DATA SHEET

CPA Series Signal Analyzer

CPA 2026

100 kHz to 26.5 GHz

中科四点零
RF-Cube

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Definitions and conditions

Temperatures referred to in this document are defined as follows:

–Full temperature range = Individual module temperature of 5 to 68 °C, as reported by the module, and environment temperature of 0 to 55 °C.

–Controlled temperature range = Individual module temperature of 25 to 40 °C, as reported by the module, and environment temperature of 20 to 30 °C.

Specifications describe the warranted performance of calibrated instruments. Specifications data under the following conditions:

–It is within its calibration cycle

–Under auto couple control, except when Auto Sweep Time Rules = Accy

–The analyzer has been stored at an ambient temperature within the allowed operating range for at least two hours before being turned on; if it had previously been stored at a temperature range inside the allowed storage range, but outside the allowed operating range

–The analyzer has been turned on at least 30 minutes with Auto Align set to normal, or, if Auto Align is set to off or partial, alignments must have been run recently enough to prevent an Alert message; if the Alert condition is changed from Time and Temperature to one of the disabled duration choices, the analyzer may fail to meet specifications without informing the user

95th percentile values indicate the breadth of the population (approx. 2σ) of performance tolerances expected to be met in 95 percent of the cases with a 95 percent confidence, for any ambient temperature in the range of 20 to 30 °C. In addition to the statistical observations of a sample of instruments, these values include the effects of the uncertainties of external calibration references. These values are not warranted.

Typical describes additional product performance information that is not covered by the product warranty. It is performance beyond specifications that 80 percent of the units exhibit with a 95 percent confidence level over the temperature range 20 to 30 °C. Typical performance does not include measurement uncertainty.

Nominal values indicate expected performance, or describe product performance that is useful in the application of the product, but are not covered by the product warranty. Data represented in this document are Nominal unless otherwise noted.

Frequency and Time Specifications

Frequency range		
Frequency range		100kHz to 26.5 GHz
Band	**LO multiple (N)**	
0	1	100kHz to 3.05GHz
1	2	2.95GHz to 7.55GHz
2	2	7.45GHz to 9.25GHz
3	2	9.15GHz to 11.05GHz
4	2	10.95GHz to 12.75GHz
5	4	12.65GHz to 14.55GHz
6	4	14.45GHz to 16.55GHz
7	4	16.45GHz to 18.55GHz
8	4	18.45GHz to 20.55GHz
9	4	20.45GHz to 24.55GHz
10	4	24.45GHz to 26.5GHz

Frequency reference	
Accuracy	±[(time since last adjustment x aging rate) + temperature stability + calibration accuracy]
Aging rate	$\pm 3 \times 10^{-7}$/ year (First year)

Temperature stability	
20 to 30℃	$\pm 3 \times 10^{-8}$
Full temperature range	$\pm 3 \times 10^{-8}$
Achievable initial calibration accuracy	$\pm 8 \times 10^{-8}$
Example frequency reference accuracy	$=\pm(3 \times 10^{-7}+3 \times 10^{-8}+8 \times 10^{-8})$
1 year after last adjustment	$=\pm 4.1 \times 10^{-7}$
Residual FM	≤1Hz p-p in 20 ms nominal

Frequency readout accuracy (start, stop, center, marker)

±(marker frequency x frequency reference accuracy + 0.25 % x span + 5 % x RBW + 2Hz + 0.5 x horizontal resolution)

Marker frequency counter	
Accuracy	±(marker frequency x frequency reference accuracy + 0.100Hz)
Delta counter accuracy	±(delta frequency x frequency reference accuracy + 0.141Hz)
Counter resolution	0.001Hz

Frequency span (FFT and swept mode)	
Range	0Hz(zero span),10Hz to maximum frequency of instrument
Resolution	2Hz
Accuracy	
Swept	±(0.25% x span + horizontal resolution)

