BILBAO, Spain
21-27 August 2022

Programme

cirp2022.org

CIRP Bilbao 2022

The 71st CIRP General Assembly

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Welcome.

Dear CIRP Colleagues, Friends and Guests,

Welcome to the **71st CIRP General Assembly** (GA) in the city of Bilbao, Spain from 21 to 27 August 2021 organized by the Spanish CIRP delegation. After a hiatus of two years due to the COVID Pandemic, the CIRP family meets face to face again to recover the traditions and the enlightening discussions that we have longed for. The technological solutions and the effort of our colleagues from TU Munich have allowed us to continue with our activity, but on the road we have lost the possibility of discussing with our colleagues while enjoying a beer in any biergarten of Munich or a sunset in the English Bay of Vancouver. This year we will partially recover these traditions thanks to the hybrid format that will be used for the first time in the CIRP General Assembly.

The GA promises to be an intellectually stimulating and vibrant event with world-renowned scientists / academics and industrial experts presenting the latest advancements in production engineering. It will also provide an international platform to discuss novel ideas and form new partnerships for research. In these uncertain times, the CIRP community proposes a global collaboration to address the challenges related to sustainability and digitalization in manufacturing.

After 20 years, the GA returns to Spain. Bilbao, one of the cradles of the Spanish Industry, welcomes the CIRP community. The city has reshaped its landscape from the old cranes of the shipyards to the titanium cover of Guggenheim Museum, but maintains its strong link to manufacturing. The GA will showcase the manufacturing ecosystem of this area including the industry, a strong research center network (BRTA) and leading Universities in manufacturing. Present day Bilbao is the most populous city of northern Spain, which boasts a diversified economy encompassing the manufacturing, service, education and technology sectors.

Located in the Basque Country, the city and the Basque provinces offer an interesting cultural experience with exceptional contemporary and heritage attractions to explore and taste, which are reflected in the accompanying persons' program. The Accompanying Persons' program will present a mix of Basque heritage, nature, modern art and gastronomic experiences.

We have no doubt that you will have a productive week and wish you a very pleasant and enjoyable assembly in Bilbao or connected to Bilbao!



Dr. Jokin MUÑOA
jmunoa@ideko.es

Acknowledgements.

The Organising Committee are grateful to the CIRP community for selecting the city of Bilbao as the venue for the 71st CIRP General Assembly. We are delighted that you attend the GA!

We would like to thank the CIRP President and CIRP Office for their guidance and assistance throughout the preparation of the event:

CIRP President:
Professor Hans Hansen

CIRP Office:
Mrs. Chantal Timar-Schubert
(Assistant Secretary General)

Ms. Agnes Chelet
(CIRP Accountant)

Our sincere thanks to all members of the organising committee and the entire Spanish CIRP delegation for their commitment and support during the preparation of the GA.

Our special thanks go to all the CIRP colleagues and authors of the technical papers and keynotes, which exemplify world-class research. We also appreciate the efforts of our Research Affiliates and Corporate Members in attending as well as contributing to the GA.

We would like to express our gratitude to the sponsors from industry that contribute financially and exhibit exciting research, ideas, and products.

Finally, our deep thank to the public institutions from the Basque Government and the Bilbao council for their advice, support, and financial help.

Organisers.

IDEKO

https://www.ideko.es/en/home

IDEKO is a Research Center, member of the Basque Research Technology Alliance, with more than 35 years dedicated to Research, Development and Innovation of new technologies applied to Advanced Manufacturing. Its R&D+ i activity is aimed at offering innovative solutions that contribute to the competitiveness of the industry and is articulated around 4 research groups: Dynamics and Control, Manufacturing Processes, ICTs and Automation and Design and Precision Engineering.

MONDRAGON UNIBERTSITATEA, FACULTY OF ENGINEERING

https://www.mondragon.edu/en/faculty-of-engineering

Mondragon Unibertsitatea is a practical university immersed in business reality that combines training, research and knowledge transfer to improve the competitive position of companies and organisations.

- The university has a solid research and transfer model articulated around real cooperation with companies.
- More than half of the research funds are private research contracts.
- It is ranked on the top of the list of European universities in knowledge transfer by U-Multirank.

TEKNIKER

https://www.tekniker.es/en

Tekniker is a technology centre specialised in Advanced Manufacturing, Surface & Product Engineering, and ICTs for manufacturing. Its mission is geared towards fostering growth and wellbeing through R&D&I actions aimed at society and enhancing competitiveness in the business fabric in a sustainable manner. Tekniker is a member of the Basque Research and Technology Alliance (BRTA).

UNIVERSIDAD DE ZARAGOZA

https://eina.unizar.es/en

The School of Engineering and Architecture (EINA) of the University of Zaragoza is located in the top positions of the university, professional and teaching innovation rankings, with more than 4500 students, 700 professors and 160 administration and services professionals. In 2002, the research capacity of a good part of the university groups of the EINA was grouped together with others of other faculties to create the Engineering Research Institute of Aragon (I3A), with more than 400 professionals and 33 research groups in Biomedical Engineering, Information and Communication Technologies, Processes and Recycling and Industrial Technologies.

Sponsors.

Diamond sponsor

DANOBAT GROUP

https://www.danobatgroup.com/en

Danobatgroup is an industrial group specialized in the development of advanced manufacturing solutions for the most demanding industrial sectors, and a benchmark in machines, automation, turnkey solutions, and advanced services in machine tools. The group, which belongs to the MONDRAGON Corporation, has more than 65 years' experience in the application of technologies geared towards manufacturing, especially in the fields of grinding, turning, milling, boring and multifunction machines. Its offer is marketed under Danobat, Danobat-Overbeck, Hembrug, Soraluce, Goimek and Latz brands.

DMG MORI

https://en.dmgmori.com/

DMG MORI is a worldwide leading manufacturer of machine tools. Integrated automation and end-to-end digitization solutions extend our core business with turning and milling machines, Advanced Technologies and Additive Manufacturing. With modular products, we enable an easy, fast, scalable entry into digital manufacturing as well as end-to-end digitization. In the "Global One Company", around 12,000 employees are in direct contact with over 100,000 customers from 55 industries.

MITUTOYO EUROPE GMBH

https://mitutoyo.eu/en_us

Since 1934 Mitutoyo is manufacturing top-quality measuring products, dimensional and in-line metrology. Today´s portfolio covers more than 9,000 items-from handheld tools to state-of-the-art CNC coordinate measuring machines and ground-breaking in-line solutions. Mitutoyo offers calibration, repair, product and metrology training as well as IT support for the sophisticated software used in modern measuring technology. We can also design, build, test, and deliver bespoke measuring solutions and even if deemed cost-effective, take your critical measurement challenges in-house on a sub-contract basis.

Gold sponsor

BRTA

https://www.brta.eus/en/home

BRTA is an alliance formed by 17 research and technology centres: bioGUNE, nanoGUNE, biomaGUNE, energiGUNE, Azterlan, Azti, Ceit, Cidetec, Gaiker, Ideko, Ikerlan, Leartiker, Lortek, Neiker, Tecnalia, Tekniker and Vicomtech, with the support of the Basque Public Administration. The mission of BRTA is to provide science and technology based solutions to the needs and challenges of the Basque industry. BRTA aims to strengthen collaboration between its members and improve technology transfer to companies in order to increase their competitiveness.

MODULEWORKS

https://www.moduleworks.com/

ModuleWorks was founded in 2003 as a provider of CAD/CAM software components. As the world's leading supplier of 3-5 axis machining and simulation technology, many of the innovative ModuleWorks products stem from in-house research as well as collaborative projects with companies, institutions and universities around the globe. As an active CIRP member since 2013, ModuleWorks promotes effective collaboration between academia and industry as one of the essential cornerstones of technological advancement to anticipate market requests and deliver high-quality products.

Silver sponsor

ALDAKIN

http://www.aldakin.com/

ALDAKIN provides automation and industrial robotics services to industrial companies in sectors such as automotive, aeronautics, machine tools, wind energy and a wide range of other sectors. The company carries out technological engineering solutions that include industrial automation through PLCs and robotic cells with or without artificial vision. ALDAKIN have developed projects in quarries, biomass or biodiesel plants, hydroelectric power plants, line programming in the automotive or aeronautical sector. ALDAKIN also have a section dedicated to industrial robotics and collaborative robotics.

FAGOR AUTOMATION

https://www.fagorautomation.com/en/

FAGOR AUTOMATION is a company with great experience in the development and manufacturing of products for machine automation and control. It excels by its capability to develop software and the versatility of its productive process to offer solutions tailored to the needs of their customers. Historically, we at FAGOR AUTOMATION have focused our efforts on the machine-tool sector where we are one of the world leaders. Besides, its wide technical and sales network spread out in more than 50 countries through its own branch offices and distributors.

KISTLER

https://www.kistler.com/en/

Kistler presents first wireless RCD equipped with piezoelectric sensor. Kistler brings to market the first wireless RCD (rotary cutting dynamometer) with a piezoelectric sensor. It allows for highly accurate measurements of cutting forces in various machining applications. Part of the measurement system will be a new platform (software and hardware) which performs automated analyses to help increase the efficiency of processes. In the future, the analogue outputs and digital I/O will enable direct communication with machines and robots not only to monitor but also to control processes.

MAHER HOLDING

https://www.maherholding.es/en

MAHER HOLDING is an industrial group that brings great value to the machine tool sector through a portfolio of simple solutions orientated to complex market needs. Solutions based on robust and tested technology, that is easy to use and flexible, designed always with the user in mind. MAHER HOLDING is characterised by great agility in the design and implementation of innovative business models throughout its long history.

RENISHAW

https://www.renishaw.com/en/renishaw-enhancing-efficiency-in-manufacturing-and-healthcare--1030

Renishaw is a global, high precision metrology and healthcare technology group. We design, develop and deliver solutions and systems that provide unparalleled precision, control and reliability. We are also a world leader in the field of additive manufacturing (metal 3D printing), where we design and produce industrial machines which 'print' parts from metal powder. From transport to agriculture, electronics to healthcare, our breakthrough technology transforms product performance. We have more than 79 offices in 37 countries, with over 5,000 employees worldwide.

ZAYER

http://www.zayer.com/en/

ZAYER has been manufacturing milling machines in Vitoria-Gasteiz since 1957, with the highest quality and most advanced technology. We provide our products with the maximum accuracy, based on the continuous development of new technologies and customised solutions, tailored to our customers' needs.

SIKULAN

https://sikulan.com/en/

Specialising in precision mechanics, SIKULAN has over 40 years' experience in manufacturing cutting tools, and in designing and manufacturing fastening and precision machined devices. Our vocation, experience, expertise and flexibility mean we can offer bespoke solutions with absolute reassurance. The strategic locations of production plants in the Basque Country - Spain and an office in Querétaro - Mexico allow us to develop a close relationship with our customers, offering them full reassurance in leading countries on the European and American markets. SIKULAN is specialized in the design and production of dampened boring bars and special tools for automotive, aerospace, railway and energy sectors.



