



ippw
2015

12th International Planetary Probe Workshop

Cologne / Köln Germany

15–19 June 2015

Short Course on Radio Flyers: Principles of Communications,
Radio Science, Radar, Navigation & Tracking | 13–14 June

www.planetaryprobe.eu

IPPW-12 Sponsors



SunExpress

IPPW-12 Welcome

Welcome to Köln (Cologne), Germany, and the 12th International Planetary Probe Workshop. Participating in this year's Workshop and Short Course is an outstanding group of international scientists, technologists, engineers, mission designers, and policy makers. DLR has been a long-time participant in IPPWs. We are pleased to be hosting IPPW-12 in this beautiful city and look forward to introducing all attendees to DLR, Köln, and Germany.

IPPW-12 offers an abundance of participants, a varied program, and ample opportunities for networking. This year, we are continuing the session flow that began last year at IPPW-11. In order to emphasize the collaborative nature of our workshop, we are offering short presentations followed by panel discussions that feature session presenters fielding questions from the audience. In addition, we are raising the visibility of our posters by scheduling a brief presentation by each poster presenter. In order to encourage your full attendance in each session, we have avoided parallel sessions. Our community has been very busy over the past year, selecting an outstanding set of presentations and posters that you will encounter in the next four and a half days. In addition, we have solicited and evaluated nominees for the Al Seiff Award, conducted the Short Course, and awarded scholarships for student participation.

We encourage you to attend as many oral presentations and poster viewing opportunities as possible. In addition, to technical content, we have planned various social events during the week. A welcome reception is scheduled on Monday evening to introduce you to the attendees at this year's workshop. Then on Tuesday evening, our annual dinner will be held aboard the Pure-Liner floating banquet hall as we cruise down the Rhine River. In keeping with our IPPW tradition, we have slated an informative DLR tour on Wednesday afternoon. On Wednesday evening, we have scheduled our traditional poster session with food and drink to enhance your poster experience.

Since IPPW-12 is indeed a workshop, we also urge you to take advantage of the numerous opportunities during coffee breaks, lunches and social activities to build collaborative partnerships with other workshop participants. We thank our generous IPPW-12 sponsors for funding a large number of students who want to gain a better understanding of how to build a future career in this exciting field. We are very encouraged to have a large number of students with us!

On Friday, 19 June, there will be a presentation on the plans for 2016's IPPW-13 at the Johns Hopkins University Applied Physics Laboratory (APL) near Laurel and Columbia, Maryland, USA. We encourage you to attend this talk to learn about your next opportunity to join us. In this time of exciting mission planning occurring in our agencies, it is all the more valuable for us to reconnect with our colleagues and celebrate our strong planetary probe community. We encourage you to enjoy our 12th International Planetary Probe Workshop.

Let's make it a great week!

Bernie Bienstock
NASA Jet Propulsion Laboratory (JPL)
IPPW-12 International Organizing
Committee Chair

Ali Gülhan
Deutsches Zentrum für Luft- und Raumfahrt (DLR)
IPPW-12 Local Organizing
Committee Chair



Content

General Information.....	4
Introduction, Registration, Wi-Fi	4
How to get around	4
IPPW-12 Committees	7
Information for Oral Presenters.....	10
Information for Poster Presenters.....	10
Social Events	11
Technical Tour.....	13
Floor Plan.....	16
Local Services	16
Short Course.....	17
Saturday, 13 June, 2015.....	17
Sunday, 14 June, 2015.....	18
SciTech Program	19
Overview	19
Monday, 15 June, 2015	20
Tuesday, 16 June, 2015.....	24
Wednesday, 17 June, 2015	30
Thursday, 18 June, 2015	33
Friday, 19 June, 2015	36

General Information

Introduction, Registration, Wi-Fi

This booklet contains all organizational and program information for the 12th International Planetary Probe Workshop (IPPW-12), held at the Hyatt Regency Hotel, Cologne, Germany, from 13 to 19 June 2015.

Registration

The Registration Desk for the Symposium is located on the first floor in front of the "Rheinsaal" (see section Floor plan) and will be opened according to the following schedule:

Saturday,	13 June 2015	8:00 – 18:00
Sunday,	14 June 2015	8:00 – 18:00
Monday,	15 June 2015	7:30 – 18:00

For a registration outside these hours, please contact a LOC member on site.

Wi-Fi

Throughout the exhibition free Wi-Fi is available on-site. To log in please use the following data:

User: IPPW12

Password: DLR2015

How to get around

The workshop venue:



Hyatt Regency Köln

Kennedy-Ufer 2A

50679 Köln

Tel: +49 221 828 1234

Fax: +49 221 828 1370

E-Mail:

cologne.regency@hyatt.com

Foto: <http://commons.wikimedia.org>

Welcome to Cologne,

where the cathedral spires tower over one of Germany's oldest cities and its innumerable cultural and historical treasures, world-famous museums and active art scene. The world feels at home in Cologne, where people meet for a "Kölsch", a chat or simply a laugh. Life in Cologne is uncomplicated and vivacious. Concerning population, Cologne is the largest city in North Rhine Westphalia and the fourth largest city in Germany. As to area, Cologne is only slightly smaller than Berlin or Hamburg. It is made up of nine urban districts and a total of 85 quarters, known as "Veedel" in Cologne dialect.



Foto: <http://commons.wikimedia.org>

With its seven Rhine bridges and ten motorways, Cologne has an excellent transport system. Each day more than 1000 trains enter or leave Cologne "Hauptbahnhof" (main station). Over the last few years, the international Cologne-Bonn Airport has become the German hub for budget airlines and air freight, whereas the harbour has made it the second largest inland port location in Germany.

Cologne was built on ground that is steeped in history. Numerous cultural monuments from the past 2000 years, such as the medieval "Overstolzenhaus" and the "Gürzenich"-Hall, as well as modern structures such as the opera house (1957) and the Media Park (from 1989 onwards) can be found in this city.

General Information

Cologne Cultural Tax

In Cologne, a cultural tax will be charged. Business travelers are exempt from the cultural tax and do not have to pay. They do, however, have to be able to prove the business purpose of their trip. You can use the forms attached of the link below:

Employees: https://formular-server.de/Koeln_FS/findform?shortname=21-F32_KFAAbBeschEng&formtecid=2&areashortname=koeln_en

Free-Lancer: https://formular-server.de/Koeln_FS/findform?shortname=21-F33_KuturFreib&formtecid=2&areashortname=koeln_en

Climate and Clothing

In June the average temperature is 24°C (75 °F) in Cologne. Please note there may be occasional showers. The organizers suggest that you bring a light-weight jacket or pullover and an umbrella or raincoat. Weather information and forecasts are available <http://www.wetter.com/deutschland/koeln/DE0005156.html>

Credit Cards

Credit cards are accepted at most businesses including restaurants, shopping centers (malls) and gift stores, gas stations, grocery stores. Major credit cards include Visa, MasterCard, and American Express. ATMs are also located at many areas throughout Cologne.

Currency

The currency in Germany is EURO (€). The official exchange rate is published daily in the newspapers. Exchange facilities are available at the airport, main train stations and exchange agencies. Cash and travelers checks are easily exchanged in banks and hotels. Most hotels and restaurants accept international credit cards.

Exchange rates may vary. To see current exchange rates, please visit e.g. www.oanda.com

Electricity

Electric sockets are 230 volts AC, 50 Hz. European-style round two-pin plugs are in use. You need a transformer and a plug that fits the German socket.

Local Public Transport

Cologne has an excellent public transportation network of busses and trams. The conference venue can be reached by bus from all conference hotels. An overview about fares and accessible lines and hours can be taken from:

<http://www.kvb-koeln.de/german/tarif/eng.html>

Cologne, Germany is in Central European Time.

IPPW-12 Committees

International Organizing Committee

Chair: Bernie Bienstock, *Jet Propulsion Laboratory*

U.S. Co-Chair: Anita Sengupta, *Jet Propulsion Laboratory*

European Co-Chair: Ozgur Karatekin, *Royal Observatory of Belgium*

Michael Amato, *NASA Goddard*

James Arnold, *NASA Ames*

Sami Asmar, *Jet Propulsion Laboratory*

David Atkinson, *University of Idaho*

Tibor Balint, *NASA Headquarters*

Andrew Ball, *European Space Agency*

Pat Beauchamp, *Jet Propulsion Laboratory*

Jens Biele, *German Aerospace Center, DLR*

Jean-Marc Bouilly, *Airbus DS*

Bobby Braun, *Georgia Institute of Technology*

Robert Buchwald, *Airbus DS*

Neil Cheatwood, *NASA Langley*

Ed Chester

Athéna Coustenis, *Observatoire de Paris*

Jim Cutts, *Jet Propulsion Laboratory*

Jody Davis, *NASA Langley*

Karl Edquist, *NASA Langley*

Walt Englund, *NASA Langley*

Luca Ferracina, *ESA*

Francesca Ferri, *Università degli Studi di Padova*

Jim Garvin, *NASA Goddard*

Hannes Griebel, *Thales Alenia Space*

Rob Grover, *Jet Propulsion Laboratory*

Ali Gülhan, *German Aerospace Center, DLR*

Rodrigo Haya-Ramos, *Deimos Space*

Christina Holstein-Rathlou, *Boston University*

Scott Hubbard, *Stanford University*

Dean Kontinos, *NASA Ames*

Ashley Korzun, *NASA Langley*

Jean-Pierre Lebreton, *Centre National de la Recherche Scientifique*

Ralph Lorenz, *Applied Physics Laboratory*

David Mimoun, *Institut Supérieur de l'Aéronautique et de l'Espace*

Aaron Morris, *NASA Langley*

Michelle Munk, *NASA Langley*

Marc Murbach, *NASA Ames*

Jean Muylaert, *von Karman Institute*

Kamal Oudrhiri, *Jet Propulsion Laboratory*

Periklis Papadopoulos, *San Jose State University*

Cheryl Reed, *Applied Physics Laboratory*

Kim Reh, *Jet Propulsion Laboratory*

Steve Ruffin, *Georgia Institute of Technology*

Christine Szalai, *Jet Propulsion Laboratory*

Simon Tardivel, *Jet Propulsion Laboratory*

Stephan Ulamec, *German Aerospace Center, DLR*

Raj Venkatapathy, *NASA Ames*

Thomas Voirin, *European Space Agency*
 Al Witkowski, *Pioneer Aerospace Corporation*
 Lars Witte, *German Aerospace Center, DLR*
 Michael Wright, *NASA Ames*
 Tetsuya Yamada, *Japan Aerospace Exploration Agency*

