Image Quality and Colour Gamut Comparative Performance Test

Canon PIXMA G550 / G540 Photoprinter versus Inkjet Competitor

Test Objective

Canon Europe Ltd commissioned Keypoint Intelligence to conduct image quality and colour gamut testing on the Canon PIXMA G550 / G540 and on an inkjet photo printer competitor (for the purposes of this report, referred to as Device A). Testing was based on printing a mix of photographic images on OEM glossy paper, budget office glossy, and high quality ILFORD glossy photo paper with each device operated in high quality mode. Keypoint Intelligence compared the models' halftone reproduction quality as well as colour gamut performance, with all testing performed in Keypoint Intelligence's European test facility in Wokingham, UK.

Executive Summary

Keypoint Intelligence testing revealed that the Canon PIXMA G550 / G540 (with the same engine employed in the PIXMA G650/PIXMA G640) produced comprehensively larger colour gamut volumes on all three media types. It delivered up to 40% larger colour gamuts than Device A, with the highest variance shown on the high quality ILFORD glossy photo paper. The Canon printer's colour space volume advantage means it has the ability to print a wider range of colours. This result dovetails with its overall superior image quality performance in Keypoint Intelligence's subjective halftone evaluation.

A mix of 10 images was chosen to represent the type of photography a typical consumer would take and have printed as a physical keepsake. Judged by a panel of

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Keypoint Intelligence analysts and members of the general public, the Canon PIXMA G550 / G540 outscored Device A on eight of the 10 images that were printed on each printer and on three different glossy papers. The panel preferred the Canon's output overall, citing its brighter colours, better fine detailing, and more natural, warm skin tones compared to the inkjet photoprinter competitor. On each media type, colour gamut slicer images revealed the Canon device had the advantage in the mid-range orange-red tones, which is in line with the fact the Canon model includes red ink. The Canon PIXMA G550 / G540 had the advantage in the darker contrast range (hence the Canon G550 / G540's better fine detailing in the shadow areas), while both had comparable results at the very light end of the contrast area which should mean high quality when reproducing highlights.

The Canon G550 / G540 had a clear advantage with the monochrome image; it delivered a truer neutral grey than that of Device A, and excellent detailing in the light contrast areas. The Canon G550 / G540's dedicated grey ink is a huge benefit for those who like to print artistic black-and-white imagery. Device A reproduced the images very well using OEM-brand media, however its output tended to suffer from being slightly dark on the budget glossy and high quality ILFORD media, and as a consequence lacked vibrancy and fine detailing. Even so, there were examples where the competitor device handled a rich, black background extremely well and achieved a more accurate reproduction and better depth of field than the Canon device (for example, the Night Temple and Food images.
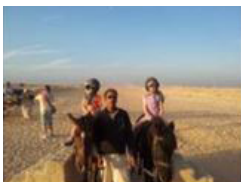
Based on the results of this test, the Canon PIXMA G550 / G540 is a strong choice for any business that prizes colour fidelity and the high-quality reproduction of both colour and black-and-white photographic images.
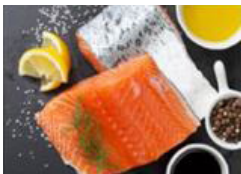
SUBJECTIVE HALFTONE ASSESSMENT

The widespread popularity of smart phone use means that the average consumer is likely to take photographs with their mobile phones these days. And, thanks to their size and portability, people can easily 'capture moments' and take candid snapshots of daily life and special occasions. Other input devices, such as digital SLRs, are still highly prized for photographic use. Despite the abundance of social media platforms where photos can be shared, people still want their personal memory images turned into physical keepsakes, whether it's an impulse buy experience photograph capturing a thrilling theme park ride, a casual family holiday shot, a birthday or wedding occasion, or a more aesthetic creative image. Print studios, and other outlets such as activity centres, leisure and theme parks, and high street digital print shops need a trusted printer that is capable of faithfully reproducing photographs taken on a variety of input devices.

Keypoint Intelligence technicians printed a selection of 10 mixed-genre images (produced on smartphone devices and digital camera SLRs) on each printer using three different media types. The images were printed at A4 size using the highest quality setting available. A panel of three Keypoint Intelligence analysts and four members of the general public assessed image output. The printed images were arranged in pairs according to media type to be viewed side by side anonymously. All images were assessed under natural daylight conditions. Each reviewer chose the image that they preferred, with an equal rating awarded where the models' quality was judged to be on par. The results below show which printer had an overall advantage or where there was an even score tally with no clear winner.

Overall Subjective Halftone Assessment Results

#	Image Quality Test Target	Canon PIXMA G550 / G540	Device A
1	Scuba Dive	✓	
2	Family Street Scene	✓	
3	Family Desert Scene	✓	
4	Family Coastal Scene	✓	

#	Image Quality Test Target	Canon PIXMA G550 / G540	Device A
5	Christmas Party	✓	
6	Elephant Monochrome Creative	✓	
7	Night Temple		✓
8	Theme Park Water Ride	✓	
9	Food		✓
10	Wedding	✓	

Advantage ✓ Equal rating =

- Using a selection of images chosen to represent a mix of photographic styles, the Canon PIXMA G550 / G540 was the decisive winner in Keypoint Intelligence's subjective image quality assessment.

- Based on the reviewers' scores, the Canon device delivered superior quality for eight out of 10 images across the different workflows, overall.

- When printing on OEM glossy and high quality ILFORD glossy media, the Canon G550 was the preferred choice for eight of the ten images; on budget office glossy it won seven out of ten, with Device A winning two (Food and Night Temple) and one (Theme Park Water Ride) was a tie.

- In general, the Canon printer's key advantages over the inkjet competitor centred on its ability to produce more vibrant colours, better fine detailing in the light contrast areas, more natural skin tones, as well as delivering superb neutral grey tones in the monochrome elephant image.

Examples of Subjective Halftone Image Quality

Family Street Scene (image source: Canon EOS 500D SLR)

Canon PIXMA G550 / G540	Device A
OEM Glossy	

Budget Office Glossy	

High Quality ILFORD Glossy	

- ▪ Most reviewers favored the Canon image across the three different media, drawing attention to its more vibrant colours, natural skin tones, and better detailing compared with that from Device A. While the competitor printer produced bright colours on its own-brand media, colours appeared darker and quite muted on the budget and high quality ILFORD papers and hence the background details were not so well defined.

Family Coastal Scene (image source: Samsung Galaxy 8 mobile)

- Five reviewers preferred the Canon image on OEM glossy, with one neutral score and one in favour of Device A's image. The Canon printer outscored Device A on budget glossy and high quality ILFORD, with the majority noting that its images were brighter and exhibited better detailing; Device A's images were, again, a little darker, and lacked vibrancy and fine detailing as a consequence.

