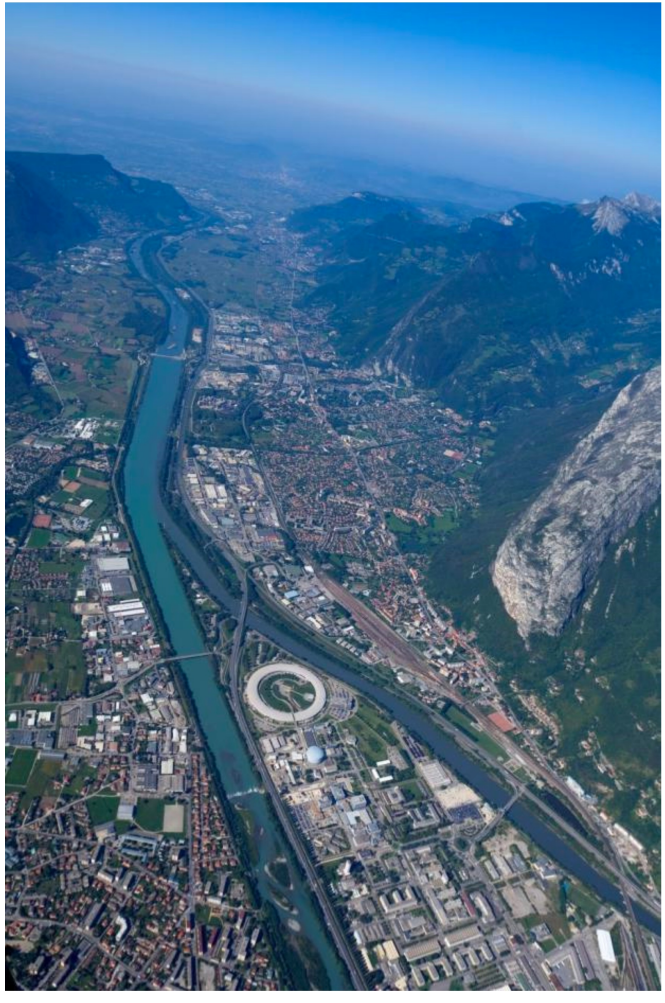

ESRF
The European Synchrotron

PROJECTS STATUS: SOME NEWS FROM THE ESRF



ESRF-EBS

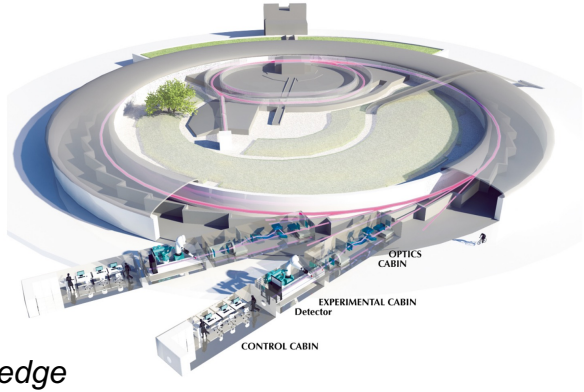
Extremely Brilliant Source

first-of-a-kind, low-emittance, high-energy synchrotron light source

N. Leclercq on behalf of the ESRF Software Group

ABOUT THE ESRF

- **European Synchrotron Radiation Facility**

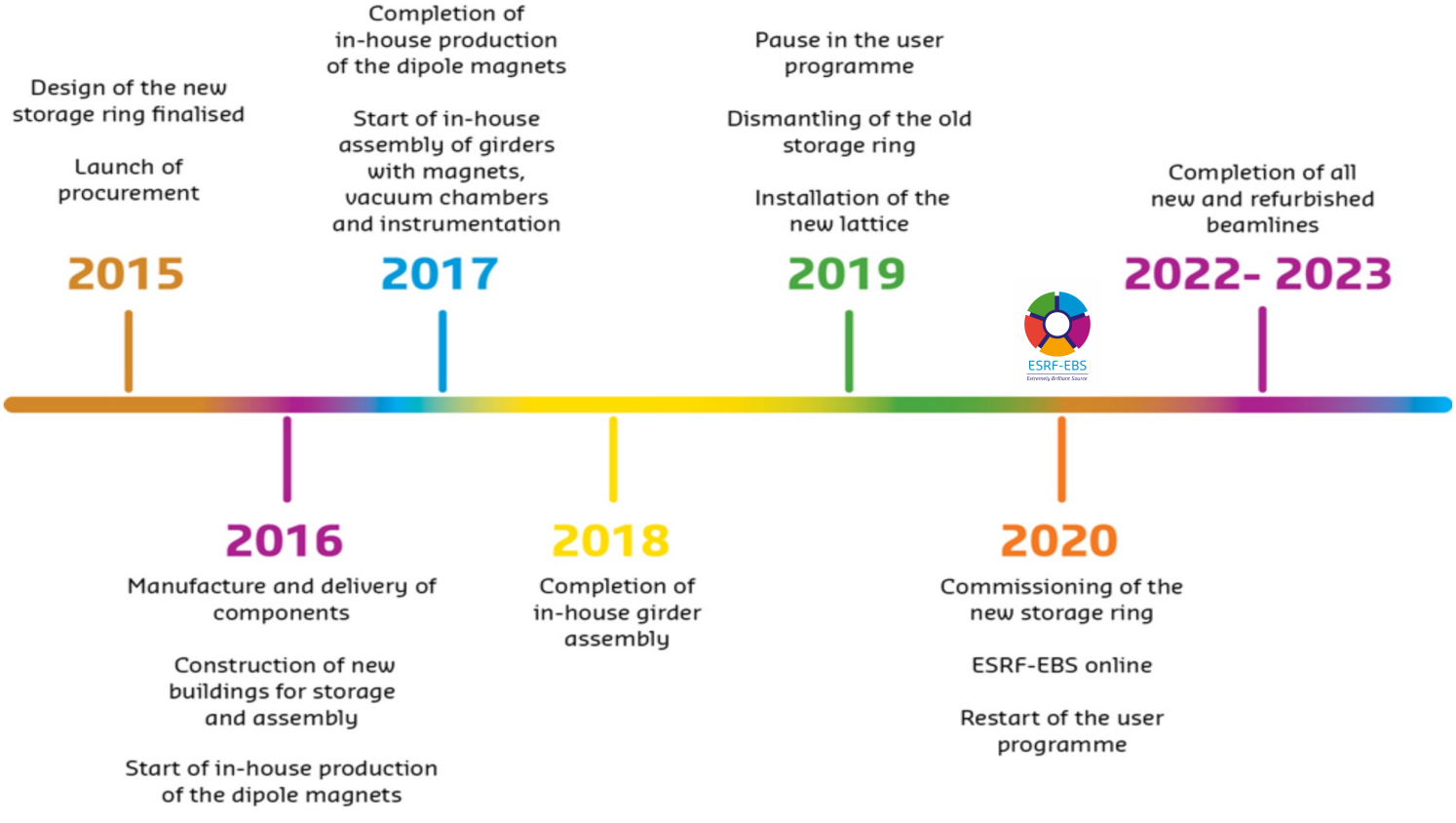


  - A photon factory from science (matter studies)
    - *light/matter interaction → knowledge (i.e., light as a probe)*
    - *photon source → (44) beamlines → experiments → data → knowledge*

  - EBS: a new machine to tackle global challenges
    - *ESRF: 30 years of state-of-the-art X-ray experimental science*
    - *answer new scientific needs →* ***new machine (4th generation storage ring)***
    - *part of an end-to-end upgrade started in 2009!*
    - *ERSF-EBS is running in user service mode since August 2020*

