

Hello! - introducing myself

- Particle physicist
 - member of CMS since 2014
 - working on Higgs boson physics and hardware trigger
- Presently postdoc at the University of Florida and 2019-2020 DR at Fermilab LPC
- I obtained this year the position of *chargé de recherche* (researcher) at the French CNRS (starting in Feb. 2022)
 - permanent position in research
 - possibility to undertake teaching activities
 - joining ATLAS!



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*please avoid
this reaction*



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Our field is so broad and there is much more to it than the specific LHC collaboration or project we currently work into

Our careers will extend beyond the HL-LHC



It goes without saying...

- What I will discuss today is my personal story and experience
- I'll try to give general (hopefully useful) advice, but...
 - everyone's story, wishes, personal needs, interests are different
 - every country has a different system for academy jobs
 - there is always an unpredictable element of randomness
- It is not a “win” to stay in academia nor a “loose” to move to the private sector/industry
 - and in this sense, I don't want to *convince* you to stay in academia today
 - being in research is a great opportunity to pursue our curiosity for science, and obtaining a permanent position is the basis to develop a long-term plan of research
 - I am sure that jobs in the private sector offer at least the same level of personal rewards, I am just less expert about that world

I accept the license terms

But what do we mean for “academia”?

- Many activities that encompass what we need to make research advance and be shared:
 - fundamental research development, coordination, applications, teaching, outreach, ...
 - not oriented to profit → public institutions
- The way academia is organised largely varies between countries!
 - France: a research “corp” (national), a teaching “corp” (national), professors (individual universities). Access to national positions with a centralised *concours*
 - Italy: public researchers (national, central *concorso*) and professors (individual universities)
 - US: scientist positions (labs), faculty positions (universities)

Take the time needed to understand how a “system” works in a specific country

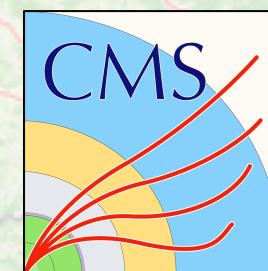
Academia is by construction a network: being connected to researchers working in a country helps to become part of that network

My path to research

Undergraduate studies at **Milano-Bicocca**

Bachelor: studies on general physics, **hardware R&D internship** for the LHCb RICH upgrade

Master: specialization in particle physics, **analysis internship** on Higgs boson physics (HH) with CMS



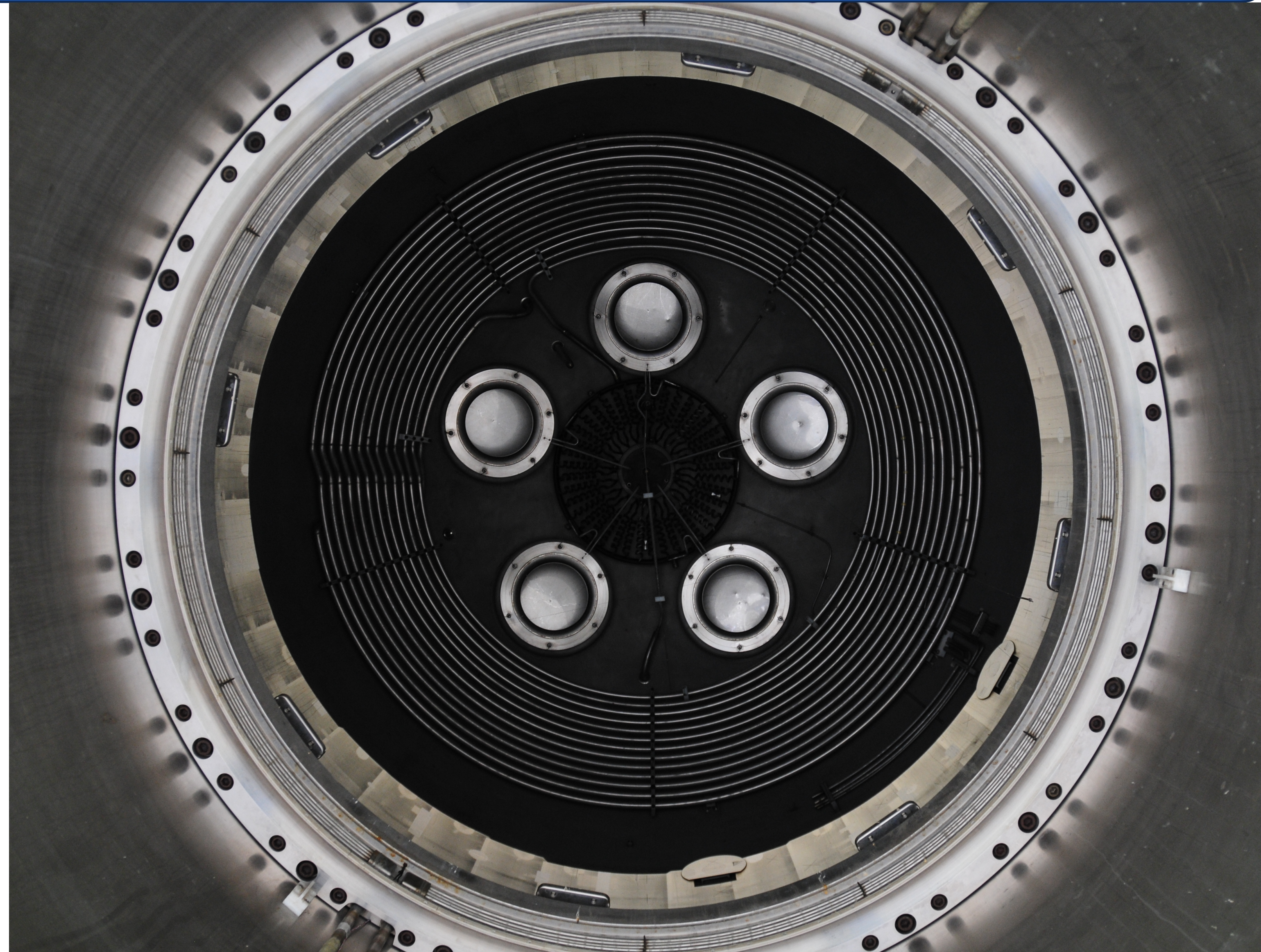
Home!