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Elephant Monochrome Creative (image source: iStock by Getty Images)

Canon PIXMA G550 / G540   **Device A**

OEM Glossy

Budget Office Glossy

High Quality ILFORD Glossy

- ▪ The majority of reviewers favored the Canon output on both the OEM glossy and high quality ILFORD paper, and all seven reviewers preferred Canon's output on budget glossy. The Canon printer has a dedicated grey ink which helps give it an edge when reproducing this black and white image. Overall, it delivered finer textures and sharper detailing in the foreground, excellent light and dark contrasts, better depth of field, and truer neutrality. Device A's images were judged to be slightly darker (especially on the budget and ILFORD glossy media) and lacked fine detailing in the shadow areas.

Night Temple (image source: Samsung Galaxy 8 mobile)

Canon PIXMA G550 / G540	**Device A**
OEM Glossy	

Budget Office Glossy	

High Quality ILFORD Glossy	

- ▪ The inkjet competitor printer was the clear winner here, with the majority of reviewers preferring its output across all different media types. It delivered finer detailing in the highlights and brighter colours. It also produced richer dark contrast areas, and a better, fuller blue beam of light, aided by the inclusion of a light cyan in its ink set. In contrast, the Canon printer struggled to print the red details in the image's bottom right area (shown circled), and the blue light beam was poorly reproduced.
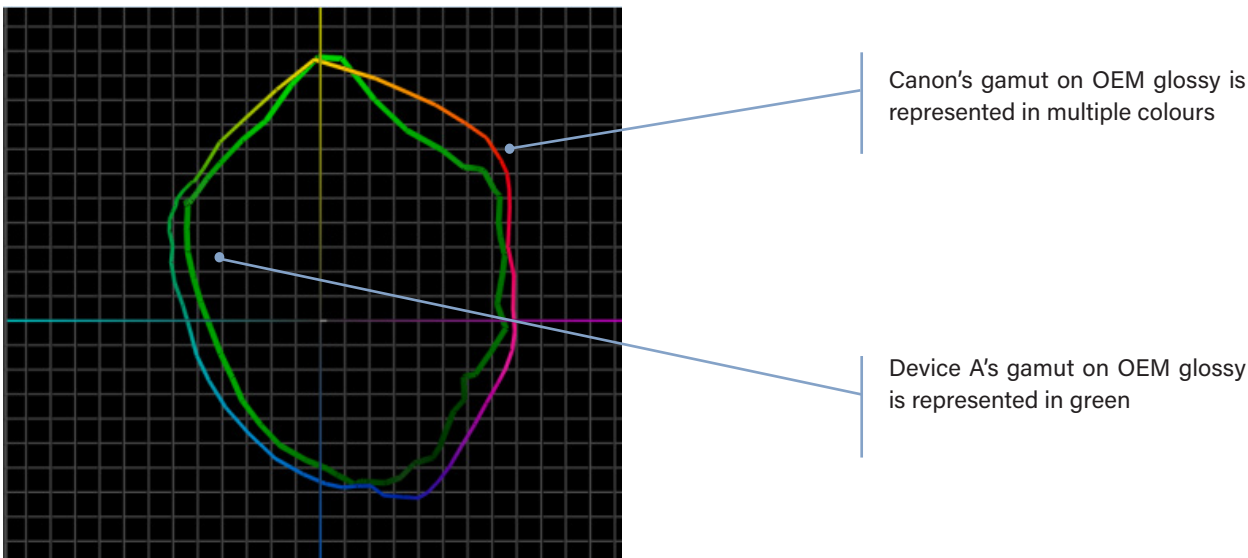
Colour Gamut and Colour Fidelity

Keypoint Intelligence analysed the colour gamut volume and colour space of both devices using the three aforementioned media types. Specifically, the evaluation included expressing each device's colour gamut space as a cubic L*a*b* unit volume and displaying the gamut 'shape' in 2D and 3D views; and showing colour gamut volume in three sliced views based on high, medium, and low L* values to illustrate the colour space available when handling images with light or dark contrast areas.

Colour Gamut Results

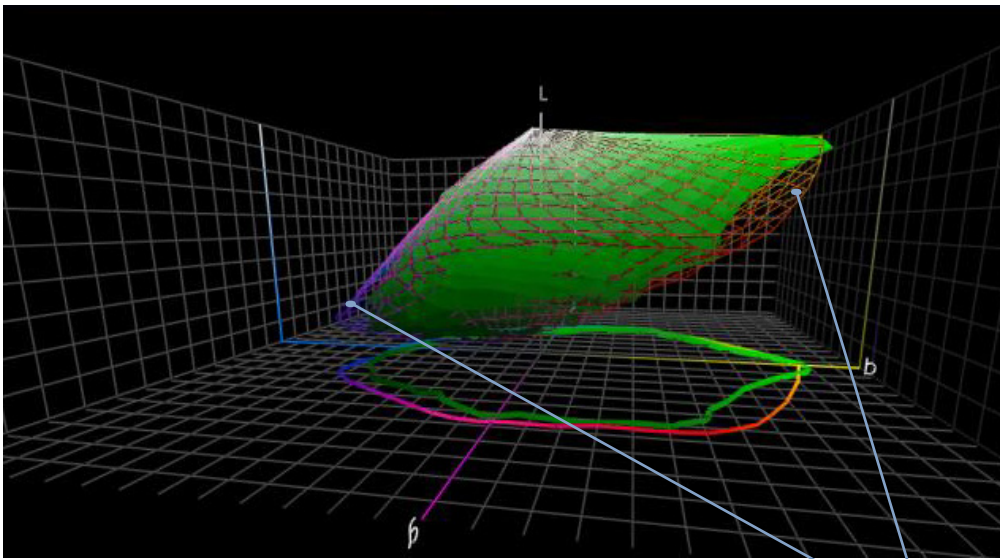| Cubic L*a*b* units Volume	Canon PIXMA G550 / G540	Device A	% larger/smaller (-) Canon vs. Device A
OEM Photo Glossy	641,396	519,413	23.5
Budget Office Glossy	632,156	482,681	31.0
High quality ILFORD Glossy	679,940	481,375	41.2

- In Keypoint Intelligence's colour gamut assessment using the devices' highest quality setting and three types of media, the Canon PIXMA G550 / G540 had a clear advantage in all three tests.

- The Canon model produced a 23.5% larger colour gamut on OEM photo glossy media with a volume of 641,396 versus a volume of 519,413 for Device A.

- It produced a 31.0% larger colour gamut than Device A on budget office glossy with a volume of 632,156 versus a volume of 482,681 for Device A.

- On high quality ILFORD glossy media, the Canon delivered a 41.2% larger colour gamut, with a volume of 679,940 versus a volume of 481,375 for Device A.

