

**Informal Group on gtr No 9 – Phase 2 (IG GTR9-PH2)  
6<sup>th</sup> meeting, Washington DC, 19 – 20 March 2013**

# **Discussion on Impactor Thresholds**



Presented by the pedestrian safety experts of the  
International Automobile Manufacturers' Organization (OICA)

---

## Background

- With document GTR9-5-20, BASt proposes to change the impactor thresholds for the FlexPLI testing
- BASt justifies the proposal with lower output values that were achieved with series production legforms in comparison to former FlexPLI prototypes
- It had been explained that the series production legforms used are those that were also used for the definition of the new certification corridors and which had been specifically prepared – the so-called “master legforms”
- These series production legforms represent the latest build level as agreed in this Informal Group and its Task Forces and meet the (new) certification corridors for the full impactor that were agreed during the activities of the Informal Group

## Background (Continued)

- With document GTR9-5-27, JAMA already explained that the process used to define the injury thresholds:
  - Is based on validation and certification of the FlexPLI components (tibia, femur, knee) (see document TEG-096 of the former FlexPLI Technical Evaluation Group);
  - Used transfer functions to validate the performance of the components against human lower limb outputs;
  - Was agreed during the work of the former TEG;
  - Would lead to the same impactor thresholds – independent of the legforms' build levels – since the component certification corridors have not been changed

