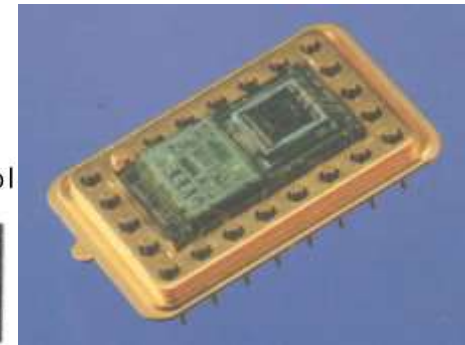
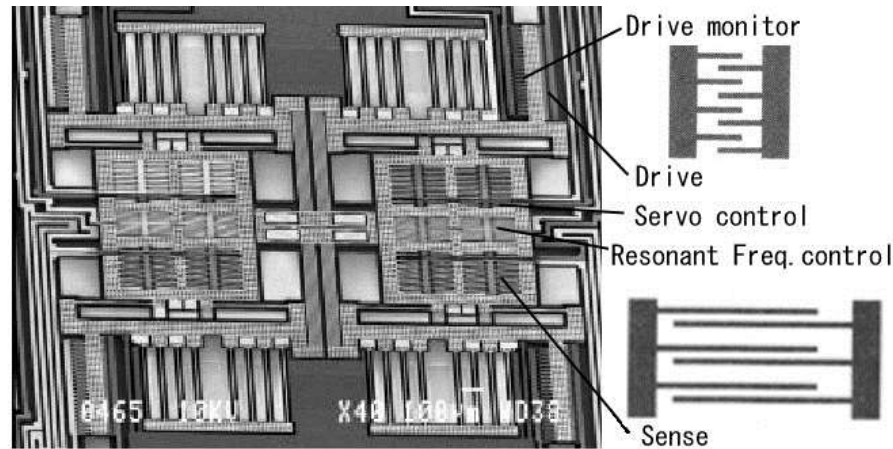


MEMS Based Safety Systems for Automotive

Masayoshi Esashi (WPI-AIMR, Tohoku Univ.)

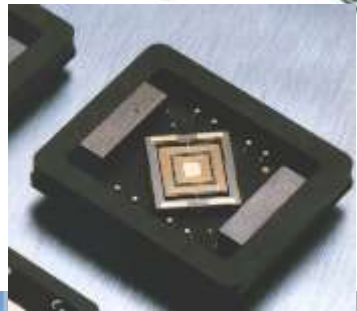
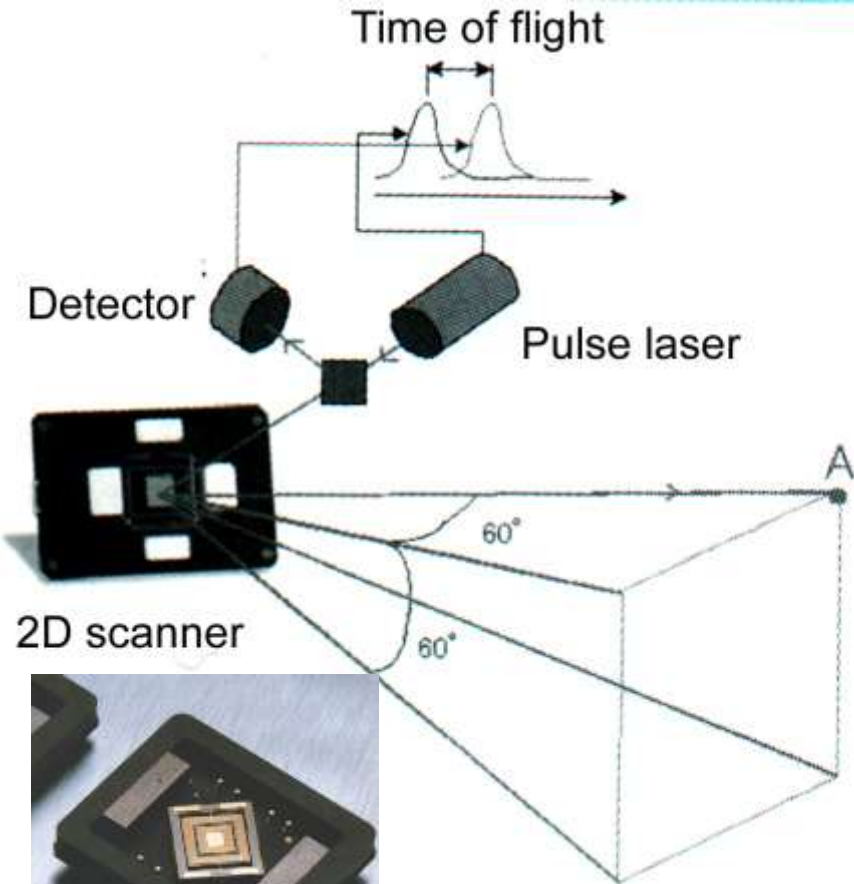
1992-1997
Two researchers from Toyota stayed in Tohoku University for collaborative development of vibrating gyroscope



