



Personalized Solutions

CT Protocol for PSI and Signature™ Guides

Purpose and Summary

This CT protocol is applicable for the Zimmer Biomet PSI and Signature Total Knee Guides* manufactured by Materialise. Zimmer Biomet cannot be held liable for other possible subsequent uses (i.e. diagnostic uses).

The scan protocol is created to obtain all relevant clinical data of the anatomical structures of the patient's knee, as well as the overall alignment of the entire limb. The resulting scans of this sequence will be used to create 3-dimensional virtual anatomical models, a personalized surgical plan and surgical guides of the patient's knee prior to knee arthroplasty surgery.

General Scan Requirements

- This protocol is intended for **16-slice** scanners or higher.

Patient Preparation

- Discuss the procedure with the patient. Make sure they understand the table will move during scanning.
- Remove any non-fixed metal prosthesis, jewelry, zippers, etc. that might interfere with the imaging region.
- Position the patient to maximize comfort and minimize motion.
- The patient must not move during any part of the scanning sequence. Patient movement will alter the relative alignment of the joints and invalidate the scan.

Patient Positioning

- Position the patient feet first, supine. Toes should be pointing up.
- Ensure the ankle is scanned on the same plane or slightly lower than the knee joint: the protocol allows for up to a 20 degree flexion of the knee joint.
- The knee can be rotated up to 20 degrees to allow for patient comfort.
- If an implant is present in the contralateral leg, elevate the contralateral knee to prevent the artifact from affecting the surgical side.

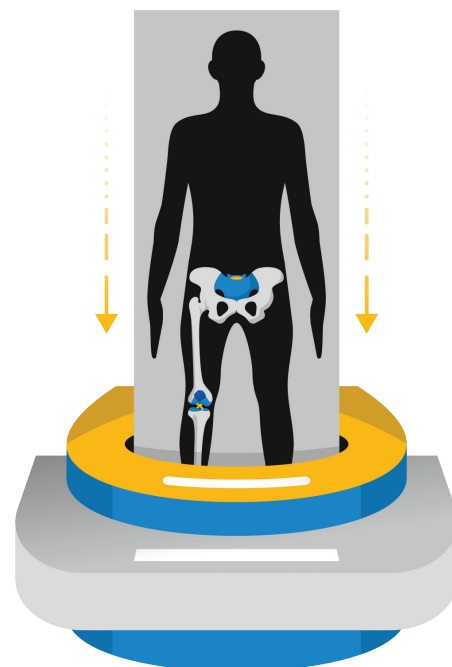
Imaging Guidelines

- Execute sagittal and coronal localizers from the anterior superior iliac spine through the calcaneus.
- When scanning the series, do not re-landmark. Laser light on first scan only.
- Only true axial will be accepted: **NO OBLIQUE**
- Do not use gantry tilt
- Use manufacturer's defaults for parameters not listed
- Use the smallest FOV possible to capture the whole required bone regions. This will require careful alignment of the leg to capture the femoral head, knee, and talus.
- Capturing all soft tissue is not necessary, only the bony regions are of interest.

For Bilateral Scans

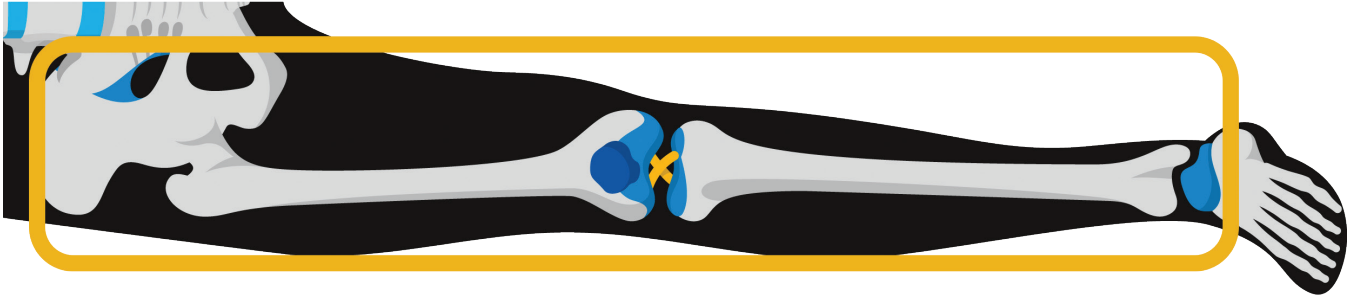
- Maximum FOV allowed for bilateral scans is 320 mm
- If both legs cannot be captured in 320 mm FOV, acquire at 500 mm FOV and reconstruct individual limbs at 250 mm FOV.
- Scan both legs simultaneously, while still following the above guidelines.

