

Development of controller circuit for multi-probe STM

T. Koyama¹, N. Kaneda¹, O. Takeuchi¹, and H. Shigekawa¹

¹Institute of Applied Physics, Univ. of Tsukuba, 305-8573, Japan.

<http://dora.bk.tsukuba.ac.jp/>

In multi-probe STM, the bias voltages applied on the probes are varied in order to flow some current from a probe to another, or to measure the sample surface potential using the probes. The stray capacitance of the shielded cables that are used between the probes and the preamplifiers, in addition to the large tunnel resistance, affects these measurements in an adverse way. When the tip bias voltage is swept in a current measurement, large displacement current flows into the stray capacitance, which is detected on the preamplifier, resulting in unignorable error. In a sample potential measurement, the stray capacitance and tunnel resistance form a low pass filter, with which the measurement's bandwidth is limited ~ 1 Hz. We successfully improved accuracy of a tunnel current measurement and expanded the bandwidth of a potential measurement by compensating the stray capacitance with newly developed preamplifier circuit. We evaluated an adequate adjustment techniques of compensation circuit for measurement and also its stability.

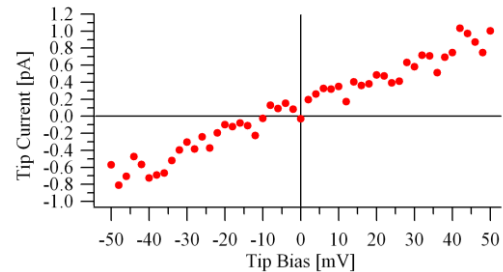


Fig. 1 . I-V characteristic on Au surface, applying a tip bias voltage from -50mV to 50mV.