Yaw rate sensor has been produced in Toyota since 2003 and used for more than 1 million cars.

Resonating gyroscope (yaw rate sensor) and accelerometer for vehicle stability control

(M.Nagao et.al., SAE World Congress, Detroit, (2004) 2004-01-1113)



NIPPON SIGNAL

ECO SCAN

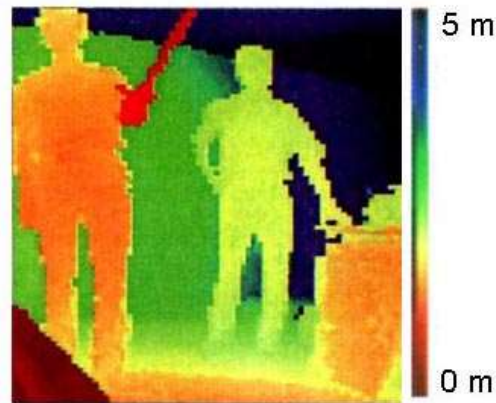
MEMS技術を利用した共振ミラー*エコスキャン*

2D Optical scanner

(N.Asada et.al., IEEE Trans. on Magnetics 30 (1994))



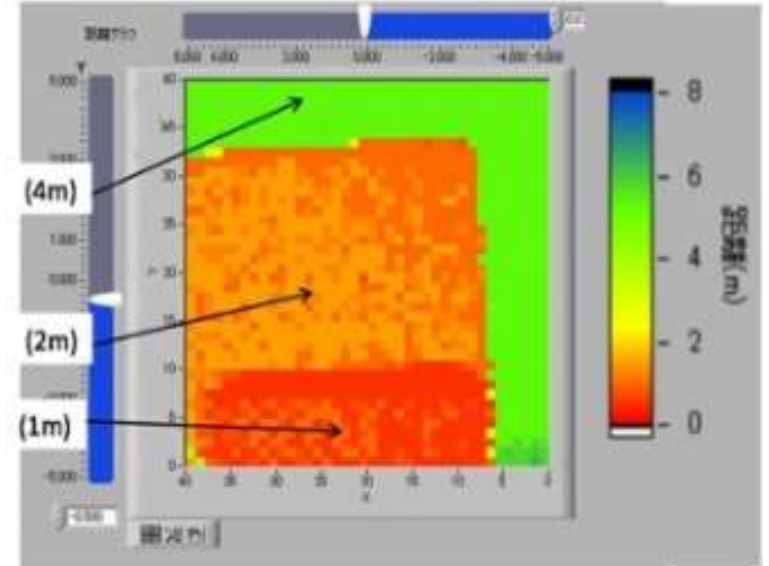
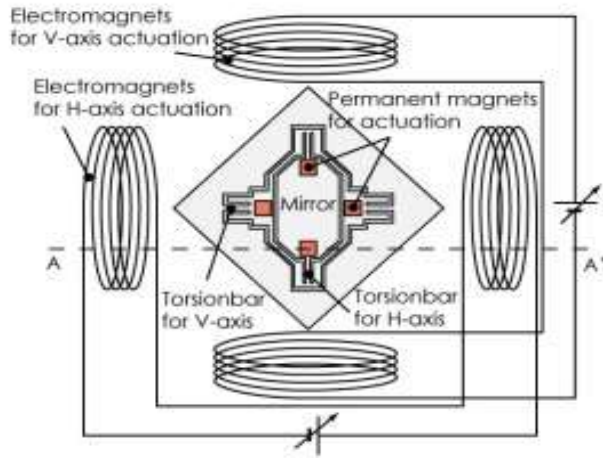
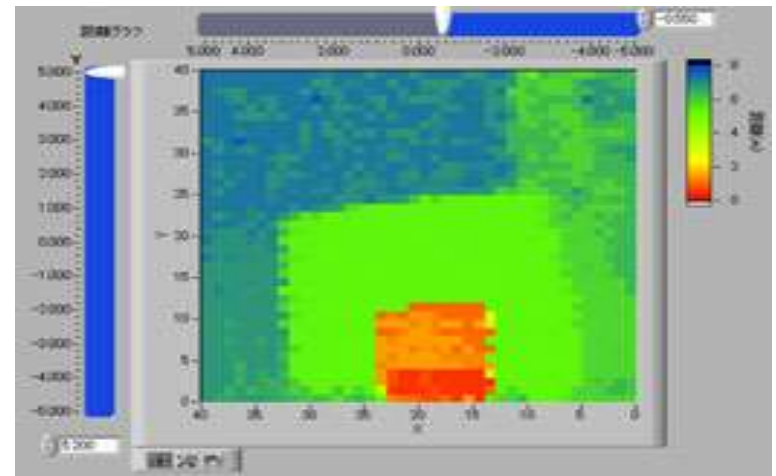
