IEEE 802.3dm

Droop and Peak Voltage in ACT Transmitter

Hossein Sedarat

ETHERNOVIA®

November 2025

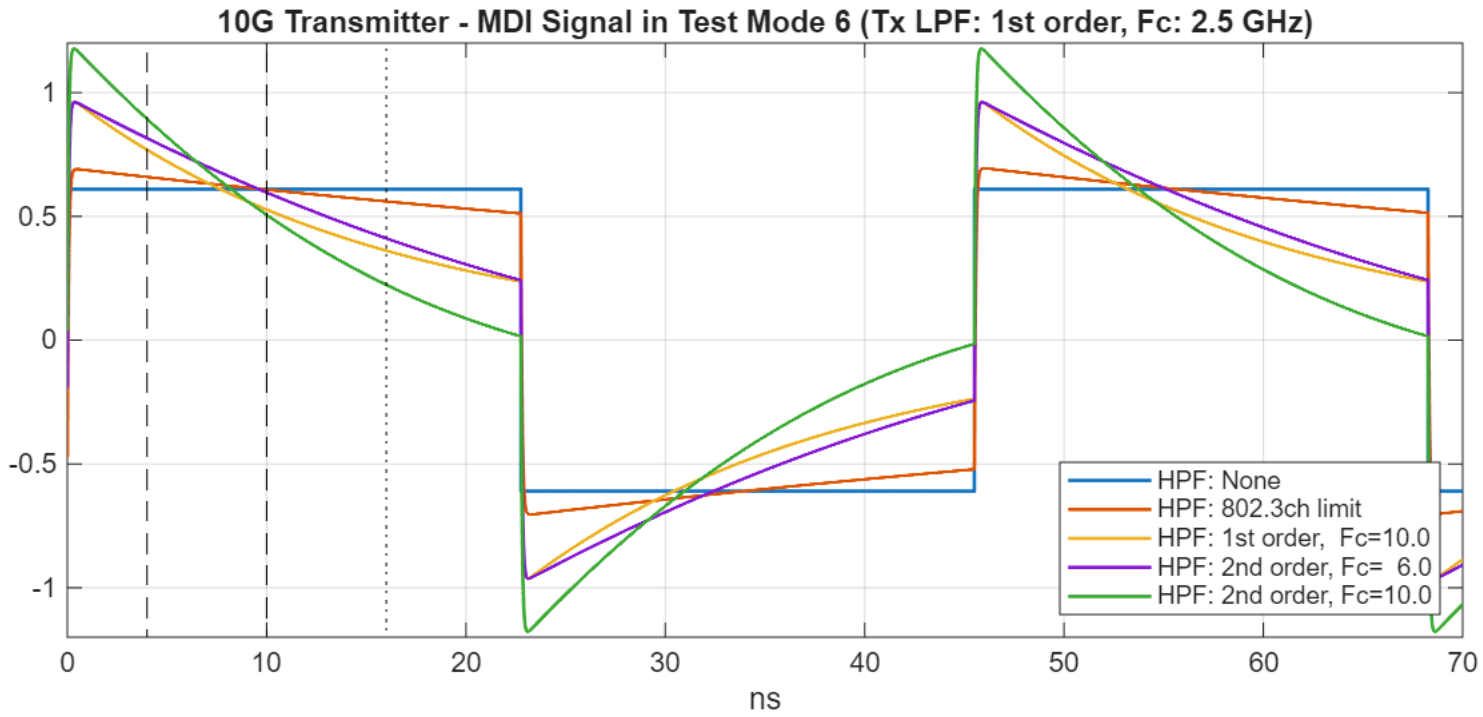
Overview

- The PoC circuits in sensor node and the aggregator do not have to be the same
- The PoC circuit in the sensor node should be simple and compact affecting the droop specification of downstream transmitter
- The PoC circuit in the aggregator can be more complex but since the ACT upstream receiver is not sensitive to droop, similar limits can be defined for both directions
- The limits on the droop and peak voltage swing depends on the order and corner frequency of the high-pass filter in PoC circuit

Downstream Direction – Droop

- 802.3ch: Droop is measured over 12 ns starting with a limit of 15%
- A 1st order HPF with Fc=2.5 MHz meets the 802.3ch droop limit
- A higher corner frequency increases the droop

PoC		Droop
HPF order	Fc (MHz)	
802.3ch		**8%**
1	10	**31%**
2	6	**33%**
2	10	**55%**



