

# **Flex-GT Full Calibration Test Procedures**

# Flex-GT Full Calibration Test Procedures (Overview)

## Long Bones

Step 1(a): Bone Core  
Quasi-static 3-Point Bending Test  
(Femur bone core, Tibia bone core)

- ✓ Evaluate Long Bone Cores Bending Characteristic
- ✓ Obtain Strain to Moment Conversion values



Step 1(b): Long Bone  
Quasi-static 3-Point Bending Test  
(Femur, Tibia)

- ✓ Evaluate Long Bone Bending Characteristics



Step 3: Assembled (Femur-Knee-Tibia)



Step 4: Assembly (Femur-Knee-Tibia)  
Dynamic Calibration Test

- ✓ Evaluate measured values

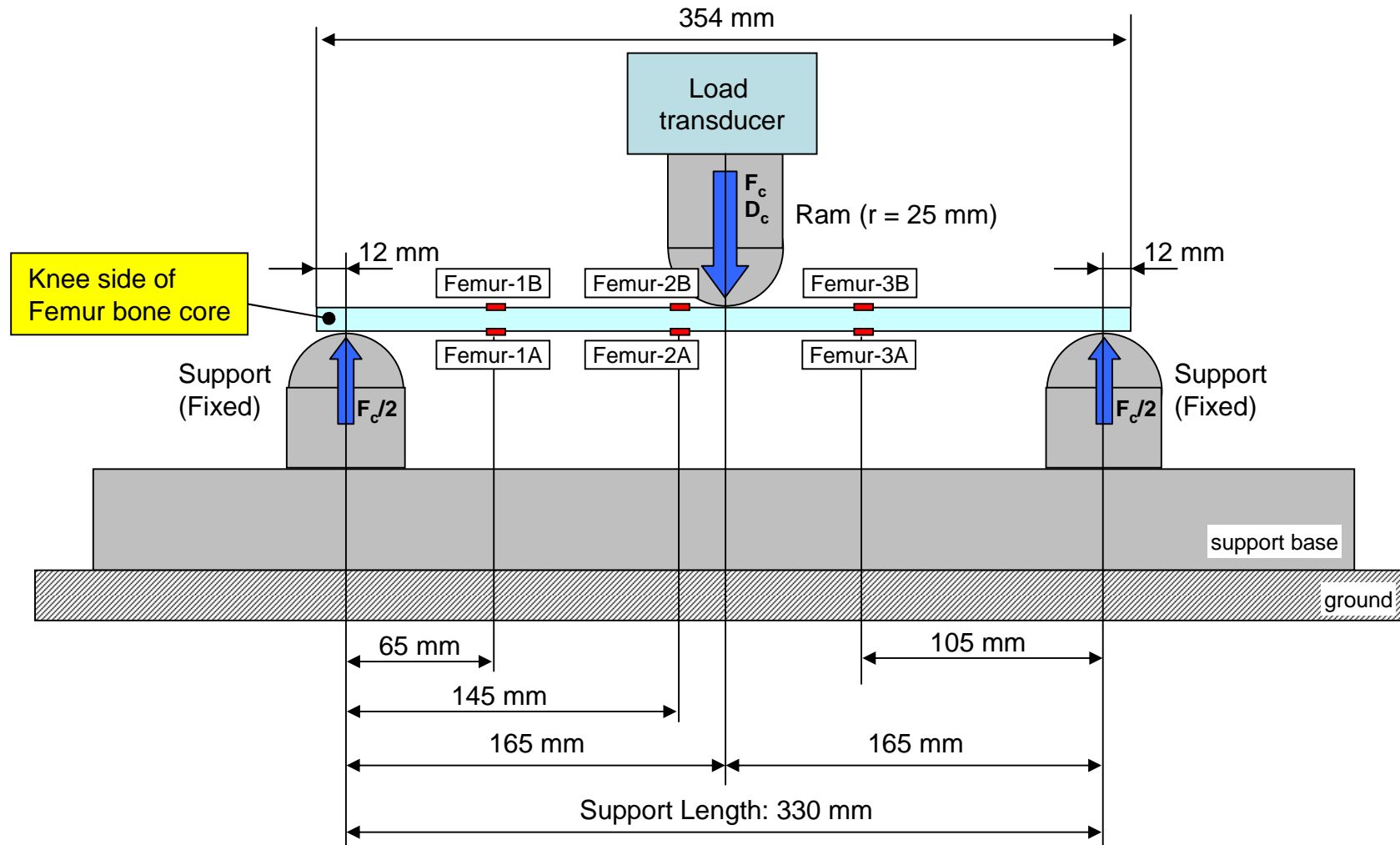
## Knee

Step 2: Knee  
Quasi-static 3-Point Bending Test

- ✓ Evaluate Knee Bending Characteristics
- ✓ Evaluate Knee Ligament Elongation Values



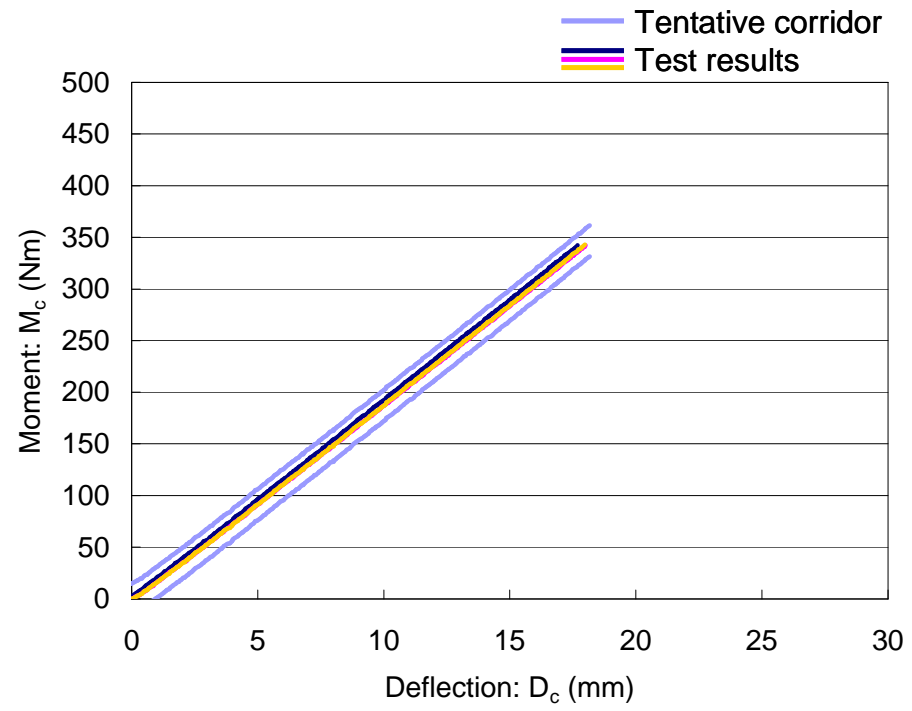
Step 1(a): Bone Core  
 Quasi-static 3-Point Bending Test  
 (Femur bone core)



- $F_c$ : Force Center,  $D_c$ : Deflection Center  
 $M_C$ : Moment Center (Nm) =  $F_c/2$  (N) x 0.165 (m)  
 $M_{F1}$ : Moment Femur-1 (Nm) =  $F_c/2$  (N) x 0.065 (m)  
 $M_{F2}$ : Moment Femur-2 (Nm) =  $F_c/2$  (N) x 0.145 (m)  
 $M_{F3}$ : Moment Femur-3 (Nm) =  $F_c/2$  (N) x 0.105 (m)

Step 1(a): Bone Core  
Quasi-static 3-Point Bending Test  
(Femur bone core)

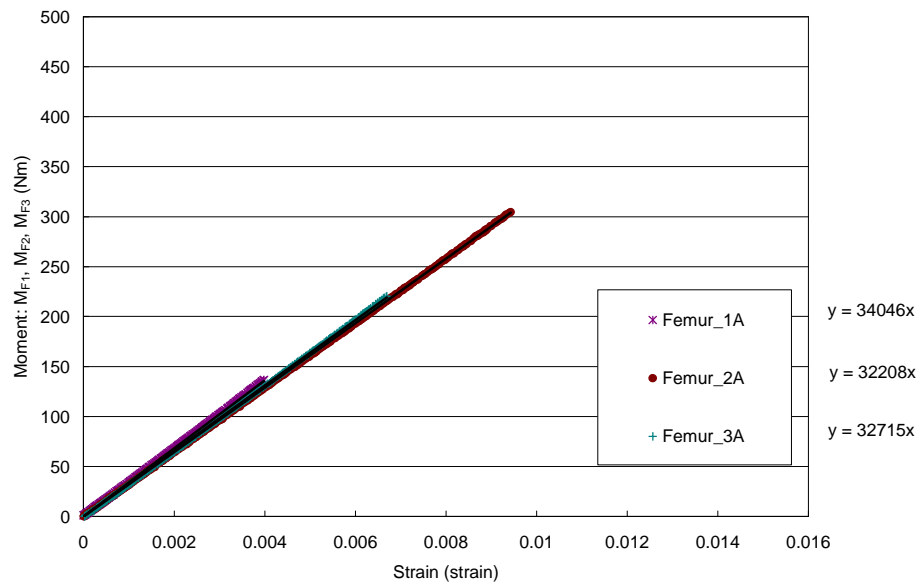
- ✓ Evaluate Long Bone Cores Bending Characteristic



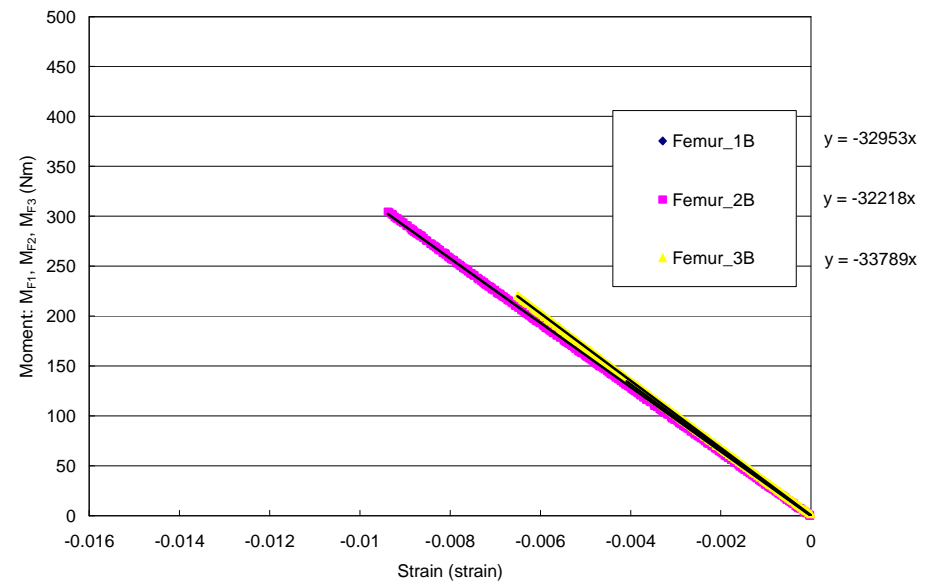
Step 1(a): Bone Core  
 Quasi-static 3-Point Bending Test  
 (Femur bone core)