Colour Gamut 2D Image on OEM Glossy

Canon's gamut on OEM glossy is represented in multiple colours

Device A's gamut on OEM glossy is represented in green

Canon PIXMA G550 / G540 colour gamut (shown chromatically) versus Device A's colour gamut (shown in green) on OEM glossy paper in highest quality settings. The Canon's colour gamut is larger in the orange-red and magenta regions of the spectrum than that of the inkjet competitor, possibly highlighting the advantage of accommodating a red ink. While Device A includes light cyan and light magenta inks, the benefit can't be detected on this 2D image.

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Colour Gamut 3D Images (Rotated Across Two Axes) on OEM Glossy


The visible wireframe shows that Canon has a larger colour space in the orange-red regions, and has an advantage in the extremities of the blue-magenta colour space
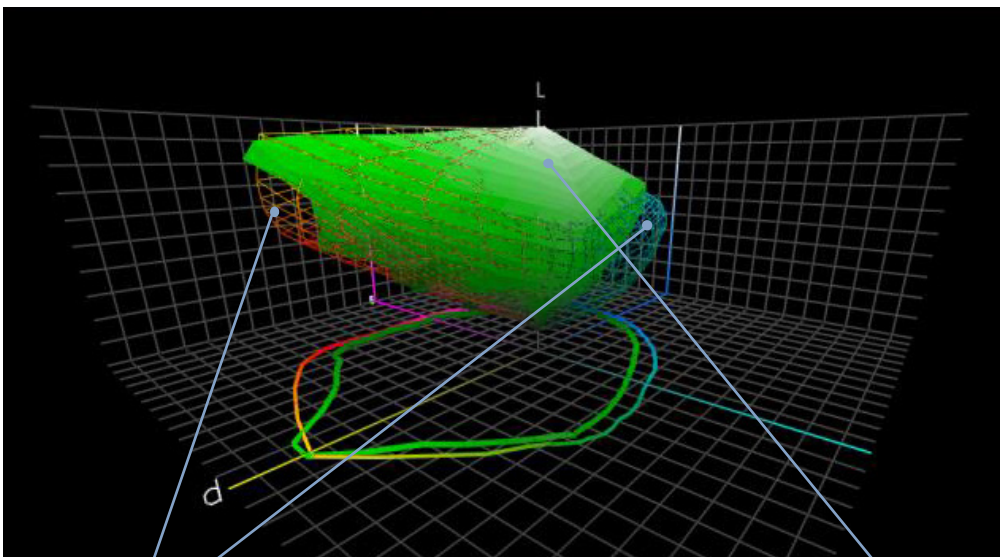
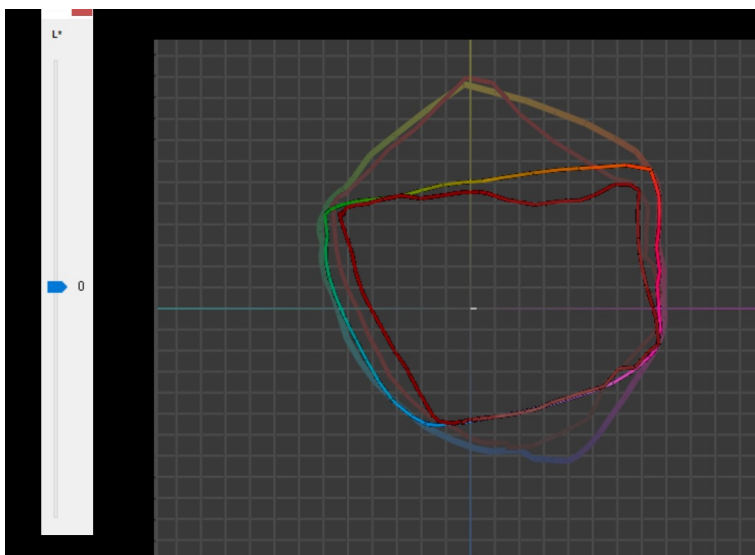Canon has a larger colour space in the red and blue regions

Device A's advantage in the lighter blue-purple colour space with the inclusion of light cyan and light magenta in its ink set is better illustrated here

Colour Gamut Slicer Images on OEM Glossy
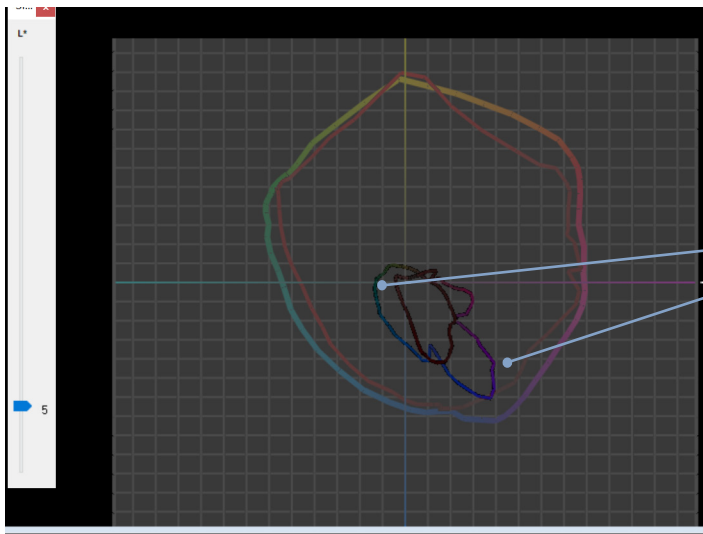
This slicer image shows the Canon's colour space (shown chromatically) advantage in the very low contrast blue to green areas.

