

Droop when a Clause 104 PSE or PD PI is encompassed within the MDI

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Review of IEEE Draft P802.3dg / D2.2



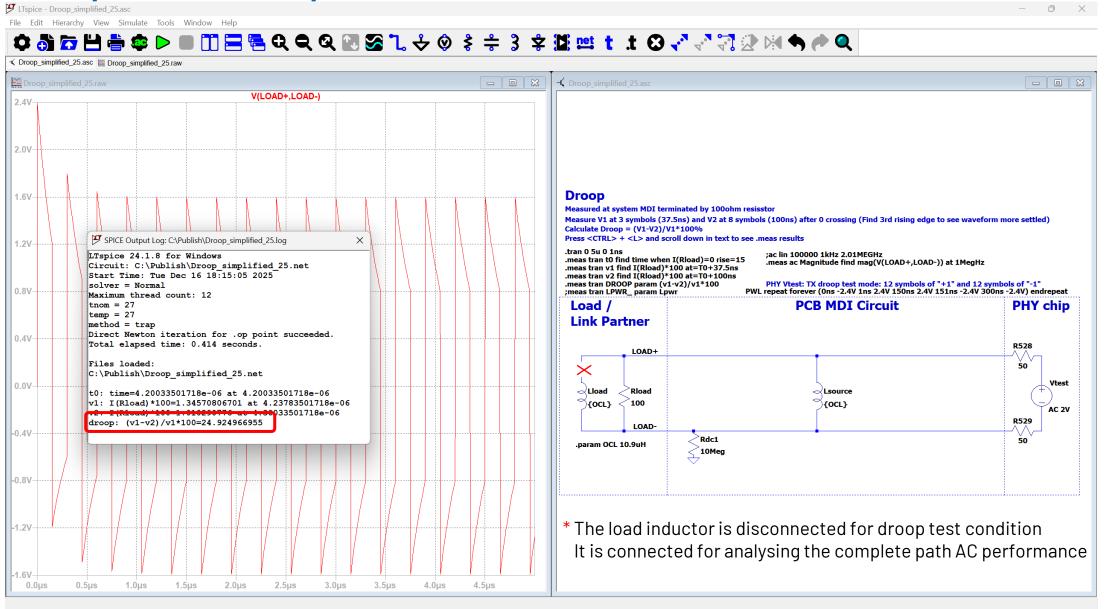
► Currently the requirement for the POE application is as follows:

When a Clause 104 PSE or PD PI is encompassed within the MDI, the magnitude of both the positive and negative droop shall be less than 25% measured with respect to an initial value at 37.5 ns after the zero crossing and a final value at 100 ns after the zero crossing.

- ▶ The value of 25% was carried over from clause 146 without much analysis or discussion
 - Since the symbol period for 100BASE-T1L is less than 10% of the symbol period for 10BASE-T1L, 25% droop is very high
 - The equivalent total open-circuit inductance (OCL) to give 25% droop is about 10.9 uH
 - With shunt inductances as low as this on both sides of the link there is significant in-band attenuation, ~ -5dB at 1MHz.
 - This could significantly affect the link performance

Droop 25% - Simplified Circuit - Transient Simulation





Droop 25% - Simplified Circuit - AC Simulation



5 5 H = \$ > ■ II = 5 Q Q Q B S L → \$ \$ \$ 3 \$ B M t t t O → → ₹ 3 D M t + → Q Droop simplified 25 ac.raw V(LOAD+,LOAD-) -3dB -6dB -9dB **√** Droop simplified 25 ac.asc **□** ⊠ -15dB Load / Droop simplified 25 ac.raw **Link Partner** SPICE Output Log: C:\Publish\Droop simplified 25 ac.log -18dB V(LOAD+.LOAD-) Freq: 999.99241KHz LTspice 24.1.8 for Windows -4.958322dB Mag: Circuit: C:\Publish\Droop simplified 25 ac.net LOAD+ 55.593669° Start Time: Tue Dec 16 18:22:28 2025 74.195728ns solver = Normal Group Delay: -21dB Maximum thread count: 12 Cursor 2 tnom = 27 Rload temp = 27Lload -- N/A-method = trap 100 {OCL} -- N/A--Direct Newton iteration for .op point succeeded. -24dB Total elapsed time: 0.287 seconds. LOAD-Ratio (Cursor2 / Cursor1) Files loaded: C:\Publish\Droop simplified 25 ac.net .param OCL 10.9uH -27dBmagnitude: mag(V(LOAD+,LOAD-))=(-4.9582771157dB,0°) at 1000000 -30dB 0.2MHz 0.4MHz 0.6MHz 0.8MHz 1.0MHz 1.2MHz 1.4MHz 1.6MHz 1.8MHz 2.0MHz

