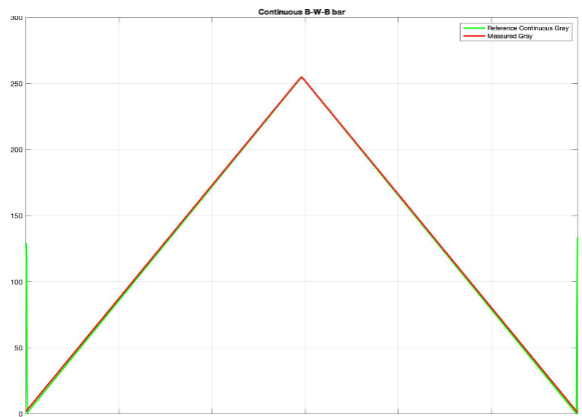
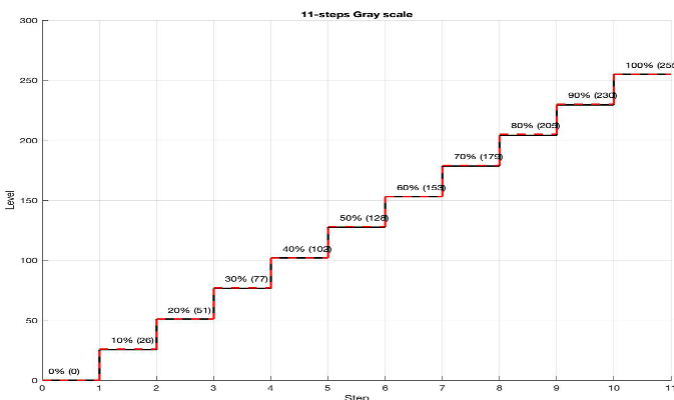
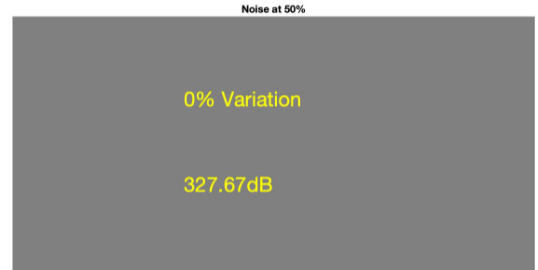
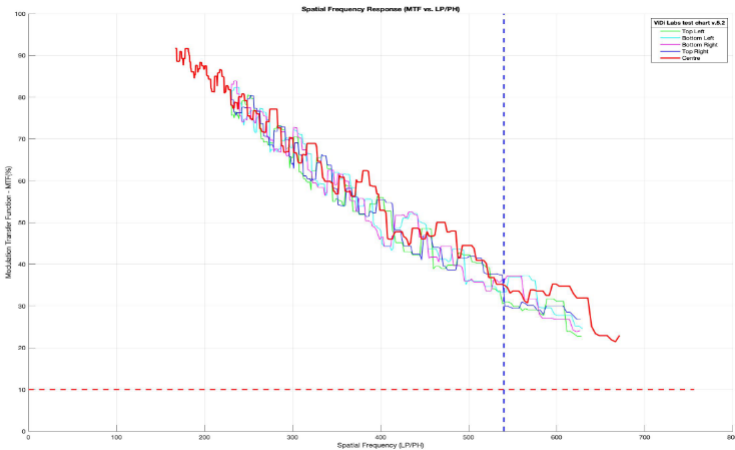
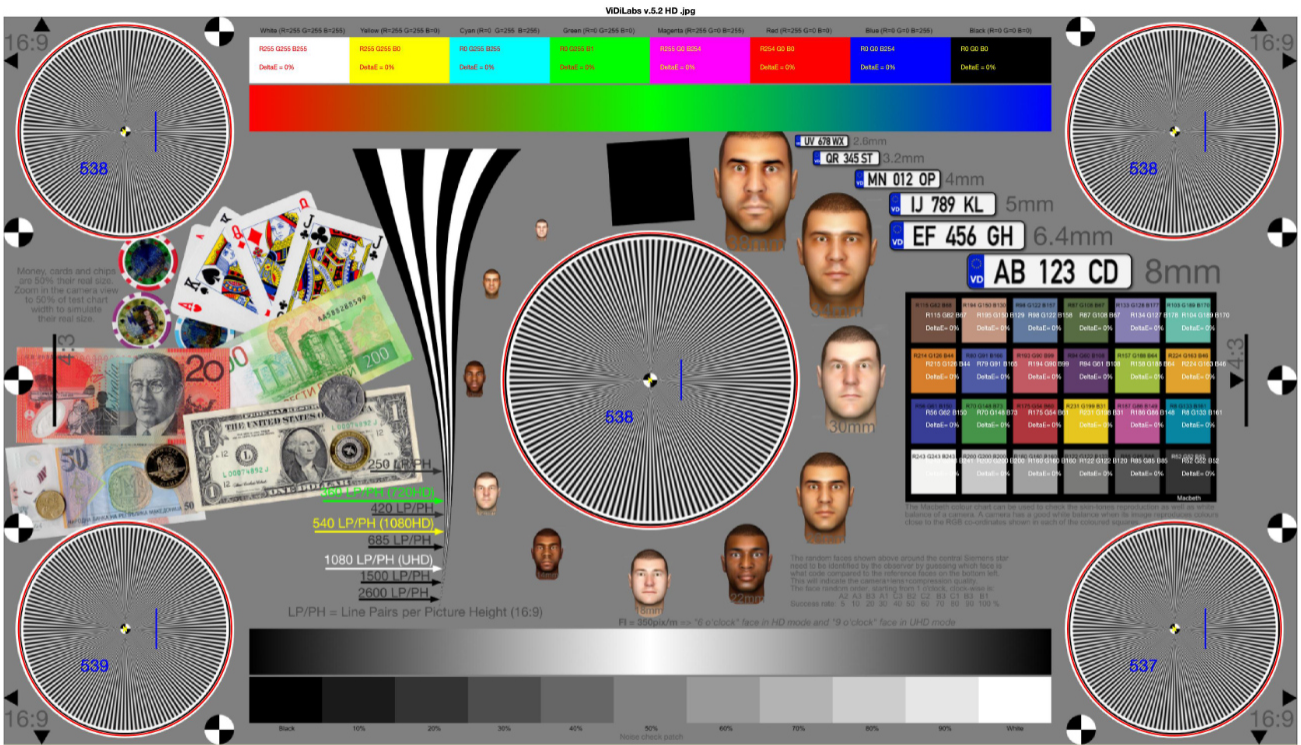
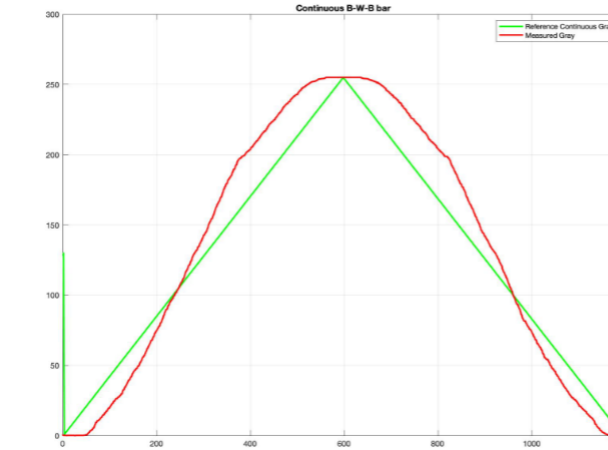
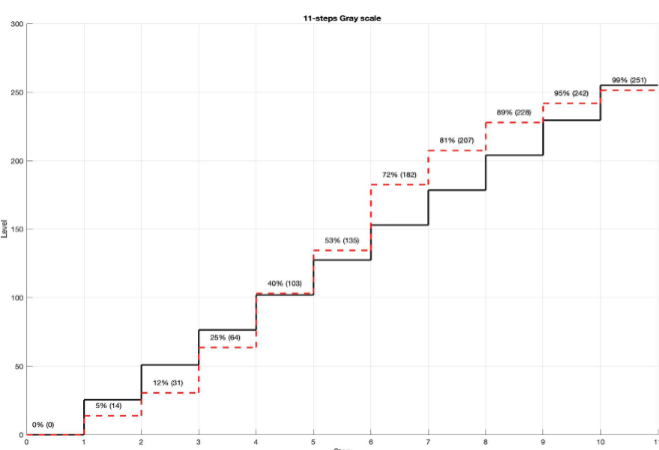
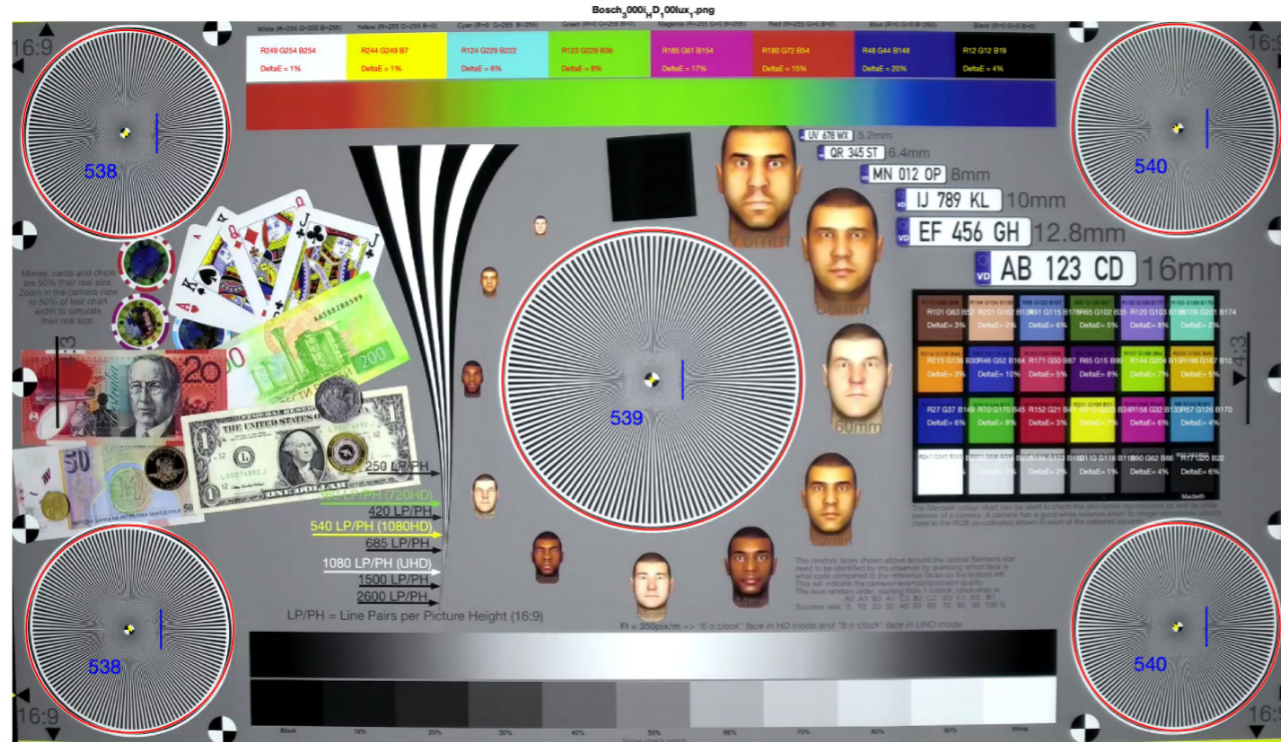


