Measurement of Coupling Attenuation for NGAUTO

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Test Standard Summary

- IEC 62153-4-7: Electromagnetic compatibility (EMC) – Test method for measuring of transfer impedance and screening attenuation or coupling attenuation of connectors and assemblies up to and above 3GHz – Triaxial tube in tube method
- Lower cut off frequency depends on coupling length L:

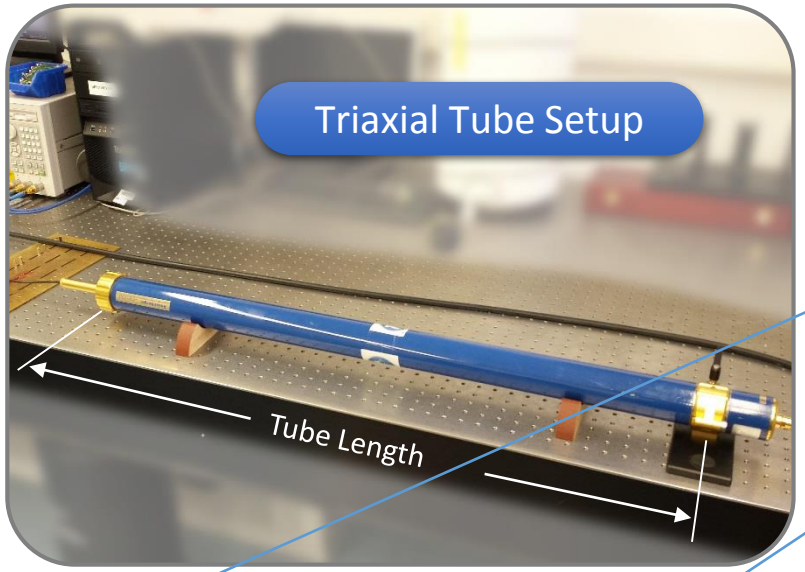
  $f_{lc} > \frac{c_o}{2 \cdot L \cdot \left|\sqrt{\varepsilon_1} - \sqrt{\varepsilon_2}\right|}$ … “electrically long“

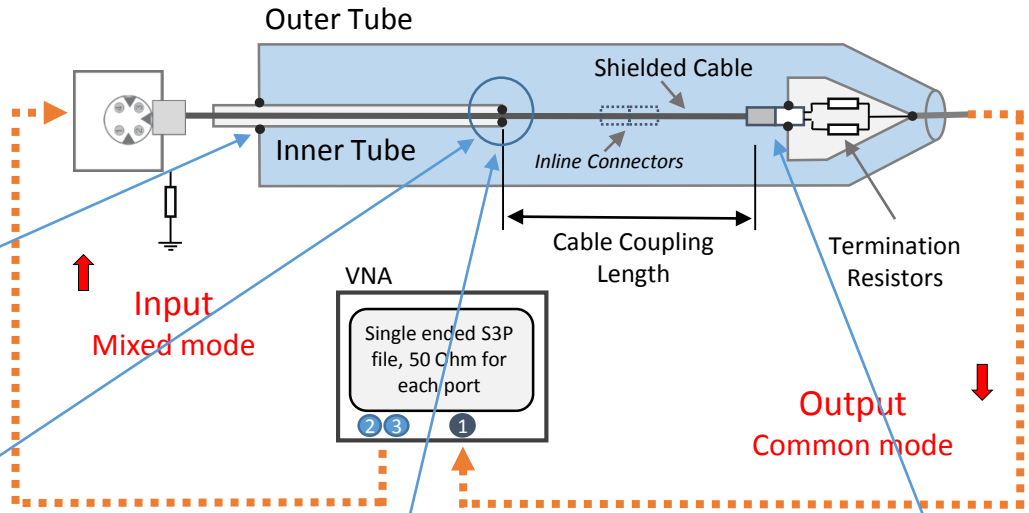
  → ~100MHz for 3m (cable permittivity 2.2)
  → ~300MHz for 1m (cable permittivity 2.2)
- Upper cut off frequency depends on diameters – 40mm outer tube works at least up to 3GHz with typical cables
- IEC standard requires renormalization to 150 Ohm environment:

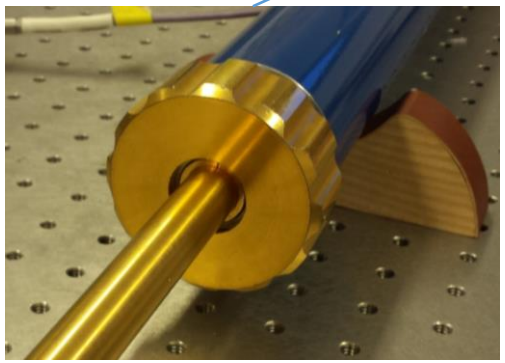
  $$Ssx_{150} = Ssx_{measured} - 10 \cdot log_{10}\left(\frac{2 \cdot 150\Omega}{Z_{DUT}}\right)$$

