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**10<sup>th</sup> TEG FlexPLI Meeting  
01 – 02 December 2009  
BASt offices, Bergisch Gladbach / Germany**

# **ACEA Comments**



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## 1. Results of ACEA Round Robin Tests (1/4)

### Conditions for ACEA manufacturers' round robin tests

- FlexPLI version GTR significantly differs from the preceding version GT / GT $\alpha$
- 3 prototypes of version GTR were initially available in January 2009 for ACEA/BASt: SN01 with wiring, SN02 & SN03 with on-board DAS
  - SN01 was sent back in May 2009
  - (SN02 is still available for ACEA members)
  - SN03 was sent back in February 2009 after initial testing to serve JAMA
  - Different electronics (different components and/or different manufacturers)
- In addition, SN04 with on-board DAS was available only in summer 2009
- ACEA members' in-house testing
  - Started in March 2009
  - Needed to be stopped in November 2009
  - Most tests were performed with the prototypes SN02 and SN04
- These tests were the first chance for European manufacturers to assess the prototypes of the FlexPLI version GTR



## 1. Results of ACEA Round Robin Tests (2/4)

Remarks based on observations and experiences during the test and their results

- Repeatability seems appropriate
- Reproducibility could not be assessed adequately (limited number of impactors)
- Usability is promising
- Technical feasibility appears promising
- Test results as well as first experiences indicate that FlexPLI version GTR has potential to be successfully used in vehicle design processes

Nevertheless:

- Numerous open issues were identified
- Some new observations need to be pursued urgently
- Detailed design studies have not been possible within 2009 due to limited time and due to a missing FE-model of version GTR



## 1. Results of ACEA Round Robin Tests (3/4)

### Open issues

- Reasons of increased test results (10% to 15%) of version GTR compared to version GT / GT $\alpha$  have not been studied in detail so far
- Some asymmetric behaviour of knee section was still observed in vehicle tests (reference: TEG/089 - ACEA tests at BAST/BGS)
- The effect on bumper designs of SUV-like vehicles is still not fully understood
- Time for collecting sufficient experiences with version GTR prototypes was very limited (around 6 months all together, just around 2 weeks per ACEA member)
- Reproducibility needs to be assessed
- A validated FE-model of version GTR is urgently needed



## 1. Results of ACEA Round Robin Tests (4/4)

### Observations during ACEA members' in-house tests

- New problems were observed which could help to improve version GTR in the pre-test phase, during and after testing related to the impactor hardware and software, e.g.
  - more user friendly software desired
  - rubber sheets, cable problems
  - uncontrolled rebound influences operational safety – this behaviour jeopardizes test equipment and staff
  - mechanical stops of measuring devices are close to the compliance criteria – for MCL stop at 28 mm elongation, for tibia from 350 Nm the stopper cables are loaded
- Further observations will be provided depending on the progress of further testing
- However, ACEA believes that solutions for these new issues can be found by all TEG partners in due time to improve the handling of FlexPLI version GTR



## 2. Bumper Relaxation Zone (1/2)

- The request of a relaxation zone with a relaxed criterion within the bumper test zone reflects technical aspects of feasible bumper designs  
(references: preamble of the gtr 9, paragraph 115  
gtr document INF GR/PS/127  
gtr document INF GR/PS/089 (EC feasibility study)  
gtr document INF GR/PS/091)
- During the gtr discussion, all experts agreed on this request and consequently a criterion of 250 g in a bumper area of 264 mm was proposed considering Industry's usual safety margin of 20 % which results in a design target of 80% = 200 g that is accepted as indication of tibia fracture

Extract from INF GR/PS/089, Section 8.1.1.

As discussed in Section 7, it is proposed to have a relaxation zone, a maximum total of 264 mm of the legform test width; for this the acceleration limit will be increased to 250 g which will give a manufacturers' target of 200 g.



## 2. Bumper Relaxation Zone (2/2)

- Technical constraints recognized by the gtr experts are not only related to towing hooks etc. but are also related to areas where a higher stiffness is necessary due to other legal requirements or due to individual requirements of e.g. special purpose vehicles
- The gtr experts stated that the request for relaxation is based on a mix of research and expert opinions
- The request for relaxation is linked directly to the legform to bumper test procedure
- The request for relaxation does not depend on the measuring tool to assess pedestrian friendliness of future bumper designs
- This relaxation request should be kept independent of the fact that gtr 9 will be amended to include a new test tools

ACEA proposes the definition of a relaxation criterion for tibia bending that is based on the same pragmatic approach as explained above





### 3. Transition Period for FlexPLI and TRL-LFI

- Discussion on the flexible legform impactor started in 2004 within the gtr experts' group
- Due to lack of experience with the FlexPLI at that time it was agreed to establish a FlexPLI TEG that started working in September 2005
- The gtr experts' group noted the need of a transition period where **either** the TRL-LFI **or** the FlexPLI (once integrated in the gtr) can be chosen for bumper testing and the respective vehicle design  
(references: preamble of the gtr 9, paragraph 115  
gtr document INF GR/PS/109)
- One vehicle life cycle is a suitable timeframe for an alternative impactor choice
- Request for a right of continuance for vehicle variants once approved with TRL-LFI

