

Activity Report

Task Force regarding Review and Update Certification Corridor
(TF-RUCC) under the IG GTR9-PH2

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1. Background

- Flex-TEG had made three component level certification corridors for Thigh, Knee and Leg Quasi-static certification tests as well as two dynamic assembly level certification corridors for Pendulum type and Inverse type for Flex-PLI.
- However, Humanetics had some difficulty producing a production Flex-PLI that could completely meet the inverse level certification corridors. This was assumed to be due to differences between the prototypes and production type.
- IG GTR9-PH2 had discussed and decided to settle a Task Force regarding Review and Update Certification Corridor (TF-RUCC) under IG GTR9-PH2 at the kick-off meeting of IG GTR9-PH2 in November 2011 to solve the above situation.
- Japan had an assignment to take a chair of the TF-RUCC, then Humanetics had an assignment to be a secretariat of the TF-RUCC.

2. Meetings

- TF-RUCC had a kick off meeting in November 2011, then TF-RUCC had 1st to 5th TF-RUCC meeting by July 2012.
- TF-RUCC conducted historical review of certification corridors, then made update proposal for component level as well as assembly level certification corridors.

Date	Nos.	Main Topic
28 th Nov. 2011	Kick-off	<ul style="list-style-type: none"> • Make Terms of Reference • Historical Review
27 th Jan. 2012	1 st	<ul style="list-style-type: none"> • Historical Review • Overall Working Schedule to Update Certification Corridor
23 rd Mar. 2012	2 nd	<ul style="list-style-type: none"> • JARI test results (Component Level) • Update Proposal for Component Level Certification Corridor
25 th May 2012	3 rd	<ul style="list-style-type: none"> • JARI and BAST Test Results (Assembly Level) • Agreement on the Update Proposal for Component Level Certification Corridor
18 th Jun. 2012	4 th	<ul style="list-style-type: none"> • BAST and Bertrandt Test Results (Assembly Level) • Update Proposal for Assembly Level Certification Corridor
30 th Jul. 2012	5 th	<ul style="list-style-type: none"> • Humanetics and Ford Test Results (Assembly Level) • Agreement on the Update Proposal for Assembly Level Certification Corridor

3. Historical Review

- TF-RUCC conducted historical review of certification corridors for component level as well as assembly level certification corridors.

3. Historical Review

3.1. Bone core production corridor

- At the first, bone core production corridor, which is only used by Flex-PLI production maker to keep bone core quality, was evaluated.
- The bone core production corridor was made by JARI from Flex-PLI type GT level, and it works well at JARI test lab with JARI test rig.
- However, Humanetics (Japan and US) test results with Humanetics (Japan and US) test rig shows slight differences compared to JARI one.
- The difference came from the difference of the test rig and maybe from the difference of test lab (sensors, settings, etc.).
- Flex-GTR bone core characteristic shall be investigated/certified by JARI because JARI is the master test lab that developed the corridors using the master test rig.

3.1. Bone core production corridor (Femur bone core)

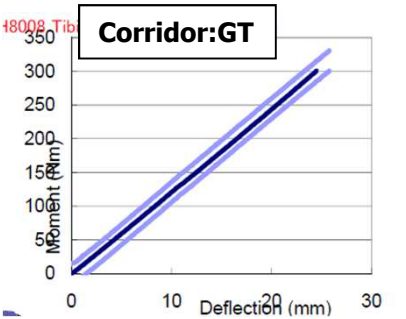
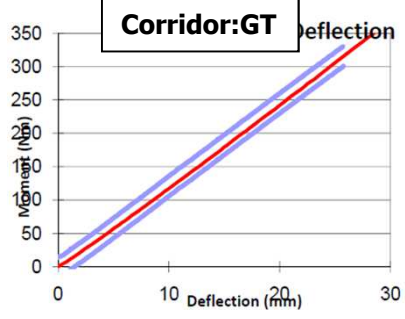
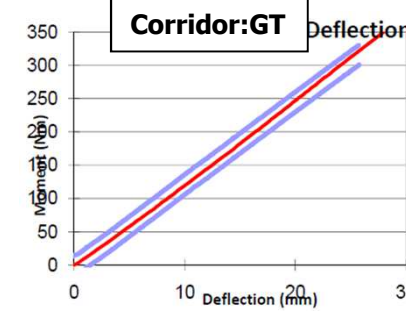
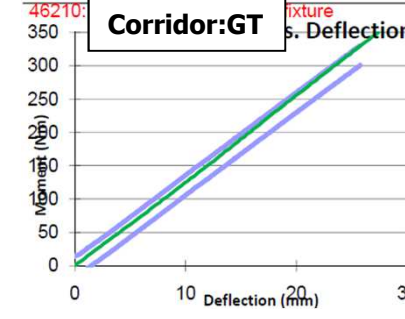
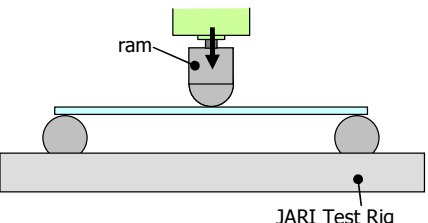
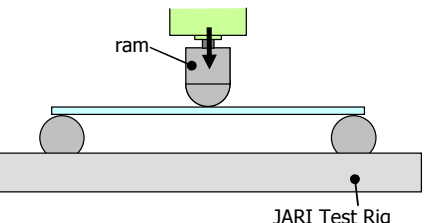
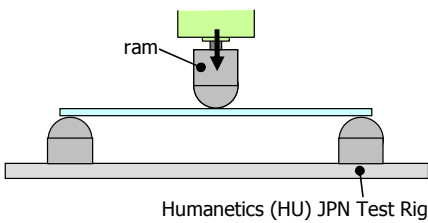
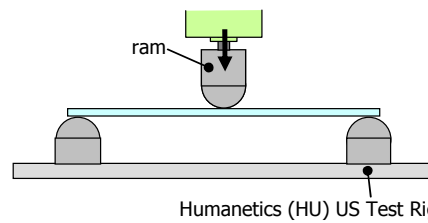
JARI Lab.	HU-JPN Lab.		HU-US Lab.
JARI Test Rig	JARI Test Rig	HU-JPN Test Rig	HU-US Test Rig
<p style="text-align: center;">JARI Test Rig</p>	<p style="text-align: center;">JARI Test Rig</p>	<p style="text-align: center;">Humanetics (HU) JPN Test Rig</p>	<p style="text-align: center;">Humanetics (HU) US Test Rig</p>
mid in corridor	mid in corridor	mid-high in corridor	high in corridor