Tube Setup (IEC 62153-4-7)

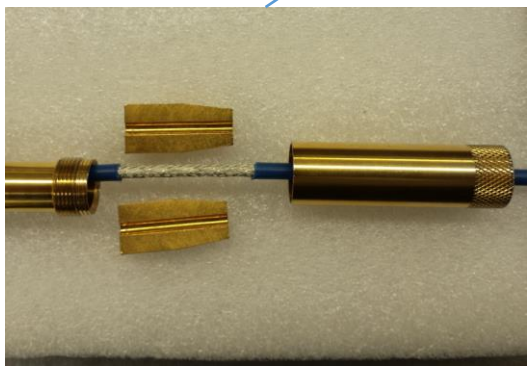
Ssd → (-) Coupling Attenuation
Ssc → (-) Screening Attenuation

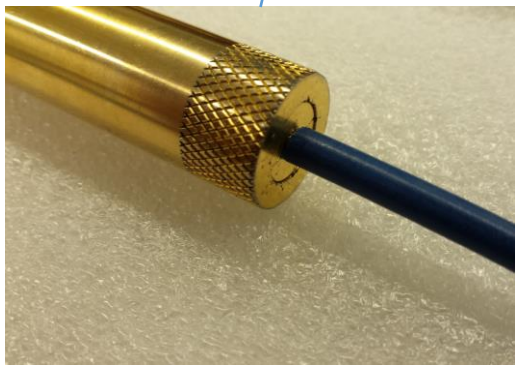




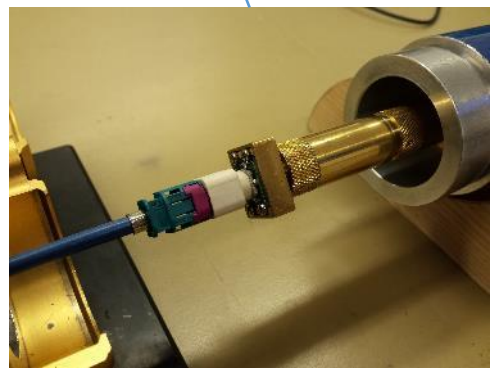


Connection inner tube to outer tube



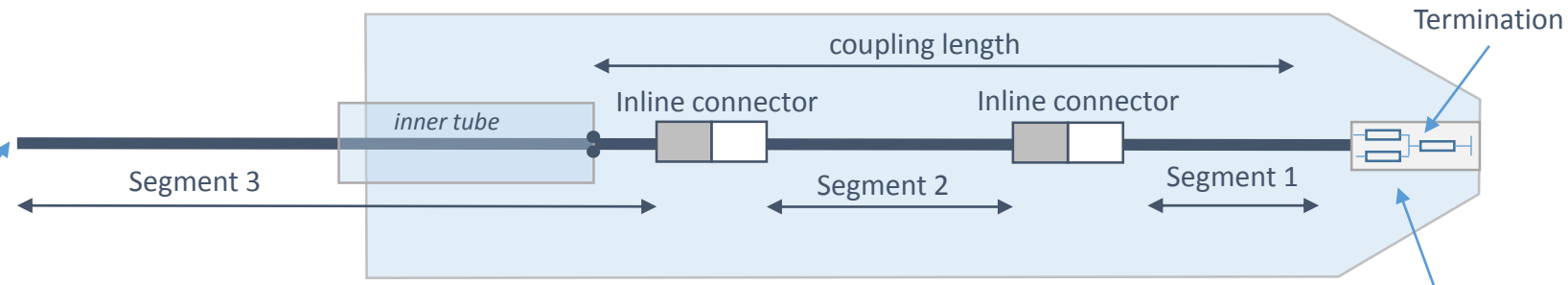


Connection cable shield to inner tube

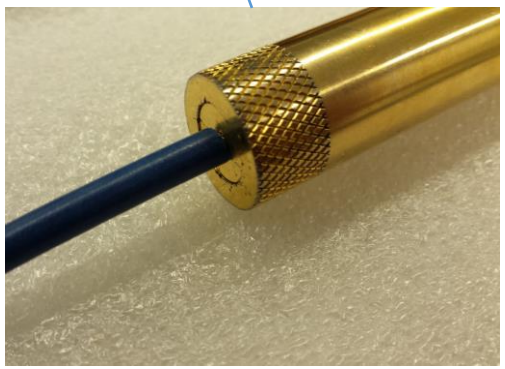


Header adapter with termination

Setup Proposal for NGAUTO Tests