It's all about our curiosity for science

- An important motivation for all of us when approaching HEP is our curiosity
 - a “scientific journey” to study Nature
 - and the related technological challenges
- Never loose sight of the motivation that drives you to a career in HEP and why we do this
 - it's the way to overcome the stressful moments of the PhD/postdoc and of applications

Inside the BEBC bubble chamber on exhibition at the CERN microcosm

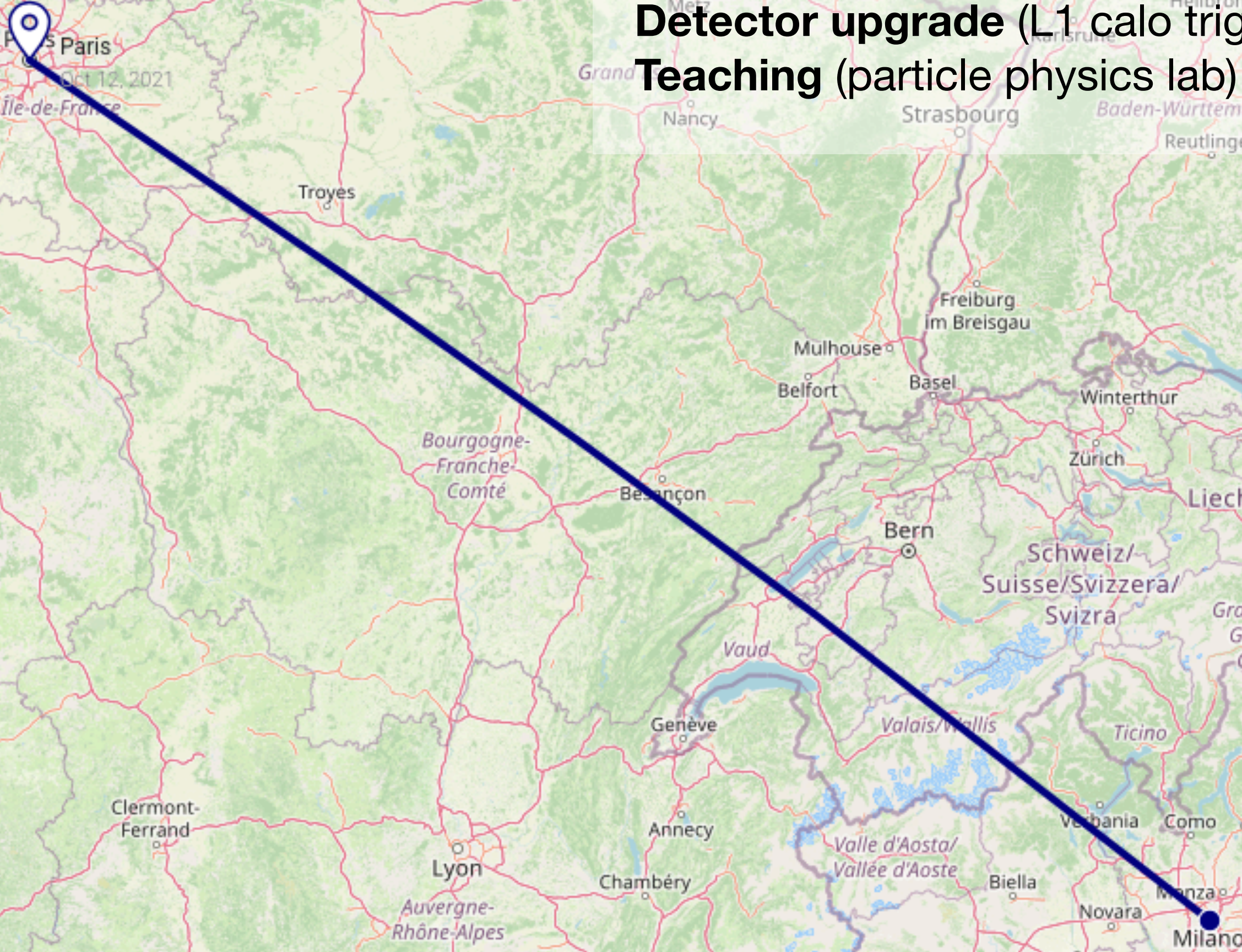
The complexity of the HEP research and of its instruments are one of the thing that stroke me the most during my first visit at CERN



