# 5. QA/QC in Digital Breast Tomosynthesis

Below is a digital breast tomosynthesis (DBT) reconstruction of the relevant section of the QUART mam/digi EPQC phantom. The available tests are described underneath. Threshold limits are provided as *recommendations*. These limits might need to be confirmed by reference studies (which are currently under discussion in IEC).

→ Titanium edge for CNR

→ Landolt ring groups in focus

→ Al beads

→ MTF object
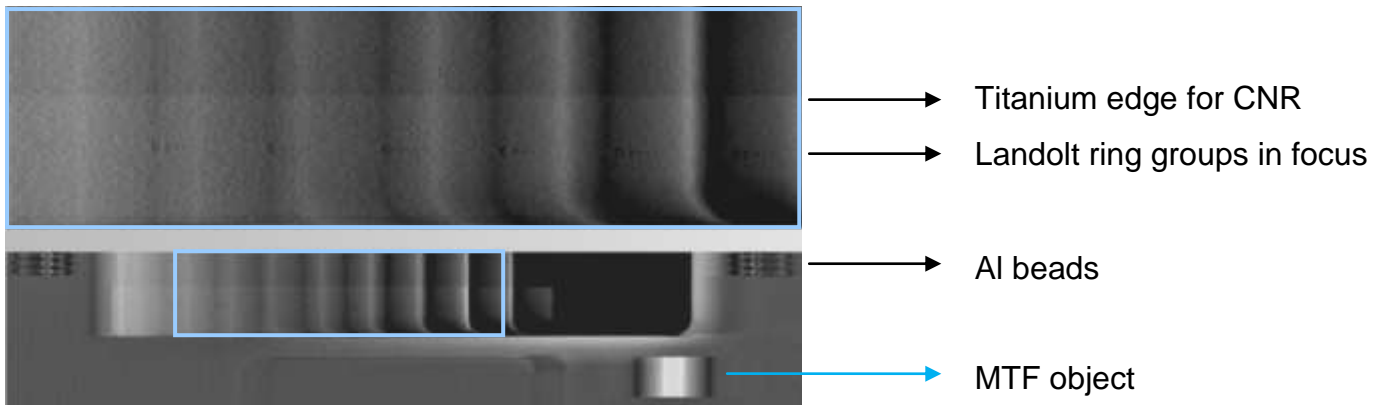
5.1 Horizontality of reconstruction planes

The two layers containing the Landolt rings must be focused within the reconstruction slices. The one at the detector surface contains 4 groups of six rings (step 9 – 12). The other layer contains 8 groups of six rings (step 1 – 8). When focusing on one of these planes, *all groups of rings contained in that plane must be visible*.

5.3 Depth Separation

The distance between the reconstructed slices containing rings in focus must be 20 mm. This serves to check and / or calibrate the height within the reconstruction algorithm.

5.2 Image stability (visual detectability, contrast-detail analysis)

Detection of the Landolt ring gaps is used to obtain a reference value at acceptance and to check stability of image quality during routine tests. *The sum of the gaps correctly detected for the 7 groups of rings corresponding to the thickest steps must be above 19* (this threshold is suggested in de las Heras et al. PMB 2013, by comparison to the limiting values defined in the EPQC).

5.4 In-Depth Low-Contrast Resolution

Each of the 12 different steps within the step-wedge contains one low-contrast number indicating the PMMA thickness corresponding to that step. *The low-contrast objects must be clearly recognised at least from the 6th step and above* (corresponding to lower PMMA thicknesses and higher transmission). In thicker PMMA material, the Contrast-to-Noise Ratio would be too low to image the fine structure of the low-contrast numbers.

5.4 Contrast-to-noise ratio (CNR) and Modulation Transfer Function (MTF)

The CNR can be calculated in each of the steps within the step wedge using the corresponding reconstruction slice for each step. For the calculation of the MTF (in both directions), the slice containing the MTF object must be used. All these measurements can be carried out using the software TomoPro to be released.

5.5. Artefact spread function or z-resolution

The aluminium beads are used to describe the artefact spread function, which informs of the device z-resolution. If desired, the artefact spread function can also be calculated for a very high attenuating object (the brass square) or a low/medium contrast object (the titanium strip).