



Comparison of Filter Classes for FlexPLI

**2nd Meeting of Informal Group GTR9 Phase 2
Osaka, March 28th and 29th 2012**

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Background



- **At the 1st meeting of the Informal Group GTR9 Phase 2 a discussion came up on whether the application of different filter classes could have an influence on the FlexPLI test results.**
- **Up to now, in contrast to SAE J211 convention, CFC180 filter class is applied to all channels, but indeed not documented yet.**
- **Euro NCAP as well as EU Regulation (EC) No 631/2009 uses CFC 180 for data processing of test results with EEVC WG 17 PLI (tibia acceleration, knee bending angle and knee shear displacement); only the headform acceleration is filtered with CFC 1000.**
- **However, it was suspected that the application of CFC180 possibly lowering the FlexPLI peak results.**
- **BAST committed to perform a comparison between channel frequency classes CFC 180 and CFC 600 for different test setups and to present the results at the subsequent meeting of this Informal Group.**

Results



- In total, four tests were taken into account, all of them filtered with CFC 180 as well as with CFC 600
- Two vehicle tests
- Two inverse certification tests
- Test results overview:

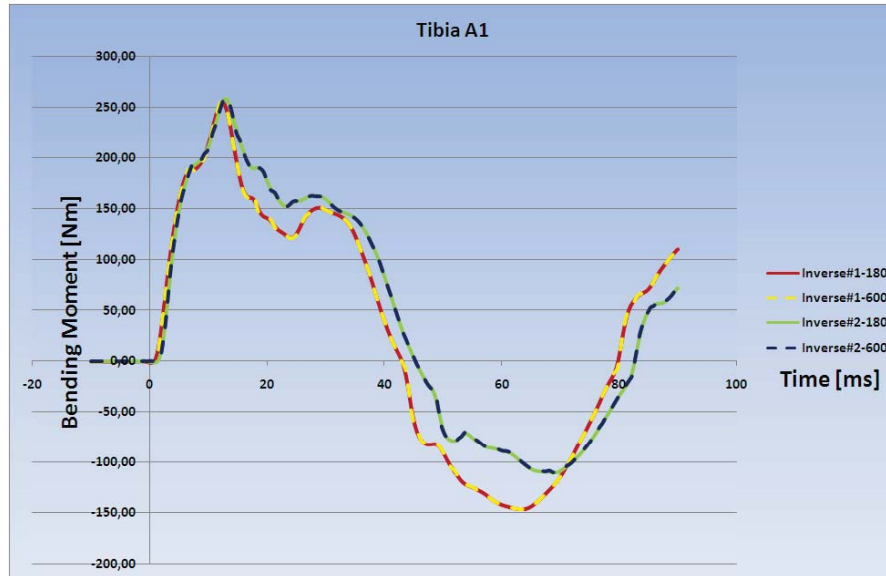
	Tibia A1	Tibia A2	Tibia A3	Tibia A4	ACL	PCL	MCL	ACC
Inverse#1-180	255,26	240,13	190,19	108,27	9,09	5,44	19,18	239,39
Inverse#1-600	256,14	240,03	190,49	108,96	9,14	5,50	19,19	261,67
Inverse#2-180	258,32	224,92	181,07	90,95	10,23	5,72	19,62	253,11
Inverse#2-600	259,63	225,46	180,91	90,50	10,39	5,72	19,60	252,37

	Tibia A1	Tibia A2	Tibia A3	Tibia A4	ACL	PCL	MCL	ACC
Vehicle#1-180	180,52	238,01	214,79	160,91	7,33	6,95	19,81	167,21
Vehicle#1-600	181,20	237,39	215,63	162,98	7,32	7,01	19,80	173,77
Vehicle#2-180	287,74	306,03	245,32	188,01	9,26	6,18	17,19	197,03
Vehicle#2-600	287,93	306,17	247,42	189,08	9,25	6,18	17,20	205,63

