

Addendum to “Primary Drive Noise Measurements”

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Purpose

- The purpose of this presentation is to:
 - Present addendum material to:
 - brandt_cg_01b_0517.pdf (presented in New Orleans)
 - Related to characterization of the IEC 61158-2 type A Fieldbus cable that was used

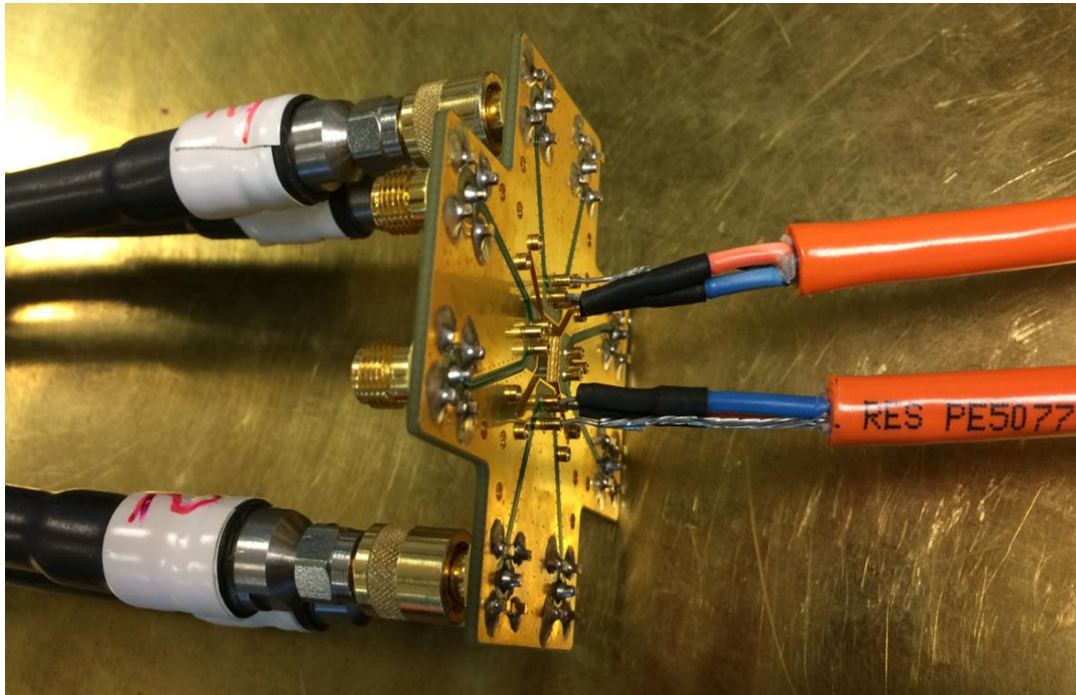
Test cable

- Belden 3076F
 - <http://www.belden.com/techdatas/metric/3076F.pdf>
- 1 pair 18 AWG stranded (7x26) tinned copper conductors
- Polyolefin insulation, polyolefin filler, PVC jacket
 - $V_p = 66\%$
- Beldfoil® shield (100% coverage)
- Tinned copper drain wire
- Fieldbus Foundation Registered Product

