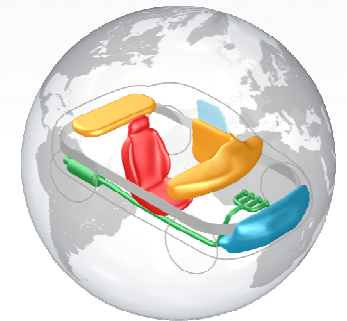


Influence of BioRID hip joint adjustment on BioRID results

Jan Basilautzkis

15.11.2010



Influence of Hip Joint Adjustment Test Overview

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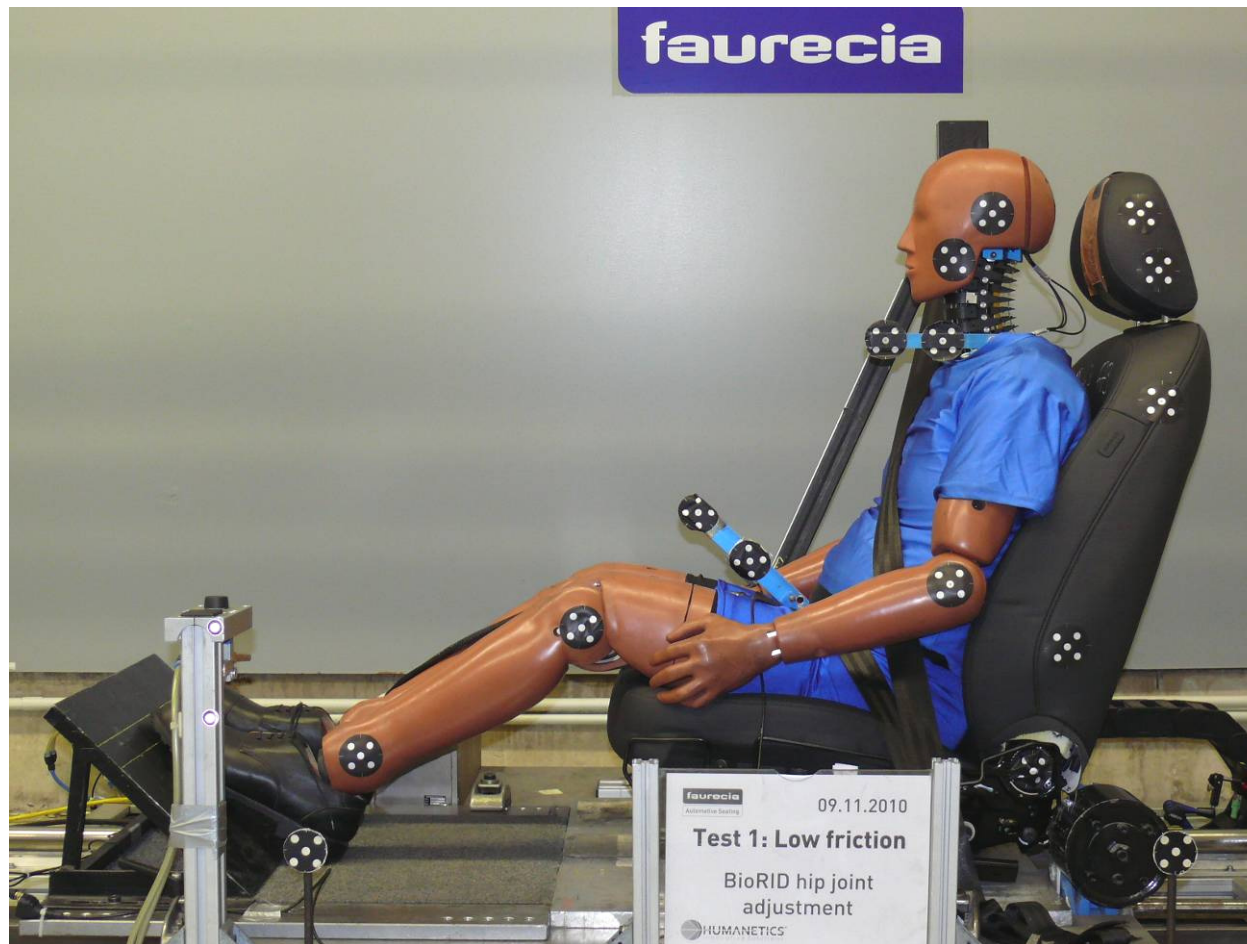
Automotive Seating

- **six tests carried out on acceleration sled**
 - **L1** and **L2**: hip joint w/o friction
 - **N1** and **N2**: hip joint with nominal friction
 - **H1** and **H2**: hip joint with maximal friction
- **14km/h pulse (specific for used sled system)**
- **BioRID-2 (S/N0041, Humanetics)**
- **serial production seat (one seat used for all tests, backrest re-adjusted before each test, height in lowest position)**
- **evaluation of dummy readings according to EuroNCAP test protocol V3.0 (medium severity pulse limits used)**

Influence of Hip Joint Adjustment Test Overview

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Automotive Seating



Influence of Hip Joint Adjustment Dummy position

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Automotive Seating

				Test Overview EuroNCAP Whiplash		Seat adjustment (test position)								BioRID Position				
Sorter	Test No.	test date	Dummy	Crash Pulse	backrest angle	torso angle	HR height	HR tilt	seat length	seat height	seat tilt	lumbar support	H-point to recliner axis (BioRID)		head - head restraint (BioRID)		Head angle	Pelvis angle
													x	z	x	z		
1	low-1	09.11.2010	S/N0041	medium	20,0		lowest	:	middle	lowest	lowest	relaxed	181	68	58	32	0,1	27,8
2	low-2	09.11.2010	S/N0041	medium	20,0		lowest	:	middle	lowest	lowest	relaxed	185	68	59	25	0,3	27,8
3	nominal-1	09.11.2010	S/N0041	medium	20,0		lowest	:	middle	lowest	lowest	relaxed	182	66	58	26	0,6	27,3
4	nominal-2	09.11.2010	S/N0041	medium	20,0		lowest	:	middle	lowest	lowest	relaxed	185	68	59	25	0,5	27,4
5	high1	09.11.2010	S/N0041	medium	20,0		lowest	:	middle	lowest	lowest	relaxed	185	64	60	23	0,4	27,3
6	high-2	09.11.2010	S/N0041	medium	20,0		lowest	:	middle	lowest	lowest	relaxed	184	65	56	24	0,4	27,3

Influence of Hip Joint Adjustment EuroNCAP measurements

faurecia Automotive Seating		Biomechanical Criteria (measured)																					
Sorter	Test No.	1st time of Head to HR contact	End of Head to HR contact	Head-X Accel max	C4-X Accel max	T1-X Accel max	T8-X Accel max	L1-X Accel max	Pelvis-X Accel max	Head Accel resultant max	Pelvis Accel resultant max	Fx+ Upper neck max	Fx- Upper neck max	Fz+ Upper neck max	Fz- Upper neck max	My+ Upper neck max	My- Upper neck max	Fx+ Lower neck max	Fx- Lower neck max	Fz+ Lower neck max	Fz- Lower neck max	My+ Lower neck max	My- Lower neck max
1	low-1	95	138	26,1	0,0	13,2	0,0	0,0	-22,3	26,3		0	-84	582	-66	11,7	-3,4	339	-37	222	-209	1,6	-8,5
2	low-2	93	135	28,1	0,0	13,2	0,0	0,0	-23,9	28,4		6	-90	595	-82	11,4	-3,8	367	0	199	-235	1,4	-10,2
3	nominal-1	94	136	29,3	0,0	14,1	0,0	0,0	-21,6	29,6		11	-94	572	-60	12,4	-4,1	370	-48	189	-222	0,9	-11,0
4	nominal-2	93	135	29,3	0,0	13,7	0,0	0,0	-23,3	29,6		14	-96	553	-62	11,4	-4,4	361	-71	174	-238	0,9	-11,0
5	high1	92	134	29,2	0,0	13,5	0,0	0,0	-21,7	29,5		17	-95	515	-55	11,2	-4,4	352	-78	156	-248	0,8	-11,3
6	high-2	93	135	29,9	0,0	13,5	0,0	0,0	-24,4	30,2		13	-91	533	-57	12,2	-4,4	367	-69	152	-238	0,9	-11,5

contact time measured with humanetics skull cap switch, real contact time probably earlier (see film and head acceleration)