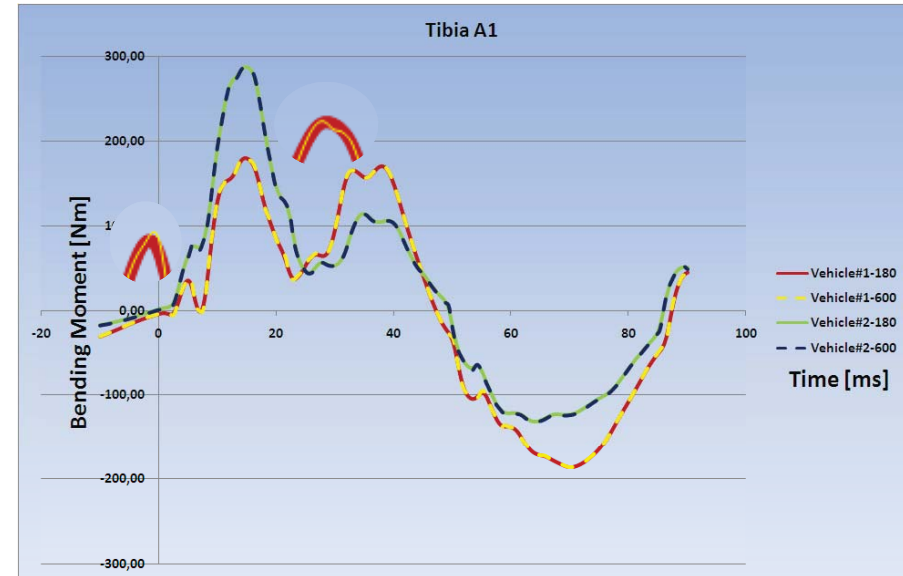
Analysis – Tibia A1



Inverse Certification Tests



Vehicle Tests

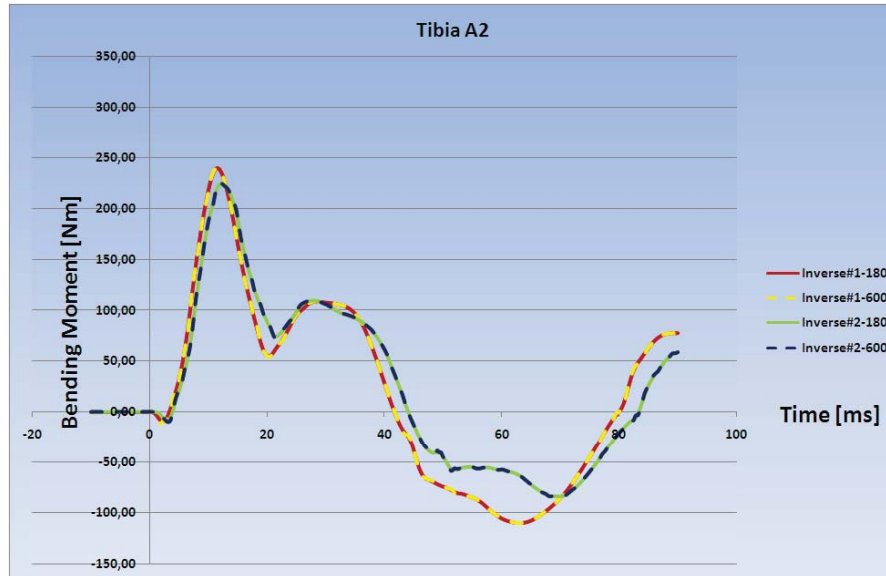


- **Almost identical time history curves**
- **Marginal influence of the application of different filter classes in vehicle tests only**

