Shuttering Methods And The Artifacts They Produce

Henry Dietz and Paul Eberhart

**Mechanical Leaf Shutter**
Iris in lens opens, closes

**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

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

**Shading by inconsistent curtain speed**
Curtain starts a few % faster... not significant

**Shading by “slit tilt” using EFCS**
Curtain isn’t at focal plane but electronic is; logically tilts slit, blocking some ray angles

**OOF PSF Shaping**
Out-Of-Focus Point Spread Function ★ Bokeh
Leaf shutter causes dynamic apodization
EFCS OOF PSF is clipped by “slit tilt”

**Temporal artifacts**
As scene illumination varies over time & Geometric Distortions

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Sony A7RII @ 1/8000s
Sony A7RII EFCS @ 1/8000s
Sony A7RII electronic @ 1/8000s

Ektar Leaf @ 1/400s
Mechanical Shutter @ 1/8000s
EFCS @ 1/8000s

Electronic Shutter @ 1/8000s

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Lens Bottom Only
EFCS Lens Bottom Only
EFCS Lens Top Only