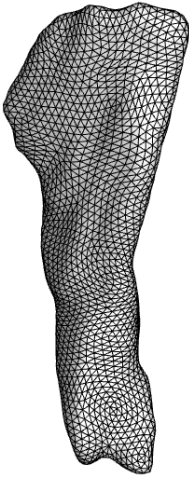
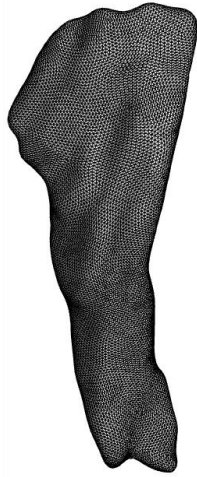
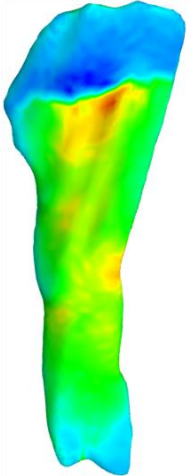
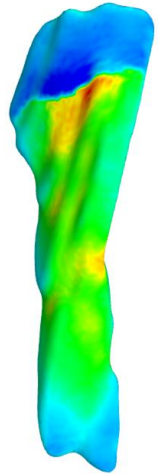
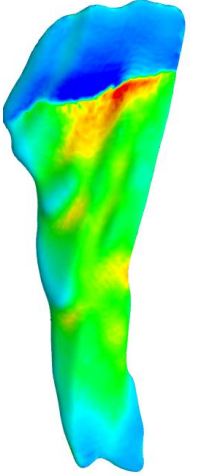
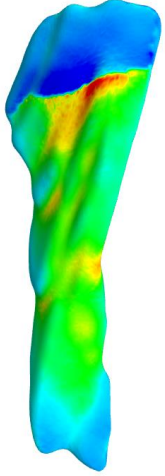
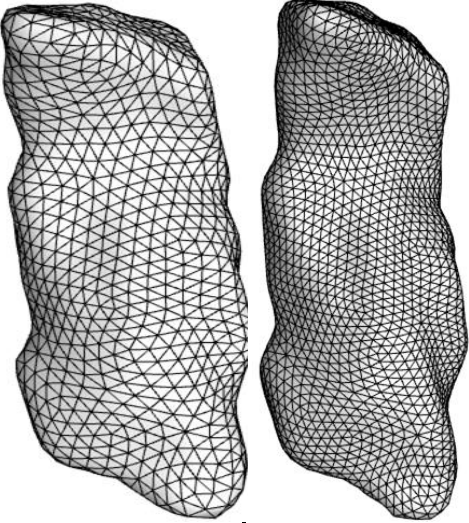
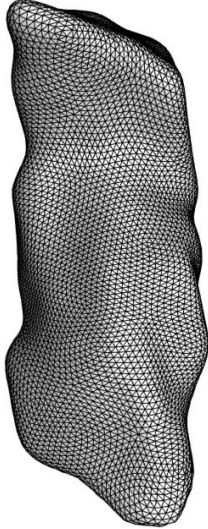
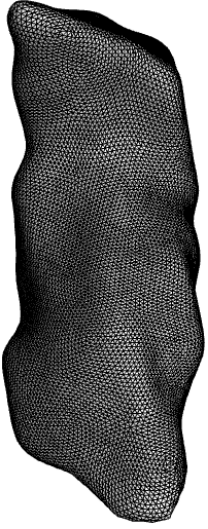
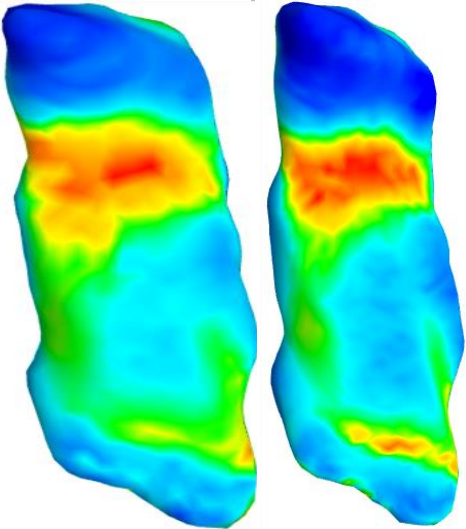