Consequently, ACEA proposes 8 years as an appropriate transition period and certification validity of models should be granted for vehicles' complete life cycles once certified with the TRL-LFI



## 4. Summary

- Vehicle tests indicate a promising status of the FlexPLI version GTR development
- Version GTR shows potential to develop pedestrian friendly vehicles
- Nevertheless, before being used as a legal tool numerous open issues are to be solved:
  - Evaluation of the reproducibility of test results using FlexPLI version GTR
  - Differences to version GT / GT $\alpha$  (higher test results) need to be investigated
  - Effects on SUV-like vehicles needs to be understood
  - A validated FE-model is urgently needed for fundamental design analyses
  - Clarification and next steps regarding new observations during the tests
  - ...
- A relaxation zone with a relaxed criterion should be provided being in line with the gtr 9 concept
- A transition period of one vehicle life cycle appears to be appropriate combined with a right of continuance once vehicle variants are certified with the TRL-LFI



## 5. Next Steps (1/2)

- TEG is requested to continue its activities in 2010
- Provision of prototype impactors needed in 2010
- Collection and investigation of solutions regarding handling problems observed so far by March 2010
- Clarification of open issues, study of SUVs, further examination of design concepts by May 2010
- A further TEG meeting to be held **before** the 47<sup>th</sup> GRSP session in May 2010 in April / May 2010



## 5. Next Steps (2/2)

- Targets for further TEG activities:
  - Careful review of all open issues
  - Technical update of the FlexPLI version GTR assessment
  - Basis for a modified gtr 9 amendment (i.e. deletion of the [...])
  
- Possible consequences for Japanese authorities (to be clarified in 10<sup>th</sup> TEG): (reference: JAMA information provided during the OICA pre-meeting in November 2008)
  - Delayed adoption of the gtr 9 amendment
  - Public comments in Japan from March 2010 (delayed)
  - Interim period of 18 months for administrative issues (reduction of 6 month)
  - New pedestrian legislation could be officially completed by end of 2012



## 6. ACEA Recommendations

- ACEA generally requests **more time to study the open issues** as detailed as possible – see proposed **next steps**, time schedule
- ACEA needs to have **further access to** prototype(s) of FlexPLI **version GTR** for further in-house tests & studies **in 2010**
- The FlexPLI should **NOT be introduced overhasty** into legislation – the elimination of problems is more difficult and time consuming after acceptance as a legal tool
- Until open issues are treated adequately, **square brackets must be kept** or **limits need to be increased**
- A **relaxation criterion** should be **defined** following the pragmatic approach of the gtr experts' group
- A **transition period** of **8 years** and the right of continuance for vehicle variants once certified with the TRL-LFI are proposed



