Anonymous Phone

DxO Image Science

Anonymous Phone - Overall image quality scores

DxOMark Mobile

72

The DxOMark Mobile score is a combination of the Photo and Video Mobile scores

The Photo Mobile Score is a combination of the photo scores for each attribute (below)

Photo

DxOMark Mobile - Photo	74
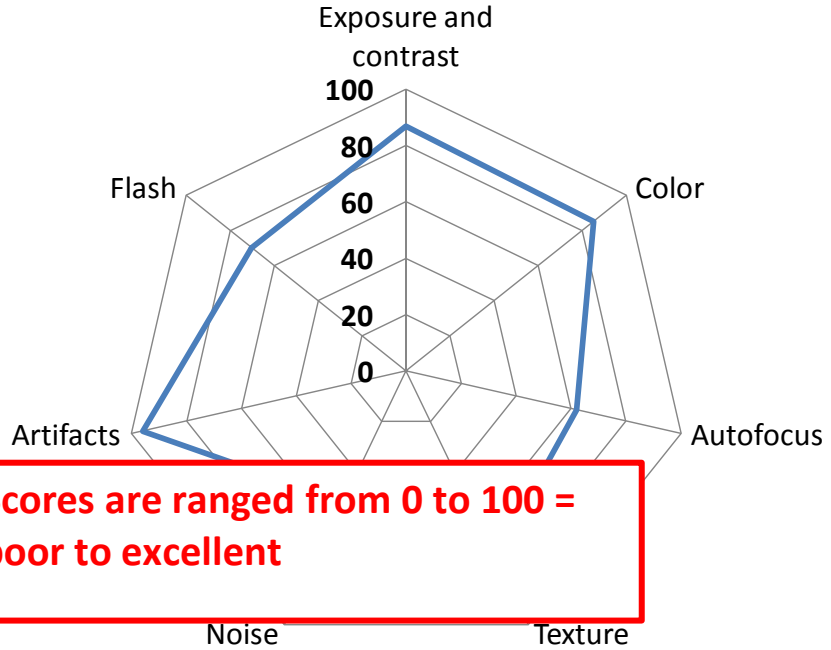
Exposure and contrast	87
Color	85
Autofocus	62
Texture	73
Noise	51
Artifacts	96
Flash	70

Scores range from 0 to 100 (from poor to excellent)

Scores are ranged from 0 to 100 = poor to excellent

Each attribute score is a combination of scores per lighting and viewing conditions (see details further in the report)

The Video Mobile Score is a combination of the video scores for each attribute (below)

Video

DxOMark Mobile - Video	68

Exposure and Contrast	91
Color	92
Autofocus	47
Texture	84
Noise	45
Artifacts	84
Stabilization	28

Scores range from 0 to 100 (from poor to excellent)

Each attribute score is a combination of scores by lighting conditions (see details further in the report)

Executive summary - photo

Pros:
- Color and exposure are very good in most lighting conditions (above 20 lux).
- Good detail preservation even for difficult use cases (8 Mp even in low light)
- Good rendering of highly contrasted scenes.
- Excellent chroma noise reduction.

Cons:
- White balance is yellowish in low light.
- Strong luminance noise, especially in low light.
- Autofocus is slow and a bit unstable (unnecessary refocus).

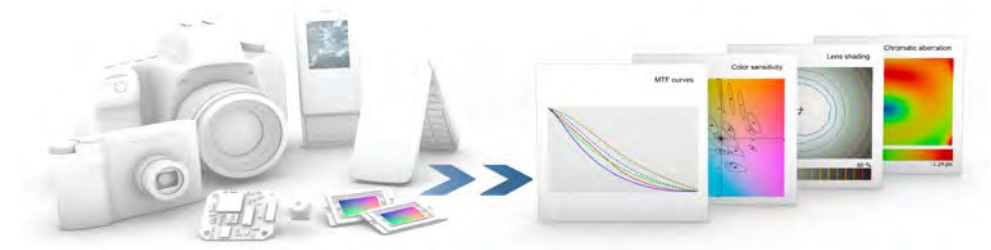Summary of the main strengths and weaknesses of the camera for still pictures

Executive summary - video

Pros:
- Nice details in bright light conditions.
- Vivid and pleasant colors.
- Good exposure.
- Good video stabilization in outdoor conditions.

Cons :
- Strong jello effects.
- Stabilization seems to be ineffective or turned off while not in outdoor lighting conditions.
- Autofocus only works when triggered manually. Large lens breathing when refocusing.
- Strong noise in low light and dark areas with an unpleasant chrominance component.

Summary of the main strengths and weaknesses of the camera for videos

Photo - scores per lighting and viewing conditions

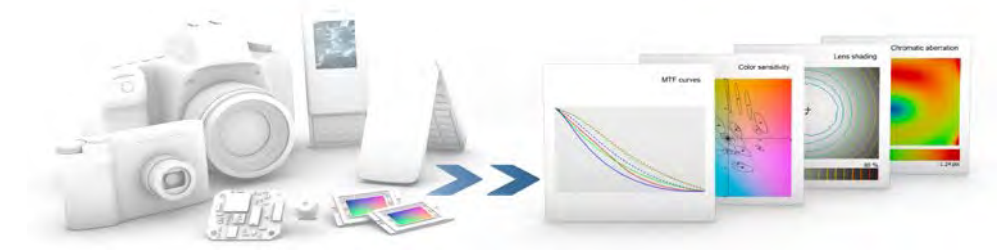| Web low light	
Overall score	76

Photo scores depend on lighting conditions (during the shooting):

 - Low light = 100 lux and less (= indoor with low light)

- Bright light = 700 lux and more (= indoor with bright light, daylight outdoor)

HD low light	
Overall score	
Exposure and contrast	
Color	
Autofocus	
Texture	
Noise	
Artifacts	
Flash	

8 Mp eq. low light	

Photo scores depend on the viewing conditions:

 - Web = images are scaled to SVGA and viewed at 25cm. Equivalent to a 61x46mm image viewed at 25cm.

- HDTV = images are scaled to fit on a HD screen (width=93cm) and viewed at 1.7m.

- 8 Mp eq. = images are scaled so that an 8 Mp image is viewed at 1:1 size on a 0.25mm pixel pitch screen at 60cm.

Web bright light	
Overall score	84
Exposure and contrast	88
Color	88
Autofocus	70
Texture	94
Noise	75
Artifacts	95

HD bright light	
Overall score	84
Exposure and contrast	88
Color	88
Autofocus	70
Texture	94
Noise	75
Artifacts	95

8 Mp eq. bright light	
Overall score	82
Exposure and contrast	88
Color	88
Autofocus	70
Texture	88
Noise	75
Artifacts	85

Video - scores per lighting conditions

Video low light	
Overall score	59
Exposure and Contrast	81
Color	88
Autofocus	47
Texture	75
Noise	25
Artifacts	82
Stabilization	4

Video bright light	
Overall score	77
Exposure and Contrast	100
Color	99
Autofocus	48
Texture	94
Noise	63
Artifacts	83
Stabilization	51

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Anonymous Phone
Summary

Specifications

General

Manufacturer	-
Model	-
Launch Date	-
Launch price	-
Dimensions	-
Weight	-
Operating system	-
Network compatibility	-

Camera

Resolution	-
Sensor size	-
Autofocus	-
Zoom lens	-
Flash	-
Flash Type	-
Stabilization	-
Face detection	-
HDR	-
Geotagging	-
Picture editor	-
Shutter	-

Video

Video resolution	-
Video frame rate	-
Video lighting	-
Video stabilization	-
Video editor	-

Display

Type	-
Size	-
Resolution	-
Touchscreen	-
Colors	-
Protection	-

Memory

Card slot	-
Internal	-

Communication

Wi-Fi	-
Bluetooth	-
USB	-

Secondary camera

Secondary camera	-
Secondary camera spec.	-

Test conditions

General information
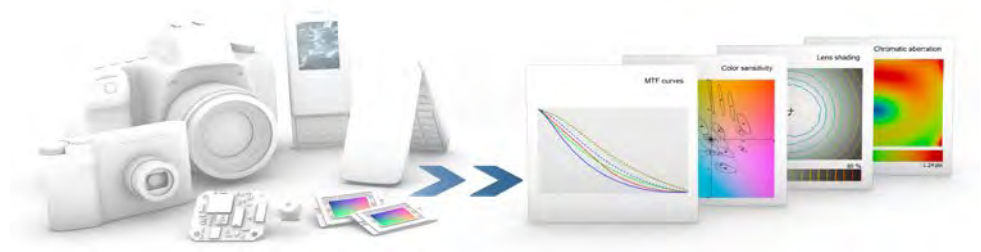
Test delivery date	September 12, 2012
Operator	BD
Location	Boulogne Billancourt, France
Reviewer	HM
Version	2.0

Device under test

Serial number	-
OS version	-

Anonymous Phone
Color, exposure and contrast

Scores

Scores per scene type (range from 0 to 100)

	bright light	low light
Exposure and contrast	88	
Color	88	80

The scores are computed by combining the objective measurements and perceptual evaluation below. The scores are between 0 (poor) and 100 (excellent)

Color code for the cells:
- Blue = Score
- Green = Perceptual evaluation
- Gray = Objective measurement

Expert analysis

Pros:
- Very pleasant and vivid colors in bright light condition.
- Good exposure for most scene types (above 20 Lux).
- White balance is accurate.
- Color shading hardly noticeable.

Cons:
- In low light conditions under incandescent illuminant pictures have a yellowish cast.

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Anonymous Phone
Color, exposure and contrast

Technical overview

This table shows average values for all illuminants

Objective measurements

> **Average measurements in low light = 20 lux (tested illuminants are below).**

> **Average measurements in bright light = 700 lux (tested illuminants are below).**

low light	
Color accuracy (Delta ab)	11.1
WB accuracy (Delta ab)	3.3
Color shading (std dev %)	

bright light	
Color accuracy (Delta ab)	10.5
WB accuracy (Delta ab)	3.7
Color shading (std dev %)	0.9

> **Definitions are given in the detailed measurements for each tested illuminant. Each value measures a default, the smaller the better.**

Subjective scores (natural scene,

Exposure
WB accuracy

> **Exposure score is obtained from a perceptual analysis on a set of outdoor and indoor pictures with different levels of illumination. The scores range from 1 (poor) to 5 (excellent). Evaluated attributes:**
> **- Average exposure level.**
> **- Contrast in dark and bright areas.**
> **- Clipping of highlights and shadows.**

> **Color, white balance and color shading are perceptually analyzed on a set of outdoor and indoor pictures taken with various light sources (tungsten, Fluo and Daylight). Scores range from 1 to 5.**

low lig	
Color shading	
Color	

bright ligh	
Color shading	
Color	

Anonymous Phone

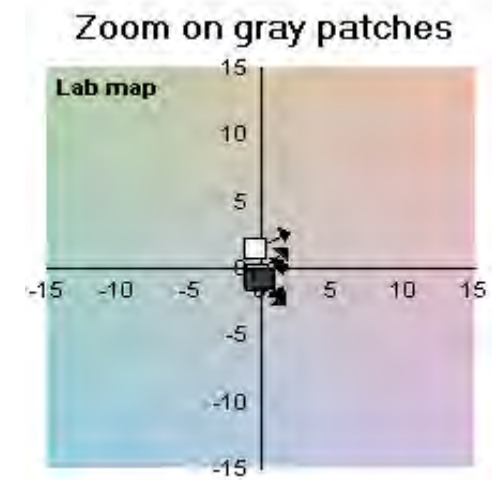## Color, exposure and contrast
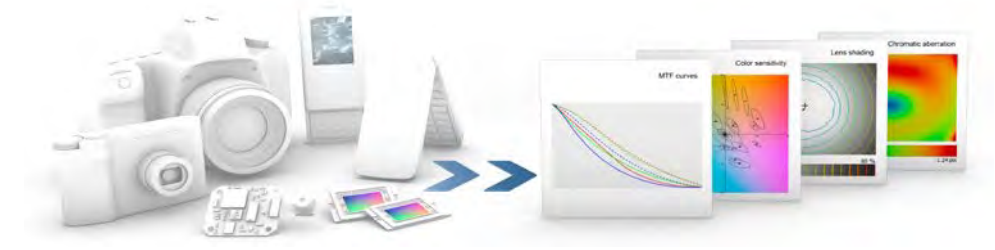
Color accuracy illuminant A

Delta ab is measured on the Colorchecker® with respect to CIE XYZ 1931 standard observer

bright light (700 Lux)

Delta ab mean	9.6
WB accuracy (Delta ab)	2.5
Delta C	7.0
Delta H	5.1

As shot

Zoom on gray patches

low light (20 Lux)

Delta ab mean	17.2
WB accuracy (Delta ab)	20.4
Delta C	12.8
Delta H	8.5

As shot

Zoom on gray patches

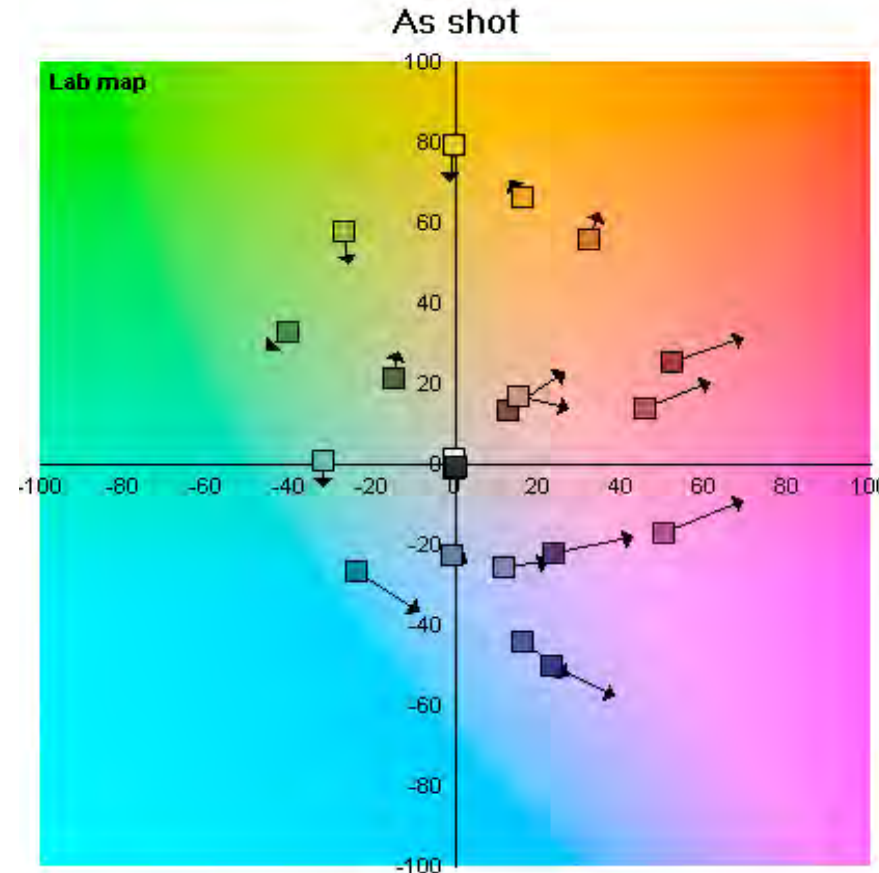# Anonymous Phone

Color, exposure and contrast
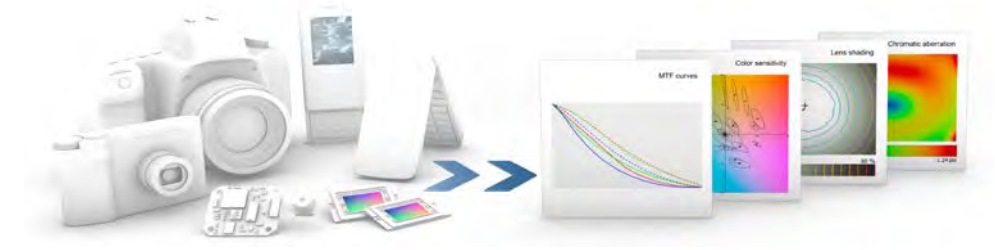
Color accuracy, illuminant D50

Delta ab is measured on the Colorchecker® with respect to CIE XYZ 1931 standard observer

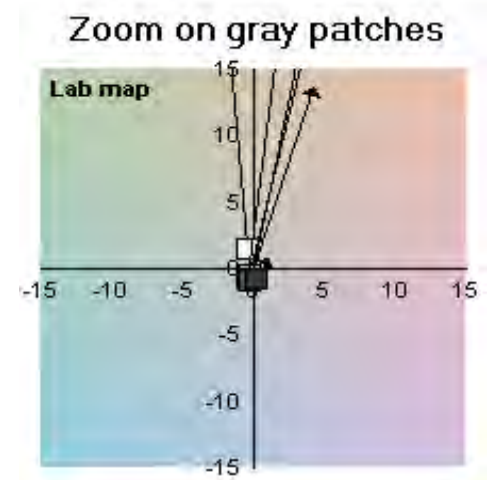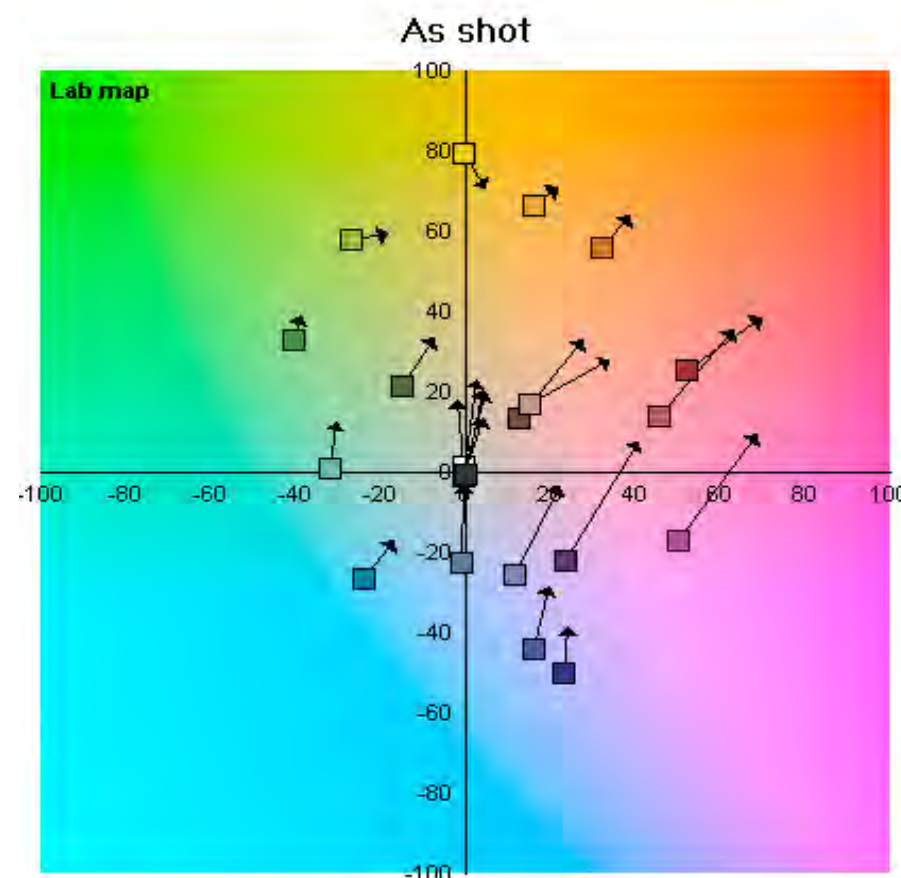| bright light (700 Lux)	
Delta ab mean	10.5
WB accuracy (Delta ab)	4.6
Delta C	8.3
Delta H	5.4