ⓘ **Note:** Unilateral images are recommended unless the patient is scheduled for a bilateral knee replacement.



Option 1: Full Leg (Single Acquisition)

Scan entire limb from anterior superior iliac spine through mid-calcaneus on the surgical side.

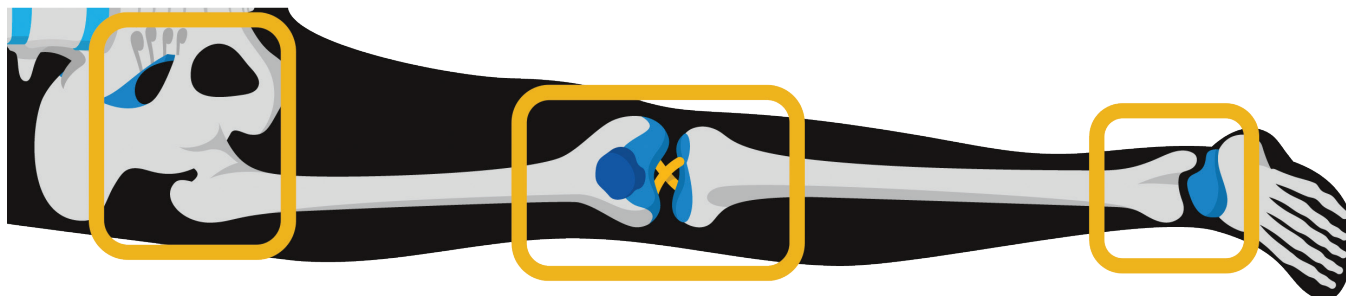


| | |
|----------------------|--|
| Collimation | <i>Slice thickness: 1.5 mm or smaller Slice increment: 50% overlap</i> |
| Field of View | 250 mm or smaller (<320 mm for bilateral scans) |
| Matrix | 512 x 512 |
| Algorithm | Moderate, standard, or soft tissue algorithm with no edge enhancement Do not use bone algorithm |
| Pitch | 1 or smaller |
| kVp and mAs | <i>kVp: 90-140 mAs: as given by automatic tube current modulation</i> Adjust depending on patient body habitus and the presence of metal in scan region. |

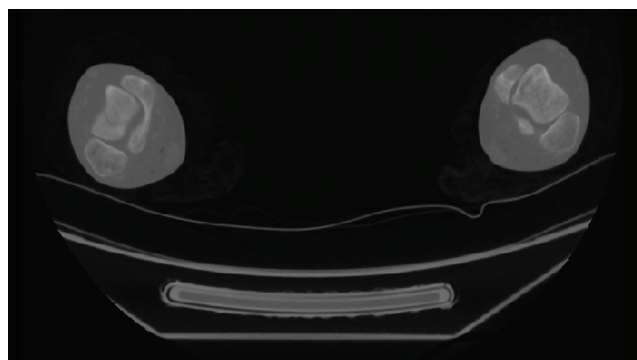
Option 2: Three Region (Sectional Acquisition)

Scan each lower joint from the surgical side. The minimum scanning volumes required for each scan are as follows:

- Ankle scan to cover the malleoli
- Knee scan to cover at least 100 mm above and 100 mm below the joint, to include the patellar ligament attachment at the tibial tuberosity.
- Hip scan to cover the femoral head and neck



