



# Summary of IRRAD/CHARM proton run 2022

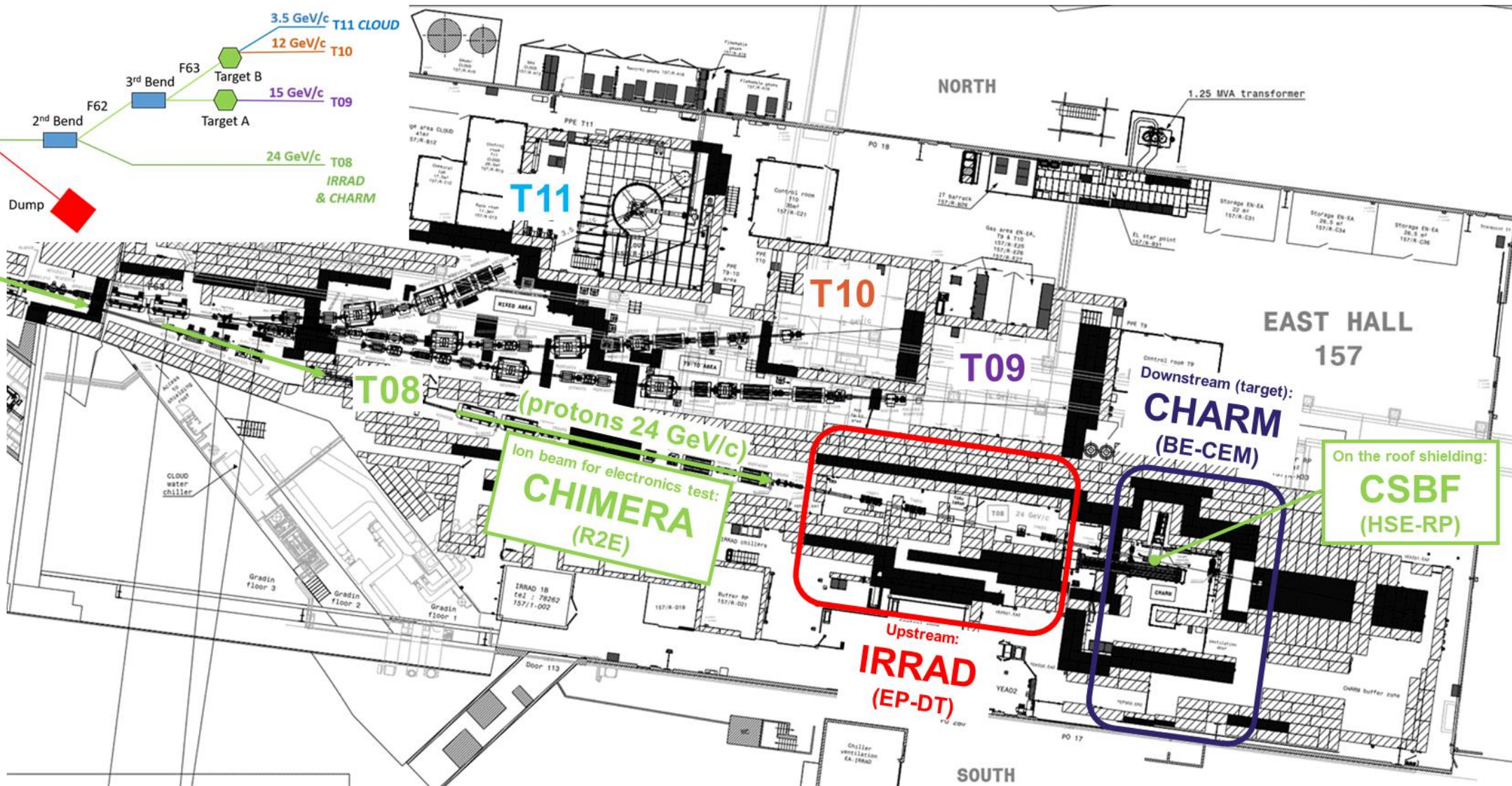
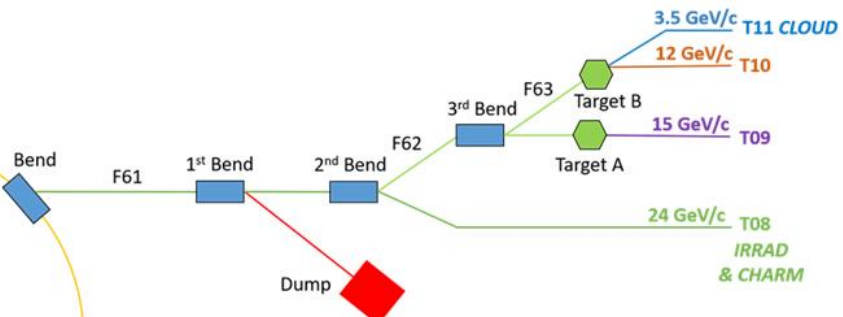
F. RAVOTTI, G. PEZZULLO, B. GKOTSE, M. KOPPITZ & colleagues (IRRAD, EP-DT)

