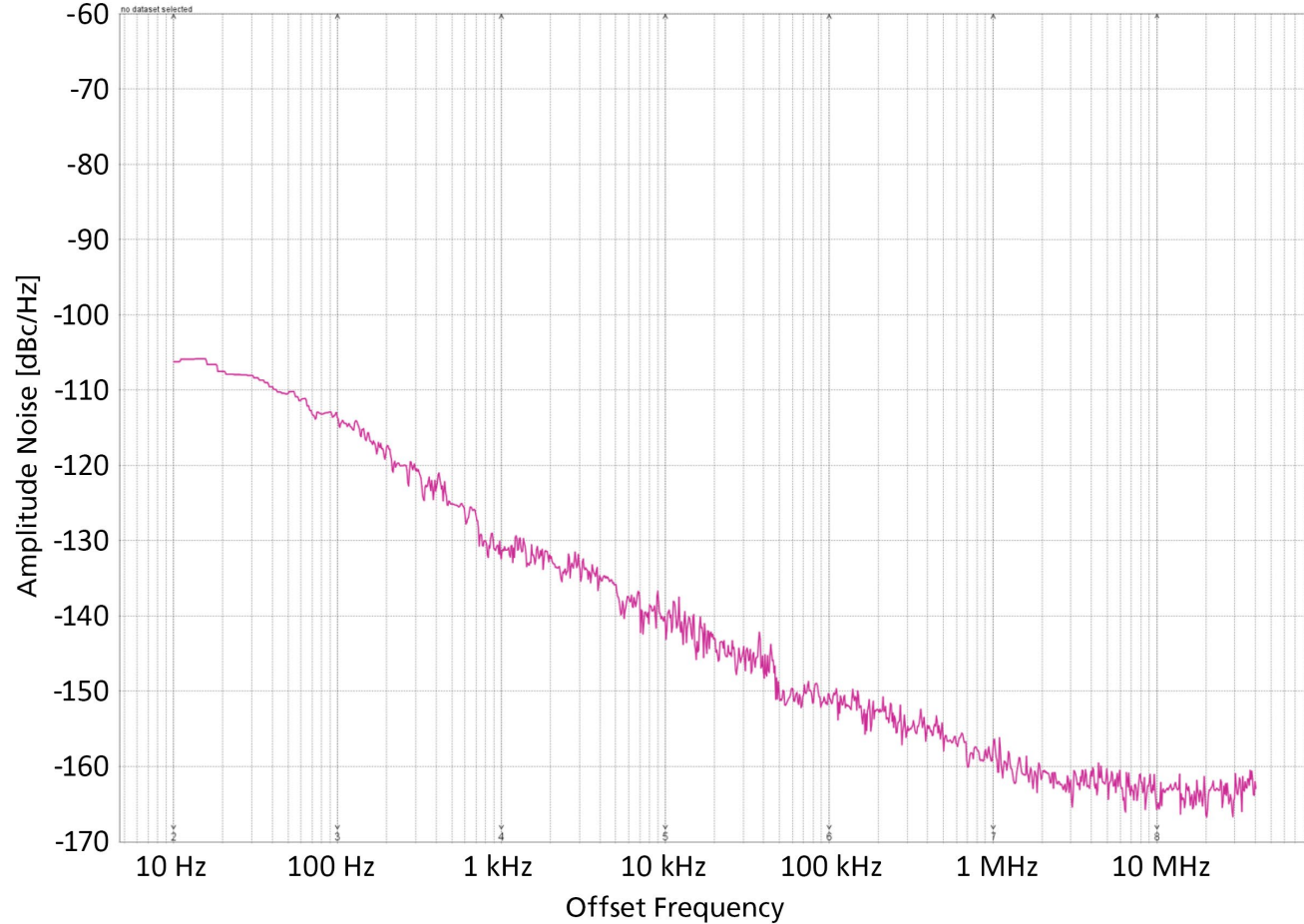
R&S SMA100B, 10 GHz all options



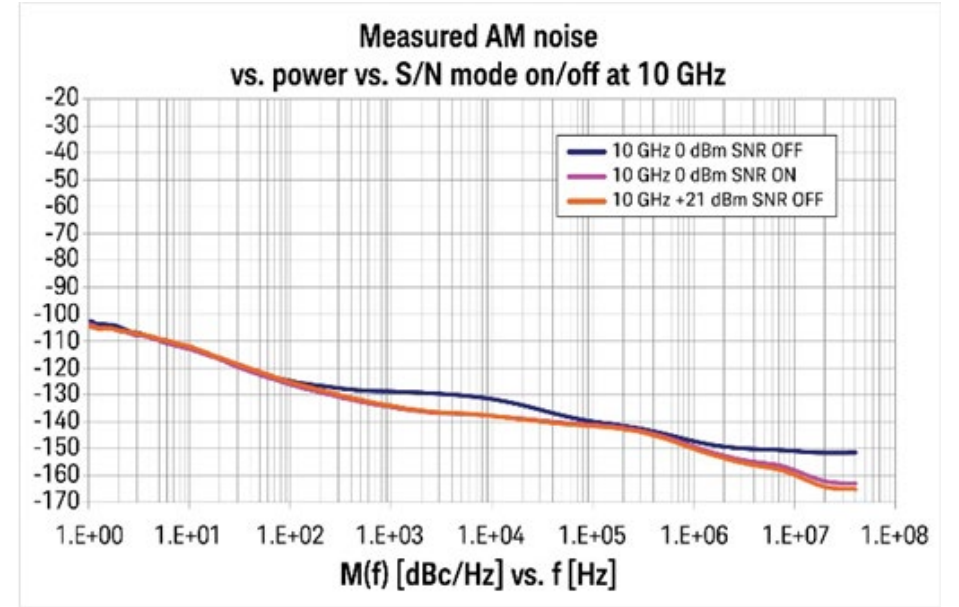
Measured SSB phase noise at $f = 10$ GHz, standard performance versus the R&S SMAB-B1H, R&S SMAB-B709, R&S SMAB-B710 and R&S SMAB-B711 options