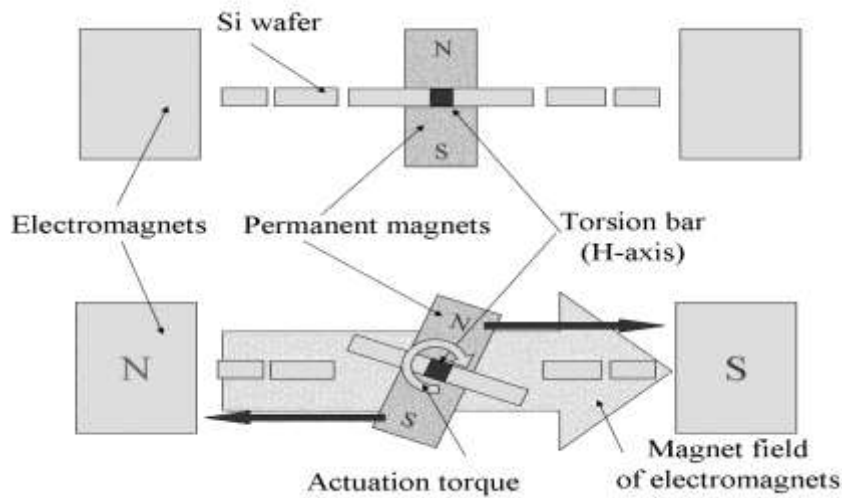
JR Ebisu station (platform doors using the ranging imager)



Color correspond to the distance

Ranging imager for safety systems and other applications

(T.Ishikawa,H.Inomata : Japan Signal Technical Report, 33, 1, p.41 (2009))

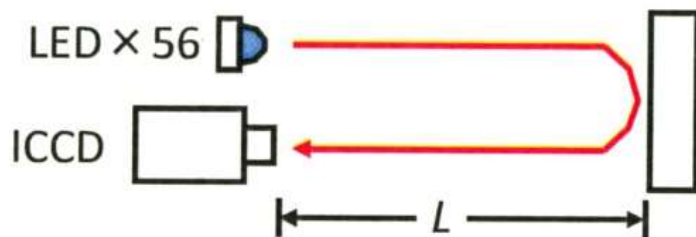


Non-resonant 2D galvanic optical scanner Obtained range image with zooming function

Range finder with zooming function using optical scanner

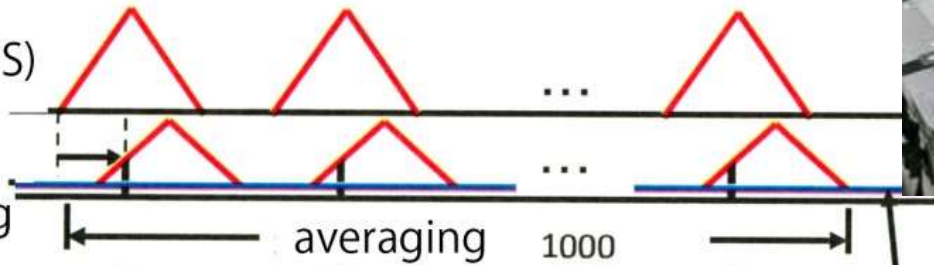
(collaboration with Toyota motor, Toyota Central Research Lab. and Richo)

