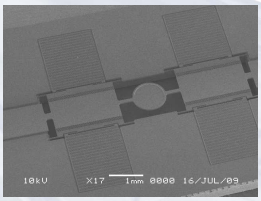
courtesy of Prof. Toshiyoshi

IEEE Int. Conf. on Optical MEMS and Nanophotonics,
Istanbul, Turkey, Aug. 8-10, 2011

A High Speed MEMS Scanner for 140-kHz SS-OCT



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Atsushi Morosawa, Changho Chong
(Santec Corporation)
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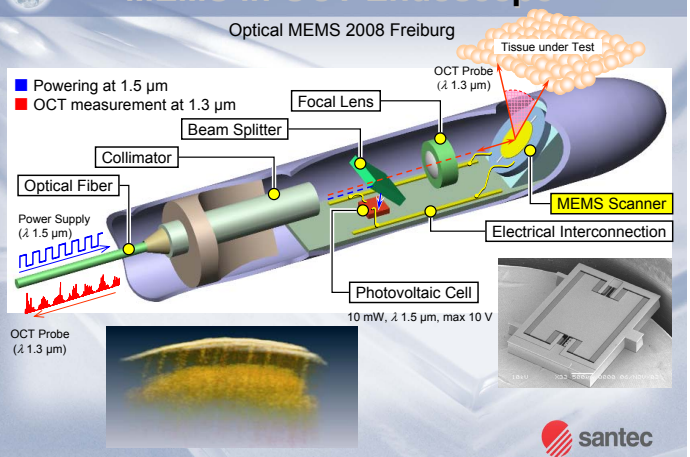
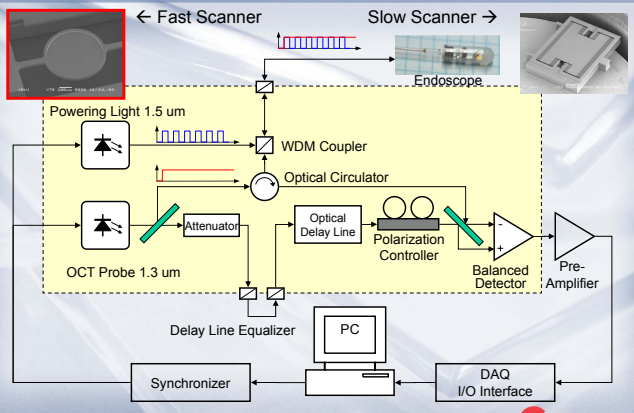
MEMS in OCT Endoscope

Optical MEMS 2008 Freiburg

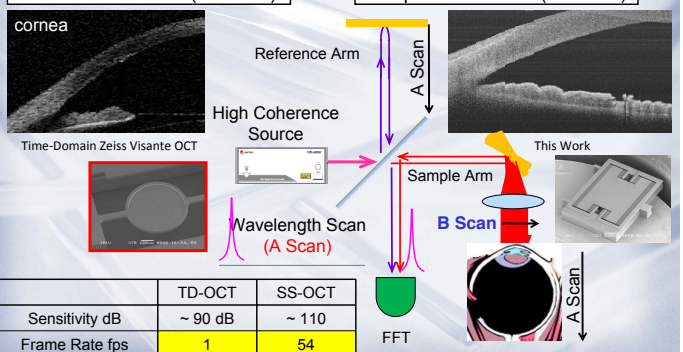


Another MEMS in OCT Today



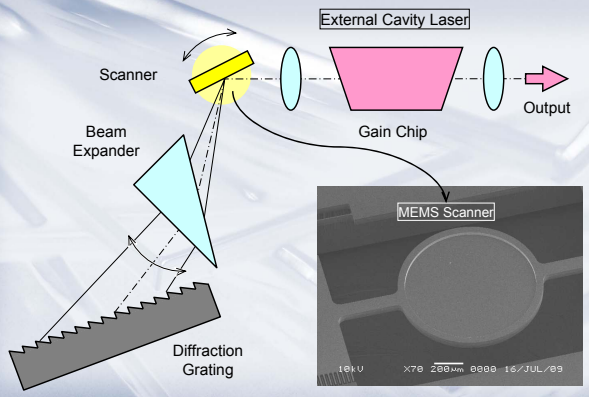
Advantage of SS-OCT

Fast and High-Resolution

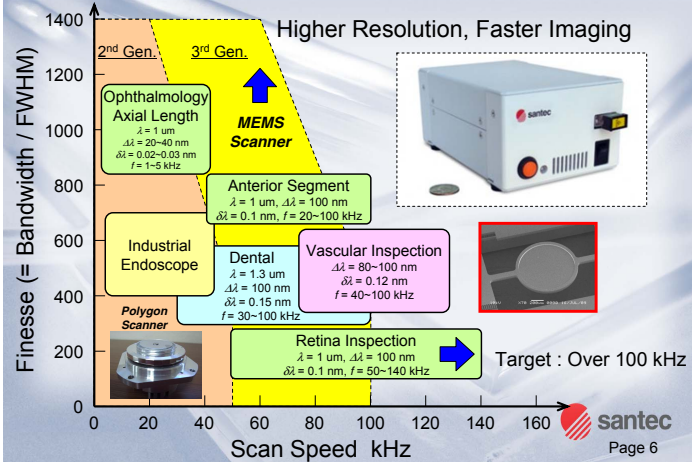


	TD-OCT	SS-OCT
Sensitivity dB	~ 90 dB	~ 110
Frame Rate fps	1	54
Resolution μm	10~15	5~10