As shot

Zoom on gray patches

low light (20 Lux)	
Delta ab mean	5.1
WB accuracy (Delta ab)	3.3
Delta C	3.6
Delta H	2.8

As shot

Zoom on gray patches

Anonymous Phone

Color, exposure and contrast

Color accuracy, illuminant coolwhite

Delta ab is measured on the Colorchecker® with respect to CIE XYZ 1931 standard observer

bright light (700 Lux)	
Delta ab mean	11.3
WB accuracy (Delta ab)	3.8
Delta C	8.8
Delta H	5.9

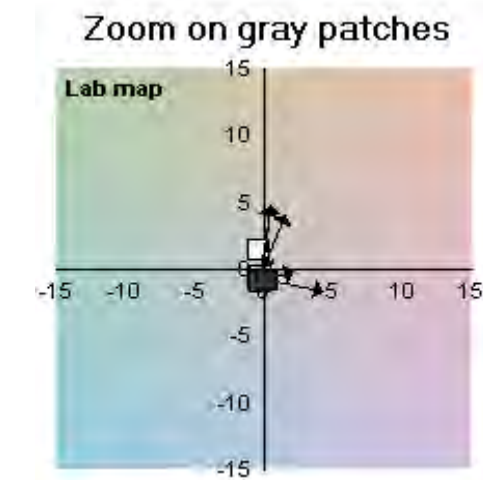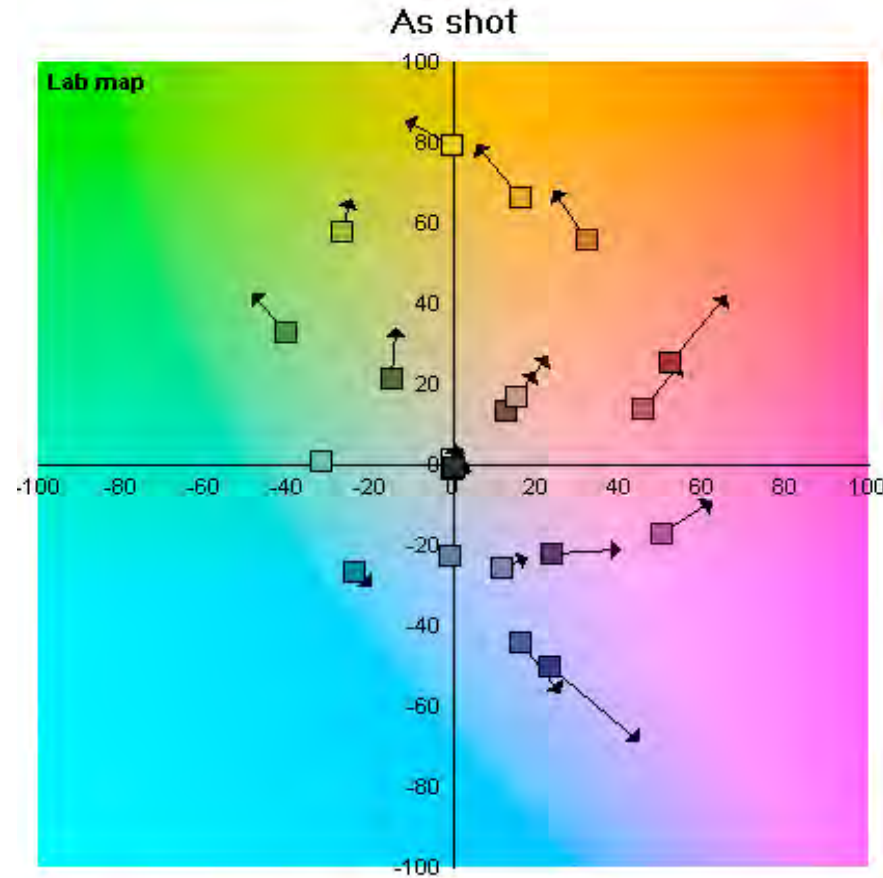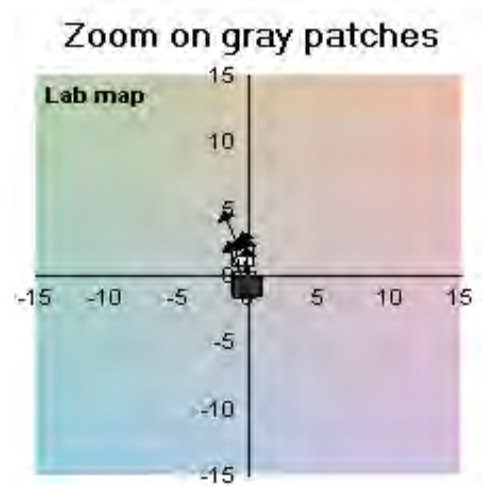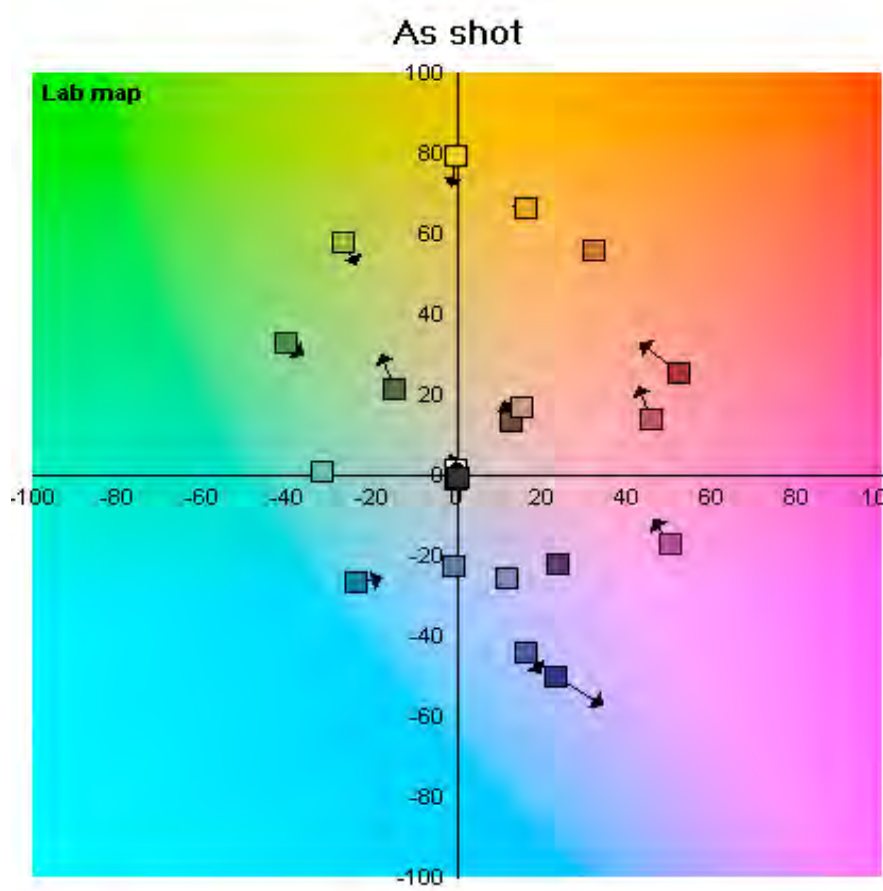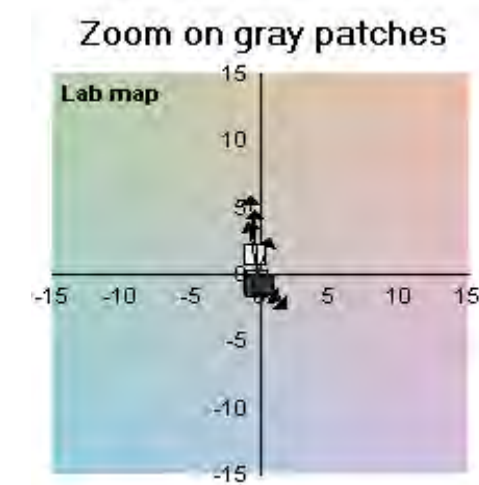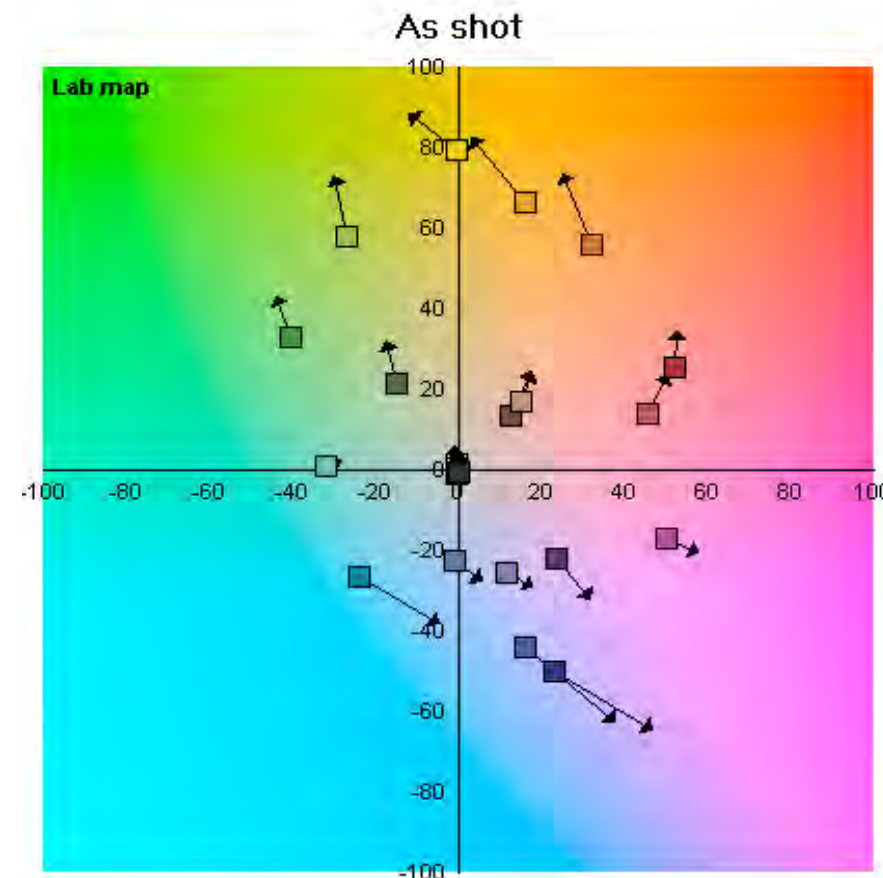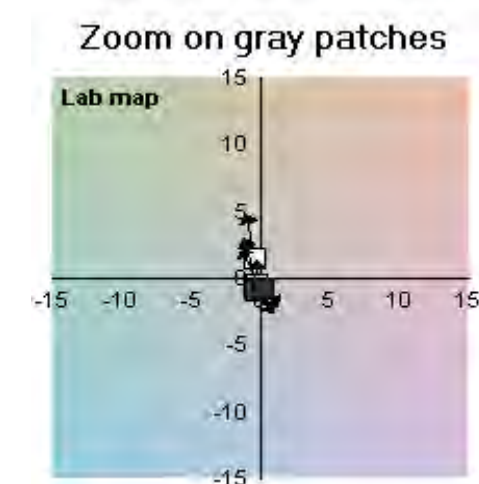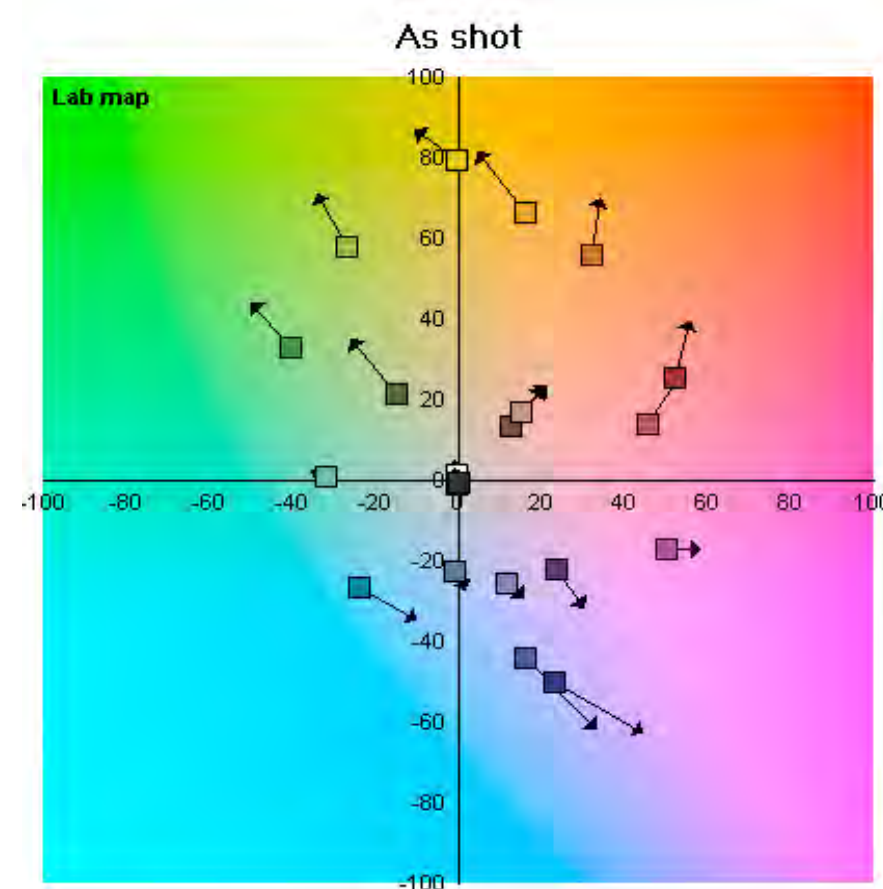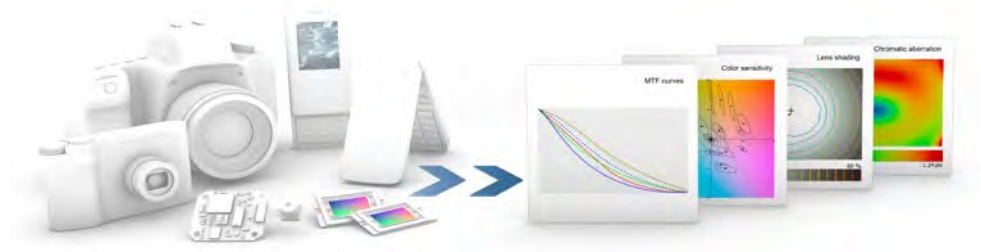## Color accuracy, illuminant TL84

Delta ab is measured on the Colorchecker® with respect to CIE XYZ 1931 standard observer

bright light (700 Lux)	
Delta ab mean	10.7
WB accuracy (Delta ab)	2.7
Delta C	8.9
Delta H	4.4

Anonymous Phone

Color, exposure and contrast

Color shading, A

		R	B	Red/Green map	Blue/Green map
bright light (700 Lux)	Max attenuation (%)	-4.7	-4.3		
	Max amplification (%)	0.6	3.5		
	Std Dev (%)	1.05			
	Average gray level	225			

Color shading average measurement is computed only from the standard deviation of the imbalance of red and blue channels compared to the green one.

		R	B		Blue/Green map
low light (20 Lux)	Max attenuation (%)	-3.5	-7.4		
	Max amplification (%)	0.9	2.3		

Maps of ratio of Red/Green channels and Blue/Green channels.

Color shading, D65

		R	B	Red/Green map	Blue/Green map
bright light (700 Lux)	Max attenuation (%)	-2.3	-2.5		
	Max amplification (%)	2.7	3.7		
	Std Dev (%)	0.68			
	Average gray level	193			

Color shading, Coolwhite

		R	B	Red/Green map	Blue/Green map
bright light (700 Lux)	Max attenuation (%)	-0.8	-4.4		
	Max amplification (%)	5.3	4.0		
	Std Dev (%)	0.99			
	Average gray level	227			

Color shading, TL84

		R	B	Red/Green map	Blue/Green map
bright light (700 Lux)	Max attenuation (%)	-1.2	-5.7		
	Max amplification (%)	5.6	2.2		
	Std Dev (%)	0.94			
	Average gray level	230			

Anonymous Phone
Color, exposure and contrast

Natural scene, perceptual scores

Scores range from 1 to 5

Color bright light	4.5		Auto exposure	4.5
Color low light	3.0			
Color shading bright light	4.5		WB adaptation	4.5
Color shading low light	4.5			

Natural scene - color and white balance - perceptual analysis

Pros:
- Very good white balance, stable and accurate in most scene types.
- Works well even with difficult scenes like portrait with a colored background.

Cons:

- In low light conditions under incandescent illuminant, the pictures are slightly yellowish. This bias remains acceptable (see the   DxO reference scene below).