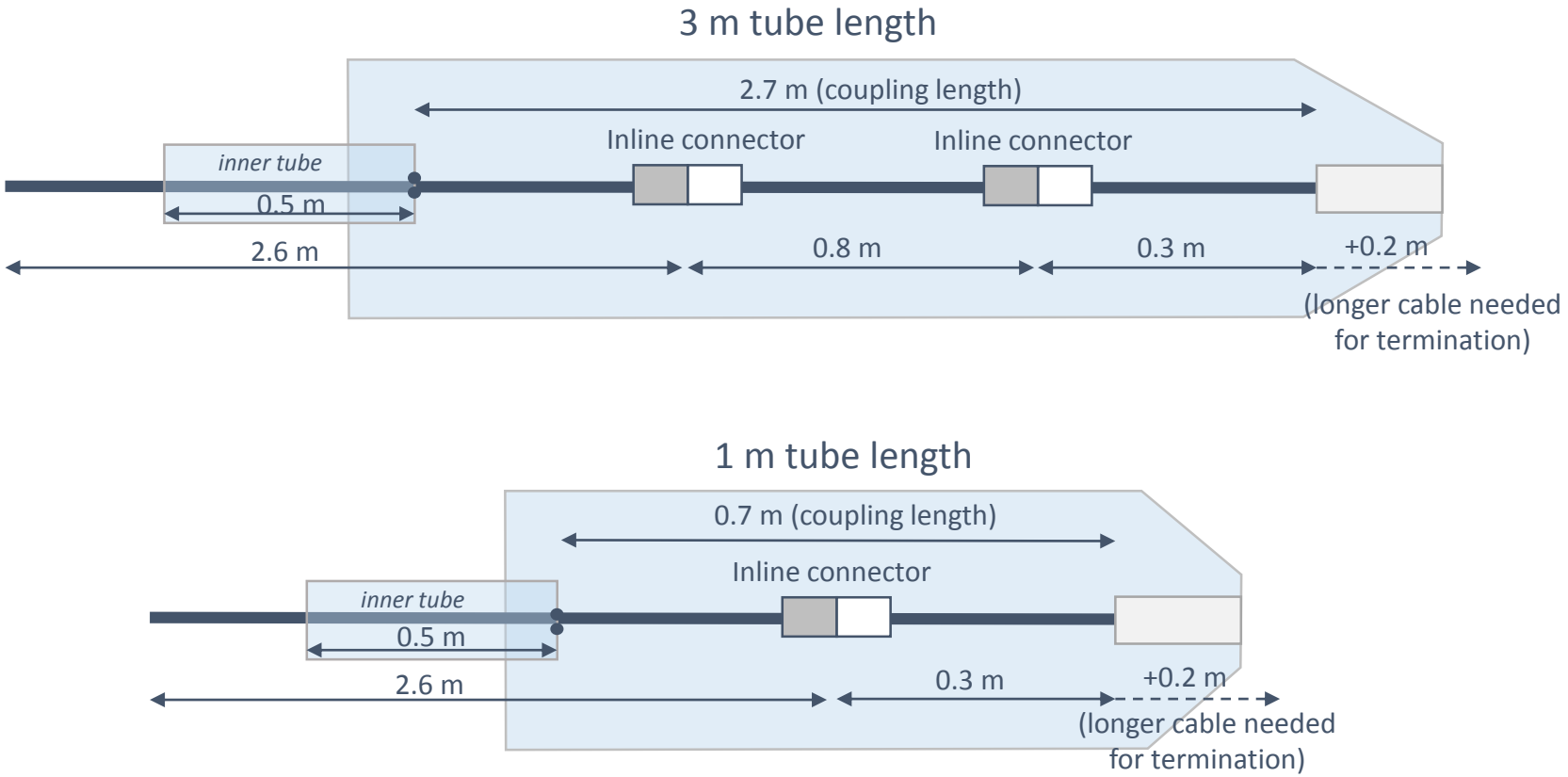
Attachment of the cable to the VNA test cables – no header



No header – termination of the cable end within the inner tube end (resistors soldered to the cable end)

- Propose direct cable termination within the tube
  - → No dependence on specific header and PCB designs
  - → No product specific header adapter and PCB needed
  - → Allows comparison of different cable/inline connectors independently from header GND design

