MXO 3 NEXT-GENERATION OSCILLOSCOPE: FAST. PRECISE. COMPACT.

Speaker: Andy Lin

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R&S OSCILLOSCOPE PORTFOLIO

The most modern scope line from 50 MHz to 16 GHz



RTH1000
60 MHz ... 500 MHz

HANDHELD



RTC1000
50 MHz ... 300 MHz

1000



RTB2
70 MHz ... 300 MHz

2000



MXO 3 Series
100 MHz ... 1 GHz

3000



MXO 4 Series
200 MHz ... 1.5 GHz

4000



MXO 5 Series
MXO 5C Series
100 MHz ... 2 GHz

5000



RTO6
600 MHz ... 6 GHz

LAB



RTP164
4 GHz ... 16 GHz

PERFORMANCE

Cost optimization design
Analog triggering

Performance optimization design
Digital triggering

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AGENDA: MXO3 SERIES OSCILLOSCOPE

- Key Specifications
- How does MXO3
- Fast. Precise. Compact
- Features & Options

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MXO 3 SERIES: KEY SPECIFICATIONS

MXO 3 Series Key Specifications	
Channels	4, 8
Bandwidth	100, 200, 350, 500 MHz, 1 GHz
Max SR	5 GSa/s
Record Length (std) / option	125 Mpts / 500 Mpts
Vertical resolution	12 bit (HW)
Max. Acquisition rate	4.5 M wmfs/s
OS	Closed Linux
Warranty	3 years



4-ch MXO34



8-ch MXO38

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MXO 3 SERIES: FAST

SEE MORE SIGNAL DETAIL AND SUBTLE CHANGES INSTANTLY

- MXO-EP ASIC
  - 400 Gbs/s processing
  - Capture up to 99% real-time signal activity
  - Enables HW-accelerated
    - Update rate (4.5 M acquisitions/s)
    - HD mode (4.5 M acquisitions/s)
    - Mask test (4 M tests/s)
    - XY mode (2 M plots/s)
    - Zone triggering (600K triggers/s)
    - Math (700K operations/s)
    - Spectrum (50K FFTs/s)
    - + other



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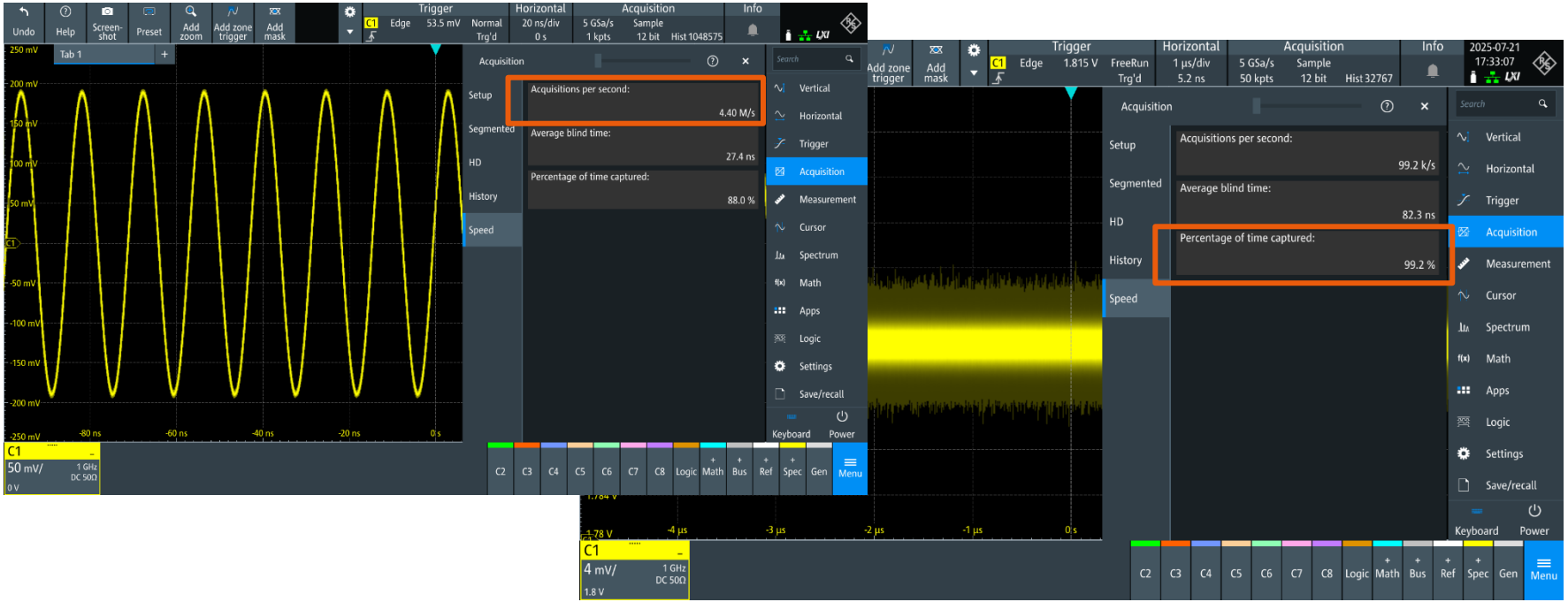
MXO 3 SERIES: FAST

