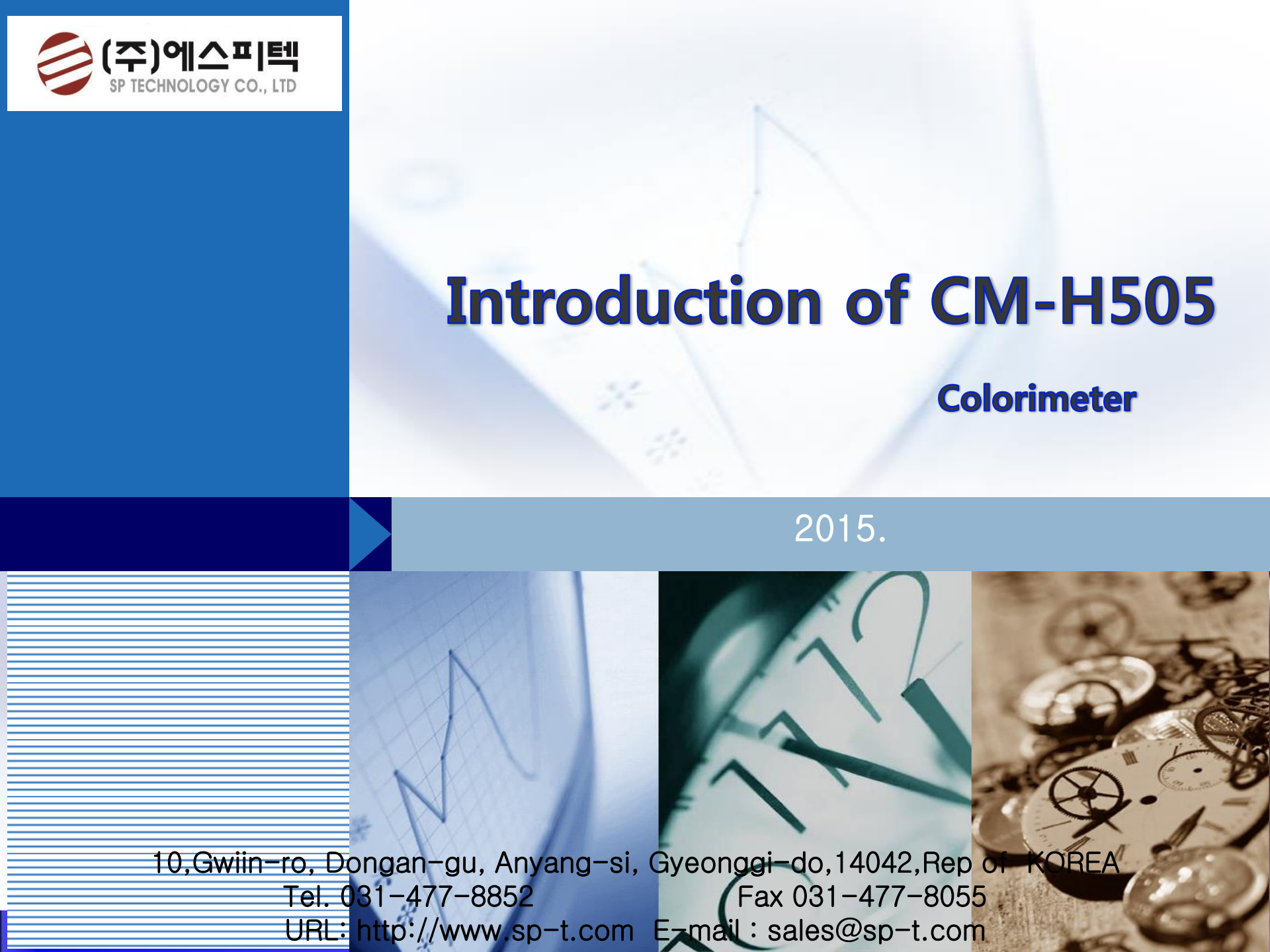


Introduction of CM-H505

Colorimeter

2015.



