IEEE
Advancing Technology for Humanity

IEEE MetroAeroSpace

VIRTUAL CONFERENCE / JUNE 22-25, 2021

Virtual Conference

WORKSHOP PROGRAM

JUNE 22-25, 2021

For more information, visit the website
www.metroaerospace.org

AESS

IEEE INSTRUMENTATION & MEASUREMENT SOCIETY

AESS
AES Chapter - IEEE Italy Section

IEEE INSTRUMENTATION & MEASUREMENT SOCIETY
ITALY CHAPTER

TABLE OF CONTENTS

MetroAeroSpace 2021 Welcome Message

On behalf of the Organizing Committee, we wish to welcome you to the 2021 IEEE International Workshop on Metrology for AeroSpace (MetroAeroSpace). Since the first edition, MetroAeroSpace represents the international meeting place in the world of research in the field of measurement and instrumentation for aerospace involving institutions and academia in a discussion on the state-of-the-art concerning issues that require a joint approach by experts of measurement, instrumentation and industrial testing, typically professional engineers, and experts in innovation metrology, typically academics. The increasing number of scientists attending MetroAeroSpace and coming from fields, that can be very far from engineering, led to a positive hybridization of the workshop.

This 8th edition will keep pursuing the state of the art and practice started over the past years. Attention is paid, but not limited to, new technology for metrology-assisted production in the aerospace industry, aircraft component measurement, sensors and associated signal conditioning for aerospace, and calibration methods for electronic test and measurement for aerospace.

MetroAeroSpace organization was a challenging task due to the large and increasing interest of our research and application areas and for the COVID-19 emergency. Efforts from several members of the MetroAeroSpace community were required to shape the technical program and manage the operational aspects. Besides, it has been challenging to set up the online platform to maintain live the presentation, and we wish that our pilot initiative could pave the way towards innovations in the organization of future scientific events. We would like to take this opportunity to thank all the colleagues that supported and cooperated with us. We also thank the public and private organizations that supported the meeting in different ways.

The MetroAeroSpace Technical Program consists of 27 oral sessions scheduled over three days. With the wide range of technical sessions covering the many fields of metrology for aerospace, we are happy to welcome you to the variety of technical presentations that await you this year. Thanks to all of the Technical Program Committee members and the reviewers who have contributed to make this outstanding program possible.

Despite the COVID-19 outbreak in conjunction with the deadline of the submission, we received 159 extended abstracts from all over the world. Due to the time limits of the workshop, only 130 papers have been selected after a painstaking activity of the program committee and additional reviewers. We like to thank all people who contributed to this process with opinions, comments, and suggestions to choose the best papers and even improve their quality.

Authors of all the above contributions are also welcome to submit an extended version to the Special Issues on IEEE J-MASS - The Journal on Miniaturization for Air and Space Systems, Sensors Journal by MDPI, and Remote Sensing Journal by MDPI.

The technical program encompasses several events and activities. The keynote speeches will be held by experts in the field of metrology for aerospace.

- ✓ Giancarlo Ferrara, DECMA/INO/DRO, DRONE/U-space Unit - R&D Work Programme Coordinator, *New Air Traffic Management (ATM) and U-space integrated services and capabilities to support the Urban Air Mobility (UAM) airspace integration challenges*.
- ✓ Stefano Debei, University of Padova, Italy, Centre of Studies and Activities for Space CISAS "G.Colombo", *From Planetary Exploration and Space Mission to Scientific Opportunities for Measurement*.
- ✓ Gabriele Mascetti, Head of Human Spaceflight Department, Italian Space Agency - ASI, *From the Gateway to Mars, the Current Scenario of Human Space Exploration*.

We are honored to have them as plenary speakers and thank them in advance for coming to our conference to share their knowledge and experiences with us.

This edition of the Workshop includes:

- ✓ MetroAeroSpace 2021 Round Table *Education in Metrology for AeroSpace*, Tuesday, June 22, 2021. Chairs: Domenico Accardo, University of Naples 'Federico II', Italy, Stephen Dyer, Kansas State University, US, Bernardo Tellini, University of Pisa, Italy.
- ✓ A tutorial offered by Giancarmine Fasano (University of Naples Federico II, Italy) on *Advances in UAS Technologies: Sense and Avoid and MultiDrone Systems*, Tuesday, June 22, 2021.
- ✓ *Military Metrology for AeroSpace*, organized by AFCEA Naples Chapter, Wednesday, June 23, 2021.
- ✓ IEEE Women in Engineering Panel *Sharing ideas with experienced and early-stage researchers*, Thursday, June 24, 2021. Panelists: Silvia Liberata Ullo, University of Sannio, Italy, Patrizia Lamberti, University of Salerno, Italy, Fiorella Lamberti, Leonardo Company, Claudia Conte, University of Naples Federico II, University of Bergamo, Italy.

These events give more opportunities to contact Institutions and experts operating in different fields of Metrology for AeroSpace. With the aim of providing a common ground for researches to share their findings on the metrology for aerospace, the Workshop was improved by adding a significant number of Special Sessions. This allows a spontaneous aggregation providing a forum of discussion close to the single research field. We wish to thank the organizers of these Special Sessions for their cooperation and support to the Workshop organization.

Several Awards offered by International Institution and Companies will be assigned, in particular to young researchers. The best contributions will be awarded, including the "*Best Conference Paper Award*", sponsored by MDPI Sensors Journal, the "*Best Paper Presented by a Young Researcher*", the "*Best Paper Presented by a Woman*" sponsored by IEEE Woman in Engineering - Italy Section Affinity Group, and the "*Best Paper of the Special Session on Metrology for Radar Systems*", this award recognizes two outstanding papers of the Special Session on Metrology for Radar Systems, the two awards are sponsored by IEEE AES Italy Chapter and MDPI Remote Sensing Journal.

We would like to conclude this message by sending to you all our virtual welcome to the historic and beautiful Naples. Southern Italy's largest city, Naples is famous for its intoxicating mix of Old World charm and modern grit. This is one of the oldest cities in Europe, with enough art, architecture, and archeology to hold its own against other metropolitan cities. But it's the wood-fired pizza that really brings the crowds. Naples' historic center (a UNESCO World Heritage site) offers plenty of attractions.

We believe you may be inspired to visit Naples and move towards the new challenges and development of the Metrology for AeroSpace.

The 8th International Workshop on Metrology for AeroSpace is about to begin!

Domenico Accardo, University of Naples 'Federico II', Italy

Leopoldo Angrisani, University of Naples 'Federico II', Italy

Pasquale Daponte, University of Sannio, Italy

Robert Rassa, Raytheon, US

MetroAeroSpace 2021 Committe

HONORARY CHAIR

Marina Ruggieri, *University of Rome "Tor Vergata", Italy*

GENERAL CO-CHAIRS

Domenico Accardo, *University of Naples 'Federico II', Italy*
Leopoldo Angrisani, *University of Naples 'Federico II', Italy*
Pasquale Daponte, *University of Sannio, Italy*
Robert Rassa, *Raytheon, US*

TECHNICAL PROGRAM CO-CHAIRS

Stephen Dyer, *Kansas State University, US*
Mauro D'Arco, *University of Naples 'Federico II', Italy*
Giancarmine Fasano, *University of Naples 'Federico II', Italy*

PUBLICATION CO-CHAIRS

Giancarlo Rufino, *University of Naples 'Federico II', Italy*
Rosario Schiano Lo Moriello, *University of Naples 'Federico II', Italy*

SPECIAL SESSION CHAIR

Marco Pertile, *University of Padova, Italy*

IEEE WIE ACTIVITIES CHAIRS

Claudia Conte, *University of Naples Federico II, University of Bergamo, Italy*
Fiorella Lamberti, *Leonardo Company*
Patrizia Lamberti, *University of Salerno, Italy*
Silvia Liberata Ullo, *University of Sannio, Italy*

TREASURY CHAIR

Cosimo Stallo, *University of Rome "Tor Vergata", Italy*

INTERNATIONAL PROGRAM COMMITTEE

Domenico Acierno, *University of Naples, Italy*

Artur L. Ribeiro, *Universidade de Lisboa, Portugal*
Roberto Sabatini, *RMIT University, Australia*
Zbigniew Siemiatkowski, *Kazimierz Pulaski University of Technology and Humanities, Poland*
Nicolas Sklavos, *University of Patras, Greece*
Patrizia Tavella, *BIPM*
Fabrizio Francesco Vinaccia, *MDBA Italia, Italy*
Graham Wild, *RMIT University, Australia*
Ruqiang Yan, *P.R. China*
Ho-Soon Yang, *KRISS, Republic of Korea*
Mark Yeary, *University of Oklahoma, US*
David Zucconi, *SAB Aerospace, Italy*

LOCAL COMMITTEE

Francesco Bonavolontà, *University of Naples 'Federico II', Italy*
Claudia Conte, *University of Naples 'Federico II', Italy*
Giorgio de Alteriis, *University of Naples 'Federico II', Italy*
Egidio De Benedetto, *University of Naples 'Federico II', Italy*
Leandro Maio, *University of Naples 'Federico II', Italy*
Vittorio Memmolo, *University of Naples 'Federico II', Italy*
Roberto Opromolla, *University of Naples 'Federico II', Italy*
Annarita Tedesco, *University of Naples 'Federico II', Italy*

MetroAeroSpace 2021 Plenary Speakers

Plenary Wednesday, June 23, 2021 - H 15:00 CEST

New Air Traffic Management (ATM) and U-space integrated services and capabilities to support the Urban Air Mobility (UAM) airspace integration challenges

Giancarlo Ferrara

DECMA/INO/DRO, DRONE/U-space Unit - R&D Work Programme Coordinator

ABSTRACT

Over the last century, the development of the aviation industry has fundamentally changed the way we live, work, and travel. During this long time, aviation has never ceased to innovate and, in the last few years, new types of aircraft have started to be developed, including Unmanned Aircraft Systems (UAS or drones) and Urban Air Mobility (UAM) aircraft. The latter may be electric Vertical Take-off and Landing (eVTOL), electric Conventional Take-off and Landing (eCTOL), and some are Personal Air Vehicles (PAV). With the development of these new aircraft types, aviation is once again taking a significant step forward.

People have always dreamed of using air travel to improve transport in cities. UAM is the realisation of that dream, enabled by advances in technology that among other things reduce the noise and size of aircraft. UAM has the potential to revolutionise the way people and packages move in and around cities by enabling point-to-point flights, by-passing ground congestion and shortening journey times.

More specifically, the term UAM refers to an ecosystem that enables on-demand, highly automated, passenger or cargo-carrying air transport services with particular reference to the urban and sub-urban environments, where aviation is often highly regulated today. The UAM industry vision involves new vehicle designs, new system technologies, the development of new airspace management constructs, new operational procedures and shared services to enable an innovative type of transport network.

The challenge is on for better, more sustainable transport technologies and models to improve commute times and accelerate the transport of goods across town.

A growing number of players, led by aerospace, automobile, and technology companies, are working on UAM solutions and eVTOL technologies to enable runway-independent operations, with very high degrees of automation, up to and including fully self-piloted aircraft. Most operators envisage a significant number of simultaneous operations around metropolitan areas and airports at altitudes up to 5000 feet and speeds up to 150 knots. These aircraft will typically carry cargo or 1-4 passengers on short trips (e.g. less than 100 km.).

There are a number of related R&D projects around the world working towards this goal, some already flying with aerial prototypes or full-scale eVTOL demonstrators. Similar to the helicopter, this new breed of aircraft is somewhere between commercial airplanes and remotely controlled UAS, configured to carry large payloads and people. The first generation of full-scale demonstrators are already flying today and initial commercial flights are possible within the next 3-5 years.

UAS/eVTOL aircraft will not be limited to very low-level (VLL) airspace but, in some cases, should share the airspace with manned aircraft, relying more on data-link than voice communications (as eVTOLs transition to autonomous operations). They will operate in both U-space and airspace managed by traditional Air Traffic Management (ATM), including airspace adjacent to commercial manned aviation (e.g. airports). In general, these new operations will be also performed in an airspace where several classes of user - such as military/police, helicopters, UAS and general aviation (GA) - are already operating. A safe and equitable integration of current and future operations is essential, therefore, especially in the urban airspace and close to airports, where traffic density and ground risk are expected to be higher.

