EXCELLABUST

EXCELLING LABUST IN MARINE ROBOTICS

Deliverable D3.2

Proceedings of Breaking the Surface summer school 1

Project Acronym:	EXCELLABUST	
Grant Agreement number:	691980	
Project title:	Excelling LABUST in marine robotics	
Funding:	Horizon2020 Twining	
Call:	H2020-TWINN-2015	
Type of action:	CSA	
Start date of project:	1st January 2016	
Duration:	36 months	
Project website:	http://excellabust.fer.hr/	
Delivery date:	31st October 2016	
Version:	1.0	
Lead participant	UNIZG-FER	
Dissemination level:		
PU	Public	X
CO	Confidential, only for members of the consortium (including the Commission Services)	

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691980.

DELIVERABLE DATA SHEET

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Deliverable number:		**D3.2.**			
Deliverable title:		**Proceedings of Breaking the Surface summer school 1**			
Work package:		**WP3 – Broad networking events**			
Type:		**Delivery date**	**31/10/2016**	**Version:**	**1.0**
Lead participant		**University of Zagreb Faculty of Electrical Engineering and Computing (UNIZG - FER)**			
Dissemination level:					
PU	**Public**				**X**
CO	**Confidential, only for members of the consortium (including the Commission Services)**				

Version log			
Revision no.	Date	Author (Partner)	Change

Deliverable summary

The **1st EXCELLABUST summer school "Breaking the Surface"** 2016 (http://bts.fer.hr/) was held from 2nd until 9th October in Biograd na Moru, Croatia and more than 220 people participated. The programme was divided in five program tracks: marine robotics (MAROB); marine biology and marine nature protection (MARBIO); maritime security, naval and coast guard operations (MARSEC); maritime, nautical and ship archaeology (MARCH), and this year's novelty in the programme: Innovation Tuesday programme (INNOVA). In 7 days 29 lectures, 11 demonstrations and 1 tutorial were presented.

This deliverable offers report on organization of BtS and its programme. The deliverable is accompanied with appendixes with abstracts, biographies and presentations of the programme presenters:
APPENDIX I. – Abstracts and biographies
APPENDIX II. – Presentations (slides)

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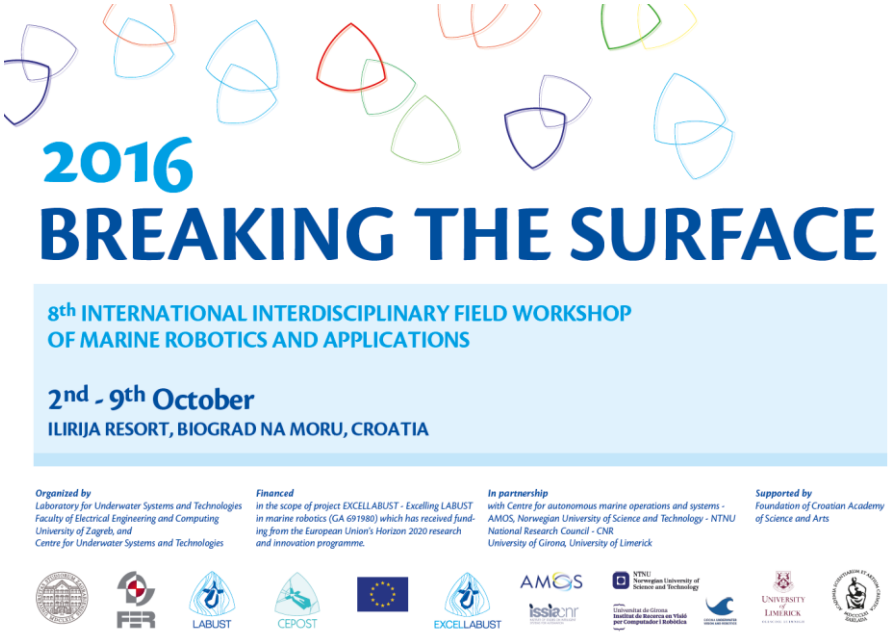
1. INTRODUCTION

The **1st EXCELLABUST summer school Breaking the Surface** 2016 was held from 2nd until 9th October in Biograd na Moru, Croatia and more than 200 people participated. The programme was divided in five program tracks: marine robotics (MAROB); marine biology and marine nature protection (MARBIO); maritime security, naval and coast guard operations (MARSEC); maritime, nautical and ship archaeology (MARCH), and this year's novelty in the programme: Innovation Tuesday programme (INNOVA). In 7 days 34 lectures, 11 demonstrations and 1 tutorial were presented.

