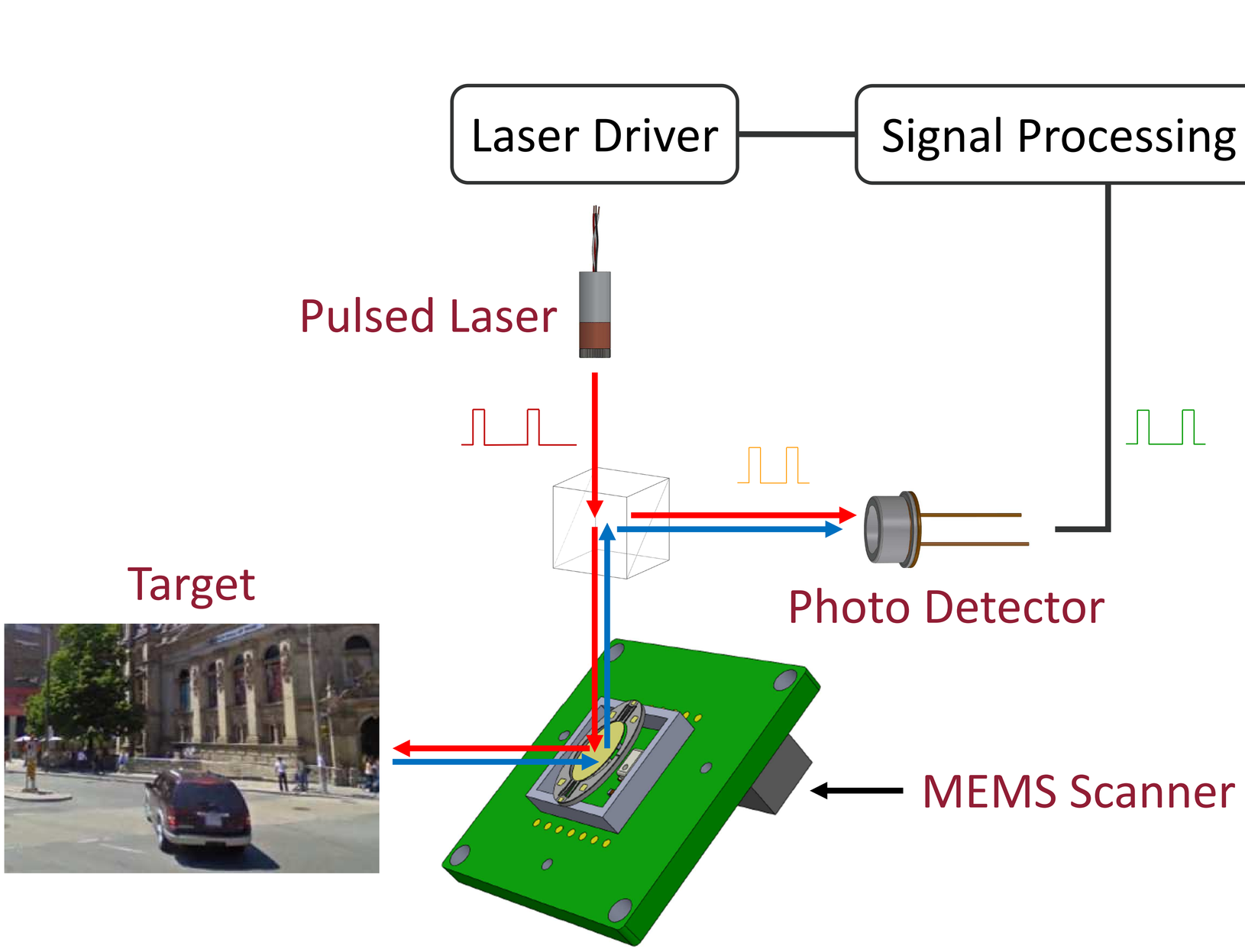
WeMEMS

Our Micro Optics. Your Mega Innovations.

WeMEMS Co. is a proud suppliers of high-speed Si MEMS (Micro-Electro Mechanical Systems) scanners with large mirrors.