## 7. Test Results, Charts

The following charts contain the results of the ACEA round robin tests

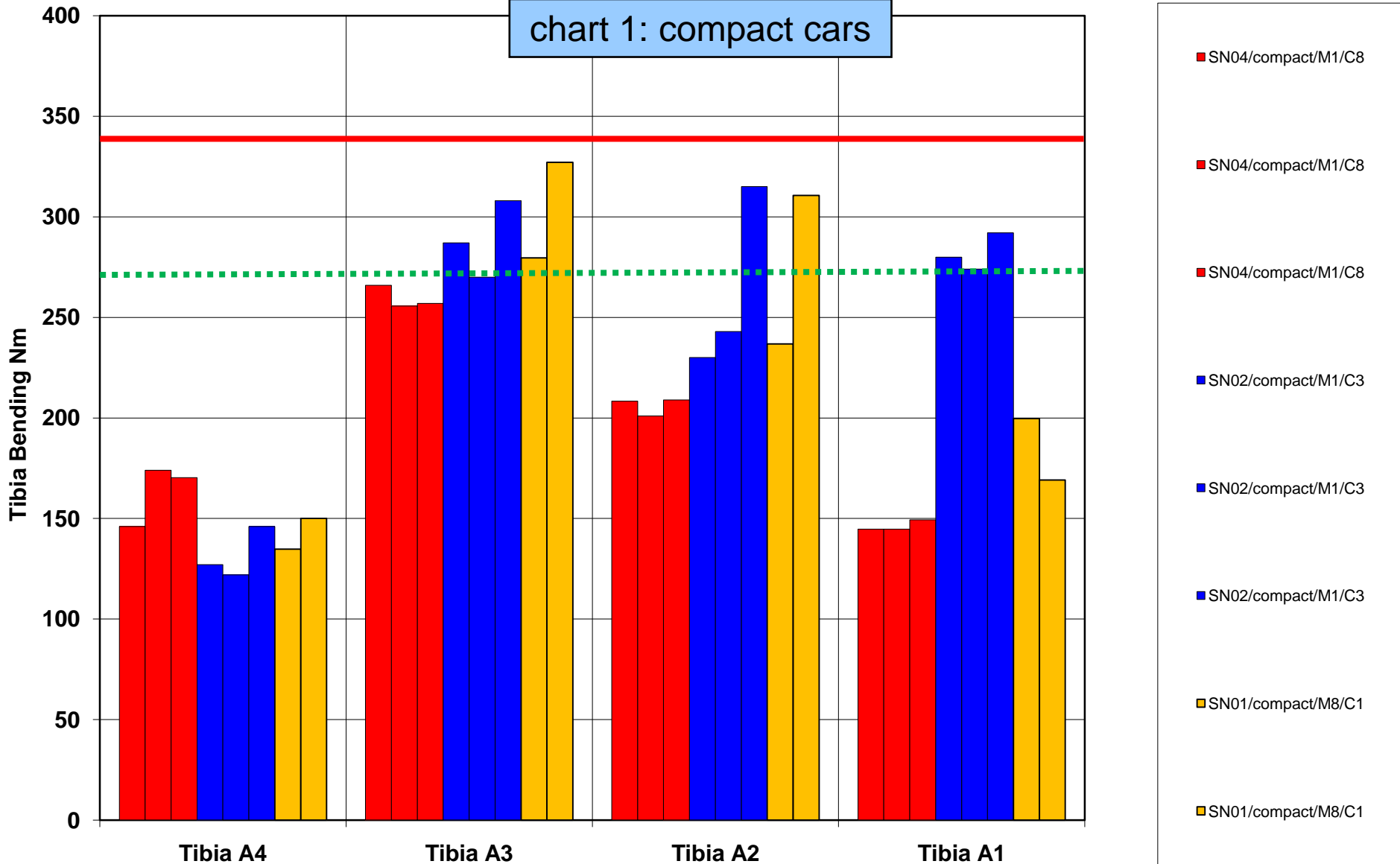
- Red pillars indicate test results produced with impactor no. SN04
- Blue pillars show those produced with impactor no. SN02
- Yellow pillars show results produced with impactor no. SN01
- 16 different vehicles of 8 different manufacturers were tested; overall, the pillars represent results of 87 single tests
  - Each pillar may represent either a single test or an average of several tests
  - Pillars of the same color just indicate the same impactor but NOT the same vehicle, impact location etc. and therefore cannot be used to assess the quality of the impactors
- Charts 1, 3, 5 and 7 show tibia bending moments measured on compact cars, sedans, small family cars and SUV's as well as sport cars
- Charts 2, 4, 6 and 8 show the measured ligaments elongations respectively

Legend: SN04 / sedan / M1 / C2  
means

- that was tested with prototype no. 4 of the FlexPLI version GTR
- which is a sedan-type vehicle
- of manufacturer no. 1
- vehicle no. 2