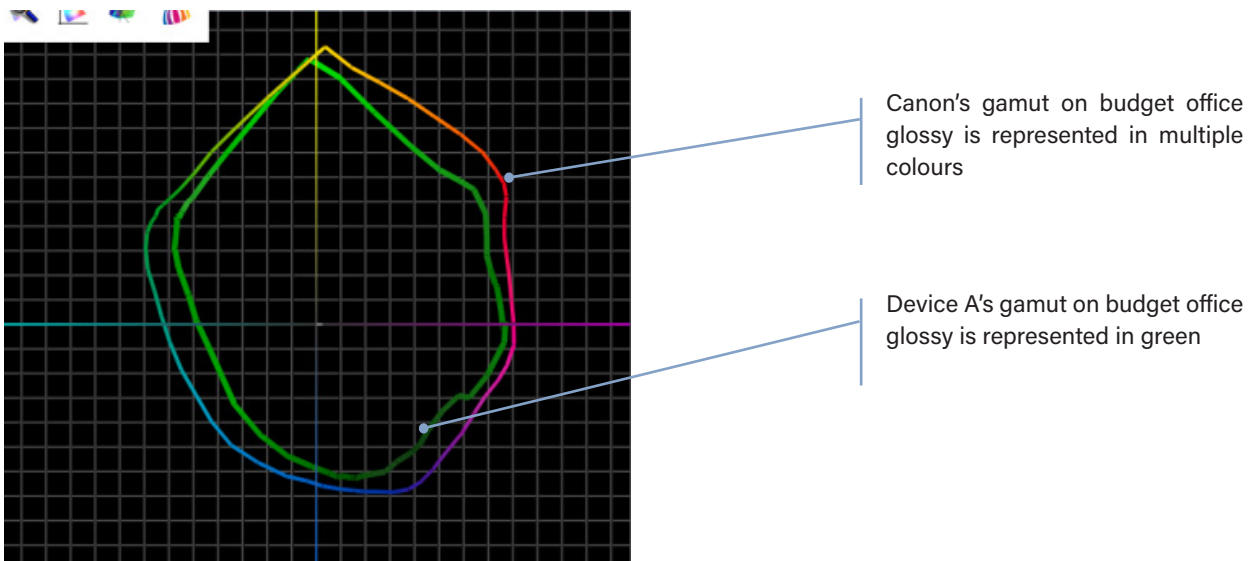Device A (in red) has an advantage in the dark contrast magenta tones

In the mid-range tones, Canon has a slightly larger colour space in the blue-green and red-orange regions

(Canon = chromatic; Device A = red)
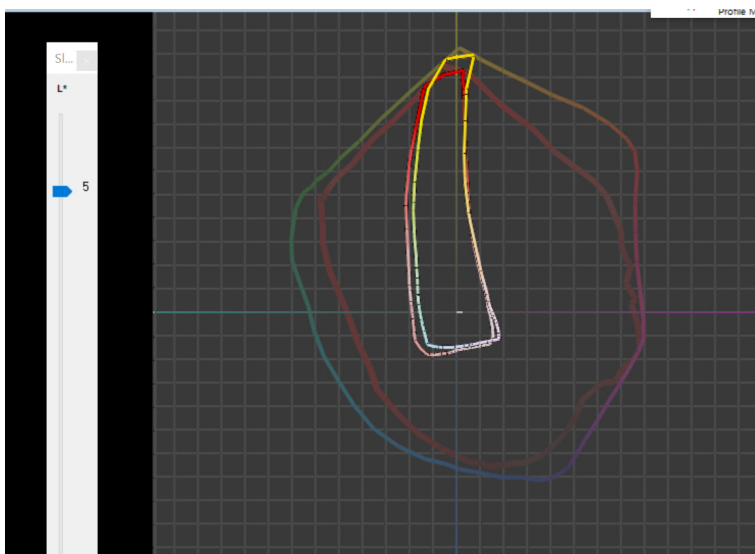
The models are evenly matched in terms of the very light end of the contrast area which should aid when reproducing highlight areas in images. This is evident in the halftone image examples shown above.

Colour Gamut 2D Image on Budget Office Glossy

Canon's gamut on budget office glossy is represented in multiple colours

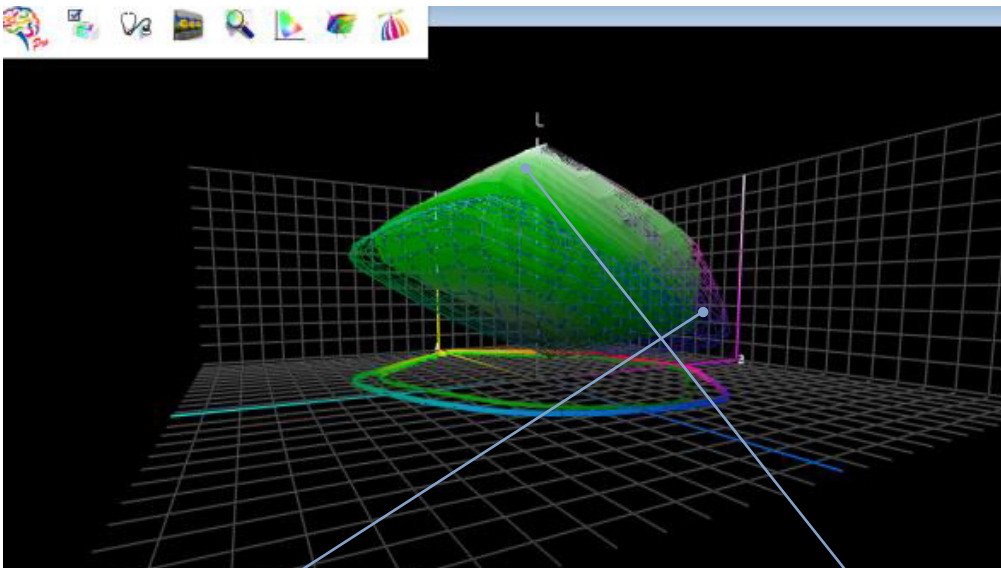Device A's gamut on budget office glossy is represented in green

Canon PIXMA G550 / G540 colour gamut (shown chromatically) versus Device A colour gamut (shown in green) on budget office glossy paper in highest quality settings. The Canon's colour gamut is larger across the spectrum than that of Device A, except for the yellow region. It has a clear advantage in the orange-red region which could be attributed to its red ink.