The purpose of the product

- ✓ A Si laser scanner using MEMS technology rotates a reflective mirror adjusting the direction of the incident laser at high speed as a key engine for image sensors for LiDAR or display for AR.
- ✓ MEMS scanner are essential components of autonomous vehicles and drones, whose markets are rapidly expanding.
- ✓ MEMS scanner can be provided with angular position sensors enabling LiDAR to generate more accurate 4D perception data (shape, distance and velocity).



Address : 621-1, Dasan Bldg., 123 Cheomdangwagi-ro, Buk-gu, Gwangju, S. Korea, 61005
Tel : +82-62-715-2782 or 2424 **Mobile : +82-10-5405-3770**
Web : http://www.wemems.co.kr **E-mail : sales@wemems.co.kr**

WeMEMS

Our Micro Optics. Your Mega Innovations.

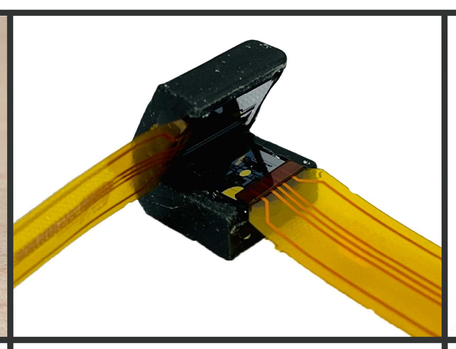
Products lineup

No.	Product/ Service	Operation modes	Mirror size	Driving freq.	Scanning angle	Remarks
1	One-axis scanner	Resonant	1 ~ 6 mm	1 ~ 9 kHz	> 40 °	LiDAR
2	“	Quasi-static	3.5 ~ 5.0 mm	0 ~ 120 Hz	> 25 °	Biomedical
3	Two-axis scanner	Resonant	1 ~ 2 mm	8 ~ 33 kHz	> 45 °	LiDAR AR
		Quasi-static		0 ~ 60 Hz	> 18 °	
4	“	Quasi-static	1~ 4 mm	0 ~ 120 Hz	> 18 °	Biomedical
5	Services	MEMS design and simulation: Mechanical, Electrical, Thermal analysis from chip to PKG level				

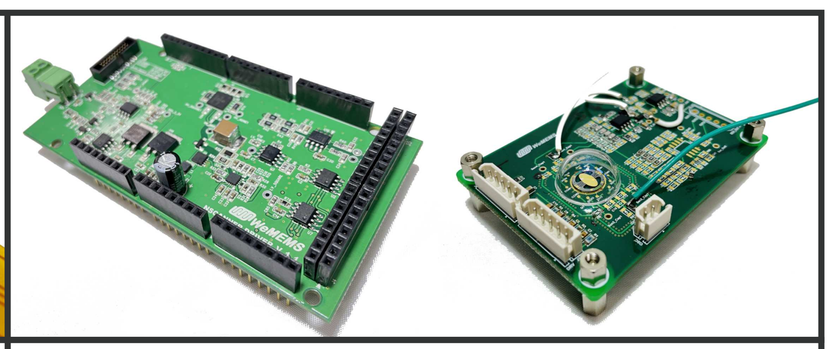
* The specifications are subject to change with no notice.
* Refer to product specifications for details.

