

Solved: Strange Beam of Light over Mayan Temple and Florida [Lightning + Rolling Shutter Artifact]

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Mick West
Administrator
Staff Member



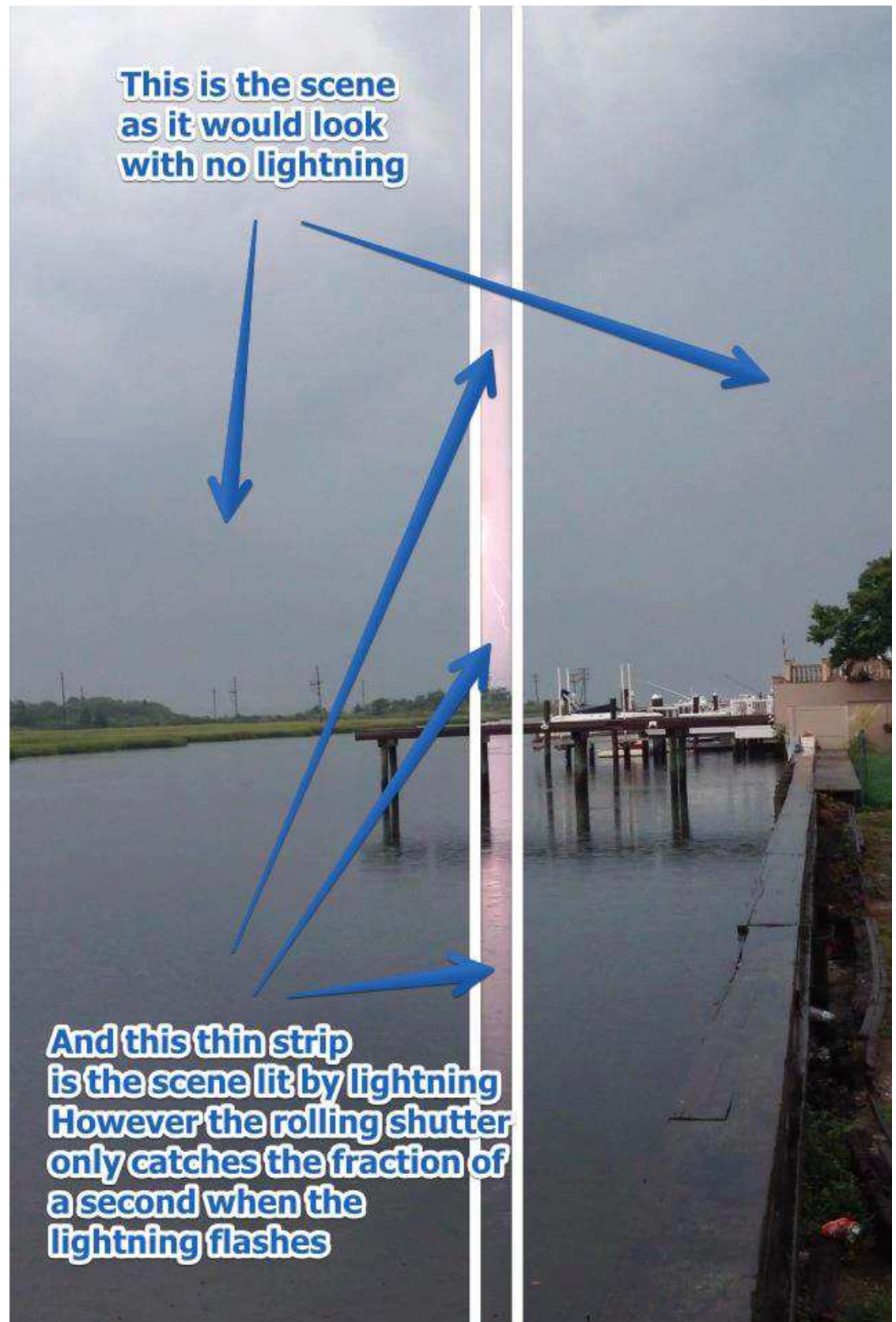
The above images are examples of a rolling shutter artifact. A "rolling shutter" means that the image is recorded one row (or column in portrait orientation) at a time, and not simultaneously. This means if the exposure and the flash are of very short duration, then the flash will only illuminate some pixel rows (or columns) of the image. Slowed down it looks a bit like this:



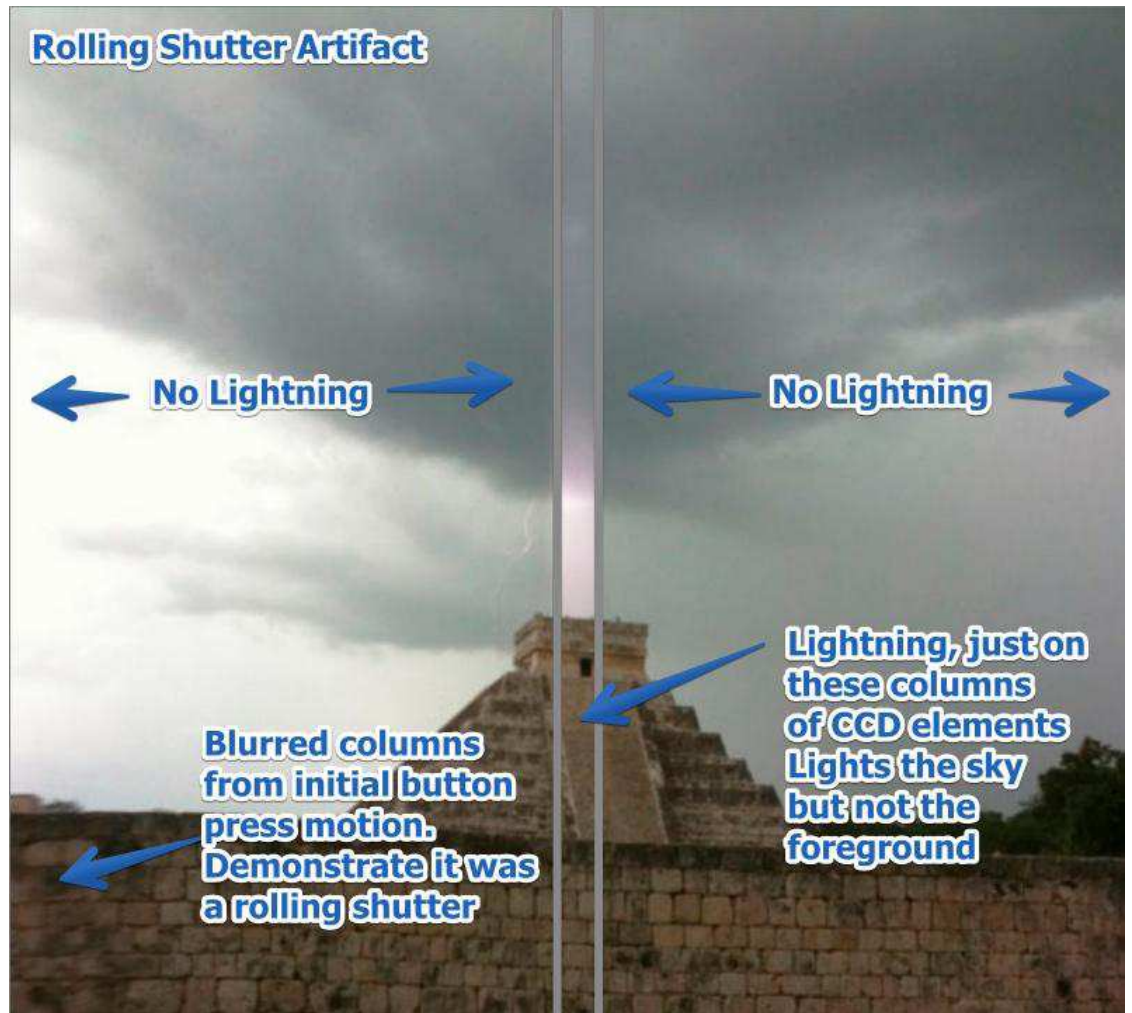
The green rectangle is the rolling shutter window - what the camera sees of the scene at any one time, and it builds up the actual photo by reading from this

rectangle. The flash of lighting is very short, but still lights up all the pixels in the rolling shutter window, causing the "beam".