**Colour Gamut 3D Images (Rotated Across Two Axes) on Budget Office Glossy**
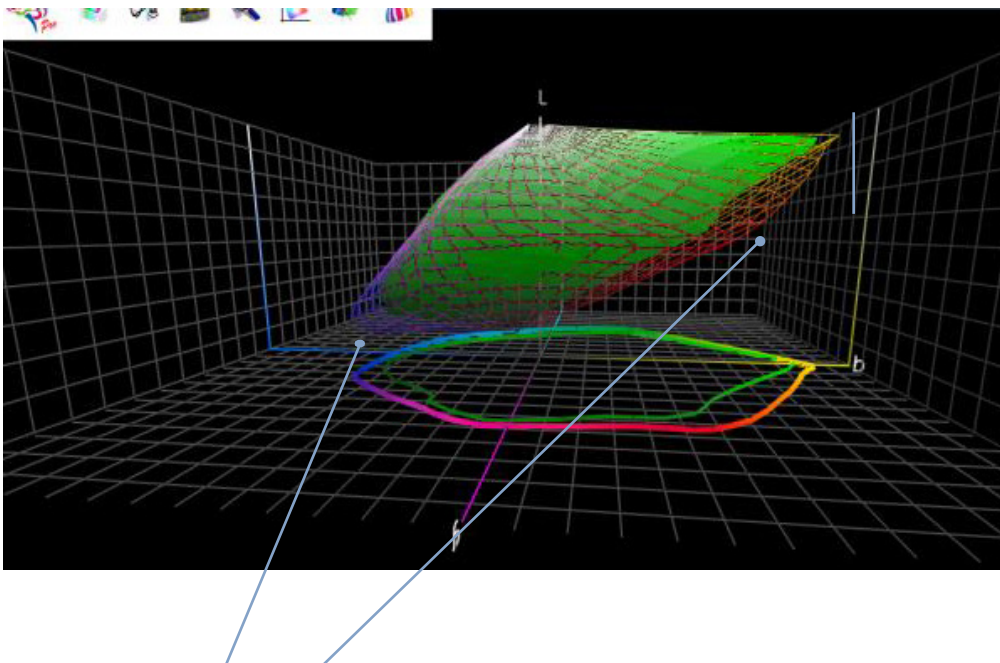
Canon is very strong in the orange-red region and the dark contrast magenta-blue areas as indicated by the visible wireframe
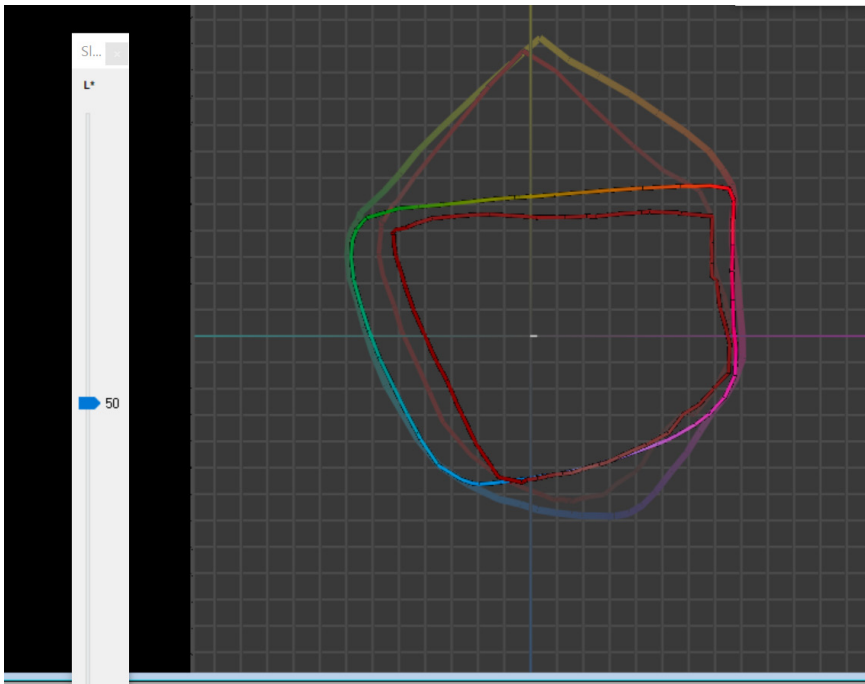
Again, this shows a clear wireframe advantage for the Canon in the red regions

Device A, however, is strong in the light contrast areas

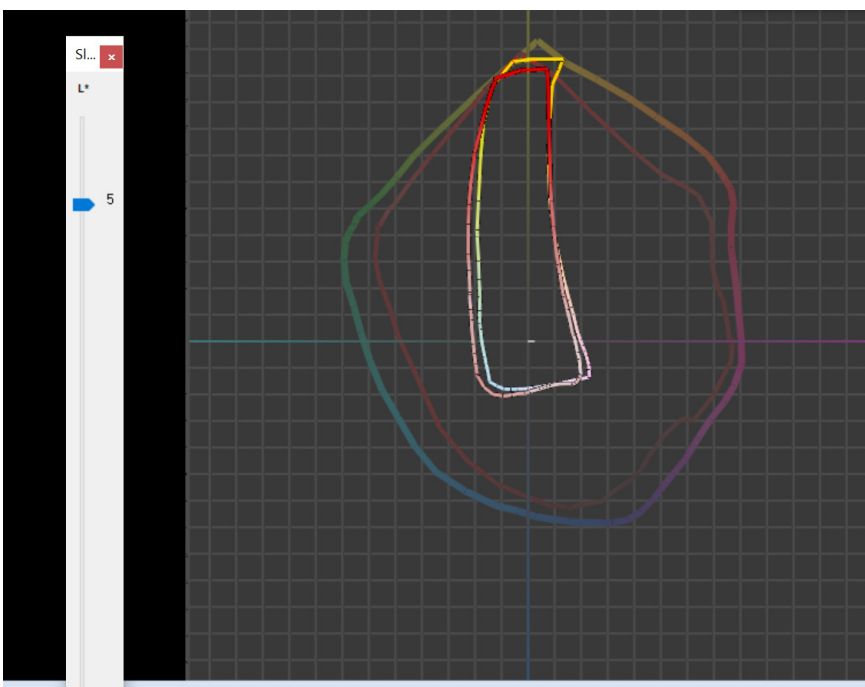**Colour Gamut Slicer Images on Budget Office Glossy**
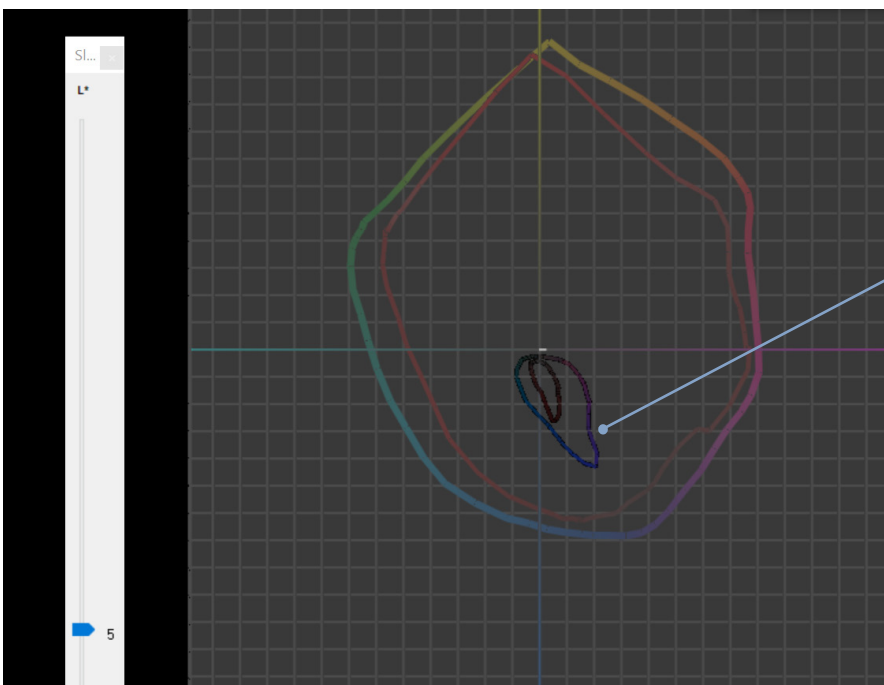
This slicer image shows the Canon's significant colour space advantage in the very low contrast areas
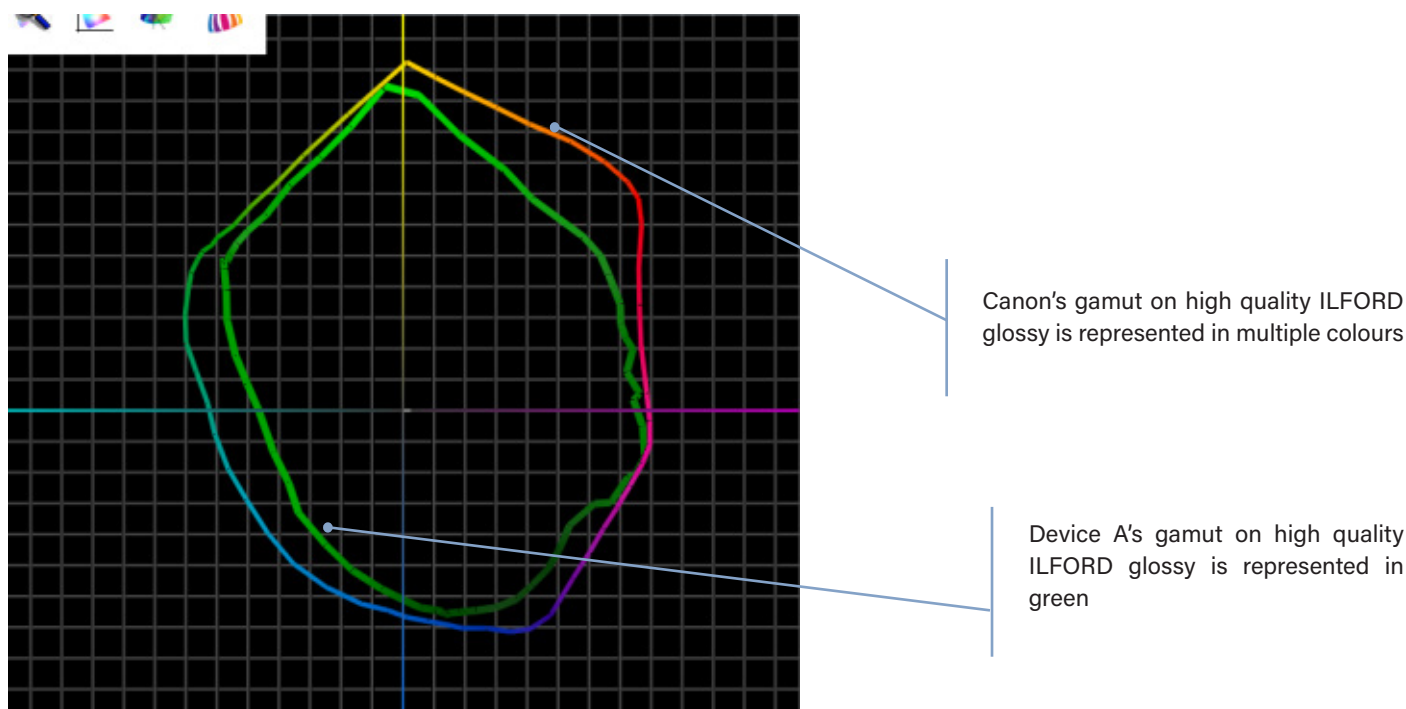
(Canon = chromatic; Device A = red)