Outdoor condition
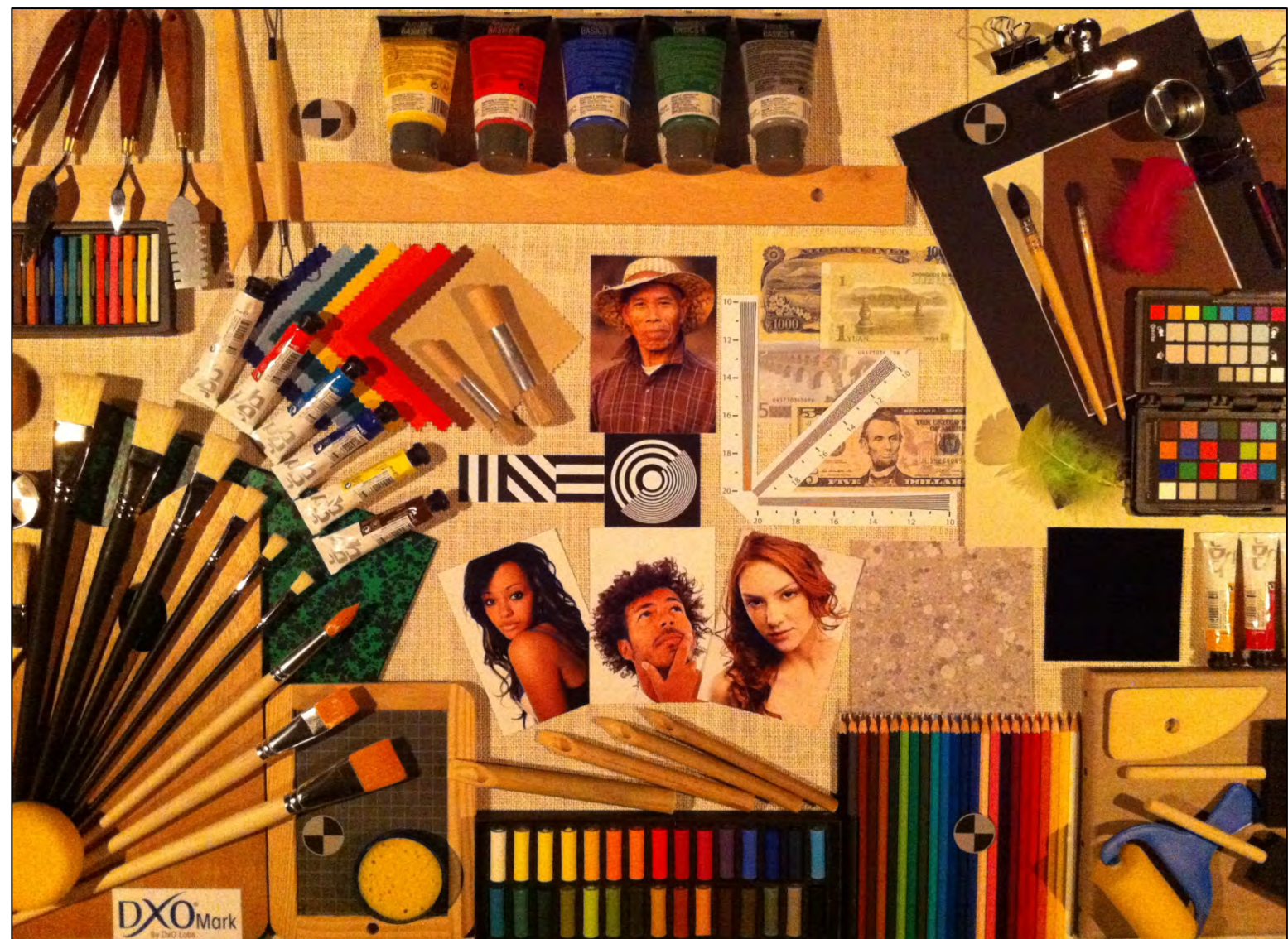
Reference Scene - Tungsten - 20 Lux

Anonymous Phone

Color, exposure and contrast
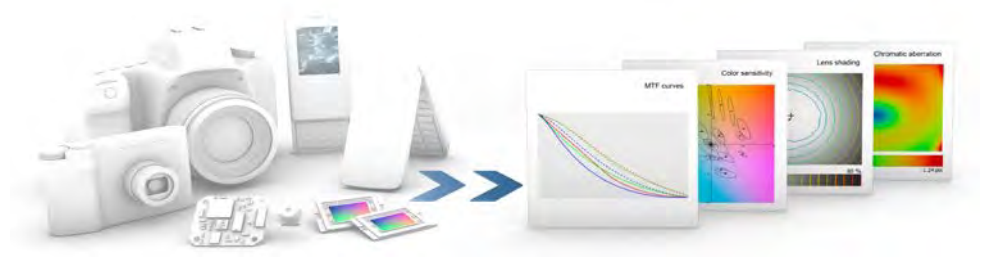
Natural scene - color shading and exposure - perceptual analysis

Pros:
- Almost no color shading under every tested illuminant.
- Good rendering of highly contrasted scenes

Good dynamic range even under challenging outdoor lighting conditions

Anonymous Phone
Noise and details

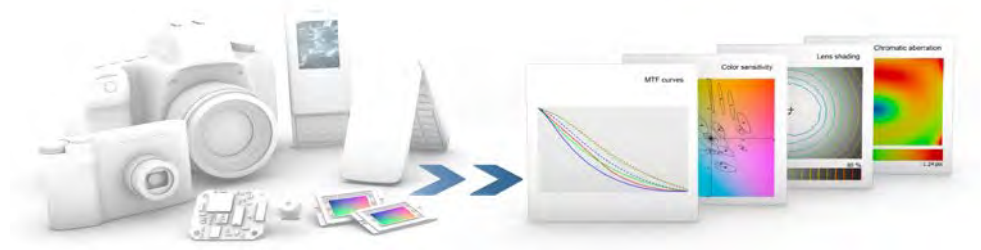## Scores

Scores per scene type and viewing conditions (range from 0 to 100)

	Texture		Noise	
	bright light	low light	bright light	low light
8 Mp eq.	88	58	75	51
HD	94	76	75	67
WEB	94	81	75	69

Scores for texture and noise from 0 to 100 (poor to excellent). They are given per lighting and viewing conditions (see summary for further explanations), and combine objective measurements and perceptual analysis shown below.

Expert analysis

Pros:
- Overall good detail preservation, even in low light.
- Excellent chroma noise reduction.

Cons:
- Luminance noise is too strong.

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Acutance (CPIQ standard) = value assessing the sharpness of an image as viewed by the human visual system, depending on the viewing condition (size of image, size of screen or print, viewing distance).

Only the values of texture acutance are given here. The measurements are expressed in %.
The higher the score, the more details can be seen in an image.

Technical overview

Texture acutance, expressed in %

Illuminant	Daylight		Fluo (D50)	Tungsten (A)	
Lux	700	100	700	100	20
8 Mp eq.	81	69	79	67	60
	88	83	88	83	77
	87	86	87	86	84

Visual Noise (from ISO and CPIQ standard) = value assessing the noise in an image as perceived by the human visual system, depending on the viewing condition (size of image, size of screen or print, viewing distance).

The measurements have no unit and can be simply viewed as a weighted average of noise standard deviation for each channel in the CIE L*a*b* color space. The lower the measurement, the less noise in the image.

	Daylight	Fluo (D50)		Tungsten (A)	
	700	100	700	100	20
	0.92	1.85	1.30	2.33	4.03
	0.70	0.79	0.84	1.44	2.27
	0.40	0.29	0.44	0.78	1.22

Anonymous Phone
Noise and details

Texture acutance

Texture acutance, expressed in %
For each scene type and viewing condition, the graph represents acutance = f(lux)
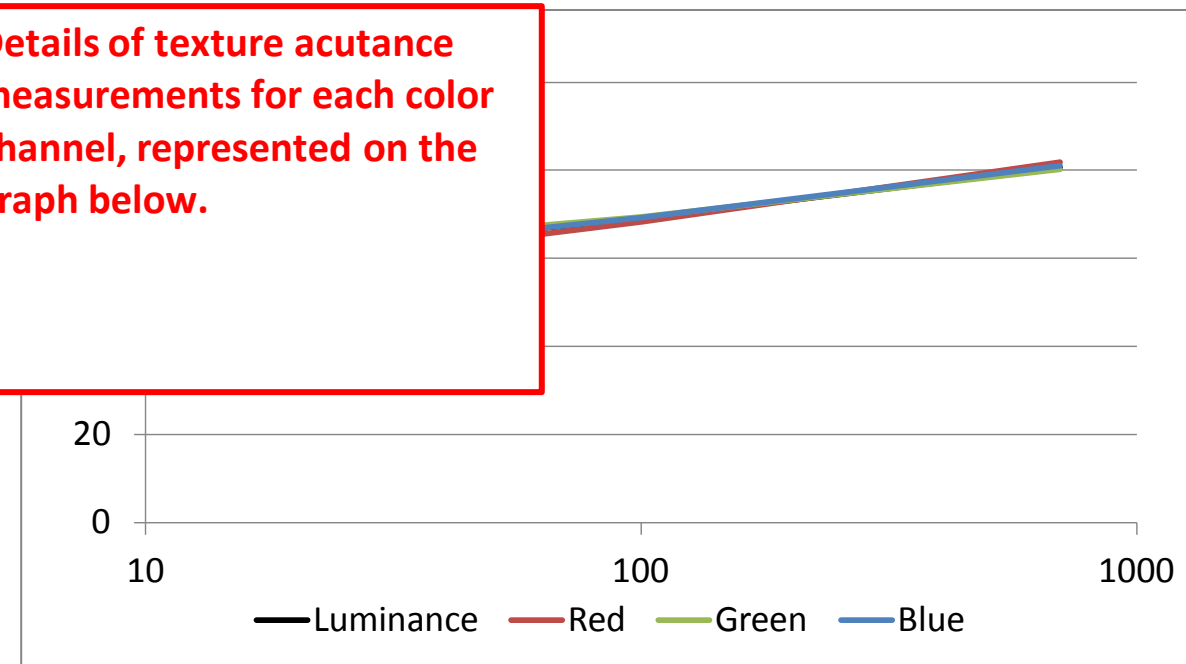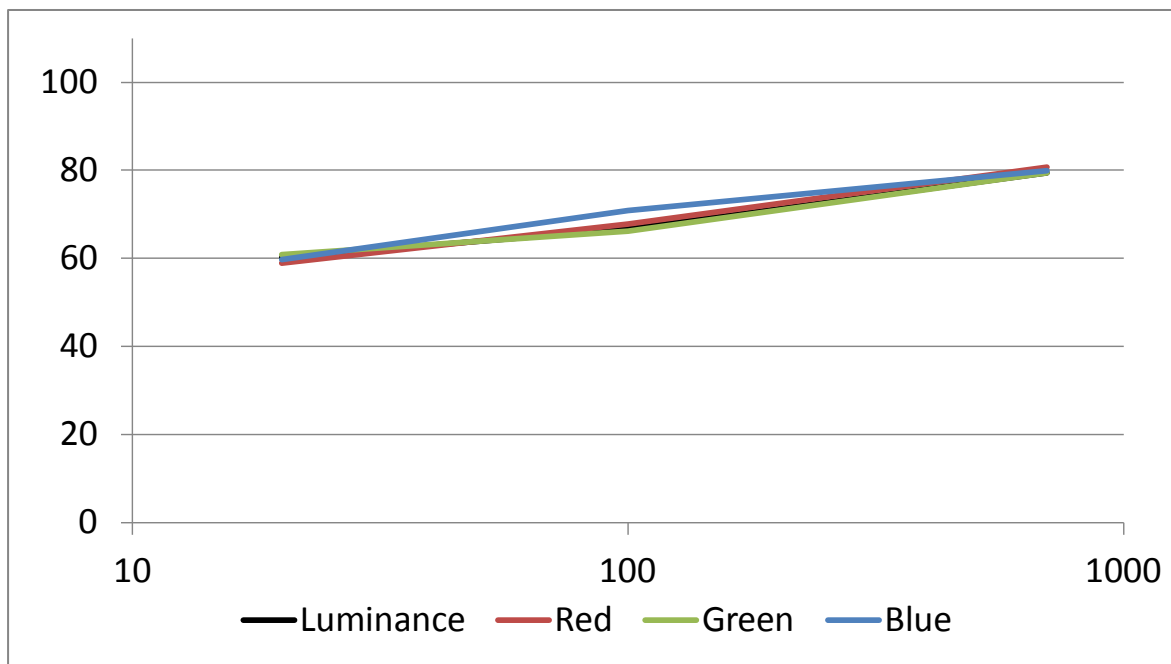
Illuminant A

	8 Mp eq.			
Lux	Luminance	Red	Green	Blue
700	79	81	79	80
100	67	68	66	71
20	60	59	61	60

Details of texture acutance measurements for each color channel, represented on the graph below.

Illuminant D50

	8 Mp eq.			
Lux	Luminance	Red	Green	Blue
700	81	82	80	81
100	69	68	69	69
20	61	59	63	61

	HD			
Lux	Luminance	Red	Green	Blue
700	88	88	87	88
100	83	84	82	86
20	77	76	78	77

	HD			
Lux	Luminance	Red	Green	Blue
700	88	90	88	89
100	83	82	83	83
20	77	75	78	77
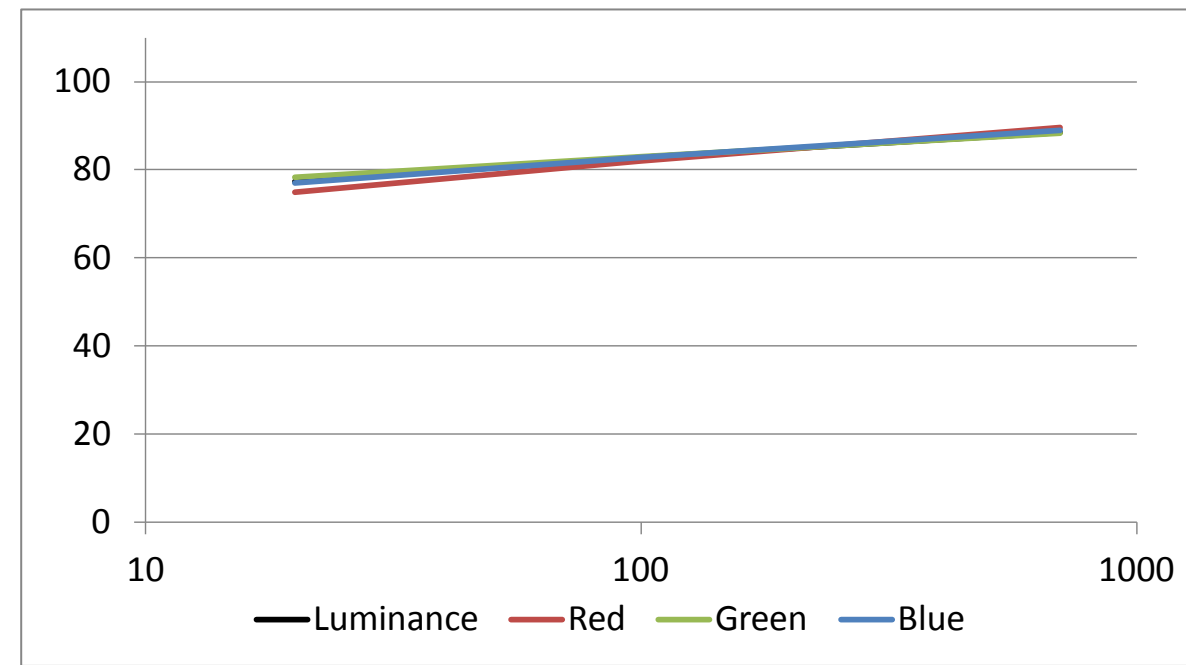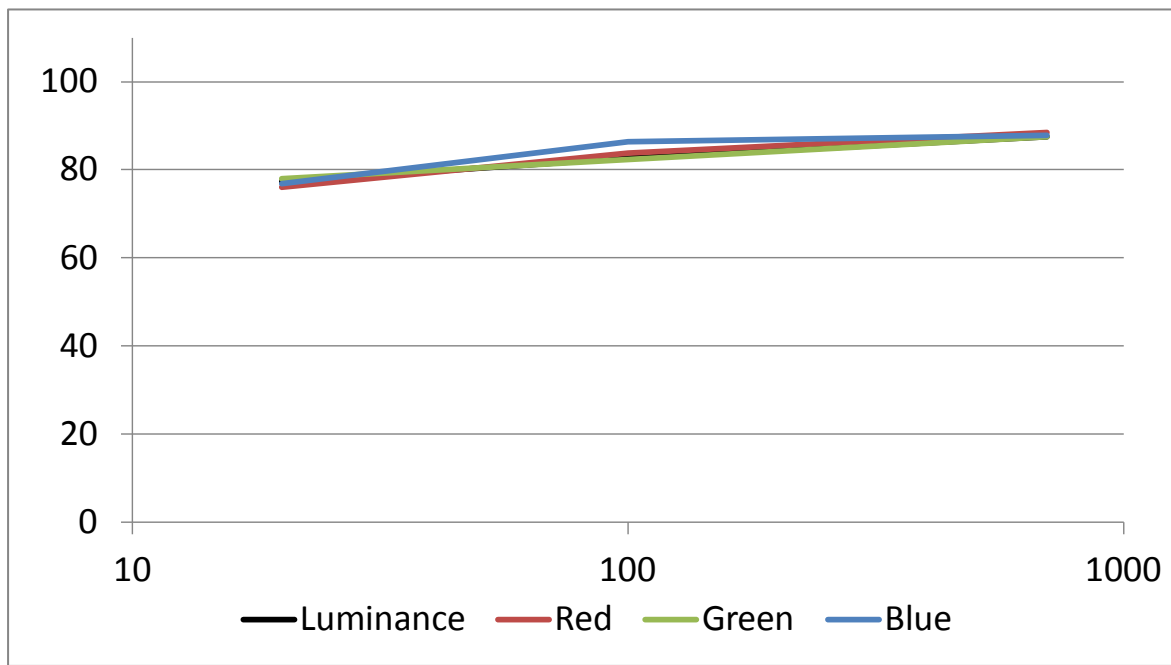
	Web			
Lux	Luminance	Red	Green	Blue
700	87	87	87	87
100	86	86	86	88
20	84	83	84	84

	Web			
Lux	Luminance	Red	Green	Blue
700	87	88	87	87
100	86	85	86	86
20	84	83	84	84