✓ Obtain Strain to Moment Conversion values

example

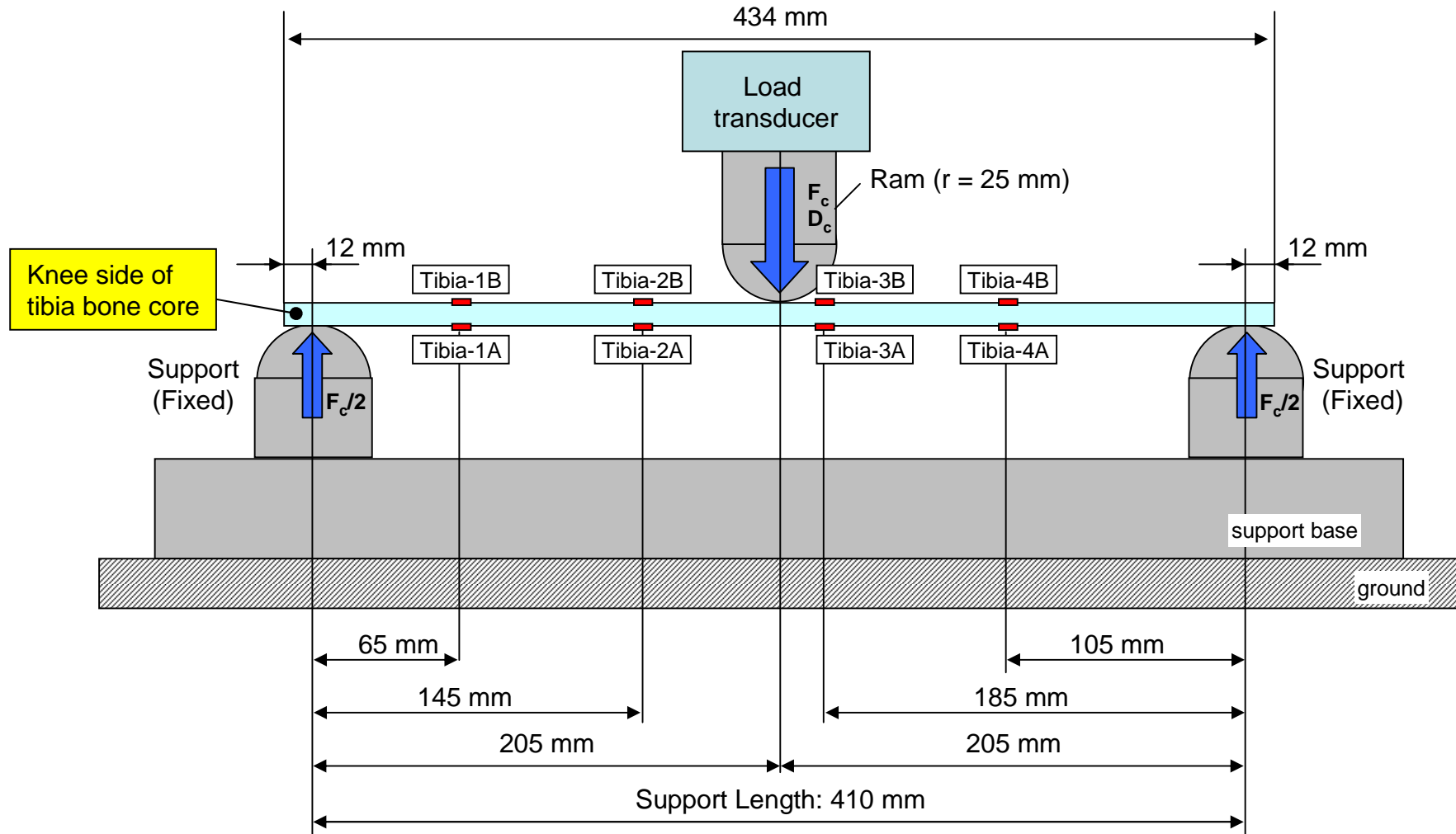


a) Strain gauges (side A: opposite side of loading)



b) Strain gauges (side B: loading side, spear gages for side A)

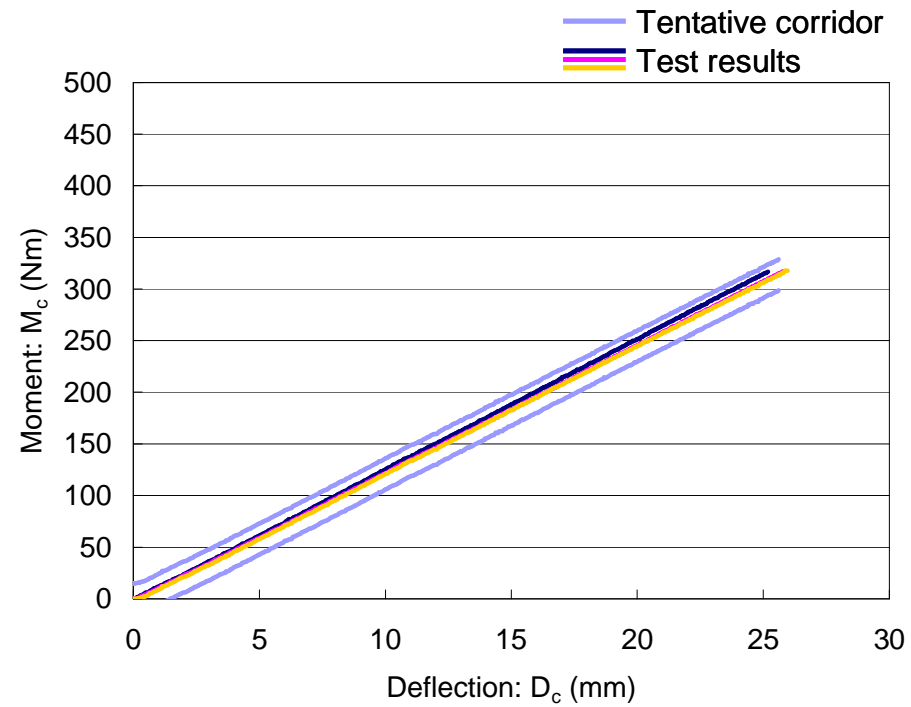
Step 1(a): Bone Core  
 Quasi-static 3-Point Bending Test  
 (Tibia bone core)



- $F_c$ : Force Center,  $D_c$ : Deflection Center  
 $M_C$ : Moment Center (Nm) =  $F_c / 2$  (N) x 0.205 (m)  
 $M_{T1}$ : Moment Tibia-1 (Nm) =  $F_c / 2$  (N) x 0.065 (m)  
 $M_{T2}$ : Moment Tibia-2 (Nm) =  $F_c / 2$  (N) x 0.145 (m)  
 $M_{T3}$ : Moment Tibia-3 (Nm) =  $F_c / 2$  (N) x 0.185 (m)  
 $M_{T4}$ : Moment Tibia-4 (Nm) =  $F_c / 2$  (N) x 0.105(m)

Step 1(a): Bone Core  
Quasi-static 3-Point Bending Test  
(Tibia bone core)

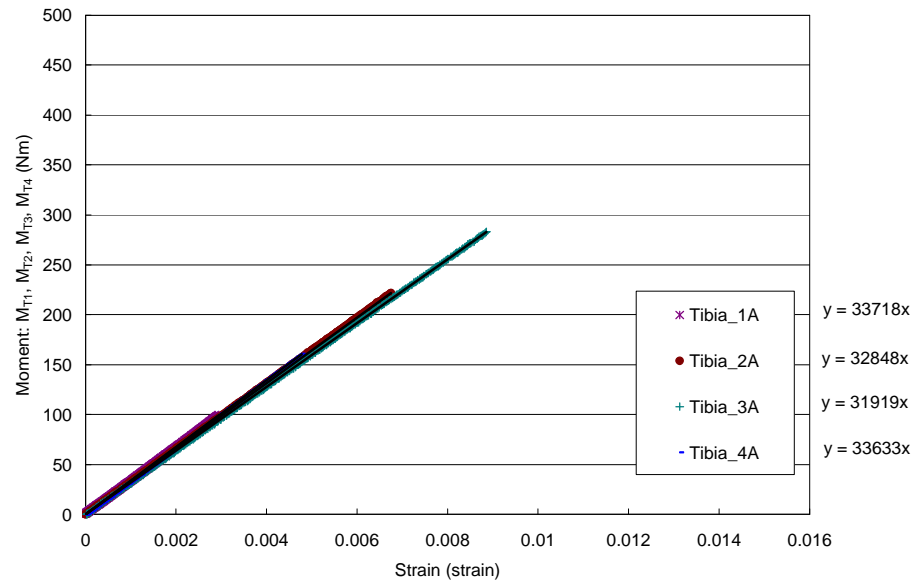
- ✓ Evaluate Long Bone Cores Bending Characteristic



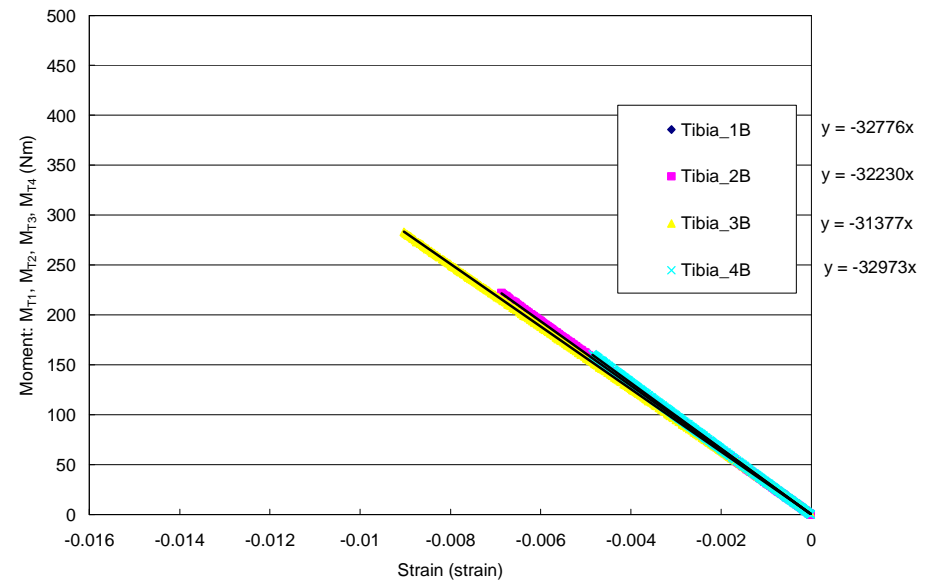
Step 1(a): Bone Core  
 Quasi-static 3-Point Bending Test  
 (Tibia bone core)