Program Organizing Committee

US Co-Chair Aaron Morris, *NASA Langley*
European Co-Chair Hannes Griebel, *Thales Alenia Space*

Sami Asmar, *Jet Propulsion Laboratory*
 Gilles Bailet, *Ecole Central Paris*
 Pat Beauchamp, *Jet Propulsion Laboratory*
 Jens Biele, *German Aerospace Center, DLR*
 Robert Buchwald, *Airbus DS*
 Jim Cutts, *Jet Propulsion Laboratory*
 Karl Edquist, *NASA Langley*
 Ozgur Karatekin, *Royal Observatory of Belgium*
 Ashley Korzun, *NASA Langley*
 Jean-Pierre Lebreton, *Centre National de la Recherche Scientifique*
 Aaron Morris, *NASA Langley*
 Michelle Munk, *NASA Langley*
 Kamal Oudrhiri, *Jet Propulsion Laboratory*
 Lisa Peacocke, *Airbus DS*
 Heiko Ritter, *ESA*
 Anita Sengupta, *Jet Propulsion Laboratory*
 Aaron Stehura, *Jet Propulsion Laboratory*
 Simon Tardivel, *Jet Propulsion Laboratory*
 Stephan Ulamec, *German Aerospace Center, DLR*
 Raj Venkatapathy, *NASA Ames*
 Colin Wilson, *University of Oxford*

Local Organizing Committee

Chair: Ali Gülhan, *German Aerospace Center, DLR*
 Jens Biele, *German Aerospace Center, DLR*
 Robert Buchwald, *Airbus DS*
 Andreas Flock, *German Aerospace Center, DLR*
 Dominik Neeb, *German Aerospace Center, DLR*
 Monika Jäger, *German Aerospace Center, DLR*
 Matthias Roesberg, *CD Werbeagentur*
 Stephan Ulamec, *German Aerospace Center, DLR*
 Lars Witte, *German Aerospace Center, DLR*

Student Organizing Committee

US Chair: Stephen Ruffin, *Georgia Institute of Technology*
European Chair: Jean-Pierre Lebreton, *Centre National de la Recherche Scientifique*
U.S. Co-Chair: David Atkinson, *University of Idaho*
European Co-Chair: Athena Coustenis, *Observatoire de Paris*
 Andreas Flock, *German Aerospace Center, DLR*
 Ozgur Karatekin, *Royal Observatory of Belgium*
 Isil Sakraker, *von Karman Institute for Fluid Dynamics*

Short Course Committee

Chair: Sami Asmar, *Jet Propulsion Laboratory*
David Atkinson, *University of Idaho*
Hannes Griebel, *Thales Alenia Space*
Ozgun Karatekin, *Royal Observatory of Belgium*

AI Seiff Award Committee

Chair: Michael Wright, *NASA Ames*
Co-Chair: Andrew Ball, *European Space Agency*
James Arnold, *NASA Ames*
Tibor Balint, *NASA Headquarters*
Bobby Braun, *Georgia Institute of Technology*
Jean-Pierre Lebreton, *Centre National de la Recherche Scientifique*
Gentry Lee, *Jet Propulsion Laboratory*
Mikhail Marov, *Russia*
Periklis Papadopoulos, *San Jose State University*
Raj Venkatapathy, *NASA Ames*

Information for Oral Presenters

A PC laptop, LCD projector, and speaker remote will be available for presentation of oral talks during the scientific sessions. Please note the guidelines below for your presentation.

- Ensure your presentation “plays” on a standard Windows 7 computer equipped as described.
- Speaker presentation periods of 12 minutes will be strictly enforced.
- Presentation slides should be limited to 10 slides or less in order to adhere to the allotted 12 minutes.

In order to facilitate a smooth transition between speakers, and provide each speaker their allotted time, we will preload and test all presentations in advance. Please see the times for loading below. We will have an AV technician available to assist you with loading and testing.

To expedite the loading and testing of your file:

- Create a folder called “SESSION DAY_SPEAKER NAME_TALK TIME” and place your presentation in this folder.
- The use of personal laptops is strongly discouraged.
- No Mac laptops will be provided.
- Loading times for presentations:
 - AM Presentations: 8:00 a.m.
 - PM Presentations: 13:00 p.m.

Information for Poster Presenters

A poster session is scheduled for Wednesday evening, June 17. The poster session will be scheduled from 19:30 to 22:00. Additionally after each session the related posters will be displayed for discussion in the Foyer and “Bibliothek”. Authors should be present near their posters to answer any questions that might occur.

Poster location assignments will be provided to presenters at the workshop.

- The screens, which are holding the posters measure 1.0m x 1.4m (width x height). Therefore poster sizes should be chosen accordingly.
- There is no specific IPPW template or font size. Use professional judgment and preferences for legible reading of text and figures from a distance of ~ 2 meters
- Poster content must cover the abstract material without significant deviation
- Add the contact info for at least the lead author for possible follow up
- Add institutional logo, IPPW logo, and abstract number near the top (download black or blue IPPW logo)

For last-minute poster printing needs, there is a copy-shop located ~1km from the conference hotel (www.copyshopdeutz.de, E-Mail: info@copyshopdeutz.de, Betzdorfer Str.1 – 50679 Köln), which offers printing of large scale posters. Only DIN sizes are available. Print-out will normally take about 1/2 hour, but you can also communicate with the shop beforehand via e-mail, and arrange a print for pick up. Details should be discussed with

the shop individually. Prices for posters depend on the amount of color and the quality chosen and range from 25-50 EUR for DIN A0.

Social Events

Sunday, 14 June, 2015

19:00 – 22:00, For Students: **Student Social Event**

Sion Brewery

Unter Taschenmacher 5-7

50667 Köln

<http://www.brauhausSION.de/en/>



Courtesy of Sion Brewery

As early as 1318, beer was brewed in the immediate neighborhood of the Cologne cathedral. Sion "Jean Sion" picked up this tradition in 1912, thus laying the cornerstone for the brand Sion Kölsch. The venue is a typical German brewery in the tradition of the Cologne area with its typical charm.

Monday, 15 June, 2015

19:00 – 22:00, **Welcome Reception**

Foyer and Bibliothek, Hyatt Regency Hotel

Kennedy-Ufer 2A

50679 Köln

Tuesday, 16 June, 2015

12:30 – 13:30, For Students: **Students Development Session**

Rheinsaal (3), Hyatt Regency Hotel

Kennedy-Ufer 2A

50679 Köln

Tuesday, 16 June, 2015

19:30 – 23:00, **Conference Banquet**

Pure-Liner Ship on the Rhine River

<http://www.pure-liner.com/>

A meeting point will be announced during the workshop.



Foto: <http://www.pure-liner.de/>

Wednesday, 17 June, 2015

19:30 – 22:00, **Poster Session** with finger food

Rheinsaal (1+2), Hyatt Regency Hotel

Kennedy-Ufer 2A

50679 Köln

All posters submitted to the workshop will be presented at one glance. A finger food buffet will be served to accompany fruitful discussions with IPPW colleagues and poster presenters.

Thursday, 18 June, 2015

19:30 – 22:00, **IOC Diner (by invitation)**

Landhaus Kuckuck

Olympiaweg 2

50933 Köln

Technical Tour

Wednesday, 17 June, 2015

13:30 – 17:30, **Tour to DLR and ESA EAC Facilities in "Köln Porz"**

Linder Höhe

51147 Köln

Depart Hyatt Regency: 13:30

Return Hyatt Regency: 17:30

In keeping with the IPPW tradition, an informative tour at the premises of the German Aerospace Center (DLR) in Cologne, including the astronaut center of the European Space Agency (ESA), is scheduled on Wednesday, June 17 between 13:30 and 17:30. A shuttle service will be provided to pick up interested IPPW participants at the Hyatt Regency Hotel at 13:30. The return is planned at 17:30 at the Hyatt Regency Hotel.