10, Gwiin-ro, Dongan-gu, Anyang-si, Gyeonggi-do, 14042, Rep of KOREA
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Part 01 Feature

1. Universal Colorimeter

- Stable optical system design to reduce error (distribution of light and spectrum)
- High transmittance filter(Interference)
- Si Photo Diode

2. Compact integrated structure

- Built in controller
- light weight & Ergonomics design



Part 01 Merit

1. Real time zero(dark) calibration

- No need dark calibration
- Temperature/humidity auto calibration (patent pending)

2. Wide measuring range (Luminance)

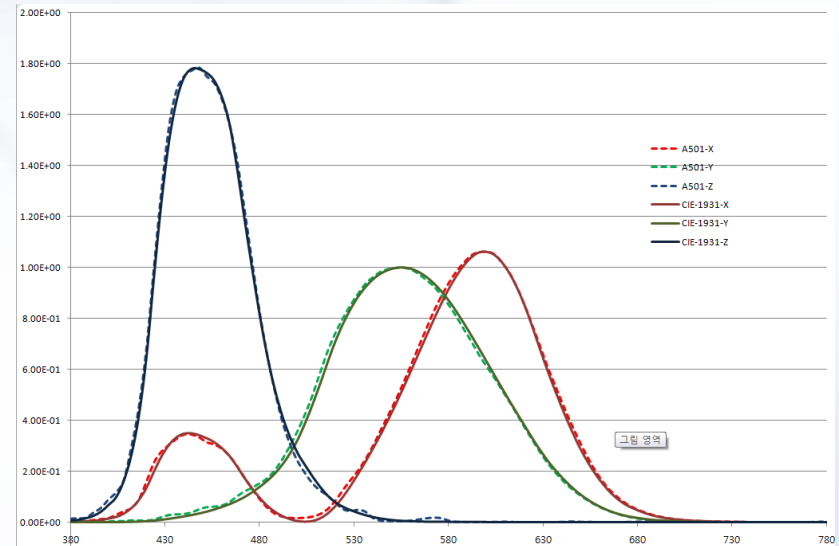
- 0.001 ~ 99,000 cd/m²
- Quick response to change luminance

3. Good agreement spectral distribution

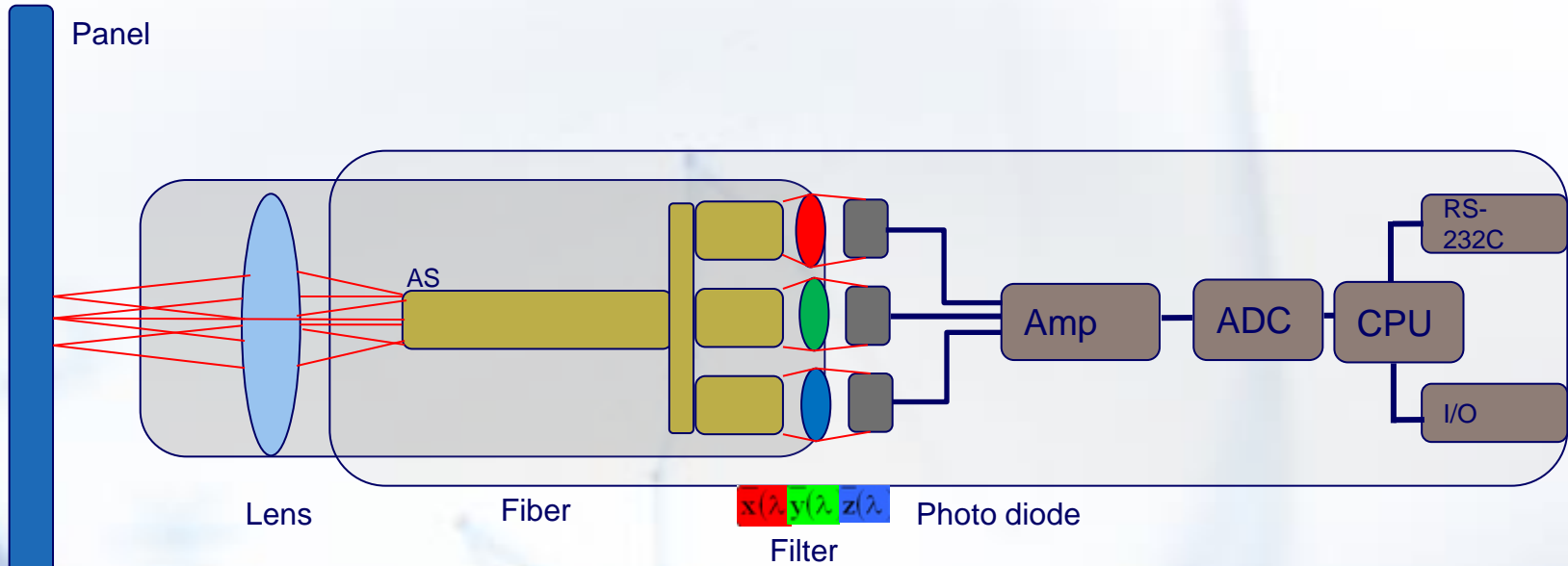
- $f_1' \leq 4\%$

4. Flicker measurement

- JEITA (FFT -> Low pass filter)