(W.Makishi, Y.Kawai and M.Esashi, Trans.IEEJ, 130-E, 4 (2010) 135-136)



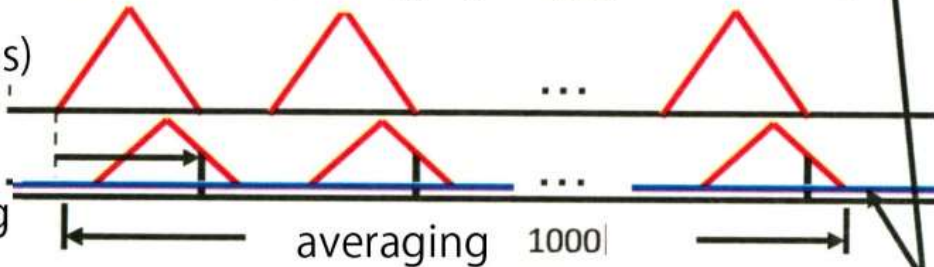
LED (200ns)

Receiving
and gating



LED(200ns)

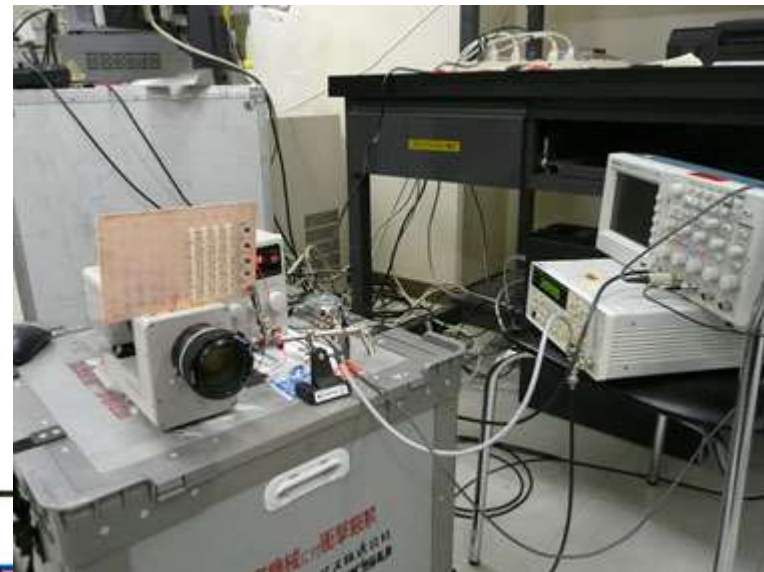
Receiving
and gating



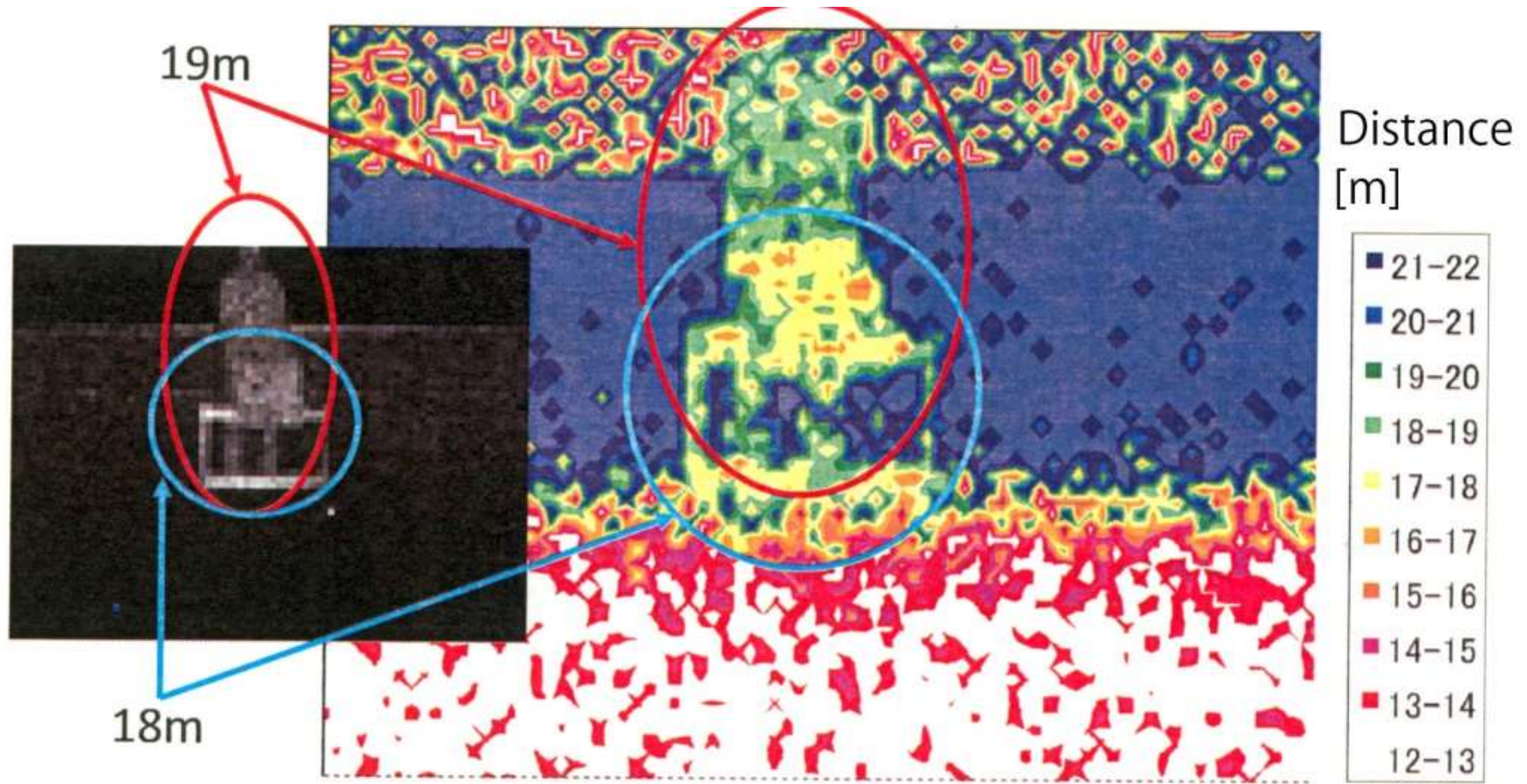
offset

Principle

Experimental setup