S. DANZECA, J. LENDARO, A. AMODIO & colleagues (CHARM, BE-CEM)

PS-SPS User Meeting Wrap-up Session, 02/12/2022, INDICO [1225504](#)



2021:  
PS

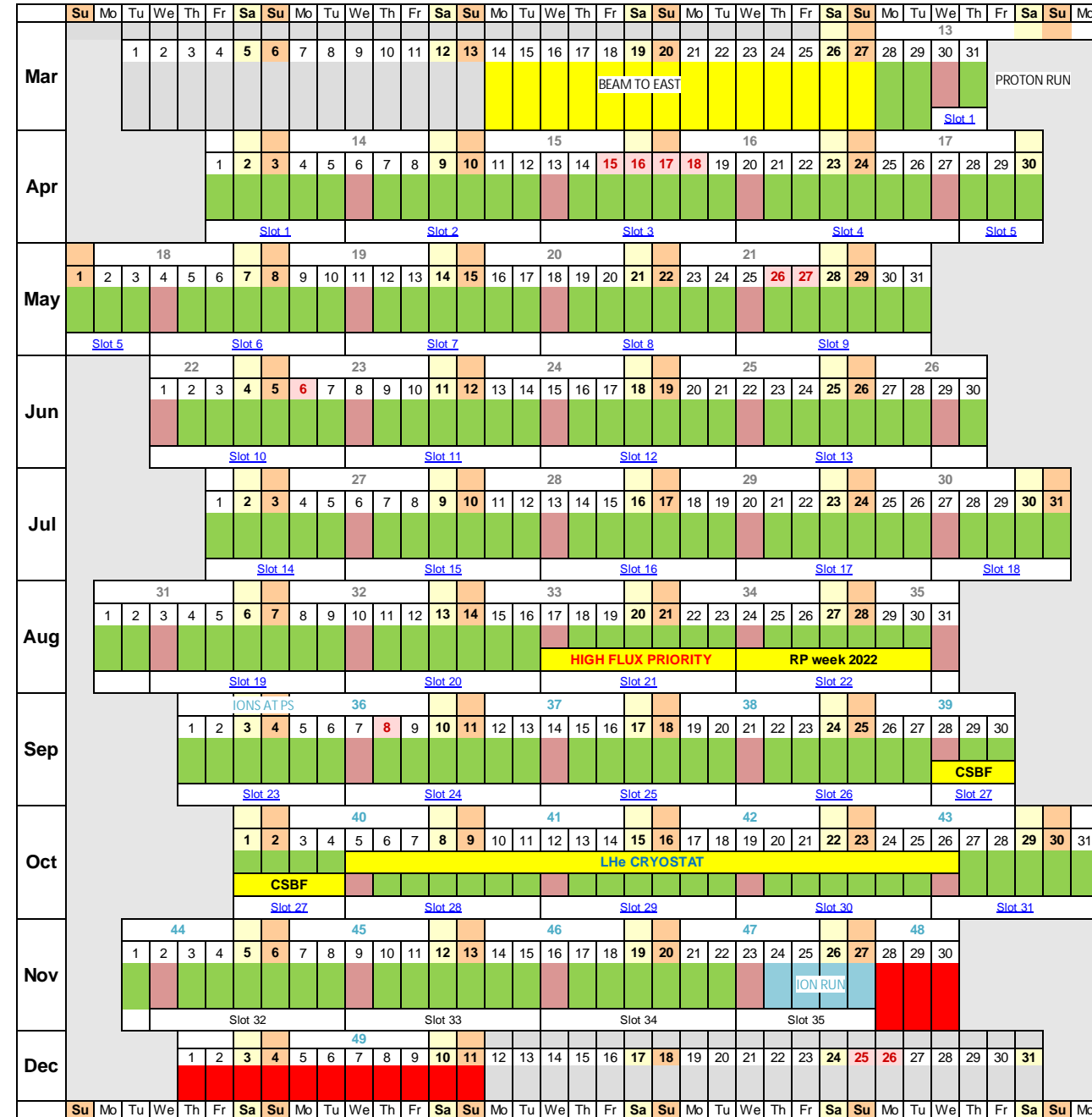


**IRRAD**  
Proton Facility

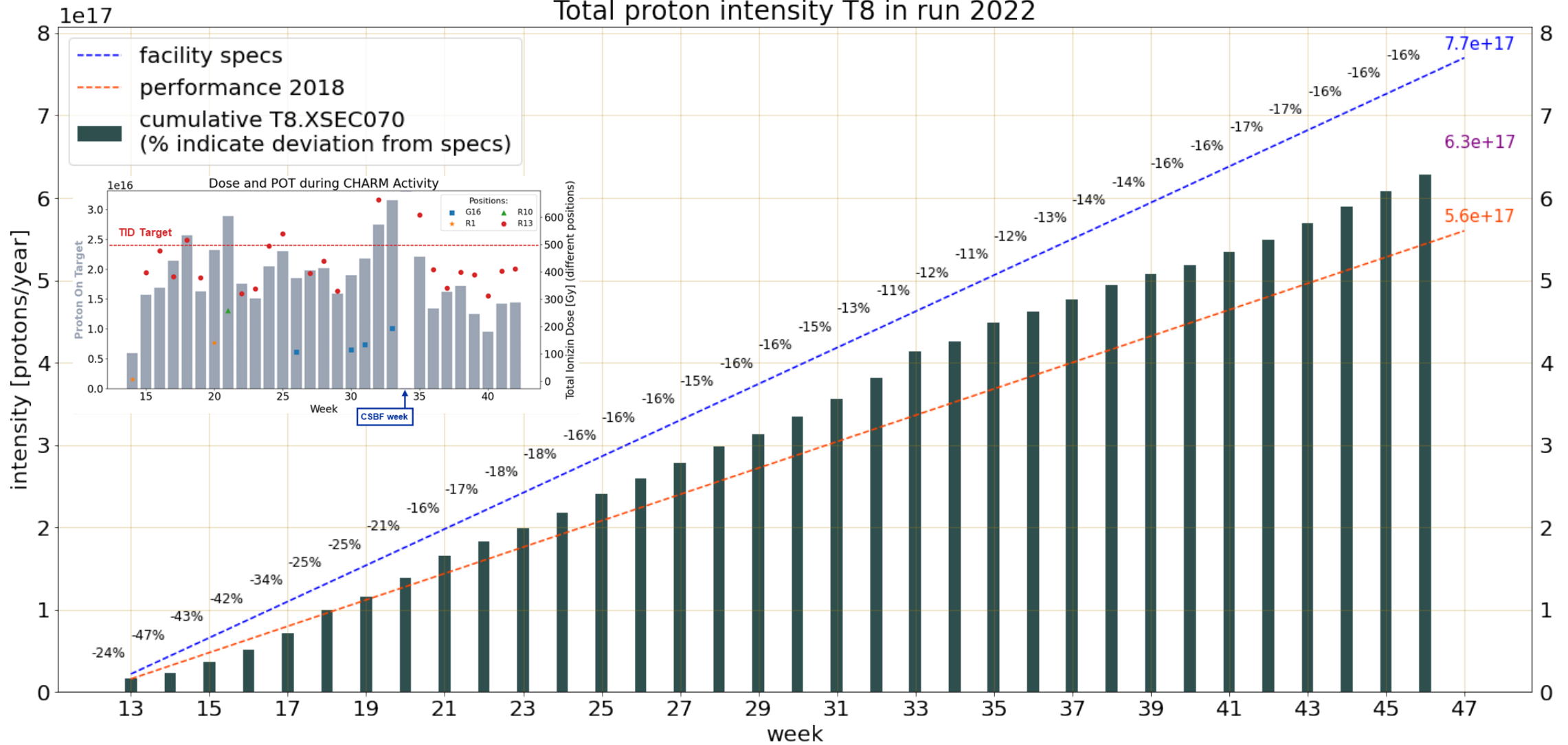


# Highlights 2022

- **34 weeks for protons:**
  - reduced of 4.5 days
  - ~4w. (w13-w16) focusing on beam studies (alignment, steering), dosimetry, mix-field characterization, BI, etc.
    - using fast- (FE) and slow-extracted (SE) beams
    - T08.XSECs Al-foils / BCT calibration ([EDMS 2783968](#))
- **some special runs:**
  - 1 week dedicated at CSBF (HSE-RP)
  - 1 week running CSBF (passive)
  - 1 week with priority for high flux
  - 3 weeks running LHe cryostat in IRRAD
- **several dedicated Wed. MDs (BE-OP & SY-ABT):**
  - optics studies, preparation ion beams, etc.
- **4.5 days for ions (CHIMERA project):**
  - reduced of ~10 days
  - see dedicated wrap-up presentation



