

Particle Therapy MasterClass educational outreach package



<https://indico.cern.ch/event/840212/>

Yiota Foka (GSI/CERN)

PTMC tutorial zoom-meeting
Thursday 11 February 2020 at 13:30 (Geneva Time)

International MasterClasses

PTMC is integrated into the International MasterClasses project

<https://physicsmasterclasses.org/index.php>

The “International Masterclasses” IMC project is an educational outreach activity that brings the excitement of cutting-edge research methods into the classroom.

Offers to pupils hands-on experience with real data

Become “scientists for a day” !



Classes by masters, experts

IMC Statistics 2019

Motivate the next generations of scientists !



7.3. - 16.4.2019

255 Institutes

54 countries involved

~ 15 000 students



Coord.: QuarkNet / TU Dresden



- 51 institutes (48)
- 54 LHC Masterclasses (50)
 - 22 ATLAS (19)
 - 32 CMS (31)
 (Incl. TRIUMF program)
- 12 MINERvA Masterclasses

- 188 institutes (177)
- 266 LHC Masterclasses (257)
 - 30 ATLAS W (35)
 - 101 ATLAS Z (104)
 - 64 CMS (58)
 - 41 LHCb (39)
 - 27 ALICE SP (18)
 - 3 ALICE R_AA (3)

Flagship project of IPPOG, International Particle Physics Outreach Group <https://ippog.org>

Concept and programme of an IMC day

Every year, during the months of February-March school-children (15-19 year old) are invited to an institute of their area.

2-5 institutes per day performing the same programme

<u>LOCAL TIME:</u>	<u>ACTIVITY</u>
8:30 - 9:00	Registration and Welcome
9:00 - 10:00	Introductory lectures
10:30 - 11:30	Visit of a lab or experiment
12:00 - 13:00	Lunch
13:00 - 15:00	Hands-on session
15:00 - 16:00	Discuss results locally
16:00 - 17:00	Video conference



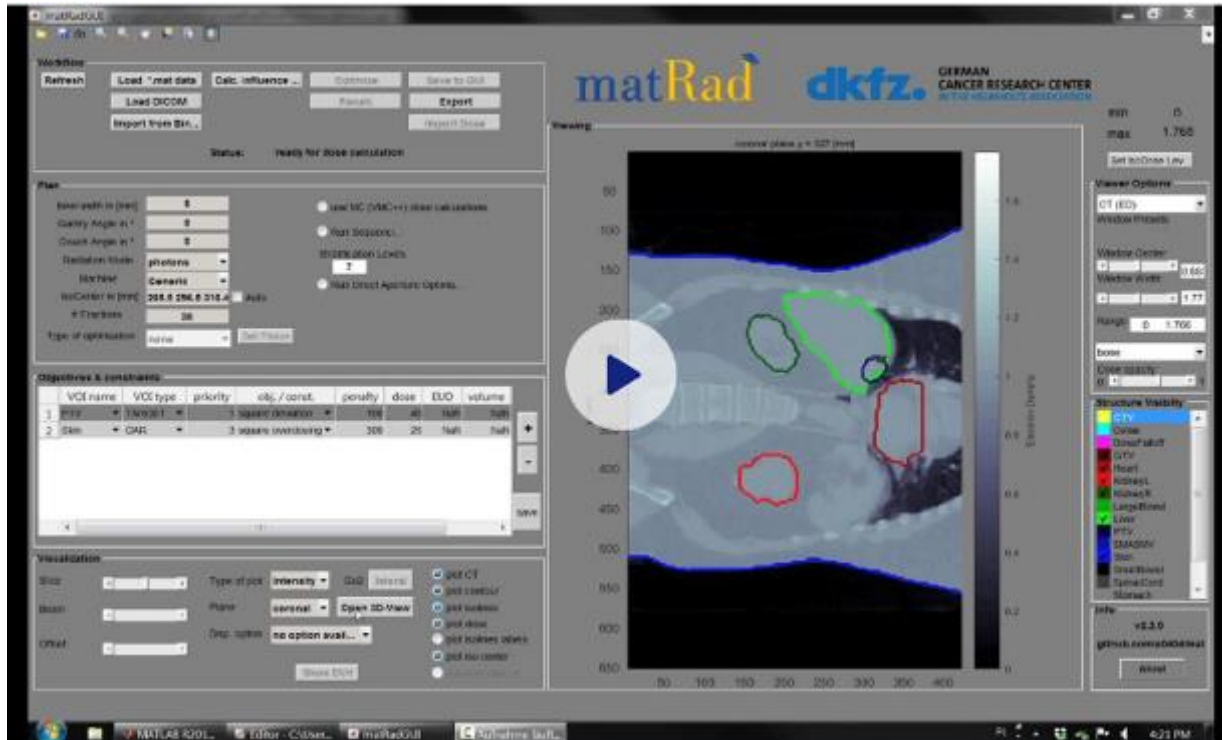
The aim is to get insight into topics and methods of research

