



RSA5000 Series

Real-time Spectrum Analyzer

- Ultra-Real 기술 적용
- 주파수 범위 : 최대 6.5 GHz
- DANL : -165 dBm(typical)
- Phase Noise : -108 dBc/Hz(typical)
- 레벨 측정 불확도(Uncertainty) : <math><0.8\text{ dB}</math>
- 최대 6.5 GHz Tracking Generator
- Min. RBW 1 Hz
- EMC Filter & Qp detector 내장
- 다양한 측정 기능(AMK)(Opt.)
- Multi 측정 모드
- 실시간 대역폭(RTBW) : 25MHz(Std.), Max 40MHz(Opt.)
- 다중 트리거 모드 및 트리거 마스크(Masks)
- 밀도(Density), 스펙트로그램(Spectrogram)과 기타 디스플레이 모드
- PC 소프트웨어(Opt.)
- 10.1" 터치 화면, 터치 동작 인식
- USB, LAN, HDMI 등 기타 인터페이스 지원

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Product Dimensions: Width × Height × Depth = 410 mm × 224 mm × 135 mm

UltraReal

Ultra-Real 기술을 바탕으로 고속의 실시간 측정모드는 분석 대역폭에서 끊임없이 신호를 취득할 수 있도록 합니다. 또한 다양한 디스플레이 모드를 지원하는데 스펙트로그램(Spectrogram), 밀도(Density), PVT, FMT 기능이 가능합니다.

Ultra-Real 기술은 다음의 특징이 있습니다.

- **심리스(Seamless)분석**
 - ◎ 분석대역폭에서 심리스 I/Q 데이터 분석
 - ◎ 심리스 스펙트럼 분석
- **FMT**
 - ◎ Frequency Mask Trigger(FMT)를 활용하여, 스펙트럼에서 산발적 혹은 과도현상 이벤트를 측정
- **복합 디스플레이**
 - ◎ 스펙트럼에 대한 갭 프리(Gap-free) 디스플레이를 나타내는 스펙트로그램(Spectrogram)
 - ◎ 신호 발생 빈도를 시각화 해주는 밀도(Density)

응용 분야

- 무선 감시(Radio monitoring)
- 무선 통신 신호 포착 및 분석
- Radar 신호 시험
- RFID, NFC 신호 시험
- 전자회로 디자인 이슈 진단 분석
- EMI Pre Test(Filter 기본 내장)



10.1 inch 화면, 멀티 터치 기능

RSA5000 Series 측정 응용

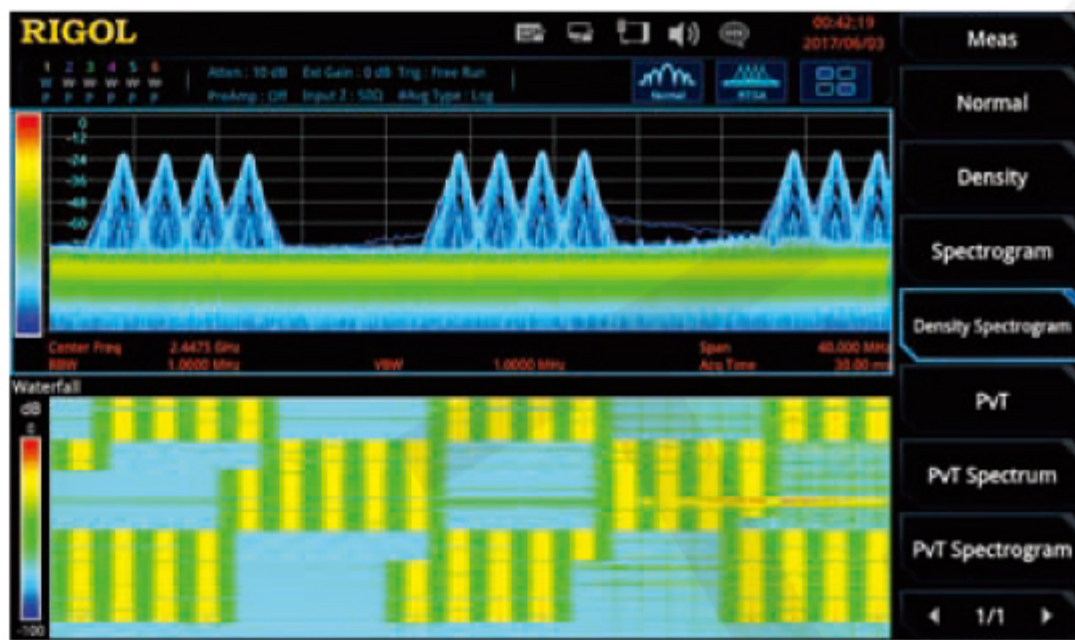
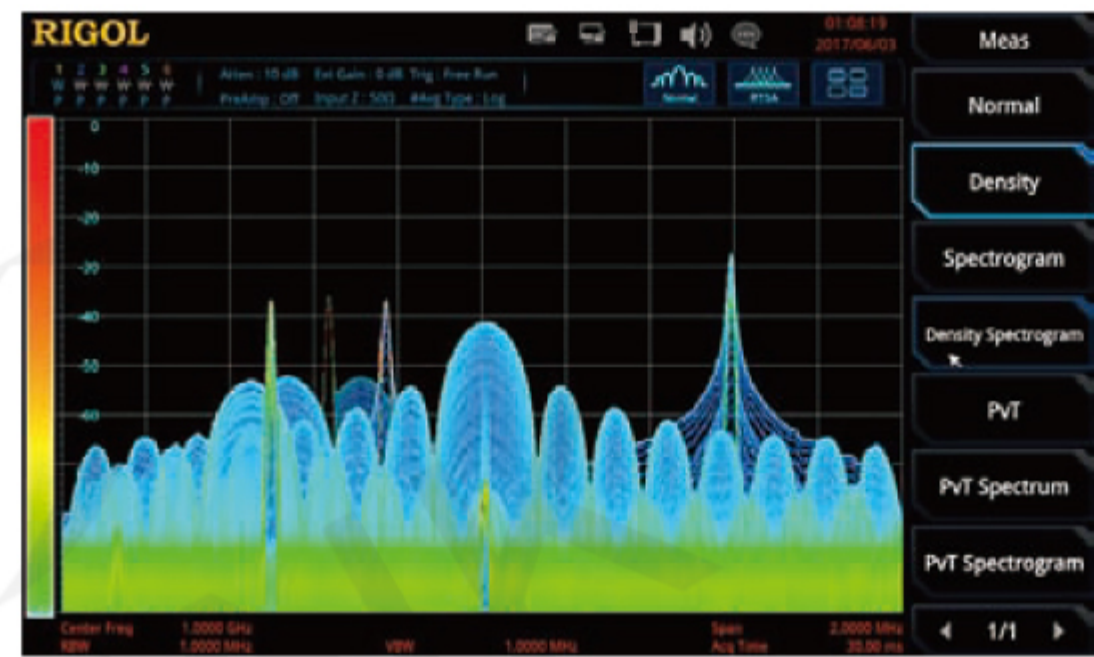


Radio 스펙트럼 모니터링

RSA5000 시리즈는 7.45us의 이벤트 구간에 대한 100% POI를 가지고 있습니다. 또한, 매초 최대 146,484 FFT까지 Ultra-Real 기술로 수행합니다. 이 기능은 스펙트럼 모니터링 분야에 유용하게 활용 가능합니다.

FMT(Frequency Mask Trigger)를 사용한 특정 신호 분석

FMT 메뉴설정 화면(템플릿)은 동적 RF 신호의 정확한 감지 및 분석을 위한 강력한 도구를 제공합니다.

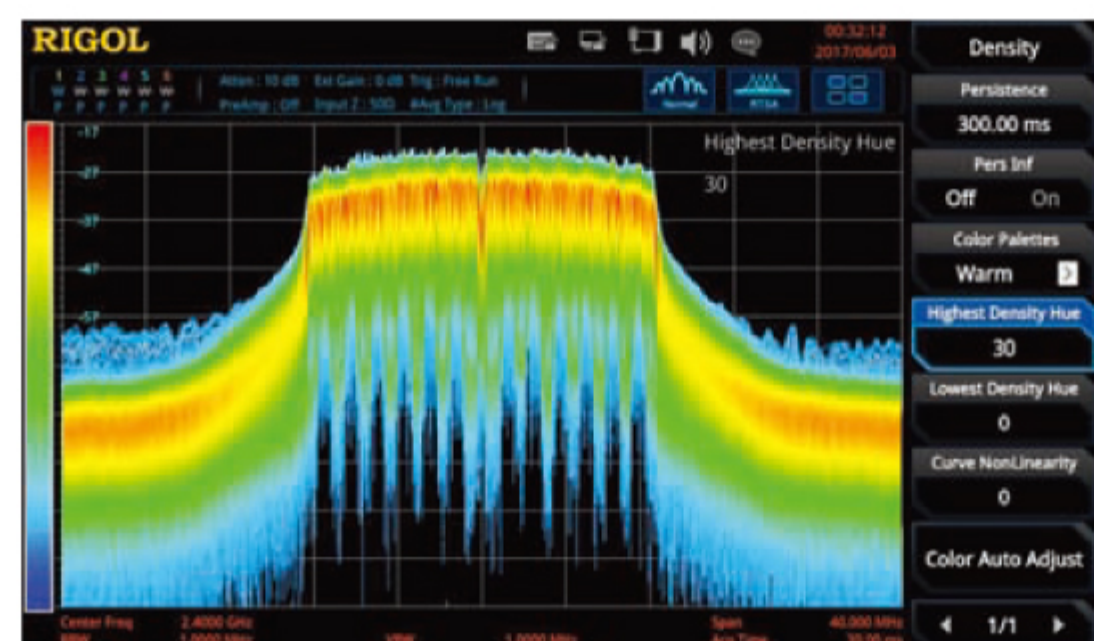
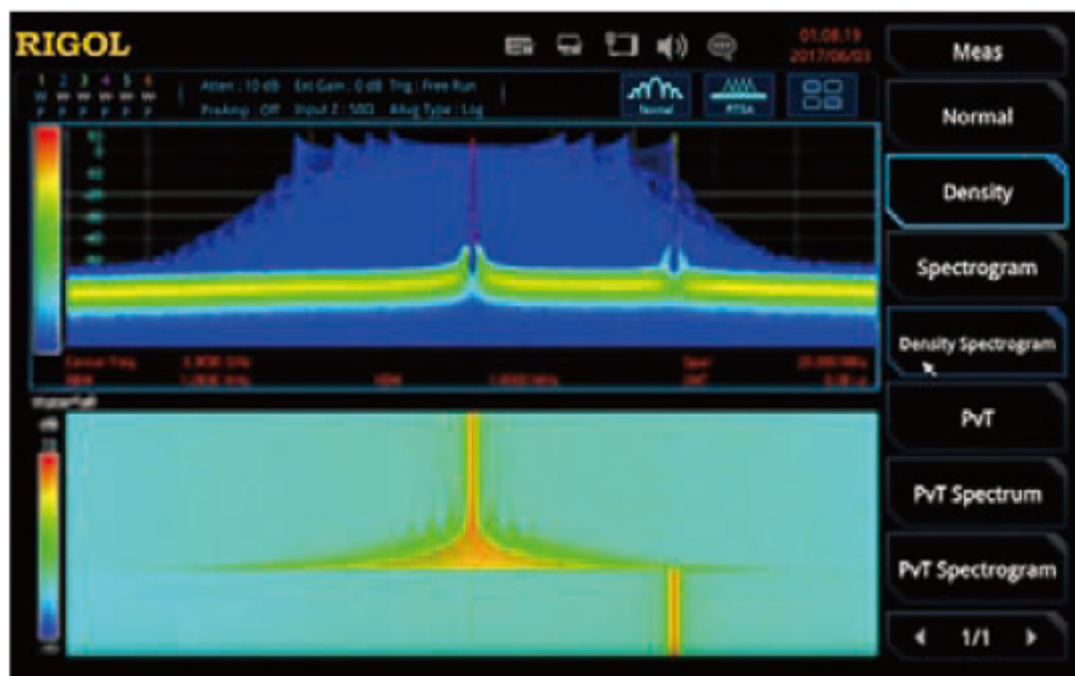


주파수 홉핑 신호 포착

실시간 스펙트럼(RTSA)은 주파수 홉핑 신호의 전 과정을 끊임 없이 수집할 수 있습니다.

