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

FlexPLI Testing: Propelling Accuracy

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

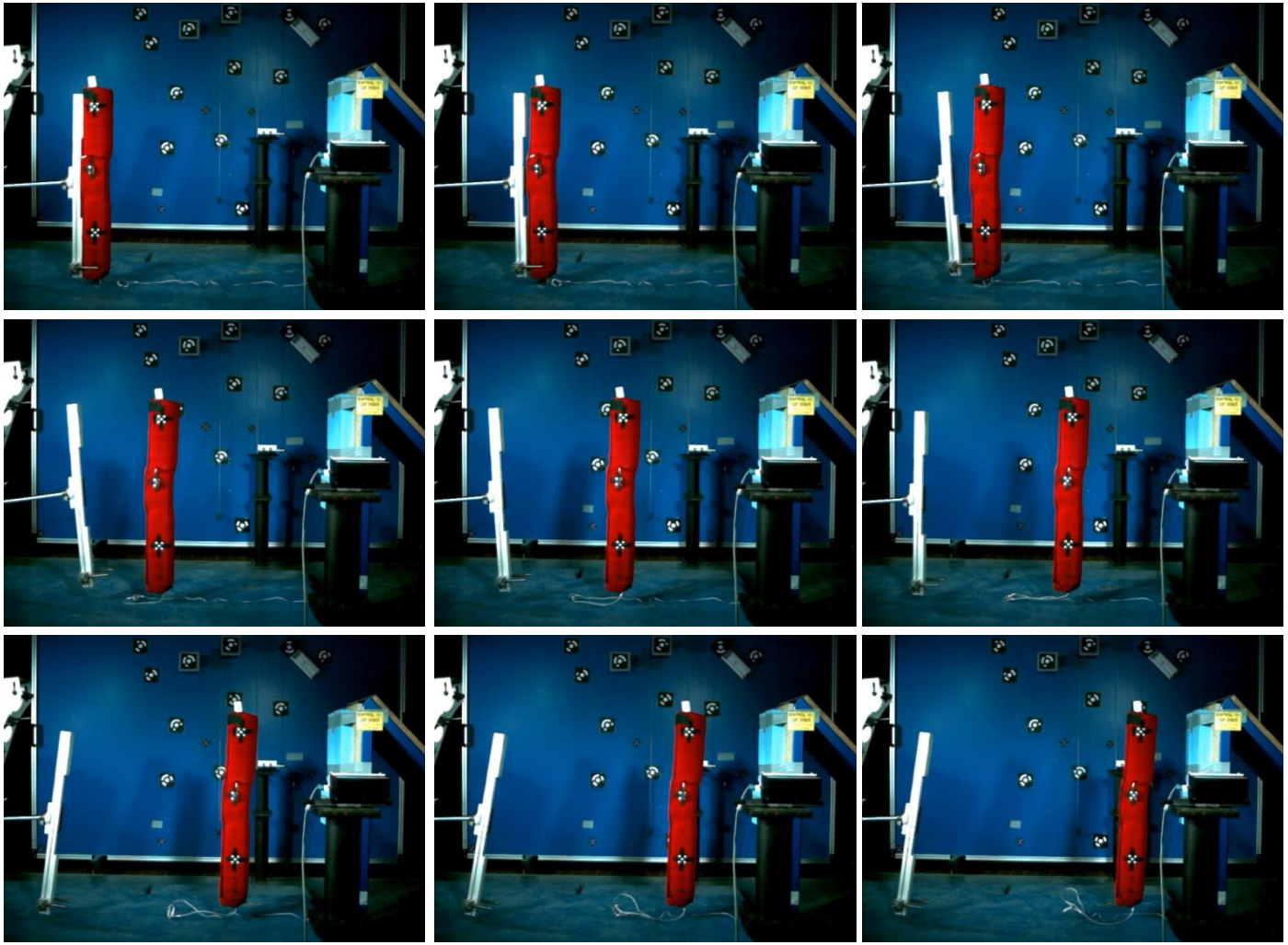
Background

- The original idea in the discussion on the FlexPLI was to simply replace the EEVC Legform Impactor by the FlexPLI whenever the latter is ready for industrial use
- Test procedure may allow this but what about test environment?
  - Usually, test rigs already exists
  - High investment for impactor needed, so preferably no further investment for other test equipment
  - Tests with both impactors, EEVC LFI and FlexPLI may be necessary at the same test rig
  - Etc.