R&S IS 1ST SCOPE MANUFACTURER TO SHOW % REAL-TIME CAPTURED & SPEED



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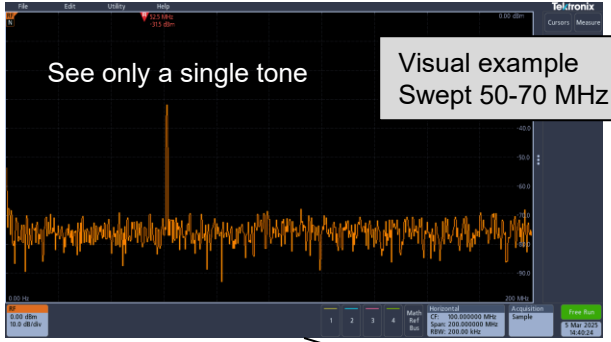
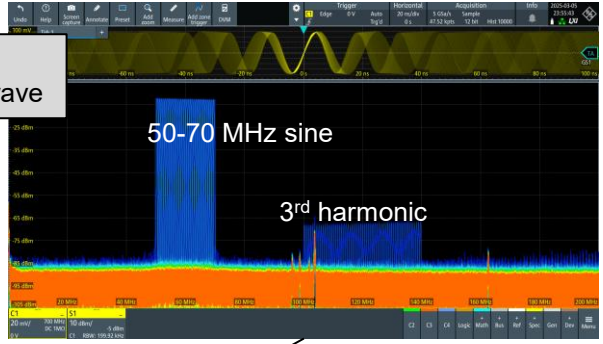
MXO 3 SERIES: FAST
COMPETITIVE COMPARISON



Visual example
Swept 50-70 MHz sine wave



	Competitor Example Txx Mxx3	R&S MXO3	Improvement
Update rate @ 20 ns/	70K wfms/s	4 M wfms/s	56X
% real time @ 20 ns/	1.4%	86%	30X
Update rate @ 1us/	30 K wfms/s	100 K wfms/s	30X
% real time @ 1us/	29%	99%	3X
Math speed (C1+C2 @ 20ns)	10 operations/s	700 K operations/s	70,000X
Spectrum speed	125 FFTs/s	50 K FFTs/s	400X

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MXO 3 SERIES: PRECISE

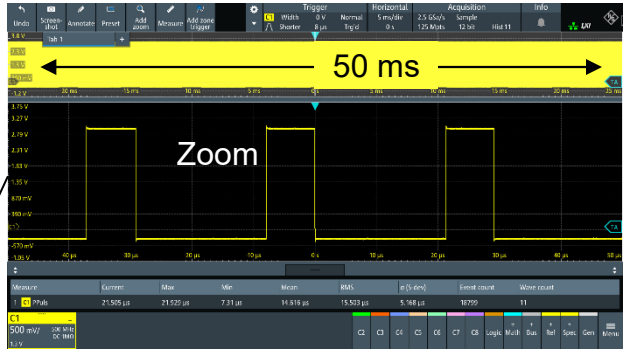
HIGHER SIGNAL TO NOISE RATIO. MORE DETAIL. MORE MEASUREMENT ACCURACY

- Vertical
  - 12-bit in HW at all sample rates
  - HD mode (MXO-EP ASIC)
    - Up to 18 bits
    - 1 KHz to 500 MHz BWL for noise reduction
  - Only 35 uV noise @1mV/ 1MΩ (20 MHz BW)

- Digital trigger (in MXO-EP ASIC)
  - Isolate small changes in the presence of large signals (.0001 div trigger sensitivity)
  - User selectable hysteresis (0 to 5 div)

- 125 Mpts standard memory (500 Mpts option)
  - Capture 50 ms at full long BW/SR (200 ms with option)





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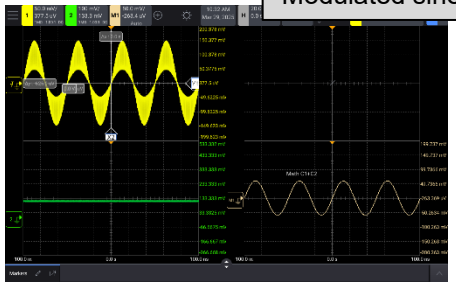
MXO 3 SERIES: PRECISE