Amplitude noise APLC vs Keysight

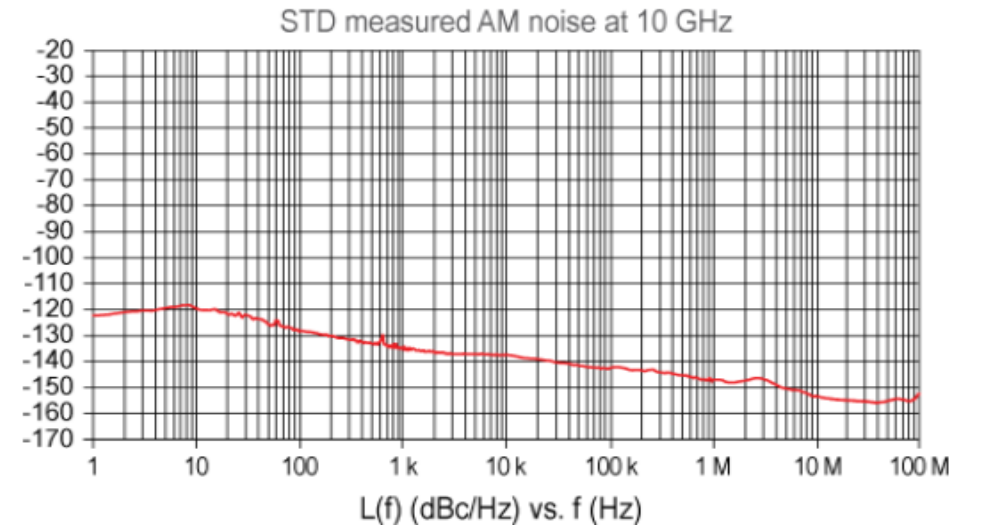
AnaPico APLC 10 GHz



Keysight N5183B, AM Noise

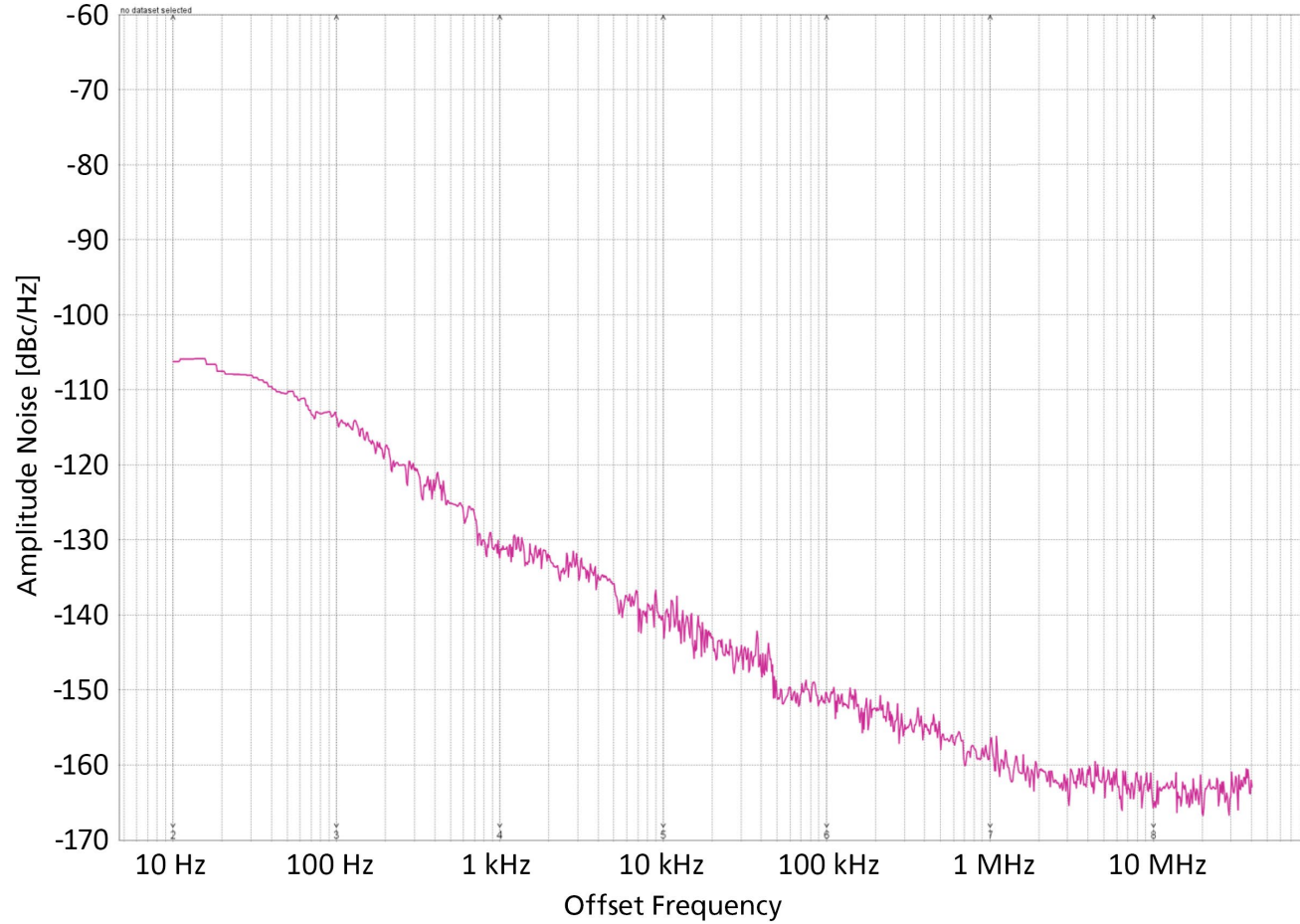


