

SCIENTIFIC REPORT
by Prof. Volokitin for Short Visit Grant N 607

As a result of the investigations during Short Visit Grant N607 in period 10.06.05-16.06.05, 24.06.05-27.06.05 the joint article with Bo Persson entitled "2D-system enhancement of the non-contact friction between closely spaced bodies" was prepared for publication. The abstract of the article is submitted below.

Abstract. The effect of an external bias voltage and spatial variation of the surface potential on the damping of cantilever vibrations is considered. The electrostatic friction is due to energy losses in the sample created by the electromagnetic field from the oscillating charges induced on the surface of the tip by bias voltage and spatial variation of the surface potential. The similar effect arises when the tip is oscillating in the electrostatic field created by charged defects in the dielectric substrate. The electrostatic friction is compared with the van der Waals friction when the friction arises from the fluctuating electromagnetic field due to quantum and thermal fluctuation of the current density inside the bodies. We show that the electrostatic and van der Waals friction are greatly enhanced if on the surfaces of the sample and the tip there are 2D-system, e.g. 2D-electron system or incommensurate adsorbed layer of ions exhibiting acoustic vibrations. It is shown that the damping of the cantilever vibrations due to electrostatic friction is close to the damping observed in recent experiments of Stipe *et al.* [B.C.Stipe, H.J.Mamin, T.D.Stowe, T.W.Kenny, and D.Rugar, Phys.Rev. Lett. **87**, 0982001(2001)]. We demonstrate that at the short separation the van der Waals friction can be large enough to be measured experimentally.

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