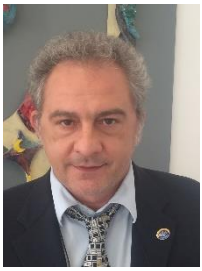
Innovative ATM/U-space services and the development of smart, automated, interoperable, and sustainable traffic management solutions will be key enablers for achieving this high level of integration. ATM and U-space will also need to address a variety of constraints to meet the requirements of "priority aviation" such as security or emergency service manned aviation. It is, therefore, obvious that the most critical success factor for UAM operations will be the ability to identify solutions that allow UAS, UAM/eVTOL and all the other airspace users (unmanned and manned) to operate safely, securely, sustainably and efficiently in a controlled and fully integrated airspace, without undue impact on operations currently managed by ATM.

These challenging objectives can only be achieved through an evolutionary development process ensuring the definition and timely deployment of appropriate, advanced and interoperable ATM/U-space infrastructure, technology, and traffic management capabilities, providing advanced services that fit with expected types of operation and levels of demand.

As this important and growing domain evolves, it is clear that new operational concepts, regulations and standards will be needed, underpinned by existing and new technologies. The whole environment will also need to integrate safely with manned aviation and Air Traffic Management as an important research and innovation challenge.

Plenary Thursday, June 24, 2021 - H 09:00 CEST

From Planetary Exploration and Space Mission to Scientific Opportunities for Measurement



Stefano Debei
University of Padova, Italy
Centre of Studies and Activities for Space CISAS "G.Colombo"

ABSTRACT

Planetary exploration and space missions represent a multi and interdisciplinary environment in which the role of Measurement and Metrology is fundamental to guarantee the full characterization and scientific performance of the S / C and instrumentation for all stages of development.

Even during the feasibility studies of space instruments, mathematical models, prototypes, breadboards are necessary to test not only the concept but also compliance with the highest level requirements, thanks to an original and sophisticated instrumental set-up specially designed and calibrated.

Throughout the development of the project and finalized the process that leads to the creation and qualification of the instruments, a complete test campaign is conducted to prove not only the reliability but, in particular, the actual metrological performance.

To do this, the instruments are tested on facilities that reproduce the space environment, in terms of absolute pressure, extreme temperatures, high heat flows, vibration environment and all the relevant parameters. In many cases the facilities are specially developed and their complexity is sometimes greater than the development of the space instrument itself. The talk aims to highlight the scientific opportunities offered by space programs to the scientific community that deals with metrology and measurements.

Plenary Friday, June 25, 2021 - H 09:00 CEST

From the Gateway to Mars, the Current Scenario of Human Space Exploration

Gabriele Mascetti
Head of Human Spaceflight Department
Italian Space Agency - ASI

ABSTRACT

The global scenario of human space exploration is rapidly and significantly evolving; if up to few years ago the exploration endeavour was a challenge for few space fairing nations, now it has acquired a global attention by many new actors who are joining the game. Exploration is about extending human presence deeper into the solar system; but designing for humans in space implications that make it much more complex than designing for robots in space - and complexity means costs. Such costs cannot be beared by any country alone, neither the paradigm of exploration relying on public funds only can be currently effective. The new economy growing around the space exploration business is one of the driving changes which will make a human presence beyond the low Earth orbit more credible.

The coordination efforts set in place by the most relevant space agencies of the world have identified Mars as ultimate destination for humans in space. As a necessary stepstone in order to pursue such goal, the Moon will be the destination towards which global exploration efforts are being put at present. Only 12 people in the history of humanity have stepped on the surface of our natural satellite; in the next years, mankind will reestabilish its presence on the Moon, in order to acquire the necessary knowhow and expertise to take a step forward, to evaluate the sustainability of a permanent human presence in deep space and in prevision of more challenging destinations.

Italy is part of this adventure, too. Thanks to the experience gained in its participation to the ISS program, and to the quality of the industries and of the research centers on the national territory, Italy is now a key partner of the majour space agencies in this new race for the Moon.

MetroAeroSpace 2021 Round Table

Tuesday, June 22, 2021 - H 15:00 CEST

Education in Metrology for AeroSpace

The role of instrumentation and measurement (I&M) in aerospace systems is continuing to grow. As a consequence of the evolution, I&M for aerospace systems has become progressively more complex to design, develop, and maintain. I&M is not confined merely to aircraft, but includes specific solutions for air-traffic management (ATM) applications; communication, navigation and surveillance (CNS) systems; and automated decision-support systems (DSS) for manned/unmanned aircraft operations in all classes of airspace, addressing both strategic and tactical operational timeframes.

In traditional academic settings, the scope of I&M has often been narrowed from aviation/aerospace electronics systems to aircraft electronics. Improving coordination between industry and academic institutions can decrease the gap between university preparation and industry needs.

The main aim of the Round Table on Education in Metrology for AeroSpace is focused on allowing discussion among well-known experts, providing international perspective and highlighting innovative solutions and common approaches in the field of education for I&M in aerospace.

CHAIRS

Domenico Accardo, *University of Naples 'Federico II', Italy*

Stephen Dyer, *Kansas State University, US*

Bernardo Tellini, *University of Pisa, Italy*

SPEAKERS

Tatiana Bulimaga, Veaceslav Sprincean, *Research & Innovation Institute, Moldova State University*

Alexander Nebylov, *Saint-Petersburg State University of Aerospace Instrumentation, Russia*

Nikolay Rodnishchev, *Tupolev Kazan National Research Technical University - KAI, Russia*

Yevgeny Somov, *Samara State Technical University, Korolev Samara State Aerospace University, Russia*

Carlo Bettanini, *University of Padova, Italy*

Marco Lovera, *Politecnico di Milano, Italy*

Matteo Perghem Gelmi, *Italian Air Force Academy*

Cristian-Emil Moldoveanu, *Military Technical Academy in Bucharest, Romania*

Ioannis Templalexis, *Hellenic Air Force Academy, Greece*

Konrad Wojtowicz, *Military University of Technology, Warsaw, Poland*

Vladimir Saetchnikov, *Belarusian State University, Belarus*

Roberto Sabatini, *RMIT University, Australia*

Stephen Dyer, *Kansas State University, USA*

MetroAeroSpace 2021 Tutorial

Tuesday, June 22, 2021 - H 16:30 CEST

Advances in UAS Technologies: Sense and Avoid and Multi-Drone Systems

Giancarmine Fasano

University of Naples Federico II, Italy

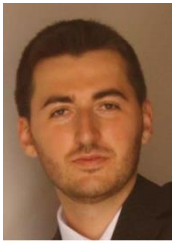
ABSTRACT

The tutorial covers technological challenges and recent advances relevant to two areas of high interest for Unmanned Aircraft Systems (UAS): sense and avoid and multi-drone systems.

In the latest years, sense and avoid (SAA), or detect and avoid (DAA), has represented one of the main roadblocks to the integration of UAS operations. In the first part of the tutorial, architectures, technologies, and algorithms for SAA are outlined, with emphasis on non-cooperative sensing and data fusion. Current perspectives and recent progress relevant to SAA for UAS integration in the traditional Air Traffic Management (ATM) system and in the framework of UAS Traffic Management (UTM) / U-Space and Urban Air Mobility, are finally presented.

The second part of the tutorial deals with potential and challenges of multi-UAS architectures, which represent a powerful and evolving technology both in the civil and in the military field. Application advantages and taxonomies of multi-drone systems are discussed, addressing the concepts of UAS swarming and manned/unmanned teaming. Approaches for cooperative path planning, guidance, and navigation are described also based on simulation and flight data.

SPEAKER BIO



Giancarmine Fasano is Associate Professor at the University of Naples "Federico II", where he holds courses in "Unmanned Aircraft Systems" and "Space Flight Dynamics". His research activities in the field of aeronautics are focused on UAS, and in particular on sense and avoid and cooperative multi-UAV systems. In the space field he is mainly interested in distributed space systems and proximity operations, with emphasis on relative motion design and control, and in space surveillance. He is Vice-Chair of the Avionics Systems Panel of the IEEE Aerospace and Electronic Systems (AES) Society, Associate Editor of the IEEE AES Magazine, Associate Editor of the IEEE Transactions on AES, IEEE Senior Member. Since 2019 he has been Member of the Organizing Committee, Chair of the Student Research Competition, Tutorial Instructor, and since 2020 Track Chair at the IEEE/AIAA Digital Avionics Systems Conference (DASC). He is also Member of the AIAA Sensor Systems and Information Fusion Technical Committee and AIAA Senior Member. He was Member of the IAA Committee on Small Satellites. He has co-authored over 150 publications and five book chapters.

Military Metrology for AeroSpace

Wednesday, June 23, 2021 - H 09:30 CEST

Military Metrology for AeroSpace is a parallel event of 2021 IEEE International Workshop on Metrology for AeroSpace.

The event is organized by **AFCEA - Naples Chapter**, **University of Sannio** and **Ordine degli Ingegneri di Napoli**.

PROGRAM

09:30 **Welcome Addresses**
Organizing Committee

09:40 **Welcome**
B.Gen.(r) Dario Nicolella, President AFCEA Chapter Naples

09:50 **Welcome**
Prof. Eng. Edoardo Cosenza, President Engineer's Association of Naples

10:00 **Defence & Space**
Capt (N) Stefano Reversi, Chief of Policy and Innovation Office of the Italian Defence Space General Office

10:30 **Air Urban Mobility in Turin, Italy, Skygate Project**
B.Gen. (r) Giovanni Savoldelli Pedrocchi

11:00 **Military Cadets and Officers Training on Metrology**
Lt.Col. Konrad Wojtowicz, Military University of Technology, Poland

11:30 **EDIDP program: Space Situational Awareness (SSA) projects**
T.Col. Ferdinando Dolce

11:45 **Military SSA – Advanced Space Command and Control (SC2) capability in SSA**
Giulio Troso, Leonardo Vitrociset

12:15 **A methodology to manage the Risk of Obsolescence of Complex Systems (an update)**
Eduardo De Francesco, Ruggero De Francesco, Sabino Giarnetti – Setel Group

12:45 **Closing remarks**
B.Gen.(r) Dario Nicolella – Prof. Eng. Edoardo Cosenza

IEEE Women in Engineering Panel

Thursday, June 24, 2021 - H 14:30 CEST

Sharing ideas with experienced and early-stage researchers

In line with the objectives of the WIE Commitment Chart "Steering girls to STEM", the purpose of the panel is to promote female models who are role models and who carry out mentoring activities towards young minds. To this end, the panel wants to highlight how from the comparison between experienced and early stage researchers on their respective experiences it is possible to identify guidelines and prospects for growth and good practices that increase the presence of young women in the specific fields of research.

IEEE Women in Engineering WIE
Italy Section
WIE Affinity Group

The structure of the Panel will be composed as follows: # 3 Topics: Measurements; Telecommunications; Radars; # 3 Speakers experienced researchers (women) with # 2 young researchers / Ph.D. students for each experienced researcher.

Each speaker, role model in the reference sector, will address one of the three selected topics, with a talk on her sector; then the two early-stage researchers (two for each Speaker) will take the floor and will be able to briefly speak about their experience and ask questions to the Speaker.

