Acquisition of volume images

**X-ray computed microtomography**

**Volume measurement**
X-ray computed microtomography is a technique to acquire volume images in opaque materials. These images are analysed to detect defaults (for example cavities) in the material from a direct treatment of grey levels or to measure displacement and strain fields in the bulk of the volume by using digital volume correlation technique for example. In this last case, X-ray computed microtomography coupled with digital volume correlation allows us to investigate mechanical problems in materials.

**Principle**
X-ray computed microtomography allows us to reconstruct the internal structure of a specimen in three dimensions from a series of radiographies. Each radiography gives a measurement of absorption of X rays crossing the specimen in a direction. We also talk to tomography by absorption. To obtain a good image of the volume, each radiography corresponds to a particular point of view. The specimen is placed on a rotation stage between the X-rays source and the detector to obtain different points of view. Only the principle of conic-beam tomography is presented. It corresponds to devices of laboratory as the ones that we have. All the radiographies are used by a reconstruction procedure giving a volume.

**Laboratory devices**

- VISCOM X8050,
  - 160kV, 320W, resolution >5µm
  - Reconstruction software DigiCT

- Rx Solutions EasyTom XL Duo
  - Source Hamamatsu micro spot 150 kV 75 W
  - Source Hamamatsu nano spot 160 kV
  - Detector Varian – Paxscan 2520DX CsI
  - Resolution >0.25µm
- Rx Solutions UltraTom
  - Source Hamamatsu micro spot 150 kV 75 W
  - Source Hamamatsu nano spot 160 kV
  - Detector Varian – Paxscan 2520DX CsI
  - Camera Hamamatsu 4000x2624 pixels
  - Reconstruction software Xact

**In situ loading devices**
- traction/compression/bending devices 20,400, 6000N
Examples of reconstructed volumes

Wood

Cancellous bone

Laminated composites, inclusion of copper particles
Examples of studies
The following publications present some examples of studies where X-ray tomography is used.


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