PHY Performance Test Suite Report

Color Key: Nominal | Marginal | Failure

192.168.221.109 | Test Port 1,1 | Date September 2 2020 | Time 1:02 PM | DUT Type Single Port 10/100/1000 Device Port 1

Suite Version: 5.2.00 07-17-20 PVA H/W Ver: 3

Sifos Technologies

Basic Capablities

Auto-Negotiation

AUTO-NEG	ACKS	1000BaseT	100BaseTX	10BaseT	100BaseT4	Pause	Link_OK	MDI/MDI-X	NLP_Link
EXTENDED	EXTENDED	FULL	HALF+FULL	HALF+FULL	NO	RESPOND	YES	AUTO	LINKED

	Rx_OK	Gig Mode	M-S Fault	Mstr Fault	Slv Fault	Training Time (sec)	Stability
1000Base-T Links	YES	AUTO	NONE	NONE	NONE	1.4	OK

Link Verification and Integrity

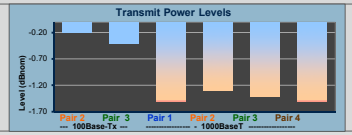
	MDI Connection				MDI-X Connection			
	10BaseT	100BaseTx	1000BaseT Master	1000BaseT Slave	10BaseT	100BaseTx	1000BaseT Master	1000BaseT Slave
Full Duplex	100	100	100	100	100	100	100	100
Half Duplex	100	100	N/A	N/A	100	100	N/A	N/A
Link Time*(sec)	0.6	0.5	1.6	2.1				

* Link Time is auto-negotiated for MDI/MDI-x

Transmitter & Interface Tests

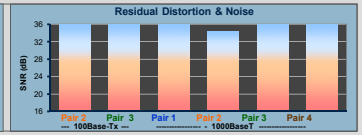
Tx Power Level

Link Rate	Pair 1	Pair 2	Pair 3	Pair 4	Units
100BaseTX		-0.2	-0.4		dBVnom
1000BaseT	-1.5	-1.3	-1.4	-1.5	dBVnom



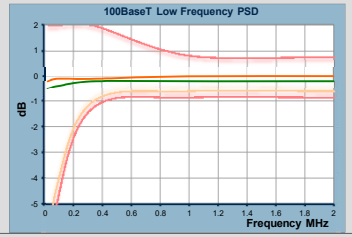
Signal Quality (SNR)

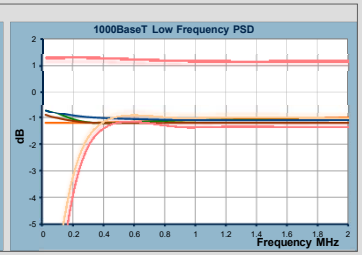
Link Rate	Pair 1	Pair 2	Pair 3	Pair 4	Average	Min SNR	Units
100BaseTX		36	36		36	36	dB
1000BaseT	36	34.5	36	36	35.625	34.5	dB



Low Frequency PSD

Link Rate	Frequency		Pair 1 PSD	Pair 2 PSD	Pair 3 PSD	Pair 4 PSD	Average	Min PSD	Units
100BaseTX	0.02	MHz		-0.2	-0.5		-0.35	-0.5	dB
	0.08	MHz		-0.1	-0.4		-0.25	-0.4	dB
	0.33	MHz		-0.1	-0.2		-0.15	-0.2	dB
	1	MHz		0	-0.2		-0.1	-0.2	dB
	2	MHz		0	-0.2		-0.1	-0.2	dB
1000BaseT	0.02	MHz	-0.7	-1.2	-0.7	-0.9	-0.875	-1.2	dB
	0.08	MHz	-0.8	-1.2	-0.8	-1	-0.95	-1.2	dB
	0.33	MHz	-1	-1.2	-1.2	-1.2	-1.15	-1.2	dB
	1	MHz	**-1.1**	**-1.1**	**-1.1**	**-1.2**	**-1.125**	**-1.2**	dB
	2	MHz	**-1.1**	-1	**-1.1**	**-1.2**	**-1.1**	**-1.2**	dB





