# Further Considerations Regarding a 7.5 Gb/s Rate

May 2026
Munich, Germany

Tony Schedl, BMW
Steve Gorshe, Microchip

# Supporters

- Ahmad Chini, Broadcom
- Mehmet Tazebay, Broadcom
- Kamal Dalmia, NXP

# OEM Speed Grade Requirements for next Generation automotive Camera Architecture.

A realistic OEM scenario for a next generation automotive camera architecture requires the following speed grades:

- In total up to 15 cameras in the car:
  - ➔3 cameras require a speed grade of < 1 Gb/s.
  - ➔9 cameras require a speed grade of < 2.5 Gb/s.
  - ➔3 cameras require a speed grade of < 7.5 Gb/s.

- Conclusions:
  - ➔ Actually there is no camera usecase utilizing 5 Gb/s or 10 Gb/s.
  - ➔ 7.5 Gb/s allows for low cost integration of camera usecases.

# OEM Speed Grade Requirements for next Generation automotive Display Architecture.

A realistic OEM scenario for a next generation automotive display architecture requires the following speed grades:

- In total up to 7 displays in the car:
  - ➔2 displays require a speed grade of < 2.5 Gb/s.
  - ➔3 displays require a speed grade of < 5 Gb/s.
  - ➔2 displays require a speed grade of < 7.5 Gb/s.

- Conclusions:
  - ➔ Actually there is no display usecase utilizing 10 Gb/s.
  - ➔ 7.5 Gb/s allows for low cost integration of display usecases.

# IEEE802.3dm Scope Compatability

- **From the PAR:** "The scope of this project is to specify additions to and appropriate modifications of IEEE Std 802.3 to add Physical Layer specifications and management parameters for electrical media and operating conditions that are optimized for automotive end-node camera links for operation up to 10 Gb/s in one direction and with a lower data rate in the other direction."

- Presentation https://www.ieee802.org/3/dm/public/0326/gorshe_3dm_02a_0326.pdf explained why there is no need to define an equivalent 7.5 Gb/s MAC because the MAC is inherently rate-less
- **In response to this question, David Law clarified to the authors as follows:**
  - "… a MAC can support any aggregate data rate less than or equal to its MAC data rate. …"
  - "Based on this, I believe that you are correct that a 7.5 Gb/s PHY will operate correctly with a 10 Gb/s MAC (assuming the RS supports this). …"

- **In summary, a P802.3dm high-speed rate of 7.5 Gb/s can use the existing 10 Gb/s MAC definition**

# Technical Considerations

- **As explained above, there are P802.3dm applications that could benefit by a rate between 5 and 10 Gb/s**
  - For example, a camera using 3840x2160 @ 12bpp @ 60fps -> 5.986 Gbps
- **Adopting PAM3 modulation for 7.5 Gb/s would result in the same PHY symbol rate as PAM2 for 5 Gb/s and PAM4 for 10 Gb/s**
  - Consequently, there should be no need for additional performance testing to evaluate the proposal
- **PAM3 is already defined and specified in IEEE 802.3 Table 97-2**
- **Consequently, adding 7.5 Gb/s support at the PHY is straightforward with effectively no change other than PAM3 modulation that can reference Table 97-2**
  - The added complexity is the PAM3 encoder/decoder, which is similar to the PAM4 complexity

# Technical Advantages of 7.5G PAM3

- **PAM3 provides greater Euclidean distance than PAM4, resulting in SNR improvement that would enable improved performance at longer reaches**

- **PAM3 allows using lower pulse voltage levels than PAM4**
  - Providing a power reduction advantage relative to PAM4
  - The voltage levels are compatible with smaller geometry IC technology
    - Supporting PAM4 voltage levels adds significant complexity and relative cost due to PHY die area

# Conclusions

- **In summary:**
  - There are  substantial number of known, significant automotive imager applications for which 7.5 Gb/s is better suited than 10 Gb/s:
  - Due to the MAC being inherently rate-less, 7.5 Gb/s can use the 10 Gb/s MAC
  - Using PAM3 has significant technical advantages in terms of performance and fit with future silicon geometries

- **Consequently, it is proposed to:**
  - Add new 7.5 Gb/s objectives
  - Include this option as elaborated in pending D2.0 comments

# Thank You