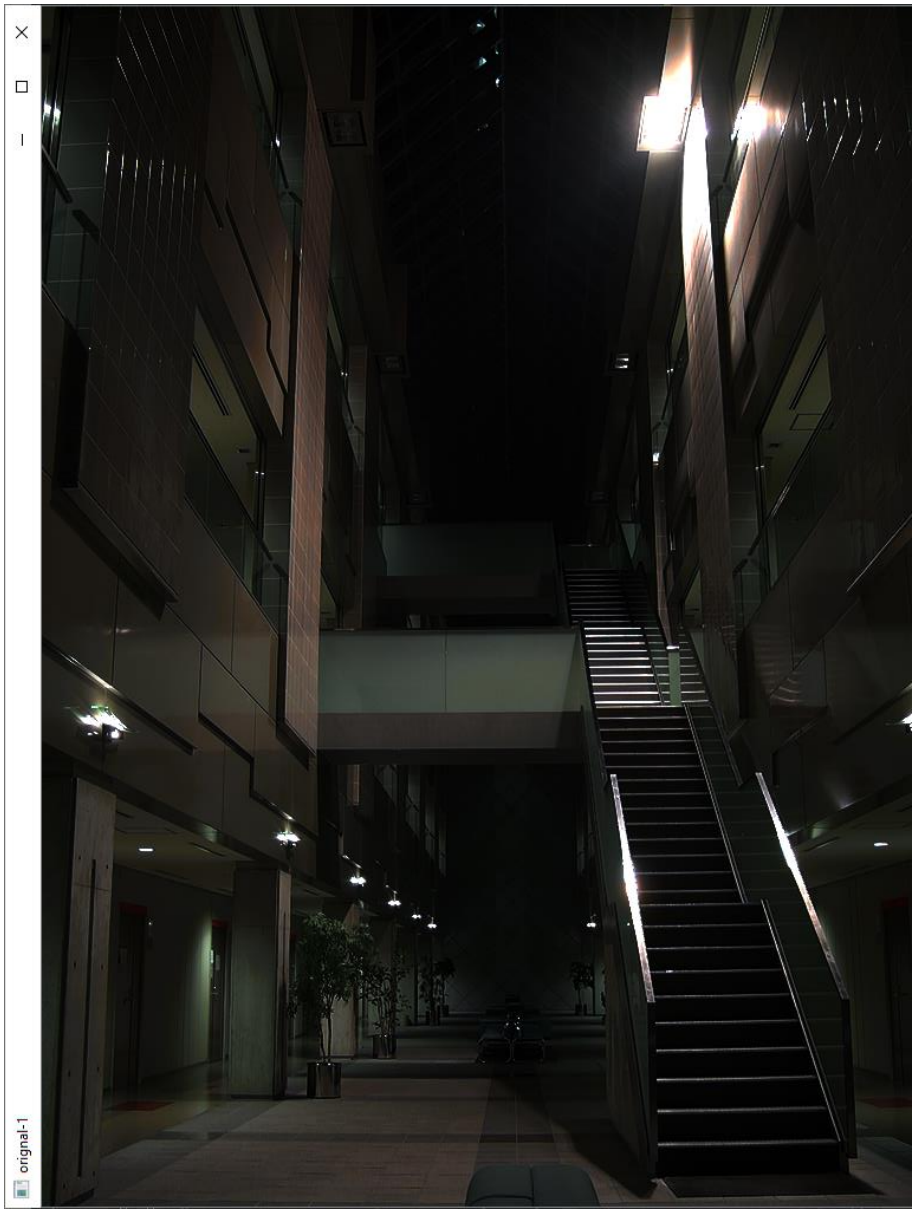
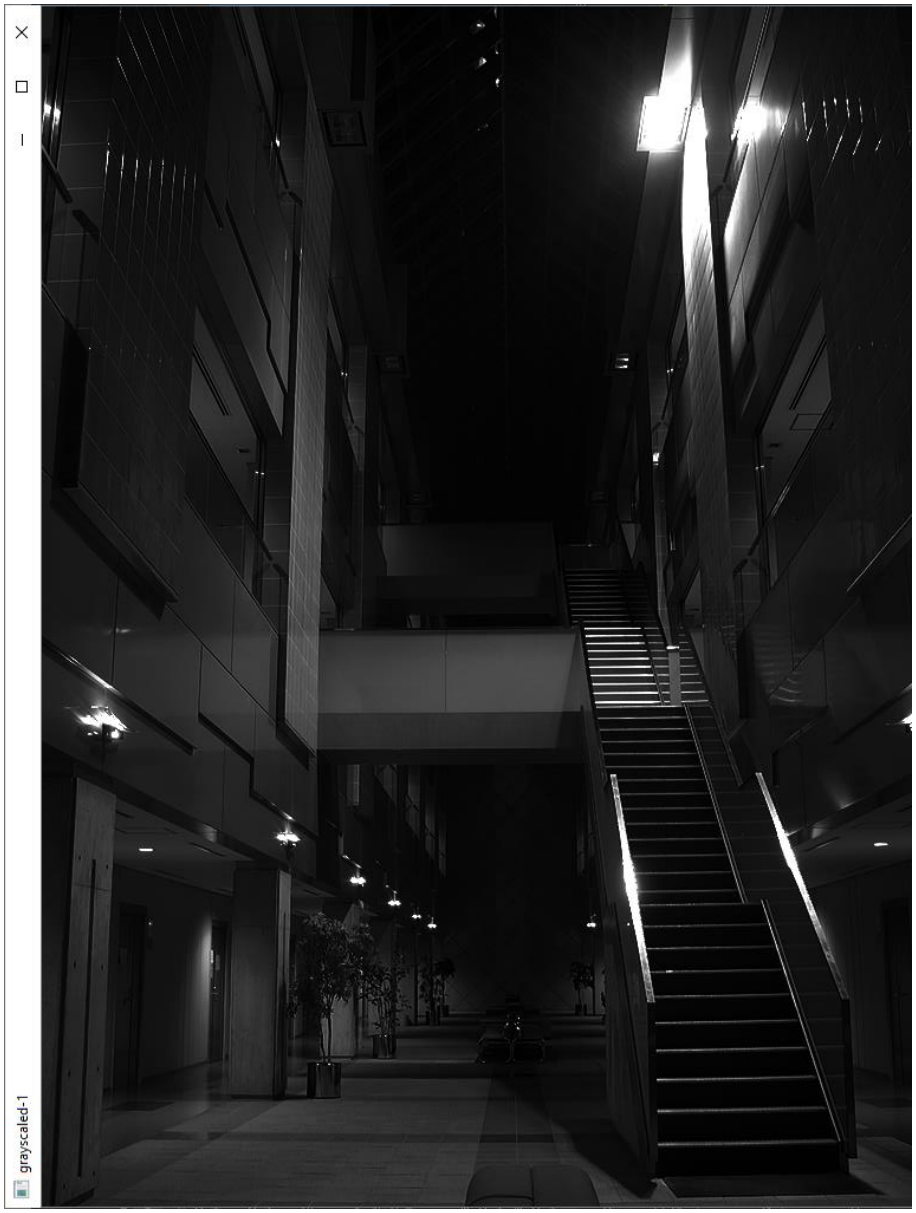
1 Problem # 1: Gamma Mapping of HDR Images for 8-bit Display [30 Points]

