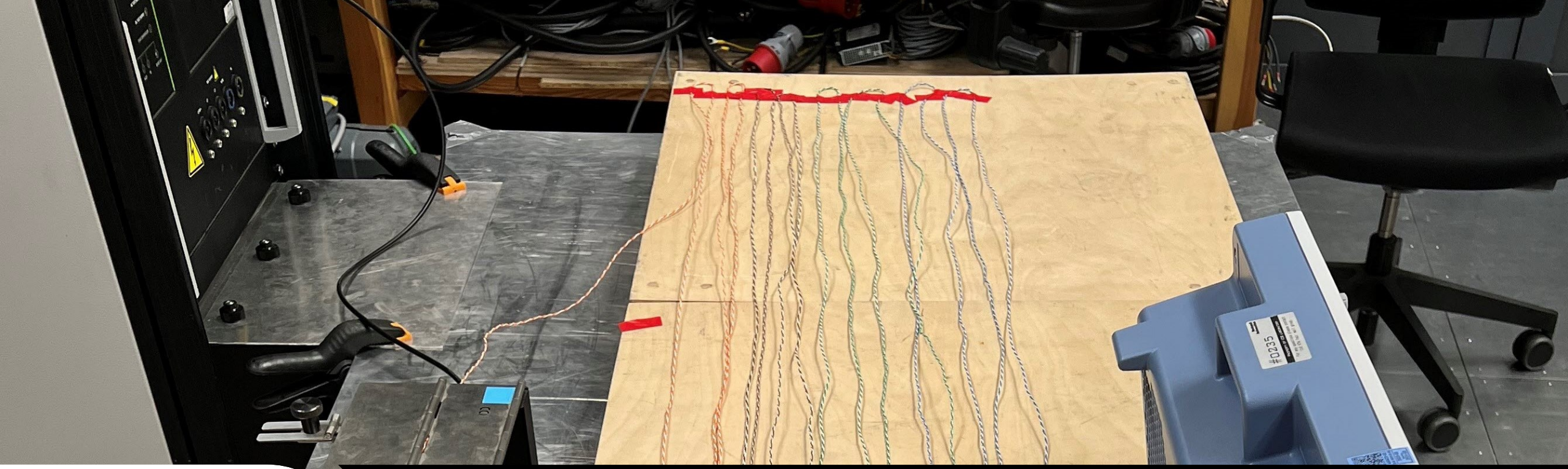


Impulse noise in multidrop link

Rockwell Automation

expanding **human possibility**®

Two concepts of grounding in multidrop

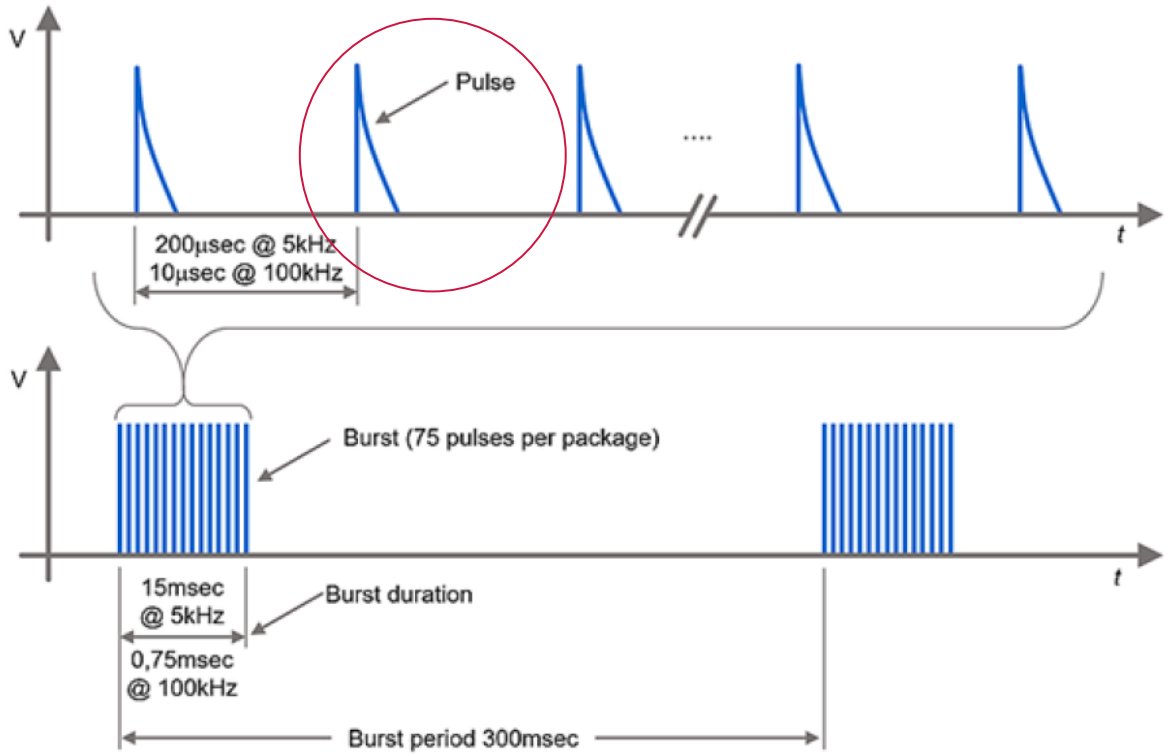
Test setup

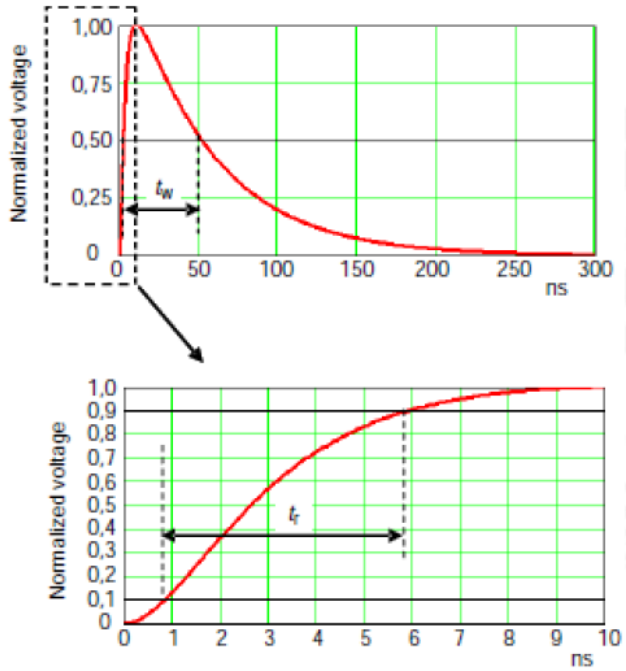
Noise in an industrial cable

Noise in a twisted pair

Electrical Fast Transients (burst transients) are common mode disturbances coming from an arc when mechanical contact is open due to a switching process.

Similar disturbances could be observed from motor drivers and other load switching signals, if their cables bundled together with SPE cables.



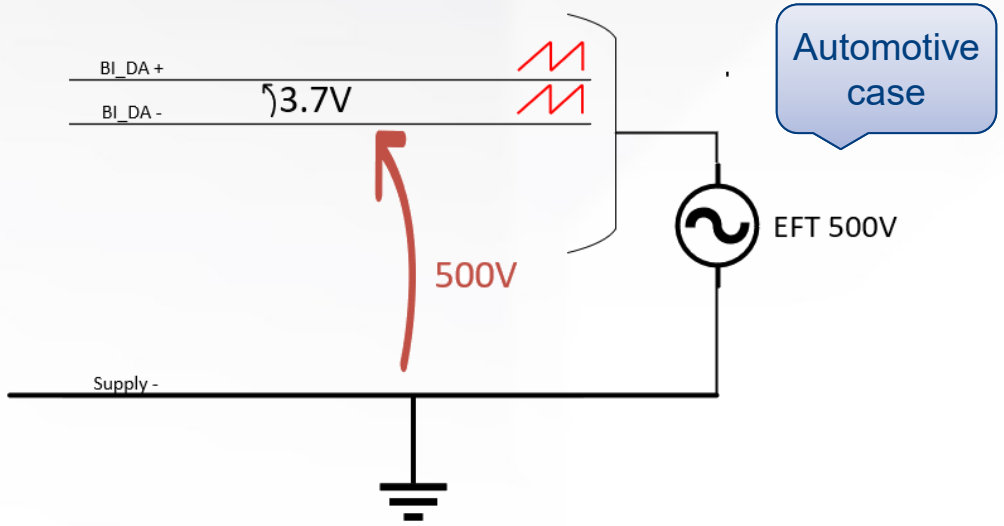


Common Mode noise immunity vs power routing

T1S PHY refers to its local GND pin. Two approaches can be followed:

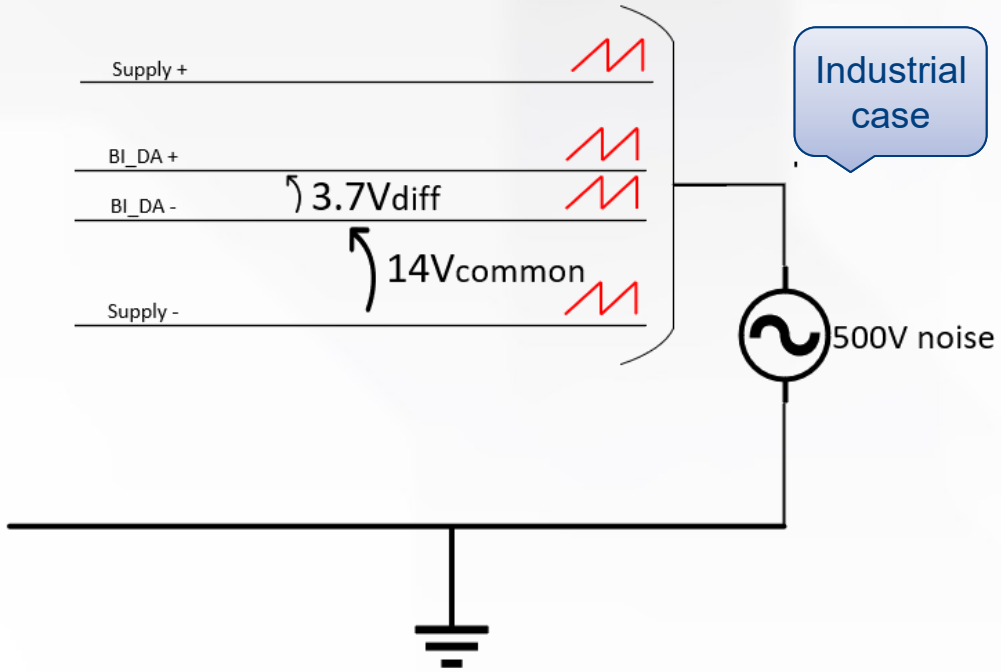
Single pair routing, separate power:

- the noise couples between PHY GND and SPE
- Large CM noise (e.g. 500Vpp)



Composite routing with power (including PoDL):