JARI Test Rig

Humanetics (HU) JPN Test Rig

3.1. Bone core production corridor (Tibia bone core)

JARI Test Lab.	HU-JPN Test Lab.		HU-US Test Lab.
JARI Test Rig	JARI Test Rig	HU-JPN Test Rig	HU-US Test Rig
			
 <p style="text-align: center;">JARI Test Rig</p>	 <p style="text-align: center;">JARI Test Rig</p>	 <p style="text-align: center;">Humanetics (HU) JPN Test Rig</p>	 <p style="text-align: center;">Humanetics (HU) US Test Rig</p>
mid in corridor	mid in corridor	mid-high in corridor	high in corridor



JARI Test Rig

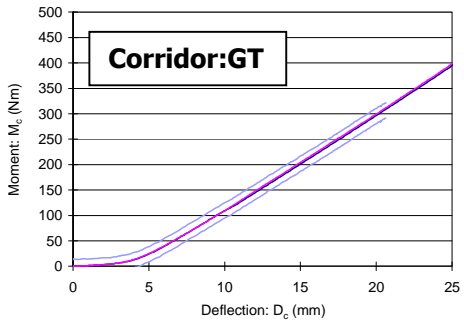
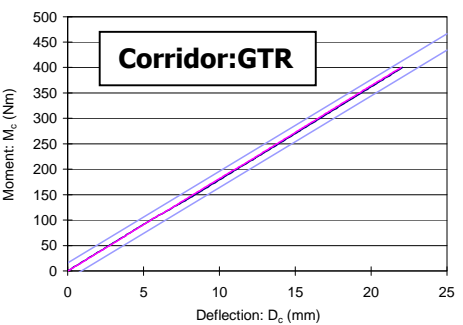
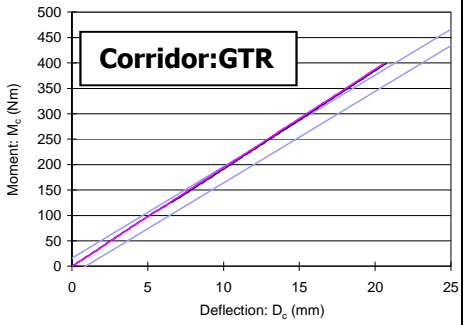
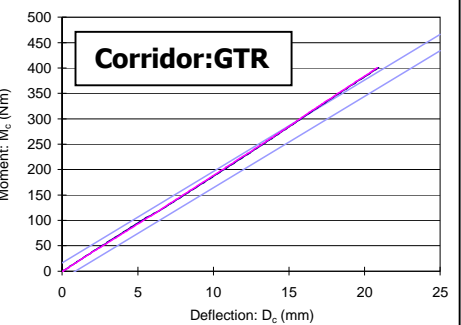
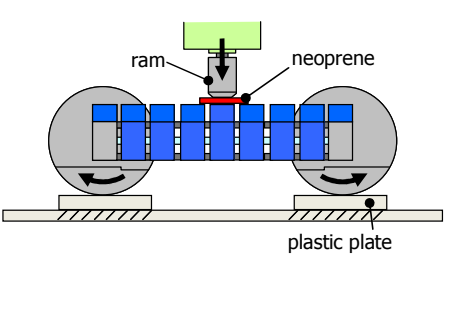
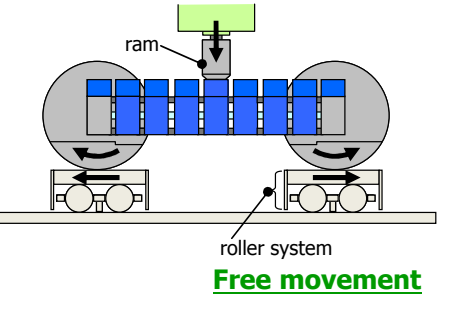
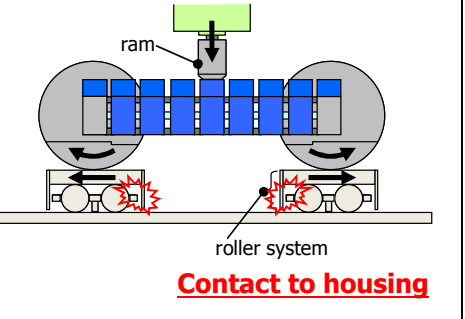
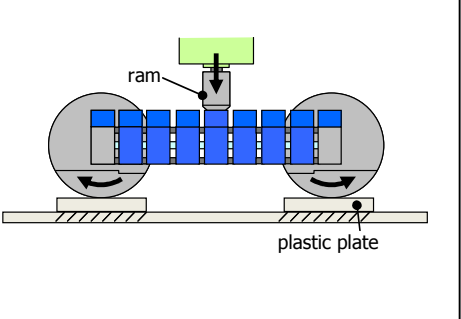
Humanetics (HU) JPN Test Rig

3. Historical Review

3.2. Component level certification corridor

- At the second, component level certification corridor, which is used by Flex-PLI user to investigate component level Flex-PLI quality, was evaluated. Findings are described as follows:
- The roller support system, which is used for the certification test, causes high variations in the test results.
- The plastic plate support system, used for Flex-GT, provides stable test results.
- Recommend to use the plastic plate support system for Flex-GTR certification tests.
- Need to update the Flex-GTR component corridors.
- Draft proposal shall be developed by mid March 2012 using JARI test data.

