Agilent ENA Series Network Analyzers

Amplifier Measurement Wizard Operation Manual

Rev. 01.11



April 2010

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Sample Program

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Overview of the program

The ENA Amplifier Measurement Wizard VBA macro assists setting measurement conditions for amplifier tests..

Program Description

Program title	Amplifier Measurement Wizard
VBA File Name	EnaAmplifierWizard_0111.vba
Revision	Rev.01.11

Supported ENA models and firmware

Models	Firmware
E5070B/E5071B 2-port/3-port/4-port	Rev.6.50 or later
(Requires opt.x13 extended power range)	
E5071C 2-port/4-port	Rev.8.00 or later

<u>Required external instruments</u>

• Power meter and power sensor (for harmonics and gain compression measurement)

Measurements supported in the Wizard

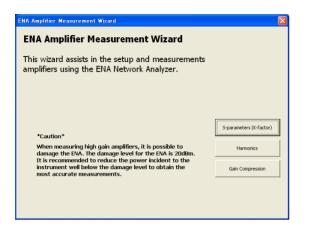
- S-parameter measurements
- Harmonic measurements (ENA Opt 008 FOM is required)
- Gain compression measurements (CW / Swept)

Starting VBA Program

- **Step1.** Copy VBA file to local drive of ENA.
- Step2. Press Macro Setup on the front panel.
- Step3. Press Load Project and load VBA file.
- **Step4.** Press Macro Run on the front panel.

VBA Procedure: Startup Dialogue

The VBA starts with following dialogue.



The measurement type can be selected with this dialog. The procedure of the wizard and measurement result for each measurement type is described below.

(Note: If the measurement wizard dialogue gets behind the ENA application during the operation, press [Focus] hard key on ENA.)

VBA Procedure: S-parameter Measurements

ENA Amplifier Measurement Wizard S-parameter Measurements Introduction [step1/3] Stimulus Parameter Setup [step1/3] Connect Device and Measure Verage Averaging : Kfactor definition Eack Next

[step1/3] Stimulus Parameter Setup

Amplifier Measur					
-parameter step1/3] Stimu					
Sweep Setup	ius Parame	eter Se	up		
Start Frequency:	0.1	MHz	Stop Frequency:	8500	MHz
Center Frequency:	4250.05	MHz	Frequency Span:	8499.9	MHz
Sweep Type :	Linear Fi	req		Freq : 100k - 8.	5GHz
Average					
Avg. Factor :	16		IFBW :	70 kHz	•
Averaging :	OFF				
Power			Point	s	
Power :	-20		Numbe	er of Points: 20)1
	Power: -55 to 1	.0 dBm		Poin	t : 2 - 1601
				Back	Next Done

[step2/3] Calibration

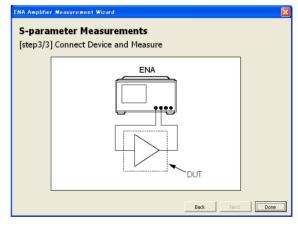
Introduction

ENA Amp	NA Amplifier Measurement Wizard 🛛 🛛 🔀				
S-pa	rameter Measuremen	ts			
[step2	2/3] Calibration				
	Select Cal Kit Connector Calibration	KR			
	Port1 3.5mm	Unnecessary when calibrating with ECal module			
	Port2 3.5mm 💌 85033E				
	Perform Calibration				
	Port1 Port2 Port2	Omit Isolation			
	OPENOPEN	Aug 5.450			
	SHORT SHORT	Avg Factor			
	LOADLOAD				
	Thru Isolation (Opt	onal)ECal			
	PORT1-2 PORT1-				
		Done			
		Back Next Done			





[step3/3] Connect Device and Measure



Measurement result (With K-factor)



VBA Procedure: Harmonics Measurements

NA Amplifier Measurement Wizard NA Amplifier Measurement Wizard Harmonic Measurements Harmonic Measurements [step1/3] Stimulus Parameter Setup Introduction Fundamental Frequency (fD) Harmonics *Caution* The ENA Frequency Offset Mode (option 008) is required for harmonic measurements. Start Stop ✓ second (2*f0) MHz 1700 MHz 🗹 third (3*f0) 0.1 [step1/3] Stimulus Parameter Setup Center . Span 🗆 fourth (4*f0) ENA 850.05 MHz 1699.9 MHz 🗆 fifth (5*f0) [step2/3] Calibration Power Average IFBW Power Avg Factor [step3/3] Connect Device and Measure • 51 -20 dBm 16 70 kHz Power: -55 - +10 dBm OFF ршт Back Next Do Back Next D