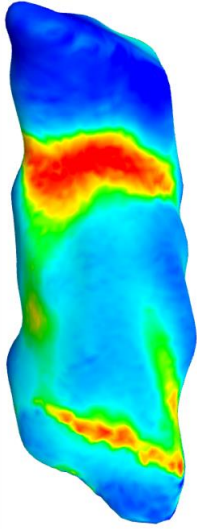
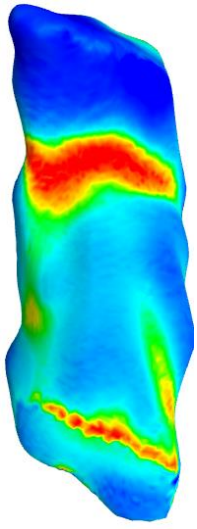
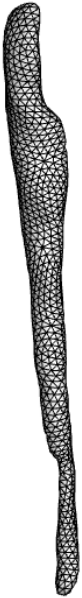
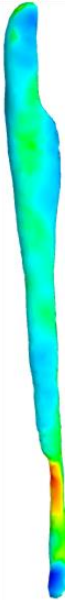
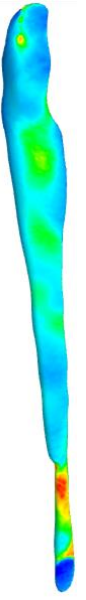
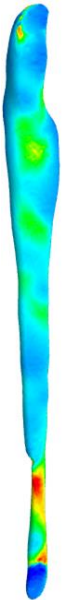
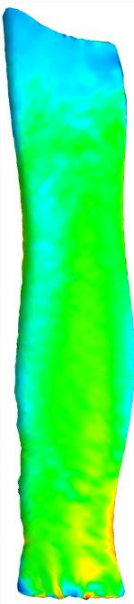
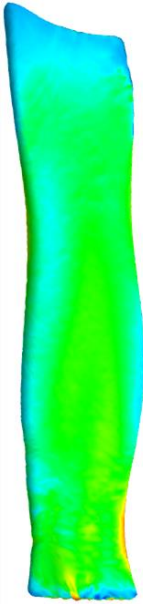
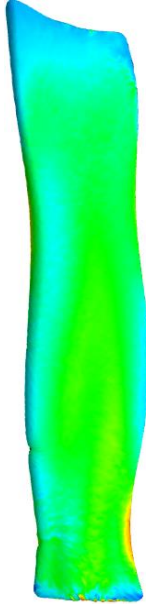
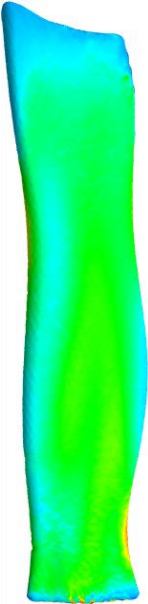