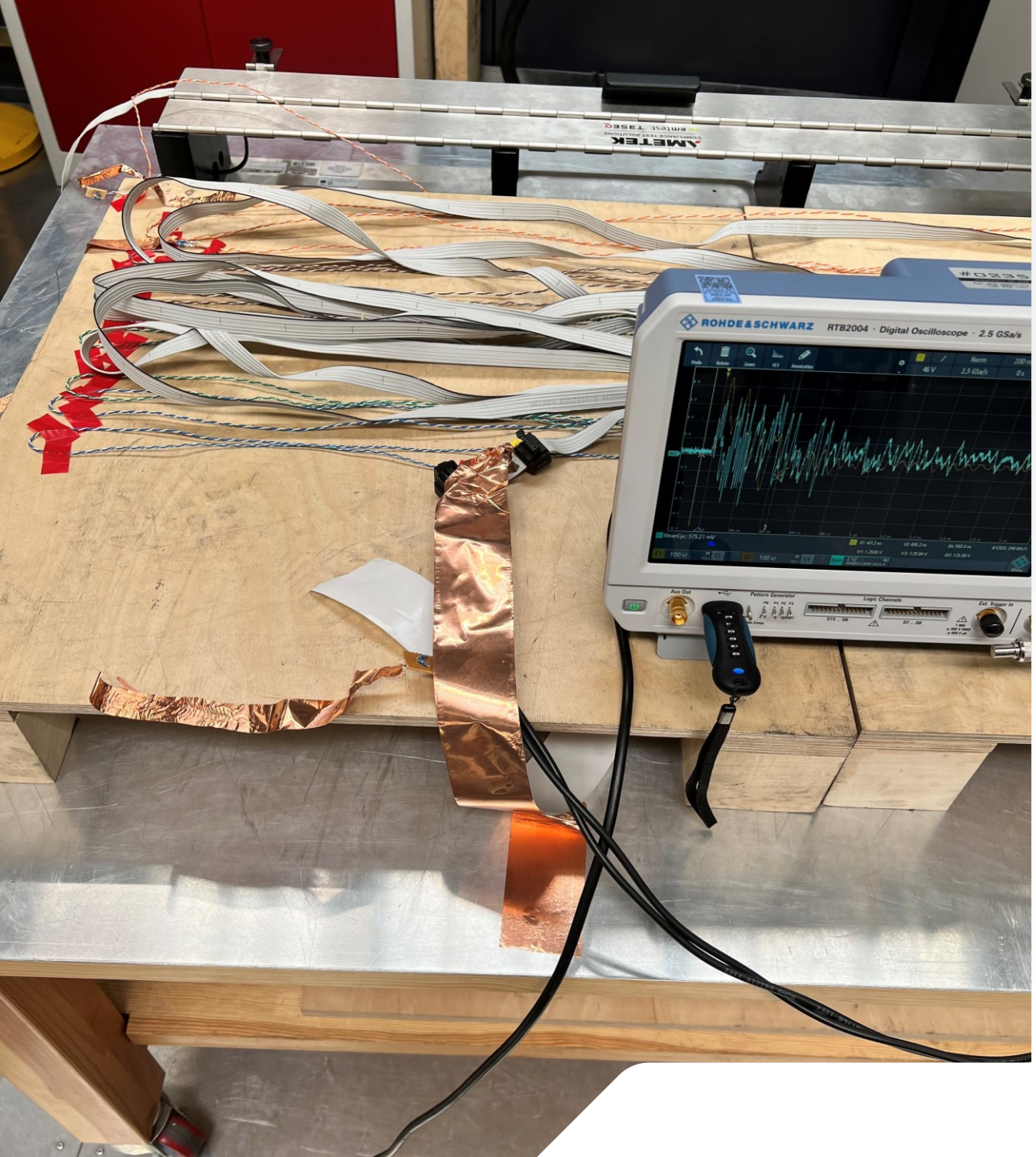
- the noise couples to both PHY GND and SPE
- the PHY sees only the difference in coupling between GND and SPE



Electrical Fast Transient (Burst) testing

Two main setups have been tested to compare noise behavior

- Industrial cable featuring composite routing with power
- Single Twisted Pair cable, with separate power routing

