

SSA5000A IQA&IFO Operation Manual

January 16, 2024

1. IQ Acquisition

IQ acquisition is similar to zero-span measurement in Swept SA, where the input signal is displayed as I/Q data results. It is commonly used for measuring digital modulated signals and supports exporting IQ data to txt files for users to perform data demodulation and analysis. The IQA window presents the I and Q signal waveforms, depicting the voltage changes over time. The I signal is represented by the yellow trace, while the Q signal is represented by the purple trace. I/Q views provided in spectrum measurements enables users to examine complex components of the same signal without the need to modify settings or measurements.

1.1 Amplitude

Configuring the amplitude parameters of the analyzer makes the display of the measured signal visually appealing and minimizes measurement errors. By adjusting these parameters, the signal can be displayed in the current window in an easily observable format. Once the amplitude parameters have been modified, the measurement process will commence anew.

1.1.1 Ref Value

The reference line may be positioned top, center or bottom of the marker by setting a reference value.1.2 Scale/Div

Configuring the unit for each vertical scale division in the logarithmic display can be done by either manually setting the value or enabling automatic scaling, which is determined by the measured results.

1.1.2 Attenuation

Based on the magnitude of the input signal, the user configures the corresponding RF front-end attenuator and amplifier to avoid distortion when presenting large input signals and reduce noise when dealing with small input signals.

1.2 Sweep

1.2.1 Sweep/Measure

The analyzer can be set to perform a single Scan/Measure or continuous Scan/Measure by selecting the 'Single' or 'Continue' mode.

1.2.2 Restart

Restarting the current scan or measurement is achieved by initiating a re-Scan/Measure, particularly if the scan parameters have been modified.

1.3 Meas Setup

Click on the 'Measurement Settings' menu and select appropriate averaging parameters, center



frequency, measurement time, and sampling rate based on the specific parameters of the acquired IQ signal.

1.3.1 Avg|Hold Number

Averaging|Hold count N represents the counter when the trace type is set to 'Average'. In a single measurement (Single) and any valid trace type set to 'Average', the scan will stop when the counter reaches N.

A higher (Average|Hold) count can reduce the influence of noise or other random signals, highlighting the stable characteristics of the signal.

1.3.2 Averaging

Enable or disable the averaging calculation option for measurement results.

1.3.3 Avg Mode

Choose the control type for the averaging function. This determines the averaging operation after reaching the specified data acquisition count (average count).

Options include:

-Exponential (Exp): The measurement averages using a specified number of exponentially weighted averages. The average value is displayed at the end of each scan.

- Repeat: The measurement resets the average counter each time the specified number of averages is reached.

1.3.4 Center Freq

Ensure that the set center frequency matches the frequency of the IQ signal, otherwise the IQ waveform will not be displayed properly.

1.3.5 Meas Time

Set the time for signal acquisition, which represents the recording duration of the waveform. Due to memory limitations, the maximum measurement time may decrease when using a higher sampling rate.

1.3.6 Sample Rate

Set the sampling rate for signal acquisition, indicating the number of IQ pairs collected per second. Choose an appropriate sampling rate based on the specific IQ signal to avoid distortion in the acquired IQ signal.

1.4 Operation Demonstration

1 Input the 16QAM signal through the RF port of SSA5000A.

2[Use the IQ Acquisition to observe the I/Q signal waveform of the signal:



(1)Click <u>Mode/Meas</u> \rightarrow <u>Spectrum Analyzer(SA)</u> \rightarrow <u>IQ Acquisition</u> \rightarrow <u>Replace/Add</u> \rightarrow <u>OK</u>.