FFT	±(0.10% x span + horizontal resolution)	
Sweep time and triggering		
Range	Span = 0Hz	1µs to 6000s
	Span ≥ 10Hz	1ms to 4000s
Accuracy	Span ≥ 10Hz, swept	±0.01% nominal
	Span ≥ 10Hz, FFT	±40% nominal
	Span = 0Hz	±1% nominal

Frequency and Time Specifications (Continued)

Trigger	Free run, video, external, RF burst, periodic timer	
Trigger delay	Span = 0 Hz or FFT	-150 to +500ms
	Span ≥ 10 Hz, swept	1µs to 500ms
	Resolution	0.1µs
Time gating		
Gate methods	Gated LO; gated video; gated FFT	
Gate length range (except method = FFT)	100.0ns to 5.0s	
Gate delay range	0 to 100.0s	
Gate delay jitter	33.3ns p-p nominal	
Sweep (trace) point range		
All spans	1 to 40001	
Resolution bandwidth (RBW)		
Range (-3.01 dB bandwidth)	1 Hz to 3 MHz (10 % steps), 4, 5, 6, 8 MHz	
Bandwidth accuracy (power)	1Hz to 750kHz	±1.0%(±0.044dB) nominal
	820kHz to 1.2MHz	±2.0%(±0.088dB) nominal
	1.3 to 2.0MHz	±0.13dB nominal
	2.2to 3MHz	±0.22dB nominal
	4 to 8MHz	±0.45dB nominal
Bandwidth accuracy (-3.01 dB)	1Hz to 1.3MHz	±2% nominal
RBW range		
Selectivity (-60 dB/-3 dB)	4.1:1 nominal	
Analysis bandwidth		
Maximum bandwidth	25MHz (40MHz Option)	
Video bandwidth (VBW)		
Range	1 Hz to 3 MHz (10 % steps), 4, 5, 6, 8 MHz, and wide open (labeled 50 MHz)	
Accuracy	±6% nominal	
Measurement speed		
Local measurement and display update rate	11ms (90/s) nominal	
Remote measurement and LAN transfer rate	6ms (167/s) nominal	
Marker peak search	5ms nominal	
Center frequency tune and transfer	22ms nominal	
Measurement/mode switching	75ms nominal	

Amplitude Accuracy and Range Specifications

Amplitude range			
Measurement range			
	Preamp off	Displayed average noise level (DANL) to +27dBm	
Input attenuator range	0 to 70 dB in 2dB steps		
Maximum safe input level			
Average total power			
	+27dBm(0.5W)	Input attenuation ≥ 10dB, preamp off	
Peak pulse power	+27dBm(0.5W)	Input attenuation ≥ 20dB, preamp on	
	+47dBm(50W)	< 10 µs pulse width, < 1% duty cycle, and input attenuation ≥ 30dB	
DC volts			
AC coupled	±16Vdc		
Display range			
Log scale	0.1 to 1dB/division in 0.1dB steps		
	1 to 20dB/division in 1dB steps (10 display divisions)		
Linear scale	10 divisions		
Scale units	dBm, dBmV, dBµV, dBmA, dBµA, V, W, A		
Frequency response		**Specification**	**95%(≈2σ)**
(10dB input attenuation,20 to 30°C, σ = nominal standard deviation)			
Preamp on	9kH to 10MHz	±0.50dB	±0.4dB
	10MHz to 3GHz	±0.65dB	±0.5dB
	3 to 13.6GHz	±1.30dB	±0.8dB
	13.6 to 19.3GHz	±1.50dB	±1.0dB
	19.3 to 24.2GHz	±2.20dB	±1.3dB
	24.2 to 26.5GHz	±2.50dB	±1.3dB
	100kHz to 10MHz	±0.60dB	±0.5dB
	10MHz to 3GHz	±1.40dB	±1.0dB
	3 to 7.5GHz	±1.40dB	±1.2dB
	7.5 to 13.6GHz	±1.20dB	±1.0dB
	13.6 to 21GHz	±1.40dB	±1.2dB
	21 to 24.2GHz	±2.00dB	±1.8dB
	24.2 至 26.5GHz	±2.80dB	±2.4dB
Input attenuation switching uncertainty		**Specifications**	**Additional information**
Attenuation > 2dB, preamp off	50MHz (reference frequency)	±0.3dB	±0.15dB typical
Relative to 10 dB (reference setting)	100kHz to 3.0GHz		±0.30dB nominal
	3.0 to 7.5GHz		±0.50dB nominal
	7.5 to 26.5GHz		±0.70dB nominal