Particle Therapy Centre



PTMC and Treatment Planning

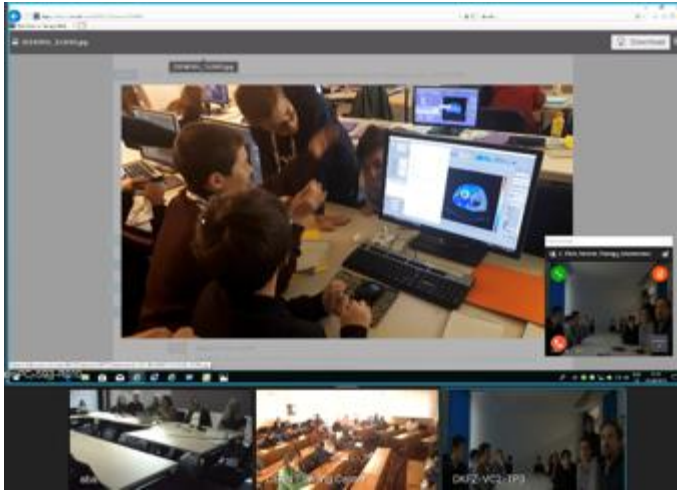
Based on professional open source treatment planning: matRad
developed by Heidelberg DKFZ www.matrad.org



First contact proposed by C.G.
Simplified version by HD DKFZ



PTMC pilots in 2019

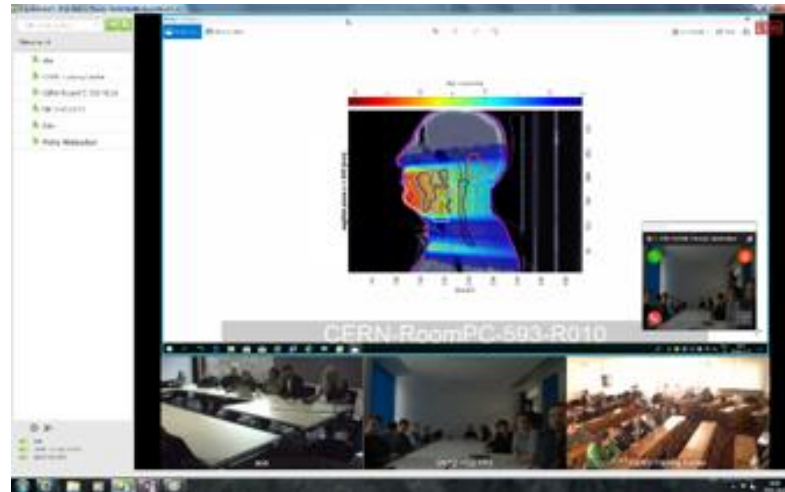


CERN, DKFZ, GSI

Common discussion: intuitive, visual comparisons of photons, protons, ions

- First test: locally at GSI on 7th February 2019
Participation of CURIEosity Team from Crete
- First pilot: CERN, DKFZ Heidelberg, GSI, 5th April 2019

Survey: positive results from students
Hope and motivation to contribute to the fight against cancer



PTMC in IMC 2020 and 2021

Publication CHEP in arxiv 6 may: <https://arxiv.org/abs/2005.02215>

Approval for IMC2020

- IMC Steering Group: Presentation and Feedback
- Material ready for IMC web: during summer 2019 Uni Sarajevo: web pages
- In the IMC program for 2021
- 25 institutes registered and more interested

Dates IMC2021: 11.2-27.3 2021

Switching to online/zoom sessions

MATERIAL and TRAINING:

- Material/methods for zoom/online sessions
- Training of tutors, support teams

In Greece:

Veroia Library: whole greece

With the support of Aris Mamaras (AUPh)

PTMC in 2021

Every Friday at 13:30 we hold a "Helpdesk" for any questions and/or training.
The next ones are:

12th February: <https://indico.cern.ch/event/1006829/>

19 February: <https://indico.cern.ch/event/1006832/>

26 February: <https://indico.cern.ch/event/1006833/>

PTMC in 2021

Examples of a PTMC Session (9:00-16:00
and a Videoconference (16:00-17:00 CET)

- **EXAMPLE PTMC Session 9:00-16:00**

<https://indico.cern.ch/event/1002980/>

- **EXAMPLE VIDEOCONFERENCE 16:00-17:00 Central European Time**


<https://indico.cern.ch/event/999420/>

09:00 → 09:15 **Welcome**

Welcome and aim of the PTMC day, set the stage.
For a visual impression a virtual Particle Therapy centre is in the link below.