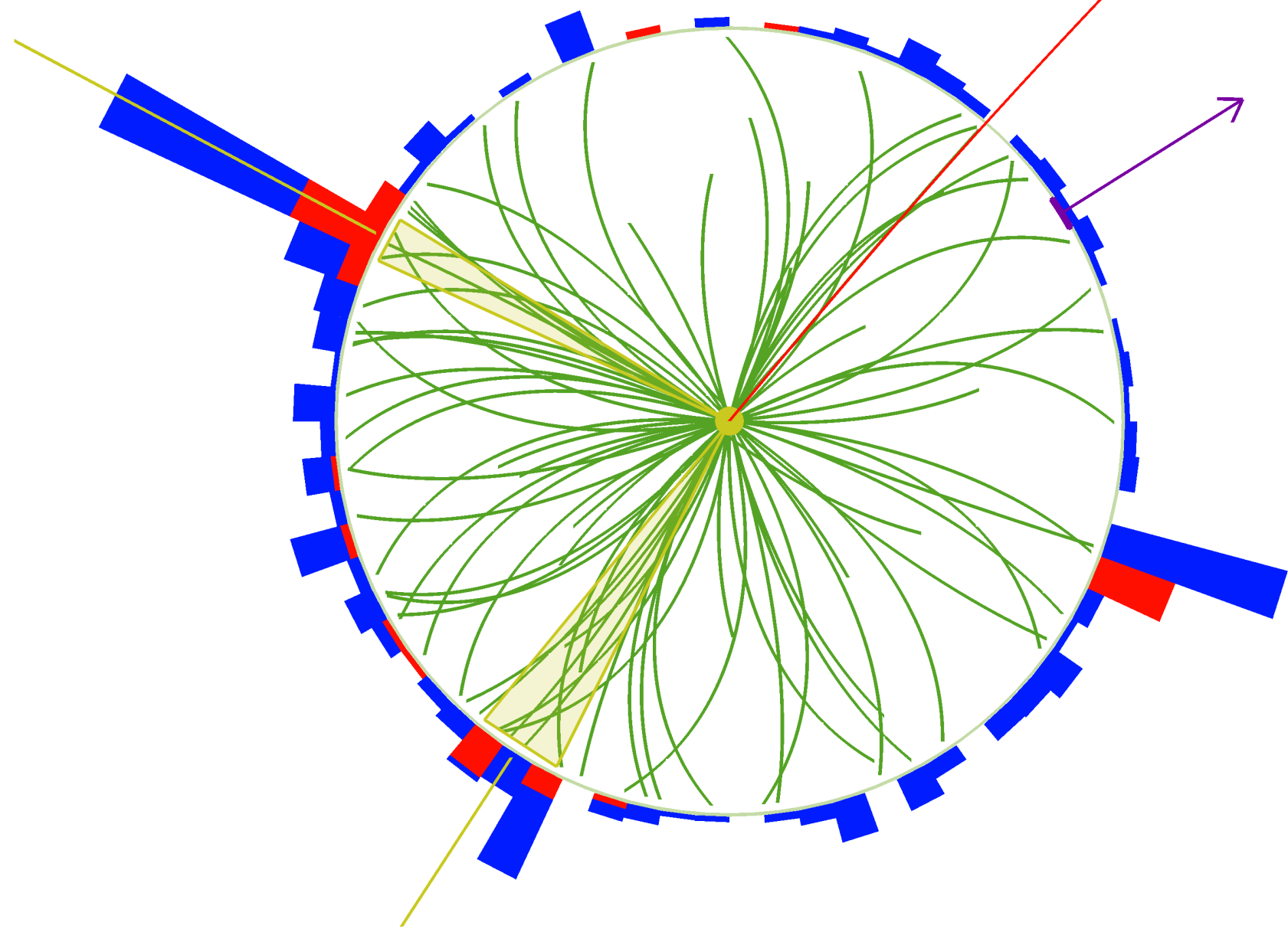
My path to research



PhD at **LLR-École polytechnique**
Physics analysis ($HH \rightarrow b\bar{b}\tau\tau$) with the first 13 TeV data
Detector upgrade (L1 calo trigger) for the Run 2
Teaching (particle physics lab)



A PhD: developing a scientific work



An event display from the $HH \rightarrow bb\tau\tau$ analysis I worked on during my PhD

- Achieving a PhD demonstrates your capability to develop a scientific research work
 - it is **your** work! Bring in your ideas to the topic that you chose