ETHERNOVIA®

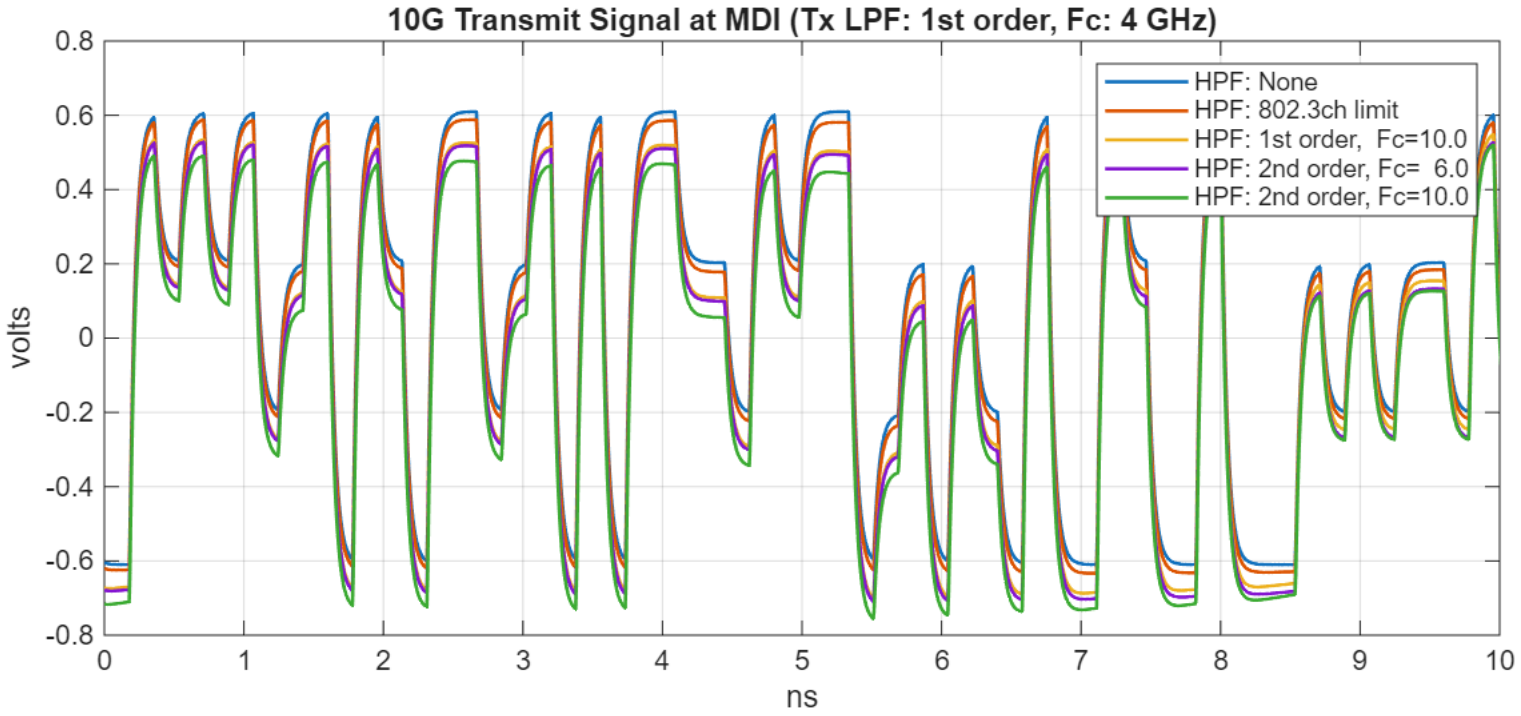
Downstream Direction – Max Swing

- As the droop increases, so is the maximum signal swing at MDI
- The maximum swing grows to 1.7 volts pk-pk with corner frequency at 10 MHz

Data Rate = 10G

PoC		Max Voltage STP Volts, Pk-Pk
HPF order	Fc (MHz)	
802.3ch		**1.3**
1	10	**1.5**
2	6	**1.6**
2	10	**1.7**