Setup Proposal for NGAUTO Tests



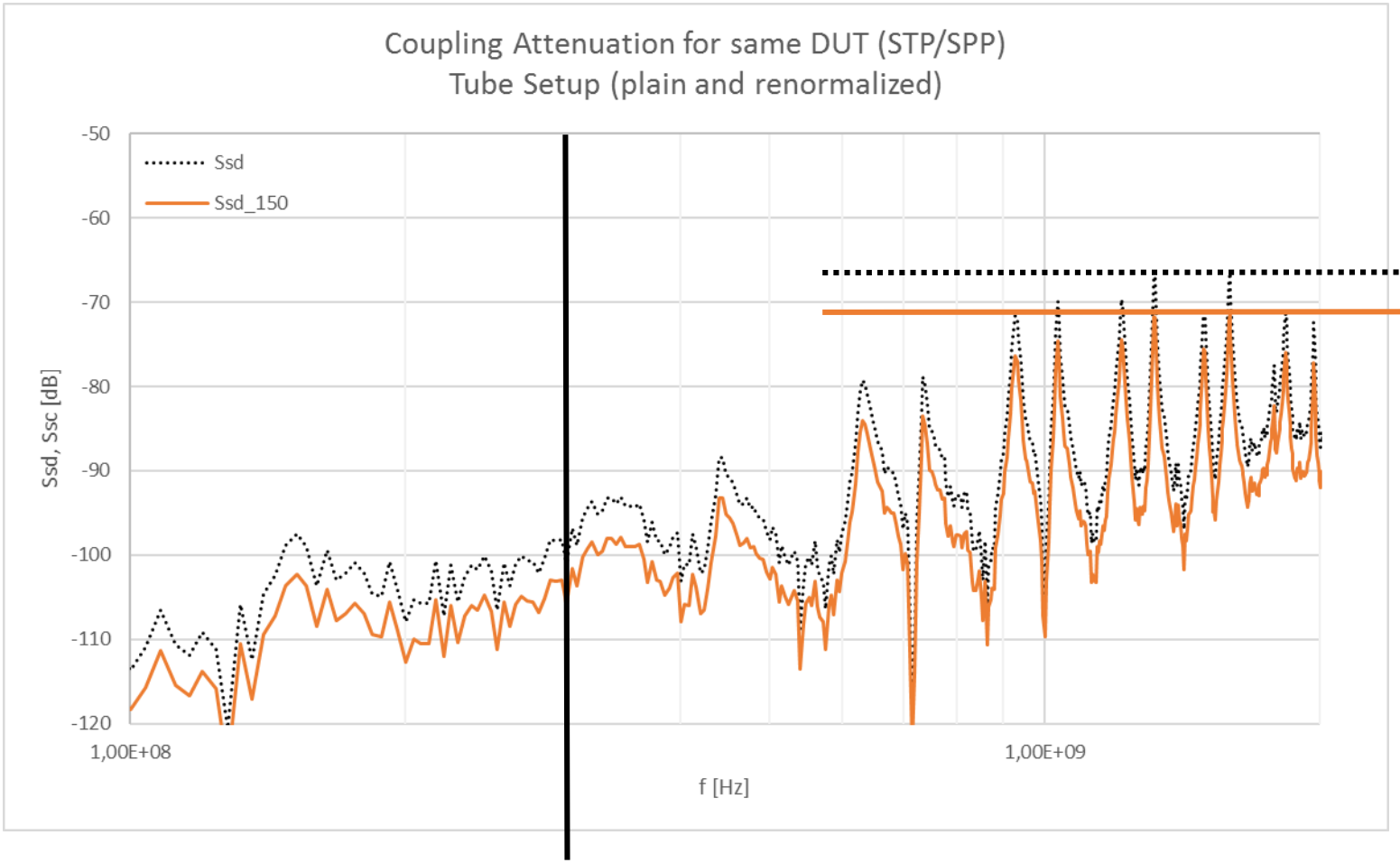
Cable assemblies to be prepared:

2.6m – Connector – 0.8m – Connector – 0.5m

(use same segments)

2.6m – Connector – 0.5m

Example (1m DUT, Cable with Header)



Ssd raw data (max value)

Ssd renormalized to 150 Ohm environment according to IEC standard → = RawData – 4.8dB

→ Propose not to renormalize

Lower cut off frequency (~300MHz)

Summary – Measurement of Coupling Attenuation for NGAUTO

- Use of standard IEC 62153-4-7
- Measure Ssd as it is (no renormalization)
- Measure Scd and 4-port S-parameters in addition for information
- Use direct cable termination inside the tube (no header)
- 3m tube topology:
  2.6m – connector – 0.8m – connector – 0.5m*
- 1m tube topology: same as 3m topology with 0.8m segment removed
  2.6m – connector – 0.5m*

* … 0.5m includes 0.3m inside the tube plus 0.2m extra for termination