Amplitude Accuracy and Range Specifications (Continued)

Total absolute amplitude accuracy		
(10dB attenuation, 20 to 30°C, 1Hz ≤ RBW ≤ 1MHz, input signal -10 to -50dBm, all settings auto-coupled except Auto Swp Time = Accy, any reference level, any scale, σ = nominal standard deviation)		
At 50MHz	±0.40dB	
At all frequencies	±(0.40dB + frequency response)	
Preamp on	±(0.36dB + frequency response) (95%)	
Input voltage standing wave ratio (VSWR) (0dB attenuation)		
10MHz to 26.5GHz	< 2.4 nominal	
Resolution bandwidth switching uncertainty (referenced to 30 kHz RBW)		
1Hz to 3MHz RBW	±0.15dB	
4，5，6，8MHz RBW	±1.0dB	
Reference level		
Range		
Log scale	-170 to +23dBm in 0.1dB steps	
Linear scale	Same as log (707pV to 3.16V)	
Accuracy	0dB	
Display scale switching uncertainty		
Switching between linear and log	0dB	
Log scale/div switching	0dB	
Display scale fidelity		
-80dBm ≤ input mixer level < -10dBm ±0.15dB total		
Trace detectors		
Normal, peak, sample, negative peak, log power average, RMS average, and voltage average		
Preamplifier		
Frequency range	100kHzto 7.5GHz（Low band） 100kHzto26.5GHz（Full range）	
Gain	100kHz to 26.5GHz	+20dB nominal
Noise figure	10MHz to 26.5GHz	DANL+176.24dB nominal

Dynamic Range Specifications

1dB gain compression (two-tone)		
		Total power at input mixer
Preamp off	10MHz to 7.5GHz	+6dBm nominal
	7.5 to 13.5GHz	+4dBm nominal
	7.5 to 13.5GHz	+2dBm nominal
Preamp on	10MHz to 7.5GHz	-15dBm nominal
	7.5 to 26.5GHz	-19dBm nominal

Displayed average noise level (DANL) (Input terminated, sample or average detector, averaging type = Log, 0dB input attenuation, IF Gain = High, 20 to 30°C) Parentheses indicate typical performance		
	Preamplifier OFF	**Preamplifier ON**
100kHz to 1MHz	(-125)dBm	
1 to 20MHz	-130,(-135)dBm	-154,(-158)dBm
20MHz to 1.5GHz	-145,(-150)dBm	-160,(-163)dBm
1.5 to 4.5GHz	-144,(-149)dBm	-160,(-163)dBm
4.5 to7.6GHz	-140,(-145)dBm	-156,(-161)dBm
7.6 to 9.5GHz	-141,(-147)dBm	-158,(-160)dBm
9.5 to 13GHz	-136,(-140)dBm	-156,(-160)dBm
13 to 14.5GHz	-141,(-145)dBm	-156,(-161)dBm
14.5 to 19.3GHz	-132,(-138)dBm	-153,(-157)dBm
19.3 to 23GHz	-134,(-139)dBm	-152,(-157)dBm
23 to 24GHz	-132,(-137)dBm	-150,(-155)dBm
24 to 26.5GHz	-128,(-133)dBm	-144,(-149)dBm