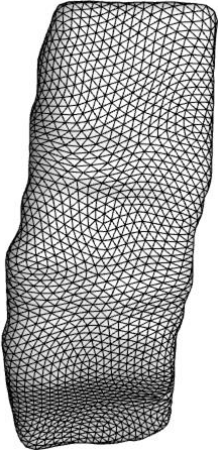
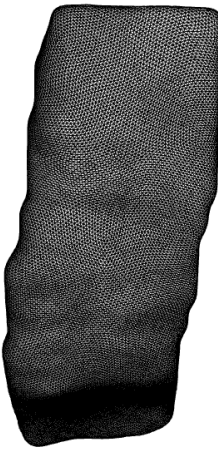
Mesh convergence results:

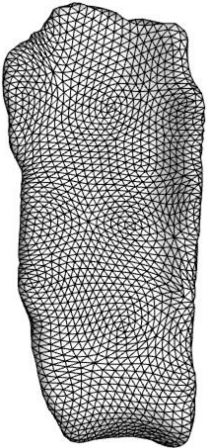
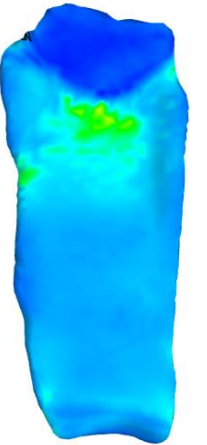
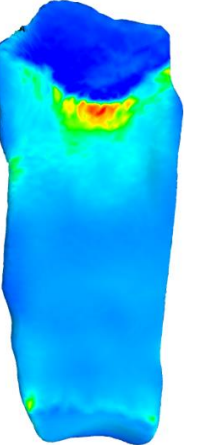
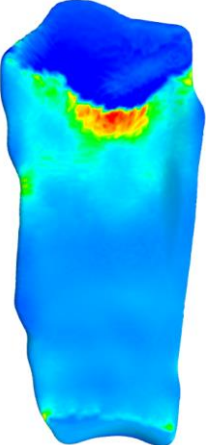
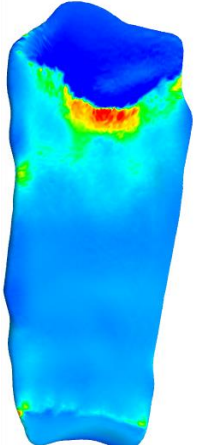
	ACL_IP4	ACL_IP6	ACL_IP8	ACL_IP10
# of Elements	21307	58535	114484	189626
# of Nodes	37071	177876	311184	632700
Computation time (sec)	28	67	112	254
Reaction Force (N)	163	138	135	129
Force change %		-15	-2.1	-4.4
Mesh				
Linear Tetrahedral Elements				
Fiber Stretch Colormap Range (0.93-1.19)				
(Anterior side)				

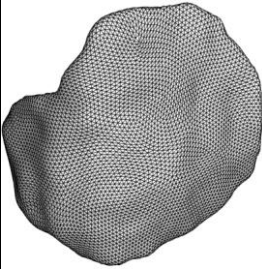
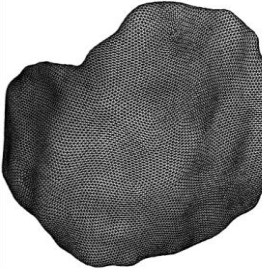
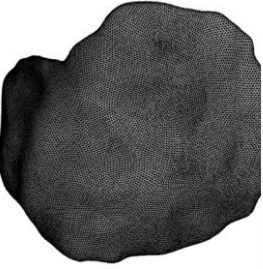
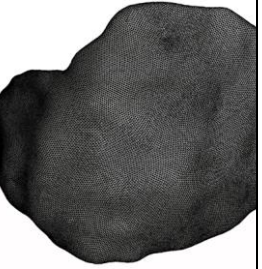
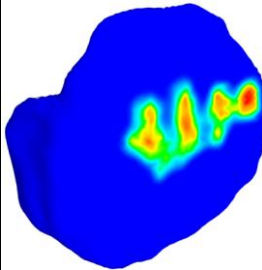
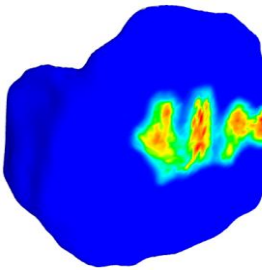
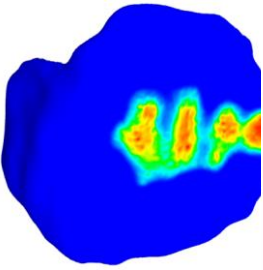
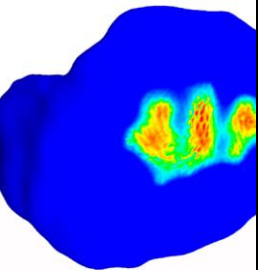
	PCL_IP3	PCL_IP4	PCL_IP6	PCL_IP8
# of Elements	9265	20647	57323	112592
# of Nodes	15488	59114	158312	567622
Computation time (sec)	23	35	66	283
Reaction Force (N)	508	413	402	387
Force change %		-18	-2.6	-3.7
Mesh				
Fiber Stretch Colormap Range (0.99-1.13)				

