

# EPICS Archiver Appliance – Installation and Use at BESSY/HZB

Switching from Channel Archiver to the Archiver Appliance after 20 years of successful use.

Thomas Birke – Helmholtz-Zentrum Berlin für Materialien und Energie GmbH

**ABSTRACT:** The EPICS Archiver Appliance went into operation at HZB/BESSY in April 2018. After running for a year as an optional new archiver, the Archiver Appliance switched places with the old Channel Archiver and is now the central productive archiver in currently three installations at HZB. To provide a smooth transition from the Channel Archiver to the EPICS Archiver Appliance for end users as well as applications, some frontends like e.g. the ArchiveViewer and other applications needed some modifications to be fully usable. New retrieval frontends are also provided and will replace the ArchiveViewer in the future. In addition the versatile retrieval API rapidly improved the development of Python applications for analysis and optimization.

## MOTIVATION

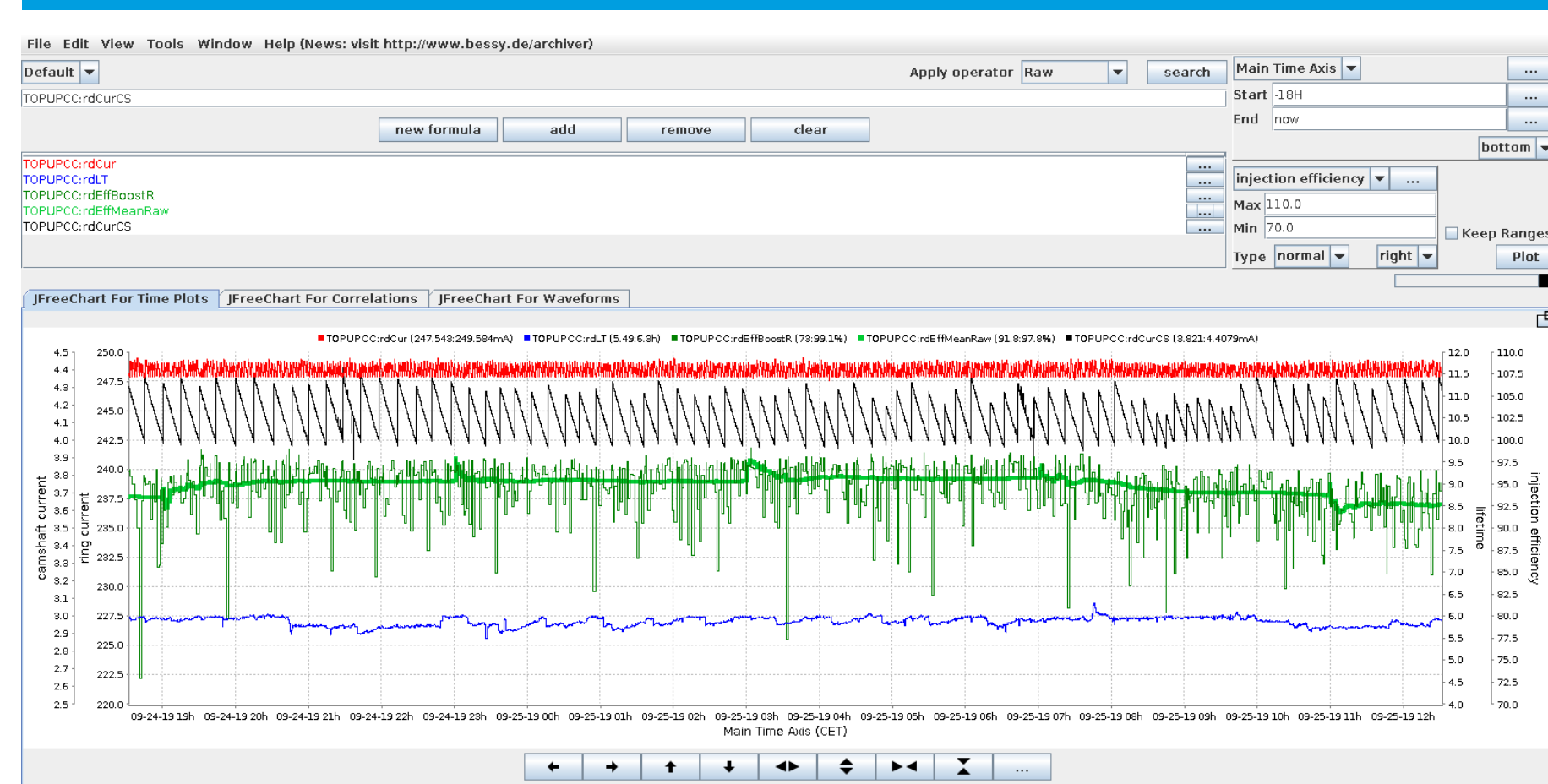
At the beginning of user operation at BESSY-II back in 1998, the Channel Archiver was the best choice to archive control system data in an EPICS based control system environment. This setup has been a reliable workhorse for many years and users gladly accepted the ease of use of the ArchiveViewer to access data from anywhere in the world, launching it using JavaWebStart from the central BESSY/HZB Archiver Web page.