3.2. Component level certification corridor (Femur)

With Neoprene	No Neoprene		
Plastic Plate	Roller System		Plastic Plate
	Gap	No gap	
 <p style="text-align: center;">Corridor:GT</p>	 <p style="text-align: center;">Corridor:GTR</p>	 <p style="text-align: center;">Corridor:GTR</p>	 <p style="text-align: center;">Corridor:GTR</p>
 <p style="text-align: center;">plastic plate</p>	 <p style="text-align: center;">roller system Free movement</p>	 <p style="text-align: center;">roller system Contact to housing</p>	 <p style="text-align: center;">plastic plate</p>
<ul style="list-style-type: none"> • easy setting • good repeatability 	<ul style="list-style-type: none"> • difficult setting • difficult to control which data can be obtained 		<ul style="list-style-type: none"> • easy setting • good repeatability

3.2. Component level certification corridor (Tibia)

With Neoprene	No Neoprene		
Plastic Plate	Roller System		Plastic Plate
	Gap	No Gap	
<p style="text-align: center;">Corridor:GT</p>	<p style="text-align: center;">Corridor:GTR</p>	<p style="text-align: center;">Corridor:GTR</p>	<p style="text-align: center;">Corridor:GTR</p>
<p style="text-align: center;">ram, neoprene, plastic plate</p>	<p style="text-align: center;">ram, roller system Free movement</p>	<p style="text-align: center;">ram, roller system Contact to housing</p>	<p style="text-align: center;">ram, plastic plate</p>
<ul style="list-style-type: none"> • easy setting • good repeatability 	<ul style="list-style-type: none"> • difficult setting • difficult to control which data can be obtained 		<ul style="list-style-type: none"> • easy setting • good repeatability

3.2. Component level certification corridor (Knee)

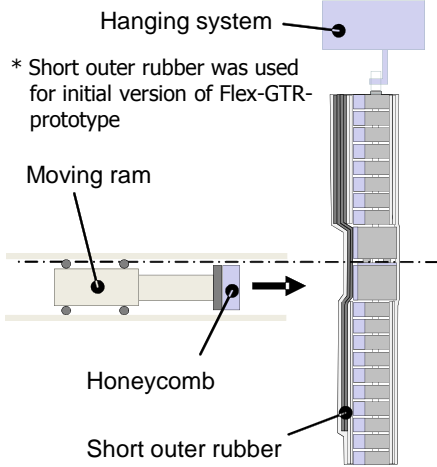
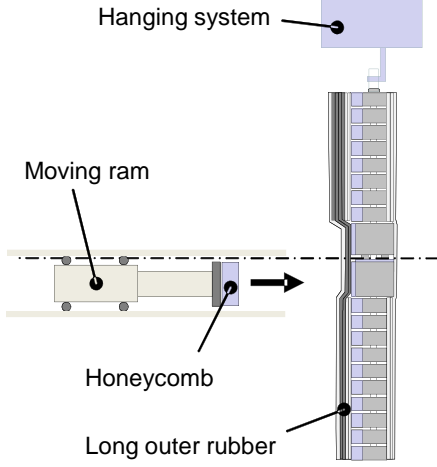
	With Neoprene Roller System		
Plastic Plate	Gap	No Gap	Plastic Plate
MCL Corridor:GT	Corridor:GTR 	Corridor:GTR 	Corridor:GTR
ACL, PCL Corridor:GT	Corridor:GTR 	Corridor:GTR 	Corridor:GTR
<ul style="list-style-type: none"> • easy setting • good repeatability 	<ul style="list-style-type: none"> • difficult setting • difficult to control which data can be obtained 	<ul style="list-style-type: none"> • easy setting • good repeatability 	

3. Historical Review

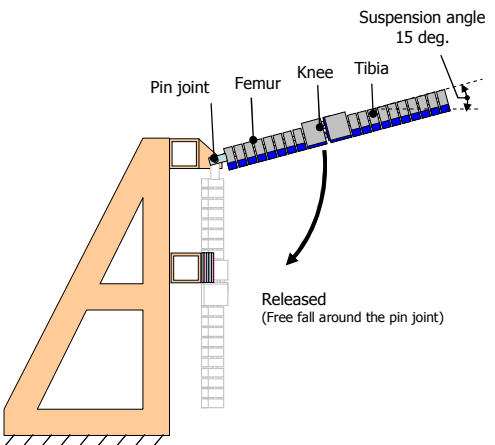
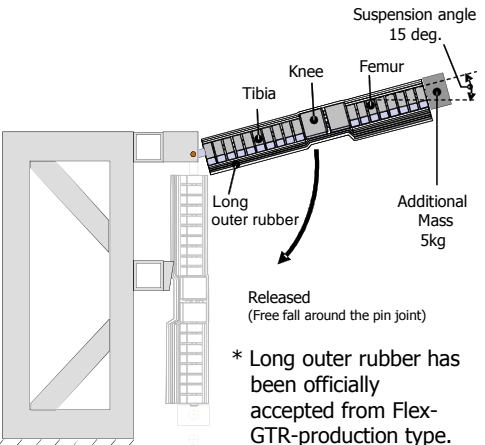
3.3. Assembly level certification corridor

- At the third, assembly level certification corridor, which is used by Flex-PLI user to investigate assembly level Flex-PLI quality, was evaluated. Findings are described as follows:
 - **Pendulum type impact test**
 - Not brand-knew knees were used to develop the current pendulum test certification corridors.
 - Bone core bending characteristics were unclear.
 - Need to update the current pendulum test certification corridors using brand-knew/overhauled impactors.
 - Draft proposal shall be developed by using JARI (master test lab for pendulum) and BAST and Bertrandt (comparable with master test lab) data.
 - **Inverse type impact test**
 - Short flesh rubber as well as not brand-new bone cores were used to develop the current inverse test certification corridors.
 - Need to update the current inverse test certification corridors using brand-knew/overhauled impactors.
 - Draft proposal shall be developed using BAST (master test lab for inverse) JARI and Bertrandt (comparable with master test lab) data.