A good summary connecting physics and particle therapy can be found on the animation link.


Conveners: Mr Damir Skrijelj (UNSA) , Fehima Ugarak (University of Sarajevo (BA))

 Animations

09:15 → 10:15 **Introductory Lectures: UNSA (Sarajevo)**

Convener: Amra Ibrahimovic (University of Sarajevo (BA))

 MasterClass_theory...

 MasterClass_theory...

10:15 → 10:25

Break


10:25 → 11:15 **Presentation**

11:15 → 11:45

Break

11:45 → 12:15 **Visit of a lab or experiment**

Real-time virtual visit at ALICE LHC experiment.
As an alternative to a visit to a local lab or experiment, videos can be used (see the link below)


 PTMC useful materi...


12:15 → 13:15

Lunch Break

13:15 → 15:45 **Hands-on session**

Convener: Amila Avdic (University of Sarajevo (BA))

 PTMCpres_-_English...

 PTMCpres_-_English...

Video conference: Particle Therapy Masterclass 24th March

 Wednesday 24 Mar 2021, 16:00 → 17:00 Europe/Zurich

 CERN

16:00 → 17:00 **Video conference**

16:00-17:00 CET

Conveners: Benjamin Dedic (University of Sarajevo (BA)) , Fehima Ugarak (University of Sarajevo (BA)) , Hans-Peter Wiese

Helmholtzzentrum fur Schwerionenforschung GmbH (DE))

16:00 **Welcome**

Presentation of results

Speaker: Yiota Foka (GSI - Helmholtzzentrum fur Schwerionenforschung GmbH (DE))

16:05 **Presentation by University of Tuzla**

Speaker: Hedim Osmanovic (University of Tuzla/Faculty of Science)

16:15 **Presentation by Kaunas University of Technology, Kaunas**

Speaker: Brigita Abakeviciene

16:25 **Presentation by Vilnius Univesity, Vilnius**

Speaker: Aušra Kynienė (Vilnius University)

16:35 **Presentation by Saint-Petersburg University**

Speaker: Dr Grigori Feofilov (St Petersburg State University (RU))

16:45 **Presentation by University of Egypt**

Speaker: Mahmoud Nasar

16:55 **Quiz**

Speaker: Mr Damir Skrijelj (UNSA)

PTMC in a kit: Installation and Testing

The necessary material for installation and the hands-on,
including recording:

- **PTMC in a kit in ENGLISH (Spanish, Bosnian, Greek coming)**

https://drive.google.com/drive/folders/1jRnLf49N_yRoOGg8V8vwq3DIpnetWdF0



Installation_MatRad.mp4 



PTMC.mp4 

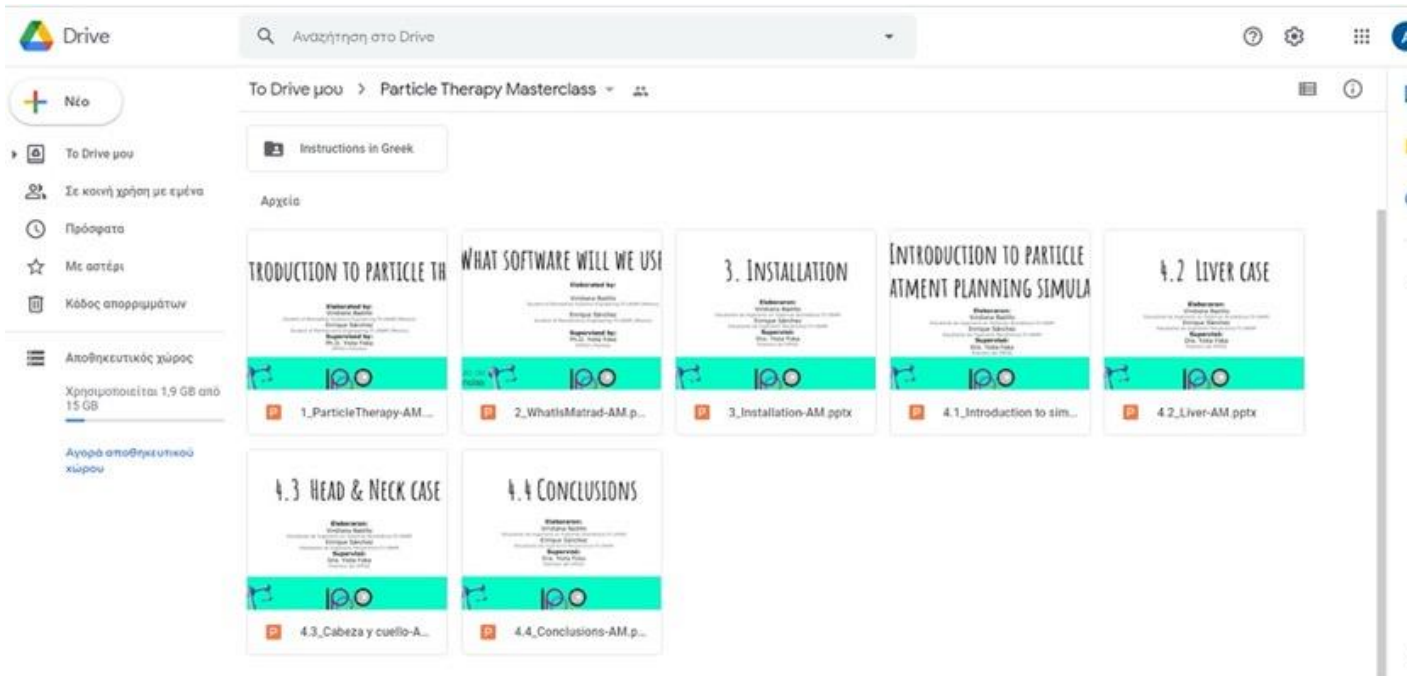


README_Installation_matRad.docx 

PTMC in a kit Installation and Testing

For fast installation and testing, instructions in google drive:
in English, Mexican/Spanish, Greek: by Aris Mamaras, Viridiana, Enrique

https://drive.google.com/drive/folders/1jRnLf49N_yRoOGg8V8vwq3DIpnetWdF0



The screenshot shows a Google Drive interface with a search bar at the top containing the text "Αναζήτηση στο Drive". Below the search bar, the folder path is "To Drive μου > Particle Therapy Masterclass". The folder contains a sub-folder "Instructions in Greek" and a list of files. The files are:

- 1_ParticleTherapy-AM...
- 2_WhatIsMatrad-AM p...
- 3_Installation-AM pptx
- 4.1_Introduction to sim...
- 4.2_Liver-AM pptx
- 4.3_Cabeza y cuello-A...
- 4.4_Conclusions-AM.p...

Each file has a thumbnail showing a slide with a title and a green bar at the bottom. The thumbnails are:

- 1. Introduction to Particle Therapy
- 2. What Software Will We Use
- 3. Installation
- 4.1. Introduction to Particle Therapy Simulation
- 4.2. Liver Case
- 4.3. Head & Neck Case
- 4.4. Conclusions

On the left side of the Drive interface, there is a sidebar with navigation options: "Νέο", "To Drive μου", "Σε κοινή χρήση με εμένα", "Πρόσφατα", "Με αστερί", "Κάδος απορριμάτων", "Αποθηκευτικός χώρος", "Χρησιμοποιείται 1,9 GB από 15 GB", and "Αγορά αποθηκευτικού χώρου".

PTMC material in web page

The PTMC web page <https://indico.cern.ch/event/840212/overview>

provides a lot of material :<https://indico.cern.ch/event/840212/page/17998-materials>

Instructions for tutors, moderators, necessary definitions:

<https://indico.cern.ch/event/840212/page/17986-instructions>

Presentations: <https://indico.cern.ch/event/840212/page/17999-presentations>

Animations: <https://indico.cern.ch/event/840212/page/18000-animations>



Particle Therapy MasterClass

[Uni Sarajevo: web pages](https://indico.cern.ch/event/840212/) <https://indico.cern.ch/event/840212/>

- Home
- Posters
- Aim
- Materials
- Agenda
- Instructions
- Invitation
- Survey
- Articles
- Photos
- Contacts and Teams
- Events
- Sponsors
- Contact**

