

# Keysight U4431A

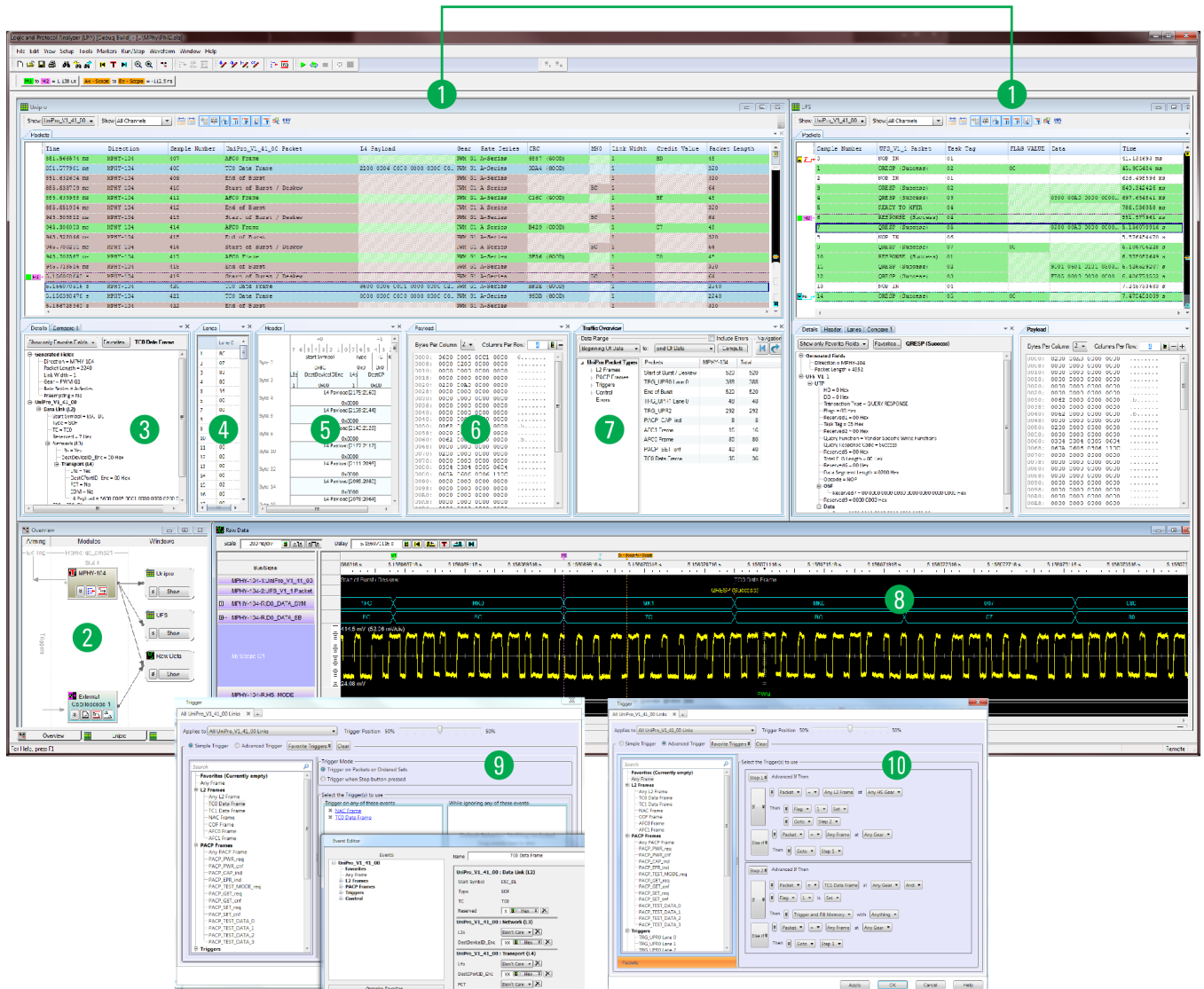
## MIPI™ M-PHY Protocol Analyzer

### Data Sheet

Deep insight to help you  
win the race to M-PHY



# Accelerate M-PHY products with deep insight across your entire design



1. Link multiple windows together or track correlated events with markers
2. Any number of filters and views can be applied. Organize them easily in the overview GUI
3. Peel-off tabs let you isolate packet details
4. Lanes
5. Headers
6. Payload
7. Get the “big picture” with the Overview tab
8. Raw Mode lets you see the “why” behind your protocol. Integrate with any Infiniium oscilloscope
9. Quickly customize simple drag-and-drop trigger macros
10. Use advanced if-then-else triggers to branch in any direction to up to eight different conditions. Add counters, timers, and flags for even more control

