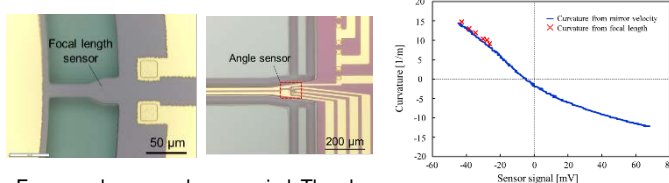
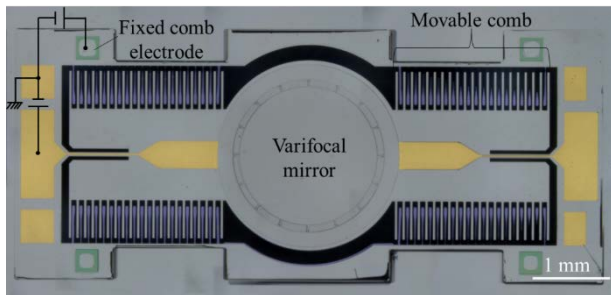


2 Optical MEMS and Micro/Nano-Optics (Hane, Kanamori)

Optical MEMS and Micro/Nano-Optics are studied in this laboratory.

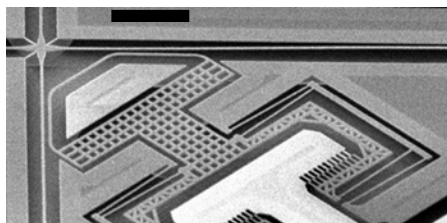
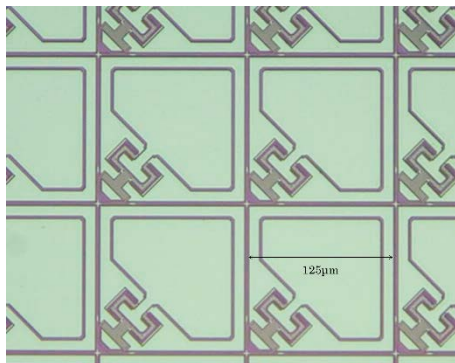
1. Micro-mirrors for display, telecommunication and sensing, 2. Optical micro-sensors for mechatronics and spectroscopy, 3. Silicon nanowire waveguide devices for telecommunication, 4. GaN-MEMS, 5. Nano-structured optics and meta-materials (color filter, antireflection, plasmonics)

Scanner with Varifocal Micro-Mirror



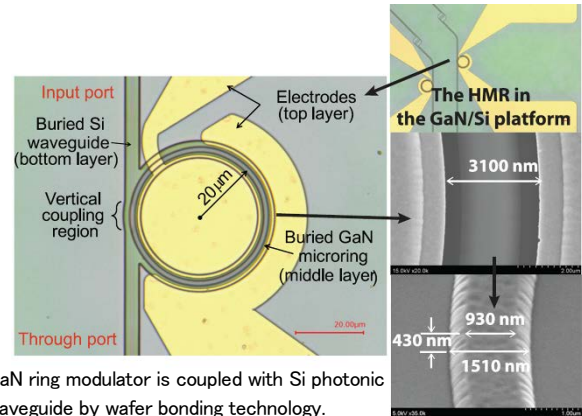
Focus and scan angle are varied. The changes are monitored by Si piezoresistive sensors. K. Nakazawa, J. J. MEMS, 26, (2017) 440

Silicon waveguide switch for cross connect



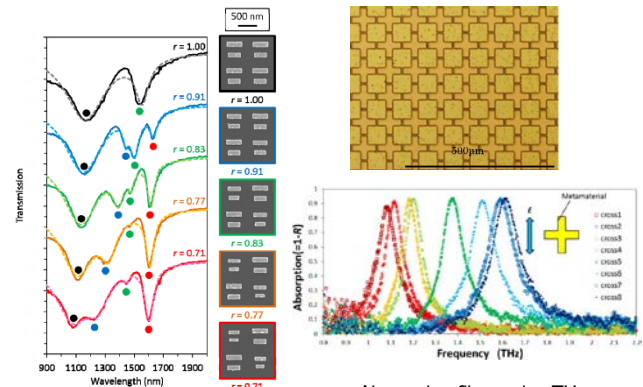
Matrix type switch consists of Si photonic waveguides. Gaps of couplers are varied by comb-drive actuator for switching. The couplers are located near the cross points of Si waveguides. The switch is developed for cross connect in data centers. S. Abe, Photon. Technol. Lett. 26 (2014) 1553

GaN ring modulator coupled to Si waveguide

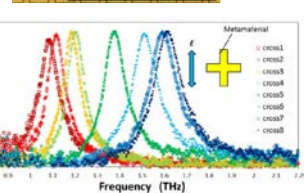
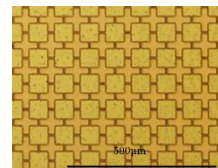


GaN ring modulator is coupled with Si photonic waveguide by wafer bonding technology. Lightwave is modulated by the refractive index change of electro-optic effect of GaN. B. Thubthimthong, Appl. Phys. Lett. 122 (2018) 071102

Nano structural optics (Meta-material)

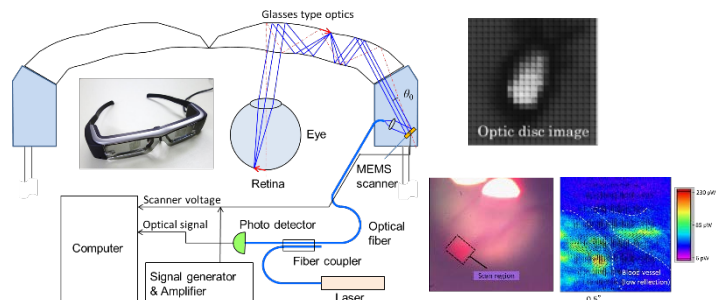


Metamaterial filter using Fano resonance, Y. Moritake, Opt. Exp. 24 (2016) 9332



Absorption filter using THz metamaterials Y. Ishi, IEEE J. 136-E (2016) 172

Smart glasses retinal imaging with MEMS scanners



Retinal imaging using smart glasses and MEMS scanners. Retinal images of pig eyes, N. Kaushik, International Display workshops, Dec. 6-8, 2017, Sendai