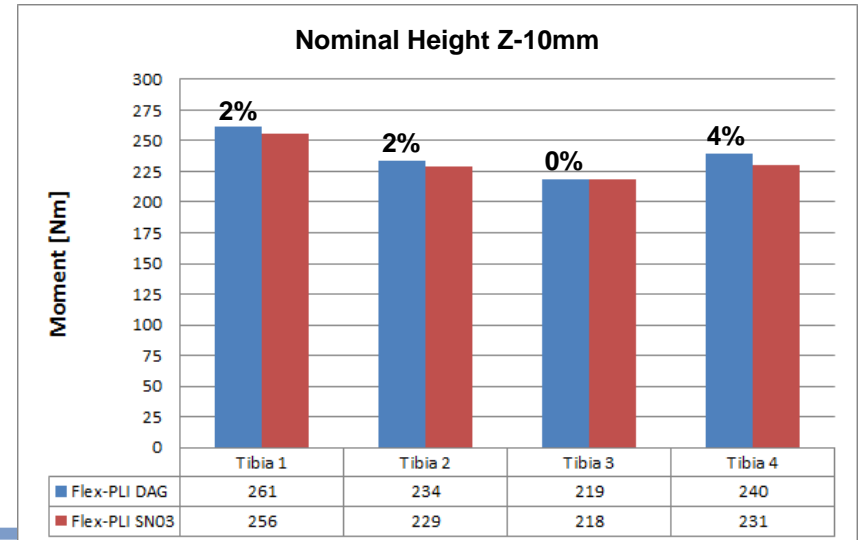
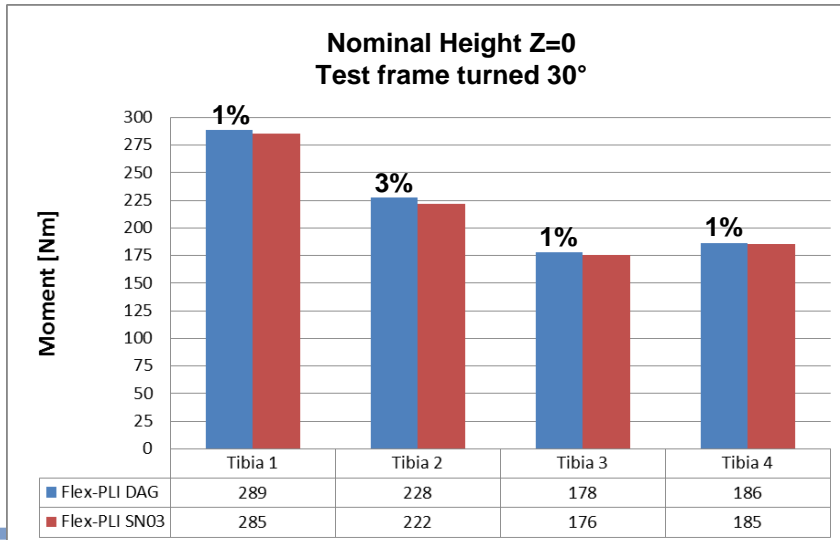
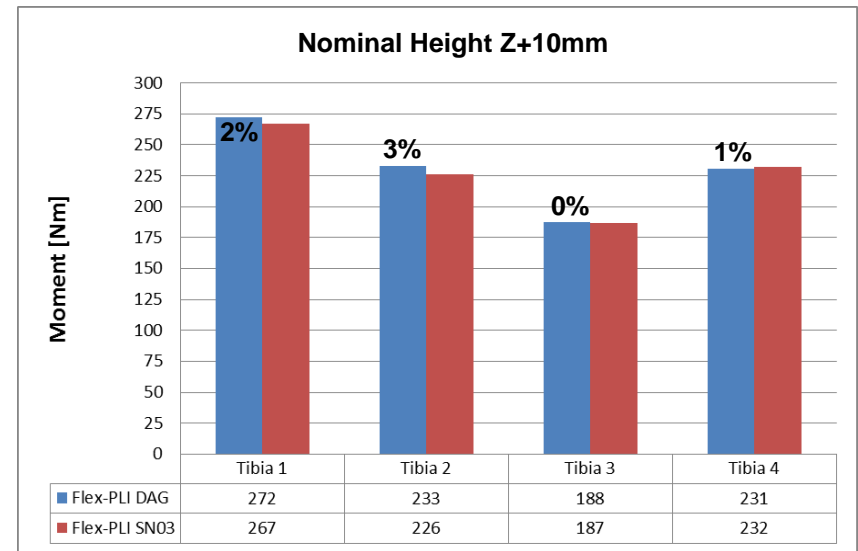
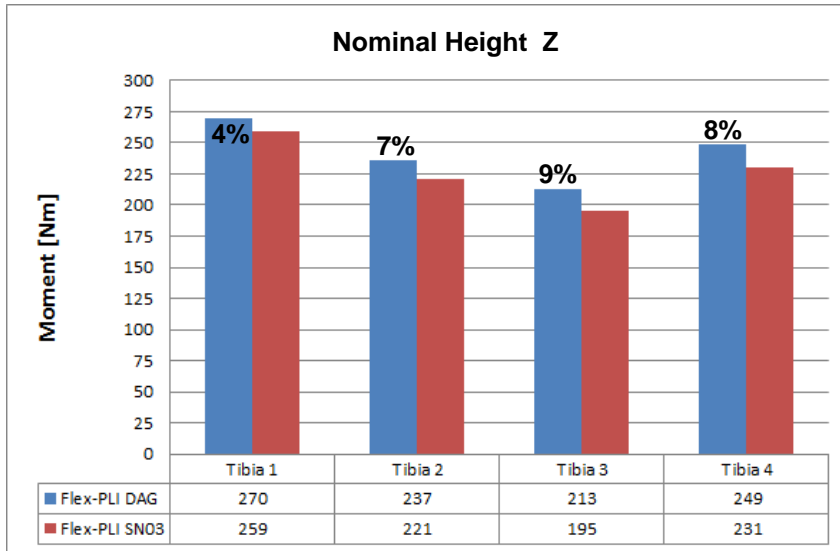
## Assessment of BASt's Proposal

- The study conducted by BASt used two vehicle models (sedans), in total 18 tests were conducted with a former prototype legform and 16 tests with serial production legforms (“master legs”)
  - ⇒ It is questionable whether conclusions can be drawn for the whole vehicle fleet with such a limited number of tests and tested vehicles
  
- For the study of BASt, just two legforms were used
  - ⇒ It is questionable whether the performance of two impactors can be generalized even if they are “master legs”; industry already noted that the outputs of the impactors vary considerably
  - ⇒ Tests with another impactor – that was confirmed to have the same build level as the “master legs” – show higher output values (see pages 6 and 7: tests were conducted against a test rig to guarantee that no vehicle influence can be seen, 2 tests per measuring point were conducted)

