

### **3.2 Efficient Phase-Matched Frequency Doubling in KNbO<sub>3</sub> Channel Waveguides**

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The fabrication of low-loss channel waveguides is essential in integrated optic devices, such as compact frequency doublers and electro-optic modulators. We have developed a method to fabricate channel waveguides by combining the techniques of ion implantation and ion sputtering.

The channel waveguides with typical cross sections of  $5 \times 5 \mu\text{m}^2$  confine both TE and TM modes which is a prerequisite for birefringent phase-matched second harmonic generation. Loss measurements yielded minimum losses of  $2 \text{ dBcm}^{-1}$  at a wavelength of 633 nm. Noncritically phase-matched SHG was also demonstrated in these waveguides. 4 mW of cw blue power at a wavelength of 435 nm were generated in a 7 mm long guide with a fundamental laser power of 200 mW corresponding to a normalized second harmonic generation efficiency of  $20 \% \text{ W}^{-1} \text{ cm}^{-2}$ .