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TJS SEMICONDUCTOR LASERS FOR SQUEEZED STATE GENERATION

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Semiconductor lasers driven by a high-impedance constant-current source reduce the intensity noise to below the shot-noise level when biased far above the threshold current. However, there are few lasers to generate squeezed states due to the mode-partition noise. Our purpose is the optimization of Transverse Junction Stripe (TJS) lasers for the generation of the high level squeezed light. TJS lasers have the p+-p-n structure formed by two-step Zn diffusion process. The process brings about the intermixing of the active and the cladding layers when the active layer thickness is about less than 0.1mm. The intermixing modifies the interface between layers and degrade the characteristics of lasers. The intermixing is influenced by Si concentration in layers. Then high V/III ratio used during the growth to decrease Si concentration keeping carrier concentration. As a result, the intermixing was suppressed and TJS lasers showed good characteristics, low threshold and high efficiency. The intensity noise was measured by double balanced homo-dyne detection technique at 80K. The lasers had a cavity length of 200mm. The mirror facets were deposited antireflection (10coating at the front and the rear facets, respectively. The laser chips were mounted on copper block directly because this method induced compressive stress in lasers and suppressed TM mode gain. About -2.8dB of squeezing was measured when the lasers were biased about 20 times threshold. After correcting for the loss in the measurement setup, this corresponded to -4.5 dB of squeezing in front of the laser facet.