✓ Obtain Strain to Moment Conversion values

example



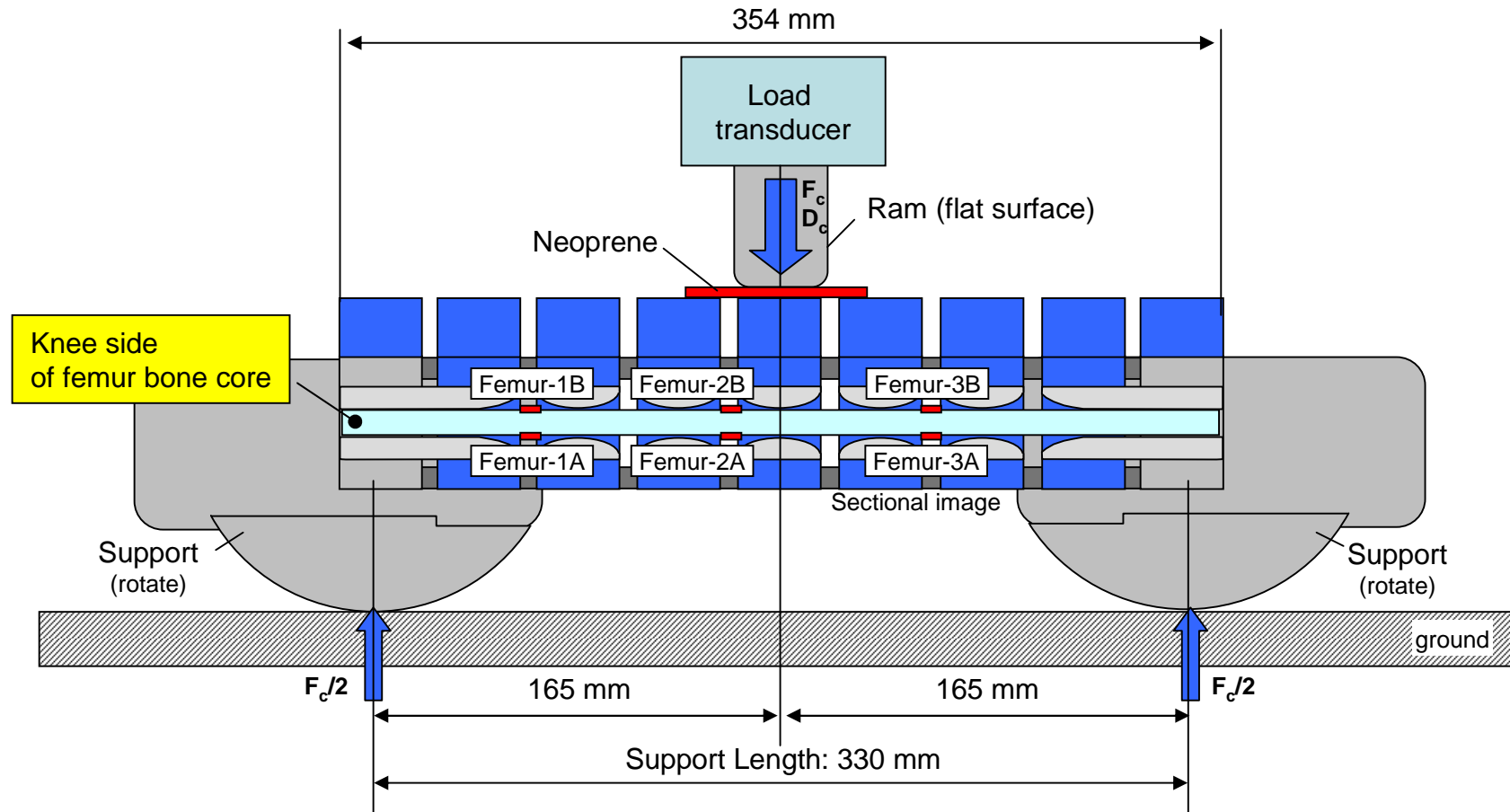
a) Strain gauges (side A: opposite side of loading)



b) Strain gauges (side B: loading side, spear gages for side A)



Step 1(b): Long Bone  
 Quasi-static 3-Point Bending Test  
 (Femur)

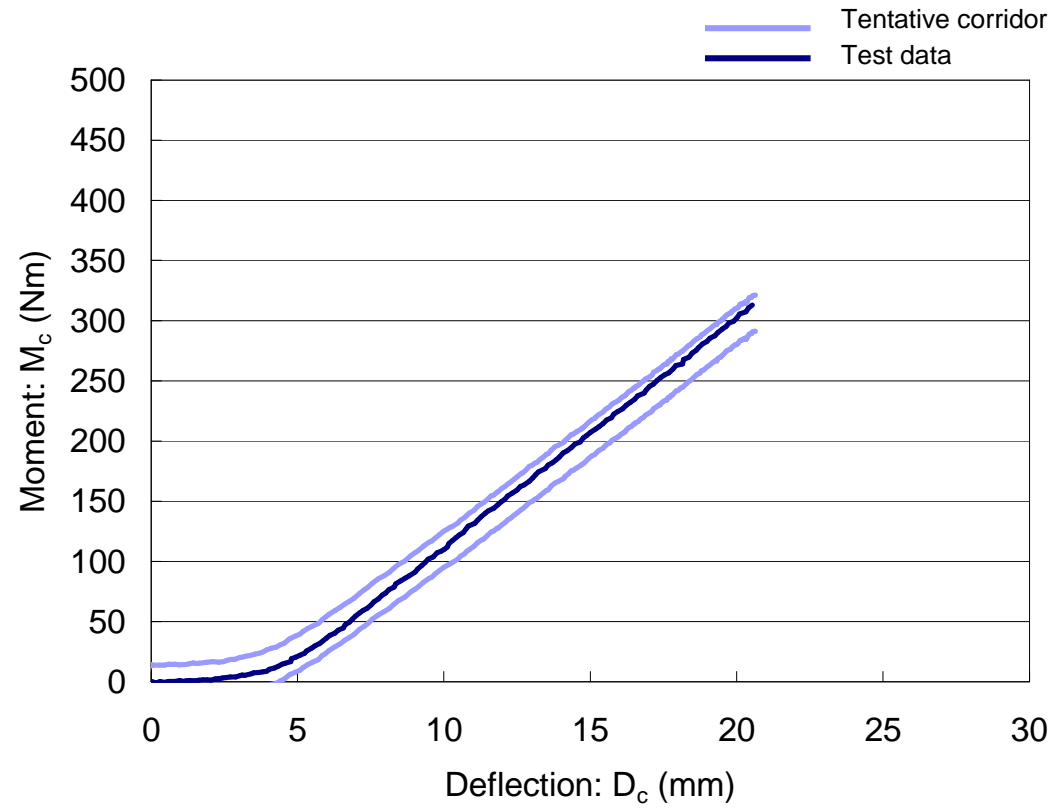


$F_c$ : Force Center,  $D_c$ : Deflection Center  
 $M_c$ : Moment Center (Nm) =  $F_c/2$  (N) x 0.165 (m)

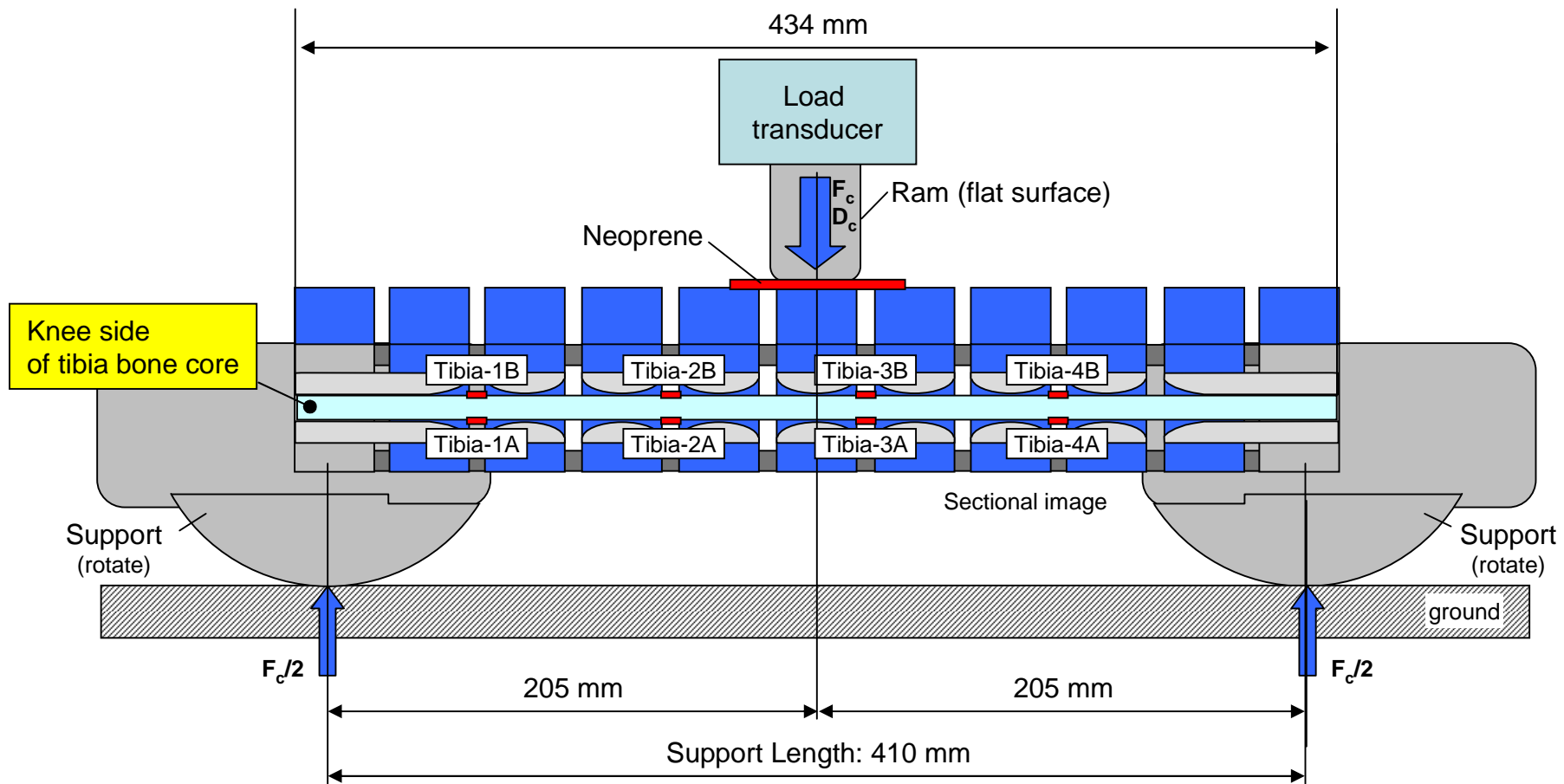
Step 1(b): Long Bone  
Quasi-static 3-Point Bending Test  
(Femur)