ESRF-EBS
Extremely Brilliant Source

THE ESRF UPGRADE PROGRAM – BEYOND THE PHOTON SOURCE…



THE ESRF UPGRADE PROGRAM – BEYOND THE PHOTON SOURCE

2015
Design of the new storage ring finalised

Launch of procurement

2016
Manufacture and delivery of components

Construction of new buildings for storage and assembly

Start of in-house production of the dipole magnets

2017
Completion of in-house production of the dipole magnets

Start of in-house assembly of girders with magnets, vacuum chambers and instrumentation

2018
Completion of in-house girder assembly

2019
Pause in the user programme

Dismantling of the old storage ring

Installation of the new lattice

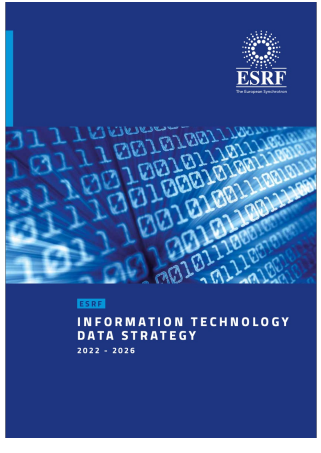
2020
Commissioning of the new storage ring

ESRF-EBS online

Restart of the user programme

2022- 2023
Implementation of the IT Data Strategy (*)

Completion of all new and refurbished beamlines



(*) 2022-2026 - see https://www.esrf.fr/files/live/sites/www/files/about/information-material/it-strategy-brochure

THE ESRF UPGRADE PROGRAM – BEYOND THE PHOTON SOURCE

- **an end-to-end program**
  - 150 M€ spread over **4 components** from 2015 to 2023
    - *following the180 M€ invested from 2009-2015*
  - **a new machine (EBS)**
    - *new SR + adapted transfer line & booster – open to users in 2020*
  - **4 new (flagship) beamlines + 14 refurbished** + 29 unchanged
    - *47 beamlines in 2023 – (some on hold for budget constraint)*
    - *3 of the new beamlines on hold due the budget constraint*
  - **a new X-ray detectors program**
    - *faster readout + higher resolution → data deluge (tens of TB/day)*
- **data management & processing**
  - we are changing the scale at which we address the related offer & services
  - digital transformation of the institute (data-oriented services)

DATA MANAGEMENT & PROCESSING: A NEW DIMENSION IN OUR ACTIVITY

- **industrialization of experimental data engineering and processing**

DATA MANAGEMENT & PROCESSING: A NEW DIMENSION IN OUR ACTIVITY

- **industrialization of experimental data engineering and processing**
  - on premises cloud infrastructure (data center) – data storage, access & processing
    - *online & offline data processing*
    - *domain-specific web applications + jupyter notebooks as user interface*

  - (data center construction postponed to 2025 + opening of some dedicated positions on hold)

IT ORGANIZATION AND STAFFING

- **IT@ESRF: 6 teams involved**

  - Infrastructure Division – IT Services Group – **Network Unit** (5 FTE)
  - Infrastructure Division – IT Services Group – **Unix Systems Unit** (10 FTE)

  - Engineering Division – Software Group – **Accelerator Control Unit** (10 FTE)
  - Engineering Division – Software Group – **Beamlines Control Unit** (20 FTE)
  - Engineering Division – Software Group – **Data Automation Unit** (11 FTE)

  - Scientific Division – **Algorithms & (Scientific) Data Analysis Group** (10 FTE)

ACU HIGHLIGHTS

- **constant enhancement of the EBS control system**
  - the EBS operation is our priority (24/7 operation)
    - *+500 Tango classes, +110 Java GUIs for the control room*
    - *+26000 Tango devices running in +3000 Tango device-servers on +360 hosts (mostly KVM instances)*
  - new features & refurbishments
    - *e.g., rewrote the magnets/power-supplies ecosystem (22% of the CS in terms of num. of devices)*