Influence of Hip Joint Adjustment EuroNCAP measurements

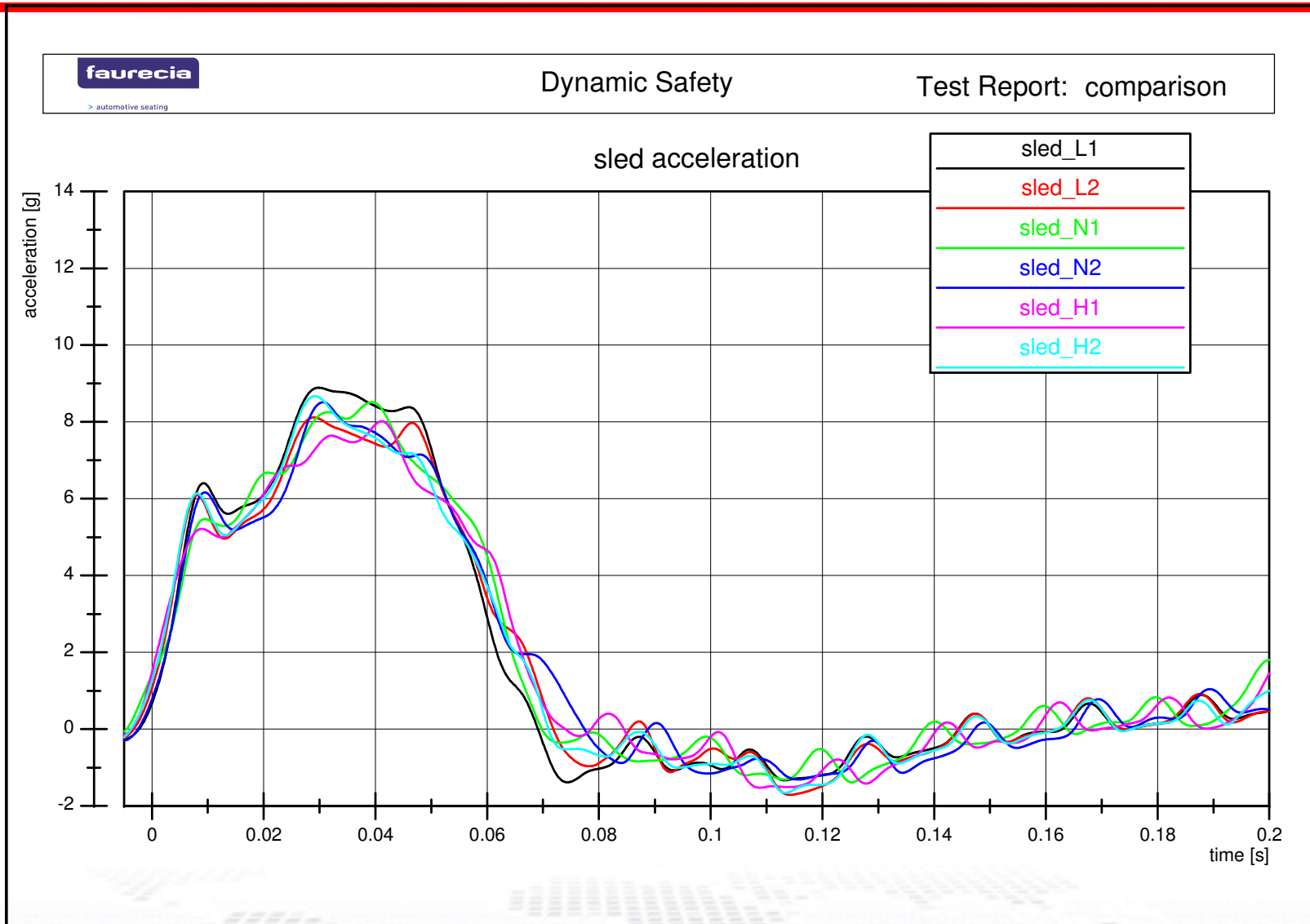
faurecia Automotive Seating		Biomechanical Criteria (calculated) analysis						Assessment according to EuroNCAP V3.0								
Sorter	Test No.	Nfa max (ETHZ)	Nep max (ETHZ)	Nea max (ETHZ)	Nfp max (ETHZ)	NIC max (CFC60)	Head rebound velocity	Dynamic assessment of single test								
								NIC CFC60	Nkm	Head rebound velocity	Fx+ Upper neck max	Fz+ Upper neck max	T1-X Accel max	time HRC	dyn. Deflection, 24km/h only	raw points (dynamic)
1	low-1	0,000	0,085	0,001	0,222	19,3	4,4	0,18	0,41	0,14	0,50	0,22	0,00	cap.	n/a	1,44
2	low-2	0,075	0,095	0,001	0,205	19,1	4,6	0,19	0,43	0,06	0,50	0,20	0,00	cap.	n/a	1,38
3	nominal-1	0,074	0,100	0,001	0,210	19,1	4,7	0,19	0,42	0,02	0,50	0,23	0,00	cap.	n/a	1,36
4	nominal-2	0,071	0,119	0,062	0,197	18,7	4,8	0,21	0,44	0,00	0,50	0,25	0,00	cap.	n/a	1,40
5	high1	0,073	0,123	0,001	0,190	18,4	4,8	0,22	0,45	0,00	0,50	0,30	0,00	0,00	n/a	1,47
6	high-2	0,073	0,111	0,000	0,196	19,3	4,8	0,18	0,44	0,00	0,50	0,28	0,00	cap.	n/a	1,40