3.3. Assembly level certification corridor (Inverse)

	Flex-GT	Flex-GTR-prototype	Flex-GTR-production																														
Test Method	-	 <p>Hanging system</p> <p>* Short outer rubber was used for initial version of Flex-GTR-prototype</p> <p>Moving ram</p> <p>Honeycomb</p> <p>Short outer rubber</p>	 <p>Hanging system</p> <p>Moving ram</p> <p>Honeycomb</p> <p>Long outer rubber</p>																														
- Flesh	-	• With	• same as left																														
- Honeycomb	-	• With	• same as left																														
- Outer rubber	-	• Short	• Long																														
Corridor	-	<table border="1"> <thead> <tr> <th></th> <th>Upper (Nm)</th> <th>Lower (Nm)</th> <th></th> <th>Upper (mm)</th> <th>Lower (mm)</th> </tr> </thead> <tbody> <tr> <td>Tibia-1</td> <td>277</td> <td>237</td> <td>ACL</td> <td>11</td> <td>9</td> </tr> <tr> <td>Tibia-2</td> <td>269</td> <td>223</td> <td>PCL</td> <td>6</td> <td>5</td> </tr> <tr> <td>Tibia-3</td> <td>204</td> <td>176</td> <td>MCL</td> <td>23</td> <td>18</td> </tr> <tr> <td>Tibia-4</td> <td>120</td> <td>98</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		Upper (Nm)	Lower (Nm)		Upper (mm)	Lower (mm)	Tibia-1	277	237	ACL	11	9	Tibia-2	269	223	PCL	6	5	Tibia-3	204	176	MCL	23	18	Tibia-4	120	98				same as left
	Upper (Nm)	Lower (Nm)		Upper (mm)	Lower (mm)																												
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Tibia-4	120	98																															
- Developed by	-	• BAST	• same as left																														
- Base data	-	• Flex-GTR-prototype with Short outer rubber*	• same as left																														
- Test lab	-	• BAST (3 impactors) and JARI (1 impactor), n= 31 in total	• same as left																														
- Impactor conditions	-	• Tibia: Used	• same as left																														
	-	• Femur: Used	• same as left																														
	-	• Knee: Used	• same as left																														