DLR is the national aeronautics and space research center of the Federal Republic of Germany. Its extensive research and development work in aeronautics, space, energy, transport and security is integrated into national and international cooperative ventures. In addition to its own research, Germany's space agency (DLR) has been given responsibility by the federal government for the planning and implementation of the German space program. DLR is also the umbrella organization for the nation's largest project management agency. DLR has approximately 8000 employees at 16 locations in Germany: Cologne (headquarters), Augsburg, Berlin, Bonn, Braunschweig, Bremen, Goettingen, Hamburg, Juelich, Lampoldshausen, Neustrelitz, Oberpfaffenhofen, Stade, Stuttgart, Trauen, and Weilheim. DLR also has offices in Brussels, Paris, Tokyo and Washington D.C.

DLR has its headquarters in Cologne. The site is located next to Cologne-Bonn airport. Approximately 1,500 employees work in the institutes and facilities and in the central administration. Space flight is one of the main research areas at the site in Cologne. The effects of microgravity on the organisms of humans and on materials revolving in an orbit around the Earth are investigated. A broad range of cross-disciplinary experiments involving the Institute of Space Simulation, the Institute of Materials Research, the Institute of Aerospace Medicine, the Microgravity User Support Center (MUSC) and the European Astronaut Training Center demonstrate close cooperation and expertise.

Aviation research, another main research area at DLR Cologne, focuses on the development of new materials and on the optimization of propulsion technologies. Emphasis is on reducing emission values and - at the same time - increasing performance and reliability. These activities are supported by numerous large-scale test facilities, e.g. wind tunnels, engine and materials testing systems. The immediate vicinity to the European Transonic Wind Tunnel (ETW), the most modern and efficient installation of its kind, is an invaluable asset in this work.

Energy technology, the third column of the location's scientific undertakings, focuses on regenerative energy sources. DLR commands a high-flux density solar furnace that concentrates the sun's radiation 2000 to 3000-fold and is used for solar-technological and solar-chemical experiments. In the field of Transportation Research the relevant Institutes and Facilities work on subjects such as Air Transport Forecast and Airport Research. Besides space medicine, the DLR-Institute of Aerospace medicine also deals with life science and psychology problems concerning traffic and aviation. The Institute's research activities are focused on the central task of providing for the health and performance of the persons involved (pilot, crew, passenger, astronaut, motorist, resident etc.).

The European Astronaut Centre (EAC) is a center of excellence for astronaut selection, training, medical support and surveillance, as well as supporting astronauts and their families in preparation for, and during, their spaceflights. For astronauts and for the ground operations personnel, EAC is the training center for all European-built Space Station hardware such as ESA's Columbus laboratory and the Automated Transfer Vehicle supply and service ferry. The European Astronaut Centre reinforces the European commitment to human space programs. The center's tasks include:

- Selecting European astronauts, preparing and implementing Basic, Advanced and Mission Training for astronauts on missions to the International Space Station.
- Planning and scheduling of the astronaut's activities and flight assignments, and maintaining their health, fitness and proficiency.
- Training astronauts from the international partner space agencies, for all major European hardware delivered to the International Space Station.
- Providing medical expertise including preventive medicine, evidence-based medicine and psychology, as well as nutrition and fitness, and medical support to astronauts before, during and after missions.
- Providing public relations assistance and promoting human spaceflight and exploration through the public appearances of the European astronauts.

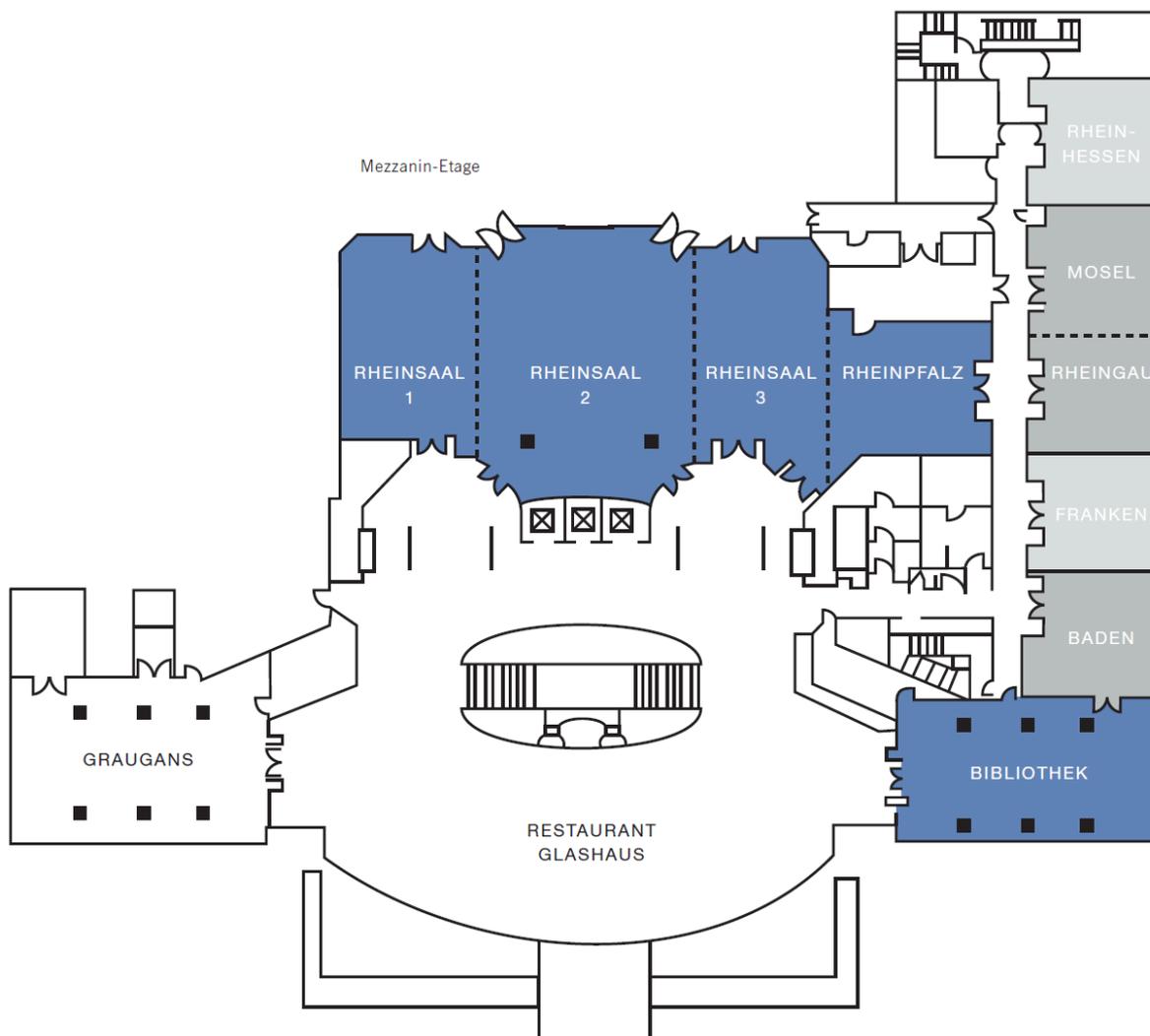
The European Astronaut Centre was established in 1990 and is located near Cologne, Germany. Our team is made up of more than 100 people including staff from the German Aerospace Centre (DLR), the French space agency (CNES).

The tour includes the visit of the following institutions:

- DLR, Institute of Aerodynamics and Flow Technology, Department of Supersonic and Hypersonic Technologies
- DLR, Space Operations and Astronaut Training, Microgravity User Support Center (MUSC), ESA Rosetta Philae Lander Control Center (LCC)
- DLR, Institute of Aerospace Medicine, :envihab
- ESA, European Astronaut Centre (EAC)

Floor Plan

The following plan summarizes the workshop premises on the first floor of the Hyatt Regency Hotel. The registration desk is located in the "Foyer", which describes the area outside the "Rheinsaal" on the first floor. The SciTech oral presentations will be held in the "Rheinsaal" (1+2). Poster presentations per sessions will be held in the "Bibliothek". The dedicated Poster session on Wednesday evening will be held in the "Rheinsaal" (1+2+3).



Courtesy of Hyatt Regency Hotel

Local Services

- **ATM:** Various ATM's are located in Deutzer Freiheit, 50679 Köln
- **Pharmacy:** Löwen Apotheke, Deutzer Freiheit 70, 50679 Köln
- **Supermarkets:** REWE City, Deutzer Freiheit 84-86, 50679 Köln
- **Post Offices:** Deutsche Post, Breite Straße 6, 50667 Köln
- **Public Transportation:** see KVB-pocket guide in conference bag

Short Course

Radio Flyers: Principles of Communications, Radio Science, Radar, Navigation, and Tracking

The 2015 IPPW short course will address topics related to theme of radio signals and their usage in support of operational and science goals of planetary probe missions. Topics include telecommunications, navigation, tracking, Radio Science, and Radar. Speakers will give an overview of each topic from basic principles then as applied to planetary probe mission design, engineering, and science. More focused talks include Doppler Wind Experiments and studies of atmospheric scintillation and refraction, cross-correlation of Doppler and inertial measurements during Entry, Descent, and Landing (EDL). In addition, communications issues unique to EDL, and radars for EDL sequencing and planetary surface studies will be presented.

