

Particle Therapy MasterClass educational outreach package



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

Yiota Foka (GSI/CERN)

**Dedicated tutorial zoom-meeting
Saturday 5 December 2020 at 14:00 (Greece Time)**

International MasterClasses

PTMC is integrated into the International MasterClasses project

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

+ satellite dates

+ Spanish VCs

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, the International Particle Physics Outreach Group

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

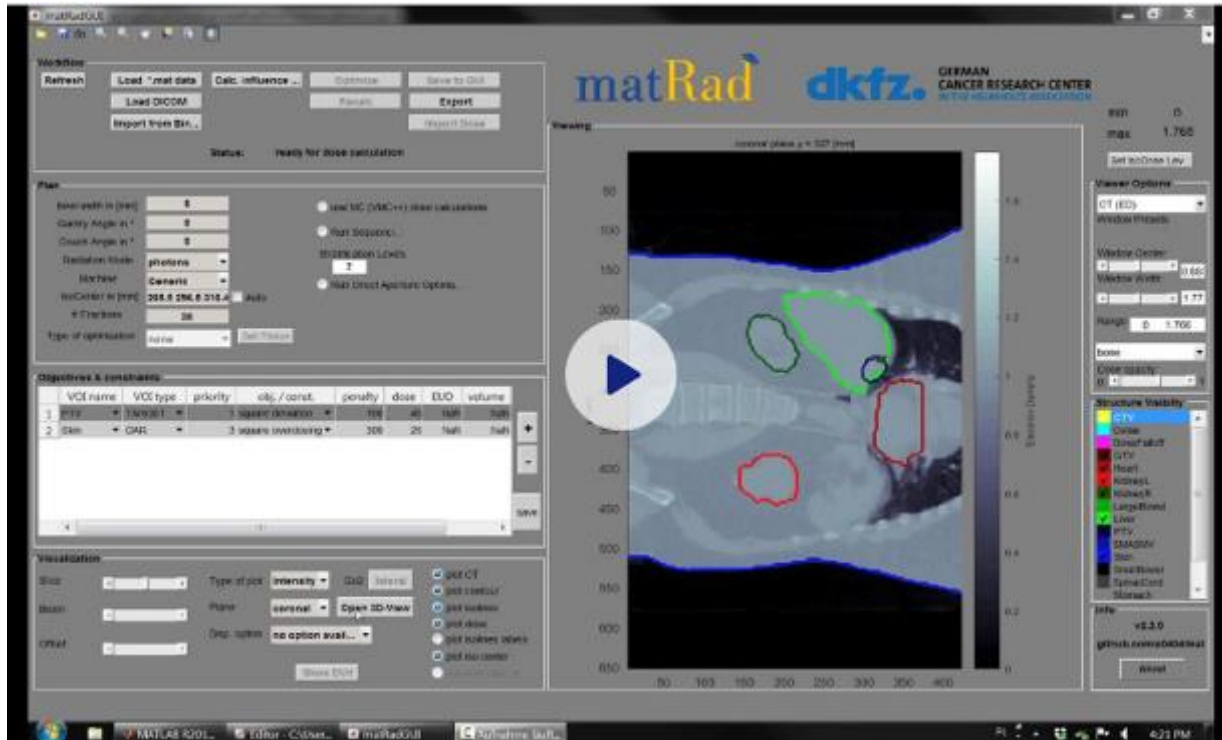
<u>LOCAL TIME:</u>	<u>ACTIVITY</u>
8:30 - 9:00	Registration and Welcome
9:00 - 10:00	Introductory lectures
10:30 - 11:30	Visit of a lab or experiment
12:00 - 13:00	Lunch
13:00 - 15:00	Hands-on session
15:00 - 16:00	Discuss results locally
16:00 - 17:00	Video conference



