



Contribution ID: 1355 Contribution code: THPM124

Type: **Poster Presentation**

Conceptual design of the high-power electron beam irradiator using niobium-tin superconducting cavity

Thursday, 11 May 2023 16:30 (2 hours)

In recent years, there has been an increasing demand for high-intensity beams related to electron beam irradiation, such as mass production of nuclear-medicine examination by using ^{99}Mo and high-efficiency production by material modification through material irradiation. While the acceleration of high-current beams can be realized by using a superconducting cavity, a compact accelerator is desirable for general-purpose irradiation beams. In this paper, we designed a 10 MeV, 50 mA high current beam irradiator for practical use based on the experimental results of highly efficient production of nanocellulose by wood irradiation. The conceptual design of the accelerator, which consists of the electron gun, the superconducting cavity, and the irradiation section, was carried out. Especially, we designed a 10 MeV, 50 mA high-current beam accelerator by using a new Nb₃Sn superconducting cavity. We estimated how compact the accelerator can be and how much the operating electrical power can be suppressed.

Funding Agency

We are funded by “Development of innovative quantum beam technology for high-efficiency nanocellulose production” of NEDO Feasibility Study Program in 2021.

Footnotes

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Session Classification: Thursday Poster Session

Track Classification: MC8: Applications of Accelerators, Technology Transfer and Industrial Relations and Outreach: MC8.U07: Industrial Applications