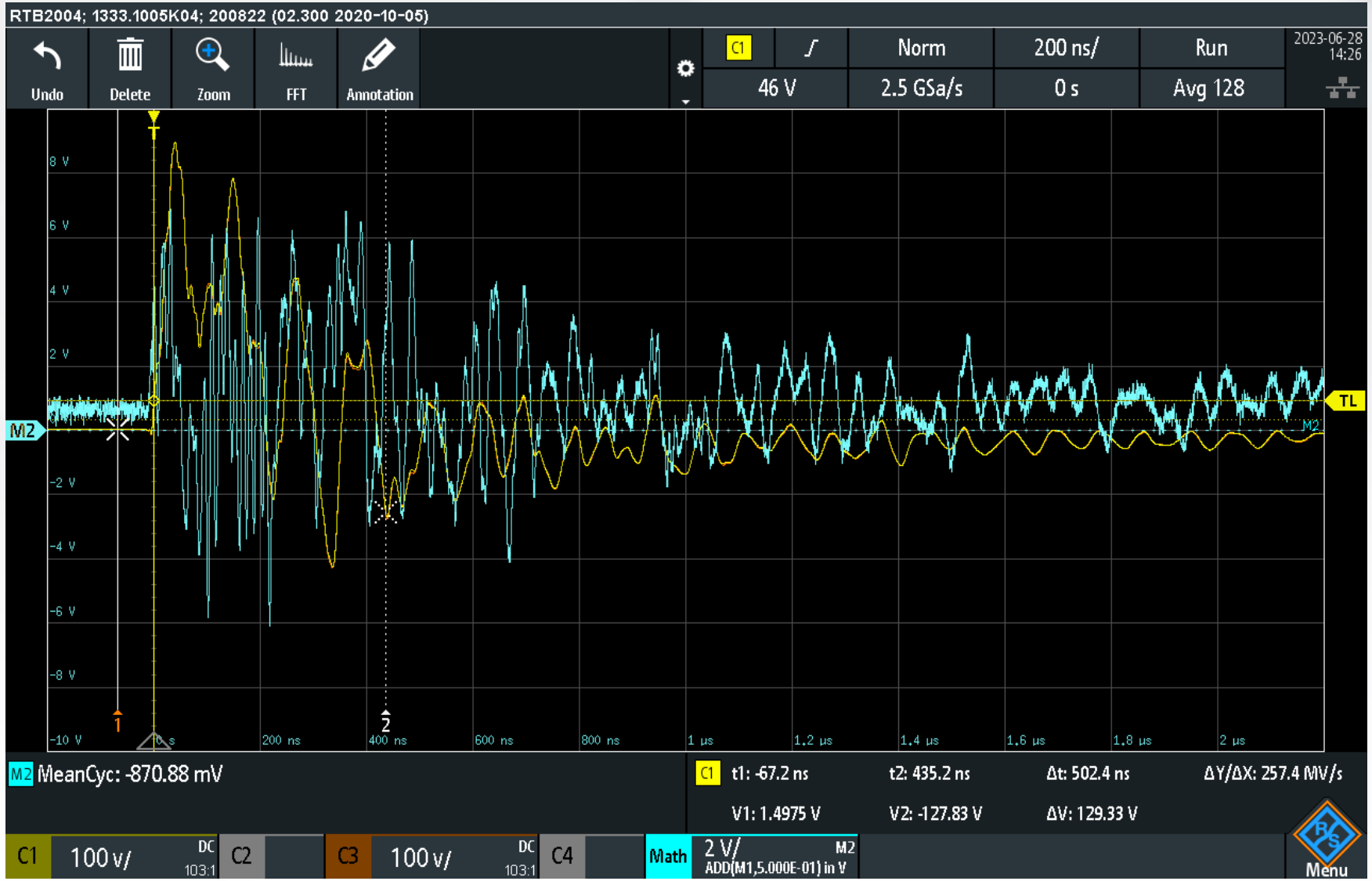


Industrial cable results

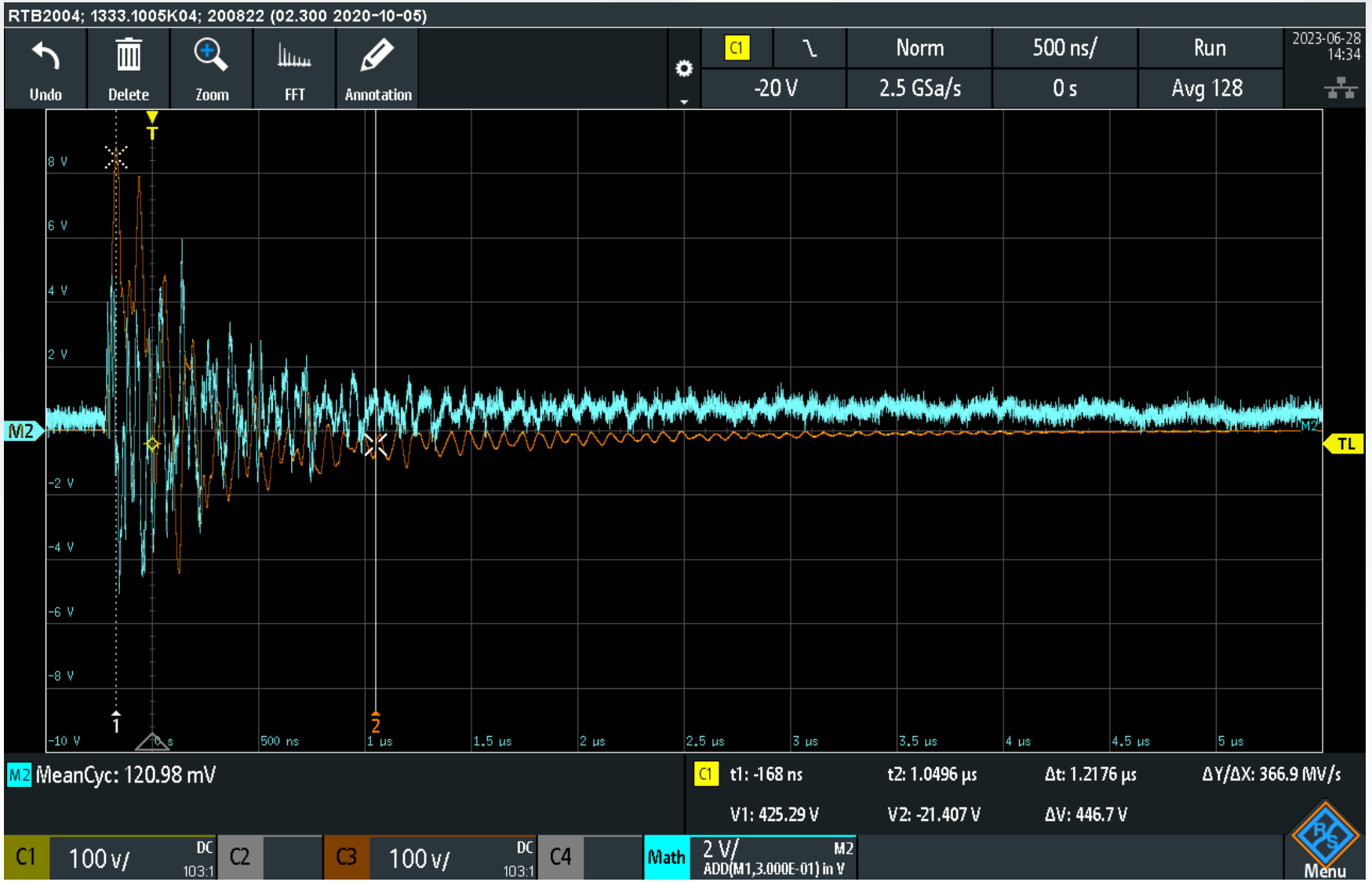
7-wire ODVA flat cable, comprising balanced 10BASE-T1S pair, power and other lines

Industrial cable, no nodes, 1kV burst, SPE to table (yellow)