Keysight E8257D, AM Noise

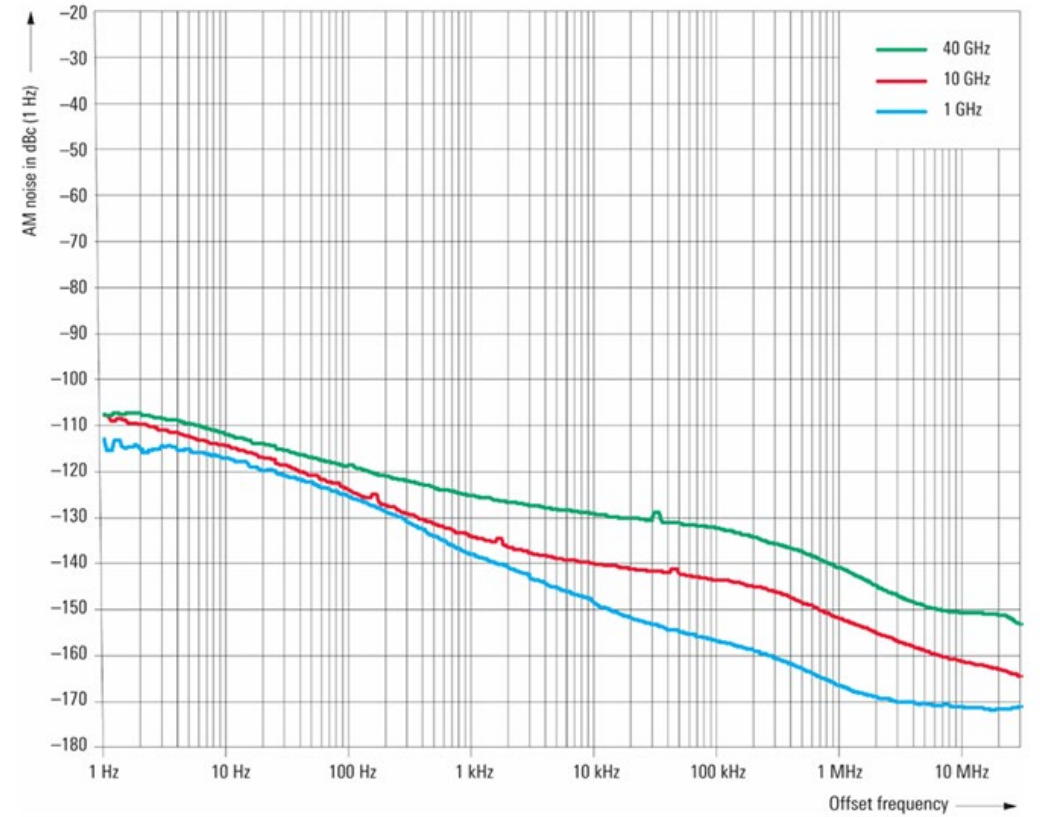


Amplitude noise APLC vs R&S SMA100B

AnaPico APLC 10 GHz



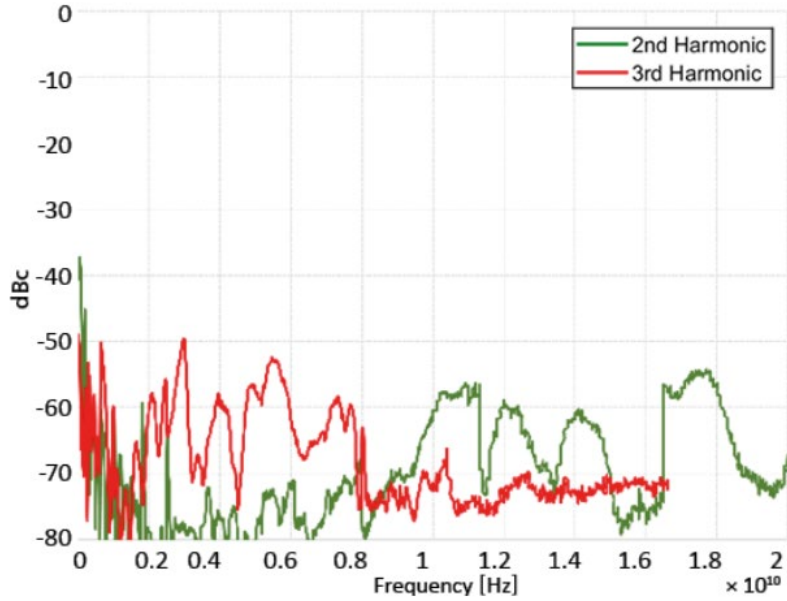