Background (Continued)

- For the FlexPLI, a specific pusher plate is recommended by the legform manufacturer to assure stable propelling (see document TEG-117 of the former FlexPLI Technical Evaluation Group TEG [1])
- When testing with the FlexPLI, it was noted that it is quite challenging to get a stable free-flight phase even when using the recommended pusher plate
- Consequently, specific pushing devices need to be developed to use the FlexPLI with existing test rigs
- An example, consisting of the pusher plate and a test rig specific carrier, is shown at the next pages [2]

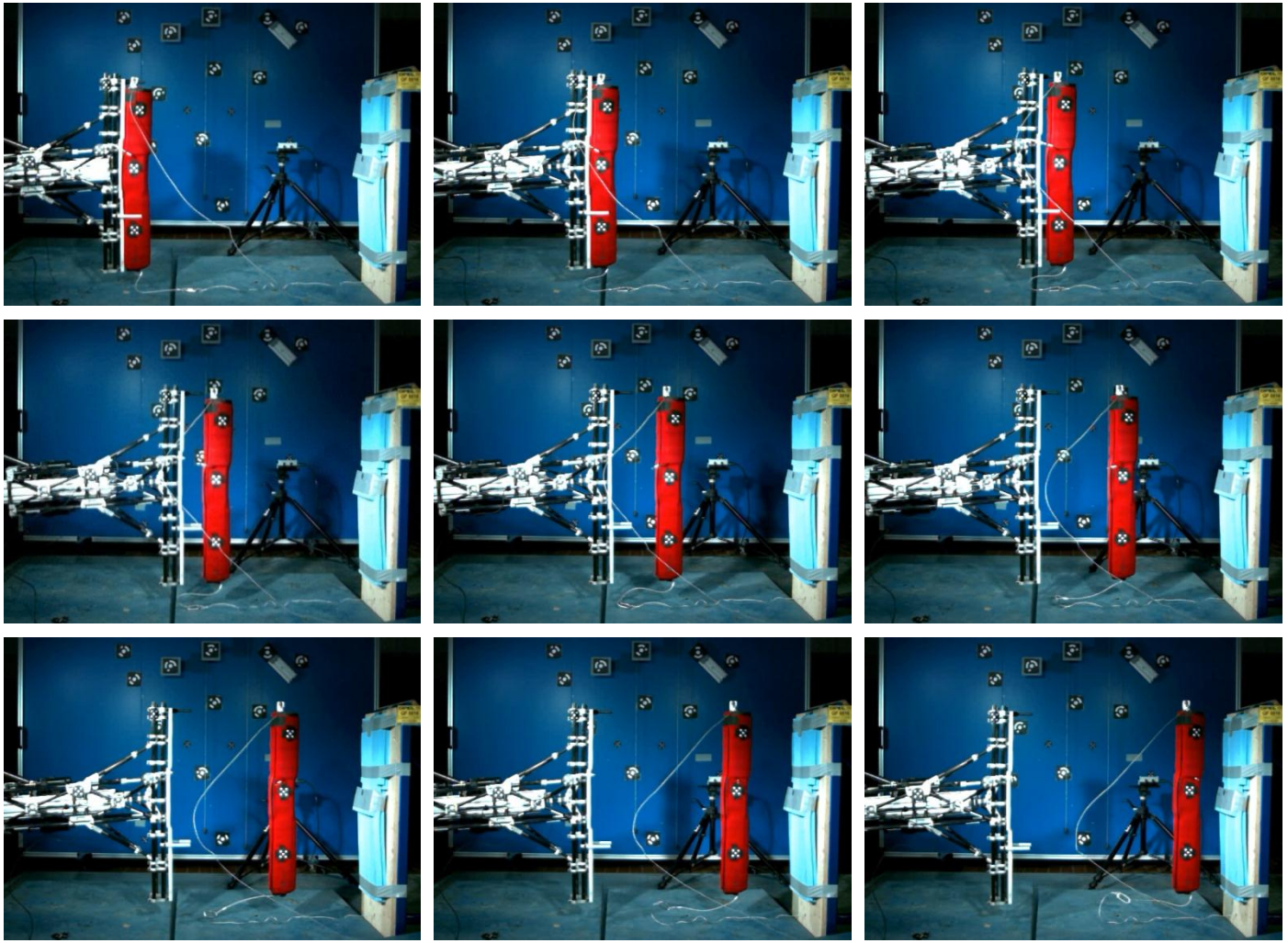
Example: Testing with the FlexPLI using the pusher plate according to TEG-117



