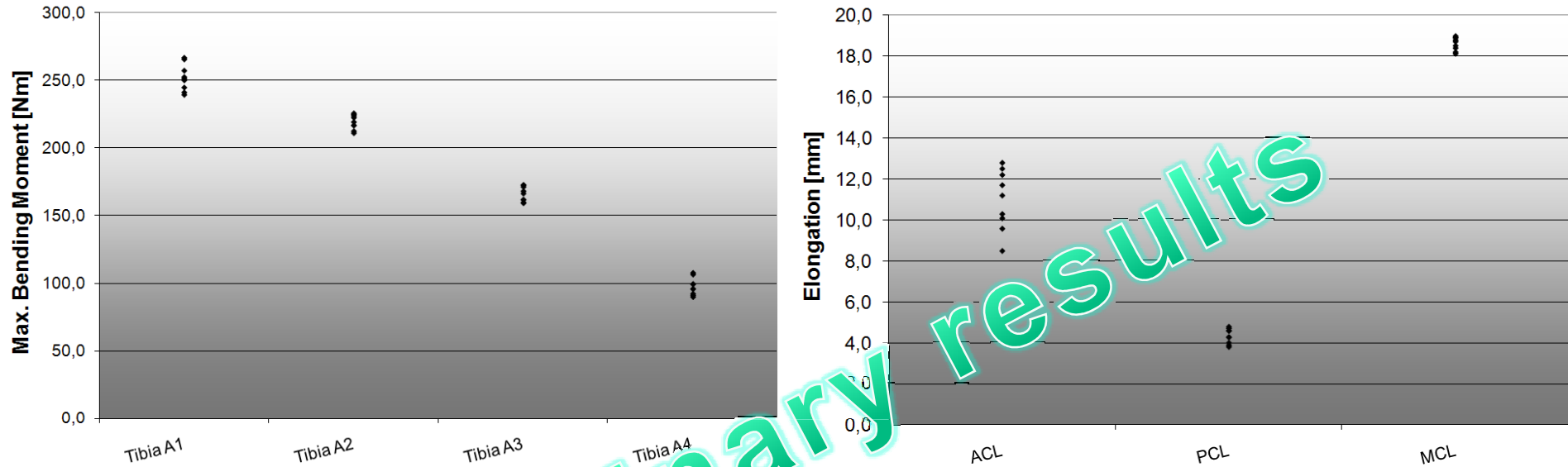


# Inverse tests – Impactor variation



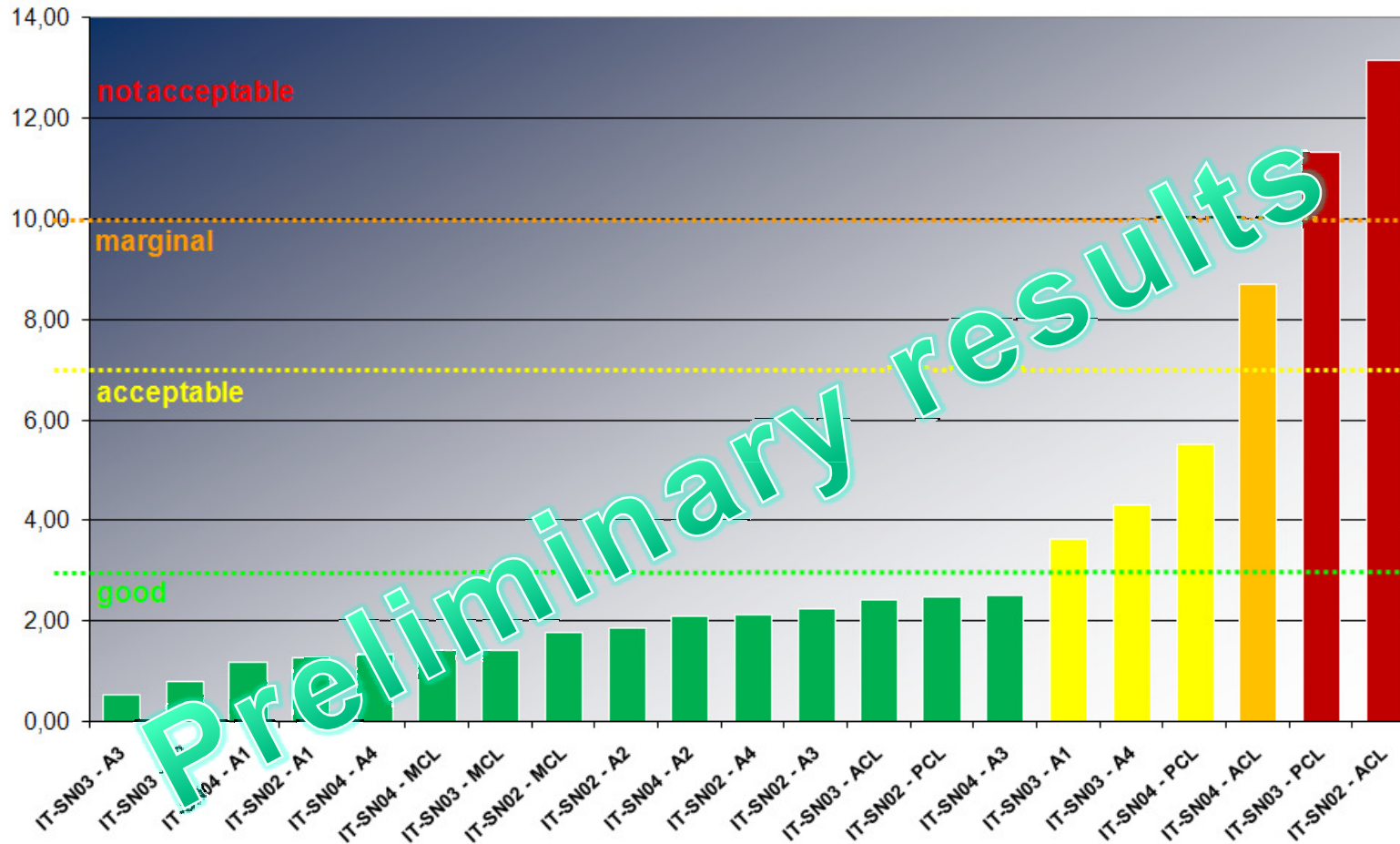
- Variation of ACL peak results of impactors SN02 and SN04
- Each impactor shows a different characteristic of ACL traces

## Test results - reproducibility:



- Again, for the determination of the reproducibility corridor all segments with good repeatability [CV < 5%] of test results were taken into account
- *Reproducibility corridors for ACL and PCL had to be calculated by the results of one single impactor !!! (significance ?!)*
- Tibia segments A1-A3 and the MCL ligament of all impactors with reproducible test results [max. deviation from mean value < 10%]
- Tibia segment A4 of one impactor and ACL and PCL ligaments of two impactors outside the reproducibility corridor

## Repeatability - CV [%]:



- **Good repeatability for a high number of segments**
- **Repeatability of ACL and PCL ligaments significantly lower and partly unacceptable**

Overview test programme Flex-GT

Certification tests

Inverse tests

**Summary and next steps**

Preliminary results

## I) Certification tests:

- In general good repeatability of test results
- Slight variation of test results from impactor to impactor
- $r_{(tibia, MCL)} > r_{(ACL, PCL)}$
- $r_{(ACL, PCL)}$  sometimes unacceptable despite elimination of knee twist
- R good except ACL and partly PCL results
- No significant influence of test setup variation on ligament results
- Replacement of cross beam padding seems to have a small effect on bending moment results → periodic padding replacement recommended

## II) Inverse tests:

- In general good repeatability of tibia and MCL test results
- $r_{(tibia, MCL)} > r_{(ACL, PCL)}$
- ACL characteristics vary from impactor to impactor
- $R_{(tibia, MCL)}$  good
- Very high scatter of ACL results

## III) General:

- Tendencies shown during the certification tests were confirmed and stressed by the tests under idealised test conditions
- Therefore, inverse testing seems to be a more appropriate assembly certification method
- For a detailed investigation and assessment of the reproducibility of test results according to ISO/TC22/SC12/WG5 Doc N751 and subsequently a definition of certification corridors
  - more impactors are needed
  - round robin tests (last time test variability) have to be carried out
- Further research on the repeatability and reproducibility of real car test results needed

Thank you!

Preliminary results

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