R&S SMA100B, AM Noise B711



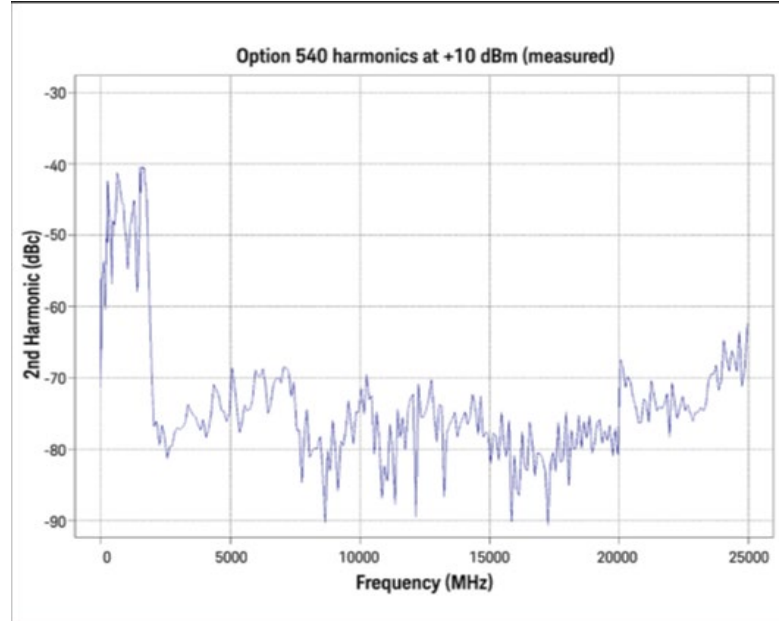
Measured AM noise at $f = 1$ GHz, 10 GHz and 40 GHz with the R&S®SMAB-B711 option