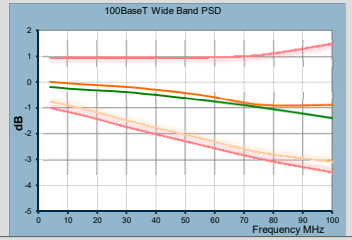
Estimated Pk-Pk Voltage & Droop		Pair 1 Vpp	Pair 2 Vpp	Pair 3 Vpp	Pair 4 Vpp
100BaseTX	UTP Diff. Volts Pk-Pk		1.996	1.951	
	500ns Droop%, >2.4µsec τ		98.0%	97.8%	
1000BaseT	Pk. Diff. Volts T.S. #1 A->B	**1.331**	1.346	**1.331**	**1.316**
	Droop% T.S. #1 F->G,H->J	96.5%	95.3%	96.5%	96.3%

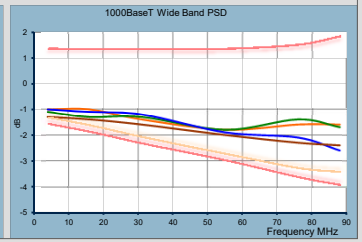
PSD Trace Color Key: Pair 1 | Pair 2 | Pair 3 | Pair 4

Marginal Limit Line | Failing Limit Line

Wide Band PSD

Link Rate	Frequency		Pair 1 PSD	Pair 2 PSD	Pair 3 PSD	Pair 4 PSD	Average	Min PSD	Units
100BaseTX	4	MHz		0	-0.2		-0.1	-0.2	dB
	16	MHz		-0.1	-0.3		-0.2	-0.3	dB
	31	MHz		-0.2	-0.4		-0.3	-0.4	dB
	55	MHz		-0.5	-0.7		-0.6	-0.7	dB
	76	MHz		-0.9	-1		-0.95	-1	dB
	100	MHz		-0.9	-1.4		-1.15	-1.4	dB
1000BaseT	4	MHz	-1	-1	-1.1	-1.3	-1.1	-1.3	dB
	16	MHz	-1.1	-1	-1.3	-1.4	-1.2	-1.4	dB
	31	MHz	-1.2	-1.4	-1.3	-1.6	-1.375	-1.6	dB
	55	MHz	-1.9	-1.8	-1.8	-2	-1.875	-2	dB
	76	MHz	-2.1	-1.6	-1.4	-2.3	-1.85	-2.3	dB
	88	MHz	-2.6	-1.6	-1.7	-2.4	-2.075	-2.6	dB





Estimated Mask Fits		Pair 1 Fit	Pair 2 Fit	Pair 3 Fit	Pair 4 Fit
100BaseTX	Rise/Fall Time: 4+1 nsec		4.21	4.26	
1000BaseT	Test Signal #1 Mask Fit	**Fit_OK**	**Fit_OK**	**Fit_OK**	**Fit_OK**

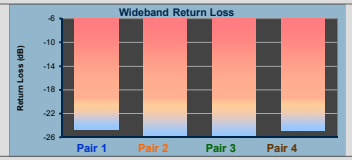
Pair 1 | Pair 2 | Pair 3 | Pair 4

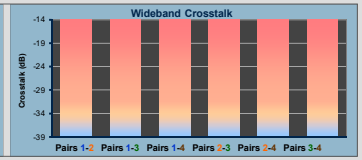
Marginal Limit Line | Failing Limit Line

Skew, Echo, Xtalk *(1000BaseT Interfaces)*

	Pair 1	Pair 2	Pair 3	Pair 4	Average	Maximim	Units
Time Skew	0	0	0	0	0	0	nsec
Return Loss	-24.6	-26	-26	-24.9	-25.375	-24.6	dB

	Pairs 1-2	Pairs 1-3	Pairs 1-4	Pairs 2-3	Pairs 2-4	Pairs 3-4	Average	Maximim	Units
Crosstalk	-39	-39	-39	-39	-39	-39	-39	-39	dB