Si MEMS mirror

Scanner for LiDAR



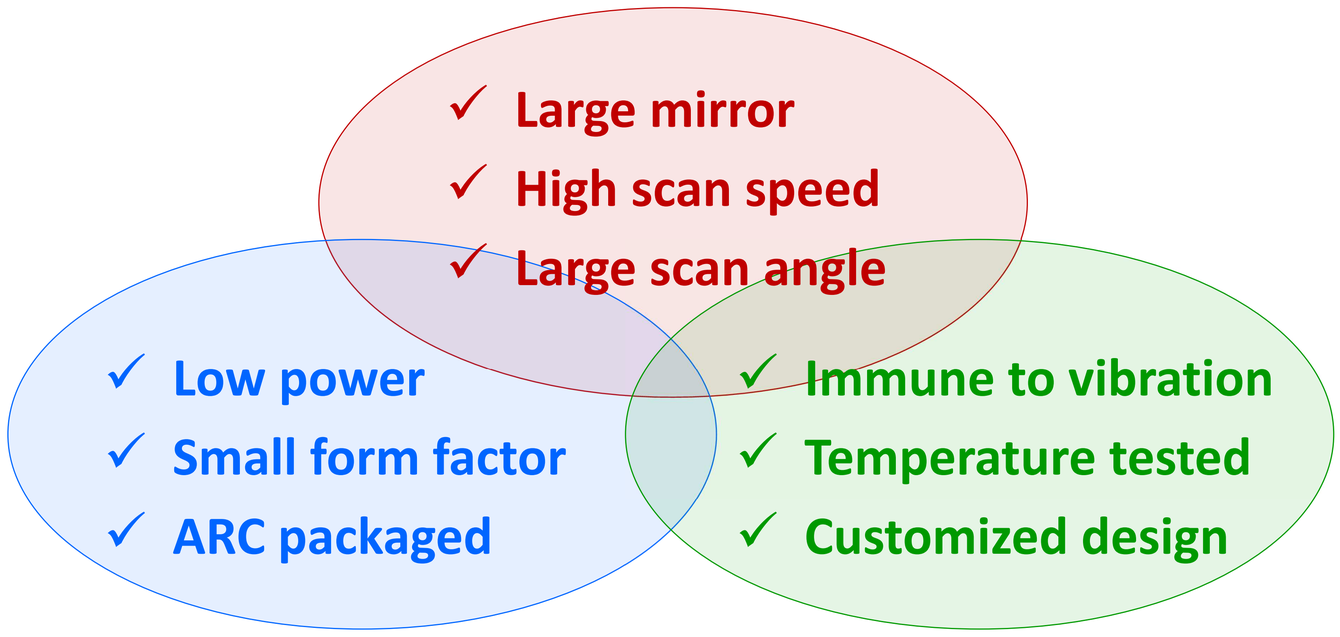
Scanner for display



Scanner driver and development Kit

Merits of WeMEMS Scanner

- ✓ WeMEMS has successfully developed packaged MEMS scanners employing specially designed structures that has passed rigorous vibration and temperature tests.
- ✓ Since MEMS scanners can meet the expectations for autonomous vehicles, LiDAR manufacturers have been focusing on improving their performance to meet the requirements.



Address : 621-1, Dasan Bldg., 123 Cheomdangwagi-ro, Buk-gu, Gwangju, S. Korea, 61005
Tel : +82-62-715-2782 or 2424 Mobile : +82-10-5405-3770
Web : http://www.wemems.co.kr E-mail : sales@wemems.co.kr

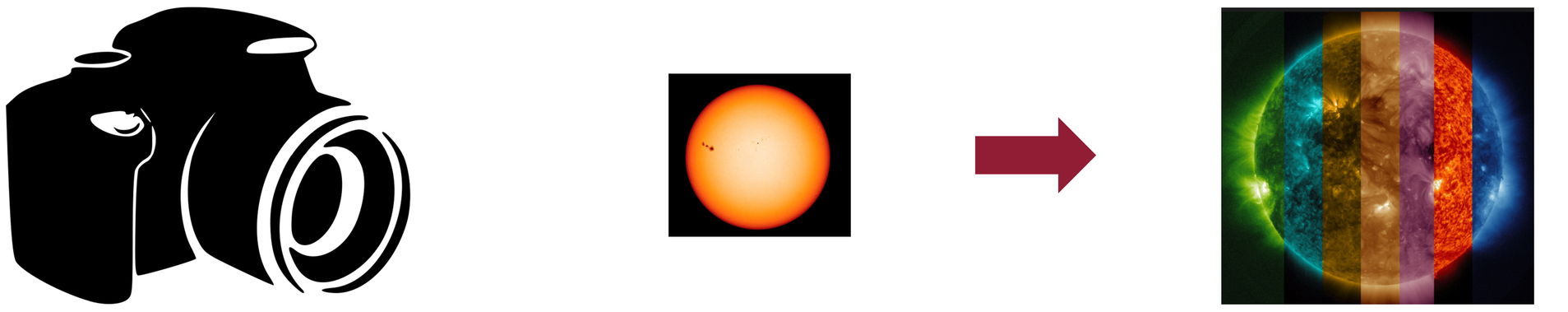
WeMEMS

Our Micro Optics. Your Mega Innovations.

