

I need to determine the exposure difference between two areas of an image. What's the best way?

The best practical way is to compare the **mean linear luminance** of the two areas, then convert the ratio to **stops**.

Formula:

$$\text{exposure difference in stops} = \log_2 \left( \frac{L_2}{L_1} \right)$$

Where  $L_1$  and  $L_2$  are the average **linear** brightness/luminance values of the two selected regions.

A good workflow:

1. Open the image in a tool that can sample regions, ideally one that supports linear values.
2. Select area A and area B with the same-sized or representative masks.
3. Convert pixel values from gamma-encoded sRGB to linear light before averaging.
4. Compute average luminance for each area:

$$Y = 0.2126R + 0.7152G + 0.0722B$$

5. Compute:

$$\Delta EV = \log_2(Y_B/Y_A)$$

Interpretation:

- +1 stop : area B is twice as bright as area A.
- +2 stops : area B is four times as bright.
- -1 stop : area B is half as bright.
- 0 stops : same exposure/brightness.

Important caveat: do **not** just compare RGB values or Photoshop "brightness" numbers directly unless you know they are linear. Most image files are gamma-encoded, so

averaging raw pixel values will give a misleading result.


For a quick approximation, you can sample both regions with a photo editor's histogram/mean value tool, but for accurate exposure difference, use linearized pixel data.



How can I do this using typical tools (lightroom, photoshop, web tools, etc) on a fujifilm raw image?

For a Fujifilm RAF raw, the "best" method depends on whether you want a **photographic/editing answer** or a **sensor/raw exposure answer**.

## Best practical answer: RawDigger

For true raw exposure comparison, use **RawDigger**. It reads the RAF raw data directly, before Lightroom/Photoshop tone curves, film simulations, white balance rendering, profiles, etc. RawDigger's Exposure Edition specifically shows raw histograms and selected-area statistics, including for selected regions.  RawDigger

Workflow:

1. Open the Fujifilm .RAF in RawDigger.
2. Select area A with the rectangle/selection tool.
3. Note the mean value, ideally from the **Raw Composite** or per-channel values.
4. Select area B and note the mean value.
5. Compute:

$$\Delta EV = \log_2 \left( \frac{\text{mean B}}{\text{mean A}} \right)$$

Examples:

- B mean = 2000, A mean = 1000 → **+1 stop**
- B mean = 4000, A mean = 1000 → **+2 stops**
- B mean = 707, A mean = 1000 → **-0.5 stop**

This is the most defensible method if you're asking "how many stops brighter did the

sensor record this area?"

## Lightroom: good for approximation, not ideal

Lightroom can show RGB values under the cursor in Develop, but those values are from Lightroom's rendered image pipeline, not raw sensor values. They are affected by:

- profile / film simulation
- white balance
- exposure slider
- tone curve
- contrast/highlights/shadows
- masking
- display-referred rendering


So Lightroom is useful for saying "how bright do these areas appear in my current edit," but not great for raw exposure difference.


A decent Lightroom workflow:

1. Reset the image or use a neutral profile.
2. Disable tone curve, contrast, highlights, shadows, clarity, etc.
3. Use the eyedropper / cursor readout under the histogram.
4. Sample similar-sized representative areas.
5. Compare the RGB percentages, preferably the neutral/luminance-ish value if both areas are gray/neutral.

But don't convert those values directly to stops unless you know they are linear. Lightroom's displayed values are not a clean linear exposure measurement.

## Photoshop: better than Lightroom if you use a linear workflow

Photoshop has an **Info panel** that reports pixel values, and the Eyedropper / Color Sampler can average over an area rather than reading a single pixel. Adobe documents that the Info panel shows color values as you move over the image, and the Eyedropper/Color Sampler can use larger sample sizes instead of point sampling.  Adobe Help Ce...