Camera model	Sensor size	Resolution		
Raw test chart file	N/A	1920x1080		



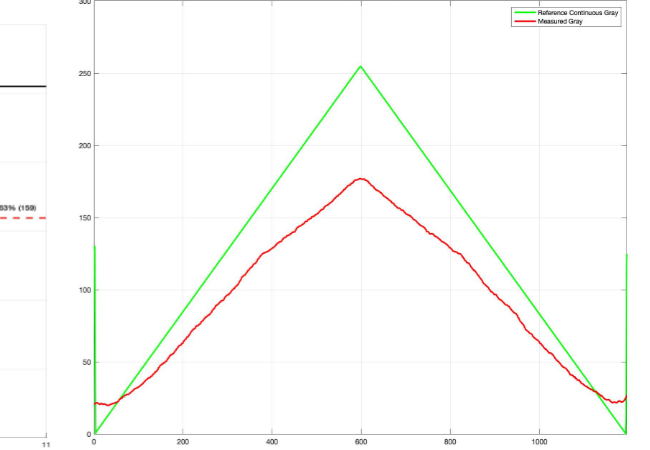
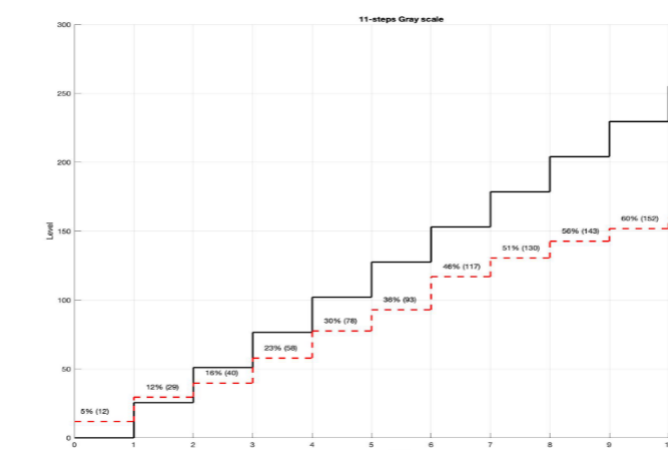
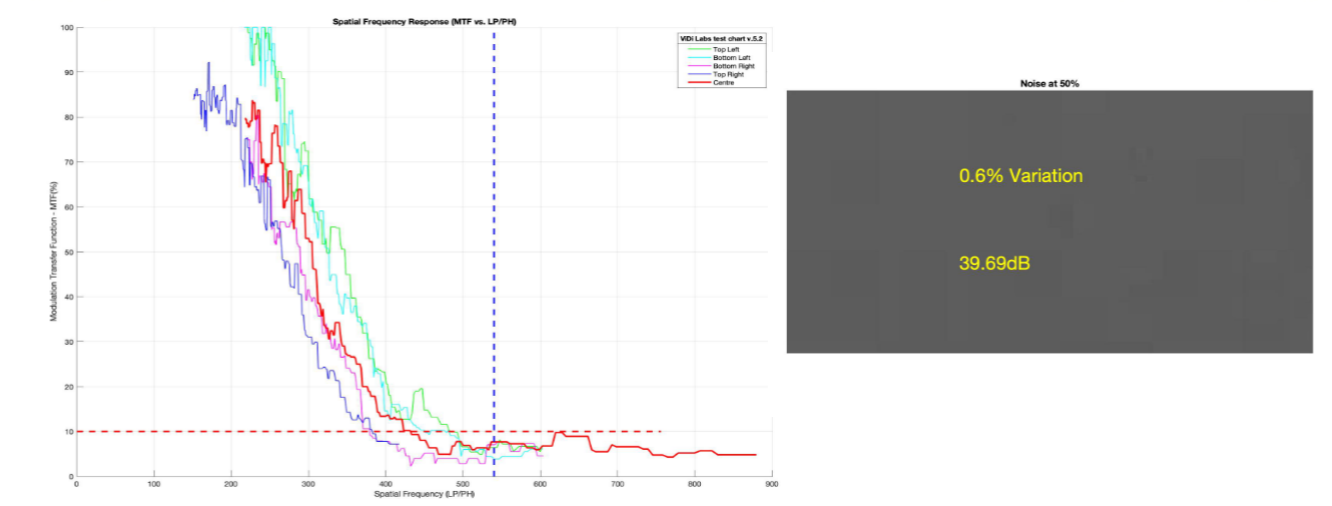
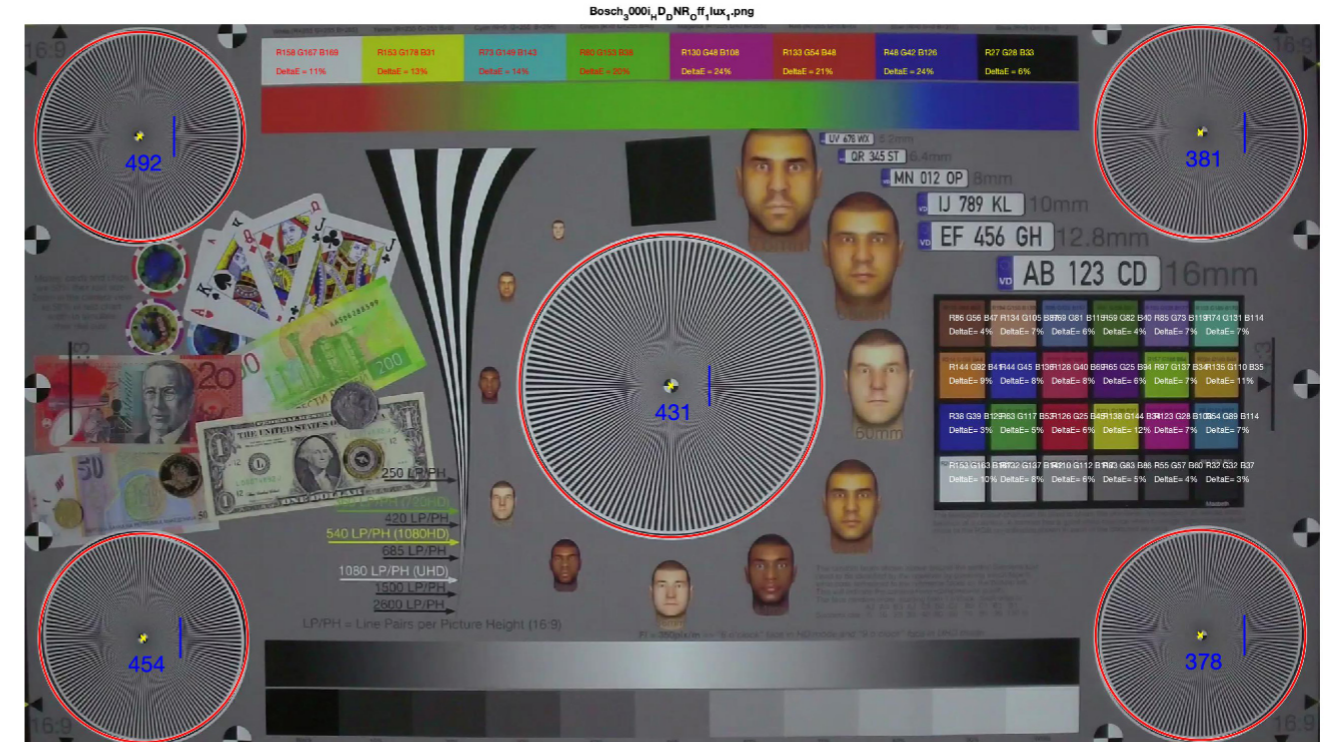
The analysed image here is the reference raw test chart electronic image. Because of this, the resolution is as high as it can be, which for an HD (1920x1080) resolution is 540LP/PH, there are no errors in reading the colours (0%), the 11-grey steps are reproduced perfectly, where red dotted line is completely overlaid with the black reference steps, the Black-White_Black bar strip is also perfectly linear, following the reference "pyramid" lines. The noise is 0, as there are no noise nor compression artefacts.