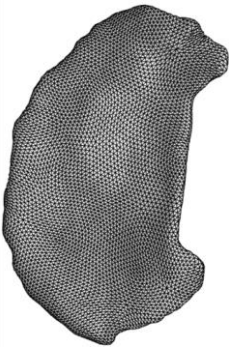
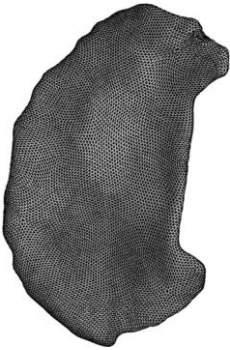
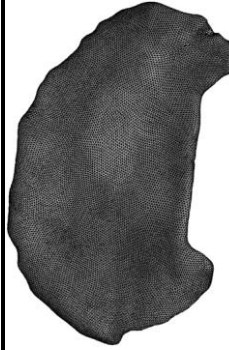
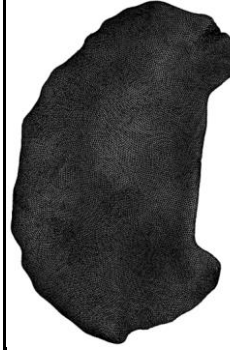
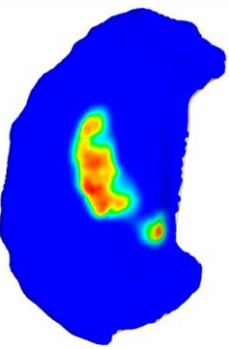
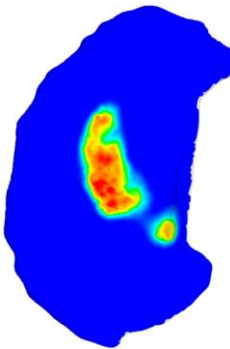
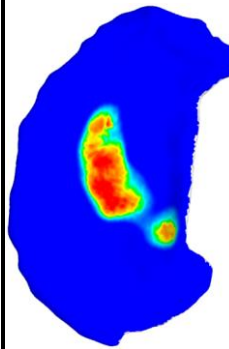
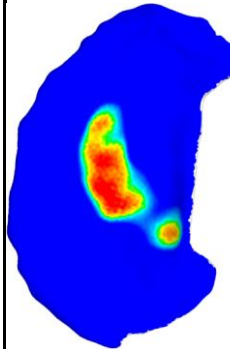
	LCL_IP3	LCL_IP4	LCL_IP6	LCL_IP8
# of Elements	6180	13828	38756	76133
# of Nodes	10801	24591	104020	219212
Computation time (sec)	17	22	44	80
Reaction Force (N)	40.7	40.9	38.5	37
Force change %		0.4	-5.8	-3.8
Mesh				
Fiber Stretch Colormap Range (0.96-1.18)				

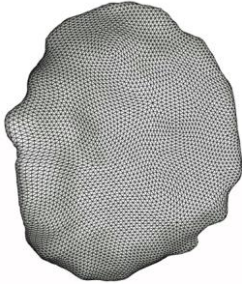
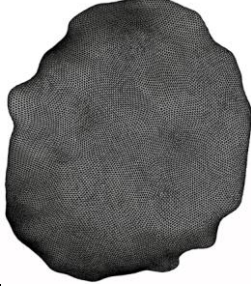
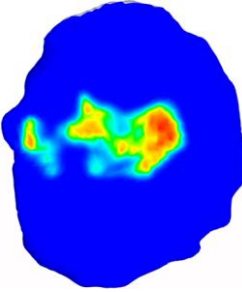
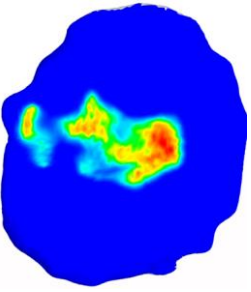
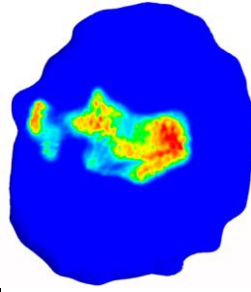
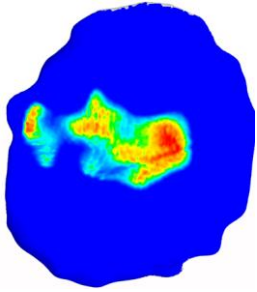
	MCL_IP5	MCL_IP7	MCL_IP9	MCL_IP11
# of Elements	29188	66031	117417	183666
# of Nodes	61430	206830	399390	578730
Computation time (sec)	34	72	111	162
Reaction Force (N)	232	213	209	208
Force change %		-8.1	-1.8	-0.4
Mesh				
Fiber Stretch Colormap Range (0.92-1.2)				