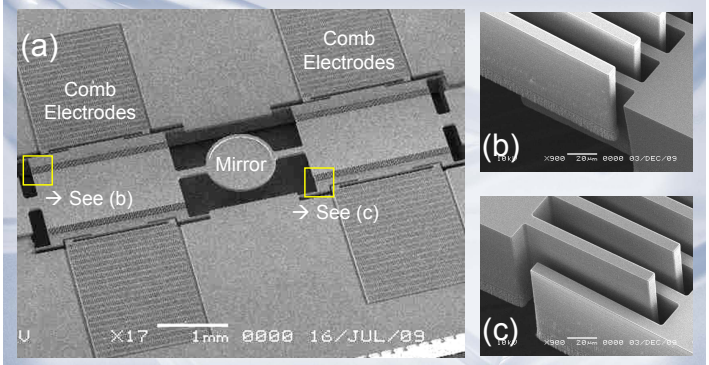
Swept-Source with MEMS



R&D of OCT Light Sources

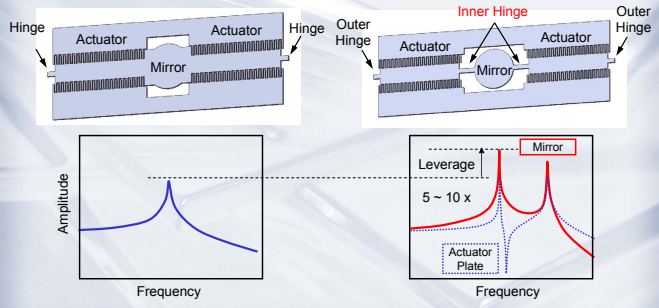


2DoF MEMS Scanner



2DoF MEMS Scanner

With Angle Magnifying Mechanism

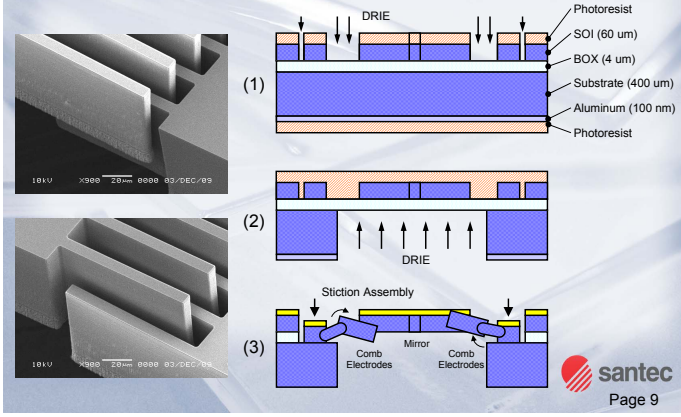


Co-developed by Epson and Santec in 2005

M. Yoda, K. Isamoto, C. Chong, H. Ito, A. Murata, and H. Toshiyoshi, "Design and Fabrication of A MEMS 1-D Optical Scanner using Self-Assembled Vertical Combs and Scan-Angle Magnifying Mechanism," IEEE/LEOS Int. Conf. on Optical MEMS and Their Applications, August 1-4, 2005, Oulu, Finland. (oral B2)

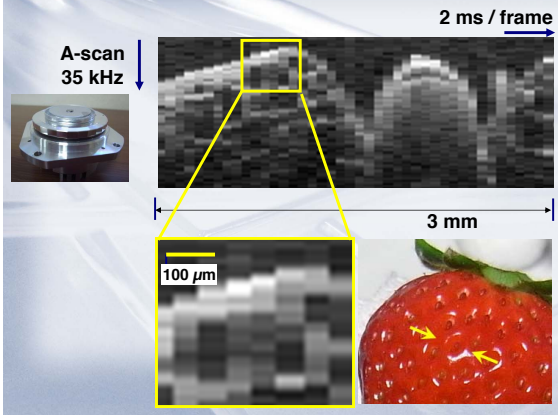
Fabrication Process

Only Two Photolithography Steps



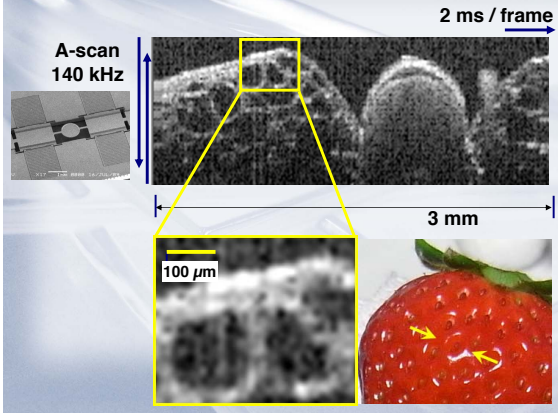
OCT with Conventional 35 kHz

Poor Resolution ~ 50 μm



OCT of This Work 140 kHz

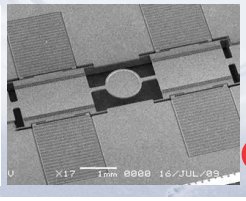
High Resolution ~ 10 μm



Summary: High Speed OCT

MEMS Scanners for Both Endoscope Head and Light Source

	Experimental Results	Note
Scan Speed	140 kHz	Round-Trip Scan
Band Width	100 nm	1310 nm (in Air)
OCT Resolution	9 μm	
Spectrum Width	0.25 nm	
Coherence Length	3 mm	
Maximum Power	20 mW	
Dynamic Range	60 dB	



6.5 deg
70 kHz
70Vdc +/- 70Vac