144
标题: Propagation of gamma rays and production of free electrons in air
作者: Dimant, YS (Dimant, Y. S.); Nusinovich, GS (Nusinovich, G. S.); Sprangle, P (Sprangle, P.); Penano, J (Penano, J.); Romero-Talamas, CA (Romero-Talamas, C. A.); Granatstein, VL (Granatstein, V. L.)
来源出版物: JOURNAL OF APPLIED PHYSICS 卷: 112 期: 8 文献号: 083303 DOI: 10.1063/1.4762007 出版年: OCT 15 2012
在 Web of Science 中的被引频次: 0
被引频次合计: 0
引用的参考文献数: 18
摘要: This paper is devoted to the analysis of production of free electrons in air by gamma-rays leaking from radioactive materials. A model based on the Klein-Nishina scattering theory is used to calculate scattering cross sections and approximate the electron production rate. The model includes the effects of primary gamma-quanta radiated by the source as well as that scattered in air. Comparison of the model with the MCNPX kinetic code (http://mcnpx.lanl.gov/) in a sample problem shows excellent agreement. The motivation for this research comes from the recently proposed concept of remote detection of concealed radioactive materials [V. L. Granatstein and G. S. Nusinovich, J. Appl. Phys. 108, 063304 (2010)]. The concept is based on the breakdown in air at the focal point of a high-power beam of electromagnetic waves produced by a THz gyrotron with a 10-20 mu s pulse. The presence of a radioactive material can greatly exceed the production rate of free electrons over the natural background rate. Additional electrons act as seeds to initiate the breakdown and create sufficiently dense plasma at the focal region. The dense plasma can then be remotely detected as an unambiguous effect of the concealed radioactive material. (C) 2012 American Institute of Physics. [http://dx.doi.org/10.1063/1.4762007]
入藏号: WOS:000310597500016
语种: English
文献类型: Article
KeyWords Plus: AVERAGE ENERGY; ION PAIR; GASES
地址: [Dimant, Y. S.] Boston Univ, Ctr Space Phys, Boston, MA 02215 USA
[Nusinovich, G. S.; Romero-Talamas, C. A.; Granatstein, V. L.] Univ Maryland, Inst Res Elect & Appl Phys, College Pk, MD 20742 USA
[Sprangle, P.; Penano, J.] USN, Res Lab, Div Plasma Phys, Washington, DC 20375 USA
通讯作者地址: Dimant, YS (通讯作者),Boston Univ, Ctr Space Phys, Boston, MA 02215 USA.
出版商: AMER INST PHYSICS
出版商地址: CIRCULATION & FULFILLMENT DIV, 2 HUNTINGTON QUADRANGLE, STE 1 N O 1, MELVILLE, NY 11747-4501 USA
Web of Science 类别: Physics, Applied
研究方向: Physics
IDS 号: 030VF
ISSN: 0021-8979
29 字符的来源出版物名称缩写: J APPL PHYS
ISO 来源出版物缩写: J. Appl. Phys.
来源出版物页码计数: 6