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Optical Coherence Tomography (OCT)

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Hamamatsu Photonics

TECHNOLOGY DAYS 2024 | HAMAMATSU PHOTON IS OUR BUSINESS

Medical science
Manufacturing
Life Science
Environmental science
Daily life
Fundamental research
Automotive

SINCE **1953**

10 RESEARCH & PRODUCTION FACILITIES

5,795 EMPLOYEES

221.4 BILLION

1953 2023

5.6% R&D EXPENSE

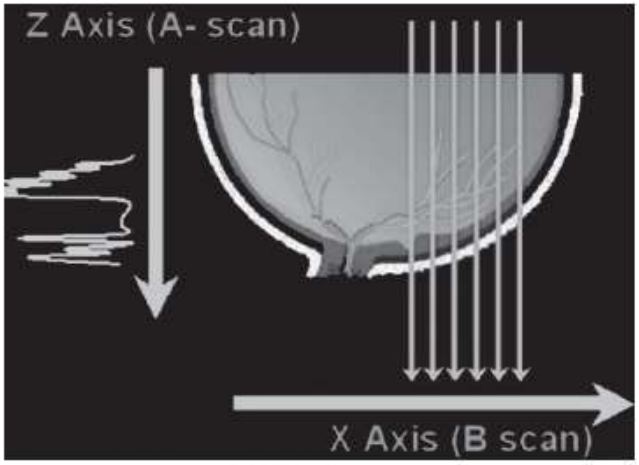
3 NOBEL PRIZE CONTRIBUTIONS

15.000 PRODUCTS

2/3 CUSTOM SPECIFIC

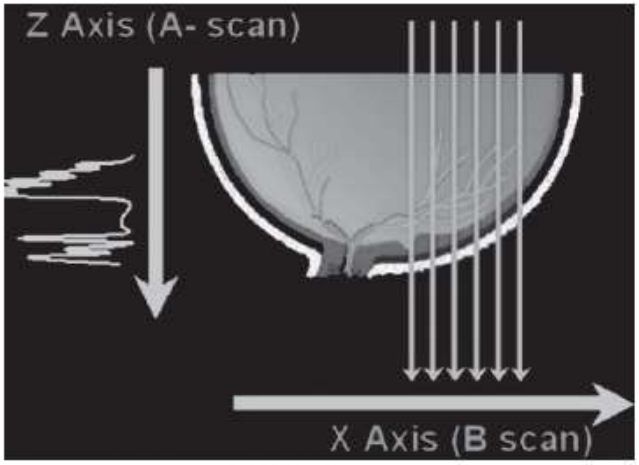
*Figures taken in 2023