COMPETITIVE COMPARISON

Visual example
Modulated sine wave + DC signal





	Competitor Example Kxx Hx3	R&S MXO 3	Improvement
Max SR	3.2 Gsa/s	5 Gsa/s	1.5
Vertical resolution (HW)	14 bits	12 bits	.25X
Max resolution	16 bits	18 bits	4X
Noise 1mV/ @ 500 MHz @ 1MΩ	96 uV (1.2% full screen)	65 uV (.65% full screen)	1.8X
Max SR	3.2 Gsa/s	5 Gsa/s	1.5
Memory (option)	20 Mpts (100 MPts)	125 Mpts (500 Mpts)	6X
Offset @ 1mV/ 50Ω	±1.5 V	± 3V	2X
Display	10.1" SVGA	11.6" full HD	2.3X
Math on all acquired samples?	No. Forced speed vs accuracy tradeoff	Yes	
FFT on all acquired samples?	No. Forced speed vs accuracy tradeoff	Yes	

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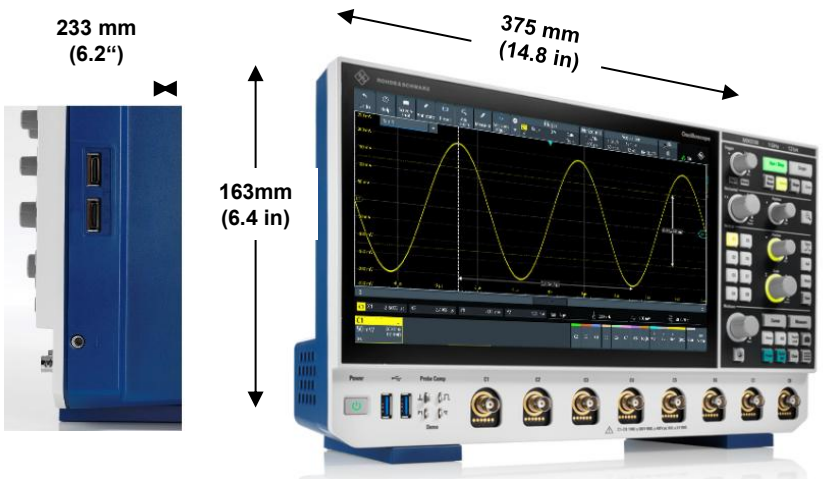
MXO 3 SERIES: COMPACT

FITS ANYWHERE. BIG PERFORMANCE. SMALL FOOTPRINT.

- 4- and 8-ch models in incredibly small footprint
- Light weight (4 kg, 8.8 lbs.)
- 5U rackmount height
- 100mm x 100mm VESA mount
- Large functionality in small size



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MXO 3 SERIES: COMPACT

COMPETITIVE COMPARE

Source: Keysight



Source: Tektronix





	Kxx Hx3	Txx Mxx 3	R&S MXO3	Improvement
Rackmount height	6U	6U	5U	1U
Weight (4-ch)	5.2 kg (11.6 lbs.)	5.3 kg (11.7 lbs.)	4 kg (8.8 lbs.)	4X
Display size	10.1"	11.6"	11.6"	30%
Display resolution	1080 x 800	1920 x 1280	1920 x 1280	2X
VESA mount	No	No	100 x 100mm	
Channel density (cm3 per channel) ☺	3686	3403	1780	2X