3.3. Assembly level certification corridor (Pendulum)

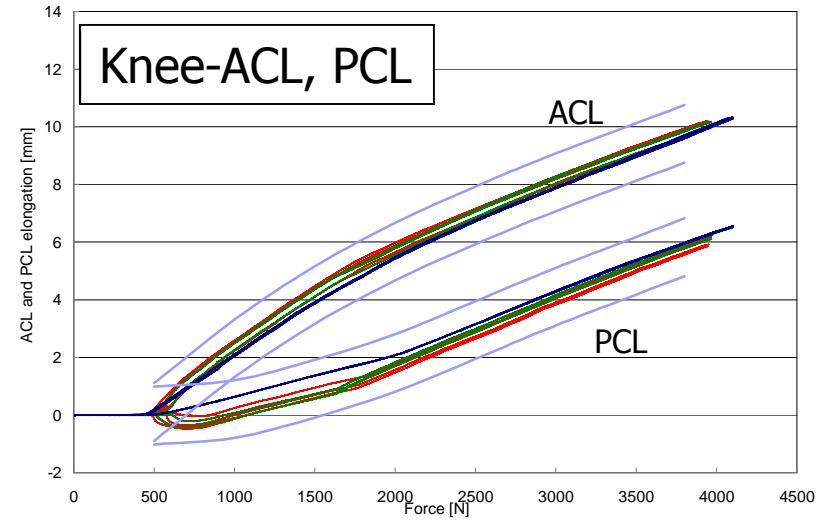
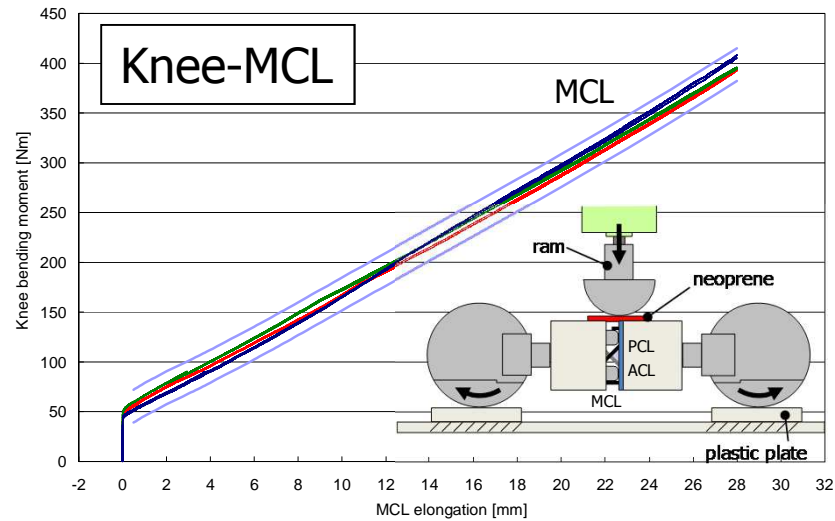
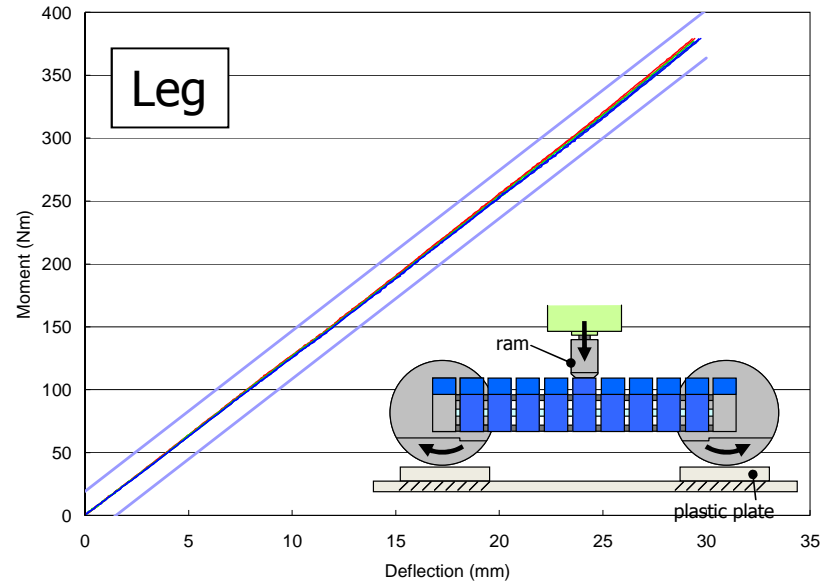
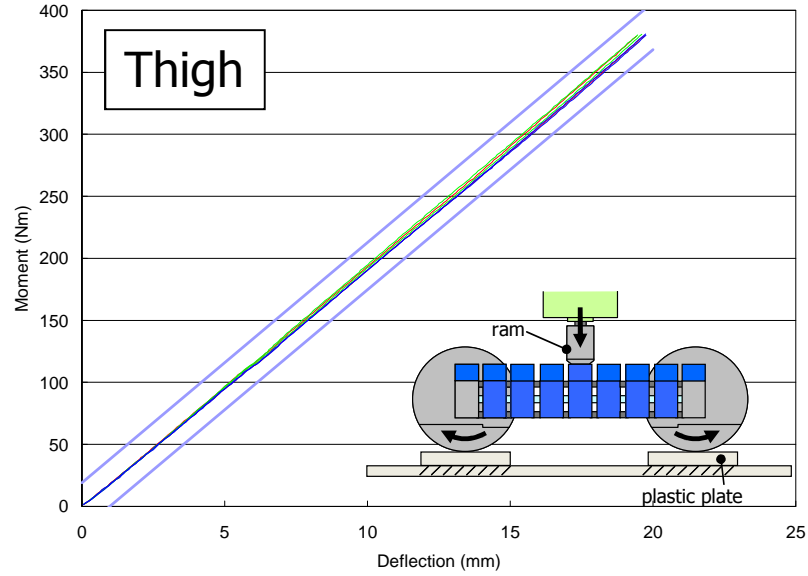
	Flex-GT	Flex-GTR-prototype	Flex-GTR-production																																																												
Test Method	 <p>Suspension angle 15 deg.</p> <p>Pin joint, Femur, Knee, Tibia</p> <p>Released (Free fall around the pin joint)</p>	 <p>Suspension angle 15 deg.</p> <p>Tibia, Knee, Femur</p> <p>Long outer rubber, Additional Mass 5kg</p> <p>Released (Free fall around the pin joint)</p> <p>* Long outer rubber has been officially accepted from Flex-GTR-production type.</p>	same as left																																																												
- Flesh	•Without	•With	•same as left																																																												
- Attachment position	•Top of femur	•Bottom of tibia	•same as left																																																												
- Additional mass	•Without	•With	•same as left																																																												
- Outer rubber length	-	•Long	•same as left																																																												
Corridor	<table border="1"> <thead> <tr> <th></th> <th>Upper (Nm)</th> <th>Lower (Nm)</th> <th></th> <th>Upper (mm)</th> <th>Lower (mm)</th> </tr> </thead> <tbody> <tr> <td>Tibia-1</td> <td>163</td> <td>133</td> <td>ACL</td> <td>5.0</td> <td>2.6</td> </tr> <tr> <td>Tibia-2</td> <td>122</td> <td>92</td> <td>PCL</td> <td>4.1</td> <td>1.7</td> </tr> <tr> <td>Tibia-3</td> <td>86</td> <td>56</td> <td>MCL</td> <td>14</td> <td>12</td> </tr> <tr> <td>Tibia-4</td> <td>52</td> <td>22</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		Upper (Nm)	Lower (Nm)		Upper (mm)	Lower (mm)	Tibia-1	163	133	ACL	5.0	2.6	Tibia-2	122	92	PCL	4.1	1.7	Tibia-3	86	56	MCL	14	12	Tibia-4	52	22				<table border="1"> <thead> <tr> <th></th> <th>Upper (Nm)</th> <th>Lower (Nm)</th> <th></th> <th>Upper (mm)</th> <th>Lower (mm)</th> </tr> </thead> <tbody> <tr> <td>Tibia-1</td> <td>272</td> <td>235</td> <td>ACL</td> <td>11</td> <td>9.0</td> </tr> <tr> <td>Tibia-2</td> <td>211</td> <td>185</td> <td>PCL</td> <td>5.4</td> <td>4.0</td> </tr> <tr> <td>Tibia-3</td> <td>160</td> <td>135</td> <td>MCL</td> <td>26</td> <td>23</td> </tr> <tr> <td>Tibia-4</td> <td>108</td> <td>94</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		Upper (Nm)	Lower (Nm)		Upper (mm)	Lower (mm)	Tibia-1	272	235	ACL	11	9.0	Tibia-2	211	185	PCL	5.4	4.0	Tibia-3	160	135	MCL	26	23	Tibia-4	108	94				same as left
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- Base data	•Flex-GT	•Flex-GTR-prototype with Long outer rubber*	•same as left																																																												
- Test lab	•JARI	•JARI (2 impactors), n=12 in total	•same as left																																																												
- Impactor conditions	•Tibia: Brand-New	•same as left	•same as left																																																												
	•Femur: Brand-New	•same as left	•same as left																																																												
	•Knee: Brand-New	•Knee: Used	•same as left																																																												

4. Update Activity

- TF-RUCC made update proposal for component level as well as assembly level certification corridors.
- **Component level certification corridor**
 - Update proposal regarding component level certification corridor was made based on JARI (master test lab for component level certification test) test results using master legs (SN01, SN03, E-leg).
 - Detailed procedures were described in "TF-RUCC-3-03 Japan-Progress-Report 120508, Page 1 to Page 39".
- **Assembly level certification corridor**
 - Update proposal regarding assembly level certification corridor was made based on JARI, BAST and Bertrandt (master test lab and test labs comparable with master test lab for assembly level certification test) test results using master legs (SN01, SN03, E-leg).
 - Detailed making procedures were described in "TF-RUCC-4-04_BAST-Refinement of Dynamic Assembly Certification Corridors_FINAL_2012.06.18."
- Above update proposals were accepted by TF-RUCC members in the 5th TF-RUCC meeting in July 2012.