Optical Coherence Tomography



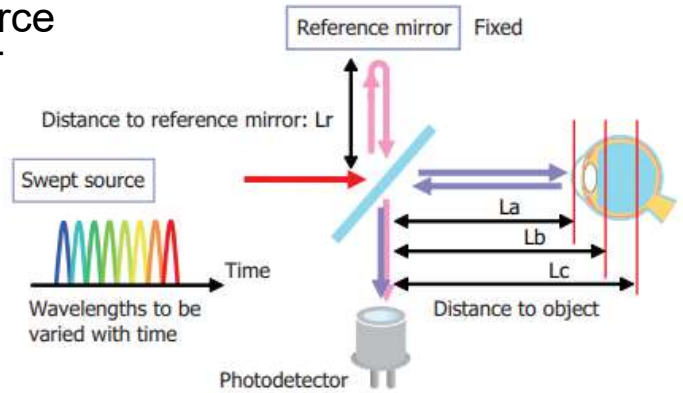
OCT fundus scan

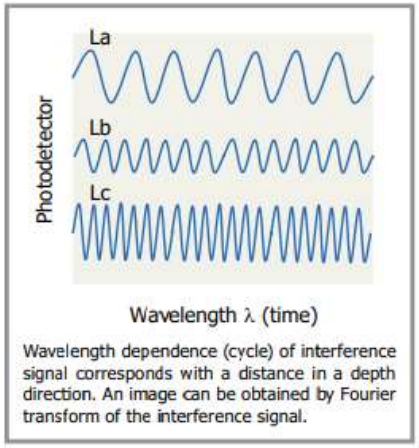
Optical Coherence Tomography



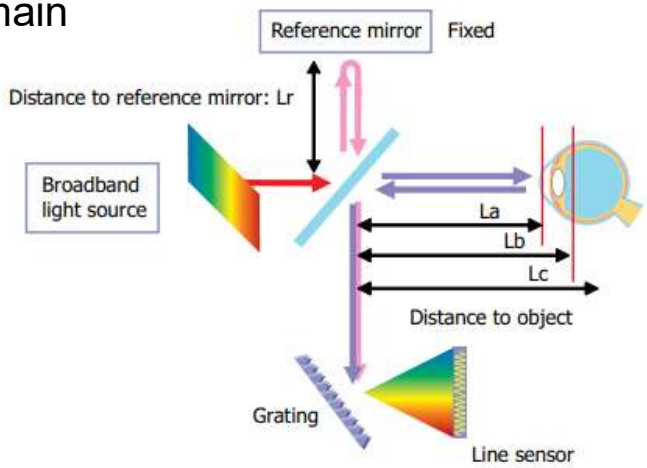
OCT fundus scan

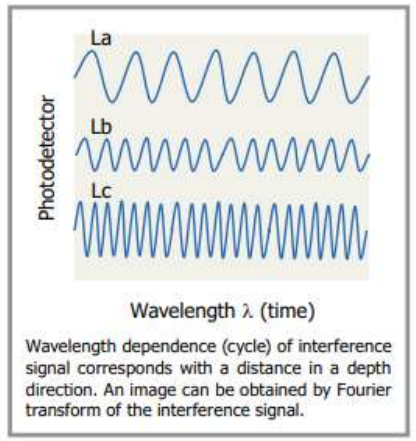
Swept Source (SS) - OCT





Spectral Domain (SD) - OCT



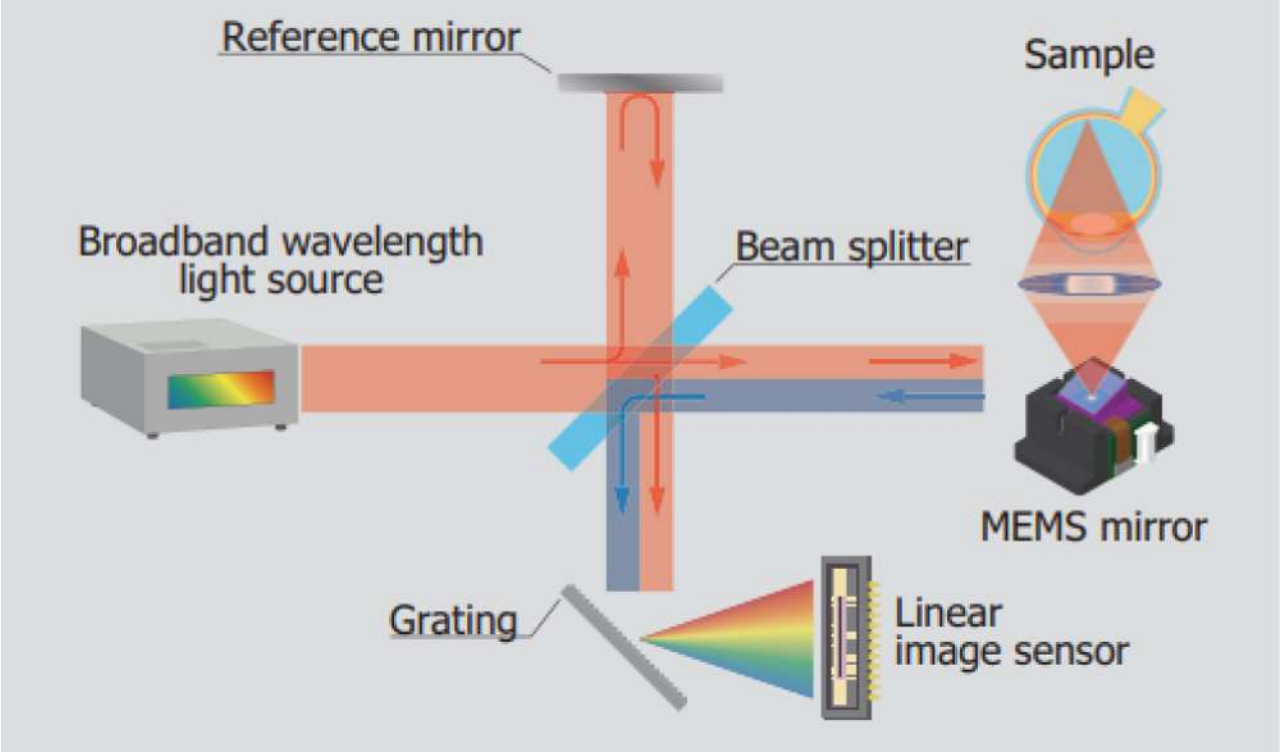


Why Optical Coherence Tomography?

Myopia is increasing worldwide, and last estimation made from World Hearth Organization is that by 2050, half of the world‘s population will be nearsighted, and one in ten of them will suffer from strong myopia (risk of losing eyesight).

