Nonlinear Starter Kit for Agilent Network Analysers
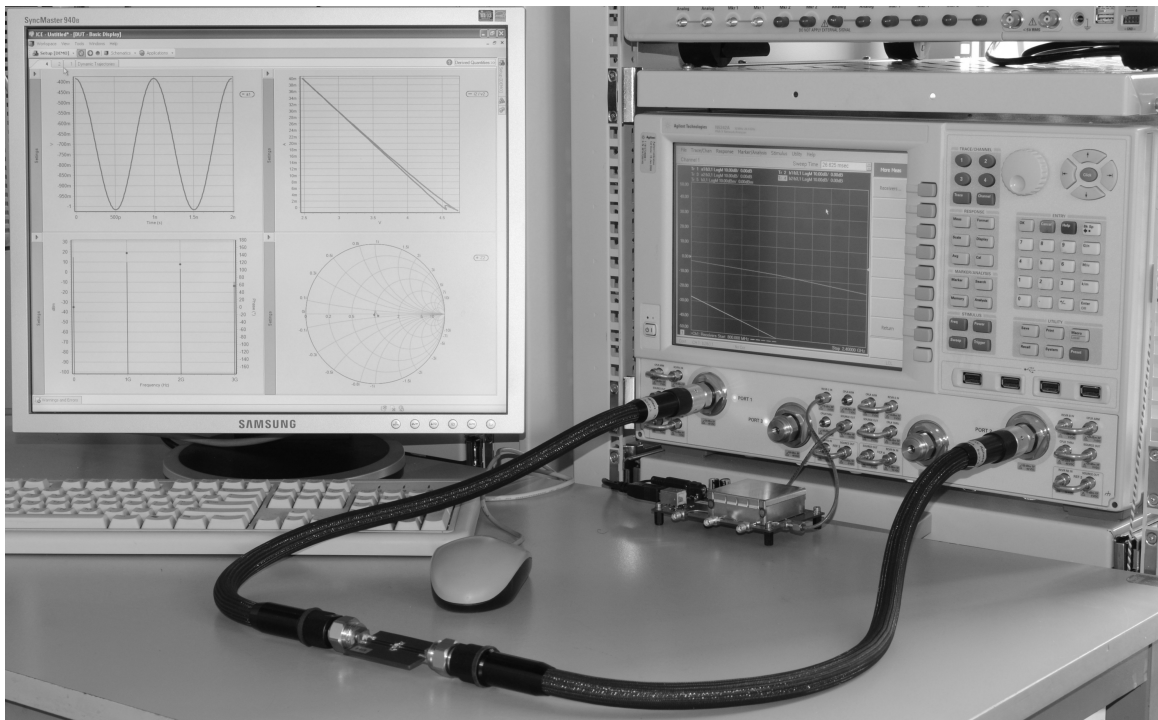
Make your first steps in the nonlinear world

Contents

Introduction

The NM310S is a cost-efficient nonlinear starter kit, allowing you to make your first steps in the nonlinear world with your vector network analyser. It combines hardware and software that runs on top of a selection of vector network analysers (VNA) from Agilent Technologies. The combination of the VNA and the NM310S starter kit is referred to as "PNAPlus".

On top of the standard measurement capabilities of the Agilent VNA, the PNAPlus provides calibrated measurement capability of the time waveforms of the incident and reflected waves or voltages and currents at the ports of a component under test. The time waveforms are periodic with a minimal frequency of 20 MHz and with spectral components up to 3 GHz.

The NM310S starter kit consists of:

- 1x NM201 double-output comb generator (20MHz-3GHz) used as synchronizer and Harmonic Phase Reference

- 1x NM311S Connection Kit

- 1x USB stick containing the NMDG's ICE software installer, a ICE 30 day demo license[1], a quick start guide and several tutorials.

This starter kit runs on top of the 4-port Agilent™ N5241A/42A/44A/45A/47A, with the following options:

- 4-port test set – dual source (Option 400)
  or Extended power range and bias tees (Option 419)
  or Additional Switches (Option 423, includes Option 419)
- → Frequency offset (Option 080)

When the option 419 is missing, one needs to put external attenuators in front of the measurement receivers of Port 1 and Port 2.

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1   The ICE 30 day demo license will allow you to begin immediately your first steps in the nonlinear world. A final license is delivered for your system on demand.