Canon's advantage in the mid-range red-orange and blue-green tones is again very evident

(Canon = chromatic; Device A = red)

The models are largely evenly matched in terms of the light contrast on budget glossy

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Colour Gamut 2D Image on High Quality ILFORD Glossy

Canon's gamut on high quality ILFORD glossy is represented in multiple colours

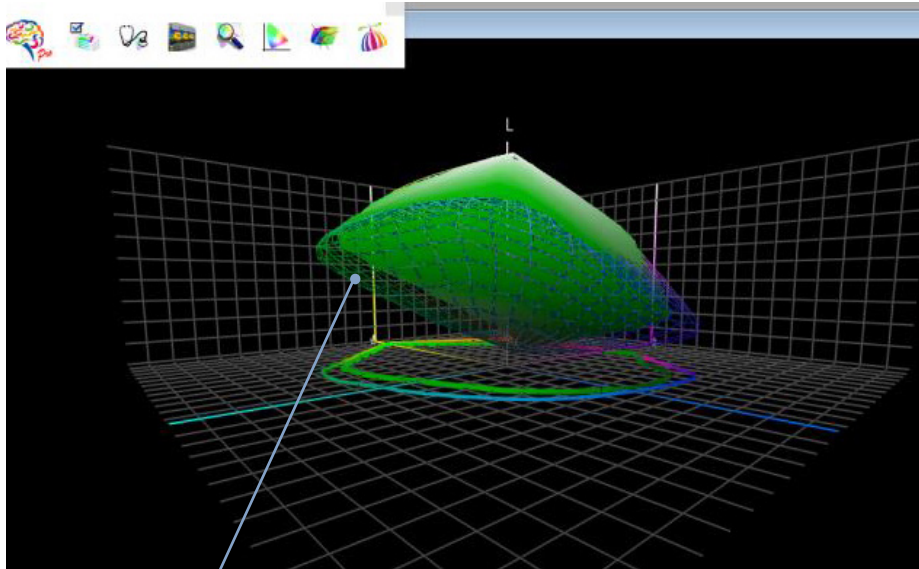Device A's gamut on high quality ILFORD glossy is represented in green

Canon PIXMA G550 / G540 colour gamut (shown chromatically) versus Device A colour gamut (shown in green) on high quality ILFORD glossy paper in highest quality settings. Canon's colour gamut has a clear advantage in the orange-red and blue-green regions.