PANELISTS

Silvia Liberata Ullo, *University of Sannio, Italy*
Patrizia Lamberti, *University of Salerno, Italy*
Fiorella Lamberti, *Leonardo Company*
Claudia Conte, *University of Naples Federico II, University of Bergamo, Italy*

SPEAKERS

Athina P. Petropulu, *Rutgers University, US*
Maria Sabrina Greco, *University of Pisa, Italy*
Antonia Maria Tulino, *University of Naples Federico II, Italy*

MetroAeroSpace 2021 - Patronages

MARINA MILITARE

Virtutis Siderum Tenus

UNIVERSITÀ DEGLI STUDI DEL SANNIO
Benevento

Politecnico di Bari

Military University of Technology

TECHNICAL UNIVERSITY SOFIA

VITAE DISCIMUS

POLITECHNIKA LUBELSKA


PAŃSTWOWA
WYŻSZA
SZKOŁA
ZAWODOWA
W CHEŁMIE
2001


DIPARTIMENTO DI
INGEGNERIA
INDUSTRIALE


DIE TI
UNI NA
VERSITA' DEGLI STUDI DI
POLI FEDERICO II
DIPARTIMENTO DI INGEGNERIA ELETTRICA
E TECNOLOGIE DELL'INFORMAZIONE


CIPMaG
Centro Interdipartimentale
del Politecnico di Bari
"Magna Grecia" – Taranto


CISAS
G. COLOMBO


Centro Servizi Metrologici e Tecnologici Avanzati
eSMA


AIDAA
ASSOCIAZIONE ITALIANA
DI AERONAUTICA E ASTRONAUTICA


CRdC Tecnologie Scarl


AFCEA
Europe


AFCEA
AFCEA NAPLES CHAPTER


associazione italiana
gme
gruppo misure
elettriche ed elettroniche


Gruppo Nazionale

MetroAeroSpace 2021 - Sponsors

Program Schedule - June 22, 2021

TUESDAY, JUNE 22	
15:00 - 16:30 CEST	Round Table Education in Metrology for AeroSpace **Chairs:** Domenico Accardo, Stephen Dyer, Bernardo Tellini
16:30 - 17:20 CEST	Tutorial Session #1 **ADVANCES IN UAS TECHNOLOGIES: SENSE AND AVOID AND MULTI-DRONE SYSTEMS** Giancarmine Fasano, *University of Naples "Federico II"* **Chair:** Marco Pertile, *University of Padova, Italy*

Program Schedule - June 23, 2021

WEDNESDAY, JUNE 23			
09:30 - 13:00 CEST	**Military Metrology for AeroSpace**		
14:30 - 15:00 CEST	**Opening Ceremony - Welcome Addresses** Prof. Matteo Lorito, *Rector of University of Naples Federico II, Italy* **Chair:** Leopoldo Angrisani, *University of Naples Federico II, Italy*		
15:00 - 15:50 CEST	**Plenary Session** - New Air Traffic Management (ATM) and U-space integrated services and capabilities to support the Urban Air Mobility (UAM) airspace integration challenges **Giancarlo Ferrara**, *DECMA/INO/DRO, DRONE/U-space Unit - R&D Work Programme Coordinator* **Chair**: Domenico Accardo, *University of Naples Federico II, Italy*		
16:00 - 17:30 CEST	**Technical Session - 1.1** Special Session - Sensors and Solutions for Autonomous Aerospace Systems Chair: D. Accardo	**Technical Session - 1.2** Special Session - Measurement for improving quality, reliability and safety in aerospace applications Chairs: M. Catelani, L. Ciani, G. Patrizi	**Technical Session - 1.3** General Session - Part I Chair: E. Lorenzini
17:30 - 17:45 CEST	**BREAK**		
17:45 - 18:45 CEST	**Technical Session - 2.1** Special Session - Metrology and instrumentation for unmanned aerial vehicles Chair: K. Wojtowicz	**Technical Session - 2.2** Special Session - University satellites and aerospace research and development Chair: V. Saetchnikov	**Tecnical Session - 2.3** General Session - Part II Chair: G. Rufino

Program Schedule - June 24, 2021

THURSDAY, JUNE 24			
09:00 - 09:50 CEST	**Plenary Session** - From Planetary Exploration and Space Mission to Scientific Opportunities for Measurement **Stefano Debei**, *University of Padova, Italy* Chair: L. Angrisani		
10:00 - 11:15 CEST	**Technical Session - 3.1** Special Session - Metrology for Radar Systems - Part I Chairs: A. Farina, S. L. Ullo	**Technical Session - 3.2** Special Session - Advances on multimodal imaging based intelligent systems in aerospace metrology Chairs: P. Ferraro, N. Gallo, V. Pagliarulo, E. Stella	**Technical Session - 3.3** Special Session - Measurements and Instrumentation for Autonomous Spacecraft and Planetary Exploration - P I Chairs: S. Chiodini, R. Giubilato, M. Pertile
11:15 - 11:30 CEST	**BREAK**		
11:30 - 12:45 CEST	**Technical Session - 4.1** Special Session - Metrology for Radar Systems - Part II Chairs: A. Farina, S. L. Ullo	**Technical Session - 4.2** General Session - Part III	**Tecnical Session - 4.3** Special Session - Measurements and Instrumentation for Autonomous Spacecraft and Planetary Exploration - P II Chairs: S. Chiodini, R. Giubilato, M. Pertile
14:30 - 16:15 CEST	**WIE Panel** - ***Sharing ideas with experienced and early-stage researchers*** **Chair:** P. Lamberti, University of Salerno, Italy		
16:30 - 18:15 CEST	**Technical Session - 5.1** Special Session - Manufacturing and metrology in the aerospace industry Chairs: J. Jozwik, D. Mazurkiewicz, I. Zgorski	**Technical Session - 5.2** Special Session - Complex systems operational availability: measurements, methodologies and requirements Chair: F. Leccese	**Tecnical Session - 5.3** Special Session - Measurements and Instrumentation for Autonomous Spacecraft and Planetary Exploration - P III Chairs: S. Chiodini, R. Giubilato, M. Pertile

Program Schedule - June 25, 2021

FRIDAY, JUNE 25			
09:00 - 09:50 CEST	**Plenary Session** - From the Gateway to Mars, the Current Scenario of Human Space Exploration **Gabriele Mascetti**, *Italian Space Agency - ASI* **Chair:** *Pietro Ferraro, CNR, Italy*		
10:00 - 11:15 CEST	**Technical Session - 6.1** Special Session - S2S - Space to Space: Scientific and Technological Challenges for Human and Robotic Space Exploration - Part I Chairs: V. Ancona, P. Ferraro, P. Maggiore, P. Messidoro	**Technical Session - 6.2** Special Session - Structural health monitoring and nondestructive testing for aerospace - Part I Chairs: M. Laracca, L. Maio, V. Memmolo	**Technical Session - 6.3** Special Session - Terrestrial and in-flight verification of the GNC systems for aerospace vehicles - Part I Chairs: Y. Somov, P. Castaldi
11:15 - 11:30 CEST	**BREAK**		
11:30 - 12:45 CEST	**Technical Session - 7.1** Special Session - S2S - Space to Space: Scientific and Technological Challenges for Human and Robotic Space Exploration - Part II Chairs: V. Ancona, P. Ferraro, P. Maggiore, P. Messidoro	**Technical Session - 7.2** Special Session - Structural health monitoring and nondestructive testing for aerospace - Part II Chairs: M. Laracca, L. Maio, V. Memmolo	**Tecnical Session - 7.3** Special Session - Terrestrial and in-flight verification of the GNC systems for aerospace vehicles - Part II Chairs: Y. Somov, P. Castaldi
14:30 - 15:45 CEST	**Technical Session - 8.1** General Session - Part IV	**Technical Session - 8.2** Special Session - Structural health monitoring and nondestructive testing for aerospace - Part III Chairs: M. Laracca, L. Maio, V. Memmolo	**Tecnical Session - 8.3** Special Session - Mechanical and Thermal Metrology for Aerospace Applications Chairs: G. Cerasuolo, A. Martucci, O. Petrella
15:45 - 16:00 CEST	**BREAK**		
16:00 - 17:00 CEST	**Technical Session - 9.1** Special Session - Measurements in the research of aerodynamics and control of drones Chairs: Z. Czyż, J. Jozwik	**Technical Session - 9.2** Special Session - GARFIELD – General Aviation Research and Development. Metrology, Methods and Instrumentation Chair: Jarosław Pytka	**Tecnical Session - 9.3** General Session - Part V Chair: G. Fasano
17:15 - 17:30 CEST	**AWARD AND CLOSING CEREMONY**		

Technical Sessions - Tuesday, June 22

15:00 - 16:30 CEST

ROUND TABLE

Room: Virtual Room #1

Chairs: Domenico Accardo, *University of Naples 'Federico II', Italy*
Stephen Dyer, *Kansas State University, US*
Bernardo Tellini, *University of Pisa, Italy*

Education in Metrology for AeroSpace

SPEAKERS:

Tatiana Bulimaga, Veaceslav Sprincean, *Research & Innovation Institute, Moldova State University*
Alexander Nebylov, *Saint-Petersburg State University of Aerospace Instrumentation, Russia*
Nikolay Rodnishchev, *Tupolev Kazan National Research Technical University - KAI, Russia*
Yevgeny Somov, *Samara State Technical University, Korolev Samara State Aerospace University, Russia*
Carlo Bettanini, *University of Padova, Italy*
Marco Lovera, *Politecnico di Milano, Italy*
Matteo Perghem Gelmi, *Italian Air Force Academy*
Cristian-Emil Moldoveanu, *Military Technical Academy in Bucharest, Romania*
Ioannis Templalexis, *Hellenic Air Force Academy, Greece*
Konrad Wojtowicz, *Military University of Technology, Warsaw, Poland*
Vladimir Saetchnikov, *Belarusian State University, Belarus*
Roberto Sabatini, *RMIT University, Australia*
Stephen Dyer, *Kansas State University, USA*

16:30 - 17:20 CEST

TUTORIAL

Room: Virtual Room #1

Chair: Marco Pertile, *University of Padova, Italy*

Advances in UAS Technologies: Sense and Avoid and Multi-Drone Systems

Giancarmine Fasano, *University of Naples Federico II, Italy*

Technical Sessions - Wednesday, June 23

09:30 - 13:00 CEST

MILITARY METROLOGY FOR AEROSPACE

Room: Virtual Room #1

PROGRAM

09:30 **Welcome Addresses**
Organizing Committee

09:40 **Welcome**
B.Gen.(r) Dario Nicolella, President AFCEA Chapter Naples

09:50 **Welcome**
Prof. Eng. Edoardo Cosenza, President Engineer's Association of Naples

10:00 **Defence & Space**
Capt (N) Stefano Reversi, Chief of Policy and Innovation Office of the Italian Defence Space General Office

10:30 **Air Urban Mobility in Turin, Italy, Skygate Project**
B.Gen. (r) Giovanni Savoldelli Pedrocchi

11:00 **Military Cadets and Officers Training on Metrology**
Lt.Col. Konrad Wojtowicz, Military University of Technology, Poland

11:30 **EDIDP program: Space Situational Awareness (SSA) projects**
T.Col. Ferdinando Dolce

11:45 **Military SSA – Advanced Space Command and Control (SC2) capability in SSA**
Giulio Troso, Leonardo Vitrociset

12:15 **A methodology to manage the Risk of Obsolescence of Complex Systems (an update)**
Eduardo De Francesco, Ruggero De Francesco, Sabino Giarnetti – Setel Group

12:45 **Closing remarks**
B.Gen.(r) Dario Nicolella – Prof. Eng. Edoardo Cosenza

14:30 - 15:00 CEST

OPENING SESSION – WELCOME ADDRESSES

Room: Virtual Room #1

Chair: Leopoldo Angrisani, *University of Naples Federico II, Italy*

Prof. Matteo Lorito
Rector of University of Naples Federico II, Italy

15:00 - 15:50 CEST

PLENARY SESSION

Room: Virtual Room #1

Chair: Domenico Accardo, *University of Naples Federico II, Italy*

New Air Traffic Management (ATM) and U-space integrated services and capabilities to support the Urban Air Mobility (UAM) airspace integration challenges

Giancarlo Ferrara
DECMA/INO/DRO, DRONE/U-space Unit - R&D Work Programme Coordinator

16:00 - 17:30 CEST

SESSION 1.1

Special Session - Sensors and Solutions for Autonomous Aerospace Systems

Room: Virtual Room #1

Chair: Domenico Accardo, University of Naples Federico II, Italy
Claudia Conte, *University of Naples Federico II, University of Bergamo, Italy*
Giorgio de Alteriis, *University of Naples Federico II, University of Bergamo, Italy*

16:00 Accurate Attitude Inizialization Procedure based on MEMS IMU and Magnetometer Integration

Giorgio de Alteriis, University of Naples Federico II, University of Bergamo, Italy
Verdiana Bottino, University of Naples Federico II, Italy
Claudia Conte, University of Naples Federico II, University of Bergamo, Italy
Giancarlo Rufino, University of Naples Federico II, Italy
Rosario Schiano Lo Moriello, University of Naples Federico II, Italy

16:15 Distributed Hybrid Sensors Architectures for Launch Vehicle Avionics and Future Space Transportation Systems

Paolo Marzioli, Sapienza University of Rome, Italy
Lorenzo Frezza, Sapienza University of Rome, Italy

16:30 Design and Energy Systems of Stratospheric Airships

Paweł Skalski, The Łukasiewicz Research Network - Institute of Aviation, Poland

16:45 Measurement Correction of a Set of Analog Sun Sensors via Neural Network

Semsettin Numan Sozen, TUBITAK Space Technologies Research Institute, Turkey
Murat Gokce, TUBITAK Space Technologies Research Institute, Turkey
Cagatay Yavuzyilmaz, TUBITAK Space Technologies Research Institute, Turkey
Farid Gulmammadov, TUBITAK Space Technologies Research Institute, Turkey
Halil Ersin Soken, Middle East Technical University, Turkey