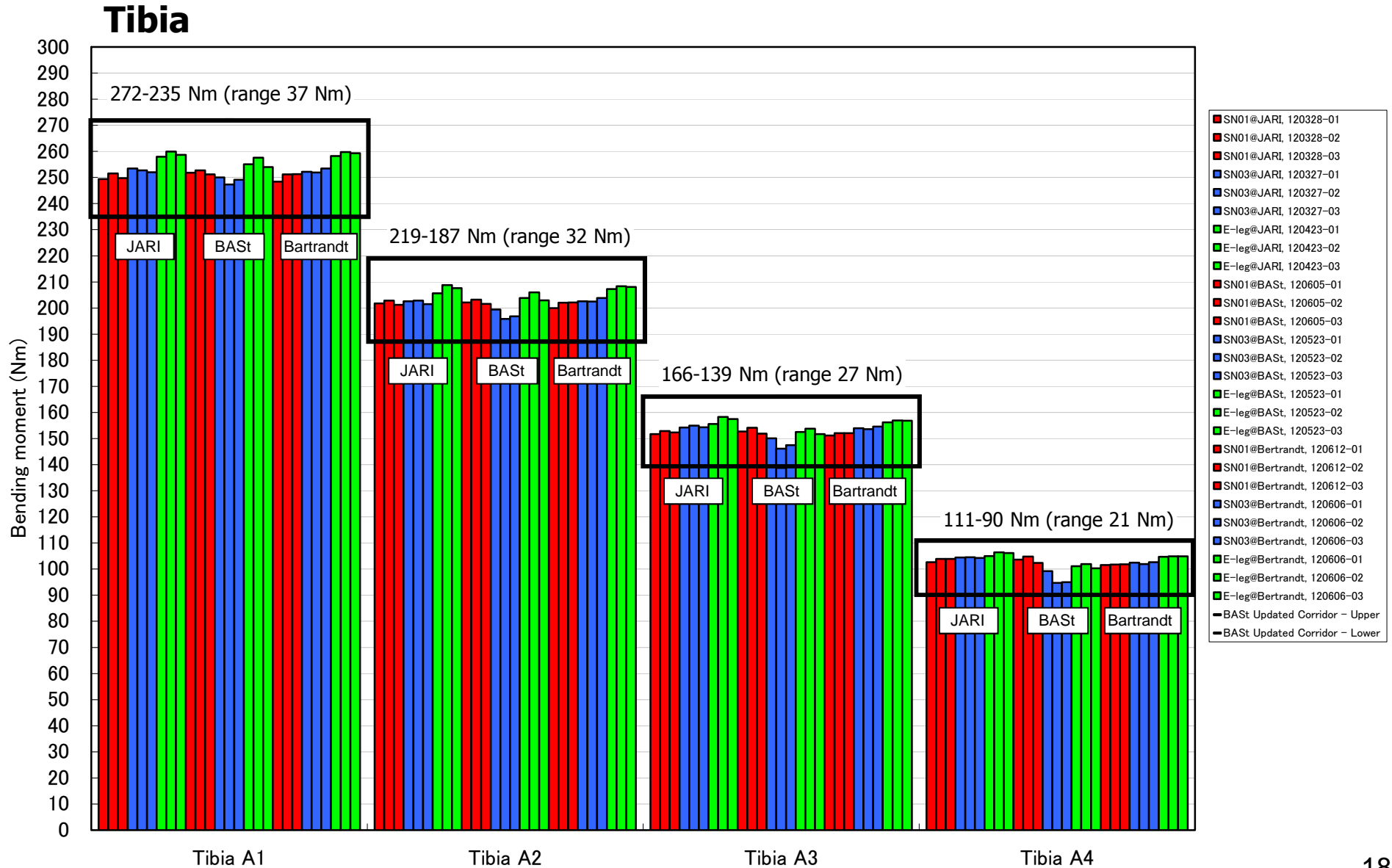
4. Update Activity

- Component Level Certification Corridor -



4. Update Activity

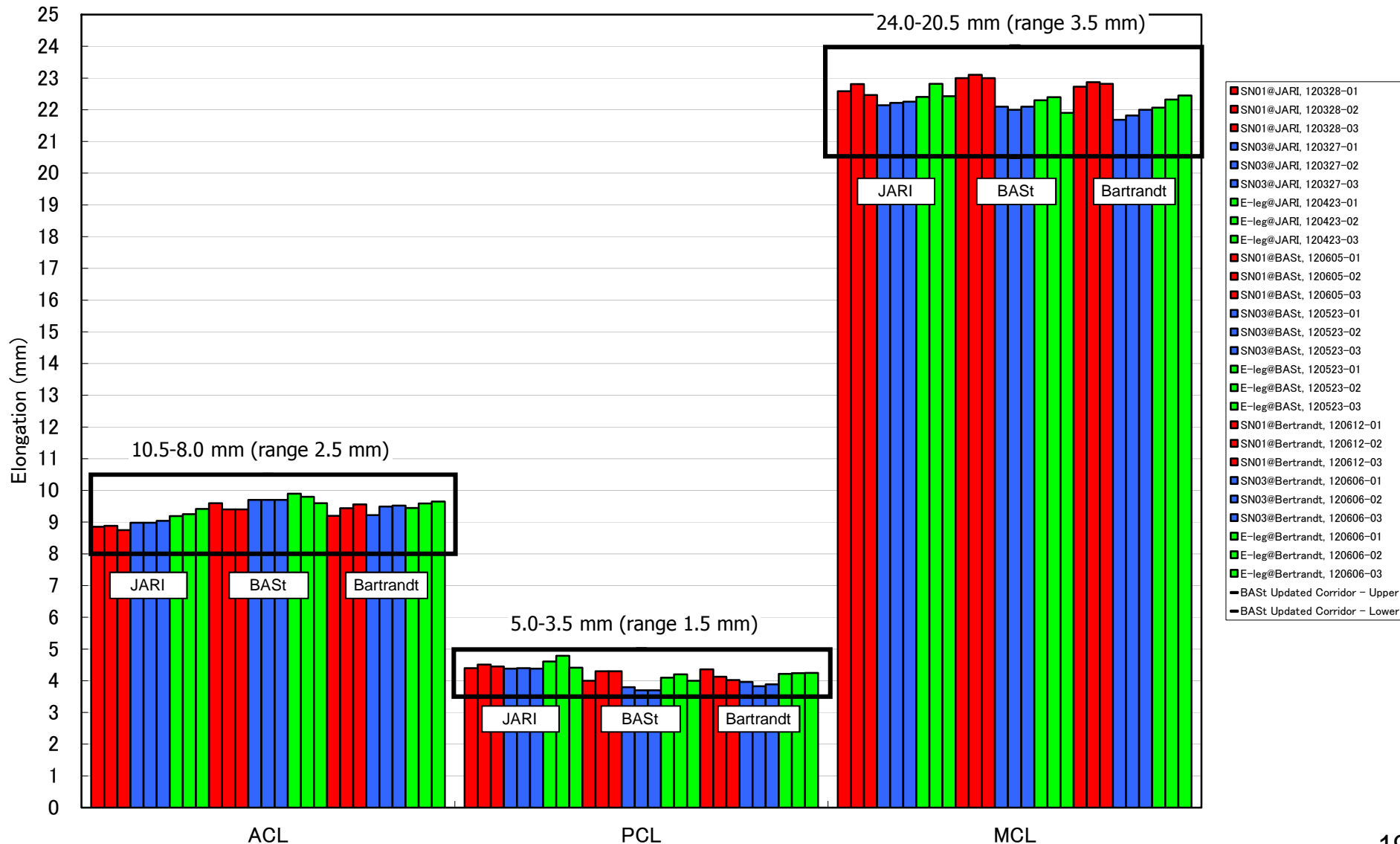
- Assembly Level Certification Corridor: Pendulum -