With the amount of data growing over the years, managing the size-limited archive index files of 30 TB of archived data became a serious issue for administrators as well as for users.

In 2015, M. Shankar released a work-in-progress version of the EPICS Archiver Appliance [1]. Even this early implementation solved many problems showing up with the Channel Archiver. A first instance has been setup to archive a few high-volume PVs for about three months sliding window. It has been used since then mostly for post-mortem analysis of data that couldn't be archived with the main Channel Archiver due to insufficient hardware resources.

From day one on, scientists and engineers very much appreciated the ease of access to archived data from analysis applications written in python.

## USER'S FAVOURITE



The **ArchiveViewer** – originally written by S. Chevtsov for the Channel Archiver – is still the favorite browser for archived data amongst users at HZB and hence needs to be maintained until an accepted replacement has been established!

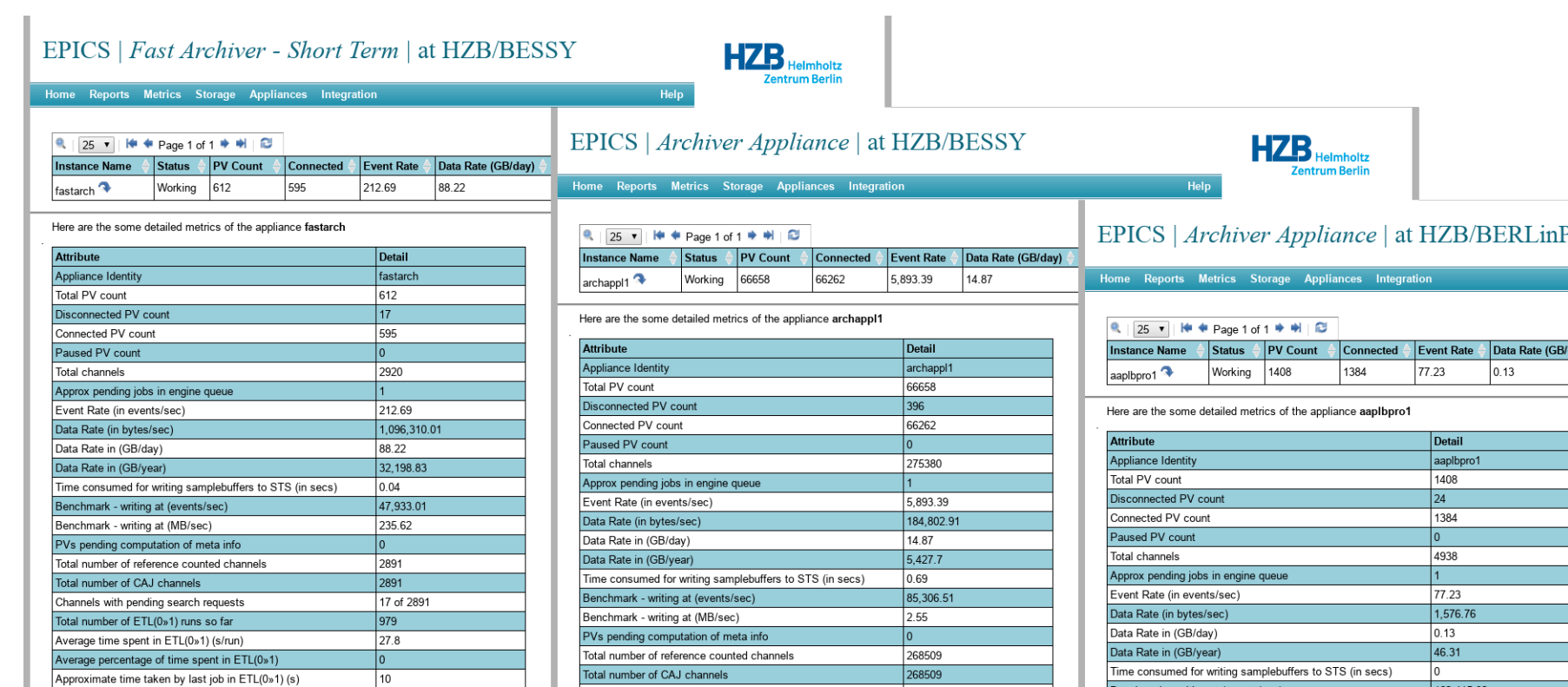
It has been **adapted by M. Shankar** to optionally also retrieve data from the **EPICS Archiver Appliance**. A few local changes have been made to fix e.g. display of waveforms or to do proper data-reduction the way ArchiveViewer expects it.

