

## **Emittance Measurements of Electron Beams Generated from Cu and Diamond Photocathodes,**

E. GIANNICO, V. NASSISI, Department of Physics, I.N.F.N. LECCE-I; A. RAINO, Department of Physics, I.N.F.N. BARI-I; A. BELOGLAZOV, General Physics Institute, Academy of Sciences, Moscow - The electron beam characteristics generated from photocathodes illuminated by two UV excimer laser beams working at 308 nm (XeCl) and at 222 nm (KrCl) are reported. The cathode used a 4 microns thick diamond film and a 1 mm thick Cu disc. Utilizing a new experimental setup composed by two movable slit arrays, the beam emittance measurements were performed. The electron beam phase space areas were determined selecting the beam in small beamlets and measuring the beamlet direction spread by small cups and the slit arrays. The higher emission was obtained utilizing the lower laser wavelength. With a 4 mm<sup>2</sup> beam spot and 0.5 mJ laser energy the maximum currents from the Cu and diamond film cathode were 370 and 410 mA, respectively and the corresponding emittances were 56.5 and 85 [mm mrad]. From these values the normalized beam brightness were estimated to be 460 MA[m rad]<sup>-2</sup> for Cu cathode and 230 MA[m rad]<sup>-2</sup> for diamond cathode. When the XeCl laser was used a low output current was obtained even if the laser energy was 2.5 mJ. The output current was higher than the Child-Langmuir\* and its maximum value was 16.4 A from Cu cathode with the KrCl laser.

\* A. Beloglazov, V. Nassisi, and M. Primavera; Rev. Sci. Instrum. 66, 3883 (1995)