- **new CI/CD platform**
  - keeping the code catalog under control – enhance its life-cycle management
  - innovative way to compose the device-servers
  - see *Damien Lacoste's* talk on Wednesday afternoon

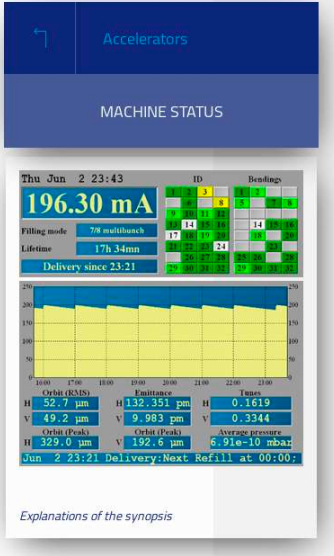
ACU HIGHLIGHTS

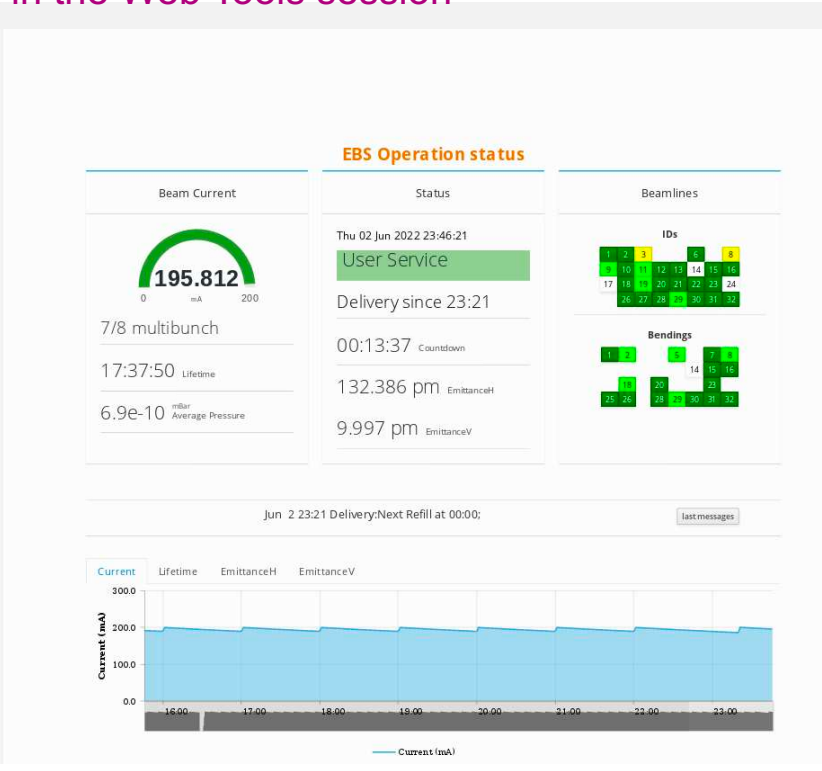
- **enhanced Storage Ring simulator**
  - pyAT-based (https://atcollab.github.io/at/index.html)
    - *accelerator toolbox (implemented in python)*
    - *python for beam dynamics aspects*
  - even closer to the “real” machine
    - *same Tango devices, same GUIs*
  - off-line developments/testing
    - *commissioning booster*
  - 4 instances
    - *including one in production with high availability constraints (standby)*
  - ultimate version: an EBS digital twin
    - *bi-directional interactions between the machine and its virtual counterpart*

- **contributions to Tango**
  - 4 staff members involved in the project: Andy G., Damien L., Reynald B. and myself
  - project management, subcontractors’ activity follow-up, MRs impl. & reviews (kernel & more)