### Key features:

- Track multiple M-PHY busses from the PHY to the Application layer
- Up to Gear 3 HS data rates
- Up to 16 GB trace depth
- Up to 4 data lanes
- Raw Mode 8 b/10 b data views
- N-way trigger branching
- Powerful interface that allows unlimited customization of system views.
- Add new protocols and capability at any time after purchase.

### Target users: Designers and Validators of

- M-PHY
- IP
- Application processors
- Memory/chipsets
- Mobile devices
- Mobile embedded systems

### Broad and deep insight into your mobile computing designs.

Time correlate multiple busses and views. Up to 5 modules (M-PHY, D-PHY, PCI, DDR, high-speed logic, and HDMI) can be integrated in one mainframe, and multiple frames can be connected for even greater flexibility. Most modules and protocols (exception is HDMI) can be correlated and cross-triggered. This makes it easy to see how different parts of your design interact. Link multiple windows together (6) or track correlated events with up over 1,000 user-defined markers.

Customize your display in seconds. Isolate any packet's header (5), or data as a packet payload (6) or individual lanes (4) with "peel off" tabs. Adjust data columns just like you would in a spreadsheet – drag and drop columns, double click dividers to resize, right-click to add/delete content.

Raw Mode (8) lets you see the "why" behind your protocol. Raw 8b/10b data that is acquired by the analyzer can be displayed as a time-correlated waveform view. Look even deeper by adding time-correlated traces from your Infiniium oscilloscope.

Get the "big picture" with analysis tools. The Overview tab (7) generates a count of the various types of traffic in any period of time, including errors; then step through each occurrence with embedded navigation tools. Use global markers to make time and occurrence measurements across all display views.

Any number of filters and views can be applied to your views to isolate the data that interests you. Organize them easily in the overview GUI (2).

Want to try out the UI? Just ask your Keysight Technologies, Inc. representative for a link to the latest release.



Combine multiple modules in a 2 (M9502A) or 5 (M9505A) slot AXIe mainframe to analyze and simulate cross-system behavior.