EXHIBITORS

AFM CLUSTER

https://www.afm.es/en/home

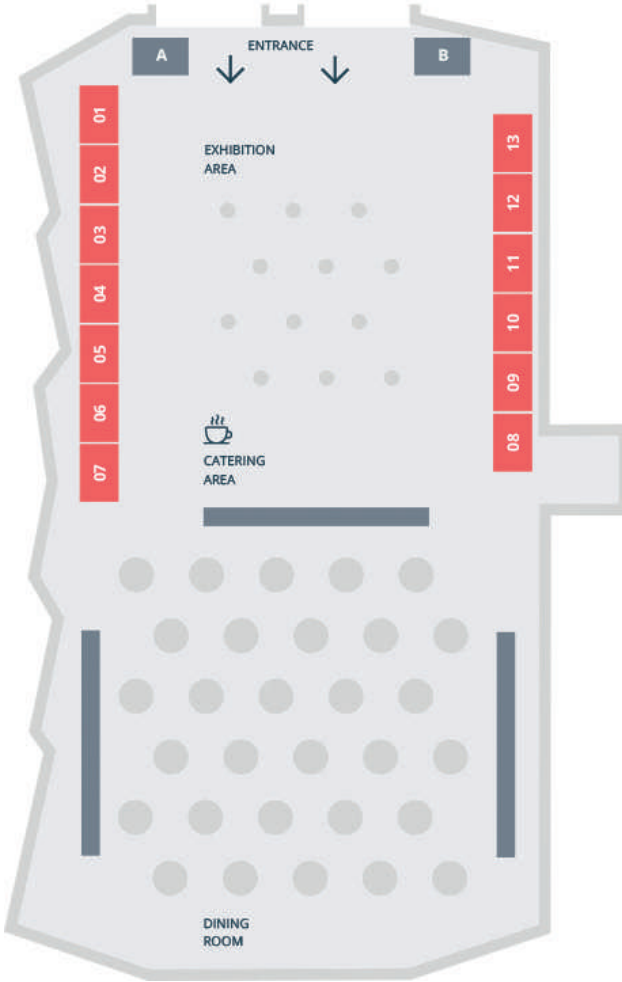
AFM CLUSTER is the organisation that represents the interests of Advanced Manufacturing in Spain. Consisting of six industrial associations, it groups together more than 600 companies that employ more than 16,500 people and account for over 3 billion euros in revenue. The six interrelated and synergistic sectors served by AFM CLUSTER are as follows: machine tools and advanced manufacturing technologies (AFM), additive manufacturing and 3D printing (ADDIMAT), hand tools, hardware and industrial supply (ESKUIN), contract manufacturing and mechanical engineering (AFMEC), smart manufacturing technologies and services (STECH) and technology-based companies and start-ups (UPTEK).

SAINT-GOBAIN ABRASIVES

https://www.saint-gobain-abrasives.com/en-sea

Saint-Gobain Abrasives, the world's leading manufacturer of abrasives, offers powerful, precise and user-friendly solutions enabling customers to shape and surface-finish all types of materials even in the most complex and challenging applications across a diverse range of markets. As the technology leader, Saint-Gobain Abrasives sits at the forefront of the industry providing highly engineered, high-performance value-adding abrasives, thanks to its continual investment in R&D and close collaboration with customers. This strong commitment ensures that exciting new products are continuously introduced which offer substantial customer benefits - helping to improve process productivity and reshape the world of abrasive solutions.

Location plan.



Luxua room, level 3

Booth / Company

01
Sikulan

02
Aldakin

03, 04
Mitutoyo

05, 06
Dmg Mori

07
Zayer

08
ModuleWorks

09
Kistler

10, 11
DanobatGroup

12
Renishaw

13
Fagor Automation

A
AFM Cluster

B
Saint-Gobain Abrasives

CIRP Council 2022.

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Professor H. Hansen

Vice President
Professor B. Lauwers

Vice President Elect
Elect Professor F. Fang

Past President
Professor M. Mitsuishi

Secretary General Treasurer
Professor D. Dumur

Technical Secretary
Professor K. Erkorkmaz

Council Members
Professor J. Aurich
Professor M. Hauschild
Professor M. Kunieda
Professor E. Lutters
Professor S. Smith
Professor T. Tolio

Editorial committee.
CIRP Annals

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J. Cao
M. Davies
J. Duflou
K. Erkorkmaz
X. Jiang
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D. Lucca
R. M'Saoubi
P. Martins
N. Michailidis
K. Rajurkar
R. Roy
J. Vancza (Vice-Chairman)

Liaison Committee.

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STC C	D. Biermann	S. Melkote	P. Arrazola
STC Dn	R. Stark	T. Tomiyama	N. Anwer
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STC G	H. Yamaguchi	C. Heinzel	E. da Silva
STC M	A. Matsubara	M. Zaeh	K. Erkorkmaz
STC O	G. Lanza	T. Tolio	A. Nassehi
STC P	A. Donmez	A. Archenti	Y. Takaya
STC S	B. Mullany	R. Leach	G. Tosello

Others

Cross-STCs	J. Aurich	E. Lutters (co-chairmen)	
Terminology Cttee	R. Schmitt	M. Urgo	F. Laroche
CMAG	M. Fujishima	Y. Murtezaoglu K. Erkorkmaz	L. Uriarte
CIRP Annals	S. Kara	J. Vancza	
CIRP JMST	B. Karpuschewski (Editor-in-chief)		
CIRP Encyclopedia	T. Tolio (Editor-in-chief)		

Organising committee.

Chairperson



Dr. Jokin Muñoa
Ideko

Vicechairpersons



Dr. Pedro J. Arrazola
Mondragon Unibertsitatea



Dr. Luis Uriarte
Tekniker



Dr. Jose Antonio Yagüe-Fabra
Universidad de Zaragoza

Accompanying Person Programme



Mertxe Uzkudun
Ideko



Amaia Murua

Team members



Dr. Ana Aranzabe
Tekniker



Dr. David Barrenetxea
Ideko



Dr. Xavier Beudaert
Ideko



Dr. Lander Galdos
Mondragon Unibertsitatea



Dr. Aitor Madariaga
Mondragon Unibertsitatea



Dr. Unai Mutilba
Tekniker



Dr. Ramón Uribe-Echeberria
Ideko

Practical information.

Venue
Bilbao Exhibition Center
Azkue, 1. Barakaldo
(+34) 944 040 000

Date
21 to 27 August 2022

Opening Hours:
Date time
Sunday, 21 August, 17:00 - 20:30
Monday, 22 August, 08:00 - 19:00
Tuesday, 23 August, 08:00 - 18:30
Wednesday, 24 August, 08:00 - 18:00
Thursday, 25 August, 08:00 - 18:30
Friday, 26 August, 08:00 - 18:00
Saturday, 27 August, 08:00 - 16:30

Parking
BEC Car Park is located underneeth the venue and has 4000 spaces located on 3 different levels. Each area is divided into three areas identified by colours.

The best option to park is the blue area, located under Halls 1 and 2. If you are willing to book a parking space or to find out more information, visit: https://bilbaoexhibitioncentre.com/en/parking/

On-site Registration Fees
Access to all General Assembly sessions and activities will only be permitted subject to registration. All prices and transactions are in Euros (€).

Delegate part I & II: 1100€
Delegate part I: 750€
Accompanying person part I & II: 750€
Accompanying person part I: 550€
Accompanying person kids part I & II: 375€
Accompanying person kids part I: 275€

On-site registration for the accompanying person programme and acompanying person kids will be subject to availability and is not guaranteed. Please ask staff at the Enquiries Desk.

Changes between delegate and accompanying person programmes are not allowed.

Individual tickets for the Welcome Reception, Assembly Dinner and Farewell Dinner will be available.

Tickets for the Dinners must be booked at least **a day** before the event:

Extra ticket for the Assembly Dinner: 120€
Extra ticket for the Farewell Dinner: 120€
Extra ticket Kids for the Assembly Dinner: 60€
Extra ticket Kids for the Farewell Dinner: 60€

Payments for on-site registration can be made in cash (€) and credit card.

Accepted credit cards: VISA, Mastercard.

Items included in the fees

Delegate Part I & II
Attendance at all sessions from 21st to 27th August, programme booklet, conference bag, documentation, certificate of attendance, lunches and coffee break refreshments during conference days, Welcome Reception on Sunday 21st August.

Assembly Dinner on Wednesday 24th August and go and return transportation from Hotel Puerta de Bilbao.

Farewell Dinner on Saturday 27th August and go and return transportation from Plaza de Museo de Bellas Artes, 5, (Bus stop) Bilbao and Hotel Puerta de Bilbao.

Delegate Part I only
Attendance at all sessions from 22nd to 24th August, programme booklet, conference bag, documentation, refreshments, lunches and coffee break refreshments during conference days, Welcome Reception on Sunday 21st August.

Assembly Dinner on Wednesday 24th August and go and return transportation from Hotel Puerta de Bilbao.

Accompanying Person Part I & II
Attendance at the Opening Session on Monday 22nd August, participation in the planned tours with lunches included from Monday 22nd to Friday 26th August, programme booklet, conference bag, Welcome Reception Sunday 21st August, Opening Session on Monday 22nd August, Assembly Dinner on Wednesday 24th August and go and return transportation from Hotel Puerta de Bilbao and Farewell Dinner on Saturday 27th August and and go and return transportation from Plaza de Museo de Bellas Artes, 5, (Bus stop) Bilbao and Hotel Puerta de Bilbao.

Accompanying Person Part I only
Attendance at the Opening Session on Monday 22nd August, participation in the planned tours with lunches included from Monday 22nd to Wednesday, 24th August, programme booklet, conference bag, Welcome Reception Sunday 21st, Opening Session on Monday 22nd August and Assembly Dinner on Wednesday 24th August and go and return transportation from Hotel Puerta de Bilbao.

Accompanying Person Kids* Part I & II
Attendance at the Opening Session on Monday 22nd August, participation in the planned

tours with lunches included from Monday 22nd to Friday 26th August, programme booklet, conference bag, Opening Session on Monday 22nd August, Assembly Dinner (kids menu) on Wednesday 24th August, lunch and Farewell Dinner (kids menu) on Saturday 27th August and return transportation from the BEC to the Farewell Dinner venue.
* Valid for up to 12 years

Accompanying Person Kids* Part I only
Attendance at the Opening Session on Monday 22nd August, participation in the planned tours with lunches included from Monday 22nd to Wednesday, 24th August, programme booklet, conference bag, Opening Session on Monday 22nd August and Assembly Dinner (kids menu) on Wednesday 24th August.
* Valid for up to 12 years

Badges

The name badges are coloured to indicate the attendee / registration type, as follows:

Attendee type badge colours
Delegate for Part I & II:Blue-gray
Delegate for Part I only: Imbrex red
Delegate for Part II only: Maroon
Accompanying Person for Part I & II: Turquoise
Accompanying Person for Part I only: Lilac
Accompanying Person for Part II only: Light yellow
Organising Committee and staff: Green
Exhibitor staff: Yellow
Assembly Dinner ticket: Sky blue
Farewell Dinner ticket: Salmon

Registration documents and badges are issued at the Registration Desk in the GA venue. For security purposes, badges must be worn at all time inside the Convention Centre and during all of the CIRP GA 2022 sessions, including the social events and Accompanying Person programme. Only people wearing the official CIRP GA 2022 name badges will be admitted to the CIRP meetings, lunches, refreshments, social events and Accompanying Person programme.