 - shape the thesis to be *your* thesis
 - eventually this is a “test bench” for part of the work as a researcher
- At the same time you are student, so take your rightful time to **learn**
 - both scientific and technical aspects of HEP
 - learn how to be a scientist

With a PhD you rightfully become part of the scientific research community

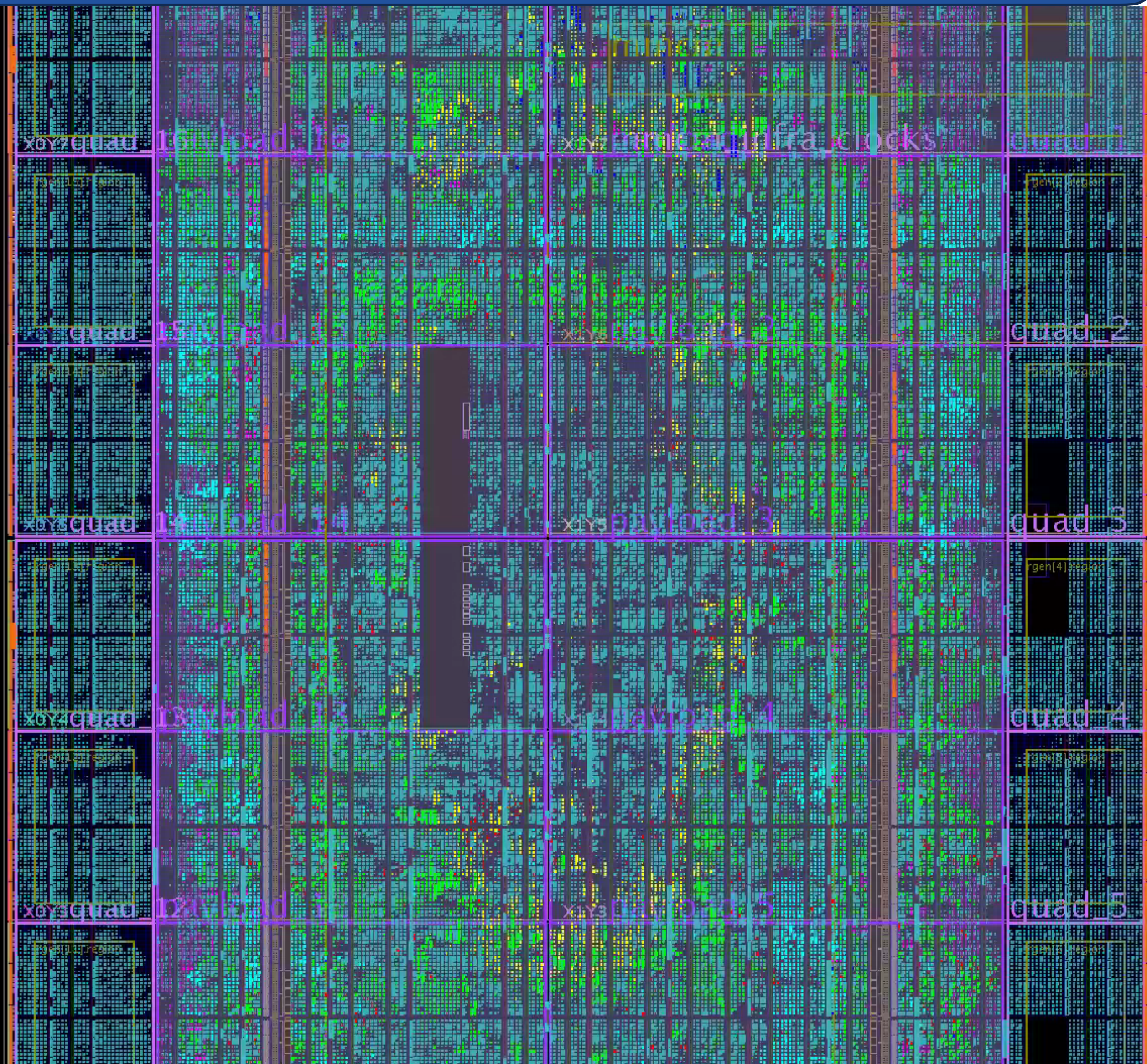
Albeit stressful at (many) times, take the occasion to enjoy your work and be proud of your achievements

