Considerations and Proposal for Link Length

IEEE 802.3
ISAAC Study Group

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Motivation

- As a Study Group, we need to converge on basic parameters such as link length, media type, and speeds

- Suggestions for link length and media type have been made in
  - https://www.ieee802.org/3/ISAAC/public/102523/jonsson_3ISAAC_01_102523.pdf
  - https://www.ieee802.org/3/ISAAC/public/102523/Dalmia_ISAAC_02_10252023%20Speed%20Reach.pdf

- This presentation harmonizes the findings and combines them in a joint proposal for objectives

Disclaimer

Data rates above 10Gbps are not addressed in this presentation. At the same time, this presentation has no intention to preclude further proposals for higher data rates in this Study Group.

All existing 802.3 Automotive Ethernet PHYs meet at least 15 m, except cy

Project	PHY name	Cable type	Link length
bp	1000BASE-T1	Jack. UTP (STP)	15 m
bw	100BASE-T1	UTP	15 m
bv	1000BASE-RH	POF	40 m
cg	10BASE-T1S	UTP	15 m (25 m)
ch	MGBASE-T1	STP	15 m
cy	25GBASE-T1	STP	11 m
cz	MGBASE-AU	GOF	40 m
dh	?	POF	15 m

15 m link length was identified as the required link length for automotive. For example....

https://grouper.ieee.org/groups/802/3/RTPGE/public/may12/hogenmuller_01_0512.pdf

Need for coax cable support

- None of the automotive suitable 802.3 PHYs have specified a coaxial channel. However, today's cameras are commonly connected with coax

- In order to be competitive with incumbents, the ISAAC solution has to support coax and Power-over-Coax (PoC)

  - Unbalanced power over needs one set of passives, balanced power over needs two.

  - Therefore PoC implementation is generally more cost efficient than (a) STP with separate power or (b) STP with PoDL

Including coax can ease link length requirements

Example IL with real IL/m values for certain automotive coax and STP cables @3GHz Nyquist Frequency
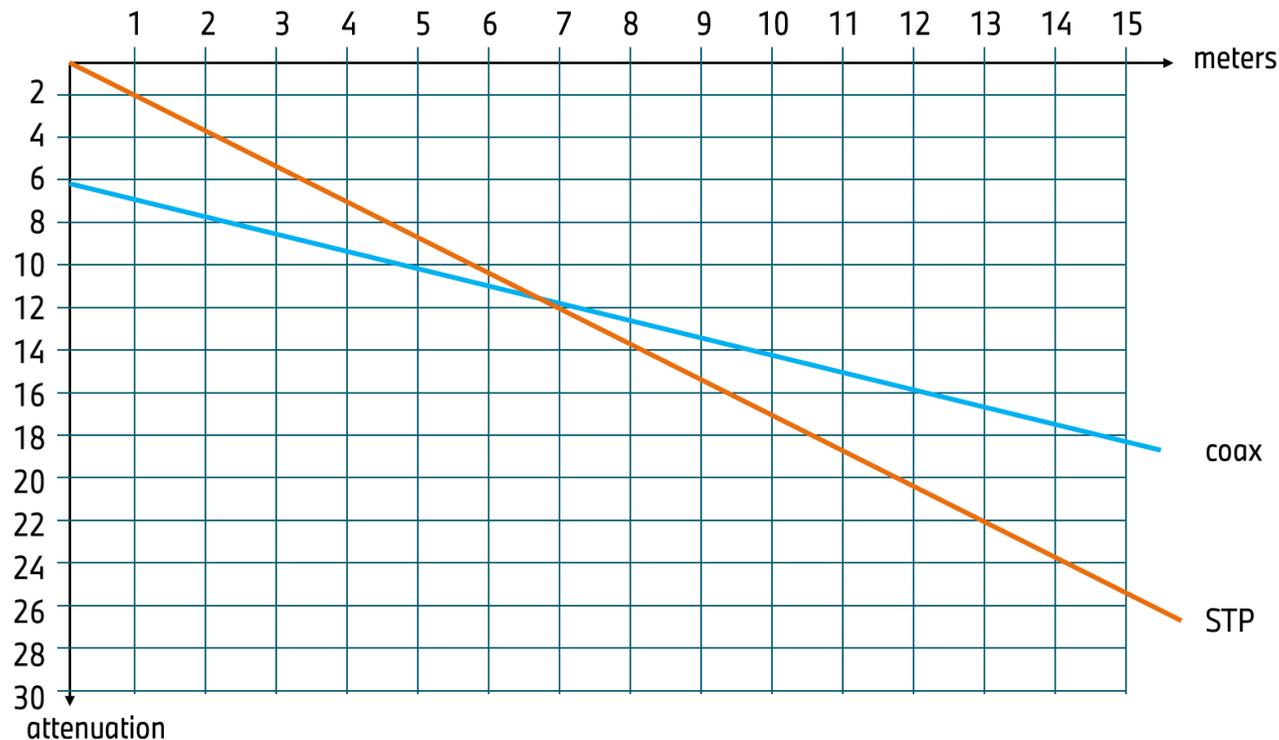
- For longer cables, coax has better insertion loss characteristics than STP for **comparable outer diameter**

- It is reasonable to assume that coax can supports longer link lengths

- If coax meets 15 m (and the automotive requirement), STP can be defined to meet less

The proposal is to request a link length of 15 m

- 15 m operation up to 10 Gbps has proven feasible with IEEE 802.3ch

- Benchmark with IEEE 2977 (A-PHY) and ASA-ML(E)

- Meeting the 15m exploiting the lower loss in coax potentially allows for simpler PHY(s) compared with ch and cy (which might help to increase competitiveness with incumbents) and STP length can be reduced

- Allows for flexibility in the transition from centralized P2P connections to fully zonal without having to consider different link length support

Parameters for the respective objectives

We believe there is general consensus to support *at least* the following elements in the objectives

- STP/Coax

- 15m

- 10Gbps/100Mbps, 5Gbps/100Mbps, 2.5Gbps/100Mbps

- Two inline connectors

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Proposed objective text

- Define performance characteristics of link segments suitable for use with automotive balanced-pair and automotive unbalanced coaxial cables supporting use of up to 2 inline connectors and up to at least 15m reach on at least one type of automotive cabling. Define an electrical PHY to support up to 10 Gbps point-to-point operation in one direction and up to 100 Mb/s point-to-point operation in the other direction over the defined link segments.

- Repeat for 2.5 and 5 Gbps

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Motion

- Adopt the objective(s) as proposed on slide 9 of this slide set.

Mover:

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Thank You!