- Beldfoil® Tape = Aluminum Foil-Polyester Tape, 100% coverage

Setup

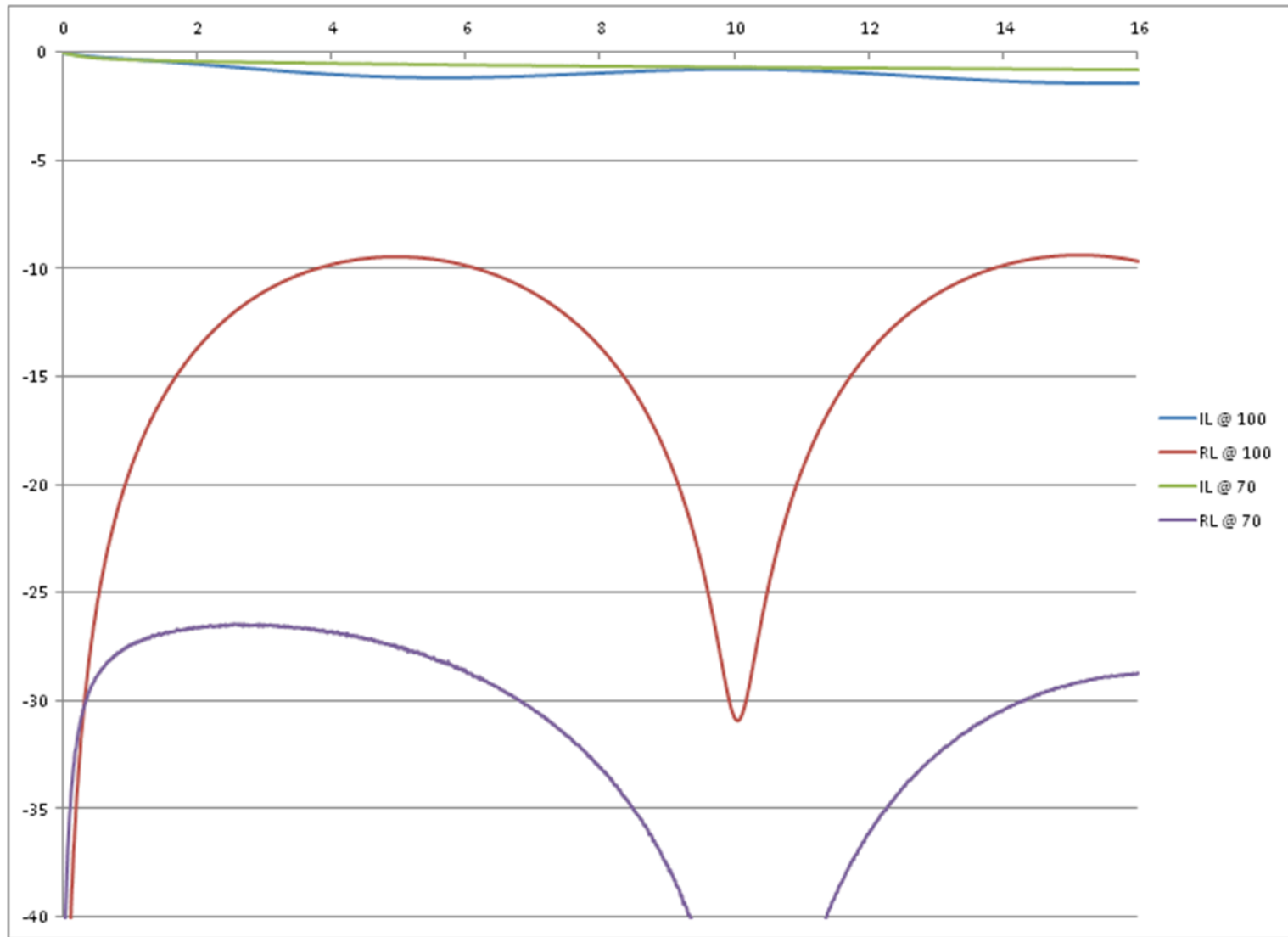
- 15 m of Belden 3076F
- 4-port VNA measurement
 - Directly through test adapter