[step1/3] Stimulus Parameter Setup

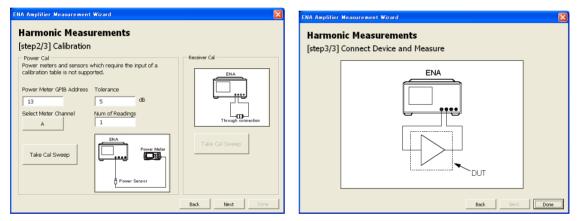
[step2/3] Calibration

Introduction

[step3/3] Connect Device and Measure

Points Number of Points

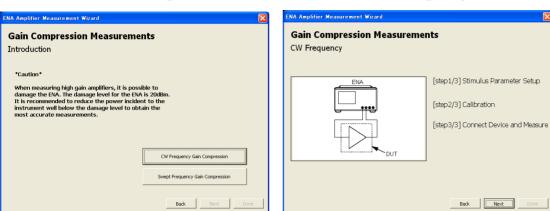
Point : 2 - 1601



Measurement result

	Print Advances	and Harmony		Ted Harrows		
0(1) LOG MAG 1	0.00ds/ A## 0.00	Tr1 8(1) Log Mag	10.00db/ Ref 0.00	Tr1 8(1) Log Mag	10.00d8/ ### 0.000	ESOTEC Mers
10.00	111111111111	10.00		30.00		
Fundan	nental	2nd		3rd		Measurement
0,000		0.000+		0.000		Format Log Mag
-20.00 -30.00 -40.00		-20,00 -30,00 -40.00	~^	-20.00		Scale
-50.00 et 1: Start 100 MHz et 2: Start 100 MHz	Stop 1.7 GHL Stop 1.7 GHL	-10.00 Avrt 1 Start 300 MHz Port 2: Start 200 MHz	1000 1.7 DHE 9100 3.4 DHE	-10.00 Not 1 Stat 100 Heiz Not 2 Stat 300 Meiz	100p 1.7 (He 100p 5.1 (He	Deplay
95art 100 MHr 5109 1.7 GHz	1001 1001 1001 1001	Start \$20 Mer 2 Stop 1.7 Get	RO NO DE ON	3 Stop 3.7 GHz	RCP RCP 06	Average
r1 8(1) Log Mag 1 50.00	0.000k/ Fat 0.000	30.00	10.00m/ #ef 0.00	Tr2 573 Log Mag		Calify aton
4th		55 5 th		0.000UDC	10.00m/ ### 0.000	SIMAR
10.00 0,000* 10.00		10.00 0.000x -10.00	•	-70.00	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Sweep Set.
20.00	~	-20,00 -30,00 -40,00		-10.00		Tripper
50.00 t 1: Start 100 Melj t 2: Start 400 Melj	5100 1.7 GHI 5100 5.0 GHz	-50:00 Port II Brart 300 MHz Port II Start 500 MHz	9100 L7 0H	-80.00 -90.00 -100.0		Mater
Start 100 MHz Stop 1.7 GHz	PC7 RC7 - 08	5 5100 1.7 GHz	RCF I NCP I DITI COL	6 31at 100 Met	Strp 1.7 GHL	Marker Sear
emeric New uraments			8			Marker Funct
armonics value calculate						Analysis
dBc) are shown in Cho [Tr1] second; [Tr2] the						

VBA Procedure: Compression Measurements (CW)



Introduction (Select Sweep Mode)

Introduction (CW Frequency)

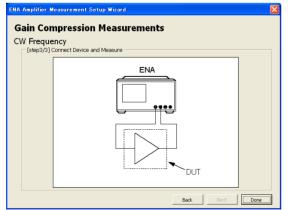
[step1/3] Stimulus parameter setup

[step2/3] Calibration

ENA Amplifier Measurement	Wizard		٥	ENA Am
Gain Compressi CW Frequency	on Measurer	nents		Gair CW F
[step1/3] Stimulus Parame Power Select Power Range	tter Setup Start -15 Center -7.5	dBm 0 dBm 15	dBm	[step2 Pow Power albra Power [13] Select
Frequency CW Frequency 1000 MHz Freq : 300k - 20GHz	Average Avg Factor 16 OFF	IFBW 70 kHz 💌	Points Number of Points 201 Point : 2 - 1601	Ta
		Bac	k Next Done	