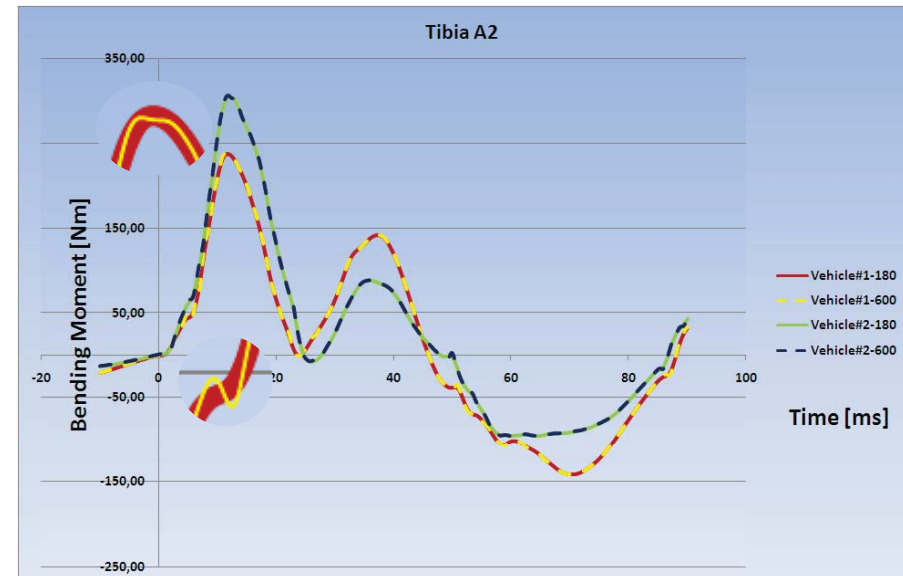
Analysis – Tibia A2



Inverse Certification Tests



Vehicle Tests

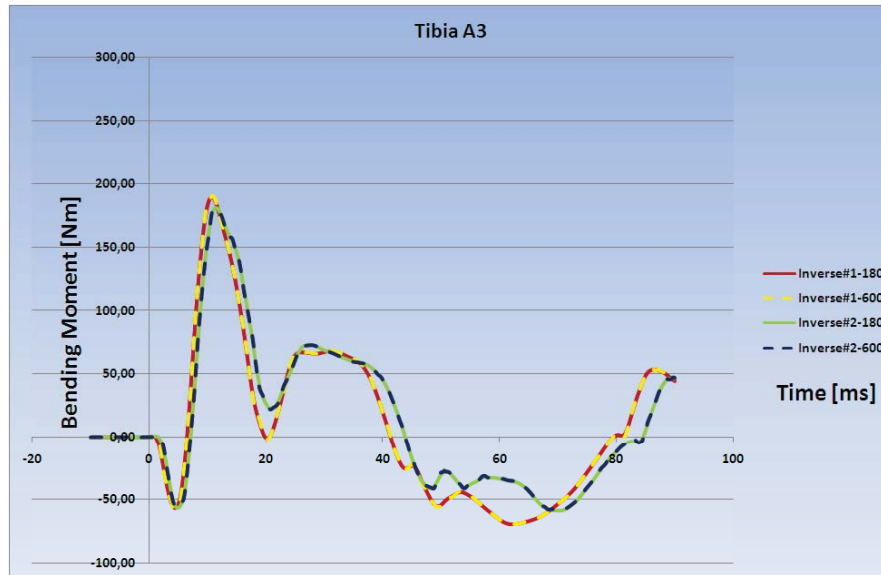


- **Almost identical time history curves**
- **Marginal influence of the application of different filter classes in vehicle tests only**