ACU HIGHLIGHTS

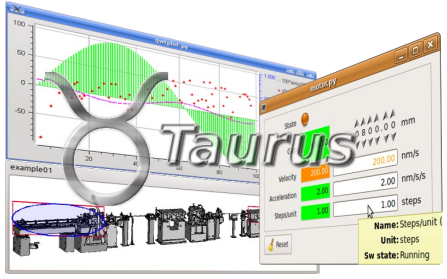
- **replacing the EBS operation status page**
  - currently base on an obsolete technology (Jyse)
  - new impl: ESRF C++ backend (by JLP) + dedicated frontend (by AB + ALM)
  - see Axel Bocciarelli's talk in the Web Tools session





ACU HIGHLIGHTS

- **adopting TAURUS for GUIs**
  - refocus on cppTango-based solutions (beyond GUIs dev.)
    - *promote Python in the Team, join a community*
    - *java/swing now considered as legacy in most institutes*



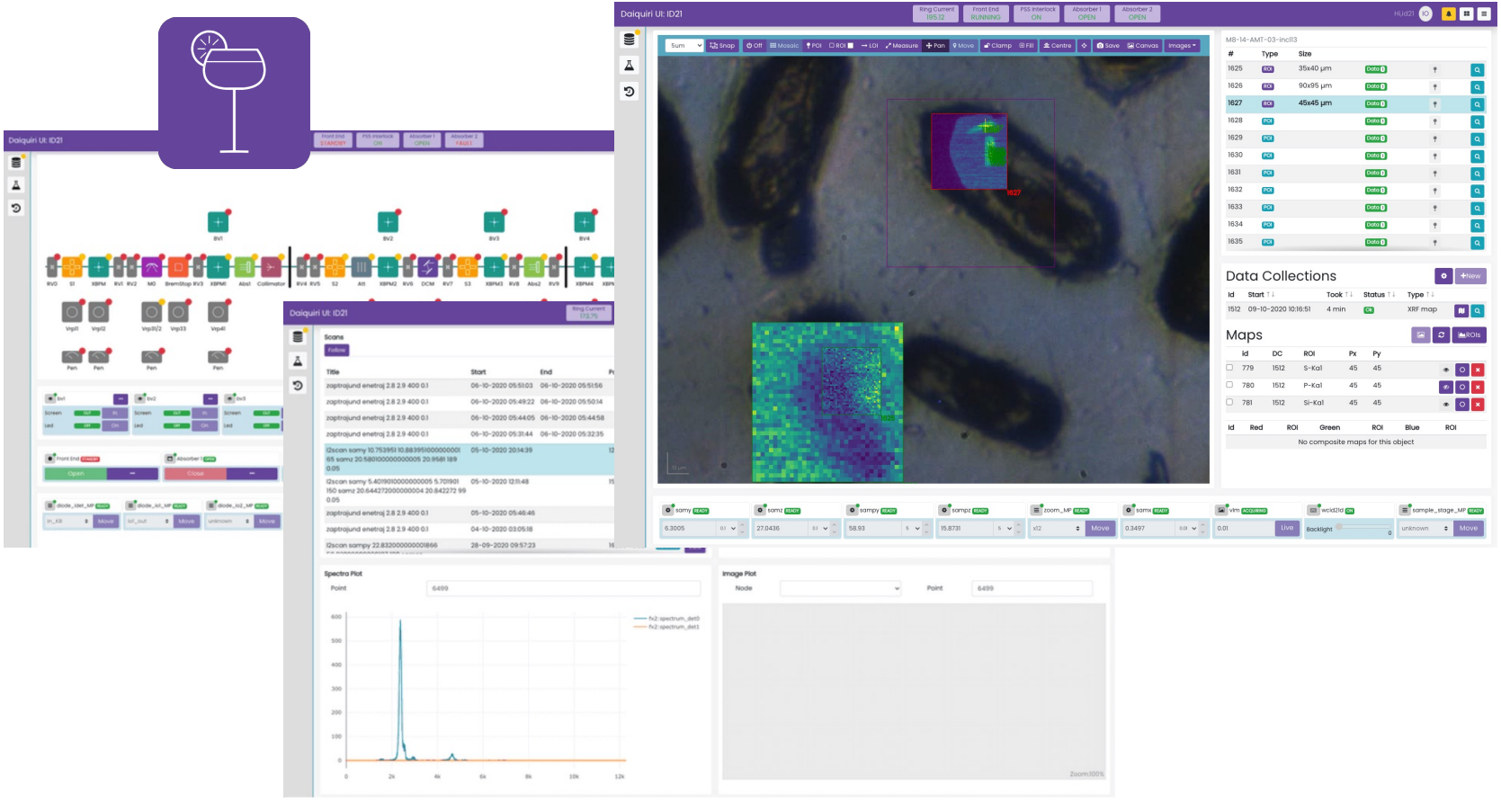
  - what about the +110 GUIs apps currently based on ATK (Java/Swing)?
    - *Java/Swing will allow LTS for (at least) a decade*
    - *new apps or major refurbishments will be developed with TAURUS*