Anonymous Phone
Noise and details
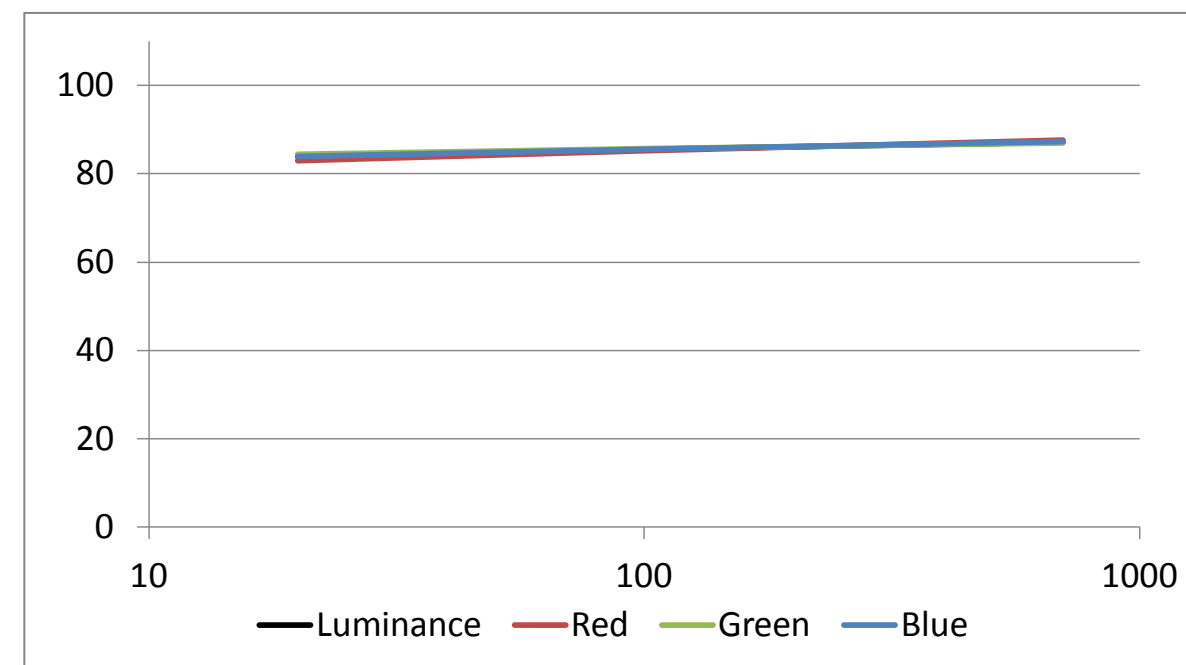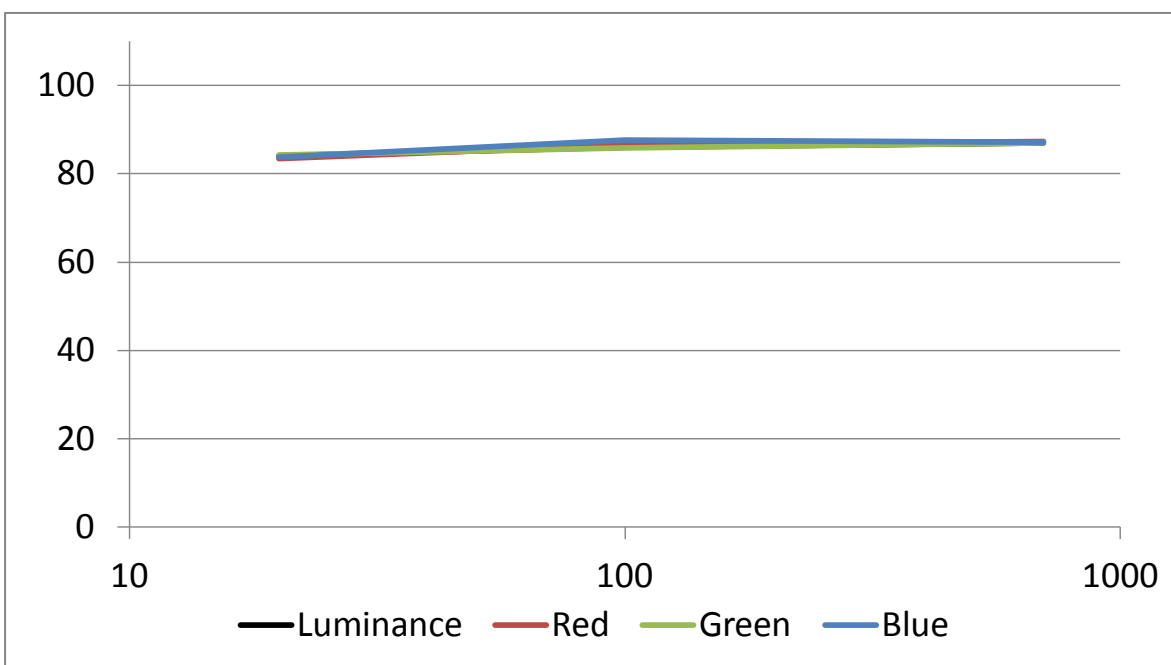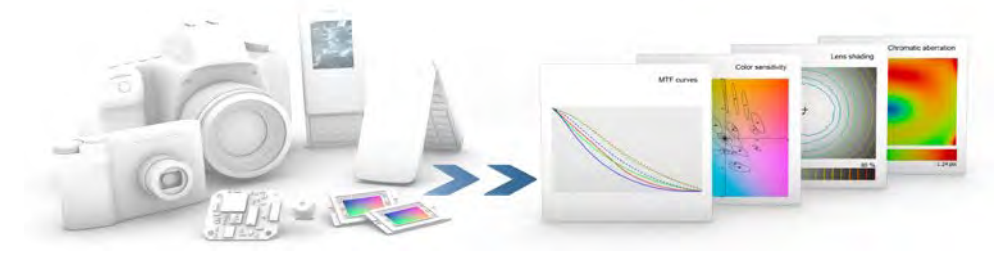
Edge acutance

Edge acutance, expressed in %
For each scene type and viewing condition, the graph represents acutance = f(lux)

Illuminant A

Lux	8 Mp eq.			
	Luminance	Red	Green	Blue
700	78	76	79	77
100	70	66	70	75
20	64	62	64	65

Illuminant D50

Lux	8 Mp eq.			
	Luminance	Red	Green	Blue
700	80	79	81	83
100	70	70	71	72
20	62	60	62	61

Details of edge acutance measurements for each color channel, represented on the graph below.

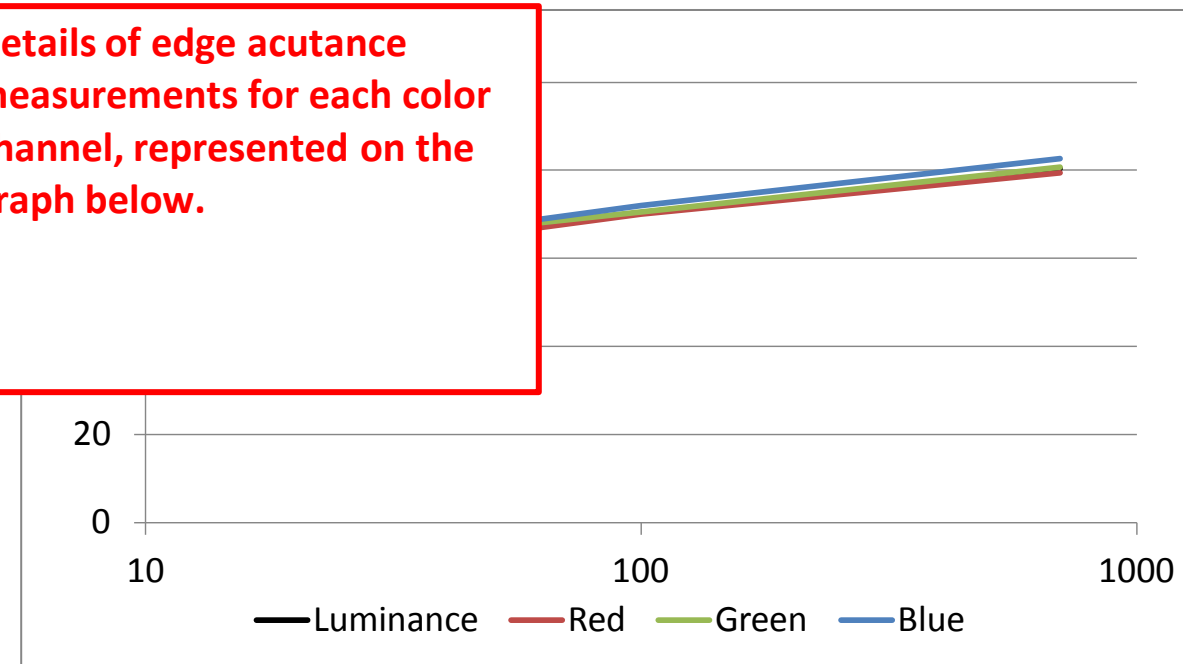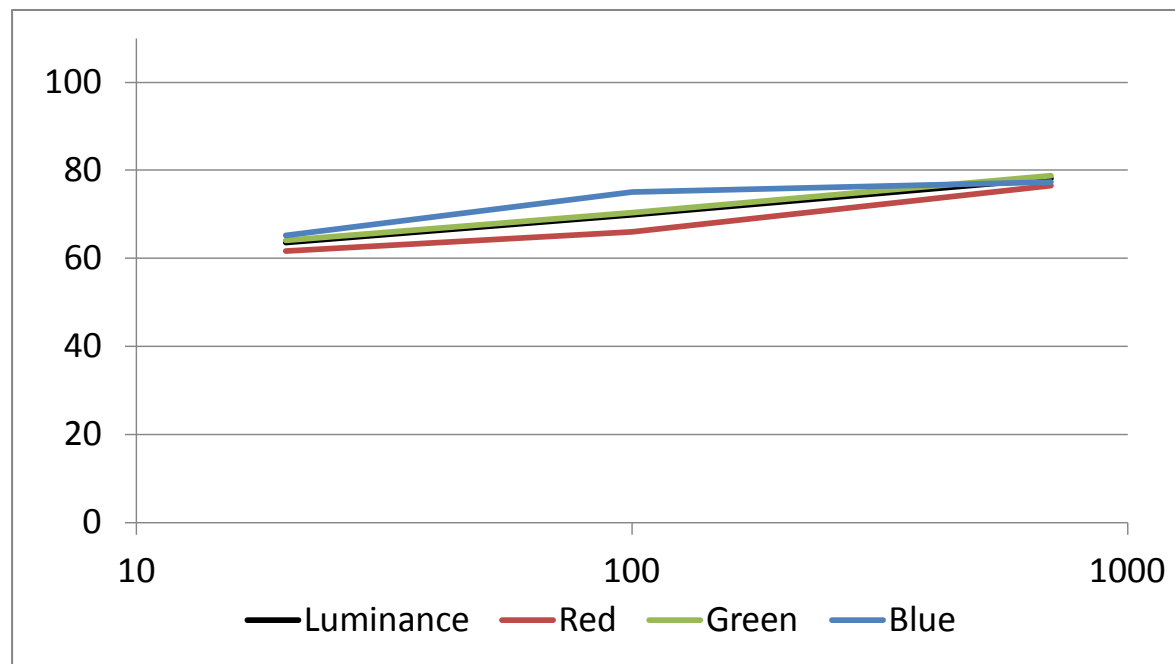| Lux	HD			
	Luminance	Red	Green	Blue
700	88	86	89	87
100	85	82	86	90
20	81	79	82	83

Lux	HD			
	Luminance	Red	Green	Blue
700	88	87	89	91
100	85	84	85	86
20	82	79	82	82
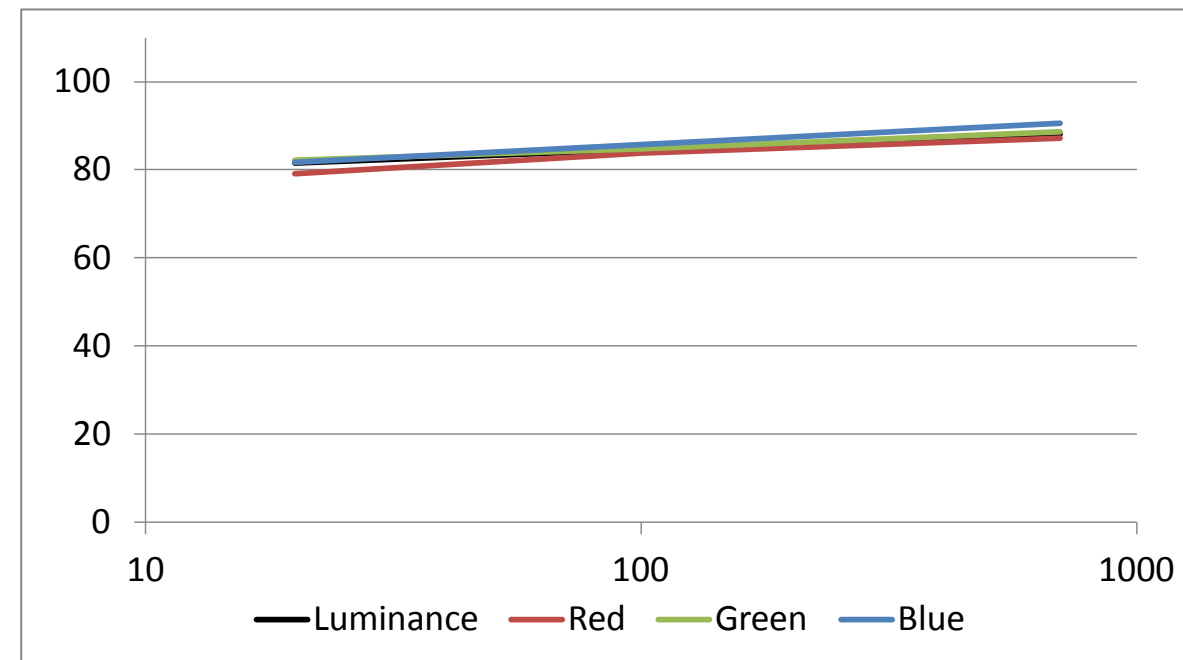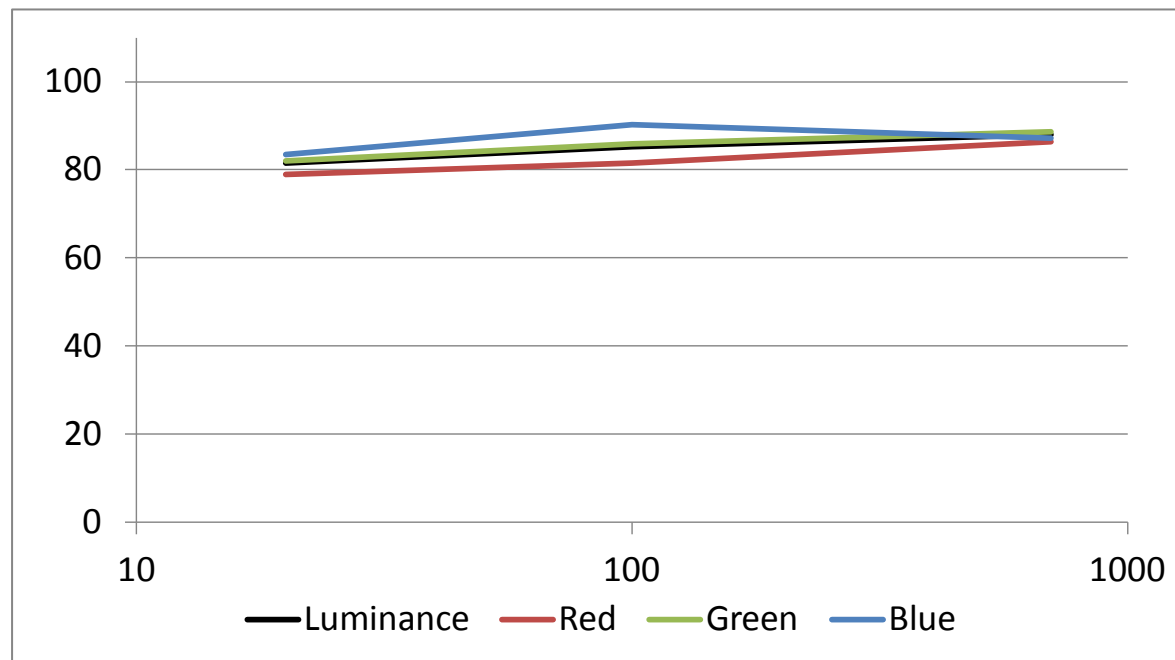
Lux	Web			
	Luminance	Red	Green	Blue
700	87	85	87	86
100	86	84	86	89
20	84	82	85	86

Lux	Web			
	Luminance	Red	Green	Blue
700	86	85	86	88
100	86	85	86	86
20	85	83	85	85

Anonymous Phone
Noise and details
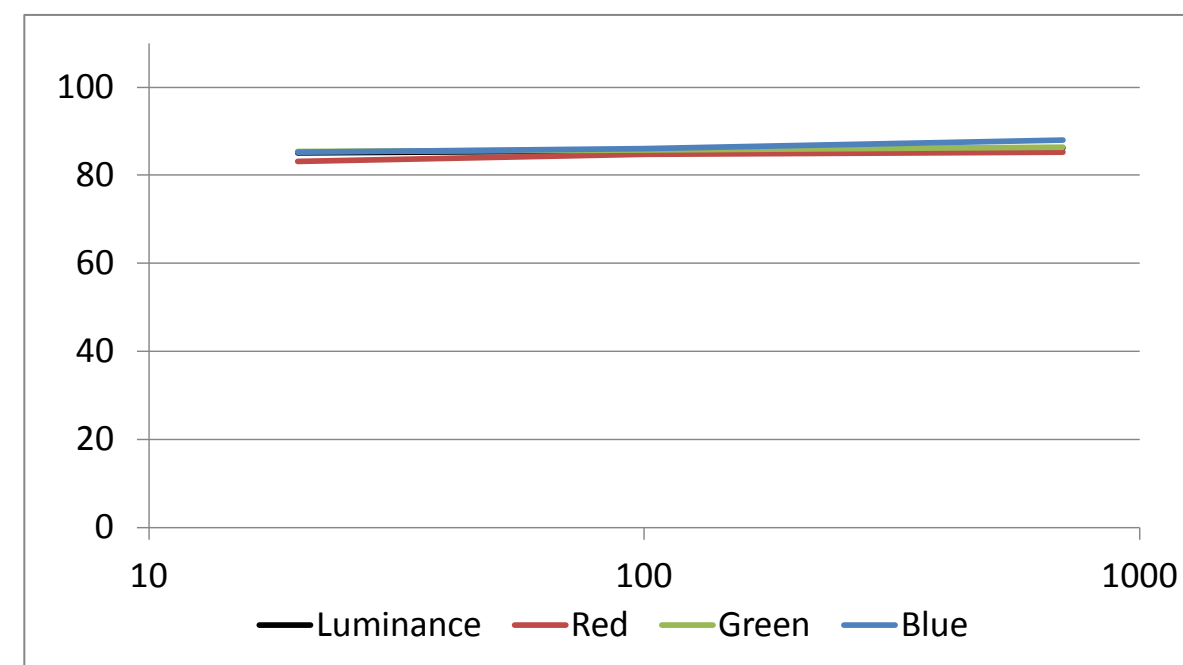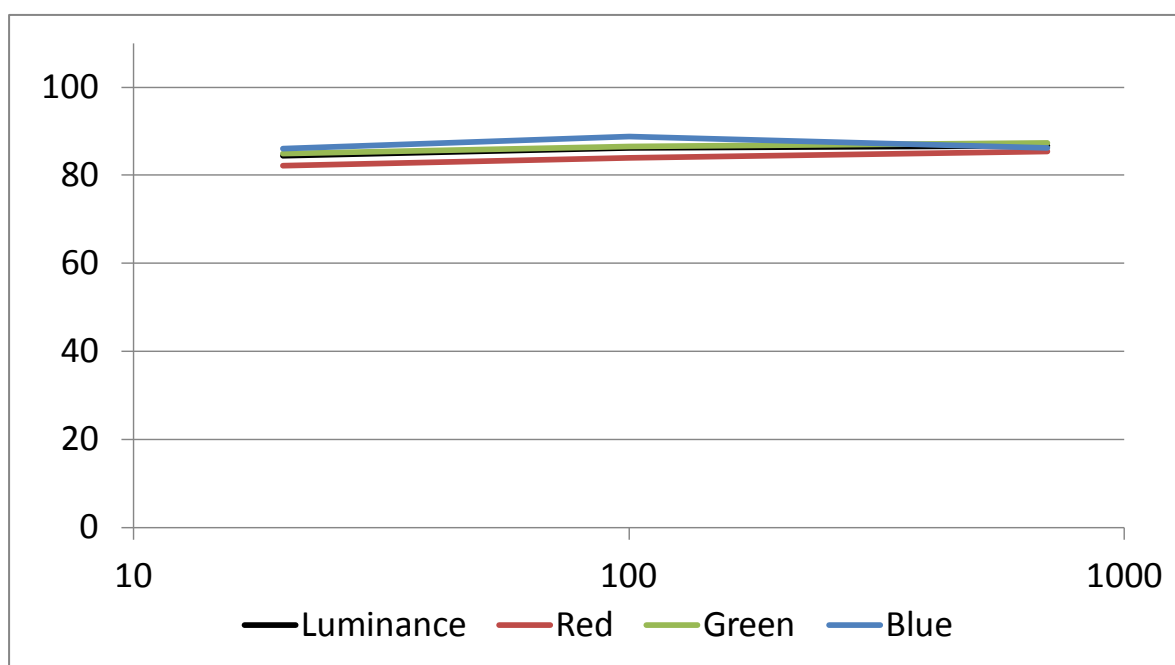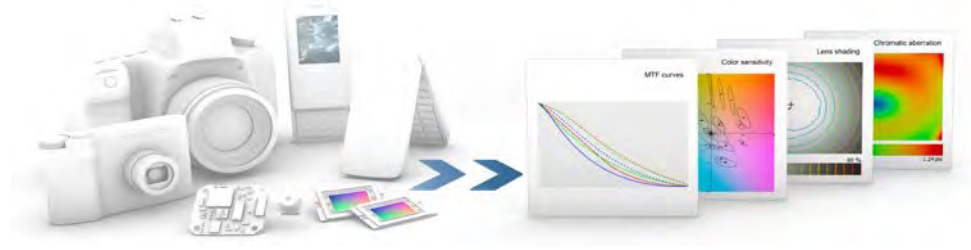
Visual noise