WiFi 신호 시험

RSA5000 시리즈는 WiFi 및 기타 통신 신호의 테스트 요구 사항을 충족시키기 위하여 최대 40MHz까지 실시간 대역폭(RTBW)을 제공합니다.



PLL Lock 과정 분석

위상고정루프(PLL)의 안정 시간은 실시간 스펙트럼에서 시간에 따른 주파수 변화를 측정한 결과에 의하여 직접 관찰 가능합니다.

▶ 사양(Specifications)

사양은 다음의 조건 상태에서 측정합니다. 장비는 교정 주기 이내에 있어야 하며, 적어도 두 시간 동안 상온(0 ~ 50도)에 보관해두고 있어야 하며, 약 40분 동안 워밍업이 되어야 합니다. 또한 메뉴얼 상의 사양은 측정 불확도를 포함합니다.

Typical: 실상온에서 80% 이상이 특성 성능을 충족

Nominal: 디자인시의 사양 혹은 예상 평균 혹은 평균 성능

Measured: 시간이 경과함에 따른 Drift 특성과 같이 예상 성능과 비교할수 있도록 설계 단계에서 측정된 속성

NOTE: 여기서 언급된 모든 차트는 별도 명시되지 않는 한 상온에서 다양한 장비를 사용한 측정 결과입니다. 트래킹 발생기 사양을 제외한 모든 특성은 TG는 꺼져 있는 상태입니다.

Measurement Mode

Measurement Mode
General-Purpose Spectrum Analyzer (GPSA)
Real-time Spectrum Analyzer (RTSA)

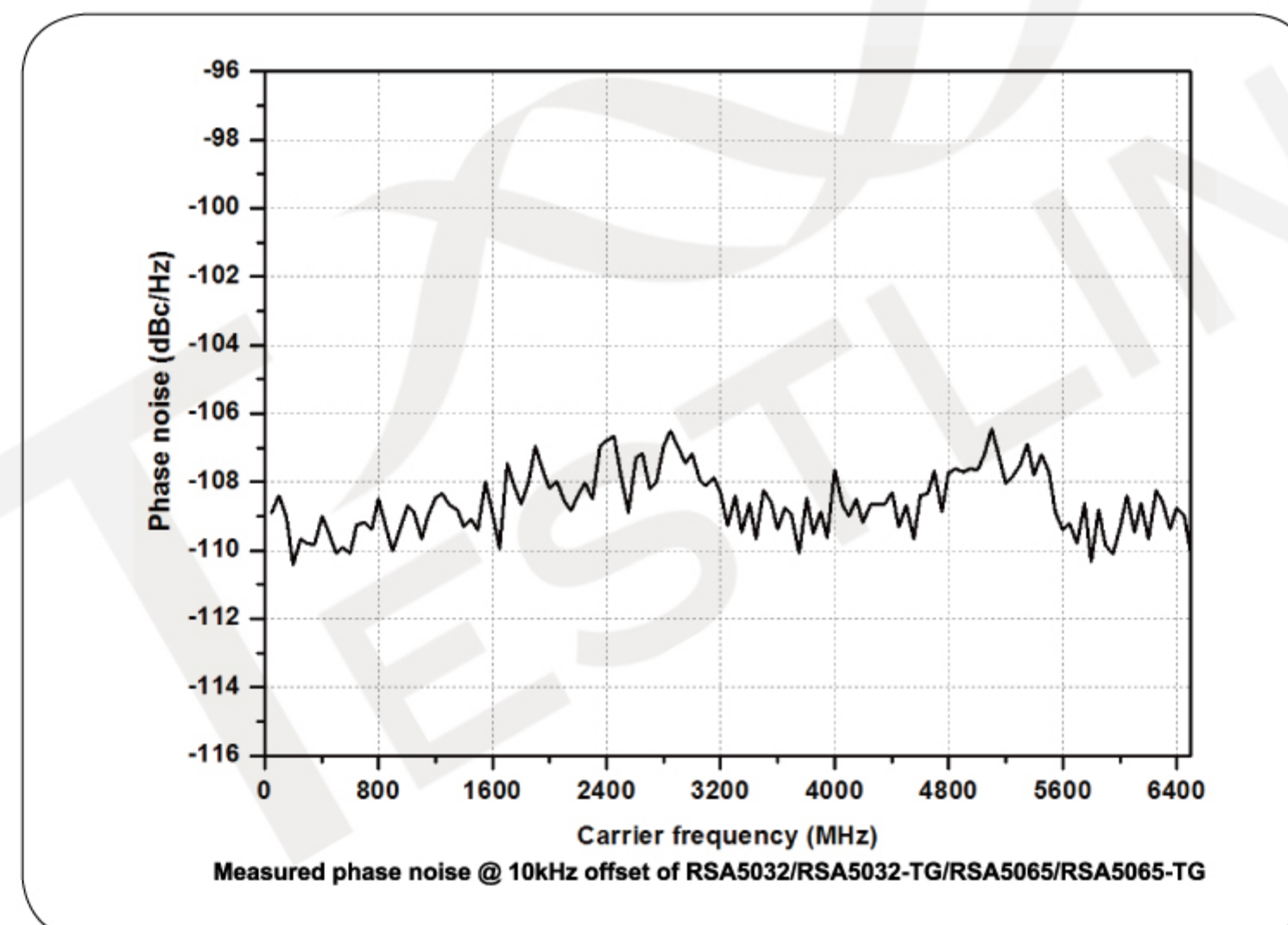
All Measurement Modes

Frequency		RSA5032	RSA5032-TG	RSA5065	RSA5065-TG
Frequency Range		9 kHz to 3.2 GHz		9 kHz to 6.5 GHz	
Internal Reference Frequency					
Reference Frequency		10 MHz			
Accuracy		$\pm[(\text{time since last calibration} \times \text{aging rate}) + \text{temperature stability} + \text{calibration accuracy}]$			
Initial Calibration Accuracy	Standard	<1 ppm			
	Option OCXO-C08	<0.1 ppm			
Temperature Stability	0°C to 50°C , with the reference 25°C				
	Standard	<0.5 ppm			
	Option OCXO-C08	<0.005 ppm			
Aging Rate	Standard	<1 ppm/year			
	Option OCXO-C08	<0.03 ppm/year			

GPSA Mode

Frequency

Frequency Readout Accuracy		
Marker Frequency Resolution	span/(number of sweep points - 1)	
Marker Frequency Uncertainty	$\pm(\text{marker frequency readout} \times \text{reference frequency accuracy} + 1\% \times \text{span} + 10\% \times \text{resolution bandwidth} + \text{marker frequency resolution})$	
Frequency Counter		
Resolution	1 Hz	
Uncertainty	$\pm(\text{marker frequency readout} \times \text{reference frequency accuracy} + \text{counter resolution})$	
Frequency Span		
Range	0 Hz, 10 Hz to maximum frequency	
Resolution	2 Hz	
Uncertainty	$\pm\text{span}/(\text{number of sweep points} - 1)$	
SSB Phase Noise		
		20 °C to 30 °C, $f_c = 500$ MHz
Carrier Offset	1 kHz	<-95 dBc/Hz (typical)
	10 kHz	<-106 dBc/Hz, <-108 dBc/Hz (typical)
	100 kHz	<-106 dBc/Hz, <-108 dBc/Hz (typical)
	1 MHz	<-115 dBc/Hz, <-117 dBc/Hz (typical)