Spurious responses		
Residual response	200kHz to 26.5GHz(swept)	-90dBm

(Input terminated and 0dB attenuation)	Zero span or FFT or other frequencies	-100dBm nominal		
Image responses (First mixer)	**Tuned frequency (f)**	**Mixer level**	**Response**	
	10MHz to 26.5GHz	-10dBm	-70dBc(-80dBc typical)	
Image responses (Second mixer)	**Tuned frequency (f)**	**Excitation Freq**	**Mixer level**	**Response**
	10MHz to 20.5GHz typical)	f+1470MHz	-10dBm	-70dBc(-80dBc
	20.5GHz to 26.5GHz typical)	f-1470MHz	-10dBm	-70dBc(-80dBc
LO-related spurious	10MHz to 26.5GHz		-10dBm	-64dB typical
Other spurious responses	**Mixer level**	**Response**		
IF feedthrough	-10dBm	-75dBc(-80dBctypical)		
First RF order (f ≥ 10 MHz from carrier)	-10dBm	-70dBc(-80dBc)		
High RF order (f ≥ 10 MHz from carrier)	-10dBm	-70dBc(-80dBc)		

Dynamic Range Specifications (Continued)

Second harmonic distortion (SHI)			
Source frequency	**SHI(nominal)**		
10MHz to 3.75GHz	+50dBm		
3.75 to 13.25GHz	+62dBm		
Third-order intermodulation distortion (TOI)			
Parentheses indicate typical performance			
	Preamp off (Two -20 dBm tones at input mixer spaced by 100 kHz, 0 dB attenuation,20 to 30 °C)	10MHz to 2GHz	+12dBm,(+16)dBm
		2 to 3GHz	+12dBm,(+17)dBm
		3 to 7.5GHz	+12dBm,(+16)dBm
		7.5 to 13.6GHz	+11dBm,(+15)dBm
		13.6 to 26.5GHz	+8dBm,(+12)dBm
	Preamp on (Two -45 dBm tones at input mixer spaced by 100 kHz, 0 dB attenuation,20 to 30 °C)	10MHz to 26.5GHz	-8dBm nominal

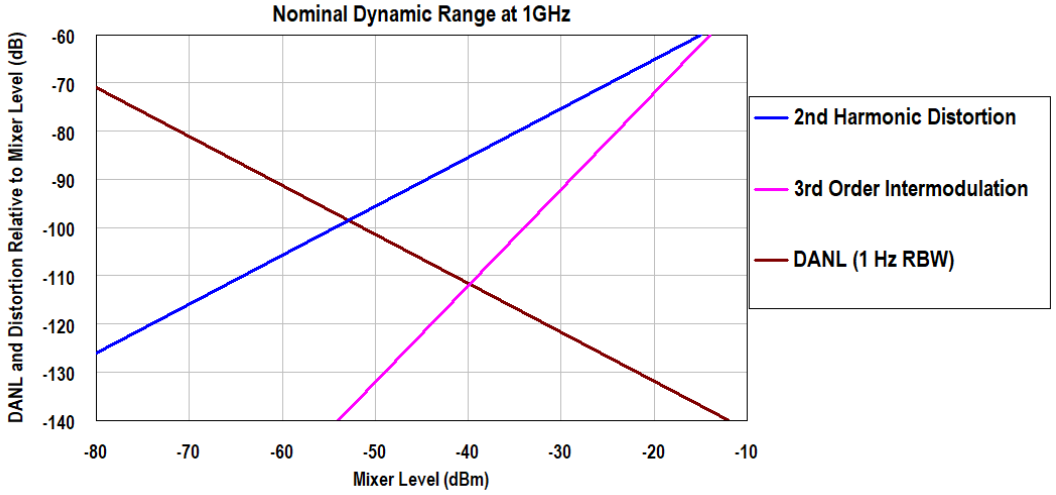

Figure 1. Nominal dynamic range for Band 0, for second and third order distortion,10 MHz to 3 GHz