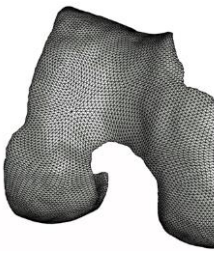
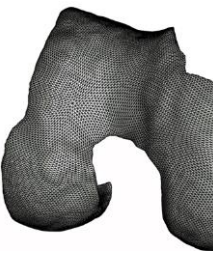
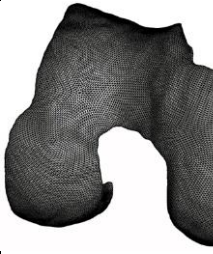
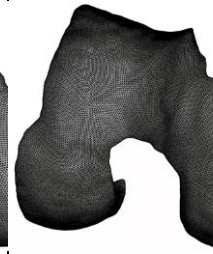
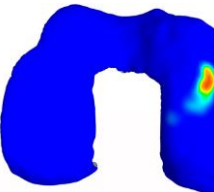
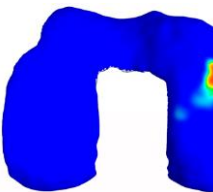
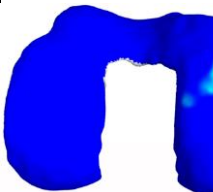
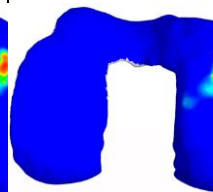
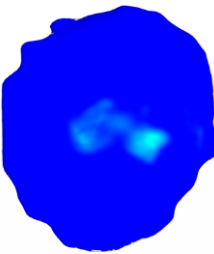
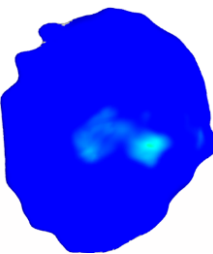
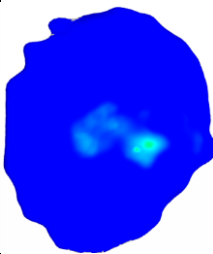
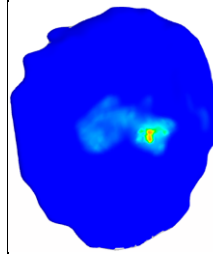
	QAT_IP4	QAT_IP6	QAT_IP8	QAT_IP10
# of Elements	15316	42068	82535	136597
# of Nodes	25038	116682	253734	576678
Computation time (sec)	8	42	115	457
Reaction Force (N)	2190	2090	2160	2040
Force change %		-4.5	3.3	-5.5
Mesh				
Fiber Stretch Colormap Range (0.99-1.18)				