Part 01 Configuration



Part 02 Application 1

Small OLED (Smartphone)

Object : White balance measurement and adjust

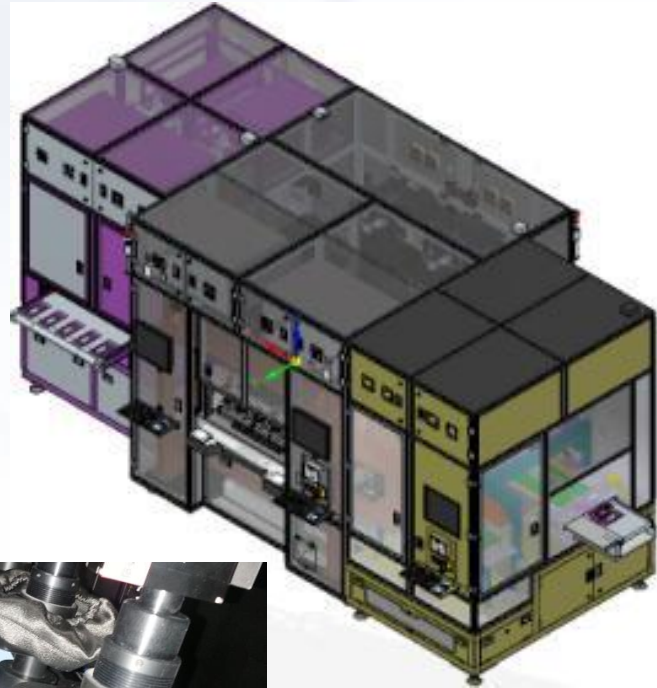
Requirements :

Luminance (cd/m^2): 0.3 ~ 300

Speed : $300\text{ms} \leq 1$ (cd/m^2)

$33\text{ms} \geq 1$ (cd/m^2)

Working Distance : $\geq 100\text{mm}$



Part 02 Application 2

Large OLED (TV)

Object : 1.White balance measurement and adjustment(Multi Point)

2.Uniformity measurement

Requirements :

Luminance (cd/m²): 0.3 ~ 300

Speed : 300ms ≤ 1 (cd/m²)

33ms ≥ 1 (cd/m²)

Working Distance : ≥30mm



Part 02 Application 3

LCD panel color measurement

Object : Color gamut and contrast ratio measurement

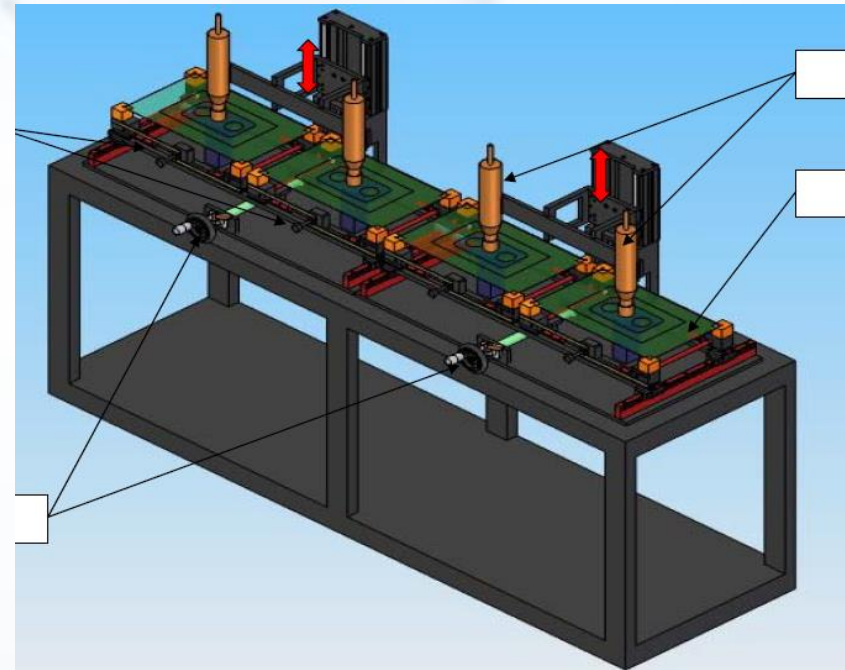
Requirements :