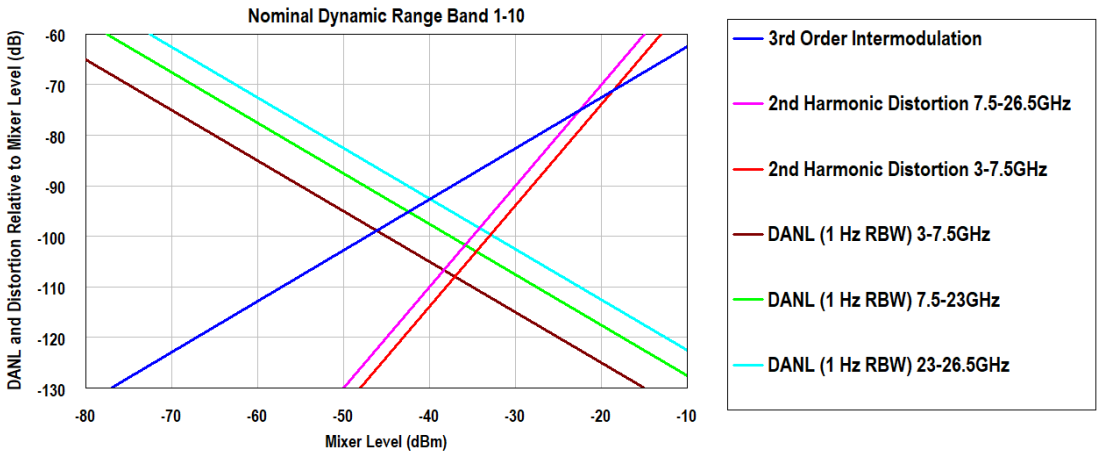

Figure 2. Nominal dynamic range, for second and third order distortion, 3 GHz to 26.5 GHz

Dynamic Range Specifications (Continued)

Phase noise	Offset	Specification	Typical
Noise sidebands (20 to 30°C, CF=1 GHz)			
	100Hz		-80dBc/Hz nominal
	1kHz	-100dBc/Hz	-102dBc/Hz
	10kHz	-107dBc/Hz	-108dBc/Hz
	100kHz	-108dBc/Hz	-110dBc/Hz
	1MHz	-130dBc/Hz	-132dBc/Hz