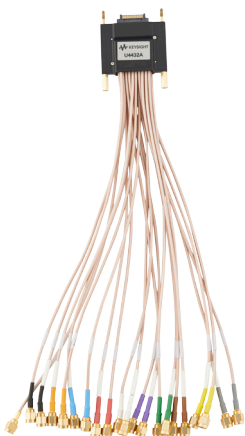
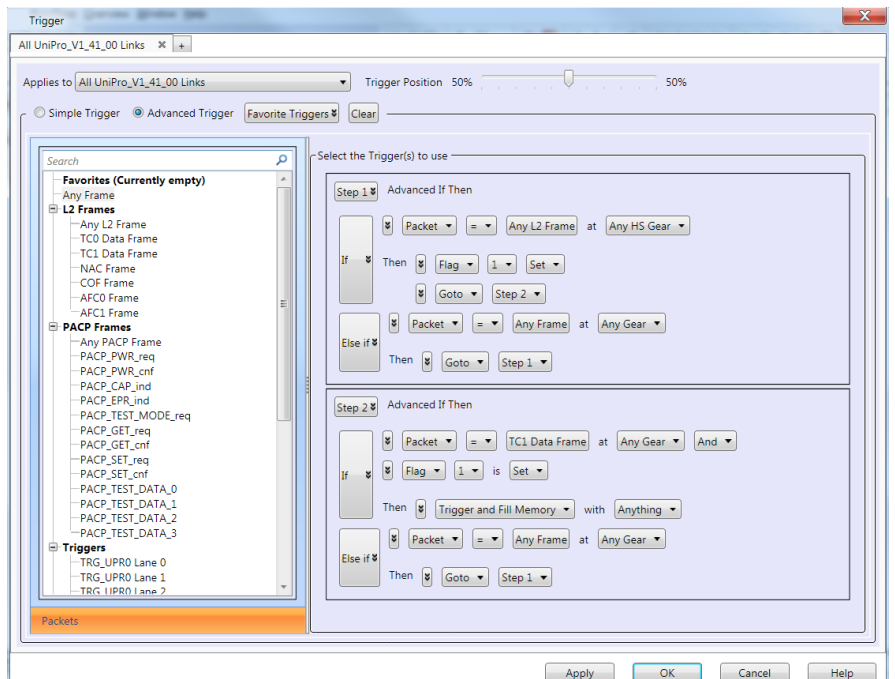
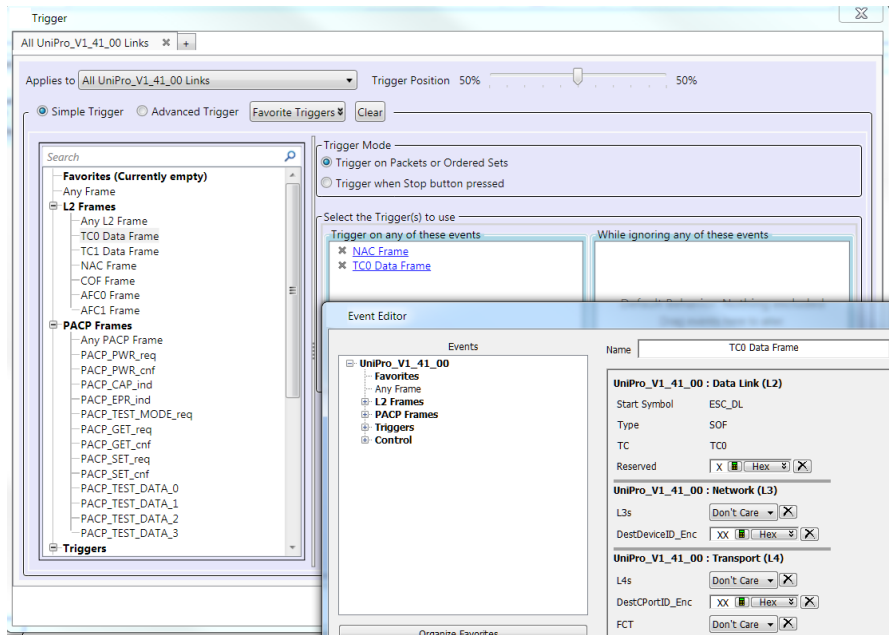
## Accelerate M-PHY products with deep insight across your entire design (continued)

Isolate events with protocol-aware triggers. Simple drag-and-drop trigger macros can be quickly customized by clicking on the blue hyperlink. Or choose advanced if-then-else triggers to branch in any direction to up to 8 different conditions, and add a variety of qualifying conditions.

Trigger on packet types, PHY and stack errors, payload data (up to 32 bytes), flags, counters, and time delays. You can also specify speed, transmission type, and link state.

Probing that leverages Keysight’s high-speed oscilloscope and high-speed logic analysis technologies. The U4433A high-Z MIPI M-PHY differential probe connects to Keysight’s 12 GHz ZIF tips to ensure a flexible, yet non-intrusive connection. U4433A is the recommended probe for most applications.

Users may want to consider the U4432A SMA probe, which allows a quick connection to a prototype’s existing SMA connectors. 2:1 splitters can typically be tolerated when running in Large Amplitude (LA) mode. Alternately, the 5340-104-10DB pick-off tee from Picosecond Pulse Labs has demonstrated an impedance model similar to the U4433A probe.