Proposal

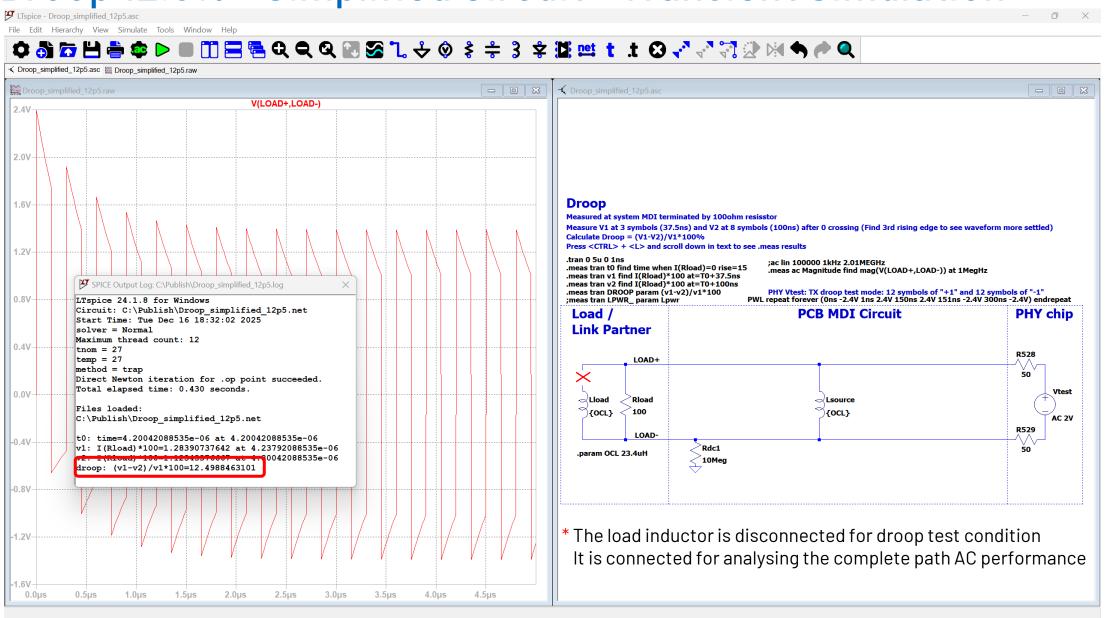


- ▶ We propose to set the limit to 12.5% measured over 62.5 ns
 - The equivalent total OCL is about 23.4 uH
 - This would improve the in-band attenuation, to about -1.65dB at 1MHz
- ► The proposed text is as follows:

When a Clause 104 PSE or PD PI is encompassed within the MDI, the magnitude of both the positive and negative droop shall be less than 12.5% measured with respect to an initial value at 37.5 ns after the zero crossing and a final value at 100 ns after the zero crossing.