Simplicity of using the ArchiveViewer resides in the installation-free start-mechanism **JavaWebStart**, that unfortunately has been discontinued.

## CURRENT INSTALLATION @ HZB

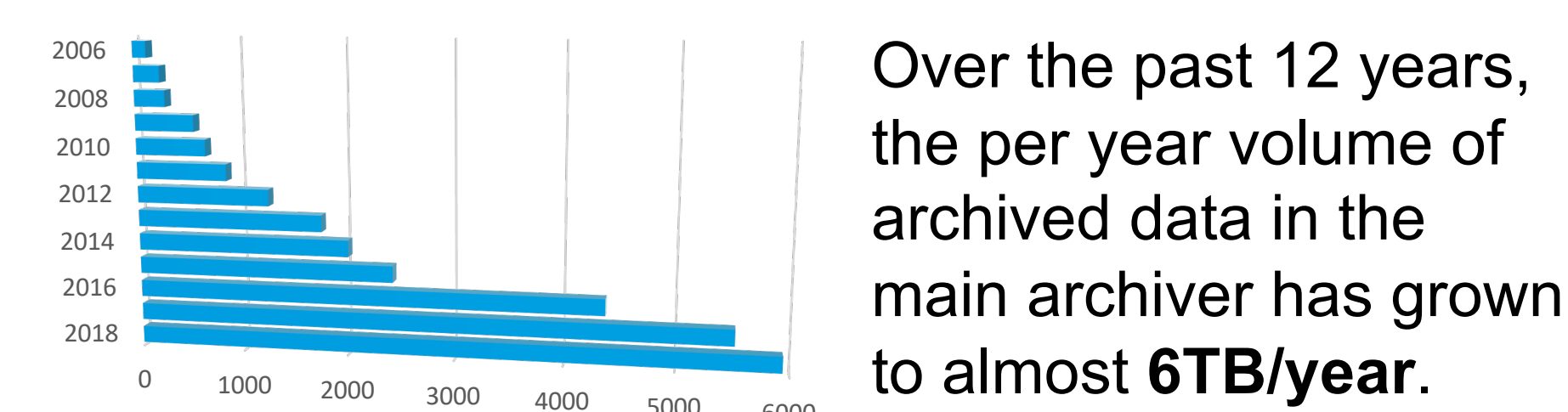
### Running instances of Archiver Appliance

| Instance  | # of PVs | GB/year | comment                             |
|-----------|----------|---------|-------------------------------------|
| FASTZC    | 612      | 32200   | High volume PVs, only 3 months kept |
| BESSY     | 66658    | 5900    |                                     |
| bERLinPro | 1408     | 50      | Rapidly increasing [2]              |
| MLS       | 13515    | 560     | Planned for beginning of 2020       |



