

Accepted Manuscript

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PII: S0167-9317(15)30122-2
DOI: doi: [10.1016/j.mee.2015.12.021](https://doi.org/10.1016/j.mee.2015.12.021)
Reference: MEE 10070

To appear in:

Received date: 27 October 2015
Revised date: 16 December 2015
Accepted date: 30 December 2015

Please cite this article as: Anjli Sharma, Ho Seob Kim, Dae-Wook Kim, Seungjoon Ahn, A carbon nanotube field-emission X-ray tube with a stationary anode target, (2015), doi: [10.1016/j.mee.2015.12.021](https://doi.org/10.1016/j.mee.2015.12.021)

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A carbon nanotube field-emission X-ray tube with a stationary anode target

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PACS : 85.35.Kt, 85.45.Bz

Abstract

We have successfully fabricated the vacuum-sealed compact X-ray tube with carbon nanotube (CNT) emitters without any active vacuum pump. The adhesion between the CNT emitter and cathode substrate was greatly improved such that no detachment occurs when the emitter generates high current. The CNT emitter has reliable electron emission characteristics after it goes through vacuum brazing procedure at high temperature. In order to design the X-ray tube with a stationary anode target, we have performed thermal analysis of stationary anode target surface. The field emission pulse-current was observed to be stable, about 90 mA at an anode voltage of 10 kV, and ~80% of the field emission current arrived at the cathode. Also, the vacuum level of the vacuum-sealed X-ray tube was maintained quite well, which was indirectly confirmed by the stable field emission current.

Keywords : X-ray tube, carbon nanotube (CNT), nano field emitter, stationary anode, thermal analysis

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