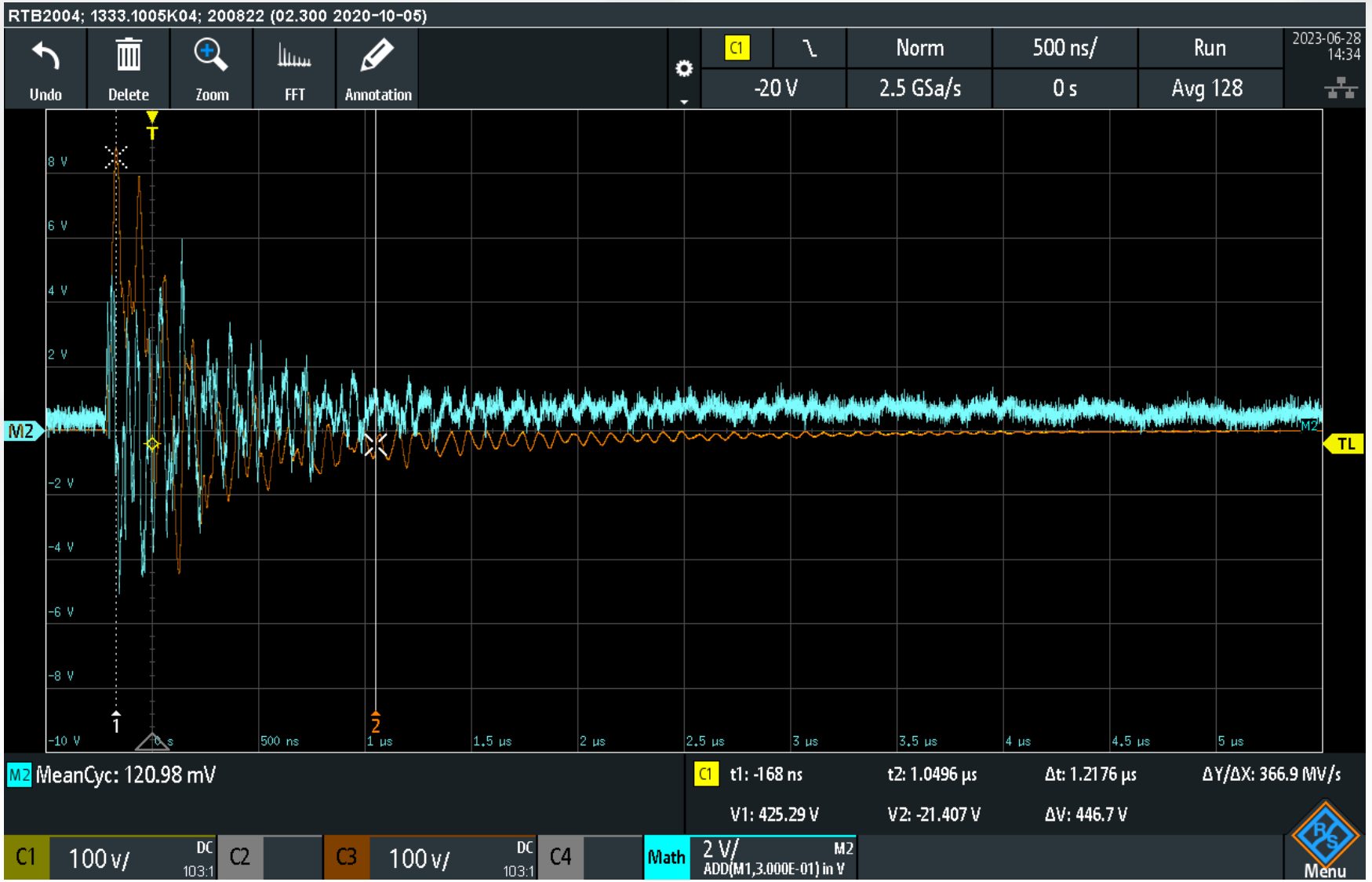
Industrial cable, no nodes, 1kV burst, SPE to local GND (cyan)

