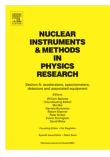
Accepted Manuscript

Diagnostic X-ray sources -present and future

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 PII:
 S0168-9002(17)30587-9

 DOI:
 http://dx.doi.org/10.1016/j.nima.2017.05.034

 Reference:
 NIMA 59872

To appear in: Nuclear Inst. and Methods in Physics Research, A

Received date : 28 April 2017 Revised date : 23 May 2017 Accepted date : 24 May 2017

Please cite this article as: R. Behling, F. Grüner, Diagnostic X-ray sources –present and future, *Nuclear Inst. and Methods in Physics Research, A* (2017), http://dx.doi.org/10.1016/j.nima.2017.05.034

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ACCEPTED MANUSCRIPT

1	Diagnostic X-ray Sources – Present and Future
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5 Abstract

6 This paper compares very different physical principles of X-ray production to spur ideation. Since more than 120 7 years, bremsstrahlung from X-ray tubes has been the workhorse of medical diagnostics. Generated by X-ray 8 segments comprised of X-ray tubes and high-voltage generators in the various medical systems, X-ray photons in 9 the spectral range between about 16 keV and 150 keV deliver information about anatomy and function of human 10 patients and in pre-clinical animal studies. Despite of strides to employ the wave nature of X-rays as phase sensitive means, commercial diagnostic X-ray systems available until the time of writing still rely exclusively on measuring 11 12 the attenuation and scattering of X-rays by matter. Significant activities in research aim at building highly brilliant 13 short pulse X-ray sources, based on e.g. synchrotron radiation, free electron lasers and/or laser wake-field 14 acceleration of electrons followed by wiggling with magnetic structures or Thomson scattering in bunches of light. 15 While both approaches, non-brilliant and brilliant sources, have different scope of application, we speculate that a 16 combination may expand the efficacy in medical application. At this point, however, severe technical and 17 commercial difficulties hinder closing this gap. This article may inspire further development and spark innovation 18 in this important field.

Keywords: X-ray sources, X-ray tubes, medical imaging, synchrotrons, Thomson scattering, laser wakefield
 acceleration.

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