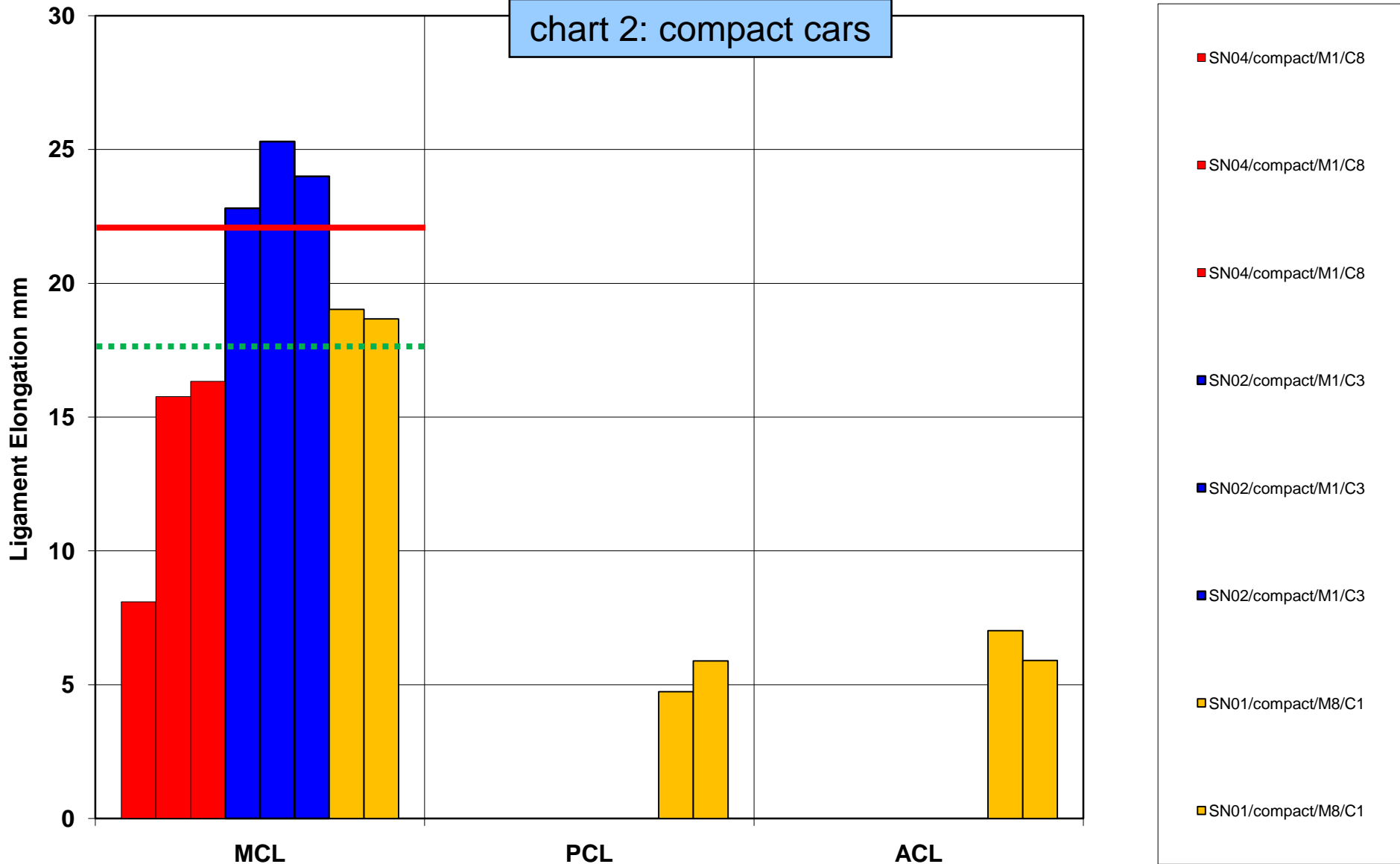
chart 1: compact cars



Results may NOT be used to assess the quality of the impactors – please refer to the explanatory notes in section 8