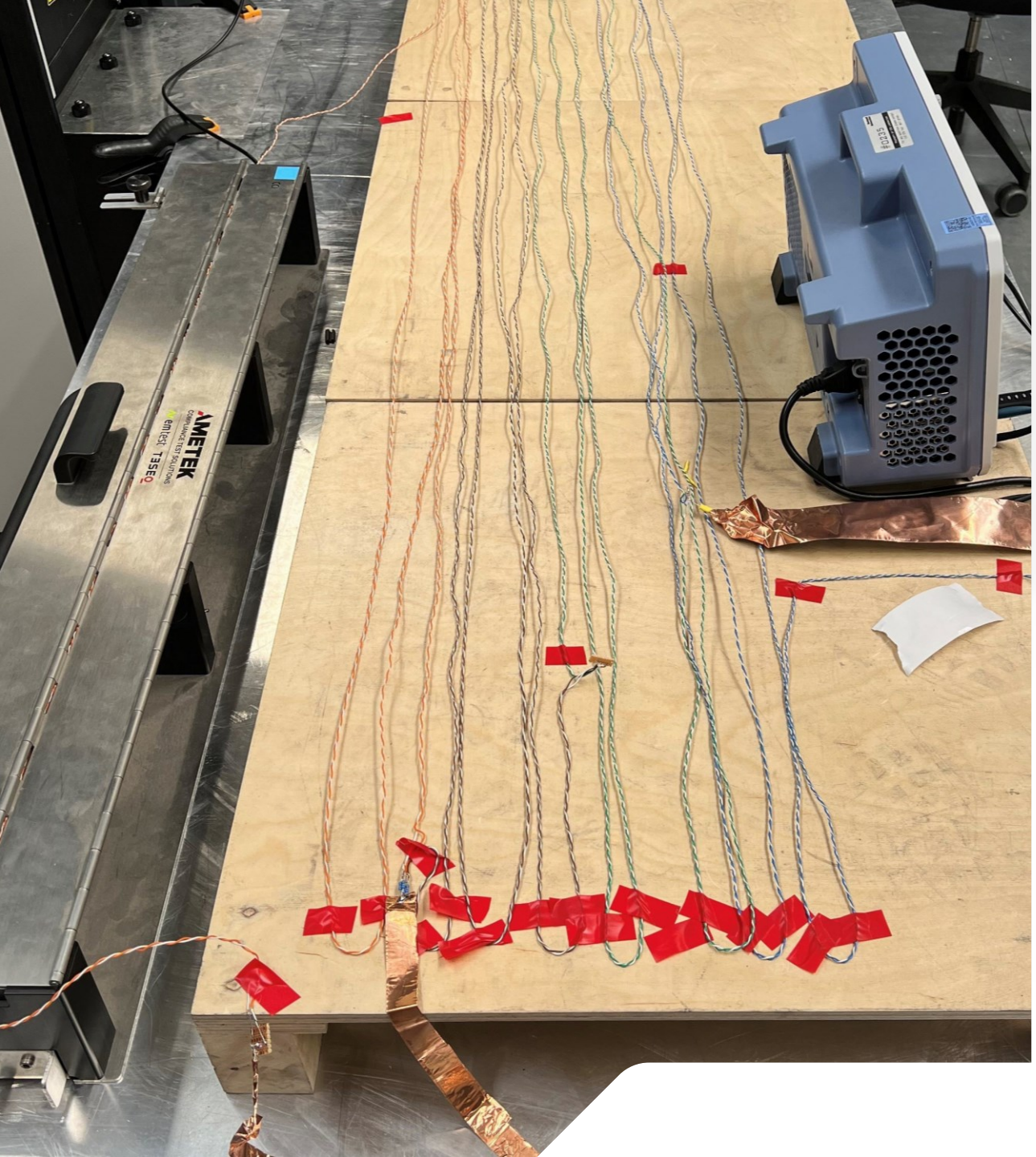


Industrial cable, no nodes, 1kV burst, SPE+ vs SPE- (cyan)



Industrial cable, no nodes, 1kV burst, SPE+ vs SPE- (cyan)