Camera model	Sensor size	Resolution	Illumination	White Balance	Noise Reduction	WDR
Bosch-3000i	1/2.8"	1920x1080	100lux	Auto	On	Off



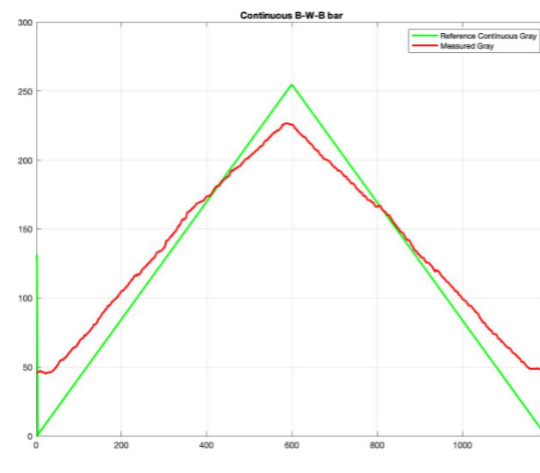
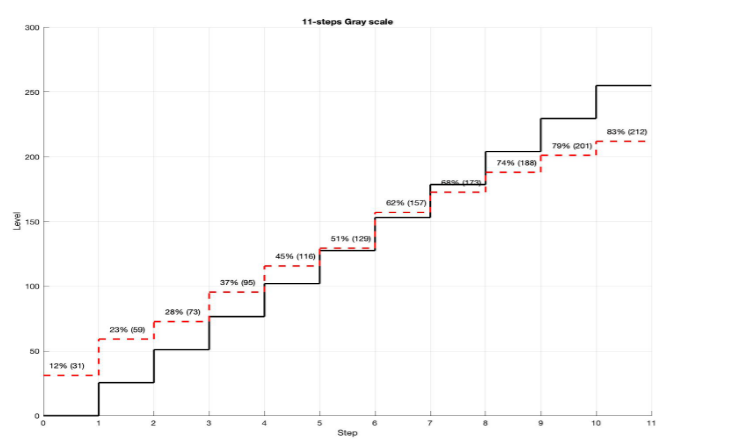
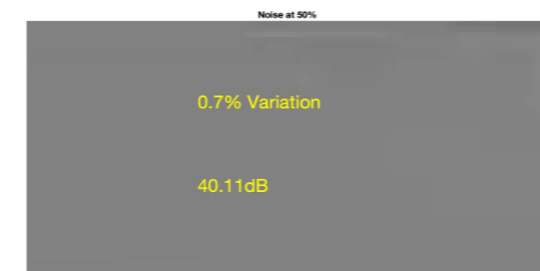
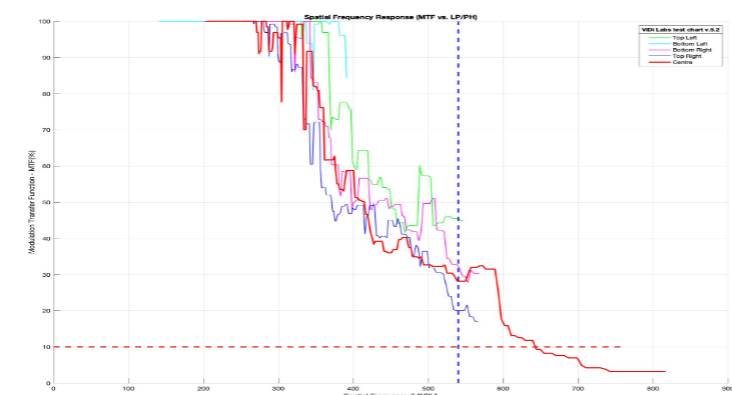
This camera showed excellent resolution overall (both in the centre and corners), but it shows some vignetting, where the peripheral areas are slightly darker than the central area. Colour rendering is pretty good, with very low deviation from white balance (showing only 1%) and very good skin colours of only 2%~3% deviation. An unusual and high Gamma curve which makes the image appear very contrasty.