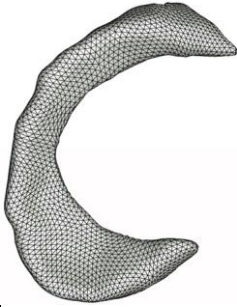
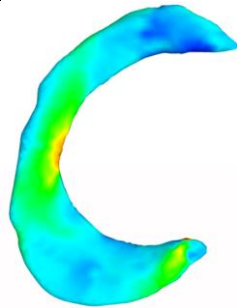
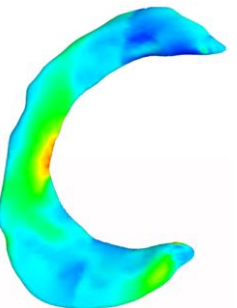
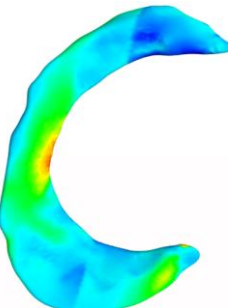
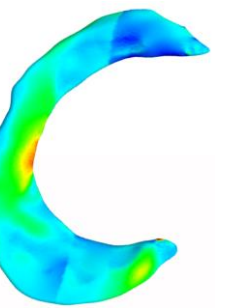
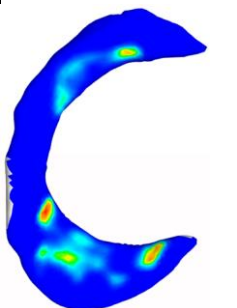
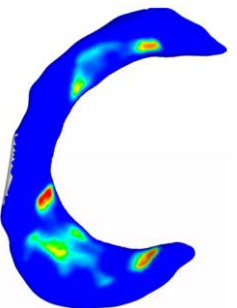
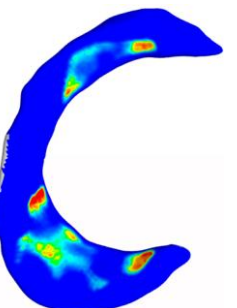
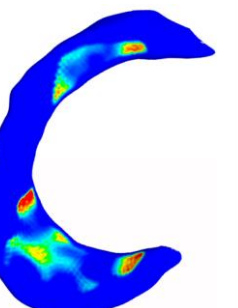
	PTL_IP4	PTL_IP6	PTL_IP8	PTL_IP10
# of Elements	14025	38813	76294	126243
# of Nodes	22127	93296	186802	407666
Computation time (sec)	15	31	56	150
Reaction Force (N)	1140	930	898	904
Force change %		-18	-3.4	0.6
Mesh				
Fiber Stretch Colormap Range (0.96-1.3)				

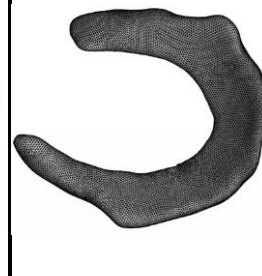
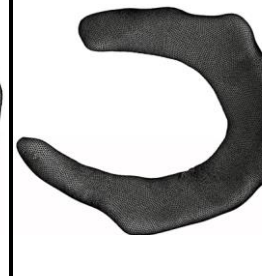
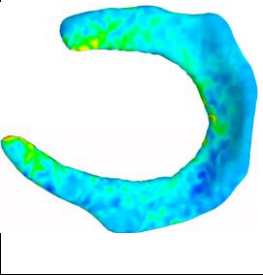
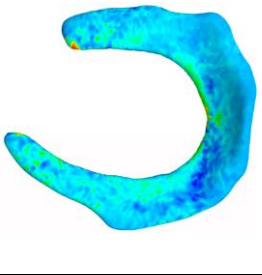
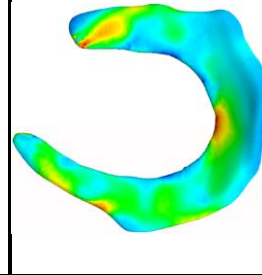
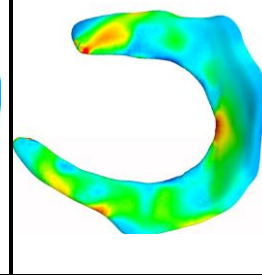
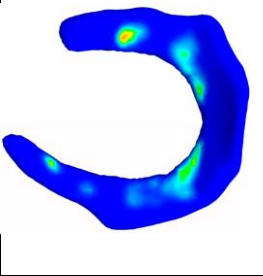
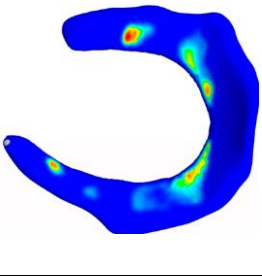
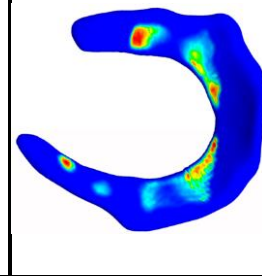
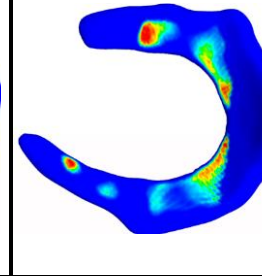
	PTC_IP6	PTC_IP8	PTC_IP10	PTC_IP12
# of Elements	48299	94610	156593	234025
# of Nodes	58735	160890	211360	595480
Computation time (sec)	38	87	101	431
Reaction Force (N)	764	819	833	877
Force change %		7.1	1.7	5.2
Mesh				
Contact Pressure colormap range (0-10.3)				