Emergency Contact

Delegates
+34 609 069 619 (Secretariat)

Available 21 - 27 August during the General Assembly
Opening hours only from 08:00 - 20:00h.

Scientific information
+34 618 92 63 44 (Xavier Beudaert)

Accompanying persons
+34 688 605 270 (Mertxe Uzkudun)

Emergency Calls

112: Main emergency number ambulance, police, fire service. This will work from any mobile phone.

Lunches

Lunches for the 22nd to 26th August will be served in Luxua Room on Level 3 of the BEC.

Lunch for the CMAG group on Tuesday 23rd August will be served in Luxua Room on Level 3 of the BEC into a designated area.

Coffee break

Coffee / tea and light snacks for delegates will be served during breaks in Luxua Room, Level 3 of the venue.

Computer Room

Room 5 is equipped with computers and a printer for delegates use from Monday 22nd August to Friday 26th August. There will also be space available for delegates to work in the room with laptops.

Photography

It is forbidden to take photos during the sessions. A profesional photographer will be in charge of taking the photos in following events: Welcome Reception, Opening Session, Assembly Dinner and Farewell Dinner.

Speakers' Presentations

All speakers are invited to check their presentation in room 5, where computers wil be available to download the presentations. In case you have any problem, a technician will be at your disposal to help you. You won't be able to upload your presentation directly in the room where you will present or connect your personal computer in it.

All conference rooms are equipped with a data/video projector, screen, PC with internet access, laser pointer, microphones and sound system. Presentation slides should be prepared in widescreen 16:9 format. If you wish to use your personal laptop, you should check in advance that it is compatible with the installed equipment (software, connectors and format).

IMPORTANT: The projector connector is HDMI. If you would like to use your own laptop with a different connector or if you use a Mac, please ensure that you bring along a suitable adapter.

Technical assistance will be available in all of the conference rooms.

Social programme transpotation

Assembly dinner, Euskalduna Palace
Wednesday, 24 August 2022
Transfer: Bus departure from:
- Hotel Puerta de Bilbao at 19:00

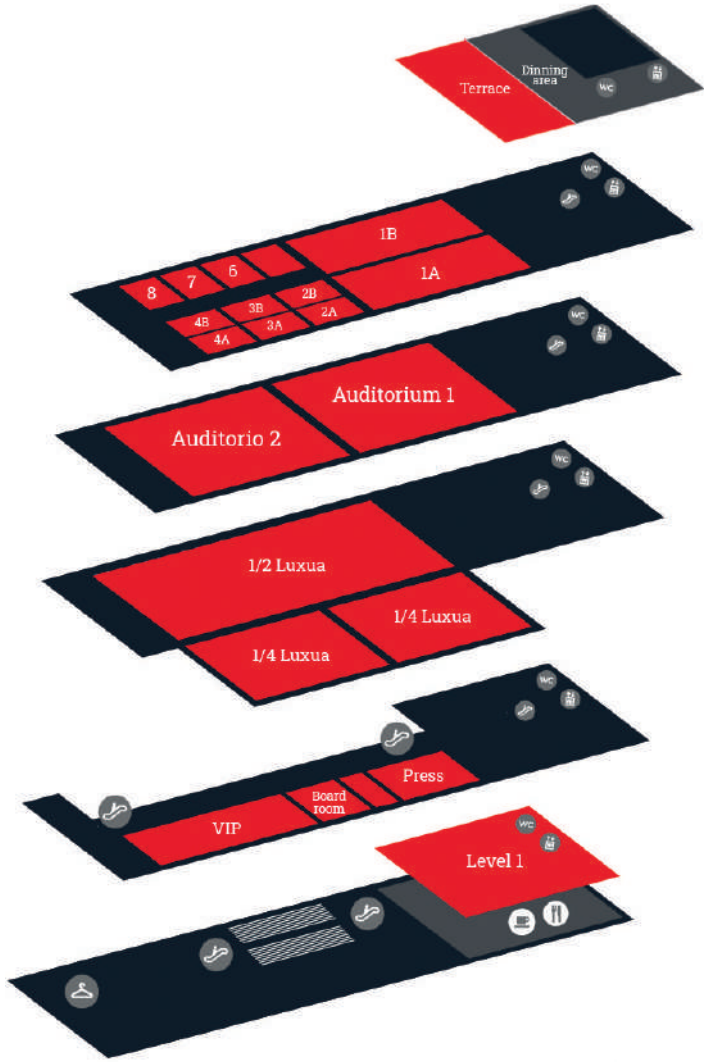
Farewell dinner, Loizaga Tower
Saturday, 27 August 2022
Transfer: Bus departure from:
- Plaza de Museo de Bellas Artes at 18:00
- Hotel Puerta de Bilbao at 18:00

Internet Access

Wi-Fi is available throughout the venue.

Network name: CIRP2022
Password: CIRP2022

Venue map / Floor plan.



Level 7

Level 5

Level 4

Level 3

Level 2

Level 1

Level	Room	Event
7	**Torre Bec**	Welcome reception.
5	**R1A**	Session room.
5	**R1B**	Session room.
5	**R2**	Session room.
5	**R3**	Session room, Liaison Committee, Research Affiliates Meeting.
5	**R4**	Session room.
5	**R5**	Computer room.
5	**R6**	Membership Cttees, Council Meeting.
4	**Auditorium**	Opening session, Keynotes, Session room. Presentation 72nd General Assembly in Dublin, Cross STC Meeting, General Meeting.
3	**Luxua**	Exhibition area, Coffee breaks and Dinning room.
2	**Board room**	Board meeting, CIRP office, President suites.
1	**Hall**	Registration desk.

General information.

Medical Assistance

Contact the reception desk at your hotel to ask for medical assistance or phone 112. If at the GA venue, please go to the Registration Desk and speak to staff on duty who will be able to source a first aider.

Security

Bilbao is a safe city with low criminality rates. However, street crime is often opportunistic, especially during those dates with Bilbaos' festivities, so making yourself less of a target, moving with purpose and being aware of your surroundings will go a long way to keeping you safe. Plan your route in advance. Carry a charged mobile phone and some cash, and tell someone where you're going. Keep your valuables including your mobile phone, other devices and jewellery, hidden. Try to avoid walking alone at night in places such as parks and side streets or any unfamiliar environment.

Drinking Water

Tap water is safe to drink anywhere in Spain unless mentioned otherwise. However, if you prefer, bottled mineral water is available for purchase at convenience stores, supermarkets, station kiosks, at the venue, etc.

Currency Exchange

The official currency in Spain is the EURO. Therefore it is the only currency accepted when paying by cash. Currency exchange service might be available at some hotels and banks. You can also change it in EuroChange Bilbao if you are at the City Centre.

Credit Cards, Debit Cards, Travellers' Cheques and ATMs

Major credit cards such as VISA and MasterCard are widely accepted in Spain, while cards such as Diners Club or American Express are only accepted by large retailers. Foreign issued debit cards may be accepted by Spain payment terminals but you are advised to check with the retailer before paying. Travellers' cheques are generally not accepted in most shops, restaurants or hotels in Spain. They have to be cashed at major banks, post offices or bureau de change outlets, usually at unfavourable rates.

There are many ATM machines for you to use across Spain and almost every bank has a cash dispenser. Cash machines can also usually be found in the venue and in some shopping centres.

Cards must have a chip and PIN in order to be accepted by ATMs in Spain.

Climate
The daily weather forecast can be found on the Bilbao's Meteorological Office website: https://www.aemet.es/es/eltiempo/prediccion/municipios/bilbao-id48020

Electricity / Power Supply
Spain's electrical grid uses a frequency of 50 Hz and a voltage of 230V. Appliances rated between 220V and 240V are safe to plug into Spanish sockets. It is not always safe to use equipment that is rated at a differents voltage. Depending on your country, you may require a power socket adapter.

Value Added Tax (VAT)
The VAT rate (consumption tax) for Spain is currently 21% for the majority of purchased goods and services.

Taxis
The different taxi companies that operate in Bilbao are:

Radio Taxi Bilbao:
+34 944 44 88 88

Tel Taxi Bilbao:
+34 944 10 21 21

Tipping
Tipping is entirely voluntary in Spain and it is not customary to leave 10 - 15% of the bill.

Smoking
Smoking is strictly banned in all indoor public places and at certain outdoor locations that are 'substantially enclosed', such as football grounds and covered walkways. It is also banned on all parts of a railway station, including open-air platforms. You are allowed to smoke outdoors, but always check surrounding areas for non-smoking signs.

Units of Measurement
The metric system is used in Spain (kg, g, l, m, km, etc.) Temperature in Celsius.

Liability / Insurance
The Organising Committees and/or Conference Organisers cannot accept any responsibility for personal injuries or losses / damage to private property of registered delegates as a result of any cancellations, accidents, illness or other occurrences that may arise in connection to the General Assembly. Delegates are strongly advised to take out their own appropriate travel and medical health insurance prior to travelling.

Covid.

Situation

The situation of the Covid19 pandemic in Bilbao and the Basque Country is under control, the number of covid infections and hospitalizations is reducing rapidly after peaking in mid-July due to the new omicron variants (BA.4&BA.5). Vaccination rate is very high and most infected people develop mild to moderate illness and recover without hospitalization. ICU occupancy due to Covid cases is well below 10%. You can track the situation in Basque Country in the next page:
https://www.euskadi.eus/boletin-de-datos-sobre-la-evolucion-del-coronavirus/web01-a2korona/es/

Covid measures

In Spain, it is mandatory to wear face masks in any public transportation (including metro, tram, buses and taxis), medical centers, hospitals and pharmacies. Eating and drinking on public transport is not permitted.

BEC, the venue, has a good ventilation (ID1) similar to that commonly used in hospitals, medical centers and laboratories, and assures the highest air quality category thanks to a high frequency 100% external air renewal. During the pandemic, BEC has been awarded for their anti-covid protocols. In addition, the organization will measure the quality of the ventilation by means of CO2 meter to assure a good air quality and avoid infections.

During the conference, the use of face mask will not be mandatory following the actual legislation of Spain, but there will be face masks available in the reception of the Conference for those participants willing to use it. The use of face mask is recommended for high-risk groups.

What to do in case of symptoms

The most common symptoms of the recent COVID-19 variants are sore throat, tiredness, fatigue, headache, dry cough and fever. In most cases, these symptoms are mild and might cause difficulties to continue with ordinary activities during a couple of days. If you have any symptoms you are strongly advised to wear a properly fitted FFP2 o N95 mask that are available in the reception of the conference to avoid infecting others.