Receiver Tests

10Base-T MDI Line Loss and		Link_Chk
Slew_Rate=	5_ns -2.7dB	UP
Tx Offset	-50 ppm	UP
Tx Offset	50 ppm	UP
Tx Offset	-100 ppm	UP
Tx Offset	100 ppm	UP
Noise	10 dB(40mV)	UP
Noise	14 dB(40mV)	UP
Jitter	13.5 dB(1.4ns)	UP
Jitter	18 dB(1.4ns)	UP
Noise+Jitter	10.5_13.5 dB & dB	UP
Noise+Jitter	13.5_17 dB & dB	UP

100Base-Tx MDI Line Loss and		Link_Mon	
Slew_Rate=	5_ns -2.7dB	100	%
Tx Offset	-50 ppm	100	%
Tx Offset	50 ppm	100	%
Tx Offset	-100 ppm	100	%
Tx Offset	100 ppm	100	%
Noise	5 dB(40mV)	100	%
Noise	11 dB(40mV)	100	%
Jitter	10.5 dB(1.4ns)	100	%
Jitter	16 dB(1.4ns)	100	%
Noise+Jitter	4_9.5 dB & dB	100	%
Noise+Jitter	10_15 dB & dB	100	% **SNR1**

1000Base-T MASTER: Line Loss and		Link_Mon	
Slew_Rate=	3.5_ns -1.9dB	100	%
Slew_Rate=	5_ns -2.7dB	100	%
Noise	-1 dB(40mV)	100	%
Noise	1.5 dB(40mV)	100	%
Noise	4 dB(40mV)	100	%
Jitter	-1 dB(1.4ns)	100	%
Jitter	1 dB(1.4ns)	100	%
Jitter	3 dB(1.4ns)	100	%
Noise+Jitter	-1.5_-1.5 dB & dB	100	%
Noise+Jitter	1_0 dB & dB	100	%
Noise+Jitter	3.5_2 dB & dB	100	% **SNR3**

Summary			
	Limited	Good	Excellent
10Base-T			
	Limited	Good	Excellent
100Base-Tx			
	Limited	Good	Excellent
1000Base-T			

10Base-T MDI-X Line Loss and		Link_Chk
Slew_Rate=	5_ns -2.7dB	UP
Tx Offset	-50 ppm	UP
Tx Offset	50 ppm	UP
Tx Offset	-100 ppm	UP
Tx Offset	100 ppm	UP
Noise	10 dB(40mV)	UP
Noise	14 dB(40mV)	UP
Jitter	13.5 dB(1.4ns)	UP
Jitter	18 dB(1.4ns)	UP
Noise+Jitter	10.5_13.5 dB & dB	UP
Noise+Jitter	13.5_17 dB & dB	UP

100Base-Tx MDI-X Line Loss and		Link_Mon	
Slew_Rate=	5_ns -2.7dB	100	%
Tx Offset	-50 ppm	100	%
Tx Offset	50 ppm	100	%
Tx Offset	-100 ppm	100	%
Tx Offset	100 ppm	100	%
Noise	5 dB(40mV)	100	%
Noise	11 dB(40mV)	100	%
Jitter	10.5 dB(1.4ns)	100	%
Jitter	16 dB(1.4ns)	100	%
Noise+Jitter	4_9.5 dB & dB	100	%
Noise+Jitter	10_15 dB & dB	100	% **SNR2**

1000Base-T SLAVE: Line Loss and		Link_Mon	
Slew_Rate=	5_ns -2.7dB	100	%
Tx Offset	-100 ppm	100	%
Tx Offset	100 ppm	100	%
Tx Offset	-115 ppm	100	%
Tx Offset	115 ppm	100	%
Offset+Noise	-100_-1 ppm & dB	100	%
Offset+Noise	100_-1 ppm & dB	100	%
Offset+Noise	-100_1.5 ppm & dB	100	%
Offset+Noise	100_1.5 ppm & dB	100	%
Offset+Noise	-100_4 ppm & dB	100	%
Offset+Noise	100_4 ppm & dB	100	% **SNR4**

