III. EXPERIMENT

The optical modulator used in the present experiment was the traveling-wave type Mach-Zehnder optical modulator with a shielding plane as shown in Fig. 8. Dimensions of the modulator is described in detail in [8]. We used y-cut LiNbO$_3$ substrate whose edges were mirror polished, and single mode optical waveguides were formed by Ti diffusion into the surface of the substrate. The transmission line for the signal wave and the shielding plane were made of NbN. The coupling length $L$ was 20mm. The fabrication process of the shielding plane is shown in Fig. 9. We made the shielding plane with the various heights from 3μm to 7μm for velocity matching.

In the experiment we used a semiconductor laser with the wavelength of $\lambda=1.3\mu$m. In order to guide laser light into the optical waveguide in LiNbO$_3$, substrate we used a polarization maintaining fiber at the input end and excited a TE mode in the optical waveguide. We attached optical fibers to the mirror polished edge of the substrate. The connection between optical fibers and LiNbO$_3$ substrate was made by an adhesive which is hardened at illuminating ultra-violet light with the use of minute glass tubes.

For measuring microwave modulation characteristics in the frequency range between dc and 26.5GHz, we adopted the envelope detection method [11], [12], where the microwave response of the modulator can be estimated by the time averaged response of the powermeter even in the case when the cutoff frequency of the powermeter is much lower than the microwave frequency.

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