

DC AND PULSED STUDIES OF FIELD EMISSION FROM CARBON FIBER AND CARBON NANOTUBE CATHODES

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Field emission cathodes have been a research topic for many decades, with recent interest centering on carbon nanotube (CNT) and carbon fiber structures. These cathodes may well prove useful for a variety of applications, ranging from compact millimeter and THz vacuum electronic devices (VEDs), flat panel displays, and compact x-ray sources. In this presentation we describe experiments performed by the Air Force Research Laboratory's Directed Energy and Materials Directorates to investigate small area, and in many cases, single emitter cathodes. The cathodes range from multiple emitters of 100 micron diameter on a 1 mm² substrate to single emitters consisting of single carbon fibers or CNT ropes. We also discuss various coatings applied to these emitters. We describe lifetime data, as well as the effective beta for each configuration. In addition, we present preliminary information on efforts to determine the Fermi energy for each cathode sample. Finally, we compare each of the cathodes under both DC and pulsed operation in identical geometries for both cases.