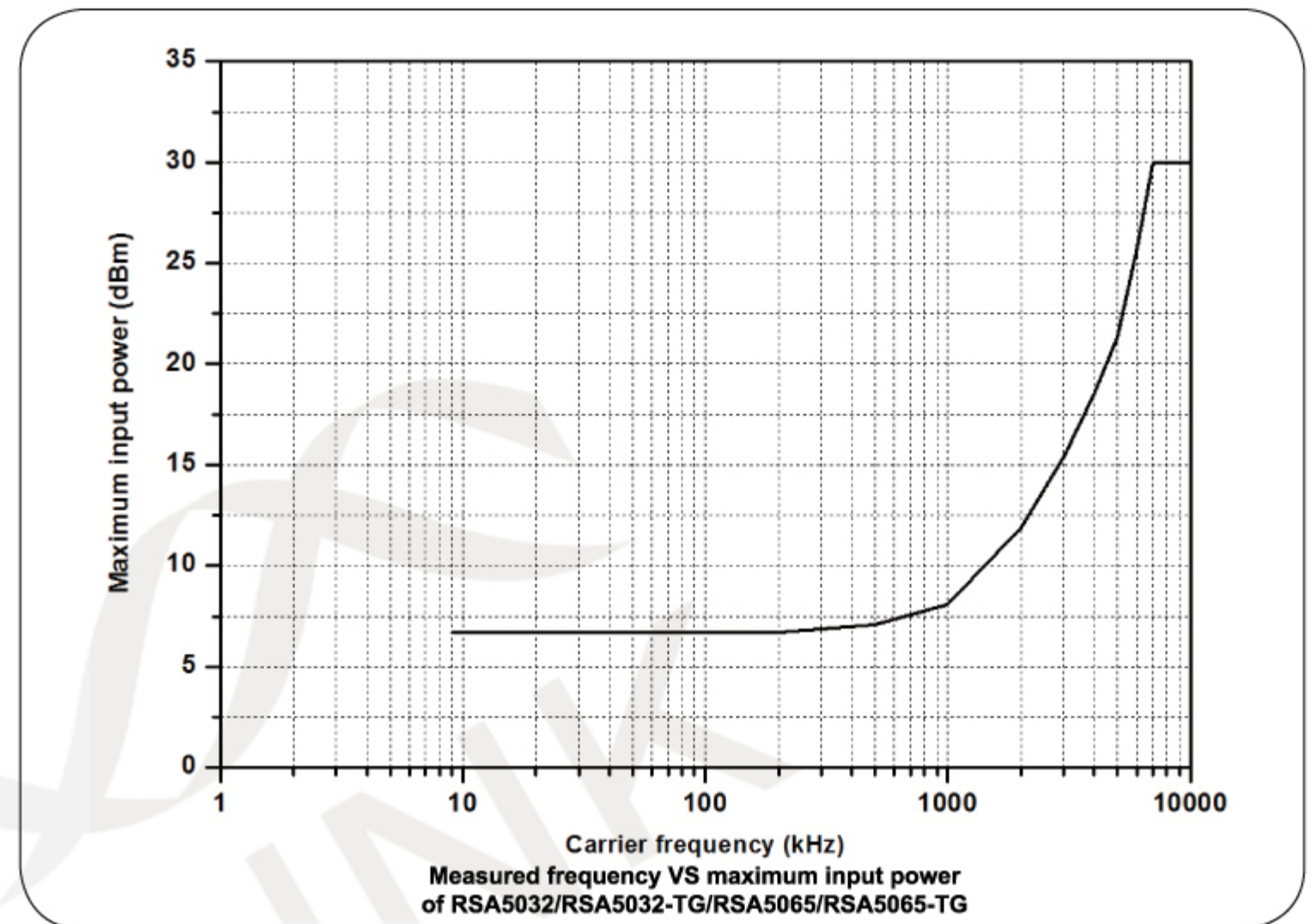
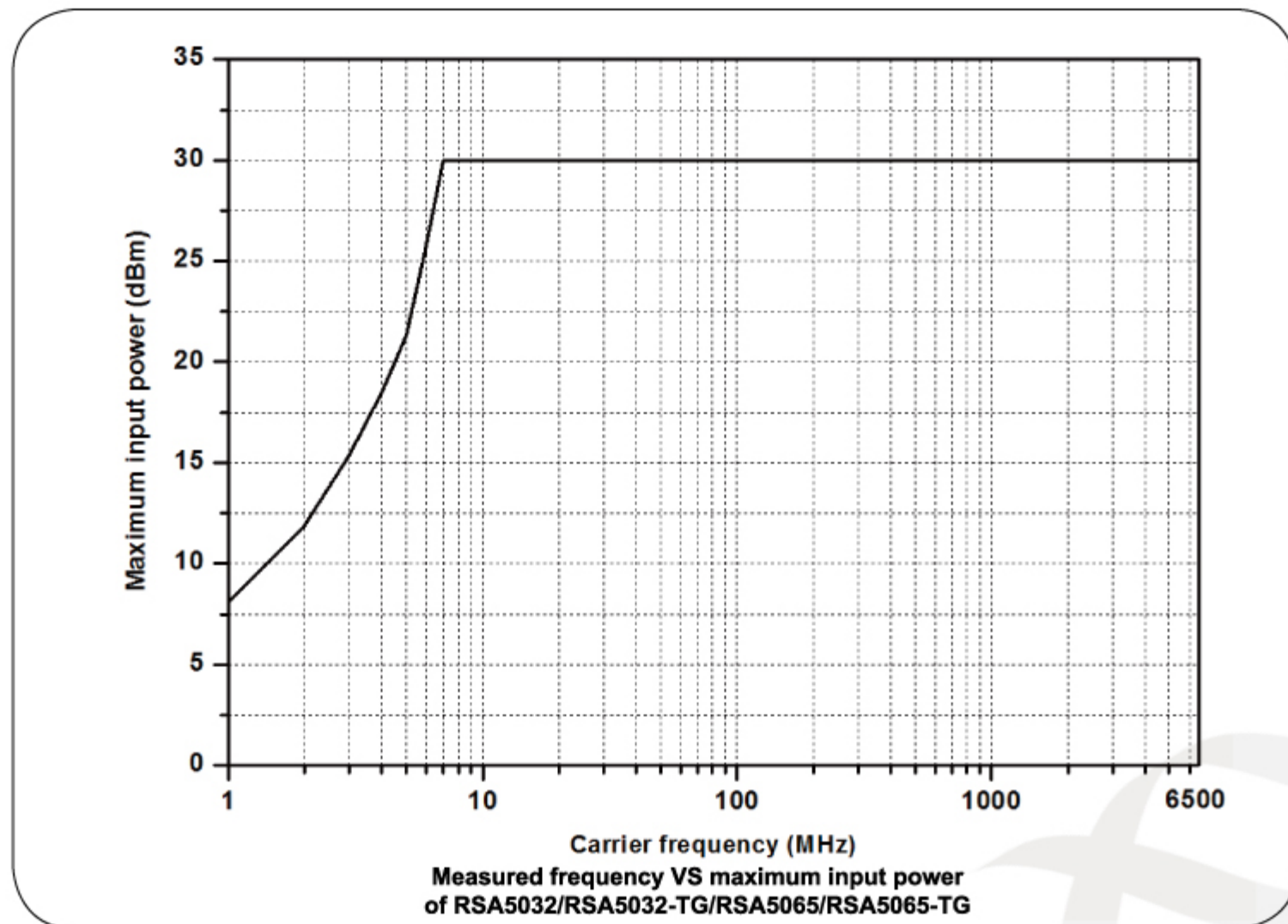


Residual FM	
	20 °C to 30 °C , RBW = VBW = 1 kHz
Residual FM	<10 Hz (nominal)
Bandwidth	
	Set "Sweep Time Rule" to "Accy"
Resolution Bandwidth (-3 dB) ^[1]	1 Hz to 10 MHz, in 1-3-10 sequence
RBW Accuracy	<5% (nominal)
Resolution Filter Shape Factor (60 dB: 3 dB)	<5 (nominal)
Video Bandwidth (-3 dB)	1 Hz to 10 MHz, in 1-3-10 sequence
Resolution Bandwidth (-6 dB)	200 Hz, 9 kHz, 120 kHz, 1 MHz

Note: [1] When the tracking generator is enabled or in zero span mode, the available range of RBW is from 1 kHz to 10 MHz.

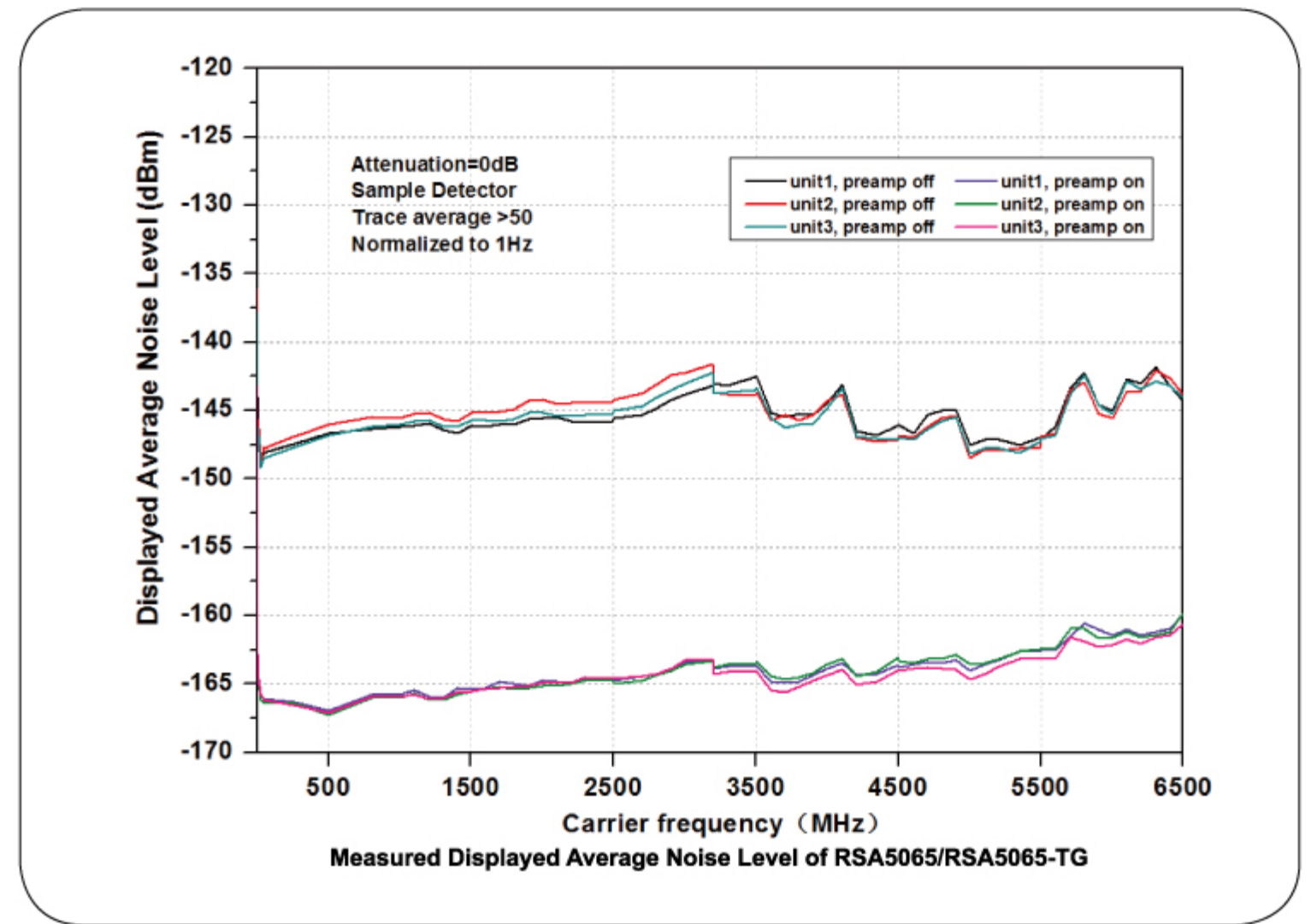
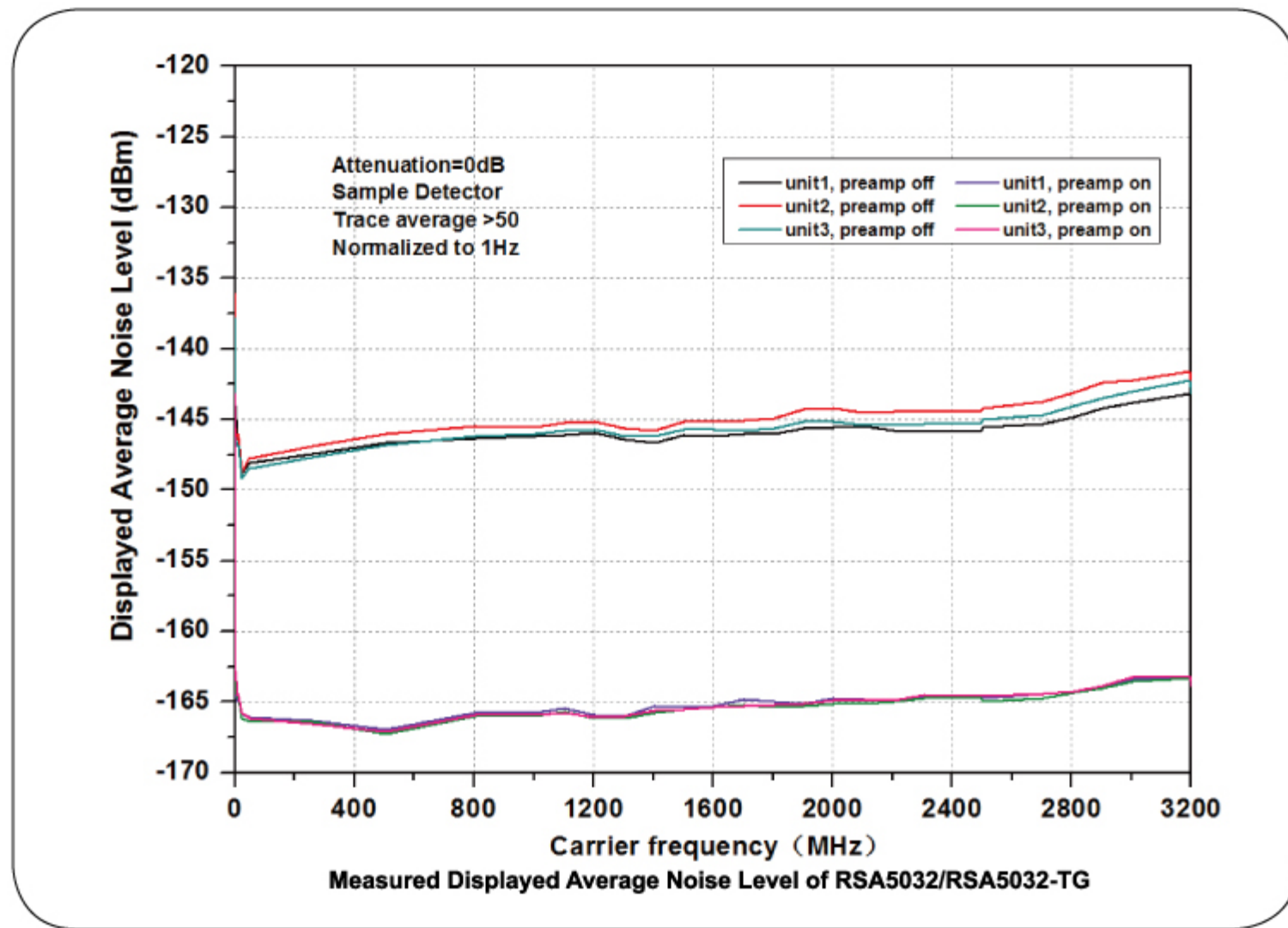
Amplitude