Here's what's going on in the first image. Notice the beam also shows up in the reflection.



And with the Mayan temple, the lighting is behind the temple, so it only lights up the sky, and not the temple itself. So it looks like the "beam" goes behind the temple.







This can be replicated with a flash set to strobe, and taking lots of photos or video with an iPhone:



The fact that the "beam" can go "behind" the clouds can seem confusing in a still image. But it's really just that the lightning is behind the clouds, and they are thick enough to block the light. I simulated a similar effect using the flash and a foam pool toy. If the flash is in front of the toy then it illuminates it, and you get the stripe across the toy. If the flash is moved behind the toy, then the toy is not illuminated, so the "beam" (the stripe of the image) looks like it's going behind the toy.



It looks like the flash is not actually working, however you have to remember that for most of the frame, it's actually off. The only time the flash is on is during the white bar.

In my image the flash gives a white light (as a camera flash is obviously intended to), but lightning often shows up as a purple or pink tinge:



Typical lightning photography with a rolling shutter looks more like half the image being lit by lightning, rather than the column we see above. Here's a more typical lightning shot at night with this problem:

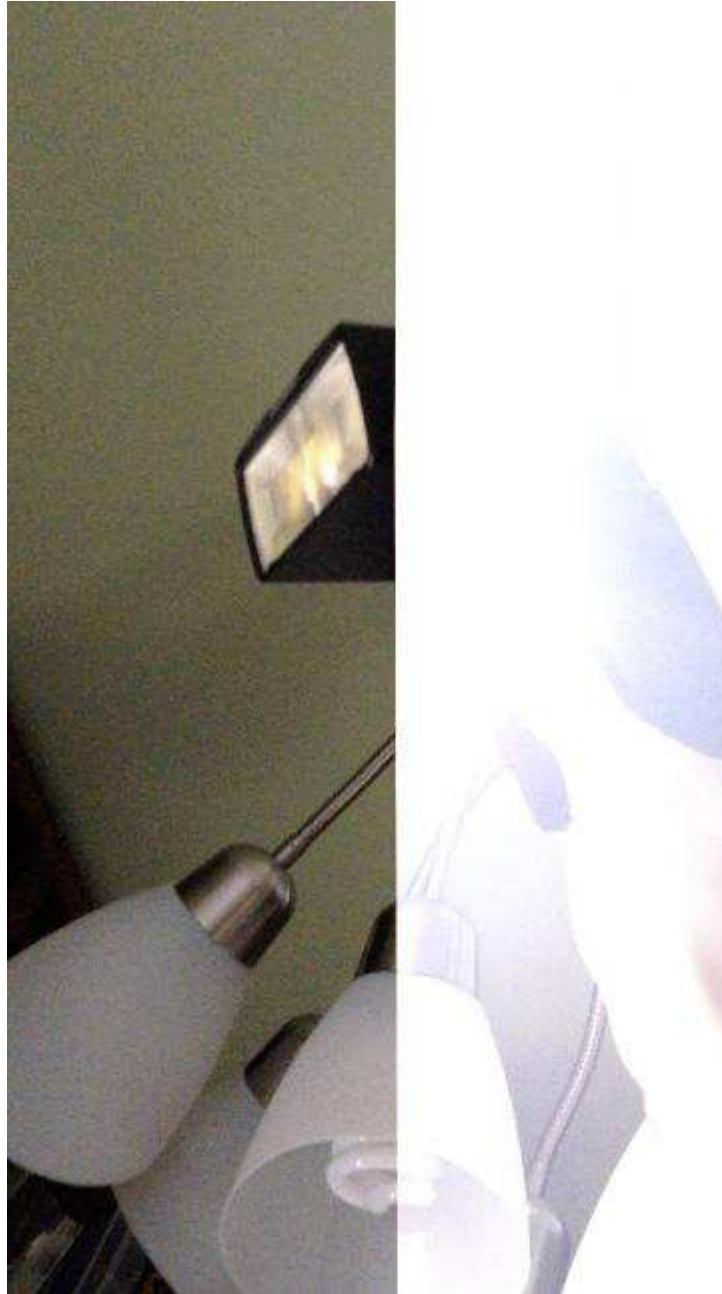
<http://www.productionapprentice.com/tutorials/ccd-vs-cmos/>



Notice it's horizontal. The image is scanned one row at a time, but when you take a photo in portrait mode, then those rows are the columns.

Here I've repeated the flash experiment in a darker setting, and we get the half-

illuminated image:



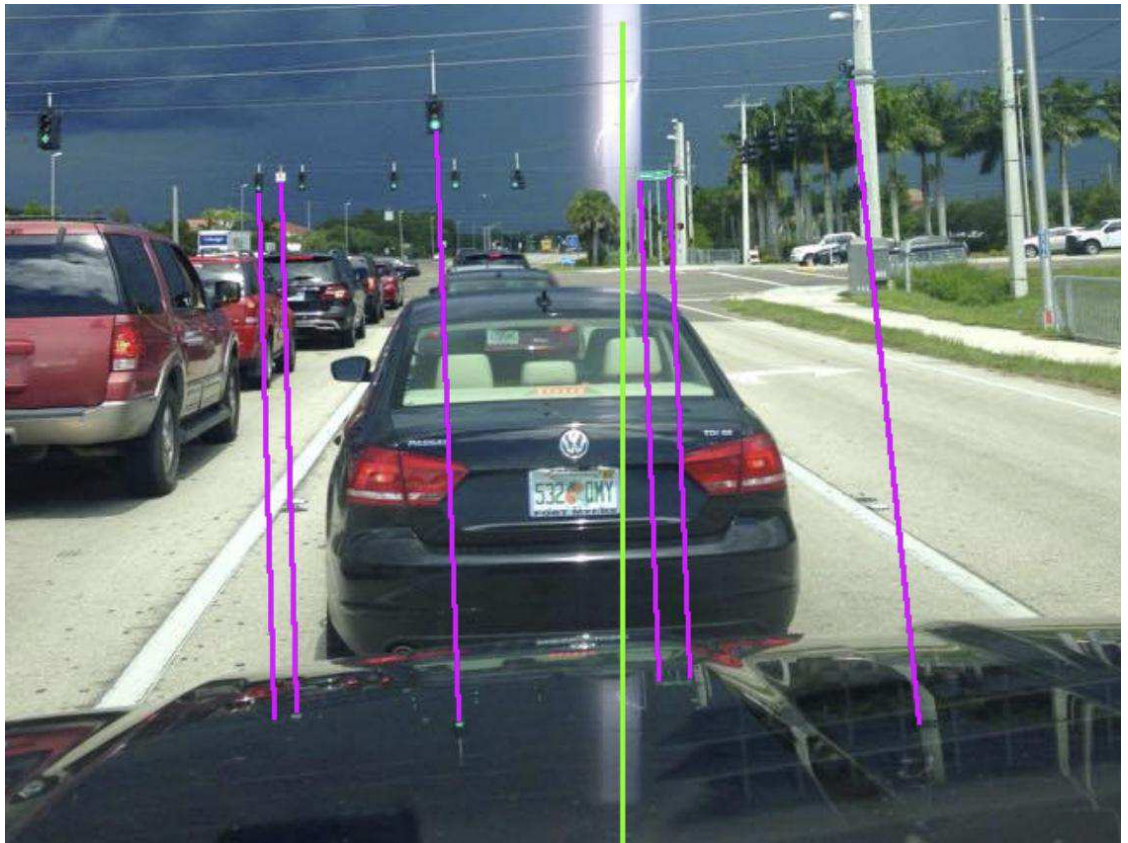
Update Aug 15 2015, a new example:



[source](#), [location](#)

Here the illusion of it being a beam behind the clouds is particularly striking, as a band of dark clouds is partially obscuring the illuminated clouds behind. You can see part of the lightning bolt just below the power lines. Remember it's not actually a beam of light, it's just a slice of a scene as it would look illuminated by lightning.