# Total proton intensity T8 in run 2022



- $2.2 \times 10^{16}$  p/w  $\rightarrow$  facility specification + EA sharing after LS2 to reach IRRAD/CHARM weekly targets (see last slide)
- $\sim 1.8 \times 10^{16}$  p/w vs.  $1.6 \times 10^{16}$  p/w (performance 2018)  $\rightarrow$  +13%
- beam sharing (1 EAST\_T8 every  $\sim 10$  BP) achieved in average during  $\sim >1/2$  of the weeks (estimation)

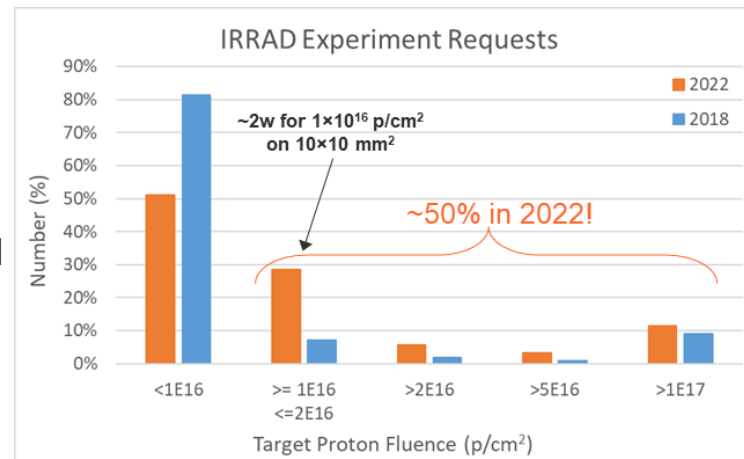
# Statistics 2022

## • IRRAD:

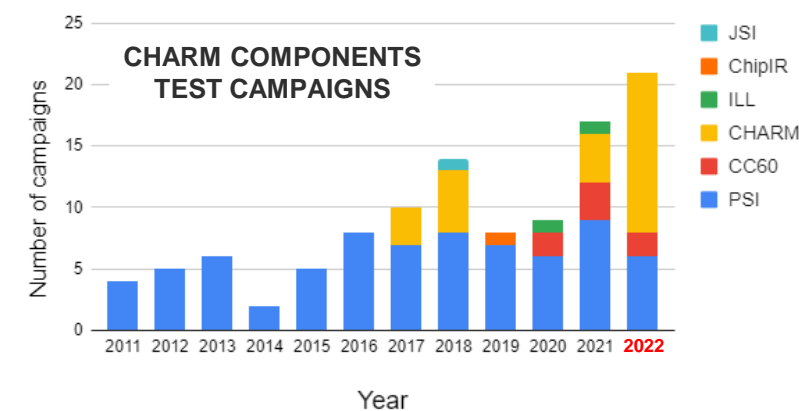
- **54 experiments** registered
- **>600 samples** processed:
  - LHC Experiments: ATLAS, CMS, LHCb Phase II upgrade
  - R&D & expt. support: EPRD, RD53, RD50, EP-ESE / DT
  - CERN ATS Projects: TE-MSD, EN-EL, R2E
  - EU-projects & external: AIDAInnova, CNES (FR)
- **~50% requests exceeding  $10^{16}$  p/cm<sup>2</sup>**
  - cold (-25°C), cryogenic & large areas often required
  - irradiations to  $10^{17}$  p/cm<sup>2</sup> level require ~1 year!