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SA1 _ 1 2	3 4 5 6 Input Ζ: 50 Ω Atten: 20	dB Sig Track: Off Avg Type: Log-Pw	vr Sweep: Continuou	S	
Swept SA	Window Management				
Ref Level 0 dBm	Select Mode/Measurement:			Window Management:	
Log	Mode	SA Measurement		SA1 IQ Acquisition	
-10	Spectrum Analyzer (SA)	Swept SA			
-20	Vector Network Analyzer (VNA)	Channel Power			
-30	Cable and Antenna Test (CAT)	ACPR	Add =>		
	Modulation Analyzer (MA)	Occupied BW	Replace =>		
-40	EMI Measurement(EMI)	T-Power			
-50	Real-Time Spectrum Analyzer (RTSA)	тоі			
60	New Ratio (NR)	Spectrum Monitor			
-50 -70	Long Term Evolution (LTE)	CNR			. notable she that
	Pulse	Harmonic			
	BlueTooth (BT)	IQ Acquisition			
-90				OK Cancel	
-100					
Start 950 MHz		Center 1 GHz			Stop 1.05 GHz
RBW 1 MHz VBW 1 MH	Z	Span 100 MHz			Sweep ~1 ms (1001pts)

(2) Click <u>FREQ</u>, configure the center frequency corresponding to the IQ signal.



(3) Click \underline{AMPTD} , Adjust the reference level, the scale and measurement time to better display the I/Q waveform on the screen.

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(4) Click <u>Save/Recall</u>, save IQ data as .txt file.

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SA1 Input 2 IQ Acquisition Freq F	Z: 50 Ω Atten: 20 dB Ref: Ext(S) Preamp: Off	Sig Track: Off	Avg Type: Log-Pw Trig: Free Run	r Sweep: Single					System	
Ref Level -39.5 mV			Ţ					e :	Save File	System
Lin	Save File					l O	$\square \times$			
520 m	< > ^ 俞	ocal				(±	前 …		Recall File	Conne- ction
380 m	> 🛄 local	Name		Size T	уре	Date Modified				Reset
240 m								2	File Browser	Display
100 m							-			Align- ments
-40 m										
-180 m										Power
-320 m										Self Test
460 m										
-600 m	File Name	16QAM iqdata					ОК			
-740 m	File Type	Text (*.txt)	_				Cancel			
		Ce	enter 1 GHz			Meas Time 5	ms (5000pts)			

2. IF Output

The intermediate frequency (IF) output signal can be used for external signal processing and can be



obtained via the 'IF Out' output connector on the instrument's rear panel. Please note that the IF output is only useful in Zero Span.

The IF Out signal, centered at approximately 120MHz, is simply a down-converted version of the RF Input signal that is present at the tuned frequency. The bandwidth of the IF output signal is approximately 40MHz. Requires Option SSA5000-IFO.

2.1 Operation Demonstration

1[Input the RF signal to the RF port, and then output the IF signal through the IF Out connector on the rear panel.

2[Click <u>FREQ</u>, configure the center frequency corresponding to the RF signal and turn on the Zero Span mode.



3 Click Input/Output, turn on the IF Out function.

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SA1 Swep	t SA		123456 WWWWWW NNNNNN	Input Z: 5 Freq Ref:	i0 Ω Int(S)	Atten: Pream	20 dB ıp: Off	Sig T	rack: Off	Avg Trig	g Type: Log-Pwr g: Free Run	Sweep: Cont	inuous			Input/	Output	
i	Ref 0 dBi	m	Atten 20 dB													IF Ou		Input
Log																		
-10																		Correction
-20																		Output
-30																		
-40																		
-50																		
60																		
-60																		
-70																		
-80																		
-90																		
-100																		
Start 1	GHz						C	enter	1 GHz					Stop 1 GHz				
#RBW	300 kHz	VB	W 300 kHz				S	pan 0	Hz				Sweep ~2	200.2 us (1001pts)				

4 Use another spectrum analyzer to observe the IF signal. Configure the center frequency to 120 MHz and the span to 50 MHz.



IF Output when input an 1GHz RF signal

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IF Output when input a 3.5 GHz NR signal



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