This table shows the values of visual noise, and the variance of L, a and b channels

Illuminant A

	8 Mp eq.			
Lux	**Visual Noise**	**L**	**a**	**b**
700	1.30	0.20	0.26	0.09
100	2.33	0.71	0.16	0.31
20	4.03	2.33	0.22	0.31

	HD			
Lux	**Visual Noise**	**L**	**a**	**b**
700	0.84	0.06	0.23	0.04
100	1.44	0.29	0.14	0.19
20	2.27	0.74	0.22	0.17

	Web			
Lux	**Visual Noise**	**L**	**a**	**b**
700	0.44	0.02	0.12	0.01
100	0.78	0.15	0.09	0.06
20	1.22	0.30	0.15	0.06

Illuminant D50

	8 Mp eq.			
Lux	**Visual Noise**	**L**	**a**	**b**
700	0.92	0.13	0.21	0.02
100	1.85	0.77	0.07	0.02
20	4.85	3.60	0.27	0.21

	HD			
Lux		**L**	**a**	**b**
700		0.07	0.18	0.01
100		0.23	0.06	0.01
20	2.65	0.93	0.30	0.20

	Web			
Lux	**Visual Noise**	**L**	**a**	**b**
700	0.40	0.03	0.11	0.00
100	0.29	0.06	0.04	0.00
20	1.32	0.24	0.23	0.10

Details of visual noise measurements and variance values for each channel in CIE L*a*b* color space.

Natural scene - perceptual scores

Scores range from 1 to 5
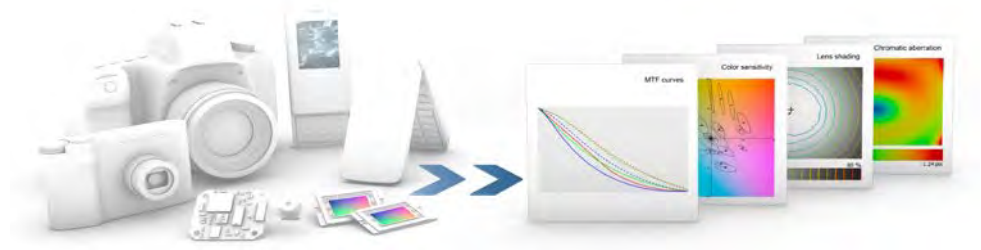
	bright light	low light
Texture	4.5	3.5
Noise	3.0	2.5

Perceptual evaluation of noise and texture. The score is obtained from an analysis of a set of outdoor and indoor pictures. The scores range from 1 to 5.

Natural scene - perceptual analysis - bright light

In outdoor conditions, images contain many nice details, but noise is already visible in homogeneous areas such as blue sky, even in bright light.
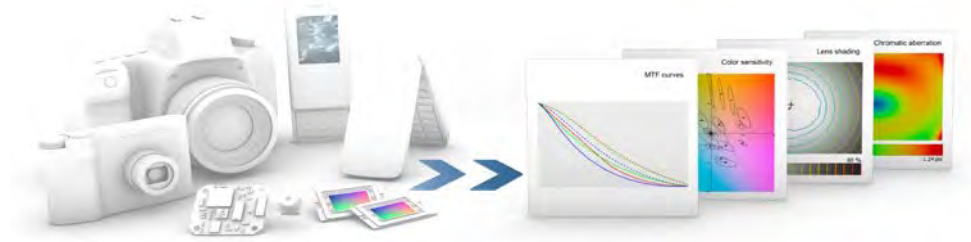
Crop at 100%

Reference scene - perceptual analysis - low light

In low light condition:
Pros:
- Detail preservation is fairly good.
- No residual chroma noise .

Cons:
- A loss of details is noticeable.
- Luminance noise is too strong.
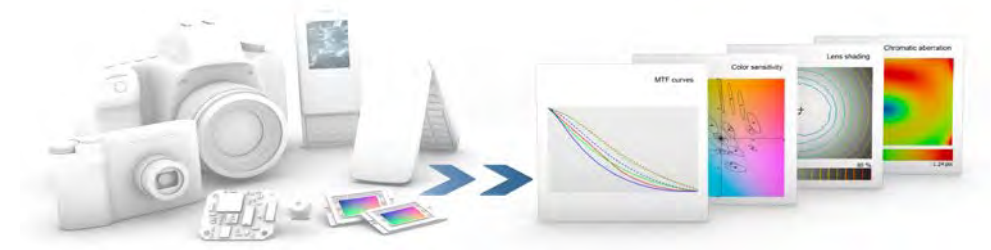
100% crops at 20 Lux: details are kept (see the hair or the feather) but at the cost of a very strong noise in homogeneous parts

Scores

Scores per scene type and viewing conditions (range from 0 to 100)

	bright light	low light
Web	95	95
HD	95	95
8 Mp eq.	85	85

Scores for photo artifacts range from 0 to 100 (poor to excellent). Scores are given per lighting and viewing conditions (see summary for further explanations).
Scores are computed from the objective measurements and perceptual analysis below. Tested artifacts are:
- Chromatic aberration
- Distortion
- Color fringing
- Demosaicing artifact
- Ringing
- Sharpness field uniformity
- Vignetting

Summary

Expert analysis

Pros:
- No major image artifacts.

Cons:
- Slight loss of sharpness can be observed in the corners.
- Noticeable moiré in some difficult pictures.

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Technical overview

Objective measurements

	Web	HD	Screen (1:1)
Sharpness center - Acutance (%)	97	95	83
Sharpness corner - Acutance (%)	95	91	61
LCA max (arcminute)	0.03	0.06	0.15
Ringing center	6.1%		
Ringing corner	1.0%		
Maximum geometric distortion	-0.27%		
Luminance shading	14%		

Sharpness field uniformity is qualified by the average difference of acutance measured in the center and in the corners of an image. The values are obtained from measurements below.

Acutance and ringing measurements are computed from pictures of an MTF chart at 1m distance with D50 illuminant at 1000 lux.

Distortion, vignetting and chromatic aberration measurements are computed from pictures of a DOT chart at 1m distance with D50 illuminant at 1000 lux.

Subjective scores

Scores range from 1 to 5

Sharpness	4.0
Color fringing	4.5

Perceptual evaluations of sharpness uniformity and color fringing are obtained from analysis of a specific set of outdoor images where these artifacts usually appear.

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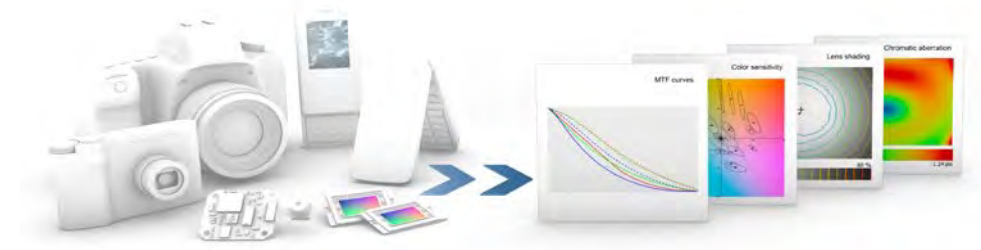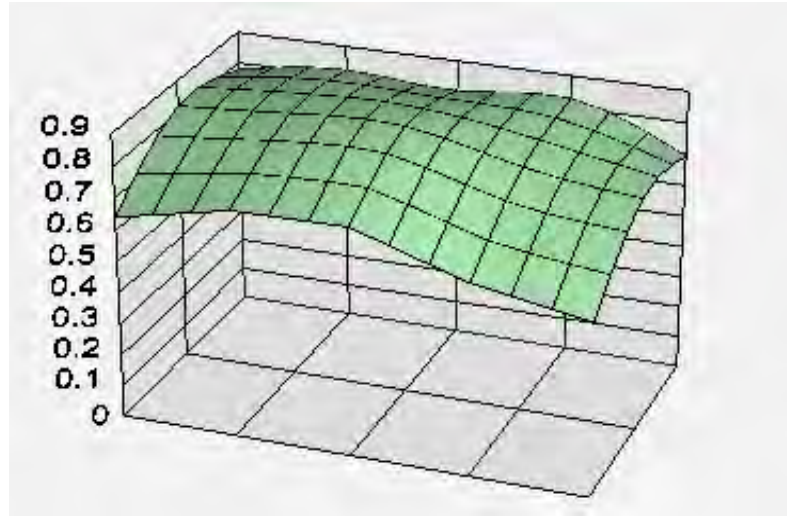
Anonymous Phone

Artifacts

Acutance in the field (8Mp eq.)

This table contains the acutance of the green channel, expressed in %

HORIZONTAL		VERTICAL	

Green channel (Acutance)				
78	82	80	83	69
82	84	85	78	73
64	72	72	61	54
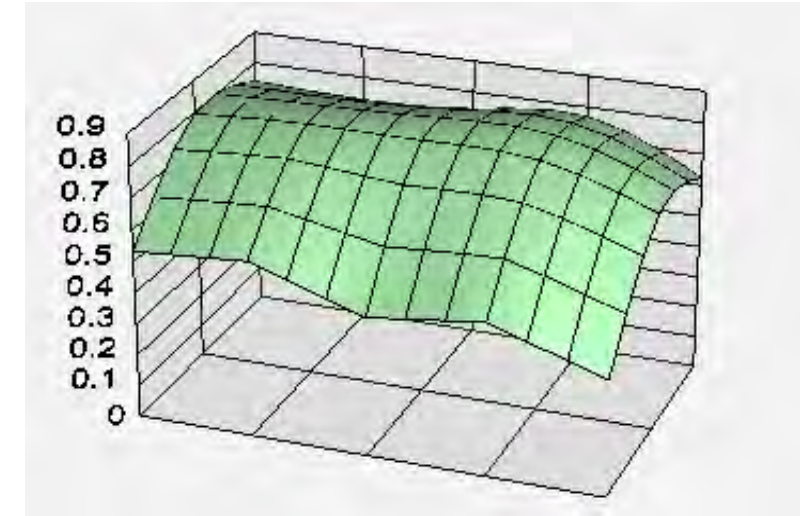
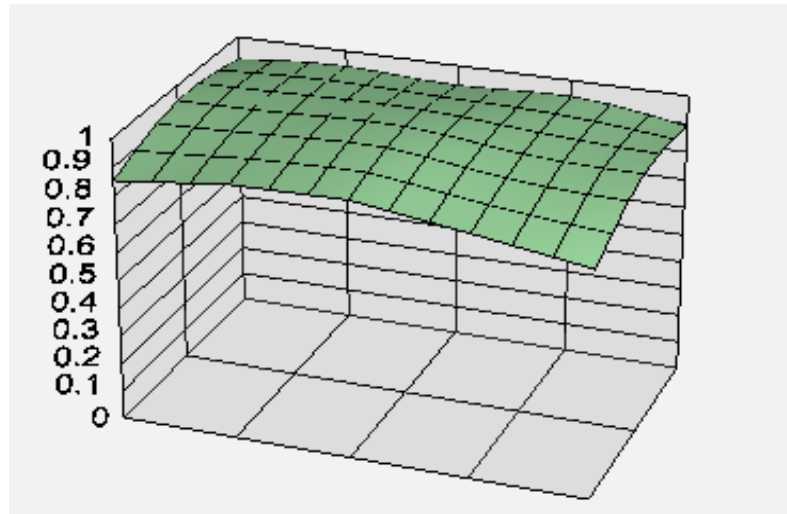| Green channel (Acutance)			
			62
			69
			37

Acutance maps are computed from the best focus among 30 measurements (see autofocus measurements).
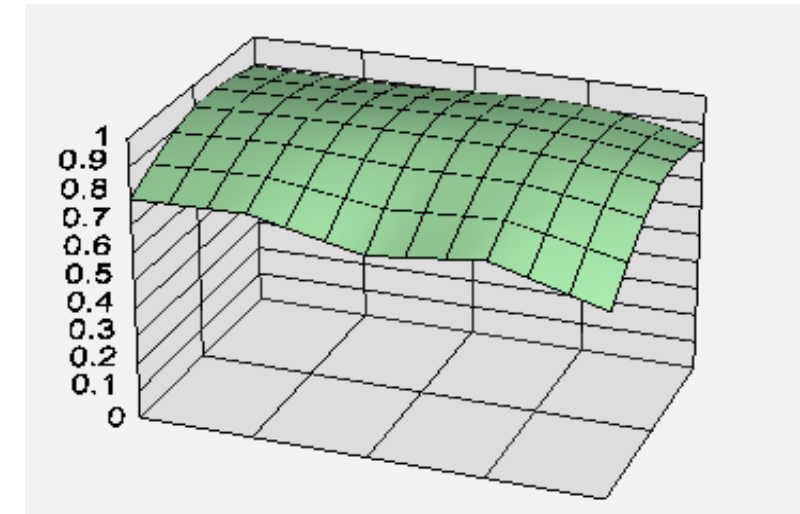
Acutance in the field (HD)

This table contains the acutance of the green channel, expressed in %

HORIZONTAL		VERTICAL	

Green channel (Acutance)				
93	93	91	93	91
93	96	96	94	92
93	96	96	94	92

Green channel (Acutance)				
91	89	91	91	88
92	94	94	93	90
92	94	94	93	90

Acutance in the field (Web)

This table contains the acutance of the green channel, expressed in %

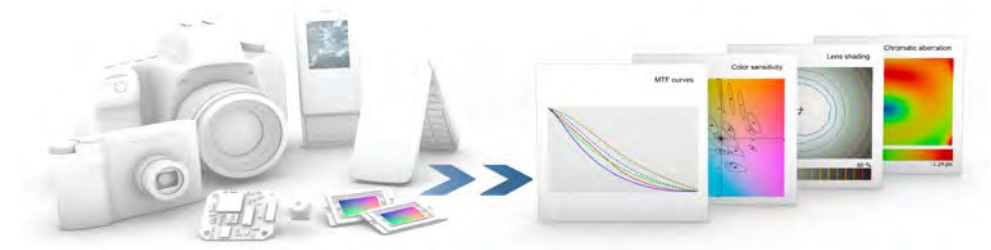| HORIZONTAL		VERTICAL	
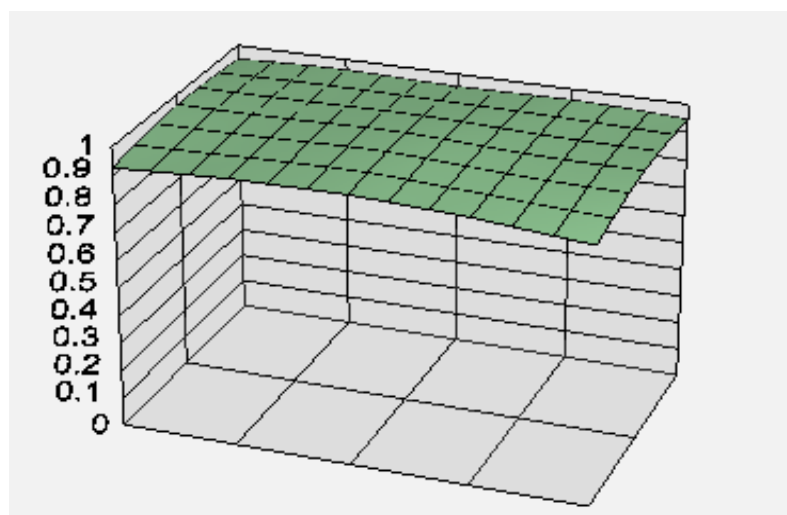
Green channel (Acutance)				
96	96	95	95	95
96	97	97	96	95
96	97	97	96	95
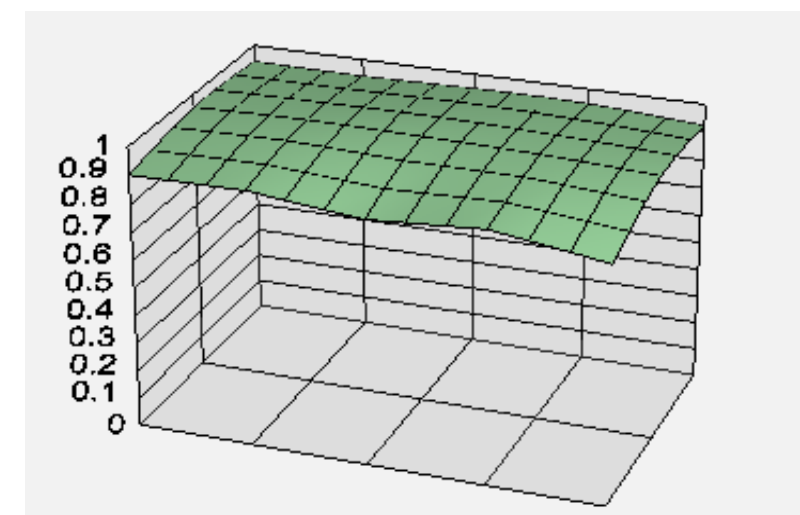
Green channel (Acutance)				
95	94	95	94	94
95	96	96	95	95
95	96	96	95	95