✓ Evaluate Long Bone Bending Characteristics

example



Step 1(b): Long Bone  
 Quasi-static 3-Point Bending Test  
 (Tibia)

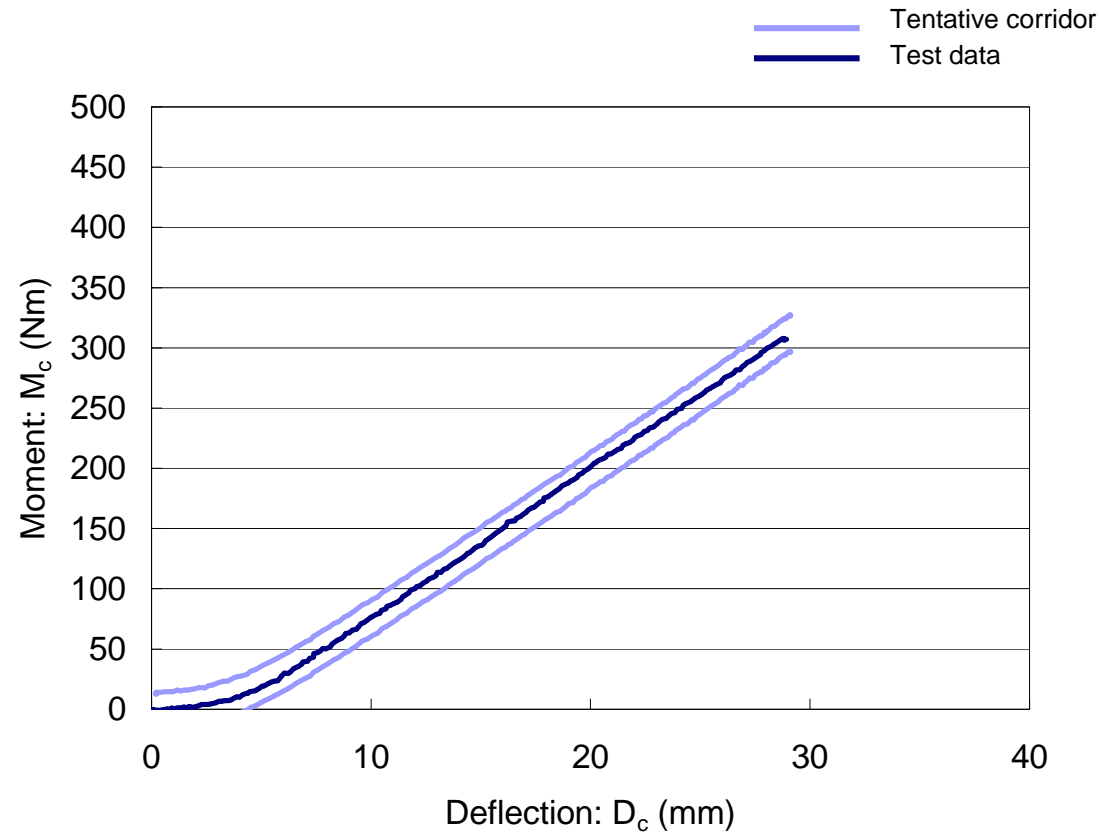


$F_c$ : Force Center,  $D_c$ : Deflection Center  
 $M_c$ : Moment Center (Nm) =  $F_c/2$  (N) x 0.205 (m)

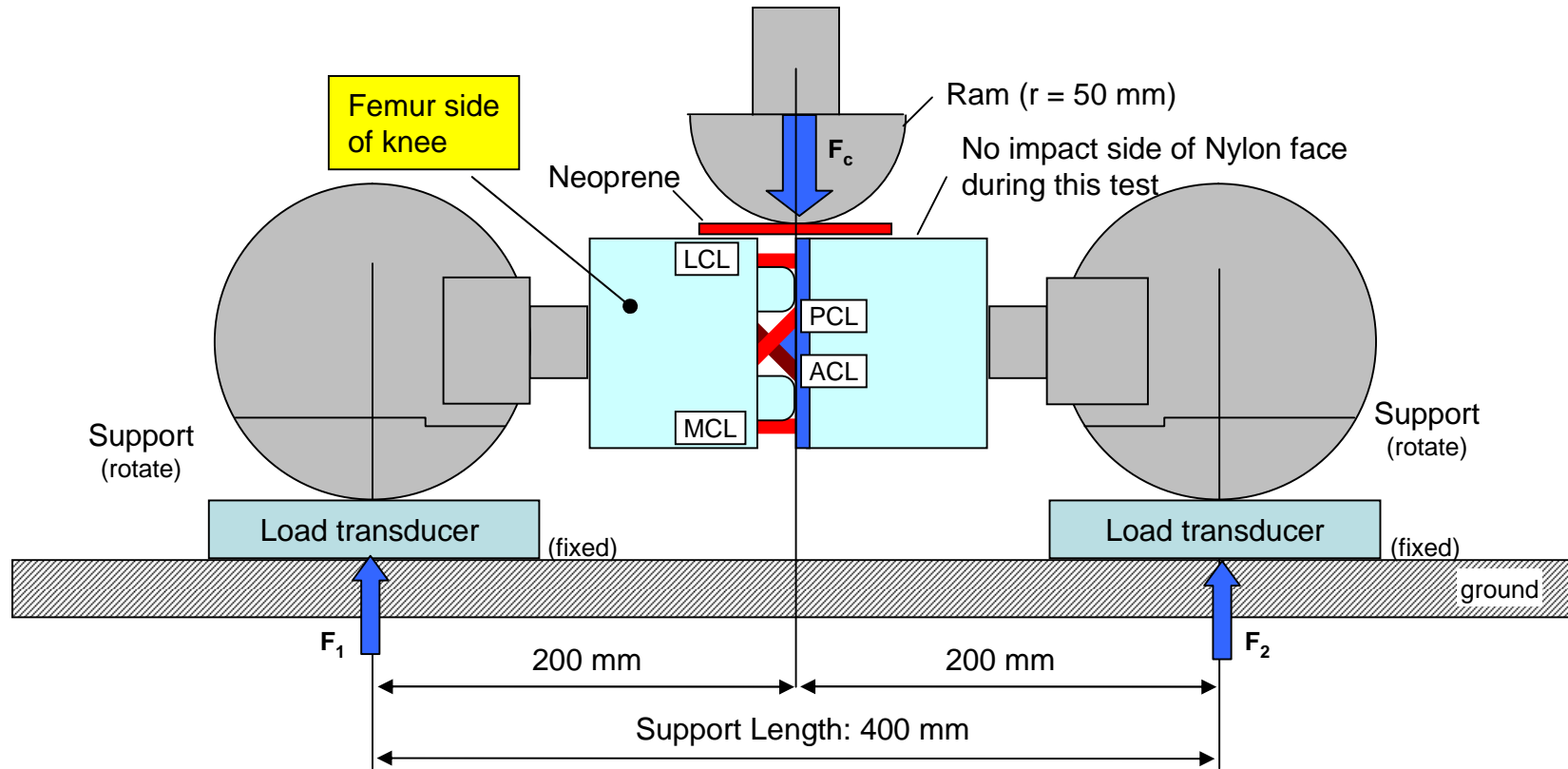
Step 1(b): Long Bone  
Quasi-static 3-Point Bending Test  
(Tibia)