**Colour Gamut 3D Images (Rotated Across Two Axes) on High Quality ILFORD Glossy**
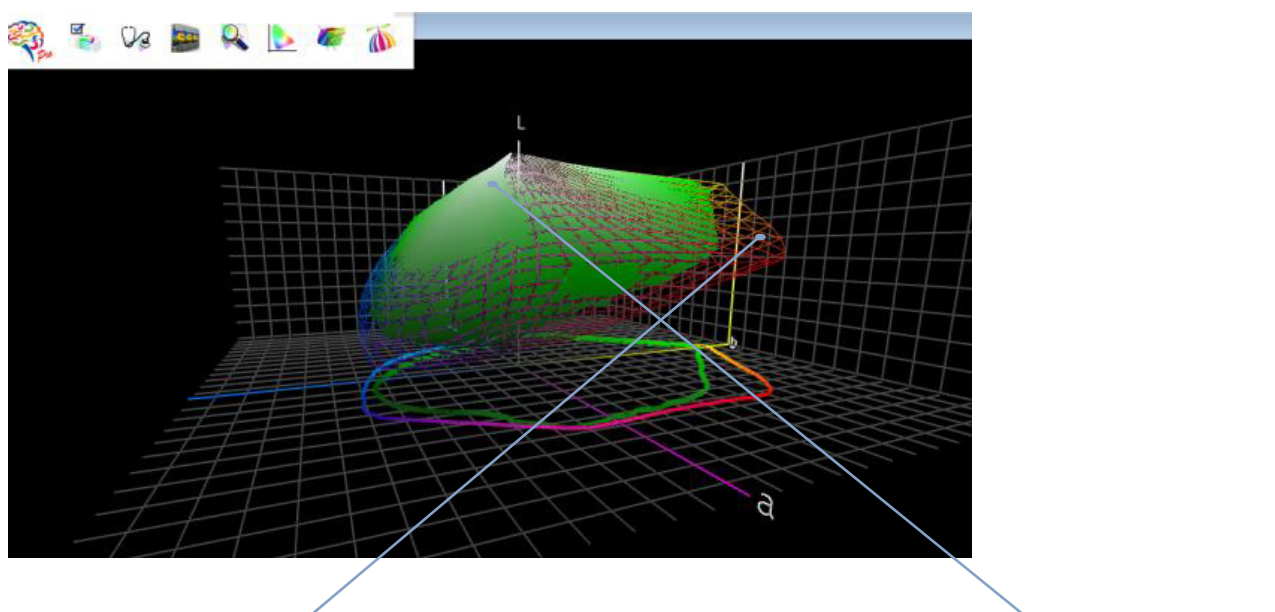
Canon's wireframe advantage in the red colour space with the inclusion of red in its ink set is clearly illustrated here

Device A, however, is strong in the light contrast blue areas

With the view tilted upwards, Canon has the larger colour gamut at the bottom end of the colour space
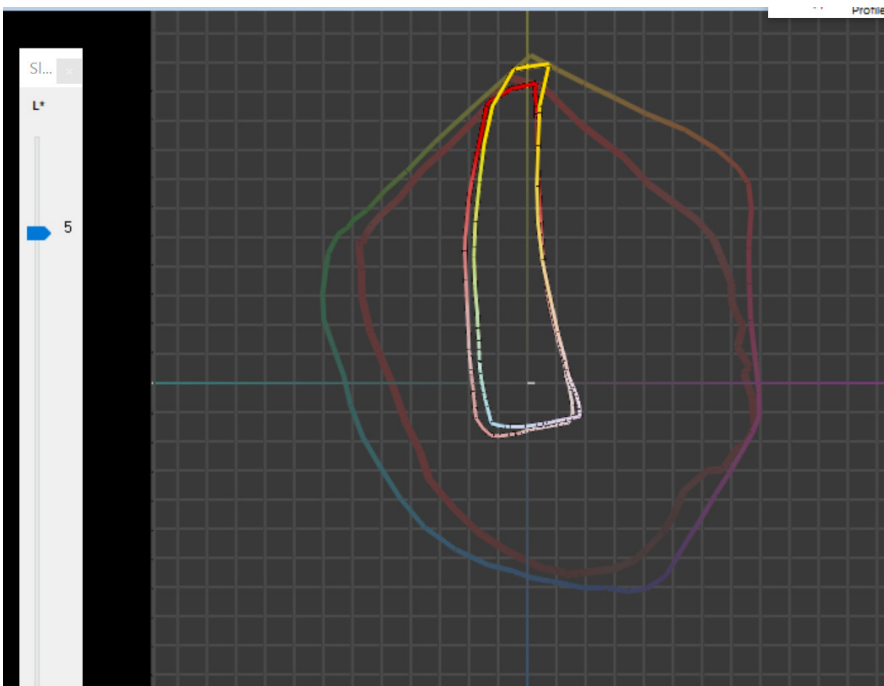
Colour Gamut Slicer Images on High Quality ILFORD Glossy
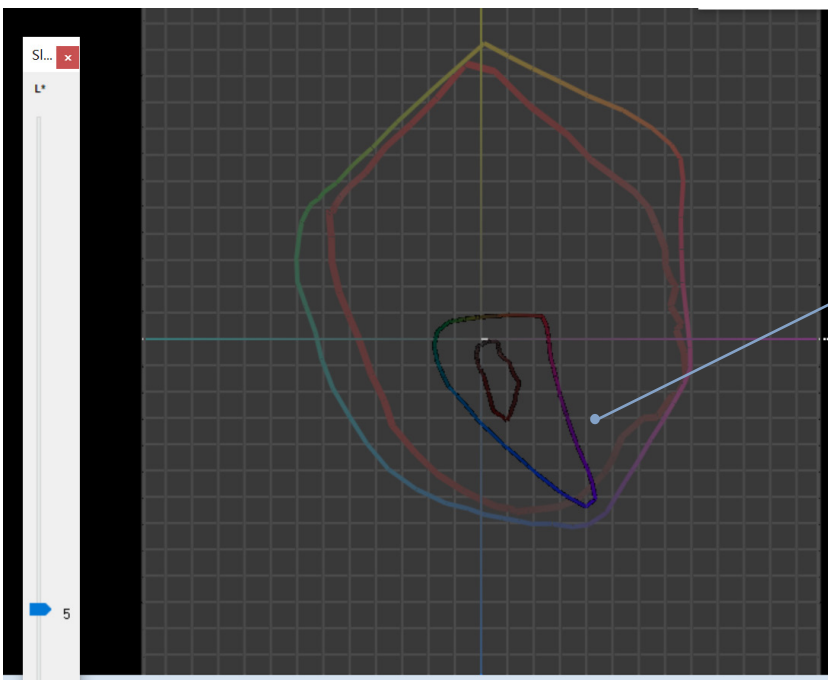
This slicer image from underneath shows the Canon's significant colour space advantage in the very low contrast areas