Adobe also notes that Point Sample reads one pixel, while larger sample sizes average an area.  Adobe Help Center

A better Photoshop workflow:

1. Open the RAF through Adobe Camera Raw.

2. In ACR, choose a neutral profile and turn off major tone adjustments.
3. Open into Photoshop as **16-bit**.
4. Ideally use a **linear RGB color space** if available in your workflow.
5. Open **Window → Info**.
6. Choose the **Color Sampler Tool** or Eyedropper.
7. Set sample size to something like **11×11**, **31×31**, or larger depending on the image.
8. Place samplers in area A and B.
9. Read the RGB values.
10. Convert to luminance and compare.

For linear RGB values:

$$Y = 0.2126R + 0.7152G + 0.0722B$$

Then:

$$\Delta EV = \log_2(Y_B/Y_A)$$

If you are in ordinary sRGB/Adobe RGB/ProPhoto with gamma encoding, the numbers are not directly exposure-linear. They can still be useful for rough comparison, but the stop calculation will be approximate.

## **Web tools: usually not recommended for RAF exposure math**

Most web image tools will either:

- not read Fujifilm RAF files directly,
- convert through a hidden rendering pipeline,
- apply tone curves/gamma,
- strip raw sensor meaning,
- report only 8-bit sRGB values.

They are fine for visual brightness comparison, not for accurate stop differences.

## **My recommended workflow**

For a Fujifilm raw file:

**Use RawDigger if you care about real exposure.**

Measure mean raw values in the two selected regions, then calculate:

$$\log_2(B/A)$$

## Use Photoshop if you care about the edited/rendered result.

Open the RAF with neutral settings, sample averaged regions with the Info panel, and compare luminance. Just remember it is no longer a pure raw exposure measurement.

A simple calculator expression:

$\log(B/A) / \log(2)$



For example:

$\log(1850/920) / \log(2) = 1.01$  stops



       Sources

9:2325-210x164				9:2771-216x181			
Min	Max	Avg	σ	Min	Max	Avg	σ
44	1044	890.3	40	12	64	34.9	5.80
552	2100	1840.6	69	52	168	83.0	8.11
1044	1448	1241.7	49	28	88	49.4	6.59

A sample from the "light" and "dark" sections of the image measured in RawDigger are attached. what is the % light transmission difference between the two sections?

Using the **Avg** values from your RawDigger samples:

Channel	Light avg	Dark avg	Dark / Light transmission
R	890.3	34.9	3.92%
G	1840.6	83.0	4.51%
B	1241.7	49.4	3.98%

Using a luminance-weighted RGB estimate:

$$Y = 0.2126R + 0.7152G + 0.0722B$$

the dark section is about:

$$\frac{Y_{dark}}{Y_{light}} = 4.41\%$$

So the darker section transmits about **4.4% as much light** as the lighter section.

Equivalently, it blocks/reduces light by about:

$$100 - 4.41 = 95.6\%$$

That is about a **4.5-stop difference**, because 4.4% transmission is roughly  $1/22.7$  as much light.

For a simpler raw-photo answer, I'd probably use the **green channel** here, since it usually dominates luminance and has the best sampling density on Bayer/X-Trans sensors:

$$83.0/1840.6 = 4.51\%$$

So: **approximately 4.5% transmission**, or **95.5% less light**, between the dark and light sections.



The dark section is the inside of a car window, and the light section is the same target piece of paper outside the window, so what is the visible light transmission of the window?

Based on your RawDigger samples, the window's measured **visible light transmission is approximately 4.4–4.5%**.

Using the luminance-weighted RGB values:

$$Y = 0.2126R + 0.7152G + 0.0722B$$

Light/outside paper:

$$Y_{outside} = 1595.3$$

Dark/paper through window:

$$Y_{through} = 70.35$$

So:

$$VLT = \frac{70.35}{1595.3} \times 100 = 4.41\%$$

Using just the green channel, which is often a good proxy for visible brightness in raw data:

$$VLT = \frac{83.0}{1840.6} \times 100 = 4.51\%$$

So I'd report this as:

**Measured VLT  $\approx$  4.5%**

That means the window is reducing visible light by about:

$$100 - 4.5 = 95.5\%$$

In exposure terms, that is about:

$$\log_2(1595.3/70.35) = 4.5 \text{ stops}$$

A couple of caveats: this assumes both samples were taken at the same exposure, same target, same illumination, and that RawDigger is showing black-level-corrected raw values. Reflections, angle through the glass, polarization, and the tint's color bias can shift the result a bit. But from the data you posted, the practical VLT is **about 4–5%, centered around 4.5%**.