This can be especially confusing when you notice the reflection of the "beam" on the hood of the car. Your brain naturally interprets this as a reflection of the scene, and so you think there's actually a beam in the sky. But if you look closely, you'll see the reflection in the hood is actually of a slightly different area of the sky. The "reflection" lines up perfectly vertically, whereas the nearby traffic signals are sloped. If this actually was a reflection of a beam in the sky, then it would also be sloped.



So while it's a reflection of sky illuminated by lighting, it's not the same area of the sky. It's a little unintuitive.

So again, what we are seeing here is essentially one normal image overlaid with a slice of another image that's illuminate by lighting. (And note that what looks like the reflection of a building in the lower right is actually the reflection of the air conditioning vent inside the car)

Warning: Complicated Explanation Ahead!

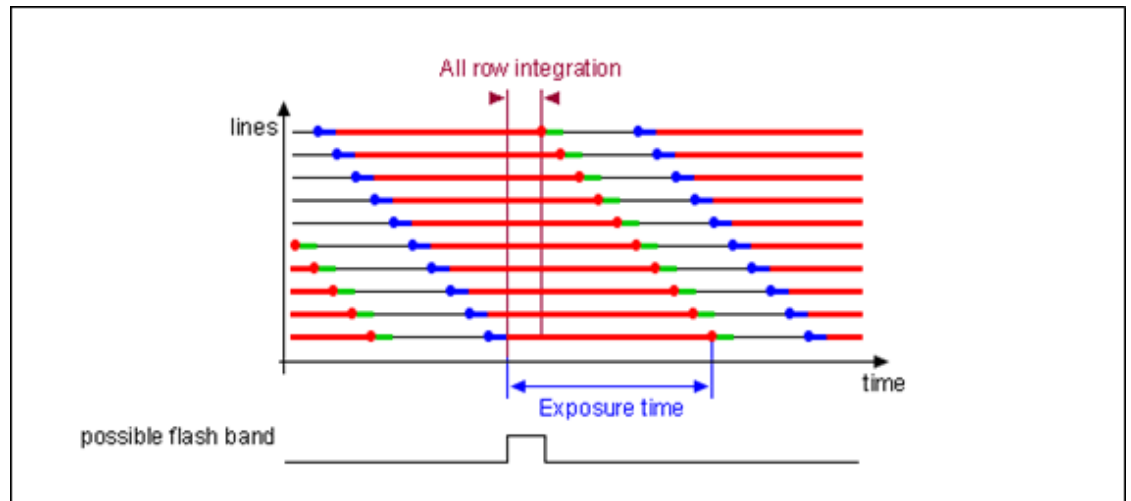
A very unintuitive topic here is the width of the band. Why does a long exposure (in a dark setting) give a wide band, but the short exposure (in sunlight) give a narrow band? You would think that if the exposure is short, then more of that exposure would be happening during the flash, so the band would be wider.

The first thing here is that the flash I use only has a duration of 1/5000th of a second (0.2 ms), so if things work the way the previous paragraph suggested, then the *most* we could illuminate would be a band 1/166th the width of the image (in portrait orientation), and yet we see that we can get half or more of the image illuminated. So what's going on? How can a 1/166th of a frame exposure illuminate half the lines in a frame? And why does it get narrower for shorter exposures?

The answer is complicated. CMOS sensors can only be *read* one line at a time, and yet the *exposures* can happen simultaneously (or at least overlap). So the reset of each line (the start of when it begins to record) is staggered to match the read-out speed, and the exposure length is actually on an individual line basis.

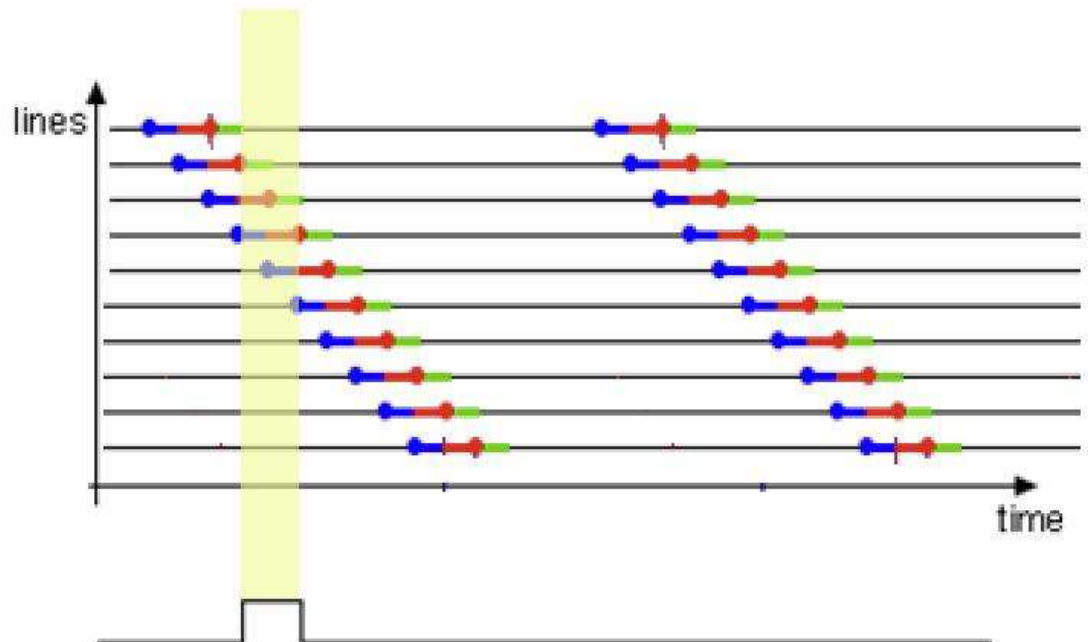
The diagram below is showing the "flash window" - i.e. the portion of a frame in which you can fire the flash and have it affect all the rows. Normally when you use the flash, then it's quite dark and so you have a long exposure, and hence quite a big window in which you can fire the flash, If you were to go outside of this window, you'd get the top or the bottom of the image only illuminated by the

flash.



Source

In brighter conditions, the per-line exposures are shorter, so it's more like:



Notice the read-out of the lines (green) is the same angle, as that can't get any faster. This also dictates when the reset (blue) happens. But now that the exposure time (red) is much shorter, only a few lines can get exposed during the flash. Hence the "beam" is narrower for a shorter exposure.