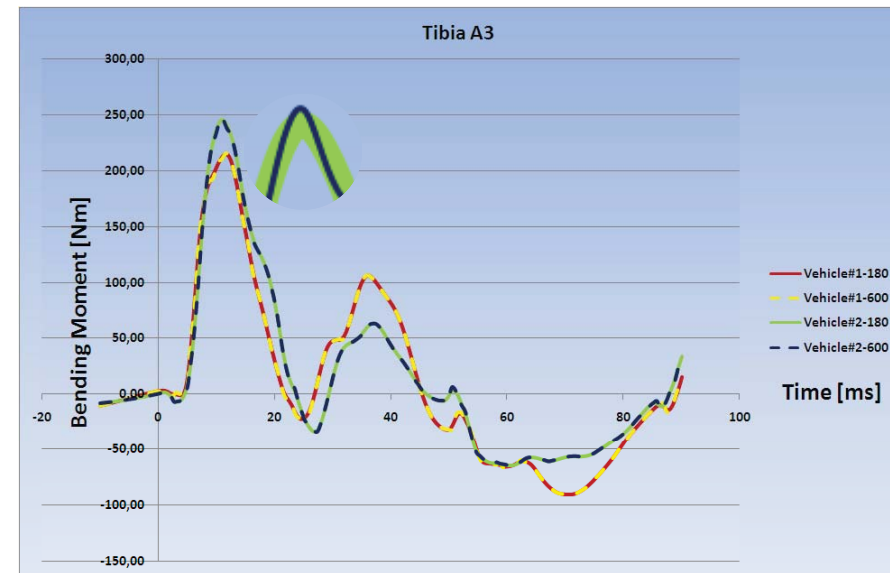
Analysis – Tibia A3



Inverse Certification Tests



Vehicle Tests

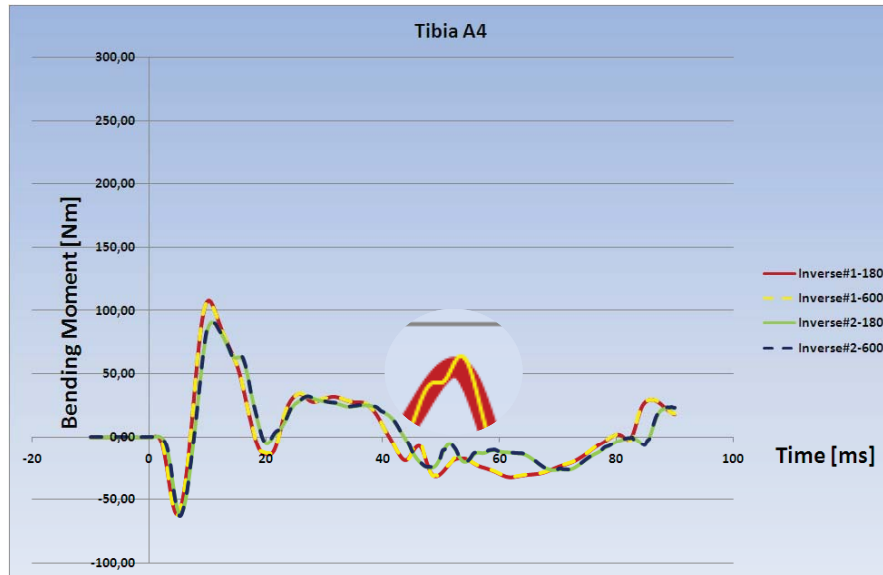


- Almost identical time history curves
- Marginal influence of the application of different filter classes in vehicle tests only