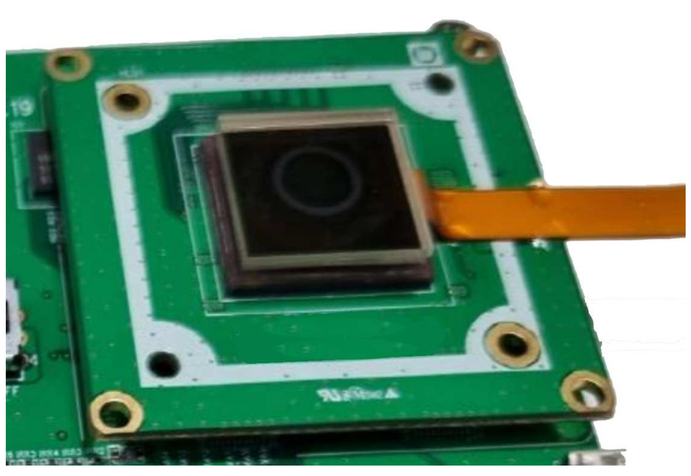
Tunable Spectral Filter

✓ Spectral imaging is the acquisition of a spectrum for each pixel in an image of a scene for the purpose of object locating, material identification or process detection.

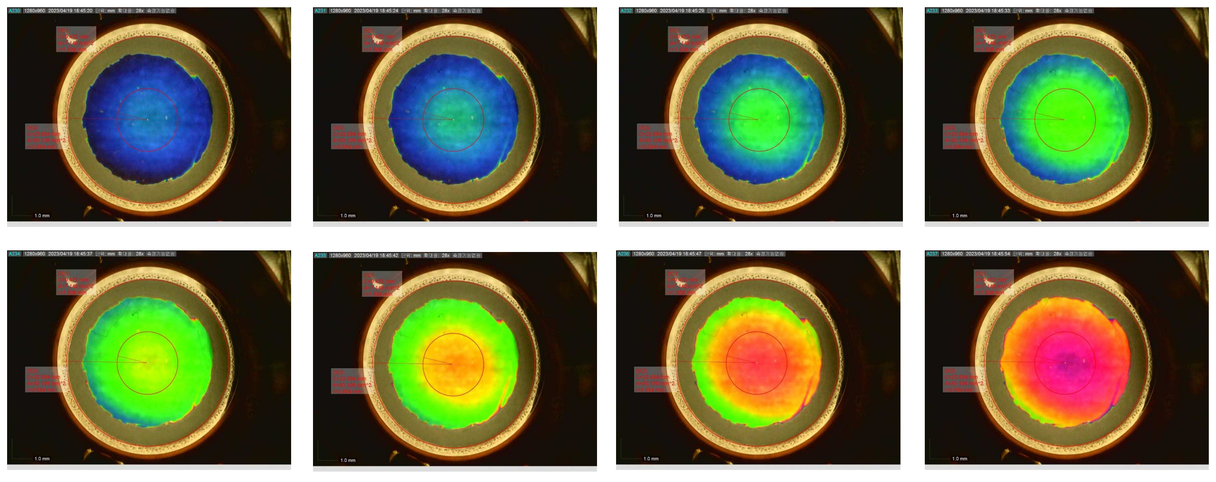
✓ WeMEMS has developed a tunable spectral filter utilizing a fabry-perot cavity.