Cable: STP Maximum Tx Power

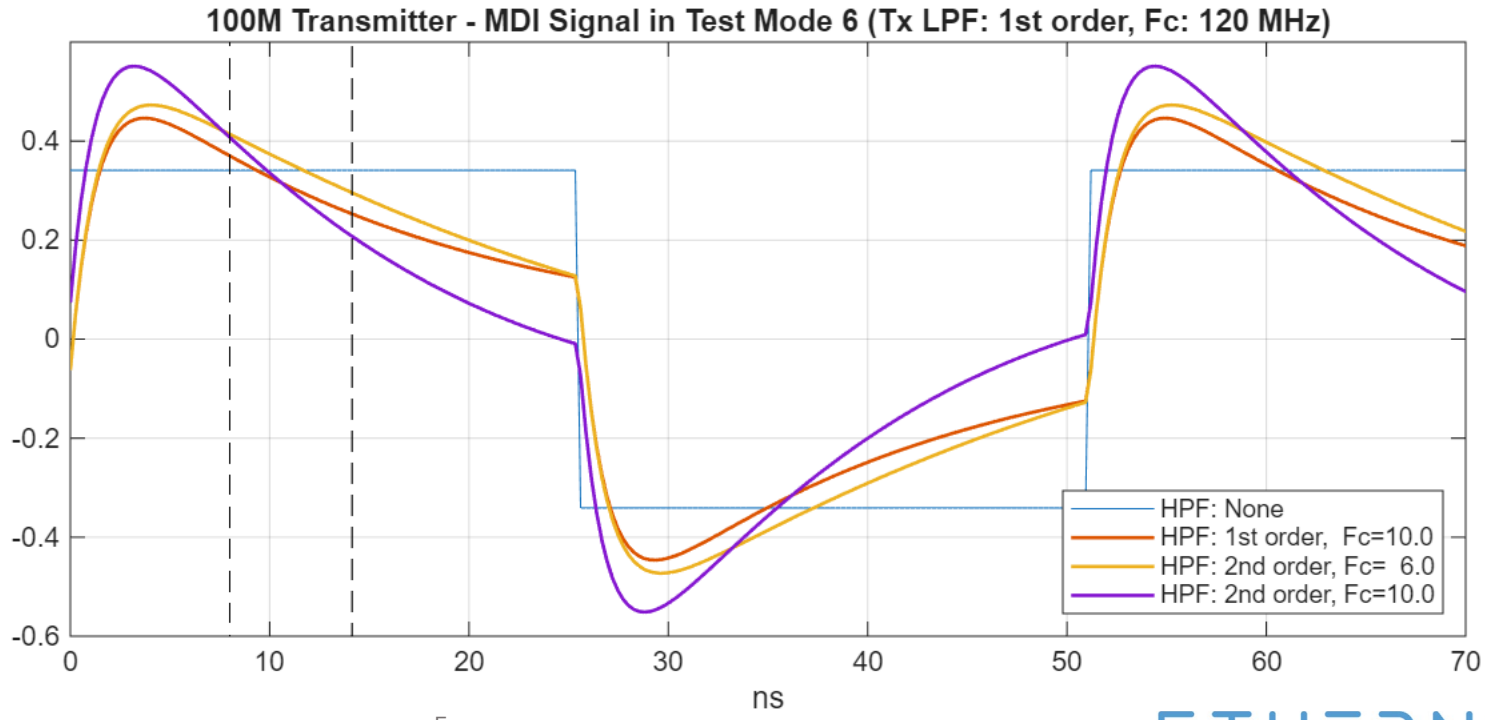


ETHERNOVIA®

Upstream Direction – Droop

- Use 3 baseband symbols of +1s and -1s so that the frequency of the square-wave is close to that of downstream
- The reference measurement should be farther away from zero-crossing to accommodate for the lower bandwidth of the upstream signal

