Creating and Calibrating Showcase 2013 Environments

The industry has no HDR standard for light intensity scale yet. The cameras record images based on the middle bracket so you cannot measure the pixel value and know for sure how many lux or cd/m2 correspond to it. Therefore we have the lighting contribution sliders to set the scale of the light intensity.

We want to maintain consistency between hardware and ray tracing. Ray tracing can generate shadows using HDR but in hardware we cannot have object on object shadows without a directional light. Therefore, we have to separate the sun light from the skylight into two separate values.

HDR images recorded with a DSLR camera do not include the full sun intensity because they do not have such short exposures. SpheronVR cameras record the full range of the sun light but then you cannot add any directional light without doubling the illumination. We don't have any reliable way of knowing if the sun is clamped or not in an HDR and by how much.

Showcase does not have automatic exposure right now. If you reproduce exactly a sunny day environment, you may need to adjust the camera exposure compensation each time you orbit from the sun direction against it. So, if ease of use and reliable good looks are more important than exact light simulation, you can calibrate the environment in such a way that no surface is too dark or too bright.

Here are three workflows to create Showcase environments, suited for beginner, intermediate and expert users.

1. **Beginner user.**
   - This workflow creates an environment with a third party HDR and with the goal to generate a scene that looks decent from any direction, and does not look overly bright dark no matter how you navigate around the model.
   - Load the environment calibration model and the HDR into Showcase and choose the Light conditions preset that matches the content of the HDR image. Adjust the directional light and shadows to match the sun direction in the HDR image by clicking on the sun reflection in the chrome sphere.
   - Change directional light contribution to zero and adjust the lighting image contribution until the background looks as bright as necessary and the model looks is shaded like the sun is behind a cloud.
   - Change the directional light contribution until the brightest point on the white sphere is rendered white.
   - Look at the model from different angles and adjust the two light contribution values until the model, the background and the shadows look as desired.

2. **Intermediate user.**
   - Create an environment with a HDR file obtained from a third party and create realistic renderings.
   - Import environment calibration .dwg file into your scene and position it where you can see its objects.
   - Open Environment Properties - Lighting tab. Load HDR image in Latlong format (4096x2048 pixels recommended) and rotate it as desired.
   - Open the Directional Light and Shadows, press Move light button and Ctrl-click on the brightest spot reflected in the chrome sphere. Now the sun direction matches the background.
   - Choose one of the lighting conditions presets according to the lighting conditions in the HDR image. If none of the presets match the lighting conditions, use the table below to set the exposure value and the preliminary lighting contributions.

Lighting conditions	Lux	EV
Snow in clear sunlight	192000	16
Exterior: Tropical Sunlight	96000	15
Exterior: Temperate Sunlight	48000	14
Exterior: Cloudy	24000	13
Exterior: Sunrise	12000	12
Exterior: Dawn	6000	11
Interior: Sunlit	3000	10
Interior: Daylight and Artificial	1500	9
Interior: Office Lighting	750	8
Interior: Classroom Lighting	375	7
Interior: Auditorium Lighting	187	6
Interior: Warehouse Lighting	94	5
Exterior: Parking	47	4
Exterior: Road Lighting	25	3
Interior: Nighttime	10	2

- The exposure value for light conditions is saved with the environment and describes the intensity of the incident light. If you want to make the viewport darker or brighter, you should use the brightness slider in the Task UI or the compensation slider in the camera properties. They are linked together and saved with the scene.
- Change directional light contribution to zero and lower the exposure value by 2.0. Adjust the lighting image contribution until the horizontal surface of the grey 127, 127, 127 material renders 127, 127, 127. To measure the color open a color picker from File>Settings> User settings and Switch to Monochrome preset in the Camera Properties. Make sure that the background looks as bright as necessary and the model looks is shaded like the sun is behind a cloud.
- Change the exposure back to the value before subtracting 2.0 and adjust the directional light contribution until the brightest point on the white sphere is rendered white.
- Look at the model from different angles and adjust the two light contribution values until the model, the background and the shadows look as desired.
- Note: On a sunny day, the exposure value measured on a horizontal 18% grey card is around 14 in the sun and 12 in the shadow, that's why we suggest subtracting 2.0 when measuring the shadow. This workflow assumes that the HDR image was created using a DSLR camera and stores the light coming from the sky and ground but not the full sun intensity. We add the directional light to brighten the surfaces facing the sun and to generate shadows. The value subtracted from the exposure value ranges between 1.0 and 3.0, really, with 1.0 for HDR images created with a SpheronVR camera if there is a lot of sun recorded in the HDR.

3. **Advanced user.**
    - Creating an environment where you are actually taking the pictures and want to be as physically correct as possible for lighting simulation.
    - If you are present at the scene when you record the HDR, you can use a photographic 18% grey card and a camera or light meter to record the light intensity. You place the grey card horizontally in the full light in the same place as the camera recording the HDR. You point the light meter to it and record the exposure value. If you use a camera to measure, you point it at the grey card and record the ISO, aperture and shutter speed and later determine the exposure value using an exposure value table. The second measurement necessary is done with the grey card in the same horizontal place. You cast shadow with your hand or any object and record the new value.

- If you record the full dynamic range of the sun, using a SpheronVR camera, the HDR image will contain the full light energy of the environment and the directional light contribution should be zero. In this case, the hardware rendering will have no object on object shadows due to the current limitations. You will be able to render the scene very realistically in ray tracing only because in HW you cannot have object on object shadows if the environment light has zero contribution. So, when you record the HDR it's important that you don't set the exposure brackets so high that the HDR contains the full range of the sun intensity. Ideally, the sun should not be brighter in the HDR image that the bright white clouds on the sky.
- You load a horizontal surface with a grey 127, 127, 127 color in Showcase, load the HDR and enter the exposure value recorded in the shadow. You change the directional light contribution to zero and find the value for lighting image contribution that makes the grey material render 127, 127, 127.
- You change the exposure value to the value recorded in the full light and adjust the directional lighting contribution to make the grey material render 127, 127, 127.
- You adjust the camera exposure compensation for each image you render.

4. There's also the car or building interior, where you need to take into consideration that the interior is in the shadow, so you may need to change the compensation in the camera properties.