Breaking the Surface summary:



Dates: 2nd – 9th October 2016

Location: Biograd na Moru, Croatia

Website: http://bts.fer.hr/

Programme:

- 29 lectures
- 11 demonstrations
- 1 tutorial

Participants:

- 221 participant

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2. REPORT ORGANIZATION

The first part of the report describes the BtS 2016 organization, including the work program. The deliverable is accompanied with appendixes with abstracts, biographies and presentations of the programme presenters:
APPENDIX I. – Abstracts and biographies
APPENDIX II. – Presentations (slides)

3. ABOUT BREAKING THE SURFACE

Breaking the Surface - BtS summer school has been organized by UNIZG FER LABUST for the last 7 years – first three years as a part of FP7-REGPOT CURE project, while in the following years with Office of Naval Research Global support. During the years, BtS served as a meeting place of experts and students of marine robotics and the marine robotics application areas such as marine biology, marine archaeology, marine security, oceanography, marine geology and oceanology. This is the world's first successful, multi-year field training program that combines academic topics in marine robotics and robotics application areas and hands-on working experience in the sea, doing remote sensing and sampling for various ocean sciences.

Breaking the Surface summer school is organized in attempt to strengthen links between marine robotics research and end-users and provide EXCELLABUST partners with one-week intense summer school consisting of plenary talks, hands-on trainings and demonstrations of marine technologies, by EXCELLABUST partners and worldwide experts.

The program is organized in the form of plenary talks, hands-on tutorials and demonstrations of marine technologies, e.g. marine robotics (MAROB); marine biology and marine nature protection (MARBIO); maritime security, naval and coast guard operations (MARSEC); maritime, nautical and ship archaeology (MARCH), oceanography (OCEAN), and this year's novelty in the programme: Innovation Tuesday programme (INNOVA).

4. ORGANISERS

Breaking the Surface summer school is organized under the European Union's Horizon 2020 project EXCELLABUST - Excelling LABUST in marine robotics (GA 691980). The main organizers are University of Zagreb Faculty of Electrical Engineering and Computing, Laboratory for Underwater Systems and Technologies and Centre for Underwater Systems and Technologies with organization support from Institute of Studies on Inteligent Systems for Automation - ISSIA, National Research Council of Italy (CNR), University of Girona (UdG), and University of Limerick (UL).

Breaking the Surface organization structure is as follows:

4.1. GENERAL CHAIR

Prof. Dr. Sc. Zoran Vukić

University of Zagreb,
Faculty of Electrical Engineering and Computing,
Laboratory for Underwater Systems and Technologies

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4.2. PROGRAMME COMMITTEE

Assoc. Prof. Dr. Sc. Nikola Mišković
Chairman
EXCELLABUST project Coordinator

University of Zagreb,
Faculty of Electrical Engineering and Computing,
Laboratory for Underwater Systems and Technologies

Marco Bibuli, PhD

Centre Nazionale delle Richerce - CNR
Institute of intelligent systems for automation - ISSIA

Prof. Bridget Buxton, PhD

University of Rhode Island,
Department of History

Massimo Caccia, MSc

Centre Nazionale delle Richerce - CNR
Institute of intelligent systems for automation - ISSIA

Assoc. Prof. Marc Carreras, PhD

University of Girona
Computer Vision and Robotics Research Institute - VICOROB

Dr.-Ing. Thomas Glotzbach

Ilmenau Technical University

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Edin Omerdić, PhD

University of Limerick

Asst. Prof. Dr. Sc. Irena Radić-Rossi

University of Zadar,
Department of Archaeology

Prof. Pere Ridao, PhD

University of Girona
Computer Vision and Robotics Research Institute - VICOROB

Prof. Asgeir Sørensen, PhD

Norwegian University of Science and Technology
Department of Marine Technology
Centre for Autonomous Marine Operations and Systems

Prof. Daniel Toal, PhD

University of Limerick

4.3. ORGANIZING COMMITTEE

Ivana Mikolić, mag. ing

University of Zagreb,
Faculty of Electrical Engineering and Computing,
Laboratory for Underwater Systems and Technologies

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Petra Mikolić, M. Phil

University of Zagreb,
Faculty of Electrical Engineering and Computing,
Laboratory for Underwater Systems and Technologies

Darija Josić, mag. exp. bio.