## • CHARM:

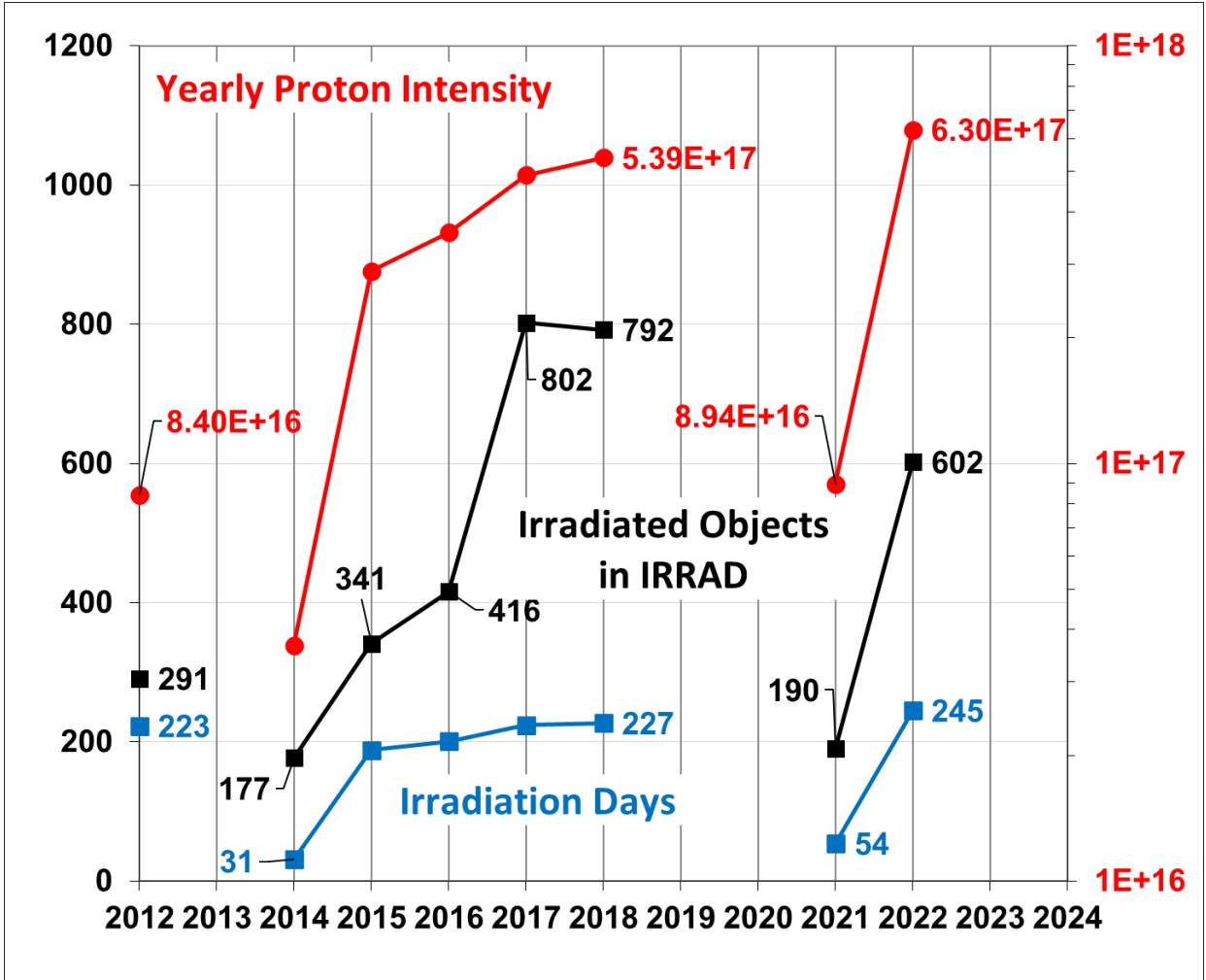
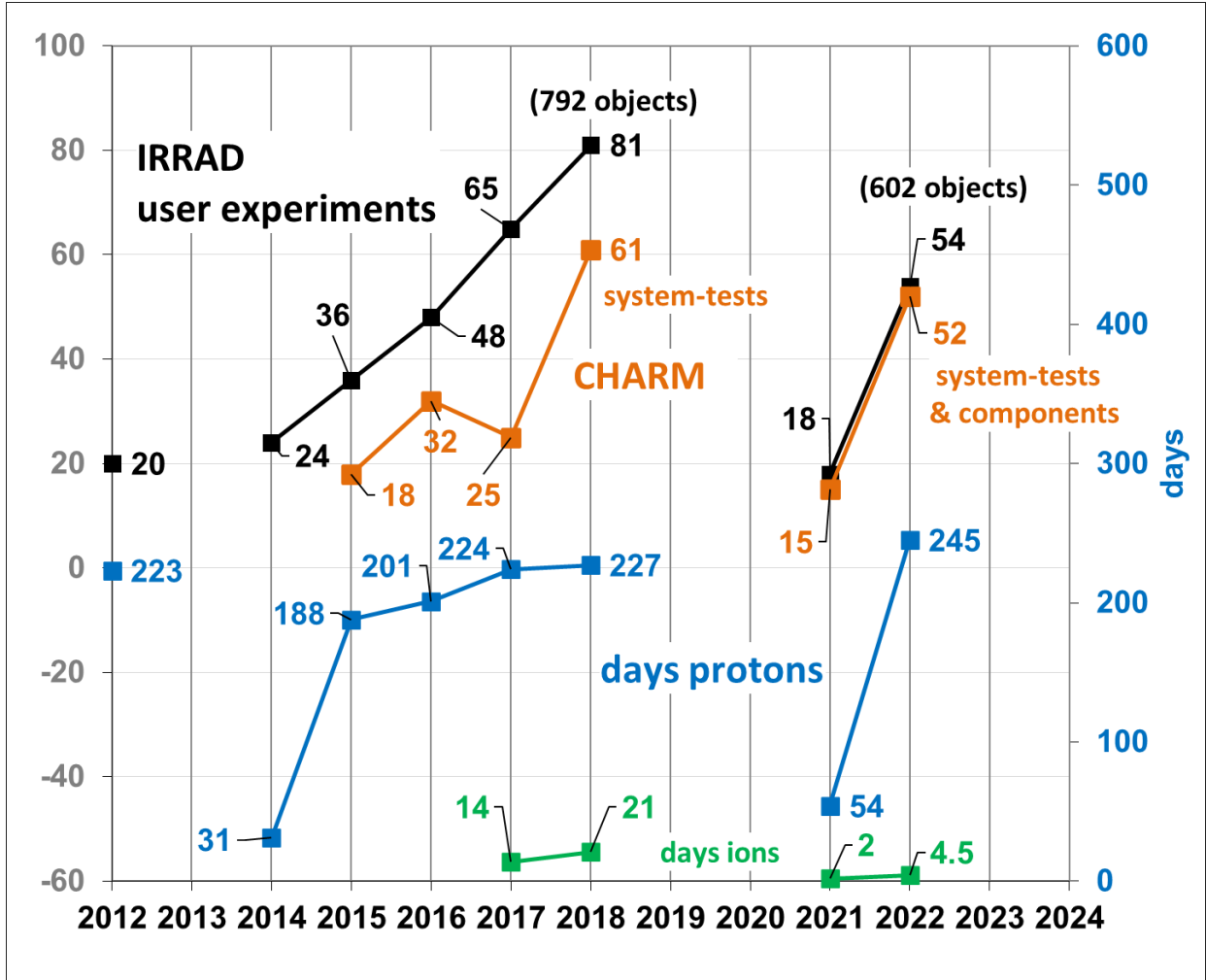
- **29 users** scheduled
- **39 system-level & 13 component tests:**
  - ATS: SY-BI / EPC / STI, TE-MPE / VSC, BE-CEM
  - RCS: EP-DT, CMS, ATLAS, Caen, Wiener
  - EU-projects: RADNEXT (3 users)
- **increasing number of requests**



