*Sifos Technologies Application Brief:* **PhyView Anlayzer**

# PHY Performance Test Suite: IEEE 802.3 Correlations

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**Ethernet PHY Tests for 1000BASE-T**

| IEEE Specifications | | PhyView Analyzer / PHY Performance Test Suite: 1000Base-T | | |
|---|---|---|---|---|
| **Standard reference** | **Description** | **PHY Performance Test Report** | **Correlation** | **Comment** |
| IEEE802.3.2005 Sub clause 40.6.1.2.1 | Difference A, B peak output voltage* | Pk.Diff.Volts T.S.#1 A-B | Direct* | Estimated parameter has been correlated to actual IEEE 802.3 measurements. PVA does not require test signal. |
| IEEE802.3.2005 Sub clause 40.6.1.2.1 | Point A peak output voltage* | Pk.Diff.Volts T.S.#1 A-B, SNR, and Low Frequency PSD | Partial | If "Differential A,B Peak Output Voltage" tests nominal but Point A or Point B Peak Voltage is not, then the resultant amplitude asymmetry will impact **SNR** and in severe cases, impact **Low Frequency PSD** owing to magnetic DC biasing. |
| IEEE802.3.2005 Sub clause 40.6.1.2.3 | Point A template test* | Test Signal #1 Mask Fit | Direct* | Estimated parameter has been correlated to actual IEEE 802.3 measurements. PVA does not require test signal. |
| IEEE802.3.2005 Sub clause 40.6.1.2.1 | Point B peak output voltage* | Pk.Diff.Volts T.S.#1 A-B, SNR, and Low Frequency PSD | Partial | *See Point A Peak Output Voltage above* |
| IEEE802.3.2005 Sub clause 40.6.1.2.3 | Point B template test* | Test Signal #1 Mask Fit | Direct* | Estimated parameter has been correlated to actual IEEE 802.3 measurements. PVA does not require test signal. |
| IEEE802.3.2005 Sub clause 40.6.1.2.1 | Point C peak output voltage* | Pk.Diff.Volts T.S.#1 A-B, SNR | Partial | If "Differential A,B Peak Output Voltage" tests nominal but Point C and/or Point D Peak Voltage is not, then either the transmit gain is non-linear and/or there is amplitude asymmetry, either one of which represents non-correctable distortion that will affect **SNR**. |
| IEEE802.3.2005 Sub clause 40.6.1.2.3 | Point C template test* | Test Signal #1 Mask Fit, SNR | Partial | Point C will typically replicate Point A mask performance unless there is excessive residual noise that would affect **SNR**. |
| IEEE802.3.2005 Sub clause 40.6.1.2.1 | Point D peak output voltage* | Pk.Diff.Volts T.S.#1 A-B | Partial | *See Point C Peak Output Voltage above* |
| IEEE802.3.2005 Sub clause 40.6.1.2.3 | Point D template test* | Test Signal #1 Mask Fit | Partial | Point D will typically replicate Point B mask performance unless there is excessive residual noise that would affect **SNR**. |
| IEEE802.3.2005 Sub clause 40.6.1.2.3 | Point F template test* | Test Signal #1 Mask Fit | Partial | Point A and B are the more stringent mask fits while Points F & H are more determined by external test circuit. |
| IEEE802.3.2005 Sub clause 40.6.1.2.2 | Point G droop test* | Droop% T.S. #1 F-G,H-J | Direct* | Estimated parameter has been correlated to actual IEEE 802.3 measurements. PVA does not require test signal. |
| IEEE802.3.2005 Sub clause 40.6.1.2.3 | Point H template test* | Test Signal #1 Mask Fit | Partial | *Partial Indicator - See Port F Template Test above.* |
| IEEE802.3.2005 Sub clause 40.6.1.2.2 | Point J droop test* | Droop% T.S. #1 F-G,H-J | Direct* | Estimated parameter has been correlated to actual IEEE 802.3 measurements. PVA does not require test signal. |
| IEEE802.3-2005 Sub clause 40.8.3.3 | MDI common mode output voltage | | | |
| IEEE802.3-2005 Sub clause 40.6.1.2.5 | Jitter master filtered | SNR | Gross | Severe (failing) jitter will impact **SNR** measurements. |
| IEEE802.3-2005 Sub clause 40.6.1.2.5 | Jitter master unfiltered | SNR | Gross | Severe (failing) jitter will impact **SNR** measurements. |
| IEEE802.3-2005 Sub clause 40.6.1.2.5 | Jitter slave filtered | SNR | Gross | Severe (failing) jitter will impact **SNR** measurements. |
| IEEE802.3-2005 Sub clause 40.6.1.2.5 | Jitter slave unfiltered | SNR | Gross | Severe (failing) jitter will impact **SNR** measurements. |
| IEEE802.3-2005 Sub clause 40.8.3.1 | MDI return loss | (Wideband) Return Loss | Partial | **Wideband Return Loss** readings will point to likely success (< -21dB) or likely failure (>-18dB) in MDI Return Loss measurements. *See PVA-3000 Reference Manual, Section 1.3.8.* |
| IEEE802.3-2005 Sub clause 40.6.1.2.4 | Transmitter distortion | SNR | Partial* | **SNR** reports on aggregate uncorrectable characteristics of incoming transmitted signal. PVA does not require Test Signal 4 or prescribed postprocssing of capture waveform. This may be ultimately a more useful metric because correctable distortions don't impair performance. |
| IEEE802.3-2005 Sub clause 40.6.1.2.6 | Transmit Clock Frequency | | | |
| *Not Specifed by 802.3 Clause 40* | Transmit Crosstalk | (Wideband) Crosstalk | Direct | Report Pair-Pair Power Leakage from DUT transmitter. |
| IEEE802.3-2005 Sub clause 40.6.1.3.1 | Receiver Differential Input Signals | 1000Base-T Rx Test | Direct | Link Monitor and/or Packet Flow with IEEE worst case Insertion Loss & External Coupled Noise. |
| IEEE802.3-2005 Sub clause 40.6.1.3.2 | Receiver Frequency Tolerance | 1000Base-T Rx Test | Direct | Link Monitor and/or Packet Flow with IEEE worst case Frequency Offset. |
| IEEE802.3-2005 Sub clause 40.6.1.3.3 | Common Mode Noise Rejection | | | |
| IEEE802.3-2005 Sub clause 40.6.1.3.4 | Alien Crosstalk Noise Rejection | 1000Base-T Rx Test | Direct | Link Monitor and/or Packet Flow with IEEE worst case Insertion Loss & External Coupled Noise. |
| *Not Specifed by 802.3 Clause 40* | Receiver Jitter Tolerance | 1000Base-T Rx Test | Direct | Link Monitor and/or Packet Flow with IEEE worst case timing jitter (Master & Slave Modes). |