✓ Evaluate Long Bone Bending Characteristics

example



Step 2: Knee  
Quasi-static 3-Point Bending Test

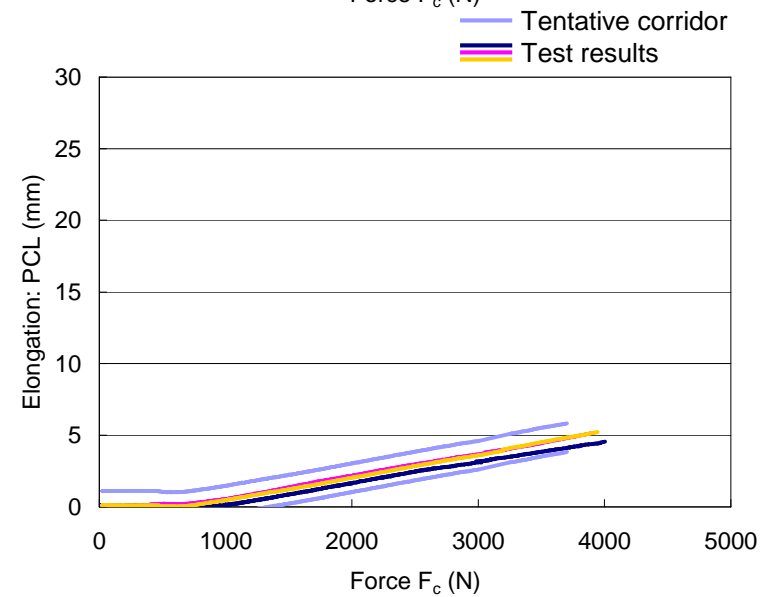
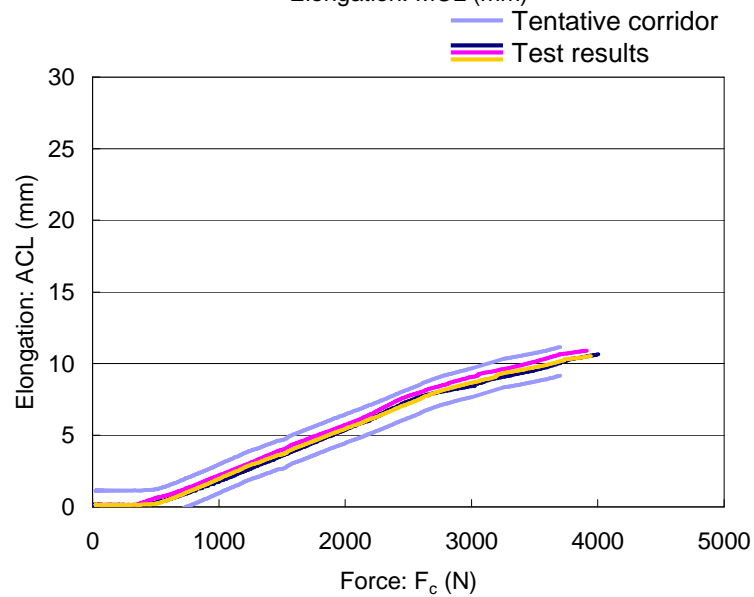
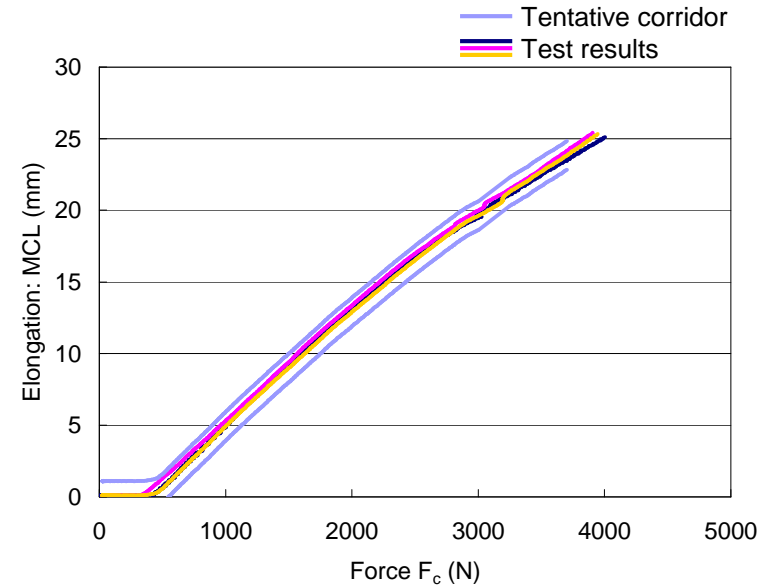
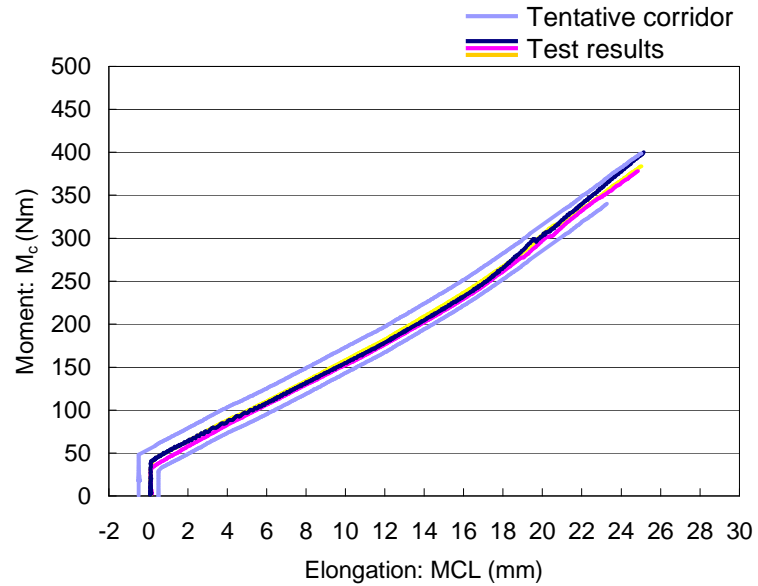


$F_1$ : Support force of Femur side of knee

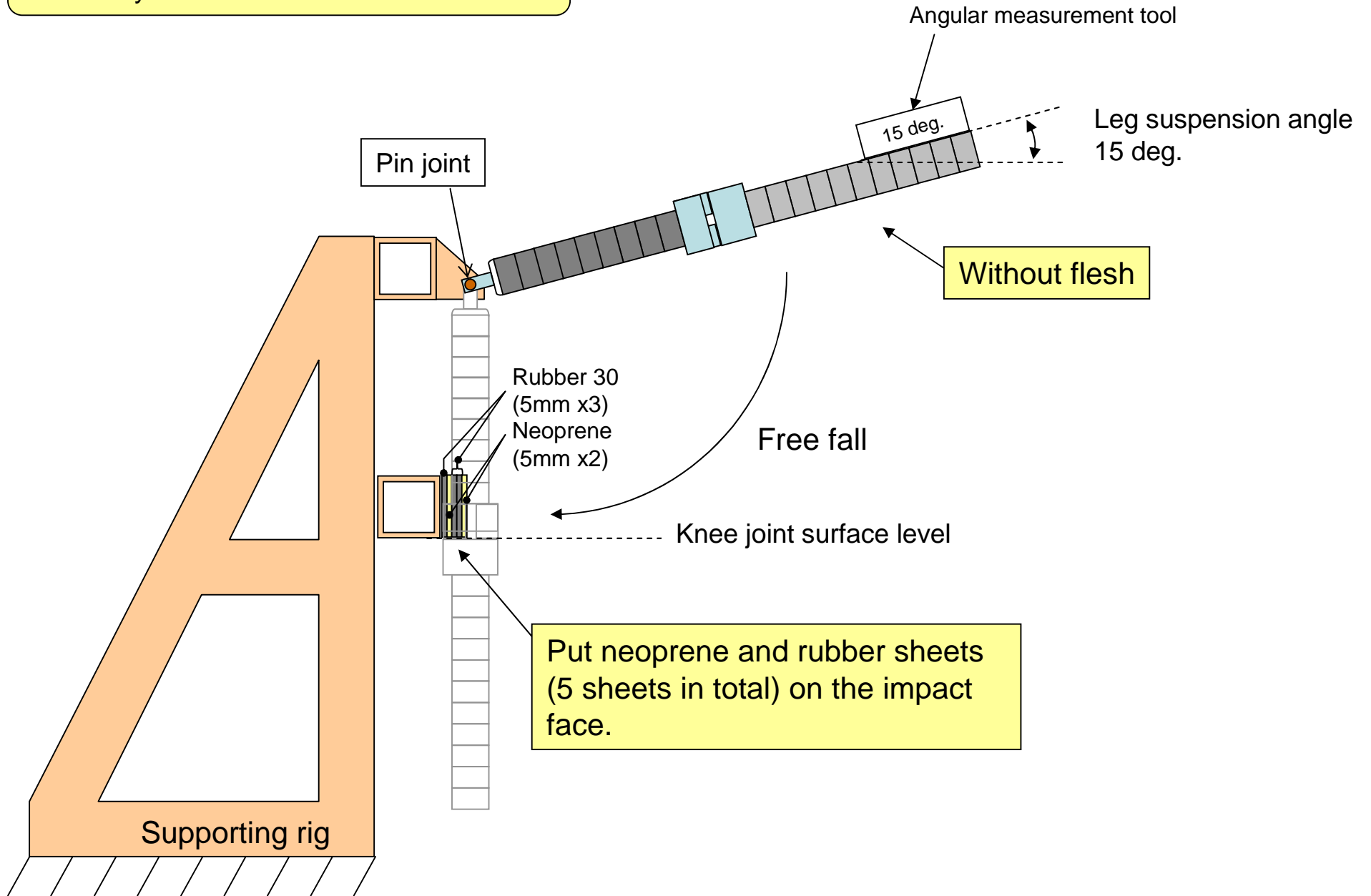
$M_c$ : Moment Center - at Knee joint surface (Nm) =  $F_1$  (N) x 0.2 (m)

## Step 2: Knee Quasi-static 3-Point Bending Test

- ✓ Evaluate Knee Bending Characteristics
- ✓ Evaluate Knee Ligament Elongation Values