- **Negative Chain:** Dependence on smartphones and living indoors
- **Problem:** Eye case services are poorly integrated into health systems

Spectral Domain (SD) - OCT



New direction of Optical Coherence Tomography

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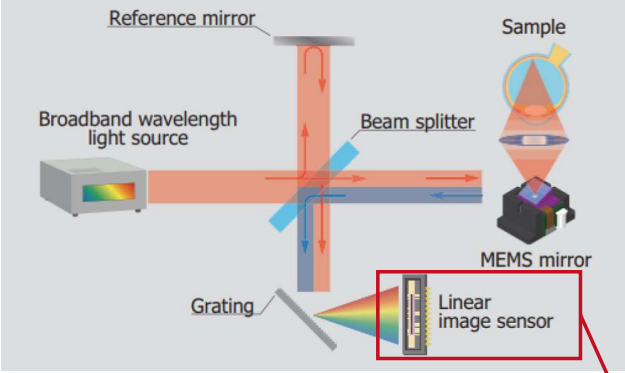
Conventional instrument
(Eye diagnosis at hospital)

Emerging use scenes
(Screening test and self-check with AI doctor)

- ✓ Compact, Low cost by replacing Galvano mirror by MEMS mirror
- ✓ Screening test by home doctor, eyeglass shop, etc
- ✓ Self-check at home, etc

Optical Coherence Tomography – Sensors



■ Lineup

Parameter	S15729-01	S11639-01	S16514-2048-11	S15611
Photo				
Type	CCD	CMOS	CMOS	CMOS
Pixel size (µm)	*10 x 180*	*14 x 200*	*14 x 200*	*7 x 200*
Number of pixels	*2048*	*2048*	*2048*	*1024*
Line rate (kHz)	70	4.6	4.6	34
Quantum efficiency [at 900 nm]	*54%*	*24%*	*45%*	*25%*
Output	Analog	Analog	Analog	Digital
Circuit*1	C15821-2351 C15821-2151	C13015-01	C13015-01	Demo kit

■ Lineup

Parameter	C15821-2351	C15821-2151*1	C16605
Photo			
Image sensor	CCD image sensor*2 S15729-01		CMOS image sensor S11639-01, etc.*3
Line rate (kHz)	*70*		*4*3*
A/D resolution (bit)	*10 or 12*		*16*
Dimensions (mm)	60 x 60 x 45.82	60 x 60 x 43.3	Sensor board: 41.6 x 20 x 2.2 Interface board: 50 x 38 x 2.2
Interface	*CameraLink*	*USB 3.1 Gen 1*	*USB 2.0*
Supply voltage (V)	+12		+6

*1 Product release date: August 2023 *2 Sensor included *3 Sensor is sold separately. See the C16605 datasheet for applicable sensor and line rate.

■ Lineup

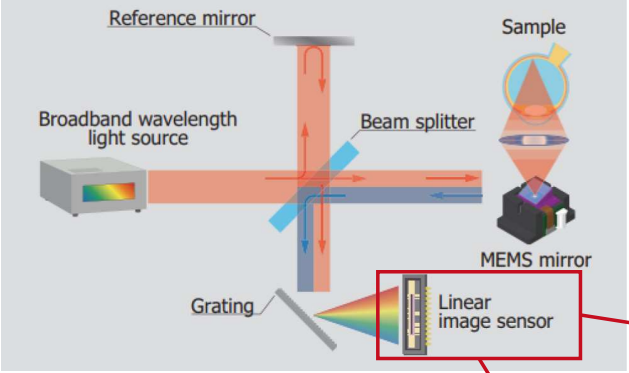
Parameter	G10768-1024D	G14714-1024DK
Photo		
Pixel size (µm)	25 x 100	12.5 x 12.5 *
Number of pixels	*1024*	*1024*
Line rate max. (kHz)	*39*	*40*

*12.5 x 250 µm pixel size typeis also available (G14714-1024DG) .

■ Lineup

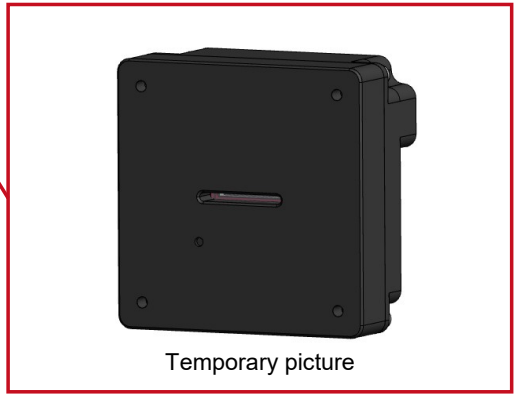
Parameter	C12668-01	C12668-02	C12668-03	C12668-04	C12668-05	C12668-06
Photo						
Optimal wavelength band (µm)	1	1.3	1	1.3	1	1.3
Cutoff frequency (MHz)	DC to 200		DC to 400		0.1 to 800	
Common-mode rejection ratio (dB)	35		30		30	
Conversion impedance (kV/A)	15 (50 Ω)		5 (50 Ω)		29 (50 Ω)	
Output noise voltage (mVp-p)	20		20		80	
Supply voltage (V)	±12		±12		±12	
Dimensions (mm)	25 x 54.5 x 65		25 x 78 x 72		18 x 63 x 70	