Luminance (cd/m^2): 0.3 ~ 500

Speed : $300\text{ms} \leq 1$ (cd/m^2)

$33\text{ms} \geq 1$ (cd/m^2)

Working Distance : $\geq 30\text{mm}$



Part 03 Spectrum matching

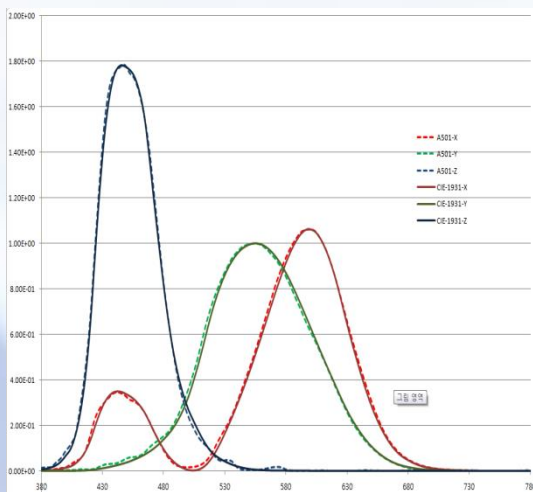
$$f_1' \leq 4\%$$

- Minolta CA-310 grade accuracy

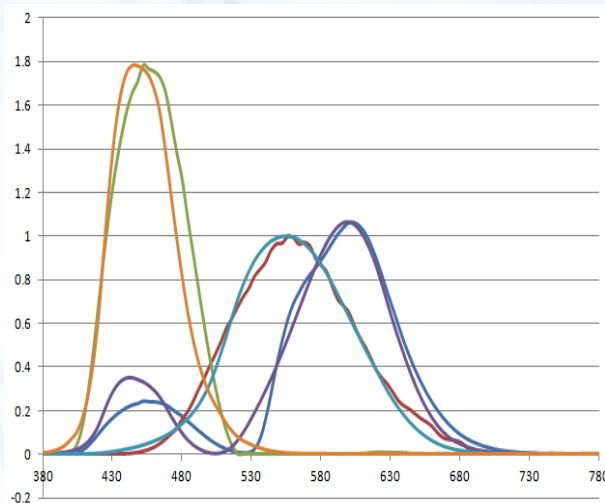
2013/5

By Monochromator

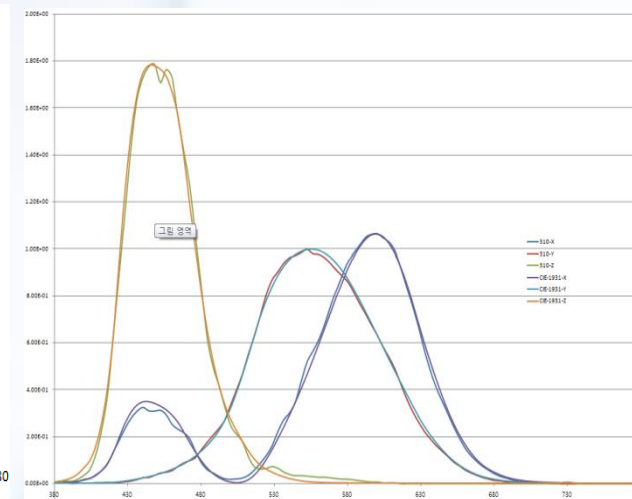
CM-H505



Minolta CA-210



Minolta CA-310



f_1'