Camera model	Sensor size	Resolution	Illumination	White Balance	Noise Reduction	WDR
Bosch-3000i	1/2.8"	1920x1080	1lux	Auto	On	Off



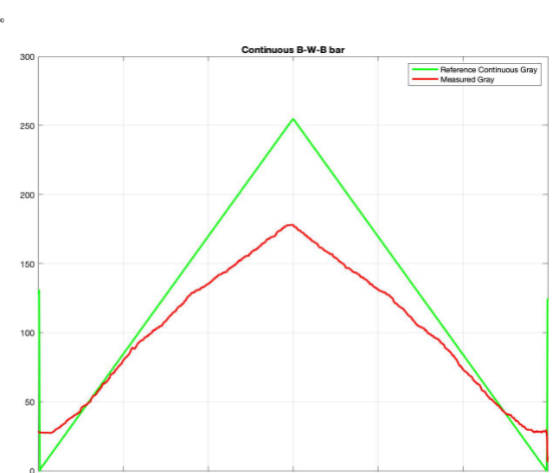
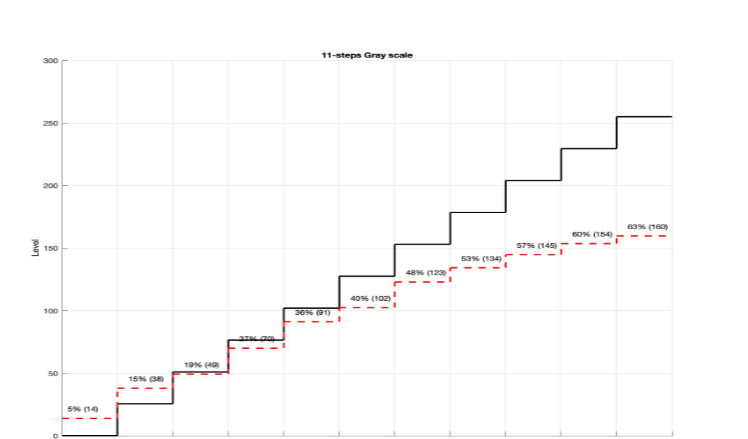
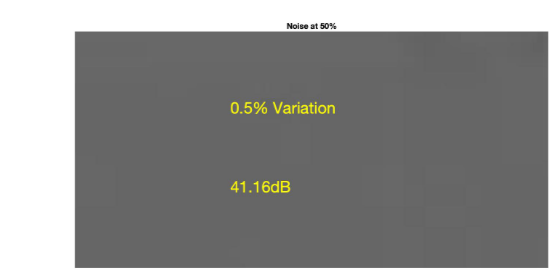
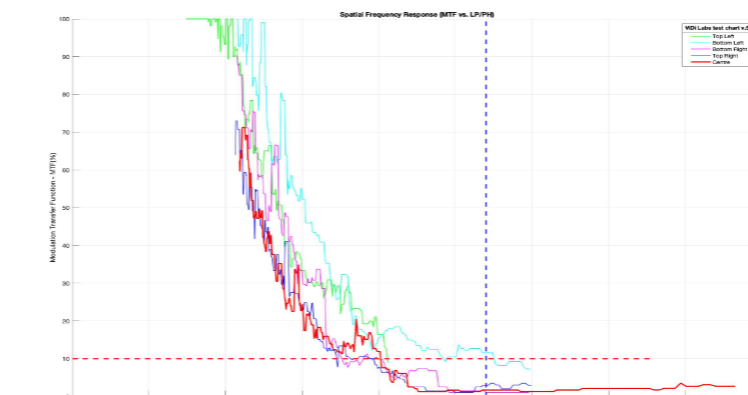
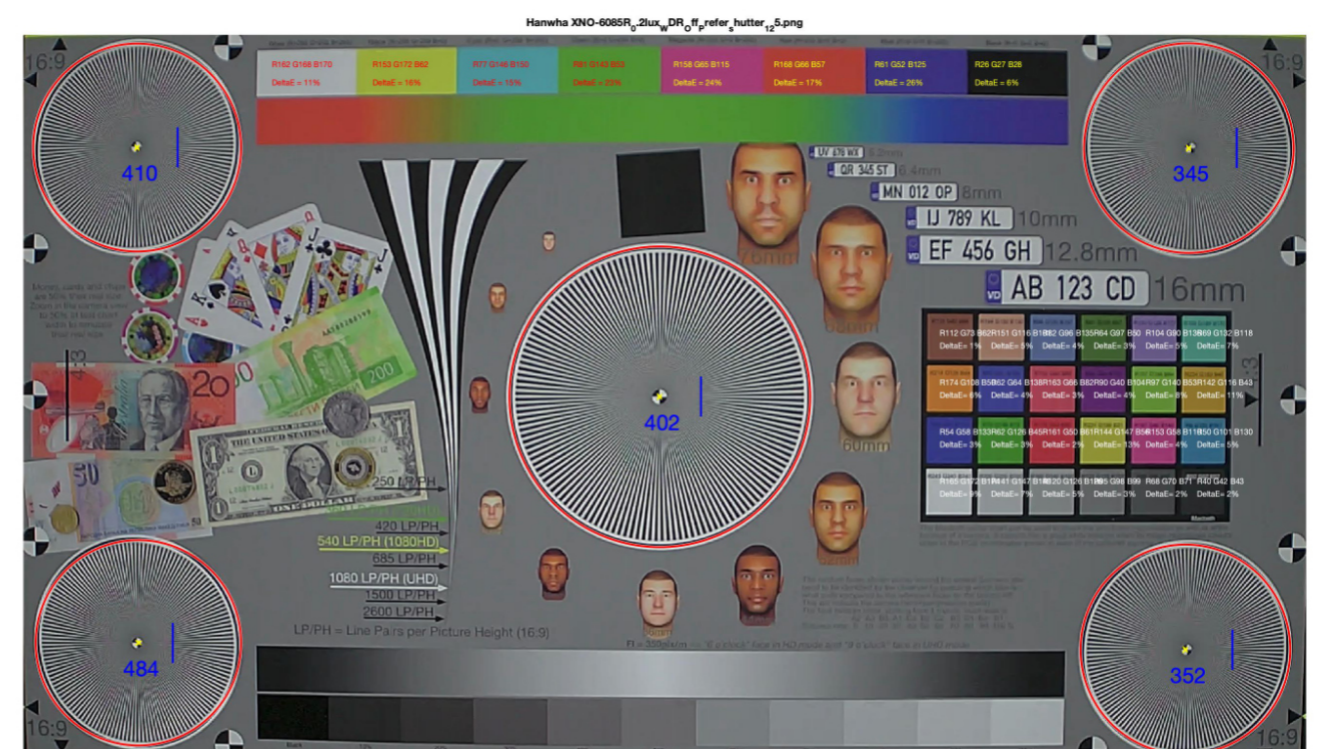
The same camera as in the previous page, but this time at 1lux reflected illumination. Still holding the resolution pretty well (431 LP/PH at the centre), although as we have said in many places, resolution is by definition, not measured at such a low light. But this detail gives an indication of the loss of details at such low light levels, which influence pixel density for facial, number-plates or any other recognition.