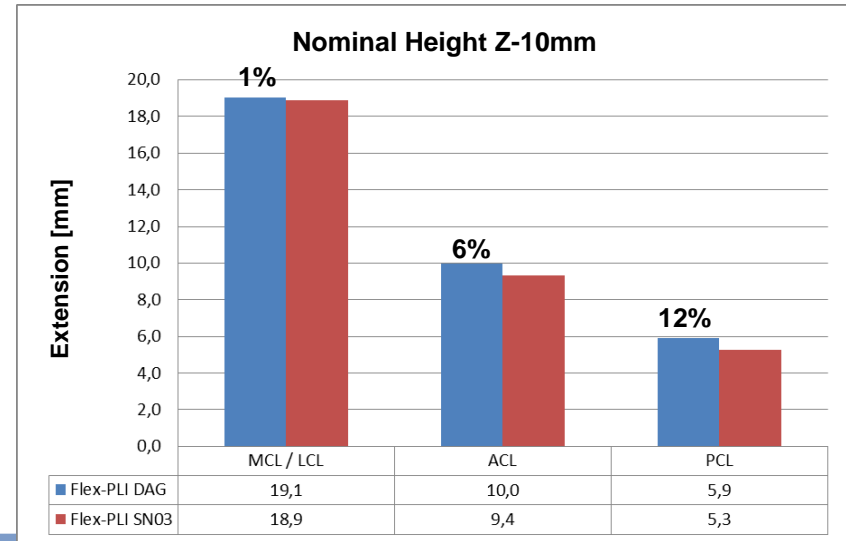
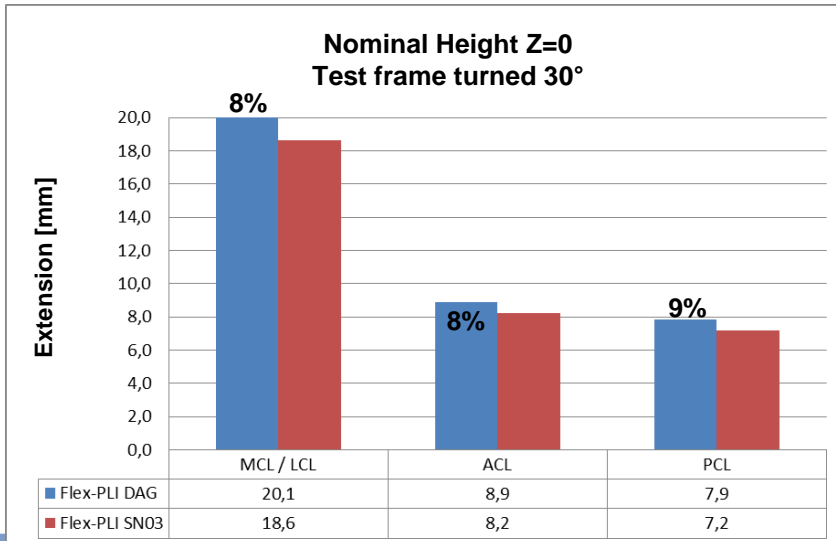
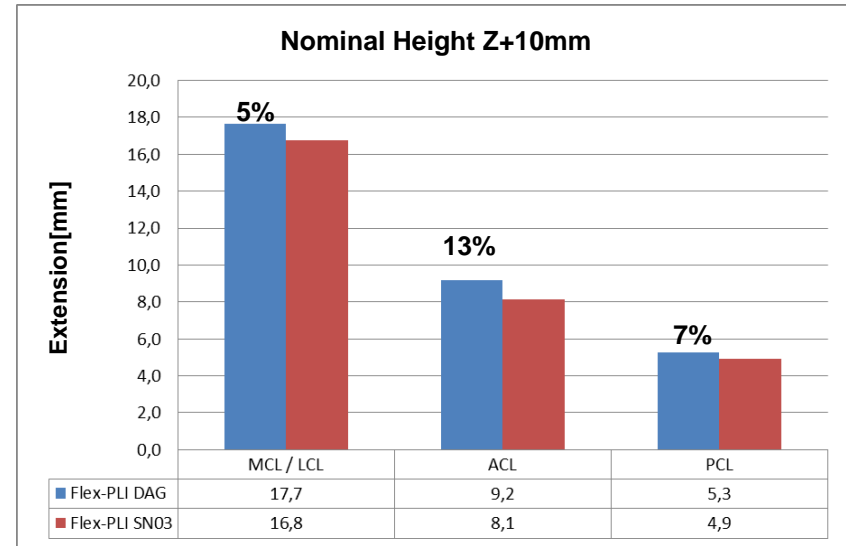
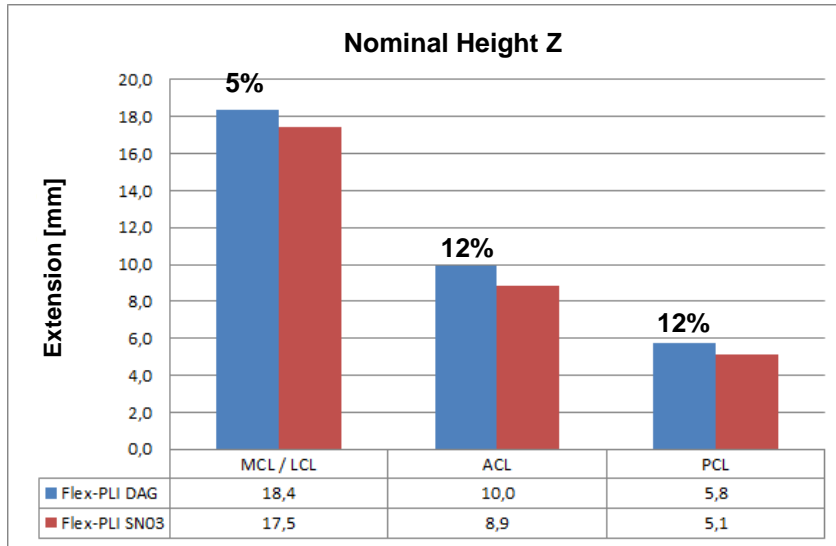
## Assessment of BAST's Proposal (Continued)