Rapid COVID test are available in any pharmacy and also in the reception of the conference. If you have tested positive, the organization recommends self-isolation. The organization will provide a link for online participation.

If the symptoms of COVID-19 get worse and you start feeling very unwell, particularly under abnormal breathing pattern the breathing change or feel that you are getting increasingly short of breath, the organization has a phone number to support you in this situation and manage the contact with the emergency services and hospitals (+34 688 605254). In any case, the local phone number for emergency services is (+34 112).

Reference links

Covid situation in Bilbao area:

Hospitals and ICU situation in Spain (in Spanish):
https://www.rtve.es/noticias/20220729/ocupacion-camas-covid-19-hospitales-espanoles/2042349.shtml

Epidemiology bulletin (in Spanish):
https://www.euskadi.eus/boletin-de-datos-sobre-la-evolucion-del-coronavirus/web01-a2korona/es/

What to do in case of symptoms (in Spanish):
https://www.euskadi.eus/como-actuo/web01-a2korona/es/

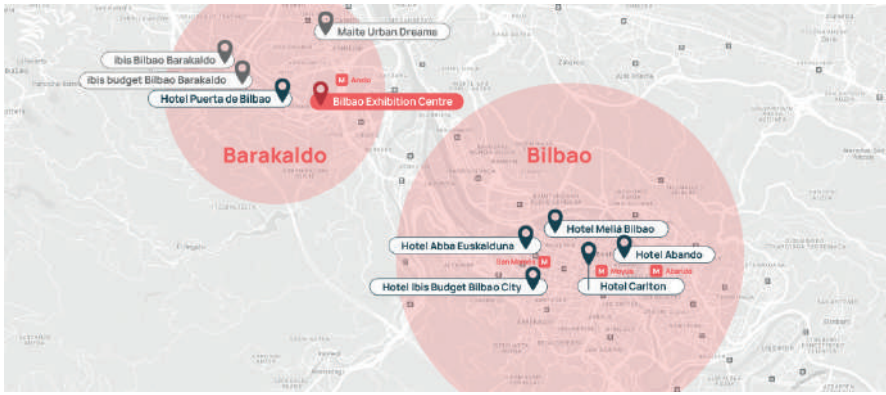
Generic WHO information on the virus (English)
Worldwide epidemiology update:
https://www.who.int/publications/m/item/weekly-epidemiological-update-on-covid-19---27-july-2022

Advice for public:
https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public


MAIN SHOPPING AREAS / AXES COMMERCIAUX
Central Bilbao / Bilbao Centre :
Pedestrian shopping areas / Commerciale piétonnière
Shopping areas / Commerciale
Gastronomy / Hôtellerie et Restauration
Culture and Art / Culture et Art
Bilbao Nightlife / La Nuit de Bilbao
Old Town / Vielle Ville :
Shopping, sightseeing and gastronomy / Commerciale, monuments et gastronomie
CONVENTIONAL SIGNES
SIGNES CONVENTIONNELS
Tourist Office / Office du Tourisme
Parking / Parking
Health Center / Centre de Santé
Church / Église
Petrol Station / Station Service
Bicycles Road / Piste Cyclable
Metro Stop / Arrêt de Metro
Euskotren Stop / Arrêt de Euskotren
Renfe Stop / Arrêt de Renfe
FEVE Stop / Arrêt de FEVE
Funicular / Funiculaire
Tramway Stop / Arrêt de Tramway
Airport Bus / Bus Aéroport
Taxi / Taxi
Museum / Musée
Lifts or scalators / Elevateur
Bus parking / Parking autobus
E. 1: 12.500
TÚNEL ARTXANDA - LA SALVE
TÚNEL LA SALVE - UGASKO
AV. MAURICE RAVEL
ARTATZAMINA
MANDOBIDE
CASTAÑOS
TRISTÁN LEGUIZAMÓN
HUERTAS
FONTECHA SALAZAR
AV. Guardia Civil
A.P.B.
C.P.
PL. LA SALVE
PASEO CA
Puente La Salve
Río
Aldabe
Residencia Siervas de Jesús
AVENIDA UNIVERSIDADES
DE LOS INGLESES
Uribitar
MUELLE CAMPA
Puente Pedro Arrupe
Guggenheim
ABANDOKO ERREPUBLIKAREN PARKEA
Tourist Bus
ALAMEDA MAZARREDO
HEROS
COSME ECHEVARRIETA
BARRENCUA
JUAN DE AJURIAGUERRA
ABAN
RAMON RUBIAL
PARQUE REPÚBLICA DE ABANDO
Puente de Deustu
ABANDOIBARRA
PLAZA EUSKADI
Club Deportivo
PL. S. JOSÉ
C.C. Zubiarte
Abandoibarra
LEHENDAKARI LEIZAOLA
PS. EDUARDO VICTORIA DE LECEA
PL. MUSEO
PL. CHILLIDA
ALDA. CONDE ARTECHE
P.P. TEOFILO UGUARO
COLÓN DE LARREATE
Subd. del Gobierno
PLAZA MOYUA
MAXIMO AGUIRRE
A.I.S.S.
Hacienda
DR. ACHUCARRO
GRAN VÍA DON DIEGO LÓPEZ DE HARO
PASEO ESTUARIO
CLAVE SALA
ESTRAUNTZA
PL. CAMPUZANO
GARCIA RIVERO
Polideportivo
Euskalduna
PS. JOSE ANSELMO CLAVE
PL. SAGRADO CORAZÓN
Gobierno Vasco
Ertzaintza
Ambulatorio
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Jefatura Superior Policía
ALCALDE
Hospital Cruz Roja
MUELLE RAMÓN DE LA SOTA
AVENIDA
RODRIGUEZ ARIAS
GREGORIO DE LA REVILLA
MANUEL ALLENDE
ALAMEDA DE URQUIJO
AVENIDA DOCTOR
LDO. POZA
PL. VICTOR CHAVARRI
PL. B. ECHANIZ
Map of Bilbao city centre.

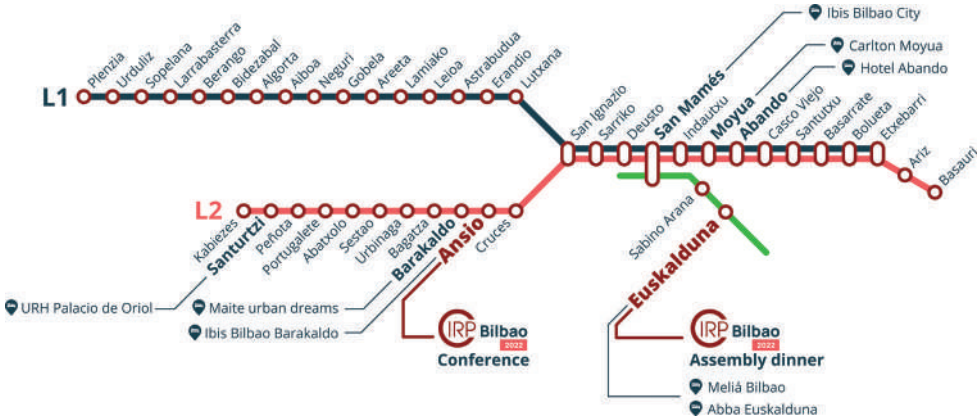

Funicular de Artxanda
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P. DE VIANA
AV. ZUMALACARREGUI
AVENIDA ZUM
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Campos de Mallona
CAMINO POLVORIN
AMADEO DEPRIT
MEDICO M. PEDRO CORTES
M. AGUIRRE
VIRGEN
BATALLA DE LEPANTO
TRAV. MALLONA
CALZADAS DE MALLONA
BARRIO LA CRUZ
BERROJALBIZ
JULITA
GRUPO STO. D. DE GUZMAN
C. Viejo
Calzadas de Mallona
Casco Viejo
Banco de Bilbao
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PL. M. UNAMUNO
ITURRIBIDE
ZUMA
Zubizuri
Bilboats
PASEO URIBITARTE
P. Baroja
PL. PIO BAROJA
NERBIOI
Aduana
Ayunt.
PLAZA VENEZUELA
ACEBAL
ISOZAKI ATEA
PL. DE LA CONVIVENCIA
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Pte. del Ayuntamiento
SENDEJA
ESPERANZA
VDA. DE EPALZA
PASEO DEL ARENAL
Pte. del Arenal
PL. S.N. BERRIA
ASKATASUNA
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ARENAL
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Pte. de La Ribera
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PARQUE MIRIBILLA
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TENOR CONSTANTINO
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Palacio de Justicia
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M. Unamuno
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Escuela Univers. Estudios Empresariales
BERTENDONA
Correos
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ALAMEDA RECALDE
ALAMEDA DE URQUIJO
ALAMEDA DE MAZAROSA
ALAMEDA DE RECALDE
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Ertzaintza
Zabálburu
P.M. ARTOLA
NICOLAS ALCORTA
PICASSO
PABLO IRALA
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Baralkaldo - Bilbao.





Metro Bilbao.



Public Transportation

Due to COVD 19 pandemic, it is mandatory to wear a face mask in the public transportation.

The BEC is well connected to Bilbao City centre. Subway L2 line (Basauri-Kabiezes) service takes 20 minutes (12 stops) while the car ride is about 10 minutes from the city centre.

The Ansio metro station (line 2) is in front of BEC.

Free metro card

Together with your documentation you will receive a metro card to travel from BEC (venue) to the Center of Bilbao, topped up with 12 journeys for those who registered to part I & II and 6 journeys for those who have registered to part I.

In case you need more journeys, you will be able to charge your card in any of the Metro Bilbao station's machines.



Programme Part I.