Reference: crash.tech 2012 [2]

(Photo sequence to be followed from left to right and then from top to bottom)

Example: Pusher plate according to TEG-117 and a test rig specific carrier



Reference: crash.tech 2012 [2]

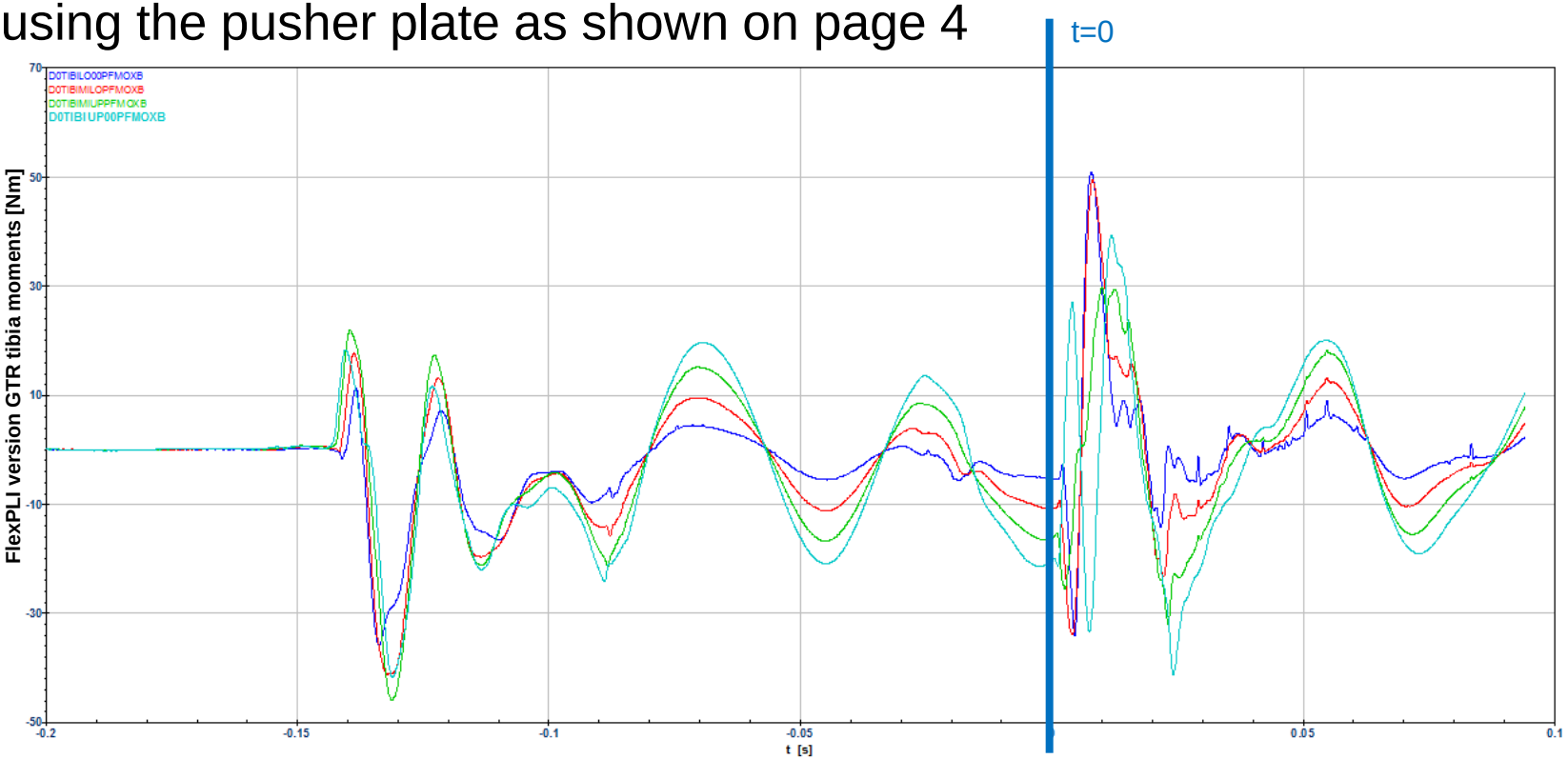
(Photo sequence to be followed from left to right and then from top to bottom)