Spectral imaging schematic

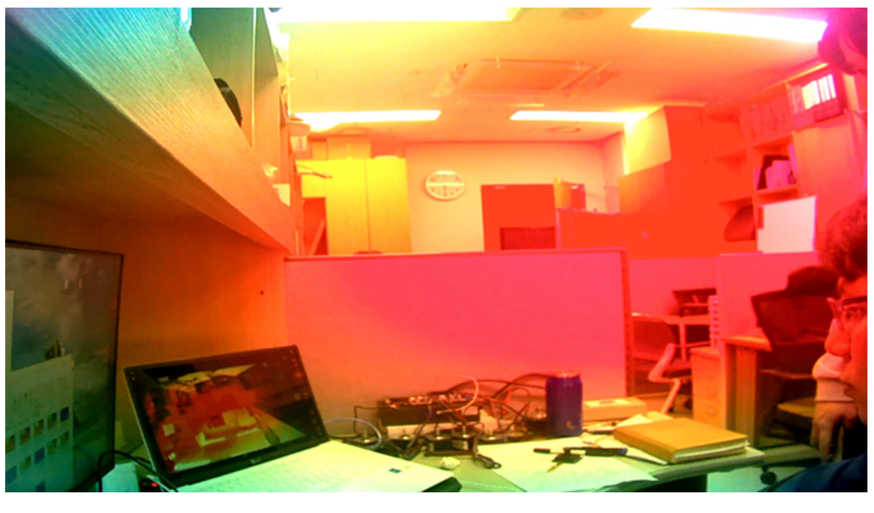


WeMEMS tunable spectral filter (w/ image sensor assembly)



Wavelength tuning

Experimental Performance



Imaging

Parameter	Value
Clear aperture [mm]	~ 3
Spectral range [nm]	450 -700
FWHM [nm]	< 30
Average peak transmission [%]	> 30
Stop-band transmission [%]	< 3
CWL repeatability [nm]	3.6
Switching time [msec]	< 30

Address : 621-1, Dasan Bldg., 123 Cheomdangwagi-ro, Buk-gu, Gwangju, S. Korea, 61005
Tel : +82-62-715-2782 or 2424 **Mobile : +82-10-5405-3770**
Web : http://www.wemems.co.kr **E-mail : sales@wemems.co.kr**

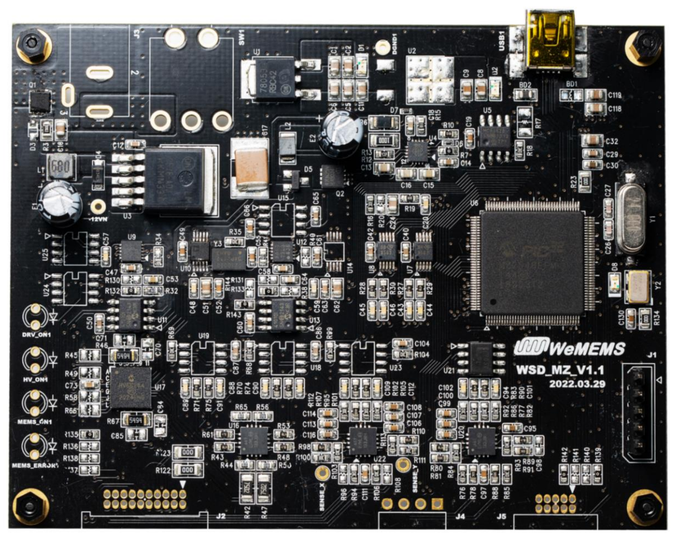
WeMEMS

Our Micro Optics. Your Mega Innovations.

2-axis MEMS scanner

- ✓ A 2-axis gimbaled MEMS scanner was developed using quasi-static and resonant actuators.
- ✓ The 2-axis scanner can control the scanning direction of the laser beam in the LiDAR systems, making it easy to detect the three-dimensional images of the objects.