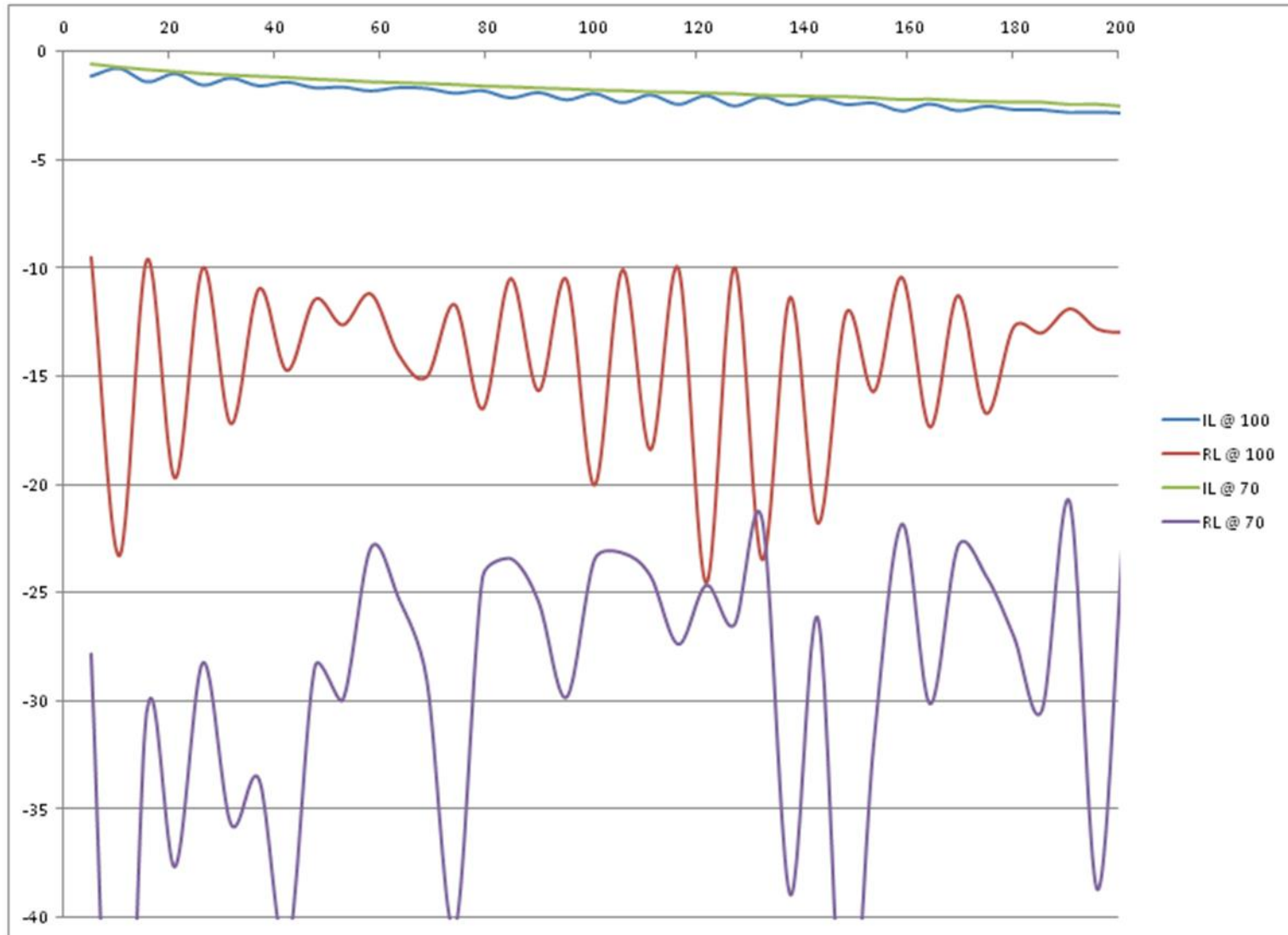
Measurement Result

- S-parameter measurements transformed to the expected impedance (100 Ω differential, 25 Ω common mode)
 - **Indicated a mismatch**
- Cable was found to be closer to:
 - 70 Ω differential
 - 20 Ω common mode