(a) You are provided two high dynamic-range (HDR) images, `hw1_atrium.hdr` and `hw1_memorial.hdr` (Fig. 1). Read each color image, convert to grayscale and display. Include the displayed image into your report, and comment on which details in the image are easy/difficult to see.

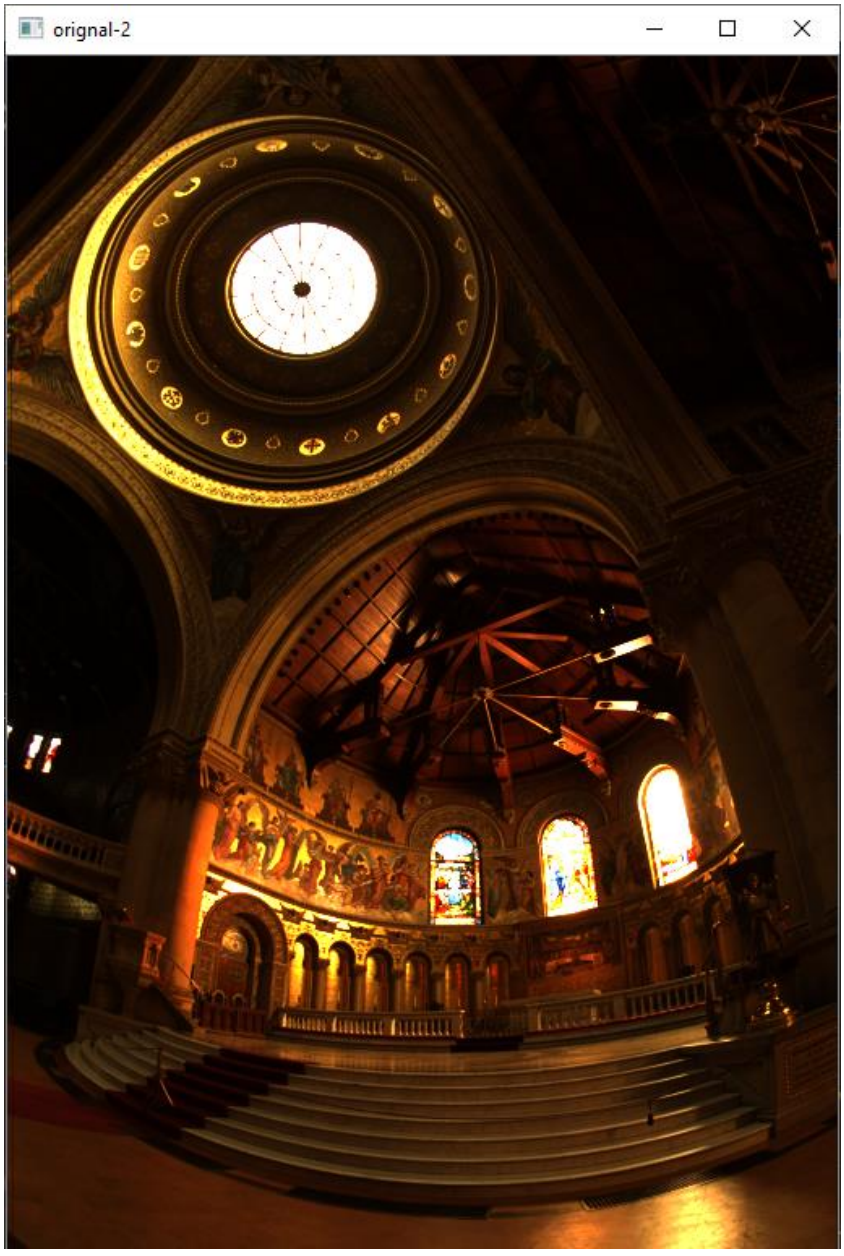


Grayscaled:



In gray scaled image almost all the features of the hdr image are visible but we can see a slight difficulty in observing the features as we move up on the staircase