University of Zagreb,
Faculty of Electrical Engineering and Computing,
Laboratory for Underwater Systems and Technologies

4.4. TECHNICAL COMMITTEE

mr. sc. Antonio Vasilijević,
Chairman

University of Zagreb,
Faculty of Electrical Engineering and Computing,
Laboratory for Underwater Systems and Technologies

Kruno Zubčić

Croatian Conservation Institute,
Heritage Protection Service,
Underwater Archeology Section

Đula Nađ, dipl. ing.

University of Zagreb,
Faculty of Electrical Engineering and Computing,
Laboratory for Underwater Systems and Technologies

Filip Mandić, mag. ing.

University of Zagreb,
Faculty of Electrical Engineering and Computing,
Laboratory for Underwater Systems and Technologies

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Anja Babić, mag. ing.

University of Zagreb,
Faculty of Electrical Engineering and Computing,
Laboratory for Underwater Systems and Technologies

Milan Marković

University of Zagreb,
Faculty of Electrical Engineering and Computing,
Laboratory for Underwater Systems and Technologies

M. Eng. Marin Stipanov

University of Zagreb,
Faculty of Electrical Engineering and Computing,
Laboratory for Underwater Systems and Technologies

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5. BREAKING THE SURFACE 2016

5.1. PROGRAMME STRUCTURE

BtS program is comprised of academic lectures, hands-on tutorials, presentation of projects and equipment and company demonstrations.

5.1.1. LECTURES

Lectures by experts in the domains of Marine robotics (MAROB), Marine biology (MARBIO), Maritime archaeology (MARCH), Maritime security (MARSEC) and Innovations (INNOVA).

List of speakers:

Marine robotics (MAROB):

- Stjepan Bogdan, University of Zagreb Faculty of Electrical Engineering and Computing, Croatia: *Unmanned system for maritime security and environmental monitoring*
- Massimo Caccia, National Research Council - CNR, Institute of intelligent systems for automation - ISSIA (Italy): *Modular portable marine robotics*
- Mandar Chitre, National University of Singapore (Singapore): *A decade of research in underwater cooperative navigation: what have we learned?*
- Giovanni Indiveri, University of Salento (Italy): *The H2020 project WiMUST: Widely scalable Mobile Underwater Sonar Technology. An overview*
- Mirko Kovač, Imperial College London (UK): *Aquatic Micro Aerial Vehicles (AquaMAV) for water sampling and marine exploration*
- Stephen C. Licht, University of Rhode Island (USA): *Deep sea sampling with soft robotics: early results and future directions*
- Alfredo Martins, Institute for Systems and Computer Engineering, Technology and Science (Portugal): *Marine robotics – A tool for increased awareness from land to the deep sea*
- Timothy Mundon, University of Washington (USA): *The role of underwater robotics in the growth of marine renewable energy*
- Dan Toal, University of Limerick (Ireland): *Robotics for challenging ocean intervention in marine renewable energy and other applications*
- Kotaro Yamafune, Texas A&M University (USA): *Methodology of recordin and analyzing shipwreck sites using multi-image photogrammetry*

Marine biology (MARBIO):

- Sunčica Bosak, University of Zagreb Faculty of Science, Department of Biology (Croatia): *Observations from the Invisible Forest: the diversity of marine phytoplankton*
- Mark Jessopp, University College Cork (Ireland): *Co-existence of top marine predators and humans….and the role of technology*
- Francisco Sanchez, Spanish Institute of Oceanography (Spain): Investigating the submarine canyons and seamounts in Spanish waters through non-invasive methodologies

Marine archaeology (MARCH):

- Jens Auer, University of Southern Denmark (Denmark): *Recording "in the dark". The challenges of recording a submerged 8th century structure in the Schlei Fjord, Northern Germany*
- Smiljko Rudan, University of Zagreb Faculty of Mechanical Engineering and Naval Architecture (Croatia): *Nautical archaeology from the naval architecture point of view*
- Francesco Tiboni, University of Genoa (Italy): *Underwater and Instrumental Archaeology. A Special Relationship*

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- Gustau Vivar, Centre d'Arqueologia Subaquàtica de Catalunya (Spain): *The Underwater Archaeology Centre of Catalonia. The works with AUV and submersibles in archaeological sites*

Maritime security (MARSEC):

- Cormac Gebruers, National Maritime College of Ireland (Ireland): *Marine Robotics Applications in Humanitarian, Search & Rescue and Civilian Focussed Security Operations – what might the future hold?*

Innovation Tuesday (INNOVA):