Facilities used per year



# Facility Statistics



# T08 Proton Beam

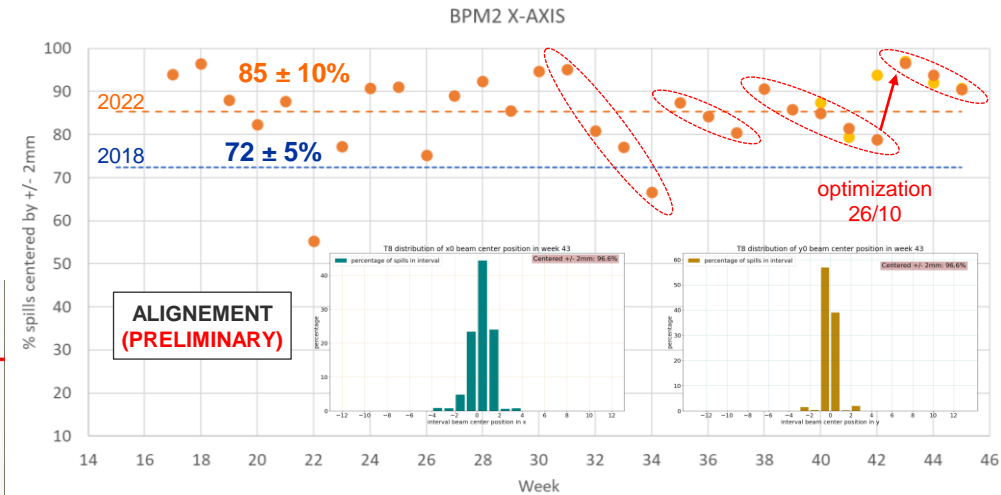
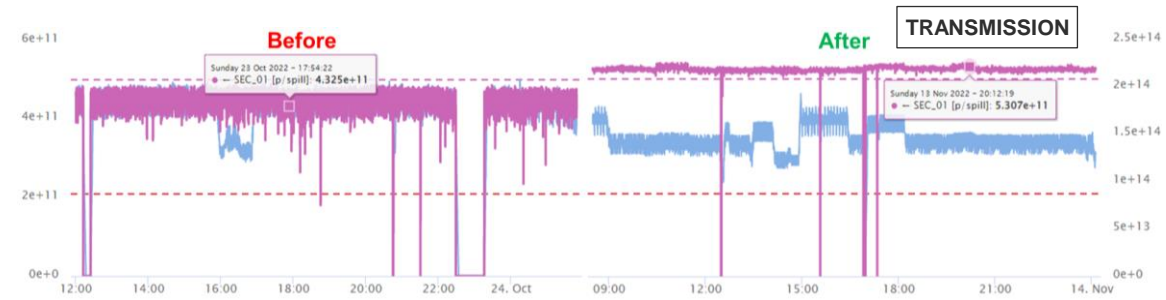
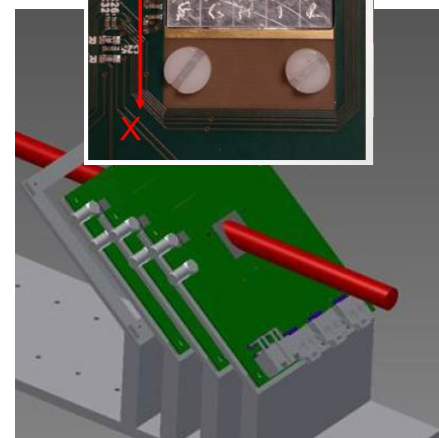
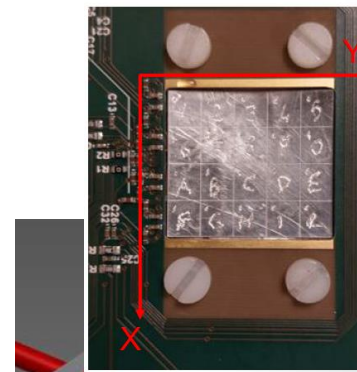
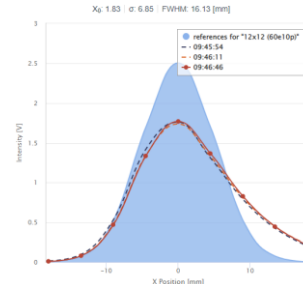
## • Beam Transmission:

- calibration of XSEC070 confirm the **~20% transmission loss** during slow-extraction
- **variations  $\sim 1 \times 10^{11}$  p/spill** sometime observed

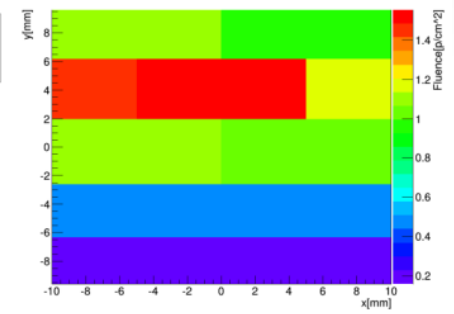
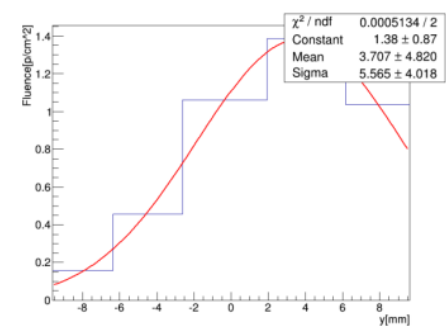
## • Beam Profile & Alignment:

- preliminary analysis on BPM2 (center within  $\pm 2$ mm):
  - **improved beam trajectory** (both axes), but **larger variations**
  - **slow “drift” of the beam center** (x-axis only) along the weeks
  - **incertitude on the absolute position** (y-axis only) being investigated during YETS with metrology & beam colleagues
- tail on the horizontal profile (BPM1)
  - **scattering of lower energies** when reducing extraction losses ?
- user experiments have broad range of requirements:
  - overall **quality much improved** compared to 2021
  - improving **long-term stability** will likely improve the precision we can deliver to some of our user experiments.