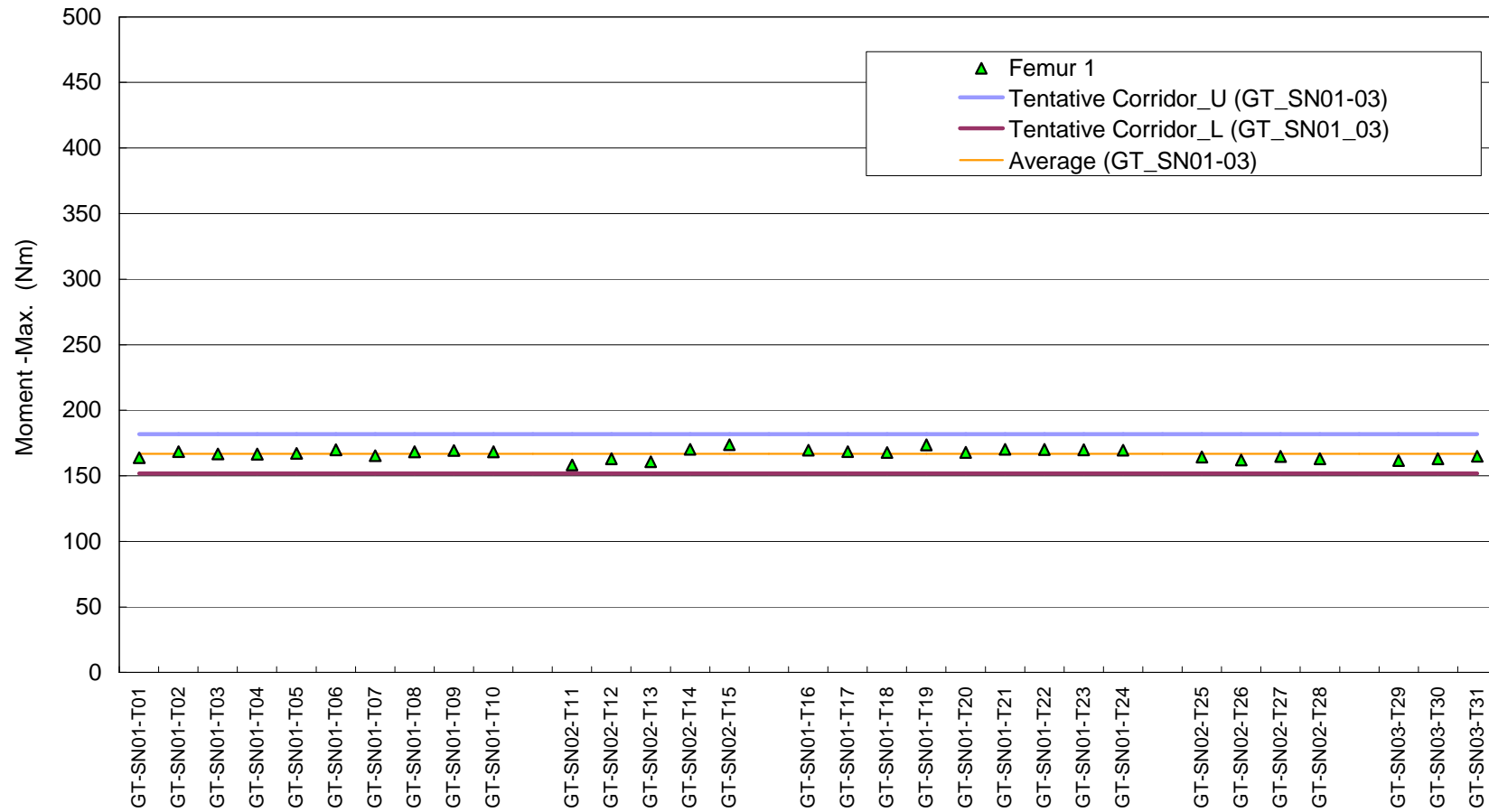


Step 4: Assembly (Femur-Knee-Tibia)  
Dynamic Calibration Test



## Step 4: Assembly (Femur-Knee-Tibia) Dynamic Calibration Test

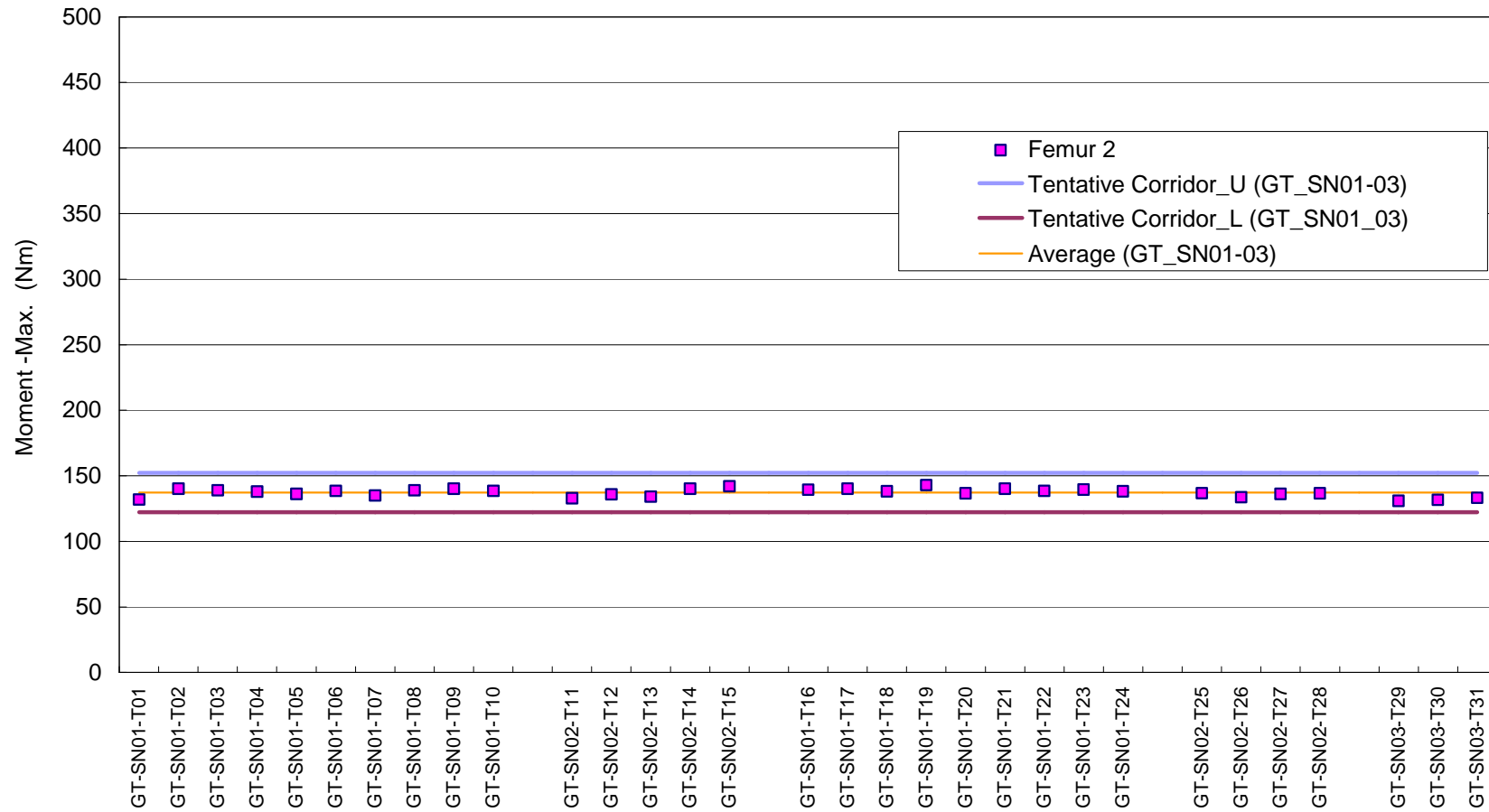
✓ Evaluate measured values





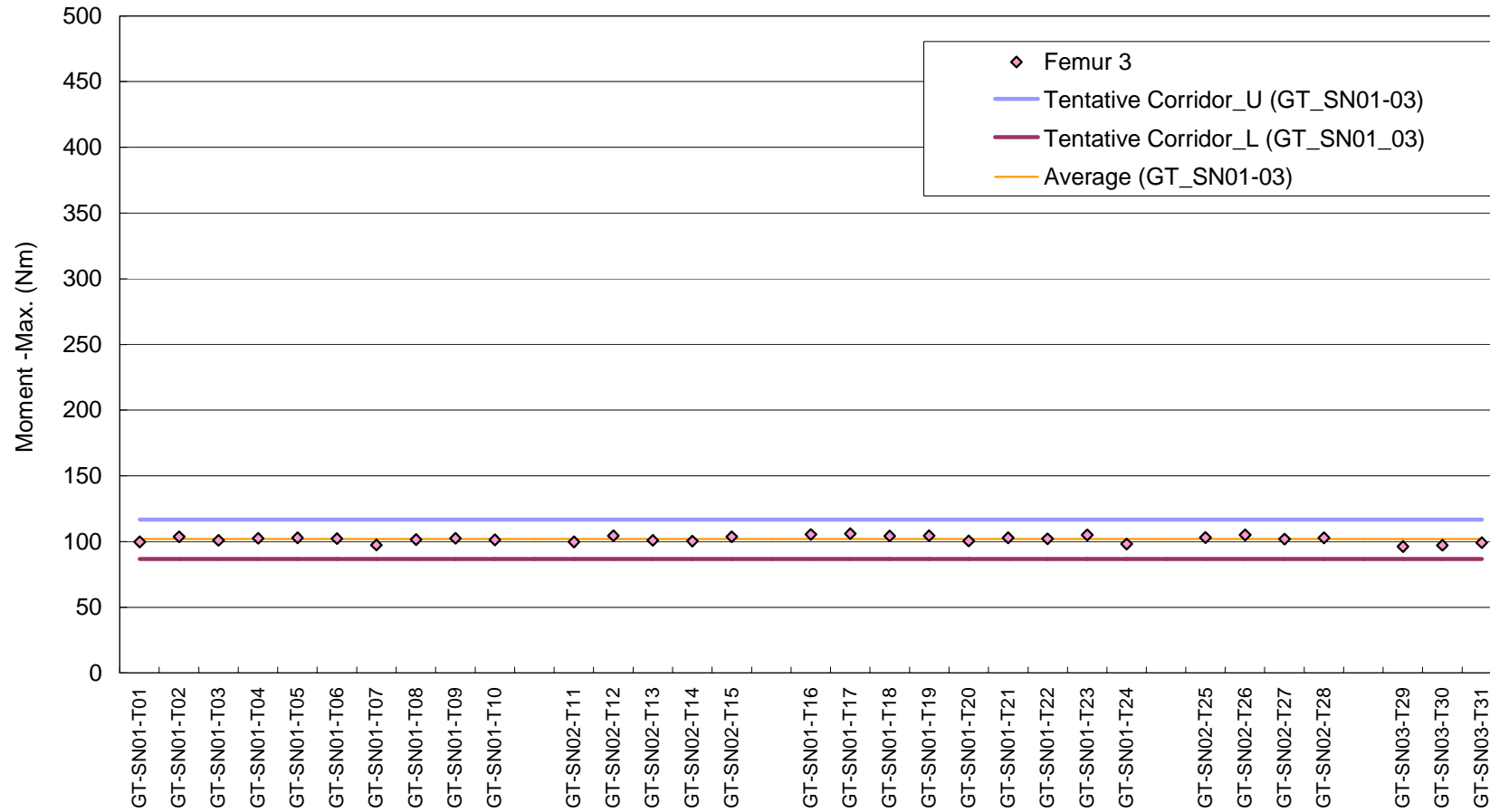
## Step 4: Assembly (Femur-Knee-Tibia) Dynamic Calibration Test

✓ Evaluate measured values



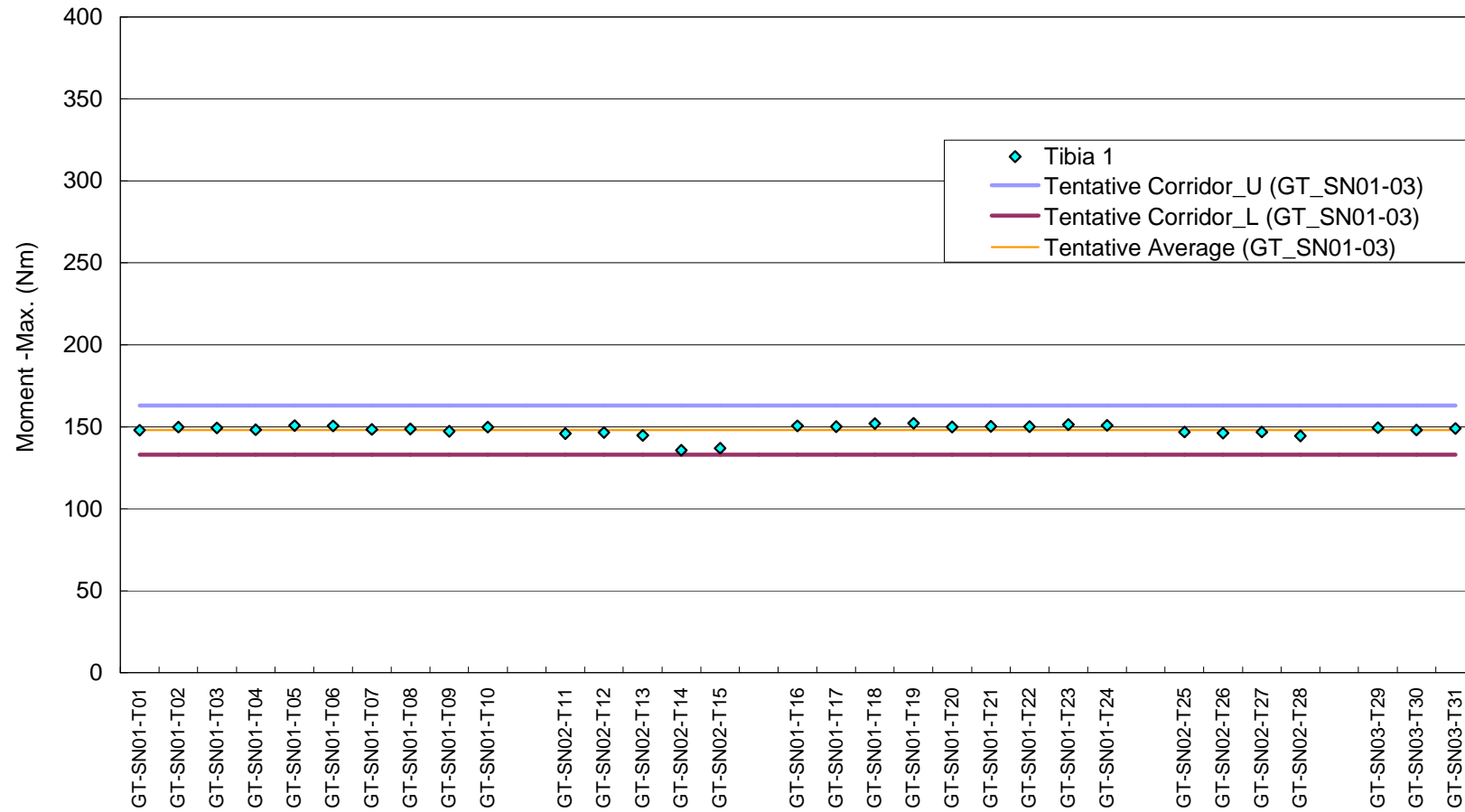
## Step 4: Assembly (Femur-Knee-Tibia) Dynamic Calibration Test

