Competitive Comparison:

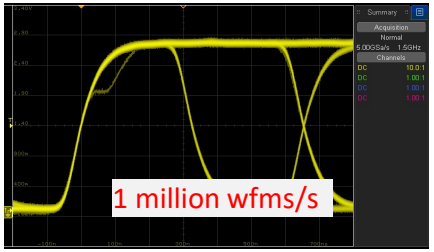
Keysight InfiniiVision 4000/6000 X-Series versus Danaher Tektronix MSO46/44 Series

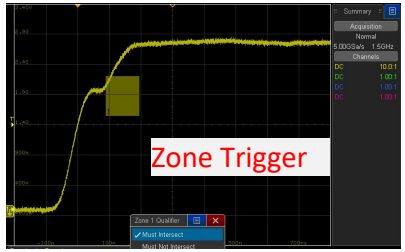
An oscilloscope that sees everything, triggers on anything…

With much faster waveform update rates, zone trigger, hardware-based serial bus analysis, and a lower price-point, Keysight's InfiniiVision 4000 and 6000 X-Series oscilloscopes are much better scopes than the Tek 4 Series to use in the R&D environment to debug designs. The Tek 4 Series is limited to just 22 waveform/sec update rate in the normal/default acquisition mode, making it not a good oscilloscope choice for uncovering random and infrequent events. Although FastAcq improves this scope's waveform update rate, there are many tradeoffs involved when using this special mode of operation. Keysight "MegaZoom IV custom" ASIC technology powers the fastest waveform update rates, responsive deep memory, integrated MSO, integrated dual channel WaveGen, hardware-based Zone Trigger and integrated protocol analyzer with hardware-based decoding.

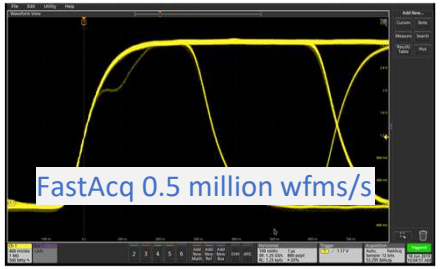
Experience the faster update rate with Zone Trigger

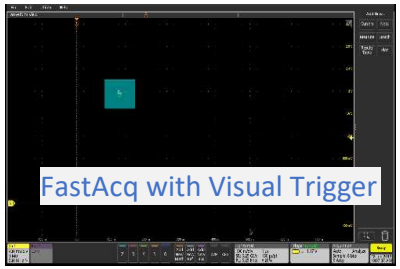
Both scopes can capture this random and infrequent event, Keysight scope capture it twice as often and successfully isolate it with hardware-based Zone Trigger.





The Tek 4 Series (using FastAcq) can also capture this event, but without the special FastAcq mode the Tek 4 Series fail to show this waveform anomaly. Although FastAcq is fast enough to reveal the information, once the user selects Visual Trigger to isolate the waveform, the Tek scope reverts to a normal acquisition mode with 22 waveforms per second update rate.





