

# Obsidian

Model S / Model R

## Shooting Guideline



KANDA   
3D Virtual Reality Camera

The purpose of this guide is to share general experience of shooting VR content with Kandao Obsidian R/S.

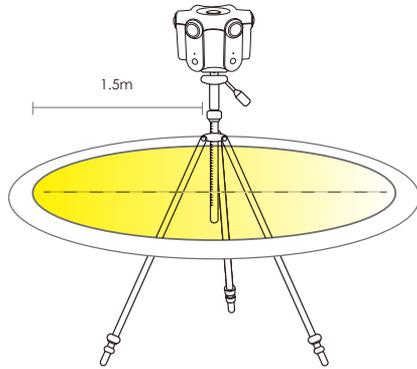
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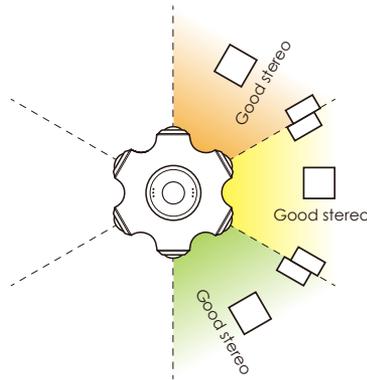


# 1.Distance from the camera

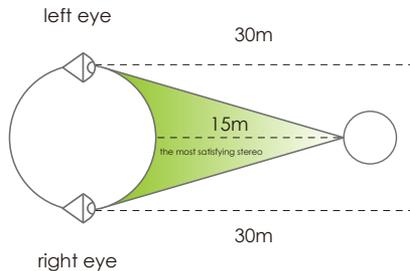
1.1 Generally objects should be at least 1.5 m away from the camera for good stitching.



1.2 The area between 2 lenses has better tolerance for closer objects. However, as objects get closer the likelihood of stitching artifacts increases.

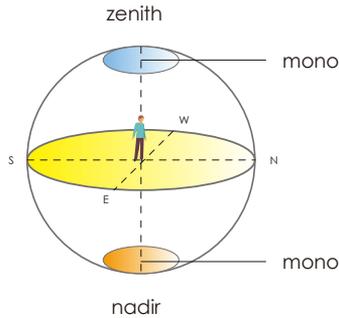


1.3 The most satisfying stereo tends to be found at distances of less than 15 meters. Beyond 30 meters, stereo is barely perceptible.

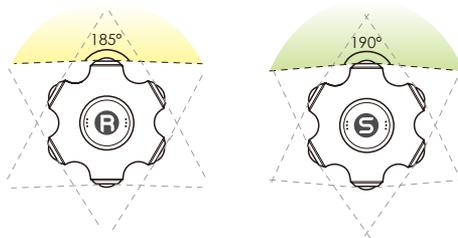


## 2. Stereo

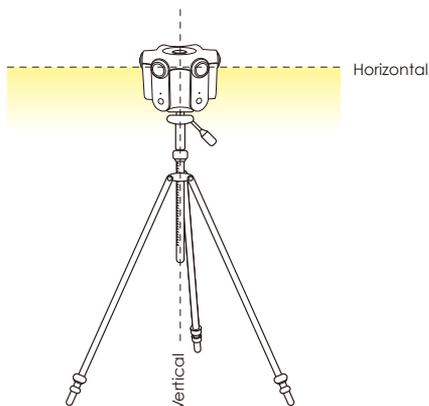
2.1 In current omni directional stereo format, the zenith and nadir cannot preserve proper depth information. Noted that we make monoscopic zenith and nadir instead of stereo in our stitched output.



2.2 The vertical FOV of individual lens is 185 degrees for Obsidian R, and 190 for Obsidian S. The cameras are designed in this way to have enough overlapping for stereoscopic stitching, depth estimation and 6DOF reconstruction.



2.3 The camera should be set up horizontally to provide comfortable stereo for viewers, so check the level of the camera before every shot. Changing observation direction, or correcting horizon in postproduction, is easy in monoscopic video but difficult in stereo.



### 3.Camera motion

3.1 Kandao Studio can stitch scenes in which the camera moves, but when these scenes played back in HMD, they can cause dizziness and nausea if the motion is not at a constant velocity in a straight line.



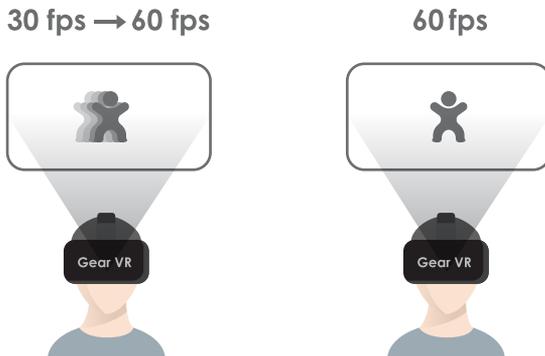
3.2 Use of a stabilization system is highly recommended when doing camera moves to prevent sway, and make sure to keep the camera horizon lines stable and horizontal.