Harmonics AnaPico APLC vs Keysight N5183B, E8257D

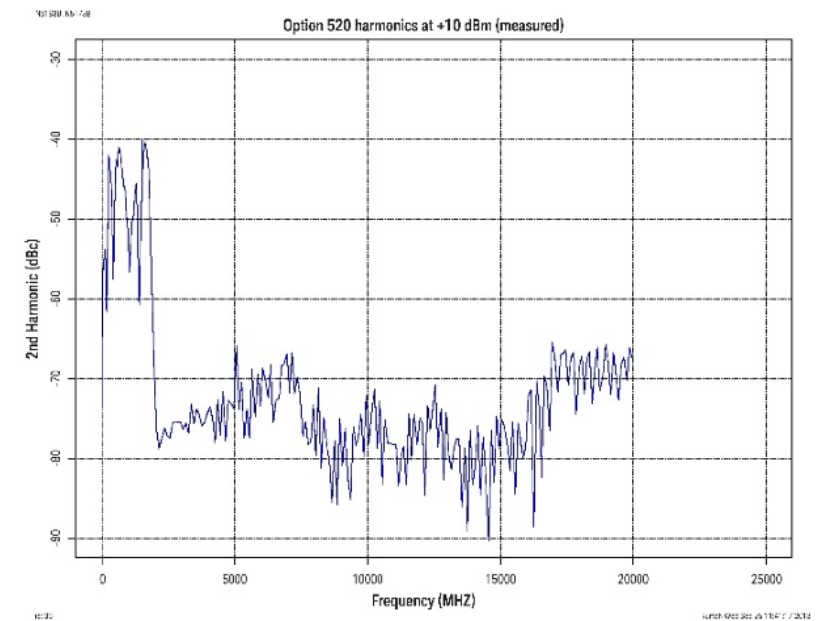
Harmonics APLC



Keysight harmonics N5183B

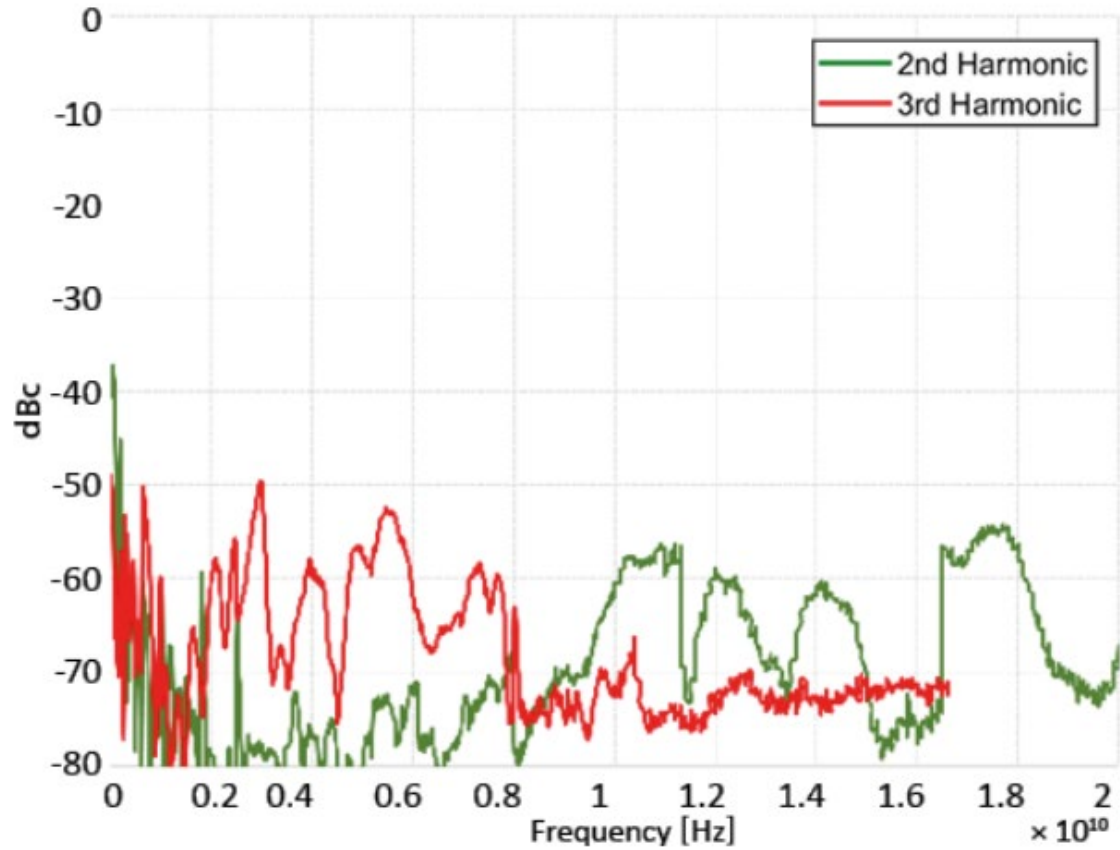


Keysight harmonics E8257D

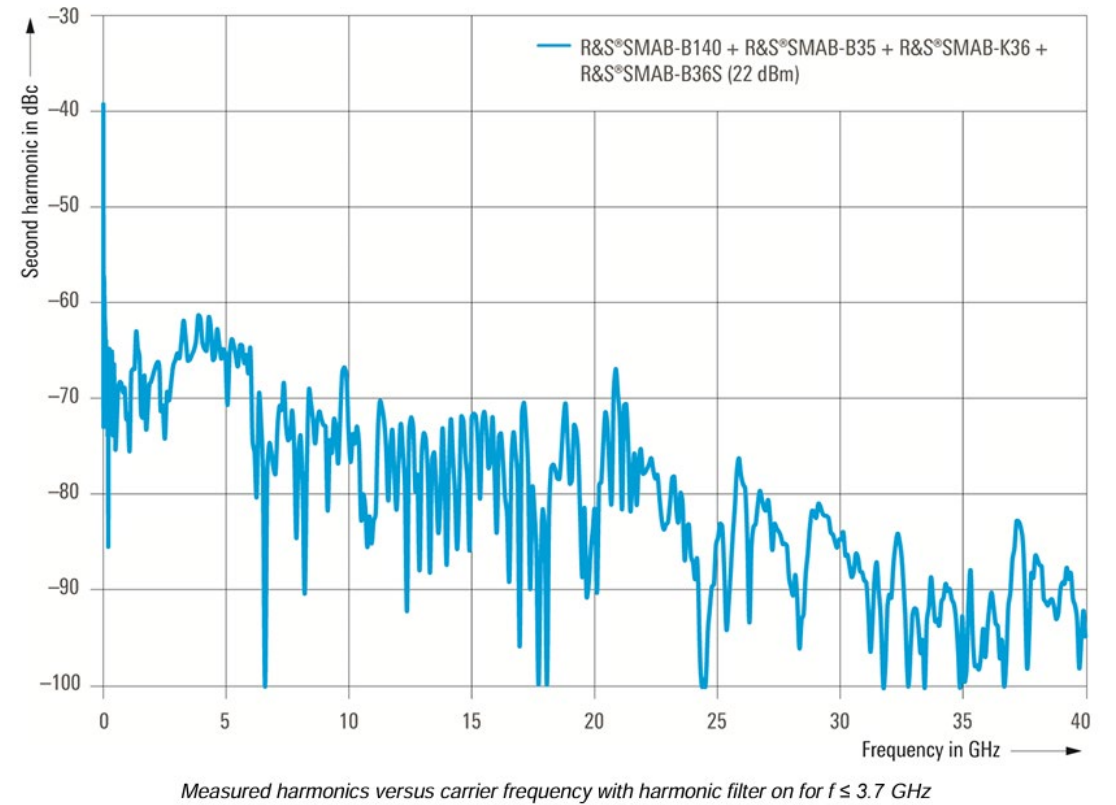


Harmonics AnaPico APLC vs R&S SMA100B

Harmonics APLC

