

Needs, Targets, Priorities & Challenges

Automotive Display Trends

(Selected Topics)

• Larger Displays

- Direct view ⇒ 20+”
- Non-standard (16:9) aspect ratio
- Head-up towards contact analogue (AR)



• Higher Resolution

FHD in near future, UHD might come; higher ppi towards “RETINA”

• Higher Display Quality

Larger gamut, faster response time for LCD, lower power, sunlight readability

• Flexible Displays with seamless integration

• More Displays (today's luxury cars displays are tomorrows intermediate, ...)

Instrument cluster, infotainment, controls, HUD, rear seat, smart mirror,

Needs, Targets, Priorities & Challenges

Vehicle's display



Alfa Romeo Giulia
Project 952, 2016



Alfa Romeo Stelvio
Project 949, 2017



Chrysler Portal, EV of FCA
@ CES 2018 Las Vegas



Mitsubishi concept
2017



Characterization - Key Automotive challenges and standards



Brightness



Color



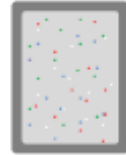
Luminance
 Uniformity



Pixel & Line Defects



Black Mura



Sparkle



Mura



Image Sticking



View Angle



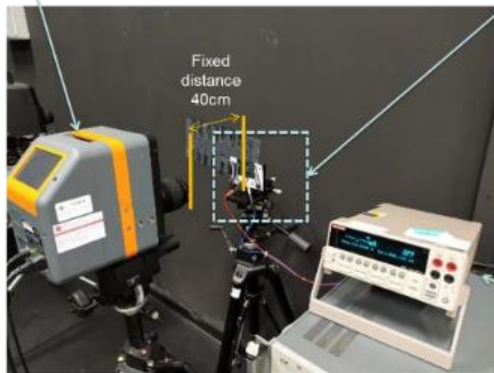
LED Mura

FCA 7.Z6161 – 7.M0015 – FCA 900805

- **Current density** as function of the applied voltage
- Device **luminance** as function of the applied voltage
- Device **colorimetric coordinates** as function of the applied voltage
- **Microscope** analysis (non-contact profilometers)

Radiant PMI16-XB
 colorimetric camera

Sample holder with
 electrical connections



Sourcemeter
 Keithley 2400

FCA 900053 - SAE J2412

- **Thermal cycles** - Electrical performance will be checked at the end of the test
- **Humidity test** - Electrical performance will be checked at the end of the test
- **Accelerating weathering** SAEJ 2412 (@ 1240kJ)
- **Natural weathering** 1 year or 6 months of external exposure (@ 5° or 45°)

Ciclo SAE J-2527

	Dark Cycle	Light Cycle	
timing	1	2	h
humidity	95	50	% RH
black panel temp	38	70	°C
Dry bulb temp.	38	62	°C
Total cycle timing	3	hrs	
energy intensity @340nm with Extended UV filter	0.55	W/m2/nm	



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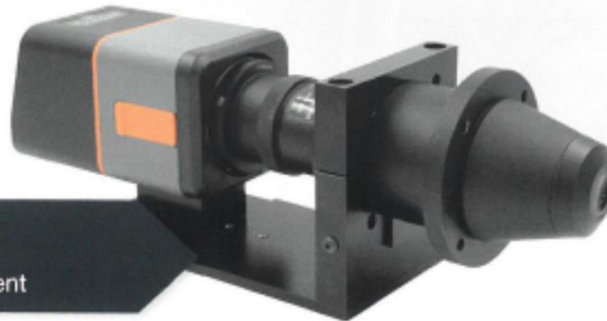
High definition photometric digital camera to capture images of LCD and OLED displays combined to imaging processing software:

- Luminance
- Contrast
- Color GAMUT
- MURA effects



RADIANT Photo-colorimetric Camera IM29

RADIANT
VISION SYSTEMS
A HORIBA MINOLTA Company



Conoscope Lens
For View Angle Performance Measurement



RADIANT Photometric Camera PYM29

- View angle performance measurements



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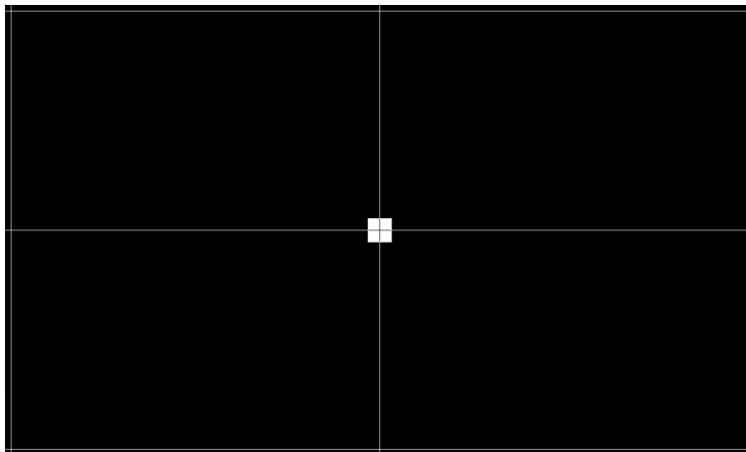
Tests will be performed in darkroom condition

Radiant IP-PMY16:

array-detector luminance meter with a CCD sensor of 4896 x 3264 pixels cooled at 5°C

Required condition:

1. Green pattern
2. Perfect alignment between display pixel array and camera pixel array



The pattern on the left is used to verify condition 1 and 2. The white box must have known sizes (in this case 40x40 pixels)