General block diagram

4-port N524xA Option 400 / 419

4-port N524xA Option 423
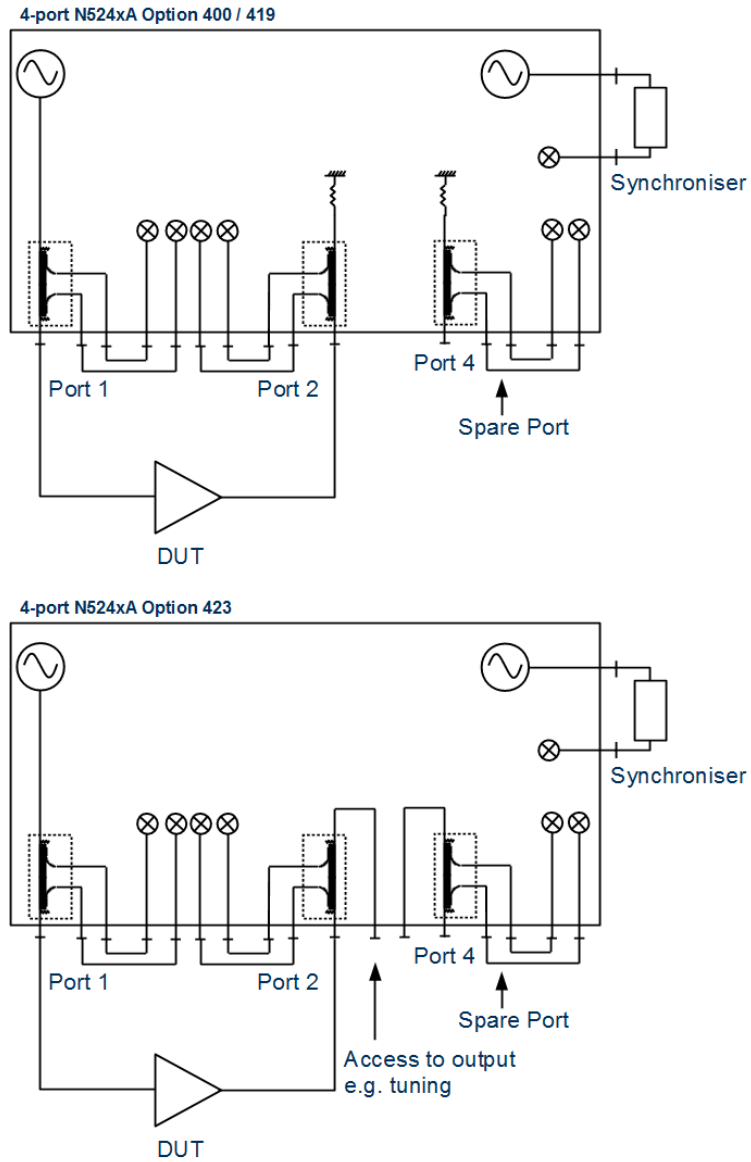
Block diagrams of PNAPlus for the different Agilent VNAs

Connectivity

NM201 Comb Generator

Input port connector	SMA, female
Output port 1 connector	SMA, female
Output port 2 connector	SMA, female
Trigger port 1 connector	SMA, female
Trigger port 2 connector	SMA, female
USB control port	USB Type B
DC Power Connector	2.1 mm DC Jack

NM311S Connection Kit

2x semi-rigid cables (Synchroniser)	
Input port connector	3.5 mm, male
Output port connector	3.5 mm, male
1x flexible cable (Harmonic Phase Reference)	
Input port connector	SMA, male
Output port connector	SMA, male
1 x adapter	
Input port connector	3.5 mm, female
Output port connector	3.5 mm, female

ICE software requirements

Please refer to the NMDG Software Requirements document, for general information about the requirements.

Specifications

Hardware specifications

N5242A Vector Network Analyser

Overall Specifications for PNAPlus

Frequency range	20 MHz – 3 GHz	limited by NM201
Minimal frequency grid spacing	20 MHz	

Reflectometers

Insertion loss	<8 dB, typ. 5dB	
Coupling factor		
in Reference channel	typ. 17 dB	
in Measurement channel	typ. 15 dB	
Damage power level	+30 dBm	
Damage DC voltage	40 V	

Specifications

Port bias

Maximum nominal input voltage	40 V	
Maximum nominal input current	200 mA	
Damage voltage	40 V	
Damage current	500 mA	

Receivers

Compression		@ Test port

Reference receiver channel
  Odd harmonics only
  All harmonics
	
	+13 dBm
	+7 dBm
		
		60 dBc SFDR**
		60 dBc SFDR**

Measurement* receiver channel
  Odd harmonics only
  All harmonics
	
	+17 dBm
	+10 dBm
		
		60 dBc SFDR**
		60 dBc SFDR**

Damage power level	+15 dBm	
Damage DC voltage	0V	

* Including 20 dB Attenuator
** Spurious Free Dynamic Range including harmonics

Receiver step attenuators (419)