Anonymous Phone
Artifacts

Distortion

This curve displays the magnification in the field, with the center value normalized to 1
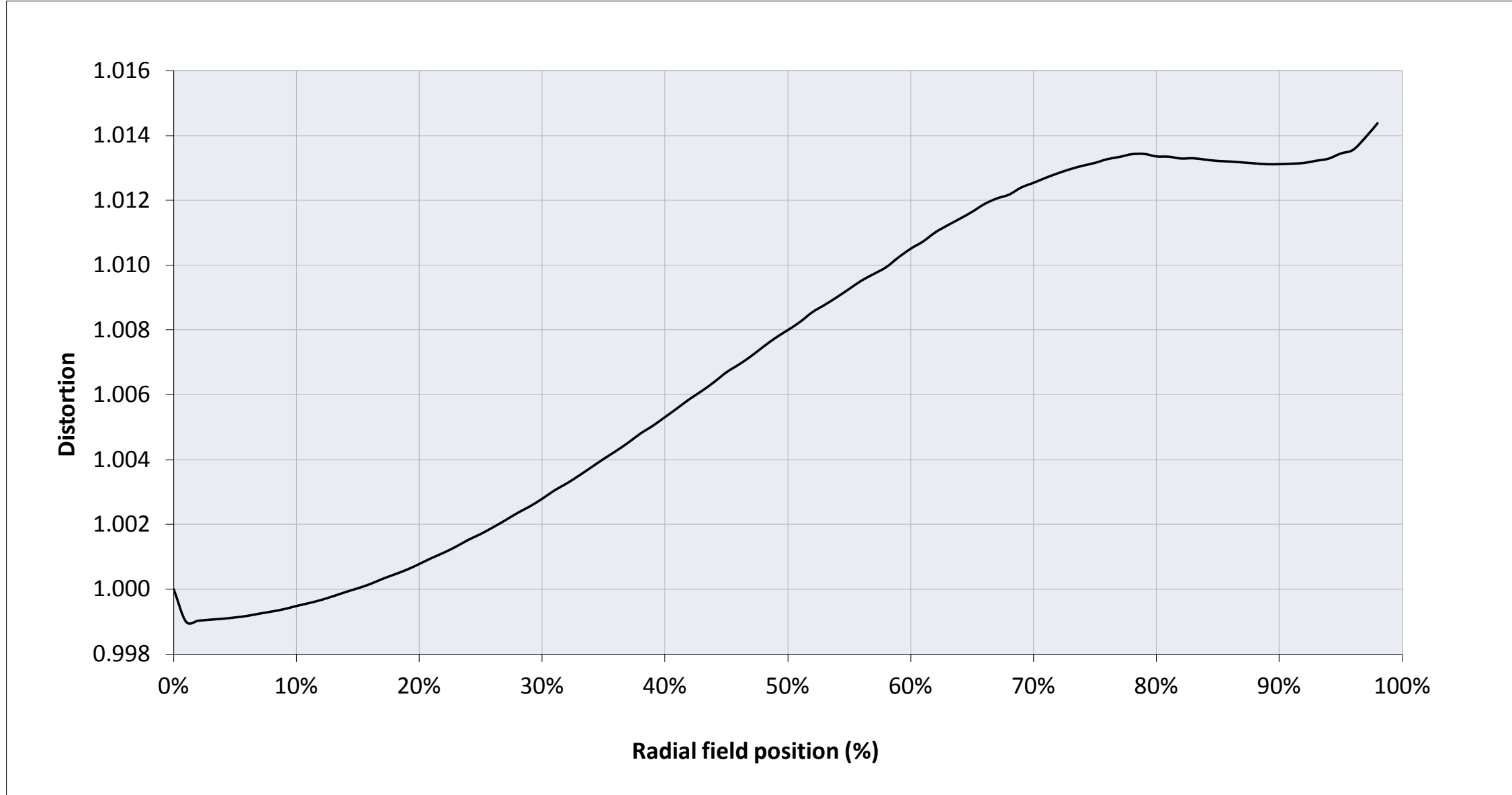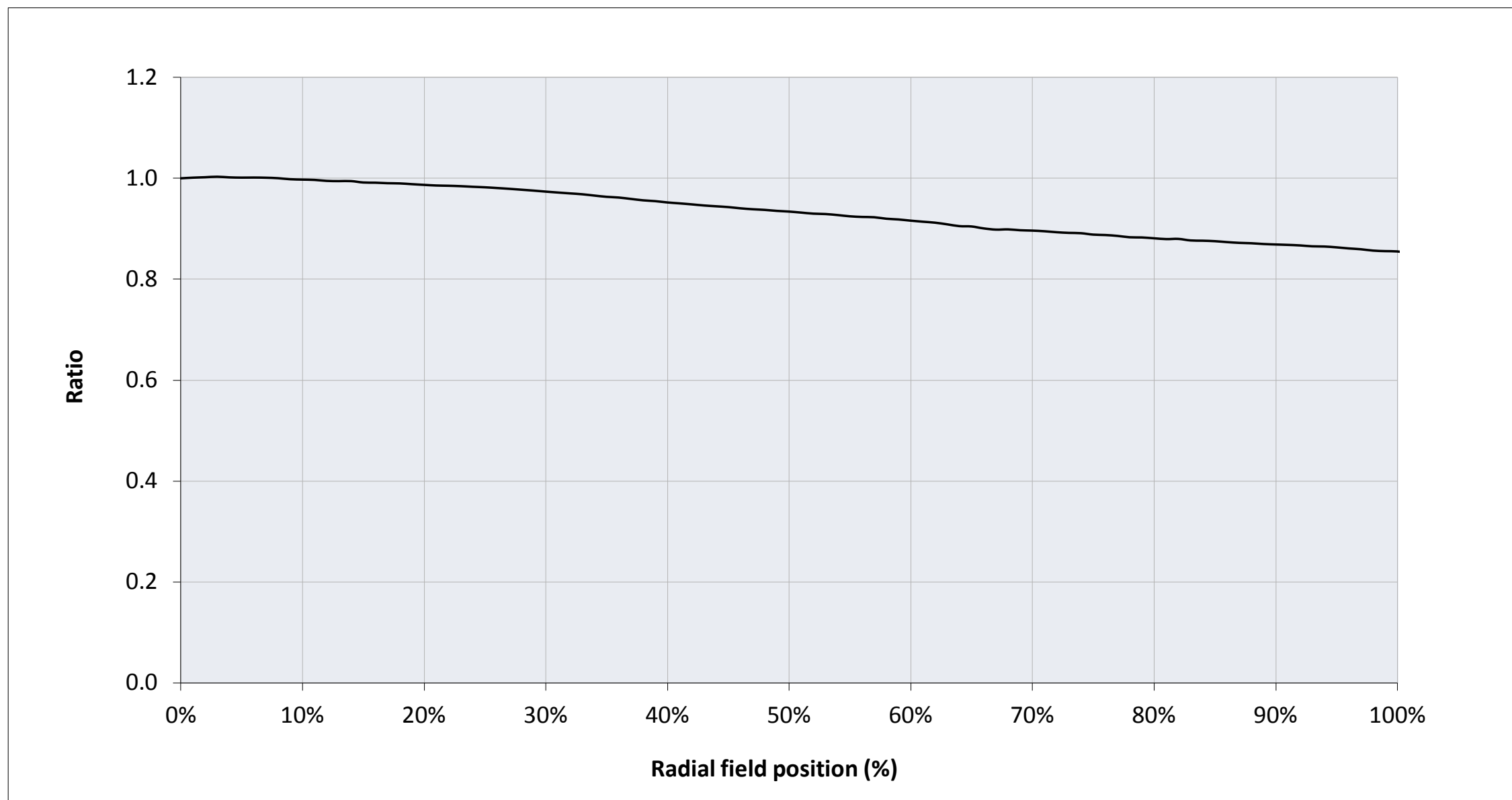
Luminance shading

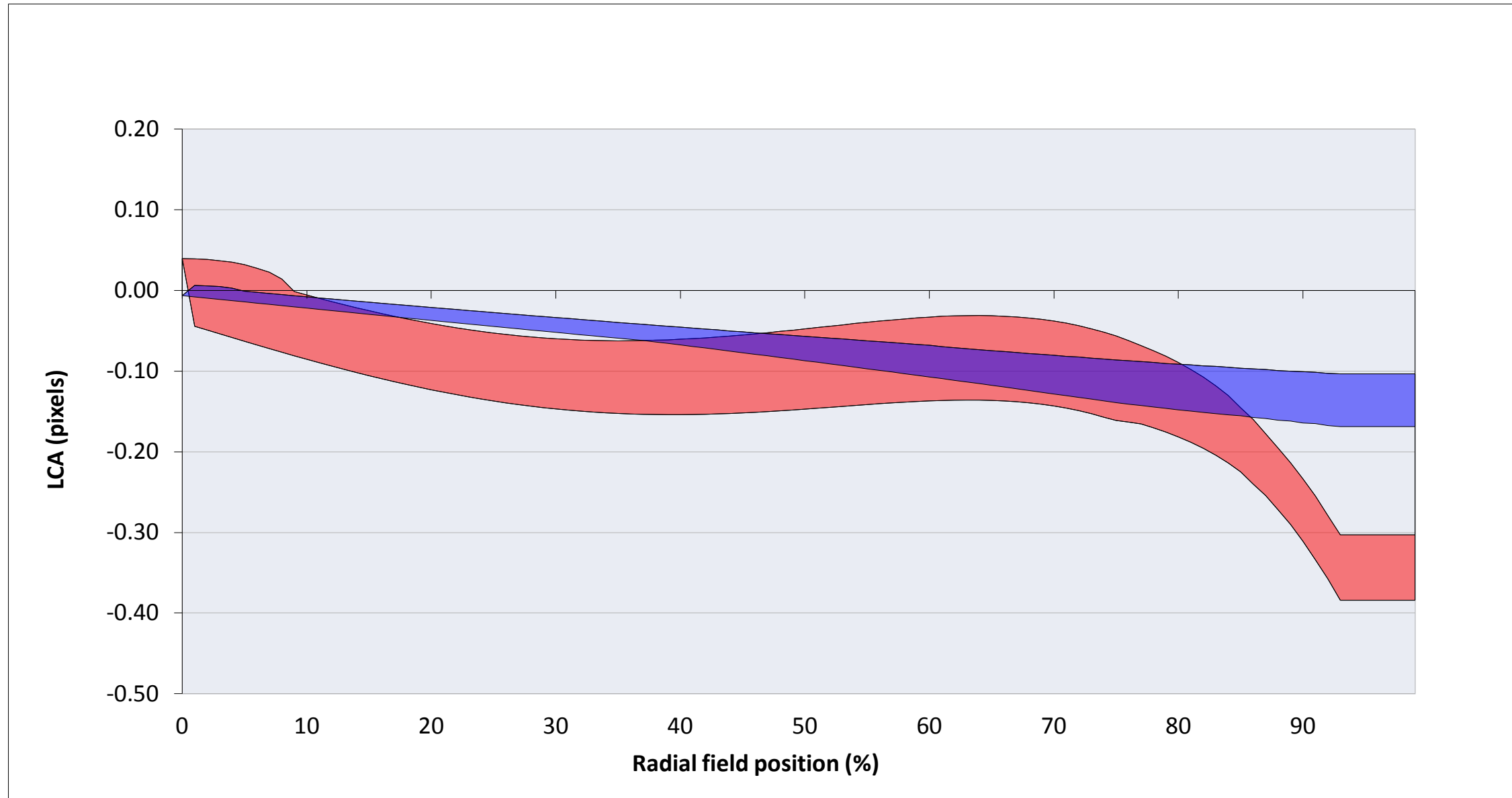This graph shows the radial relative luminance profile
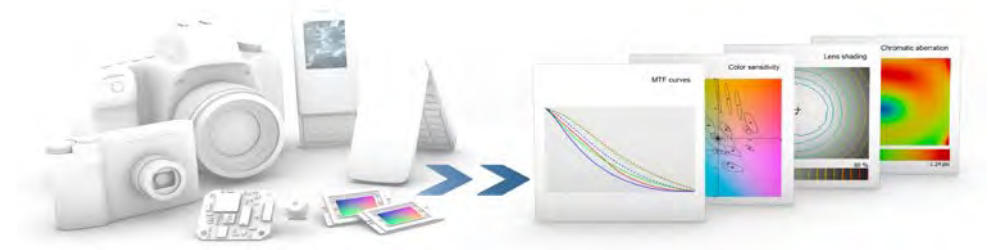
Anonymous Phone

Artifacts

Lateral chromatic aberrations

These curves display the span (min to max) of the spatial shift between the R and B color planes and the G color plane

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Artifacts

Natural scene - perceptual scores

Scores range from 1 to 5

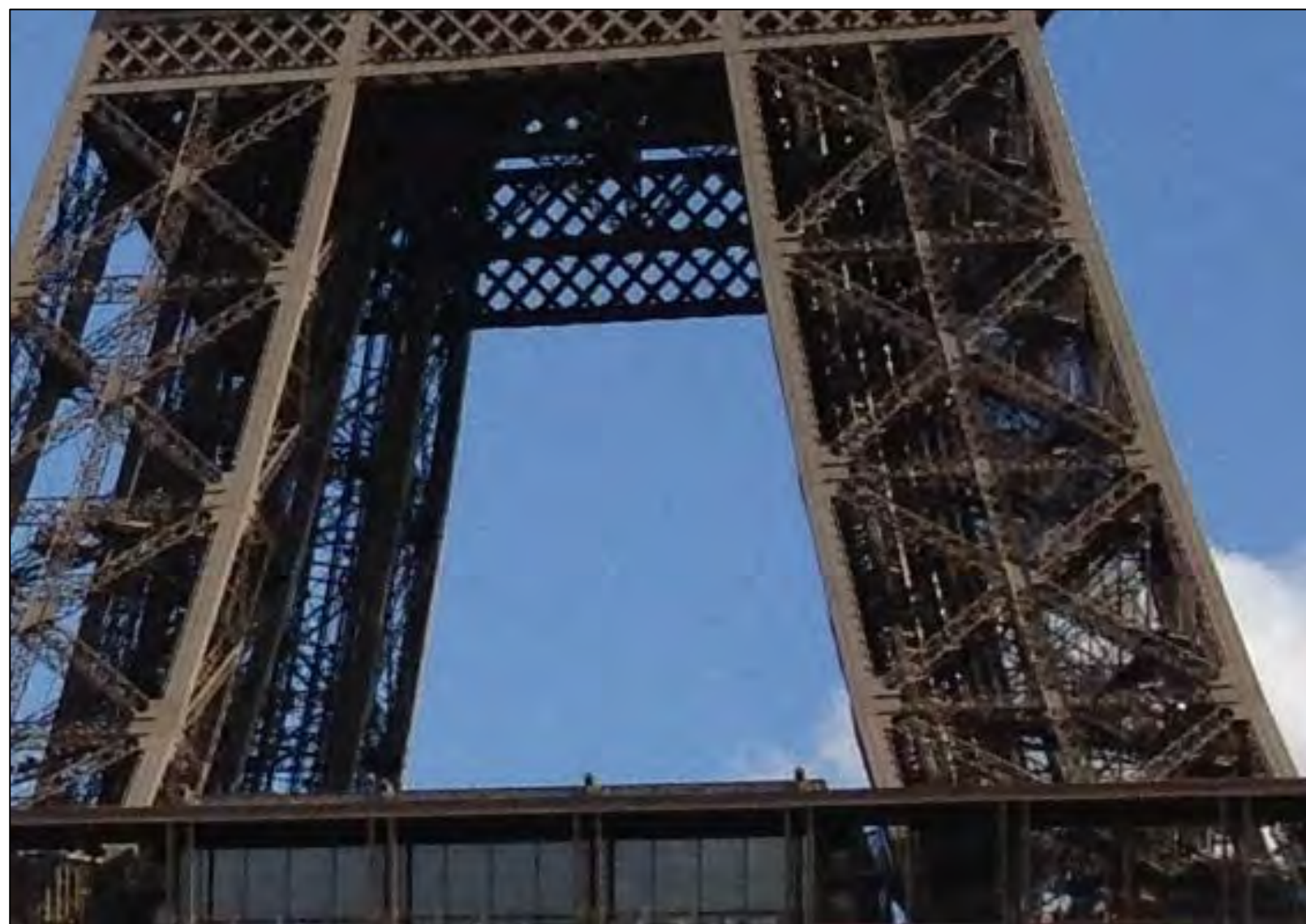| Color Fringing	4.5
Sharpness	4.0

Natural scene - perceptual analysis

Pros:
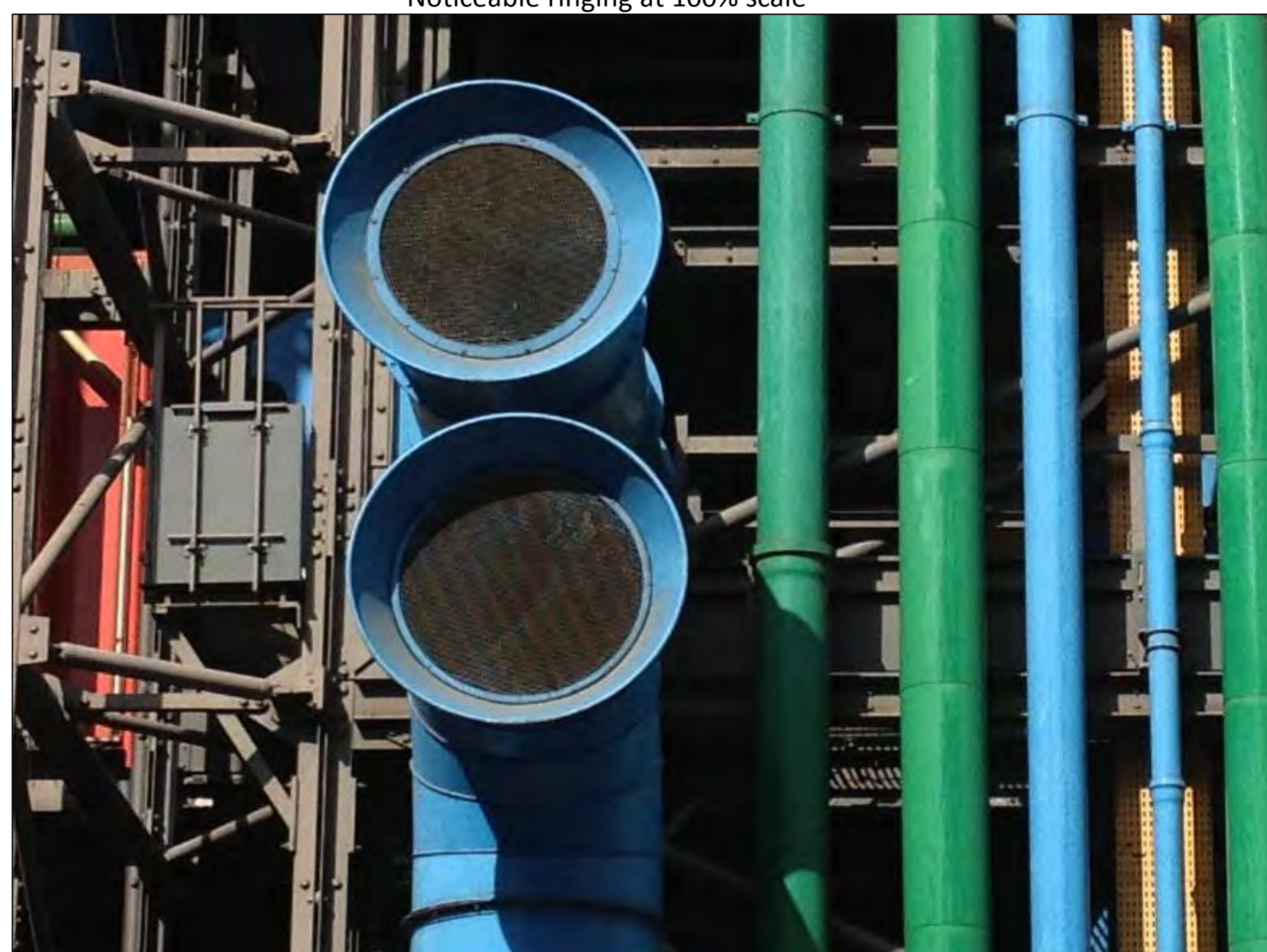
- Color fringing is barely noticeable.