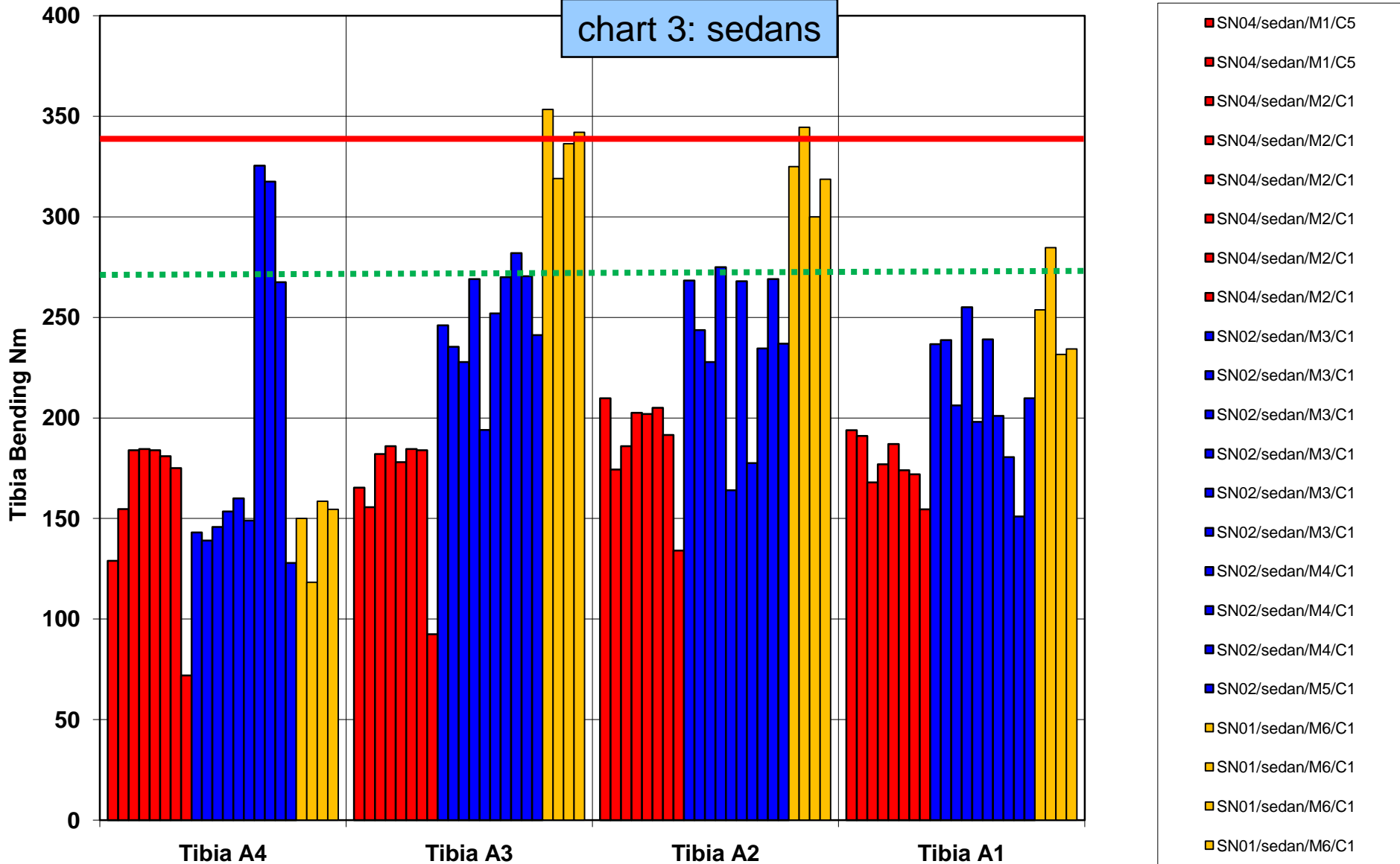


chart 2: compact cars

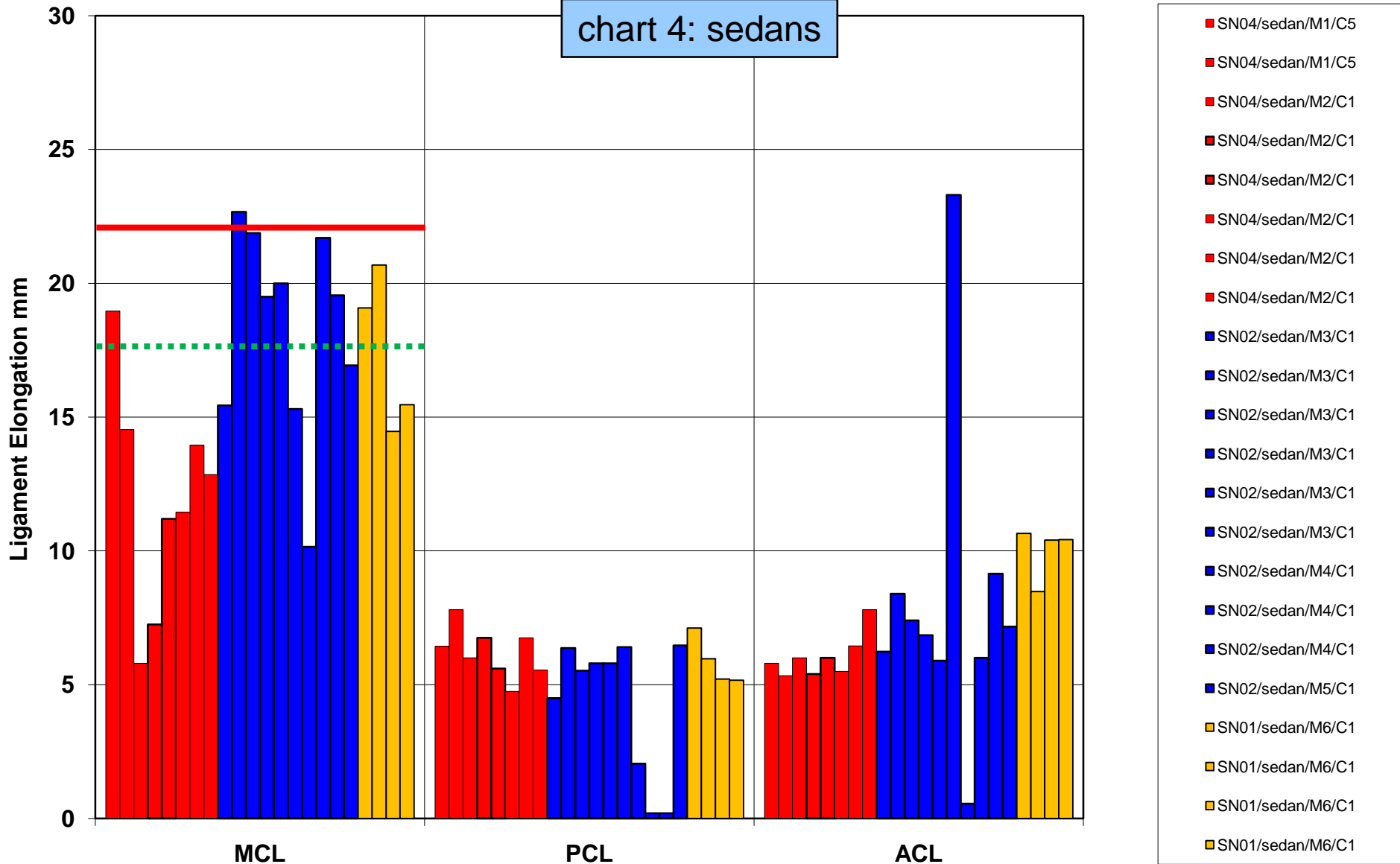


Results may NOT be used to assess the quality of the impactors – please refer to the explanatory notes in section 8





