Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Electrostatic characterization of Near-Field-Emission SEM HUGO CABRERA, DANILO ANDREA ZANIN, LORENZO GIUSEPPE DE PIETRO, URS RAMSPERGER, DANILO PESCIA, Laboratory for Solid State Physics, ETH Zurich, Switzerland — The properties of the primary electron beam in Near-Field-Emission SEM (NFESEM) are uniquely determined by the actual geometry and position of the conducting components in the experimental apparatus. The reciprocal dependence of the accessible quantities, namely the voltage applied to the emitting tip with respect to the conducting sample surface (V), the relative distance between the tip and the sample (d) and the field-emission current (I), has been thoroughly characterized. In particular, the voltage V needed to produce a given current I has been measured as a function of d; the values of I have been chosen in the range from 0.05 nA to 1.5 nA, while d has been varied from 4 to 1500 nm. For values of d smaller than a certain threshold $\bar{d}$, dependent on the tip, V turns out to be directly proportional to the distance between the tip and the sample surface. At larger distances, $d > \bar{d}$, we found $V \propto I^a \cdot d^b$, with a and b generally varying from one tip to the another. These results are supported by preliminary theoretical calculations which assume electrostatic geometries directly inspired by the NFESEM setup, such as an hyperboloid-shaped emitter with a conduction plane lying at a generic d.

Alessandro Vindigni
Laboratory for Solid State Physics, ETH Zurich, Switzerland

Date submitted: 11 Nov 2011 Electronic form version 1.4