- Anders Aune, Norwegian University of Science and Technology - NTNU (Norway): *Value creation from research through university spin-offs*
- Kemal Delić, Hewlett-Packard Co (France): *The Art of Innovation*
- Erik Dyrkoren and Martin Ludvigsen, Blueye Robotics (Norway): *BluEye Robotics – providing underwater adventures for everyone*
- Francis Flannery, SonarSim (Ireland): *Bootstrapping SonarSim: A Start-up Journey*
- David Lane, Heriot-Watt University (UK): *From Research to Revenues - The Puzzle of the Market*
- Luis Madureira, OceanScan - Marine Systems & Technology, Lda (Portugal): *The Light Autonomous Underwater Vehicle – Affordable technology to address scientific and societal needs*
- Pere Ridao, University of Girona (Spain): *IQUA Robotics: from lab to market*
- Asgeir J. Sørensen, Norwegian University of Science and Technology - NTNU (Norway): *Why and how becoming a researcher and entrepreneur?*
- Darío Sosa Cabrera, ACSM (Spain): *Titanrob: 3d printed Titanium Manipulators Innovation in the ROV sector*
- Clayton Stewart, University College London (UK): *Comments on the Management of Technology Startup Companies*

5.1.2. TUTORIALS

- Edin Omerdić, University of Limerick (Ireland): Thruster Control using LabVIEW Real-Time & FPGA Graphical Programming

5.1.3. DEMONSTRATIONS

- Thomas Glotzbach, Technische Universitaet Ilmenau (Germany): *Surface-aided AUV path following: theory and practice. Demo with a Medusa-class vehicle*
- Luis Madureira, OceanScan (Portugal): *OceanScan: Mission Planning & Data Analysis*
- Pere Ridao, Natàlia Hurtós, Narcís Palomeras, University of Girona (Spain): *University of Girona: Mission Planning, Data Analysis and Girona500 deployment*
- EvoLogics (Germany) - Oleksiy Kebkal, Veronika Kebkal: EvoLogics
- Brodarski Institut
- Hydroid, Kongsberg – Graham Lester, Simone Di Giacomo