	TBC-M_IP6	TBC-M_IP8	TBC-M_IP10	TBC-M_IP12
# of Elements	56399	110452	182445	272425
# of Nodes	56202	112578	341088	449334
Computation time (sec)	39	58	175	232
Reaction Force (N)	696	748	845	853
Force change %		7.4	12.9	0.9
Mesh				
Contact Pressure colormap range (0-12)				

	TBC-L_IP6	TBC-L_IP8	TBC-L_IP10	TBC-L_IP12
# of Elements	55935	109648	181185	270417
# of Nodes	68664	193608	309522	791226
Computation time (sec)	49	129	228	938
Reaction Force (N)	708	721	745	751
Force change %		1.8	3.3	0.8
Mesh				
Contact Pressure colormap range (0-15)				

	FMC_IP8	FMC_IP10	FMC_IP12	FMC_IP15	FMC_IP18	FMC_IP20
# of Elements	143045	235071	349055	562669	828974	1251032
# of Nodes	135300	223990	342260	845350	1228070	1958860
Computation time (sec)	63	80	99	235	372	579
Reaction Force (N)	1280	1320	1340	1560	1620	1740
Force change %		3.1	1.5	16	3.8	7.4
Mesh						
Contact Pressure colormap range (0-24) (Medial Side)						
Contact Pressure colormap range (0-24) (Lateral Side – displayed on TBC-L)						

	MNS-M_IP4	MNS-M_IP6	MNS-M_IP8	MNS-M_IP10
# of Elements	21601	59919	117405	193857
# of Nodes	34070	145840	412030	668190
Computation time (sec)	63	120	296	458
Reaction Force (N)	362	355	372	368
Force change %		-1.9	4.7	-1.1
Mesh				
Fiber stretch colormap range (0.94-1.12)				
Contact Pressure colormap range (0-8.5)				

	MNS-L_IP4	MNS-L_IP6	MNS-L_IP8	MNS-L_IP10
# of Elements	21602	59927	117391	193962
# of Nodes	23412	107172	222300	351384
Computation time (sec)	63	128	277	412
Reaction Force (N)	404	421	595	625
Force change %		4.2	41.3	5
Mesh				
Fiber Stretch colormap range (0.96-1.1) (Superior side)				
Contact Pressure colormap range (0-12) (Superior side)				

Material Properties convergence results:

Ligaments

Tissue	Displacement in fiber direction [mm]	Desired Linear Stiffness Range [N/mm]	Initial guess c5	Measured linear stiffness [N/mm]	Final guess c5	Measured Linear stiffness [N/mm]
ACL_IP6	3	242±28	535	122	5000	225
LCL_IP6	5	59±12	467	18	4000	47
MCL_IP7	5	63±14	467	93	300	74
PCL_IP4	3	258±62	431	283	431	283

Tendons:

Tissue	Displacement in fiber direction [mm]	Desired Modulus Range [MPa]	Reference length [mm], cross sectional area [mm ²]	Initial guess c5	Measured linear stiffness K [N/mm], Modulus E [MPa]	Final guess c5 *	Measured linear stiffness K [N/mm], Modulus E [MPa]
PTL_IP6	5	337.8.±67.7	L=48.6245 A=35.8423	777.56	K=441.1216 E =598.435	337.8	K=277.62 E=376.626
QAT_IP4	5	255.3±64.1	L=54.4644 A=68.3829	777.56	K =865.105 E =689.023	255.3	K= 447.696 E= 356.57

* when c5 was set to the average modulus in the range, measured modulus fell within 2 standard deviations, which is a good sanity check.

Cartilage:

Tissue	Desired Linear Stiffness Range [N/mm]	Initial guess C1, K	Measured linear stiffness [N/mm]	Final guess C1, K	Measured linear stiffness [N/mm]
TBC-L_IP6	20.38±5.32	C1 = 2.54 K=100	53.25	C1 = 1.1 K*=44	23.65

*C1 was adjusted and K was chosen to maintain the same ration C1:K as the initial guess

Meniscus:

c5 will be set to 92 Mpa as it fall within the range of reported values.