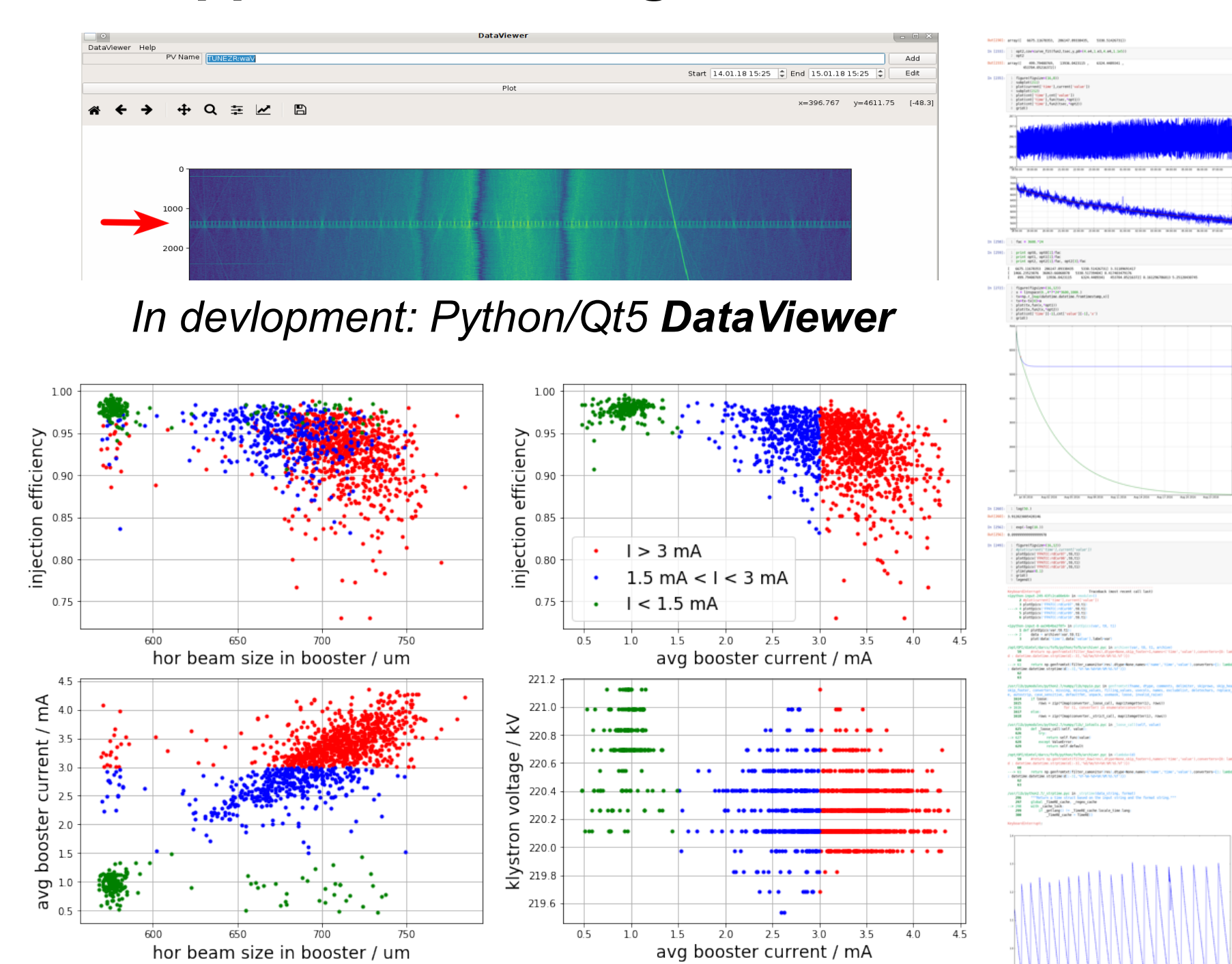
Screenshots: Metrics screens of all running instances

### Growth of Archived Data Volume 2006 – 2018



Over the past 12 years, the per year volume of archived data in the main archiver has grown to almost **6TB/year**.

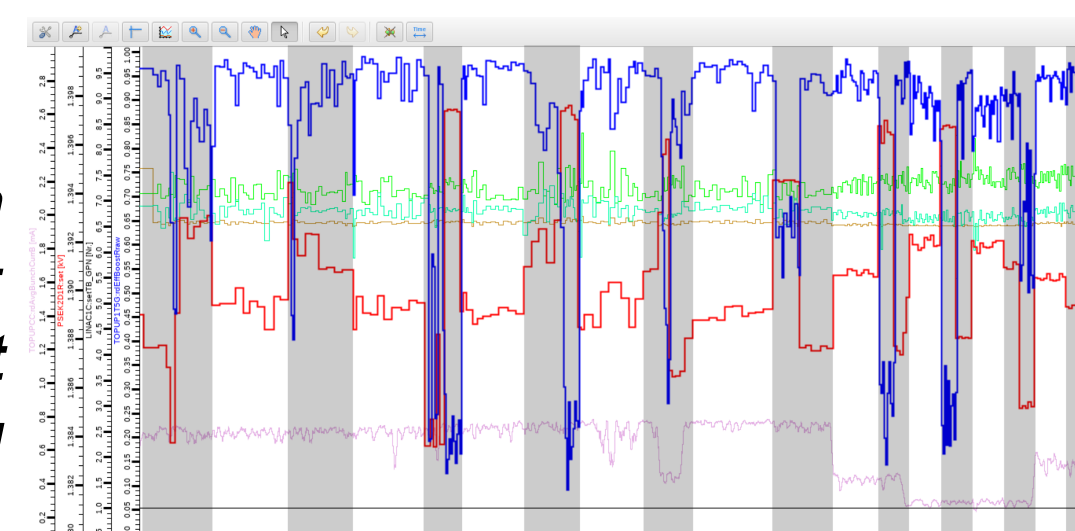
### New Applications using Archiver Data



Example plots created using **jupyter notebooks** analyzing machine performance.