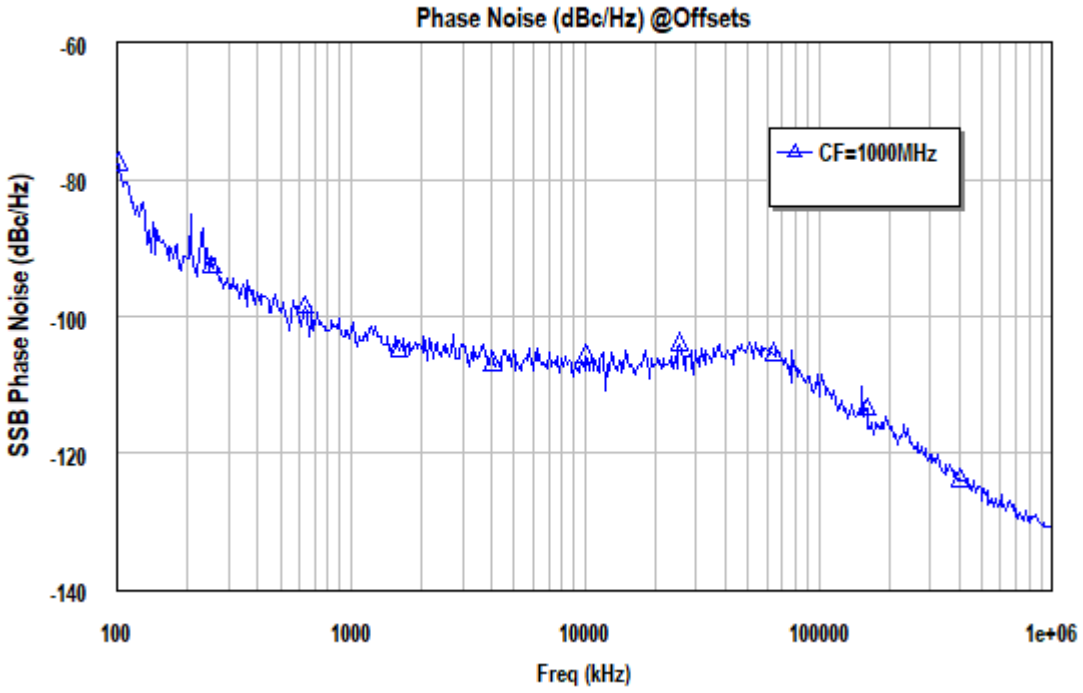

Figure 3. Nominal phase noise at different center frequencies

General Specifications

Temperature range	
Operating	0 to 55°C
Storage	-40 to 70°C
Environmental stress	
Samples of this product have been type tested in accordance with the RF-Cube Environmental Test Manual 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, vibration, altitude, and power line conditions.	
Power requirement	
Power drawn from chassis	≤90W
Weight	
Net	2.2kg(4.9 lbs)
Shipping	4.2kg(9.3 lbs)
Dimensions	
Height	64mm(2.5 in)
Width	150mm(5.9 in)
Length	175mm(6.9 in)
Calibration cycle	
The recommended calibration cycle is one year; calibration services are available through RF-Cube service centers	

Inputs and Outputs

RF input	
Connector	2.92mm-K,50Ω nominal
10 MHz in	
Connector	SMA-K,50Ω nominal
10 MHz out	
Connector	SMA-K,50Ω nominal
Trigger in	
Connector	SMA-K,10kΩ nominal
Trigger out	
Connector	SMA-K,50Ω nominal
Analog out	
Connector	SMA-K,50Ω nominal

I/Q Analyzer

Frequency			
Frequency span			
Standard instrument	100kHz to 25MHz		
Option B40	100kHz to 40MHz		
Resolution bandwidth (spectrum measurement)			
Range			
Overall	100mHz to 3MHz		
Span = 1MHz	50Hz to 1MHz		
Span = 10kHz	1Hz to 10kHz		
Span = 100Hz	100mHz to 100Hz		
Window shapes			
Flat top, Uniform, Hanning, Gaussian, Blackman, Blackman-Harris, Kaiser Bessel (K-B 70 dB, K-B 90 dB and K-B 110 dB)			
Analysis bandwidth			
Standard instrument	100kHz to 25MHz		
Option B40	100kHz to 40MHz		
IF frequency response (standard 10 MHz IF path)			
IF frequency response (demodulation and FFT response relative to the center frequency, 20 to 30°C)			
Center frequency (GHz)	Span (MHz)	Max. error	RMS (nominal)
≤3.0	≤10	±0.40dB	0.03dB
3.0<f≤26.5	≤10		0.10dB
IF phase linearity (deviation from mean phase linearity, nominal)			
Center frequency (GHz)	Span (MHz)	Peak-to-peak	RMS
≤3.0	≤10	0.5°	0.2°
3.0<f≤7.5	≤10	0.5°	0.4°
7.5<f≤26.5	≤10	0.5°	0.4°
Data acquisition (standard 10 MHz IF path)			
Time record length	4,000,000 IQ sample pairs		
Sample rate	90MSa/s		
ADC resolution	14 Bits		
Data acquisition (B40 IF path)			
Time record length			
IQ analyzer	4,000,000 IQ sample pairs		
Sample rate	90MSa/s		
ADC resolution	14 Bits		

System Requirements

Operating system	Windows10(64 bit)
Processor speed	1.86 GHz minimum
Available memory	4 GB minimum
	8 GB recommended
Available disk space	4GB
Video	Support for DirectX 10 graphics with 128 MB graphics recommended (Super VGA supported)
Browser	Microsoft Internet Explorer 7.0 or greater