Camera model	Sensor size	Resolution	Illumination	White Balance	Noise Reduction	WDR
Hanwha-XNO6085R	1/2"	1920x1080	100lux	Auto	On	Off



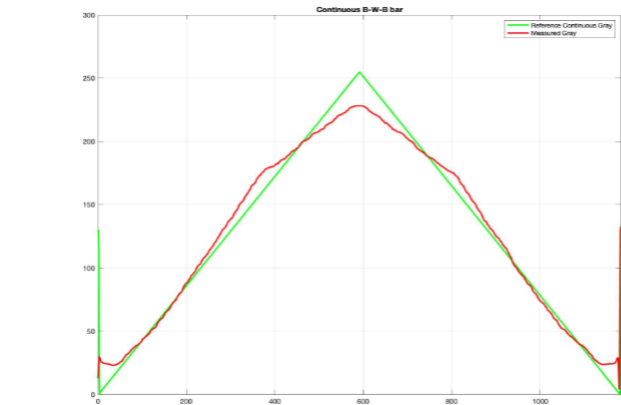
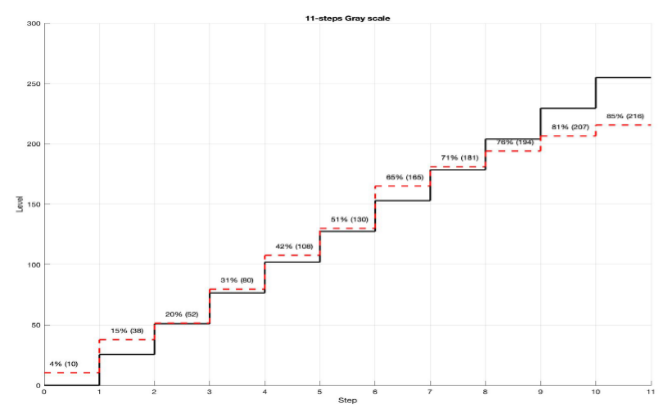
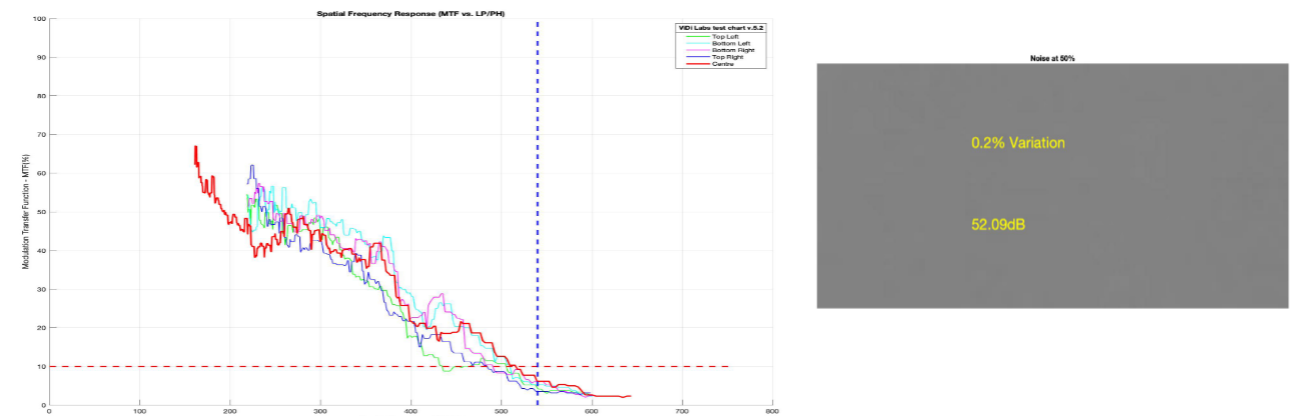
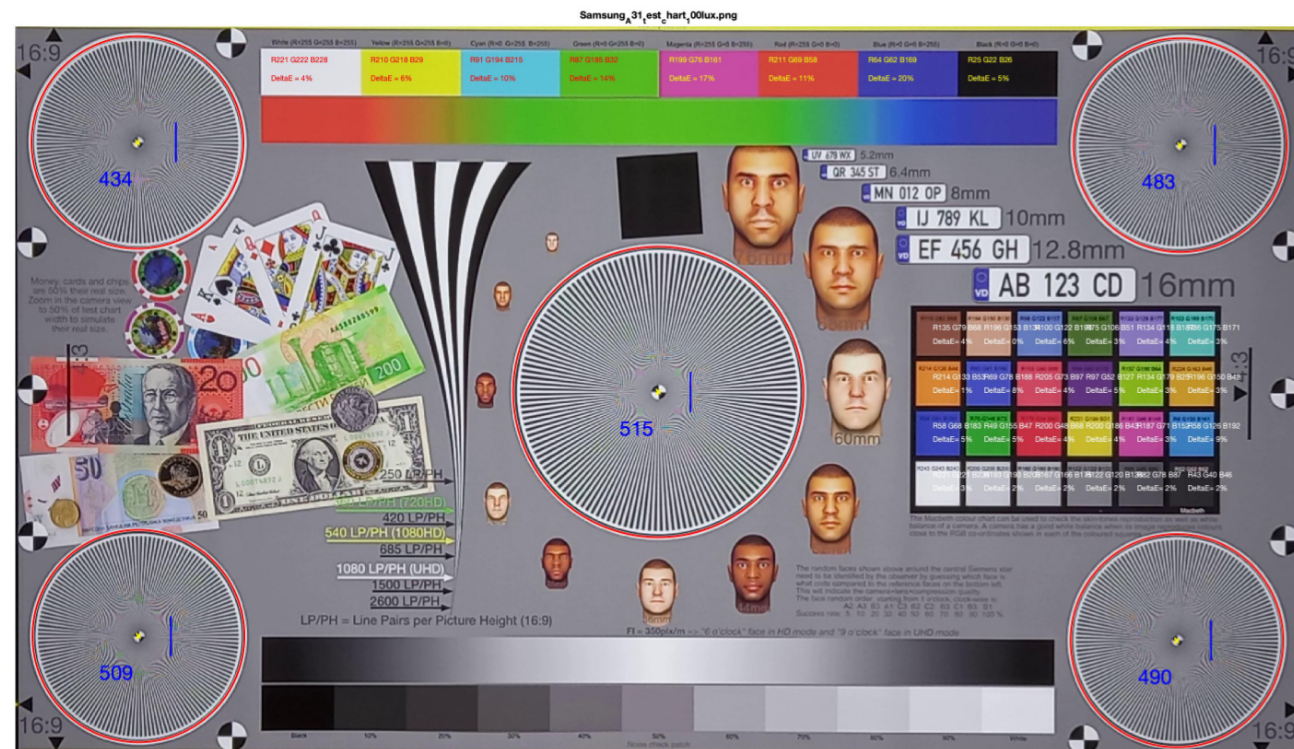
The resolution is maximum at this light levels, basically coming very close to the limit of 540LP/PH, which means the optical resolution of the lens is very good. Linearity is one of the best we have seen in a CCTV camera, although not as good as a mobile phone camera. This is a 1/2" sensor camera and it is no surprise the S/N is better than the 1/3" sensors. The accumulated noise (sensor and digital processing, including the compression artefacts) is good, coming over 40dB. The colour accuracy is good, white being with 4% deviation error, and skin tones in the Macbeth chart pretty good at around 2~4%.