PoC		Droop
HPF order	Fc (MHz)	
1	10	**32%**
2	6	**36%**
2	10	**65%**



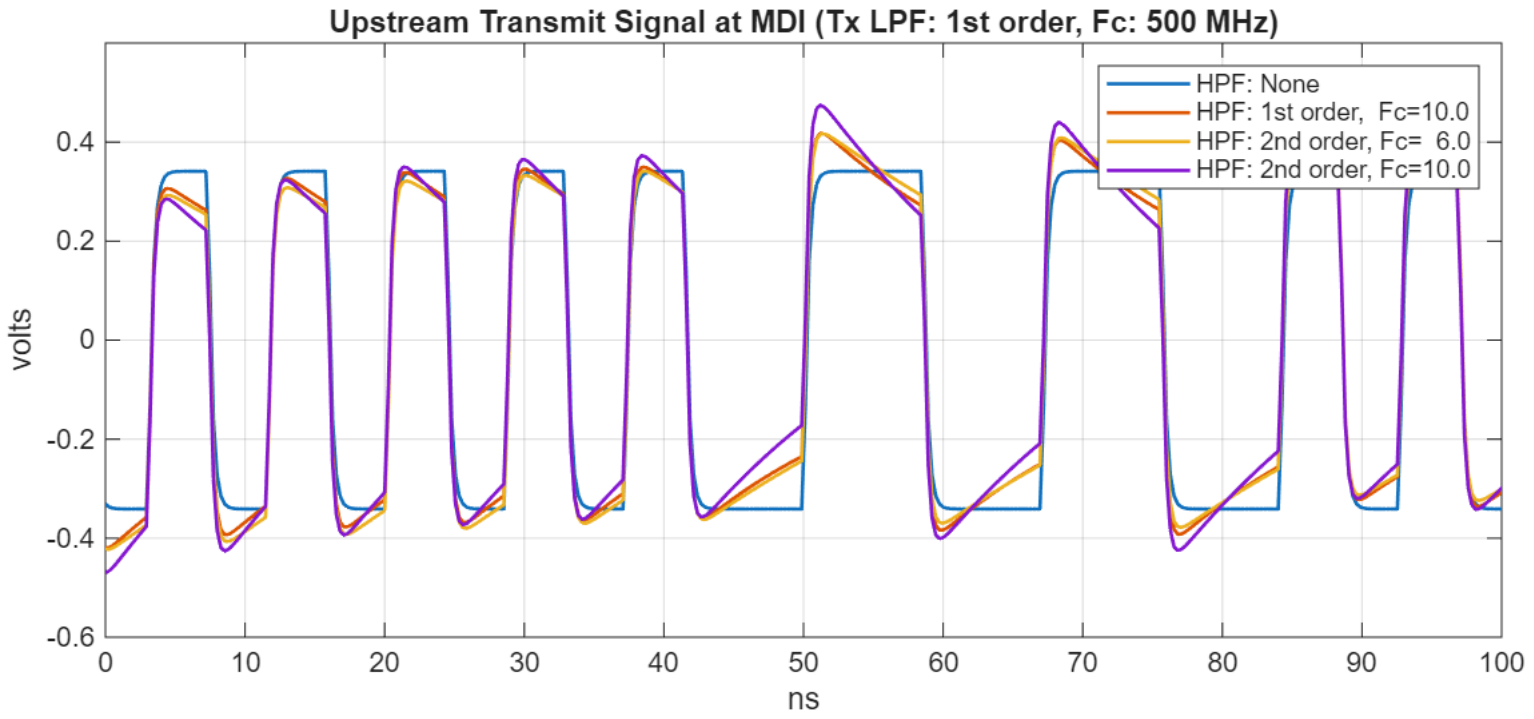
ETHERNOVIA®

Upstream Direction – Max Swing

Maximum signal swing at MDI can grow to as much as 1.0 volts pk-pk as the corner frequency grows to 10 MHz

PoC		Max Voltage Volts, Pk-Pk
HPF order	Fc (MHz)	
1	10	**0.9**
2	6	**0.9**
2	10	**1.0**

Cable: STP Tx Power = 0 dBm



ETHERNOVIA®

Changes in 200.9

Transmit swing for lower rate is scaled as proposed in sedarat_2507

Table 200–11—Transmit peak-to-peak voltage limits, high speed mode

Transmit Rate	-T1 Max (V)	-V1 Max (V)
10G	**1.7**	**0.85**
5G	**1.3**	**0.65**
2.5G	**1.0**	**0.50**

Changes in 200.10

200.10.1 Test modes

...

When test mode 6 is enabled, PHY shall transmit a continuous pattern of 3 {+1} baseband symbols followed by 3 {-1} baseband symbols. These symbols are transmitted with no Manchester encoding, generating a square wave with a period of 51.2 ns. The transmit symbols are timed from free-running local clock source.

…

200.10.2.1 Maximum output droop

…

droop shall be less than 30% measured with respect to an initial value at 8 ns after zero crossing and a final value at 14 ns after zero crossing (6 ns period).

200.10.2.6 Transmitter peak output

…

the differential transmit signal of a 100M+MultiGBASE-T1 transmitter shall be less than 1.0 V peak-to-peak at the MDI.

…

the differential transmit signal of a 100M+MultiGBASE-V1 transmitter shall be less than 0.5 V peak-to-peak at the MDI.

…

Summary

- The limit of droop specified in 802.3ch may be too stringent for the downstream direction as it translates to more complex PoC circuit
- The ACT upstream receiver is not sensitive to droop and the limit for droop can be similar to downstream
- A maximum of 30% droop over 6 ns is proposed for both directions

- The proposed relaxed limit for droop results in larger signal swing

Data Rate		10G	5G	2.5G	100M
Max Signal Swing (Volt Pk-Pk)	STP	**1.7**	**1.3**	**1.0**	**1.0**
	Coax	**0.85**	**0.65**	**0.50**	**0.50**


ETHERNOVIA®
Thank You