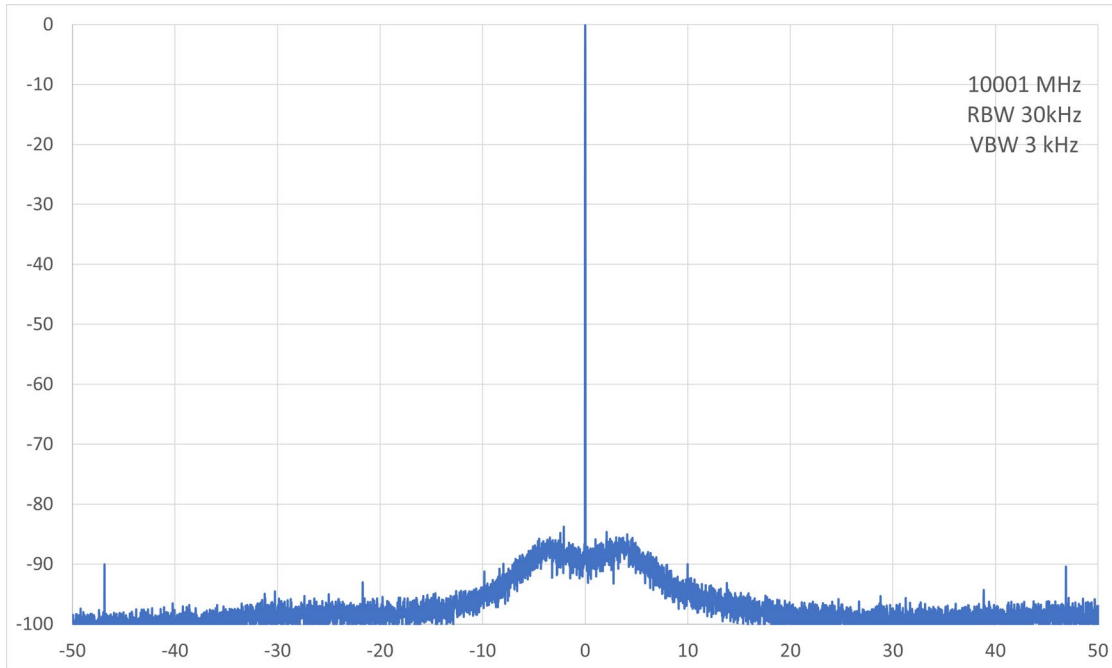


Harmonics SMA100B

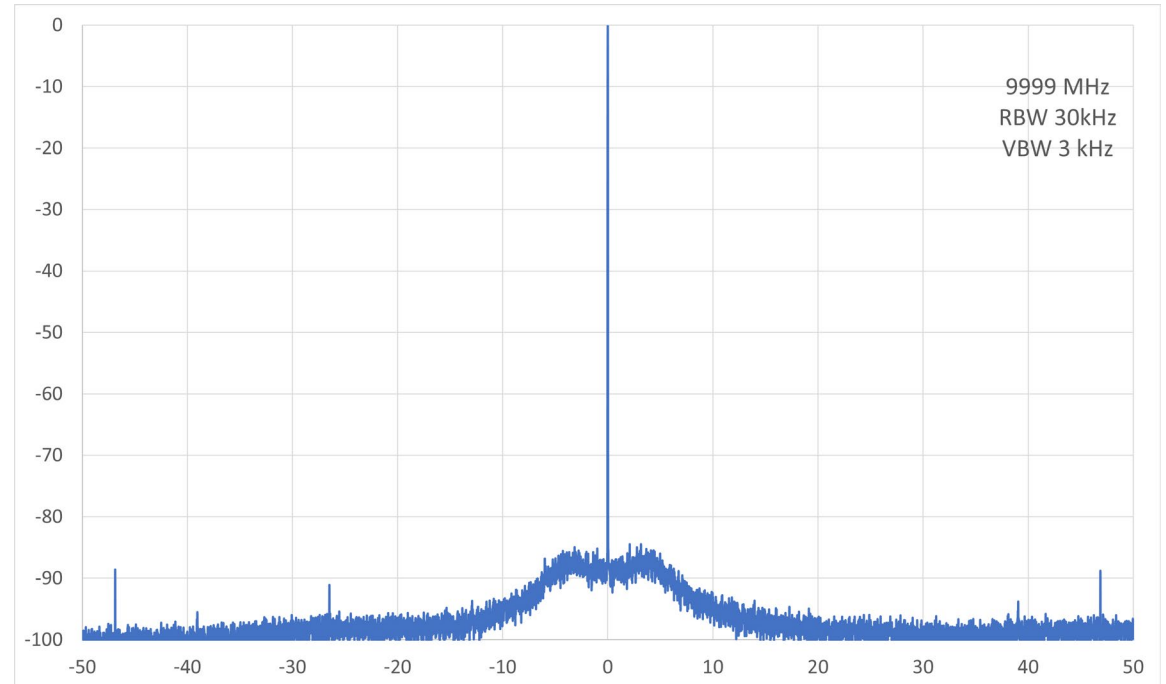


Nonharmonics AnaPico APLC

AnaPico APLC Spectrum 10 001 MHz



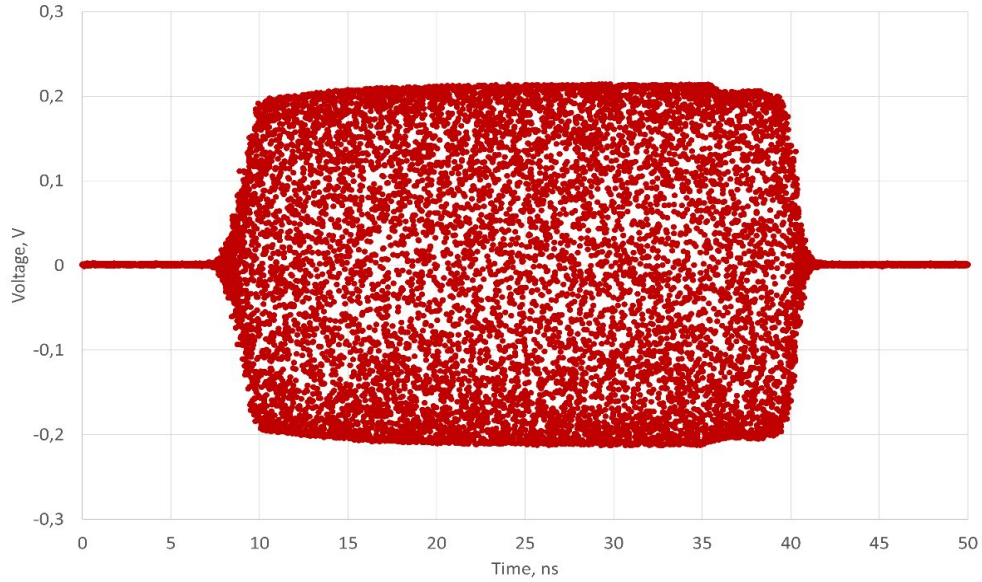
AnaPico APLC Spectrum 9 999 MHz



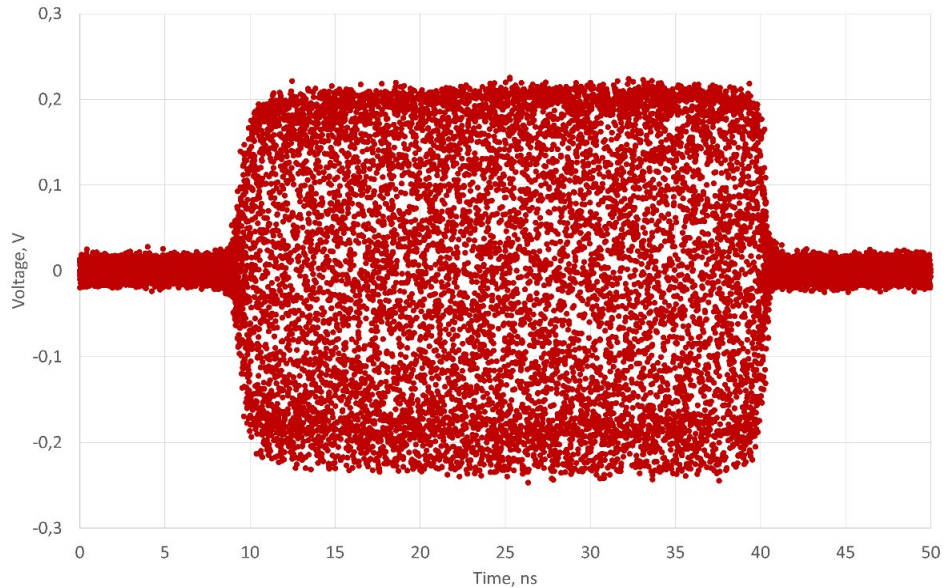
The level of nonharmonics depends on the frequency of the signal, the best values are obtained when the signal frequency is a multiple of the reference frequency. Due to the flexible reference technology APLC demonstrates a low level of nonharmonics in the whole frequency range, which is especially important for such applications as LO-substitution and receiver test.

