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1003-65-1512 **Laurent Desbat*** (`laurent.desbat@imag.fr`), TIMC-IMAG, In3S, faculte de Medecine, UJF, 38706 La Tronche, France. *Sampling conditions and efficient schemes in helical tomography.*

In helical tomography, we measure x-ray attenuations along lines, with an x-ray source turning on an helix around the patient. The aim is to reconstruct from such acquired projection data g the 3D attenuation f of the patient. In the presented work, we study the sampling conditions of helical tomography when only a detector row is used and f is supposed to be in $\mathcal{C}_0^\infty(\mathbb{R}^3)$. This leads to the study of the 3D Parallel Beam X-Ray Transform $\mathcal{P}f$ and the 3D Fan Beam X-Ray Transform $\mathcal{D}f$. Indeed, sampling in helical tomography is just sampling $\mathcal{P}f$ or $\mathcal{D}f$ with the helical constraint $t(\phi) = (2\pi/T_{\text{rot}})\phi$ or $t(\beta) = (2\pi/T_{\text{rot}})\beta$, T_{rot} being the helical pitch.

Generalizing 2D results, we give the essential support of the Fourier transform of $\mathcal{P}f$ and $\mathcal{D}f$. Based on Petersen-Middleton theorems, this yields sampling conditions. We derive from these sampling conditions efficient schemes that fulfill the helical constraint and improve on previous results. In particular, we show efficient relations between the pitch, the angular and the detector sampling rates. We show reconstructions from efficient sampling schemes and comparisons with classical schemes. (Received October 05, 2004)