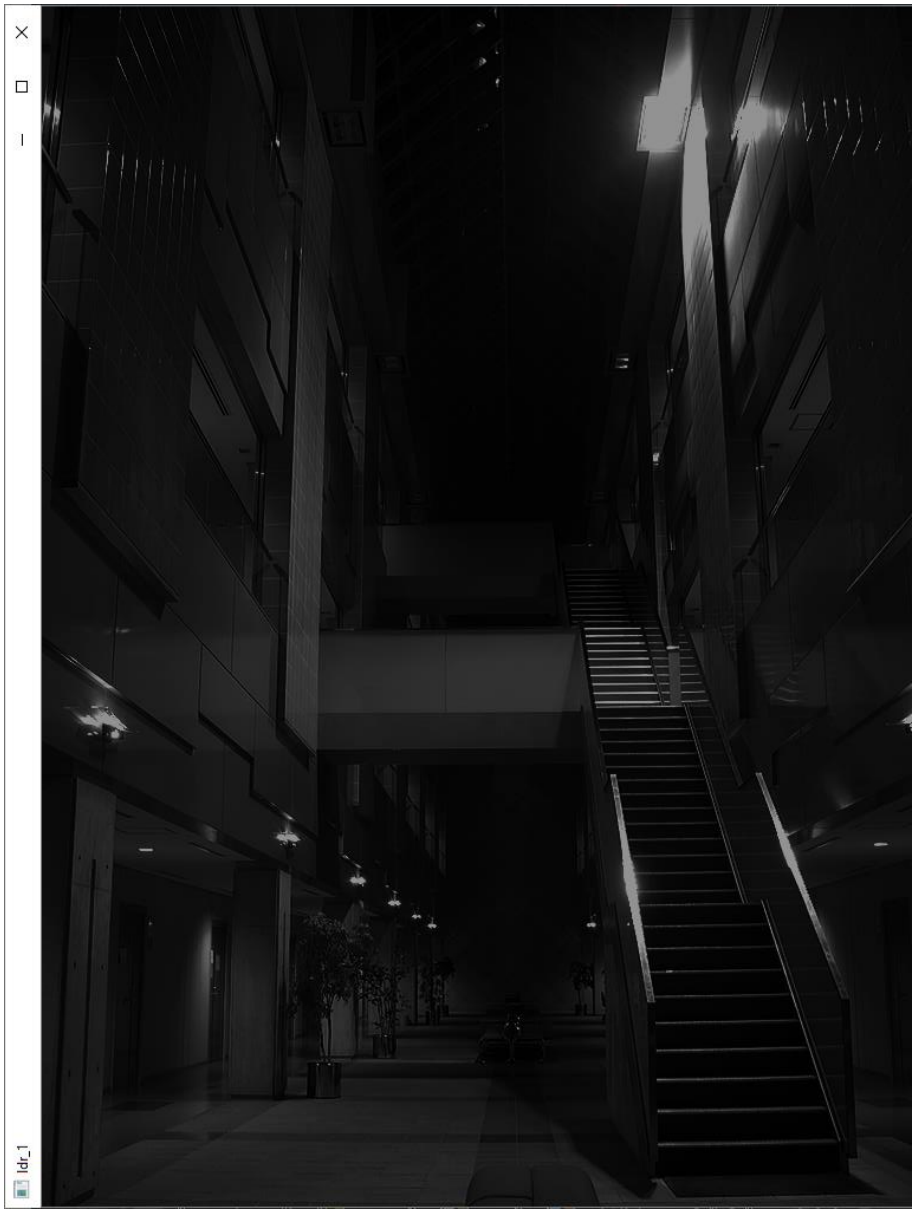
HDR-2



Grayscale

The gray scaled image has dark rooftop region so the details over there are difficult to observe.

(b) Apply a γ-non-linearity mapping to each grayscale HDR image from part (a) to reduce its dynamic range (you may not call any MATLAB/OpenCV functions for γ mapping; write the necessary code yourself). Show the new image, and include in the report. For each image, find and report a value of γ that allows you to see nearly all the details.



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The values for gamma mappings were:

c	gamma
1	0.9
0.5	1.1
0.3	1.2

(c) Repeat part (c), but now apply γ-non-linearity mappings to each of the red, green, and blue color channels. First, use the same value of γ for all color channels. Then, experiment with different values of γ for each color channel. What is the effect of using different values of γ for each color channel compared to using a common value? You may submit images to facilitate your explanation.

If we use same value of gamma for all the color channels we can clearly observe that the resultant image is nearly similar to the original image.

In our case we applied gamma=0.9 to all color channels, and we can clearly see the image. Results are shown below.