Issue

- It was noted, that even with such a high-performance pushing device it is hard to achieve a stable free-flight phase of the FlexPLI
- In addition, it is questionable whether the impactor's behaviour can be controlled in detail during the free-flight phase
- Therefore, clear requirements are needed to:
  - On one hand to achieve reliable and repeatable test results;
  - On the other hand to allow, to a certain extent, the unavoidable movement of the impactor during the free-flight

Time history curves for the moments during the free-flight phase

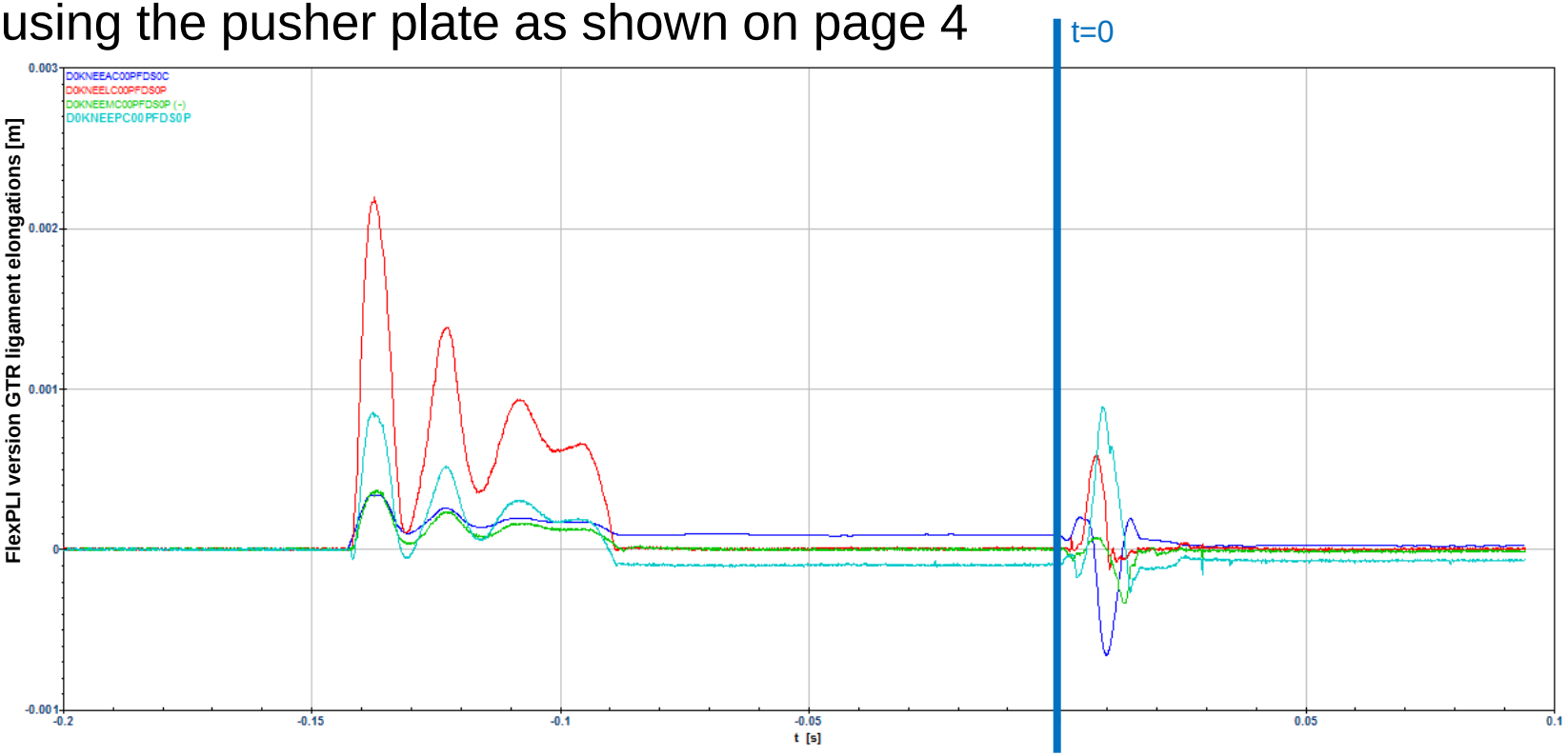
using the pusher plate as shown on page 4



