# 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.

KEYSIGHT TECHNOLOGIES

# 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)

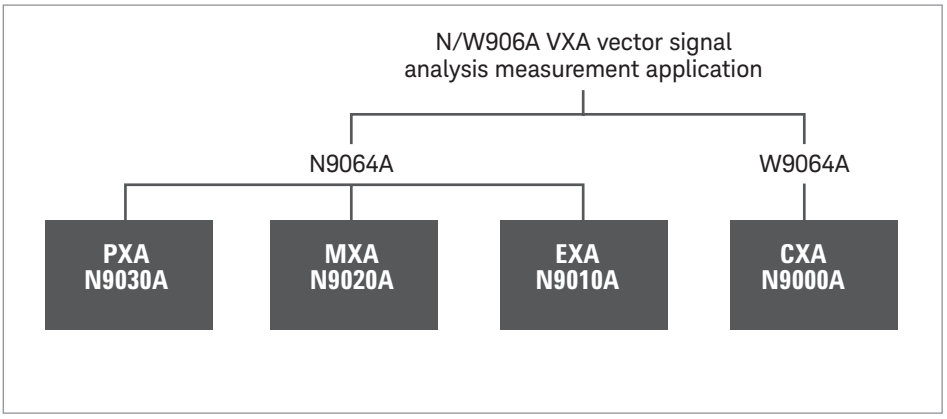


Figure 1. The N9064A runs inside of the PXA, MXA, and EXA signal analyzers, while the W9064A runs inside of the CXA signal analyzer

## N/W9064A-2FP flexible digital modulation analysis

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

- MSK, QPSK, 8PSK, BPSK, π/4 DQPSK, π/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

# 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}:<br>Set modulation format = QPSK<br>Symbol rate = 1 MHz<br>Alpha/BT = 0.35 |

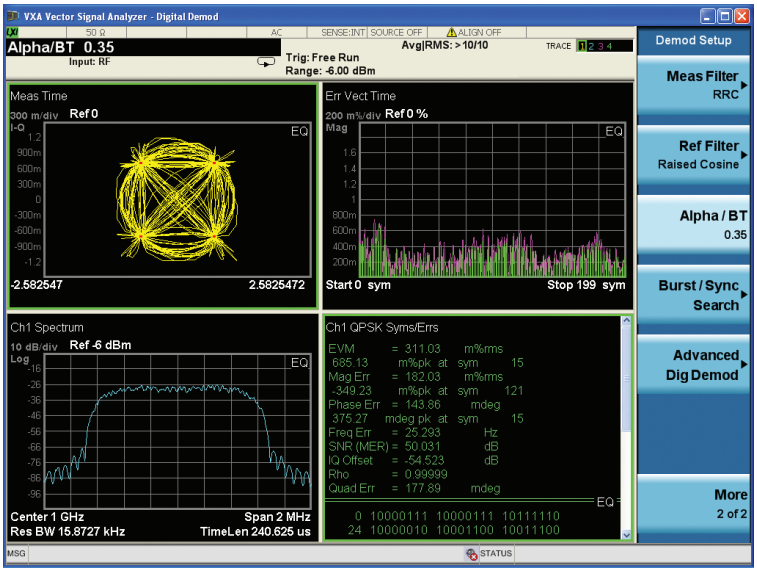


Figure 2. QPSK modulation analysis in default quad view: Trace 1 (upper left), IQ constellation; Trace 2 (lower left), spectrum; Trace 3 (upper right), error vector magnitude versus time (symbol) trace; Trace 4 (lower right), symbols/error table

## 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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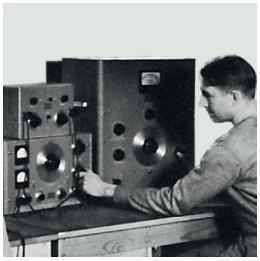

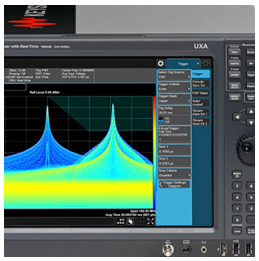

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