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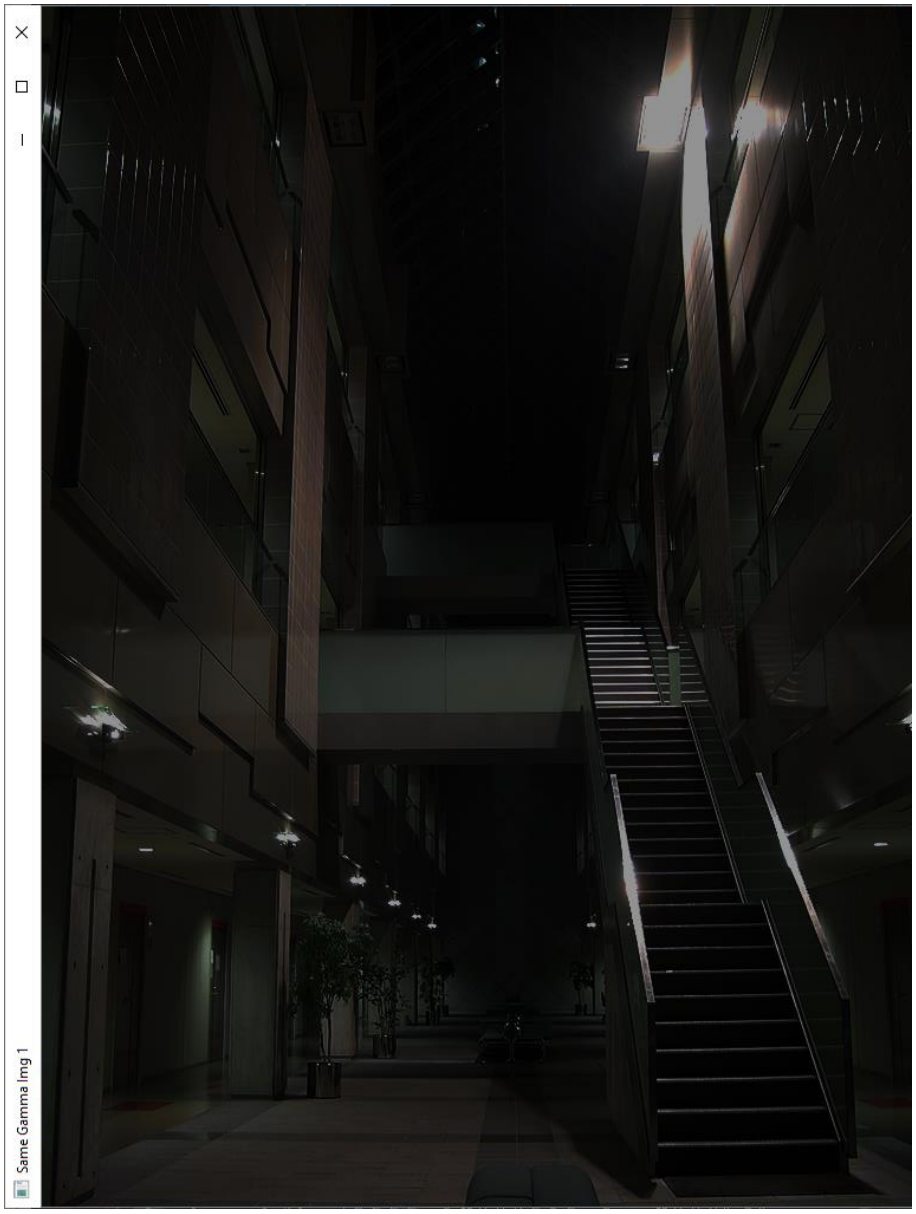
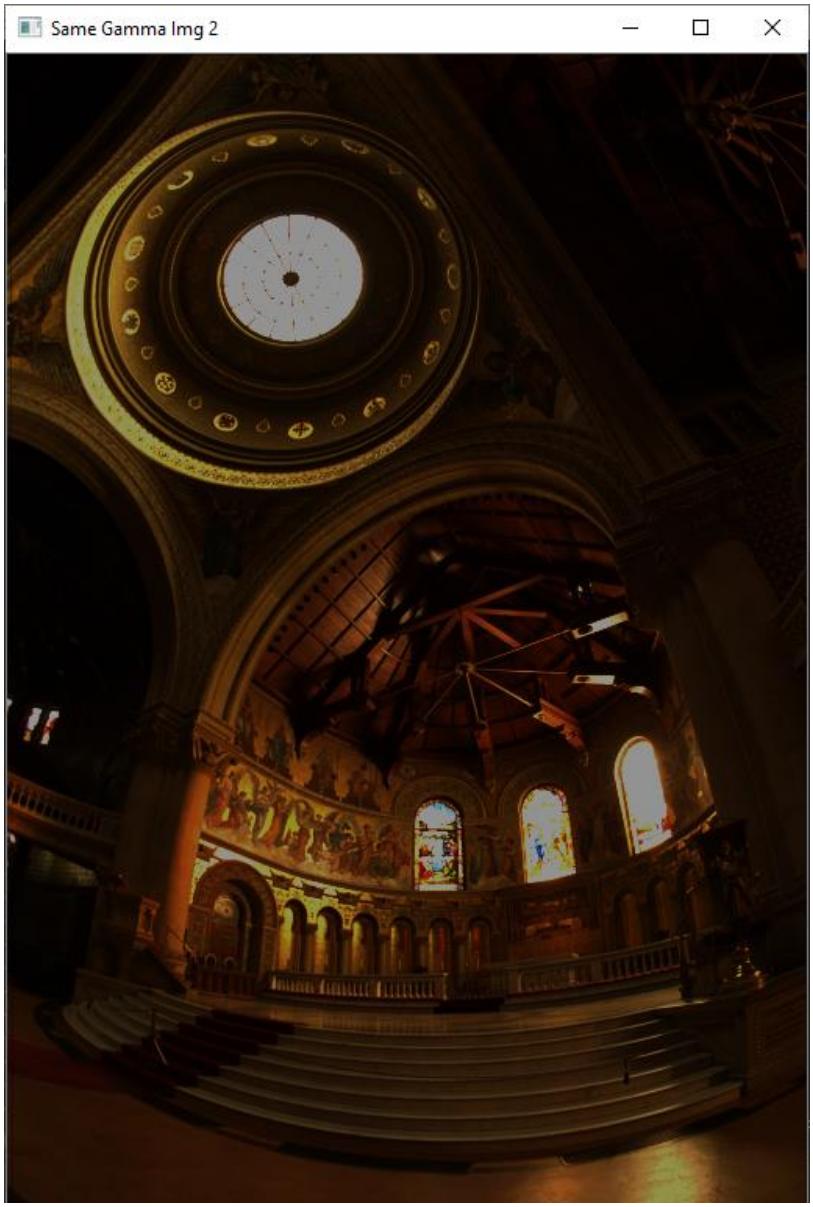