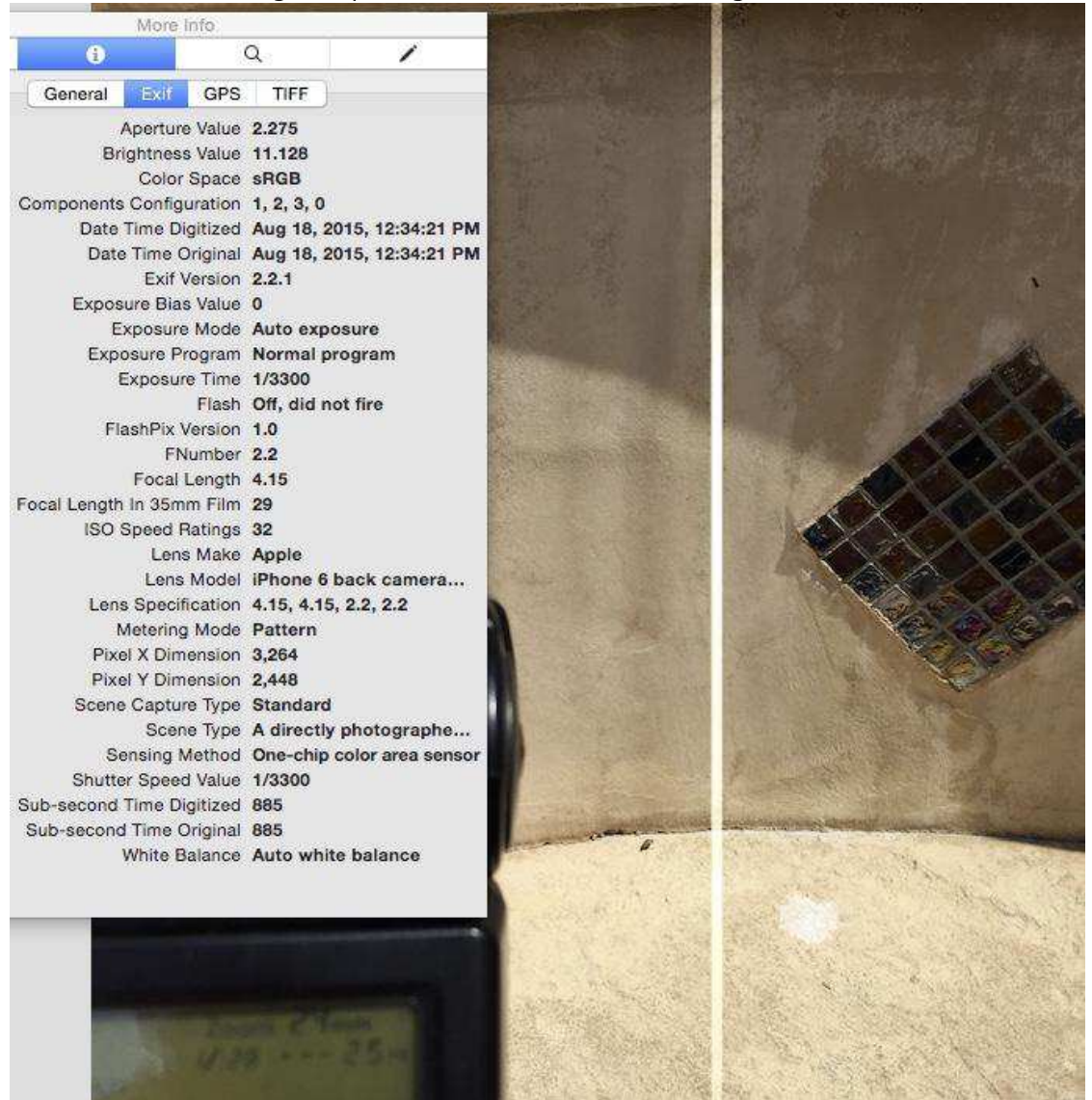
So the width (or height in landscape) of the beam are actually dependent on three factors

1. The exposure duration - the red lines above.
2. The rolling speed - how quickly does the "rolling shutter" move across the sensor. Determined here by read-out speed - the green line.
3. The flash duration (the yellow bar)

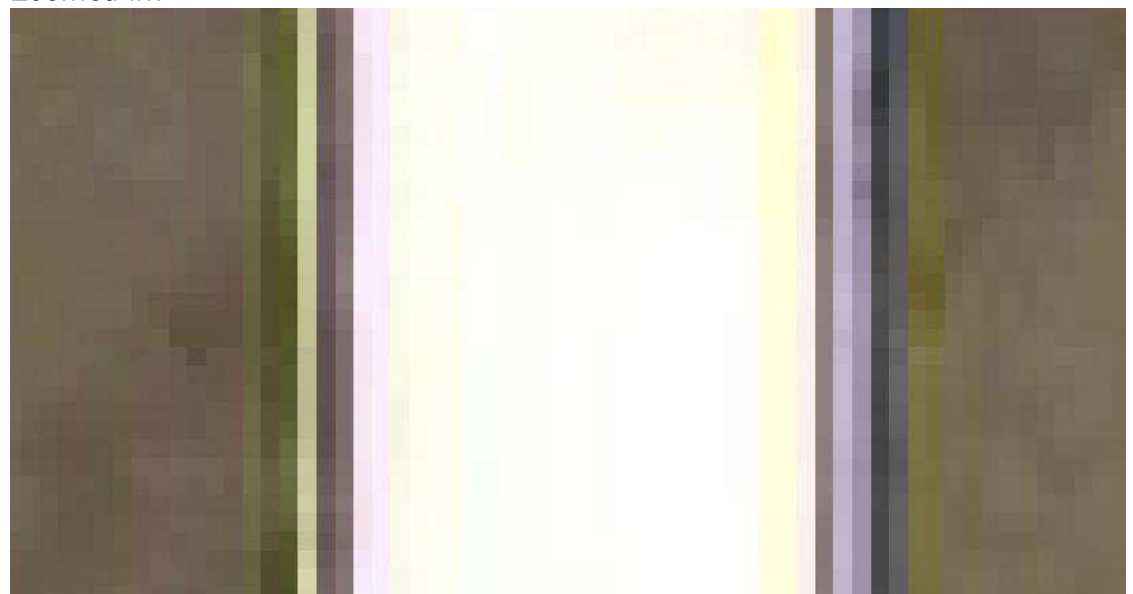
This gives us a minimum width of the "beam". It's the duration of the flash, divided by the read-out cycle time (i.e. the time between starting two consecutive read-outs). The faster the camera's read-out time, the smaller the potential "beam" and the sharper the edges.

Why sharp edges? The start and end of the flash might also occur during the reset or read-out phase of the lines, meaning that line only gets partially exposed to the flash. This means the edges of the "beam" are not always sharp.

The narrowest possible beam comes from a combination of short exposure and short flash. Here I took individual photos in bright sunlight, which gave an Exposure Time of 1/3300. The flash is 0.2ms, or 1/5000 of a second, about 2/3 the duration of a single Exposure time. Here's what we got:



Zoomed in:



So we have a 36 pixel wide beam on a 2488 wide image. There are really lines (as the camera is just rotated 90 degrees). Only half the pixels in the middle are a solid bright color - that would be where the flash fell entirely within the exposure time. The colored pixels on either side indicate where the flash only partially was within the actual exposure time, with the different colors indicating different contributions from the red, green and blue sensors as they are read at out different times.

For a discussion of Rolling Shutters in SLR cameras, see: <https://www.metabunk.org/will-an-sl...ts-like-a-beam-of-light-with-lightning.t6718/>

Note: The above post is a summary post from material in the discussion thread below, hence the subsequent discussion might seem somewhat redundant. Updated with the Florida photo on 8/15/2015

Last edited: Aug 30, 2015

Mick West, Mar 8, 2014

#1

Informative x 2 Like x 1 Winner x 1



Picture is pretty small but looks like a ray of sunlight that broke through the clouds to me. A larger image would be better...then we could tell if its photoshop...

pseacraft
Active Member

pseacraft, Mar 8, 2014

#2

Like x 1



pseacraft said: ↑

Picture is pretty small but looks like a ray of sunlight that broke through the clouds to me. A larger image would be better...then we could tell if its photoshop...