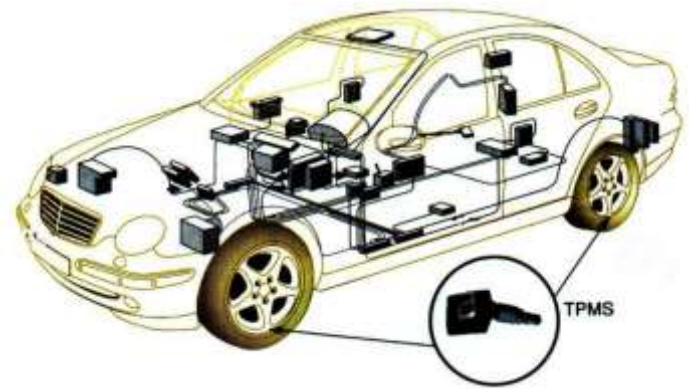
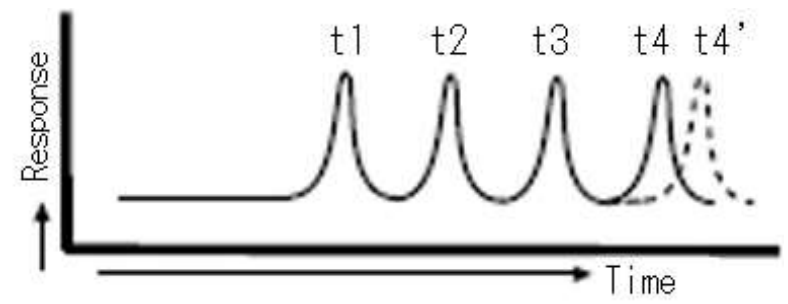
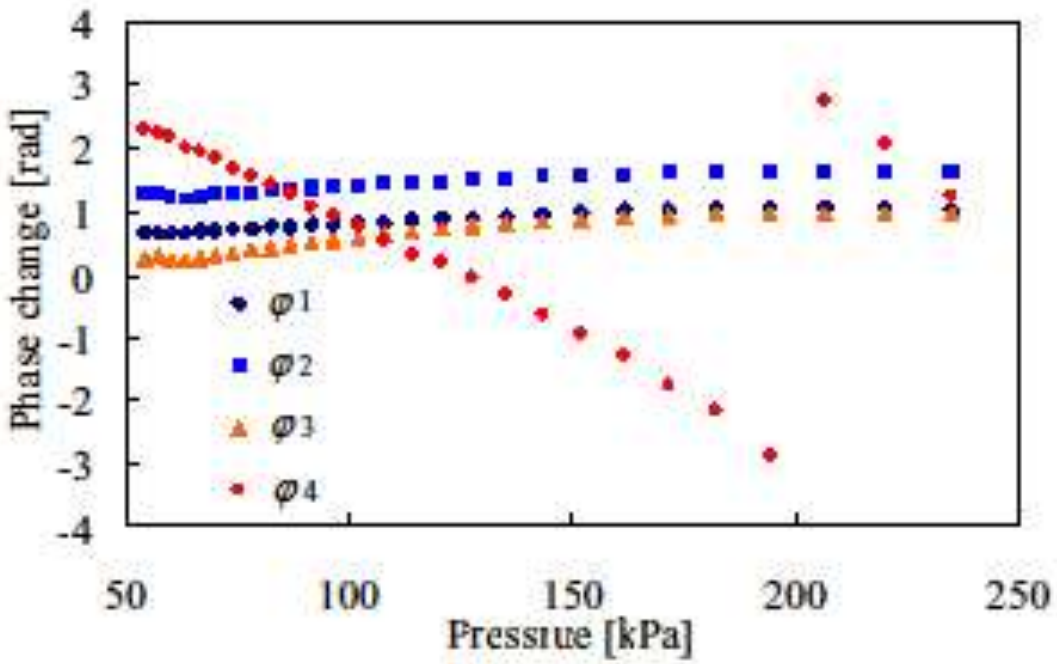
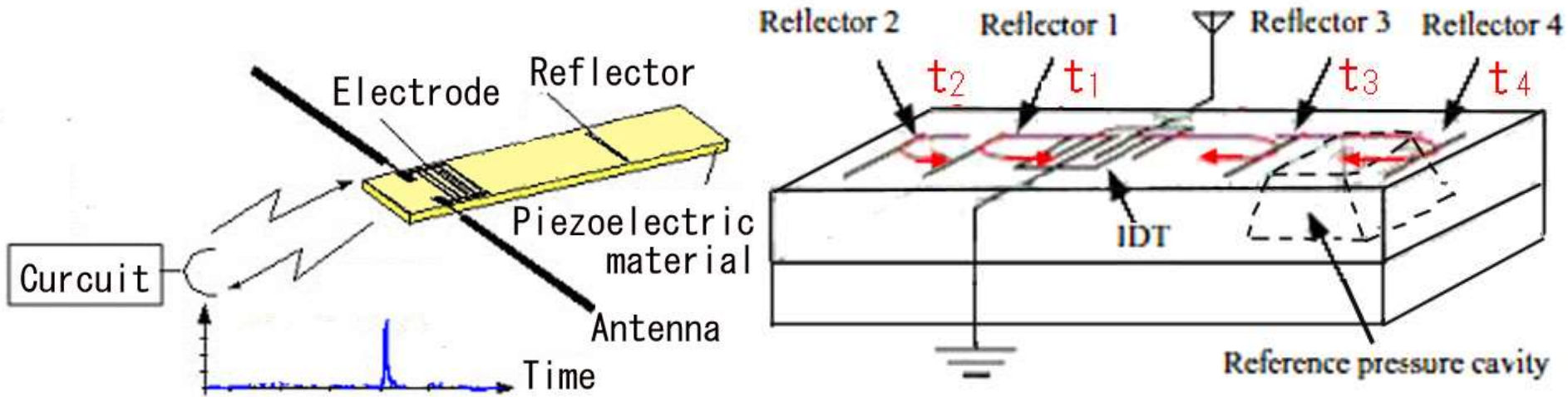