Ø 1,41

Ø 1,38

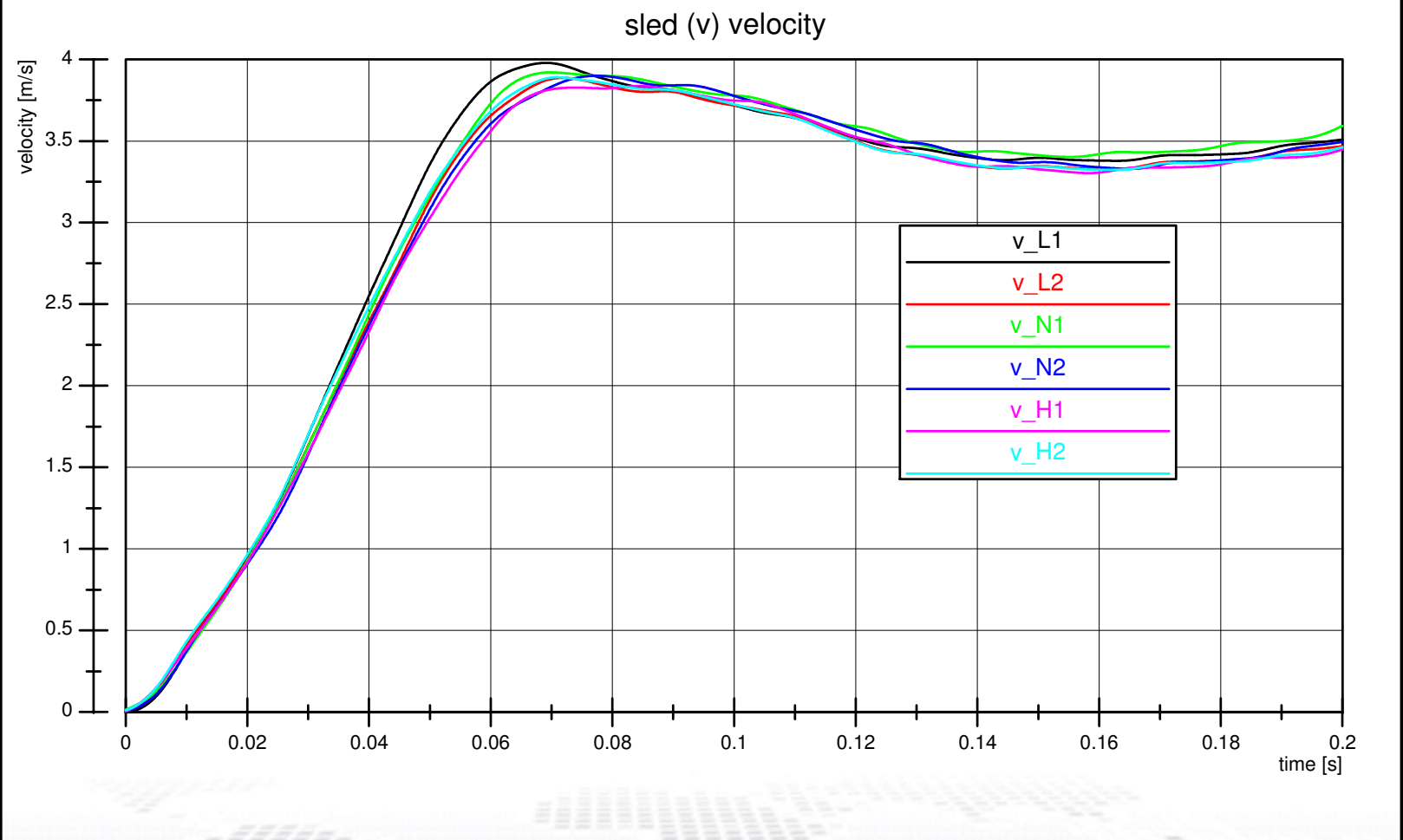
Ø 1,43

Sled Acceleration

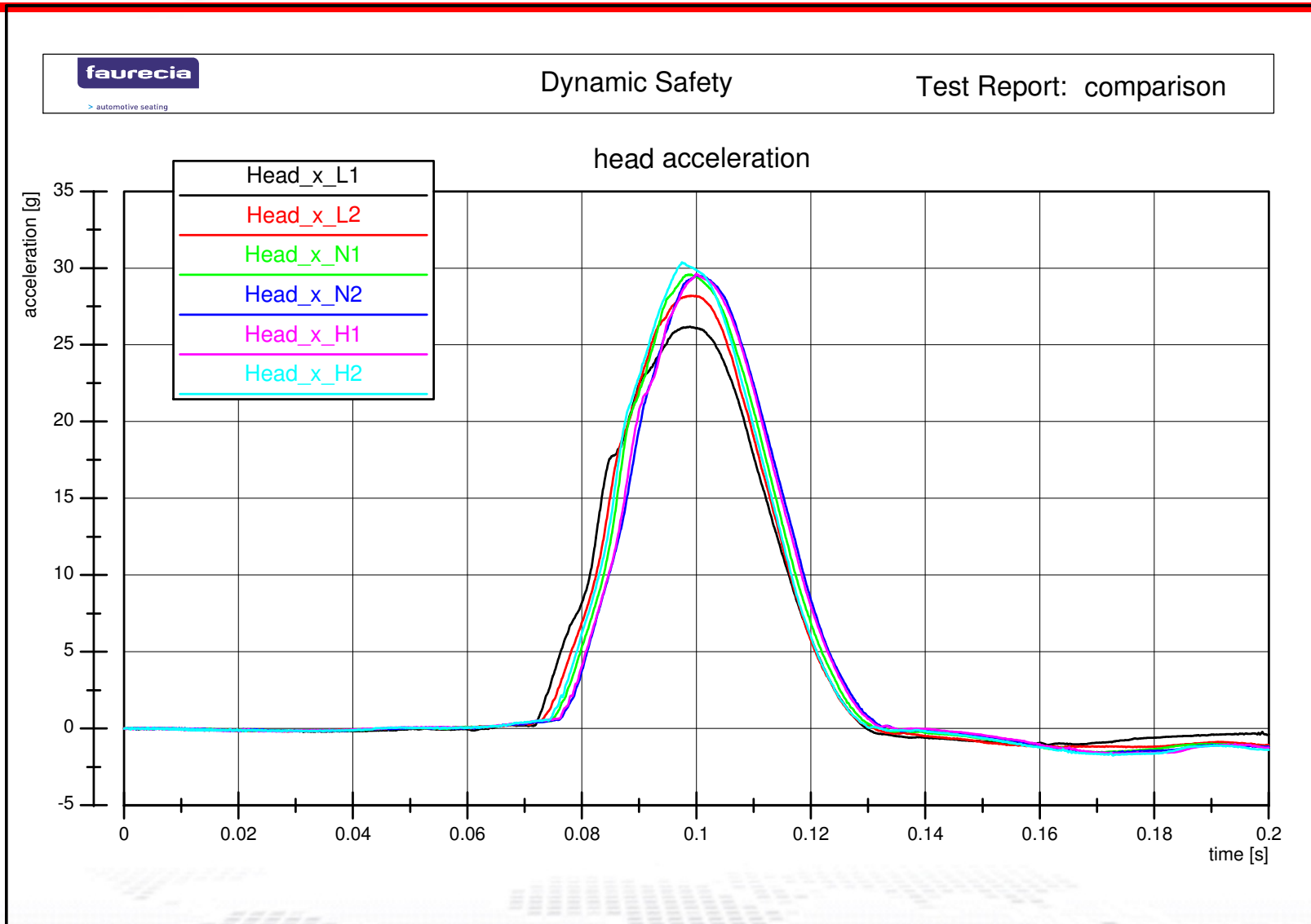


Sled Velocity

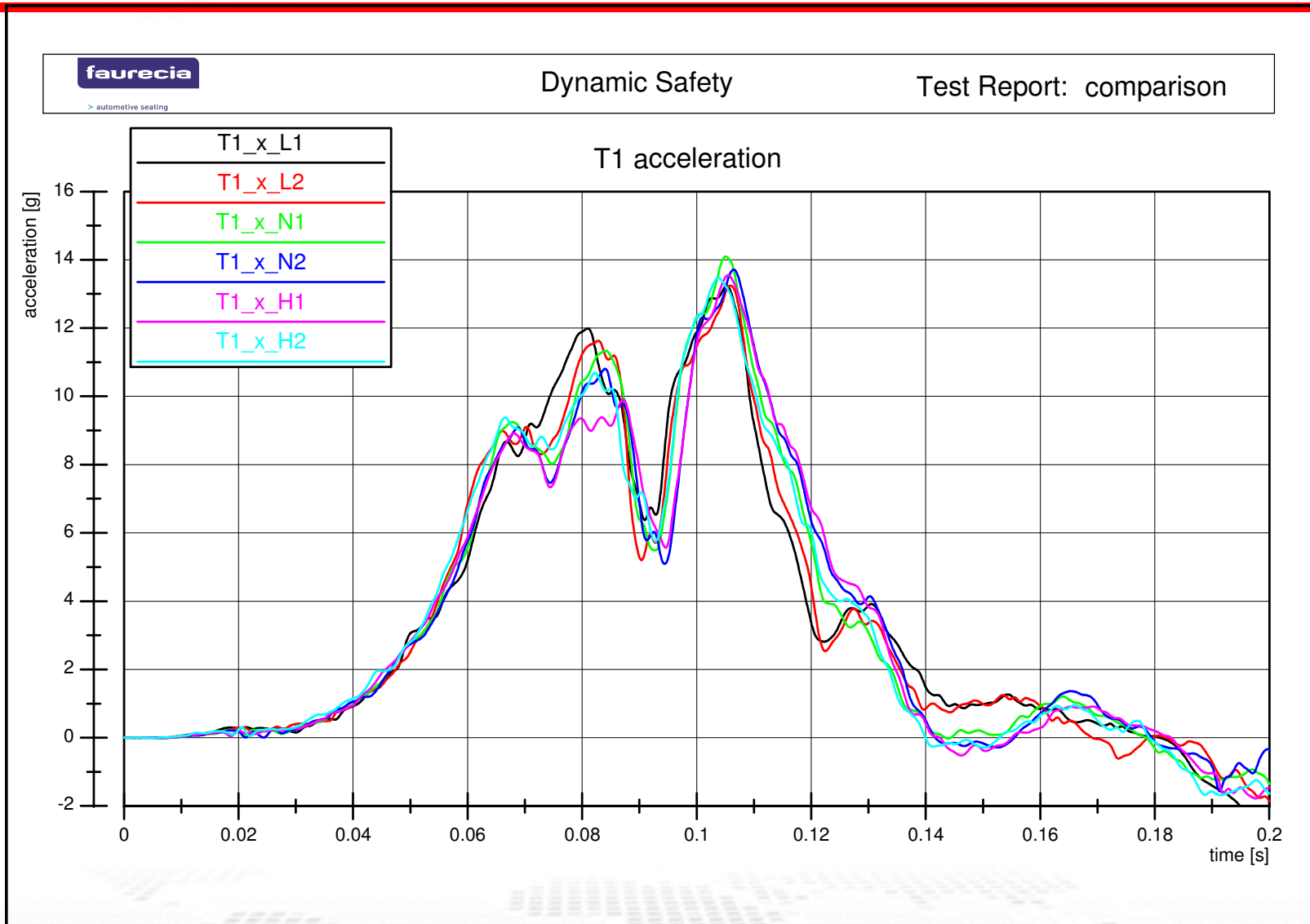
faurecia > automotive seating Dynamic Safety Test Report: comparison



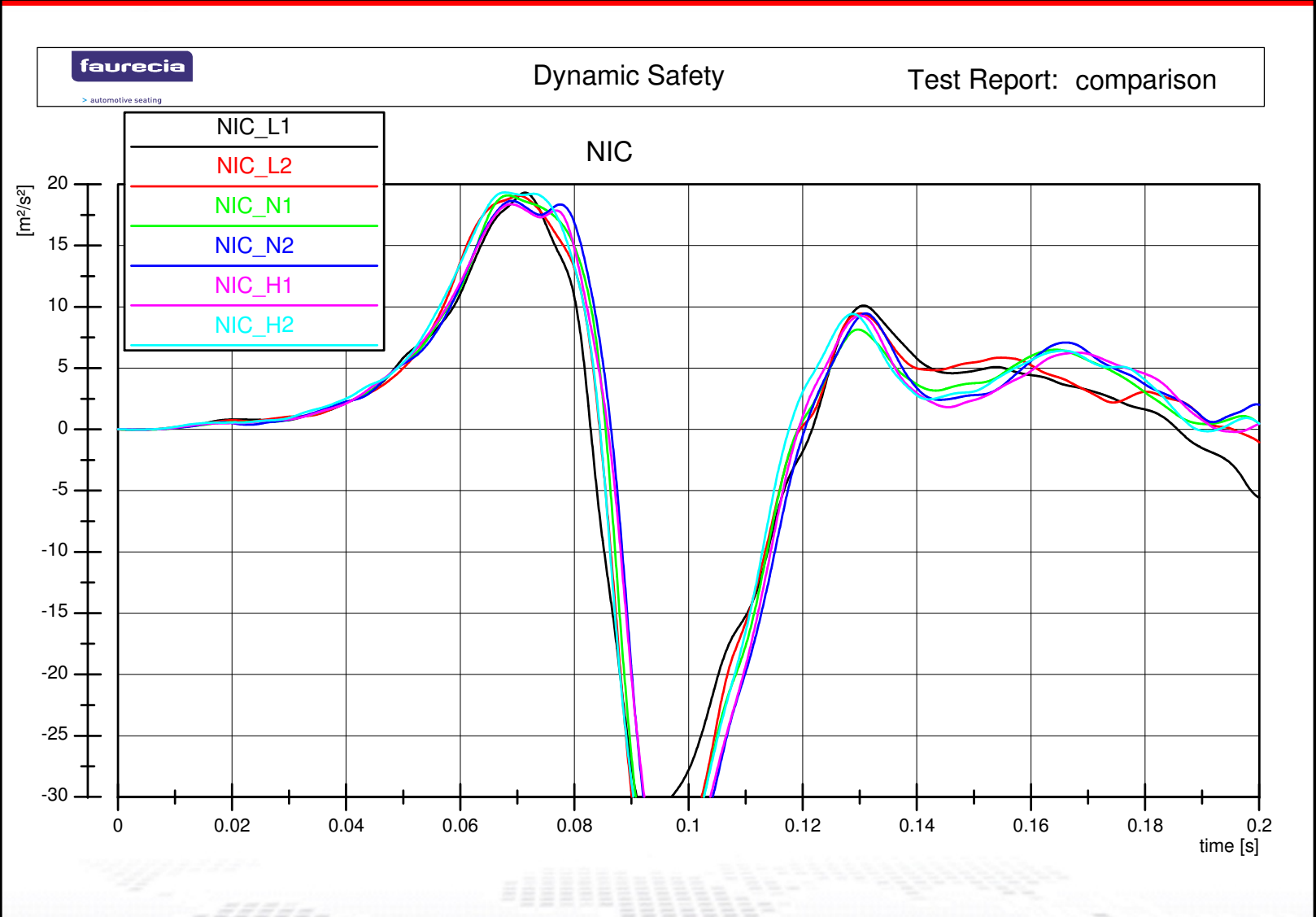
Head Acceleration



T1 Acceleration

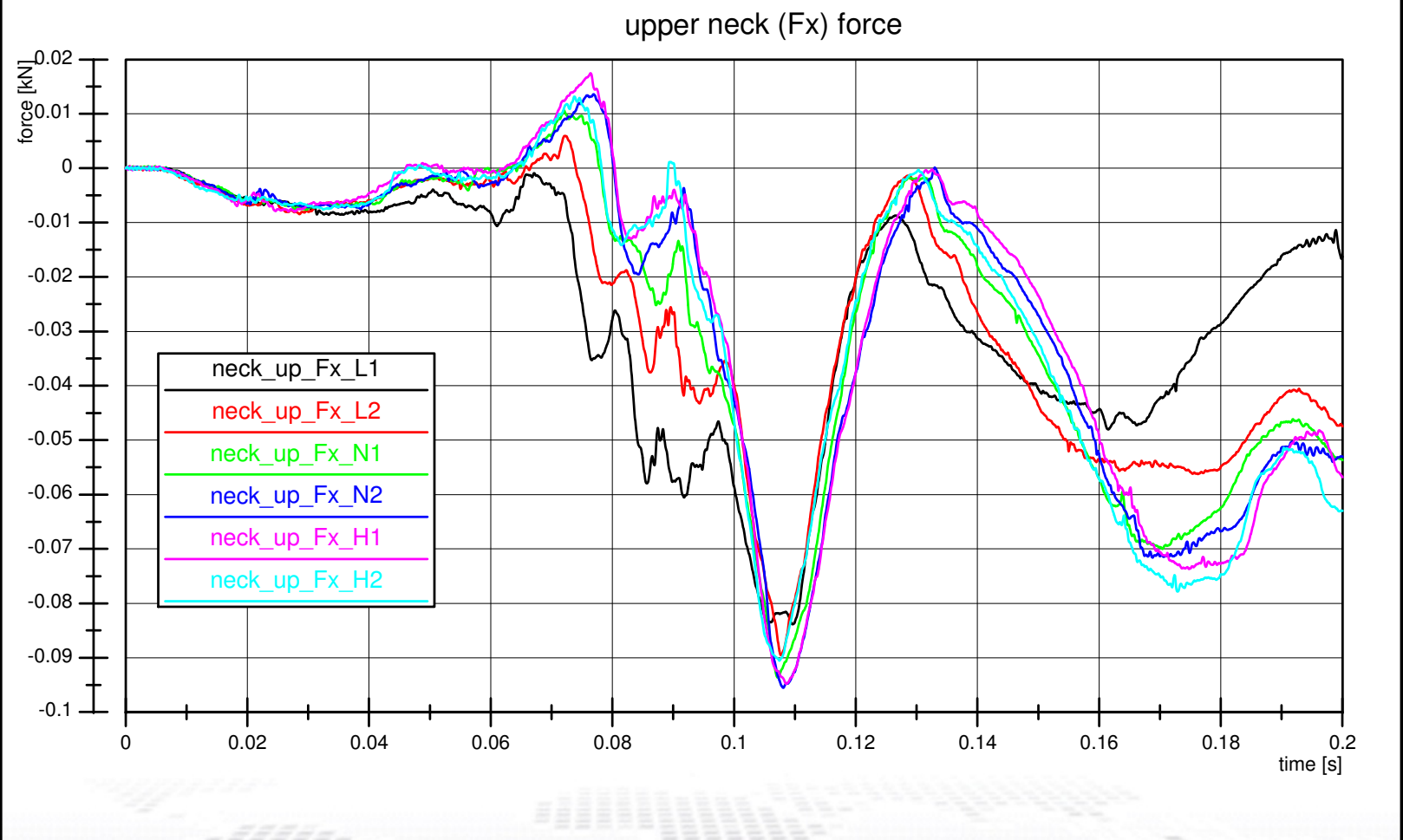


NIC [CFC60]

