3D HDTV list of technical specification of the prototype and individual functionality

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1. Introduction

After evaluation of several alternatives during the last months (Sony, Ikegami, Toshiba, Fraunhofer), the final specification for the camera modules is based on the *Fraunhofer IIS "**MicroHD II**"* camera modules (see attached description # 1). This module was evaluated specifically during a visit at Fraunhofer ILS in Erlangen, and was found to be most adequate in terms of image quality, size and dimensions, compatibility and telemetry. Due to a special codec encapsulation developed by Fraunhofer, synchronized FullHD multichannel transmission can be realized over standard Ethernet telemetry, without the need for an extra fibreoptic channel. This is a major advantage in terms of portability of the system within platforms available among EUROFLEETS partners.

The following list shows the status of specification discussed among the partners and Fraunhofer ILS:

2. Scientific application

1.) A. Scientific object inspection (corals, organisms, rocks)

Area of focus	0.3 - 2 m
Macro-capability	< 0.3m
Field of view	> 45°
Baseline	+/- human eye

Individual functionality

Main goal of this scientific application is based on short range high resolution inspection of organisms (corals, organisms, rocks). To fulfil the requirement, the baseline of cameras has to be approx. the distance of human eyes. Typically, handling of camera should be designed as handheld system, operated by ROV manipulator. Optionally, a stand-alone version with short-range application is also envisaged for long-time operation, e.g. short-distance observatory tasks.

2.) B. Scientific vertical or 3D horizontal mapping (*optional*, TBD)

Area of focus	1 - 8 m
Field of view	> 45°
Baseline	artificial, large, max. the width of the ROV 1.5m

Individual functionality

Main goal of this scientific application is based on mid range, high resolution inspection of areas in front of vehicle (plateaus, coral reefs, bacterial mats, rocks). To fulfil the requirement, the baseline of cameras has to be larger, approx. in widths of vehicle. Typically, handling of camera should be designed as fixed system entirely mounted on ROV frame. In addition, a stand-alone surface moored version is also envisaged for long-time operation, e.g. broad view observatory tasks.

3. Basic Techniques

System setup

3D Setup	Modular, fixed focal length, remote variable focus and iris
Pressure housing	2 cameras in separate housings, 4000m (6000m opt.)
Baseline	Variable, motor-driven, wet (not inside housings). A baseline drive motor is an option; there are many constraints (weight, new actuator, and new cable). Alternatively, the baseline can be adjusted manually before each dive.
Positioning	Probably one frame for each application: **Type A**: mounted on small frame, positioned by a remotely operated manipulator on ROV (equipped optionally with motor for baseline change) **Type B:** on a larger frame installed on the ROV (on scientific module).
Image quality	The best HD quality with synchronisation
Telemetry	1x Ethernet/ASI link for the image of the 2x cameras and the attitude data (in a 3rd pressure housing there will be integrated the ASI/Ethernet gateway 100Mb/s max.) 1x serial line only, for the control/command of the 2x cameras and their lens, see below

Telemetry/Data

Camera1 - Camera2	- Camera video frame sync - H.264 compression and ASI - remote focus sync between 2 cameras - 12-26VDC power range - RS485 control of cameras and lens - RS485 control of baseline drive (optional, breakout)
Camera2 - ROV	- Third-party ASI-to-Ethernet converter (min. 2 ASI channels, optional more, in 1x Eth. channel), Datarate <= 100 Mbit - Serial line RS485 - DC power 12-26V
Cabling and wiring	**Opt. A:** Only one cable between the 2 cameras, (1 connector only on each camera, will afford a dense pin-out plus high datarate connection, constraints due to very compact housings) **Opt. B:** Only one cable between the master camera and the ROV (1 connector more on the master camera a low number of wires

	on each connector, are HF connections necessary?
Control and Display	
Topside (Ship) Control	- RS485 bus controls Camera1 and Camera2 synced, plus lens focus via RS 485/RS232 - RS485 bus delivers camera attitude data (G-force, acceleration, etc), plus heading?) - RS485 bus delivers data to control the baseline adjustment motor (via STAN?) - Video (2+ channel ASI) over Ethernet
Topside - Display	- Ethernet to 2x ASI converter - 2x ASI to HDMI or HD-SDI converter, synchronized? - 3D monitor display (circular polarized or shutter?) - STAN automated stereo correction should be evaluated if to be included into the topside telemetry chain for control of corrected images, focus (?) and baseline control
Topside - Storage	Format for distributable 3D HD digital storage has to be discussed. Datavolume has to be discussed.

Ongoing work for next month

1. Purchase of camera modules and interfaces (Quotation already exists)

2. Purchase of lens and lens control electronics (Quotation under preparation)

3. Definition and Purchase of 3D display screens

3. Benchtests of cameras, optical hardware and interfacing

4. Design of underwater camera housings and optical ports

5. Design of baseline driver electronics and mechanical setup

6. Design of central telemetry unit and interfacing to camera