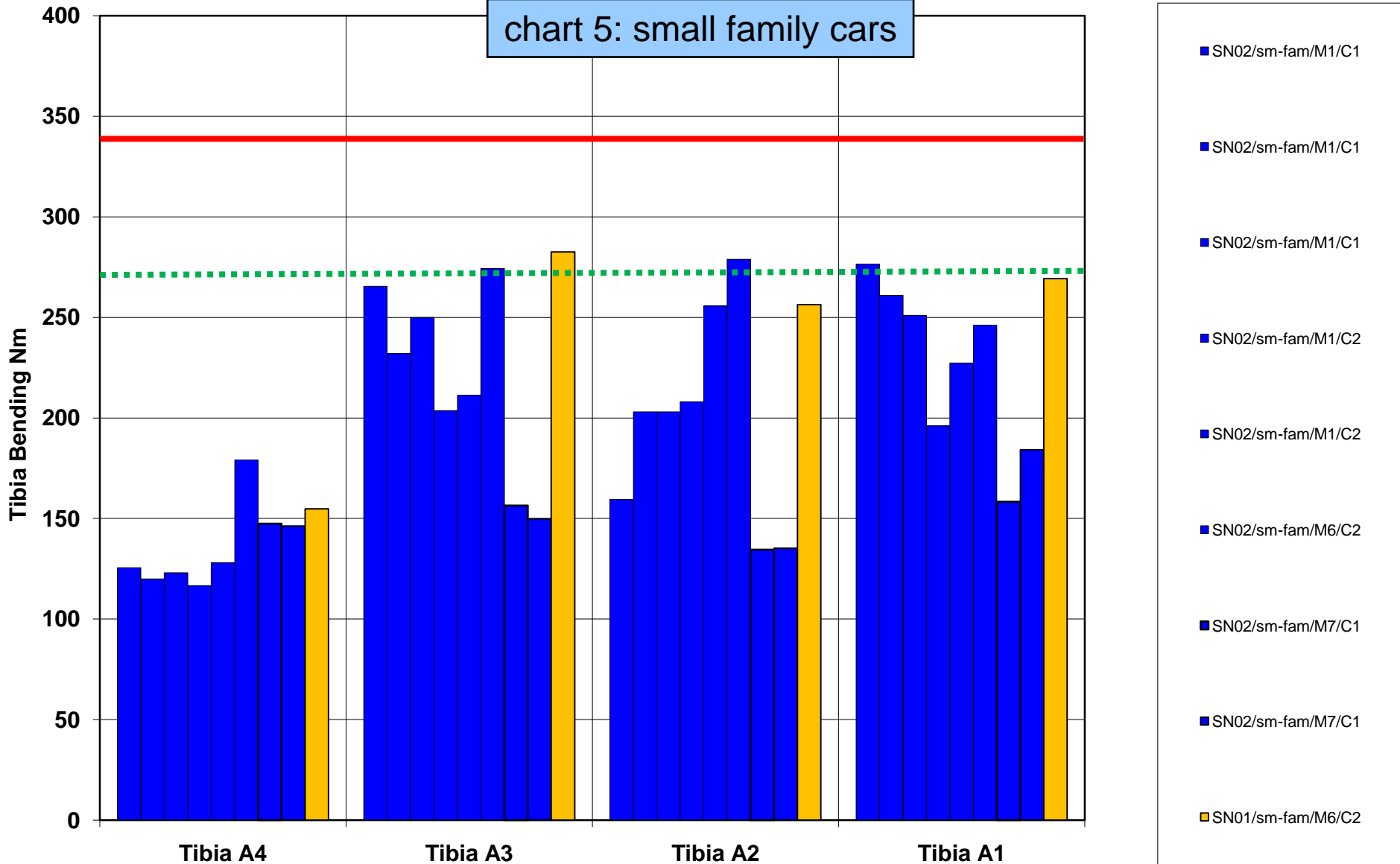
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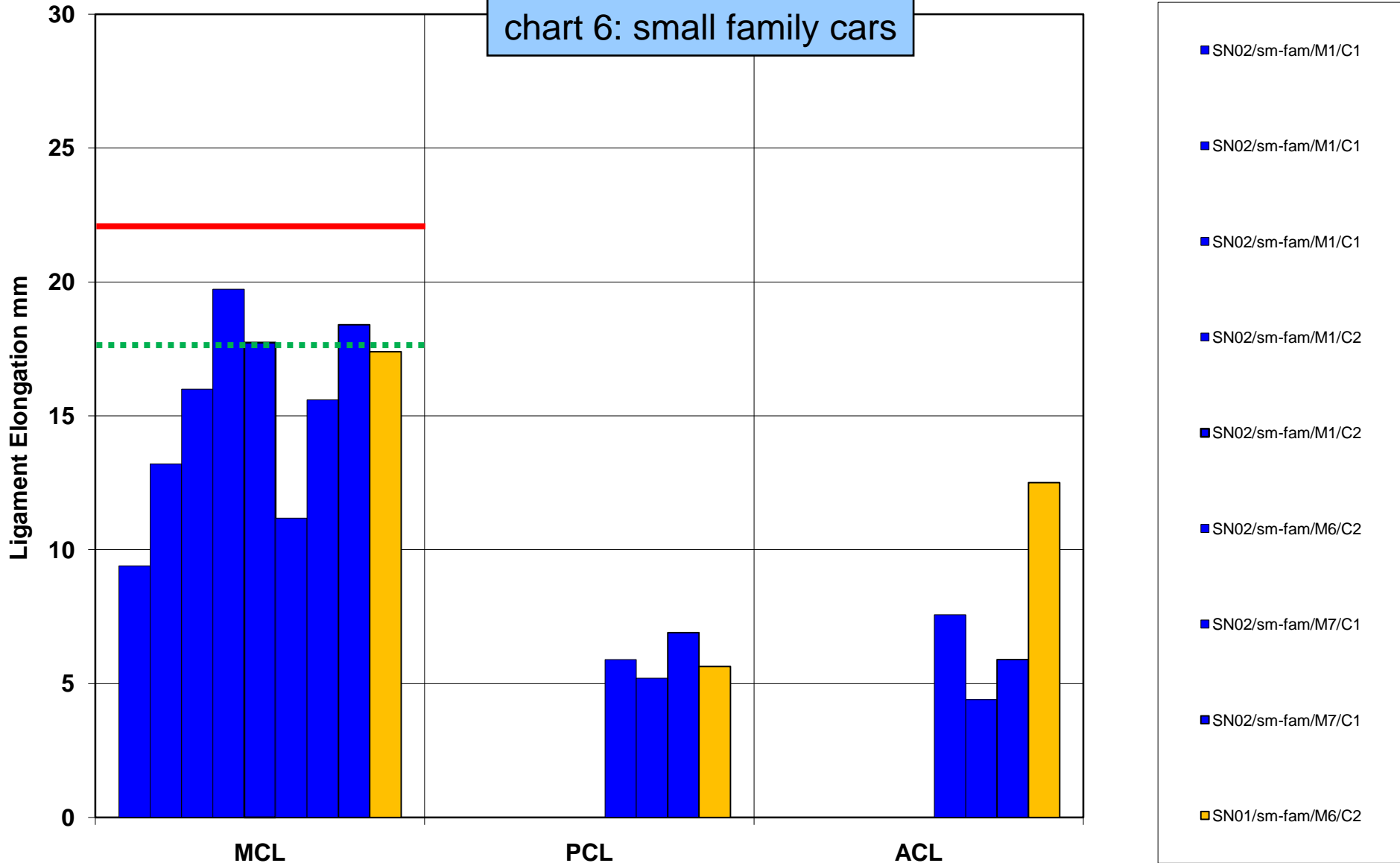
chart 5: small family cars