Local Rx Health (Lowest Pair)		SNR dB
100 Base-TX	SNR1	30.6
100 Base-TX	SNR2	30.4
1000 Base-T	SNR3	23.3
1000 Base-T	SNR4	22

Report Ver: 5.0.01

PhyView Analyzer Measurements

Measurement	Description	Reported Units
Auto-Negotiation Parameters	Link Partner Base & Extended Page Advertisements & Acks: These parameters are related to the information obtained during initial auto-negotiation with the port-under-test.	**AUTO-NEG**: EXTENDED | BASE | NO **ACKS**: EXTENDED | BASE | NO | N/A **1000BaseT**: FULL | HALF | HALF+FULL | NO **100BaseTX**: FULL | HALF | HALF+FULL | NO **10BaseT**: FULL | HALF | HALF+FULL | NO | N/A **100BaseT4**: YES | NO | N/A **PAUSE**: RESPOND | XMIT | RESPOND+XMIT | NO | N/A
	Link Partner Base Status & Capabilities: LINK_OK is link partner remote fault indicator MDI_MDI-X indicates if link partner is Auto-MDI or not NLP_LINK inidicates if link partner will link without auto-neg.	**LINK_OK**: YES | FAULT | N/A **MDI_MDI-X**: AUTO | MDI_ONLY | MDI-X_ONLY | N/A **NLP_LINK (No Auto-Neg)**: LINKED | UNLINKED
	Gigabit Link Status & Capabilities Rx_OK: Indicates error free performance of link partner receiver GIG_MODE: Indicates ability to link both MASTER & SLAVE M-S FAULT: Indicates Master-Slave resolution fault MSTR FAULT: Indicates fault forcing SLAVE to port-under-test SLV_FAULT: Indicates fault forcing MASTER to port-under-test TRAINING_TIME: Time (sec) for MASTER-SLAVE sync-up STABILITY: Assess if PVA port 2.5dB loss impacts gig linkup (UNSTABLE) or if 10/100 DUT does not reliably respond to 're-links' (NO_RELINK)	**Rx_OK**: YES | NO | N/A **GIG_MODE**: AUTO | MASTER_ONLY | SLAVE_ONLY | N/A **M-S FAULT**: NONE | FAULT | N/A **MSTR_FAULT**: NONE | FAULT | N/A **SLV_FAULT**: NONE | FAULT | N/A **TRAINING_TIME**: NONE | FAULT | N/A **STABILITY**: OK | UNSTABLE | NO_RELINK | N/A
Link Verification and Integrity	Link Monitor (Stability) measurements of each advertised capability. Link Up Time measuring time from physical connection until operable link. Link Time is measured without forcing MDI or MDI-X.	**Link Monitor**: Count 0-100 where 100 is 100% stable **Link Up Time**: Seconds (resolved to 0.1 seconds)
Tx Power Level	Wideband RF Power at DUT Interface relative to an ideal transmitted signal (100BaseTx or 1000BaseT).	**dB(nominal)** Where "nominal" is the ideal wideband power level specified for a 100BaseTx or 1000BaseT transmitter. (A **0dB** result is therefore ideal.
SNR	Signal-to-Noise Ratio (SNR) characterizes all forms of non-correctable signal distortion including noise or crosstalk ingress, signal compression, and severe ISI (inter-symbol interference).	**dB** (Ideal Signal Power / Residual Distortion Components) The measurement ceiling for SNR is 36 dB - this corresponds to a distortion level of 1 part in 4000.
PSD	Power Spectral Distortion (PSD) characterizes the spectral frequency response of a LAN transmitter relative to that of an ideal transmitted signal (100BaseTx or 1000BaseT).	**dB** (33 frequency points over selected range). The measurement floor is below -2 dB.
Echo Response	Bulk (wideband) Echo Response is equivalent to Return Loss in a typical RF transmission system. It characterizes total reflected energy across the frequency spectrum and therefore assesses the degree of deviation from a nominal 100Ω transmission line.	**dB** Ratio of total reflected to total transmitted power. Measurements are normalize to test port calibrations. The measurement floor is -26 dB.
Crosstalk	Bulk (wideband) Crosstalk is equivalent to Isolation in a typical RF transmission system. It characterizes total power transmitted between any two specified pairs with the assumption that these transmissions are bi-directional on average.	**dB**. Ratio of total ingress (crosstalk) power to total transmitted power. Measurements are normalized to test port calibrations. The measurement floor is -39 dB.
Pair Skew	Pair Skew reports any symbol period timing differences between pairs in a 1000BaseT link. Each measurement reports 4 pairs, of which 3 pairs are each compared to a reference pair.	**nsec**. Measurement granularity is one symbol period, or 8 nsec per pair.
Link Stability (Link Monitor)	Samples live link status (10/100BaseT) and/or gigabit remote receiver status (1000BaseT) to assess link stability. Counts from 1 to 100 samples with sampling interval configurable as 20, 50, or 100msec.	Type: **Link Status** or **Gigabit Remote Rx Status** Count: Count 1 to 100) of Link "Up" or Remote Rx "OK" Indications
Packet Count	Count of Received MAC frames. Each PVA-3000 port can transmit user-configured MAC frames with programmable size, burst duration, packet gap, and repeating 4-byte payload pattern. Each PVA-3000 port will count incoming MAC frames either independent of or coincident with MAC frame transmission.	**Packet Count** (Continuous transmission is supported with counts into billions of packets.)