<http://www.pinterest.com/pin/231653974554520462/>

deirdre
Moderator

Staff Member



deirdre, Mar 8, 2014

#3

heres a similar pic. and [incorrect] explanation

Hill says it's not wonder that "of the three images, the 'light beam' only occurs in the image with a lightning bolt in the background. The intensity of the lightning flash likely caused the camera's CCD sensor to behave in an unusual way, either causing an entire column of pixels to offset their values



deirdre
Moderator

Staff Member

or causing an internal reflection [off of the] camera lens that was recorded by the sensor.”

<http://www.blippitt.com/pyramid-light-beam/>

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deirdre, Mar 8, 2014

#4



Pete Tar
Moderator

Staff Member

Naaaaa.

Why isn't the flare across the whole image, and why does it go behind the jetty in the first one?

Pete Tar, Mar 8, 2014

#5



Robert Tankersley
Member

deirdre said: ↑

<http://www.pinterest.com/pin/231653974554520462/>



What I see is some sort of illusion. One would think that if the light source is behind the pier pylon then you would get a shadow on this side of the pylon. Yet the light continues to reflect this side of the pier pylon with no shadow. And

without super zoom Mick has it would appear that the joisting and rails of the pier were lit by on the backside of the light source.

Robert Tankersley, Mar 8, 2014

#6



solrey
Senior Member

Georgie said: ↑

Hi there! I'm new here, so sorry if this has already been talked about. I looked around but I couldn't find it....

*A friend on FB posts stuff like this all the time *sigh*. I'd unfriend him, but I guess I like a train wreck...*

Anybody know what it is??



Here's another where lightning produced the same kind of lens flare.

<http://www.ericsteske.com/2012/06/lightning-photographs-produce-crazy.html>



I'm not sure if it's because the lightning was so bright, or because I was shooting through the side window of my car, but the lightning is creating some pretty epic lens flares in this photo!

I was using [Slow Shutter Cam](#) app for iPhone in Light Trail mode with a light sensitivity of 1.

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EXIF data on Georgies pic looks like it was taken from a phone.

File Size 67 kB
File Type JPEG
MIME Type image/jpeg
Image Width 640
Image Height 960
Encoding Process Baseline DCT, Huffman coding
Bits Per Sample 8
Color Components 3
X Resolution 1
Y Resolution 1
YCbCr Sub Sampling YCbCr4:2:0 (2 2)

solrey, Mar 8, 2014

#7

Like x 3 Useful x 1



Pete Tar said: ↑

*Naaaaa.
Why isn't the flare across the whole image, and why does it go behind the jetty in the first one?*

youre right, it must be the starship enterprise.

deirdre, Mar 8, 2014

#8

Funny x 2

deirdre
Moderator
Staff Member



I'd like to see the exif data and a high res version but am sure that doesn't exist...I have never had a pic like this of any lightning that I have shot... it could be a lens or sensor artifact..

Ask and you shall receive...tks solrey

pseacraft, Mar 8, 2014

#9

pseacraft
Active Member



Robert Tankersley said: ↑

What I see is some sort of illusion. One would think that if the light source is behind the pier pylon then you would get a shadow on this side of the pylon. Yet the light continues to reflect this side of the pier pylon with no shadow. And without super zoom Mick has it would appear that the joisting and rails of the pier were lit by on the backside of the light source.

I'm pretty sure that a reflection won't be able to cast a shadow, not the sort of reflection we see in that image anyway because that's more of an optical illusion dependant on the viewer than a real reflected light.

Can't make out the lighting up of the rails on the pier.

Pete Tar
Moderator
Staff Member

It looks like a flare, but a flare should obscure over the image, not go behind things.

It would be worth hearing if it was sighted optically or just showed up in the picture.

Pete Tar, Mar 8, 2014

#10



George B
Extinct but not forgotten Staff Member

Pete Tar said: ↑

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Can't make out the lighting up of the rails on the pier.

It looks like a flare, but a flare should obscure over the image, not go behind things.

It would be worth hearing if it was sighted optically or just showed up in the picture.

Excellent point about the light column being behind un- distorted items in foreground.

George B, Mar 8, 2014

#11



deirdre
Moderator

Staff Member

George B said: ↑

Excellent point about the light column being behind un- distorted items in foreground.

the items wouldnt be distorted. I can see the lightning reflected in the water which probably is why the pixel issue continues. the real question is why the pyramid beam stops directly at the pyramid.

deirdre, Mar 8, 2014

#12



Pete Tar
Moderator

Staff Member

But it might be possible, if you take into account what's happening in the pyramid picture above, maybe the flare only happens over things with a certain image value?

Pete Tar, Mar 8, 2014

#13

deirdre said: ↑

I can see the lightning reflected in the water



Pete Tar
Moderator

Staff Member

Wow, I can't.

One clue they used in the pyramid pic was

Further proof can be found in the fact that the light beam, when isolated in Photoshop, runs absolutely vertical in the image.

"That's a little suspicious since it's very unlikely that the gentleman who took this picture would have his handheld iPhone camera positioned exactly parallel to the 'light beam' down to the pixel level,"

Content from external source

but I don't know if that works for this picture.

Pete Tar, Mar 8, 2014

#14

Like x 1



deirdre
Moderator

Staff Member

Pete Tar said: ↑

Wow, I can't.

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Further proof can be found in the fact that the light beam, when isolated in Photoshop, runs absolutely vertical in the image.

"That's a little suspicious since it's very unlikely that the gentleman who took this picture would have his handheld iPhone camera positioned exactly parallel to the 'light beam' down to the pixel level,"

but I don't know if that works for this picture.



deirdre, Mar 8, 2014

#15

Agree x 1



JRBids
Senior Member

Georgie said: ↑

Hi there! I'm new here, so sorry if this has already been talked about. I looked around but I couldn't find it....

*A friend on FB posts stuff like this all the time *sigh*. I'd unfriend him, but I guess I like a train wreck...*

Anybody know what it is??



I just saw a similar photo on FB except the light was coming out of a pyramid. I'm sure someone else will post the photo, since GMTA.

Edit. See that Deidre did.

JRBids, Mar 8, 2014

#16



Pete Tar
Moderator

Staff Member

Doh. If that beam were physically there then it's reflecting off an imperfect surface, the river, right? So it would be distorted. It's not, therefore, artifact.

Pete Tar, Mar 8, 2014

#17

Agree x 2



deirdre
Moderator

Staff Member

Pete Tar said: ↑

Doh. If that beam were physically there then it's reflecting off an imperfect surface, the river, right? So it would be distorted. It's not, therefore, artifact.

I think they mean its a camera artifact. did you message him and ask?

deirdre, Mar 8, 2014

#18



Robert Tankersley
Member

The flair seems to be related to the amount of light being emitted by the lightning. the flair seems to dimm as it gets higher in the clouds and dim as it comes closer in the water reflection.

Robert Tankersley, Mar 8, 2014

#19

Agree x 2



Hama Neggs
Senior Member

Pete Tar said: ↑

*Naaaaa.
Why isn't the flare across the whole image, and why does it go behind the jetty in the first one?*

I think it's actually seen in front of the land and trees on the far shore and also the jetty. It's just too faint to see very well against those darker colors.

Hama Neggs, Mar 8, 2014

#20

Agree x 2

Georgie said: ↑

Anybody know what it is??