	X	Y	Z
CM-H505	3.4%	3.2%	3.4%
CA-210	16.9%	8%	19.5%
CA-310	4.4%	2.3%	5.1%

Part 03 Evaluation – Standard illuminant A

CS-2000			CM-H505			CA-310			CS2000 vs CM-H505			CS2000 vs CA310		
Y	x	y	Y	x	y	Lv	x	y	dLv	dx	dy	dLv	dx	dy
305.35	0.450	0.411	309.30	0.451	0.410	306.69	0.451	0.410	1.3%	0.001	-0.001	0.4%	0.001	-0.002
268.27	0.450	0.411	271.15	0.451	0.410	268.87	0.451	0.410	1.1%	0.001	-0.001	0.2%	0.001	-0.002
239.64	0.450	0.411	242.08	0.450	0.410	240.04	0.450	0.410	1.0%	0.001	-0.001	0.2%	0.001	-0.001
211.53	0.450	0.411	213.59	0.450	0.410	211.78	0.450	0.410	1.0%	0.001	-0.001	0.1%	0.001	-0.001
180.43	0.450	0.411	182.16	0.451	0.410	180.62	0.451	0.410	1.0%	0.001	-0.001	0.1%	0.001	-0.001
150.75	0.450	0.411	152.00	0.450	0.410	150.72	0.450	0.410	0.8%	0.001	-0.001	0.0%	0.001	-0.001
120.91	0.450	0.411	121.78	0.450	0.410	120.75	0.450	0.410	0.7%	0.001	-0.001	-0.1%	0.001	-0.001
90.94	0.450	0.411	91.65	0.450	0.410	90.88	0.450	0.410	0.8%	0.001	-0.001	-0.1%	0.001	-0.001
60.67	0.450	0.411	61.36	0.451	0.411	60.84	0.451	0.410	1.1%	0.001	-0.001	0.3%	0.001	-0.001
30.15	0.450	0.412	30.50	0.451	0.411	30.24	0.451	0.410	1.1%	0.001	-0.001	0.3%	0.001	-0.001
20.94	0.450	0.412	21.18	0.451	0.411	21.00	0.451	0.410	1.1%	0.001	-0.001	0.3%	0.001	-0.002
10.52	0.450	0.412	10.61	0.452	0.412	10.52	0.452	0.411	0.9%	0.002	-0.001	0.0%	0.002	-0.001
5.12	0.450	0.412	5.17	0.451	0.412	5.12	0.451	0.411	0.9%	0.001	-0.001	0.1%	0.001	-0.001
0.99	0.450	0.413	1.00	0.451	0.411	0.99	0.451	0.410	0.9%	0.001	-0.002	0.0%	0.001	-0.002
0.18	0.454	0.413	0.17	0.457	0.410	0.17	0.457	0.410	-1.2%	0.002	-0.003	-2.1%	0.003	-0.004