Contact pt.mc@cern.ch

ENLIGHT Animations

Short video presentation of the ENTERTVISION project



Initial Training Network for hadron therapy



Material in the web in several languages

- **Presentations**
- **Posters**
- **Animations** (ENLIGHT, therapy centers)
- **Instructions**
- **Workplan**
- **Demos**

<https://videos.cern.ch/record/2690592>

PR material:

- **articles**
- **photos**
- **events description**

**THE first
and only... PTMC
in IMC2020
in Mexico**

PTMC in MXC 2nd March 2020



Un día de física para la sociedad

Un día de física y su impacto en la sociedad

2 March 2020
ICN-UNAM, IF-UNAM
Mexico/General timezone



- Overview
- Timetable
- Contribution List
- Author List
- Speaker List
- Registration
 - Registration Form
- Participant List
- Photos

Participant List

PTMC in MXC 2nd March 2020

Number of participants: 104

name	institution	position	city	country/region
AGUILAR ARÉVALO, Alexis	ICN, UNAM		Mexico	Mexico
ALENCASTE DESACHY, David Antonio	CCH Sur	Estudiante (BECA 100%)	Mexico	Mexico
ANIMAS AVILA, Yessica Alejandra	Colegio Anglo Mexicano Coyoacán	Estudiante (BECA 100%)	Mexico	Mexico
ARREDONDO HERNÁNDEZ, Jesús Enrique	Escuela Nacional	Estudiante	Mexico	Mexico

Closed registration
reaching max capacity of
auditorium (100 students)
2x25 groups for hands-on



Instituto de
Ciencias
Nucleares
UNAM



Hands-on: a strong experience



- We could not see **how physics relates with medicine**
- When listening at the lectures in the morning we could not believe that in the afternoon we would be **able to handle treatment planning and with such accurate results**

From participants to collaborators

Attendees of IMC were attracted by
Science, Technology, Engineering
and Math careers.

It was definitely our case



It is inspiring to young students.

This could mean more professionals in STEM
topics

Noteworthy fact:
now we collaborate in UNAM with our MC tutor
Antonio Ortiz Velasquez



**PTMC Material
can be used
for different
occasions**

PTMC in Conferences, Open Days...

ENLIGHT, Caen, 2019

ACCELERATORS FOR HEALTH AND INTERNATIONAL MASTERCLASSES

Yvonne Foka, for the PTMC Team, GSI, Germany

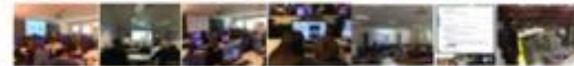
Particle Therapy MasterClass – an accelerator-driven application for health

ACCELERATORS AND PARTICLE THERAPY

During the past century, particle accelerators played an essential role in advancing scientific knowledge and our increasing understanding of being. Today, they are being increasingly used not only in research laboratories but also in hospitals and industry. The associated technology advances, the interest for new applications research, fund developments are exponentially supported by EU funded projects such as EURAD, MARS, among others. In contrast, the number of accelerator-based therapy and diagnostic techniques increased considerably over past decades, paving an increasingly interdisciplinary understanding and cross-fertilisation difficult to reach otherwise.

MASTERCLASS CONCEPT

One of the aims to highlight benefits from fundamental research to medical applications and vice versa, involved a new MasterClass on Particle Therapy was developed. It was proposed to attend the program of the International Physics Outreach Group (IPPTG) an educational outreach activity and flagship project of the International Particle Physics Outreach Group (IPPOG). The program engages young people with fundamental research and its applications offering them the chance to interact, exchange their ideas and gain a hands-on experience on their field. At the end of the day they still a common video conference to discuss their results in international scientific collaboration.



HANDS ON TREATMENT PLANNING

The newly developed Particle Therapy MC is addressing high-school students who are invited at a workshop to research, specially for a day, to enhance in the world of science.



PILOT PARTICLE THERAPY MC

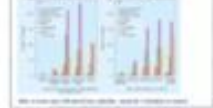
A pilot day-long MC was given in April 2019 at the participation of GSI/FAIR, CERN Meeting and CERN all having the same approach:

- 3 lecture, accelerator, medical applications,
- hands-on experience, MC using facility,
- interactive, hands-on treatment planning,
- International Videoconference: results, Q&A,

EVALUATION

The goal of the MC program is to allow participants to experience methods and tools within research. Evaluations have shown that they:

- enjoy the event,
- become an accelerator user (interested for fundamental research and its applications),
- get motivated for further scientific studies and to build to further developments,
- want to do in-depthing assessment of their immediate surroundings, such as family, friends,



OUTLOOK

The MC concept remains valid to attract 10-15 years school children around the world with about 200 participants from 20 participating countries in 2019.