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

PTMC and Treatment Planning

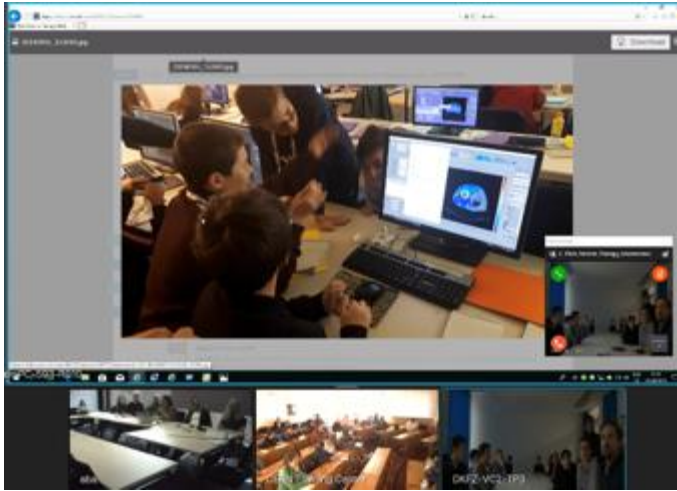
Based on professional open source treatment planning: matRad
developed by Heidelberg DKFZ www.matrad.org



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



PTMC pilots in 2019

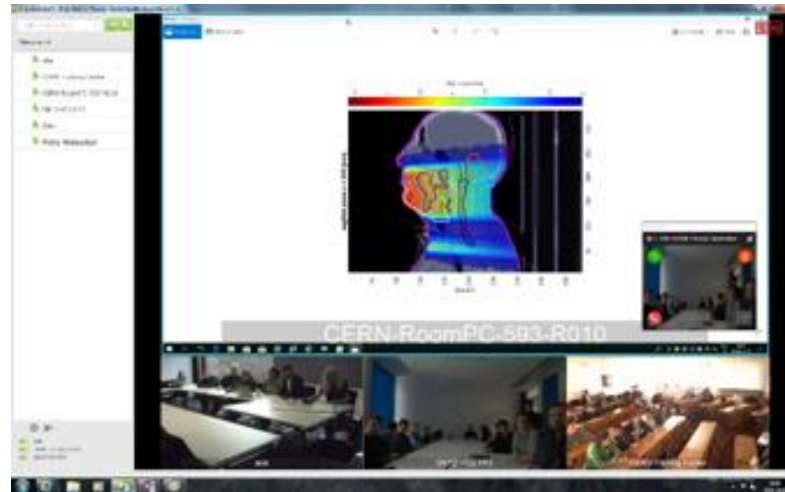


CERN, DKFZ, GSI

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 2020
- 25 institutes registered and more interested

In Greece:

Thessaloniki (AUPh, PAP, TECH)
Veroia, Korinthos, Chios...

In contact with relevant associations
With the support of Aris Mamaras

Dates IMC2021: 11.2-27.3 2021

To prepare for switching to online/zoom sessions

DEVELOPING and TRAINING PLANS:

- Develop material/methods for zoom/online sessions
- Training of tutors, support teams
- **Develop material for uni, masters levels: workflows, lectures**

**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



PTMC in Puebla 2nd March 2020

<https://youtu.be/pqx1Gj28GBE>



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**

PTMC Material Contributors and Plans



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**



International Particle Physics Outreach Group



INTERNATIONAL
MASTERCLASSE

hands on particle physics

Home

Information for High School Students

Information for Teachers and Educators

Information for Institutes and Physicists

Schedule

Intl. Day of Women and Girls in Science

<http://physicsmasterclasses.org/>



International Masterclasses
14th International Masterclasses 2018

Each year more than 13.000 high school students in 52 countries come to one research centres for one day in order to unravel the mysteries of particle physics. insight in topics and methods of basic research at the fundamentals of matter and force measurements on real data from particle physics experiments themselves. At the end of the research collaboration, the participants join in a video conference for discussion and here for media coverage.