Measurement Range	
Range	$f_c \geq 10$ MHz DANL to +30 dBm
Maximum Safe Input Level ^[1]	
DC Voltage	50 V
CW RF Power	+30 dBm, attenuation ≥ 40 dB, preamp off. -10 dBm, attenuation = 20 dB, preamp on.
Maximum Damage Level	
CW RF Power	+33 dBm (2 W)



Displayed Average Noise Level (DANL)		RSA5032	RSA5032-TG	RSA5065	RSA5065-TG
		attenuation = 0 dB, sample detector, trace averages ≥ 50 , tracking generator off, normalized to 1 Hz, 20°C to 30°C, input impedance = 50 Ω .			
Preamp off	9 kHz to 100 kHz	<-120 dBm (typical)		<-120 dBm (typical)	
	100 kHz to 20 MHz	<-135 dBm, <-140 dBm (typical)		<-135 dBm, <-140 dBm (typical)	
	20 MHz to 1.5 GHz	<-142 dBm, <-145 dBm (typical)		<-142 dBm, <-145 dBm (typical)	
	1.5 GHz to 2.7 GHz	<-140 dBm, <-143 dBm (typical)		<-140 dBm, <-143 dBm (typical)	
	2.7 GHz to 3.2 GHz	<-138 dBm, <-141 dBm (typical)		<-138 dBm, <-141 dBm (typical)	
	3.2 GHz to 5.5 GHz			<-138 dBm, <-143 dBm (typical)	
	5.5 GHz to 6.5 GHz			<-136 dBm, <-141 dBm (typical)	
Preamp on	100 kHz to 20 MHz	<-152 dBm, <-160 dBm (typical)		<-152 dBm, <-160 dBm (typical)	
	20 MHz to 1.5 GHz	<-162 dBm, <-165 dBm (typical)		<-162 dBm, <-165 dBm (typical)	
	1.5 GHz to 2.7 GHz	<-160 dBm, <-163 dBm (typical)		<-160 dBm, <-163 dBm (typical)	
	2.7 GHz to 3.2 GHz	<-158 dBm, <-161 dBm (typical)		<-158 dBm, <-161 dBm (typical)	
	3.2 GHz to 5.5 GHz			<-156 dBm, <-161 dBm (typical)	
	5.5 GHz to 6.5 GHz			<-154 dBm, <-159 dBm (typical)	

Note: [1] When $f_c < 10$ MHz, the maximum safe input level is decreased.

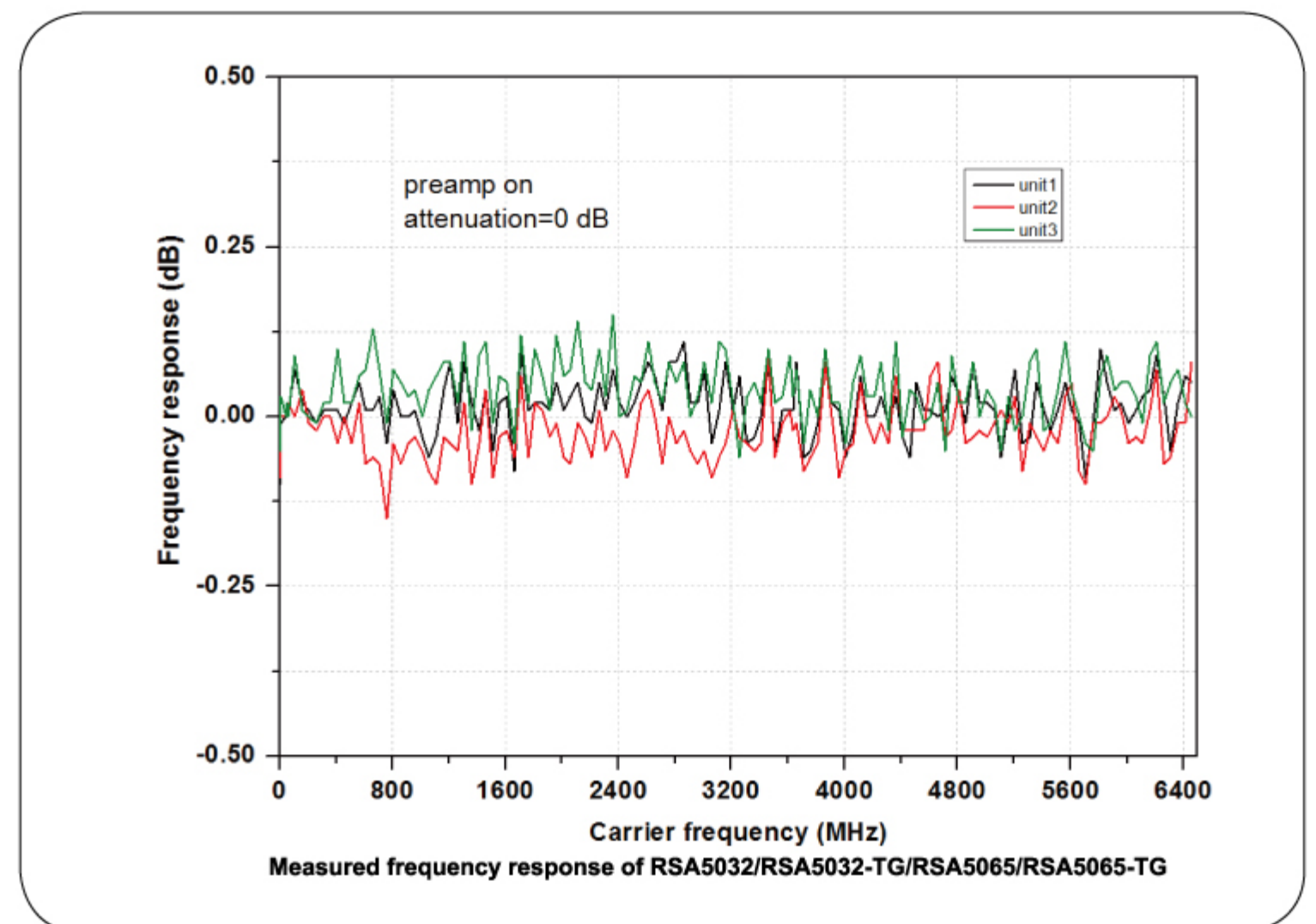
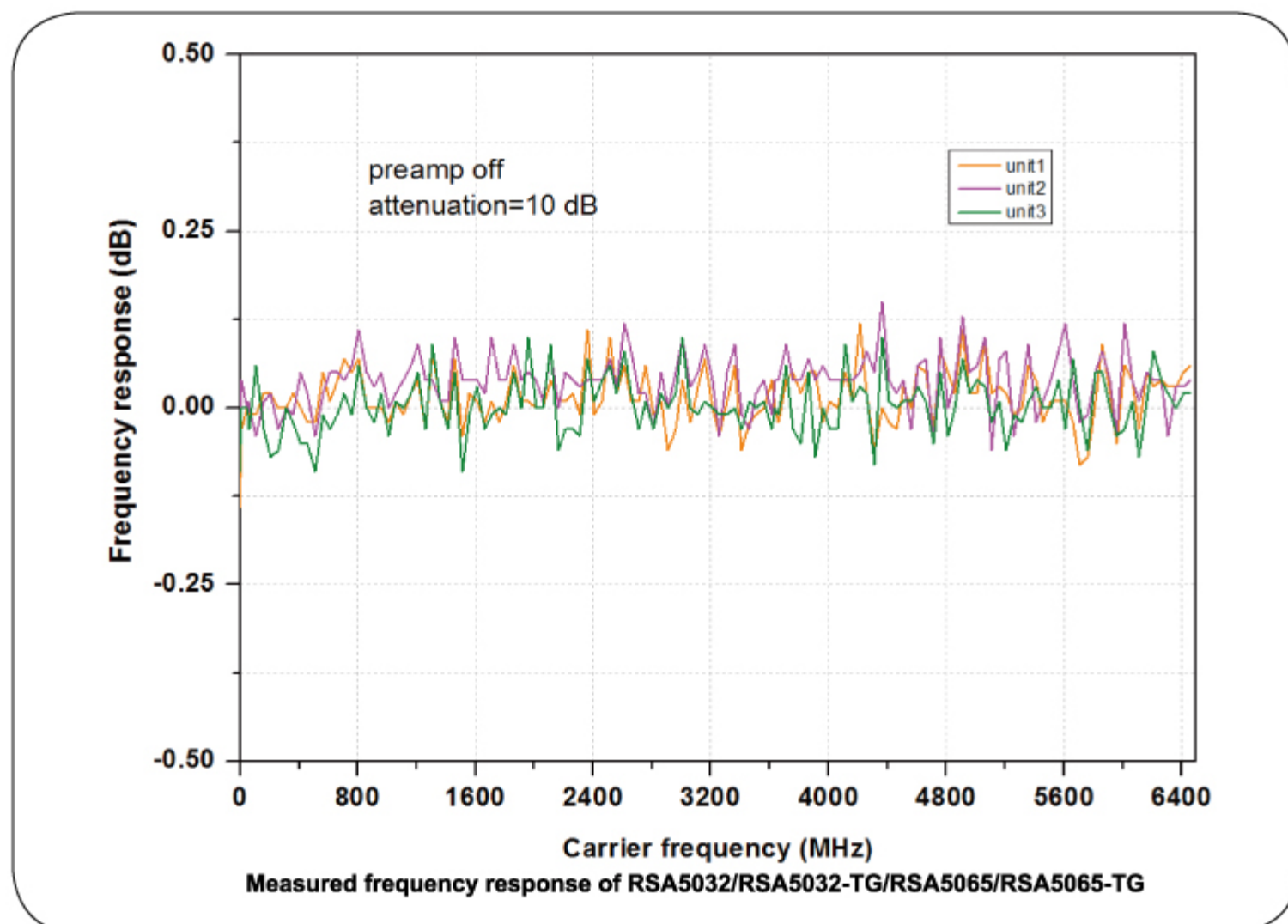