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5.2. SCHEDULE

	SUNDAY 02.10.	MONDAY, 03.10.	TUESDAY, 04.10.	WEDNESDAY, 05.10.	THURSDAY, 06.10.	FRIDAY, 07.10.	SATURDAY, 08.10.
09:00 - 09:45		*OPENING SESSION* Mislav Grgić Zoran Vukić Nikola Mišković	*INNOVA 1* **From Research to Revenues - The Puzzle of the Market** David Lane	*MARBIO 1* **Co-existence of top marine predators and humans....and the role of technology** Mark Jessopp	*MAROB 6* **Robotics for challenging ocean intervention in marine renewable energy and other applications** Dan Toal	*MAROB 9* **Unmanned system for maritime security and environmental monitoring** Stjepan Bogdan	
09:45 - 10:30		*MAROB 1* **The H2020 project WiMUST: Widely scalable Mobile Underwater Sonar Technology. An overview** Giovanni Indiveri	*INNOVA 2* **Comments on the Management of Technology Startup Companies** Clayton Stewart	*MAROB 4* **Modular portable marine robotics** Massimo Caccia	*MARBIO 2* **Observations from the Invisible Forest: the diversity of marine phytoplankton** Sunčica Bosak	*MARBIO 3* **Investigating the submarine canyons and seamounts in Spanish waters through non-invasive methodologies** Francisco Sanchez	
10:30 - 10:45		COFFEE BREAK	COFFEE BREAK	COFFEE BREAK	COFFEE BREAK	COFFEE BREAK	
10:45 - 11:30		*MAROB 2* **Deep sea sampling with soft robotics: early results and future directions** Stephen C. Licht	*INNOVA 3* **The Art of Innovation** Kemal Delić	*MAROB 5* **The role of underwater robotics in the growth of marine renewable energy** Tim Mundon	*MAROB 7* **Aquatic Micro Aerial Vehicles (AquaMAV) for water sampling and marine exploration** Mirko Kovac	*MAROB 10* **A decade of research in underwater cooperative navigation: what have we learned?** Mandar Chitre	
11:30 - 12:15		*MARCH 1* **Nautical archaeology from the naval architecture point of view** Smiljko Rudan	*INNOVA 4* **Why and how becoming a researcher and entrepreneur?** Asgeir Sørensen	*MARCH 2* **Recording "in the dark". The challenges of recording a submerged 8th century structure in the Schlei Fjord, Northern Germany** Jens Auer	*MARCH 3* **The Underwater Archaeology Centre of Catalonia. The works with AUV and submersibles in archaeological sites** Gustau Vivar	*MARCH 4* **Underwater and Instrumental Archaeology. A Special Relationship** Francesco Tiboni	FIELD TRIP
12:15 - 13:00		*MAROB 3* **Methodology of recording and analyzing shipwreck sites using multi-image photogrametry** Kotaro Yamafune	*INNOVA 5* **Value creation from research through university spin-offs** Anders Aune	*MARSEC 1* **Marine Robotics Applications in Humanitarian, Search & Rescue and Civilian Focussed Security Operations – what might the future hold?** Cormac Gebruers	*MAROB 8* **Marine robotics – A tool for increased awareness from land to the deep sea** Alfredo Martins	*MARSEC 2* **Underwater and Instrumental Archaeology. A Special Relationship** Adrian Dann	
13:00 - 14:30		LUNCH	LUNCH	LUNCH	LUNCH	LUNCH	
14:30 - 14:45		*Tutorial* **University of Girona: Mission planning**	EvoLogics EviNS workshop	*INNOVA 6* **OceanScan** Luis Madureira	*Company presentation* **Evologics**	*Company presentation* **Hydroid**	**University of Girona** *Girona500 data analysis*
14:45 - 15:00							
15:00 - 15:15				*INNOVA 7* **Blueye Robotics** Dyrkoren & Ludvigsen	**OceanScan** Data Analysis	*Tutorial intro* **Edin Omerdić: Thruster Control using LabVIEW Real-Time & FPGA Graphical Programming**	*Company presentation* **Brodarski Institute**
15:15 - 15:30							
15:30 - 15:45		*Tutorial* **OceanScan: Mission planning**		*INNOVA 8* **Bootstrapping SonarSim: A Start-up Journey** Francis Flannery	*DEMO* **Evologics** Group 1	*DEMO* **CNR** Group 2	*DEMO* **subCULTron** Group 3
15:45 - 16:00							
16:00 - 16:15				COFFEE BREAK			
16:15 - 16:30				*DEMO* **Blueye Robotics**	*Tutorial hands-on* Group 1	*DEMO* **CADDY** Group 2	*DEMO* **AquaMAV** Group 3
16:30 - 16:45	REGISTRATION	*University of Girona:* *Girona500 deployment*		*INNOVA 9* **IQUA Robotics: from lab to market** Pere Ridao	*DEMO* **Evologics** Group 2	*DEMO* **CNR** Group 3	*DEMO* **subCULTron** Group 1
16:45 - 17:00							
17:00 - 17:15				*INNOVA 10* **Titanrob** Darío Sosa Cabrera	*Tutorial hands-on* Group 2	*DEMO* **CADDY** Group 3	*DEMO* **AquaMAV** Group 1
17:15 - 17:30		*DEMO* **OceanScan**					
17:30 - 17:45				*INNOVA 11* **Round table** moderated by Asgeir Sorensen	*DEMO* **Evologics** Group 3	*DEMO* **CNR** Group 1	*DEMO* **subCULTron** Group 2
17:45 - 18:00					*Tutorial hands-on* Group 3	*DEMO* **CADDY** Group 1	*DEMO* **AquaMAV** Group 2
18:00 - 18:15							
18:15 - 18:30							
18:30 - 18:45	WELCOME DRINK	NORWEGIAN NIGHT					
18:45 - 19:00							
19:00 - 19:15							
19:15 - 19:30							POOL PARTY: DINNER + CLOSING CEREMONY
19:30 - 20:30	DINNER	DINNER	DINNER	DINNER	DINNER		DINNER

LEGEND:						
Special sessions	Lecture: MARCH	Tutorial	Hydroid company programme	Brodarski Institute ship demo	CNR demo	
Lecture: MAROB	Lecture: MARSEC	EvoLogics company programme	University of Girona programme	CADDY FP7 project demo	NATO SpS MORUS project demo	
Lecture: MARBIO	Lecture: INNOVA	OceanScan company programme	AquaMAV demo	H2020 subCULTron project demo	SOCIAL EVENTS	

LOCATIONS:

- LECTURES HALL @ HOTEL ADRIATIC (PURPLE) — Programme: ALL *lectures and presentations*
- LAVENDER BAR ROOM @ HOTEL ADRIATIC (PURPLE) — Programme: *tutorial, mission plannings, data analyses*
- SEA POOL & OPEN WATERS NEARBY — Programme: *equipment demonstrations*
- LAVENDER BAR @ HOTEL ADRIATIC (PURPLE) — Programme: *night social events*