** Measurement performed with incoming 4-pair "nominal" 1000BaseT signal. This is more realistic than the "disturbing signal" utilized in 802.3 test setups.*

| PhyView Analyzer / PHY Performance Test Suite: Test Time & Coverage Chart | | | |
|---|---|---|---|
| **PHY Performance Test** | **Typical Test Time** | **Total Time Per 24 Ports** | **Parameters Included** |
| 1000Base-T Transmit & Interface Test | 338 Sec. (84 Seconds / Pair) | 2.25 Hours | Wideband Power, SNR, Low Band & Wideband PSD, Pair Skew, Return Loss, Crosstalk, Pk.Diff.Volts T.S.#1 A-B, Droop% T.S. #1 F-G,H-J, Test Signal #1 Mask Fit |
| 100Base-Tx Transmit Test (MDI & MDI-X) | 120 Sec. (60 Seconds / Pair) | 0.8 Hours | Wideband Power, SNR, Low Band & Wideband PSD, UTP Diff. Volts Pk-Pk, 500ns Droop%, >2.4msec τ |
| 1000Base-T Receiver Test (Master & Slave) | 6.4 Min. (3.2 Minutes / Mode) | 2.5 Hours | Max Insertion Loss Response, ±100 & ±115 ppm Timing Offset Response, -2, +1, & +4 dB(40mV) Alien Crosstalk Response, 0, +3, & +6 dB(1.4nsec) Jitter Response, Combo Insertion Loss + Alien Crosstalk + Jitter or Offset Response |
| 100Base-T Receiver Test (MDI & MDI-X) | 4.2 Min. (2.1 Minutes / Pair) | 1.7 Hours | Max Insertion Loss Response, ±50 & ±100 ppm Timing Offset Response, +5 & +10 dB(40mV) Alien Crosstalk Response, +6 & +12 dB(1.4nsec) Jitter Response, Combo Insertion Loss + Alien Crosstalk + Jitter Response |
| 10Base-T Receiver Test (MDI & MDI-X) | 4.2 Min. (2.1 Minutes / Pair) | 1.7 Hours | Max Insertion Loss Response, ±50 & ±100 ppm Timing Offset Response, +8 & +13 dB(40mV) Alien Crosstalk Response, +9 & +15 dB(1.4nsec) Jitter Response, Combo Insertion Loss + Alien Crosstalk + Jitter Response |





Verification, Simplified.