Trigger Hippiie
Senior Member



It's lightning. I can't explain the lens flare effect though.





EDIT: I made the post without noticing there was an entire third page full of replies. That's the second time I've done this in a week... geez, I'm getting old.

Last edited: Mar 8, 2014

Trigger Hippie, Mar 8, 2014

#21

Like x 1



Robert Tankersley
Member

Siliezar, who recently shared his photographs with occult investigators, told Earthfiles.com that he and his family didn't see the light beam in person; **it appeared only on camera**. "It was amazing!" he said. He showed the iPhone photo to his fellow tourists. "No one, not even the tour guide, had ever seen anything like it before."

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<http://www.nbcnews.com/id/46560621/...show-sign-gods-or-iphone-glitch/#.UxuesvldXbM>

Last edited by a moderator: Mar 8, 2014

Robert Tankersley, Mar 8, 2014

#22

Like x 1



Robert Tankersley
Member

According to Jonathon Hill, a research technician and mission planner at the Mars Space Flight Facility at Arizona State University, which operates many of the cameras used during NASA's Mars missions, it is almost definitely the latter. Hill works with images of the Martian surface taken by rovers and satellites, as well as data from Earth-orbiting NASA instruments, and is fully versed in the wide range of potential image artifacts and equipment errors.

He says the "light beam" in the Mayan temple photo is a classic case of such an artifact — a distortion in an image that arises from the way cameras bounce around incoming light.

It is no mere coincidence, Hill said, that "of the three images, the 'light beam' only occurs in the image with a lightning bolt in the background. The [intensity of the lightning flash](#) likely caused the camera's CCD sensor to behave in an unusual way, either causing an entire column of pixels to offset their values or causing an internal reflection (off the) camera lens that was recorded by the sensor." In either case, extra brightness would have been added to the pixels in that column in addition to the light hitting them directly from the scene.

Content from external source

<http://www.nbcnews.com/id/46560621/...show-sign-gods-or-iphone-glitch/#.UxuesvldXbM>

Last edited by a moderator: Mar 8, 2014

Robert Tankersley, Mar 8, 2014

#23



NoParty
Senior Member

With respect to the Chichen Itza picture, the rule, as I recall it from my Intro to Logic course in college went as follows:

"If accompanying tour guide has not seen such a photo before, it follows that it is the work of Mayan god Kukulcan."

NoParty, Mar 8, 2014

#24

Funny x 1



solrey
Senior Member

So the image in question was taken with an iphone. Good to know because that points to an artifact peculiar to iphones. I think iphones were used in the pyramid pics but I'm not 100% on that. In my previous post the description of the pic with similar artifacts said they were...

using Slow Shutter Cam app for **iPhone** in Light Trail mode with a light sensitivity of 1.

Content from external source



solrey, Mar 8, 2014

#25



WeedWhacker
Senior Member

deirdre said: ↑

heres a similar pic. and explanation

Hill says it's not wonder that "of the three images, the 'light beam' only occurs in the image with a lightning bolt in the background. The intensity of the lightning flash likely caused the camera's CCD sensor to behave in an unusual way, either causing an entire column of pixels to offset their values or causing an internal reflection [off of the] camera lens that was recorded by the sensor."

<http://www.blippitt.com/pyramid-light-beam/>

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[View attachment 6406](#)

After seeing your comparative picture, dierdre, and explanation, I'm of the mind that this is "case closed".

Seems there are likely to be more and more such image anomalies in the future, as technology advances, and outpaces the layperson's ability to keep up with all of the details and implications. We can't all be experts in every subject.

WeedWhacker, Mar 8, 2014

#26



Mick West
Administrator
Staff Member

deirdre said: ↑

heres a similar pic. and explanation

Hill says it's not wonder that "of the three images, the 'light beam' only occurs in the image with a lightning bolt in the background. The intensity of the lightning flash likely caused the camera's CCD sensor to behave in an unusual way, either causing an entire column of pixels to offset their values or causing an internal reflection [off of the] camera lens that was recorded by the sensor."

<http://www.blippitt.com/pyramid-light-beam/>

Content from external source

[View attachment 6406](#)

I believe something like this explanation to be correct, but not "causing an entire column of pixels to offset their values or causing an internal reflection " and I have performed some experiments that shed some light.

To replace the lightning bolt I used a flash, set to strobe mode, and recorded it with an iPhone 5.



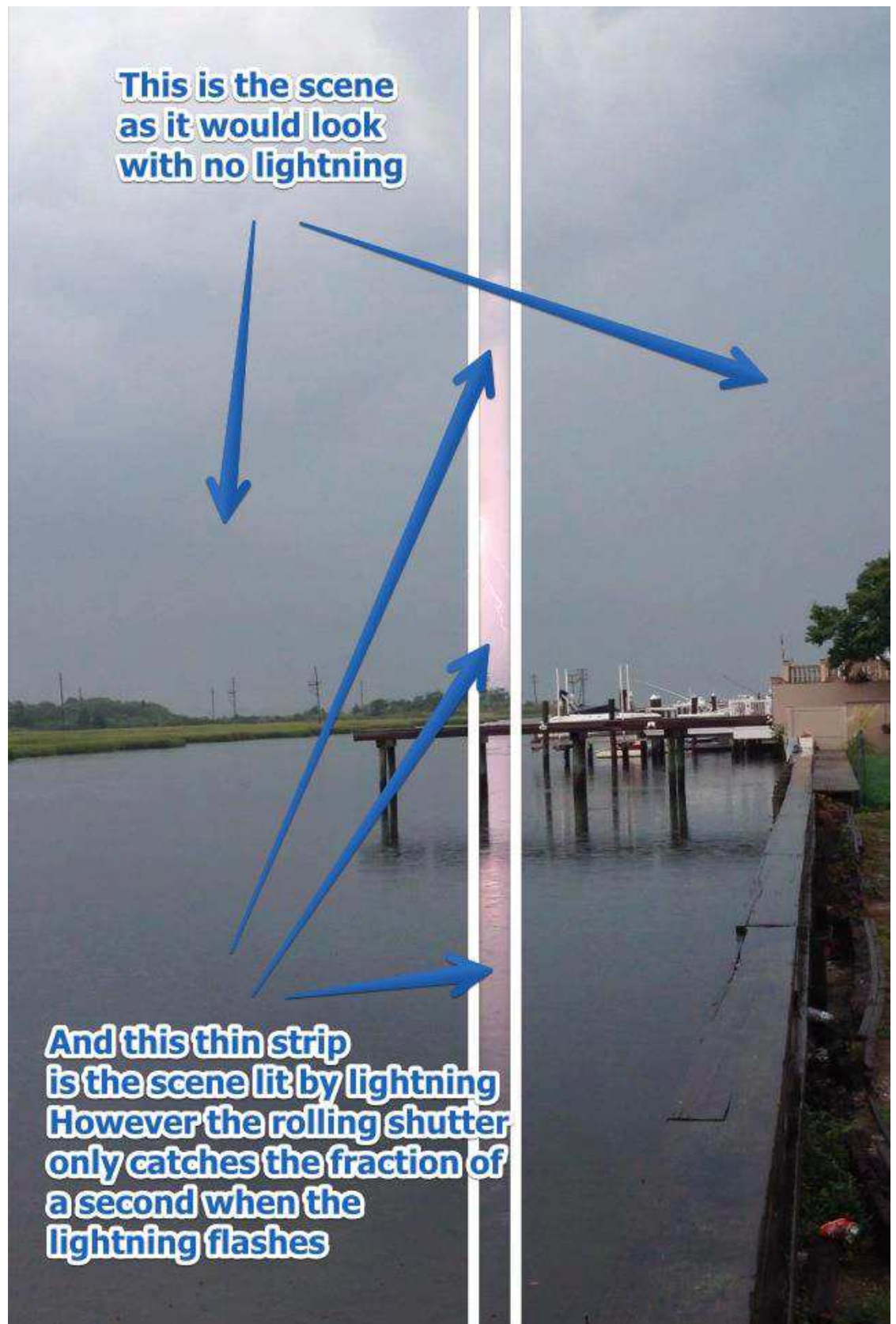
It created a variety of images like:





What we are seeing here with the flash is an artifact of the rolling shutter in the iPhone, and not a column of pixels going bad, or an internal reflection.