Optical Coherence Tomography – Image Sensor Module



NEW

Image Sensor Modules



Temporary picture

UNDER DEVELOPMENT

C16821 series

Features:

- PD: 7µm x 200µm, 1024 pixels
- High-speed readout: 34kHz
- MIPI interface

**-01: with AR coat*

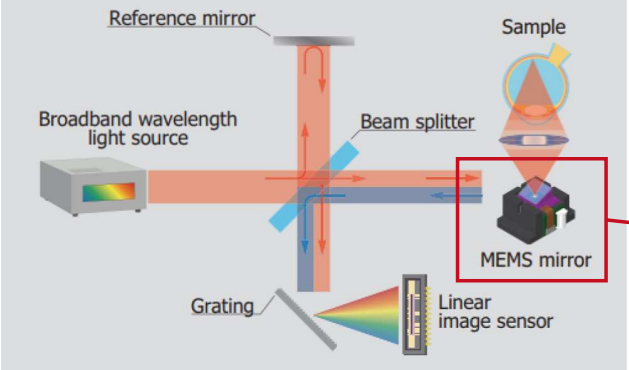
-02: without window

C17287

Features:

- PD: 7µm x 200µm, 2048 pixels
- High-speed readout: 61kHz
- USB 3.2 Gen 1x1 (5Gbps)

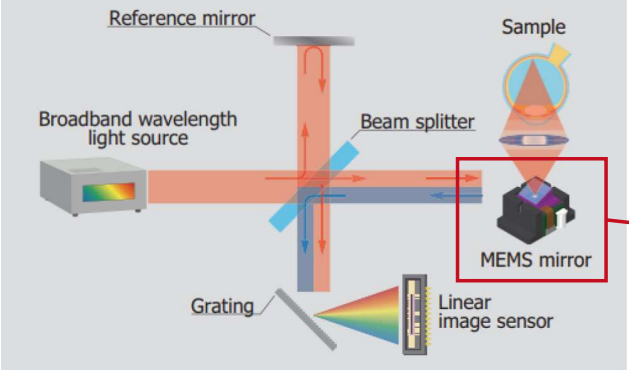
Optical Coherence Tomography – MEMS Mirror



Parameter	2D resonant / linear	2D linear	1D linear
	S13989-01H	S13973	S12237-03P
Photo			
Scan mode	Raster (2 axes)	2-axis linear	1-axis linear
Mirror size (mm)	$\phi 1.2$	$\phi 2.0$	$\phi 2.6$
Optical deflection angle	$\pm 20° / \pm 12°$	$\pm 10° / \pm 10°$	$\pm 15°$
Operation frequency	29.3 kHz / 100 Hz max.	90 Hz max.	100 Hz max.
Mirror coating	Al*1	Au	Al*1
Window	Yes*1	No	No
Evaluation circuit*2	C13884HC	C15087	C15087

*1 Please consult a Hamamatsu representative for the availability of Au mirror coating and a window optimized for an NIR region.
*2 Sold separately

Optical Coherence Tomography – MEMS Mirror



Parameter	2D resonant / linear	2D linear	1D linear
	S13989-01H	S13973	S12237-03P
Photo			
Scan mode	Raster (2 axes)	2-axis linear	1-axis linear
Mirror size (mm)	ϕ1.2	ϕ2.0	ϕ2.6
Optical deflection angle	±20° / ±12°	±10° / ±10°	±15°
Operation frequency	29.3 kHz / 100 Hz max.	90 Hz max.	100 Hz max.
Mirror coating	Al*1	Au	Al*1
Window	Yes*1	No	No
Evaluation circuit*2	C13884HC	C15087	C15087

*1 Please consult a Hamamatsu representative for the availability of Au mirror coating and a window optimized for an NIR region.
*2 Sold separately

NEW

MEMS Mirror S17363

Features:

- Mirror size: ϕ5.0 mm
- Optical deflection angle: ±10 / ±10°
- Frequency: 100 Hz/50 Hz

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Thank you for listening

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