

Resolution and 50% MTF with Canon CMOS and Film Cameras

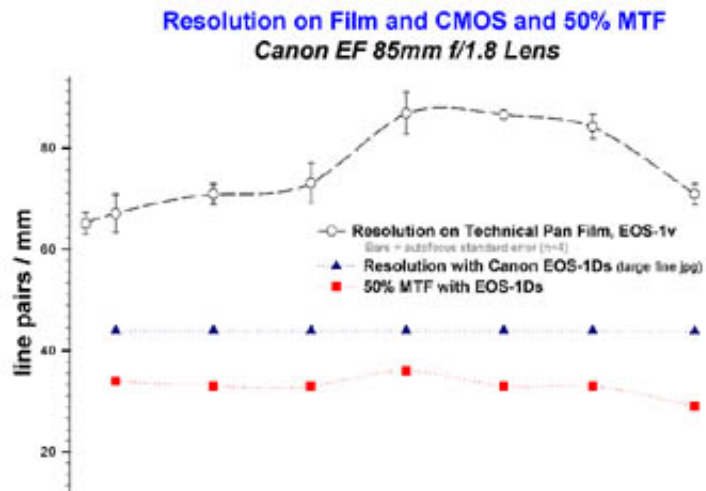
Comparison among the Canon EOS-1Ds, EOS-1D Mark II, 20D, D60 and EOS-1V /Astia 100F film

With evolution of digital CMOS cameras as well as transparency film, comparisons were made among 35mm format cameras and digital slr cameras with respect to their ability to produce sharp images when enlarged. Resolution of imaging systems was measured using a USAF 1951 test pattern on an Edmund Scientific resolving power chart. 50% MTF (modulation transfer function) which most authorities consider to be a better indicator of camera system sharpness was measured using the [Koren 2003 chart](#). Comparison photographs were also taken.

<i>Camera / Imaging System</i>	<i>Camera Megapixels</i>	<i>Pixel Size (μm)</i>	<i>Pixel Area (sq. μm)</i>	<i>Resolution (lp/mm)</i> EF 85mm f/1.8 @ f/8	<i>50% MTF (lp/mm)</i> EF 85mm f/1.8 @ f/8
Canon 20D	8.2	6.5	42	62	36
Canon D60	6.3	7.4	55	55	50
EOS-1D Mark II	8.2	8.4	71	55	50
EOS-1Ds	11	8.8	77	55	40
EOS-1v / Astia 100F Measure from image scanned with Nikon CS 4000 ED from film	NA	NA	NA	79	28
EOS-1v / Astia 100F Measure direct from film	NA	NA	NA	88	ND

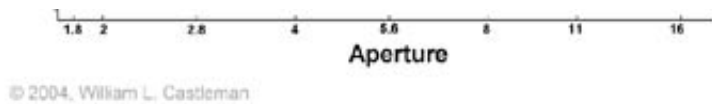
Abbreviations: lp/mm = line pair per mm; NA = not applicable; ND = not done

- Resolution and 50% MTF from digital images measured on best of 10 RAW exposures at ISO 100 converted with Phase One C1 Pro v 3.5 except for 20D RAW images which were converted with Canon DPP. *Note:* Once Phase One develops their RAW processing software for the 20D, 20D images will be reprocessed and reanalyzed.
- Resolution on central focus point with film were measured by [this method](#)
- Resolution on central focus point with CMOS images and all 50% MTF measurements by [this method](#) except measurements were made on tifs converted from RAW files which yielded higher resolution than when using large fine jpg camera output.





[Link to Comparison Images](#)



Resolution and 50% MTF variations with aperture for the EF 85mm f/1.8

[50% MTF](#) and [resolution](#) comparisons among varying quality lenses at 85mm

Conclusions

- Current Canon EOS-1D and 20D digital slr cameras outperform film in image quality and sharpness
- The 20D that has the smallest pixel size of the cameras tested and has the highest resolution. The EOS-1D Mark II achieved the highest image quality when resolution and 50% MTF and image appearance were compared.
- It is unclear from testing to date whether lower 50% MTF scores for the 20D in this test are inherent to the sensor and in-camera image processing or at least in part explained by differences in C1 Pro and Canon DPP Raw conversion.
- Film continues to have higher resolving capacity with high quality lenses than CMOS sensor-based digital cameras. However, after scanning for viewing and printing, lower 50% MTF in film is associated with lower overall image sharpness.

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