PROFILE



ALIGNEMENT (PRELIMINARY)



© ATLAS Pixel ITk colleagues (similar for CMS CROC)

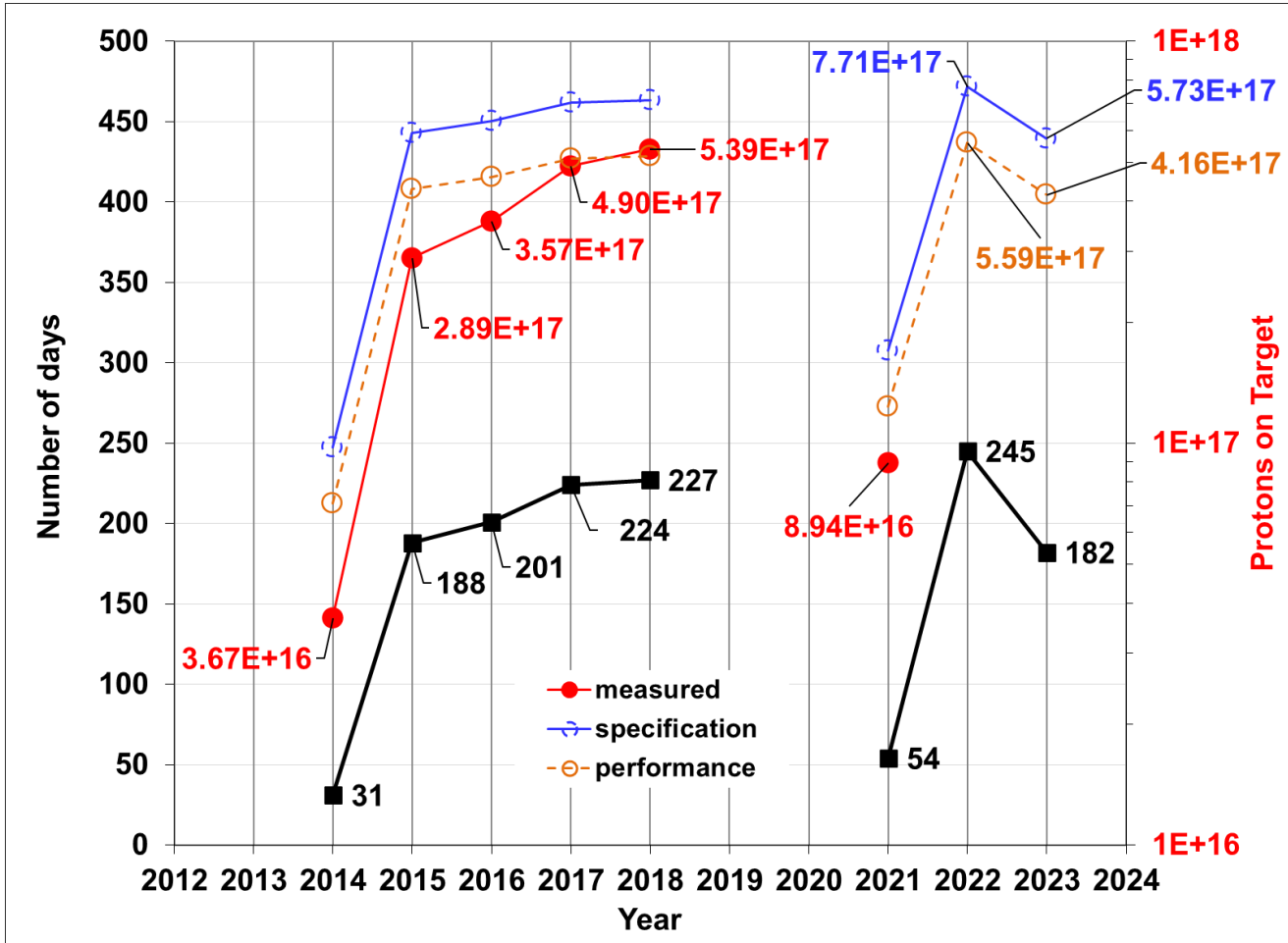
# Many thanks to everyone involved!:



*... AND SEE YOU IN 2023!*



# Baseline for T08 Operation



## Intensity KPIs (details [here](#)):

- T8 beam spec's: [EDMS 1270807](#)
- Sharing from [EDMS 2618217](#)
- Extracted Intensity: **60×10<sup>10</sup> p/spill**
- T8 transmission: **80%**
- [EDMS 2783968](#)
- PS availability: **90%**
- Weekly operation time: **153h**
- Baseline values:
  - **2.2×10<sup>16</sup> p/w** (4.4×10<sup>10</sup> p/s)
  - **CHARM** to reach **TID ~500 Gy/w**
    - **CHARM “week” is shorter than in IRRAD!**
  - **IRRAD** to reach **DD ~1×10<sup>16</sup> 1MeV<sub>eq</sub>/cm<sup>2</sup>/w** (1x1cm<sup>2</sup>)
    - **it depends on beam steering!**
  - Performance 1<sup>st</sup> run as “minimum”: **1.6×10<sup>16</sup> p/w**