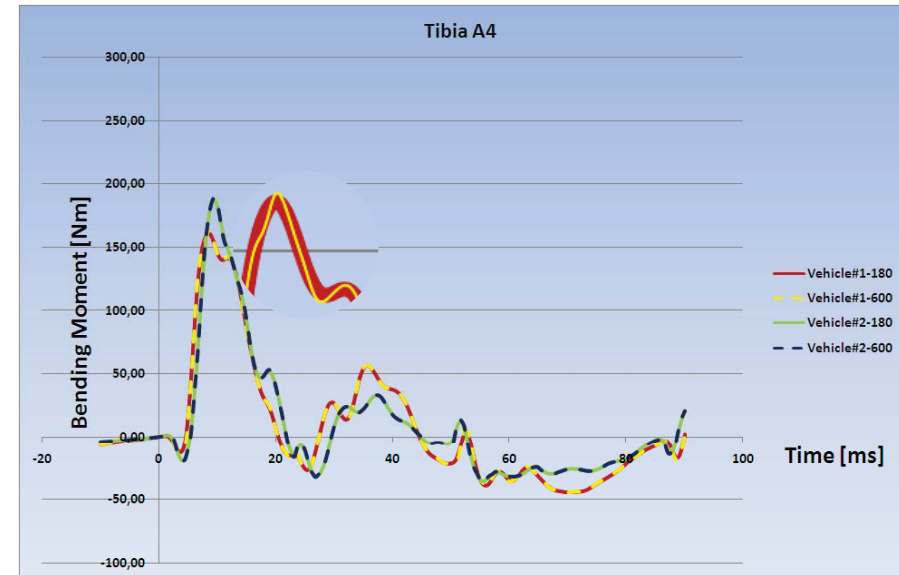
Analysis – Tibia A4



Inverse Certification Tests



Vehicle Tests

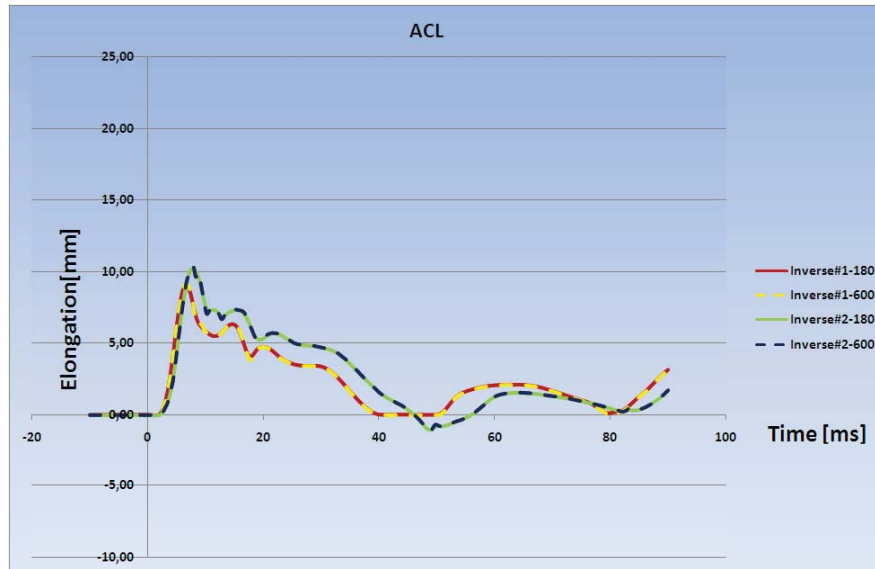


- Almost identical time history curves
- Marginal influence of the application of different filter classes