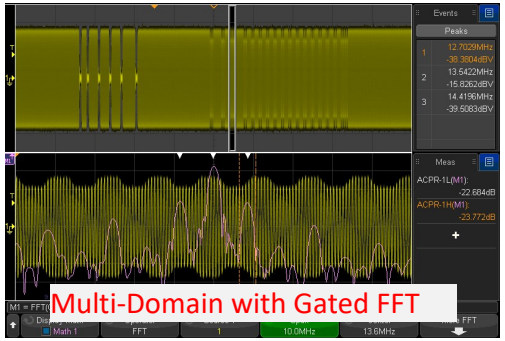
	Keysight 4000/6000 X-Series	Tek MSO 44/46
Bandwidth	200 MHz to 1.5 GHz (4000X) √ 1 GHz to 6 GHz (6000X)	200 MHz to 1.5 GHz
Upgradable bandwidth	√ Yes, up to 6 GHz	Yes, up to 1.5 GHz
Sample rate	5 GSa/s (4000X) √ 20 Gsa/s (6000X)	6.25 Gsa/s
Acquisition memory	4 M pts	31.25 M points (standard) √ 62.5 M points (optional)
Segmented memory	√ Yes	No
Channels	(2 or 4) + 16 (MSO model)	√ 4 or 6 "flex" channels
ADC Bits	8 bits	8 bits @ 6.25 GSa/s √ 12 bits @ ≤ 3.125 GSa/s
WaveGen	Dual Channel 20 MHz	Single Channel 50 MHz
Waveform update rate (max)	√ 1,000,000 wvfms/sec (4000X) 500,000 wvfms/sec (6000X)	22 wvfms/sec (Norm Acq) 500,000 wvfms/sec (FastAcq)
Zone/Visual Trigger	√ 200,000 triggers/sec (4000X) 170,000 trigger/sec (6000X)	22 triggers/sec
Zone Trigger	√ Yes Hardware-based	Yes Software-based
Mask Test	√ Yes	No
Frequency Response Analysis	√ Yes	No
Serial bus support	√ Hardware-based decoding Symbolic and mask test for automotive	Software-based decoding, no automotive masks
Training signals	√ Built-in/Standard	No
Display	12.1" capacitive touch	√ 13.3" capacitive touch
Warranty & Calibration Period	Warranty: 3 years √ Calibration: 2 years	Warranty: 3 years Calibration: 1 year

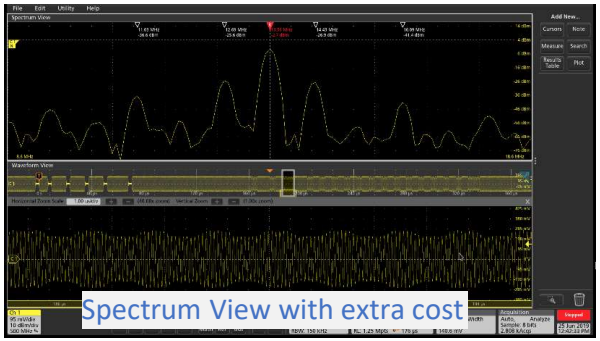
1.To obtain the equivalent of a 4-channel MSO requires ordering a 6-channel Tek 4 Series model along with two 8-channel logic probes at $1900 each.

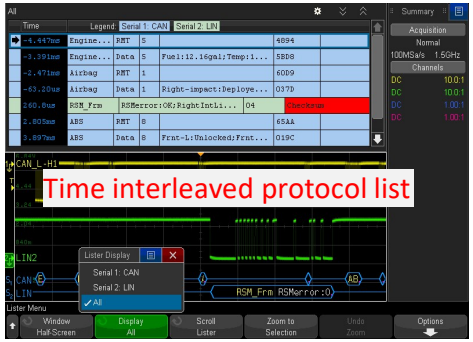
KEYSIGHT TECHNOLOGIES

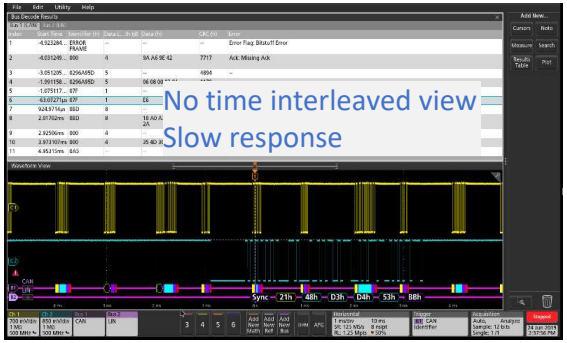
FFT/Spectrum View

The old MDO4000 included a built-in/true spectrum analyzer that performed frequency-domain measurements synergistically with time-domain oscilloscope measurements based on scope triggering and gating. (same as Keysight InfiniiVision Series) The Tek new 4 Series comes standard with a very basic FFT waveform math function without Gated FFT, selectable windowing, and FFT scaling controls for center/span frequency. Tek offers an option for “Spectrum-View” for additional charge to get all the features above. These pay-for features of Tek’s Spectrum View option are basically what’s already available on Keysight’s InfiniiVision scopes at no extra charge. The following shows an example on gated FFT measurements. Keysight also perform the following critical RF measurements (not available on Tek 4): Channel Power, Occupied Bandwidth, Adjacent Power Ratio, and Total Harmonic Distortion.