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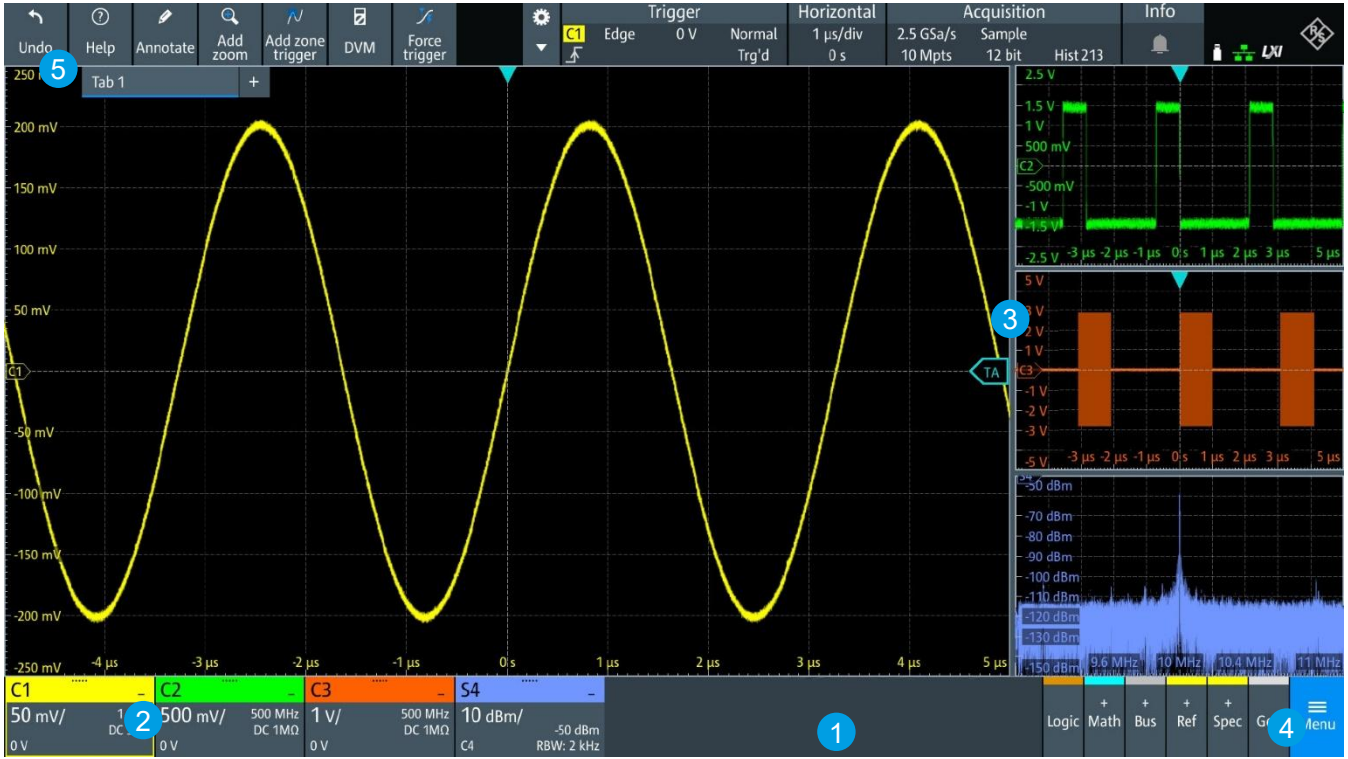
MXO 3 SERIES: SMARTGRID



Customize your layout, fast

1 Tap to turn on sources and other functions.
2 Quickly customize your display layout with drag and drop using R&S SmartGrid.
3 Adjust grid and result table boundaries using sliders.

Quick access to settings and capabilities

4 Easily navigate to all settings using the main menu.
5 Quickly access important tools with toolbar icons.

Short learning curve

The MXO user interface is designed for minimal learning curve for users of other scopes. For users who need a function description or who interface to the scope programmatically, simply press on the help button (5) on the toolbar to see both a description of the functionality and the associated SCPI command.

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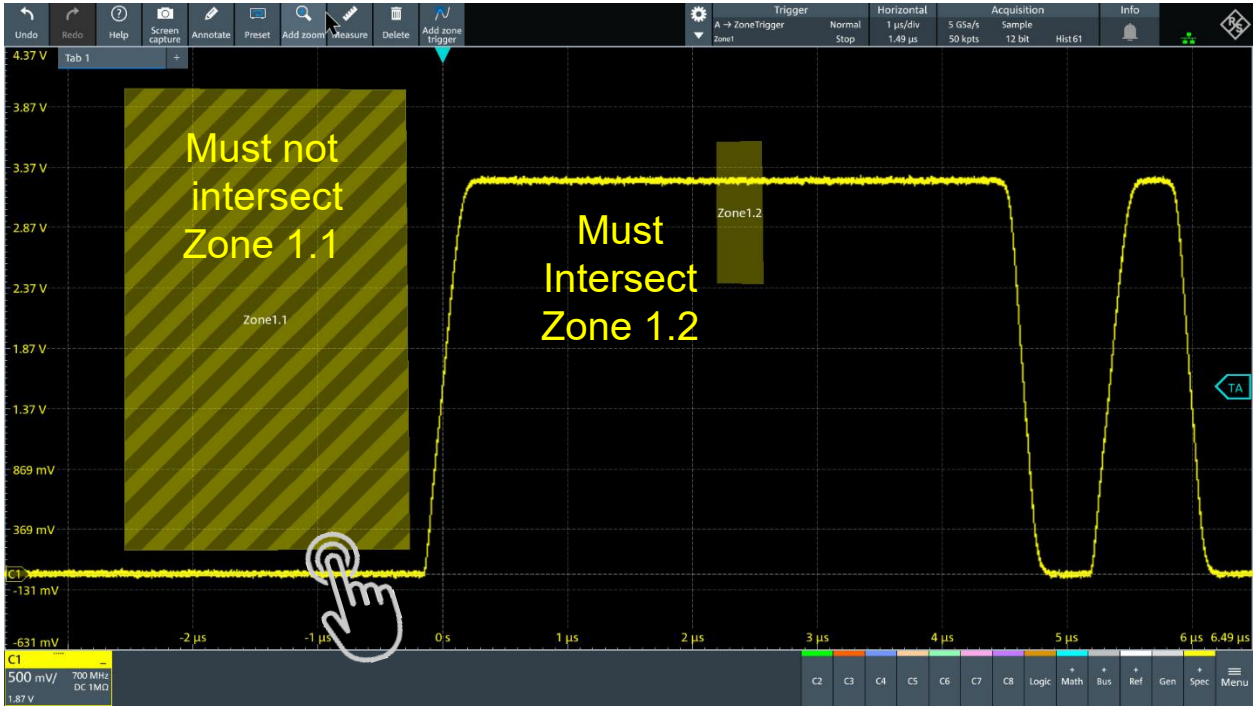
MXO3 SERIES: ZONE TRIGGER