17:00 Research on errors of magnetic field sensors and algorithms for determining 3D spatial deviation in aeronautical heading reference systems

Mirosław Witoś, Air Force Institude of Technology, Poland
Andrzej Szelmanowski, Air Force Institude of Technology, Poland
Andrzej Pazur, Air Force Institude of Technology, Poland
Jerzy Borowski, Air Force Institude of Technology, Poland

17:15 Performance Analysis for Human Crowd Monitoring to Control COVID-19 disease by Drone Surveillance

Claudia Conte, University of Naples Federico II, University of Bergamo, Italy
Giorgio de Alteriis, University of Naples Federico II, University of Bergamo, Italy
Francesco De Pandi, University of Naples Federico II, Italy
Enzo Caputo, University of Naples Federico II, Italy
Rosario Schiano Lo Moriello, University of Naples Federico II, Italy
Giancarlo Rufino, University of Naples Federico II, Italy
Domenico Accardo, University of Naples Federico II, Italy

16:00 - 17:30 CEST

SESSION 1.2

Special Session - Measurement for improving quality, reliability and safety in aerospace applications

Room: Virtual Room #2

Chairs: Marcantonio Catelani, *University of Florence, Italy*
Lorenzo Ciani, *University of Florence, Italy*
Gabriele Patrizi, *University of Florence, Italy*

16:00 Beam characterization methods at the TOPIMPLART proton linear accelerator: an application to space components qualification

G. Bazzano, ENEA CR Frascati, Italy
A. Ampollini, ENEA CR Frascati, Italy
E. Cisbani, Istituto Superiore di Sanità (ISS), Italy
C. De Angelis, Istituto Superiore di Sanità (ISS), Italy
S. Della Monaca, Istituto Superiore di Sanità (ISS), Italy
P. Nenzi, ENEA CR Frascati, Italy
E. Nichelatti, ENEA CR Casaccia, Italy
G.B. Palmerini, Sapienza University of Rome, Italy
L. Picardi, ENEA CR Frascati, Italy
M. Piccinini, ENEA CR Frascati, Italy
C. Ronsivalle, ENEA CR Frascati, Italy
M. Sabatini, Sapienza University of Rome, Italy

16:15 Motor speed reconstruction in a compact EMA for primary flight controls via sensor-fusion technique

Gianpietro Di Rito, Università di Pisa, Italy
Benedetto Luciano, AESIS srl, Italy
Nicola Borgarelli, Umbra Group spa, Italy
Marco Nardeschi, Umbra Group spa, Italy

16:30 Quasi-static load space qualification test

Martina Orefice, CIRA, Italian Aerospace Research Centre, Italy
Vincenzo Quaranta, CIRA, Italian Aerospace Research Centre, Italy
Giovanni Bruno, CIRA, Italian Aerospace Research Centre, Italy
Giuseppe Martinotti, Tyvak International, Italy
Carmine Carandente Tartaglia, Università degli Studi della Campania Luigi Vanvitelli, Italy

16:45 A machine learning-based predictive model for risk assessment in airport areas

Giovanni Gugliandolo, University of Messina, Italy
Maria Teresa Caccamo, University of Messina, Italy
Giuseppe Castorina, University of Messina, Italy
Domenica Letizia Chillemi, University of Messina, Italy
Fabio Famoso, University of Messina, Italy
Gianmarco Munaò, University of Messina, Italy
Marcello Raffaele, University of Messina, Italy
Valeria Schifilliti, University of Messina, Italy
Agostino Semprebello, University of Messina, Italy
Salvatore Magazù, University of Messina, Italy

17:00 Cooling improvement of an aircraft engine in pusher configuration

Aleksander Olejnik, Military University of Technology, Poland
Łukasz Kiszkowiak, Military University of Technology, Poland
Adam Dziubiński, Lukasiewicz Research Network – Institute of Aviation, Poland
Maciej Majcher, Military University of Technology, Poland

17:15 Analysis of MEMS devices under temperature stress test

Domenico Capriglione, University of Cassino and Southern Lazio, Italy
Marco Carratù, University of Salerno, Italy
Marcantonio Catelani, University of Florence, Italy
Lorenzo Ciani, University of Florence, Italy
Gabriele Patrizi, University of Florence, Italy
Antonio Pietrosanto, University of Salerno, Italy
Roberto Singuaroli, University of Florence, Italy
Paolo Sommella, University of Salerno, Italy

16:00 - 17:30 CEST

SESSION 1.3

General Session - Part I

Room: Virtual Room #3

Chair: Enrico Lorenzini, *University of Padova, Italy*

16:00 Aerodynamic characterization of a Delta-wing UAV based on real flight data processing

P. Longobardi, EPFL-TOPO, Switzerland
G. Laupré, EPFL-TOPO, Switzerland
J. Skaloud, EPFL-TOPO, Switzerland

16:15 2D Closed-Form Solution for the Measurement of the Angle of Attack and Sideslip Angle

Alberto Brandl, Politecnico di Torino, Italy
Piero Gili, Politecnico di Torino, Italy

16:30 UAV-based Measuring Station for Monitoring and Computational Modeling of Environmental Factors

Veaceslav Sprincean, Moldova State University, Republic of Moldova
Adrian Paladi, Moldova State University, Republic of Moldova
Vasili Andruh, Moldova State University, Republic of Moldova
Anton Danici, Moldova State University, Republic of Moldova
Petru Lozovanu, Moldova State University, Republic of Moldova
Florentin Paladi, Moldova State University, Republic of Moldova

16:45 Topology optimization of the optical bench for the MicroMED dust analyzer

Marco Giovanni Corti, Politecnico di Milano, Italy
Diego Scaccabarozzi, Politecnico di Milano, Italy
Bortolino Saggin, Politecnico di Milano, Italy
Pietro Valnegri, Politecnico di Milano, Italy
Francesca Esposito, INAF - Osservatorio Astronomico di Capodimonte, Italy
Fabio Cozzolino, INAF - Osservatorio Astronomico di Capodimonte, Italy
Giuseppe Mongelluzzo, INAF - Osservatorio Astronomico di Capodimonte, Italy

17:00 Comparison of candidate mechanism concepts for a deployable space telescope

Pietro Valnegri, Politecnico di Milano, Italy
Bortolino Saggin, Politecnico di Milano, Italy
Diego Scaccabarozzi, Politecnico di Milano, Italy
Marco Giovanni Corti, Politecnico di Milano, Italy
Fabrizio Capaccioni, INAF – Istituto di Astrofisica e Planetologia Spaziali, Italy
Giancarlo Bellucci, INAF – Istituto di Astrofisica e Planetologia Spaziali, Italy
Giovanna Rinaldi, INAF – Istituto di Astrofisica e Planetologia Spaziali, Italy

17:15 The SAIFE Project: Demonstration of a Model-Free Synthetic Sensor for Flow Angle Estimation

Angelo Lerro, Polytechnic University of Turin, Italy
Alberto Brandl, Polytechnic University of Turin, Italy
Piero Gili, Polytechnic University of Turin, Italy
Marco Pisani, Istituto Nazionale di Ricerca Metrologica, Italy

17:45 - 18:45 CEST

SESSION 2.1

Special Session - Metrology and instrumentation for unmanned aerial vehicles

Room: Virtual Room #1

Chair: Konrad Wojtowicz, *Military University of Technology, Poland*

17:45 Design and testing of an autonomous ARTVA detector for small drones

Francesco De Giudici, University of Padova, Italy
Federico Toson, University of Padova, Italy
Alberto Piva, University of Padova, Italy
Pietro Artusi, University of Padova, Italy
Lorenzo Olivieri, University of Padova, Italy
Carlo Bettanini, University of Padova, Italy

18:00 Safe Landing Area Determination (SLAD) for Unmanned Aircraft Systems by using rotary LiDAR

Gennaro Ariante, University of Naples "Parthenope", Italy
Salvatore Ponte, University of Campania "L. Vanvitelli", Italy
Umberto Papa, University of Naples "Parthenope", Italy
Giuseppe Del Core, University of Naples "Parthenope", Italy

18:15 Fluxgate Magnetometers Application Onboard UAVs Features

Fedir Dudkin, Lviv Centre of Institute for Space Research, Ukraine
Vira Pronenko, Lviv Centre of Institute for Space Research, Ukraine
Valerii Korepanov, Lviv Centre of Institute for Space Research, Ukraine

18:30 ADS-B Surveillance Application for RPAS DAA System

Vittorio Di Vito, CIRA, Italian Aerospace Research Centre, Italy
Giulia Torrano, CIRA, Italian Aerospace Research Centre, Italy

17:45 - 18:45 CEST

SESSION 2.2

Special Session - University Satellites and Aerospace Research and Development

Room: Virtual Room #2

Chair: Vladimir Saetchnikov, *Belarusian State University, Belarus*

17:45 SDR Based X-Band University Ground Station as Remote Sensing Technologies Learning Environment

Siarhei V. Liashkevich, Belarusian State University, Belarus
Vladimir A. Saetchnikov, Belarusian State University, Belarus

18:00 Orbit Determination Methods For LEO Satellites From Probabilistic Analysis, Circular Motion Model And Single Pass Doppler Measurements

Alexander Spiridonov, Belarusian State University, Belarus
Vladimir Saetchnikov, Belarusian State University, Belarus
Dmitrii Ushakov, Belarusian State University, Belarus
Vladimir Cherny, Belarusian State University, Belarus
Alexey Kezik, Belarusian State University, Belarus

18:15 LEDSAT 1U CubeSat GPS receiver Electro-Magnetic Interference (EMI) analysis

Lorenzo Frezza, Sapienza University of Rome, Italy
Paolo Marzioli, Sapienza University of Rome, Italy
Niccolò Picci, Sapienza University of Rome, Italy
Andrea Gianfermo, Sapienza University of Rome, Italy
Emanuele Bedetti, Sapienza University of Rome, Italy

Diego Amadio, Sapienza University of Rome, Italy
Federico Curianò, Sapienza University of Rome, Italy
Fabio Santoni, Sapienza University of Rome, Italy

18:30 Monitoring of air pollutants using a stratospheric balloon
Federico Toson, University of Padova, Italy
Dumitrita Sandu, University of Padova, Italy
Luca Vitali, University of Padova, Italy
Andrea Conte, University of Padova, Italy
Daniele Panariti, University of Padova, Italy
Lorenzo Olivieri, CISAS G. Colombo, University of Padova, Italy

17:45 - 18:45 CEST
SESSION 2.3
General Session - Part II
Room: Virtual Room #3
Chair: Giancarlo Rufino, *University of Naples Federico II, Italy*
Claudia Conte, *University of Naples Federico II, University of Bergamo, Italy*
Giorgio de Alteriis, *University of Naples Federico II, University of Bergamo, Italy*

17:45 A Handheld 3D Surface Measurement System
Abby M. Lindberg, GelSight Inc., USA
F. Garrett Reis, GelSight Inc., USA
Micah K. Johnson, GelSight Inc., USA

18:00 Microwave-photonic technologies for satellite telecommunication payloads: a focus on photonic RF frequency conversion
Luca Rodio, Politecnico di Bari, Italy
Vincenzo Schena, Thales Aenia Space Italia, Italy
Marco Grande, Politecnico di Bari, Italy
Giovanna Calò, Politecnico di Bari, Italy
Antonella D'Orazio, Politecnico di Bari, Italy

18:15 Estimation of Attitude Using Robust Adaptive Kalman Filter
Batu Candan, Middle East Technical University, Turkey
H. Ersin Soken, Middle East Technical University, Turkey

18:30 Investigation of point cloud registration uncertainty for gap measurement of aircraft wing assembly

Ye Yang, Queen's University Belfast, UK
Yan Jin, Queen's University Belfast, UK
Mark Price, Queen's University Belfast, UK
Gasser Abdelal, Queen's University Belfast, UK
Colm Higgins, Queen's University Belfast, UK
Paul Maropoulos, Queen's University Belfast, UK

Technical Sessions - Thursday, June 24

09:00 - 09:50 CEST
PLENARY SESSION
Room: Virtual Room #1
Chair: Leopoldo Angrisani, *University of Naples Federico II, Italy*

From Planetary Exploration and Space Mission to Scientific Opportunities for Measurement

Stefano Debei, *University of Padova, Italy*

10:00 - 11:15 CEST
SESSION 3.1
Special Session - Metrology for Radar Systems - Part I
Room: Virtual Room #1
Chairs: Alfonso Farina, *Selex ES Consultant, Italy*
Silvia Liberata Ullo*, University of Sannio, Italy*