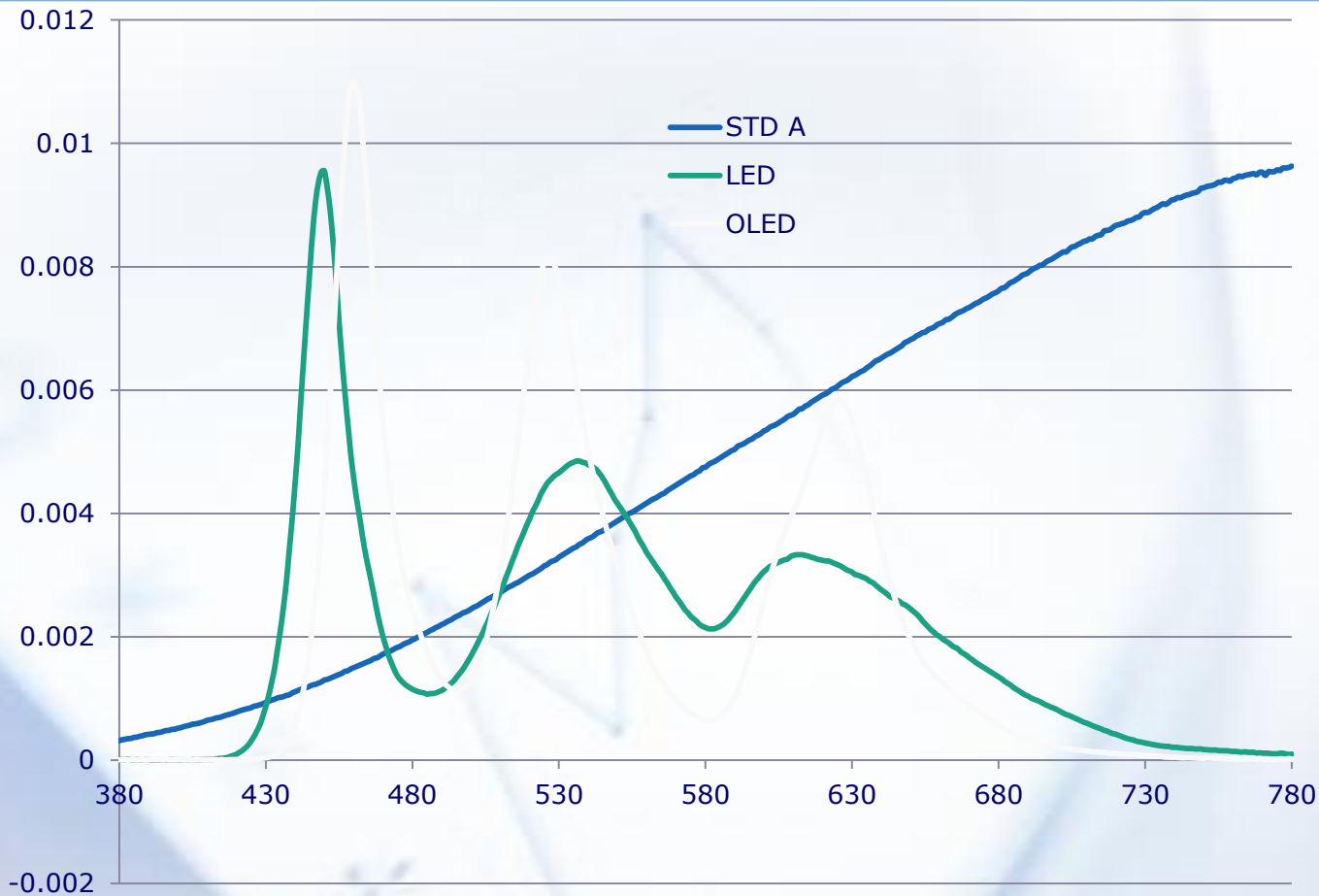
Part 03 Evaluation – LED monitor

		CA-310				CM-H505			
		Lv	dLv	dx	dy	Lv	dLv	dx	dy
LED monitor	W255	238.83	-0.5%	0.001	0.000	239.52	0.0%	0.000	0.001
	R255	47.51	0.2%	-0.003	0.001	47.84	0.5%	0.000	-0.001
	G255	181.49	-1.0%	0.003	-0.004	181.88	0.5%	-0.002	0.002
	B255	10.85	-0.7%	0.001	0.000	10.39	0.8%	-0.002	0.000
	W150	79.83	-0.4%	0.002	0.000	77.10	-0.5%	0.000	0.002
	R150	15.33	0.1%	-0.003	0.001	15.33	0.9%	0.001	-0.001
	G150	60.06	-0.8%	0.003	-0.004	58.04	0.7%	-0.002	0.002
	B150	3.81	-0.5%	0.001	0.000	3.60	1.4%	-0.002	0.000
	W100	28.85	0.0%	0.002	0.000	27.93	0.7%	-0.001	0.000
	R100	5.93	-0.1%	-0.003	0.001	5.77	0.5%	0.000	-0.001
	G100	21.80	-1.0%	0.003	-0.003	21.09	0.3%	-0.001	0.002
	B100	1.60	0.8%	0.000	0.000	1.51	1.0%	-0.002	0.000
	W50	4.43	-0.3%	0.001	0.000	4.35	-0.3%	0.000	0.002
	R50	1.15	1.1%	-0.002	0.002	1.13	0.6%	-0.001	0.001
	G50	3.42	-0.3%	0.002	-0.002	3.35	-0.3%	-0.002	0.001
	B50	0.52	-0.3%	0.001	0.001	0.50	0.2%	-0.002	0.001
W0	0.35	-0.5%	-0.001	0.002	0.33	1.0%	-0.004	0.002	