Don't forget the hardware

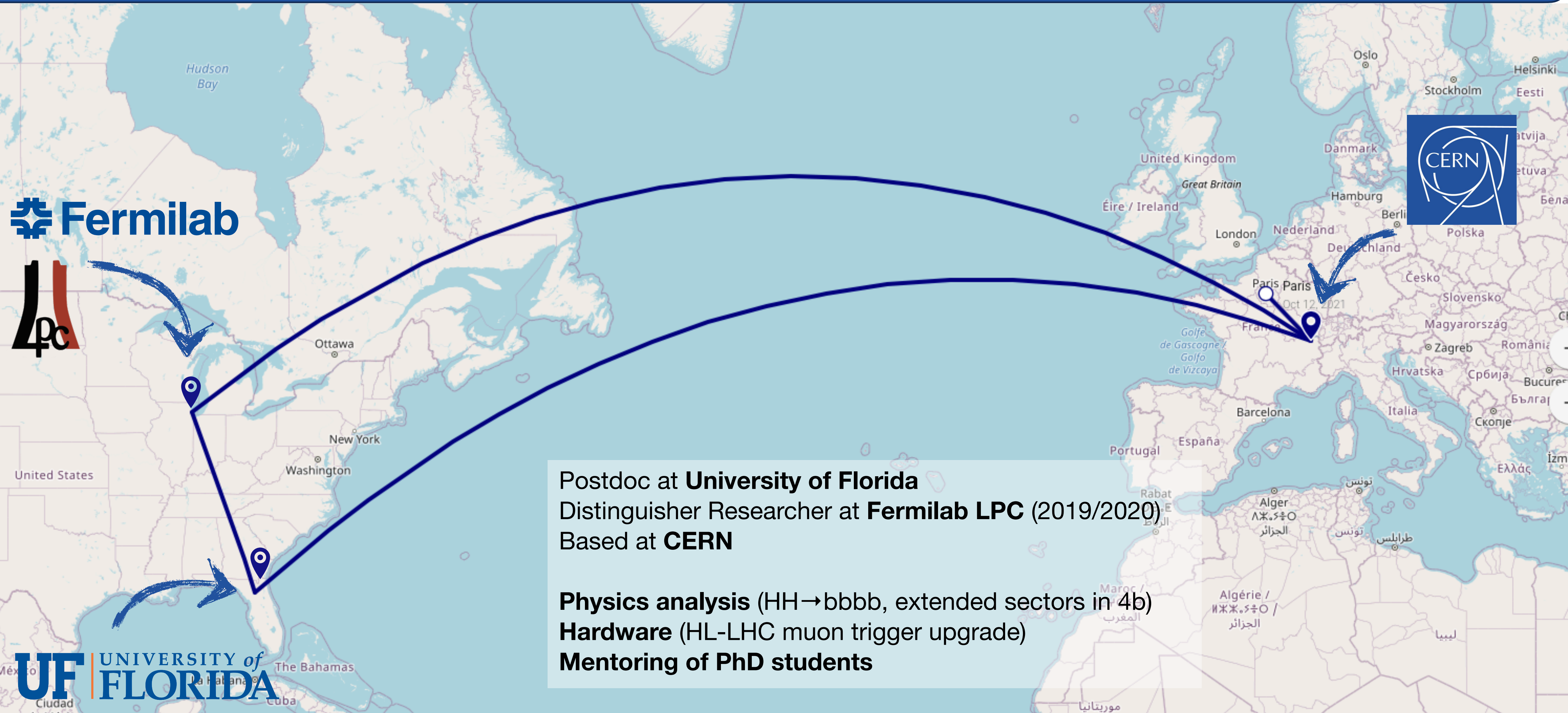
- I had the chance to dedicate ~50% of my PhD to a hardware project (CMS Run 2 L1 calorimeter trigger upgrade)
- Hardware and detector are an essential part of any experimental physics project
 - and I personally found it particularly interesting, it's a completely different world w.r.t. analysis
- Search committees for positions showed great interest in the hardware activity
 - **definitely a well balanced analysis-hardware expertise is a strong point in a CV**

