# Impact of iterative reconstructions on image quality in clinical CT images demonstrated by a novel noise power spectrum measurement tool

Hugo Pasquier*†[1], Francois Gardavaud[2], Alain Rahmouni[1,3], and Alain Luciani[1,3]

[1]CHU Henri Mondor - Service d'imagerie médicale, Créteil – Université Paris-Est Créteil Val-de-Marne (UPEC), Assistance publique - Hôpitaux de Paris (AP-HP) – 51 Avenue du Maréchel de Tassigny 94010 Créteil CEDEX, France

[2]Hôpital Tenon - Service d'Imagerie Médicale, Paris – Assistance publique - Hôpitaux de Paris (AP-HP) – 4 rue de la Chine, Paris, France

[3]IMRB Equipe 18 - INSERM (U955) – Institut National de la Santé et de la Recherche Médicale - INSERM – 8 rue du Général Sarrail 94010 Créteil cedex, France

**Résumé**

**Introduction:** To quantify noise texture and magnitude characteristics of clinical Computed Tomography (CT) images obtained with Iterative Reconstructions (IR) techniques.
**Methods:** An algorithm was developed to extract noise texture and magnitude metrics from 10 chest and abdomen clinical CT-scans (Discovery CT750 HD; GE Healthcare, Wisconsin) performed for oncology follow-up by measuring a global Noise Power Spectrum (NPS). After subtraction of adjacent slices, a segmentation algorithm was applied to exclude remaining anatomical structures. Noise magnitude (i.e. area under the 1D-NPS curve) and peak frequency (fpeak) were measured and compared for chest and abdomen on image subsets of all CT scans reconstructed using Filtered Back Projection (FBP), Adaptive Statistical Iterative Reconstruction 30 % (ASIR30), 50 % (ASIR50) and Model-Based Iterative Reconstruction (MBIR).

**Results:** Compared to FBP, ASIR30 and ASIR50, MBIR reduced noise magnitude by 31 %, 17 % and 13 % in chest and by 47 %, 34 % and 29 % in abdomen respectively ($p < 0.01$ each). These noise magnitude reductions were also associated to changes in noise texture: for chest and abdomen, fpeak were significantly lower for MBIR (0.08 and 0.09 mm-1 respectively), ASIR50 (0.13 and 0.14 mm-1 respectively) and ASIR30 (0,16 and 0.18 mm-1 respectively) compared to FBP (0.23 and 0.27 mm-1 respectively; $p < 0.01$ each).
**Conclusion:** Assessing NPS of clinical CT examinations can demonstrate the reduction of noise magnitude and the changes of noise texture associated to IR. This method could be used to tailor CT protocols according to radiologists' preferences regarding noise texture and magnitude.

**Mots-Clés:** Computed Tomography, Image Quality, Noise Power Spectrum, Iterative Reconstructions

*Intervenant
†Auteur correspondant: hugo.pasq@gmail.com