Camera model	Sensor size	Resolution	Illumination	White Balance	Noise Reduction	WDR
Hanwha-XNO6085R	1/2"	1920x1080	1lux	Auto	On	Off



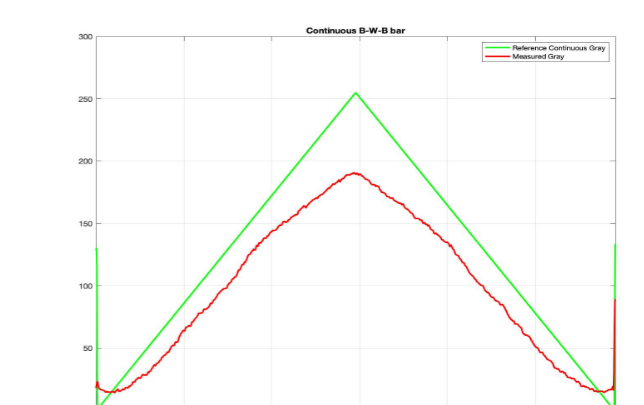
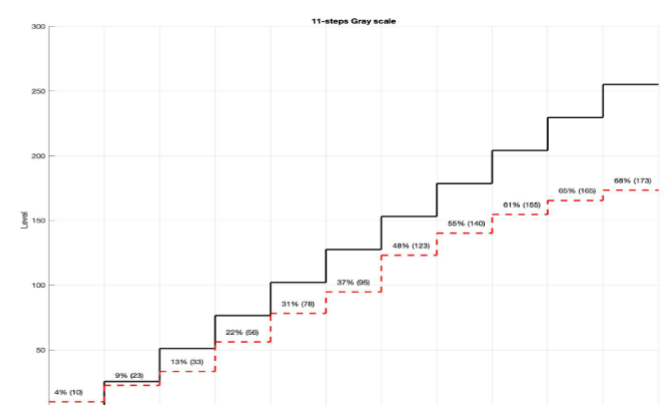
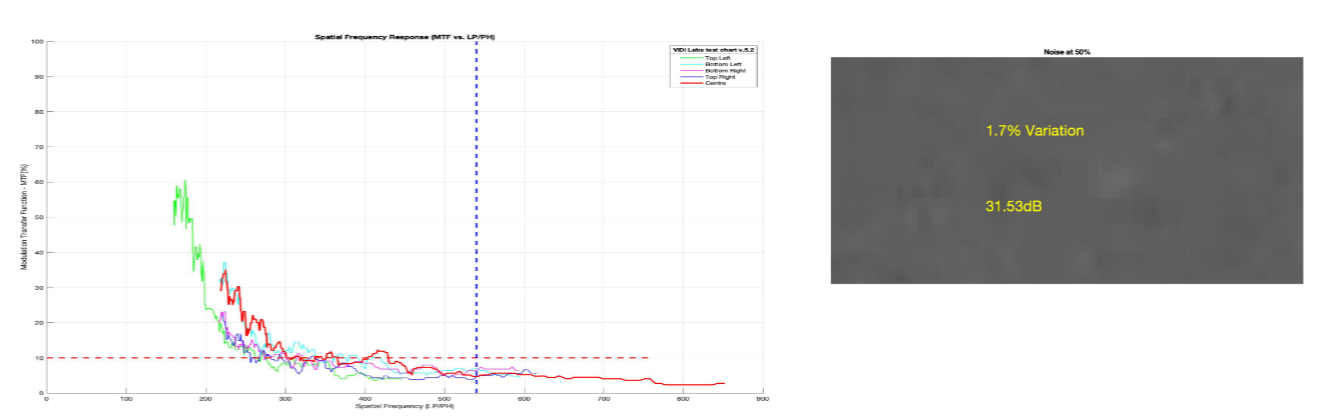
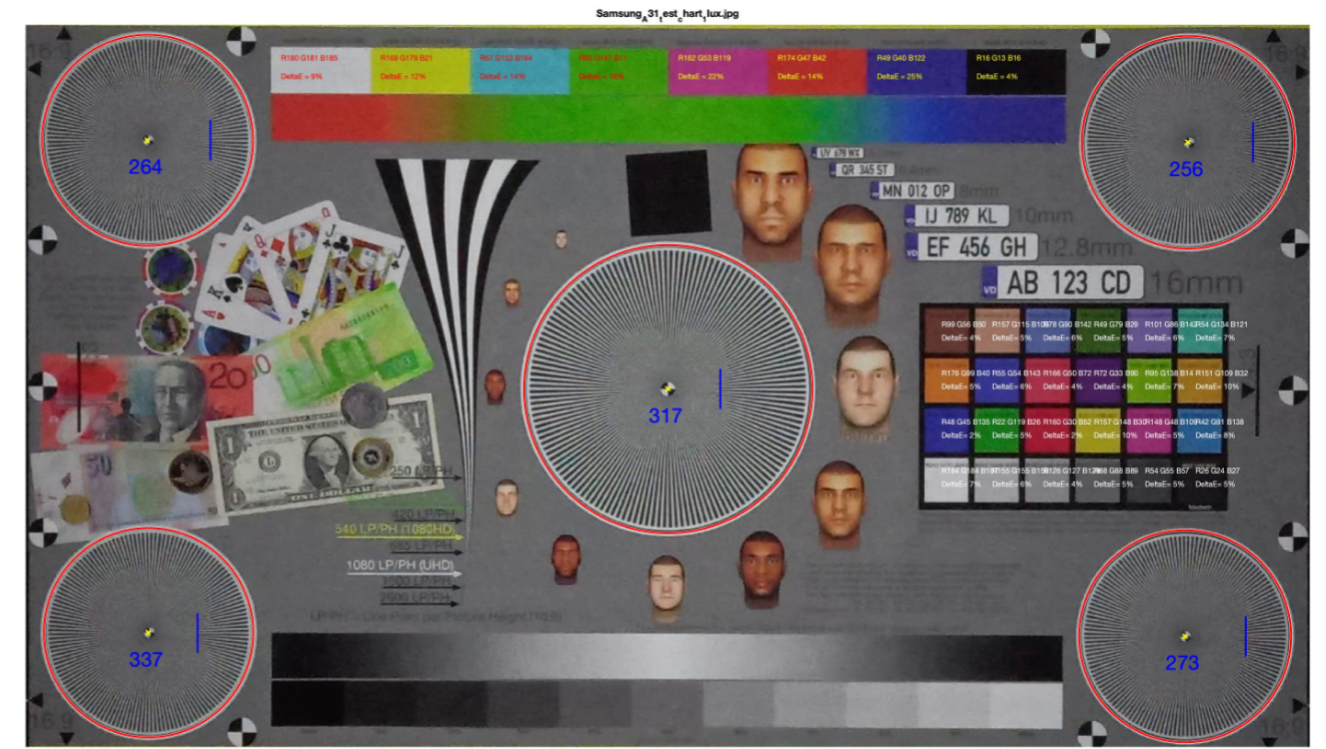
The same camera as in the previous page, but this image is produced at 1lux. When comparing to the previous camera at the same light level of 1lux, one can see that this appears a brighter image, although slightly lower resolution. The noise is however lower, producing S/N just over 41dB. The main reason for the lower noise is that the pixels of this camera are larger than the one on page 3, since the sensor is 1/2", versus the 1/2.8".