Part 03 Evaluation – OLED

		CA-310				CM-H505			
		Lv	dLv	dx	dy	Lv	dLv	dx	dy
OLED	W255	242.10	0.5%	-0.001	0.000	224.79	0.0%	0.001	-0.001
	R255	71.00	0.8%	-0.002	0.001	68.76	-0.4%	0.000	0.000
	G255	189.02	0.8%	-0.002	0.004	181.49	-0.3%	0.001	-0.001
	B255	18.28	0.5%	0.000	0.000	17.17	0.4%	0.002	0.000
	W150	71.00	0.6%	-0.001	0.000	66.21	-0.4%	0.001	-0.001
	R150	20.33	0.5%	-0.002	0.001	19.28	0.1%	0.000	-0.001
	G150	55.15	0.6%	-0.002	0.003	52.10	-0.6%	0.001	-0.001
	B150	5.87	0.3%	0.000	0.000	5.41	0.8%	0.001	0.000
	W100	28.97	1.3%	-0.001	0.000	26.88	-1.4%	0.001	-0.001
	R100	8.04	0.8%	-0.002	0.001	7.53	0.0%	0.000	-0.001
	G100	22.23	0.9%	-0.002	0.003	20.76	-0.4%	0.002	-0.001
	B100	2.45	0.6%	-0.001	-0.001	2.22	1.6%	0.002	0.000
	W50	6.87	1.1%	-0.001	0.000	6.20	-0.7%	0.000	-0.001
	R50	1.81	0.7%	-0.002	0.001	1.64	-0.3%	0.002	-0.001
	G50	5.26	1.1%	-0.002	0.003	4.80	-0.9%	0.002	0.001
	B50	0.66	0.0%	0.000	0.000	0.56	0.5%	0.002	0.000
W0	0.15	-1.7%	-0.001	0.001	0.12	-3.4%	-0.004	0.002	

Part 03 Evaluation – Sample spectrum



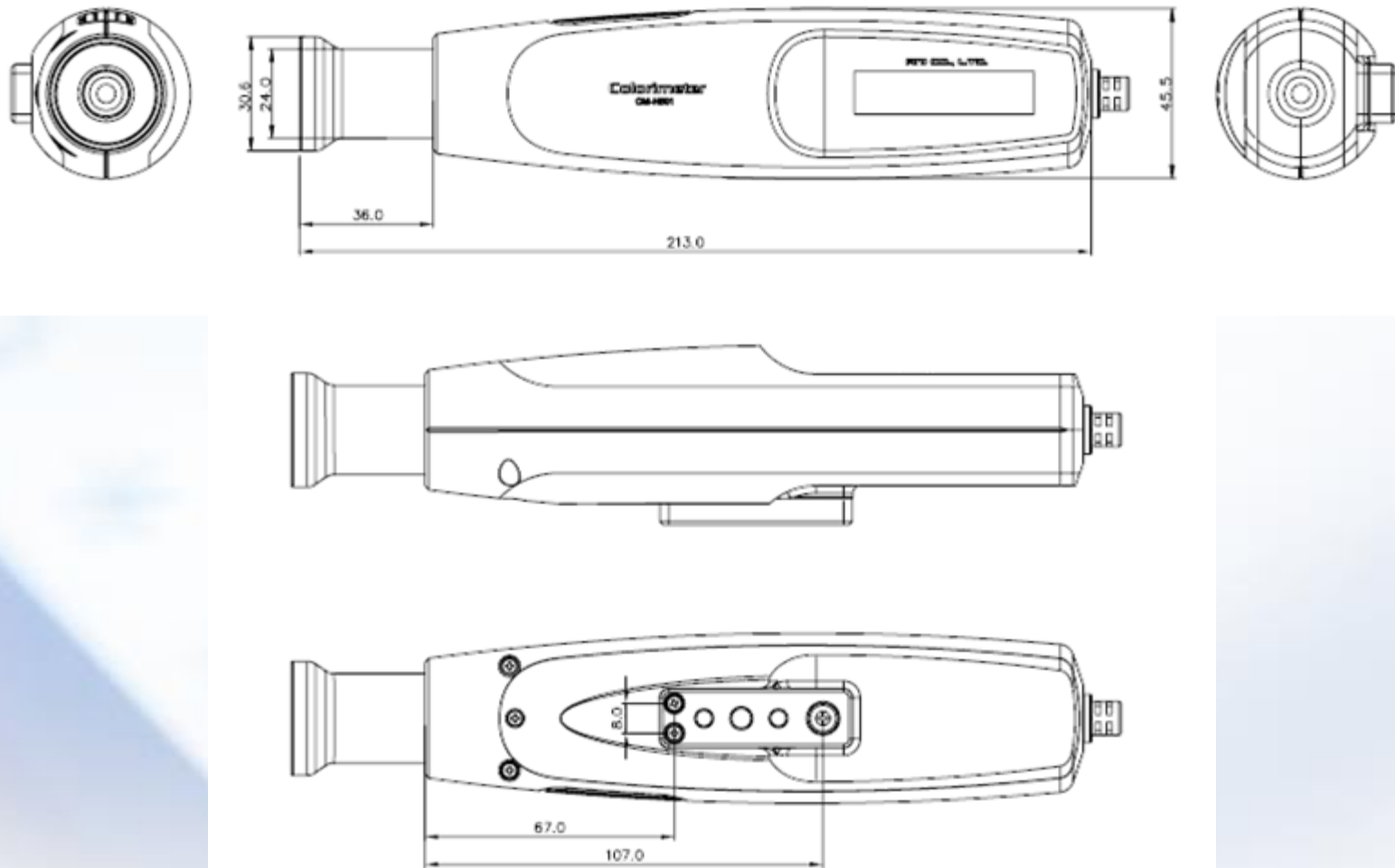
$xy \leq \pm 0.003$ (in different spectrum condition.)