A "rolling shutter" means that the image is scanned one row (or column in portrait orientation) at a time, and not simultaneously. This means if the flash is of very short duration, it will only illuminate some pixel columns of the image. That's what is going on in the OP image:



In my image the flash gives a white light (as it is designed to), but lightning often shows up as a purple or pink tinge:



This is a surprisingly rare artifact, as it requires a brief lightning bolt to occur either entirely in the reset or read-out portion of the exposure, both of which are very short. To duplicate it I had to use a high speed strobe in sunlight to get the flash at the right time

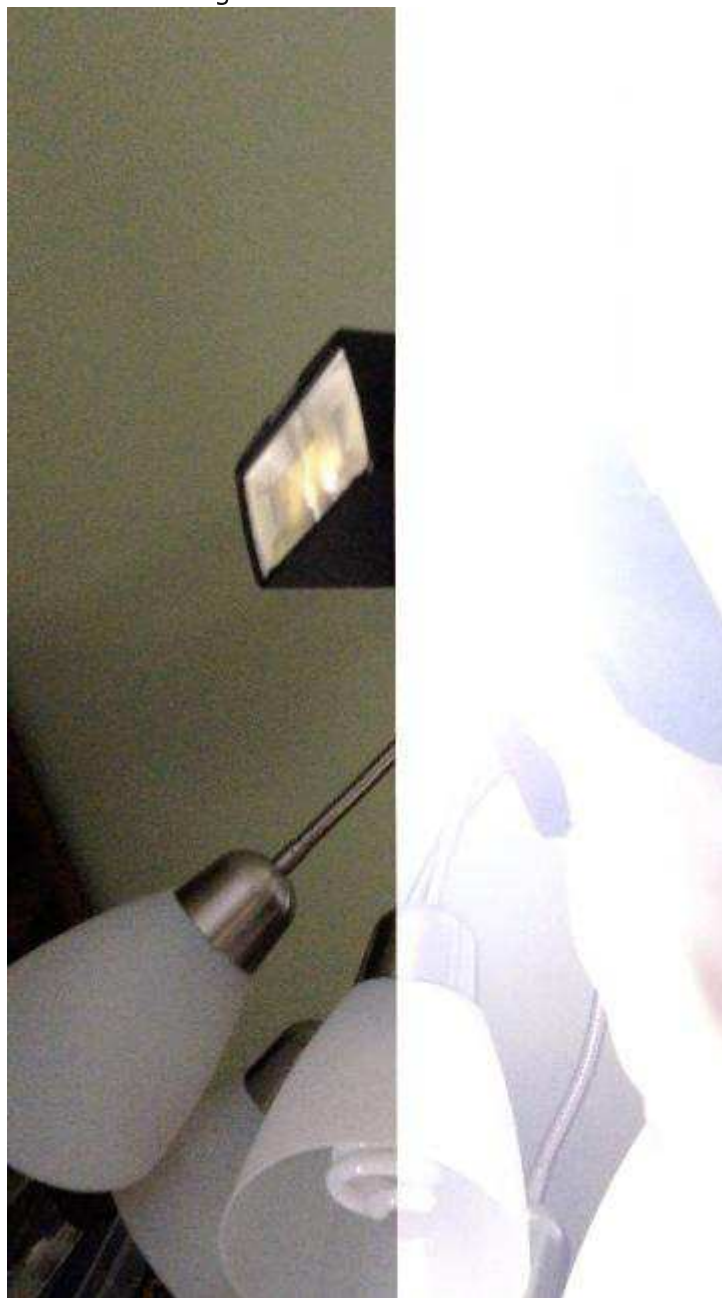
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<http://www.productionapprentice.com/tutorials/ccd-vs-cmos/>



Notice it's horizontal. The image is scanned one row at a time, but when you take a photo in portrait mode, then those rows are the columns.

Here I've repeated the flash experiment in a darker setting, and we get the half-illuminated image:



This video demonstrates what is going on with a rolling shutter, although it's a little misleading as it assumes the reset and read-out phases are happening

Last edited: Mar 9, 2014

Mick West, Mar 8, 2014

#27

Winner x 3



Mick West
Administrator

Staff Member

Oops, I split the thread without realizing there was another page! I shall merge and reword.

Mick West, Mar 8, 2014

#28



Pete Tar
Moderator

Staff Member

Can you replicate it appearing behind darker objects?

Pete Tar, Mar 8, 2014

#29



Pete Tar said: ↑

Can you replicate it appearing behind darker objects?

Yes, although hard to replicate the circumstances perfectly. Here I'm holding my flash behind a leather armchair (see my hand at the bottom left)

Mick West
Administrator
Staff Member



It's going "behind" the pyramid because what you are seeing is the sky being lit up by the flash. The foreground is dark and facing away from the lighting, so is hardly lit. The OP image has the reflection of the sky.

Mick West, Mar 8, 2014

#30

Like x 2



WeedWhacker
Senior Member

deirdre said: ↑

youre right, it must be the starship enterprise.

As a long-time Trekker...I fear I must disagree. The color of the Phaser beam is inconsistent with Federation technology.

()

WeedWhacker, Mar 8, 2014

#31

Agree x 1 Funny x 1 Winner x 1



Robert Tankersley
Member

WeedWhacker said: ↑

As a long-time Trekker...I fear I must disagree. The color of the Phaser beam is inconsistent with Federation technology.

()

It must be romulan then

Robert Tankersley, Mar 8, 2014

#32

Like x 2 Funny x 2 Agree x 1 Winner x 1



Mick West
Administrator
Staff Member

solrey said: ↑

So the image in question was taken with an iphone. Good to know because that points to an artifact peculiar to iphones. I think iphones were used in the pyramid pics but I'm not 100% on that. In my previous post the description of the pic with similar artifacts said they were...

using Slow Shutter Cam app for **iPhone** in Light Trail mode with a light sensitivity of 1.

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It's not unique to iPhones, it would happen with any camera using a rolling shutter.

Mick West, Mar 8, 2014

#33

Like x 1 Agree x 1



Pete Tar
Moderator
Staff Member

Perhaps a better way to demonstrate the obscuring would be with the rungs of a ladder?