HW ACCELERATED

- Triggering described graphically.
- Complements traditional scope triggering.
- Isolates events when hardware-based triggers fall short.
- ZT supports:
  - Analog channels
  - Math
  - Spectrum



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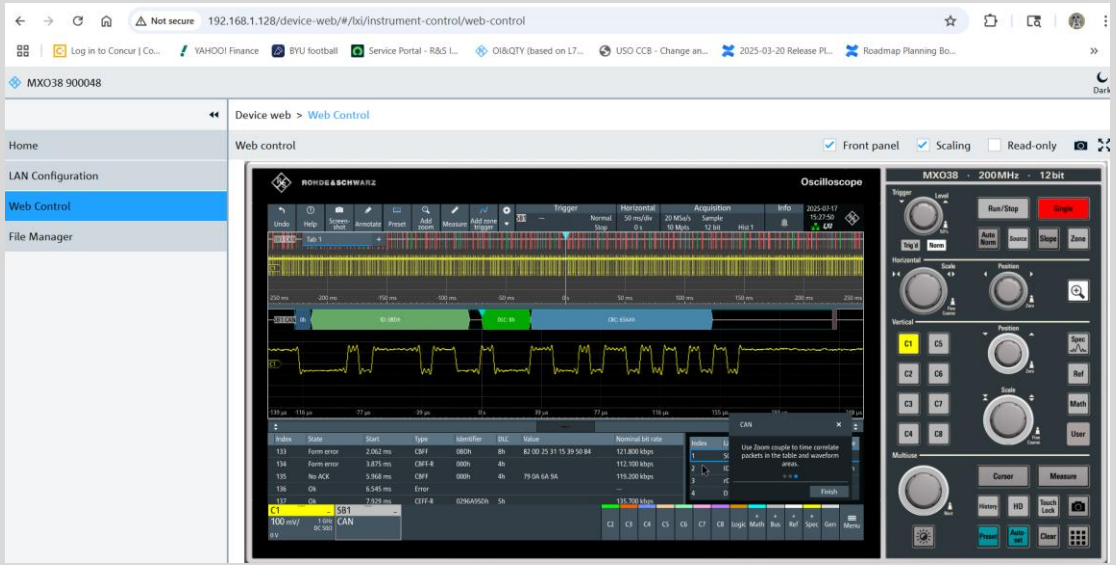
MXO 3 SERIES: REMOTE CONTROL & CONNECTIVITY

Built-in web server

- Webserver access to instrument via browser
- File manager access on webserver via browser

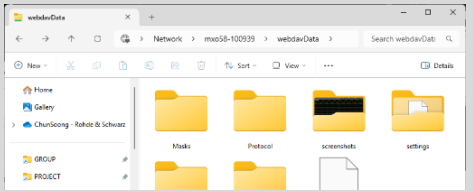


Mount to network drive

- Mount MXO3 to network drive for saving/recalling files

WebDav

- Using webDav extension to access instrument data via file browser "\\mxo58-100939\webdavData"



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MXO3: STANDARD PROBES











Standard passive probes: RT-ZP05M
(one per analog channel)

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MXO 3 SERIES

COMPATIBLE WITH R&S PROBE PORTFOLIO



Passive GP



Broadband



EMC near field



Differential High voltage



Differential



Current



Probe positioners



High voltage



Single ended active



Differential modular



Power rail



Optical isolated

Also compatible with wide range of probes from:

- PEM
- PMK
- PicoTest
- Other 3rd parties

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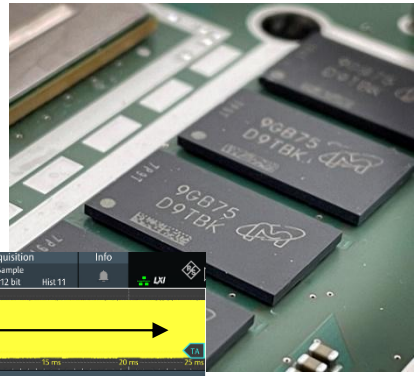
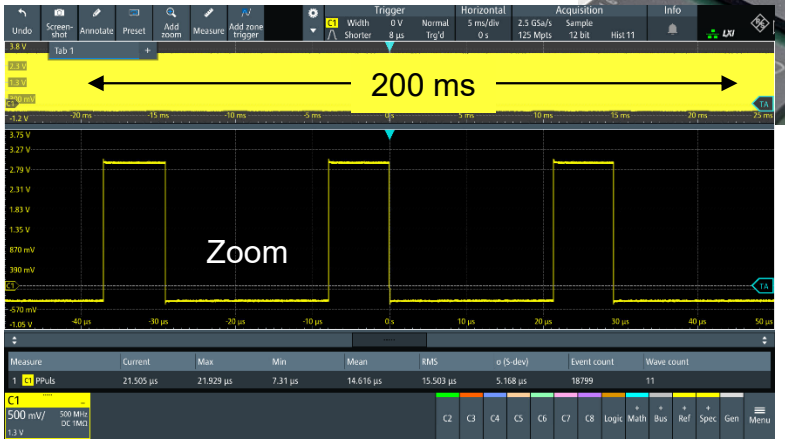
MXO 3 SERIES: EXTENDED MEMORY OPTION

OPTION MXO3-B105

- Increases
  - 500 Mpts RL (from 125 Mpts std)
    - Capture 200 ms @ 2.5 Gsa/s
  - 1 M Segments (10K std)
    - History
    - Segmented memory





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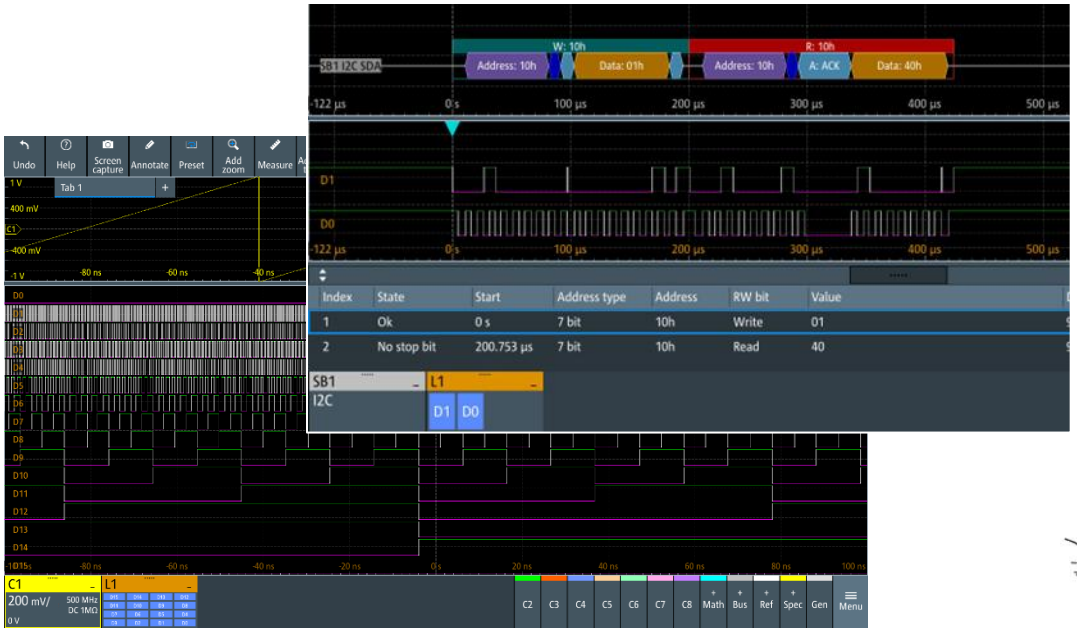
MXO 3 SERIES MSO-ENABLED:
16 DIGITAL CHANNELS (OPTION MXO3-B1)



- MSO enabled:
  - just add MXO3-B1
    - 16 digital channels
    - 5 Gsa/s
    - 125 Mpts
    - 300Mhz



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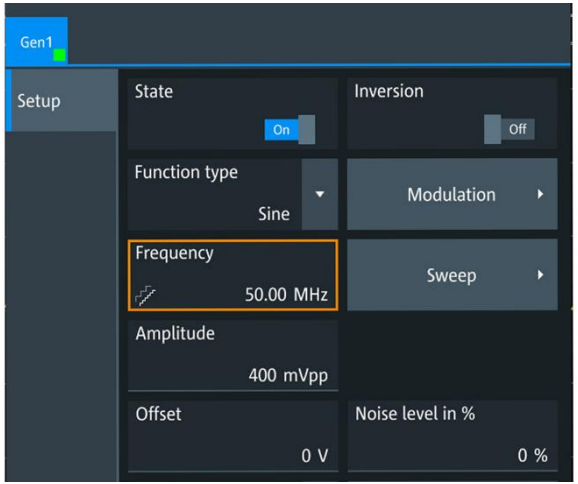
MXO 3 SERIES: ARBITRARY WAVEFORM GENERATOR