Part 04 Specification

Model		CM - H505	
Receptor		Silicon Photo Cell (CIE 1931 XYZ filter)	
Measurement area		Ø10 mm, Ø20 mm	
Working distance		27±5 mm	
Acceptance angle		5°	
Expose time		0.1 ~ 650 msec	
A/D resolution		16 bit	
Display range	Luminance	0.0001 to 99,000 cd/m ²	
	Chromaticity	0.0001	
Luminance	Measurement range	0.001 ~ 99,000 cd/m ²	
	Accuracy (white)	0.1 ~ 1 cd/m ²	±3% (200 msec)
		≥1 cd/m ²	±2% (33 msec)
Luminance	Repeatability	0.1 ~ 1 cd/m ²	0.5% (σ, 200 msec)
		≥1 cd/m ²	0.5% (σ, 33 msec)
Chromaticity	Measurement range	0.001 ~ 9,9000 cd/m ²	
	Accuracy	0.1 ~ 1 cd/m ²	±0.005 (white)
		≥1 cd/m ²	±0.003 (white/mono)
Chromaticity	Repeatability	0.1 ~ 1 cd/m ²	0.001 (σ, 200 msec)
		≥1 cd/m ²	0.001 (σ, 33 msec)
Measurement speed		0.1 ~ 1 cd/m ²	5 ~ 20 count/sec
		≥1 cd/m ²	30 count/sec
Interface		RS-232C	
Protocol		Minolta RS-232C Protocol Compatible	
Display		16 X 2 line	
Operating temperature		10 to 35°C	
Input Voltage		9V, 300mA	
Size / Weight		213(W) X 45(H) / 400g	



Part 04 Dimension diagram



Part 05 Compare specifications

항목	CM-H505	Minolta (CA-210)	Minolta (CA-310)
Picture			
FOV	10 mm or 27mm	10 mm or 27mm	10 mm or 27mm
WD	27±5mm	30±5mm	30±5mm
Acceptance angle	±5°	±5°	±5°
Measuring range(cd/m ²)	0.001~99,000	0.3~3000	0.015~6000
Display	Integrated	Separate	Separate
Interface	RS-232C	RS-232C or USB	RS-232C or USB
Probe dimension/weight	213 X 45 /400g	236X49/500g	236X49/500g
Body dimension	Integrated	340X110X213	340X110X213

Part 05 Compare hardware

Item	CM-H505	Minolta (CA-210)	Minolta (CA-310)
Filter	Interference Filter Advantage : 1.High transmittance 2.insensitive to temperature/humidity Disadvantage : 1. precision control to incidence angle	Glass Filter Disadvantage: 1. Low transmittance 2. sensitive to temperature/humidity	Interference Filter
Sensor	Si-Photodiode	Si-Photodiode	Si-Photodiode
Light guide	Lens & Fiber Advantage : 1.control incidence angle 2.eliminate polarization Disadvantage : 1.High cost	Lens & Fiber	Lens & Fiber
Randomize	Pizza shape(round 6 split)	Pizza shape	Pizza shape
Amp(Circuit)	Integration Advantage : 1.Deep light (by control expose time) Disadvantage : 1. S/W frequency and flicker	Instance amplifier Advantage : 1. Real time frequency Disadvantage : 1. limit gain.	Instance amplifier

Thank You !

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