- Unacceptable impactor movement during the free-flight phase noted
- Progression of sinus curves at t=0 may even influence the peak values of the test results

Time history curves for the ligaments during the free-flight phase

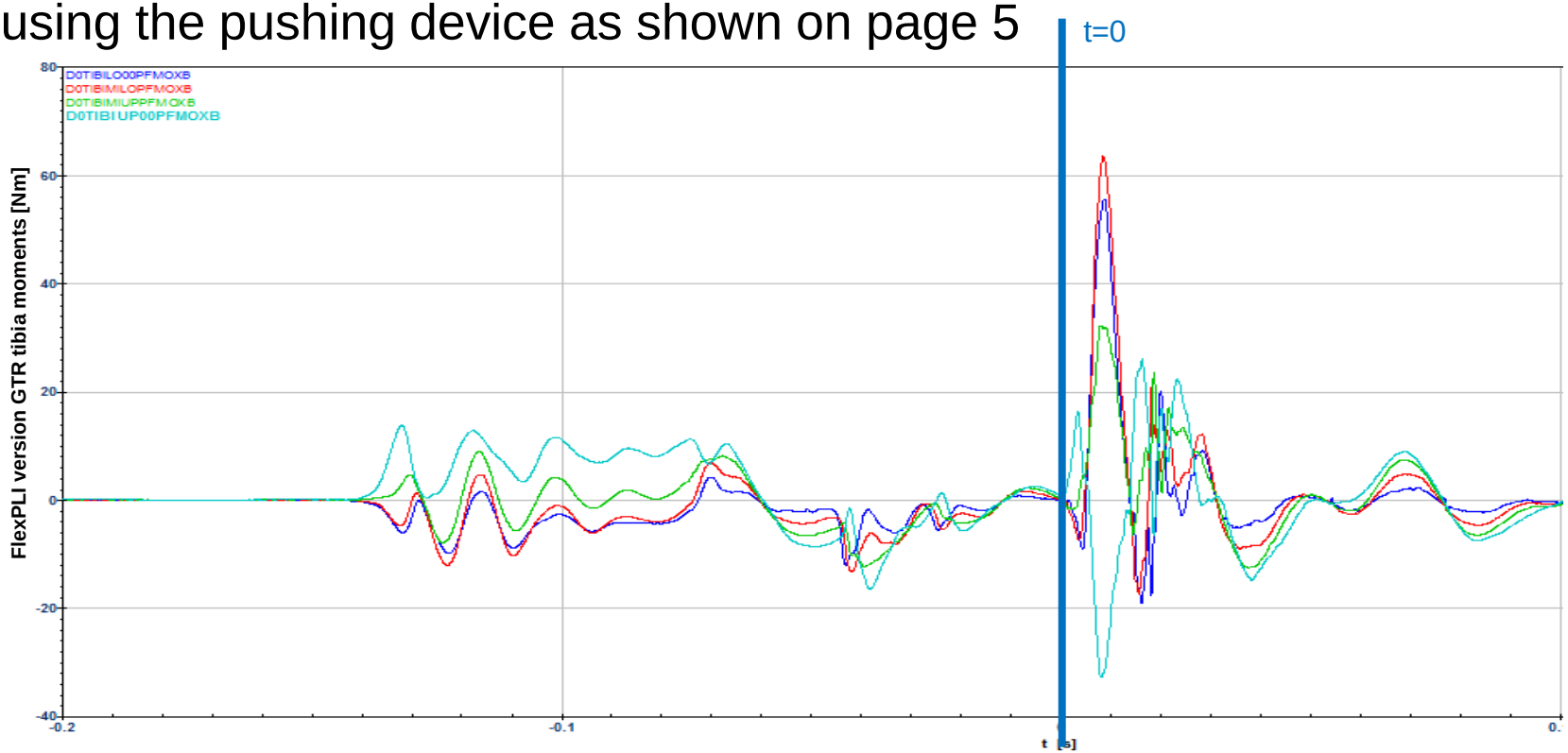
using the pusher plate as shown on page 4