Pulse modulations AnaPico APLC vs Keysight

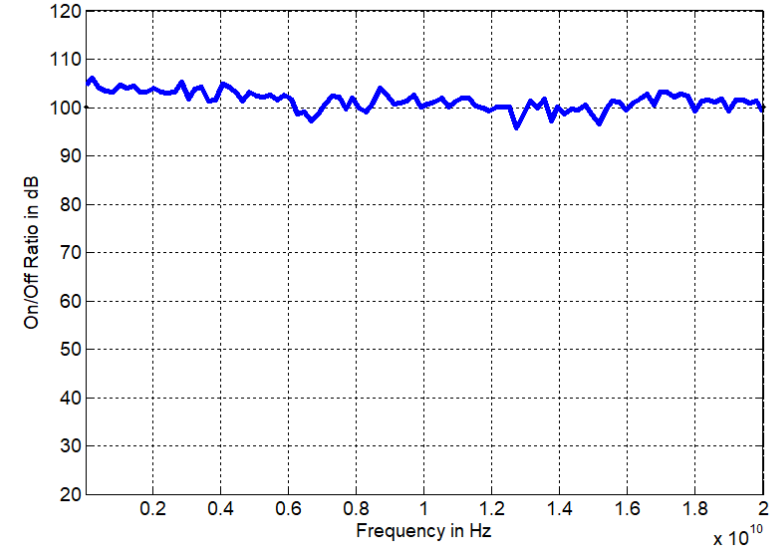
AnaPico APLC 10 GHz 30 ns



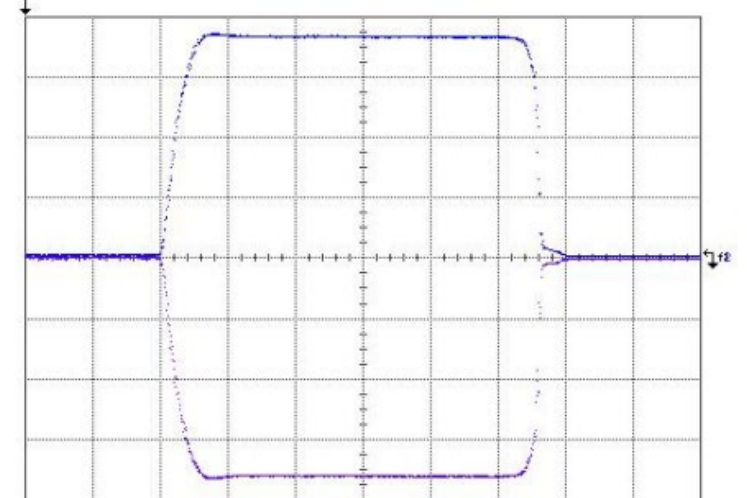
AnaPico APLC 50 GHz 30 ns



AnaPico APLC On/Off ratio Pulse modulation







Keysight E8257D 9 GHz, 10ns/div.



Measured pulse modulation envelope

Frequency = 9 GHz, amplitude = 10 dBm, ALC Off, 10 ns/div

Price comparison, price EXW country of origin

AnaPico APLC40	Keysight E8257D	Keysight N5153B	R&S SMA100B
			
<p>APLC40- Frequency range 40 GHz</p> <p>LN+- low phase noise + frequency stability</p> <p>PE2- Step attenuator</p> <p>MOD- Analog+narrow pulse modulation</p>	<p>E8257D-540 frequency range 40 GHz 72 354 \$</p> <p>1EU-High power 9 637 \$</p> <p>1E1-Step attenuator 5 473\$</p> <p>UNY- Low phase noise 22 745 \$</p> <p>UNT- analog modulation 5694 \$</p> <p>UNW- Narrow pulse modulation 11 051 \$</p>	<p>N5183B-540 frequency range 40 GHz 64 416 \$</p> <p>UNW- pulse modulation 7246 \$</p> <p>UNT Analog modulation 5048 \$</p> <p>1EA-High power 7246 \$</p> <p>1E1-Step attenuator 6061 \$</p> <p>UNY- Low phase noise 17057 \$</p>	<p>SMA100B- 3200 EUR base unit</p> <p>B140- Frequency range 40 GHz 53 470 EUR</p> <p>B711- Low phase noise 19 255 EUR</p> <p>K36 Ultra High Power 20 770 EUR</p> <p>B35 High power 8 350 EUR</p> <p>K22,K23,K27- Pulse modulation 7765 EUR</p> <p>K720-Analog modulation 2505</p>
30-35% Cheaper	Total 126 954 \$	Total 107 074\$	Total 115 315 EUR

The price is an estimate, differences may occur due to price changes, sales and pricing policies in different fear.

Conclusion

The APLC competes successfully among top-of-the-line instruments with the maximum number of options. The model has both technical and price advantages.

The following points should be noted in the competitive analysis.

1. The APLC platform allows to create both single-channel and multichannel generators up to 4 channels, which is an advantage for ATE Testing, LO-Substitution, Radar Simulation, Phase-coherence application tasks
2. The highest maximum power is achievable on the SMA100B generator, also this device has the best harmonic level in the class.
3. The APLC structural design utilizes an additional gain stage after 22 GHz, allowing higher power output than Keysight generators in the 22-40 GHz range.
4. APLC competes with SMA100B in phase noise and non-harmonic distortion, both devices have an advantage over Keysight N5183B, E8257D generators.

The APLC is the best in class in a number of aspects.

1. Frequency tuning speed of 15 microseconds when other instruments take more than 1 ms.
2. Long-term frequency stability of 0.02 ppm per year
3. Pulse modulation parameters. best rise/fall time of 3-5 ns in class combined with high on/off ratio of 100 dB.
4. Unique combination of features Low phase noise, high frequency hopping speed and long-term stability, which are mutually exclusive in the class.