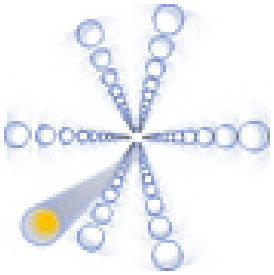

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# PS1-22: CST Simulations of Smith-Purcell Radiation from lamellar and Echelle Gratings for Sub-THz Frequencies

*Monday, 6 October 2014 17:00 (1h 30m)*

THz frequency region is very challenging part of electromagnetic spectrum for radiation generation and detection because of relatively low maturity level of components and systems that operate in this region. Although situation is improving with more and more advances in the field, much of challenging and exciting potential still remains untapped [1].

Recent advances in generation of short (hundreds of femtoseconds) pre-bunched beams have a potential to generate coherent THz radiation with high signal-to-noise ratio occurring via Smith-Purcell radiation (SPR) from diffraction grating in super-radiant regime. Measurements of frequency locked coherent SPR in sub-THz frequency region were demonstrated in [2, 3]. Currently LUCX accelerator at High Energy Accelerator Research Organisation (KEK) is being upgraded by introducing femtosecond Ti-Sapphire laser system and ultimately it will generate short few tens of femtosecond electron bunches [4, 5].

In this report we present simulations of SPR from gratings of lamellar and echelle profiles, that later on will be used in the experiment at LUCX facility. The simulations are performed in Computer Simulation Technology (CST) Particle Studio (PS) software package. Spectral-angular characteristics of SPR are investigated for various parameters of the gratings: number of periods, groove depth in the case of lamellar grating, groove tilt in the case of echelle grating. The results are compared with the Resonant Diffraction Radiation theory developed in [6]. Frequencies nearing towards 1 THz are considered in the simulations. Characteristics of SPR for micro-bunch beam and beam size effects are investigated.

References

1. D.M. Mittleman, Frontiers in terahertz sources and plasmonics, Nature Photonics 7 (2013) 666.
2. S.E. Korbly, A.S. Kesar, J.R. Sirigiri and R.J. Temkin, Observation of frequency-locked coherent Terahertz Smith-Purcell radiation, PRL 94 (2005) 054803.
3. A.S. Kesar, R.A. Marsh and R.J. Temkin, Power measurements of frequency locked Smith-Purcell radiation, PRSTAB 9 (2006) 022801.
4. M. Fukuda, S. Araki, A. Deshpande, Y. Higashi, Y. Honda, K. Sakaue, N. Sasao, T. Taniguchi, N. Terunuma and J. Urakawa, Upgrade of the accelerator for the laser Undulator compact X-ray source (LUCX), NIMA 637 (2011) S67.
5. A. Aryshev, S. Araki, M. Fukuda, K. Lekomtsev, M. Shevelev, J. Urakawa, A. Potylitsyn and K. Sakaue, Development of advanced THz generation schemes at KEK LUCX facility, Proc. PASJ (Nagoya, Japan) (2013) SUP020
6. A.P. Potylitsyn, Smith-Purcell effect as resonant diffraction radiation, NIMA 145 (1998) 60.

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