Well structured project

- procedures
- instructions
- material
- translations

Not difficult for newcomers

- teachers
- institutes

This program is organized at TU-Dresden in the framework of the International Particle Physics Outreach Group IPPOG. The video linkup between the institutes is realized with valuable technical support from the Vidyo support at CERN IT. We gratefully acknowledge financial support from the Helmholtz Alliance "Physics at the Terascale", the BMBF German Federal Ministry of Education and Research, EPS HEPP High-Energy and Particle Physics Division of the European Physical Society, and from TU Dresden. An offline version of this website is available as DVD from the organizers and distributed to all participating students.

The material can be used for many other purposes



PTMC Local Sessions

Bosnia and Herzegovina: Tuzla, 7 march 2019



Provided feedback for improvements

Contacts/Training by UNSA colleagues



Hedim Osmanović, Associate Professor
Edis Djedovic
University of Tuzla

PTMC in Conferences, Open Days...

ENLIGHT, Caen, 2019

ACCELERATORS FOR HEALTH AND INTERNATIONAL MASTERCLASSES

Yvonne Foka, for the PTMC Team, GSI, Germany

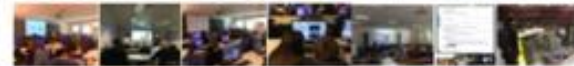
Particle Therapy MasterClass – an accelerator-driven application for health

ACCELERATORS AND PARTICLE THERAPY

During the last 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 CLICARE, MILES, 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

The aim is to highlight benefits from fundamental research for medical applications and vice versa. In a new MasterClass on Particle Therapy we developed it into a proposal to avoid the program of the International Physics Outreach Group (IPPTG) an educational outreach activity and flagship project of the International Particle Physics Outreach Group (IPPTG). The program engages young people with fundamental research and its applications offering them the chance to interact with scientists for a day and get 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

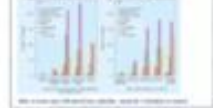
A pilot 40-day MC was held in April 2019 with the participation of 100 high school students and 100 MCs at having the same approach:

- 3 lecture, accelerator, medical applications,
- hands-on experience, MC's training facility,
- interactive, hands-on treatment planning,
- international videoconferencing results, MCs.

EVALUATION

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

- enjoy the event,
- become an accelerator user (trained for fundamental research and its applications),
- get motivated for further scientific studies and to study fields 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 100 participants from 20 participating countries in 2020.