Camera model	Sensor size	Resolution	Illumination	White Balance	Noise Reduction	WDR
Samsung-A31	?	1920x1080	100lux	Auto	On	Off



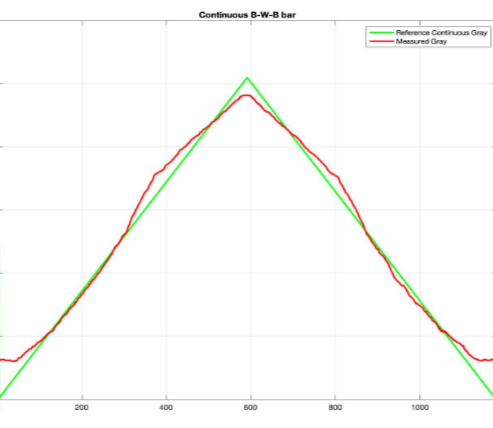
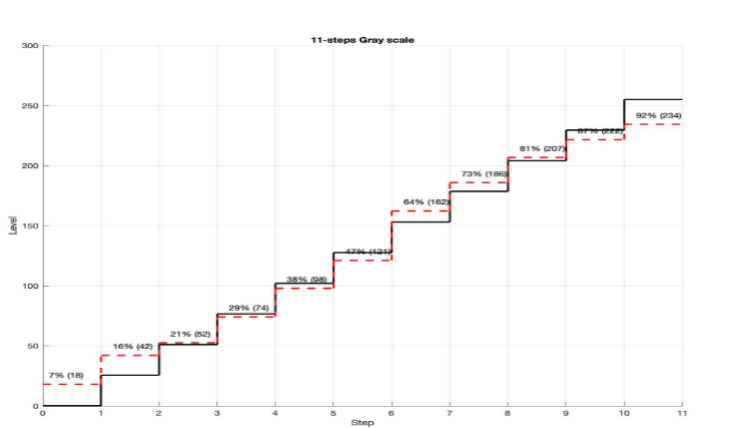
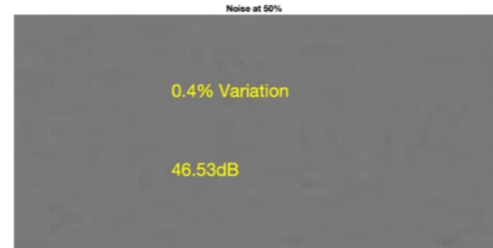
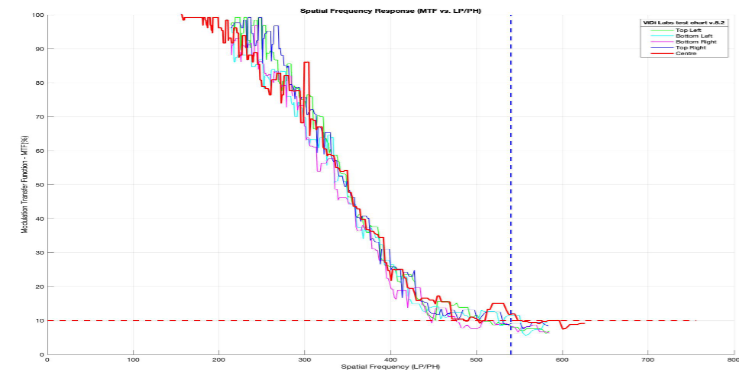
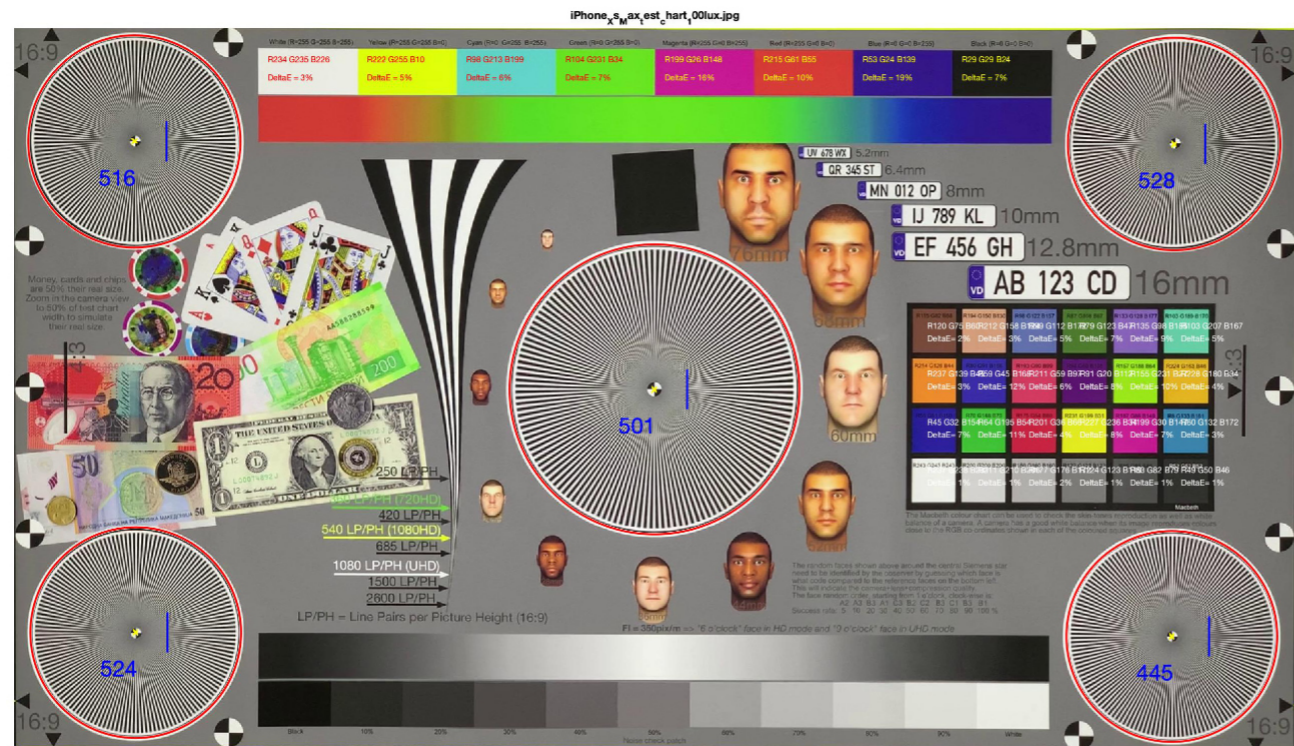
This image is from a Samsung Galaxy A31 mobile phone, which was set to record the test chart in HD, with its portrait mode camera (one of the four) and then a snap-shot exported. Like with the iPhone7, the optics is almost non-distorting, but the resolution is slightly lesser than expected. The S/N ratio is very good on this model, and the skin colour reproductions are pretty good, with some errors being 0. This phone has four cameras at the back, and we used the portrait (or depth) one, but sadly, we could not get information on the sensor dimensions, other than it is a 5MP sensor.

Camera model	Sensor size	Resolution	Illumination	White Balance	Noise Reduction	WDR
Samsung-A31	?	1920x1080	1lux	Auto	On	Off