	PART 1													
	Sunday, Aug. 21, 2022	**Monday, Aug. 22, 2022**				**Tuesday, Aug. 23, 2022**					**Wednesday, Aug. 24, 2022**			
		Room 4	Audit 1	Room 3	Room 1B	Room 4	Room 1A	Room 3	Room 1B	Room 2	Room 1A	Room 4	Room 3	Room 1B
08:00		Registration if not done on Sunday												
08:30						KN Dn	C4	E5	S5	ITP	O1	F1	G1	KN M
09:00		Opening Session [Auditorium]				Dn5	C5	E6	S6	ITP	O2	F2	G2	M5
09:30						Dn6	C6	E7	S7	ITP	O3	F3	G3	M6
10:00	Board meeting [Board room]	Coffee break				Coffee break					Coffee break			
10:30						A1	C7	E8	S8	CMAG	KN O	F4	G4	M7
11:00		Keynote Paper A [Auditorium]				A2	C8	E9	S9	CMAG	O4	F5	G5	M8
11:30		Keynote Paper E [Auditorium]				A3	C9	E10	S10	CMAG	O5	F6	G6	M9
12:00	Lunch	Lunch				Lunch			Corporate Members Lunch		Lunch			
12:30														
13:00														
13:30						A4	C10	E11	S11	P1	O6	F7	KN G	M10
14:00	Membership Cttees [Room 6]	Keynote Paper F [Auditorium]				A5	C11	E12	S12	P2	O7	F8	G7	M11
14:30		Keynote Paper P [Auditorium]				A6	C12	E13	S13	P3	O8	F9	G8	M12
15:00		Keynote Paper S [Auditorium]				A7	C13	E14		P4	O9	F10	G9	M13
15:30		Coffee break				Coffee break					Coffee break			
16:00		Dn1	KN C	E1	S1	A8	C14	E15	M1	P5	O10	F11	G10	M14
16:30	Council Meeting [Room 6]	Dn2	C1	E2	S2	A9	C15	E16	M2	P6	O11	F12	G11	M15
17:00		Dn3	C2	E3	S3	A10	C16	E17	M3	P7		F13		M16
17:30		Dn4	C3	E4	S4	A11	C17	E18	M4	P8		F14		
18:00		Presentation 72nd General Assembly in Dublin [Auditorium]				A12								
18:30														
19:00	Welcome reception [BEC, 7th floor roof top]										Assembly dinner [Euskalduna Palace] Bus departure: 19:00h.			
19:30														
20:00														

Programme Part II.

	PART 2								
	Thursday, Aug. 25, 2022				Friday, Aug. 26, 2022				Saturday, Aug. 27, 2022
	Room 4	Room 3	Room 1A	Room 1B	Room 4	Room 1A	Room 1B	Room 3	
08:30	STC Dn	Terminology Committee	STC S	STC G	STC F	STC C	STC P	STC O	LIAISON COMMITTEE Meeting [Room 3]
09:00									
09:30									
10:00	Coffee break				Coffee break				Coffee break
10:30	STC Dn	Communication Committee	STC S	STC G	STC F	STC C	STC P	STC O	COUNCIL Meeting [Room 6] / Research Affiliates meeting [Room 3]
11:00									
11:30									
12:00									
12:30	Lunch				Lunch				
13:00									
13:30									
14:00	Industrial Symbiosis in Discrete Manufacturing CWG		Artificial Intelligence in Manufacturing CWG	Production Technologies & Systems for E-Mobility CWG		STC E	STC M	STC A	GENERAL MEETING PART I for Fellows/Honorary/Emeritus [Auditorium]
14:30									
15:00									GENERAL MEETING PART II for all CIRP Members only [Auditorium]
15:30									
16:00	Coffee break				Coffee break				
16:30	Cross STC Meeting (for all CIRP members only) [Auditorium]					STC E	STC M	STC A	
17:00									
17:30									
18:00									Farewell dinner [Loizaga Tower] Bus departure: 18:00h.
18:30									
19:00									

Opening session programme.

Monday, August 22nd
09:00 - 10:30
Auditorium

09:00	**Musical introduction** Aukeran Dantza Taldea
09:10	**Welcome by host institution** **Arantxa Tapia**, Basque Minister for Ecomic Development **Jokin Muñoa**, Chairman of GA2022
09:25	**Presidential address** **Hans Nørgaard Hansen**, Denmark
09:40	**Dance show** Aukeran Dantza Taldea
09:50	**Perspectives of Sustainability in the Aeronautical Industry** **Jaime Fernández Castañeda**, ITP Aero, Spain
10:05	**Nicolau Award ceremony and Taylor medal Ceremony**
10:25	**Final remarks** **Jokin Muñoa**, Spain

Invited speaker



Jaime Fernández Castañeda

ITP Aero, Spain

Perspectives of Sustainability in the Aeronautical Industry

Synopsis

The air transport sector is strategic due to its social function, as well as its economic importance, which, far from being limited to its own sphere, is projected as a catalyst and multiplier element for the rest of the economic sectors. Sustainability and specifically, the net decarbonisation of air transport in 2050 is a mandate that will mark the evolution of the sector until the middle of this century. Moreover, a digital transformation is taking place that affects all production systems at an unprecedented rate.

Profile

Jaime Fernandez-Castañeda is an aeronautical engineer from the Polytechnic University of Madrid and a master's degree in Economics and Management of Innovation and Technological Policy. He has developed his professional career mainly in ITP Aero where he has been working for 25 years. He started as an Aerodynamic Methods engineer developing part of the ITP Aero design system, in 2007 he became chief engineer of several projects. Between 2012 and 2014, he was engineering director at the Mexican subsidiary, and later he was the chief engineer of the Technology Development projects and Head of Simulation Technology department. He currently holds the position of Head of Research & Technology since 2020.



Keynote paper session.

Monday, August 22nd
11:00 - 12:00
Auditorium

11:00	**STC A - Closed Loop Systems to Circular Economy: A Pathway to Environmental Sustainability?** Sami Kara (1); Michael Hauschild (1), John Sutherland (1), Tim McAloone	[F]
11:30	**STC E - 3D Bioprinting: Materials, Processes and Applications** Paulo Jorge Bartolo (1), Ajay Malshe (1), Eleanora Ferraris (2), Bahattin Koç	[F]

Monday, August 22nd
14:00 - 15:30
Auditorium

14:00	**STC F - Simulation of Metal Forming - Visualization of Invisible Phenomena in the Digital Era** Jun Yanagimoto (1), Dorel Banabic (1), Mihaela Banu, Lukacs Madej (2)	[F]
14:30	**STC P - Advances in the Metrological Traceability and Performance of X-Ray Computed Tomography** Wim Dewulf (1), Harald Bosse (3), Simone Carmignato (1), Richard Leach (1)	[F]
15:00	**STC S - The Implication and Evaluation of Geometrical Imperfections on Manufactured Surfaces** Brigid Mullany (1), Enrico Savio (1), Han Haitjema (1), Richard Leach (1)	[F]

Authors: **(1)** Fellows, **(2)** Associate Members, **(3)** Corporate Members.
Modality: **[F]** Face to face presentation, **[O]** Online presentation, **[T]** To be confirmed.

A

Session on Life-Cycle Engineering and Assembly

Session programme.

Tuesday, August 23rd
10:30 - 12:00
Room 4

10:30	**A1 - Pilot study-based sharing system design method** Yasushi Umeda (1), Ryo Ishida, Gaku Miyake, Yusuke Kishita, Genichiro Matsuda, Akio Tajima	[F]
11:00	**A2 - Mechanism for matching circular products and customers with top trading cycles** Nariaki Nishino (2), Koji Kimita, Taisei Ito	[O]
11:30	**A3 - Systemic improvement of lifecycle performance by leveraging product and service interdependencies – a case of a product for wind power generation systems** Tomohiko Sakao (2), Abhijna Neramballi, Johannes Matschewsky, Annelie Carlson, Max Bäck, Vishnu Teja Tirumalasetty	[F]

Tuesday, August 23rd
13:30 - 15:30
Room 4

13:30	**A4 - Improving environmental performances of integrated bladed rotors for aircraft** Lea Rupcic, Eleonore Pierrat, Kilian Fricke, Torsten Moll, Michael Z. Hauschild (1), Alexis Laurent	[F]
14:00	**A5 - Effects of deposition parameters on cumulative energy demand for Cold Metal Transfer additive manufacturing processes** Paolo C. Priarone (2), Angioletta R. Catalano, Alessandro Simeone, Luca Settineri (1)	[F]
14:30	**A6 - Deliberative robotics – a novel interactive control framework enhancing Human-Robot collaboration** Anna Valente (2), Gianluca Pavesi, Mattia Zamboni, Emanuele Carpanzano (1)	[F]
15:00	**A7 - Digital twin-enabled advance execution for Human-Robot collaborative assembly** Sichao Liu, Xi Vincent Wang (2), Lihui Wang (1)	[F]

Authors: **(1)** Fellows, **(2)** Associate Members, **(3)** Corporate Members.
Modality: **[F]** Face to face presentation, **[O]** Online presentation.

Session programme.

A

Session on Life-Cycle Engineering and Assembly

Tuesday, August 23rd
16:00 - 18:30
Room 4

16:00	**A8 - On deformable object handling: model-based motion planning for human-robot co-manipulation** Sotiris Makris (2), Emmanouil Kampourakis, Dionisis Andronas	[F]
16:30	**A9 - Upscaling of soft material grippers to heavy duty applications in handling and assembly** Franz Dietrich, Alexander Müller / G. Seliger (1)	[T]
17:00	**A10 - In-mould assembly of functionally integrated structures: a surrogate model for fast quality assessment** André Hürkamp, Tim Ossowski, Klaus Dröder (2)	[F]
17:30	**A11 - On-the-fly bare die bonding based on laser induced forward transfer (LIFT)** Ludger Overmeyer (2), Simon Nicolas Gottwald, Matthias Springer, Jan Friedrich Düsing	[F]
18:00	**A12 - Data-driven process characterization and adaptive control in robotic arc welding** Peng Wang, Joseph Kershaw, Matthew Russell, Jianjing Zhang, Yuming Zhang, Robert X. Gao (1)	[F]

C
Session on Cutting

Session programme.

Monday, August 22nd
16:00 - 18:00
Audit 1

16:00	**STC C - Process Monitoring of Machining** Roberto Teti (1), Dimitris Mourtzis (1), Doriana D'Addona (2), Alessandra Caggiano (2)	[O]
16:30	**C1 - An analytical model for the optimized design of micro-textured cutting tools** Hossam A. Kishawy, Amr Salem, Hussien Hegab, Ali Hosseini, Mohamed A. Elbestawi (1)	[F]
17:00	**C2 - Partitioning of primary shear zone heat in face milling** Langenhorst, Jens Sölter, Carsten Heinzel (2)	[F]
17:30	**C3 - A novel analytical algorithm for prediction of workpiece temperature in end milling** Waseem Akhtar, Ismail Lazoglu (1)	[O]

Tuesday, August 23rd
08:30 - 10:00
Room 1A

08:30	**C4 - Material removal mechanism of multi-layer metal-film nanomilling** Yongda Yan, Jiqiang Wang, Yanquan Geng, Guoxiong Zhang (1)	[O]
09:00	**C5 - Dynamic rotating-tool turning of micro lens arrays** XinQuan Zhang (2), ZhenDong Wang, Zhe Zhang, LiMin Zhu	[O]
09:30	**C6 - Reconfigured multi-axis diamond shaping of complex monolithic optics** Rui Huang, Nicholas Yew Jin Tan, Dennis Wee Keong Neo, Kui Liu / M. Rahman (1)	[T]

Tuesday, August 23rd
10:30 - 12:00
Room 1A

10:30	**C7 - Surgical oscillating saw blade to suppress forces in bone cutting** Han Wang, Urara Satake, Toshiyuki Enomoto (2)	[O]
11:00	**C8 - Orthogonal cutting mechanics of multi-directional carbon fiber reinforced polymer with interlaminar bonding effect** Xiaoliang Jin, Chunlei Song / P. Gu (1)	[F]
11:30	**C9 - Turning characteristics of titanium alloy Ti-6Al-4V with high-pressure cutting fluid** Akira Hosokawa, Koki Kosugi, Takashi Ueda (1)	[O]

Session programme.