The Particle Therapy MasterClass was approved by the International Particle Physics Outreach Group and will be integrated into the MC 2020 activities.



Open Days: CERN and Montenegro 2019

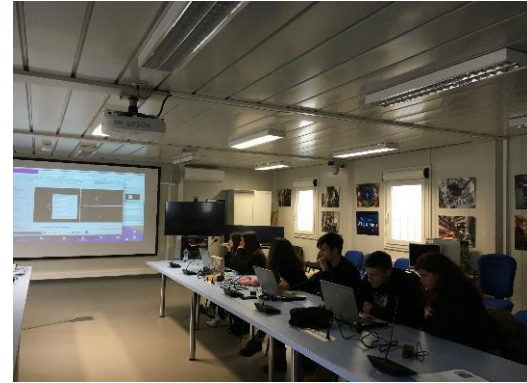


Experiences with CURIEocity team from Crete

From Crete



... to CERN



... to GSI



Acknowledgements

Workshop on Ions
for Cancer Therapy, Space Research
and Material Science

SPACE RESEARCH
WORKSHOP
ON IONS FOR
CANCER THERAPY
MATERIAL SCIENCE

Workshop Main Topics
28-30 of August at Great Arsenali

Particle therapy status

- Centres worldwide
- Treatment planning and imaging novel methods
- Challenges, new R&D directions

Space research and dosimetry
Nanotechnology, electronics and material research
Modelling and benchmarking of experiments
Novel accelerators and training

Chania, Crete, Greece

26 - 30
August
2017

Public Events
26 of August - science fair at Neorio Moro
27 of August - public talks at Great Arsenali
30 of August - coffee with scientists at Neorio Moro

<https://indico.cern.ch/e/ions2017/>

International Advisory Committee
Eleonora Aurilio (INFN, Italy)
Philip Barrow (University of Oxford, UK)
Mario Barone (INFN, INFN, Italy)
Paolo Guillemin (OD & FAIR, Germany)
Apostolos Karakostas (Medical School, University of Crete, Greece)
Vasilios Karakostas (INFN, Italy)
Panos Raaij (University of Cyprus, Cyprus)
Boris Shcherbakov (ITP, Russia)
George Stavroukakis (Technical University of Crete, Greece)
Thomas Suter (CERN, Switzerland)

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C. Baker (TU, Greece)
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N. Kallitrikaki (TU, Greece)
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M. Jank (MUT, Japan)
A. Katsenava (CERN, Spain and SPBU, Russia)
D. Spasibichukova (SPBU, Russia)

From particle physics to cancer therapy
Manjit Dasgupta, CERN, 27 August 2017
Episteme Dapkinou initiates the Ionbeam Campaign
Public talk at Great Arsenali on the occasion of International Workshop
on Ions for Cancer Therapy, Space Research and Material Science

BIOMAT and BIOPHYSICS

Focus on medical applications

Archamps, 19 June 2018

6

Workshop and public events in Chania in 2017
Theme: benefits for society from fundamental research

Acknowledgements PTMC

matRad Developers

Wahl, Niklas
Bangert, Mark
Hans-Peter Wieser

DKFZ Heidelberg

LoC: Wahl, Niklas
Katrin Platzer, Malte Ellerbrock
Noa Homolka Amit Ben Antony Bennan

GSI

LoC: Yiota Foka
GSI Biophysics:
Christian Graeff, Radek Pleskac
GSI ALICE, EMMI :
Ralf Aeverbeck, Malzacher, Peter
GSI IT :
Thorsten Kollegger, Behnert, Katharina
Osdoba, Sascha

General Coordination : Yiota Foka

CERN (staff and users)

CERN: tutors
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Alexander Gerbershagen
Evangelia Dimovasili
Elena Benedetto

CERN/ARIES: Maurizio Vretenar, Valerie Brunner
CERN/ENLIGHT: Manjit Dosanjh Petya Georgieva
CERN/KT: Manuela Cirilli Anais Rassat Rita Ferreira
Giovanni Porcellana
CERN: Visits Service Erwan Harrouch Francois Butin
CERN: Training Centre: Eric Bonnefoy M-L LECOQ

Uni Sarajevo: web pages

Amila Avdic
Amra Ibrahimovic
Mirsad Tunja

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