Saturday, 13 June, 2015

Time	Topic	Presenter
9:00	Registration & Logistics	
9:30	Course Introduction	Asmar, S.
9:40	Spacecraft Communications Systems	Rodrigues, M.; Griebel, H.
10:30	EDL Communications	Asmar, S.; Karatekin, O.
10:50	Break	
11:10	Radio Science & Tracking	Asmar, S.
12:00	RS: Atmospheric Science	Asmar, S.
12:40	Lunch	
13:50	RS: Gravity Science	Asmar, S.; Andert, T.
14:30	RS: Planetary Surface Scattering	Asmar, S.; Simpson, R.
14:50	Break	
15:10	RS: Doppler Wind Experiments	Atkinson, D.
16:10	RS: Instrumentation	Hausler, B.
16:30	Adjourn	

Sunday, 14 June, 2015

Time	Topic	Presenter
9:30	Planetary Exploration with Radar	Lorenz, R.
10:10	EDL Radar	Lorenz, R.
10:30	RS: Solar Science	Bird, M.
10:50	Break	
11:10	RS: Atmospheric Drag	Rosenblatt, P.
11:30	Navigation	Guinn, J.
12:10	Lunch	
13:20	Deep Space Tracking Stations	Lanucara, M.
14:00	Hands-on Demonstration	Griebel, H.; Karatekin, O.; Asmar, S.
15:10	Break	
15:30	Panel Questions and Discussion	
16:30	Adjourn	

Student Social Event

So, 19:00, Sion Brewery

See page 11 for further information.

SciTech Program

Overview

Day	Start	End	Description	Location
MO	07:30	18:00	Registration Open	Hyatt Foyer
	08:30	09:00	Welcome Coffee	Hyatt Foyer
	09:00	10:00	Opening Session	Hyatt Rheinsaal (1+2)
	10:00	10:20	Morning Coffee	Hyatt Bibliothek & Foyer
	10:20	12:30	Opening Session (continued)	Hyatt Rheinsaal (1+2)
	12:30	13:30	Lunch Break	Hyatt Bibliothek & Foyer
	13:30	14:54	Session 1 - Missions	Hyatt Rheinsaal (1+2)
	14:54	15:18	Afternoon Coffee	Hyatt Bibliothek & Foyer
	15:18	17:30	Session 1 - Missions (continued)	Hyatt Rheinsaal (1+2)
June 15, 2015	18:00	21:00	Welcome Reception	Hyatt Bibliothek & Foyer
TU	08:00	08:30	Welcome Coffee	Hyatt Foyer
	08:30	10:06	Session 2 - EDL Technologies	Hyatt Rheinsaal (1+2)
	10:06	10:30	Morning Coffee	Hyatt Bibliothek & Foyer
	10:30	12:30	Session 2 - EDL Technologies (continued)	Hyatt Rheinsaal (1+2)
	12:30	13:30	Lunch Break	Hyatt Bibliothek & Foyer
			For Students: Professional Development Session	Hyatt Rheinsaal (3)
	13:42	14:54	Session 3 - Inflatable and Deployable Systems	Hyatt Rheinsaal (1+2)
	14:54	15:18	Afternoon Coffee	Hyatt Bibliothek & Foyer
	15:18	17:30	Session 3 - Inflatable and Deployable Systems (continued)	Hyatt Rheinsaal (1+2)
June 16, 2015	19:30	23:00	Conference Banquet	Pure-Liner Ship on the Rhine River
WE	08:00	08:30	Welcome Coffee	Hyatt Foyer
	08:30	10:06	Session 4 - Science Investigations and Instrumentation	Hyatt Rheinsaal (1+2)
	10:06	10:30	Morning Coffee	Hyatt Bibliothek & Foyer
	10:30	12:30	Session 4 - Science Investigations and Instrumentation (continued)	Hyatt Rheinsaal (1+2)
	12:30	13:30	Lunch Break	Hyatt Bibliothek & Foyer
	13:30	17:30	Tour to DLR and EAC	DLR Facility in "Köln Porz"
June 17, 2015	19:30	22:00	Poster Session with finger food	Hyatt Rheinsaal (1+2+3)
TH	08:00	08:30	Welcome Coffee	Hyatt Foyer
	08:30	10:06	Session 5 - Airless Bodies	Hyatt Rheinsaal (1+2)
	10:06	10:30	Morning Coffee	Hyatt Bibliothek & Foyer
	10:30	12:30	Session 5 - Airless Bodies (continued)	Hyatt Rheinsaal (1+2)
	12:30	13:30	Lunch Break	Hyatt Bibliothek & Foyer
	13:30	14:54	Session 6 - Europa and Titan	Hyatt Rheinsaal (1+2)
	14:54	15:18	Afternoon Coffee	Hyatt Bibliothek & Foyer
June 18, 2015	15:18	17:30	Session 6 - Europa and Titan (continued)	Hyatt Rheinsaal (1+2)
FR	08:00	08:30	Welcome Coffee	Hyatt Foyer
	08:30	10:06	Session 7 - Cross Cutting Technologies	Hyatt Rheinsaal (1+2)
	10:06	10:30	Morning Coffee	Hyatt Bibliothek & Foyer
	10:30	12:30	Session 7 - Cross Cutting Technologies (continued)	Hyatt Rheinsaal (1+2)
	12:30	13:30	Lunch Break	Hyatt Bibliothek & Foyer
	13:30	16:00	Closing Session	Hyatt Rheinsaal (1+2)
	June 19, 2015	16:00	16:00	IPPW-12 Adjourned

Registration
Workshop Program
Short Course Program
Student Events
Additional Events
Breaks

Monday, 15 June, 2015

Opening Session

Chair: Gülhan, A.; Bienstock, B.

Oral Presentations

Mo, 09:00 *IPPW-12 Welcome*
Bienstock, B.

Mo, 09:05 *IPPW-12 Program Review & Introduction of Hansjörg Dittus*
Gülhan, A.

Mo, 09:15 *IPPW-12 DLR Welcome*
Dittus, H.

Mo, 09:35 *Presentation of Al Seiff Award*
Wright, M.

Mo, 09:40 *Al Seiff Award Presentation*
Ragent, B.; Papadopoulos, P.

Mo, 10:00 Morning Coffee

Mo, 10:20 *ESA's Steps towards Re-Entry Technologies and Systems Reusability: From the IXV Mission Design-To-Flight Experience to the Pride Mission Definition*
Tomino, G.

Mo, 10:45 *Entry Probes At NASA Ames: Past, Present, and Thoughts on the Future*
Smith, C.

Mo, 11:10 *Future Exploration of Ganymede and Europa with Juice and Other Missions*
Coustenis, A.

Mo, 11:35 *Realizing the Future of Deep Space Communication and Navigation;*
[IPPW2015-1112]
Deutsch, L.J.; Townes, S.; Vrotsos, P.; Cornwell, D.

Mo, 12:00 Lunch Break

Missions Session

Chair: Griebel, H.; Stehura, A.; Wilson, C.

As our knowledge of the solar system in which we live expands, the future of space exploration depends on the evolution of mission concepts and the technologies which enable them. This session will explore these technologies and mission concepts, covering innovative and conceptual mission proposals as well as past and present missions already flying or being implemented.

Mo, 13:30 *Introduction to workshop*
Morris, A; Griebel, H.

Mo, 13:42 *Insight Entry Descent and Landing Overview and Development Status; [IPPW2015-2103]*
Kipp, D.M.; Buecher, D.; Wikowski, A.; Glantz, A.

Mo, 13:54 *2015 Update: Mars 2020 Entry, Descent, and Landing System Overview; [IPPW2015-2104]*
Villar, G.; Stehura, A.; Otero, R.; Hines, E.; Chen, A.

Mo, 14:06 *Irena (International Re-Entry Demonstrator Action); [IPPW2015-2105]*
Bouilly, J.M.; Pisseloup, A.; Rasse, B.; Bousquet, P.W.; Weihs, H.; Chiarelli, C.; Vekinis, G.; Munk, M.; Yamada, T.

Mo, 14:18 *An Overview Of The Soarex And Techedsat Flight Series: Missions to Advance Re-entry Experimentation and Flight Technology; [IPPW2015-2106]*
Murbach, M.S.; Guarneros, A.

Mo, 14:30* *Biodome: Concept of an EDL System for Returning Small Biological Samples from Leo; [IPPW2015-2108]*
Rossman, G.; LeVine, M.; Lawlor, S.; Sloss, T.; Mishra, P.; Tan, Z.P.; Braun, R.D.

Mo, 14:42 *Poster introductions*

Mo, 14:54 **Afternoon Coffee & Poster Discussions**

Poster Presentations

Mo, Poster *Venus Atmospheric Maneuverable Platform (Vamp) - Science Vehicle Concept; [IPPW2015-2201]*
Lee, G.; Polidan, R.; Ross, F.; Sokol, D.; Miller, J.; Bolisay, L.

Mo, Poster* *Full Scale Plasma Testing Of A Small Entry Probe; [IPPW2015-2202]*
Sakraker, I.; Umit, E.; Bailet, G.; Scholz, T.; van der Haegen, V.