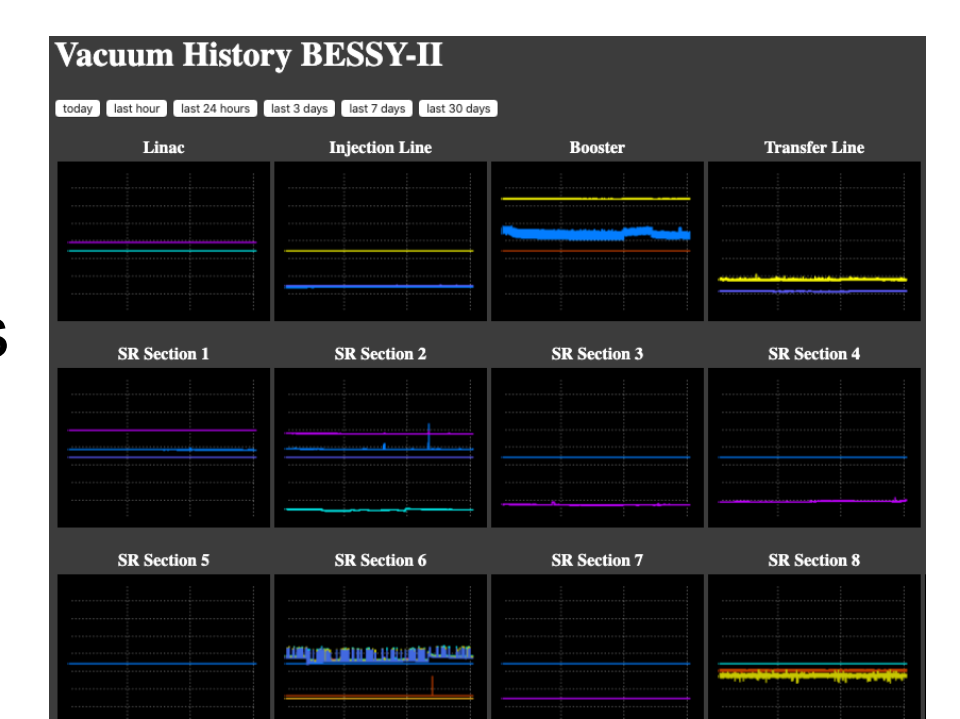
**Offline and Post Mortem Data-Analysis** and the use of archiver data for **Machine Learning** in python have vastly improved.

Use with **Machine Learning: Deep Reinforcement Learning** – pre-training with historical data [3].