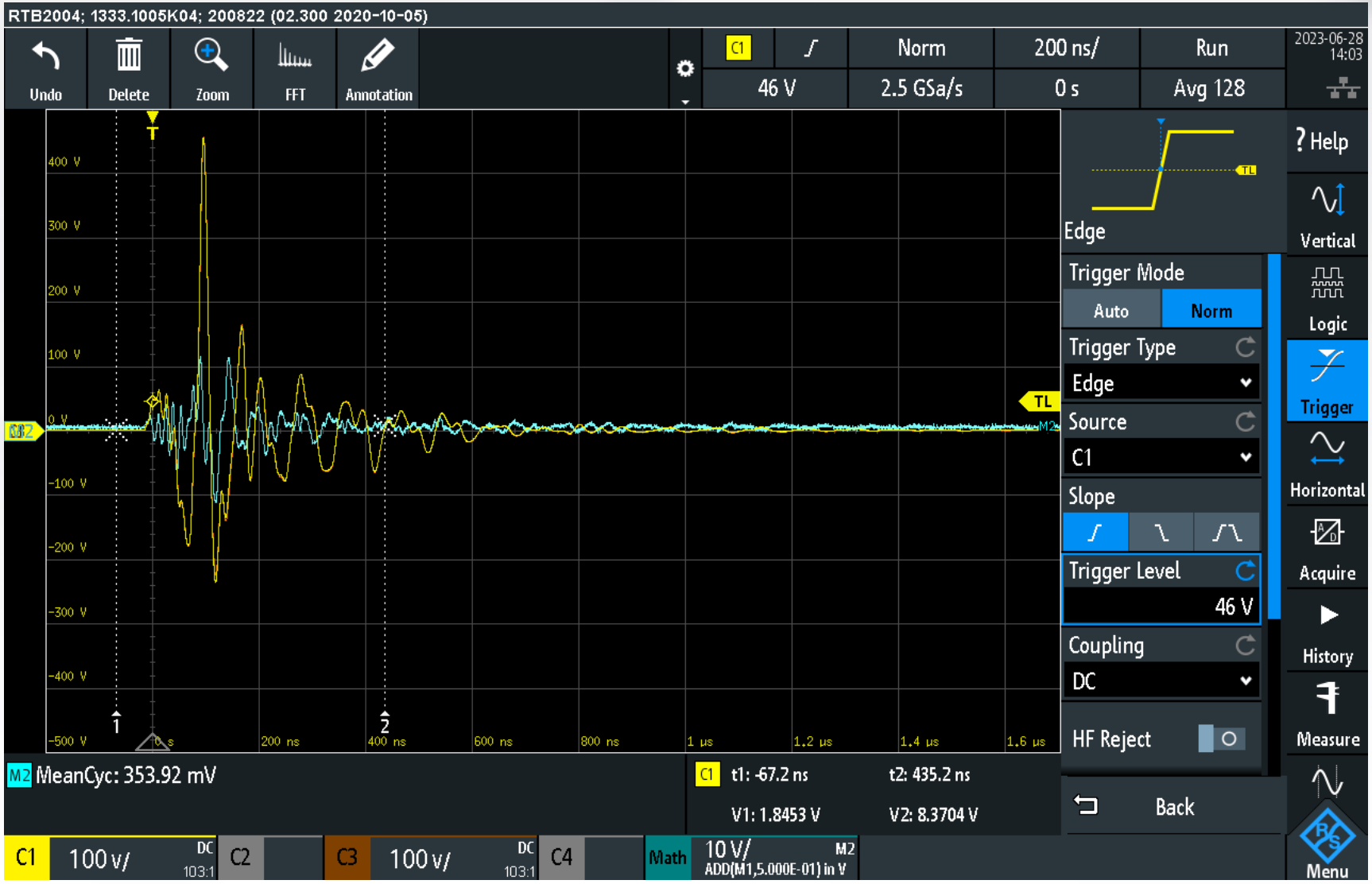




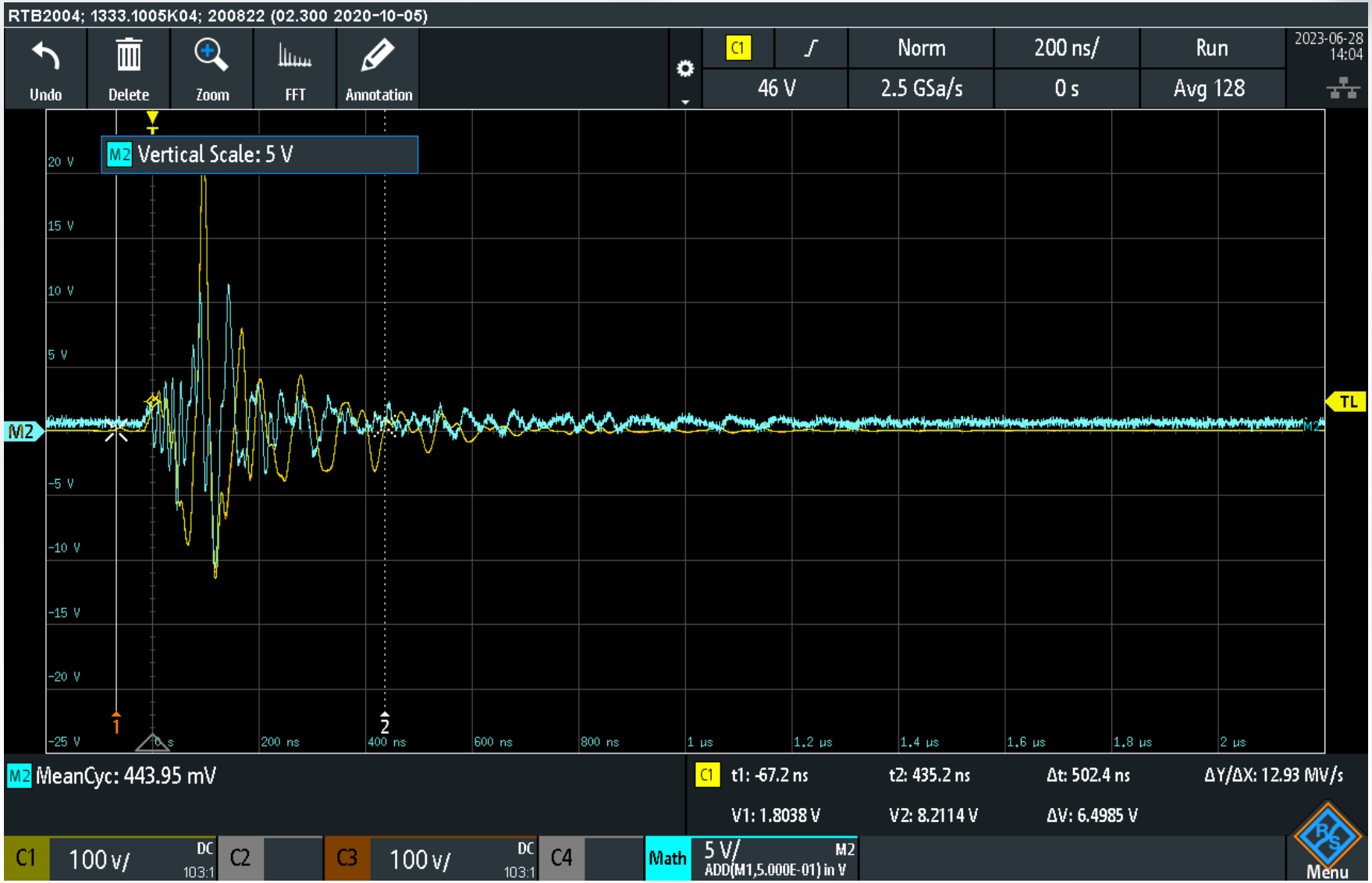
UTP cable results

Ordinary twisted pair from CAT6 cable

