Testlab

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Haar, July 1st 2018

TV Test Nr. 2018-0017.1

Client:	Samsung Electronics Co., Ltd. 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do 16677, Korea
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EUTs:	TV, Samsung QE65Q9FN TV, Samsung QE65Q7FN
Type of Test:	Residual Image

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Table of contents:

1.) Table of delivered EUTs and accessories

All data in this report are only valid for the product specified below

Two TV-sets were delivered in standard sales package with accessories.

EUT 1:   TV
Manufacturer: Samsung
Model: QE65Q9FNAT
Model Code: QE65Q9FNATXZG
Version No.:   02/QNQ9F
Serial: 0BE43SLK300019H
Software Version: T-KTM2DEUC-1103.5, BT-S

EUT 2:   TV
Manufacturer: Samsung
Model: QE65Q7FNAT
Model Code: QE65Q7FNATXXU
Version No.:   01/QNQ7F
Serial: 0BLH3SDK300010W
Software Version: T-KTM2DEUC-1103.5, BT-S

All measurements have been conducted with EUT1 and EUT2.

2.) Description of measurements and test environment

2.1 Measurement equipment

Equipment	Manufacturer	Type	Internal Labelling
Spectroradiometer	Konika/Minolta	CS2000	
Thermal Camera	Flir	E4	
UHD-BD-Player	Panasonic	DMP-UB900	
HDMI-Splitter	1-8	HDMI 2.0a	
Imaging Software	Portrait Displays	Calman 5 Pro	
Power Meter	Zimmer	LMG-95	

2.2 Measurements

2.2.1 Method of tests and analysis

Residual images are strongly dependent on the intensity of burn-in patterns on the screen, as on the time they are being displayed. In modern TV sets maximal intensity is only achieved by special pattern size, special sequencing, and coding in HDR. Time of maximal luminance is limited by TV´s screensavers.

For measurements and analysis of residual image and burn-in we build on the method described in IDMS 1.03 (Information Display Measurement Standard, www.icdm-sid.org) chapter 10.4 "Residual Image".

To get maximum performance out of the EUT we made some enhancements:

- sequences are coded in HDR for maximum stress
- black pattern has a white frame to minimize backlight dimming
- white pattern is reduced to 36% area to avoid strong power limiting
- area of burn in is only APL 16% (instead of 48%) for maximum light output
- countermeasures against screen saver (dynamic sequence)

To get more relevant results we:

- added analysis of 10 Nit grey frame (for short time image sticking)
- added measurement of long term residual contrast after cooling phase
- added measurements by thermal camera to analyze the heat of the panel

Our source sequence is coded in MP4-video, UHD, H.265, SMPTE-2084 PQ EOTF, BT-2020 Color Space, 23,976 fps, and played back from UHD-BD-Player.

Burn-in-time for image sticking (memory effect): 10 minutes

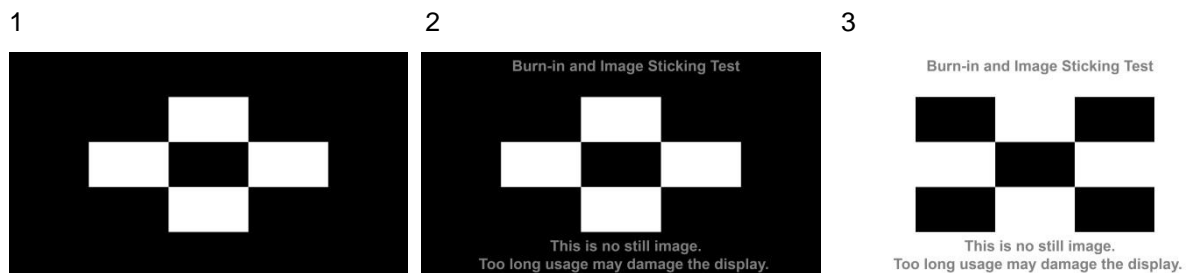Burn-in-time for destructive burn-in: 72 hours

2.2.2 Burn-in Test sequence:

Patterns for measurement before and after burn-in:

1   2   3

1) Fullscreen black with tiny white frame and markers

2) White (10.000 Nits) area 36% with markers

3) Dark grey (10 Nits) fullscreen with markers

Pattern for burn-in:

1   2   3

1) Checkerboard rectangle size of 0.2 x 0.2 screen, without border rectangles: APL 16%

2) Adding text, blinking with (1) every four frames

3) Border rectangles white for strong APL change to reset screen saver of TVs: 2 seconds, every 20 seconds

4) Loop to (1), use whole sequence for specified time

The TVs are reset to default picture mode "standard" factory setting. Eco-Mode (Light Sensor) is switched off. Auto shutdown after four hours is switched off. Before the tests TVs get 30 min. warmup phase by watching TV program.

Test sequences are played back by UHD-BD Player (USB Input Mediaplayer) and sent to the TVs, where they are put in at HDMI-1.

4.) Conclusion

4.1. Even though we use a HDR-sequence with maximum light output there are no residual image problems noticeable. Memory effect is measured minimally in the Q9 with its 480 QLEDs, but not visible. Wearing-out of backlight or panel was not measurable in our one week lab session (including three days burn-in test), as after standby phase panel gets back to normal. It is very hard to isolate retention artefacts, as dimming is very strong on these TVs (because they are to be measured in standard mode). For example in the burn-in test the Q9FN changes it brightness along with the blinking burn-in image sequence between 600 and 1200 Nits. Still pictures (white, black, grey) for measurements get darker after less than one minute, so results have to be captured fast.

After acknowledging these factors, making screenshots and thermal measurements it is safe to say that both EUTs suffer from no relevant residual image problems at all.

- No burn-in
- No image sticking

All 2018 Samsung QLED-TV use the same panel technology with VA (vertical alignment) and its backlight unit structure is configured either full area local dimming (like the Q9FN we tested), or in the bottom edge like the Q7FN.

Samsung Electronics GmbH assured us in written form that all TVs of the Samsung 2018 QLED-Series use the same LED configuration between both and generate similar brightness as the ones we measured, so residual image and burn-in effects have to be identical. So we can conclude, that no 2018 model suffers from neither relevant memory effect (image sticking) nor destructive burn-in.

(Model types see page 7)

4.2 Models of the Samsung 2018 QLED-TV series:

Model / Type series		
Q9	Qx55Q9xN*****	World wide model
	Qx65Q9xN*****	
	Qx75Q9xN*****	
	GQ55Q9xN*****	German model only
	GQ65Q9xN*****	
	GQ75Q9xN*****	
Q8	Qx55Q8xN*****	World wide model
	Qx65Q8xN*****	
	Qx75Q8xN*****	
	GQ55Q8xN*****	German model only
	GQ65Q8xN*****	
	GQ75Q8xN*****	
Q7	Qx55Q7xN*****	World wide model
	Qx65Q7xN*****	
	Qx75Q7xN*****	
	GQ55Q7xN*****	German model only
	GQ65Q7xN*****	
	GQ75Q7xN*****	
Q6	Qx49Q6xN*****	World wide model
	Qx55Q6xN*****	
	Qx65Q6xN*****	
	Qx75Q6xN*****	
	Qx82Q6xN*****	
	GQ49Q6xN*****	German model only
	GQ55Q6xN*****	
	GQ65Q6xN*****	
	GQ75Q6xN*****	
	GQ82Q6xN*****	

1st "x" include
N : Korea/USA/South America
E : EU/CIS
A : Asia, Africa, China, Taiwan

2nd "x" include
C : Curved
F : Flat
S: Super Resolution