NA Amplifier Measurement Setup Wizard	
Gain Compression Measuremen CW Frequency	ts
[step2/3] Calibration Power Cal Power resers and sensors which require the input of a calibration table is not supported. Power Meter GPIB Address Tolerance [13] 5 dB	2-port Cal Connector Calbration Kit Port 3.5mm V 85038 V Port2 3.5mm V 85038 V
Select Meter Channel Num of Readings	Avg Factor 8 Port1 Port2 Port SHORT LOAD Fru Port12 Port1
	Back Next Done

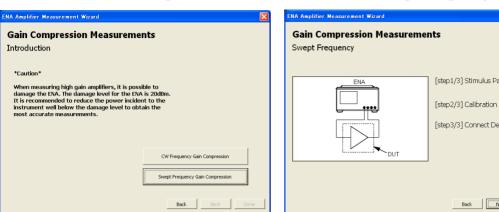
[step3/3] Connect Device and measure



Measurement result

A 100 300 ar 100 300 ar 100 P1dB Power P1dB Power 20 20 20 20 20 20 20 20 20 20	A405
S21 LogMag	Dente La Contraction Di Contraction
Les S21 LogMag	10 50000
6.07 6.09 6.03 muse 90.007 / Mr 6.007 (201 7.03 muse 90.007 / Mr 6.007 (201 7.03 M 900 - 201 - 2	0.2000 6
5.00 5.00 5.02 mare to.007 / sef 0.000 (22) 5.02 mare to.007 / sef 0.000 (22) 7.02 Power Sweep	
10.0 rst -sto.412 date 21.942	a Automical 5 D
	Patrence 26.000
S21 Phase	Marker Parler o
	between a come
.000 >	Phase C
60.0 70.0	Reta
Power Sweep	
	100-10 68m (010) (01

VBA Procedure: Compression Measurements (Swept)



Introduction (Select Sweep Mode)

Introduction (Swept Frequency)

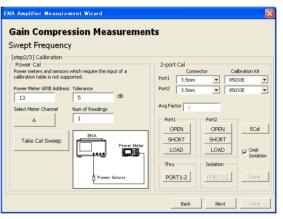
Gain Compression Measureme Swept Frequency	nts
	[step1/3] Stimulus Parameter Setup [step2/3] Calibration [step3/3] Connect Device and Measure
	Back Done

X

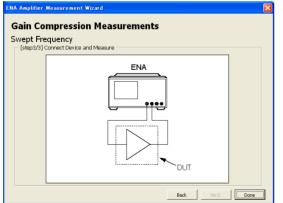
[step1/3] Stimulus parameter setup



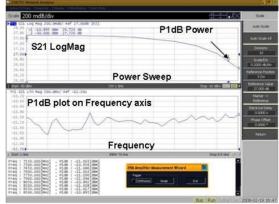
ENA Amplifier Measuremen	t Wizard			×
Gain Compress	ion Meas	uremen	its	
Swept Frequency				
- [step1/3] Stimulus Parar	neter Setup			
Power Select Power Range	Start	Stop		Points Power Points
-25 to 10 dBm 🔹	-15	dBm 0	c	IBm 51
	Center	Span		Freq Swept Points
	-7.5	dBm 15	c	IB 101
				Point : 2 - 1601
Frequency	Freq : 300k - 20	GHz	Average	
Start	Stop		Avg Factor	IFBW
10 MHz	1000	MHz	16	70 kHz 🔻
Center	Span		OFF	
505 MHz	990	MHz		
				Back Next Done



[step3/3] Connect Device and measure



Measurement result



Revision History

Revision	Date	Description
01.00	Mar 2008	Initial Revision
01.01	Apr 2008	Modified Frequency Range Check
01.10	Oct 2008	Supported 20GHz Option
01.11	Mar 2009	Revised the Image of K-factor Definition