4. Update Activity

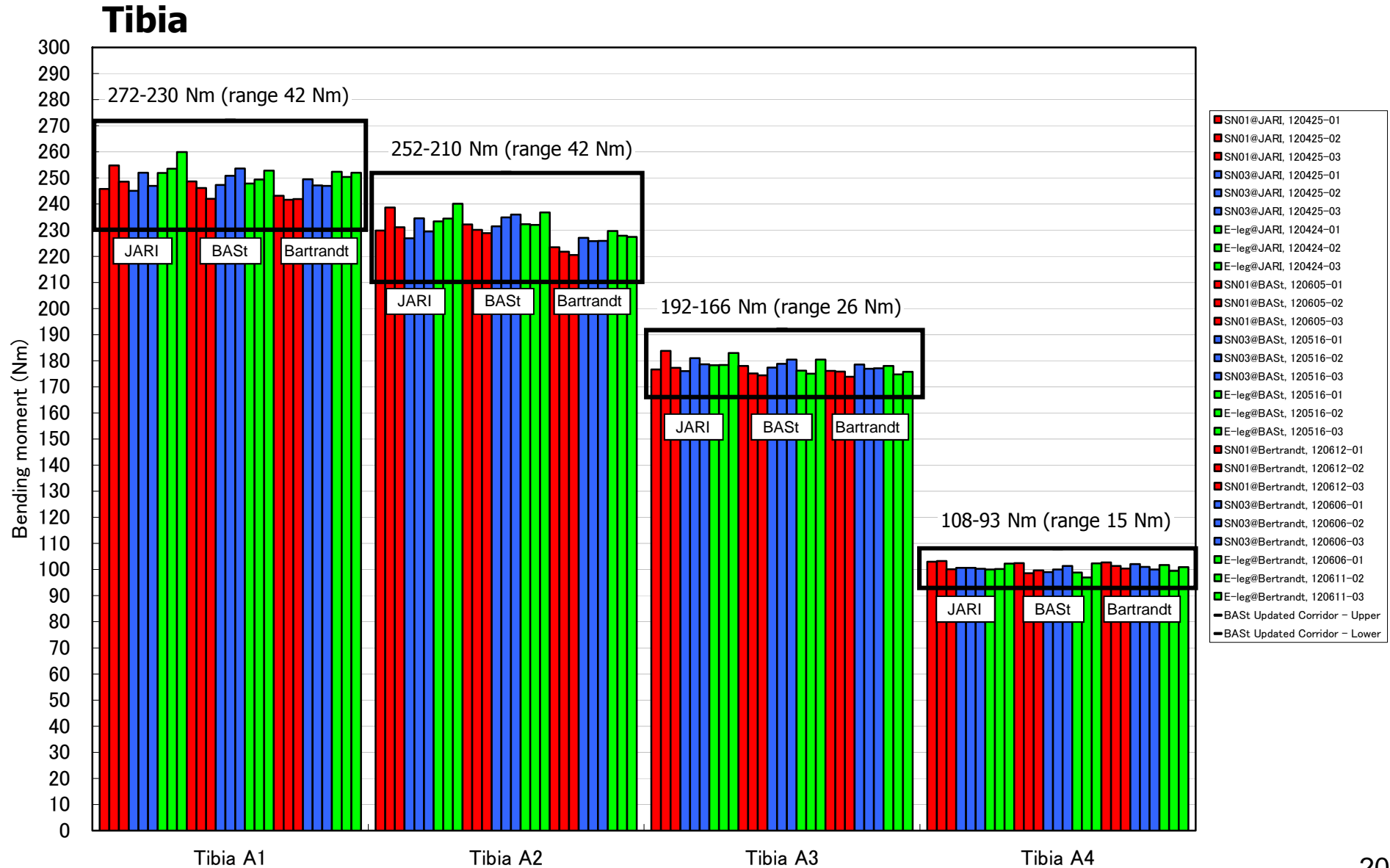
- Assembly Level Certification Corridor: Pendulum -