Range finder using LED pulse and image intensifier camera with shutter



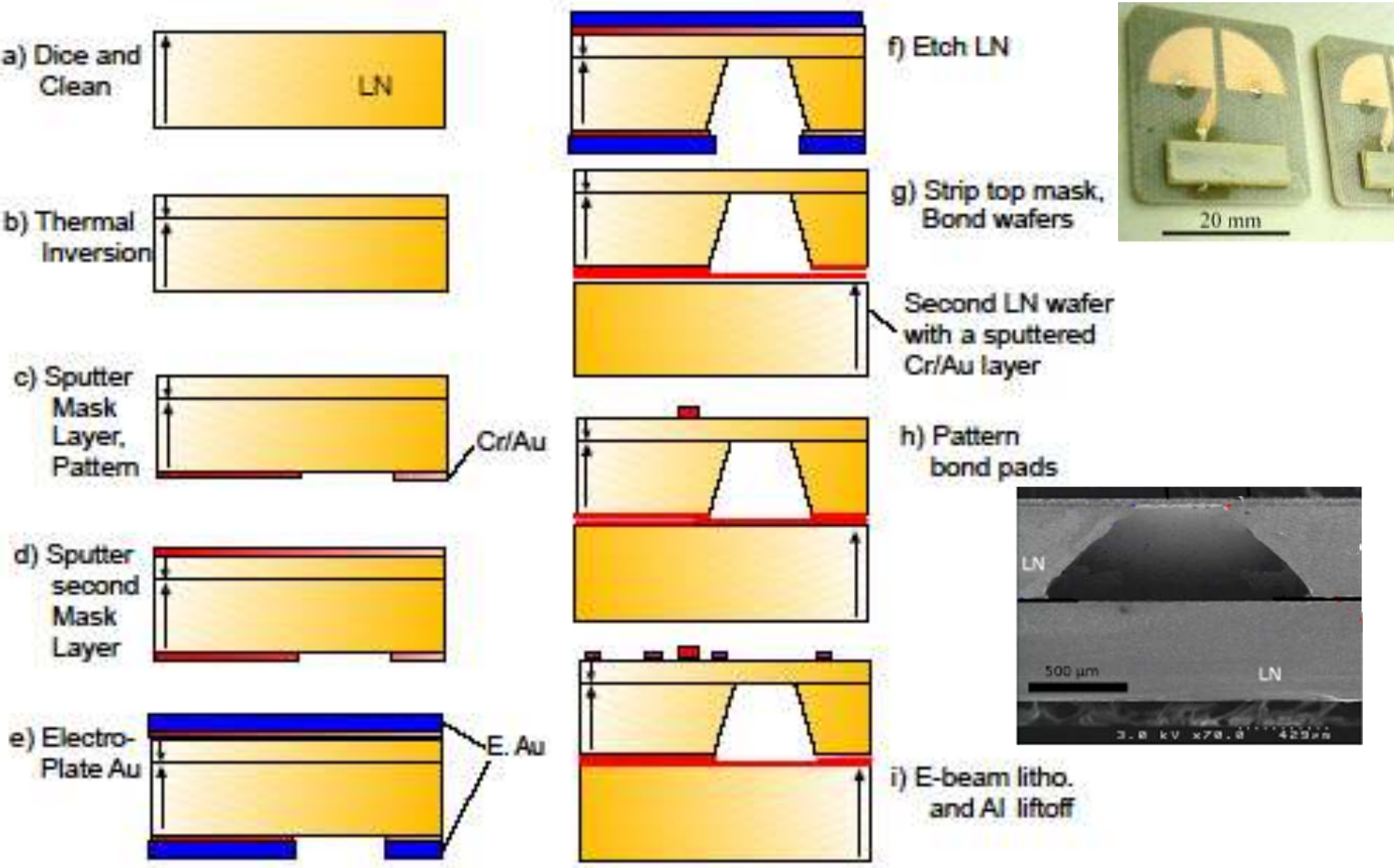
Experimental result

Range finder using LED pulse and image intensifier camera with shutter



SAW passive wireless sensor for pressure monitoring

(S.Hashimoto (Nissan motor), IEEJ Transactions on Sensors and Micromachines, 128-E (2008) 231)



Selective etching of lithium niobate (LN) using polarization dependent selective etching

(A.Randles, 2008 IEEE International Ultrasonic Symposium (2008) p.1124)