Mo, Poster* *Lunar Mission One: The First Crowdfunded Mission to the Moon Presenting New Opportunities for Lunar Science; [IPPW2015-2203]*
Cooper, D.; Anand, M.; Crawford, I.A.; Sims, M.R.; Smith, A.; Burgess, R.; Joy, K.H.; Cockell, C.S.; Sephton, M.A.; Russell, S.S.

Mo, Poster *Exomars 2018: An International Cooperation for Searching Life on Mars; [IPPW2015-2204]*
Mura, F.; Allasio, A.; Musetti, B.

Mo, Poster* *The European Ultrasonic Planetary Core Drill (Upcd) Project: Overview & Concept Of Operations; [IPPW2015-2205]*
Timoney, R.; Harkness, P.; Li, X.; Worall, K.; Bolhovitins, A.; Cheney, A.; Lucas, M.

Oral Presentations (cont'd)

Mo, 15:18 *Hera Entry Probe Mission to Saturn, an ESA M-Class Mission Proposal; [IPPW2015-2110]*
Atkinson, D.H.; Lebreton, J.P.

Mo, 15:30 *Surface Targets For Venus Exploration from the Vexag Targets Workshop; [IPPW2015-2111]*
Esposito, L.W.

Mo, 15:42 *Cupid's Arrow: An Innovative Nanosat to Sample Venus' Upper Atmosphere; [IPPW2015-2112]*
Bienstock, B.J.

Mo, 15:54 *Lifting Entry & Atmospheric Flight (Leaf) Applications at Solar System Bodies; [IPPW2015-2113]*
Lee, G.; Polidan, R.; Ross, F.; Sokol, D.; Miller, J.; Bolisay, L.

Mo, 16:06 *Ikaros and Solar Power Sail-Craft Missions for Outer Planetary Region Exploration; [IPPW2015-2114]*
Kawaguchi, J.; Mori, O.; Saiki, T.; Shirasawa, Y.; Kato, H.; Tsuda, Y.; Boden, R.; Matsumoto, J.; Chujo, T.; Kikuchi, S.

Mo, 16:18 *The Roles of Design and Cybernetics for Planetary Probe Missions; [IPPW2015-2115]*
Balint, T.; Hall, A.

Mo, 16:30 *Preliminary Design of the Phasing Strategy of Lunar Orbit Rendezvous Operation for a Sample Return Mission; [IPPW2015-2109]*
Wang, Z.; Meng, Z.; Gao, S.; Peng, J.

Mo, 16:42 Panel Discussion

Welcome Reception

Mo, 18:00, Foyer and Bibliothek

See page 11 for further information.

Tuesday, 16 June, 2015

EDL Session

Chair: Morris, A.; Venkatapathy, E.

This session is focused on the engineering and technology of end-to-end EDL architectures, including landers, probes, and deployment of flight vehicles. Contributions in the fields of GN&C, supersonic retropropulsion, architecture transitions, landing structures (airbags), and instrumentation (aerothermodynamic sensor systems, hazard detection and avoidance, pinpoint landing, etc.) will be presented.

Oral Presentations

- Tu, 08:30** *Introduction to workshop*
Morris, A; Griebel, H.
- Tu, 08:42** *NASA's Space Technology EDL Investments: Path for Enabling Human Mars Missions; [IPPW2015-3102]*
Munk, M.M.; Cianciolo, A.D.; Drake, B.G.
- Tu, 08:54** *Conformal Ablative Thermal Protection System for Small and Large Scale Missions: Approaching Trl 6 for Planetary and Human Exploration Missions and Trl 9 for Small Probe Missions; [IPPW2015-3103]*
Beck, R.A.S.; Gasch, M.J.; Milos, F.S.; Stackpoole, M.M.; Smith, B.P.; Switzer, M.R.; Venkatapathy, E.; Wilder, M.C.; Boghhozoian, T.; Chavez-Garcia, J.F.
- Tu, 09:06** *The Future of Landing: Terrain Relative Navigation From Prototype to Mars 2020; [IPPW2015-3104]*
Stehura, A.; Brugarolas, P.; Casoliva, J.; Chen, A.; Johnson, A.; Mohan, S.
- Tu, 09:18** *On-Board Terrain Relative Guidance-Target Selection for the Mars 2020 Mission; [IPPW2015-3105]*
Brugarolas, P.; Alexander, J.; Lee, A.; Lee, C.; Farthpour, N.; Flores, M.; Macala, G.; Stupik, J.; Wette, M.; Wong, E.
- Tu, 09:30** *Investigation of a Low Cost Concept for Landing Impact Attenuation; [IPPW2015-3106]*
Buchwald, R.; Reinhard, B.; Schröder, S.; Brauner, C.; Gebauer, I.
- Tu, 09:42** *Poster introductions*
- Tu, 10:06** **Morning Coffee & Poster Discussions**

Poster Presentations

- Tu, Poster*** *Supersonic Vehicle Configuration Transitions to Enable Supersonic Retropropulsion during Mars Entry, Descent, and Landing; [IPPW2015-3201]*
Blette, D.J.
- Tu, Poster*** *Simulation Tools for Controlled Separation of Reusable Sub-Orbital Vehicles from Carrier Aircraft. ; [IPPW2015-3202]*
Durand, G.; Van Hove, B.; Paris, S.; Karatekin, Ö.
- Tu, Poster*** *Trajectory Analysis of an Atmospheric Breathing Supersonic Retropropulsion Vehicle to Land Heavy Payloads on Mars; [IPPW2015-3203]*
Gonyea, K.C.; Auslender, A.H.; Braun, R.D.
- Tu, Poster*** *Analysis of Diffusion in Hypersonic Flow Regimes; [IPPW2015-3204]*
Eyi, S.; Gür, H.B.
- Tu, Poster*** *Reentry Blackout Alleviation through Electrostatic Manipulation of Plasma; [IPPW2015-3205]*
Krishnamoorthy, S.; Close, S.
- Tu, Poster*** *Analysis of Hypersonic Flow around a Re-Entry Vehicle Using Three Dimensional Navier-Stokes Equations; [IPPW2015-3206]*
Ozgun, M.; Eyi, S.
- Tu, Poster*** *Analysis of Hypersonic Non-Equilibrium Reentries with Newton-Gmres Method; [IPPW2015-3207]*
Piskin, T.; Eyi, S.
- Tu, Poster*** *Molecular Simulation of Surface Oxidation for Heat Shields; [IPPW2015-3208]*
Poovathingal, S.; Schwartzentruber, T.E.; Stern, E.C.; Candler, G.V.
- Tu, Poster*** *Closed Molding of Conformal Ablative Thermal Protection System Material; [IPPW2015-3209]*
Sidor, A.T.; Braun, R.D.
- Tu, Poster** *An Ablation Model for The Vaporization of Chondritic Meteoroids in the Atmosphere; [IPPW2015-3210]*
Stern, E.C.; Chen, Y.K.; White, S.M.

- Tu, Poster** *Overview of the 2nd Gen 3.7M Hiad and Flexible Tps Static Load Test Series; [IPPW2015-3211]*
Swanson, G.T.; Kazemba, C.D.; Johnson, R.K.; Hughes, S.J.; Calomino, A.M.; Cheatwood, F.M.; Cassell, A.M.
- Tu, Poster** *Hazard Assessment of Thruster Plume Induced Surface Alteration for the Insight Mission; [IPPW2015-3212]*
Kipp, D.M.; Grover, R.M.; Lisano, M.
- Tu, Poster** *High-Enthalpy Flow Diagnostics for Heat Shield Material Qualification; [IPPW2015-3213]*
Loehle, S.; Eberhart, M.; Fulge, H.; Hermann, T.; Marynowski, T.; Meindl, A.; Zander, F.
- Tu, Poster*** *Cavity-Stabilized Scramjet Analysis Using Reduced Chemical Kinetic Mechanisms; [IPPW2015-3214]*
Rouzbar, R.; Eyi, S.
- Tu, Poster** *Reentry capabilities of CubeSat Systems;*
Herdrich, G.

Oral Presentations (cont'd)

- Tu, 10:30** *Thermal Testing of the Heeet Tps In Extreme Environments; [IPPW2015-3109]*
Gasch, M.; Stackpoole, M.; Gonzales, G.; Prabhu, D.; Ellerby, D.
- Tu, 10:42** *Measuring EDL System Performance at Mars: A Comparison of the Insight and M2020 Performance Metrics; [IPPW2015-3110]*
Hines, E.K.; Grover, R.; Way, D.; Chen, A.; Dutta, S.
- Tu, 10:54** *The Mars 2020 Approach for Assessing Landing Risks for Sites Requiring Terrain Relative Navigation; [IPPW2015-3111]*
Otero, R.E.; Huertas, A.; Calef, F.J.; Ashley, J.W.; Chen, A.; Golombek, M.P.
- Tu, 11:06** *Free Flight Testing of Atmospheric Entry Capsules in Low Subsonic Flow; [IPPW2015-3112]*
Preci, A.; Guelhan, A.

Tu, 11:18* *Upon Impact and Crashworthiness Characteristics of Venera Type Landers for Future Venus Missions; [IPPW2015-3113]*
Schroeder, K.; Bayandor, J.; Samareh, J.

Tu, 11:30 **Panel Discussion**

Tu, 12:30 **Lunch Break**
Students Development Session

Tu, 12:30, Rheinsaal 3
See page 12 for further information.