Attenuation	0 dB to 35 dB	
Attenuation steps	5 dB	

Maximum power level versus receiver attenuation

Attenuation	Reference receiver	Measurement receiver	
	Maximum power @ Source Input (Odd harm. Only/All harm.)	Maximum power @ Test Port (Odd harm. Only/All harm.)	
	External attenuator	External attenuator (20 dB included)	Internal step attenuator (419)
0 dB	+13 / +7 dBm	+17 / +10 dBm	-3 / -10 dBm
5 dB	+18 / +12 dBm	+22 / +15 dBm	+2 / -5 dBm
10 dB	+23 / +17 dBm	+27 / +20 dBm	+7 / 0 dBm
15 dB	+28 / +22 dBm	+30 / +25 dBm	+12 / +5 dBm
20 dB	+30 / +27 dBm	+30 / +30 dBm	+17 / +10 dBm
25 dB	+30 / +30 dBm	+30 / +30 dBm	+22 / +15 dBm
30 dB	+30 / +30 dBm	+30 / +30 dBm	+27 / +20 dBm
35 dB	+30 / +30 dBm	+30 / +30 dBm	+30 / +25 dBm

NM201 Comb Generator

Frequency range	20 MHz – 3 GHz	
Drive frequency range	1 GHz – 2 GHz	
Nominal input power	+4 dBm	
Input damage level	+6 dBm	
Output peak voltage	-0.55 Vp	

Waste Electrical and Electronic Equipment (WEEE)

EU Customers At the end of the product life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste Electrical and Electronic Equipment, visit ni.com/environment/weee.

Additional Hardware

Supported equipments

DC Sources (including DC Voltage and Current Meters)

R&S®NGMO series	controlled via its IEC/IEEE-bus interface
Hameg HMP series	controlled via its USB interface
Agilent 66xxA/B/C series	controlled via its IEC/IEEE-bus interface
Agilent 662x series	controlled via its IEC/IEEE-bus interface
Agilent DC4142	controlled via its IEC/IEEE-bus interface
Agilent E363xA series	controlled via its IEC/IEEE-bus interface
Keithley 24xx series	controlled via its IEC/IEEE-bus interface
Yokogawa GS610	controlled via its IEC/IEEE-bus interface

DC Voltage and Current Meters

Hameg HM8112-3	controlled via its USB interface
Agilent 34401A	controlled via its IEC/IEEE-bus interface
R&S® RTO scope series as DC Meters	controlled via its IEC/IEEE-bus interface

RF Sources

Remark: A 10 MHz clock needs to be shared between the RF source and the VNA, and the VNA is set as the master clock.

Internal Agilent N524xA sources	
R&S® SMx100A series*,**	controlled via its IEC/IEEE-bus interface
R&S® SMBV100A source*,**	controlled via its IEC/IEEE-bus interface
R&S® SMIQ source*,**	controlled via its IEC/IEEE-bus interface
R&S® SML0x series*,**	controlled via its IEC/IEEE-bus interface
Agilent 836x series*	controlled via its IEC/IEEE-bus interface
Agilent ESG series*,**	controlled via its IEC/IEEE-bus interface
Agilent PSG series*,**	controlled via its IEC/IEEE-bus interface
Anritsu MG369x series*,**	controlled via its IEC/IEEE-bus interface
SCPI-compliant RF source*	controlled via its IEC/IEEE-bus interface

*   Not supported for calibration
**   Including phase control

Pulsed IV Systems

Auriga AU4750 system	controlled via its Ethernet interface
Focus PIV system	controlled via its Ethernet interface

Power Meters

Agilent E4418A	controlled via its IEC/IEEE-bus interface
Agilent N1911A	controlled via its IEC/IEEE-bus interface
Anritsu ML2437A	controlled via its IEC/IEEE-bus interface

Tuners

Please refer to the [NMDG Software Requirements](#) document, for general information about the supported tuner models, and the required software.

Customization

Instrument drivers

Drivers for other equipments can be added on customer request.

External Test sets

External test sets for high power measurement applications (such as high power amplifier measurements) can be added on customer request, with the proper calibration routines.

Order Information

Designation	Type	Order number
20MHz-3GHz Nonlinear Starter Kit for Agilent VNA	NMDG NM310S	NM310S-N

Trademark Information

Microsoft .NET is a brand associated with Microsoft technology.

The names of actual companies and products mentioned herein may be the trademarks of their respective owners.

Contact Information

Agilent VNA   www.agilent.com

PNAPlus, NM310S and other products and services, focusing on nonlinear RF and HF char-
acterisation, behavioural modelling and test:

NMDG
LEADING BEYOND S-PARAMETERS   A National Instruments Company™

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January 2013 - Product description and specification are subject to change without notice.