10:00 **Adaptive Beam-Forming Algorithms for Active Array Sensors: an enabling capability for cognitive radars**
Valerio Tocca, Rai Way S.p.A., Italy
Domenico Vigilante, Leonardo S.p.A., Italy
Roberto Petrucci, Leonardo S.p.A., Italy
Luca Timmoneri, Leonardo S.p.A., Italy
Alfonso Farina, Selex ES Consultant, Italy

10:15 Classification of micro-Doppler radar hand-gesture signatures by means of Chebyshev moments

Luca Pallotta, University of Roma Tre, Italy
Michela Cauli, University of Roma Tre, Italy
Carmine Clemente, University of Strathclyde, UK
Francesco Fioranelli, TU Delft, The Netherlands
Gaetano Giunta, University of Roma Tre, Italy
Alfonso Farina, Selex ES Consultant, Italy

10:30 Challenges of preparation and realization of combined field tests of passive and active radar sensors on an example APART-GAS 2019 trials

Marek Brzozowski, Air Force Institute of Technology (AFIT), Poland
Mariusz Pakowski, Air Force Institute of Technology (AFIT), Poland
Zbigniew Jakielaszek, Air Force Institute of Technology (AFIT), Poland
Mirosław Michalczewski, Air Force Institute of Technology (AFIT), Poland
Mirosław Myszka, Air Force Institute of Technology (AFIT), Poland

10:45 Fading Occurrence Probability for Spaceborne Radar in Weak Plasma Scintillation

Antonio De Maio, University of Napoli Federico II, Italy
Marco Maffei, University of Napoli Federico II, Italy
Augusto Aubry, University of Napoli Federico II, Italy
Alfonso Farina, Selex ES Consultant, Italy

11:00 Transportable ATC Systems Metrology

Michele Fiorini, Leonardo S.p.A., Italy
Marco Galloro, Leonardo S.p.A., Italy

10:00 - 11:15 CEST

SESSION 3.2

Special Session - Advances on Multimodal Imaging Based Intelligent Systems in Aerospace Metrology

Room: Virtual Room #2

Chairs: Vito Pagliarulo, *CNR-ISASI, Italy*
Pietro Ferraro, *CNR-ISASI, Italy*
Ettore Stella*, CNR-STIIMA, Italy*
Nicola Gallo, *Leonardo S.p.A*.

10:00 Mechanical and morphological characterization of 3D-printed carbonPEEK composite for avionic shimming

Pietro Russo, IPCB, CNR, Italy
Antonio Langella, University of Naples "Federico II", Italy
Giulia Leone, ISASI, CNR, Italy
Gennaro D'Angelo, ISASI, CNR, Italy
Pietro Ferraro, ISASI, CNR, Italy
Vito Pagliarulo, ISASI, CNR, Italy

10:15 Damage evaluation of repeated impact events on glass/carbon hybrid composites

Giulia Leone, ISASI, CNR, Italy
Gennaro D'Angelo, ISASI, CNR, Italy
Massimo Rippa, ISASI, CNR, Italy
Vito Pagliarulo, ISASI, CNR, Italy
Pasquale Mormile, ISASI, CNR, Italy
Pietro Ferraro, ISASI, CNR, Italy
Pietro Russo, IPCB, CNR, Italy
Federica Donadio, University of Naples Federico II, Italy
Valentina Lopresto, University of Naples Federico II, Italy
Ilaria Papa, University of Naples Federico II, Italy

10:30 Qualitative comparison of methodologies for detecting surface defects in aircraft interiors

Nicola Mosca, STIIMA, CNR, Italy
Cosimo Patruno, STIIMA, CNR, Italy

Vito Renò, STIIMA, CNR, Italy
Massimiliano Nitti, STIIMA, CNR, Italy
Ettore Stella, STIIMA, CNR, Italy

10:45 Efficient objects tracking from an unmanned aerial vehicle

Ivan Saetchnikov, Belarusian State University, Belarus, University of Warwick, UK
Victor Skakun, Belarusian State University, Belarus
Elina Tcherniavskaia, Belarusian State University, Belarus

11:00 Improved Deep Learning for Defect Segmentation in Composite Laminates Inspected by Lock-in Thermography

Roberto Marani, National Research Council, Italy
Davide Palumbo, Politecnico di Bari, Italy
Michele Attolico, National Research Council, Italy
Giuseppe Bono, National Research Council, Italy
Umberto Galietti, Politecnico di Bari, Italy
Tiziana D'Orazio, National Research Council, Italy

10:00 - 11:15 CEST

SESSION 3.3

Special Session - Measurements and Instrumentation for Autonomous Spacecraft and Planetary Exploration - Part I

Room: Virtual Room #3

Chairs: Sebastiano Chiodini, *University of Padua, Italy*
Riccardo Giubilato, *German Aerospace Center (DLR), Germany*
Marco Pertile, *University of Padua, Italy*

10:00 Uncertainty of material measurements at microwave frequencies

Andrea Ferrero, Keysight Technologies
Ruihua Wang, Keysight Technologies
Marco Garelli, Keysight Technologies
Suren Singh, Keysight Technologies
Say Phommakesone, Keysight Technologies
Rusty Mayers, Keysight Technologies
Derek Lee, Keysight Technologies

10:15 Space tethers: parameters reconstructions and tests

Alice Brunello, CISAS, University of Padua, Italy
Lorenzo Olivieri, CISAS, University of Padua, Italy
Giulia Sarego, CISAS, University of Padua, Italy
Andrea Valmorbida, University of Padua, Italy
Enrico Lungavia, University of Padua, Italy
Enrico C. Lorenzini, University of Padua, Italy

10:30 Performance analysis of the "MicroMED" Optical Particle Counter in windy conditions

Giuseppe Mongelluzzo, INAF, University of Naples "Federico II", Italy
Gabriele Franzese, INAF, Italy
Fabio Cozzolino, INAF, Italy
Francesca Esposito, INAF, Italy
Alan Cosimo Ruggeri, INAF, Italy
Carmen Porto, INAF, Italy
Cesare Molfese, INAF, Italy
Simone Silvestro, INAF, Italy, SETI Institute, USA
Ciprian Ionut Popa, INAF, Italy
Diego Scaccabarozzi, Politecnico di Milano, Italy
Bortolino Saggin, Politecnico di Milano, Italy
Alberto Martin-Ortega, Instituto Nacional de Técnica Aeroespacial, Spain
Ignacio Arruego, Instituto Nacional de Técnica Aeroespacial, Spain
José Ramon De Mingo, Instituto Nacional de Técnica Aeroespacial, Spain
Nuria Andrés Santiuste, Instituto Nacional de Técnica Aeroespacial, Spain
Daniele Brienza, INAF, Italy
Fausto Cortecchia, INAF, Italy
Jonathan P. Merrison, Aarhus University, Denmark
Jens Jacob Iversen, Aarhus University, Denmark

10:45 MicroMED: study of the relation between signal durations and grain diameters

Gabriele Franzese, INAF – Osservatorio Astronomico di Capodimonte, Italy
Giuseppe Mongelluzzo, INAF – Osservatorio Astronomico di Capodimonte, Italy
Fabio Cozzolino, INAF – Osservatorio Astronomico di Capodimonte, Italy
Carmen Porto, INAF – Osservatorio Astronomico di Capodimonte, Italy
Alan Cosimo Ruggeri, INAF – Osservatorio Astronomico di Capodimonte, Italy

Francesca Esposito, INAF – Osservatorio Astronomico di Capodimonte, Italy
Fausto Cortecchia, INAF – Astrophysics and Space Science Observatory (OAS), Italy
Alberto Martín-Ortega, Instituto Nacional de Técnica Aeroespacial, Spain
Nuria Andrés Santiuste, Instituto Nacional de Técnica Aeroespacial, Spain
José Ramon De Mingo, Instituto Nacional de Técnica Aeroespacial, Spain
Ciprian Ionut Popa, INAF – Osservatorio Astronomico di Capodimonte, Italy
Simone Silvestro, INAF – Osservatorio Astronomico di Capodimonte, Italy
Daniele Brienza, INAF – Institute for Space Astrophysics and Planetology (IAPS), Italy
Ignacio Arruego, Instituto Nacional de Técnica Aeroespacial, Spain

11:00 Experimental Validation of a Deployment Mechanism for Tape-tethered Satellites

Andrea Valmorbida, University of Padova, Italy
Lorenzo Olivieri, CISAS "G. Colombo", University of Padova, Italy
Giulia Sarego, CISAS "G. Colombo", University of Padova, Italy
Alice Brunello, CISAS "G. Colombo", University of Padova, Italy
Davide Vertuani, CISAS "G. Colombo", University of Padova, Italy
Carlo Bettanini, University of Padova, Italy
Marco Pertile, University of Padova, Italy
Enrico C. Lorenzini, University of Padova, Italy

11:30 - 12:45 CEST
SESSION 4.1
Special Session - Metrology for Radar Systems - Part II
Room: Virtual Room #1
Chairs: Alfonso Farina, *Selex ES Consultant, Italy*
Silvia Liberata Ullo*, University of Sannio, Italy*

11:30 mmWave Radar Features Extraction of Drones for Machine Learning Classification

Gianluca Ciattaglia, Università Politecnica delle Marche, Italy
Giulia Temperini, Università Politecnica delle Marche, Italy
Susanna Spinsante, Università Politecnica delle Marche, Italy
Ennio Gambi, Università Politecnica delle Marche, Italy

11:45 Polish Field Tests of the PGSR-3I Beagle Ground Surveillance Radar

Marek Brzozowski, Air Force Institute of Technology, Poland
Mariusz Pakowski, Air Force Institute of Technology, Poland
Mirosław Myszka, Air Force Institute of Technology, Poland
Mirosław Michalczewski, Air Force Institute of Technology, Poland
Peter Kovacs, Pro Patria Electronics, Hungary
Szabolcs Makai, Pro Patria Electronics, Hungary

12:00 Experimental Analysis of Structured Covariance Estimators with Missing data

Massimo Rosamilia, University of Napoli Federico II, Italy
Augusto Aubry, University of Napoli Federico II, Italy
Vincenzo Carotenuto, University of Napoli Federico II, Italy
Antonio De Maio, University of Napoli Federico II, Italy

12:15 RIS-Aided Radar Sensing in N-LOS Environment

Augusto Aubry, University of Napoli Federico II, Italy
Antonio De Maio, University of Napoli Federico II, Italy
Massimo Rosamilia, University of Napoli Federico II, Italy

12:30 Measurements of the Radar Cross Section of a nano-drone at K-band

Alessio Balleri, Cranfield University, Defence Academy of the UK, UK

11:30 - 12:45 CEST

SESSION 4.2

General Session - Part III

Room: Virtual Room #2

Chair: Ioan Tudosa, *University of Sannio, Italy*

11:30 Satellite-derived Time for Enhanced Telecom Networks Synchronization: the ROOT Project

Marco Pini, Fondazione LINKS, Italy
Alex Minetto, Politecnico di Torino, Italy
Andrea Vesco, Fondazione LINKS, Italy
Diana Berbecaru, Politecnico di Torino, Italy
Luis Miguel Contreras Murillo, Telefonica, Spain
Pierre Nemry, Septentrio, Belgium
Ivan De Francesca, Telefonica, Spain
Benoit Rat, Seven Solutions, Spain
Krel Callewaert, Valdani Vicari e Associati, Belgium

11:45 An FFT-based method for Doppler observables estimation in Deep Space tracking

Andrea Togni, Alma Mater Studiorum - Università di Bologna, Italy
Marco Zannoni, Alma Mater Studiorum - Università di Bologna, Italy
Luis Gómez Casajús, Alma Mater Studiorum - Università di Bologna, Italy
Paolo Tortora, Alma Mater Studiorum - Università di Bologna, Italy

12:00 Interference Mitigation and T-RAIM for Robust GNSS Timing

Ciro Gioia, European Commission, Joint Research Centre
Daniele Borio, European Commission, Joint Research Centre

12:15 Overview of optical observation strategies and systems: LEO and GEO measurements acquisition for position and attitude determination

Lorenzo Mariani, Sapienza University of Rome, Italy
Paola Celesti, Sapienza University of Rome, Italy
Federico Curianò, Sapienza University of Rome, Italy
Lorenzo Cimino, Sapienza University of Rome, Italy
Luigi di Palo, Sapienza University of Rome, Italy
Shariar Hadji Hossein, Sapienza University of Rome, Italy
Matteo Rossetti, Sapienza University of Rome, Italy
Mascia Bucciarelli, Sapienza University of Rome, Italy
Gaetano Zarcone, Sapienza University of Rome, Italy