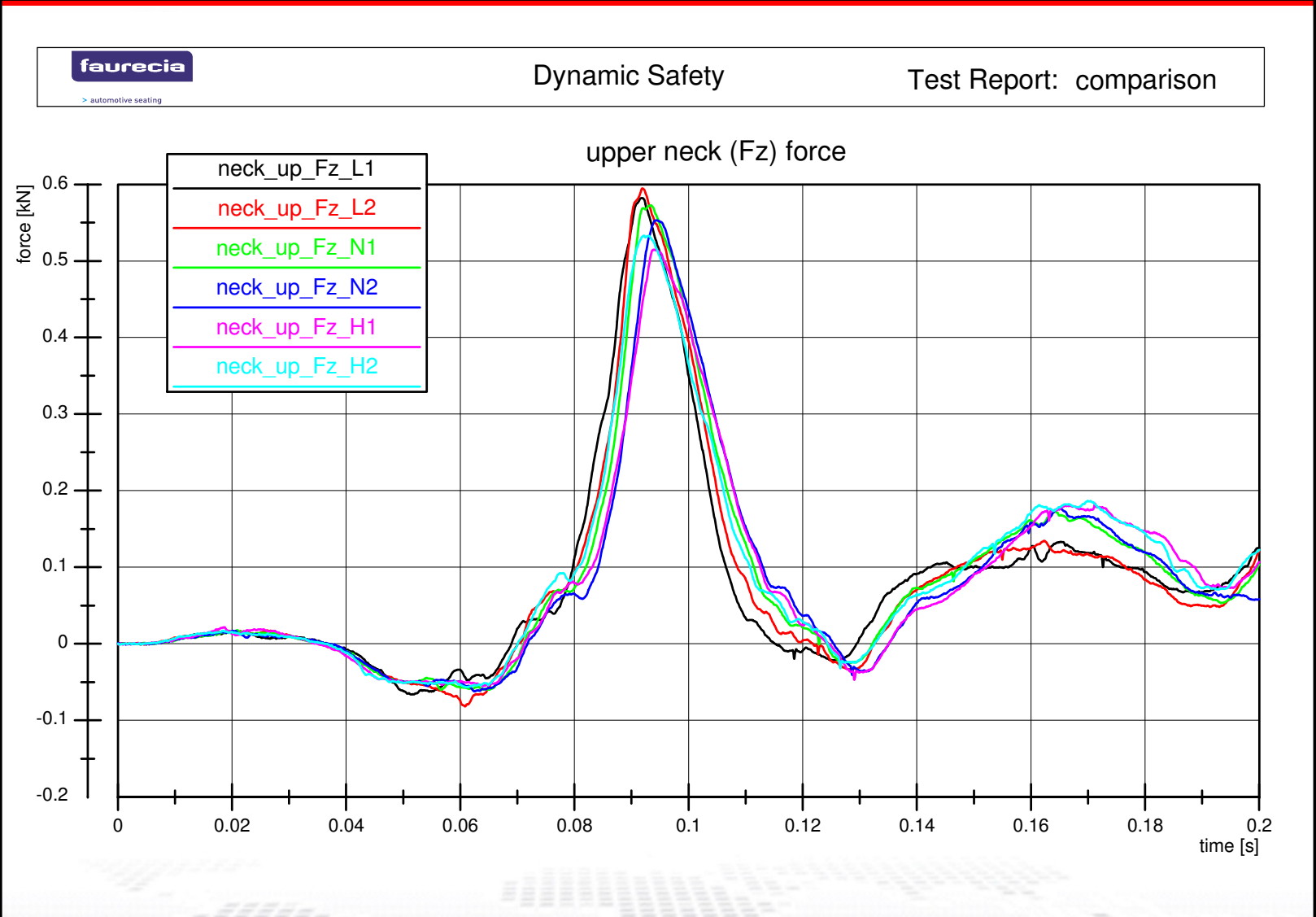


Upper Neck Fx

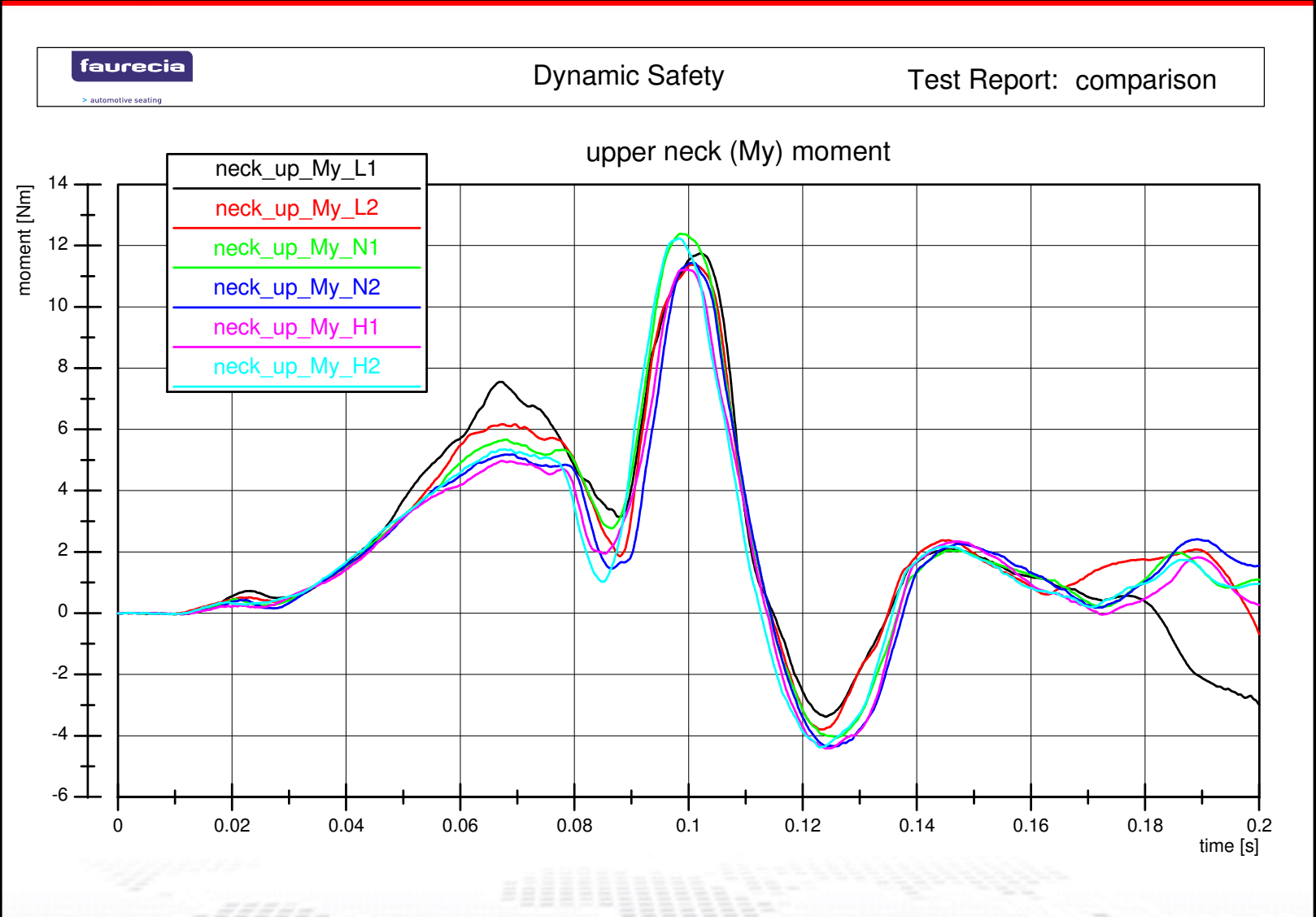
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Upper Neck Fz