Level Display

Logarithmic Scale	1 dB to 200 dB
Linear Scale	0 to reference level
Number of Display Points	801
Number of Traces	6
Trace Detector	normal, pos-peak, neg-peak, sample, RMS average, voltage average, and quasi-peak
Trace Function	clear write, max hold, min hold, average, view, blank
Scale Unit	dBm, dBmV, dBμV, nV, μV, mV, V, nW, μW, mW, W

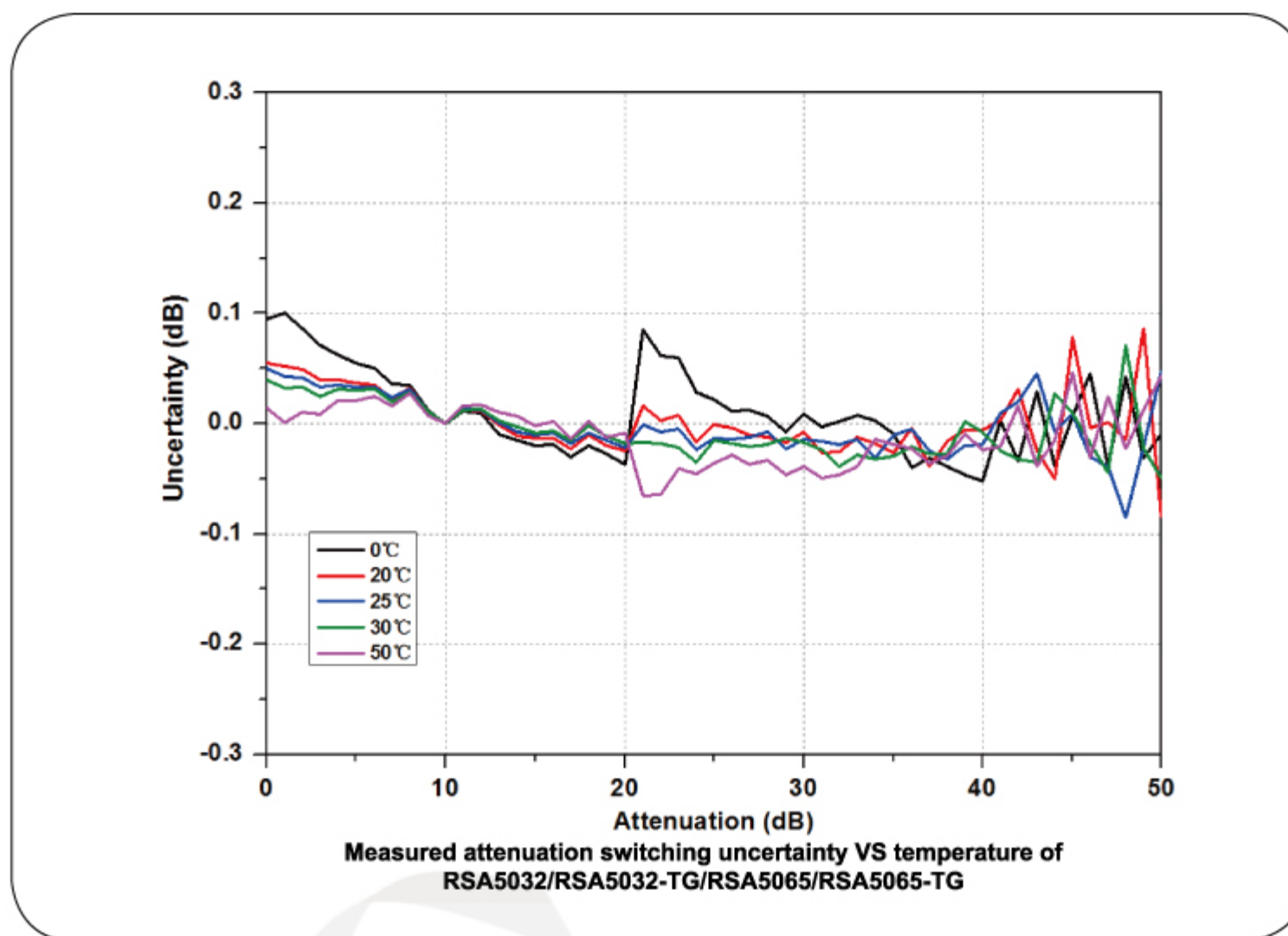
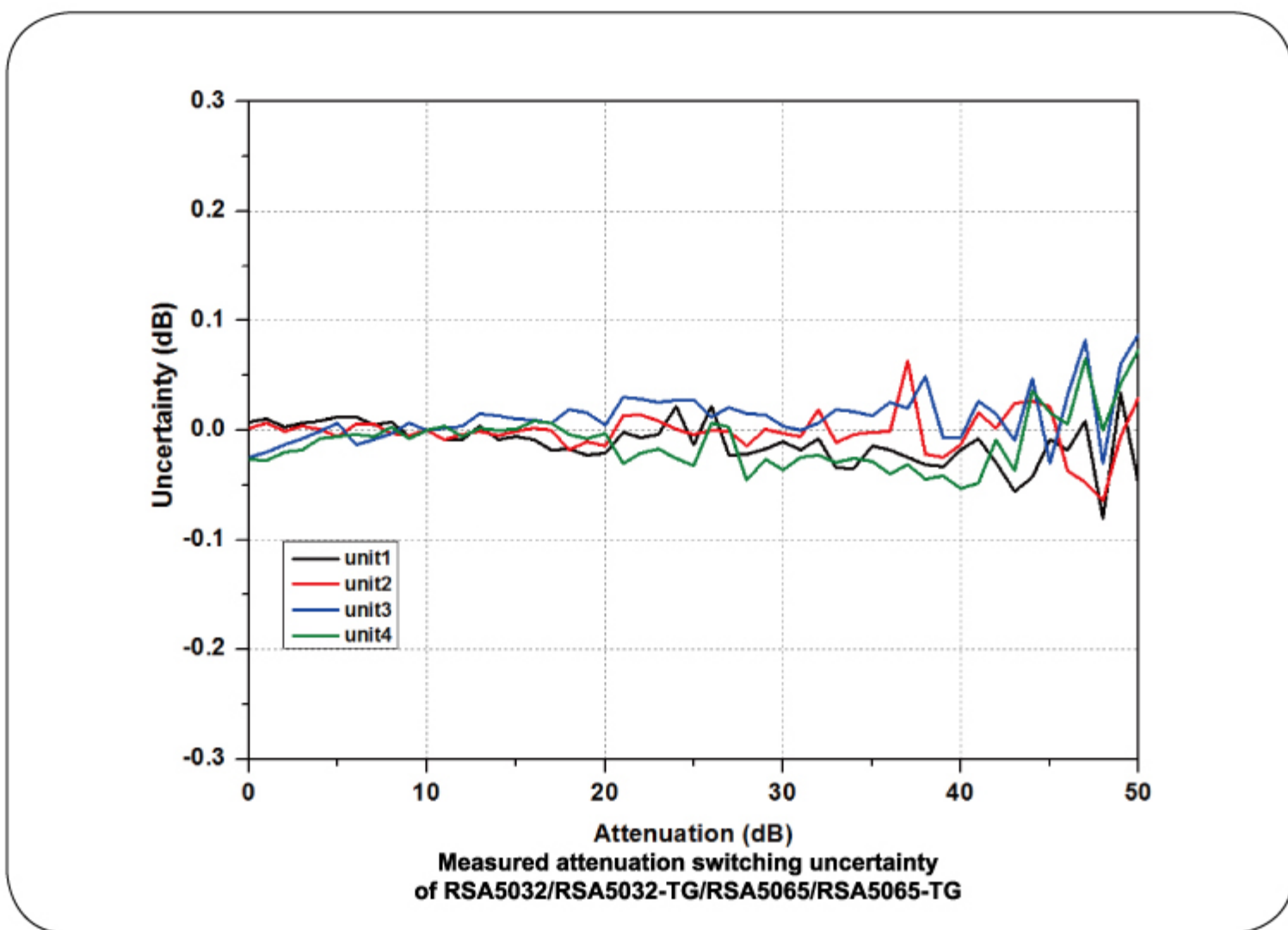
Frequency Response

		RSA5032	RSA5032-TG	RSA5065	RSA5065-TG
attenuation = 10 dB, relative to 50 MHz, 20°C to 30°C					
Preamp off	100 kHz to 3.2 GHz	<0.5 dB, <0.3 dB (typical)		<0.5 dB, <0.3 dB (typical)	
	3.2 GHz to 6.5 GHz			<0.7 dB, <0.5 dB (typical)	
attenuation = 0 dB, relative to 50 MHz, 20°C to 30°C					
Preamp on	100 kHz to 3.2 GHz	<0.7 dB, <0.3 dB (typical)		<0.7 dB, <0.3 dB (typical)	
	3.2 GHz to 6.5 GHz			<0.9 dB, <0.5 dB (typical)	



Input Attenuation Switching Uncertainty

Setting Range	0 dB to 50 dB, in 1 dB step
Switching Uncertainty	$f_c = 50$ MHz, relative to 10 dB, preamp off, 20 °C to 30 °C <0.3 dB



Absolute Amplitude Accuracy

Uncertainty	$f_c = 50$ MHz, peak detector, preamp off, attenuation = 10 dB, input signal level = -10 dBm, 20 °C to 30 °C <0.3 dB
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Reference Level

Range	Logarithmic Scale	-170 dBm to +30 dBm, in 0.01 dB step
	Linear Scale	707 pV to 7.07 V, 0.11% (0.01 dB) resolution