Cons:

- Slight ringing noticeable at 100% scale but at an acceptable level.
- Sharpness is a bit lower at corners.
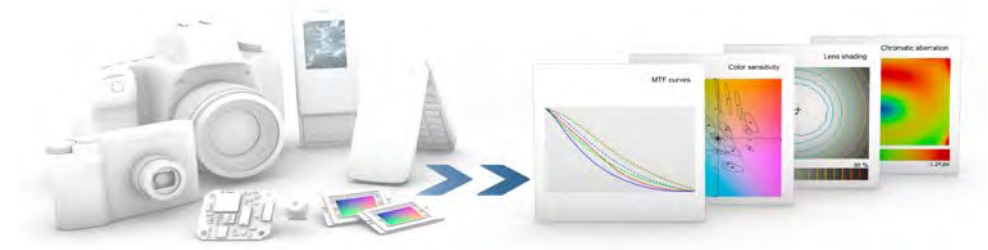- Noticeable moiré on some pictures.

Noticeable ringing at 100% scale

Noticeable moiré

Anonymous Phone

Autofocus

Scores

Scores per scene type and viewing conditions (range from 0 to 100)

	bright light	low light
8 Mp eq.	70	55

> Autofocus scores range from 0 to 100 (poor to excellent).
> Scores are given for low and bright light conditions.
> Scores are computed from the objective measurements and perceptual analysis shown below.
>
> Most important tested attributes are:
> - ability to obtain the best focus for every shots
> - autofocus speed.
>
> Two autofocus modes are tested:
> - automatic
> - manually triggered (touch screen).

Expert analysis

Pros:

- Autofocus is accurate in good lighting conditions.
- Face detection is accurate.

Cons:

- Automatic scene changes detection is slow.
- Some unnecessary refocus observed.
- Autofocus lacks repeatability, especially in low light.

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Overview

> This measurement assesses the ability of an autofocus to obtain the best focus for each shot.
> The final value is computed from the aggregation of 30 acutance measurements. Each measurement is computed from the picture of an MTF chart at 1m distance with D50 illuminant. The focus is first forced at 20 cm on a textured object, which is then removed from the camere field of view. Two autofocus modes are then tested:
> - automatic
> - manually triggered (touch screen).
> Detailed results are given below.

Technical overview

Objective measurements

	low light	bright light
Autofocus repeatability - average acutance difference with best focus	9.48%	6.44%

Natural scene - Perceptual analysis

Scores range from 1 to 5	low light	bright light
Sharpness	2.5	3.5
Speed	2.5	3.0
Smoothness	2.5	2.5
Stability	2.0	3.0

Continuous autofocus in preview	Yes
Oscillation in preview	many high oscillations
Misc.	Face detection activation

> Autofocus perceptual analysis is done by evaluation of 4 criteria:
> - sharpness repeatability and accuracy
> - speed
> - smoothness = oscillation to get at focus
> - stability = ability to stay at focus when the scene does not change.
> Scores range from 1 to 5 (poor to excellent).
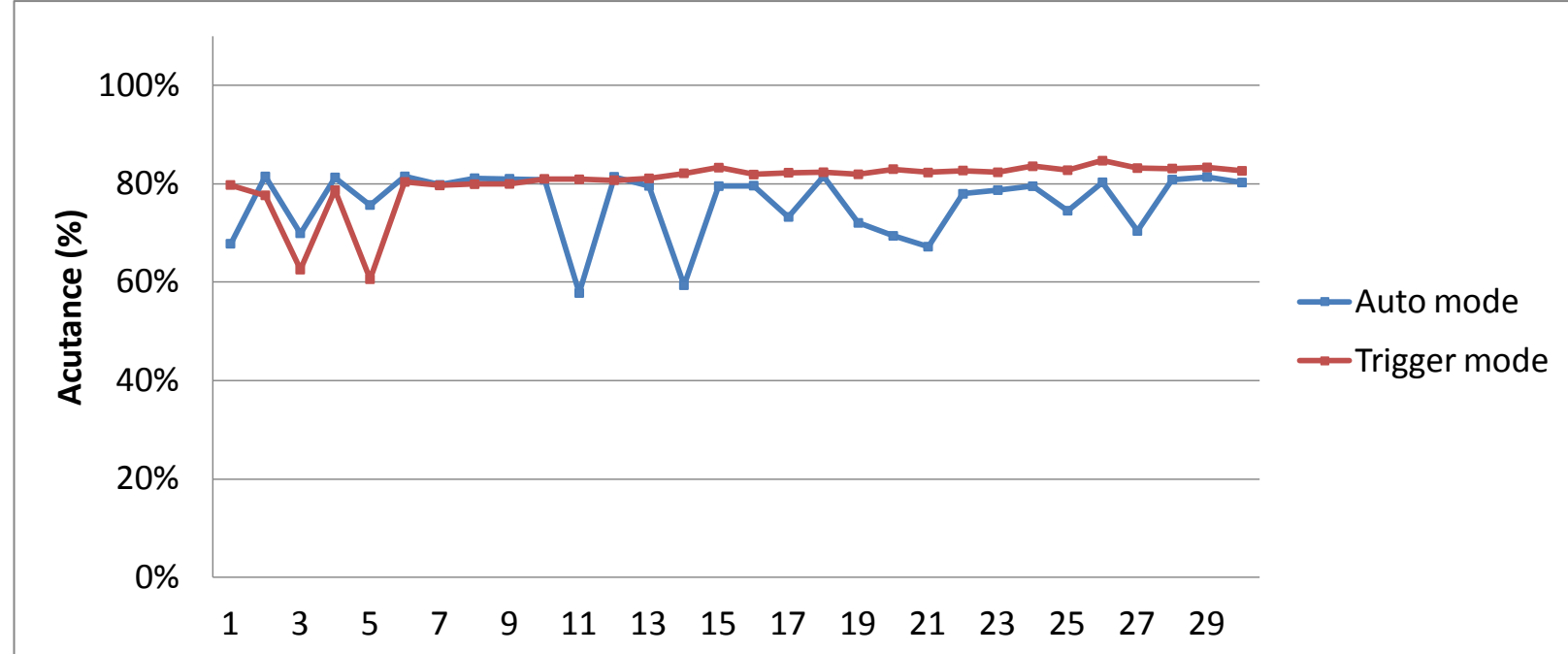
Anonymous Phone

Autofocus

Autofocus - repeatability and accuracy, bright light

Acutance (8 Mp eq in %) for 30 pictures shot with a defocus in between

Repeatability (average acutance difference with best focus)

Auto mode	**8.5%**
Trigger mode	**4.4%**

Autofocus - repeatability and accuracy, low light condition

Acutance (8 Mp eq in %) for 30 pictures shot with a defocus in between

Repeatability (average acutance difference with best focus)

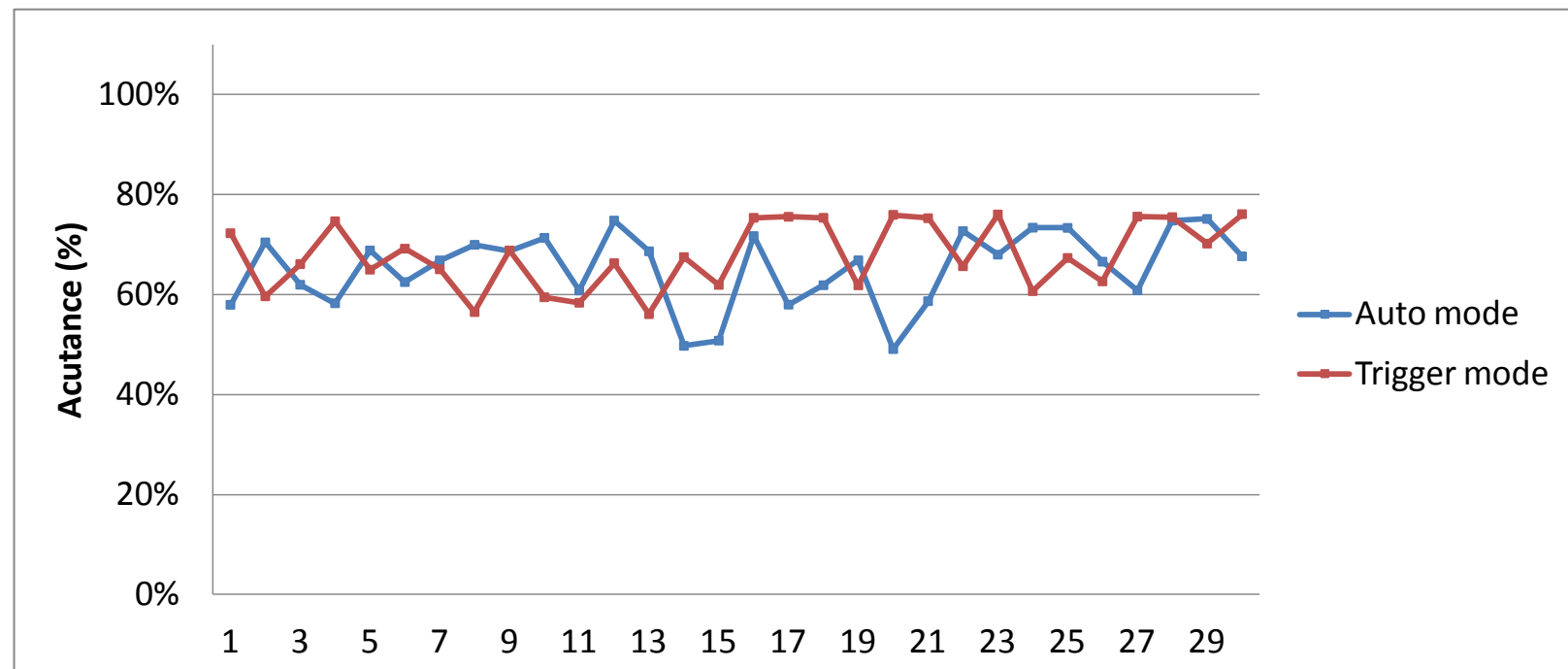| Auto mode	**10.7%**
Trigger mode	**6.4%**

Anonymous Phone

Flash

Scores

Scores range from 0 to 100

Flash	70

Flash scores range from 0 to 100 (poor to excellent). Scores are computed from the objective measurements and perceptual analysis below. Tested attributes are:
- flash uniformity
- white balance stability
- flash power
- auto-exposure and autofocus with flash.

Summary

Expert analysis

Pros:
- Good white balance.
- Flash uniformity is fine.

Cons:
- In low light tungsten plus flash illumination, a reddish cast is noticeable.
- Autoexposure and autofocus are not always accurate when using the flash.

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Technical overview

Objective measurements				
	0 Lux	5 Lux	10 Lux	20 Lux
WB accuracy (Delta ab)	1.6	1.3	2.5	1.3
WB accuracy (SMI %)	91.4	93.0	86.3	92.8
Max attenuation (%)	80.6	80.4	73.2	64.4
Mean exposure (gray level)	149	163	171	133

Flash repeatability (%)	90%

All measurements are done with or without an additional tungsten light source. Pictures are taken at 1m from the tested subject (ColorChecker chart for the white balance and uniform gray background for the flash attenuation)

Subjective scores and other tests	
Scores range from 1 to 5	
Flash	4.0
Flash repeatability	3.5

Perceptual evaluations are done from a set of images taken at 1m with or without an additional lightsource (5 to 20 lux). Evaluated attributes are autofocus, noise, texture, autoexposure. Score range from 1 to 5 (poor to excellent)
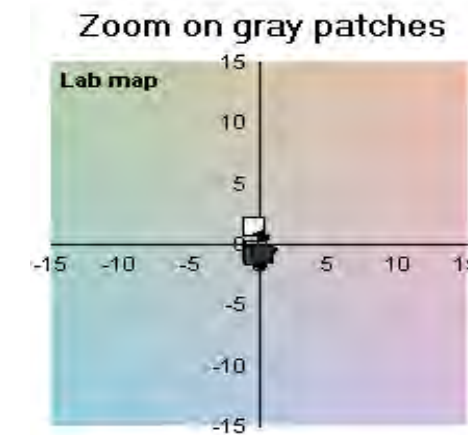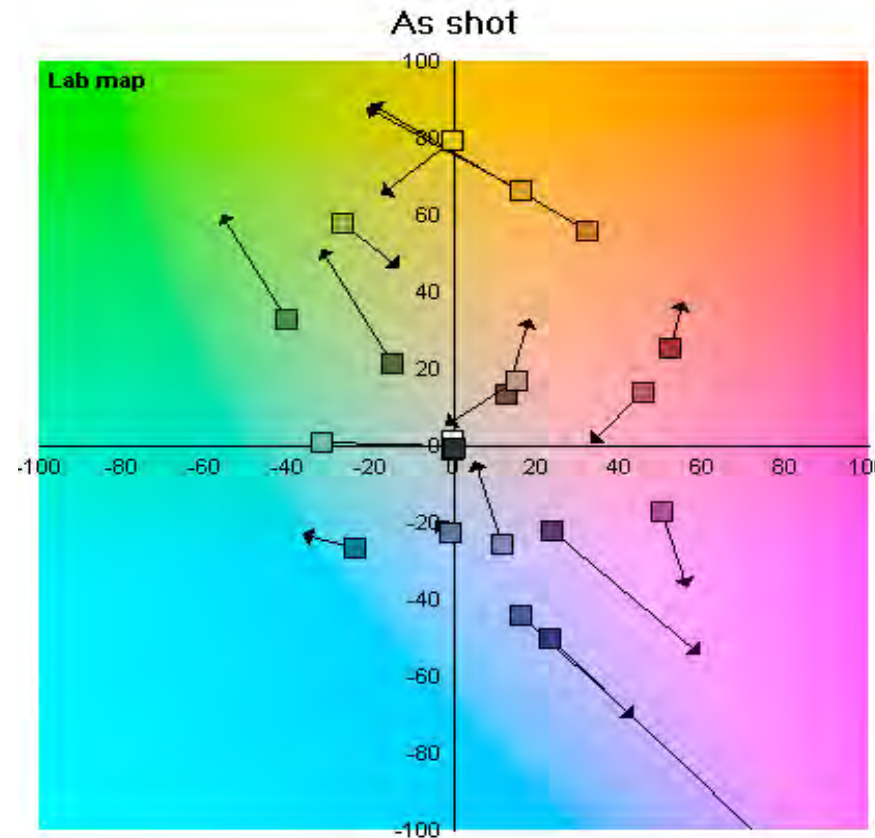
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Anonymous Phone

Flash

Color accuracy, 5 Lux

Delta ab is measured on the Colorchecker® with respect to CIE XYZ 1931 standard observer

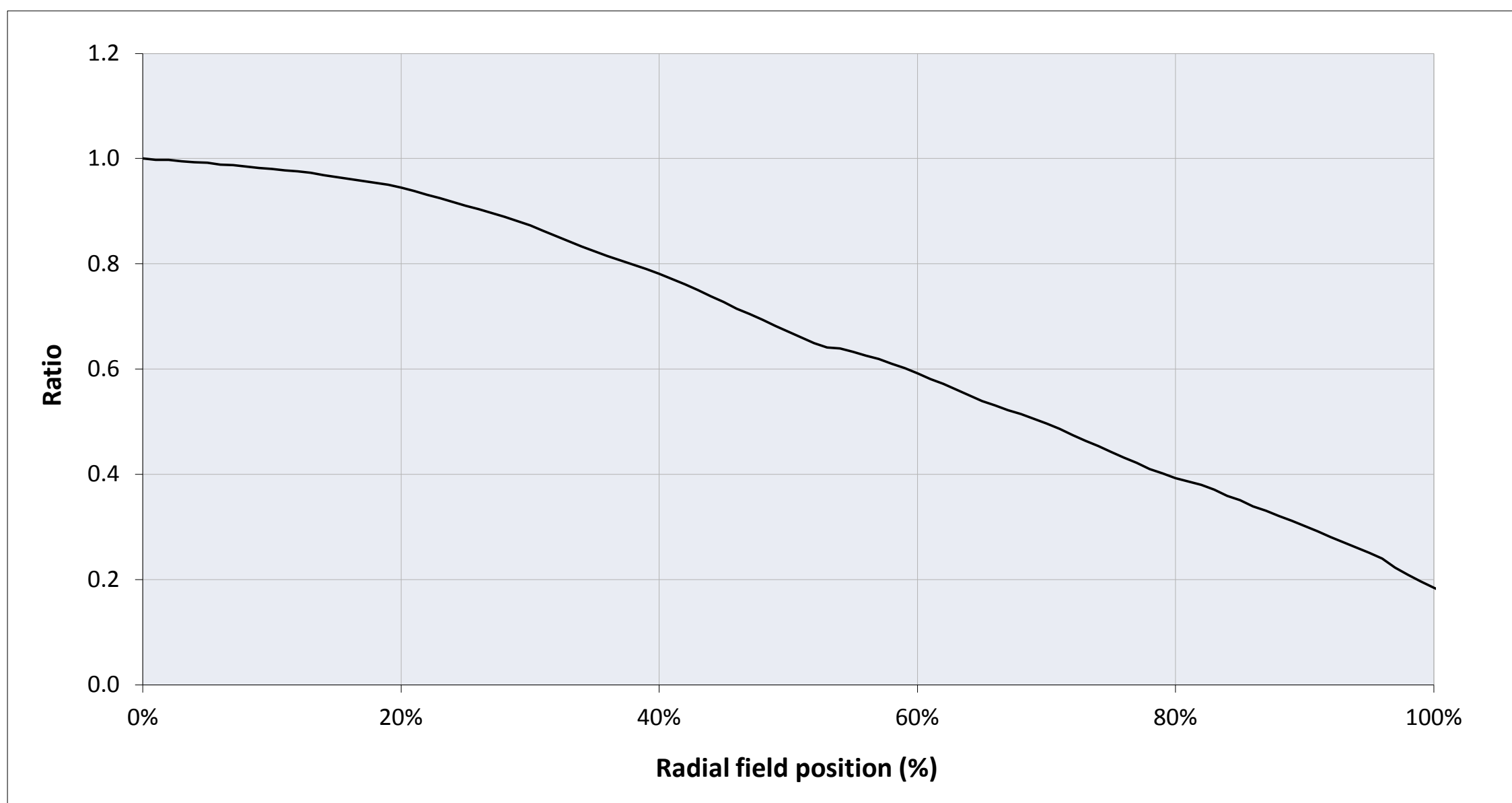|	
Delta ab mean	22.6
WB accuracy (Delta ab)	1.3

As shot

Zoom on gray patches

Flash uniformity, 5 Lux

This graph shows the radial flash profile, normalized to 1 at the center.