C
Session on Cutting

Tuesday, August 23rd
13:30 - 15:30
Room 1A

13:30	**C10 - A holistic approach for gear skiving design enabling tool load homogenization** Andreas Hilligardt, Volker Schulze (2)	[F]
14:00	**C11 - Exploratory investigation of chip formation and surface integrity in ultra-high-speed gear hobbing** Yuki Ueda, Noriyuki Sakurai, Tatsuro Takagi, Kazuyuki Ishizu, Jiwang Yan (2)	[F]
14:30	**C12 - Enhancing surface quality in cutting of gummy metals using nanoscale organic films** Mohammed Naziru Issahaq, Anirudh Udupa, Tatsuya Sugihara, Debapriya Pinaki Mohanty, James B. Mann, Kevin P. Trumble, Srinivasan Chandrasekar, Rachid M'Saoubi (1)	[F]
15:00	**C13 - Induction of residual compressive stresses in the sub-surface by the adjustment of the micromilling process and the tool´s cutting edge** Alexander Leonard Meijer, Dominic Stangier, Wolfgang Tillmann, Dirk Biermann (1)	[F]

Tuesday, August 23rd
16:00 - 18:00
Room 1A

16:00	**C14 - Effect of crystallography on residual stresses during ultra-precision machining of sapphire** Aditya Nagaraj, Sangkee Min (2)	[F]
16:30	**C15 - Surface topography irregularities generated by broaching** Gorka Ortiz-de-Zarate, Aitor Madariaga (3), Thomas H.C. Childs (1), Pedro J. Arrazola (1)	[F]
17:00	**C16 - Improved performance and surface integrity in finish machining of Inconel 718 with electrically charged tungsten disulphide MQL** Alborz Shokrani, Joseph Betts, I. S. Jawahir (1)	[F]
17:30	**C17 - Can higher cutting speeds and temperatures improve the microstructural surface integrity of advanced Ni-base superalloys?** Andrea la Monaca, Zhirong Liao (2), Dragos A. Axinte (1), Rachid M'Saoubi (1), Mark Hardy	[F]

Dn

Session on Design

Session programme.

Monday, August 22nd

16:00 - 18:00

Room 4

16:00	**Dn1 - Knowledge graph with machine learning for product design** Ang Liu (2), Dawen Zhang, Yuchen Wang, Xiwei Xu	[F]
16:30	**Dn2 - A novel deep generative model based on imaginal thinking for automating design** Lei Huang, Yuehong Yin (1), Soh Khim Ong (1)	[O]
17:00	**Dn3 - Generative design of joint contact surfaces inspired by biological morphogenesis** Santiago Arroyave-Tobon, Kalenia Marquez-Florez, Paul Heymann, Jean-Marc Linares (1)	[F]
17:30	**Dn4 - Uncertainty and modelling cost-based methodology for modelling choices in multiscale structures** Ernesto Cristino Rodriguez Pila, Claire Guillebaud, Hervé Wargnier, Nicolas Perry (2)	[F]

Tuesday, August 23rd

08:30 - 10:00

Room 4

08:30	**STC Dn - Designing Value-Driven Solutions: The Evolution of Industrial Product-Service Systems** Daniel Brissaud (1), Tomohiko Sakao (2), Andreas Riel (2), John Ahmet Erkoyuncu (2)	[F]
09:00	**Dn5 - Generative adversarial networks for tolerance analysis** Benjamin Schleich, Yifan Qie, Sandro Wartzack, Nabil Anwer (2)	[O]
09:30	**Dn6 - Automatic simulation-based design and validation of robotic gripper fingers** Aswin K. Ramasubramanian, Matthew Connolly, Robins Mathew, Nikolaos Papakostas (2)	[F]

Session programme.

E

Session on Electro-Physical and Chemical Processes

Monday, August 22nd
16:00 - 18:00
Room 3

16:00	**E1 - Optimization of Aluminium powder production through a novel ultralow pressure gas-atomization method** Michail Tsirlis, Nikolaos Michailidis (1)	[F]
16:30	**E2 - Increasing the productivity of selective laser sintering workflow by integrating cooling channels in the printing powder matrix** Sankhya Mohanty, Tamás Burger, Rasmus Peter Knudsen, Guido Tosello (2)	[F]
17:00	**E3 - Sensing approach for the In-situ determination of spatter motion within PBF-LB/M** Eric Eschner, Tobias Staudt, Michael Schmidt (2)	[F]
17:30	**E4 - Electrochemical additive manufacturing of NiCoFeCuMo high entropy alloys using a combined dissolution-deposition system** Murali Sundaram, Anne Brant, K. Rajurkar (1)	[F]

Tuesday, August 23rd
08:30 - 10:00
Room 3

08:30	**E5 - Ultrafast and large-gap microwelding of glass substrates by selective absorption of continuous-wave laser into transiently excited electrons** Shunya Yoshitake, Yusuke Ito, Naoyuki Miyamoto, Reina Yoshizaki, Naohiko Sugita (2)	[O]
09:00	**E6 - Crackless glass through-structure fabrication with laser-induced backside wet etching using detachably bonded cover** Kui-Kam Kwon, Dae-Seob Song, Ying-Jun Quan, Ji Ho Jeon, Sung-Hoon Ahn (1)	[O]
09:30	**E7 - Improving surface quality in BEAM with optimized electrode** Lin Gu, Guojian He, Kelin Li, Yifei Yang, Wansheng Zhao (2)	[O]

E

Session on Electro-Physical and Chemical Processes

Session programme.

Tuesday, August 23rd
10:30 - 12:00
Room 3

10:30	**E8 - Damage-free finishing of Lu2O3 by combining plasma-assisted etching and low-pressure polishing** Peng Lyu, Min Lai, Ze Liu, Fengzhou Fang (1)	[O]
11:00	**E9 - A new hybrid electrochemical-mechanical process (PEMEC) for polishing complex and rough parts** Joel Rech (2), Daniel Krzak, Florian Roy, Ferdinando Salvatore, Antoine Gidon, Stéphane Guérin	[F]
11:30	**E10 - Development of a process signature for Electrical Discharge Machining** Andreas Klink (2), Sebastian Schneider, Thomas Bergs (2)	[F]

Tuesday, August 23rd
13:30 - 15:30
Room 3

13:30	**E11 Metal additive manufacturing via a novel composite material using powder and polymers formed in sheets** Rocco Lupoi (2), William Abbott, Ramsankar Senthamaraikannan, Sean McConnell, John Connolly, Shuo Yin, Ramesh Padamati	[F]
14:00	**E12 - The role of scan strategies in fatigue performance for laser powder bed fusion** Wessel Wits (2), Enrico Scolaro, Emiel Amsterdam, Adam Clare (2)	[F]
14:30	**E13 - Faster than real-time path-sensitive temperature modelling of wire-arc additive manufacturing by a data-driven finite volume method** Markus Bambach (3), Iason Sideris, Maicol Fabbri, Konrad Wegener (1)	[F]
15:00	**E14 - Machine learning based track height prediction for complex tool paths in Direct Metal Deposition processes** Daniel Knüttel, Stefano Baraldo, Anna Valente (2), Friedrich Bleicher (2), Konrad Wegener (1), Emanuele Carpanzano (1)	[F]

E

Session on Electro-Physical and Chemical Processes

Tuesday, August 23rd
16:00 - 18:00
Room 3

16:00	**E15 - A reheating temperature criterion for adaptive strategy in fused filament fabrication** Jie Zhang, Jonas Neeckx, Johan Troukens, Eleonora Ferraris (2)	[F]
16:30	**E16 - Process and geometrical integrity optimization of electron beam melting for copper** Sasan Dadbakhsh, Xiaoyu Zhao, Prithiv Kumar Chinnappan, Vishal Shanmugam, Zeyu Lin, Christopher Hulme / B. Lindström (1)	[F]
17:00	**E17 - Direct writing of self-healing circuits on curvilinear surfaces** Simon S. Park (2), Robin Jeong, Jihyun Lee, Pinak Bhatt	[F]
17:30	**E18 - Understanding biomanufacturing of soy-based scaffolds for cell-cultured meat by vat polymerization** Michael P. Sealy (2), Kossi Loic M. Avegnon, Alexis Garrett, Laurent Delbreilh, Salil Bapat, Ajay P. Malshe (1)	[F]

F
Session on Forming

Session programme.

Wednesday, August 24th
08:30 - 10:00
Room 4

08:30	**F1 - Finding the pad load to suppress wrinkling in free bending of ultra-high tensile strength steel sheets** Yasuharu Tanaka, Zhigang Wang (2), Tomoyuki Hakoyama	[O]
09:00	**F2 - Producing isolated shrink corners by folding-shearing** Christopher J. Cleaver, Rishabh Arora, Evripides G. Loukaides, Julian M. Allwood (1)	[F]
09:30	**F3 - W-Temper forming of B-pillar from 7075 aluminum alloy** Zbigniew Gronostajski, Karol Jaskiewicz, Pawel Kaczynski, Mateusz Skwarski, Slawomir Polak, Jakub Krawczyk, Wladyslaw Chorzepa, Przemyslaw Trzpis / M. Pietrzyk (1)	[O]

Wednesday, August 24th
10:30 - 12:00
Room 4

10:30	**F4 - Hybrid additive manufacturing of metal laminated forming tools** Hamed Dardaei Joghan, Marlon Hahn, Jan T. Sehrt, A. Erman Tekkaya (1)	[F]
11:00	**F5 - Data-driven metal spinning using neural network for obtaining desired dimensions of formed cup** Shiori Gondo, Hirohiko Arai / K.-I. Mori (1)	[O]
11:30	**F6 - Characterization of sheet metal components by using an upsetting test with miniaturized cylindrical specimen** Peter Hetz, Martin Kraus, Marion Merklein (1)	[F]

F
Session on Forming

Wednesday, August 24th
13:30 - 15:30
Room 4

13:30	**F7 - A novel superplastic dieless drawing using fracture phenomenon for fabrication of metal tubular microneedles** Yushi Yi, Keisuke Shinomiya, Ryusaku Kobayashi, Hisanao Komine, Shoichiro Yoshihara, Tsuyoshi Furushima (2)	[O]
14:00	**F8 - The role of entrapped lubricant in asperity flattening under bulk plastic deformation** Chris V. Nielsen, Maximilian F.R. Zwicker, Jon Spangenberg, Niels Bay (1), Paulo A.F. Martins (1)	[F]
14:30	**F9 - In situ observation of the interface between a roll and a sheet in flat rolling process** Hiroshi Utsunomiya (2), Yoshimitsu Terada, Koji Ono, Ryo Matsumoto	[O]
15:00	**F10 - Inducing <111> texture in AA5182-O through continuous-bending -under-tension and recovery heat treatment processes to influence r-values** Jinjin Ha, Sarah Mayer, Zhangxi Feng, Nikolai Matukhno, Marko Knezevic, Brad L. Kinsey (2)	[F]

Wednesday, August 24th
16:00 - 18:00
Room 4

16:00	**F11 - Severe plastic deformation by Constrained Backward Flowforming** Andrea Ghiotti (2), Stefania Bruschi (1), Enrico Simonetto, Tommaso Magro, Lukasz Madej (2)	[F]
16:30	**F12 - Continuous swaging of composite wire bundles through controlled material flow** Peter Groche (1), David Löffler, Alessandro Franceschi, Fansun Chi	[F]
17:00	**F13 - Multi-material based Functionally Graded billets manufacturing through Friction Stir Consolidation of aluminium alloys chips** Abdul Latif, Giuseppe Ingarao, Livan Fratini (1)	[F]
17:30	**F14 - Metal forming driven surface engineering of thin profile wires for high precision industrial filtration screens** Krzysztof Muszka, Marcin Kwiecien, Konrad Perzynski, Janusz Majta, Lukasz Madej (2)	[F]

G
Session on Grinding

Session programme.