# PHY Performance Test Suite: IEEE 802.3 Correlations

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## Ethernet PHYTests for 100BASE-TX

| IEEE Specifications | | PhyView Analyzer / PHY Performance Test Suite: 100Base-Tx | | |
|---|---|---|---|---|
| **Standard reference** | **Description** | **PHY Performance Test Report** | **Correlation** | **Comment** |
| ANSI X3.263-1995, Section 9.1.3 | +Vout overshoot | Wideband PSD, Rise/Fall Time:4+1 nsec | Partial | Large overshoots will increase PSD at very high frequencies (75 - 100 MHz) and would likely correlate to fast Rise/Fall times. *See PVA-3000 Reference Manual, Section 1.3.3.* |
| ANSI X3.263-1995, Section 9.1.3 | +Vout overshoot decay | UTP Diff. Volts Pk-Pk, SNR | Partial | Slow overshoot decay in the presence of a large overshoot will typically increase reported Peak-Peak voltage and, if severe enough, will degrade SNR. |
| ANSI X3.263-1995, Section 9.1.3 | –Vout overshoot | Wideband PSD, Rise/Fall Time:4+1 nsec | Partial | *See +Vout Overshoot above.* |
| ANSI X3.263-1995, Section 9.1.3 | –Vout overshoot decay | | Partial | *See +Vout Overshoot Decay above.* |
| ANSI X3.263-1995, Section 9.1.6 | AOI +Vout rise time | Rise/Fall Time:4+1 nsec | Direct | Estimated Rise/Fall Time parameter has been correlated to actual IEEE 802.3 measurements. It will reflect the average of positive and negative going Rise and Fall times. |
| ANSI X3.263-1995, Section 9.1.6 | AOI +Vout fall time | Rise/Fall Time:4+1 nsec | | |
| ANSI X3.263-1995, Section 9.1.6 | AOI +Vout rise/fall time symmetry | | | |
| ANSI X3.263-1995, Section 9.1.6 | AOI –Vout rise time | Rise/Fall Time:4+1 nsec | Direct | Estimated Rise/Fall Time parameter has been correlated to actual IEEE 802.3 measurements. It will reflect the average of positive and negative going Rise and Fall times. |
| ANSI X3.263-1995, Section 9.1.6 | AOI –Vout fall time | Rise/Fall Time:4+1 nsec | | |
| ANSI X3.263-1995, Section 9.1.6 | AOI –Vout rise/fall time symmetry | | | |
| IEEE 802.3-2008 Sub clause 25.4.4a | Worst Case Droop of Transformer | 500ns Droop%, >2.4msec τ | Direct | Droop without baseline wander packet. *See PVA DC Unbalance Application for more robust analysis of low frequency response and SNR to effects of magnetic biasing.* |
| ANSI X3.263-1995, Section 9.1.8 | Duty cycle distortion | SNR | Partial | SNR reports on aggregate uncorrectable characteristics of incoming transmitted signal. Duty-Cycle would represent one form of uncorrectable distortion. *See PVA-3000 Reference Manual, Section 1.3.4.* |
| ANSI X3.263-1995, Section 9.1.4 | Signal amplitude symmetry | 500ns Droop%, >2.4msec t, SNR | Partial | Signal amplitude asymmetry will DC bias magnetics and if severe enough, will degrade both Estimated Droop and **SNR**. |
| ANSI X3.263-1995, Section 9.1.9, IEEE802.3-2005 Sub clause 25.4.5 | Transmit jitter | SNR | Gross | Severe (failing) jitter will impact **SNR** measurements. |
| ANSI X3.263-1995, Annex J UTP | AOI template | UTP Diff. Volts Pk-Pk, SNR, and Rise/Fall Time:4+1 nsec | Partial | The AOI template fit requires nominal Peak-Peak Amplitude and nominal Rise/Fall Time, parameters that are tested separately. Severe jitter could affect AOI template fit and would, if severe enough, degrade **SNR**. |
| ANSI X3.263-1995, Section 9.1.2.2 | UTP +Vout differential output voltage | UTP Diff. Volts Pk-Pk | Direct | Estimated UTP Differential Voltage Pk-Pk parameter has been correlated to actual IEEE 802.3 measurements. |
| ANSI X3.263-1995, Section 9.1.2.2 | UTP –Vout differential output voltage | UTP Diff. Volts Pk-Pk | | |
| ANSI X3.263-1995, Section 9.1.5 | Transmitter return loss | (Wideband) Return Loss | Partial | **Wideband Return Loss** readings will point to likely success (< -21dB) or likely failure (>-18dB) in MDI Return Loss measurements. *See PVA-3000 Reference Manual, Section 1.3.8.* |
| ANSI X3.263-1995, Section 9.2.2 | Differential Input Impedance | | | |
| ANSI X3.263-1995, Section 9.2.3 | Common Mode Rejection | | | |
| *Not Specifed by 802.3 Clause 25* | Receiver Differential Input Signals | 100Base-Tx Rx Test | Direct | Link Monitor and/or Packet Flow with IEEE worst case Insertion Loss & External Coupled Noise. |
| *Not Specifed by 802.3 Clause 25* | Receiver Frequency Tolerance | 100Base-Tx Rx Test | Direct | Link Monitor and/or Packet Flow with IEEE worst case Frequency Offset. |
| *Not Specifed by 802.3 Clause 25* | Alien Crosstalk Noise Rejection | 100Base-Tx Rx Test | Direct | Link Monitor and/or Packet Flow with IEEE worst case Insertion Loss & External Coupled Noise. |
| *Not Specifed by 802.3 Clause 25* | Receiver Jitter Tolerance | 100Base-Tx Rx Test | Direct | Link Monitor and/or Packet Flow with IEEE worst case timing jitter (Master & Slave Modes). |