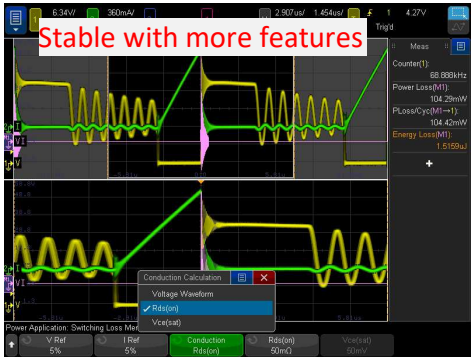


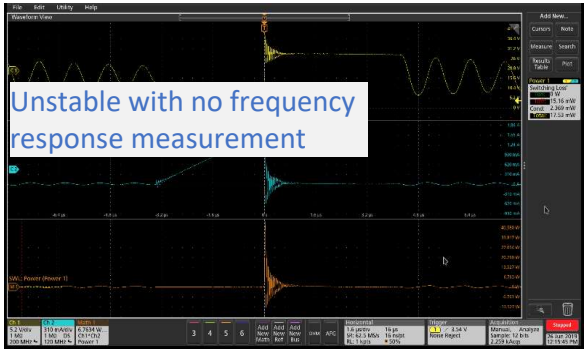
Better in serial decode

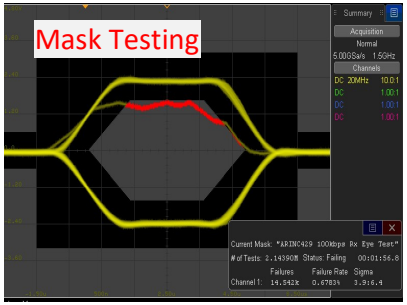
When analyzing two serial buses, Time-interleaved protocol lister/table is not available on the Tek 4 Series. You can not view the decoded results from both buses simultaneously.
The Tek 4 Series utilizes software-based decoding versus InfiniiVision’s hardware-based decoding. The update rate is slow and to improve update rates while analyzing serial buses, some users may try to engage the FastAcq mode of acquisition. Customer will then see lots oscilloscope decoding errors due to under-sampling. This is because the Tek scope automatically limited memory depth to 1k points, which also reduced the scope’s sample rate to just 500 kSa/s. Moreover, Tek 4 Series do not support symbolic decoding in LIN/CAN.

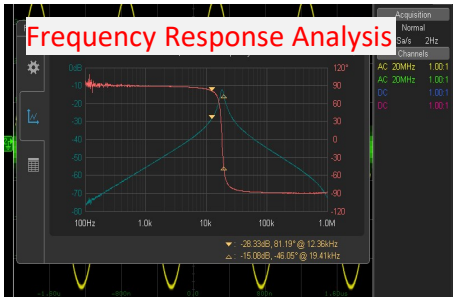
Advantage in power measurements

Both scopes from Keysight & Tek offer a full suite of power measurements. The Tek 4 Series provided very unstable and inaccurate measurements when characterizing the switching loss on the same device. The Tek screen image indicates a power loss of 169 mW, but it varied by about ±30 mW (very unstable). the Tek scope was unable to correctly identify the various switching phases based on using the default 5% reference levels. These measurement results cannot be trusted. Also, Keysight InfiniiVision scopes include two important frequency response measurements; power supply rejection ratio (PSRR) and control loop response with automatic phase margin (PM) and (GM) measurements.









InfiniiVision 4000/6000 X-Series Key advantages

- Much faster waveform update rates without compromises/tradeoffs
- Hardware-based Zone trigger
- Hardware-based serial decoding
- Serial decoding on all segments
- Faster sample rates (6000 X-Series)
- Higher bandwidth (6000 X-Series)
- Frequency Response Analysis (Bode)
- Mask testing
- Power measurements
- Lower price

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