U4432A SMA probe



U4433A differential probe

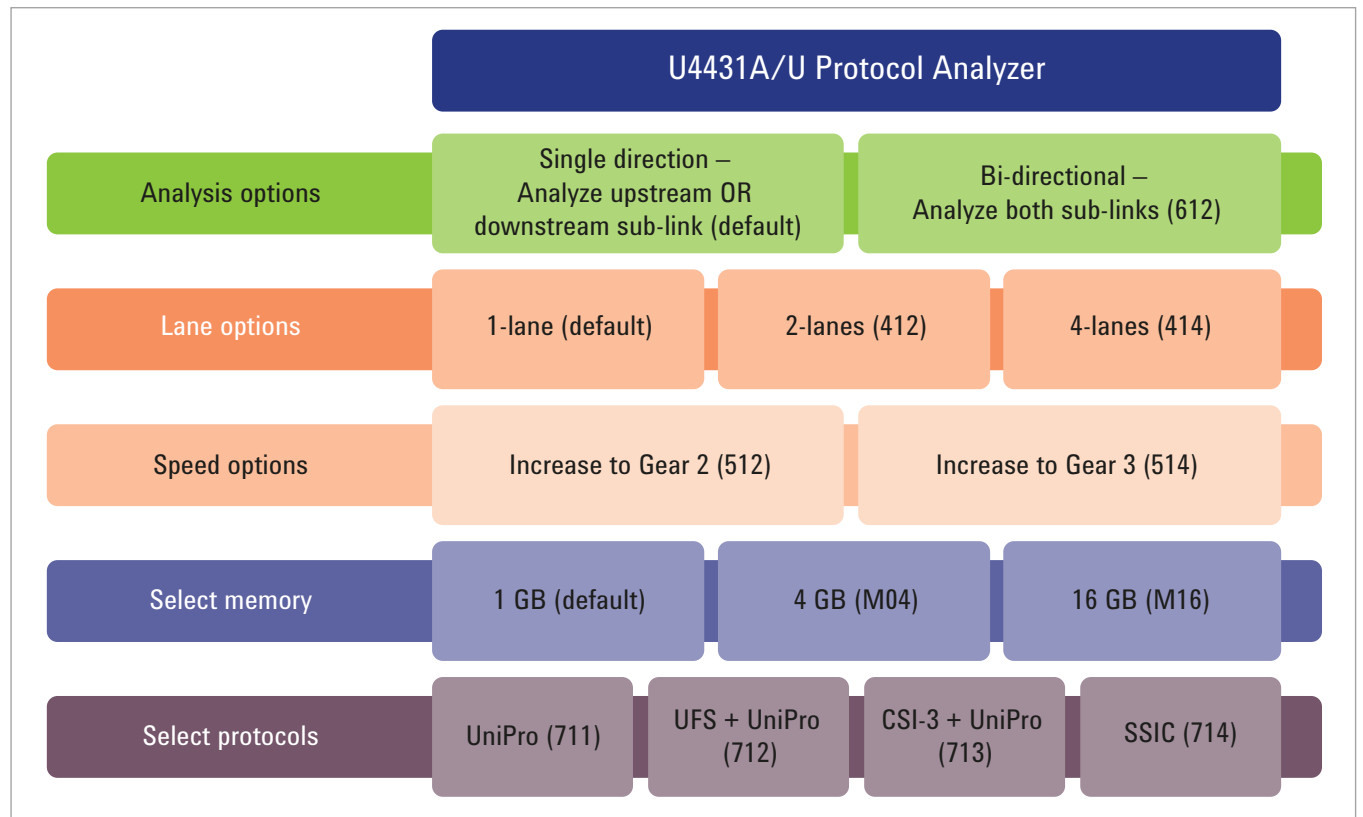
## Keysight U4431A – Performance characteristics

<b>Electrical</b>	
Minimum Vdiff	100 mV
Input impedance (DC)	
– U4433A probe + N5246A ZIF tips	700 Ω, typical
– U4432A SMA harness	128 Ω, typical
<b>Topological</b>	
Lane width	Up to 4 with option 414. Analyze 1, 2, 3, or 4-lane systems
Clocking architecture	Type I
Analysis direction	Processor-peripheral or peripheral-processor (Both directions with option 612)
Lane remapping	User-selectable
Lane polarity	User-selectable
Multiple blade support	Up to 5 time-correlated blades in one frame (configured as up to 3 separate busses), multiple frames can be correlated
<b>Performance</b>	
HS Modes supported	G1 to G3
PWM Modes supported	G0 to G7 (subject to limitations of individual protocol)
Rate Series supported (HS and PWM)	A and B
Symbol lock time (subject to protocol spec limit)	
– Fast (HS-G1)	1 symbol, typical
– Slow (HS-G2, HS-G3)	< 128 symbols
Auto speed detection and tracking	Supported (with no RSE-PO-TX support)
<b>Memory</b>	
	<b>User allocated (shared among analyzer and raw mode)</b>
Standard	1 GB
Option M04	4 GB
Option M16	16 GB
<b>Data views</b>	
Protocol version support	
– UniPro	Unified Protocol (UniPro) 1.60
– UFS	Universal Flash Storage (UFS) 2.0 (JESD220B)
– Physical Layer	M-PHY 3.0
Protocol viewer	Hierarchical packet-level display
– Protocol views	Packets, header, lanes, payload, and traffic overview
– Packet hierarchy views	Data, Link, Network, Transport, Protocol
– Protocol details	Speed, CRC, direction, errors
Waveform view	Yes, raw 8b and 10b data
Listing data view	Yes
Correlation markers	> 1,000 user-defined
Marker measurements	Yes, user-defined time and count measurements
Window correlation lock	Yes, user-defined