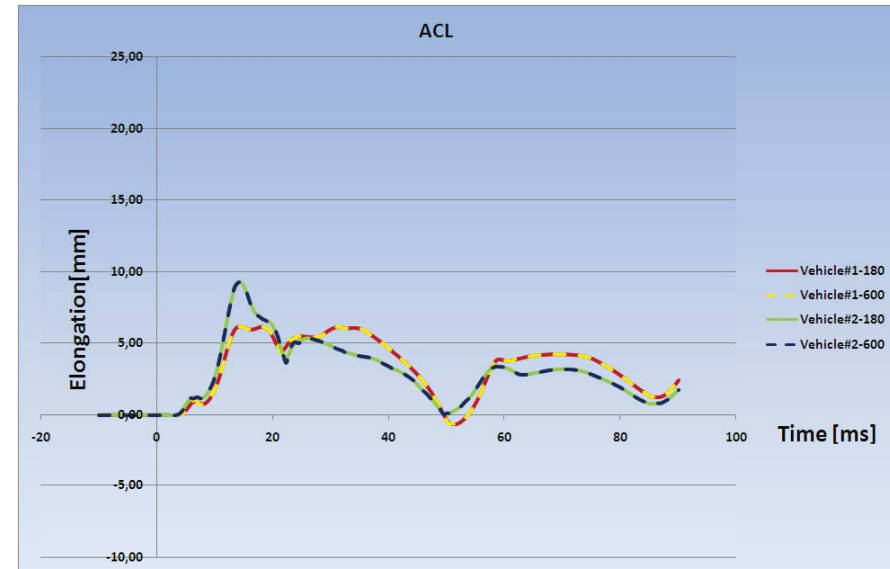
Analysis – ACL



Inverse Certification Tests



Vehicle Tests

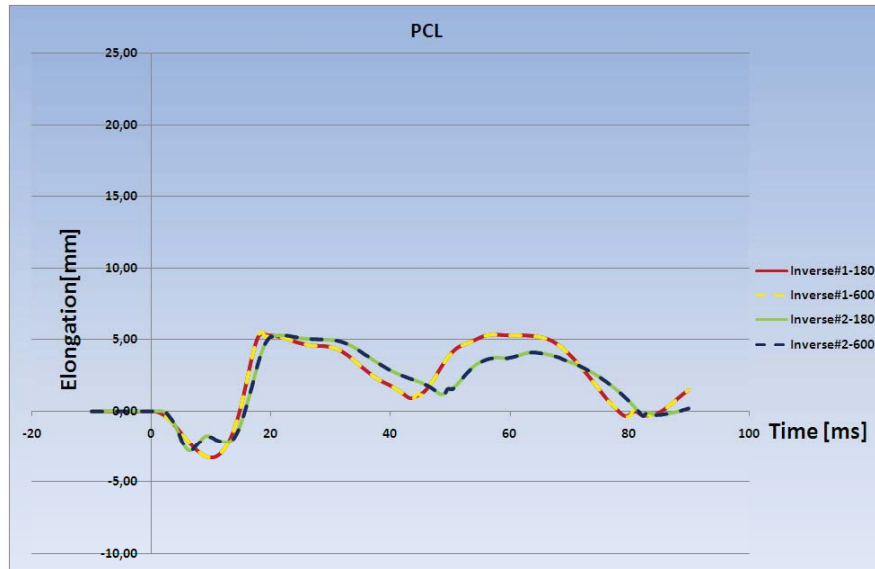


- **Almost identical time history curves**
- **No influence of the application of different filter classes on test results**