Knee



4. Update Activity

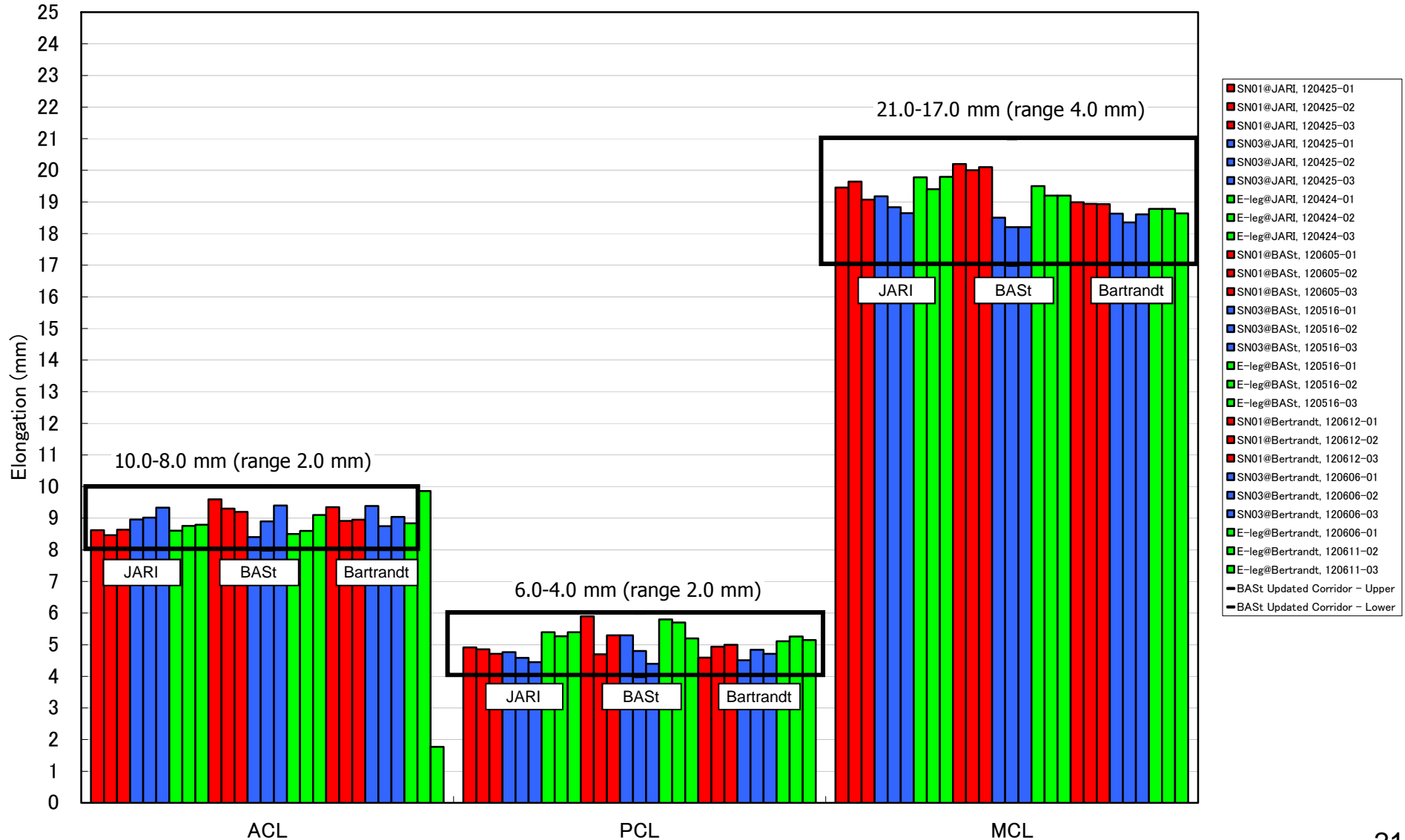
- Assembly Level Certification Corridor: Inverse -



4. Update Activity

- Assembly Level Certification Corridor: Inverse Knee -

Knee



5. Discussion

- Update proposals for component level as well as assembly level certification corridor were accepted by TF-RUCC members in the 5th TF-RUCC meeting.
- However, Humanetics are concerned that the update proposal especially for inverse channel Tibia-4 could have a problem as corridor range was significantly reduced. BAST pointed out that this was due to the good repeatability and reproducibility and low range of Tibia-4 test results using master legs. As a precautionary measure Humanetics wanted to see certification results after car testing as they believed Tibia-4 had shown problems in the past (GTR-3-05). There is a chance that Flex-PLI can not meet the update proposals after car testing.
- Humanetics recommended that they would like to wait and see certification test results just after several car tests before TF-RUCC proposals are accepted by IG GTR9-PH2.
- All TF-RUCC members agreed that if a Flex-PLI response is changed after car testing (e.g. outside corridors), it could be considered as a durability issue. The IG GTR9-PH2 shall discuss that appropriately as the parent body of TF-RUCC.

6. Conclusion

- TF-RUCC made update proposals for component level as well as assembly level certification corridors based on their activity until July 2012.
- The update proposals can be reviewed and discussed by IG GTR9-PH2 members hereafter.
- Just in case, if Flex-PLI response is changed after car testing (e.g. outside corridors), it shall be discussed appropriately in IG GTR9-PH2.

7. Working Documents

- TF-RUCC working documents are available from following UN ECE web site.

<https://www2.unece.org/wiki/pages/viewpage.action?pageId=4063359>

The screenshot shows a Confluence Wiki page for the Task Force for Review and Update Certification Corridor (TF-RUCC). The page header includes the UNECE logo and the text "United Nations Economic Commission for Europe". The main content area displays the title "Task Force for Review and Update Certification Corridor (TF-RUCC)" and a note indicating it was added by Martin Daqan and last edited on July 25, 2012. Below this, there is a section for "6 Child Pages" with a list of links to various sessions. The left sidebar contains a navigation menu with various working parties and groups. The footer of the page includes licensing information for Atlassian Confluence and Gliffy.

Task Force for Review and Update Certification Corridor (TF-RUCC)

Added by [Martin Daqan](#), last edited by [Martin Daqan](#) on Jul 25, 2012

None

6 Child Pages

- [TF-RUCC Kick-Off session](#)
- [TF-RUCC 1st session](#)
- [TF-RUCC 2nd session](#)
- [TF-RUCC 3rd session](#)
- [TF-RUCC 4th session](#)
- [TF-RUCC 5th session](#)

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