12:30 Manned-Unmanned air vehicles integration in 3D operations

Fabio Grandi, Italian Air Force

11:30 - 12:45 CEST

SESSION 4.3

Special Session - Measurements and Instrumentation for Autonomous Spacecraft and Planetary Exploration - Part II

Room: Virtual Room #3

Chairs: Sebastiano Chiodini, *University of Padua, Italy*
Riccardo Giubilato, *German Aerospace Center (DLR), Germany*
Marco Pertile, *University of Padua, Italy*

11:30 Preliminary structural design of PANCAM, a bifocal panoramic camera for planetary observation

Diego Scaccabarozzi, Politecnico di Milano, Italy
Bortolino Saggin, Politecnico di Milano, Italy
Marco Giovanni Corti, Politecnico di Milano, Italy
Pietro Valnegri, Politecnico di Milano, Italy
Claudio Pernechele, INAF - Osservatorio Astronomico di Padova, Italy
Luigi Lessio, INAF - Osservatorio Astronomico di Padova, Italy
Lorenzo Paoletti, INAF - Osservatorio Astronomico di Padova, Italy
Luca Consolaro, LOBRE srl Brescia, Italy

11:45 Design of a user-friendly control system for planetary rovers with CPS feature

Sebastiano Chiodini, CISAS "G. Colombo", University of Padova, Italy
Riccardo Giubilato, Institute of Robotics and Mechatronics DLR, Germany
Marco Pertile, University of Padova, Italy
Annarita Tedesco, University of Bordeaux, France
Domenico Accardo, University of Napoli Federico II, Italy
Stefano Debei, University of Padova, Italy

12:00 A Robust Crater Matching Algorithm for Autonomous Vision-Based Spacecraft Navigation

Roberto Del Prete, University of Naples Federico II, Italy
Alfredo Renga, University of Naples Federico II, Italy

12:15 LIDAR pointing and parameters control for close proximity operations with uncooperative target

Alessia Nocerino, University of Naples “Federico II”, Italy
Roberto Opromolla, University of Naples “Federico II”, Italy
Giancarmine Fasano, University of Naples “Federico II”, Italy
Michele Grassi, University of Naples “Federico II”, Italy

12:30 Rovers Localization by using 3D-to-3D and 3D-to-2D Visual Odometry

Simone Andolfo, Sapienza−University of Rome, Italy
Flavio Petricca, Sapienza−University of Rome, Italy
Antonio Genova, Sapienza−University of Rome, Italy

14:30 - 16:15 CEST

IEEE WIE PANEL

Sharing ideas with experienced and early-stage researchers

Room: Virtual Room #1

Chair: Patrizia Lamberti, *University of Salerno, Italy*

14:30 Introduction

14:40 Athina P. Petropulu, *Rutgers University, US*

15:05 Maria Sabrina Greco, *University of Pisa, Italy*

15:30 Antonia Maria Tulino, *University of Naples Federico II, Italy*

15:55 Q&A and Conclusion

16:30 - 18:15 CEST

SESSION 5.1

Special Session - Manufacturing and metrology in the aerospace industry

Room: Virtual Room #1

Chairs: Jerzy Józwik, *Lublin University of Technology, Poland*
Dariusz Mazurkiewicz, *Lublin University of Technology, Poland*
Ireneusz Zagórski, *Lublin University of Technology, Poland*

16:30 **Research on I/Q phase demodulation algorithm for synthetic wavelength ranging based on optical frequency comb**
Yongyao Xu, Beijing Aerospace Institute for Metrology and Measurement, China
Xiaoqiang Gao, Beijing Aerospace Institute for Metrology and Measurement, China
Lin Liu, Beijing Aerospace Institute for Metrology and Measurement, China
Tieli Zhang, Beijing Aerospace Institute for Metrology and Measurement, China

16:45 **Influence of machining with ceramic brushes on the surface quality of EN-AW 7075 aluminum alloy after abrasive waterjet process**
Jakub Matuszak, Lublin University of Technology, Poland

17:00 Temperature Field During the Hot Pressing of Ceramic Gas Turbine Components

Vasily Dutka, Ukraine National Academy of Sciences, Ukraine
Edwin Gevorkyan, Ukrainian State University of Railway Transport, Ukraine
Miroslaw Rucki, Kazimierz Pulaski University of Technology and Humanities, Poland
Zbigniew Siemiatkowski, Kazimierz Pulaski University of Technology and Humanities, Poland
Dmitrij Morozow, Kazimierz Pulaski University of Technology and Humanities, Poland
Vladimir Chishkala, V. N. Karazin Kharkiv National University, Ukraine

17:15 Comparative analysis of the measurement accuracy of geometric features of aircraft components measured by 3D digitisation system and coordinate measuring technique

Józef Kuczmaszewski, Lublin University of Technology, Poland
Jerzy Józwik, Lublin University of Technology, Poland
Paweł Pieśko, Lublin University of Technology, Poland
Magdalena Zawada-Michałowska, Lublin University of Technology, Poland

17:30 Mass Wear Measurement of Airport Baggage Belt Conveyor Systems

Jerzy Józwik, Lublin University of Technology, Poland
Ireneusz Zagórski, Lublin University of Technology, Poland
Dariusz Mazurkiewicz, Lublin University of Technology, Poland

17:45 Design and FEM Analysis of an Unmanned Aerial Vehicle Wing

Leszek Semotiuk, Lublin University of Technology, Poland
Jerzy Józwik, Lublin University of Technology, Poland
Kamila Kukiełka, The State School of Higher Education in Chelm, Poland
Krzysztof Dziedzic, Lublin University of Technology, Poland

18:00 Aviation Magnesium Alloys Milling - The Case Study

Ireneusz Zagórski, Lublin University of Technology, Poland
Jerzy Józwik, Lublin University of Technology, Poland

16:30 - 18:15 CEST

SESSION 5.2

Special Session - Complex systems operational availability: measurements, methodologies and requirements

Room: Virtual Room #1

Chair: Fabio Leccese, *Università Roma Tre, Italy*

16:30 **Navigation Equations, Uncertainty and Error Budget in Inertial Navigation Systems**

Enrico Petritoli, Università degli Studi "Roma Tre", Italy
Fabio Leccese, Università degli Studi "Roma Tre", Italy

16:45 **MPRR and Pegasis Routing Protocol comparison for Aerospace application**

Marco Cagnetti, Università degli Studi "Roma Tre", Italy
Mariagrazia Leccisi, Università degli Studi "Roma Tre", Italy
Fabio Leccese, Università degli Studi "Roma Tre", Italy

17:00 **Characterization of high-sensitive thermoplastic strain gauge sensor as wearable tool for monitoring spacesuit movement impediment**

F. Maita, IMM - CNR, Italy
A. Piccardi, IMM - CNR, Italy
I. Lucarini, IMM - CNR, Italy
M. Scatto, Nadir srl, Italy
M. Ruggeri, ESTE srl, Italy
L. Maiolo, IMM - CNR, Italy

17:15 **Low temperature dielectrics for improving interface state density in SiC devices to be deployed in avionics**

Luca Maiolo, IMM - CNR, Italy
Ivano Lucarini, IMM - CNR, Italy
Armando Piccardi, IMM - CNR, Italy
Francesco Maita, IMM - CNR, Italy

17:30 Flexible CMUT as smart tool for nondestructive testing of aircraft composite structures

I. Lucarini, IMM - CNR, Università Degli Studi Roma Tre, Italy
F. Maita, IMM - CNR, Italy
L. Maiolo, IMM - CNR, Italy
A. Savoia, Università Degli Studi Roma Tre, Italy

17:45 Design of a Thermographic System for Fire Prevention in Aircraft Cabins

Giuseppe Schirripa Spagnolo, Università degli Studi "Roma Tre", Italy
Fabio Leccese, Università degli Studi "Roma Tre", Italy

18:00 System to Monitor IR Radiation of LED Aircraft Warning Lights

Giuseppe Schirripa Spagnolo, Università degli Studi "Roma Tre", Italy
Fabio Leccese, Università degli Studi "Roma Tre", Italy

16:30 - 18:00 CEST

SESSION 5.3

Special Session - Measurements and Instrumentation for Autonomous Spacecraft and Planetary Exploration - Part III

Room: Virtual Room #3

Chairs: Sebastiano Chiodini, *University of Padua, Italy*
Riccardo Giubilato, *German Aerospace Center (DLR), Germany*
Marco Pertile, *University of Padua, Italy*

16:30 Acquisition Analysis for Small–Satellite Optical Crosslinks

Francesco Sansone, Stellar Project s.r.l., Italy
Francesco Branz, University of Padova, Italy
Andrea Vettor, CISAS, University of Padova, Itally
Alessandro Francesconi, Stellar Project s.r.l., University of Padova, Italy

16:45 Numerical Simulations for Planetary Rovers Safe Navigation and LIDAR Based Localization

Anna Maria Gargiulo, Sapienza University of Rome, Italy
Ivan di Stefano, Sapienza University of Rome, Italy
Antonio Genova, Sapienza University of Rome, Italy

17:00 Characterization of a new positioning sensor for space capture

Alex Caon, CISAS, University of Padova, Italy
Francesco Branz, University of Padova, Italy
Alessandro Francesconi, University of Padova, Italy

17:15 A conceptual study to characterize properties of space debris from hypervelocity impacts through Thin Film Heat Flux Gauges

Leonardo Barilaro, Department of Aviation - MCAST, Malta
Chiara Falsetti, University of Oxford, UK
Lorenzo Olivieri, CISAS "G.Colombo", University of Padova, Italy
Cinzia Giacomuzzo, University of Padova, Italy
Alessandro Francesconi, University of Padova, Italy
Paul Beard, University of Oxford, UK
Robert Camilleri, University of Malta, Malta

17:30 Artificial Neural Network Calibration of Wide Range of Motion Biaxial Inclinometers

Ilija Jovanovic, Ryerson University, Canada
Shaghayegh Khodabakhshian Khonsari, Ryerson University, Canada
John Enright, Ryerson University, Canada

17:45 JANUS Optical Head Line of Sight Temperature dependence Characterization and Validation by on ground test

Andrea Turella, Leonardo S.p.A., Italy
Vincenzo Della Corte, INAF-IAPS, Italy
Pasquale Palumbo, Parthenope University, Italy
Marilena Amoroso, ASI, Italy
Raffaele Mugnuolo, ASI, Italy
Giovanni Enrico Noci, Leonardo S.p.A., Italy

Technical Sessions - Friday, June 25

09:00 - 09:50 CEST

PLENARY SESSION

Room: Virtual Room #1

Chair: Pietro Ferraro, *National Research Council, Italy*

From the Gateway to Mars, the Current Scenario of Human Space Exploration

Gabriele Mascetti, *Italian Space Agency - ASI*

10:00 - 11:15 CEST

SESSION 6.1

Special Session - S2S - Space to Space: Scientific and Technological Challenges for Human and Robotic Space Exploration - Part I

Room: Virtual Room #1

Chairs: Vittorio Ancona, *Thales Alenia Space*
Pietro Ferraro, *CNR Institute of Applied Sciences and Intelligent Systems*
Paolo Maggiore, *Politecnico di Torino*
Piero Messidoro, *Politecnico di Torino*

10:00 **INVITED TALK - The new metrology for Space might not be SMART**
Anilkumar Dave, INFINITE AREA, Italy
Stephan Reckie, Global Entrepreneurship Network, USA
Valerio Cometti, V12 Design Space, Italy
Marco Generali, V12 Design Space, Italy

10:30 A deployable and inflatable robotic arm concept for aerospace applications

Pierpaolo Palmieri, Politecnico di Torino, Italy
Matteo Gaidano, Politecnico di Torino, Italy
Mario Troise, Politecnico di Torino, Italy
Laura Salamina, Politecnico di Torino, Italy
Andrea Ruggeri, Politecnico di Torino, Italy
Stefano Mauro, Politecnico di Torino, Italy

10:45 Biocompatible micro needles for smart therapy

Sara Coppola, ISASI- CNR, Italy
Veronica Vespini, ISASI- CNR, Italy
Gaetano D'Avino, Università di Napoli Federico II, Italy
Simonetta Grilli, ISASI- CNR, Italy
Pier Luca Maffettone, Università di Napoli Federico II, Italy
Pietro Ferraro, ISASI- CNR, Italy