(Canon = chromatic; Device A = red)
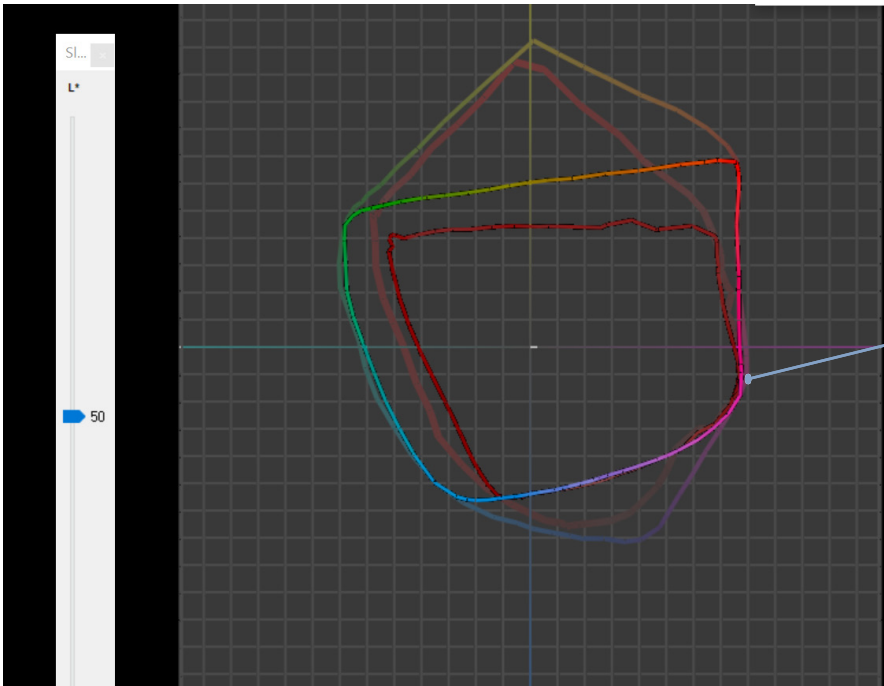
In the mid-range tones, Canon has the larger colour space except in the magenta regions where the models are more evenly matched

(Canon = chromatic; Device A = red)

The models are largely evenly matched in terms of the light contrast tones on premium glossy, but Canon has a slight edge in the yellow regions

SUPPLEMENTARY INFORMATION
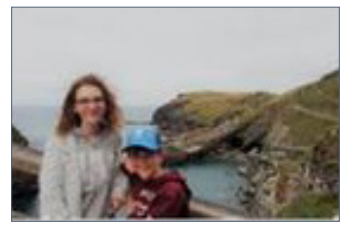
Image Quality Test Targets

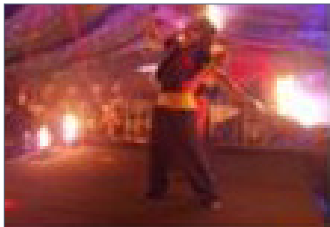1. Scuba Dive

2. Family Street Scene

3. Family Desert Scene
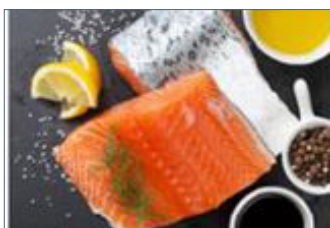

4. Family Coastal Scene

5. Christmas Party

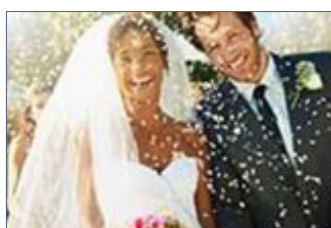6. Elephant Monochrome Creative

7. Night Temple

8. Theme Park Water Ride

9. Food

10. Wedding

Detailed Subjective Halftone Assessment Results

OEM Photo Glossy

#	Image Quality Test Target	Canon PIXMA G550 / G540	Device A
1	Scuba Dive	✓	
2	Family Street Scene	✓	
3	Family Desert Scene	✓	
4	Family Coastal Scene	✓	
5	Christmas Party	✓	
6	Elephant Monochrome Creative	✓	
7	Night Temple		✓
8	Theme Park Water Ride	✓	
9	Food		✓
10	Wedding	✓	

Advantage ✓ Equal rating =

Budget Office Glossy

#	Image Quality Test Target	Canon PIXMA G550 / G540	Device A
1	Scuba Dive	✓	
2	Family Street Scene	✓	
3	Family Desert Scene	✓	
4	Family Coastal Scene	✓	
5	Christmas Party	✓	
6	Elephant Monochrome Creative	✓	
7	Night Temple		✓
8	Theme Park Water Ride	=	=
9	Food		✓
10	Wedding	✓	

Advantage ✓ Equal rating =

High Quality ILFORD Glossy

#	Image Quality Test Target	Canon PIXMA G550 / G540	Device A
1	Scuba Dive	✓	
2	Family Street Scene	✓	
3	Family Desert Scene	✓	
4	Family Coastal Scene	✓	
5	Christmas Party		✓
6	Elephant Monochrome Creative	✓	
7	Night Temple		✓
8	Theme Park Water Ride	✓	
9	Food	✓	
10	Wedding	✓	

Advantage ✓ Equal rating =

The Canon PIXMA G550 / G540 was installed in Keypoint Intelligence's lab with the latest "0.78" level of firmware (as of February 2021). The Canon driver was left in default colour setting, with media settings set to 'Photo Paper Plus Glossy II' and 'Glossy Photo Paper' for third-party media; the image was set to print at A4 size in 'High' print quality mode.

Device A was installed in Keypoint Intelligence's lab with the latest level of firmware (as of February 2021). The driver was left in default colour setting, with media settings set to the relevant media type; the image was set to print at A4 size in highest quality mode.

Media Used in Testing

OEM own-brand :	Canon Photo Paper Plus Glossy II 260gsm
	Corresponding OEM glossy paper
Budget Office:	Staples Everyday Photo Quality Glossy Paper 180gsm
High Quality Premium:	ILFORD Photo Glossy Paper 200gsm

Test Environment Products were tested in Keypoint Intelligence's environmentally controlled UK test lab, which replicates typical office conditions.

Test Equipment Keypoint Intelligence's dedicated test network in Europe, consisting of Windows 2012 servers and Windows 10 Professional workstations, 10/100/1000BaseTX network switches and CAT5e/6 cabling.

Test Procedures The test methods and procedures employed by Keypoint Intelligence in its lab testing include Keypoint Intelligence's proprietary procedures and industry-standard test procedures. Colour gamut size is evaluated using the ICC profiles created using XRite profiler software for each media type and assessed using Chromix ColorThink Pro v3.05 software.

About Keypoint Intelligence

For 60 years, clients in the digital imaging industry have relied on Keypoint Intelligence for independent hands-on testing, lab data, and extensive market research to drive their product and sales success. Keypoint Intelligence has been recognized as the industry's most trusted resource for unbiased information, analysis, and awards due to decades of analyst experience. Customers have harnessed this mission-critical knowledge for strategic decision-making, daily sales enablement, and operational excellence to improve business goals and increase bottom lines. With a central focus on clients, Keypoint Intelligence continues to evolve as the industry changes by expanding offerings and updating methods, while intimately understanding and serving manufacturers', channels', and their customers' transformation in the digital printing and imaging sector.

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