- After an initial stimulation the ligaments achieve a stabilized behaviour - probably due to their pre-tensioning - but with a extension/compression before the vehicle impact

Time history curves for the moments during the free-flight phase

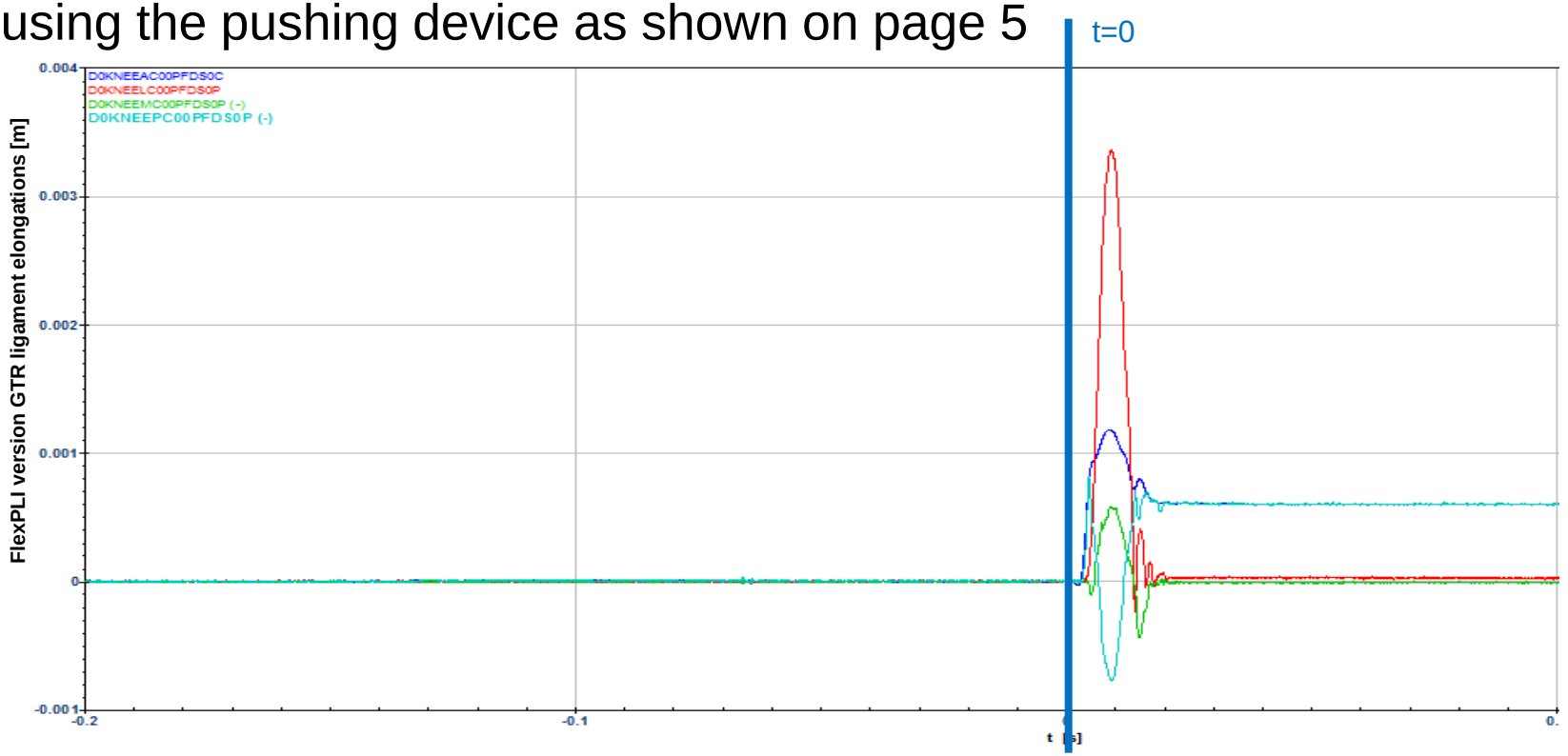
using the pushing device as shown on page 5



- The free-flight phase is much more stable, the signals tend to settle
- Also, the progression of the curves at t = 0 causes lower risks to influence the peak value of the test result