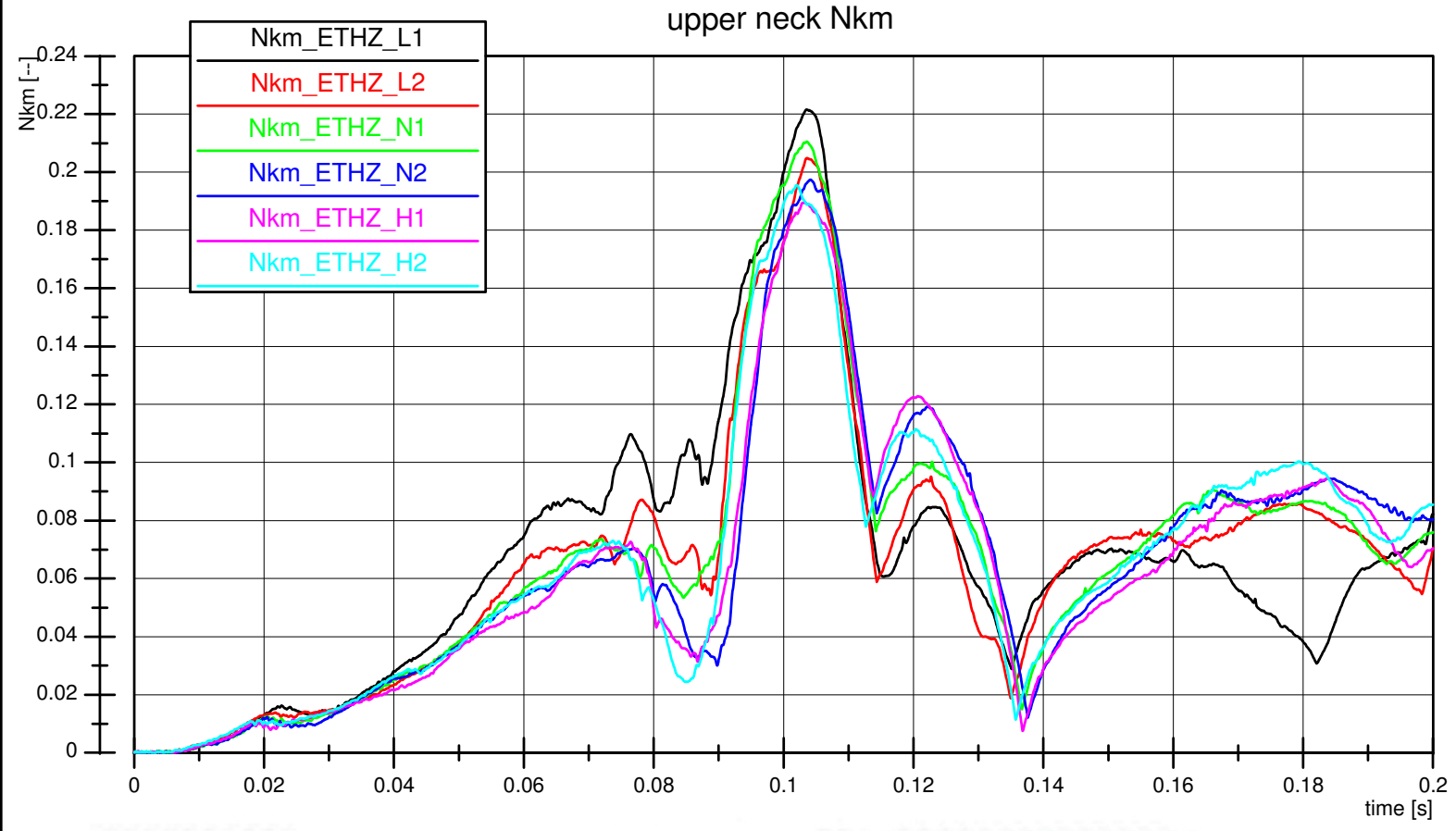


Upper Neck My

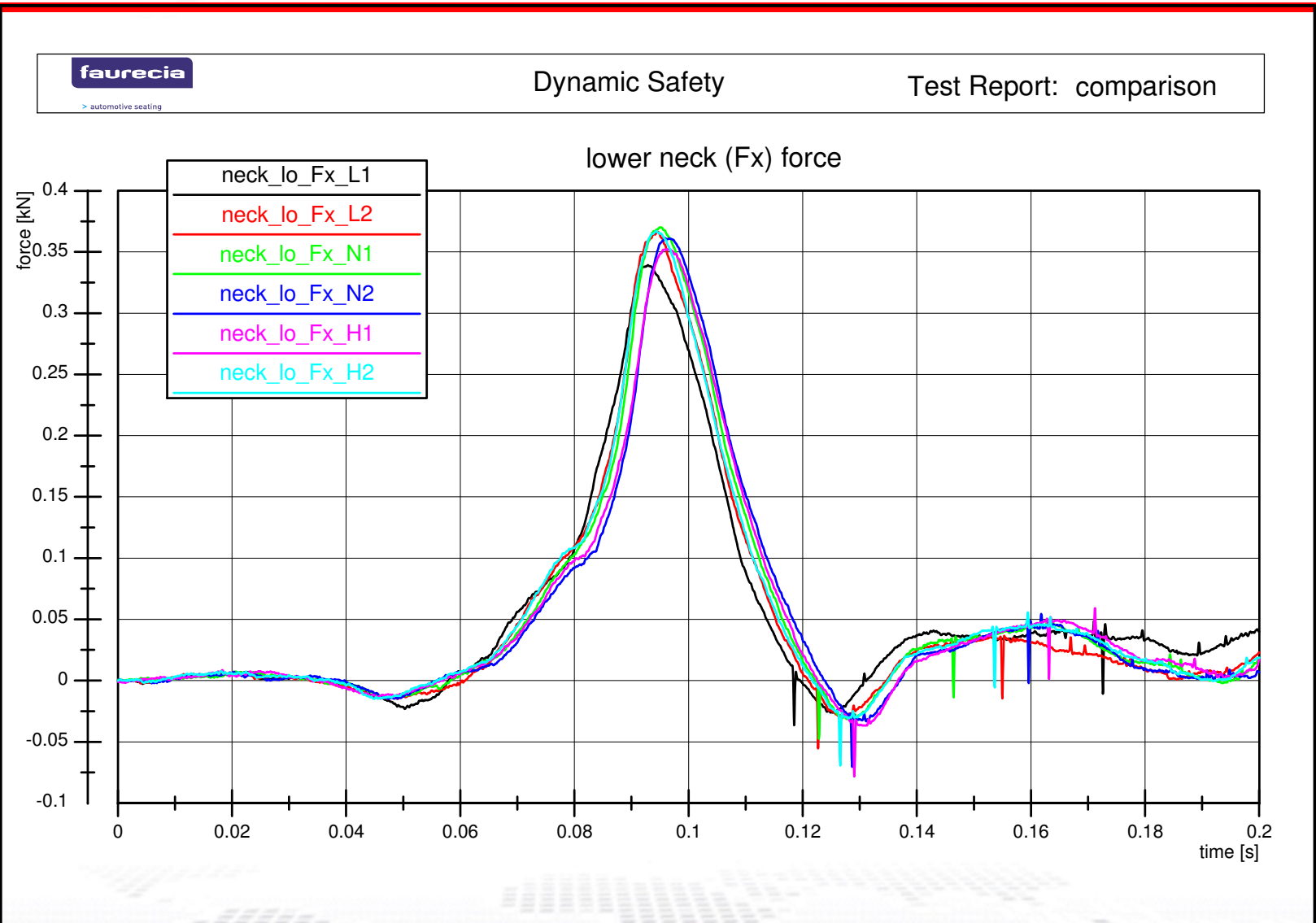


Upper Neck Nkm

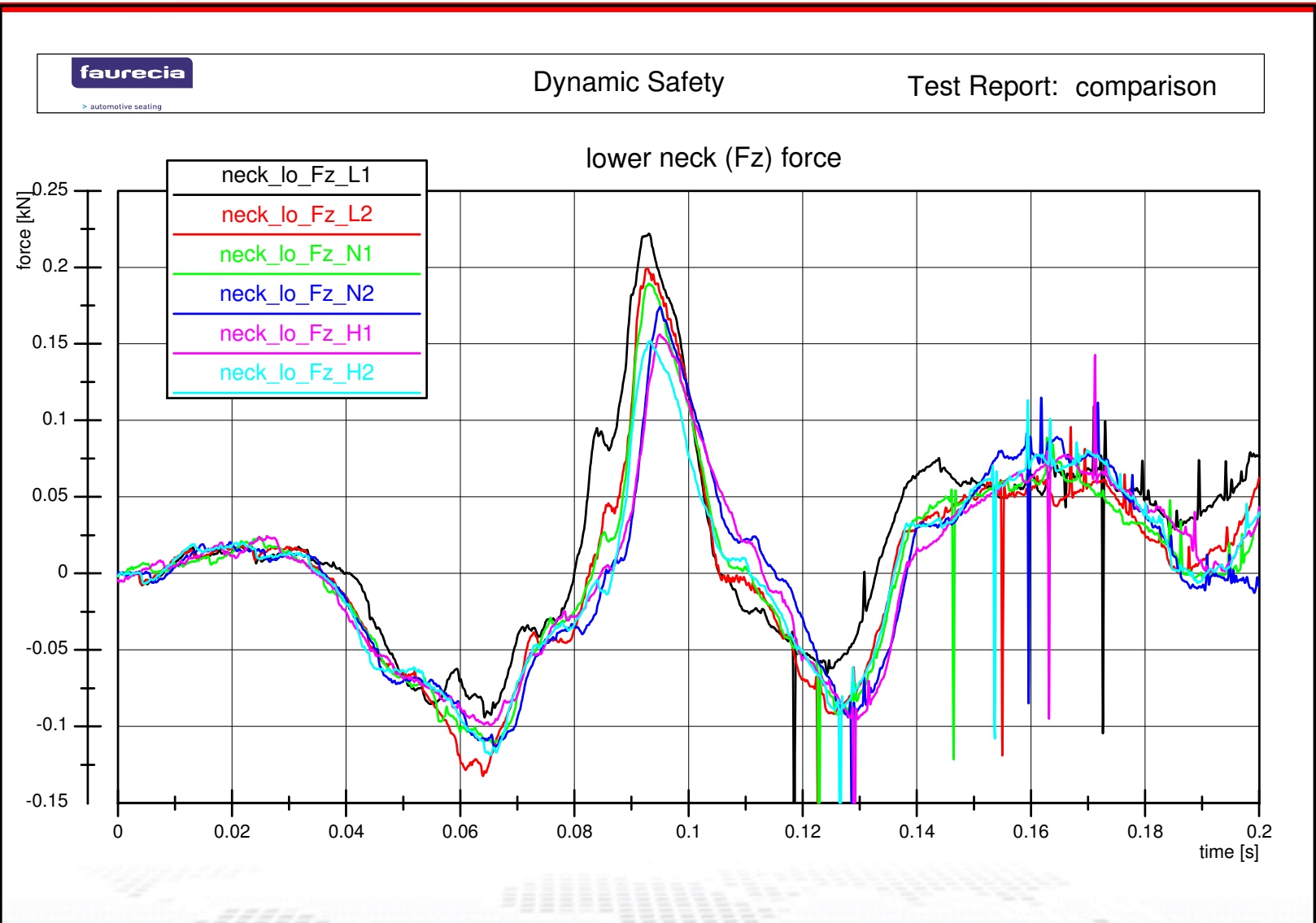
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Lower Neck Fx



