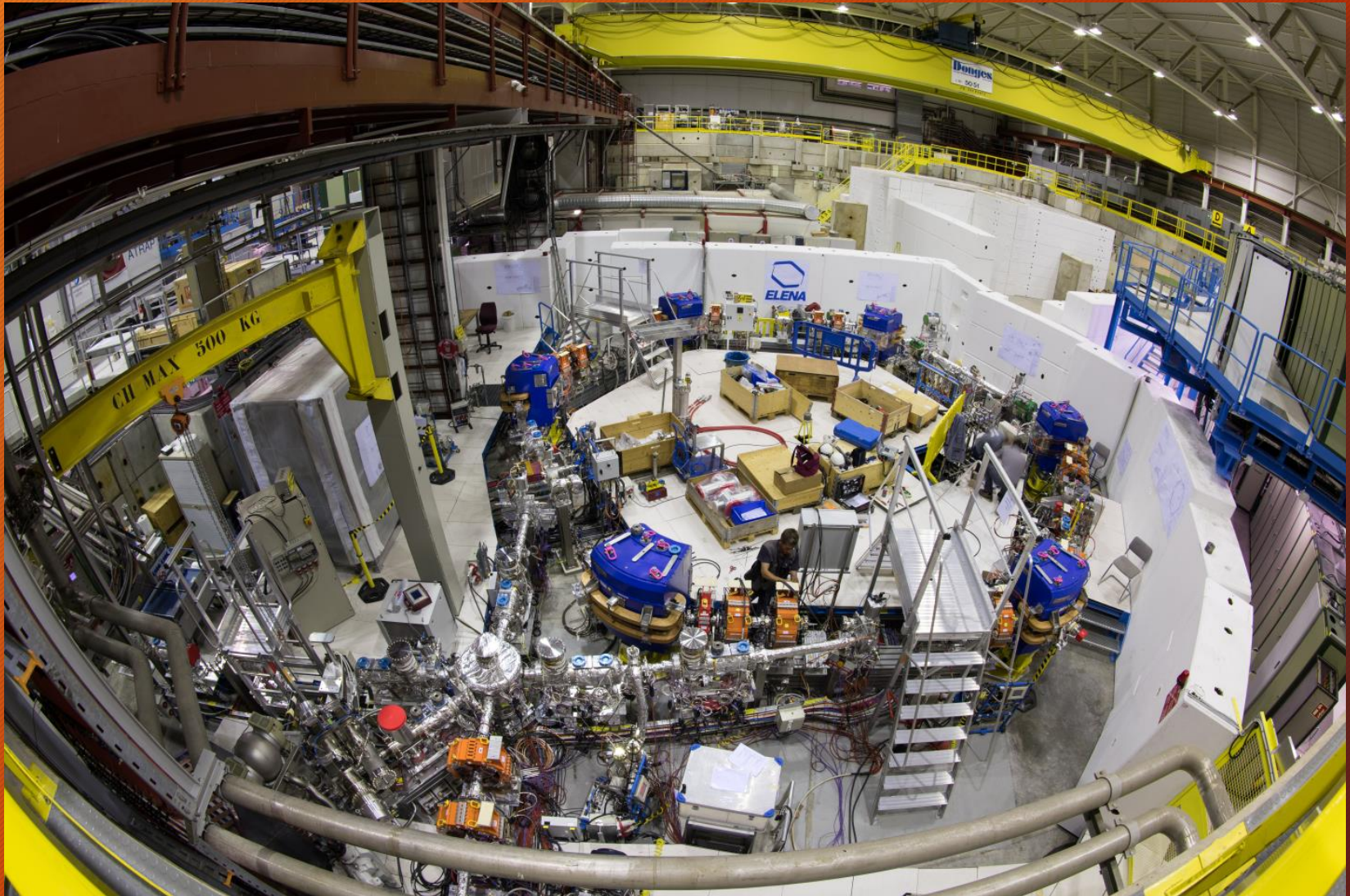




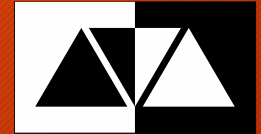
# Welcome to AVA School on Precision Studies