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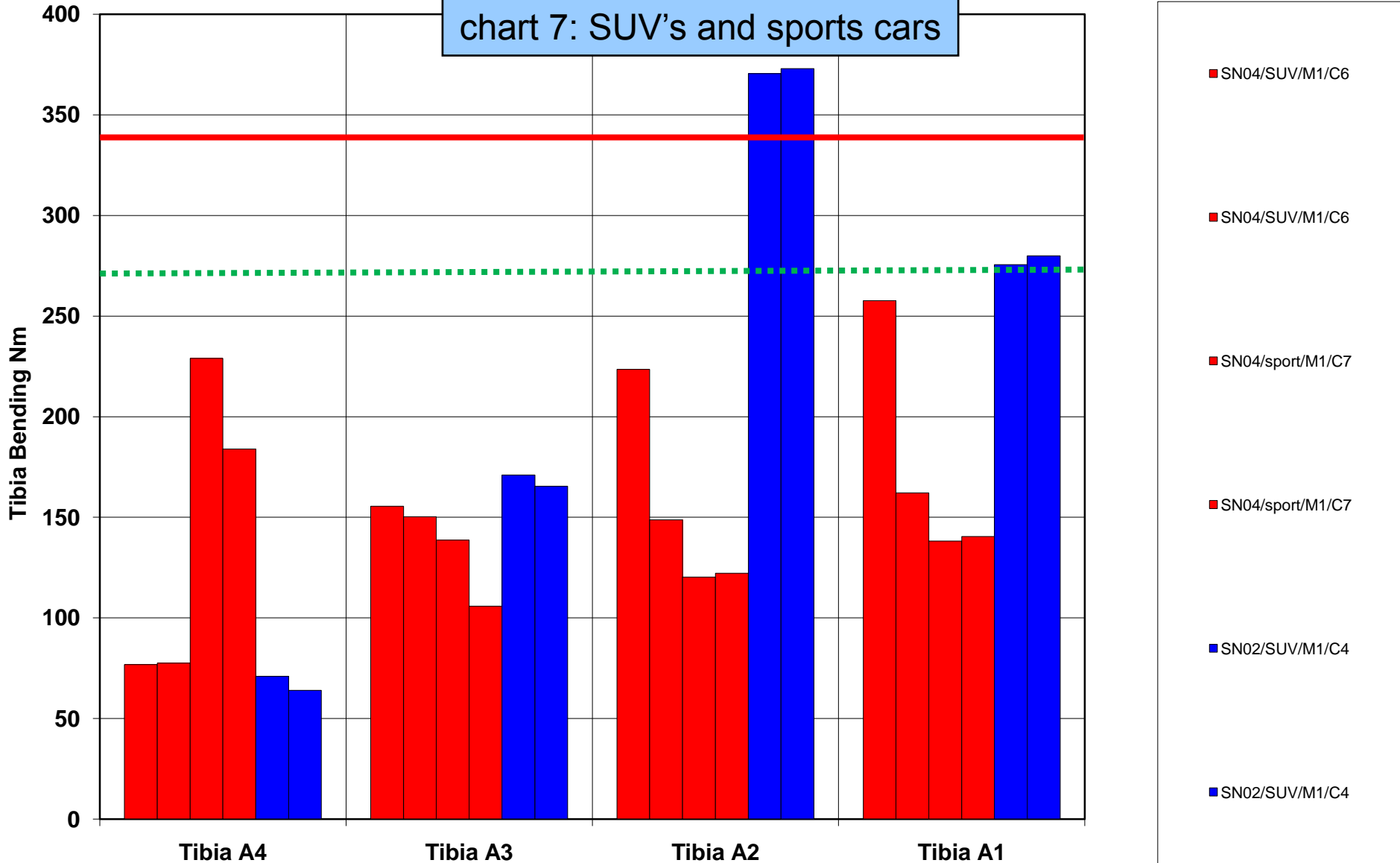
chart 6: small family cars



