Study and optimization of a X-ray source powered by the phenomenon of triboluminescence in peeling adhesive tape.

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Abstract
In the present work we discuss the viability of a triboluminescence powered x-ray source, two different experimental setups and the effects of the change between setups. We also discuss some of the optimization attempted, such as vacuum stability and emission.

Key words: ***X-ray, Instrumentation, Triboluminescence.***

Introduction

In this work we studied a x-ray source that emits radiation upon peeling adhesive tape in a low vacuum environment. We started with a setup previously established on LCARX and attempted some changes in the experimental setup to optimize the emission. One of the major problems with the first[1] setup is that o vacuum stability, since we achieved emissions of just about 1 second. In the second setup we achieved vacuum stability, but with lower intensities. We also worked with different detectors to attempt a characterization of the emission, both spatially and with respect to the spectrum.

Results and Discussion

The first change we made was to use a turbomechanic vacuum pump to solve the vacuum problem in the entire spool peeling setup. But the internal pressure still peaked after just about 1 second of emission. So, based on the work of Karl Decker [2], we modified the setup to a single belt of tape between the two spools. What we found was that the vacuum became steady. Despite the achieved stability, the intensities were somewhat low. After that, we made some measurements comparing the two setups in terms of the spatial distribution of the radiation and of the spectrum emitted.

Conclusions

Although the low intensities measured in the beginning, we still bet in the single belt setup as more promising. As the vacuum remains steady, the single belt setup promise to develop in a more reliable source for further studies.
Also this project allowed me to learn a great amount of physics, ranging from basic x-ray mechanisms to the more advanced triboluminescence. And the work from mechanical parts design to the design of a experiment gave me a lot of experience in the laboratory environment, which makes me confident to work on upcoming projects on LCARX.

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1. Camara, C. G et al; *Correlation between nanosecond x-ray flashes and stick-slip friction in peeling tape;* Nature 455; **2008**; p. 1089 - 1092.
2. Decker, K.; *The time dependence of the X-ray triboluminescence of adhesive tape*; Brigham Young University, Idaho; Senior's Thesis; **2012.**