### Automated web requests

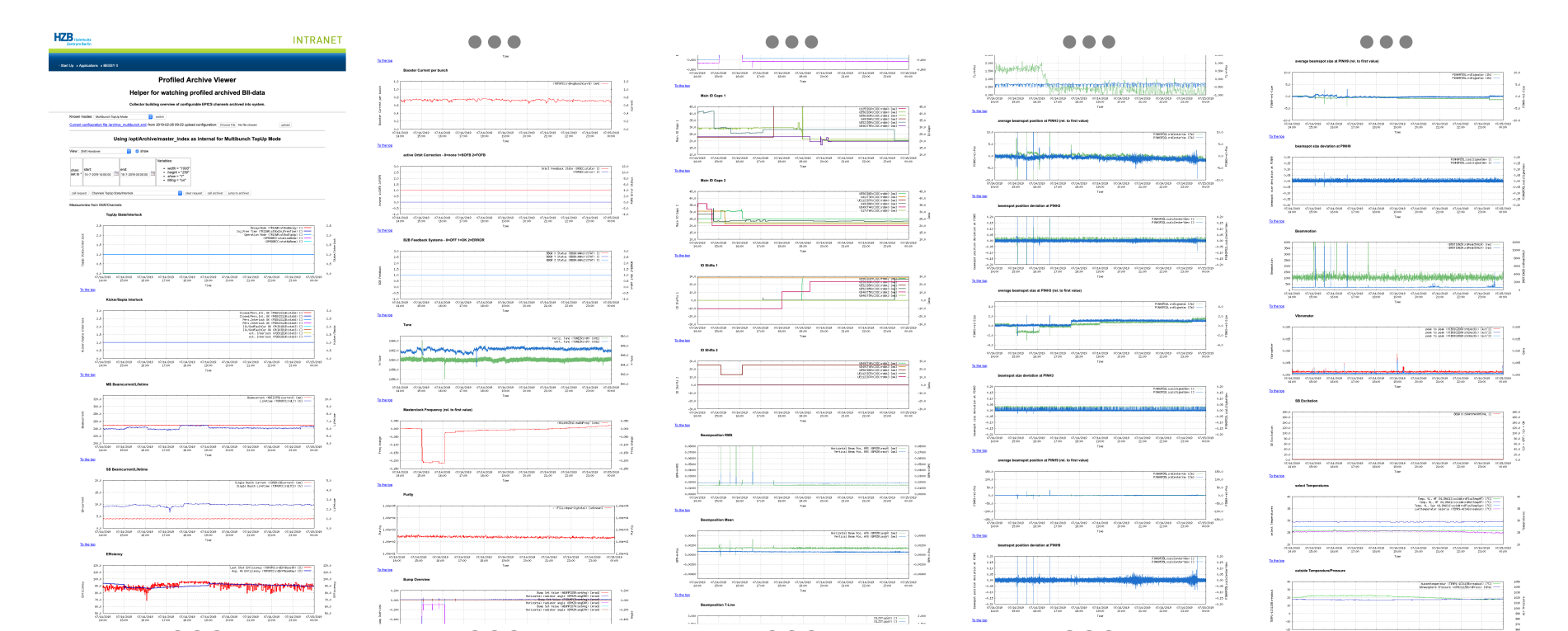
Over the years using the ChannelArchiver, several specialized web-based views have evolved. Some of these applications still have to be adapted to use the Archiver Appliance instead of the Channel Archiver as a data providing backend.



Samples of web-based applications.

Above: Overview of vacuum system status.

Below: Showing a shift-overview of the main PVs to assess the overall performance during the previous operator shift.



## SHORT TERM PLAN

- Problems with backup-system! Choice of **PARTITION\_YEAR** for LTS granularity causes >60000 files to change every day – almost breaks daily incremental backups! Switch to **PARTITION\_MONTH** is imminent.
- **Still work to do** adapting all client scripts and applications to abandon Channel Archiver and completely switch to Archiver Appliance.
- Provide **accepted alternative to ArchiveViewer**.

## CONCLUSION

- Overall a **full success** and a giant **leap forward** compared to Channel Archiver.
- **Help** from Murali Shankar (SLAC) in understanding and fixing problems was very instructive and very much appreciated.
- Instant **advantages gladly accepted** by users:
  - **response time** of queries improved,
  - **no more split archives** due to limited index size (no need to pick the „right one“),
  - **data-retrieval and -analysis with python applications** increased by a magnitude.
- **Maintenance effort** has vastly decreased.

### KEY REFERENCES

- (1) The EPICS Archiver Appliance, [https://slacmshankar.github.io/epicsarchiver\\_docs/](https://slacmshankar.github.io/epicsarchiver_docs/), Murali Shankar, SLAC, CA, USA.
- (2) Status of the Control System for the Energy Recovery Linac bERLinPro at HZB, Thomas Birke et al., Pres. at this conference: FRAPP06.
- (3) Adding Machine Learning to the Analysis and Optimization Toolsets at the Light Source BESSY II, Luis Vera Ramirez et al., Pres. at this conference: TUCPL01.

### ACKNOWLEDGEMENTS

The successful installation and setup of the several instances of the EPICS Archiver Appliance would not have been possible without the help of my colleagues Dennis Engel, Frederik Hammerschmidt, Stine Heise, Markus Ries, Andreas Schälicke, Peter Stange, Luis Vera Ramirez and all the users reporting inconsistencies and problems in our setup as well as in the software. Last but not least, a big thank you goes to Murali Shankar@SLAC for his patient assistance, fruitful help and tireless dedication.

### MORE INFORMATION



Thomas Birke

thomas.birke@helmholtz-berlin.de  
Fon: +49 30 8062-1-4934  
[www.helmholtz-berlin.de](http://www.helmholtz-berlin.de)