Inverse tests – Impactor variation

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

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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
Inverse tests – Summary

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
Summary and next steps

I) Certification tests:

• In general good repeatability of test results
• Slight variation of test results from impactor to impactor
• $r_{(\text{tibia, MCL})} > r_{(\text{ACL, PCL})}$
• $r_{(\text{ACL, PCL})}$ 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 \(\rightarrow\) periodic or padding replacement recommended

II) Inverse tests:

• In general good repeatability of tibia and MCL test results
• $r_{(\text{tibia, MCL})} > r_{(\text{ACL, PCL})}$
• $R_{(\text{tibia, MCL})}$ good
• ACL characteristics vary from impactor to impactor
• 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 (lab-to-lab test variability) have to be carried out.
- Further research on the repeatability and reproducibility of real car test results needed.
Thank you!

Preliminary results