A view of the floorplan of the FPGA implementing the CMS calorimeter trigger (2016 - A. Rose)

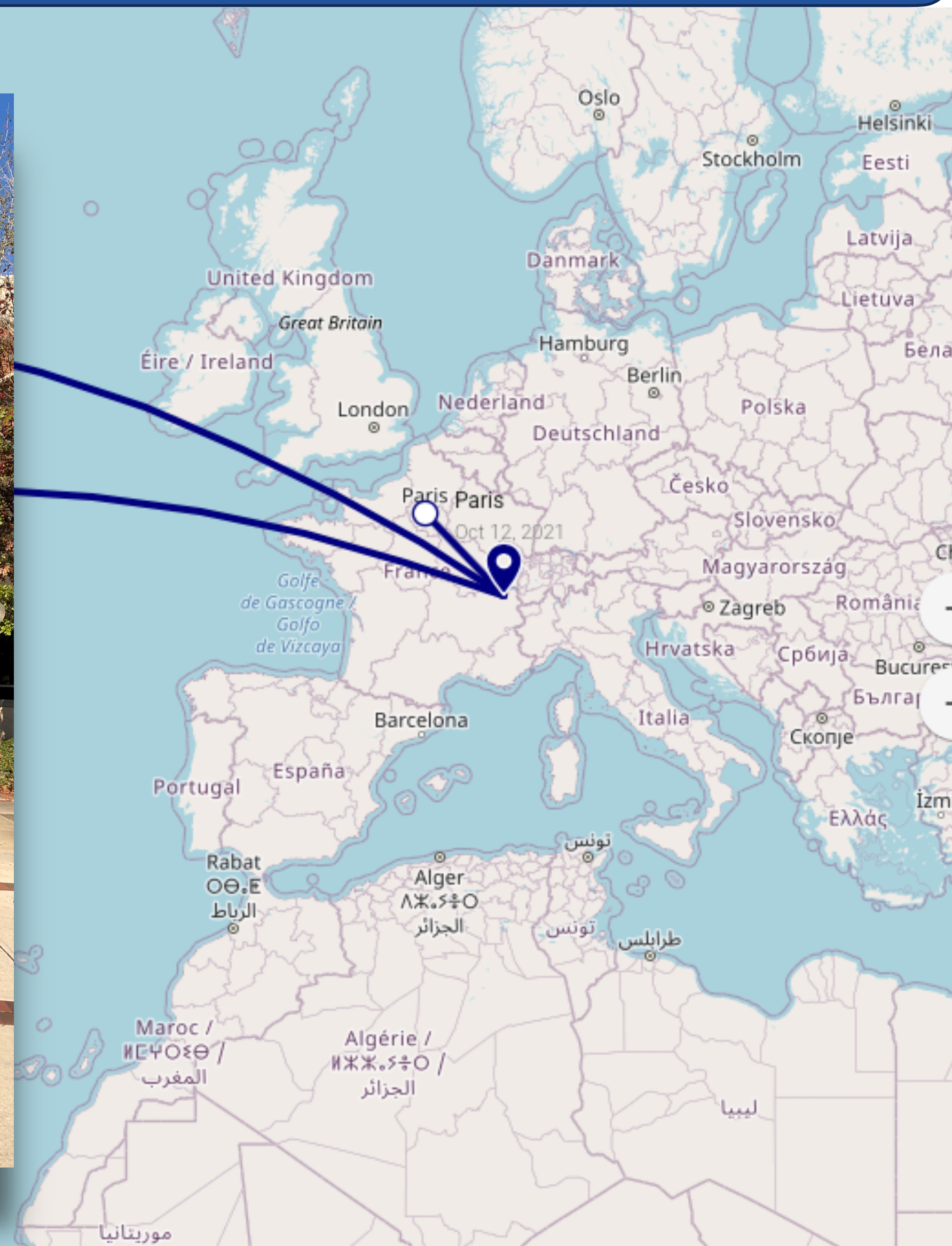
The τ finder algorithm I worked on runs somewhere in there! ►



