

901209 Imaging for Mid-water Autonomous Platforms

Camera and Optical System Design Requirements

14AUG14 – rev.B Minor edits, added Arri/Zeiss lens possibility. mrc

1. Image Capture.

- 1.1. The camera system is to be mounted on an AUV and used for recording visual transects in an ocean seawater environment.
- 1.2. Capture format. The imaging system must capture in a progressive scan format with a minimum resolution of 1920 x 1080 4:2:2 format at 10 bits at 60 frames per second or greater (1080P 60). NOTE: The design plan is to initially capture in 2k format (2048 x 1080 progressively scanned at 60 frames per second), and migrate to 4k format (4096 x 2160) when the recorder is upgraded.
- 1.3. Camera System.
 - 1.3.1. The camera must be a Sony F-5 or F-55 Cine Alta camera with a DIN “super 35” image format.
 - 1.3.1.1. Imager size: Bayer array imager 24 x 12.7mm (27.1mm diagonal).
 - 1.3.1.2. Imager aspect ratio: 1.89:1 (17:9).
 - 1.3.1.3. Imager resolution: 4096 x 2160.
 - 1.3.1.4. Lens mount: PL
- 1.4. Optical System.
 - 1.4.1. Performance requirements. All requirements are for the camera system submerged in clear seawater.
 - 1.4.1.1. The imaging system aspect ratio is 16:9.
 - 1.4.1.2. The dome port and adapter optics must have the required spatial resolution (MTF), and minimized chromatic aberration across the full imaging area such that the overall camera and optical system limiting resolution is the 4k camera imager and lens resolution and NOT the dome port and adapter optics.
 - 1.4.1.3. The Horizontal viewing angle must be greater than 80 degrees and less than 100 degrees.
 - 1.4.1.4. Depth of Field (DOF). The depth of field must resolve millimeter size objects across the range of 10cm to 2.5 meters distance from the front surface of the optical dome port. See appendix 1.
 - 1.4.1.5. The visual area of highest importance is approximately 0.5 meters from the front surface of the optical dome.
 - 1.4.2. The camera lens must be a Sony SCL-P11X15 lens set to 11mm focal length. There is no dynamic lens control requirement. *Note: There is a possibility that*

the lens specification may change to the Arri/Zeiss 12mm T2.1 standard prime. Final lens determination will be made dependent on the availability of the required design data, and before the detailed optical design starts.

- 1.4.2.1. Calculations show the lens can be set to F5.6 and the lens object focus distance can be set to 0.8 meters (31.5 inches) to meet the depth-of-field requirements.

2. Physical Requirements.

- 2.1. Operate at specific depths from 50 meters to **1500 meters in seawater.**
2.2. Operate in an ambient environment from 4 to 25 Degrees C.

3. Appendix 1. Depth of field from the camera dome for organism identification.

Distance Requirements for the Identification of Representative Organisms in the Camera Field-of View