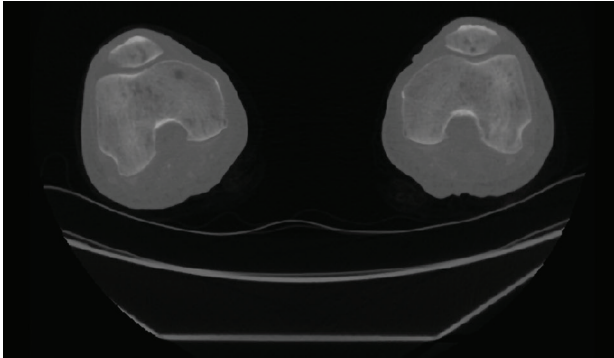
Scan region 1: Ankle



Note: Example images are bilateral, scanned at a 320 mm FOV.

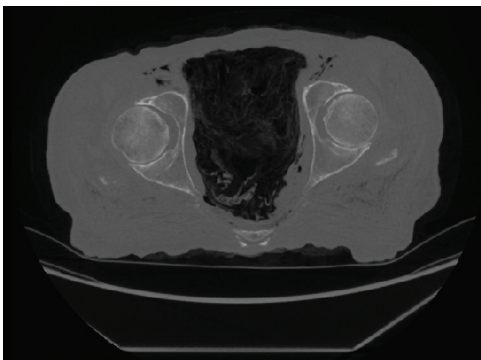
| | |
|---------------------------|---|
| Region of interest | 20 mm above and below the ankle joint, to include the malleoli and talus |
| Collimation | <i>Slice thickness:</i> 1.5 mm or smaller <i>Slice increment:</i> Contiguous slices |
| Field of View | 250 mm or smaller (<320 mm for bilateral scans) |
| Matrix | 512 x 512 |
| Algorithm | Moderate, standard, or soft tissue algorithm with no edge enhancement Do not use bone algorithm |
| Pitch | 2 or smaller |
| kVp and mAs | <i>kVp:</i> 90 <i>mAs:</i> as given by automatic tube current modulation Adjust depending on patient body habitus and the presence of metal in scan region. |

Scan region 2: Knee



| | |
|---------------------------|---|
| Region of interest | 100 mm above and below the knee joint |
| Collimation | <i>Slice thickness:</i> 1.5 mm or smaller <i>Slice increment:</i> 50% overlap |
| Field of View | 250 mm or smaller (<320 mm for bilateral scans) |
| Matrix | 512 x 512 |
| Algorithm | Moderate, standard, or soft tissue algorithm with no edge enhancement Do not use bone algorithm |
| Pitch | 1 or smaller |
| kVp and mAs | <i>kVp:</i> 90-140 <i>mAs:</i> as given by automatic tube current modulation Adjust depending on patient body habitus and the presence of metal in scan region. |

Scan region 3: Hip



| | |
|---------------------------|---|
| Region of interest | Entire femoral head and neck |
| Collimation | <i>Slice thickness:</i> 1.5 mm or smaller <i>Slice increment:</i> Contiguous slices |
| Field of View | 250 mm or smaller (<320 mm for bilateral scans) |
| Matrix | 512 x 512 |
| Algorithm | Moderate, standard, or soft tissue algorithm with no edge enhancement Do not use bone algorithm |
| Pitch | 2 or smaller |
| kVp and mAs | <i>kVp:</i> 90 <i>mAs:</i> as given by automatic tube current modulation Adjust depending on patient body habitus and the presence of metal in scan region. |

Submitting the Images

- Only DICOM format will be accepted
- No .jpg images or other formats are acceptable
- Do not submit reconstructed or reformatted images.
- Only original scan data is acceptable.
- Uncompressed Dicom data is required for processing.
- Lossy and other forms of compression are not recommended
- The scanner should be set to DICOM format “raw image,” with no compression.
If loading from PACs, import and export the scan as DICOM files with the uncompressed option.

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