

Further Considerations Regarding a 7.5 Gb/s Rate

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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.

Chinese OEM Camera Configurations — Production Evidence (2025-2026)

OEM / Model	Camera Count	High-Res Cameras	Raw BW (Top)	Speed Grade Need	Status
OEM1_Model	11 ext + 2 int	7 × 8 MP	5.75 Gb/s	< 7.5G (exceeds 5G)	Production 2025
OEM2_Model	11	6×8MP + 1×2MP	5.75 Gb/s	< 7.5G	Production 2025
OEM3_Model	11–12	3 × 8 MP	5.75 Gb/s	< 7.5G	Production 2024–25
OEM4_Model	11	1 × 8 MP front	5.75 Gb/s	< 7.5G	Production 2024–25
OEM5_Model	12–13	3 × 8 MP (front triple)	5.75 Gb/s	< 7.5G	Production 2025
OEM6_Model	16	16×HD (dist. N/A)	5.75 Gb/s	< 7.5G	Production 2024
OEM7_Model	11–12	Multi 8 MP	5.75 Gb/s	< 7.5G	2025–2026

CHINA MARKET VALIDATION

- 11-camera architectures are now mainstream for highway/urban NOA, adopted by 32 brands across 83 models including Xiaomi, XPeng, Yangwang, Li Auto

Sources: NIO Official Config Portal, Li Auto i8/i6 Launch Materials, XPeng P7+ Specs, Xiaomi SU7/YU7 Config, BYD Tang L/Han L Launch, Yangwang U8 Specs, Huawei AITO M9 2026 Refresh, Gasgoo Auto Research 2025

NIO ET9: <https://www.nio.cn/vehicle/configuration/et9>

LI AUTO i8: <https://car.autohome.com.cn/config/spec/74102.html>

Xpeng P7+: <https://car.autohome.com.cn/config/spec/69103.html>

Xiaomi SU7: <https://car.autohome.com.cn/config/spec/65768.html>

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, which was the basis for P802.3dm specifying using XGMII for the 100 Mb/s interface
- ❑ In response to a request, David Law provided the following opinion:
 - ❑ A MAC can support any aggregate data rate less than or equal to its MAC data rate.
 - ❑ The MAC can operate at any aggregate data rate, but enforces a 96 BT IPG at its data rate
 - ❑ The RS may extend the IPG for lower data rates, but cannot shorten it for higher data rates
 - ❑ Assuming the RS supports it, a 7.5 Gb/s PHY will operate correctly with a 10 Gb/s MAC
- ❑ **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:

- ❑ Include this option as elaborated in pending D2.0 comments
- ❑ Add new/updated 7.5 Gb/s objectives as part of D2.0 comment resolution

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