

Shuttering Methods And The Artifacts They Produce

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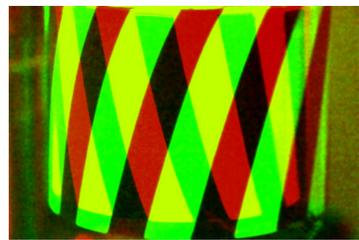
Mechanical Leaf Shutter

Iris in lens opens, closes



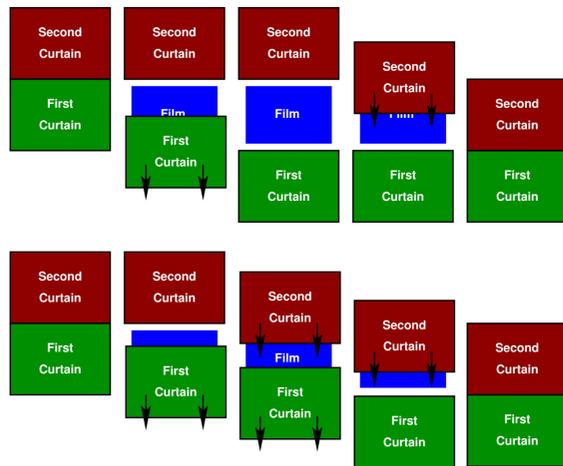
Slit diffraction

Fraunhofer diffraction by 1mm slit... *not significant*



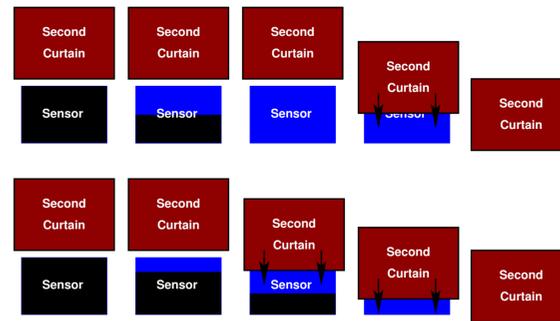
Mechanical Two-Curtain Focal Plane Shutter

First curtain reveals pixels, second curtain covers



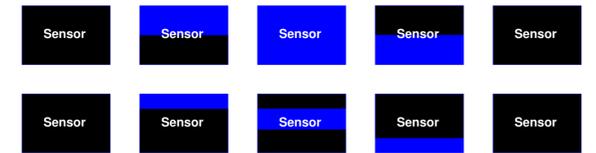
Electronic First Curtain Shutter (EFCS)

Electrically reset pixels, second curtain covers



Electronic (Rolling) Shutter

Electrically reset pixels, then read out values

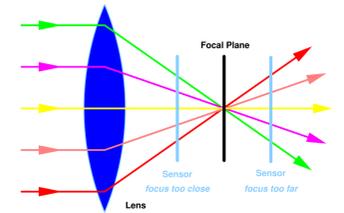
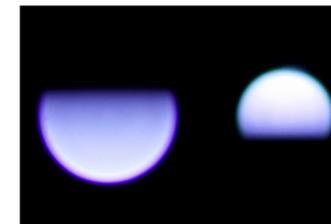


OOF PSF Shaping

Out-Of-Focus Point Spread Function ► Bokeh

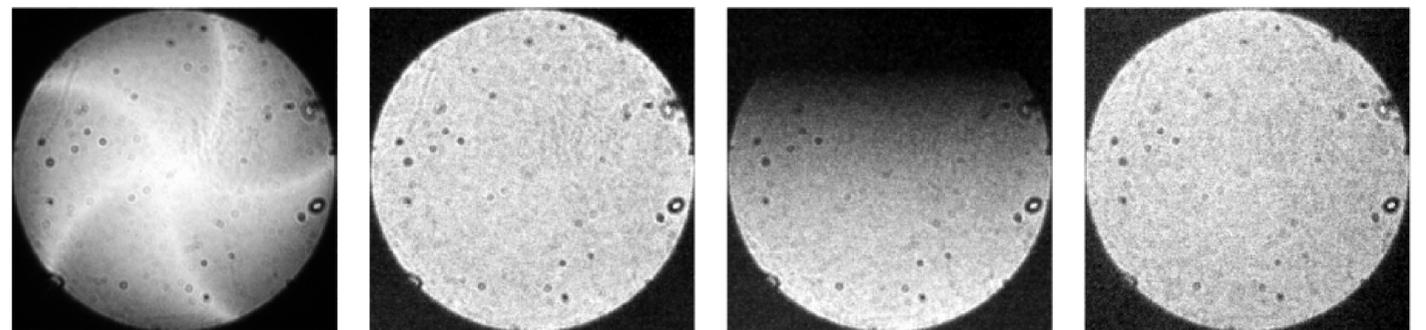
Leaf shutter causes dynamic apodization

EFCS OOF PSF is clipped by "slit tilt"



Shading by inconsistent curtain speed

Curtain starts a few % faster... *not significant*



Ektar Leaf @ 1/400s

Mechanical Shutter @ 1/8000s

EFCS @ 1/8000s

Electronic Shutter @ 1/8000s

Shading by "slit tilt" using EFCS

Curtain isn't at focal plane but electronic is; logically tilts slit, blocking some ray angles



Sony A7RII @ 1/8000s

Sony A7RII EFCS @ 1/8000s

Sony A7RII electronic @ 1/8000s



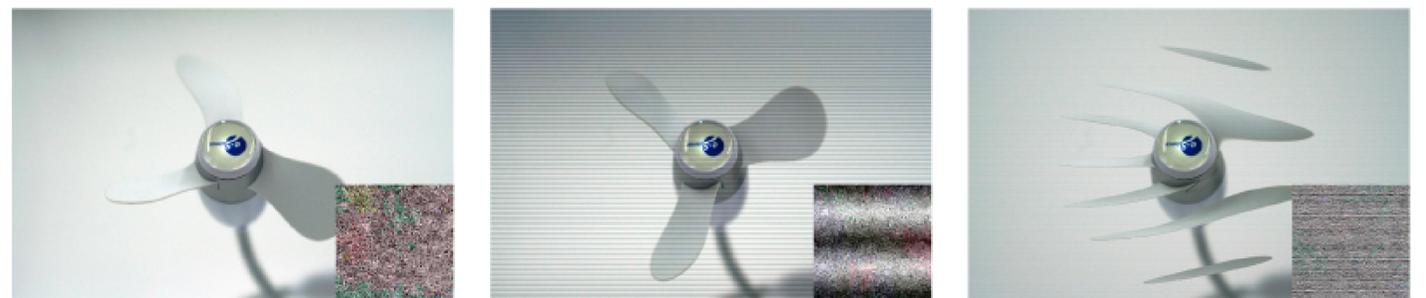
Lens Bottom Only

EFCS Lens Bottom Only

EFCS Lens Top Only

Temporal artifacts

As scene illumination varies over time & Geometric Distortions



Sony A7RII @ 1/8000s

Sony A7RII EFCS @ 1/8000s

Sony A7RII electronic @ 1/8000s