RBW Switching

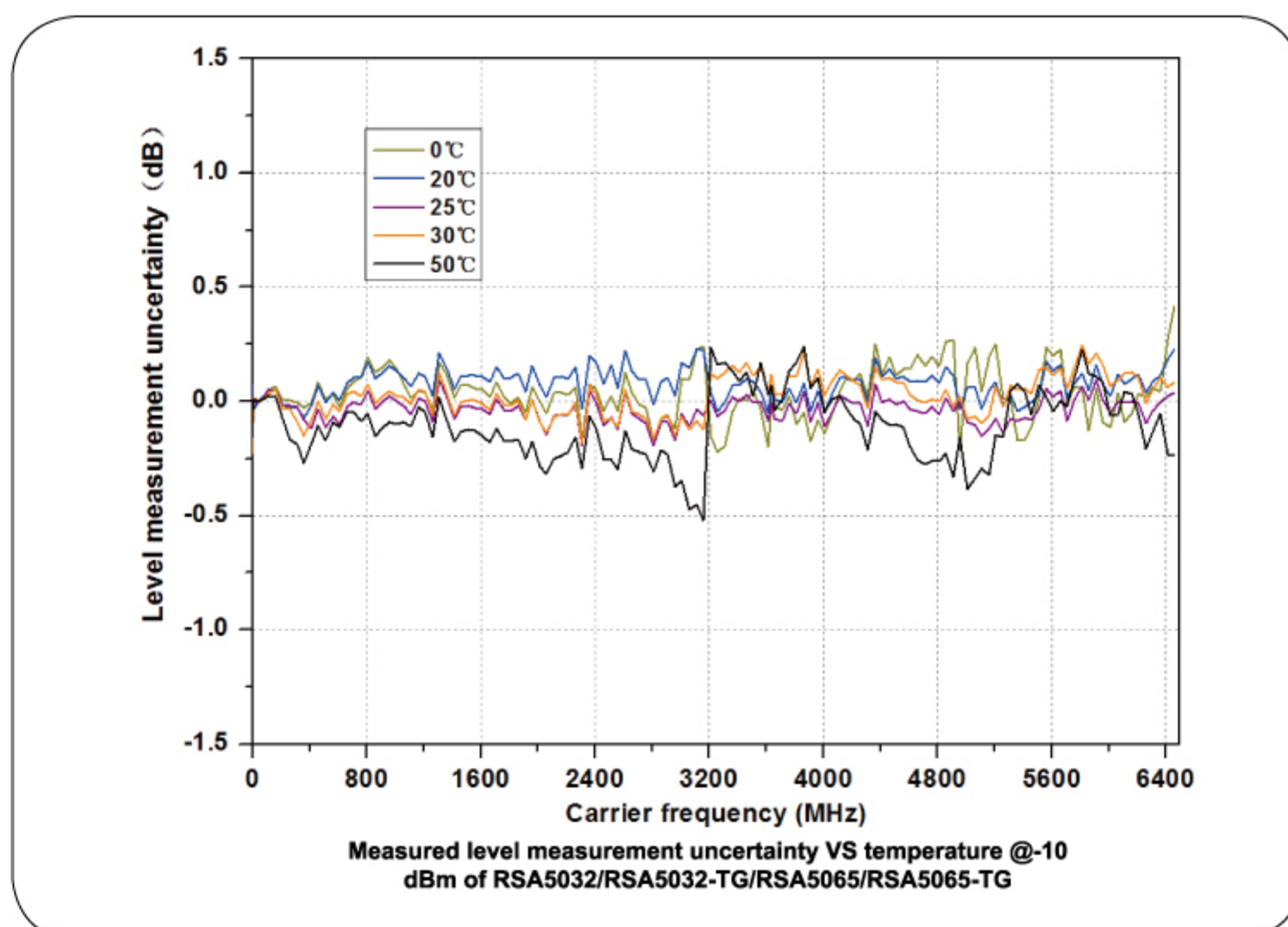
	Set "Sweep Time Rule" to "Accy", relative to 30 kHz RBW	
Uncertainty	1 Hz to 1 MHz	<0.1 dB
	3 MHz, 10 MHz	<0.3 dB

Preamp (Option RSA5000-PA)

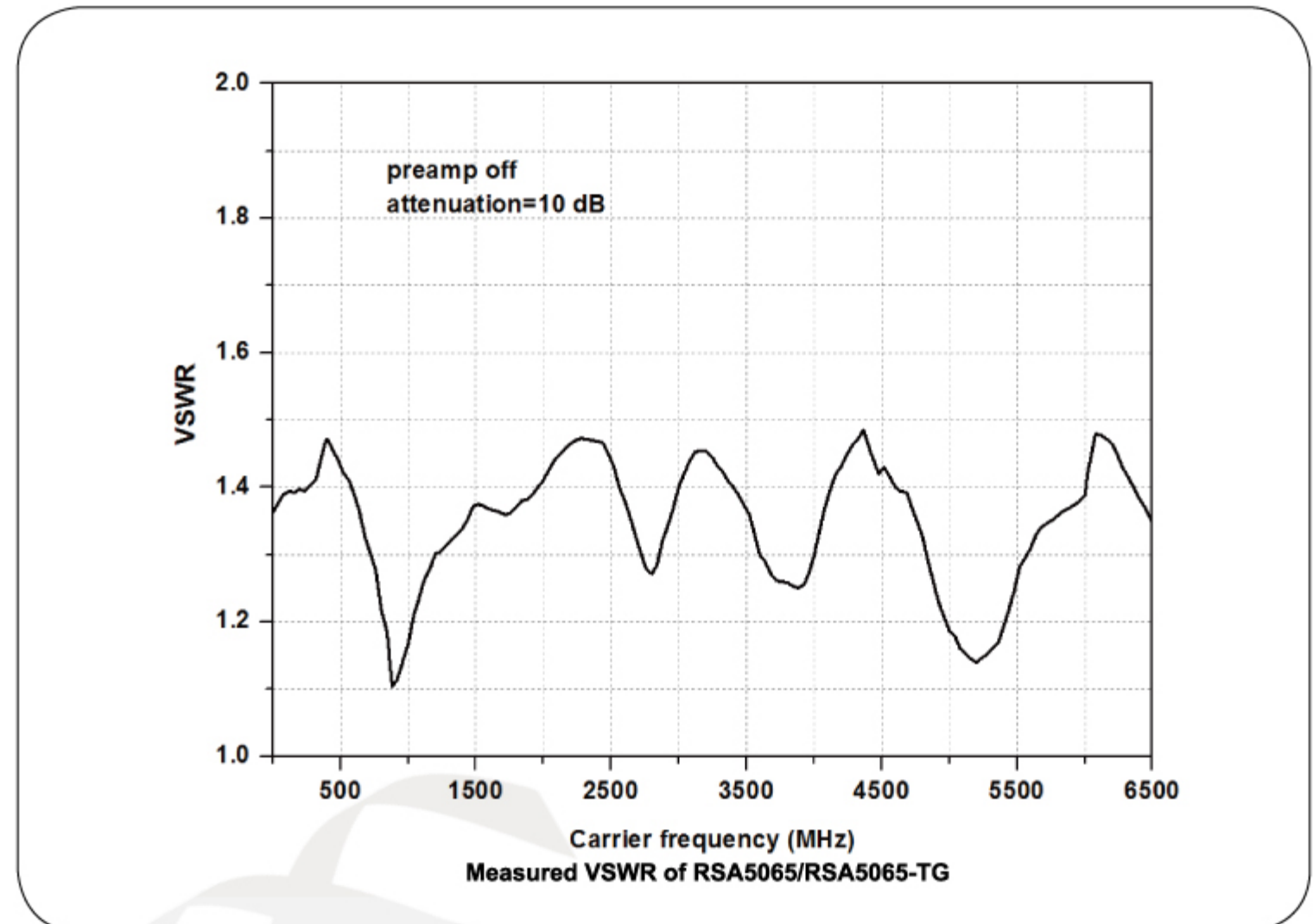
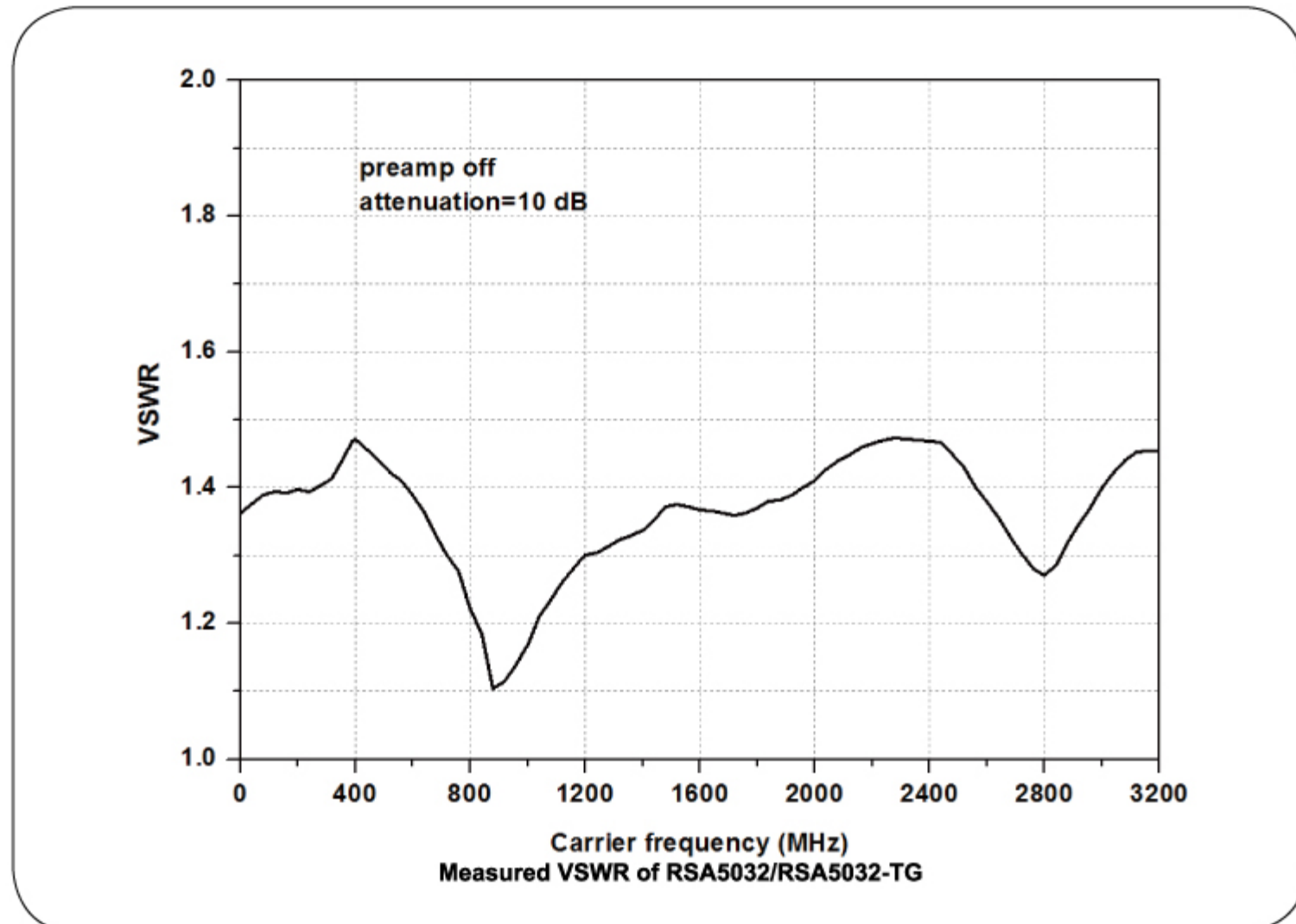
	RSA5032	RSA5032-TG	RSA5065	RSA5065-TG
Frequency Range	100 kHz to 3.2 GHz		100 kHz to 6.5 GHz	
Gain	20 dB (nominal)			