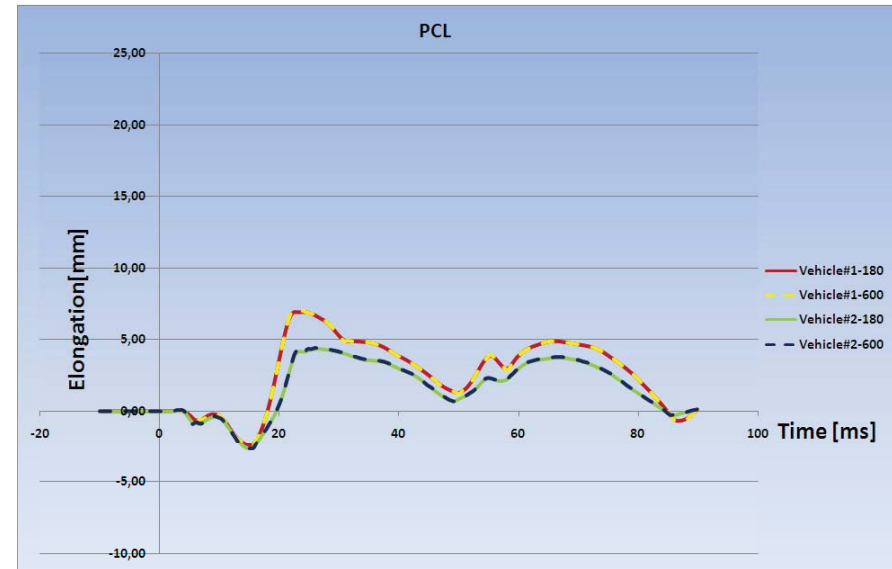
Analysis – PCL



Inverse Certification Tests



Vehicle Tests

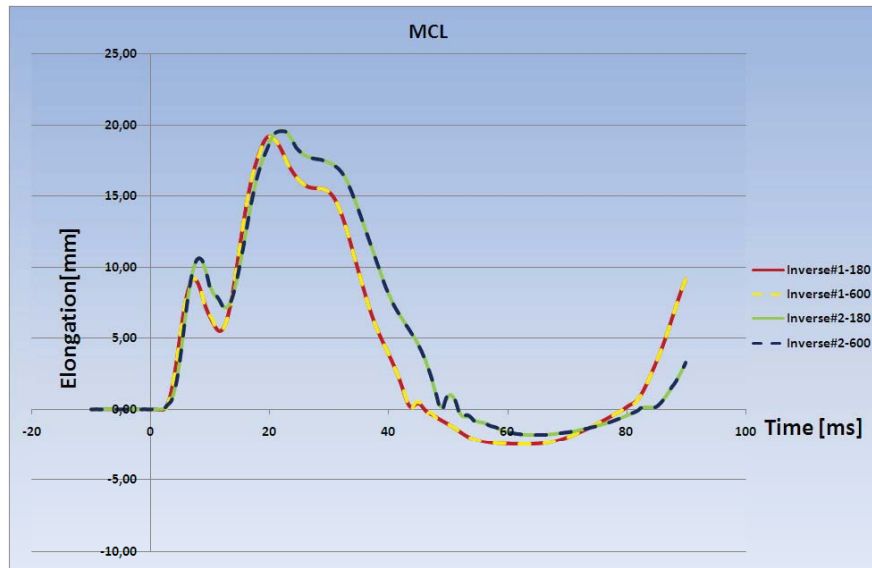


- **Almost identical time history curves**
- **No influence of the application of different filter classes on test results**

