scanning area of the setup at room temperature is about $10\,\mu\mathrm{m}\times10\,\mu\mathrm{m}$, at low temperatures it is reduced to $2\,\mu\mathrm{m}\times2\,\mu\mathrm{m}$.

### C. Electronics

The feedback loop, the high voltage amplification, and data acquisition electronics are commercially available units (ECS, Cambridge, UK). For STS measurements the output voltage is modulated with a frequency generator (Stanford Research Systems DS345, Sunnyvale). The current signal is deconvoluted with an analog lock-in amplifier (Ithaco 3916B, Ithaca, NY). For the current amplification, a current-voltage transformator with variable gain (Femto DHCL 200, Berlin) is used. The data acquisition is performed with a standard PC equipped with a digital signal processing (DSP) card.

### D. Electrical and Mechanical Filtering

Electrical and mechanical filtering is the most important challenge for proper STM and STS performance. Main reasons for the electrical noise are ground loops and long leads, mechanical noise occurs mainly through vibrations of the pumping lines (in our case mostly of the 1 K pumping line and, to a lesser extant, the still pumping line) and through boiling of the cryogenic fluids. To reduce vibrational noise no liquid nitrogen shield was used, but super insulation foil in the outer vacuum can instead. Additionally, the He dewar was pressurized to $50-100\,\mathrm{mbar}$ above athmospheric pressure to reduce boil-off. By pumping on the He dewar no further advantage was gained.

To minimize electrical noise, the STM electronics is electrically isolated from all other electronics as well as from all pumping lines. This permits the use of the cryostat as the only ground in the whole system. All leads used for measurements and control are filtered by home-built copper-powder filters (skin-effect filters). These filters are mounted on top of the STM holder next to the mixing chamber. Their main purpose is to reduce high-frequency noise. The attenuation vs. frequency curve is shown in fig 5. A further advantage of these filters is the good thermal coupling of the leads to the mixing chamber. The filters consist of 2 m of copper wire, copper powder (grain size $50\,\mu\mathrm{m}$) and a copper jacket that is attached very closely to the mixing chamber and therefore cools down the electronic system. Low-