3.3 When recording fast motion scenes, like higher fps is preferred.

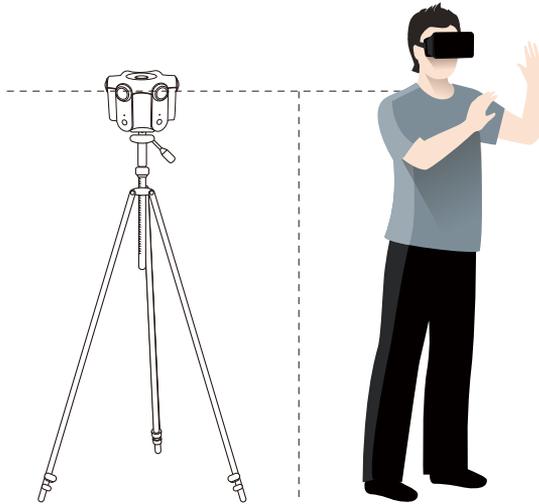


3.4 Currently 30 fps fast motion footage may appear jerky when playing in Gear VR headset. Up-sampling the footage to 60fps solves the problem.

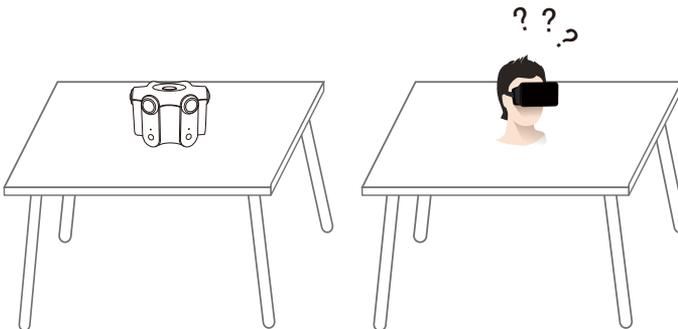


## 4.Height of the camera

4.1 In general, it's best to place the camera at "Chin height" or "shoulder height" if you want to deliver a view of an average person standing or seated. The true eye-level actually feels a bit too tall inside an HMD.



4.2 Placing the camera higher or close to the ground may seem very unnatural as if you are floating or embedded with the floor or table. While this unnatural feeling can be used to great effect in the right circumstances.

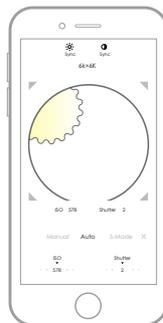
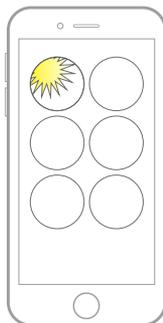
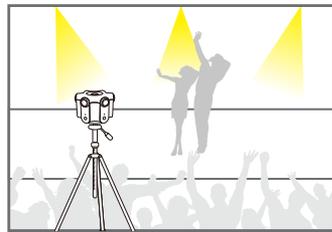
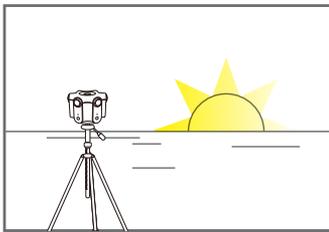


## 5. Water issues

- 5.1 Many camera rig is not built to withstand water exposure nor is Kandao Obsidian. While we are investigating options for a waterproof enclosure for the camera.
- 5.2 Shooting in rain, even a light rain is difficult as a few drops would ultimately land on one or more lenses making that portion of the scene blurry and likely unstitchable.

## 6. Extreme exposure

When shooting outside with sunset or recording concerts with lighting stage, you might have a very bright side and a darker shadow side in 360° footage. You can use Kandao Obsidian remote controller to globally or individually control each lenses ISO or shutter speed , Exposure Value (EV) to create a proper exposure around the camera, in case of the highlight areas blow out and retain details in shadow areas.



## 7. Situations to avoid

Certain kinds of scenes can be more likely to cause artifacts in stitched footage. While in practice Kandao Studio can handle most of the following cases correctly most of the time, avoiding these cases when possible will minimize the chance of artifacts.

- 7.1 Thin structures — Thin structures such as railings, tree branches, violin bows, and so on, are challenging to reconstruct. Performance improves if the thin structures are in front of a blank background and gets better the farther away the thin structures are. Errors are more likely if there are lots of thin structures at different depths.
- 7.2 Semi-transparent surfaces — Kandao Studio estimates a single depth for each point in the scene. As a result, semi-transparent surfaces with content behind them can lead to artifacts.
- 7.3 Lots of overlapping objects at different depths — If there are many different objects that overlap each other at different depths then the chance of Kandao Studio handling all of them correctly drops. For example, if looking through a chainlink fence at a person standing a couple of meters in front of a brick wall, then at the boundary in the image between the fence, the wall, and the person, there is a good chance one of them will be stitched incorrectly.
- 7.4 Repeated texture — If a scene contains many identical textures (a highly repetitive wallpaper for example) then it is possible that Kandao Studio could mix them up.
- 7.5 Lens flare — Lens flare occurring in one camera but not the next can look odd when viewed in VR.



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