- As explained by BAST, the certification corridors for the assembled legform were shifted down, depending on the test results with the so-called “master legs”, in the inverse certification test between 2.3 % and 7.8 % for the tibia moments and between 4.8 % and 7.3 % for the ligaments; for the new injury thresholds, BAST uses only the maxima of these shiftings
- ⇒ It is incoherent to only take the maxima into consideration, especially when noting that BAST also reported in an earlier document (document GTR9-4-14 of the 4<sup>th</sup> meeting of this IG) that the legforms in repeatability tests have coefficients of variation that are even higher in some cases
- ⇒ For the definition of the new certification corridors for the assembled impactor the methodology agreed in the TEG was used; consequently, for the impactor thresholds the TEG agreed methodology should also be used

# Comparison of Master Leg SN-03 with an OEM Leg of the Same Build Level (1)



# Comparison of Master Leg SN-03 with an OEM Leg of the Same Build Level (2)



## Conclusions

- Following the logic of BAST's approach, it now would be appropriate for Industry to require increasing the injury thresholds
  - However, Industry experts are in agreement that the results achieved in the TEG represent an acceptable compromise definition of the injury thresholds in gtr No 9
  - As already pointed out in document GTR9-5-23, all Industry activities especially regarding the assessment of the feasibility of vehicle countermeasures were based on agreements achieved in the TEG in 2009; new impactor thresholds may need further validation that would need to be considered for the schedule of the Informal Group
- ⇒ Industry therefore proposes to stick to the impactor thresholds as agreed in the TEG:
- Tibia bending moments of 340 Nm
  - MCL elongation of 22 mm
  - ACL / PCL elongation of 13 mm





# THANKS

For detailed questions please refer to the authors,  
Messrs. Thomas Kinsky / General Motors Europe Engineering, Dr. Abayomi Otubushin / BMW, Klaus Rathje / Daimler

---