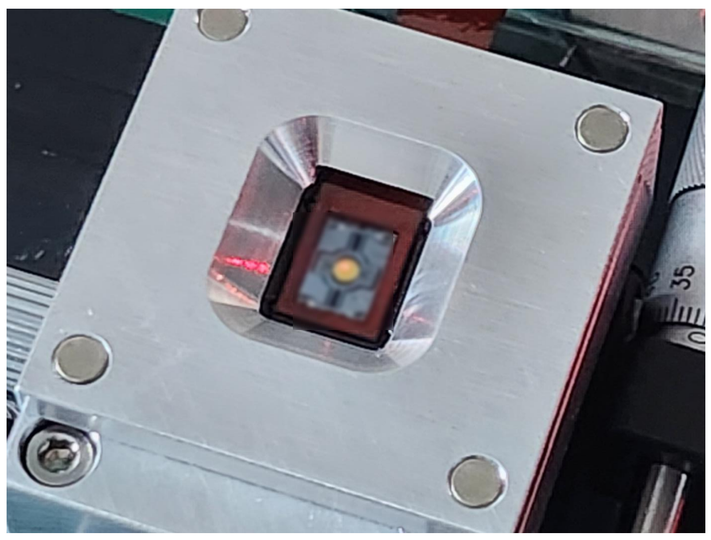
2-axis MEMS Scanner



Scanner driver

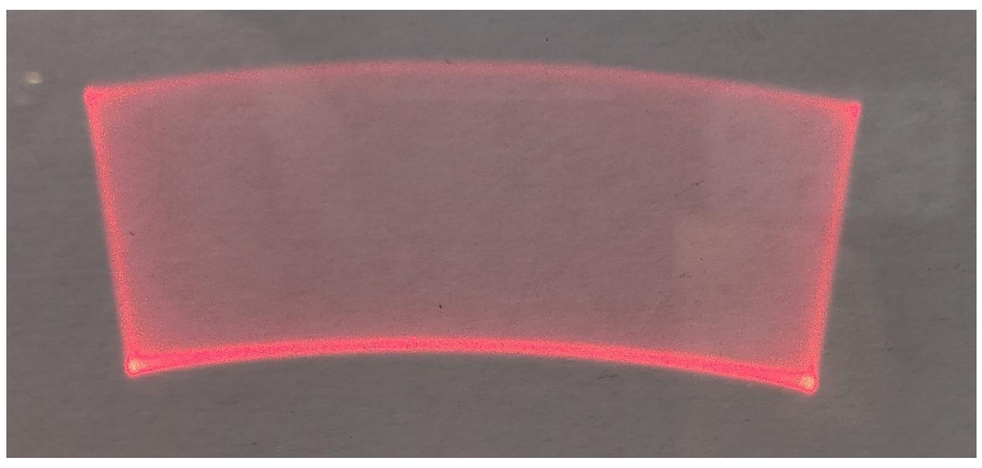
Experimental Setup

Experimental setup



Laser incidence on the MEMS mirror

Experimental Performance



Scan Image

Parameter	Value
Fast-axis driving (x) [kHz]	9.5 – 9.7
Slow-axis driving (y) [Hz]	up to 60
Fast-axis TOSA [deg.]	20
Slow axis TOSA [deg.]	9
Mirror Size [mm in dia.]	2

* TOSA: Total Optical Scanning Angle [deg.]

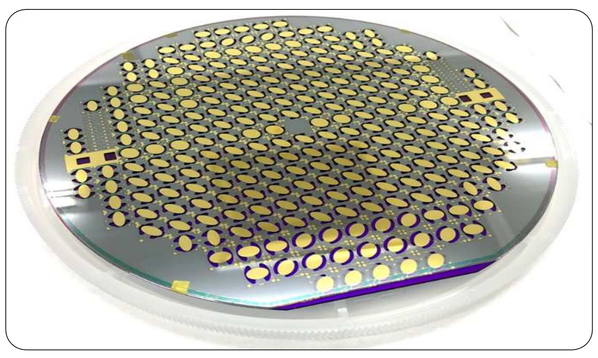
Address : 621-1, Dasan Bldg., 123 Cheomdangwagi-ro, Buk-gu, Gwangju, S. Korea, 61005
Tel : +82-62-715-2782 or 2424 **Mobile : +82-10-5405-3770**
Web : http://www.wemems.co.kr **E-mail : sales@wemems.co.kr**

WeMEMS

Our Micro Optics. Your Mega Innovations.

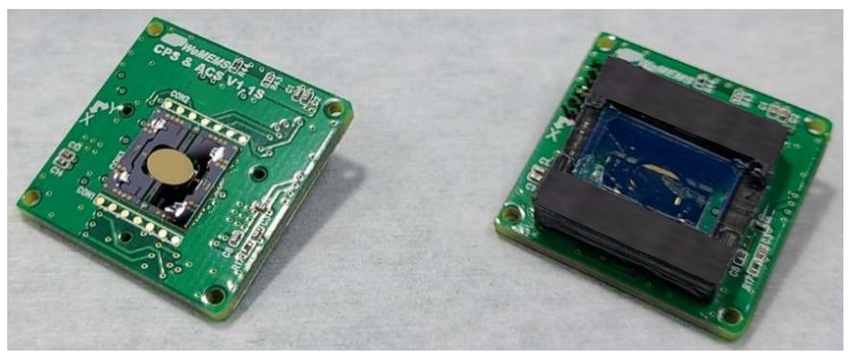
Si MEMS Resonant Scanner

- ✓ Si-based one-axis MEMS scanner chip and packaged module
- ✓ Sensor-embedded scanners and driver boards
- ✓ Scanning solutions to customers' new requirements (within 3~6 months)