Results may NOT be used to assess the quality of the impactors – please refer to the explanatory notes in section 8



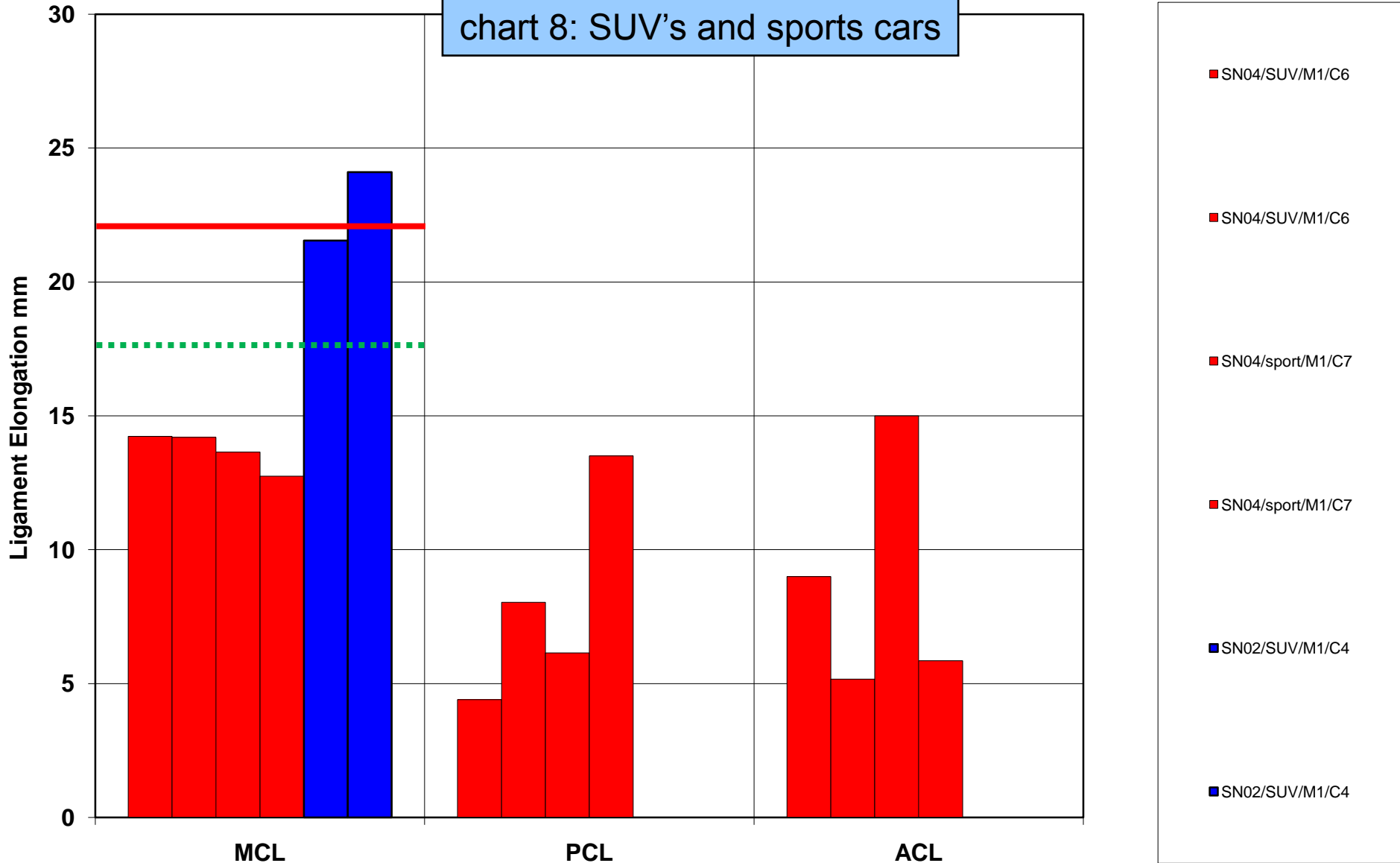
chart 7: SUV's and sports cars



Results may NOT be used to assess the quality of the impactors – please refer to the explanatory notes in section 8



chart 8: SUV's and sports cars



Results may NOT be used to assess the quality of the impactors – please refer to the explanatory notes in section 8



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**Thank you for your attention!**