OPTION MXO3-B6





- Flexible waveform generator
- Record and replay signals for further debug

ARB GEN: MXO3- B6	
Analog output	1 output with 50 or 1M Ω selection
Frequency range	1 mHz to 50 MHz
ARB memory	32 K samples
Sample rate	up to 312.5 M samples/s
Vertical resolution	14 bits
Waveform types	Sine, square, ramp, DC, pulse, cardinal sine, cardiac, Gauss, Lorentz, haversine, exponential rise/fall, arbitrary
Modulation & sweep	PWM on square, AM, FM, FSK on sine, frequency sweep on sine

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MXO 3 SERIES:SERIAL BUS TRIGGER AND DECODE OPTIONS



Option	Description	Buses
MXO3-K500	Bus Analysis	
MXO3-K510	Low-speed serial	I2C, SPI, RS-232,, RS-422, RS-485, UART, QUAD-SPI, Custom NRZ, Manchester
MXO3-K520	Automotive	CAN, CAN FD, CAN XL, LIN, SENT
MXO3-K530	Aerospace	ARINC 429, MIL-STD 1553, SpaceWire
MXO3-K550	MIPI low-speed	SPMI, RFFE, I3C
MXO3-K560	Automotive Ethernet	10BASE-T1S
MXO3-K570	USB Protocols	USB 1.1/2.0

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MXO 3 SERIES: FREQUENCY RESPONSE ANALYSIS (BODE PLOT)

(OPTION MXO3-K36, REQUIRES MXO3-B6)



- Applications
  - CLR
  - PSRR
  - Passive component characterization
- Amplitude profile support for best SNR
- 10 mHz to 50 MHz
- Parallel display of time and bode plots

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MXO 3 SERIES: POWER ANALYSIS OPTION

OPTION MXO3-K31



Harmonic Analysis

- In line with EN 61000-3-2 classes A, B, C, D, MIL-STD-1399 and RTCA DO-160
- Supports 3 simultaneous measurements (e.g. 3x harmonics)



Power Quality

- Easily determine active, reactive and apparent power, crest factor and phase angle
- Supports 3 simultaneous measurements (e.g. 3x power quality)

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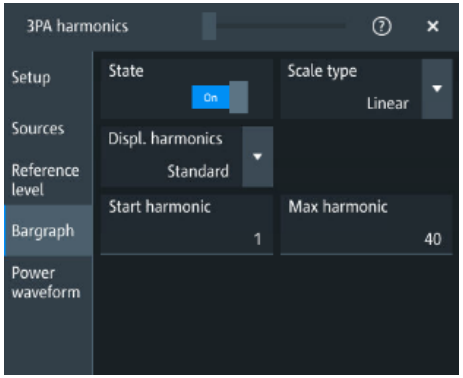
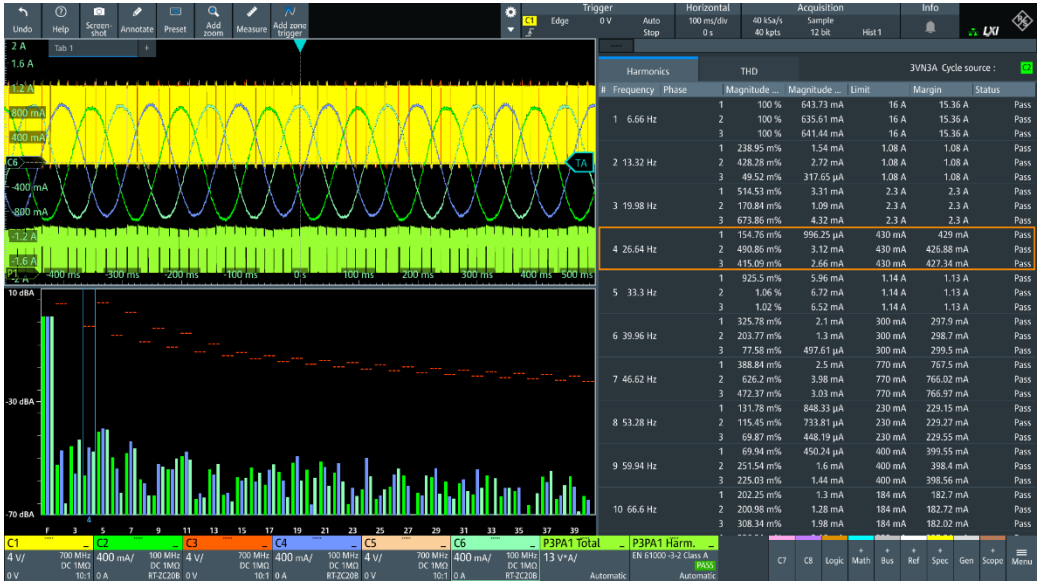
MXO3-K333 3-PHASE ANALYSIS– HARMONICS





In power harmonic, bar graph can be displayed as linear or exponential (log)

