

Keysight

VXA Vector Signal Analysis
X-Series Measurement Application
N9064A & W9064A

Self-Guided Demonstration

This document will guide you through a typical usage scenario for a Keysight X-Series signal analyzer with the VXA vector signal analysis measurement application.

Minimum Equipment and Measurement Application Configuration Requirements

All demonstrations utilize an X-Series signal analyzer with N9064A-1FP, 2FP. Keystrokes surrounded by [] indicate front-panel hardkeys; softkey operations located on the right edge of the display are surrounded by { }.

In this document, a quick demonstration will guide you through QPSK modulation analysis measurements.

N/W9064A-1FP vector signal analysis (required)

Option 1FP is the foundation of the N9064A measurement application, offering basic vector signal analysis with SCPI programming and front panel operation on an X-Series signal analyzer. It provides:

- Spectrum analysis and time domain analysis with signal tracking
- Band power, occupied bandwidth, and ACP measurements
- Markers, marker coupling, triggering
- Time gating
- Frequency counter
- Analog demodulation measurements (AM, FM, PM)

N/W9064A-2FP flexible digital modulation analysis

Option 2FP offers a complete set of modulation quality measurements for:

- MSK, QPSK, 8PSK, BPSK, $\pi/4$ DQPSK, $\pi/8$ D8PSK, D8PSK, offset QPSK
- QAM16, 32, 64, 128, 256, 512, 1024
- DVB QAM16, 32, 64, 128, 256
- FSK 2, 4, 8, 16 states
- VSB8, VSB16
- APSK16, 32, 16 w/DVB, 32 w/DVB
- CPM
- Cellular: IS-95 base and mobile, GSM, EDGE, CDPD, NADC, PDC, PHP, 3GPP (W-CDMA)
- Wireless networking: 802.11b, HIPERLAN/1(HBR and LBR), Bluetooth®, ZigBee (802.15.4, 868/915/2450 MHz), WiSUN (MR-FSK PHY)
- Digital video: DTV8 - 16, DVB16 - 256, DVB 16APSK with code rate 2/3 to 9/10, DVB32 APSK with code rates 3/4 to 9/10
- Other: APCO 25, APCO 25 P2 (HCPM, HDQPSK), DECT, TETRA, VDL Mode 3, MIL-STD 188-181C, SOQPSK-TG

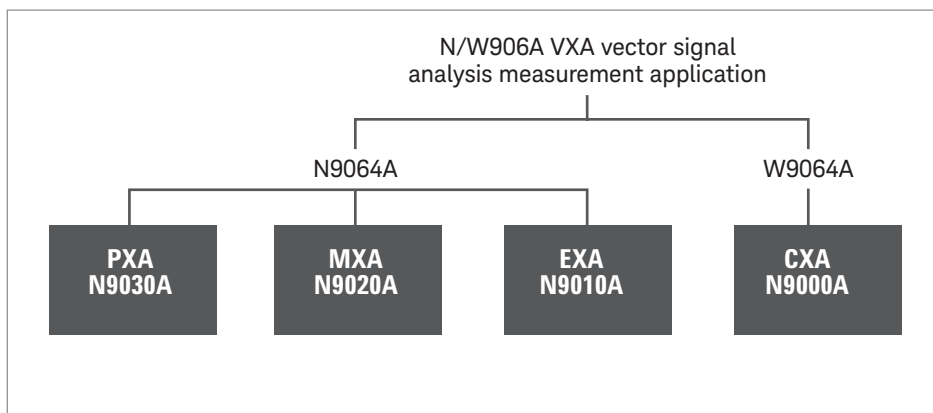


Figure 1. The N9064A runs inside of the PXA, MXA, and EXA signal analyzers, while the W9064A runs inside of the CXA signal analyzer

Demonstration

QPSK modulation analysis measurements

You can adjust the following parameters when making digital modulation measurements with VXA measurement application Option 2FP:

- Modulation format (QAM, PSK, MSK, FSK, DVBQAM, VSB, APSK)
- Symbol rate
- Measurement interval (10 to 4096)
- Points/symbol (1 to 20)
- Gain imbalance /quad skew coupling On/Off
- Measurement filter (no filter, RRC, Gaussian, EDGE, CDMA (IS-95 Base EQ), rectangular, low pass, user defined)
- Reference filter (raised cosine, RRC, Gaussian, EDGE, CDMA (IS-95 Base), rectangular, half sine, user-defined)
- Alpha/BT (0.05 to 100)
- Burst/sync search

In this demonstration, the settings for the signal generator are:

- Center frequency = 1 GHz
- Level = -10 dBm
- Symbol rate = 1 MHz
- Modulation type = QPSK
- Filter = Root Nyquist
- Filter alpha = 0.35

Configure the VXA application in the X-Series signal analyzer as follows:

| Instructions | Keystrokes |
|---|---|
| Connect the RF output of the signal generator to the RF input of the X-Series signal analyzer | |
| Enter the VXA application | [Mode] > {Vector Signal Analyzer (VXA)} |
| Preset the measurement mode | [Mode preset] |
| Set the analyzer's center frequency to 1 GHz | {Cent Freq} > [1] > [GHz] |
| Select digital modulation analysis | [Meas] > {Digital Demod} |
| Change demod setups | [Meas Setup] > {Demod Setup}: Set modulation format = QPSK Symbol rate = 1 MHz Alpha/BT = 0.35 |

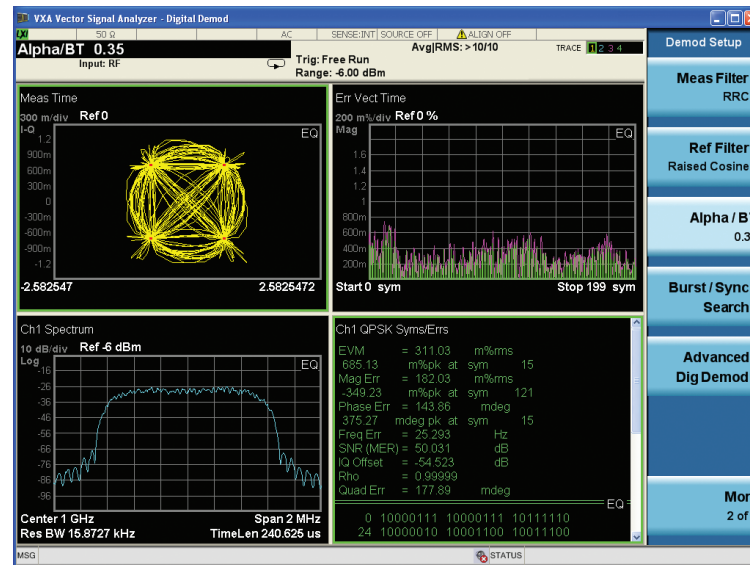


Figure 2. QPSK modulation analysis in default quad view: Trace 1 (upper left), IQ constellation; Trace 2 (lower left), spectrum; Trace 3 (upper right), error vector magnitude versus time (symbol) trace; Trace 4 (lower right), symbols/error table

Tips for digital modulation analysis

The following steps are useful when analyzing digitally modulated signals:

- Look at the IQ constellation or vector diagram for obvious over/undershoot.
- Examine the symbols/error table and note the rms EVM.
- Look at the symbols/error for quadrature and IQ imbalance errors.
- Look at IQ error phase versus time for magnitude and phase error. Phase noise will appear random. Incidental modulation will appear as a discernible waveform.
- Examine the EVM time trace. Where are the errors? At symbol times, or in between symbols? Where on the burst?
- Examine the EVM spectrum, which shows the spectrum of the error signal. In most digital systems, non-uniform noise distribution or discrete signal peaks indicate the presence of externally coupled interference.

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