Si scanner Chips

Packaged MEMS scanner

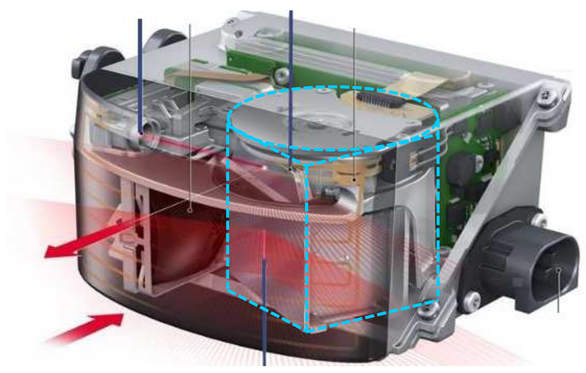


Sensor-embedded resonant scanner

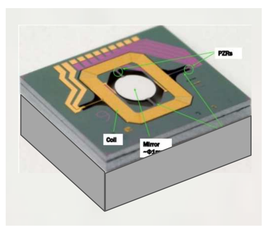
Evolution of Scanning Technology

- ✓ Miniaturization and low price are prerequisite to autonomous vehicle
- ✓ Electrostatic scanner is superior in terms of size, speed, power, reliability & price

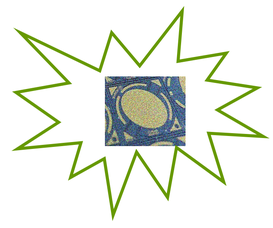
Rotating motor
Assembly (current)



Magnet
assembly (current)



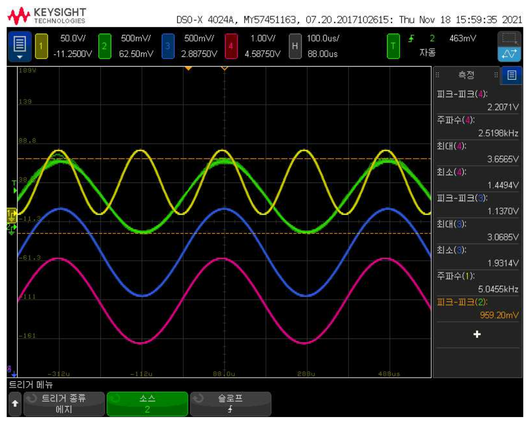
Electrostatic
integrated (voltage)



Velodyne Lidar · Valeo · MicroVision · Maradin · WeMEMS · OQMENTED · ST

Experimental Performance

Mirror 2~5 mm dia.
Freq. 2~9 kHz
OSA 25~40°
Sensor embedded



- Drive
- PSD (ref)
- Sense1
- Sensor

*Parametric oscillation

Address : 621-1, Dasan Bldg., 123 Cheomdangwagi-ro, Buk-gu, Gwangju, S. Korea, 61005
Tel : +82-62-715-2782 or 2424 **Mobile : +82-10-5405-3770**
Web : http://www.wemems.co.kr **E-mail : sales@wemems.co.kr**

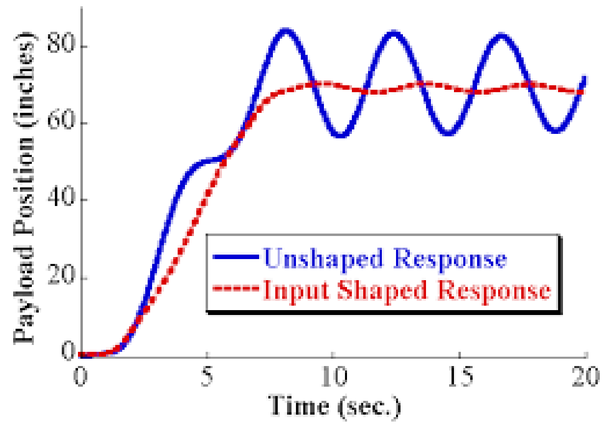
WeMEMS

Our Micro Optics. Your Mega Innovations.