Inflatable & Deployable Systems Session

Chair: Cutts, J.; Edquist, K; Griebel, H.

This session is focused on missions that use, and technology development programs that advance, inflatable and deployable technologies for planetary atmospheric descent. These technologies include, but are not limited to: parachutes, supersonic and hypersonic inflatable and mechanically-deployable aerodynamic decelerators, and parafoils. The session covers the various technologies and their benefits, as well as concepts for their use on science missions and methods for demonstrating them in technology development programs.

Oral Presentations

Tu, 13:42 *HIAD Infusion*
Cheatwood,

Tu, 13:54 *Flight Experience of the First Low Density Supersonic Decelerator Flight Test; [IPPW2015-4103]*
Chen, G.

Tu, 14:06* *Design of a Controllable Inflatable Aeroshell; [IPPW2015-4104]*
Mockel, C.; de Boer, T.; Dalmeijer, W.; Minich, A.; Ouerghi, I.; Smis, R.; Coppola, M.; van Loo, R.; Shabazi, S.; van Wijk, E.

Tu, 14:18* *Development and Validation of Multibody Flight Simulator for Parachute Descent on Mars; [IPPW2015-4105]*
Maeckelberghe, E.; Van Hove, B.; Karatekin, Ö.

Tu, 14:30 *Nano-Adept Aeroloads Wind Tunnel Test; [IPPW2015-4106]*
Smith, B.; Cassell, A.; Swanson, G.; Yount, B.; Kruger, C.; Brivkalns, C.; Zarchi, K.; McDaniel, R.; Venkatapathy, E.

Tu, 14:42 *Poster introductions*

Tu, 14:54 **Afternoon Coffee & Poster Discussions**

Poster Presentations

- Tu, Poster*** *Fluid-Structure Interaction Uncertainty over A Deformable Hiad;*
[IPPW2015-4201]
Brune, A.J.; Hosder, S.; Edquist, K.T.
- Tu, Poster** *Orbital Velocity Atmospheric Entry Flight Test Opportunity for a Second Generation HIAD System;* [IPPW2015-4203]
Hughes, S.J.; McNeil Cheatwood, F.; Swanson, G.T.; Zumwalt, C.H.; Dillman, R.A.; Del Corso, J.A.
- Tu, Poster** *Long Duration Altitude Cycling Balloon Platform;* [IPPW2015-4204]
deJong, M.; Cutts, J.; Pauken, M.
- Tu, Poster*** *Mass Estimation Modeling of Stacked Tori Inflatable Aerodynamic Decelerators;* [IPPW2015-4205]
Li, L.; Braun, R.D.

Oral Presentations (cont'd)

- Tu, 15:18** *Autonomous Guided Parafoil System for Soft and Precise Landing on Mars;*
[IPPW2015-4108]
Zhuo, W.; Wenqiang, W.
- Tu, 15:30*** *Infusion of Hiad Structural Webbing for Low-Profile Load Monitoring;*
[IPPW2015-4109]
Woollard, B.A.; Swanson, G.T.
- Tu, 15:42** *Passive Vs Parachute System Trade Applied to the Multi-Mission Earth Entry Vehicle Concept*
Munk, M.
- Tu, 15:54*** *Planetary Atmospheric EDL with Flexible and Inflatable Technologies;*
[IPPW2015-4112]
Mascolo, L.; Battipede, M.; Ambrosio, D.D.; Messidoro, A.; Battocchio, L.
- Tu, 16:06** *Hypersonic Inflatable Aerodynamic Decelerator Ground Test Development;*
[IPPW2015-4113]
Del Corso, J.A.; Hughes, S.J.; McNeil Cheatwood, F.; Calomino, A.; Johnson, K.
- Tu, 16:18** *Subscale Testing For Planetary Parachute Developments*
Sengupta, A.

Tu, 16:30 Panel Discussion

IPPW Banquet

Mo, 19:30, Pure-Liner

See page 12 for further information.

Wednesday, 17 June, 2015

Science Investigations and Instrumentation Session

Chair: Asmar, S.; Karatekin, O.; Munk, M.

The purpose of the session is to focus on typical science instrumentation flown on probe missions. Since science instrumentation requirements are key design drivers for planetary probes, it is necessary that mission planners, engineers, and managers understand probe instrument basic characteristics and their operations. In addition to science instruments, engineering instruments that provide feedback on probe environments and performance are critical to a long-term exploration view that seeks to improve mission efficiency and reduce cost and risk. The session will review current projects and studies, and explore science and engineering instrument concepts and designs as well as associated goals and results. Lessons learned from science and engineering instrumentation on earlier missions will also be included.

Oral Presentations

We, 08:30 *2005 Huygens Hasi at Titan - 2016 Exomars Amelia EDL Science: Lessons Learned and Future Perspectives; [IPPW2015-5101]*

Ferri, F.; Colombatti, G.; Aboudan, A.; Debei, S.

We, 08:42 *Mars2020 Entry, Descent, and Landing Instrumentation: Science Objectives and Instrument Requirements; [IPPW2015-5102]*

Bose, D.; White, T.R.; Schoenenberger, M.; Karlgaard, C.; Wright, H.S.

We, 08:54 *Atmospheric Science from the Mars Science Laboratory Entry Probe; [IPPW2015-5103]*

Holstein-Rathlou, C.; Withers, P.; Maue, A.

We, 09:06* *Simulation and Reconstruction Tools for Mars Atmospheric Entry; [IPPW2015-5104]*

Van Hove, B.; Karatekin, Ö.

We, 09:18* *Seven Minutes of Terror and Some Science; [IPPW2015-5105]*

Saikia, S.J.; Longuski, J.M.

We, 09:30* *Methodology for Entry Probes Trajectory Reconstruction through Radio Communications; [IPPW2015-5106]*

Gerbal, N.; Karatekin, Ö.

We, 09:42* *Estimation of Surface Temperature and Heat Flux By Inverse Heat Transfer Methods Using Internal Temperatures Measured While Radiantly Heating a Carbon/Carbon Specimen up to 1920°F; [IPPW2015-5107]*

Pizzo, M.E.; Glass, D.E.

We, 09:54 *Poster introductions*

We, 10:06 **Morning Coffee & Poster Discussions**

Poster Presentations

We, Poster* *Development of a One-Dimensional Centered Finite Difference Computational Code to Solve Direct and Inverse Heat Transfer Problems with Time-Varying Temperatures and Temperature-Dependent Thermal Properties; [IPPW2015-5201]*

Pizzo, M.E.; Glass, D.E.

We, Poster* *Cheap Real-Time Communication for Satellites and High Altitude Balloons with the Iridium Satellite Phone Network; [IPPW2015-5202]*

Pearhill, G.; Bodmer, M.; Murbach, M.; Mojica, J.; Reuter, A.; Atkinson, D.

We, Poster *Multipurpose Platform for Astrobiological Investigation; [IPPW2015-5203]*

Schultz, C.; Bärwald, W.; Böttger, U.; de Vera, J.P.; Halle, W.; Lieder, M.; Pavlov, S.; Schröder, S.; Hübers, H.W.

We, Poster* *Geologic Context of Promising Landing Sites on Titan's Mid-Latitude Regions for Future Missions; [IPPW2015-5204]*

Solomonidou, A.; Lopes, R.M.C.; Malaska, M.J.; Rodriguez, S.; Sotin, C.; Drossart, P.

We, Poster *"Regs" - A New Resistive Grid Tps Recession Sensor; [IPPW2015-5205]*

Vekinis, G.

We, Poster *Miniaturized Raman-Libs Spectrometer for Planetary In-Situ Exploration; [IPPW2015-5206]*

Schröder, S.; Böttger, U.; Hanke, F.; Pavlov, S.G.; Hübers, H.W.

We, Poster *Development of a 3D Unstructured Code for Simulating Ablative Material Response; [IPPW2015-5207]*

Stern, E.C.; Muppidi, S.; Palmer, G.E.

We, Poster *Planetary Instrument Research and Development at JPL; [IPPW2015-5208]*

Lin, Y.

We, Poster *Mars 2020, Entry, Descent and Landing Technology Payloads*

Villar

Oral Presentations (cont'd)

- We, 10:30*** *New Architecture to Use Mesoscale Atmospheric Models for Mars Entry, Descent, and Landing Simulations; [IPPW2015-5109]*
Yanes, N.J.; Dutta, S.; Way, D.J.
- We, 10:42** *Preparations for the Airborne Atv-5 Re-Entry Observation Campaign; [IPPW2015-5110]*
Loehle, S.; Jenniskens, P.; Lips, T.; Virgili, B.B.; Albers, J.; Zander, F.; Krag, H.; Grinstead, J.H.; Bacon, J.
- We, 10:54** *The Balloon Infrared Spectrograph for Surface Thermal Emission (Birste) of Venus; [IPPW2015-5111]*
Holsclaw, G.M.; Esposito, L.W.; McClintock, W.E.
- We, 11:06*** *Preparations for Variable-Gravity Regolith Penetration with an Ultrasonically-Active Probe; [IPPW2015-5112]*
Firstbrook, D.G.; Harkness, P.; Doherty, P.; Timoney, R.; MacCartney, A.; Suñol, F.
- We, 11:18** *Cubesat Sized Atmospheric Probe Mass Spectrometer for Measuring Noble Gases and their Isotopic Ratios in Planetary Atmospheres; [IPPW2015-5113]*
Darrach, M.; Farley, K.; Madzunkov, S.; Beegle, L.; Schaefer, R.; Sotin, C.; Hand, K.; Simcic, J.; Brown, M.; Burger, M.
- We, 11:30*** *Re-Entry Platform for Studying Radiation, From Payload Design to Qualification Test.; [IPPW2015-5114]*
Bailet, G.; Magin, T.; Bourgoing, A.; Laux, C.