## Ethernet PHY Tests for 10BASE-T

| IEEE Specifications | | PhyView Analyzer / PHY Performance Test Suite: 10Base-T | | |
|---|---|---|---|---|
| **Standard reference** | **Description** | **PHY Performance Test Report** | **Correlation** | **Comment** |
| IEEE802.3.2005 Sub clause 14.3.1.2.1 | Template MAU | | | *The PhyView Analyzer does not make direct transmitter measurements on 10Base-T transmitters. Generally, the expectation is that nominal performance at 1000Base-T and 100Base-Tx will infer nominal performance at 10Base-T since requirements for 1000Base-T and 100Base-Tx are much more demanding than 10Base-T.* |
| | Template TP_IDL with TPM | | | |
| | Template TP_IDL without TPM | | | |
| | Template Link Pulse with TPM | | | |
| | Harmonic content | | | |
| IEEE802.3.2005 Sub clause 14.3.1.2.1, Annex B.4.1 &B.4.3.3 | Jitter with TPM | | | |
| IEEE802.3.2005 Sub clause 14.3.1.2.1, Annex B.4.1 & B.4.3.3 | Jitter without TPM | | | |
| IEEE802.3-2005 Sub clause 14.3.1.2.5 | Common mode output voltage | | | |
| IEEE802.3.2005 Sub clause 14.3.1.2.2, Annex B.4.3.2 | Transmitter return loss | (Wideband) Return Loss | Partial | **Wideband Return Loss** readings will point to likely success (< -21dB) or likely failure (>-18dB) in MDI Return Loss measurements. *See PVA-3000 Reference Manual, Section 1.3.8.* |
| IEEE802.3.2005 Sub clause 14.3.1.3.4, Annex B.4.3.5 | Receiver return loss | | | |
| IEEE802.3.2008 Sub clause 14.3.1.3.1 | Differential Input Signals | 10Base-T Rx Test | Direct | Link Monitor and/or Packet Flow with IEEE worst case Jitter. |
| IEEE802.3.2008 Sub clause 14.3.1.3.2 | Receiver Differential Noise Immunity | 10Base-T Rx Test | Direct | Link Monitor and/or Packet Flow with IEEE worst case ingress noise. |

*Note: 100Base-Tx and 10Base-T Transmit and Receive Tests performed automatically on both pair combinations, that is, MDI and MDI-X.*





Verification, Simplified.