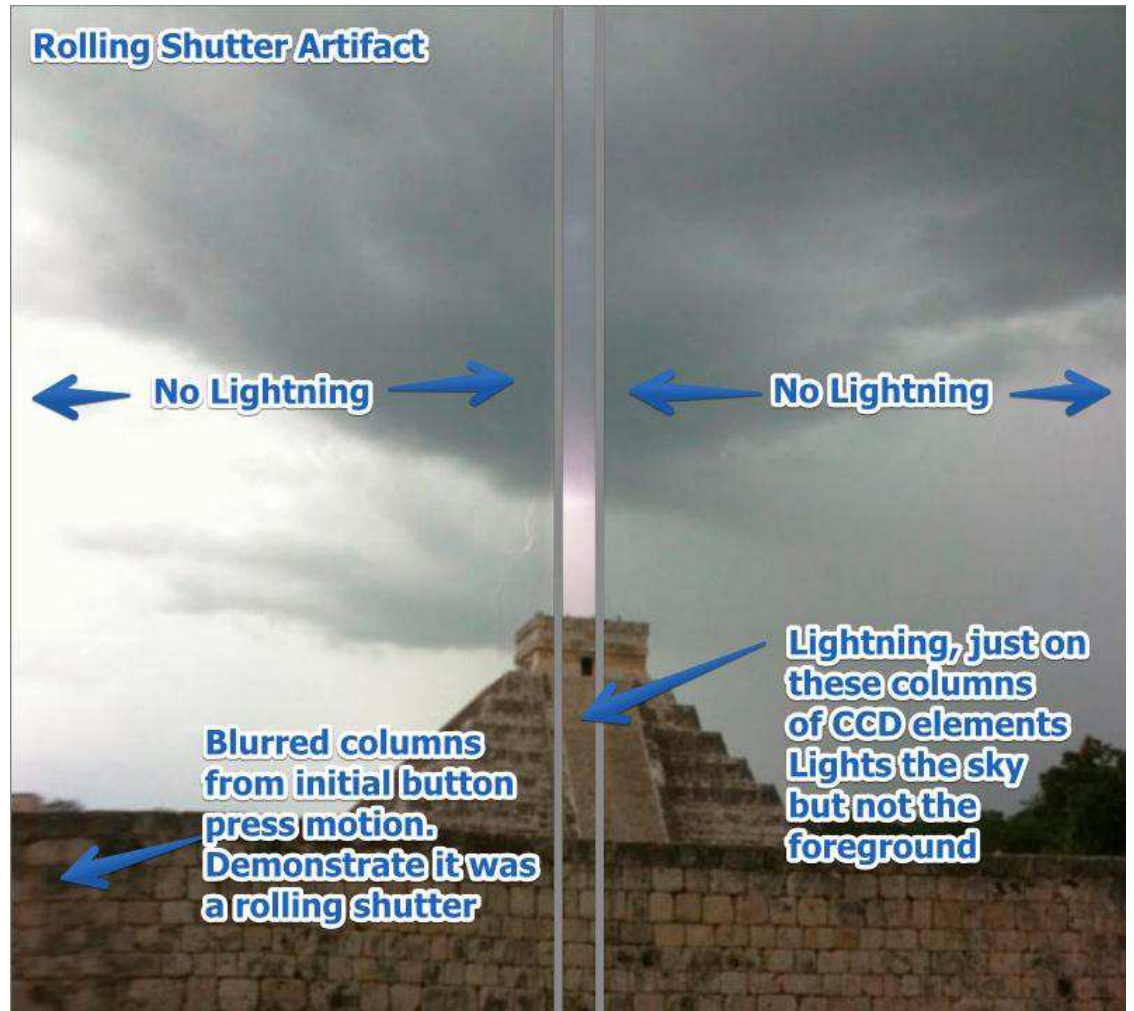
Pete Tar, Mar 8, 2014

#34

Like x 1



Mick West
Administrator
Staff Member



Mick West, Mar 8, 2014

#35

Like x 1

Here's a better illustration now it's bright enough. Two photos, one with the light source in front of the chair, and one behind:



Mick West
Administrator
Staff Member



Mick West, Mar 9, 2014

#36

Like x 1



Mark Barrington
Active Member

It's kind of interesting that digital cameras use rolling shutter, since many of them do not have a physical shutter like film cameras. I found this article to be helpful:

<http://www.diyphotography.net/everything-you-wanted-to-know-about-rolling-shutter/>

Mark Barrington, Mar 9, 2014

#37

Useful x 1



Mick West
Administrator
Staff Member

Mark Barrington said: ↑

It's kind of interesting that digital cameras use rolling shutter, since many of them do not have a physical shutter like film cameras. I found this article to be helpful:

<http://www.diyphotography.net/everything-you-wanted-to-know-about-rolling-shutter/>

The lack of a physical shutter is not why they use a rolling shutter. It's because they use CMOS sensors, rather than CCD, as CMOS is better for battery life, and easier for a slow phone to process. They could use CCD (or a [more expensive type](#)

of CMOS) with a global ("total" in your article) digital shutter.

[Edit: although rereading that, maybe you were saying that normally you need a physical shutter for rolling shutter sensors to work well? Either way, they use a rolling shutter because of cost]

Last edited: Mar 9, 2014

Mick West, Mar 9, 2014

#38



Mark Barrington
Active Member

Mick West said: ↑

The lack of a physical shutter is not why they use a rolling shutter. It's because they use CMOS sensors, rather than CCD, as CMOS is better for battery life, and easier for a slow phone to process. They could use CCD (or a more expensive type of CMOS) with a global ("total" in your article) digital shutter.

Yeah, in the old days of film photography, the difference was between a shutter curtain that was typically used on 35mm SLR cameras which used a rolling shutter and a leaf type shutter which was usually incorporated in the lens for most larger format cameras. I have used medium format cameras that used either technology. In any case, it's an artifact that would be familiar to photographers before the advent of digital photography. I was just commenting on it being called 'rolling shutter' since there's no physical shutter. For digital cameras, the 'shutter' is the interval between a pixel on the sensor starting and ending data collection.

Edit: Here's the Wikipedia article about focal plane shutters (we allways called them shutter curtains, but they were often made of metal). It mentions some of the motion and flash effects caused by rolling shutter:

http://en.wikipedia.org/wiki/Focal_plane_shutter

Last edited: Mar 9, 2014

Mark Barrington, Mar 9, 2014

#39



Mick West
Administrator
Staff Member

Mark Barrington said: ↑

Yeah, in the old days of film photography, the difference was between a shutter curtain that was typically used on 35mm SLR cameras which used a rolling shutter and a leaf type shutter which was usually incorporated in the lens for most larger format cameras. I have used medium format cameras that used either technology. In any case, it's an artifact that would be familiar to photographers before the advent of digital photography. I was just commenting on it being called 'rolling shutter' since there's no physical shutter. For digital cameras, the 'shutter' is the interval between a pixel on the sensor starting and ending data collection.

Interesting, I didn't think of it as a film artifact, but of course effectively the shutter of a camera "scans" over the frame in a similar way to a rolling digital shutter. Here's what a Film SLR shutter looks like in slow motion:

And the same on a digital SLR:

Note at 1/1000th, the exposure is a slit that "rolls" over the frame.

For a film SLR the process is:

1. Shutter opening, partial exposure
2. Shutter fully open, full exposure
3. Shutter closing, partial exposure

So if the flash happens during 1 or 3, then you will get a partial-frame illumination. And the faster the shutter speed, the less time is spend in #1, so the more likely a sync problem is.

For a digital SLR, you have the fast physical shutter, *and* you also have a slow digital rolling shutter. But the physical shutter covers the digital rolling (which happens before and after the physical shutter), so you only see digital rolling artifacts on a digital SLR when it is taking video (where the physical shutter is always open). The photo process is:

1. Roll shutter reset, so some lines are capturing, but the physical shutter is closed, so dark
2. Physical shutter opening, partial exposure
3. Shutter fully open, full exposure

- 4. Shutter closing, partial exposure
- 5. Roll shutter read. Some lines capturing, but again, it's dark.

So the effect is identical to a film SLR

With a phone camera, you only have the digital rolling shutter, so you get the artifacts in photos. The process being:

- 1. Rolling reset start
- 2. Pause
- 3. Rolling read start
- 4. Wait for read to finish

Which is highly unintuitive, and difficult to explain.

Last edited: Aug 16, 2015

Mick West, Mar 9, 2014

#40

Informative x 1

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