Time history curves for the ligaments during the free-flight phase

using the pushing device as shown on page 5



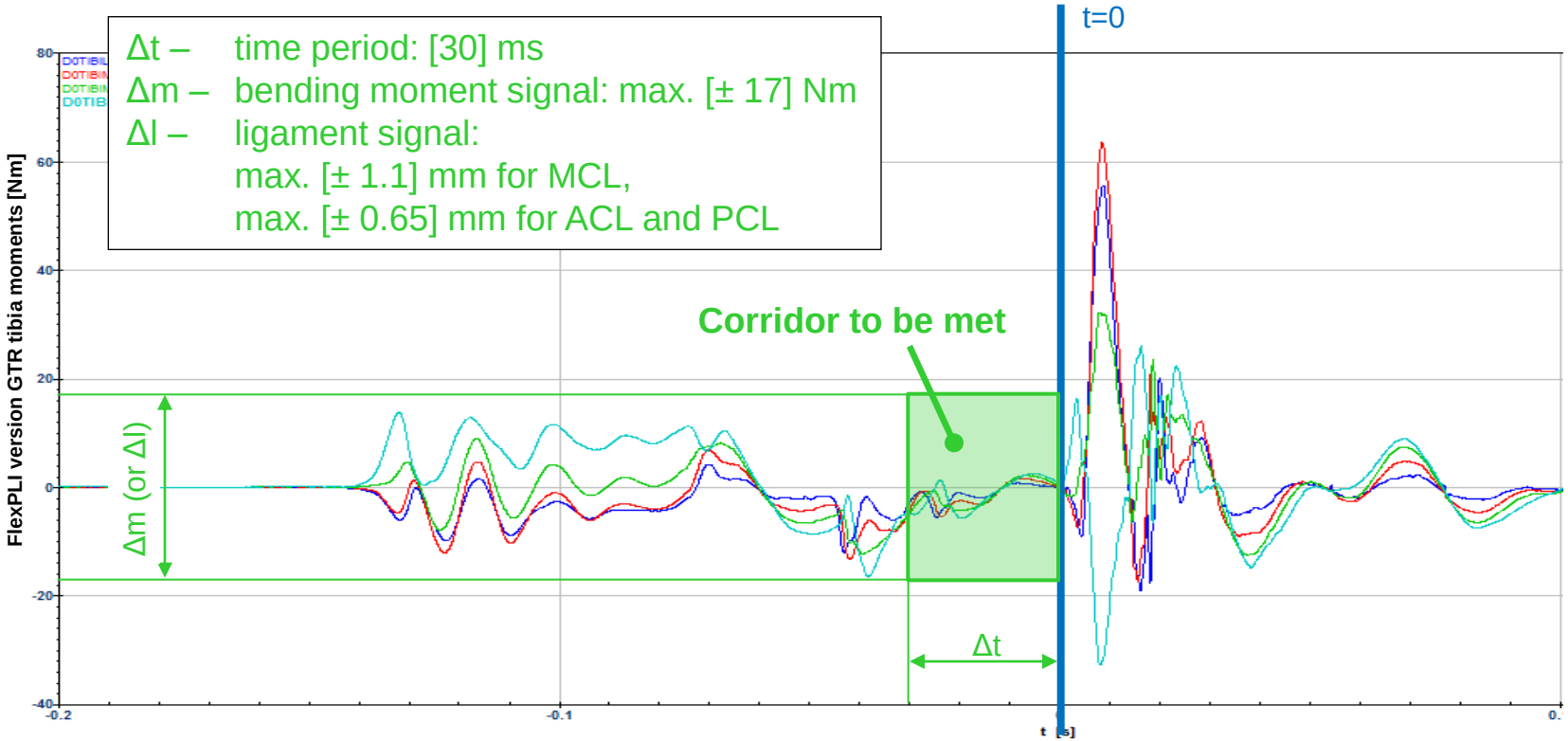
- No initial stimulation of ligaments was seen

Conclusions

- Even when achieving a very stable free-flight of the impactor, the signals indicate a certain movement of the impactor
- It is therefore proposed, to limit the signals that are recorded at t=0 to [± 17] Nm for the bending moments, [± 1.1] mm for MCL or [± 0.65] mm for ACL and PCL respectively (which represents [± 5] % of the allowed respective certification thresholds in all cases)
- The results actually measured at t=0 must not be shifted to 0
- In addition, it seems necessary to exclude possible influences of the curve progressions of the recorded signals
- It is therefore also proposed that the recorded signals must be within corridors of [± 5] % of the allowed respective overall thresholds during the last [30] ms before the impactor hits the vehicle
- This should apply to both, the signals recorded for the bending moments as well as the signals recorded for the ligaments

Information in square brackets is subject to detailed investigation right now!

Example for the corridor to be met before the vehicle impact



- Signals have to be within the corridor described in green above

Information in square brackets is subject to detailed investigation right now!

THANKS

For detailed questions please refer to the authors,
Messrs. Thomas Kinsky, Stephan Sommer and Holger Hochgesand / General Motors Europe Engineering

Literature

[1] Burleigh, M. (FTSS): Minor updates and pusher plate discussion for Flex Pli GTR; paper No. 117 of the FlexPLI Technical Evaluation Group (TEG), presented at the 10th meeting of the TEG; Bergisch Gladbach, 1 – 2 December 2009; available at the website http://www.unece.org/trans/main/wp29/wp29wgs/wp29grsp/pedestrian_flexpli.html [22.10.2012]

[2] Zeugner, M.; Kinsky, Th., Sommer, S. (Opel/GME): The Integration of the new Flexible Pedestrian Legform Impactor (FlexPLI) into an existing Test Rig Environment; proceedings of the conference crash.tech 2012; Munich, 24 – 25 April 2012