Level Measurement Uncertainty

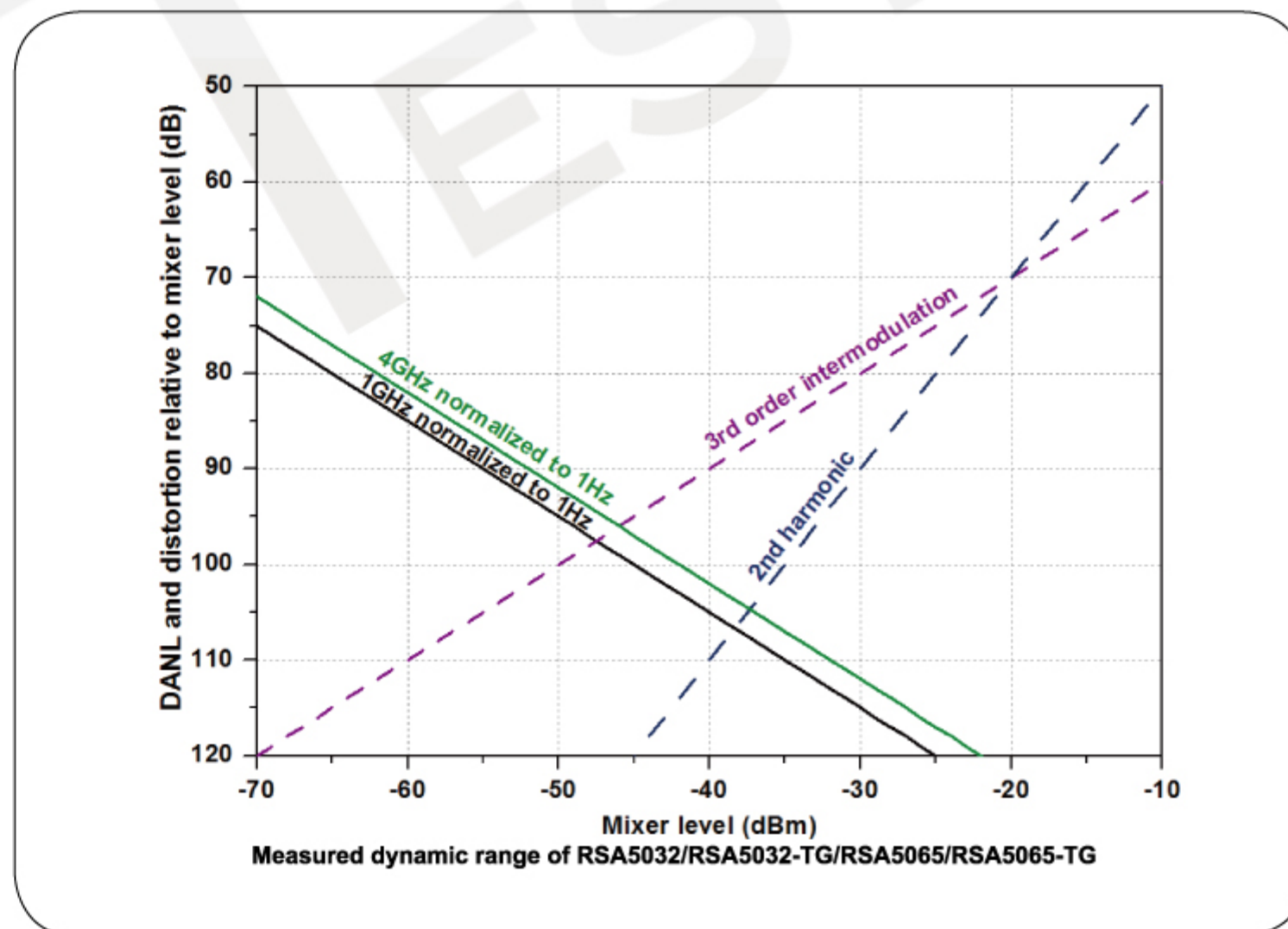
	95% confidence level, S/N > 20 dB, RBW = VBW = 1 kHz, preamp off, attenuation = 10 dB, -50 dBm < input level ≤ 0 dBm, $f_c > 10$ MHz, 20 °C to 30 °C
Level Measurement Uncertainty	<0.8 dB (nominal)



RF Input VSWR					
		RSA5032	RSA5032-TG	RSA5065	RSA5065-TG
		attenuation ≥ 10 dB, preamp off			
VSWR	300 kHz to 3.2 GHz	<1.6 (nominal)		<1.6 (nominal)	
	3.2 GHz to 6.5 GHz			<1.8 (nominal)	



Distortion	
Second Harmonic Intercept (SHI)	$f_c \geq 50$ MHz, input signal level = -20 dBm, attenuation = 0 dB, preamp off. +45 dBm
Third-order Intercept (TOI)	$f_c \geq 50$ MHz, two -20 dBm tones at input mixer spaced by 200 kHz, attenuation = 0 dB, preamp off. +11 dBm, +15 dBm (typical)
1 dB Gain Compression (P1dB) ^[1]	$f_c \geq 50$ MHz, attenuation = 0 dB, preamp off. 0 dBm (nominal)



Spurious Response	
Residual Response	input terminated with a 50 Ω load, attenuation = 0 dB, 20 $^{\circ}$ C to 30 $^{\circ}$ C <-90 dBm, <-100 dBm (typical)
Intermediate Frequency	<-60 dBc
System-related Sideband	referenced to local oscillators, referenced to A/D conversion, referenced to subharmonic of first LO, referenced to harmonic of first LO <-60 dBc
Input-related Spurious	mixer level = -30 dBm <-60 dBc

Note: [1] The frequency interval of the two-tone signals should be greater than 10 MHz.

Sweep

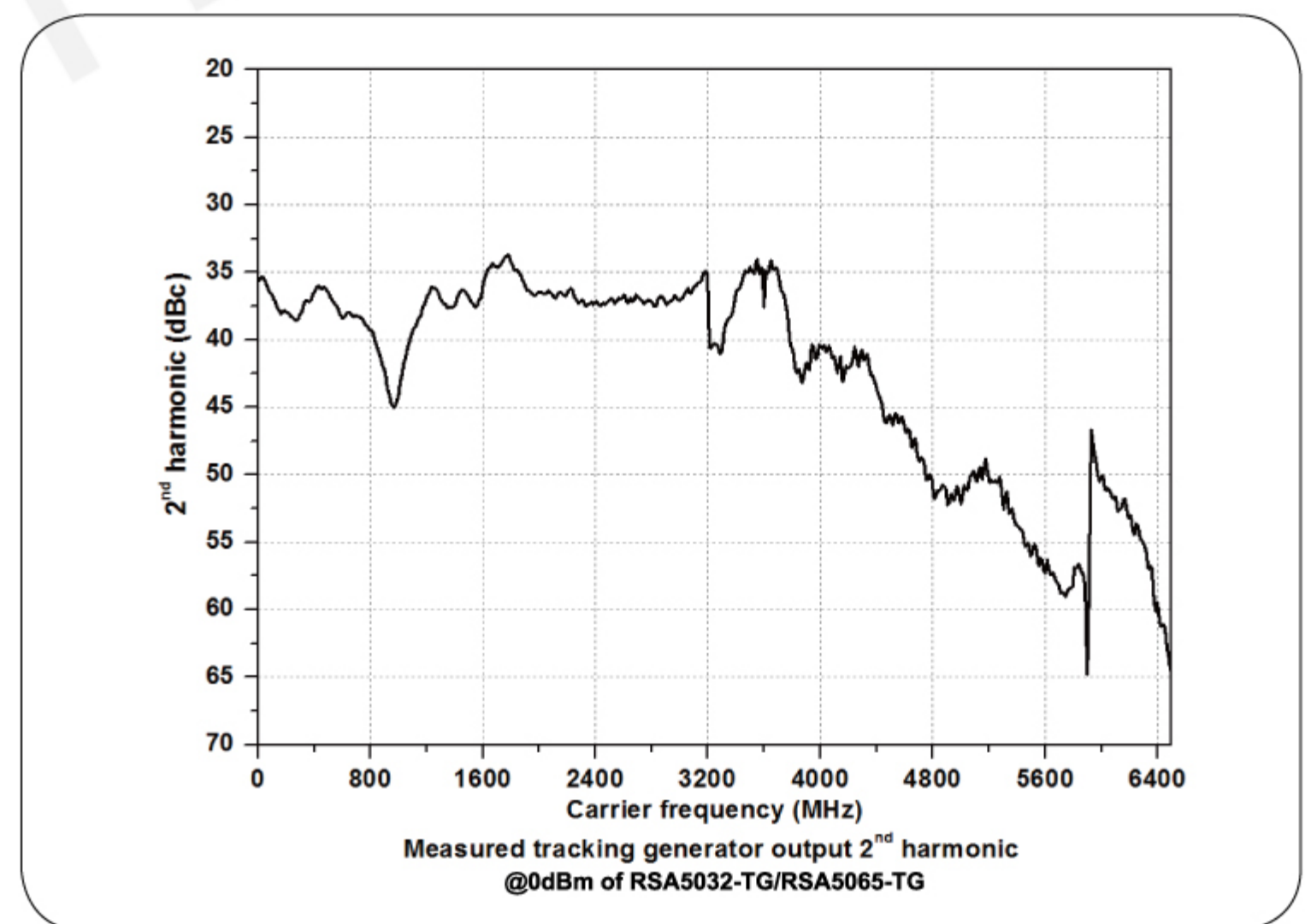
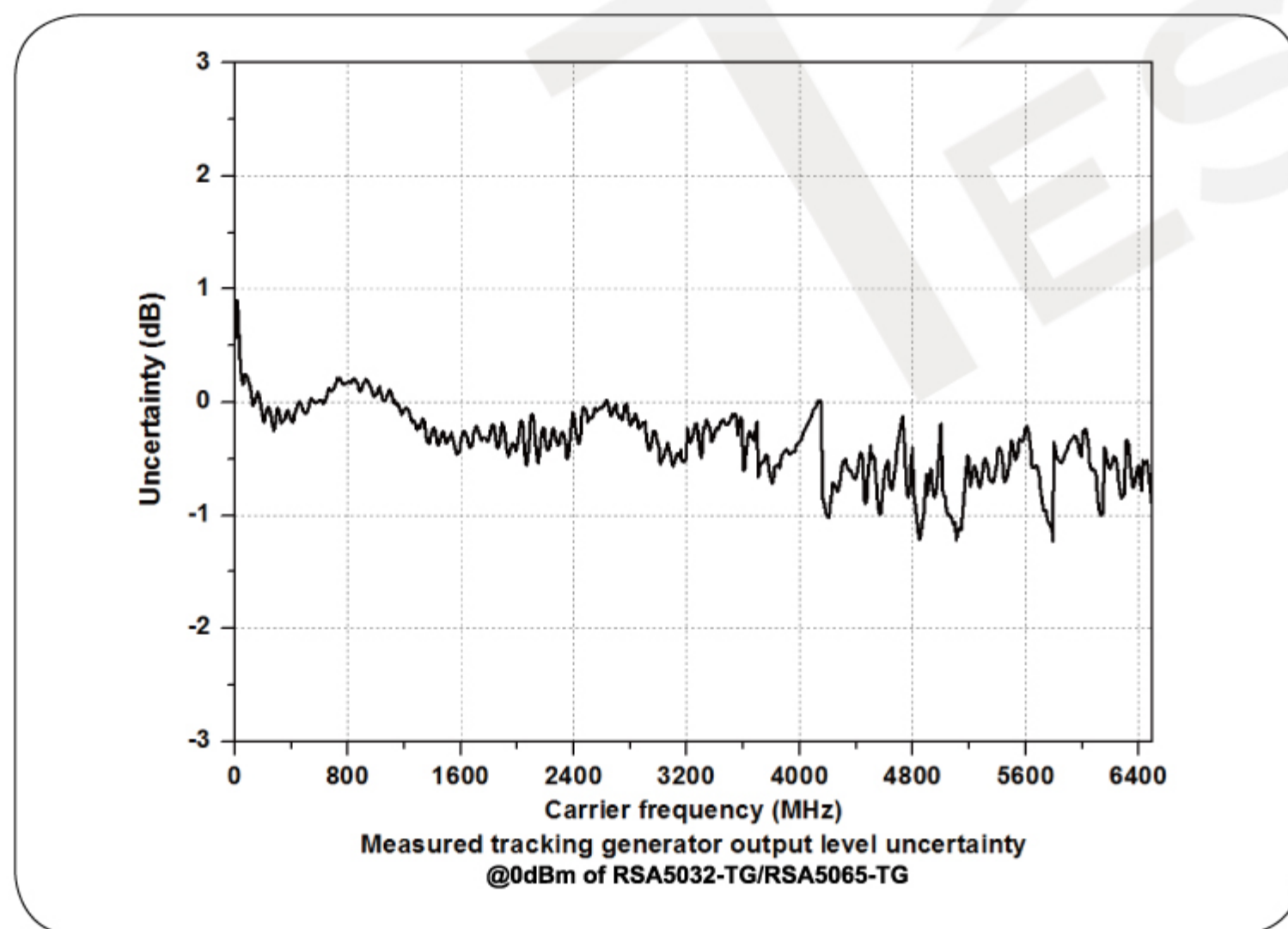
Sweep		
Sweep Time	span \geq 10 Hz	1 ms to 4,000 s
	zero span	1 μ s to 6,000 s
Sweep Time Uncertainty	span \geq 10 Hz, RBW \geq 1 kHz	5% (nominal)
	zero span (sweep time > 1 ms)	5% (nominal)
Sweep Mode	continue, single	