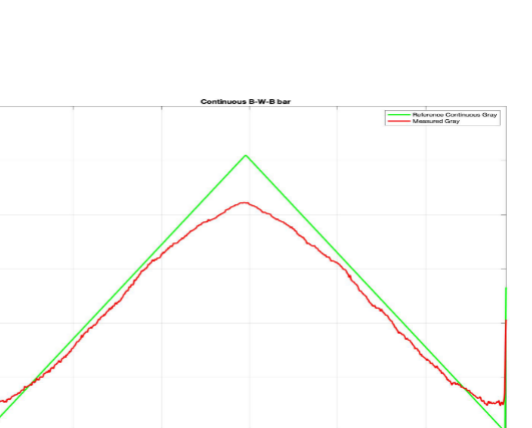
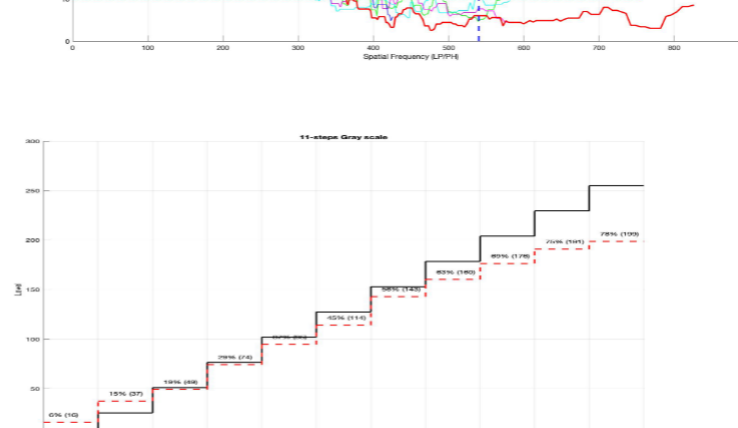
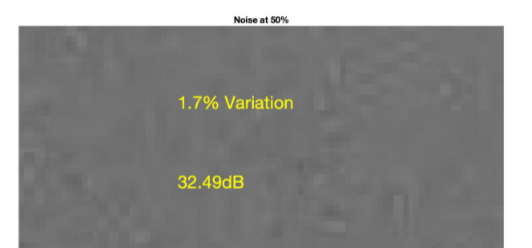
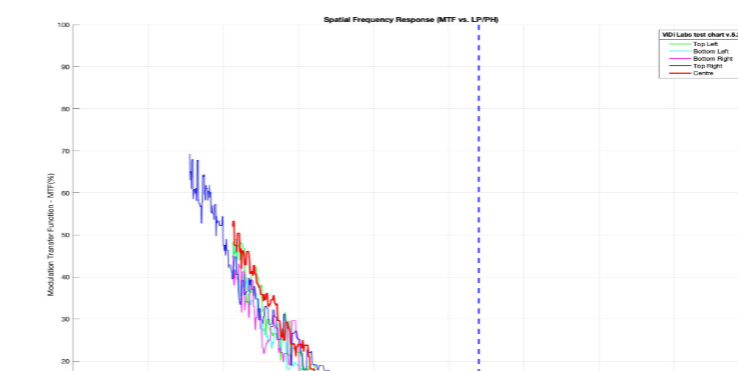
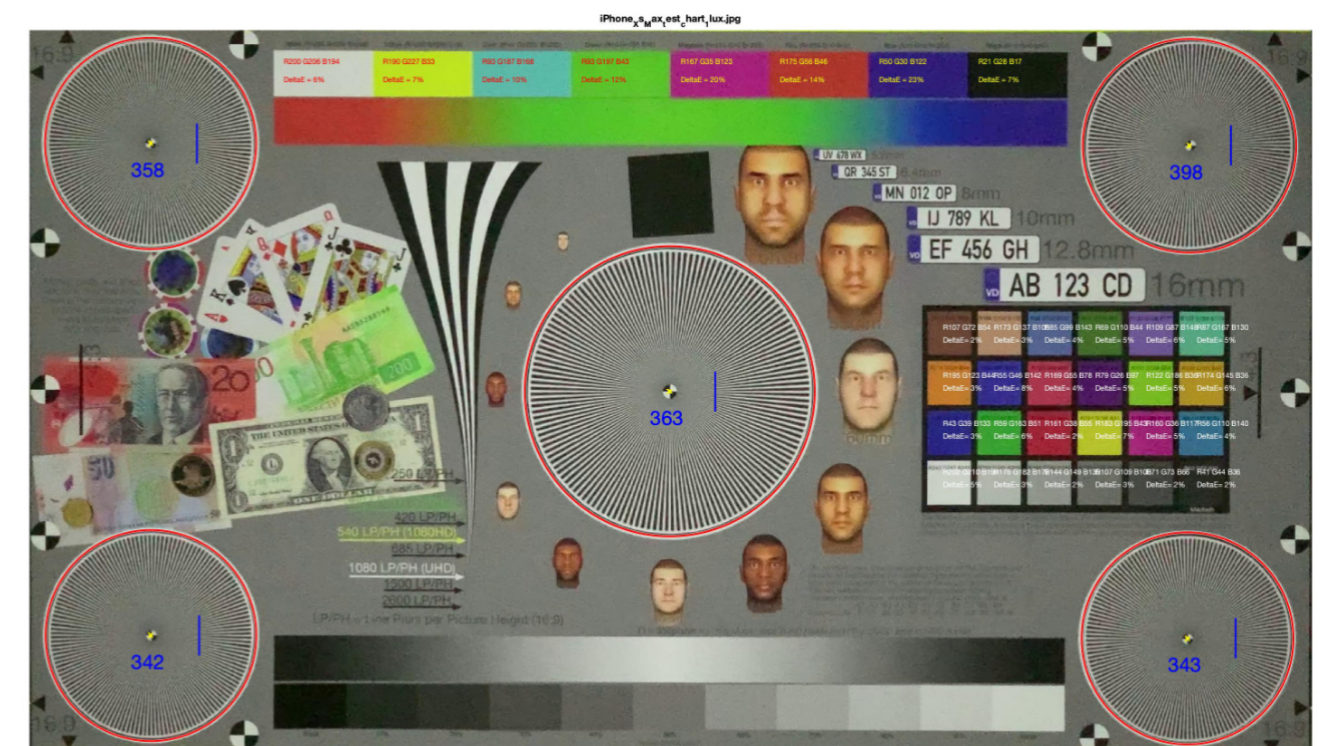
This is an image from the same Samsung Galaxy A31 mobile phone as on page 6, but this time in low light of 1lux. By definition, resolution is not measured nor stated for low light levels, but we did this test to show how small pixels sensors (around 1um) in low light can drop the resolution from 515LP/PH down to 317LP/PH. Clearly, the noise measurement is much higher so that the S/N ratio has dropped down to 32dB.

Camera model	Sensor size	Resolution	Illumination	White Balance	Noise Reduction	WDR
iPhone-Xs Max	1/3"	1920x1080	100lux	Auto	On	Off



This is an image from iPhone-Xs mobile phone. Again, optical linearity is almost perfect (no 'barrel' distortions), the resolution is pretty good and the linearity (Gamma) excellent. The S/N is not the best compared to some CCTV cameras, but still acceptable with nearly 47dB. Again, this would be due to very small pixels. The colour reproduction is very good, with white error being only 3%, while the skin colours also very low at 2~3%.

Camera model	Sensor size	Resolution	Illumination	White Balance	Noise Reduction	WDR
iPhone-Xs Max	1/3"	1920x1080	1lux	Auto	On	Off



This is a low light video image from the iPhone-Xs mobile phone at 1lux. Although optical and electronic linearity are pretty good, one can notice the excessive noise and S/N being around 32.5dB. This is simply due to the small pixel size of around 1um. As shown on the page 4 where a 1/2" sensor under some light conditions produces almost day-light image.



ViDi Labs test chart reference detail of raw image (HD size), without going through a camera/lens



Bosch 3000i @ 100lux



Bosch 3000i @ 1lux



Hanwha XNO6085R @ 100lux



Hanwha XNO6085R @ 1lux



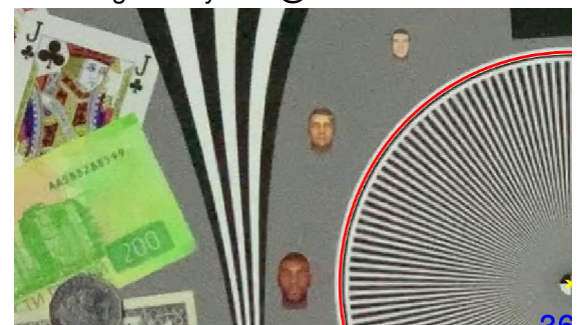
Samsung Galaxy A31 @ 100lux



Samsung Galaxy A31 @ 1lux



iPhone Xs Max @ 100lux



iPhone Xs Max @ 1lux