My path to research



My path to research



Pictures takes 2 days apart
Biggest ΔT I ever experienced

My path to research



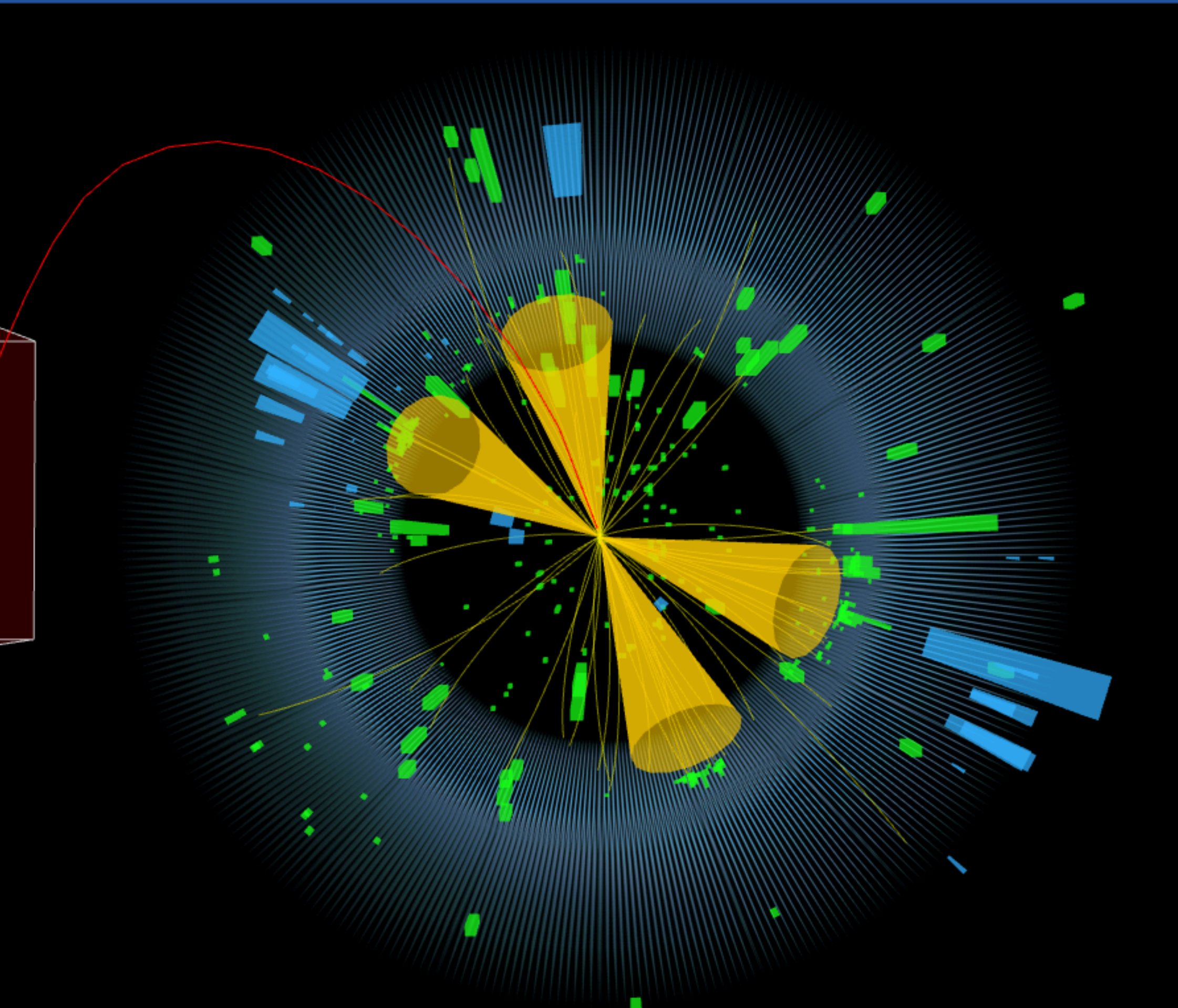
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It was for me an unexpected way to travel and get to know a completely new world (academic and social)

Not many jobs offer the same opportunity: if you are willing and curious, take it!