11:00 Label-free microfluidic platform for blood analysis based on phase-contrast imaging

Lisa Miccio, ISASI- CNR, Italy
Flora Cimmino, Ceinge, Biotecnologie avanzate, Italy
Ivana Kurelac, University of Bologna, Italy
Massimiliano M. Villone, University of Naples Federico II, Italy
Vittorio Bianco, ISASI- CNR, Italy
Martina Mugnano, ISASI- CNR, Italy
Francesco Merola, ISASI- CNR, Italy
Pasquale.Memmolo, ISASI- CNR, Italy
Daniele Pirone, ISASI- CNR, Italy
Mario Capasso, University of Naples Federico II, Italy
Achille Iolascon, University of Naples Federico II, Italy
PierLuca Maffettone, University of Naples Federico II, Italy
Pietro Ferraro, ISASI- CNR, Italy

10:00 - 11:15 CEST

SESSION 6.2

Special Session - Structural health monitoring and nondestructive testing for aerospace - Part I

Room: Virtual Room #2

Chairs: Marco Laracca, *Sapienza University of Rome, Italy*
Vittorio Memmolo, *University of Naples Federico II, Italy*
Leandro Maio, *University of Naples Federico II, Italy*

10:00 Temperature Effects and Damage Detection on CFRP through Electrical Impedance Spectroscopy

Gianluca Caposciutti, University of Pisa, Italy
Gabriele Bandini, University of Pisa, Italy
Mirko Marracci, University of Pisa, Italy
Alice Buffi, University of Pisa, Italy
Bernardo Tellini, University of Pisa, Italy

10:15 Characterization of porosity and defects on composite materials using X-ray computed tomography and image processing

Alessio Trolli, Università Politecnica delle Marche, Italy
Sara Casaccia, Università Politecnica delle Marche, Italy
Giuseppe Pandarese, Università Politecnica delle Marche, Italy
Gian Marco Revel, Università Politecnica delle Marche, Italy

10:30 Research on Non-destructive test of porous ceramic insulation material for spacecraft based on Terahertz continuous wave imaging technology

Yonghong Wu, Institute of Aerospace Metrology and Measurement Technology, China
Yuekui Zhang, Institute of Aerospace Metrology and Measurement Technology, China
Zhu Jiang, Institute of Aerospace Metrology and Measurement Technology, China
Yongyao Xu, Institute of Aerospace Metrology and Measurement Technology, China
Lin Liu, Institute of Aerospace Metrology and Measurement Technology, China
Yinxiao Miao, Institute of Aerospace Metrology and Measurement Technology, China

10:45 The Defect Identification and Localization using Ultrasonic Guided Waves in Aluminum Alloy

Mastan Raja Papanaboina, Kaunas University of Technology, Lithuania
Elena Jasiuniene, Kaunas University of Technology, Lithuania

11:00 **Structural Health Monitoring of composite pressure vessels using multiple damage indicators**

Vittorio Memmolo, University of Naples Federico II, Italy
Fabrizio Ricci, University of Naples Federico II, Italy
Leandro Maio, University of Naples Federico II, Italy

10:00 - 11:15 CEST

SESSION 6.3

Special Session - Terrestrial and in-flight verification of the GNC systems for aerospace vehicles - Part I

Room: Virtual Room #3

Chairs: Yevgeny Somov, *Samara State Technical University, Russia*
Paolo Castaldi, *University of Bologna, Italy*

10:00 **Ensuring the Survivability of Spacecraft Control System at Critical Failures in Flywheel Cluster**

Yevgeny Somov, Samara State Technical University, Russia
Sergey Butyrin, Samara State Technical University, Russia
Sergey Somov, Samara State Technical University, Russia

10:15 **Design and testing of Modular close loop Single Gimbal Variable Speed Control Moment Gyroscope**

Siddharth Deore, Sapienza University of Rome, Italy
Fabio Santoni, Sapienza University of Rome, Italy
Fabrizio Piergentili, Sapienza University of Rome, Italy
Paolo Marzioli, Sapienza University of Rome, Italy

10:30 **Real-Time Aerospace Vehicle Position Estimation Using Terrestrial Illumination Matching**

Liberty M. Shockley, Air Force Institute of Technology
Robert A. Bettinger, Air Force Institute of Technology

10:45 **In-flight Checking of an Autonomous Guidance, Navigation and Control Systems Accuracy for Earth-observing Satellites and Space Robots**

Yevgeny Somov, Samara State Technical University, Russia

Sergey Butyrin, Samara State Technical University, Russia
Sergey Somov, Samara State Technical University, Russia
Nikolay Rodnishchev, Kazan National Research Technical University, Russia
Tatyana Somova, Samara State Technical University, Russia

11:00 Mathematical Model and Control System of an Ekranoplan under the Action of Large Aerodynamic Loads

Alexander Nebylov, State University of Aerospace Instrumentation (SUAI), Russia
Alexander Panferov, State University of Aerospace Instrumentation (SUAI), Russia
Sergey Brodsky, State University of Aerospace Instrumentation (SUAI), Russia

11:30 - 13:15 CEST

SESSION 7.1

Special Session - S2S - Space to Space: Scientific and Technological Challenges for Human and Robotic Space Exploration - Part II

Room: Virtual Room #1

Chairs: Vittorio Ancona, *Thales Alenia Space*
Pietro Ferraro, *CNR Institute of Applied Sciences and Intelligent Systems*
Paolo Maggiore, *Politecnico di Torino*
Piero Messidoro, *Politecnico di Torino*

11:30 Nanotechnology-based Biosensor for the Detection of Harmful Pathogens in Potable Water

Francesca Petronella, National Research Council, Italy
Melissa De Angelis, Sapienza University of Rome, Italy
Daniela De Biase, Sapienza University of Rome, Italy
Seok-Im Lim, Jeonbuk National University, Republic of Korea
Kwang-Un Jeong, Jeonbuk National University, Republic of Korea
Nicholas Godman, Wright-Patterson Air Force Base, USA
Dean Evans, Wright-Patterson Air Force Base, USA
Michael Mcconney, Wright-Patterson Air Force Base, USA
Luciano De Sio, Sapienza University of Rome, Italy

11:45 A sensor fusion strategy based on a distributed optical sensing of airframe deformation applied to actuator load estimation

Pier Carlo Berri, Politecnico di Torino, Italy
Matteo D. L. Dalla Vedova, Politecnico di Torino, Italy
Emanuele Frediani, Politecnico di Torino, Italy
Paolo Maggiore, Politecnico di Torino, Italy
Gaetano Quattrocchi, Politecnico di Torino, Italy

12:00 Sustainable Food Production To Enable Long Term Human Space Exploration

Giorgio Boscheri, Thales Alenia Space Italia, Italy
Antonio Saverino, Thales Alenia Space Italia, Italy
Cesare Lobascio, Thales Alenia Space Italia, Italy

12:15 The Innovative Acquisition and Pointing Metrology for Next Generation Gravity Mission

Luciana Bonino, Thales Alenia Space Italia, Italy
Stefano Cesare, Thales Alenia Space Italia, Italy
Bruno Leone, ESA - European Space Agency
Luca Massotti, ESA - European Space Agency
Marco Pisani, INRiM – Istituto Nazionale di Ricerca Metrologica, Italy
Jessica Girella, Thales Alenia Space Italia, Italy

12:30 The Bishop Airlock: a de-risking opportunity for Space Exploration

V. La Regina, Nanoracks Space Outpost Europe
A. Aiello, Nanoracks Space Outpost Europe
J. Lombardo, Nanoracks Space Outpost Europe

12:45 The Gateway International Habitat: architectures for deep space exploration

A.Quaregna, Thales Alenia Space

13:00 Passive shielding for human space exploration

Mariagabriella Pugliese, University of Naples Federico II, Italy

11:30 - 12:45 CEST

SESSION 7.2

Special Session - Structural health monitoring and nondestructive testing for aerospace - Part II

Room: Virtual Room #2

Chairs: Marco Laracca, *Sapienza University of Rome, Italy*
Vittorio Memmolo, *University of Naples Federico II, Italy*
Leandro Maio, *University of Naples Federico II, Italy*

11:30 Health indicators for diagnostics and prognostics of composite aerospace structures

Georgios Galanopoulos, University of Patras, Greece
Dimitrios Milanoski, University of Patras, Greece
Agnes A. R. Broer, Delft University of Technology, The Netherlands
Dimitrios Zarouchas, Delft University of Technology, The Netherlands
Theodoros Loutas, University of Patras, Greece

11:45 Investigation on resolution of laser-ultrasound technique for detection of disbonds in adhesively bonded aluminum plates

Patrycja Pyzik, AGH University of Science and Technology, Poland
Aleksandra Ziaja-Sujdak, AGH University of Science and Technology, Poland
Łukasz Ambroziński, AGH University of Science and Technology, Poland

12:00 Inspection of the undulation structure with an in-plane differential flexible array probe

Lei Peng, Shanghai Tech University, China
Chaofeng Ye, Shanghai Tech University, China
Yu Tao, Shanghai Tech University, China
Cai Long, Shanghai Tech University, China
Ming Li, Shanghai Tech University, China

12:15 Interaction of Guided Electromagnetic Waves with defects emerging in metallic plates

Vittorio Memmolo, University of Naples Federico II, Italy
Jochen Moll, Goethe University Frankfurt, Germany
Duy Hai Nguyen, Goethe University Frankfurt, Germany
Viktor Krozer, Goethe University Frankfurt, Germany

12:30 Non-contact CFRP pre-bond quality NDT by Ion Mobility Spectrometer: Preliminary Results

Maria Salvato, DUEE-SIST - ENEA, Italy
Ettore Massera, TERIN-FSD - ENEA, Italy
Saverio De Vito, TERIN-FSD - ENEA, Italy
Sara Kirchner, IRT Saint Exupéry, France
Cécilia Gestraud, IRT Saint Exupéry, France
Julie Lecomte, IRT Saint Exupéry, France
Mara Miglietta, TERIN-FSD - ENEA, Italy
Fabrizio Formisano, TERIN-FSD - ENEA, Italy
Girolamo Di Francia, TERIN-FSD - ENEA, Italy

11:30 - 12:30 CEST

SESSION 7.3

Special Session - Terrestrial and in-flight verification of the GNC systems for aerospace vehicles - Part II

Room: Virtual Room #3

Chairs: Yevgeny Somov, *Samara State Technical University, Russia*
Paolo Castaldi, *University of Bologna, Italy*

11:30 Stochastic Optimization of Fault-tolerant Spacecraft Control at Interorbital Flights

Yevgeny Somov, Samara State Technical University, Russia
Nikolay Rodnishchev, Kazan National Research Technical University, Russia
Sergey Somov, Samara State Technical University, Russia

11:45 On-ground experimental verification of magnetic attitude control for nanosatellites

Anton Bahu, University of Bologna, Italy
Dario Modenini, University of Bologna, Italy

12:00 WIG-craft Assistance for an Aerospace Plane in Its Horizontal Launch and Landing

Alexander Nebylov, State University of Aerospace Instrumentation (SUAI), Russia

Vladimir Nebylov, International Institute for Advanced Aerospace Technologies, Russia
Alexander Panferov, State University of Aerospace Instrumentation (SUAI), Russia

12:15 Guidance and Control of a Space Robot at Additional Launching and Approaching a Communication Geostationary Satellite

Yevgeny Somov, Samara State Technical University, Russia
Sergey Butyrin, Samara State Technical University, Russia
Tatyana Somova, Samara State Technical University, Russia

14:30 - 15:45 CEST
SESSION 8.1
General Session - Part IV
Room: Virtual Room #1
Chairs: Mario Marchetti, *Sapienza University of Rome, Italy*
Andrea Delfini, *Sapienza University of Rome, Italy*

14:30 Metrological Characterization of Ground-based Sensors for Space Surveillance and Tracking

Giorgio Isoletta, University of Naples "Federico II", Italy
Carlo Lombardi, University of Naples "Federico II", Italy
Roberto Opromolla, University of Naples "Federico II", Italy
Giancarmine Fasano, University of Naples "Federico II", Italy
Moreno Peroni, Flight Test Wing of the Italian Air Force, Italy
Alessandro Panico, Flight Test Wing of the Italian Air Force, Italy
Andrea Cecchini, Flight Test Wing of the Italian Air Force, Italy
Antonio Romano, Vitrociset S.p.A, Italy
Aniello Basile, Vitrociset S.p.A, Italy
Walter Matta, Vitrociset S.p.A, Italy