  - what about web-based solutions?
    - *seen as a complementary offer, notably for dashboards*
    - *TAURUS is a more “natural” transition due to {local culture, developers’ skills, operators’ habits}*
    - *restricted application domain (GUIs only) compared to Python (GUIs, devices, scripts)*

BCU HIGHLIGHTS

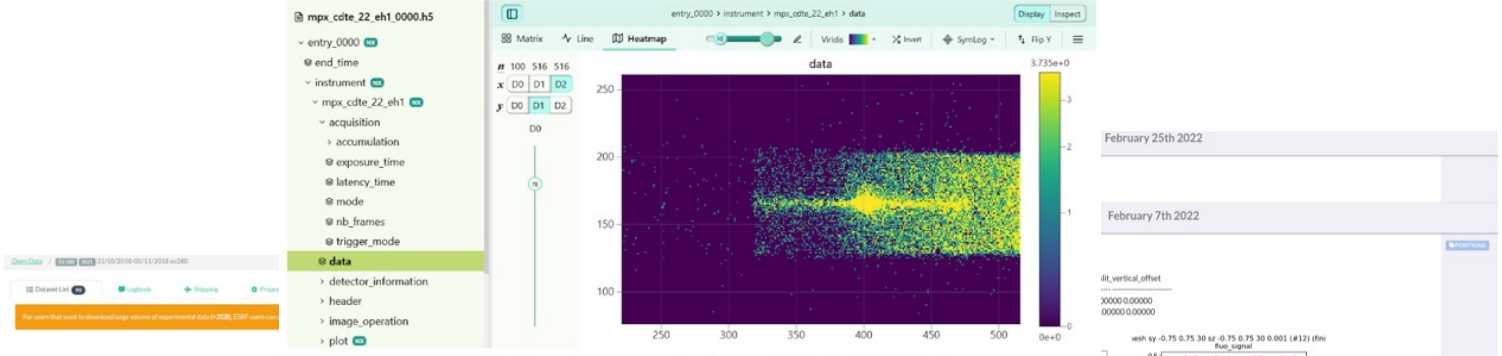
- **control & data acquisition on the 44 beamlines**
  - BLISS
    - *in-house solution similar to Sardarna or Bluesky – see https://bliss.gitlab-pages.esrf.fr/bliss/master/*
    - *deployed on 23 beamlines, 10 in progress (2023-2024)*
  - LIMA
    - *in house solution for the integration of 2D x-ray detectors (or simple cameras)*
    - *C++ with Python binding*
  - DAIQUIRI
    - *web-based framework for beamlines control and data acquisition*
    - *see https://ui.gitlab-pages.esrf.fr/daiquiri/*