A postdoc: “making” science



A $HH \rightarrow bbbb$ candidate (<https://cms.cern/news/four-beauties-tale-two-higgses>). D. Guerrero, PhD student at UF, is the person who “run” the analysis - and myself as a postdoc collaborated and supervised this work

- During your postdoc you learn and prove your capabilities to “do” science
 - not just developing the results (paper), but coordinating a team, leading a group, steering the research
- This is the time to develop *your* research
 - bring ideas that are needed to solve problems
 - suggest new areas for research (e.g. in my case: extended scalar sector searches in bbbb)
 - take leadership and be visible in the community
- Broaden your involvement
 - in my case: 3 ongoing analyses during the postdoc + hardware work - would have not been possible without being able to collaborate with a group at UF/FNAL
- The postdoc is (or becomes) the “expert” on a topic
 - bridge between the scientific long-term vision (senior, PI) and the PhD candidate (in a typical group)

Coordinating research activity

- Science in HEP is based on **collaboration**
 - the scale and complexity of our experiments requires so
- Research coordination, project management and teamwork are key skills
 - unfortunately we are rarely trained for it and we need to learn “on the field”
- **Research coordination activities are an important part of your CV**
 - physics (sub)groups, performance and detector, ... In my case: HH and HExo/HExtended physics groups
 - It's not only about the results that you make directly but also on those that you make possible
 - these positions also give strong visibility
- Don't be afraid to get involved and to build your network
 - exchange ideas with colleagues (office, conferences, coffe breaks, ...)
 - take part to activities in a (sub)group in CMS (many calls on technical topics)

*The main element of academia are people
A network is an essential part of a researcher's work environment*



Teaching and outreach

- The knowledge we develop is public and can develop and survive only if shared
 - for undergraduate/graduate level scientists, to prepare the future researchers
 - for general public, to raise awareness and spark the interest for science
- I found particularly motivating to take part to teaching and outreach activities
 - particle physics lab teacher
 - mentor/supervisor of master's and PhD students
 - CMS guide, CERN open days, ...
- For some positions, teaching and/or outreach activities are required or particularly valued
- If you have the possibility, develop your experience as teacher or a mentor
 - it is something that will be an essential part of your daily life in academia

Applying for positions

- Achieving a position is not easy...
 - success rates are at the few-% level (e.g.: at CNRS 8 positions / ~200 applicants)
- ... but don't lose your motivation at the first failures
 - I was selected for the CNRS researcher position at the 4th attempt
 - I also applied (unsuccessfully) to other positions / fellowships
 - typically 3 years of experience post-PhD are formally or implicitly required for being considered for many positions
- It is your future, so you can (and should) be picky!
 - identify the position type, country, research areas that fit your career and personal needs
 - understand what are the criteria of the selection procedure to fit your application

Preparing applications

- Applying to a job is a job by itself
 - the more applications you make, the better the result and the faster their preparation
 - it also helps in building a good set of referees for strong letters
- Panels who judge are made of people, and people love stories
 - an application is not a list of achievements but a description of what is your past and future trajectory (sometimes classic, sometimes quantum)
- It is *your* application
 - highlight your achievements and skills: why you for this position?
 - bring your ideas and your vision for the future (short and long term): careers will extend beyond HL-LHC, and many positions offer thematic freedom

It's the end

- I hope that this was a useful overview of one possible path leading to a position in academia
 - it's clearly not straightforward, but definitely possible
- My only true advice: enjoy what you are doing and feed your curiosity
 - we have the privilege to do a job that always brings new stimuli:
new challenges, new topics, new directions of research in a truly international environment
 - if you take pleasure and benefits in what you do, transitioning towards a permanent position will be much easier
- Feel free to reach out if you have other questions or want to chat informally in video or in person @ CERN (luca.cadamuro@cern.ch)
 - and if you plan to apply for a postdoc in ATLAS in Paris IJCLab :)
- Good luck for all that is next for your PhD / postdoc and for all the upcoming applications!

Don't be sorry, ask questions