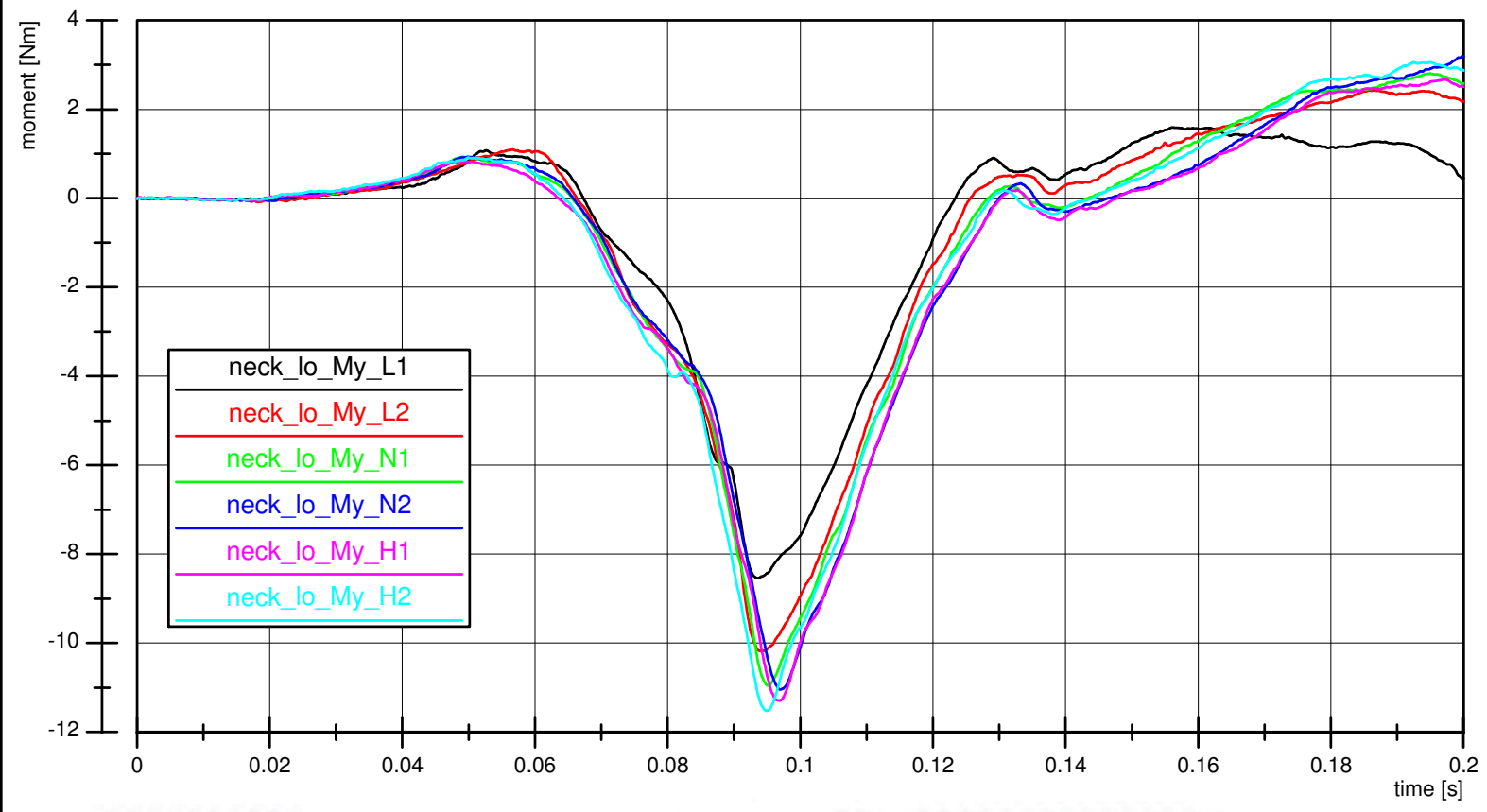
Lower Neck Fz



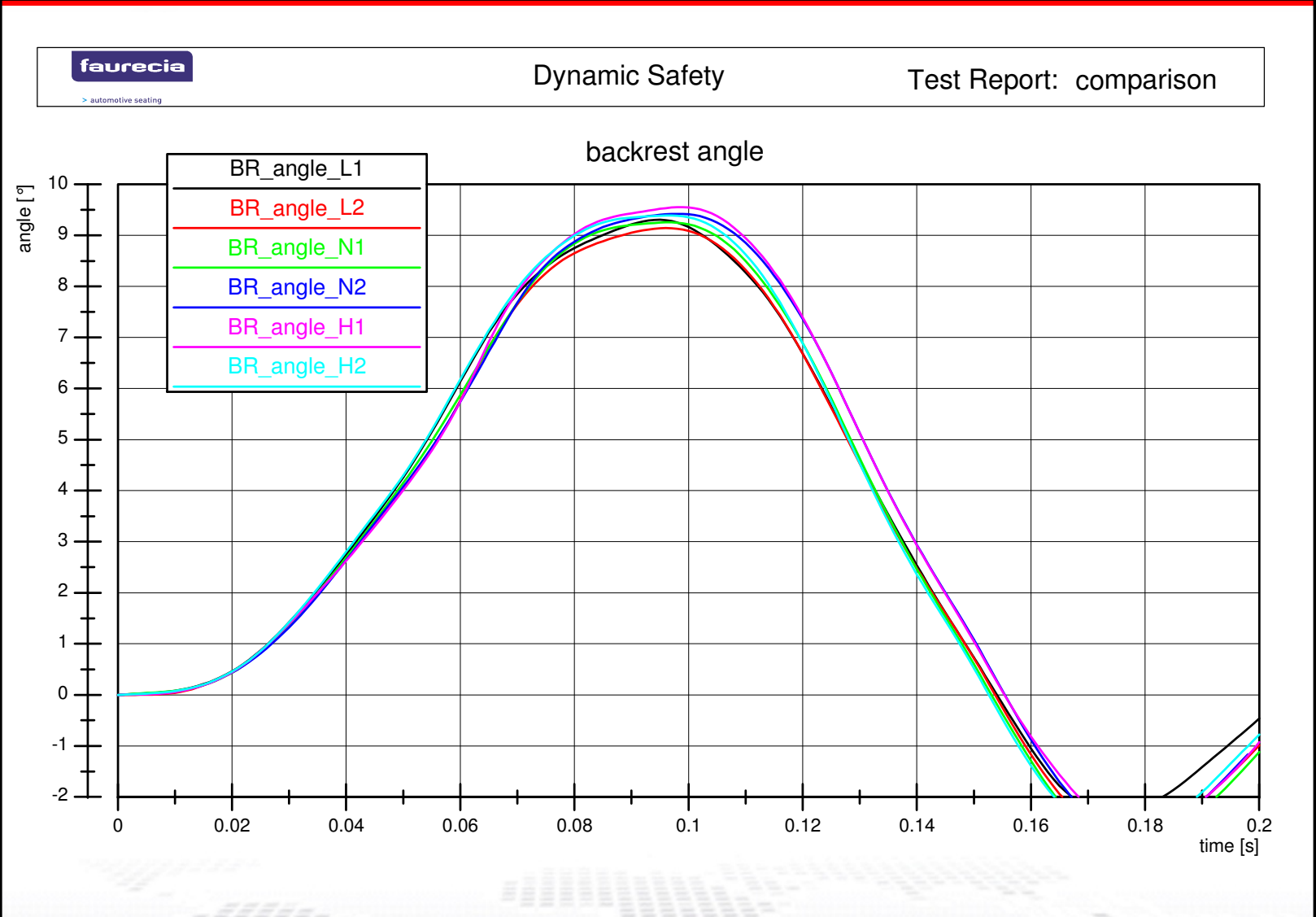
Lower Neck My

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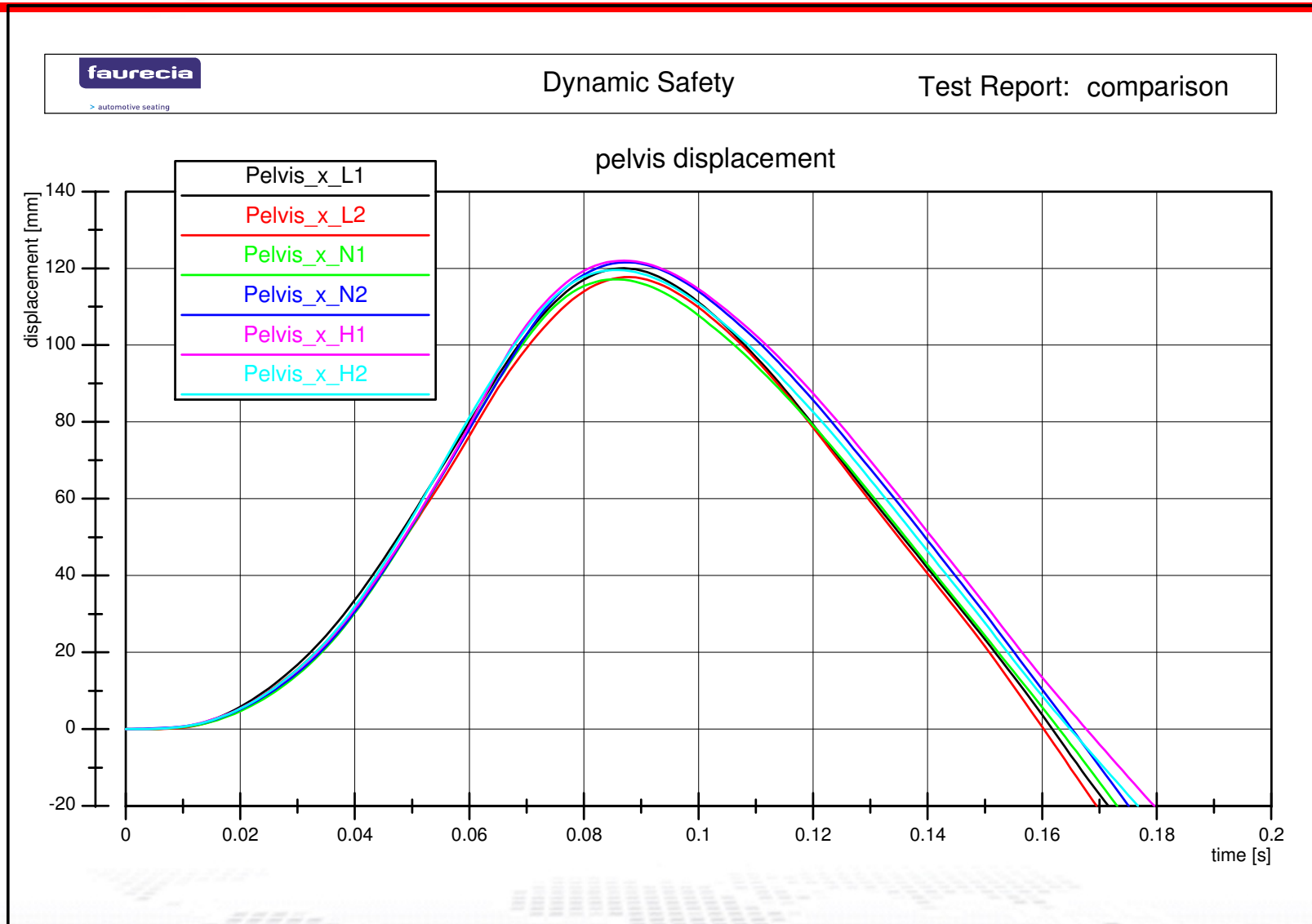
lower neck (My) moment