We, 11:42 Panel Discussion

We, 12:30 Lunch Break

DLR Tour

We, 13:30, DLR site

See page 13 for further information.

Poster Session

We, 19:30, Rheinsaal (1+2+3)

See page 12 for further information.

Thursday, 18 June, 2015

Airless Bodies Session

Chair: Buchwald, R.; Oudrhiri, K.; Sengupta, A.; Ulamec, S.

Airless bodies have unique science potential from the scientific discovery associated with solar system origin, evolutionary processes that led to the formation of the planets, and the search of primitive classes of organics that can shed light on the origin of life. The recent Dawn and Rosetta missions have returned valuable scientific data and future Osiris Rex mission and the Asteroid Redirect Mission promise to unveil many mysteries about the airless bodies. This session will cover mission overviews, descent and landing architectures, and surface science and instrumentation related to this mission class.

Oral Presentations

- Th, 08:30** *The Rosetta Mission: Design Challenges In Deep Space; [IPPW2015-6101]*
Lautenschläger, G.
- Th, 08:54** *Rosetta Lander Philae: Status after First Landing on a Comet; [IPPW2015-6103]*
Ulamec, S.; Biele, J.; Fantinati, C.; Gaudon, P.; Geurts, K.; Maibaum, M.; Salatti, M.
- Th, 09:06** *Philae Landing: Flight Dynamics Analyses for Landing Site Selection and Postlanding; [IPPW2015-6104]*
Jurado, E.; Blazquez, A.; Martin, T.; Canalias, E.; Laurent-Varin, J.; Reme-tean, E.; Garmier, R.; Ceolin, T.; Biele, J.; Jorda, L.
- Th, 09:18** *Analysis of the Descent and Bouncing Trajectory of Mascot on 1999Ju3; [IPPW2015-6105]*
Canalis, E.; Deleuze, M.; Tardivel, S.; Lange, C.; Ziach, C.
- Th, 09:30** *Can The Strategy of Concurrent Aiv, Established For Small Carry-On Spacecraft, Also be Used for Bigger Satellites?; [IPPW2015-6106]*
Grimm, C.D.; Hendrikse, J.; Termtanasombat, N.; Grundmann, J.T.
- Th, 09:42*** *Automated Design of Observation and Landing Trajectories at Small Bodies; [IPPW2015-6107]*
Surovik, D.A.; Scheeres, D.J.
- Th, 09:54** *Poster introductions*
- Th, 10:06** **Morning Coffee & Poster Discussions**

Poster Presentations

Th, Poster* *Vision-Based Autonomous Characterization and Navigation for Asteroids; [IPPW2015-6201]*
Bissonnette, V.; Dor, M.

Oral Presentations (cont'd)

Th, 10:30 *The Case for Nanolandings At Small Bodies; [IPPW2015-6109]*
Tardivel, S.; Klesh, A.T.

Th, 10:42* *Exploring Small Body Surfaces with Landed Pods; [IPPW2015-6110]*
Van Wal, S.; Tardivel, S.; Scheeres, D.J.

Th, 10:54 *Sample Return Missions: From the Lunar South Pole and From Phobos; [IPPW2015-6111]*
Ferri, A.; Pelle, S.; Houdou, B.; Fisackerly, R.

Th, 11:06 *Augmenting Primary Missions with Small Satellites for Airless Body Detection and Science*
Kamal, O.

Th, 11:18 *Overview of a New NASA Activity Focused on Planetary Defense; [IPPW2015-6113]*
Arnold, J.O.; Burkhard, C.D.; Venkatapahty, E.; Morrison, D.; Lee, T.; Dotson, J.; Prabhu, D.K.; Mathias, D.; Aftosmis, M.; Sears, D.

Th, 11:30 *Physics Based Simulation of Potentially Hazardous Asteroids Entry, Break-Up and Impact; [IPPW2015-6114]*
Venkatapathy, E.; Arnold, J.O.; Aftosmis, M.; Burkhard, C.D.; Dotson, J.; Lee, T.; Mathias, D.; Morrison, D.; Prabhu, D.K.; Sears, D.

Th, 11:42 **Panel Discussion**

Th, 12:30 **Lunch Break**

Europa and Titan Session

Chair: Cutts, J.; Morris, A.; Peacocke, L.

Europa the second moon of Jupiter is viewed as a prime candidate for extant life in the solar system. Confirming the habitability of Europa will require landing on the moon and potentially penetrating beneath the radiation-modified surface layer. However, there are great uncertainties in the surface topography that pose challenges in designing robust approaches for accomplishing this activity. Titan, with a dense atmosphere and hydrocarbon lakes, poses fewer landing challenges and also offers opportunities for aerial, marine and submarine exploration. This session will cover the science motivation for exploring Europa and Titan, instruments and measurement techniques, technology for landing on and penetrating an icy surface as well as mission concepts.

Oral Presentations

- Th, 13:30** *Scientific Goals for Future Lander Missions to Europa and Titan; [IPPW2015-7101]*
Beauchamp, P.M.
- Th, 13:54** *Penetrator for the Exploration of Europa; [IPPW2015-7103]*
Peacocke, L.; Barraclough, S.; Perkinson, M.C.
- Th, 14:18** *On the Challenges of Designing a Soft Lander for Europa; [IPPW2015-7105]*
San Martin, A.M.
- Th, 14:30** *A Thermal Simulation Tool to Support Ice-Penetrating Exploration Probes; [IPPW2015-7106]*
Kowalski, J.; Schüller, K.; Raback, P.; Dachwald, B.

Th, 14:54 Afternoon Coffee**Oral Presentations (cont'd)**

- Th, 15:18** *Guidance Navigation and Control for the Europa Clipper Mission; [IPPW2015-7108]*
Brugarolas, P.; Chen, A.; Johnson, A.; Casoliva, J.; Mohan, S.; Singh, G.; Stehura, A.; Way, D.; Dutta, S.
- Th, 15:30** *The JPL Mass Analyzer for Real-Time Investigation of Neutrals at Europa (Mare); [IPPW2015-7109]*
Darrach, M.; Sotin, C.; Madzunkov, S.; Marty, B.
- Th, 15:42** *Splashdown Testing for the Titan Mare Explorer (Time) Mission - Review; [IPPW2015-7110]*
Lorenz, R.D.
- Th, 15:54** *Development and Antarctic Field Deployment of A Maneuverable Subsurface Probe for Solar System Ices; [IPPW2015-7111]*
Dachwald, B.; Espe, C.; Feldmann, M.; Francke, G.; Kowalski, J.
- Th, 16:06*** *Autonomous Balloon Navigation Over Titan's Surface; [IPPW2015-7112]*
Garg, K.; Mooij, E.
- Th, 16:18*** *Diving Into Titan's Atmosphere; [IPPW2015-7113]*
Lübke, V.; Buchwald, R.; Wilde, D.
- Th, 16:30** *Titan Altitude Cycling Balloon; [IPPW2015-7114]*
deJong, M.; Cutts, J.; Pauken, M.

Th, 16:42 Panel Discussion**IOC Dinner (by invitation)**

See page 12 for further information.

Friday, 19 June, 2015

Cross-Cutting Technologies Session

Chair: Beauchamp, P.; Korzun, A.M.; Ritter, H.

The Cross-Cutting Technologies Session includes contributions on broadly capable technologies, both engineering systems and science instrumentation solutions, with applicability to multiple destinations, probe platforms, and/or a variety of mission objectives.

Oral Presentations

- Fr, 08:30*** *Comparative Analysis of Different Passive Hazard Mapping Techniques; [IPPW2015-8102]*
Woicke, S.; Mooij, E.
- Fr, 08:42** *Sensor Head for Autonomous Planetary Exploration; [IPPW2015-8103]*
Börner, A.; Baumbach, D.; Buder, M.; Choinowski, A.; Ernst, I.; Griebßbach, D.; Zuev, S.
- Fr, 08:54** *Lab on a Chip - Promising Technology for Space- and Oceanographic Missions; [IPPW2015-8104]*
Sommer, S.; Sohl, F.; de Vera, J.P.; Boettger, U.; Yücel, M.
- Fr, 09:06** *Marco Polo Erc Dynamic Stability Characterization*
Tran, P.
- Fr, 09:18** *High-Speed Compact Sample Return Capsule Enhanced by Lightweight Ablator and Chuteless Design; [IPPW2015-8106]*
Yamada, T.; Tanno, H.; Kitazono, K.; Ogasawara, T.
- Fr, 09:30** *Mars Sample Survivability Testing for Mars Sample Return; [IPPW2015-8101]*
Kipp, K.A.; Kang, J.D.; Ferguson, W.A.
- Fr, 09:42** *Earth Entry Vehicle Design for Sample Return Missions; [IPPW2015-8107]*
Samareh, J.A.
- Fr, 09:54** *Poster introductions*

Fr, 10:06 Morning Coffee & Poster Discussions

Poster Presentations

- Fr, Poster*** *System Performance Assessment for Magnetohydrodynamic Energy Generation during Planetary Entry; [IPPW2015-8201]*
Ali, H.K.; Braun, R.D.
- Fr, Poster*** *Actuated Payload Design for an Icosahedron Tensegrity Structure; [IPPW2015-8202]*
Tigue, J.; Goodwin, S.; Morse, K.; Rayborn, K.; Waterman, D.; Wohlschlegel, A.; Garber, M.; Atkinson, D.H.; SunSpiral, V.