BCU HIGHLIGHTS

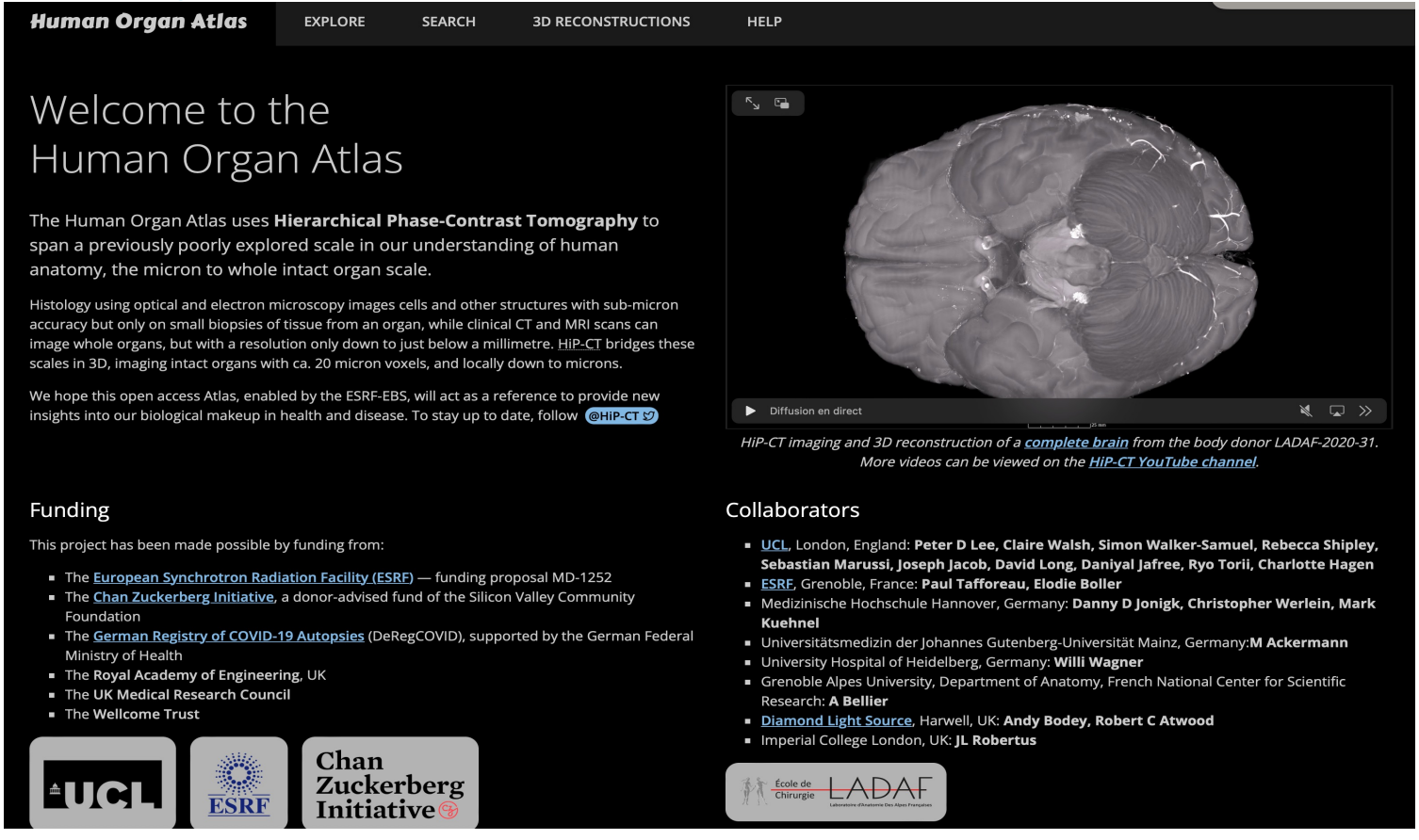


DAU HIGHLIGHTS

- **data-oriented tools & services**
  - web-based UI tools for scientific data processing & management
    - *visit https://data.esrf.fr*