Total of 40th harmonic can be displayed (as according to standard)

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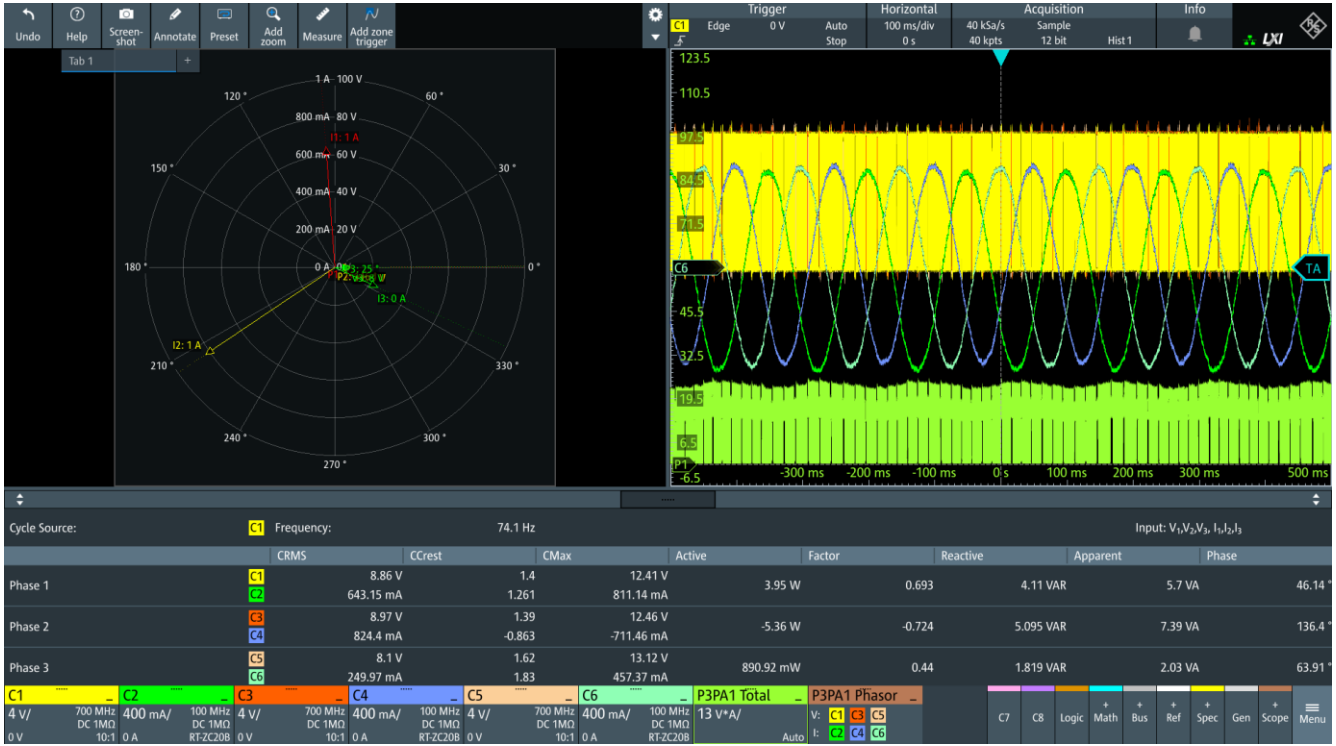
MXO3-K333 3-PHASE ANALYSIS: POWER QUALITY WITH PHASOR DIAGRAM



On v2.9 the display only supporting sinusoidal waveforms (PWM wfm plan for v2.10)

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MXO 3 : OPTION

MXO3 Options	Model
MSO option	MXO3-B1
ARB / generator	MXO3-B6
Memory extension	MXO3-B105
Serial bus options	K510-K570
Power options	K31, K36, K333
Application bundle (PK1) ARB Memory extension All serial bus trigger/decode FRA, Power analysis	PK1 = bundle of following options: B6 B105 K510,K520,K530,K550,K560 K31,K36

Options can be added at any point in time with a SW license.

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MXO 3 OSCILLOSCOPE: ACCESSORIES

R&S®MXO3-Z4
transit case, with
trolley function

R&S®ZZA-MXO3
19" rackmount kit



R&S®MXO3-Z3
soft case

R&S®MXO3-Z1
front cover

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MXO SERIES: PROBES COMPATIBILITY

- All passive probes with BNC interface are compatible (independent of manufacturer)
- All active probes with BNC interface + power supply are compatible
- RT-Z2T adapter to connect probes with TekProbe Level II interface
  - Single-ended probes: P6205, P6243, P6245, P6241, P6249
  - Current probes: TCP202
  - Differential probes: P6246, P6247, P6248, P6250, P6251
  - High-voltage differential probes: P5205, P5210
  - Electro-optical probes: P6701B, P6703B, P6711, P6713



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Thank You

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