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



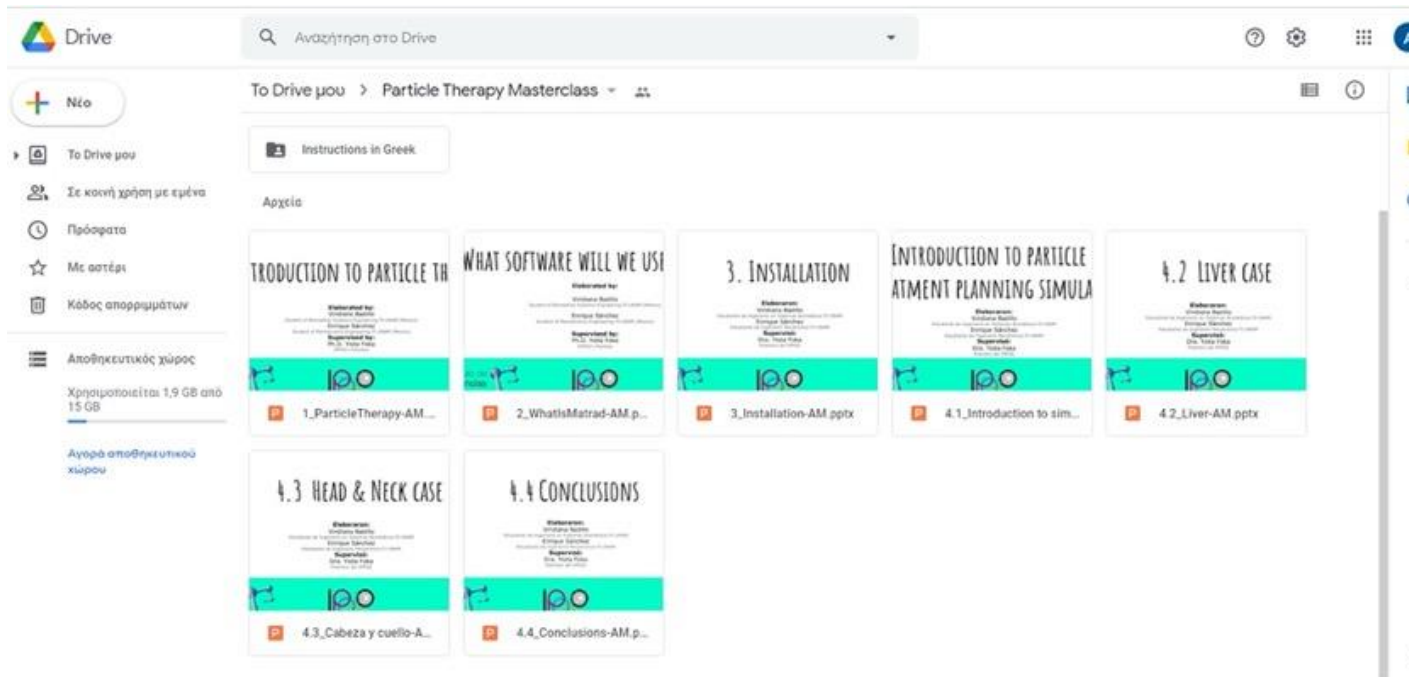
Open Days: CERN and Montenegro 2019



PTMC Contributors and Plans

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 named "Instructions in Greek" and a collection of presentation files. The files are arranged in a grid and include:

- 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 thumbnail features a red "100" icon, indicating a 100% completion or availability status. The presentation titles visible on the thumbnails are: "INTRODUCTION TO PARTICLE THERAPY", "WHAT SOFTWARE WILL WE USE", "3. INSTALLATION", "INTRODUCTION TO PARTICLE THERAPY TREATMENT PLANNING SIMULATION", "4.2 LIVER CASE", "4.3 HEAD & NECK CASE", and "4.4 CONCLUSIONS".

PTMC Contributors and Plans

- Big interest in 2020: we had to open more dates
- Training sessions at CERN and online
- Participation of SEE region
students of Sarajevo, Montenegro, Thessaloniki assist
- Experienced tutors taking it to their home countries

Expanding towards:

- age groups, reaching uni/masters...
- teachers

The students become tutors !



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

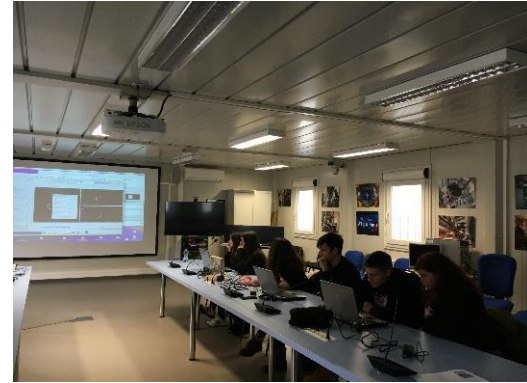


Experiences with CURIEocity team from Crete

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
Esterline Audrey Villaverde (CERN, Switzerland)
Philip Burrows (University of Oxford, UK)
Mario Brunelle (IFPA, INFN, Italy)
Paolo Guillemin (GSI & FAIR, Germany)
Apostolos Karantzas (Medical School, University of Crete, Greece)
Vasilios Karakostas (INFN, Trieste)
Panos Raaij (University of Cyprus, Cyprus)
Boris Sklarov (IITP, Russia)
George Stavroukalis (Technical University of Crete, Greece)
Thomas Suterli (CERN & DESY, Germany)

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M. Jank (MUT, Japan)
A. Katsanova (GSI, Spain and SPBU, Russia)
D. Spasibchenko (SPBU, Russia)

From particle physics to cancer therapy
Manjit Dasgupta, CERN, 27 August 2017
Episteme Daskalaki 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

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GSI ALICE, EMMI :
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Elena Benedetto

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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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