✓ Evaluate measured values



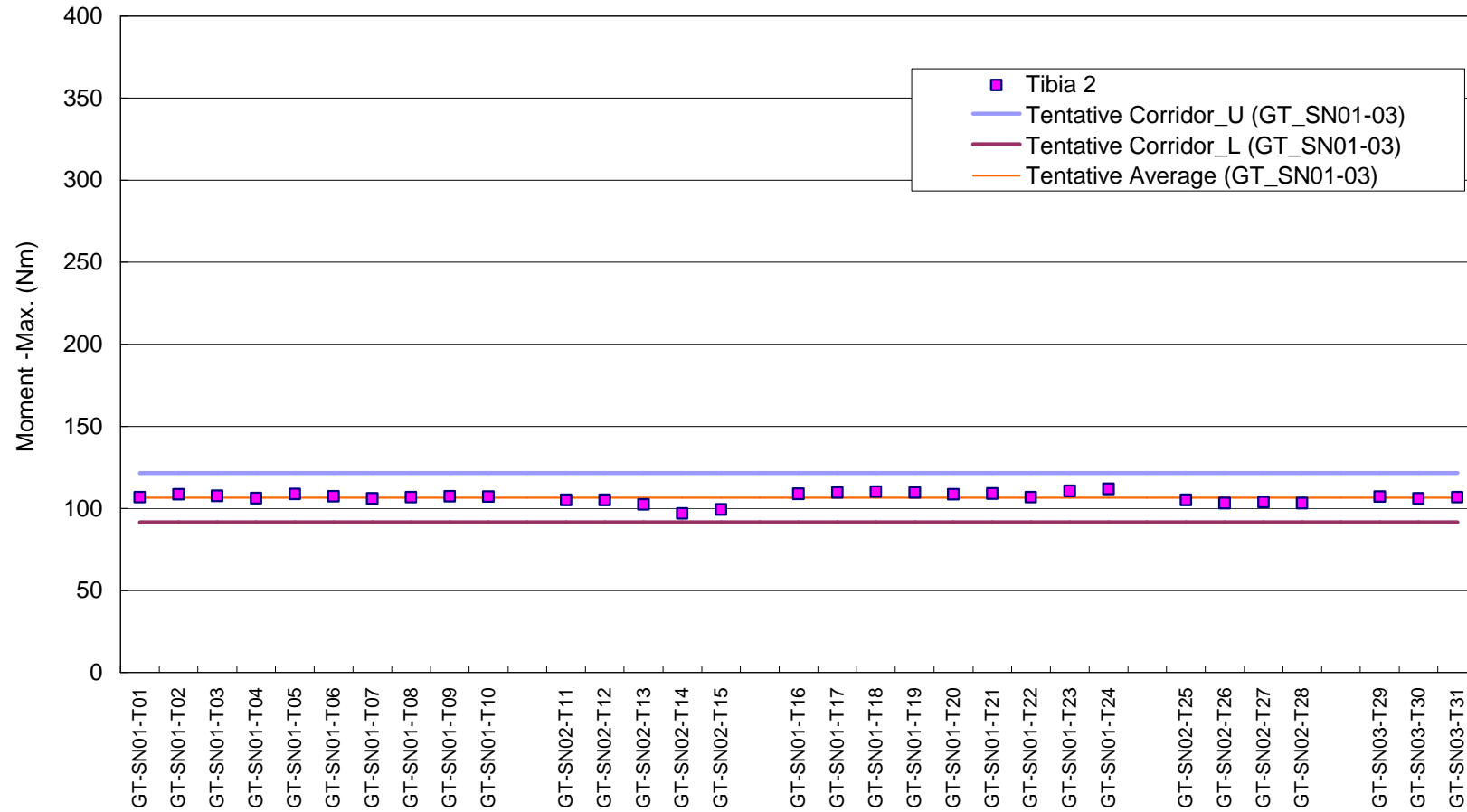
## Step 4: Assembly (Femur-Knee-Tibia) Dynamic Calibration Test

✓ Evaluate measured values



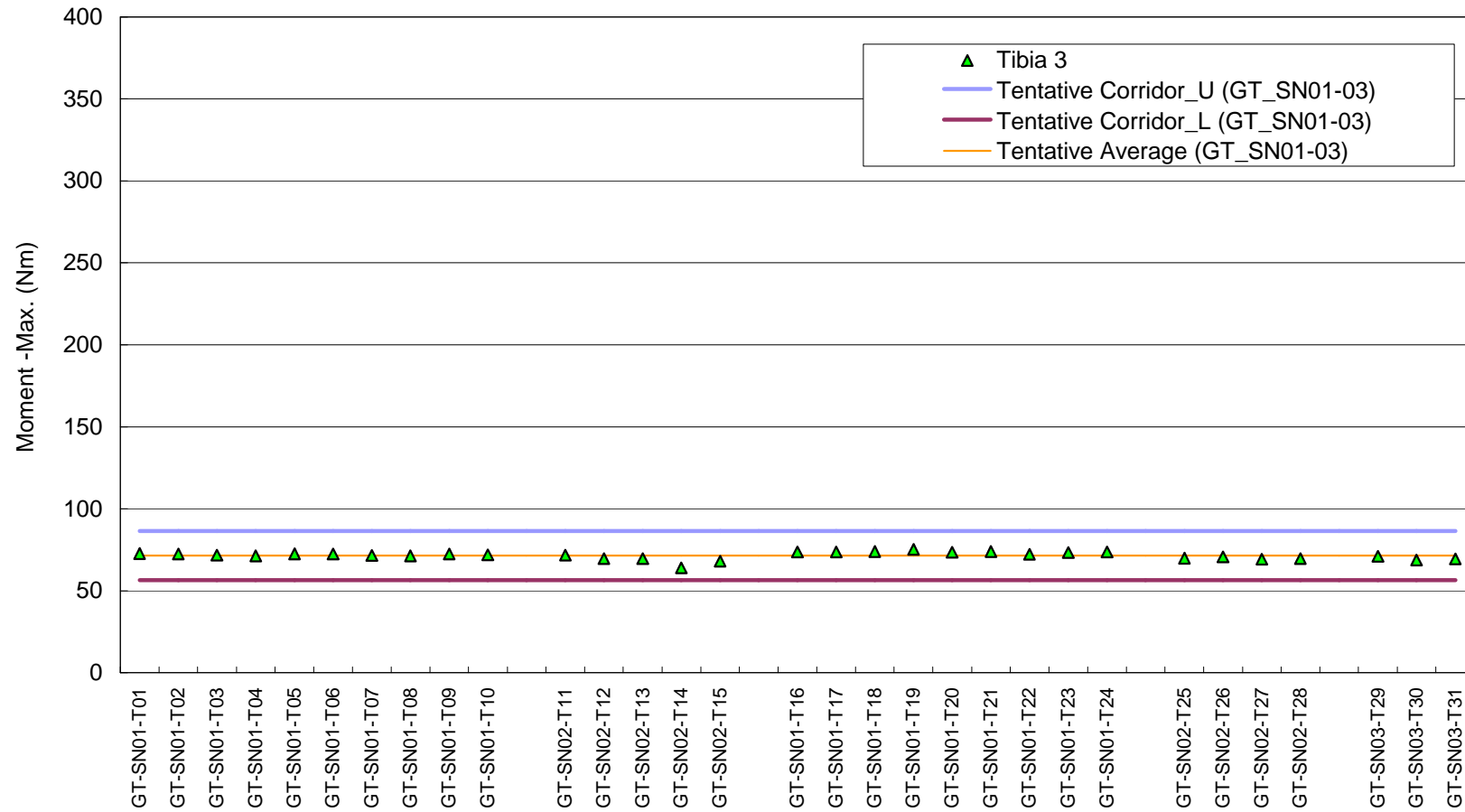
## Step 4: Assembly (Femur-Knee-Tibia) Dynamic Calibration Test