- **The Human Organ Atlas**



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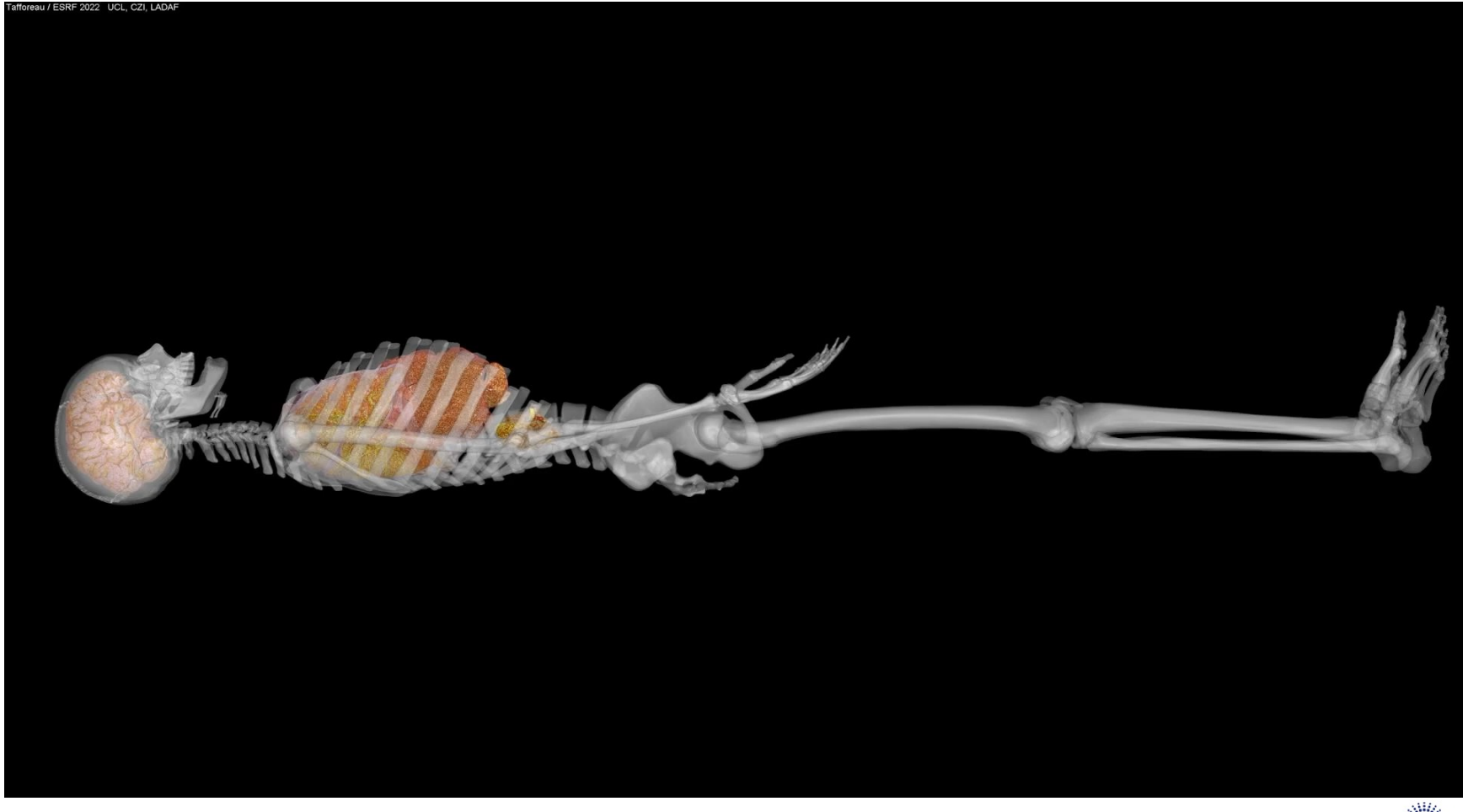

THANKS!