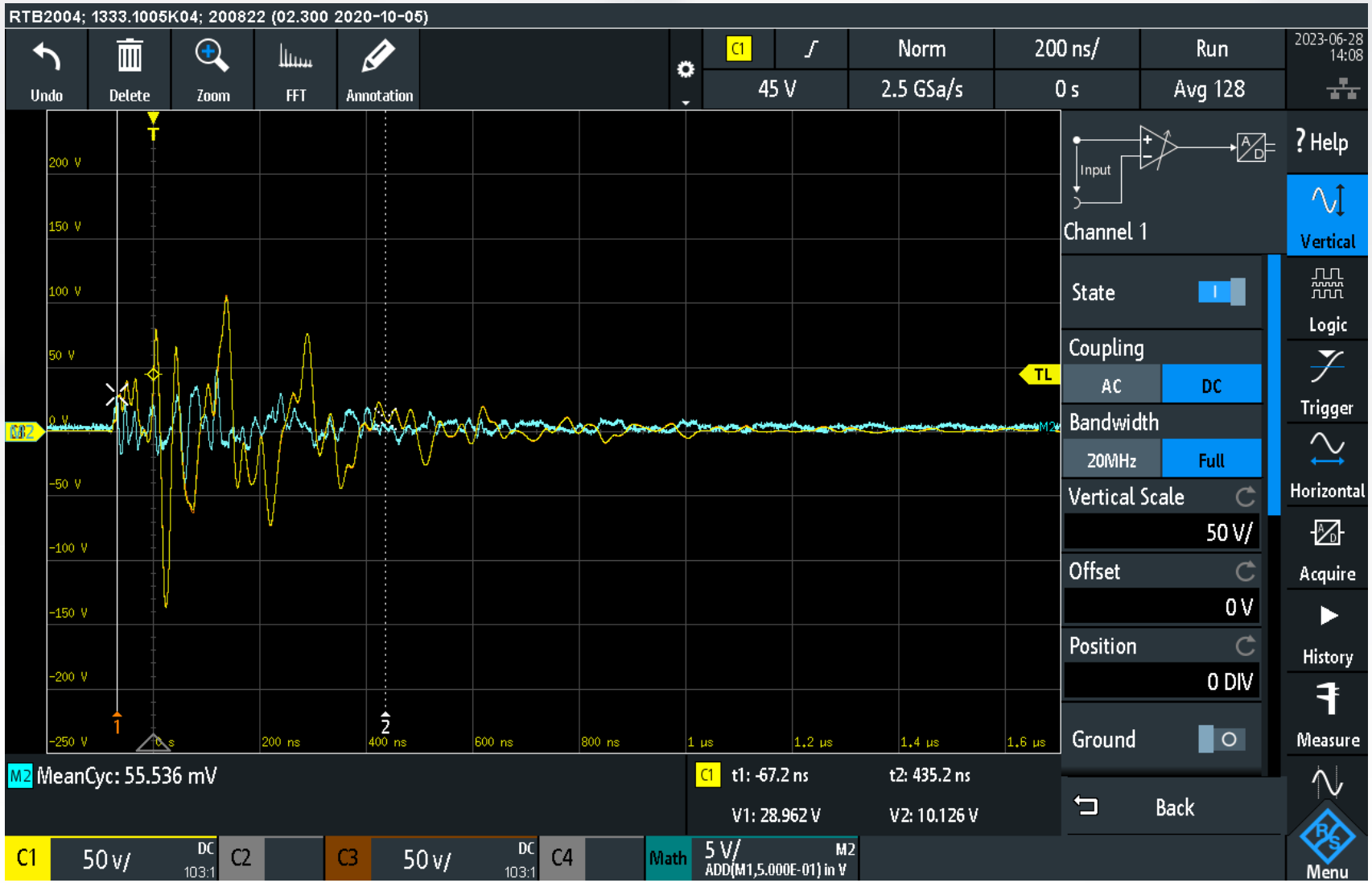
UTP cable, floating nodes, 1kV burst, SPE pair to table (yellow)