✓ Evaluate measured values



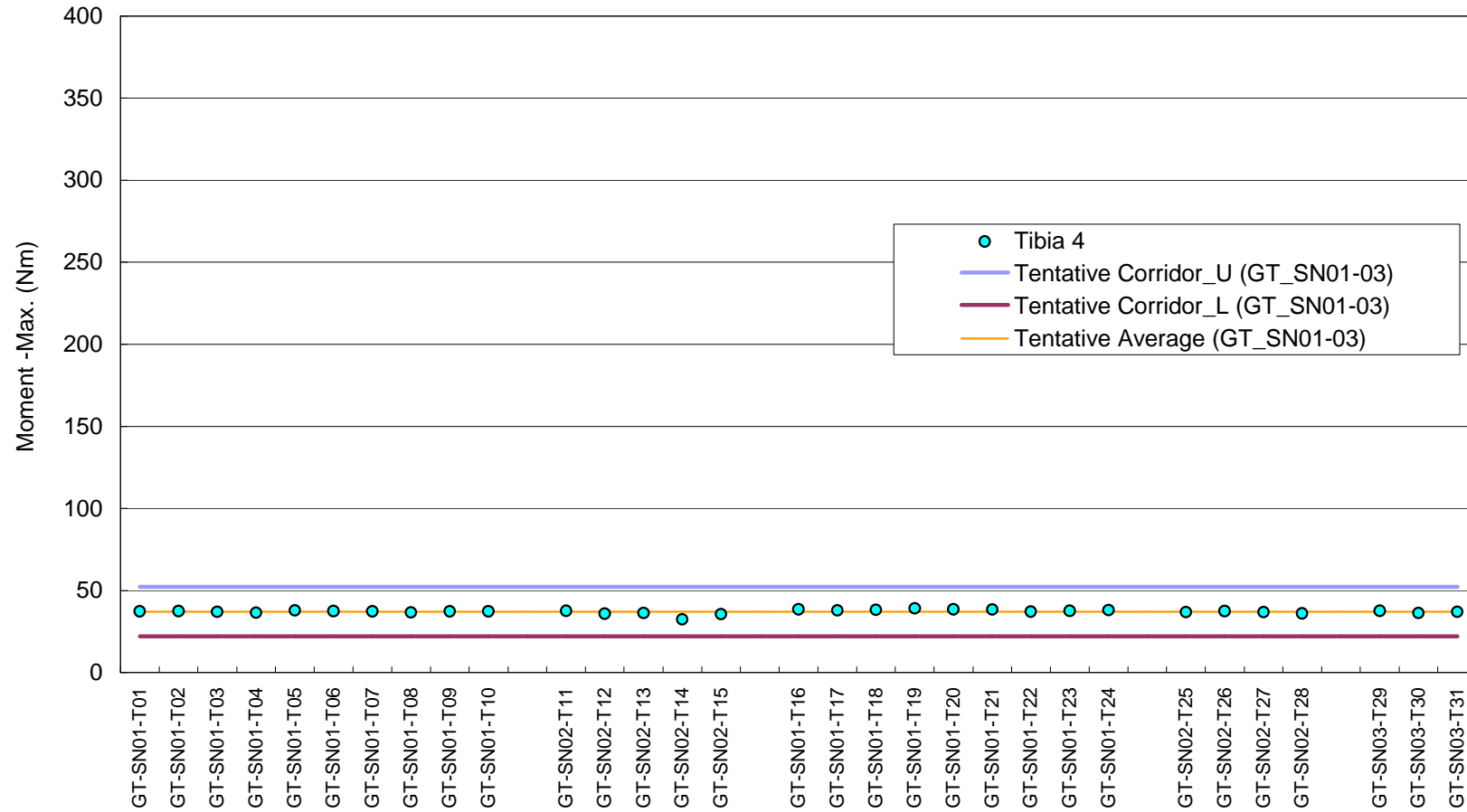
## Step 4: Assembly (Femur-Knee-Tibia) Dynamic Calibration Test

✓ Evaluate measured values



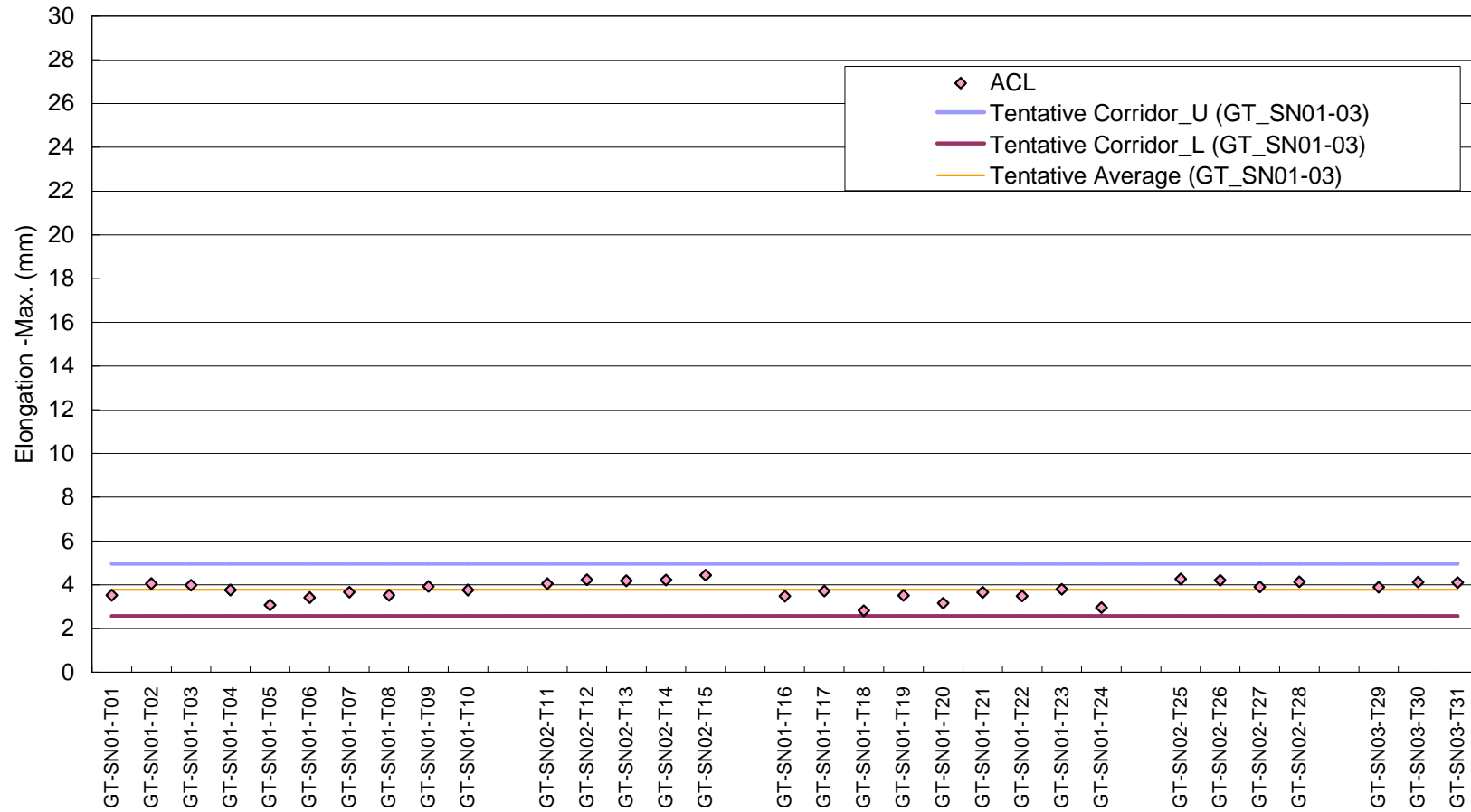
## Step 4: Assembly (Femur-Knee-Tibia) Dynamic Calibration Test

✓ Evaluate measured values



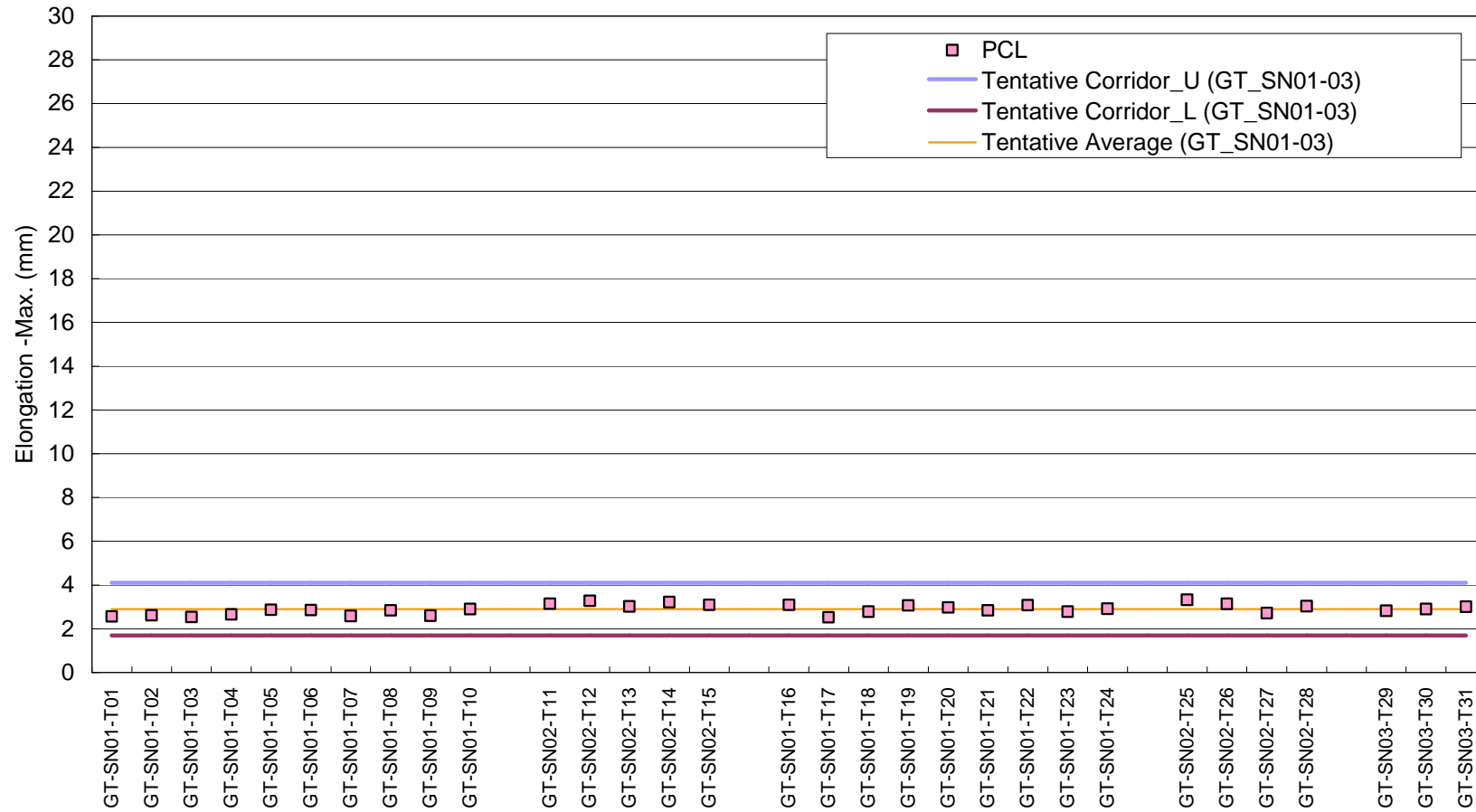
## Step 4: Assembly (Femur-Knee-Tibia) Dynamic Calibration Test

✓ Evaluate measured values



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