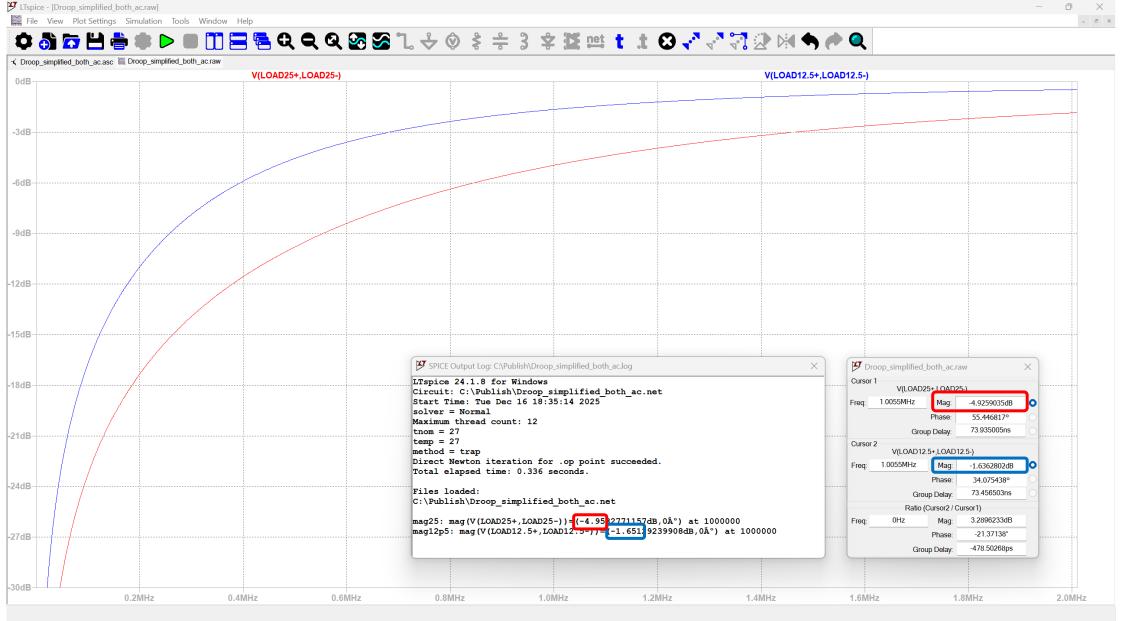
Droop 12.5% - Simplified Circuit - Transient Simulation





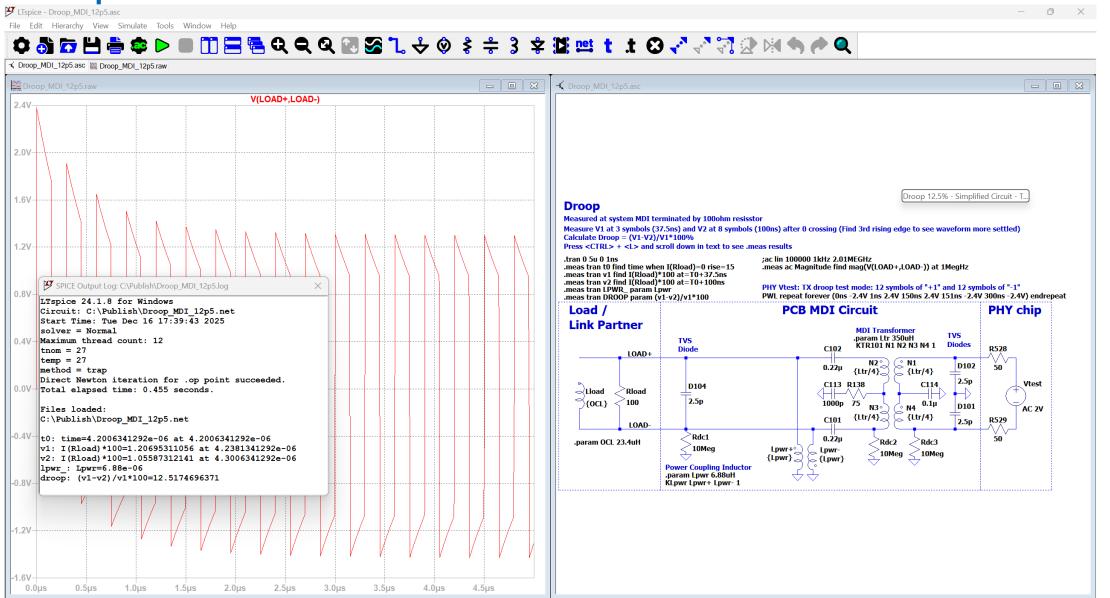
Droop 12.5% vs. 12.5% - Simplified Circuit - AC Simulation





Droop 12.5% - with MDI Circuit - Transient Simulation





Droop 12.5% vs. 25% - with MDI Circuit - AC Simulation



