VLBA ACQUISITION MEMO #180

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To: VLBA Data Acquisition Group

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Subject: Simple optical interferometer for viewing tape surface roughness

While surface roughness can be estimated from the short wavelength response of the tape, an independent method is desirable especially to determine the scale size of roughness. A simple method is to observe optical fringes (using the 0.45 μm line in a fluorescent light) between the tape and a glass tube as illustrated in the figure. With Sony D1K, the entire contact line is within 1 fringe (0.2 μm p-p) while with 3M5358, the contact line transverses 2 fringes in places. The optical fringes are very clear when viewed by eye - but I was unable to obtain good polaroids owing to the lack of a good camera adaptor and poor illumination. There is evidence (especially in the 3M5358) of a rather large scale (>50 microns) to some of the flatness variations. These large scale variations are more easily smoothed out by tape tension in thin tapes which suggests that thinner tape (the bending stiffness is proportional to thickness cubed) may, in general, have a superior short wavelength output.

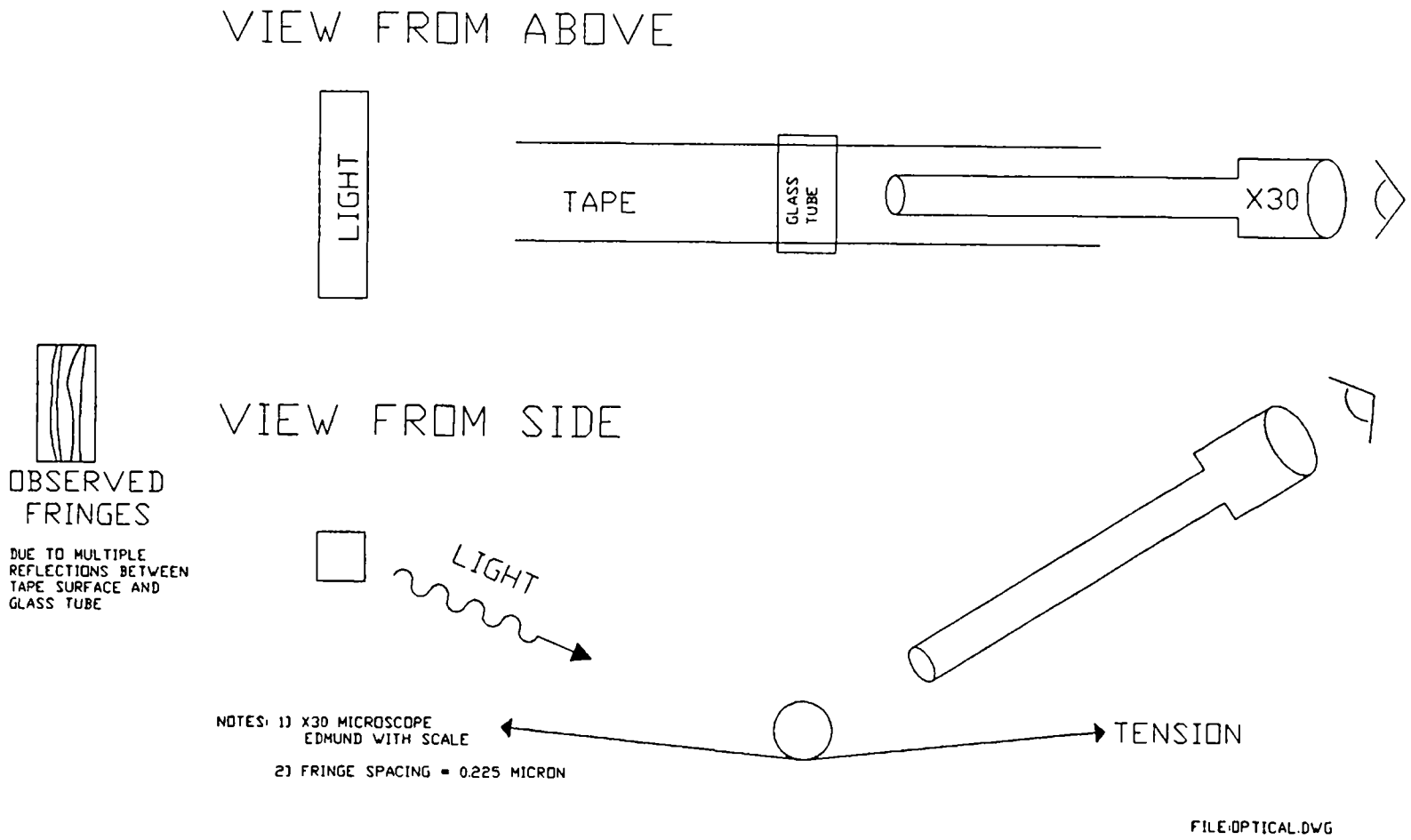
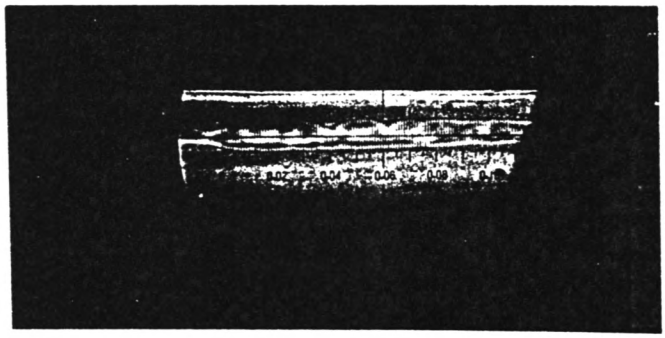
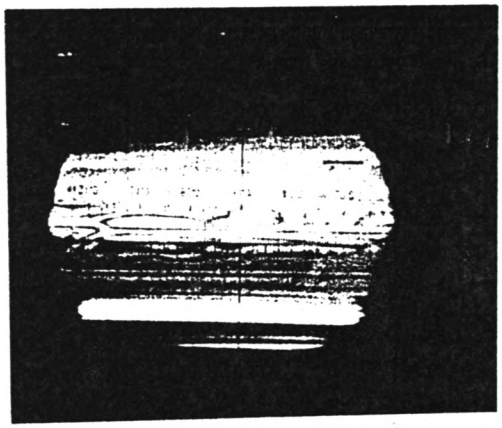


FIG. OPTICAL INTERFEROMETER TO MEASURE TAPE ROUGHNESS



Sony DIK



3M5358

Scale is approx. 270 mils/inch