Trigger

Trigger		
Trigger Source	free run, external 1, external 2, video	
Trigger Delay	span \geq 10 Hz	0 to 500 ms
	zero span	0 to 500 ms

Tracking Generator

Tracking Generator Output				
	RSA5032	RSA5032-TG	RSA5065	RSA5065-TG
Frequency Range	-	100 kHz to 3.2 GHz	-	100 kHz to 6.5 GHz
Output Level Range	-	-40 dBm to 0 dBm	-	-40 dBm to 0 dBm
Output Level Resolution	-	1 dB	-	1 dB
Output Flatness	relative to 50 MHz			
	-	± 3 dB (nominal)	-	± 3 dB (nominal)



RTSA Mode

Real-time Analysis Bandwidth	25 MHz					
	40 MHz (Option RSA5000-B40)					
Min. Signal Duration for 100% POI at the Full-Scale Accuracy	maximum span, default Kaiser window					
	7.45 μ s					
Trace Detector	pos-peak, neg-peak, sample, average					
Number of Traces	6					
Window Type	Hanning, Blackman-Harris, Rectangular, Flattop, Kaiser, and Gaussian					
Resolution Bandwidth	provides 6 RBWs for each window, except the Rectangular; for Kaiser window					
	Span	Min. bandwidth		Max. bandwidth		
	40 MHz	100 kHz		3.21 MHz		
	25 MHz	62.8 kHz		2.01 MHz		
	10 MHz	25.1 kHz		804 kHz		
	1 MHz	2.51 kHz		80.4 kHz		
	100 kHz	251 Hz		8.04 kHz		
Max. Sample Rate	51.2 MSa/s					
FFT Rate	146,484/s (nominal)					
Number of Markers	8					
Amplitude Resolution	0.01 dB					
Frequency Point	801					
Acquisition Time	Max. sample rate					
	>156.5 μ s					
Min. Signal Duration for 100% POI at Different RBWs						
	Duration Time (μ s)					
Span	RBW1	RBW2	RBW3	RBW4	RBW5	RBW6
40 MHz	26.9	16.9	11.9	9.32	8.07	7.45
25 MHz	38.9	22.9	14.9	10.9	8.82	7.82
10 MHz	86.8	46.8	26.8	16.8	11.8	9.30
1 MHz	807	407	207	107	56.3	31.3
Amplitude						
Amplitude Flatness	<0.5 dB ^[1] (nominal)					
SFDR	<-60 dBc (typical)					
UltraReal Density						
Probability Range	0 to 100% (with a step of 0.1%)					
Min. Span	5 kHz					
Persistence Duration	32 ms to 10 s					
UltraReal Spectrogram						
History Depth	8,192					
Dynamic Range Covered by Bitmap Color	200 dB					
UltraReal PVT						
Min. Acquisition Time	187.9 μ s					
Max. Acquisition Time	40 s					
Trigger						
Trigger Source	free run, external 1, external 2, power, FMT					
UltraReal FMT						
Trigger Diagram	density, spectrogram, normal, PVT					
Trigger Resolution	0.5 dB (nominal)					
Trigger Criteria	enter, leave, inside, outside, enter-leave, leave-enter					

Note:[1] Only applicable to the Normal measurement.

General Specifications

Display		
Type	capacitive multi-touch screen	
Resolution	1024 × 600 pixels	
Size	10.1"	
Color	24-bit color	
Printer Supported		
Protocol	network printer	
Mass Memory		
Mass Memory	Internal Storage	512 MB (nominal)
	External Storage	USB storage device (not supplied)
Power		
Input Voltage Range, AC	100 V to 240 V (nominal)	
AC Frequency	45 Hz to 440 Hz	
Power Consumption	55 W (typical), max. 90 W with all options	
Environment		
Temperature	Operating Temperature Range	0 °C to 50 °C
	Storage Temperature Range	-20 °C to 70 °C
Humidity	0 °C to 30 °C	≤95% RH
	30 °C to 40 °C	≤75% RH
Altitude	Operating Height	below 3,048 m (10,000 feet)
Electromagnetic Compatibility and Safety		
EMC	complies with EMC Directive 2014/30/EU, complies with or above the standard specified in IEC61326-1:2013/EN61326-1:2013 Group 1 Class A	
	CISPR 11/EN 55011	
	IEC 61000-4-2:2008/EN 61000-4-2	±4.0 kV (contact discharge), ±8.0 kV (air discharge)
	IEC 61000-4-3:2002/EN 61000-4-3	3V/m (80 MHz to 1 GHz); 3V/m (1.4 GHz to 2 GHz); 1V/m (2.0 GHz to 2.7 GHz)
	IEC 61000-4-4:2004/EN 61000-4-4	1 kV power
	IEC 61000-4-5:2001/EN 61000-4-5	0.5 kV (phase-to-neutral voltage); 1 kV (phase-to-earth voltage); 1 kV (neutral-to-earth voltage)
	IEC 61000-4-6:2003/EN 61000-4-6	3 V, 0.15 to 80 MHz
	IEC 61000-4-11:2004/EN 61000-4-11	voltage dip: 0% UT during half cycle; 0% UT during 1 cycle; 70% UT during 25 cycles short interruption: 0% UT during 250 cycles
Safety	complies with IEC 61010-1:2010 (Third Edition)/EN 61010-1:2010, UL 61010-1:2012 R4.16 and CAN/CSA-C22.2 No. 61010-1-12+ GI1+ GI2	
Environmental Stress	Samples of this product have been type tested in accordance with RIGOL's reliability test regulations and verified to be robust against the environmental stresses of storage, transportation, and end-use; those stresses include, but are not limited to, temperature, humidity, shock, and vibration. The test methods are compliant with standards specified in GB/T6587 Class 2 and MILPRF-28800F Class 3.	
Size		
(W x H x D)	410 mm × 224 mm × 135 mm (16.14" × 8.82" × 5.32")	
Weight		
Without Tracking Generator	4.65 kg (10.25 lb)	
With Tracking Generator	4.95 kg (10.91 lb)	
Calibration Interval		
Recommended Calibration Interval	18 months	

Input/Output

Front Panel Connector			
RF Input	Impedance	50 Ω (nominal)	
	Connector	N-type female	
TG Output	Impedance	50 Ω (nominal)	
	Connector	N-type female	
Internal/External Reference			
Internal Reference	Frequency	10 MHz	
	Output Level	+3 dBm to +10 dBm, +7 dBm (typical)	
	Impedance	50 Ω (nominal)	
	Connector	BNC female	
External Reference	Frequency	10 MHz \pm 5 ppm	
	Input Level	0 dBm to +10 dBm	
	Impedance	50 Ω (nominal)	
	Connector	BNC female	
External Trigger Input/Output			
External Trigger Input 1	Impedance	\geq 1 k Ω (nominal)	
	Connector	BNC female	
	Level	5 V TTL level	
External Trigger Input 2/Trigger Output	Impedance	on trigger input	\geq 1 k Ω (nominal)
		on trigger output	50 Ω (nominal)
	Connector	BNC female	
	Level	5 V TTL level	
IF Output			
IF Output	Frequency	430 MHz \pm 20 MHz (nominal)	
	Amplitude	RF input power (PRFin) \leq -10 dBm, attenuation = 0, preamp off.	
		50MHz, P _{RFIn} \pm 4 dB (nominal) other frequency, P _{RFIn} \pm 4 dB + RF frequency response (nominal)	
	Impedance	50 Ω (nominal)	
Connector	SMB male		
Communication Interface			
USB Host (4 ports)	Connector	A plug	
	Protocol	version 2.0	
USB Device	Connector	B plug	
	Protocol	version 2.0	
LAN	Connector	100/1000Base, RJ-45	
	Protocol	LXI Core 2011 Device	
HDMI	Connector	A plug	
	Protocol	HDMI 1.4b	

▶ Order Information

	Description	Order No .
Model	Real-time Spectrum Analyzer, 9 kHz to 3.2 GHz	RSA5032
	Real-time Spectrum Analyzer, 9 kHz to 6.5 GHz	RSA5065
	Real-time Spectrum Analyzer, 9 kHz to 3.2 GHz (with TG installed when leaving the factory)	RSA5032-TG
	Real-time Spectrum Analyzer, 9 kHz to 6.5 GHz (with TG installed when leaving the factory)	RSA5065-TG
Standard Accessories	Quick Guide (hard copy)	-
	Power Cable	-
Option	Preamplifier (PA)	RSA5000-PA
	High Stability Clock	OCXO-C08
	Real-time/Analysis Bandwidth 40 MHz	RSA5000-B40
	Advanced Measurement Kit	RSA5000-AMK
	Spectrum Analyzer PC Software	Ultra Spectrum
	EMI Pre-compliance Test Software	S1210 EMI Pre-compliance Software
Optional Accessories	Include: N-SMA cable, BNC-BNC cable, N-BNC adaptor, N-SMA adaptor, 75 Ω-50 Ω adaptor, 900 MHz/1.8 GHz antenna (2pcs), 2.4 GHz antenna (2pcs)	DSA Utility Kit
	Include: N(F)-N(F) adaptor (1pcs), N(M)-N(M) adaptor (1pcs), N(M)-SMA(F) adaptor (2pcs), N(M)-BNC(F) adaptor (2pcs), SMA(F)-SMA(F) adaptor (1pcs), SMA(M)-SMA(M) adaptor (1pcs), BNC T type adaptor (1pcs), 50 Ω SMA load (1pcs), 50 Ω BNC impedance adaptor (1pcs)	RF Adaptor Kit
	Include: 50 Ω to 75 Ω adaptor (2pcs)	RF CATV Kit
	Include: 6 dB attenuator (1pcs), 10 dB attenuator (2pcs)	RF Attenuator Kit
	30 dB high-power attenuator, with the max power of 100 W	ATT03301H
	N(M)-N(M) RF Cable	CB-NM-NM-75-L-12G
	N(M)-SMA(M) RF Cable	CB-NM-SMAM-75-L-12G
	VSWR Bridge, 1 MHz to 3.2 GHz	VB1032
	VSWR Bridge, 2 GHz to 8 GHz	VB1080
	Near-field Probe	NFP-3
	Rack Mount Kit	RM6041
	USB Cable	CB-USBA-USBB-FF-150

Warranty

Three years for the mainframe