Prof Carsten P Welsch

# ELENA - A fantastic opportunity



# Beneficiaries



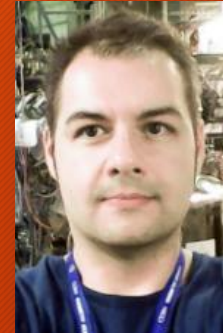
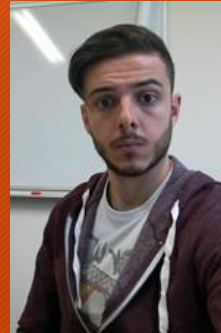
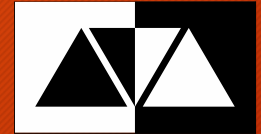
# Partner Organizations



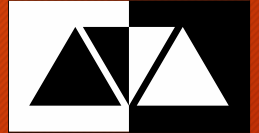
AARHUS UNIVERSITY



# AVA Fellows



# AVA Research



- Enhanced facility design
- New beam handling techniques

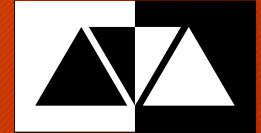


- Online diagnostics
- Improved detectors



- Experiments: Novel cooling schemes
- Spectroscopy on antihydrogen.

# AVA Events



- Topical Workshops
- Schools
- Symposium on 28 June 2019 presented project to much wider public
- Conference this fall in Vienna, *tbc.*

**Events are open to wider community!**



# AVA Brochure



## ACCELERATORS VALIDATING ANTIMATTER PHYSICS

A Marie Skłodowska-Curie European Training Network

## ANTIMATTER PHYSICS

During the first moments of the Big Bang, both matter and antimatter should have been created in equal amounts. But the observable universe is mainly matter and there remains a fundamental question to be answered by physicists:  
**Where has all the antimatter gone?**

**A**ntimatter was produced in the Big Bang, but the observable universe is made of matter. The missing antimatter is still a mystery. The research programme AVA is currently the only project in the world that is producing and measuring antimatter particles in a laboratory. AVA is currently the only project in the world that is producing and measuring antimatter particles in a laboratory. AVA is currently the only project in the world that is producing and measuring antimatter particles in a laboratory.

**ANTIMATTER** is produced in the laboratory by colliding particles at high energies. The particles are then trapped in a magnetic and electric field. AVA is currently the only project in the world that is producing and measuring antimatter particles in a laboratory.

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## CONTENTS

### THE GIRL BEHIND THE NAME

AVA is the first time a girl's name has been used in the name of a particle physics project. The name was chosen by a young girl, Mia, who was inspired by the name of the particle physicist, Marie Skłodowska-Curie.

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A Marie Skłodowska-Curie European Training Network

## ACCELERATORS VALIDATING ANTIMATTER PHYSICS

The AVA Accelerators Validating Antimatter Physics project is an innovative Training Network that has developed a Master's thesis in the field of Antimatter Physics at the Marie Skłodowska-Curie Action.

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## WORK PACKAGE

The improvements in simulations of beam storage, handling and control that are being developed in AVA's first work package need to be accompanied by R&D into enhanced Beam Diagnostics that can monitor the properties of a low energy antiproton beam and help verify simulation models experimentally.

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## BEAM DIAGNOSTICS

Diagnostics has been used in many applications in beam instrumentation. The use of low energy antiprotons as beam probes and for monitoring the properties of a low energy antiproton beam has been a new type of beam monitor which has several advantages over other beam monitors.

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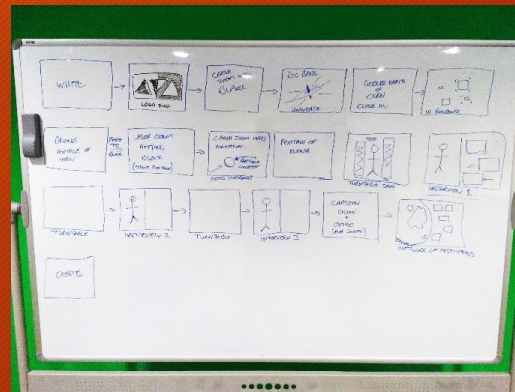
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# Nature (anti)matters



Watch the video!