Anonymous Phone
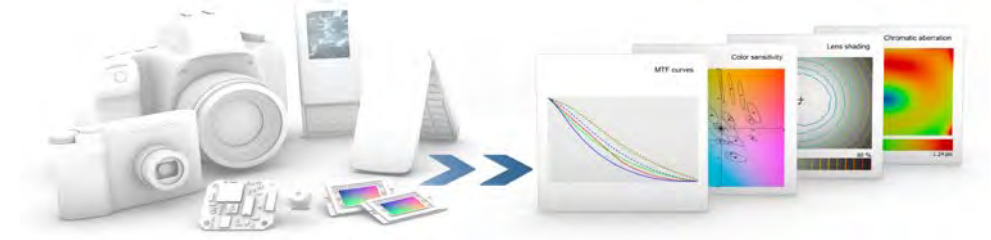
Flash

Flash uniformity, 0 Lux

This graph shows the radial flash profile, normalized to 1 at the center.
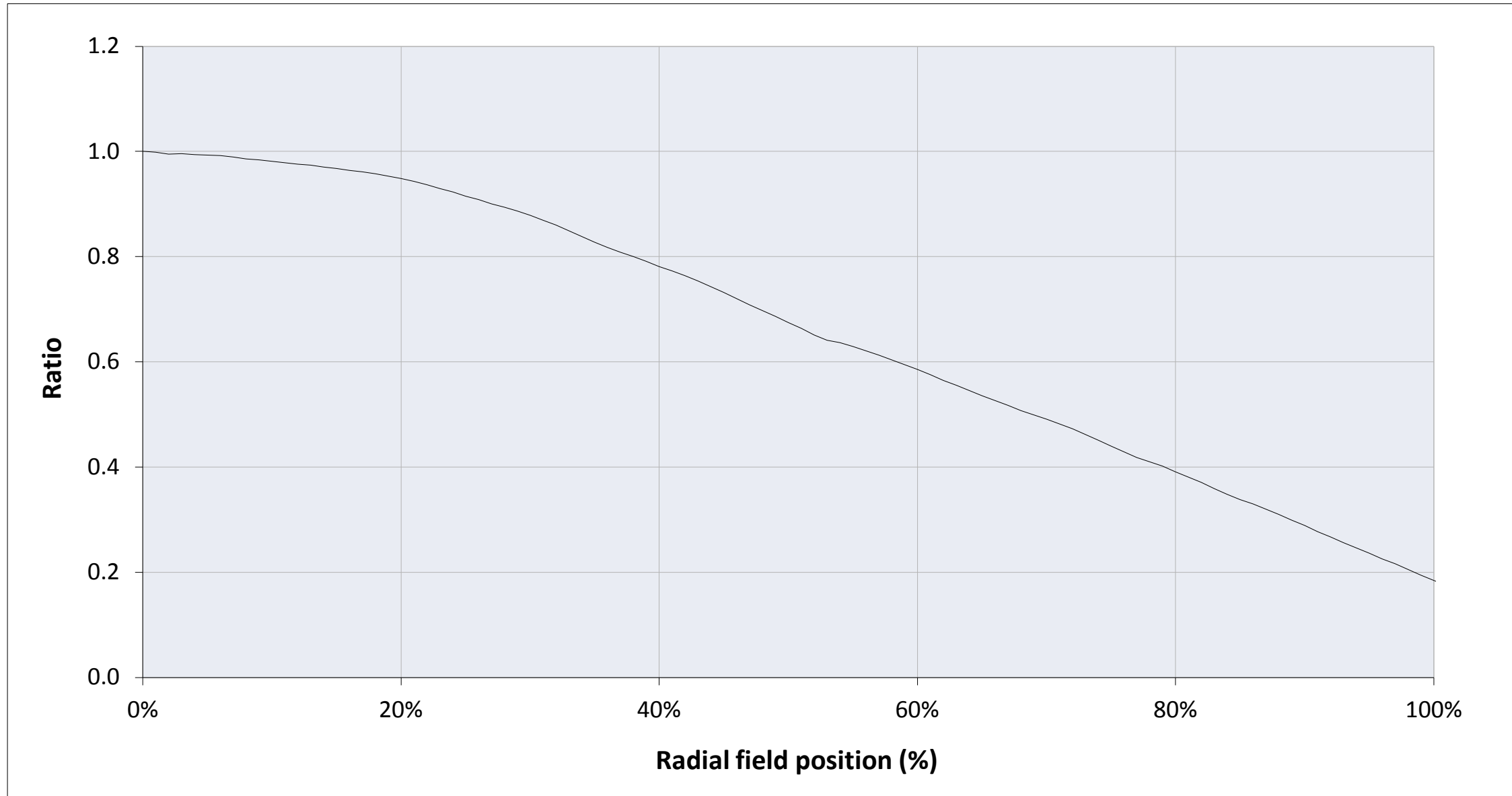
Natural scene - perceptual scores

Scores range from 1 to 5

Flash	4.0
Flash repeatability	3.5

Pros:
- Repeatability is usually good.
- Exposure is good even if colors could be more accurate.

Anonymous Phone

Flash

Natural scene - perceptual analysis

Pros:
- Pictures are well exposed down to 5 Lux.
- White balance is accurate.
- Luminance shading is noticeable but at an acceptable level.

Cons:
- at 0 lux, lack of repeatability.

Note: Red eyes correction is only available as a post-processing. It was not applied in this test.

5 Lux

0 Lux

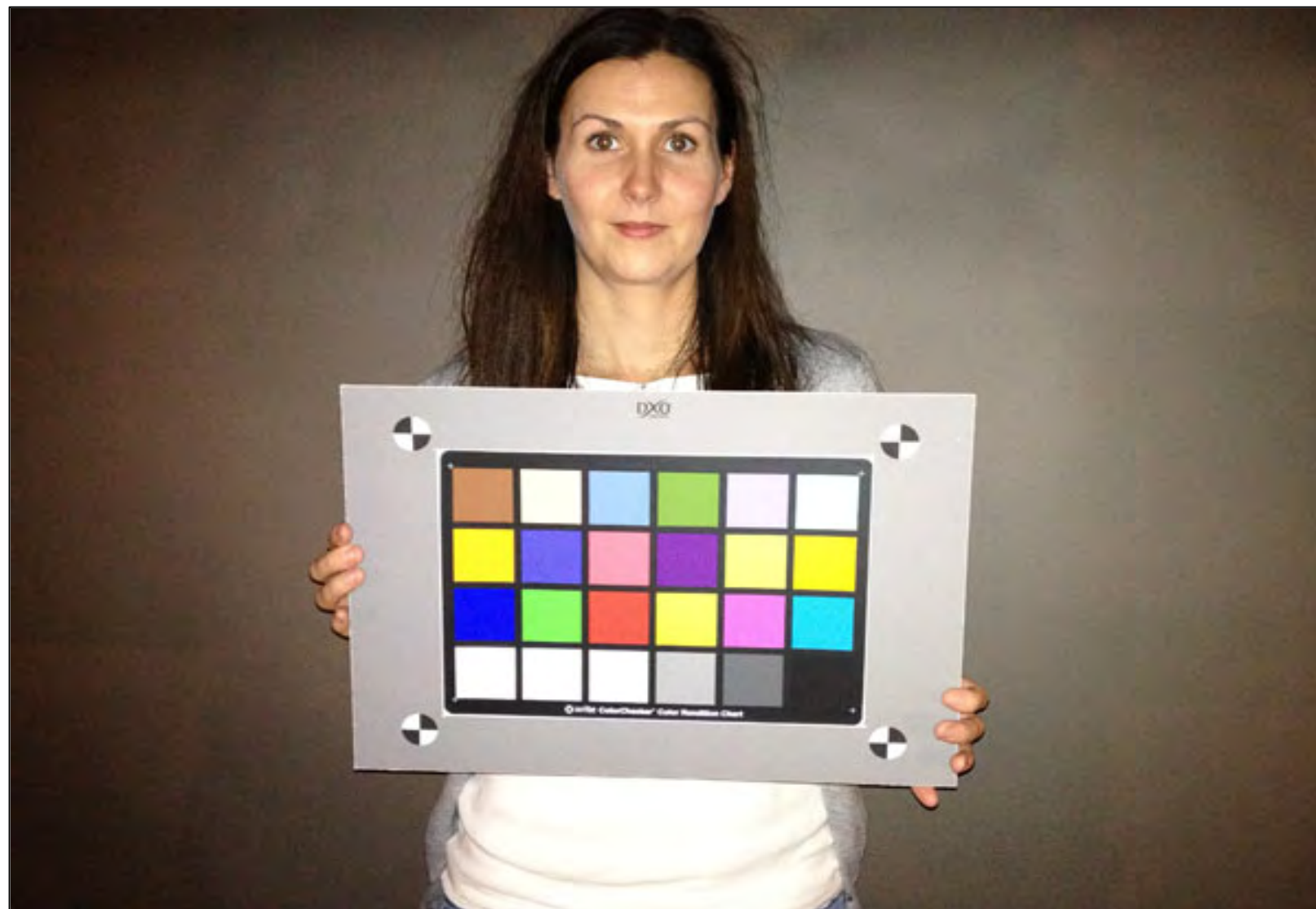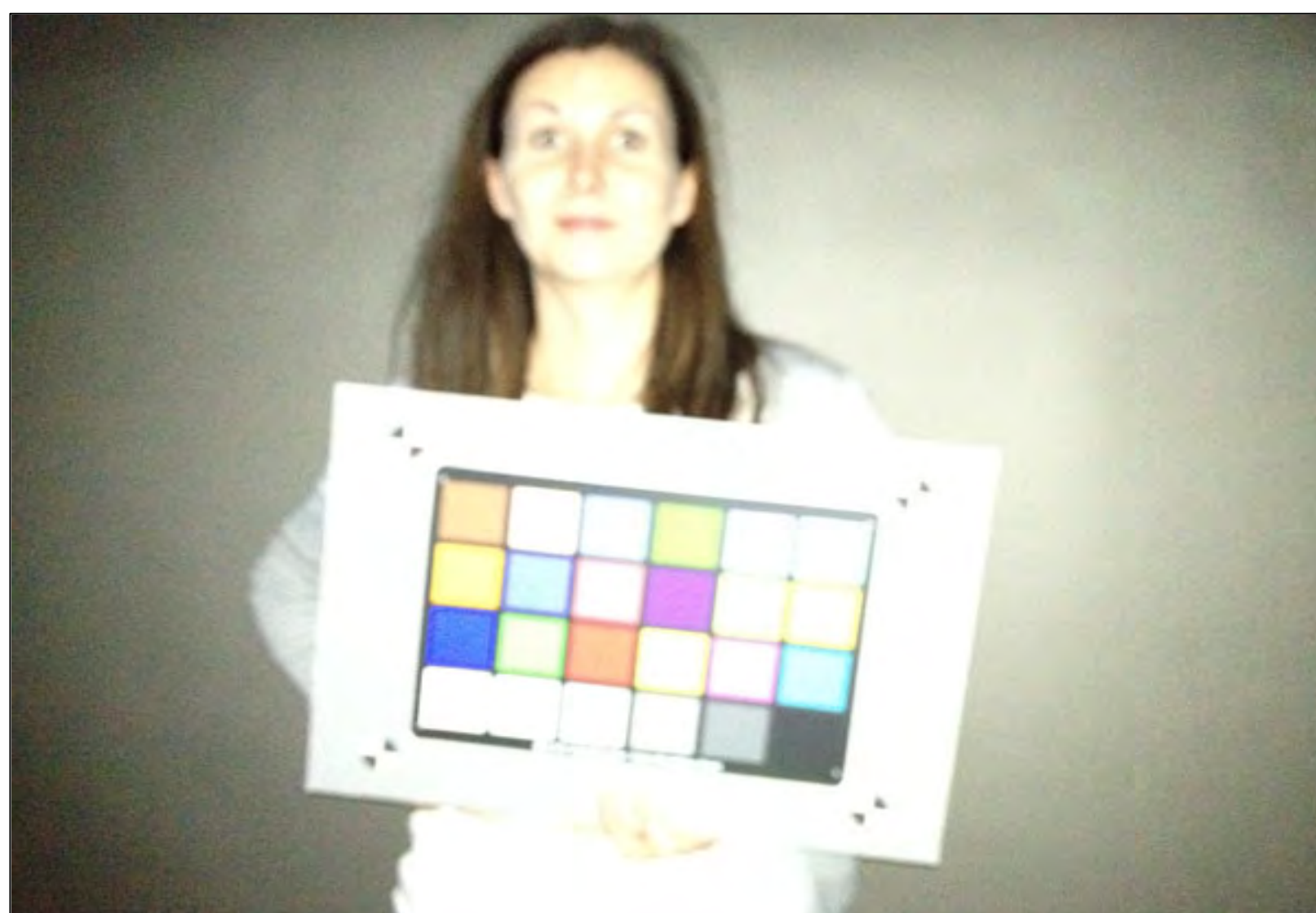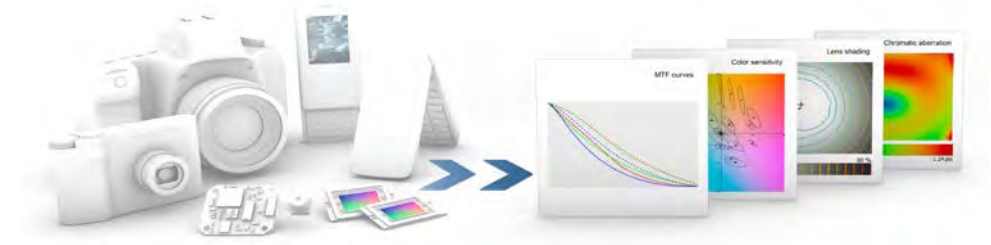# Anonymous Phone
Video

Scores

Scores range from 0 to 100

	Bright light	Low light
Exposure and Contrast	100	81
Color	99	88
Autofocus	48	47
Texture	94	75
Noise	63	25
Artifacts	83	82
Stabilization	51	4

Summary

Expert analysis

Pros:
- Nice details in bright light conditions.
- Vivid and pleasant colors.
- Good exposure.
- Good video stabilization in outdoor conditions.

Cons :
- Strong jello effects.
- Stabilization seems to be ineffective or turned off while not in outdoor lighting conditions.
- Autofocus only works when triggered manually. Large lens breathing when refocusing.
- Strong noise in low light and dark areas with an unpleasant chrominance component.

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Natural scene - perceptual scores

Scores range from 0 to 100

	Bright li
Auto exposure	100
Color rendering	96
White balance	100
Color shading	100
Texture preservation	94
Noise reduction	63
Autofocus	48
Stabilization	51
Artifacts	83

Evaluation of exposure and contrast for both static and dynamic lighting scenarios:
- **The static scenarios include tungsten and daylight sources for both low light (< 100 lux), bright light (> 300 lux) conditions, and daylight outdoor.**
- **The dynamic scenarios include progressive changes from a light source to another and from an illumination level to another. For dynamic scenarios, the smoothness (no discontinuity or oscillation) of exposure convergence is evaluated.**

Under-exposure in low light (20 lux)

Evaluation of colors (color rendering and white balance) for both static and dynamic lighting scenarios.
During dynamic scenarios, the smoothness and speed of white balance convergence is evaluated .

Slight loss of texture in low light

Evaluation of the autofocus for five attributes:
- **Stability, i.e. no unnecessary focus search for a real hand held shooting.**
- **Lens breathing: overshoot, focus oscillations, wrong direction (i.e. the autofocus starts moving in the opposite direction of subject).**
- **Tracking abilities of a subject moving closer and away from the camera.**
- **Focusing speed.**
- **Accuracy.**

manually triggered while already at focus, the whole

Both perceptual and quantitative evaluations for various use cases:
- **Static scene.**
- **Typical user manipulations required to use device's functionalities such as manual autofocus trigger.**
- **Movements in the scene uncorrelated to device's movements.**
- **Walking.**

conditions

Evaluation of typical video artifacts such as:
- **Compression (blocking, quantization, ghosting …)**
- **Frame rate and lost frames due to changes of frame rate.**

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