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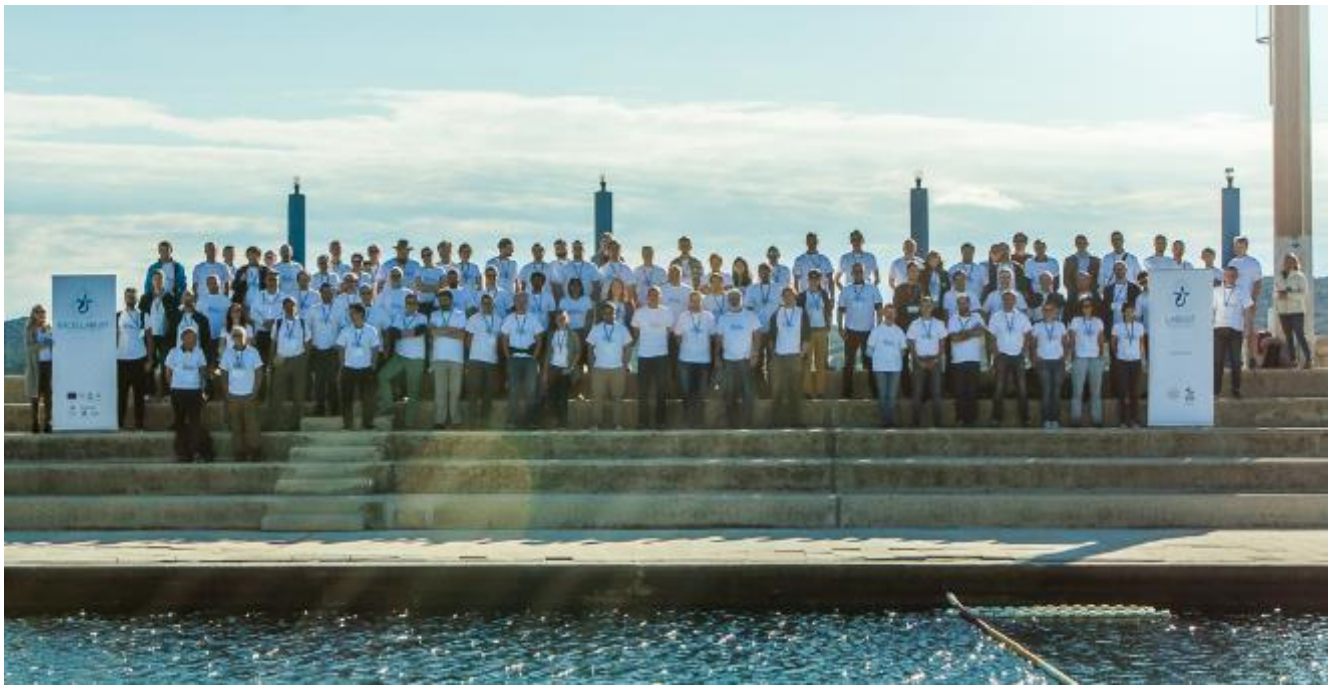
5.3. PARTICIPANTS

In 2016, 221 participants from academia and industry from various fields joined Breaking the Surface.



6. PROGRAMME ABSTRACTS, BIOGRAPHIES AND PRESENTATIONS

Lectures abstracts and lecturers biographies are available in ***APPENDIX I. – Abstracts and biographies.***
Slides from presentations are available in ***APPENDIX II. – Presentations (slides).***

7. SUPPORTERS

FINANCED BY

EXCELLABUST

Financed in the scope of project EXCELLABUST - Excelling LABUST in marine robotics (GA 691980) which has received funding from the European Union's Horizon 2020 research and innovation programme.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 691980

SUPPORTED BY

Croatian Academy of Science and Art

The Royal Norwegian Embassy in Zagreb

Križevačka pivovara

ORGANIZED BY

University of Zagreb, Faculty of Electrical Engineering and Computing

Laboratory for Underwater Systems and Technologies

Centre for Underwater Systems and Technologies

Institute of Studies on Inteligent Systems for Automation - ISSIA, National Research Council of Italy (CNR)

University of Girona (UdG)

University of Limerick (UL)

IN PARTNERSHIP WITH

AMOS – Centre for Autonomous Marine Operations and Systems, Norwegian University of Science and Technology (NTNU)

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8. Appendix I – Abstracts and biographies

Abstracts and biographies are available here.

9. Appendix II – Presentations

Presentations are available on the BtS website http://bts.fer.hr/.

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