# Project Web Site



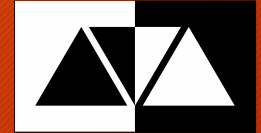
URL: (http://www.)ava-project.eu

The screenshot shows the AVA project website homepage. At the top left, there is a navigation menu with the following items: AVA, About us, AVA Brochure, Network Structure, Projects, Vacancies, News, Events, Dissemination, Press, Downloads, Links, Project T.E.A.M., Contact, and Ava - the girl behind the name. The main content area features a large banner with a black background and a white, glowing, tunnel-like structure composed of many small circles. The banner text reads: "Accelerators Validating Antimatter physics", "The goal of AVA is to enable further world-class research with low energy antiprotons", and "FIND OUT MORE". Below the banner, there is a "Welcome to AVA" section with the AVA logo and the European Union flag. The text states: "Accelerators Validating Antimatter physics (AVA) is the goal of this new network. This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 721559." Below this, there is a video player for "AVA - Nature (anti)matters" with a play button and the text "NATURE (ANTI)MATTERS". To the right of the video player, there is a short description: "A film about the Innovative Training Network AVA, where 15 Fellows carry out research with low energy antimatter to better understand nature in all its facets." and "Produced by the AVA Fellows with support from Carbon Digital."

QUASAR Group +  
Cockcroft Institute



# MIRROR Newsletter



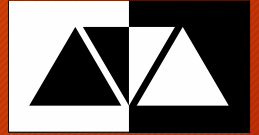
- Main communication channel of AVA
- You will receive this by email in future!



Quarterly newsletter for the antimatter research community



# AVA School in Prague



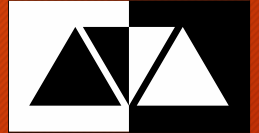
HUGE *Thank you* to Jaroslav, Ivo and many others who helped plan the School!!!

# Online agenda



	Monday	Tuesday	Wednesday	Thursday	Friday
8:30 - 9:30	<b>Start 9:15</b> Welcome Carsten Welsch (ULIV)	Probing gravity with antimatter Barbara Latacz (CERN)	Classic particle physics experiments Roman Lysak (FZU)	BASE introduction and overview Christian Smorra (CERN/RIKEN)	Atom interferometry Xiayi Cheng (M Squared)
9:30 - 10:30	Recap: Fundamentals of beam physics Javier Resta-Lopez (ULIV)	Positronium physics I Daniel Murtagh (SMI)	Physics beyond the Standard Model and Dark Matter Elise Wursten (CERN)	CPT tests (at BASE, ERC) Christian Smorra (CERN/RIKEN)	Ultracold atoms Bing Yang Innsbruck University
COFFEE BREAK					
11:00 - 12:00	Recap: Antimatter physics Cloe Malbrunot (CERN)	EDM ( $e^-$ ) in storage rings Joerg Pretz (FZJ)	Time variation of fine-structure constant Natalia Oreshkina (MPIK)	G factor measurements Andreas Mooser (MPIK)	Quantum technology Jose Verdu Galiana (U Sussex)
12:00 - 13:00	Recap: Beam diagnostics Hao Zhang (ULIV)	EDM (molecules) Steven Hoekstra (Groningen)	Testing QED Sven Sturm (MPIK)		Closing Remarks Carsten Welsch (ULIV)
LUNCH					
14:30 - 15:30	Recap: Deceleration, cooling and trap injection Lars Joergensen (CERN)				
15:30 - 16:30	Laser and penning traps Richard Thompson (Imperial College)				

# Connection details



**Monday 23<sup>rd</sup> March**

<https://ukri.zoom.us/j/373300667>

Meeting ID: 373300667

**Tuesday 24<sup>th</sup> March**

<https://ukri.zoom.us/j/503845280>

Meeting ID: 503845280

**Wednesday 25<sup>th</sup> March**

<https://ukri.zoom.us/j/383377694>

Meeting ID: 383377694

**Thursday 26<sup>th</sup> March**

<https://ukri.zoom.us/j/988153034>

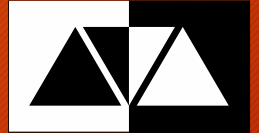
Meeting ID: 988153034

**Friday 27<sup>th</sup> March**

<https://ukri.zoom.us/j/845533602>

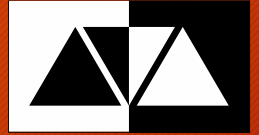
Meeting ID: 845533602

# *How to guide*



- Please turn off your microphone if you are not speaking!
- Ask questions at the end of each session;
- Some sessions will be pre-recorded; opportunity to ask questions at the end;
- Posters will be uploaded onto indico - opportunity to ask questions on Friday in final session.
- You session chairmen during the week:  
Dr Javier Resta Lopez and Dr Hao Zhang.

# Aims of School



- Create better awareness of AVA Research Program and wider context in which it is placed;
- Stimulate discussions about future research directions;
- Understand challenges and limitations in precision studies.

**Enjoy!**