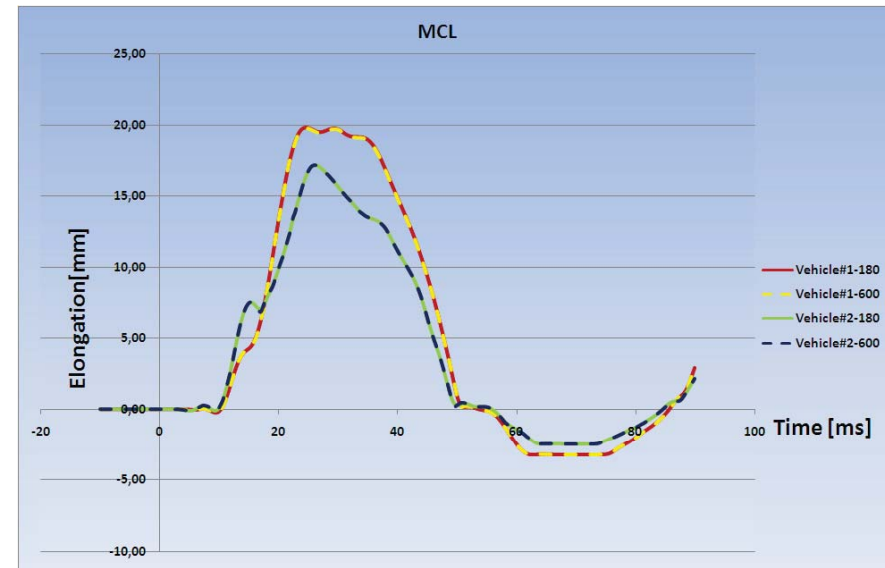
Analysis – MCL



Inverse Certification Tests



Vehicle Tests

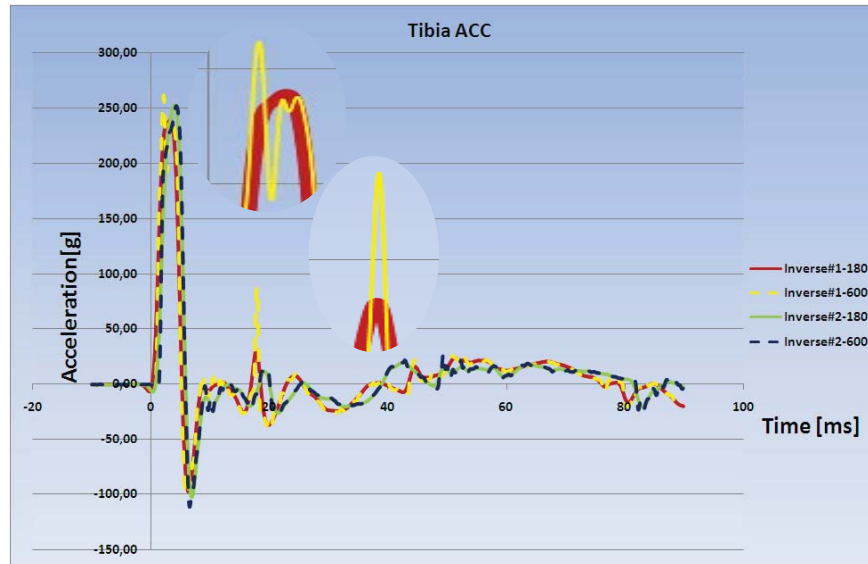


- **Almost identical time history curves**
- **No influence of the application of different filter classes on test results**

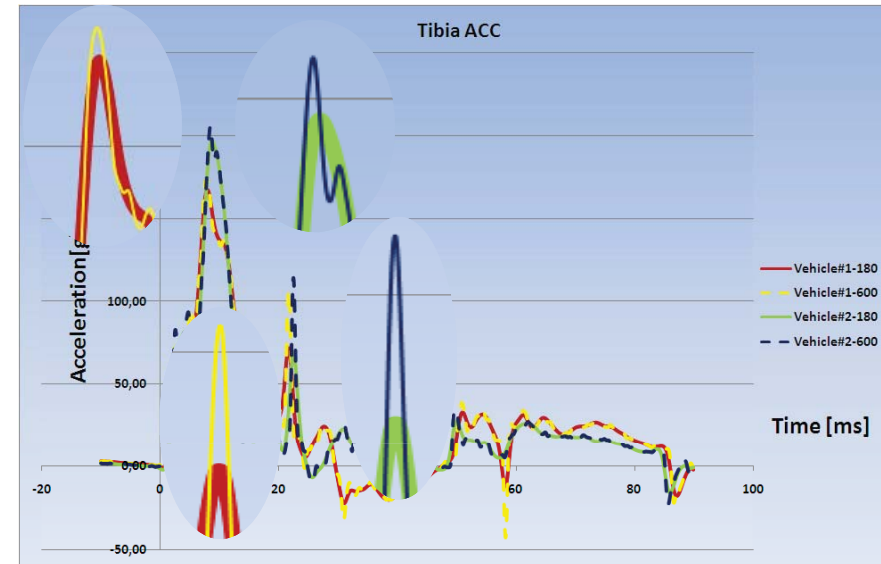
Analysis – Acceleration



Inverse Certification Tests



Vehicle Tests



- Comparative time history curves, but:
- In three out of four cases noticeable influence of the application of different filter classes on test results

Summary & Conclusions



- **Currently, all FlexPLI results are filtered with CFC 180**
- **Application of different filter classes (CFC 180 and CFC 600) on vehicle and inverse certification test results was investigated**
- **No difference in elongation peak results and time history curves**
- **Influence on bending moment results marginal**
- **Noticeable influence on acceleration results**
- **Euro NCAP filter classes are CFC 180 for all EEVC WG 17 PLI results while SAE J211 foresees CFC 1000 for ATD tibia accelerations, CFC 600 for ATD tibia moments and CFC 180 for ATD knee displacements**
- **As almost no influence on bending moment results could be detected it is suggested to stick to CFC 180 according to Euro NCAP as well as EU Regulation (EC) No 631/2009**
- **Besides, as there is already a high noise on tibia acceleration signals filtered with CFC 180 it is suggested to keep the filter class unchanged as well**



Thank you !