Measurement Result, 16 MHz



Measurement Result, 200 MHz

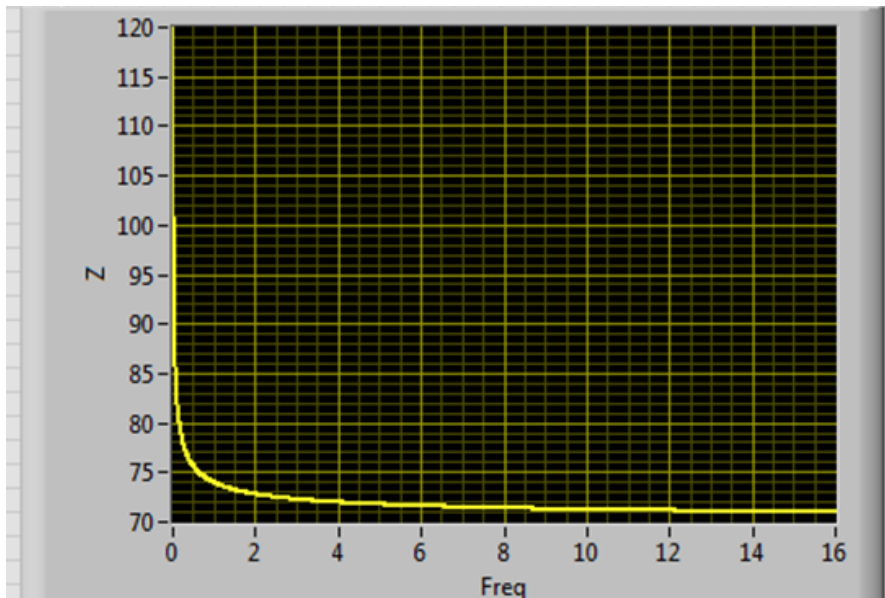


Characteristic Impedance versus Frequency

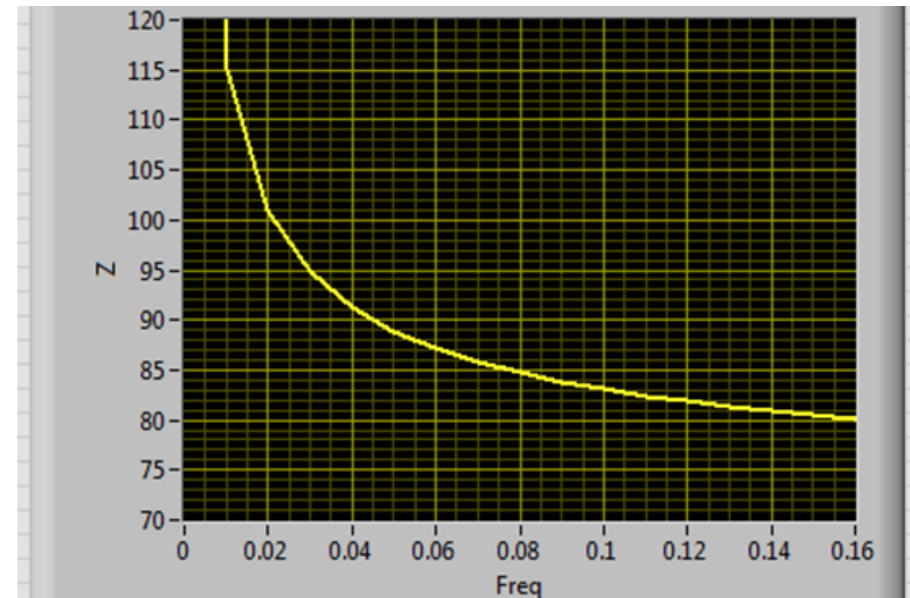
- ANSI/TIA 568-C.2 Equation I-4:
 - Note: f is in MHz

$$Z_{fit} = Z_o \left(1 + 0.055 \frac{1-j}{\sqrt{f}} \right)$$

75-72 Ω from 500 kHz to 16 MHz



100 Ω at 20 kHz



- Some explanation: <http://www.prc68.com/l/Zo.shtml>

Conclusions

- Different IEC 61158-2 type A Fieldbus cables may match poorly to 100 Ω at both the transmitter and at receiver
- We should factor this into our estimates
- It may be warranted to characterize more samples