## Keysight U4431A – Performance characteristics (continued)

Triggering		
Trigger on protocol commands	Yes, with > 50 macros	
Simple trigger	Drag and drop	
Advanced trigger		
– Sequence levels	Up to 8	
– Logical branching	N-way	
– Advanced trigger events	Timer, counter with timeout, flags, AND/OR	
Protocol triggers		
– Trigger on protocol patterns	Yes	
– Protocol pattern customization	Yes, with bit-level editing	
– Payload pattern matcher	Up to 16 4-byte patterns	
– Transmission type (HS/PWM)	Yes	
– Specific transmission speed	Yes	
– Link state	Yes	
Real-time error detection		
– 8 b/10 b	Yes	
– Disparity	Yes	
– CRC	CRC32,16,5	
– Flow control	Yes	
Analysis		
LED indicators	Sub-link state and lane width	
Traffic overview	Packet count with occurrence navigation	
Filters	User-defined packet and error filters	
Search	User-defined packet and error search	
Environmental specifications		
Radiated emissions (RE)	CISPR 11/EN55001	Group 1 Class A
Radiated immunity (RI)	EN/IEC 61000-4-3 frequency range @ V/m	80 MHz to 2 GHz @ 3 V/m; 2 GHz to 2.7 GHz @1 V/m
Electrostatic discharge	(EN/IEC 61000-4-2)+ discharge air/contact (kV)	8/4
Operating temperature	Operating range: Min-max (°C)	+5 to +40
Storage temperature	Storage range: Non-operating min-max (°C)	–40 to +70
Operating humidity	Max % RH @ temperature °C	80 @ 40
Storage humidity	Max % RH @ temperature °C	90 @ 65
Random vibration, Operating	5 to 500 Hz random, Grms	0.21
Random vibration, Survival	5 to 500 Hz random, Grms	2.09
Half sine shock	2 mS half sine delta velocity m/sec (in/sec)	1.6 (60)
Trapezoidal shock	24 mS trapezoidal delta velocity m/sec (in/sec)	8.00 (315)
Operating altitude	Kilo feet/kilo meters	10/3.1
Storage altitude	Non-operating (kilo feet/kilo meters)	15/4.6
Operating magnetic field immunity	A/m rms	30
Safety	IEC 61010-1 (3rd edition)	Single fault condition

## Module configuration



## Chassis and probing configuration

<b>Chassis options</b>	
M9502A	2-slots
M9505A	5-slots
M9502A-020	USB 2.0 host connection for either chassis
M9505A-020	Lower-speed alternative to PC control options, not recommended for > 1 GB memory
<b>PC control options</b>	
M9536A	Embedded PC module (no cables or adapters needed)
<b>Connecting via PCIe to a desktop PC</b>	
M9048A	PCIe desktop adapter
Y1202A	PCIe cable (x8 to x8)
<b>Connecting via PCIe to a laptop PC</b>	
M9045A	ExpressCard adapter
Y1200B	PCIe cable (x4 to x8)
<b>Analyzer probes</b>	
U4433A <sup>1</sup>	Probe, ZIF flying leads, MIPI M-PHY (one probe for each sub-link (analyzer))
U4432A	SMA cable, MIPI, M-PHY (one probe for each sub-link (analyzer))
N5426A	ZIF Tip, 12 GHz InfiniiMax – Kit of 10

1. Recommended probe for most cases.



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