

Objective of the project

To measure big weight you are using big scale. What use if you want to measure the weight of the atom? Is it even possible? Yes it is. You need to use NEMS device (nanoelectomechanical system). The dimensions of NEMS are 1000 times smaller than human hair thickness. To see such small devices optical microscope is not enough. You need electron microscope, which guarantee big magnification. The principal of mass detection is based on resonance frequency changes measurements of nanoscales. Their deflection can be smaller than one nanometer – this distance is comparable to distance between atoms in crystal. Thanks to quantum effects it's possible to measure such small deflections. The objective of NEMSMetSTM project is to use tunneling microscope, with quantum tunneling effect of electron – that means big sensitivity for distance changes. When you place tunneling microscope above NEMS structure, that will be clear what is resonance frequency. Combining electron and tunneling microscope gives big sensitivity and easy positioning of tunneling microscope.

Research to be carried out

In project we will show how to use tunneling effect of electron to measure small deflection. Research on thermal and electromagnetical effects during NEMSMet structures will be performed for calibrating tunneling microscope.

Reason for the research topic

Optical methods are common in NEMS measurements, but they are useless for many NEMS devices because of their dimensions. There is a need of more advanced apparatus. Only few laboratories in the world develop this kind devices. With our experience in vibration metrology field we are able to provide technology for this kind measurements.