Si MEMS Quasi-static Scanner

- ✓ Si-based one-axis & two-axis quasi-static MEMS scanner
- ✓ Arbitrary motion according to driving waveform (Input shaping)

Packaged quasi-static scanner



Input shaping

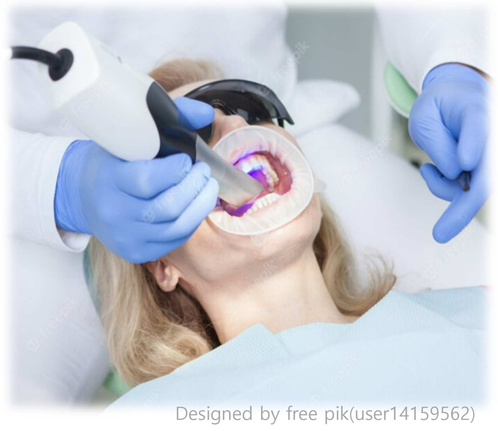
Diverse Application Fields

- ✓ Laser scanning for LiDAR, 3D scanning, industrial metrology/inspection
- ✓ Optical projection for AR microdisplay, HUD(Head Up Display), holography
- ✓ Biological applications: endoscopic OCT, medical diagnostics, sample analysis
- ✓ Optical communication etc..

Laser scanning
LiDAR system

Optical projection
Virtual Reality

Biological application
Medical diagnostics

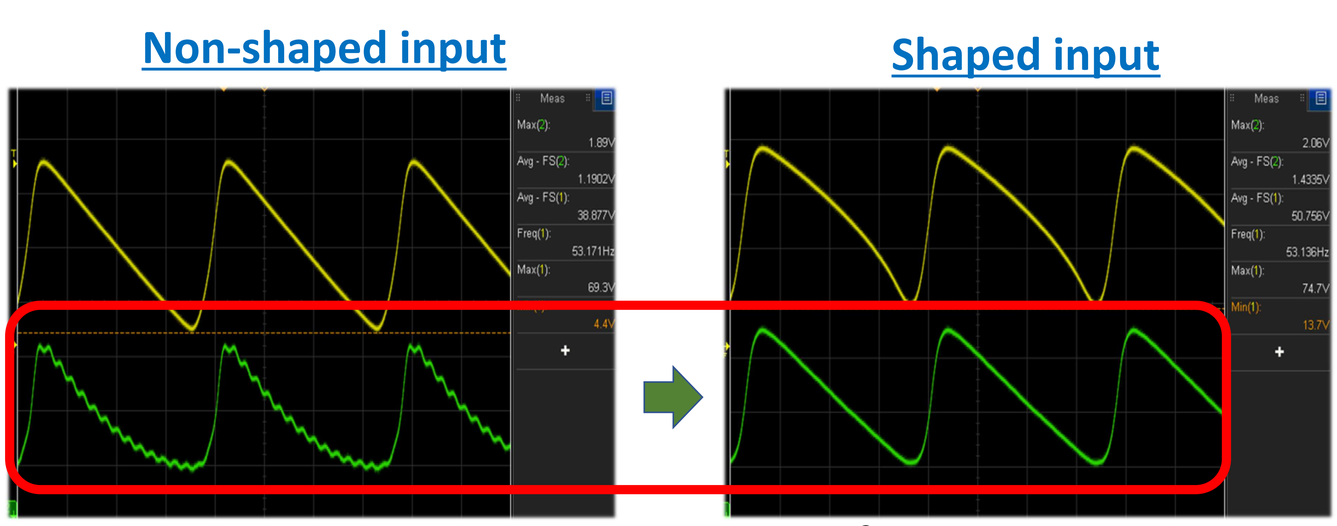


Designed by free pik(user14159562)

Linearized Motion of Mirror

- ✓ The motion of the scanning mirror is controllable by utilizing input shaping.
- ✓ The mirror motion can be linearized to expand the usable scan range.

Non-shaped input **Shaped input**



Address : 621-1, Dasan Bldg., 123 Cheomdangwagi-ro, Buk-gu, Gwangju, S. Korea, 61005
Tel : +82-62-715-2782 or 2424 **Mobile : +82-10-5405-3770**
Web : http://www.wemems.co.kr **E-mail : sales@wemems.co.kr**