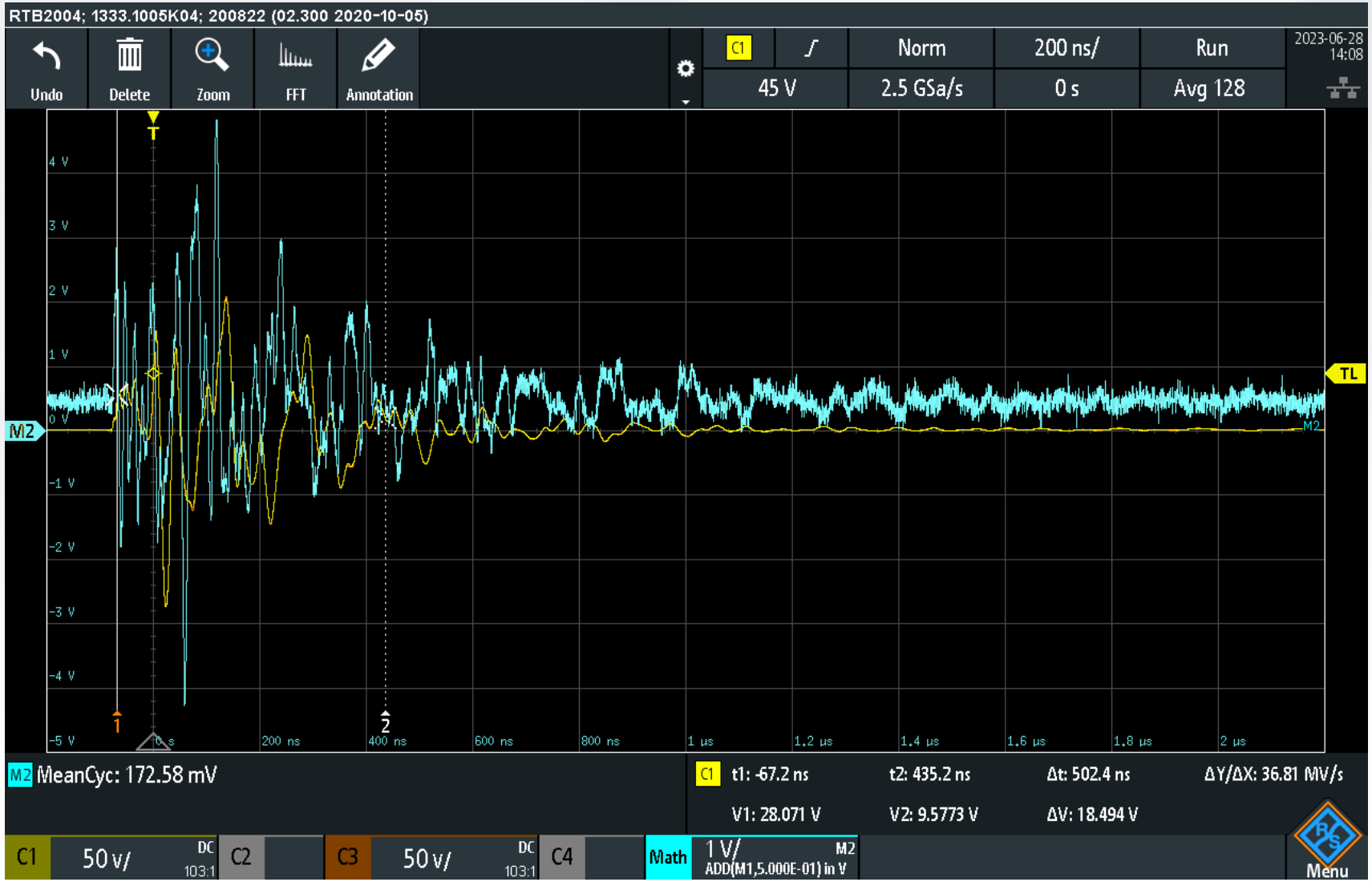
UTP cable, floating nodes, 1kV burst, SPE+ to SPE- (cyan)



UTP cable, transmitter grounded, 1kV burst, SPE pair to table (yellow)



UTP cable, transmitter grounded, 1kV burst, SPE+ to SPE- (cyan)



Conclusions

- As expected, the noise amplitudes as seen by the PHYs are vastly different
- The link noise behavior strongly depends on the common mode termination points on the link

- **The cable ringing period is similar, regardless of cable type**
- **Therefore, the erasure lengths can be expected to be similar in both cable types**

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