- Fr, Poster** *A Research of the Correction Method of the Spacecraft Near-Earth Rangi; [IPPW2015-8203]*
JingLei, L.i.u.
- Fr, Poster** *A Novel Approach for Modular Spacecraft Structures; [IPPW2015-8204]*
Kortmann, M.; Schervan, T.A.; Schmidt, H.; Dafnis, A.; Reimerdes, H.G.
- Fr, Poster*** *Proof of Concept Planetary Lander Test Article; [IPPW2015-8205]*
Montgomery, H.A.; Goyette, G.T.; Hartman, A.P.; Hereford, S.K.; Djordjevic, N.
- Fr, Poster*** *Design of a Mars Sample Return Capture Relative Navigation System; [IPPW2015-8206]*
Okсениuk, K.J.; Chait, S.B.
- Fr, Poster*** *A Novel Method of Delivering Small Payloads from a Planetary Orbiter to the Surface; [IPPW2015-8207]*
Wayne, S.; Arakawa, B.; Bjur, J.; Cumber, B.; Kisling, B.; Park, R.; Takaleh, E.; Tanner, F.; Murbach, M.; Alena, R.
- Fr, Poster** *Subscale Testing for Planetary Parachute Developments; [IPPW2015-8208]*
Sengupta, A.
- Fr, Poster** *Techedsat-3 and Techedsat-4 De-Orbit System Experiments - Recent Experience; [IPPW2015-8209]*
Murbach, M.S.
- Fr, Poster** *The Exo-Brake De-Orbit Mechanism: Recent Flight Experience; [IPPW2015-8210]*
Murbach, M.S.
- Fr, Poster** *Use of the International Space Station for Demonstrating EDL Technologies and Sensors; [IPPW2015-8113]*
Sengupta, A.; Oudrhiri, K.
- Oral Presentations (cont'd)**
- Fr, 10:30*** *Entry Vehicle Backshell Wake Flow Investigation at Mach 5 Using Additively Manufactured Models; [IPPW2015-8109]*
Fisher, T.; Quinn, M.K.; Smith, K.
- Fr, 10:42** *European Studies to Advance Development of Inflatable and Deployable Aerodynamic Decelerators*
Underwood,
- Fr, 10:54** *Advanced Ablation Characterization and Modelling; [IPPW2015-8111]*
Guelhan, A.

Fr, 11:06* *Experimental Investigations of Venus Atmospheric Entry; [IPPW2015-8112]*
deCrombrughe, G.; McIntyre, T.J.; Morgan, R.G.

Fr, 11:30 **Panel Discussion**

Closing Session

Chair: Beauchamp, P.

Oral Presentations

Fr, 13:30 *Panel Discussion: Probe Exploration: The Next Frontier?*
Lebreton, J.P. and Panelists

Fr, 14:30 *Development Challenges of Disruptive Entry System Technologies from Concept to Mission Infusion; [IPPW2015-9106]*
Venkatapathy, E.; Beck, R.; Ellerby, D.J.; Feldman, J.; Gage, P.; Munk, M.; Wercinski, P.

Fr, 15:18 *10Th Anniversary of the Huygens Probe Landing on Titan and the Creatio; [IPPW2015-9108]*
Atkinson, D.H.; Mousis, O.; Atkinson, D.H.; Spilker, T.; Venkatapathy, E.; Poncy, J.; Frampton, R.; Coustenis, A.; Reh, K.; Lebreton, J.P.

Fr, 15:30 *Student Awards*
Lebreton, J.P.; Ruffin, S.

Fr, 15:42 *Plan for IPPW-13*
Reed, C.; Amato, M.; Bienstock, B.

Fr, 15:54 *Closing and Farewell*
Gülhan, A.; Bienstock, B.

Fr, 16:00 **Meeting Adjourned**

12th International Planetary Probe Workshop, Köln, Germany

Day	Start	End	Description	Location
-----	-------	-----	-------------	----------

SA June 13, 2015	08:00	18:00	Registration Open	Hyatt Foyer
	09:00	09:30	Welcome Coffee	Hyatt Bibliothek
	09:30	17:30	Short Course (1/2) - Radio flyers	Hyatt Rheinsaal (1)

SU June 14, 2015	08:00	18:00	Registration Open	Hyatt Foyer
	09:00	09:30	Welcome Coffee	Hyatt Bibliothek
	09:30	17:30	Short Course (2/2) - Radio flyers	Hyatt Rheinsaal (1)
	19:00	22:00	For Students: Student Social Event	Sion Brewery

MO June 15, 2015	07:30	18:00	Registration Open	Hyatt Foyer
	08:30	09:00	Welcome Coffee	Hyatt Foyer
	09:00	10:00	Opening Session	Hyatt Rheinsaal (1+2)
	10:00	10:20	Morning Coffee	Hyatt Bibliothek & Foyer
	10:20	12:30	Opening Session (continued)	Hyatt Rheinsaal (1+2)
	12:30	13:30	Lunch Break	Hyatt Bibliothek & Foyer
	13:30	14:54	Session 1 - Missions	Hyatt Rheinsaal (1+2)
	14:54	15:18	Afternoon Coffee	Hyatt Bibliothek & Foyer
	15:18	17:30	Session 1 - Missions (continued)	Hyatt Rheinsaal (1+2)
	18:00	21:00	Welcome Reception	Hyatt Bibliothek & Foyer

TU June 16, 2015	08:00	08:30	Welcome Coffee	Hyatt Foyer
	08:30	10:06	Session 2 - EDL Technologies	Hyatt Rheinsaal (1+2)
	10:06	10:30	Morning Coffee	Hyatt Bibliothek & Foyer
	10:30	12:30	Session 2 - EDL Technologies (continued)	Hyatt Rheinsaal (1+2)
	12:30	13:30	Lunch Break	Hyatt Bibliothek & Foyer
			For Students: Professional Development Session	Hyatt Rheinsaal (3)
	13:42	14:54	Session 3 - Inflatable and Deployable Systems	Hyatt Rheinsaal (1+2)
	14:54	15:18	Afternoon Coffee	Hyatt Bibliothek & Foyer
	15:18	17:30	Session 3 - Inflatable and Deployable Systems (continued)	Hyatt Rheinsaal (1+2)
	19:30	23:00	Conference Banquet	Pure-Liner Ship on the Rhine River

WE June 17, 2015	08:00	08:30	Welcome Coffee	Hyatt Foyer
	08:30	10:06	Session 4 - Science Investigations and Instrumentation	Hyatt Rheinsaal (1+2)
	10:06	10:30	Morning Coffee	Hyatt Bibliothek & Foyer
	10:30	12:30	Session 4 - Science Investigations and Instrumentation (continued)	Hyatt Rheinsaal (1+2)
	12:30	13:30	Lunch Break	Hyatt Bibliothek & Foyer
	13:30	17:30	Tour to DLR and EAC	DLR Facility in "Köln Porz"
	19:30	22:00	Poster Session with finger food	Hyatt Rheinsaal (1+2+3)

TH June 18, 2015	08:00	08:30	Welcome Coffee	Hyatt Foyer
	08:30	10:06	Session 5 - Airless Bodies	Hyatt Rheinsaal (1+2)
	10:06	10:30	Morning Coffee	Hyatt Bibliothek & Foyer
	10:30	12:30	Session 5 - Airless Bodies (continued)	Hyatt Rheinsaal (1+2)
	12:30	13:30	Lunch Break	Hyatt Bibliothek & Foyer
	13:30	14:54	Session 6 - Europa and Titan	Hyatt Rheinsaal (1+2)
	14:54	15:18	Afternoon Coffee	Hyatt Bibliothek & Foyer
15:18	17:30	Session 6 - Europa and Titan (continued)	Hyatt Rheinsaal (1+2)	

FR June 19, 2015	08:00	08:30	Welcome Coffee	Hyatt Foyer
	08:30	10:06	Session 7 - Cross Cutting Technologies	Hyatt Rheinsaal (1+2)
	10:06	10:30	Morning Coffee	Hyatt Bibliothek & Foyer
	10:30	12:30	Session 7 - Cross Cutting Technologies (continued)	Hyatt Rheinsaal (1+2)
	12:30	13:30	Lunch Break	Hyatt Bibliothek & Foyer
	13:30	16:00	Closing Session	Hyatt Rheinsaal (1+2)
	16:00	16:00	IPPW-12 Adjourned	Hyatt Rheinsaal (1+2)

Registration
Workshop Program
Short Course Program
Student Events
Additional Events