PHY Performance Test Suite Estimated Parameters

Measurement	Description	Applicable Industry Specification
UTP Diff. Volts Pk-Pk	Estimate of Peak-Peak amplitude of the 100BaseTx MLT-3 transmitted waveform. Estimate will be accurate to ~2.5% (or ± 25mV) of reported Vpk-pk value.	**ANSI X3.264 Clauses 9.1.2.2 & 9.1.10** Vpk= 1000±50mV, Vpk-pk= 2000±100mV
500ns Droop%, >2.4msec τ	Estimate of the %Droop allowed in 100BaseTx Transmitted Waveform over a 500nsec measurement period. Reported as (100-droop%), similar to 1000BaseT Droop%. Typical accuracy will be ±4% of reported value.	**IEEE 802.3 Clause 25.4.4a** $V_x = V_0 * e(-t/\tau)$ where τ must be greater than 2.4 μsec = 81.2% (or 18.8% maximum droop)
Pk. Diff. Volts T.S. #1 A->B	Estimate of Peak-Peak amplitude of the 1000BaseT Test Signal #1 from Pt. A to Pt. B with 2MHz High Pass Filter applied. Estimate will be accurate to ~2.5% (or ± 20mV) of reported Vpk-pk value.	**IEEE 802.3 Clause 40.6.1.2.1** 1.34V ≤ Vpk-pk ≤ 1.64V **NOTE**: 100/1000BaseT transmitters are subject to a more stringent requirement under 100BaseTx specification.
Droop% T.S. #1 F->G,H->J	Estimate of the %Droop of the 1000BaseT Test Signal #1 measured from Pt. F to Pt. G or Pt. H to Pt. J. Reported as (100-droop%). Typical accuracy will be ±5% of reported value.	**IEEE 802.3 Clause 40.6.1.2.2** Droop% > 73.1% (or < 24.9% measured droop) **NOTE**: 100/1000BaseT transmitters are subject to a more stringent requirement under 100BaseTx specification.
Rise/Fall Time: 4+1 nsec	Estimate of the 100BaseTx Rise/Fall Time (or slew rate) of the MLT-3 transmitted waveform. Estimate will be typically be accurate to ± 0.4 nsec of reported value.	**ANSI X3.264 Clauses 9.1.6 & 9.1.10** 3 nsec ≤ Rise/Fall Time ≤ 5 nsec (measured 10% to 90%)
Test Signal #1 Mask Fit	This parameter estimates whether 1000BaseT Test Signal #1 will fit within the prescribed single-symbol pulse mask template given a hypothetical 2MHz high-pass measurement filter as defined in the standard. Possible outcomes are "OK", "Marginal", or "Fit_Problem". Pulse Mask Fit is derived from PSD characteristics and will be affected by excessively slow or fast slew rates as well as any distortion affecting mid-range frequencies in the 16 - 64 MHz region.	**IEEE 802.3 Clause 40.6.1.2.3 & Figure 40-26** Template #1 in Figure 40-26 defines the single-symbol pulse mask. **NOTE**: Template #2 Pulse Mask response is partially covered by the 1000BaseT Droop estimation above.