However, the camera and light source are both outside the window, so the light is attenuated twice through the window.

Correct — in that geometry your measured ratio is **two-pass transmission**:

$$\text{measured ratio} = T^2$$

So the window's **single-pass visible light transmission** is:

$$T = \sqrt{\frac{Y_{\text{through}}}{Y_{\text{outside}}}}$$

From the luminance-weighted values we calculated:

$$\frac{Y_{\text{through}}}{Y_{\text{outside}}} = 0.0441$$

So:

$$T = \sqrt{0.0441} = 0.210$$

That gives:

**Single-pass VLT  $\approx$  21.0%**

Using the green channel only:

$$T = \sqrt{83.0/1840.6}$$

$$T = \sqrt{0.0451} = 0.212$$

So green-channel VLT is:

**$\approx$  21.2%**

## **Updated result**

Your window is approximately:

**21% VLT**

That means it blocks/reduces about:

$$100 - 21 = 79\%$$

of visible light in a single pass.

The earlier **4.4–4.5%** number is still useful, but it represents the **round-trip transmission**: light going through the window once on the way to the paper, and again on the way back to the camera.

In exposure terms:

- Round-trip attenuation: about **4.5 stops**
- Single-pass window attenuation: about **2.25 stops**

So I'd report the car window as roughly **20–21% VLT**, assuming the geometry and illumination are as described.



39:2219-366x273				36:2933-446x286			
Min	Max	Avg	$\sigma$	Min	Max	Avg	$\sigma$
272	408	338.9	16.8	108	216	158.8	12.7
588	804	703.5	25.4	316	524	412.2	24.2
392	568	475.3	20.5	196	332	252.4	17.0

Great job! Here's another window, the light section and dark section. Perform the same analysis.

Using your new RawDigger averages:

Channel	Light avg	Dark avg	Round-trip transmission	Single-pass transmission
R	338.9	158.8	46.86%	<b>68.45%</b>
G	703.5	412.2	58.59%	<b>76.54%</b>
B	475.3	252.4	53.10%	<b>72.87%</b>

Using luminance-weighted RGB:

$$Y = 0.2126R + 0.7152G + 0.0722B$$

Light/outside section:

$$Y_{light} = 609.6$$

Dark/through-window section:

$$Y_{dark} = 346.6$$

Round-trip transmission:

$$\frac{346.6}{609.6} = 56.86\%$$

Because the light passes through the window twice:

$$T = \sqrt{0.5686} = 0.754$$

So the **single-pass VLT** is approximately:

**75.4% VLT**

Using the green channel only:

$$T = \sqrt{412.2/703.5} = 76.5\%$$

So I'd report this window as roughly:

**75–76% VLT**

That is about **24–25% visible light reduction** in a single pass, or about **0.41 stops** of single-pass attenuation.



What % tint do I need to add to the front windows to achieve the same overall VLT as the back window?

To make the **front window's overall VLT match the back window**, multiply the existing front glass transmission by the added tint film transmission:

$$VLT_{final} = VLT_{front} \times VLT_{film}$$

So:

$$VLT_{film} = \frac{VLT_{back}}{VLT_{front}}$$

From our estimates:

- Back window VLT  $\approx$  **21.0%**
- Front window VLT  $\approx$  **75.4%**

$$VLT_{film} = \frac{0.210}{0.754} = 0.279$$

So you'd need approximately:

## 28% tint film

In tint-shop terms, that means a film rated around **28% VLT**. Since common film options are usually 30%, 25%, 20%, etc.:

Added film	Expected final front VLT
35%	26.4%
30%	22.6%
28%	21.1%
25%	18.9%
20%	15.1%

So the closest common choice is likely:

**30% film** if you want to be slightly lighter than the back, or **25% film** if you want slightly darker.

For the closest match to your measured back window, **28% VLT film is the target.**



