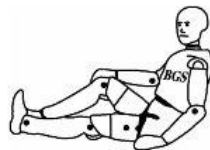
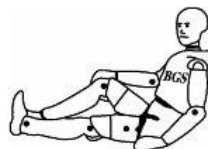


# **Flex PLI Inverse Test Setup - Moving Ram Friction**

**Dirk-Uwe Gehring  
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5<sup>th</sup> Meeting of the IG GTR9-PH2  
Bergisch Gladbach, Germany, December 2012**



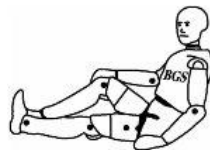
- Document GTR9-4-11e.pdf:  
Concept Tech, Austria: Investigation of the Influences of Friction within the Inverse Certification Test Setup of the FlexPLI.
- Action item from 4th meeting of IG GTR9-PH2:  
Measure the friction at the test stands and/or provide comments to the Concept document



- Friction at guiding rails can influence the test results in two ways:
  1. If there is a distance between the velocity measurement position and the impact position the friction may reduce the velocity of the ram impactor so that it will hit the legform with a lower velocity as intended.
  2. The friction could theoretically initiate a deceleration of the ram impactor and a lower energy input to the legform after the impact.



- Answers :
  1. Distance between the velocity measurement position and the impact position is approx. 0 mm. No possibility of an influence of friction before the impact.
  2. BASSt uses heavy duty roller bearings for the guiding system. The rollers minimize the friction even during the impact phase.

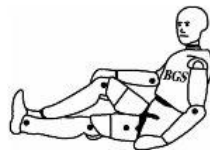


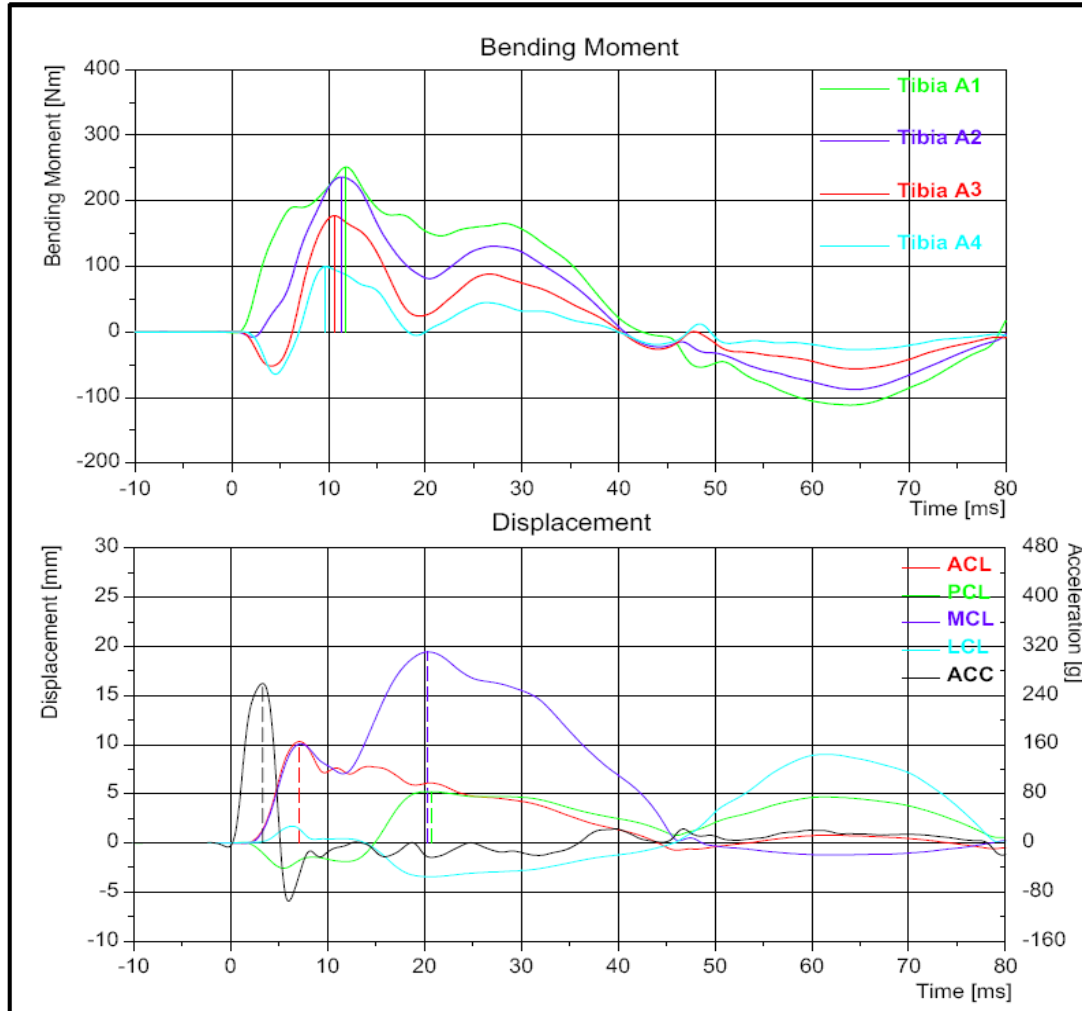
## Measurement of friction:

- Measurement with spring balance
- The friction force measured is approx. 2.5 N (!)

## Review of certification data:

- Maximum values occur up to ca. 20 ms, i.e. any effect occurring after 20 ms is irrelevant
- Influence and relevance of friction within 20 ms is unclear, but assumed to be negligible due to the short time





## Pedestrian Impact Test **bast**

**Impactor** : FLEX GTR  
**Test No.** : Inverse Calibration  
**Date** : 20.06.2012  
**Customer** : BAST

### Temperature

Stabilised temperature : 22.0 °C  
 Impact Velocity : 11.05 m/s

### Maximum Bending Moment

CFC 180  
 Tibia A1 251.5 Nm at 11.8 ms  
 Tibia A2 236.2 Nm at 11.3 ms  
 Tibia A3 177.3 Nm at 10.6 ms  
 Tibia A4 99.5 Nm at 9.7 ms

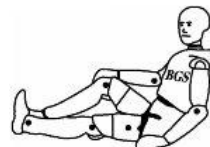
### Maximum Displacement

CFC 180  
 ACL 10.3 mm at 7.1 ms  
 PCL 5.2 mm at 20.7 ms  
 MCL 19.4 mm at 20.4 ms

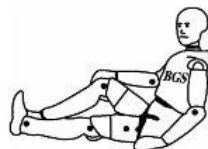
### Maximum Acceleration

CFC 180  
 ACC 259.6 g at 3.3 ms

FLEX GTR : Inverse Calibration



- Speed measurement should be taken immediately before impact (distance approx. 0 mm) to avoid any influence of friction or any other speed influencing factor before impact.
- In case of smooth-running bearings there seems to be no need to set any additional requirements on the friction



# Thank you!

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