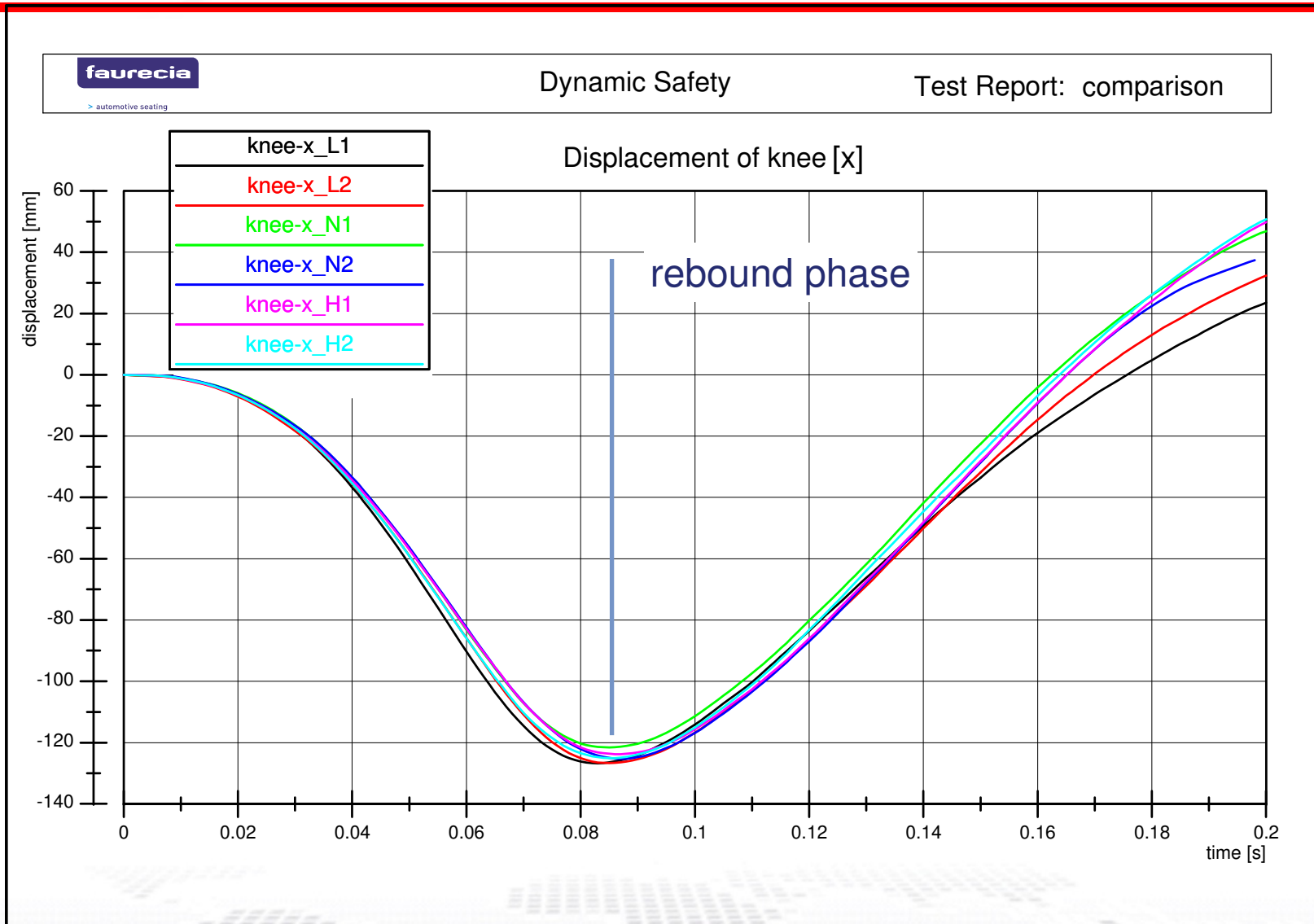
Film Analysis: backrest deflection



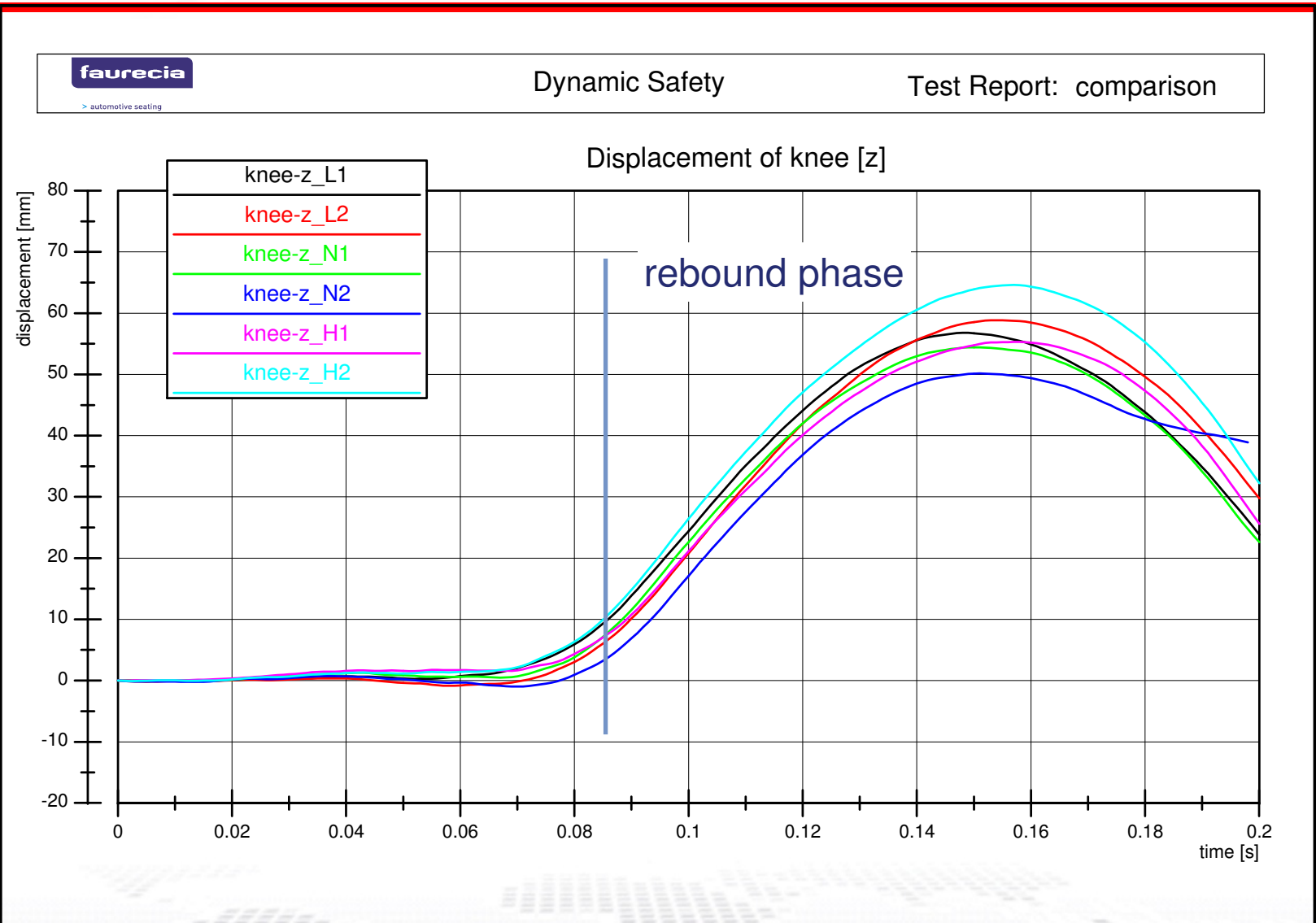
Film Analysis: displacement of pelvis



Film Analysis: displacement of knee

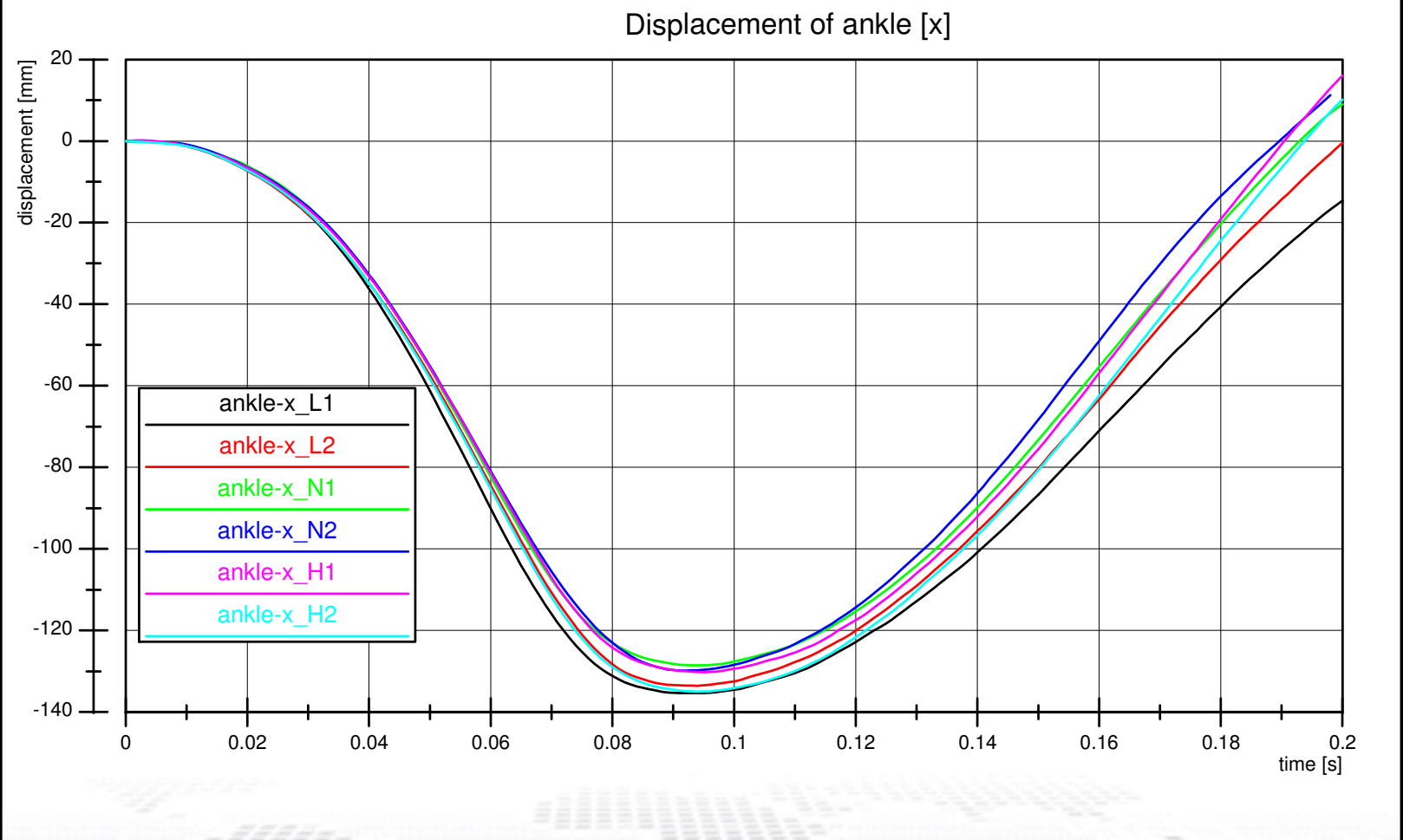


Film Analysis: displacement of knee



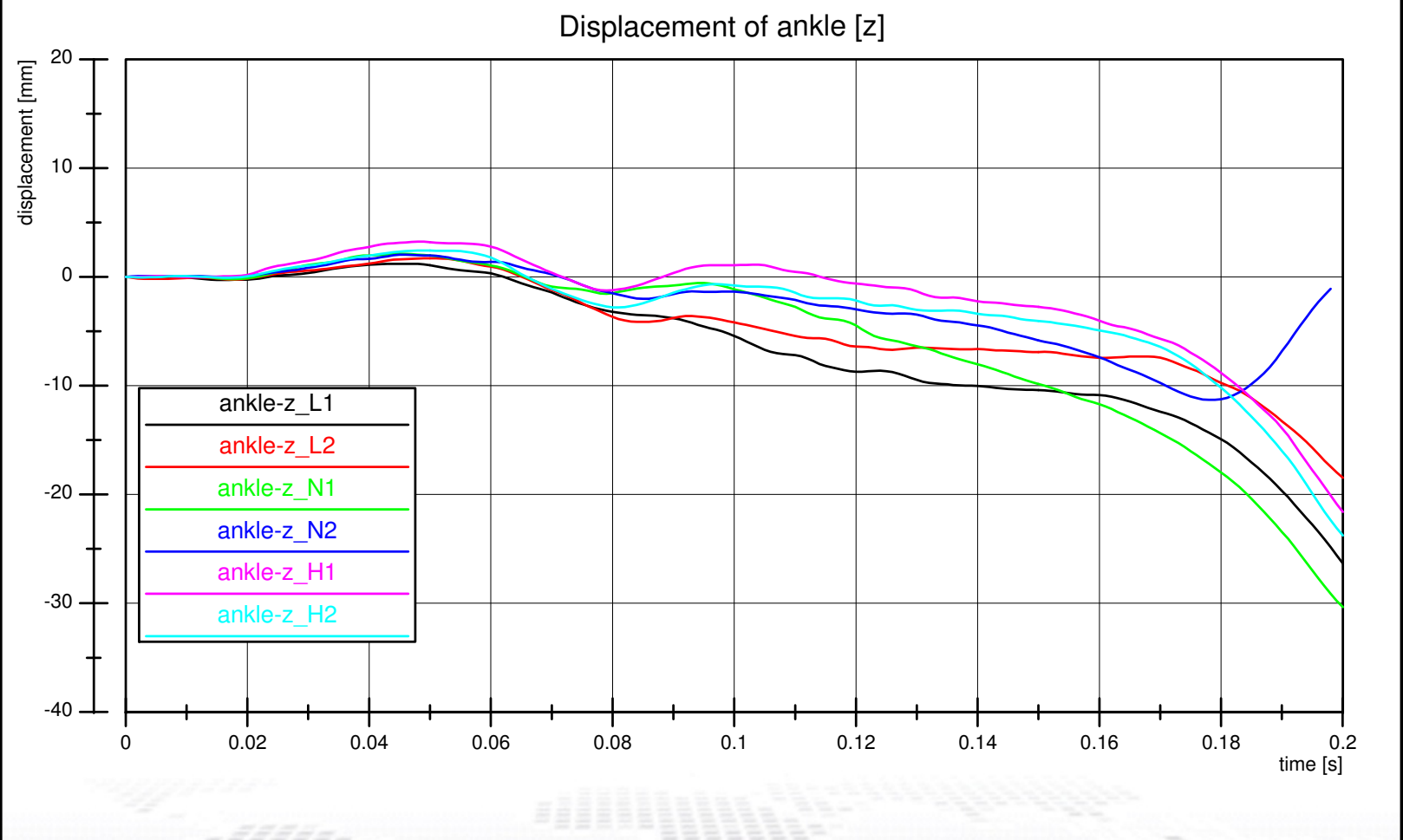
Film Analysis: displacement of ankle

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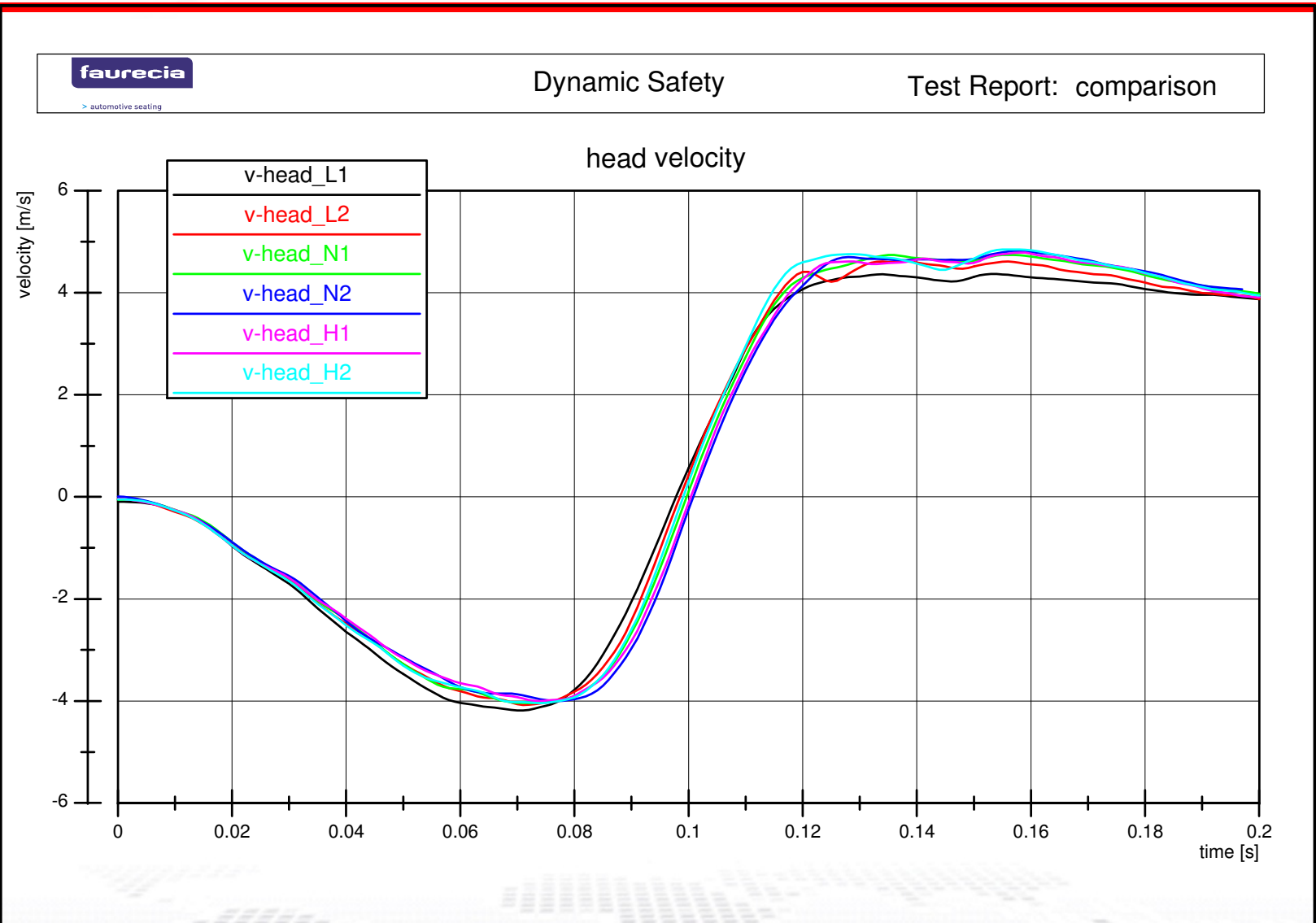


Film Analysis: displacement of ankle

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Film Analysis: head rebound velocity



Influence of Hip Joint Adjustment Observations

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- **neck forces (increasing hip joint friction)**
 - slight increase of rearward shear force (upper neck) w/o influence on rating
 - slight decrease of neck tension (upper neck) with slight influence on rating
 - slight decrease of neck tension (lower neck), no evaluation in rating
- **slight increase of rebound velocity from low to nominal friction with slight influence on rating (no difference from nominal to high friction)**
- **correct dummy positioning only possible with nominal adjustment of hip joint friction (e.g. distance between legs)**

Influence of Hip Joint Adjustment Conclusions

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Automotive Seating

- different hip joint adjustments (extreme values) could cause different neck forces and rebound velocities but do not show clear influence on EuroNCAP rating
- limitation:
 - results from 14km/h pulse with rating according to medium severity pulse may differ for correct EuroNCAP pulse
 - influence of seat design not regarded



Technical perfection, automotive passion

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