PhyView Analyzer Impairments for Rx Testing

Impairment	Description
Line Emulation	Emulates IEEE 802.3 worst case line loss (attenuation over frequency). May be applied to 2 or 4 pairs such that 100BaseTx transmit can be separated from 100BaseTx receive pair. This impairment models 90M Cat5e + 10M Cat5e patch cable and connector losses. Maintains 100Ω line impedance and approximately linear phase characteristics
Noise (Alien Crosstalk)	Applies random noise per pair that is spectrally similar to 100BaseTx. Noise source is isolated by 2.7dB from Test PHY so that DUT experiences greater noise levels. Amplitude is programmable from -6 dB to +21.5 dB in 0.5 dB steps where 0 dB corresponds to 100BaseTx limit of 40mVpp amplitude and -4 dB corresponds to 1000BaseT 25mVpp amplitude
Transmitter Offset	Applies a fixed frequency offset to transmitted 100BaseTx and 1000BaseT signals. Frequency offset may be programmed to -115ppm, -100ppm, -50ppm, +50ppm, +100ppm, and +115ppm.
Transmitter Jitter	Applies random jitter to transmitted 100BaseTx and 1000BaseT signals. Jitter level may be programmed to -6 dB to +24 dB in 0.5 dB steps where 0 dB corresponds to IEEE 802.3 specified 1.4 nsec peak-peak jitter. Transmit jitter is structured to meet 1000BaseT phase noise versus frequency profile such that jitter power above 5KHz is attenuated by ~13.5 dB relative to total jitter power
Transmitter Power	Transmitter power may be controlled on 100BaseT and 1000BaseT signals over a range of ~2.1 dB (or ~25%). This range is then summed with a nominal 2.7dB fixed loss on all Test Ports. Ten power level steps are provided.
Transmitter Slew	Transmitter slew rate may be controlled on 100BaseT and 1000BaseT signals over a range of 0.17V/nsec (or ~75%). Eight slew rate steps are provided.

Local Rx Health	Description
SNR1, SNR2	SNR1 and SNR2 indicate the lowest PVA-side SNR reading observed during 100Base-Tx Receiver Testing at the maximum Line Loss + Noise + Jitter impairment level. Because the Line Loss and Noise impairments are only applied to the outgoing Tx Pair during 100Base-Tx testing, local PVA-side SNR should be relatively high for all impairment conditions. SNR's above ~26 dB on at the PVA receiver are assurance that any link drops or or packet loss are strictly related to port-under-test receiver performance under impairment.
SNR3, SNR4	SNR3 and SNR4 indicate the lowest PVA-side SNR reading observed during 1000Base-T Receiver Testing at the maximum Line Loss + Noise + Jitter impairment level in MASTER mode and maximum Line Loss + Noise + Frequency Offset in SLAVE mode. All impairments must be applied bi-directionally in 1000Base-T, though the PVA receiver is partially isolated from the Noise impairment. The goal is to maintain ~23 dB or higher in the PVA receiver while performing Link Monitor or Packet Loss measurements of the port-under-test in order to assure that the impairments are not adversely affecting link stability on the PVA side of the link