Wednesday, August 24th
08:30 - 10:00
Room 3

08:30	**G1 - Mechanism of mid-spatial-frequency waviness removal by viscoelastic polishing tool** Wu-Le Zhu, Oliver Pakenham-Walsh, Kathryn Copson, Phillip Charlton, Kazuya Tatsumi, Bing-Feng Ju, Anthony Beaucamp (2)	[O]
09:00	**G2 - Process state estimation in Chemical Mechanical Polishing (CMP) by inverse analysis of in-process data** Norikazu Suzuki (2), Rion Yamaguchi, Yohei Hashimoto, Hozumi Yasuda, Satoru Yamaki, Yoshihiro Mochizuki	[F]
09:30	**G3 - On reduction of energy flow into workpiece in continuous generating grinding** Toru Kizaki (2), Qinru Zheng, Liming Shu, Junichi Tanaka, Toshifumi Katsuma	[O]

Wednesday, August 24th
10:30 - 12:00
Room 3

10:30	**G4 - Surface integrity in high-speed grinding of Al6061T6 alloy** Sai Guo, Jianqiu Zhang, Qinghong Jiang, Bi Zhang (1)	[O]
11:00	**G5 - Adaptive human-robot collaboration for robotic grinding of complex workpieces** Hai-Long Xie, Qing-Hui Wang, S.K. Ong (1), Jing-Rong Li, Zi-Peng Chi	[F]
11:30	**G6 - Engineered grinding tools reimplemented by precise sharpening: a case study on an ultrahard ceramic matrix composite (CMC)** Gonzalo García Luna, Dragos Axinte (1), Donka Novovic (3)	[O]

G
Session on Grinding

Wednesday, August 24th
13:30 - 15:30
Room 3

13:30	**STC G - Advances in Grinding Tools and Abrasives** A. Beaucamp (2), B. Kirsch, W. Zhu	[F]
14:00	**G7 - Understanding the properties of bronze-bonded diamond grinding wheels on process behaviour** Benjamin Bergmann, Patrick Dzierzawa / H.K. Tönshoff (1)	[F]
14:30	**G8 - Rotary dressing model for grinding wheel active surface prediction** María Garcia, Jorge Alvarez, Inigo Pombo, David Barrenetxea (1)	[F]
15:00	**G9 - Relevance of the region of interaction between the tool and the metalworking fluid for the cooling effect in grinding** Daniel Meyer (2), Lukas Schumski, Nikolai Guba, Björn Espenhahn, Tobias Hüsemann	[F]

Wednesday, August 24th
16:00 - 17:00
Room 3

16:00	**G10 - A lapping-based test method to investigate wear behaviour of bonded-abrasive tools** Nastja Macerol (3), Luiz Franca (3), Helmi Attia (1), Peter Krajnik (2)	[F]
16:30	**G11 - Mechanics of self-rotating double-disc grinding process** Radovan Drazumeric, Jeffrey Badger (3), Tomas Gustavsson, Peter Krajnik (2)	[F]

M
Session on Machines

Session programme.

Tuesday, August 23rd
16:00 - 18:00
Room 1B

16:00	**M1 - Condition monitoring of ball screw feed drives using convolutional neural networks** Maximilian Benker, Michael F. Zaeh (1)	[F]
16:30	**M2 - Real-time estimation of cutting forces via physics-inspired data-driven model** Gregory William Vogl (3), Dominique Adele Regli, Gregory Michael Corson / S. Smith (1)	[F]
17:00	**M3 - Receptance coupling substructure analysis and chatter frequency-informed machine learning for milling stability** Tony Schmitz, Aaron Cornelius, Jaydeep Karandikar, Christopher Tyler, Scott Smith (1)	[F]
17:30	**M4 - Multibody dynamic modeling of five-axis machine tool vibrations and controller** Hoai Nam Huynh, Yusuf Altintas (1)	[O]

Wednesday, August 24th
08:30 - 10:00
Room 1B

08:30	**STC M - Mechanical Interfaces in Machine Tools** Erhan Budak (1), Atsusi Matsubara (1), Alkan Donmez (2), Jokin Munoa (1)	[F]
09:00	**M5 - Modal parameter recovery from temporally aliased video recordings of cutting tools** Mohit Law, Rohit Lambora, Anshid Nuhman P, Suparno Mukhopadhyay / T. Moriwaki (1)	[F]
09:30	**M6 - Estimation of supporting fixture receptance for thin-walled milling** Kotaro Mori, Atsushi Matsubara (1)	[F]

Session programme.

M
Session on Machines

Wednesday, August 24th
10:30 - 12:00
Room 1B

10:30 **M7 - Spindle-integrated, sensor-based measurement system for cutting and controller forces** [F]
Haythem Boujnah, Naruhiro Irino (3), Yasuhiro Imabeppu, Kengo Kawai, Masahiko Mori (1)

11:00 **M8 - Robot polishing control with an active end effector based on and controller macro-micro mechanism and the extended Preston's law** [F]
Yasuhiro Kakinuma (2), Shotaro Ogawa, Katsuki Koto

11:30 **M9 - Adaptive compensation of the transmission errors in rack-and and controller-pinion drives** [O]
Alexander W. Verl (2), Lukas Steinle

Wednesday, August 24th
13:30 - 15:30
Room 1B

13:30 **M10 - Linear-rotary direct drive for multi-functional machine tools** [F]
Berend Denkena (1), Patrick Ahlborn

14:00 **M11 - Lightweight semi-actively damped high performance milling tool** [F]
Hans-Christian Moehring (2), Kim Torben Werkle

14:30 **M12 - Effectiveness of different closed-loop control strategies for deep drawing on single-acting 3D Servo Presses** [F]
Peter Groche (1), Alexander Breunig, Kelin Chen, Dirk A. Molitor, Jinjin Ha, Brad L. Kinsey (2), Yannis P. Korkolis

15:00 **M13 - Influence of guideway friction on the cutting point receptance in machine tools** [F]
Oier Franco, Xavier Beudaert (2), Kaan Erkorkmaz (1), Jokin Munoa (1)

Wednesday, August 24th
16:00 - 17:30
Room 1B

16:00 **M14 - Chatter stability of thin-walled part machining using special end mills** [F]
Faraz Tehranizadeh, Kaveh Rahimzadeh Berenji, Saltuk Yildiz, Erhan Budak (1)

16:30 **M15 - Damping in ram based vertical lathes and portal machines** [F]
Asier Astarloa, Thomas Semm, Iker Mancisidor, Helena Fernandes, Johannes Ellinger, Zoltan Dombovari, Jokin Munoa (1)

17:00 **M16 - Dynamic compliance attenuation in ball screw drives through model-based active damping of multiple vibration modes** [F]
Hessam Kalbasi Shirvani, Jason Qi Chen Zeng, Kaan Erkorkmaz (1)

O
Session on Production Systems and Organizations

Session programme.

Wednesday, August 24th
08:30 - 10:00
Room 1A

08:30	**O1 - A visual reasoning-based approach for mutual-cognitive human-robot collaboration** Pai Zheng, Shufei Li, Liqiao Xia, Lihui Wang (1), Aydin Nassehi (1)	[O]
09:00	**O2 - A network-based model robustness improvement method for product quality assurance** Meng Zhang, Fei Tao (2), Biqing Huang, A.Y.C. Nee (1)	[O]
09:30	**O3 - Reduction of planning efforts for decision making under uncertainty in global production network design** Günther Schuh (1), Andreas Gützlaff, Alexander Schollemann	[F]

Wednesday, August 24th
10:30 - 12:00
Room 1A

10:30	**STC O - Daydreaming Factories** Aydin Nassehi (1), Marcelo Colledani (1), Botond Kadar (1), Eric Lutters (1)	[F]
11:00	**O4 - Hybrid digital modelling of large manufacturing systems to support continuous evolution** Maria Chiara Magnanini, Matteo Mastrangelo, Tullio A. M. Tolio (1)	[F]
11:30	**O5 - Dynamic implementation of function-oriented selective and adaptive assembly in small-lot production** Marcello Colledani (1), Ozan Emre Demir	[F]

O
Session on Production Systems and Organizations

Wednesday, August 24th
13:30 - 15:30
Room 1A

13:30	**O6 - Tool segment repositioning minimization for bending operations** Alberto Tomás Garcia, Nikita Levichev, Reginald Dewil, Dirk Cattrysse, Joost R. Duflou (1)	[F]
14:00	**O7 - Potentials and technical implications of tag based and AI enabled optical real-time location systems (RTLS) for manufacturing use cases** Sebastian Thiede (2), Poorya Ghafoorpoor, Brendan Patrick Sullivan, Sebastian Bienia, Michael Demes, Klaus Dröder (2)	[F]
14:30	**O8 - Accurate prediction of machining cycle times by data-driven modelling of NC system's interpolation dynamics** Masafumi Endo, Burak Sencer / L. Monostori (1)	[O]
15:00	**O9 - Data augmentation-based prognostics for predictive maintenance of industrial system** Antonin Gay, Alexandre Voisin, Benoit Iung (1), Phuc Do, Rémi Bonidal, Ahmed Khelassi	[F]

Wednesday, August 24th
16:00 - 17:00
Room 1A

16:00	**O10 - Process monitoring of electron-beam based writing of semiconductor mask patterns** Kevin Helm, Sebastian Dietze, Benjamin Eynon, Dragan Djurdjanovic (2)	[F]
16:30	**O11 - Complementary learning – team machines to enlighten and exploit human expertise** Xingyu Li, Yoram Koren (1), Bogdan I. Epureanu (2)	[F]

P
Session on Precision Engineering and Metrology

Session programme.