Though the images have been a little dark but still the details are visible.

In case of different values of gamma, it was observed that there comes blue-ish or red-ish shade in the resultant image. If we choose values of gamma close to 1 and above 1, we can observe that the details are not clear now anymore and in addition to that the image now has red-ish shade.

If we keep the value of gamma below 1, we observe that the resultant image has blue-ish shade now but the details are somewhat better visible.

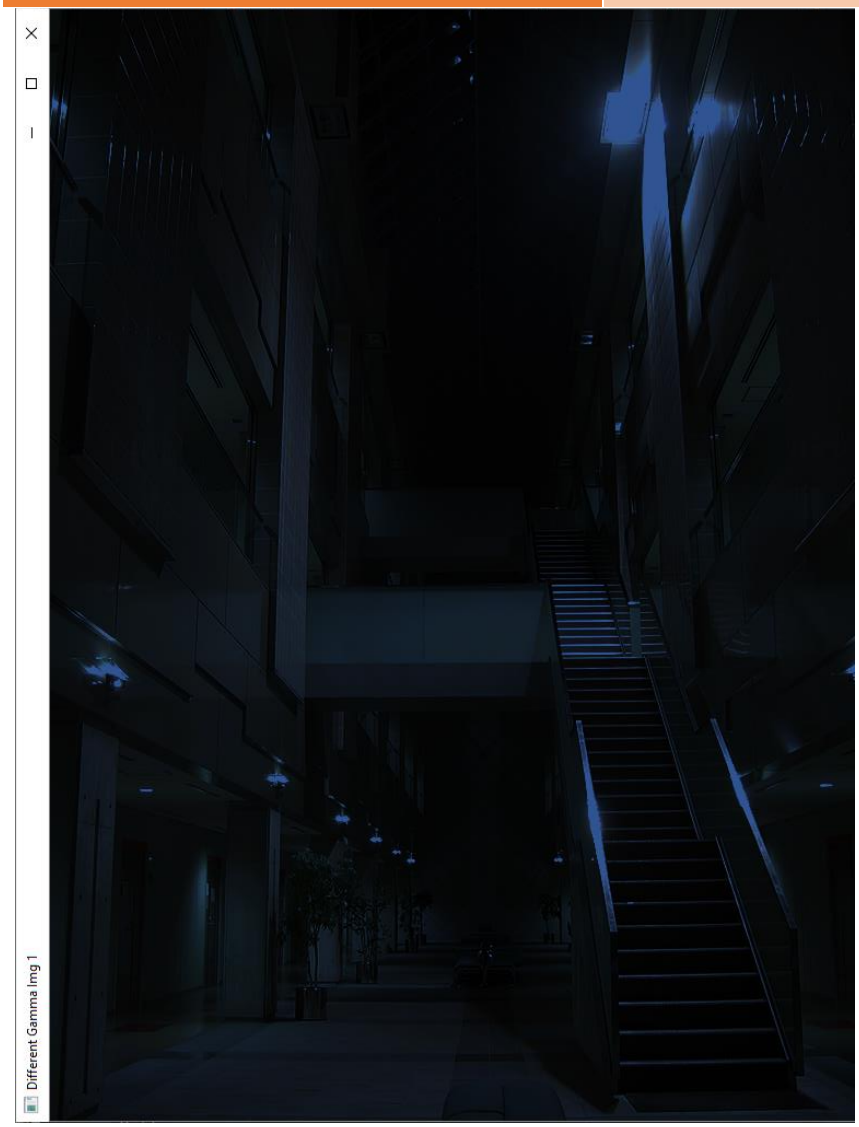
So, we decided to keep the value as mentioned below;

For hdr-1

channel	gamma
b	0.9
g	0.8
r	0.7

For hdr-2

channel	gamma
b	1.1
g	0.8
r	0.7



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