14:45 Effects of Atomic Oxygen and UV rays ageing on the Reflection Coefficient of Carbon/Carbon Plates in the 12-18 GHz Frequency Range

Andrea Delfini, Sapienza Università di Roma, Italy
Roberto Pastore, Sapienza Università di Roma, Italy
Fabio Santoni, Sapienza Università di Roma, Italy
Mario Marchetti, Sapienza Università di Roma, Italy

15:00 LEDSAT 1U CubeSat thermal analysis and steady state calibration for thermal-vacuum testing

Emanuele Bedetti, Sapienza University of Rome, Italy
Niccolò Picci, Sapienza University of Rome, Italy
Andrea Gianfermo, Sapienza University of Rome, Italy
Lorenzo Frezza, Sapienza University of Rome, Italy
Diego Amadio, Sapienza University of Rome, Italy
Federico Curianò, Sapienza University of Rome, Italy
Paolo Marzioli, Sapienza University of Rome, Italy
Andrea Delfini, Sapienza University of Rome, Italy

15:15 Data-Driven Identification Method and Simulation Modeling of a Ground Robot

Enza I. Trombetta, Politecnico di Torino, Italy
Iris David Du Mutel de Pierrepont Franzetti, Politecnico di Torino, Italy
Davide Carminati, Politecnico di Torino, Italy
Matteo Scanavino, Politecnico di Torino, Italy
Elisa Capello, Politecnico di Torino, Italy

15:30 Orbit Design for Satellite Formations devoted to Space Environment Measurements

Karthick Dharmarajan, Sapienza Università di Roma, Italy
Giovanni B. Palmerini, Sapienza Università di Roma, Italy

14:30 - 15:45 CEST

SESSION 8.2

Special Session - Structural health monitoring and nondestructive testing for aerospace - Part III

Room: Virtual Room #2

Chairs: Marco Laracca, *Sapienza University of Rome, Italy*
Vittorio Memmolo, *University of Naples Federico II, Italy*
Leandro Maio, *University of Naples Federico II, Italy*

14:30 Digital-Twins of composite aerostructures towards Structural Health Monitoring

Dimitrios P. Milanoski, University of Patras, Greece
Georgios K. Galanopoulos, University of Patras, Greece
Theodoros H. Loutas, University of Patras, Greece

14:45 Contact and non-contact methods of vibration measurement in aircraft structures

Aleksander Olejnik, Military University of Technology, Poland
Robert Rogólski, Military University of Technology, Poland
Michał Szcześniak, Military University of Technology, Poland

15:00 Low-velocity impact damage detection of CFRP composite panel based on Transfer Impedance approach to Structural Health Monitoring

Michal Dziendzikowski, Instytut Techniczny Wojsk Lotniczych, Poland
Artur Kurnyta, Instytut Techniczny Wojsk Lotniczych, Poland
Alessio Beligni, Politecnico di Milano, Italy
Claudio Sbarufatti, Politecnico di Milano, Italy
Krzysztof Dragan, Instytut Techniczny Wojsk Lotniczych, Poland
Marco Giglio, Politecnico di Milano, Italy

15:15 The use of silver conductive paint for crack propagation sensor customization

Artur Kurnyta, Air Force Insitute of Technology, Poland
Kamil Kowalczyk, Air Force Insitute of Technology, Poland
Marta Baran, Air Force Insitute of Technology, Poland
Michał Dziendzikowski, Air Force Insitute of Technology, Poland
Krzysztof Dragan, Air Force Insitute of Technology, Poland

15:30 Detection of ice accretions on composite panels using FMCW radars at 60GHz

Leandro Maio, University of Naples Federico II, Italy
Jochen Moll, Goethe-University Frankfurt, Germany
Vittorio Memmolo, University of Naples Federico II, Italy
Jonas Simon, Goethe-University Frankfurt, Germany
Thomas Maetz, Goethe-University Frankfurt, Germany
Viktor Krozer, Goethe-University Frankfurt, Germany
Andreas Nuber, Wölfel Engineering GmbH + Co. KG, Germany

Stefan Krause, Fraunhofer Institute for Wind Energy and Energy System Technology, Germany
Oliver Bagemiel, Fraunhofer Institute for Wind Energy and Energy System Technology, Germany

14:30 - 15:45 CEST

SESSION 8.3

Special Session - Mechanical and Thermal Metrology for Aerospace Applications

Room: Virtual Room #3

Chairs: Adolfo Martucci, *CIRA - Italian Aerospace Research Centre, Italy*
Giovanni Cerasuolo, *CIRA - Italian Aerospace Research Centre, Italy*
Orsola Petrella, *CIRA - Italian Aerospace Research Centre, Italy*

14:30 Plasma and material temperature/emissivity knowledge by applied physics technique based on compact VNIR emission spectroscopy in aerospace re-entry

Luigi Savino, CIRA - Italian Aerospace Research Centre, Italy
Antonio Del Vecchio, CIRA - Italian Aerospace Research Centre, Italy
Mario De Cesare, CIRA - Italian Aerospace Research Centre, Italy

14:45 TeraHertz inspections of painted steel samples

Ilaria Catapano, Institute for Electromagnetic Sensing of the Environment - CNR, Italy
Giovanni Ludeno, Institute for Electromagnetic Sensing of the Environment - CNR, Italy
Francesco Soldovieri, Institute for Electromagnetic Sensing of the Environment - CNR, Italy
Thibaud Toullier, Univ Gustave Eiffel, Inria, France
Jean Dumoulin, Univ Gustave Eiffel, Inria, France

15:00 Experimental Trends of Spectral Emissivity by Dual-Colour Pyrometers During the Development of Re-entry Tests in Ground Facilities

Carlo Purpura, Centro Italiano Ricerche Aerospaziali, Italy
Mario De Stefano Fumo, Centro Italiano Ricerche Aerospaziali, Italy

15:15 Experimental investigation on the delamination onset and propagation in composite specimens subjected to compressive loads by using Digital Image Correlation

Aniello Riccio, University of Campania "Luigi Vanvitelli", Italy
Angela Russo, University of Campania "Luigi Vanvitelli", Italy
Andrea Sellitto, University of Campania "Luigi Vanvitelli", Italy

Valerio Acanfora, University of Campania "Luigi Vanvitelli", Italy
Davide Alfano, Italian Aerospace Research Centre, Italy
Mauro Zarrelli, Institute of Polymers, Composites, and Biomaterials, CNR, Italy
Cinzia Toscano, Italian Aerospace Research Centre, Italy

15:30 Shape Memory Alloy-based actuator: experimental and modelling
Aniello Riccio, University of Campania "Luigi Vanvitelli", Italy
Salvatore Saputo, University of Campania "Luigi Vanvitelli", Italy
Mauro Zarrelli, Institute for Composite and Biomedical Materials, CNR, Italy
Andrea Sellitto, University of Campania "Luigi Vanvitelli", Italy
Carmine Napolitano, University of Campania "Luigi Vanvitelli", Italy
Valerio Acanfora, University of Campania "Luigi Vanvitelli", Italy

16:00 - 17:00 CEST
SESSION 9.1
Special Session - Measurements in the research of aerodynamics and control of drones
Room: Virtual Room #1
Chairs: Zbigniew Czyż, *Military University of Aviation, Poland*
Jerzy Józwik, *Lublin University of Technology, Poland*
Dariusz Mika, *The State School of Higher Education in Chełm, Poland*

16:00 Wind tunnel investigation of the propellers for unmanned aerial vehicle
Zbigniew Czyż, Military University of Aviation, Poland
Paweł Karpiński, Lublin University of Technology, Poland
Krzysztof Skiba, Lublin University of Technology, Poland

16:15 Vibration study of an Aircraft Diesel Opposed Piston Engine
Michał Jan Gęca, Lublin University of Technology, Poland
Grzegorz Barański, Lublin University of Technology, Poland
Łukasz Grabowski, Lublin University of Technology, Poland
Nanthagopal Kasianantham,Vellore Institute of Technology, India

16:30 Experimental study of propellers for the electric propulsion system
Zbigniew Czyż, Military University of Aviation, Poland
Paweł Karpiński, Lublin University of Technology, Poland
Krzysztof Skiba, Lublin University of Technology, Poland

16:45 Measurement system for small propeller propulsion

Jacek Pieniazek, Rzeszow University of Technology, Poland
Piotr Ciecinski, Rzeszow University of Technology, Poland

16:00 - 16:30 CEST

SESSION 9.2

Special Session - GARFIELD – General Aviation Research and Development. Metrology, Methods and Instrumentation

Room: Virtual Room #2

Chair: Jaroslaw Pytka, *Lublin University of Technology, Poland*

16:00 IMUMETER – AI-Based Sensor for Airplane Motion Measurements

Jarosław Pytka, Lublin University of Technology, Poland
Piotr Budzyński, Lublin University of Technology, Poland
Paweł Tomiło, Lublin University of Technology, Poland
Jan Laskowski, Lublin University of Technology, Poland
Joanna Michałowska, The State School of Higher Education, Poland
Ernest Gnapowski, University College of Administration and Enterprise, Poland
Dariusz Błażejczak, West University of Technology in Szczecin, Poland
Andrzej Łukaszewicz, Bialystok University of Technology, Poland

16:15 Simulation Researches of the PROPWING Airplane Propulsion System

Rafał Kliza, Lublin University of Technology, Poland
Mirosław Wendeker, Lublin University of Technology, Poland
Jan Pytka, Military University of Aviation, Poland
Piotr Kasprzak, Military University of Aviation, Poland

16:00 - 17:00 CEST

SESSION 9.3

General Session - Part V

Room: Virtual Room #3

Chair: Giancarmine Fasano, *University of Naples Federico II, Italy*

16:00 Perception fields: analysing distributions of optical features as a proximity navigation tool for autonomous probes around asteroids

Marco Zaccaria Di Fraia, Cranfield University, UK
Luke Feetham, Cranfield University, UK
Leonard Felicetti, Cranfield University, UK
Joan-Pau Sanchez, Cranfield University, UK
Lounis Chermak, Cranfield University, UK

16:15 AMPERE: exploiting Galileo for electrical asset mapping in emerging countries

Giancarmine Fasano, University of Naples "Federico II", Italy
Flavia Causa, University of Naples "Federico II", Italy
Roberto Opromolla, University of Naples "Federico II", Italy
Marcello Asciolla, University of Naples "Federico II", Italy
Marco Nisi, Free Soft & Tech S.R.L., Italy
Leonardo Pozzoli, Free Soft & Tech S.R.L., Italy
Marco Lisi, Free Soft & Tech S.R.L., Italy
Alberto Mennella, Topview S.R.L., Italy
Graziano Gagliarde, Topview S.R.L., Italy
Gianluca Luisi, Topview S.R.L., Italy
Pere Molina, Geonumerics S.L., Spain
Marta Blàzquez, Geonumerics S.L., Spain
Ismael Colomina, Geonumerics S.L., Spain
Pedro Cabrera, National University Pedro Henriquez Urena, Dominican Republic
Gustavo Rodriguez, National University Pedro Henriquez Urena, Dominican Republic
Riccardo Poggi, Business Integration Partners Belgium, Belgium
Luigi Lisi, Business Integration Partners Belgium, Belgium
Giulia Fagioli, Business Integration Partners Belgium, Belgium
Roberto Muscinelli, Business Integration Partners Belgium, Belgium

16:30 Design of 3D printed holder for quartz crystal microbalances

Diego Scaccabarozzi, Politecnico di Milano, Italy
Bortolino Saggin, Politecnico di Milano, Italy
Marianna Magni, Politecnico di Milano, Italy
Pietro Valnegri, Politecnico di Milano, Italy
Marco Giovanni Corti, Politecnico di Milano, Italy
Ernesto Palomba, Istituto di Astrofisica e Planetologia Spaziale INAF-IAPS, Italy

Andrea Longobardo, Istituto di Astrofisica e Planetologia Spaziale INAF-IAPS, Italy
Fabrizio Dirri, Istituto di Astrofisica e Planetologia Spaziale INAF-IAPS, Italy
Emiliano Zampetti, Consiglio Nazionale delle Ricerche CNR, IIA-CNR, Italy

16:45 Validation Flight Experiment for a Sounding Balloon Photovoltaic-based Attitude Determination System

Giuseppe Cataldi, Università di Pisa, Italy
Matteo Gemignani, Università di Pisa, Italy
Salvo Marcuccio, Università di Pisa, Italy

17:15 - 17:30 CEST
AWARD AND CLOSING CEREMONY
Room: Virtual Room #1