Tuesday, August 23rd
13:30 - 15:30
Room 2

13:30	**P1 - Measurement of diameter of sub-micrometer fiber based on analysis of scattered light intensity distribution under standing wave illumination** Masaki Michihata, Sojiro Murakami, Shotaro Kadoya, Satoru Takahashi (1)	[O]
14:00	**P2 - Structure estimation of deep neural network for triangulation displacement sensors** Yasuhiro Mizutani, Shoma Kataoka, Yuma Nagai, Tsutomu Uenohara, Yasuhiro Takaya (1)	[F]
14:30	**P3 - Automated vision-based inspection of mould and part quality in soft tooling injection moulding using imaging and deep learning** Yang Zhang, Shuo Shan, Flavia D. Frumosu, Matteo Calaon, Wenzhen Yang, Yu Liu, Hans N. Hansen (1)	[F]
15:00	**P4 - Metrologically interpretable feature extraction for industrial machine vision using generative deep learning** Robert H. Schmitt (2), Dominik Wolfschläger, Evelina Masliankova, Benjamin Montavon	[F]

Tuesday, August 23rd
16:00 - 18:00
Room 2

16:00	**P5 - A lateral-scanning white-light interferometer for topography measurements on rotating objects in process environments** Andreas Fischer, Dirk Stöbener, Gert Behrends / E. Brinksmeier (1)	[O]
16:30	**P6 - One step machining of hierarchical optical structures for autostereoscopic images** Yaoke Wang, Ping Guo (2) / J. Cao (1)	[F]
17:00	**P7 - WeldNet: from 3D phased-array ultrasound scans to 3D geometrical models of welds and defects** Etienne Provencal, Luc Laperrière (1)	[F]
17:30	**P8 - Explainable AI-Infused ultrasonic inspection for internal defect detection** Adithyaa Karthikeyan, Akash Tiwari, Yuhao Zhong, Satish T.S. Bukkapatnam (2)	[F]

Session programme.

S
Session on Surfaces

Monday, August 22nd
16:00 - 18:00
Room 1B

16:00	**S1 - International comparison of flatness deviation in areal surface topography measurements** Maxim Vanrusselt, Han Haitjema (1), Richard Leach (1), Peter de Groot (3)	[F]
16:30	**S2 - Surface modifications induced by turning on additively manufactured Zr-702 and their effects on cell adhesion and proliferation for biomedical applications** Domenico Umbrello (2), Maria Rosaria Saffioti, Stano Imbrogno	[F]
17:00	**S3 - Ti6Al4V titanium alloy fatigue strength after AM- and machining-based process chains** Andrea Ghiotti (2), Rachele Bertolini, Marco Sorgato, Alberto Campagnolo, Enrico Savio (1), Stefania Bruschi (1)	[F]
17:30	**S4 - Predictive model of the surface topography for compliant grinding of brittle materials** Yue Yang, Zhirong Liao (2), Zhao Wang	[T]

Tuesday, August 23rd
08:30 - 10:00
Room 1B

08:30	**S5 - Surface modification of titanium alloy via atmospheric pressure nitrogen plasma assisted femtosecond laser irradiation** Kazutoshi Katahira (2), Atsushi Ezura, Shogo Takesue, Jun Komotori	[O]
09:00	**S6 - Direct-laser-conversion of Kevlar textile to laser-induced-graphene for realizing fast and flexible fabric strain sensors** Young Jin Kim, Dongwook Yang, Han Ku Nam, Truong-Son Dinh Le, Younggeun Lee, Soongeun Kwon / S.-W. Kim (1)	[F]
09:30	**S7 - Fabrication of microstructured yttria-stabilized zirconia electrolyte surface using centrifugal molding for high-performance solid oxide fuel cells** Keisuke Nagato (2), Kohei Nagai, Toshihide Okamura, Morio Tomizawa	[O]

S
Session on Surfaces

Session programme.

Tuesday, August 23rd
10:30 - 12:00
Room 1B

10:30	**S8 - Laser texturing of Li-ion battery electrode current collectors for improved active layer interface adhesion** Luca Romoli (2), Adrian H.A. Lutey, Gianmarco Lazzini	[F]
11:00	**S9 - Analysis of tangential contact damping mechanism by direct observation using X-ray computed tomography** Daisuke Kono (2), Taisuke Yamazaki, Tomohiro Ishii, Masao Kimura	[F]
11:30	**S10 - Predictive model for bearing torque in bolt fastening** Sukkyung Kang, Somin Shin, Hyena Hwang, Sanha Kim / J.H. Chun (1)	[F]

Tuesday, August 23rd
13:30 - 15:00
Room 1B

13:30	**S11 - Strain-induced magnetic degradation in shearing FeSiB nanocrystalline thin foils analyzed by magneto-optical Kerr effect** Zhenglong Fang, Menglin Yang, Masayuki Nakao (1)	[O]
14:00	**S12 - Atomistic investigation of calcium sulfonate and lithium complex grease tribofilms under severe sliding conditions** Vikram Bedekar (2), Kuldeep Mistry, Rohit Voothaluru, Jun Qu, Jonathan D. Poplawsky	[O]
14:30	**S13 - Characterization of surface properties of thin film composite (TFC) membranes under various loading conditions** Fatima Ghassan Alabtah, Abedalkader Alkhouzaam, Marwan Khraisheh, Helmi Attia (1)	[O]

Session programme.

Industrial Technical Papers

Tuesday, August 23rd
08:30 - 10:00
Room 2

08:30	**ITP 1 - Methodology for representing knowledge of work process performed by field workers and improving the work process with work design** Takeshi Morishita(3), Koichi Akagi(3), Manabu Sawaguchi	[O]
09:00	**ITP 2 - Parameter study on distortion during precision turning of additive manufactured half shells in Invar** Raoul Roth (3), Rico Weber, Jasmin Zanolari, Kabil Ramadani, Adriaan Spierings(3), Mileva Pavlica-Patigler	[F]
09:30	**ITP 3 - Taper development when traverse grinding with diamond cup wheels** Jeffrey Badger (3)	[F]

Corporate Members Advisory Group (CMAG) meeting

Tuesday, August 23rd
10:30 - 12:00
Room 2

10:30	**CMAG - Internal CMAG meeting**	

Social programme.

Part I



Welcome reception

BEC

Sunday, 21 August 2022

- BEC, Azkue street, 1, Barakaldo.
- 19:00 - 20:30
- Dress code: Informal.
- Transfer: Walk to the rooftop terrace

Unique views from the rooftop terrace: the Big Bilbao at your feet.

Programme:

17:00 Opening of the acredittations desk

19:00 Welcome Cocktail at BEC - 7th floor

20:30 End of the Cocktail



Assembly dinner

Euskalduna Palace

Wednesday, 24 August 2022

- Abandoibarra street 4, Bilbao.
- 19:30 - 23:00
- Dress code: Informal.
- Transfer: Bus departure from:
  - Hotel Puerta de Bilbao at 19:00

It was awarded by the AIPC as the best congress center in the world.

Programme:

19:00 Bus transfer from the Puerta de Bilbao

19:30 Start of the Cocktail and tango couple performance

20:15 Dinner

22:30 End of the dinner and performance

23:00 Bus transfers to Hotel Puerta de Bilbao

23:20 Arrival to Hotel Puerta de Bilbao

Part II



Farewell dinner

Loizaga Tower

Saturday, 27 August 2022

- Barrio Concejuelo, 2012, Bilbao.
- 19:15 - 22:45
- Dress code: Informal.
- Transfer: Bus departure from:
  - Plaza de Museo de Bellas Artes at 18:00
  - Hotel Puerta de Bilbao at 18:00

Tower house with one of the most important Rolls-Royce collections in the world.

Programme:

18:00	Bus transfer from Plaza de Museo de Bellas Artes, 5 (Bus stop) and Hotel Puerta de Bilbao
19:15	Arrival at Torre Loizaga and Txalaparta welcome performance
19:30	Visit to the museum
20:30	Dinner
22:45	Bus departure to Hotel Puerta de Bilbao and Bilbao
23:30	Bus arrival



Accompanying person programme.

Part I



Getxo, Bizkai Bridge, Portugalete and Guggenheim Museum

Monday, 22 August 2022

11:00 - 17:00

Bus departure from:
- 11:00 BEC

Programme:

11:00 Bus departure from BEC

11:20 Arrival in Getxo and walk through the Bizkai Bridge to cross to Portugalete

13:15 Lunch in Portugalete

14:45 Transfer back to Bilbao

15:15 Visit to the Guggenheim Museum

17:00 End of the visit and transfer to the Hotel Puerta de Bilbao



Donostia-San Sebastian, Michelin stars city

Tuesday, 23 August 2022

08:00 - 17:00

Bus departure from:
- 08:00 Plaza de Museo de Bellas Artes
- 08:45 BEC

Programme:

08:00 Departure from Plaza de Museo de Bellas Artes, 5 (Bus stop)
08:45 Departure from BEC
10:00 Arrival in San Sebastián
10:00 Walk through Chillida's sculpture "Peine del Viento" to the funicular.
11:00 Visit Igeldo and views of the city from the viewing point and bus transfer to the city's Aquarium
12:00 Visit of the Aquarium and stroll through the port
13:15 Lunch
15:00 Old Town's visit
15:30 Transfer back to Bilbao
17:00 Arrival in Bilbao

Part I



Gernika

Wednesday, 24 August 2022

08:00 - 16:00

Bus departure from:
- 08:00 Plaza de Museo de Bellas Artes
- 08:45 BEC

Programme:

08:00 Departure from Plaza de Museo de Bellas Artes, 5 (Bus stop)

08:45 Departure from BEC

09:45 Arrival in Gernika and start of the guided visit

10:00 Visit of the reproduction of The Gernika (a painting by Picasso), Parque de los pueblos de Europa, sculptures by Chillida and Henry Moore and the Assembly House

13:15 Lunch

14:45 Departure to Bilbao

16:00 Arrival in Bilbao



Part II



Getaria, Balenciaga museum

Thursday, 25 August 2022

08:00 - 17:00

Bus departure from:
- 08:00 Plaza de Museo de Bellas Artes
- 08:45 BEC

Programme:

08:00	Departure from Plaza de Museo de Bellas Artes, 5 (Bus stop)
08:45	Departure from BEC
10:15	Arrival in Getari
10:15	Getaria's guided tour
11:30	Balenciaga Museum's visit
13:00	Departure to the Txakoli cellar
13:15	Lunch and visit Txakoli cellar
15:30	Departure to Bilbao
17:00	Arrival in Bilbao



Vitoria-Gasteiz, medieval sightseeing tour

Friday, 26 August 2022

08:00 - 17:00

Bus departure from:
- 08:00 Plaza de Museo de Bellas Artes
- 08:45 BEC

Programme:

08:00	Departure from Plaza de Museo de Bellas Artes, 5 (Bus stop)
08:45	Departure from BEC
10:00	Arrival in Gasteiz
10:30	Santa Maria's Cathedral Visit
11:40	Guided tour through the Medieval Town
13:30	Lunch
15:30	Departure to Bilbao
17:00	Arrival in Bilbao

Notes.

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71st GA Bilbao - Spain 2022

Organisers.

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