



The ePIC Hardware Database

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BNL Nuclear and Particle Physics Software Group (NPPS)

ePIC TIC Meeting

September 14th 2026

A brief history of this project

- © The need of the “Detector/Component/Hardware” database has existed for some time. In early 2026, we actively tested and evaluated the “Component Database” system originally created at ANL, using an instance managed by the BNL CAD.
- © There is a detailed analysis of this system functionality and status, including *compliance with our requirements*, maintenance and deployment issues, screenshots etc, presented in a TC meeting in July 2026:
https://docs.google.com/presentation/d/1K1sntmzvbzo26LZwhE_06R2XkXPb8rYFFQ3QJjBgQOk/edit?usp=sharing
- © In summary, most of the “Component Database” functionality was evaluated quite positively. At the same time, a few issues had been identified (next slide).

Issues

- ◎ The technology used in the **Component Database** is considered niche nowadays (it's a Java application server) and consequently it is hard to create the critical mass of expertise necessary for customization, bug fixes etc.
- ◎ We realized - *proper deployment at a computing facility* (e.g. SCDF) as opposed to a particular group/department *will be needed*, given the “precious” character of these data and critical importance of this database. This provides in particular:
 - Agile support and maintenance, best practices with regards to backup, disaster recovery, network connectivity, uninterruptible power supply etc
 - A separate issue is proper authentication/authorization, which is a prerequisite for hosting a system at BNL (or anywhere) which is open to external members and organizations. Hosting at the facility makes this possible with minimal investment of effort and minimal friction, since this is standard.

Solution

- © As a result of this study, it was decided to evaluate the following path forward: migrate the **useful design patterns and functionality** of the ANL Component Database to a more modern, customizable and easier to maintain platform; explore its integration with the facility services, support procedures and the front-end auth/auth.
- © A standard and proven solution is to use a Python-based framework such as Django, fronted by a modern web server. This approach is used in critical applications by experiments such as ATLAS, and for which there is existent and plentiful expertise in the community.
- © Therefore, the **application logic was migrated** to the new platform, while keeping all the positive features of the design and functionality (**see the backup slide**).

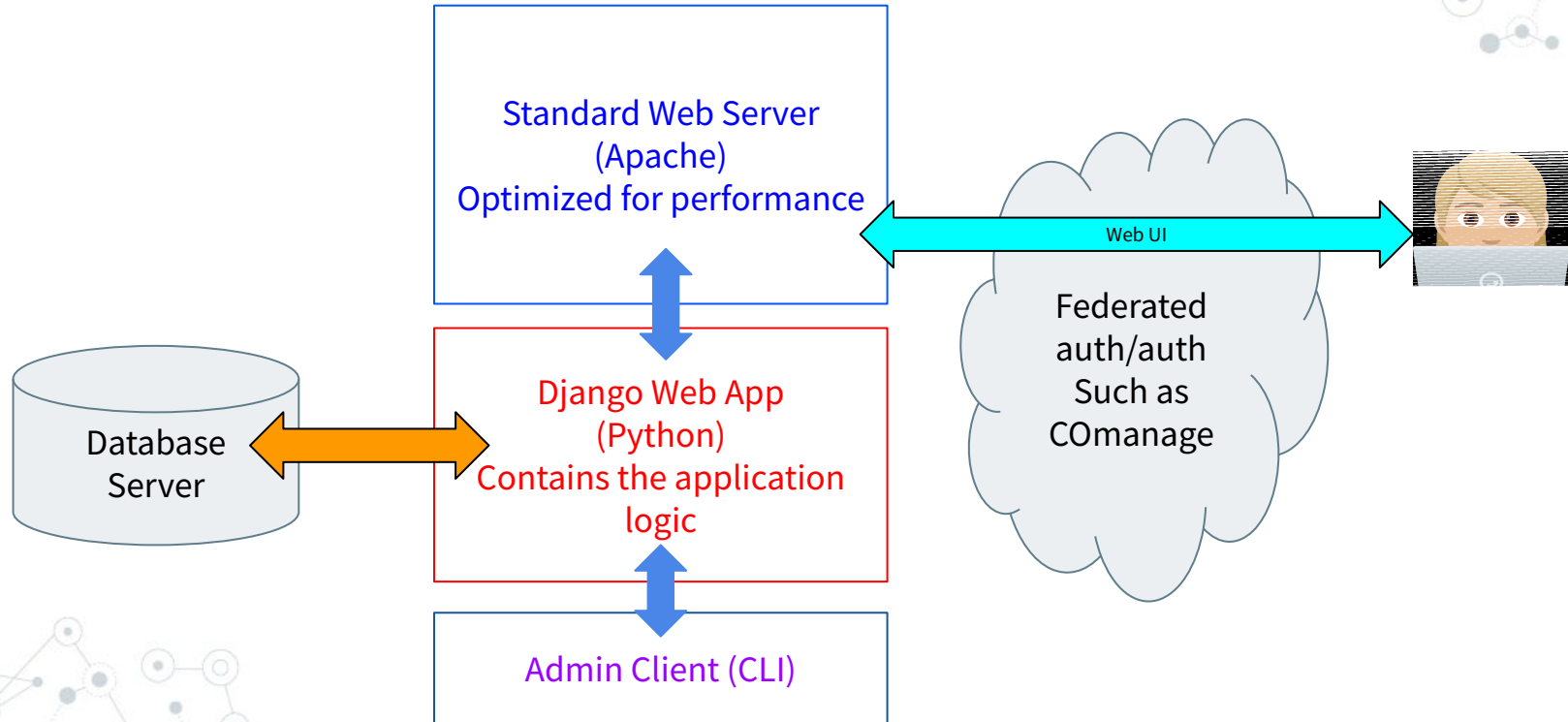
Enhancing existing features

- © Location hierarchy: institution/building/room.
- © Group-level edit rights. A user can be a member of **multiple groups**.
- © Transfer of ownership to/from authorized users.
- © Change of location, **supporting the design/assembly integrity**.
- © Search capability (by partial name, tag).
- © Filters for tabulated data, to provide focus on items of interest.

Rebranding

- © It is natural to abbreviate the “Component Database” as “CDB”
- © In practice, this creates an unfortunate confusion vis a vis Conditions Database and Calibrations Database, also often referred to as “CDB”
- © Given that, and the ongoing rebuild, it makes sense to pick another moniker, such as “**Hardware Database**” which is aligned with the domain.
- © So, now this is the working title, also abbreviated as **HDB**.

Conceptual diagram of the Hardware Database elements



Hardware Database: landing page

 **ePIC**
Hardware Database

MAIN

 **Dashboard**

CATALOG

 Components

INVENTORY

 Inventory

DESIGNS

 Designs

 Design Templates

REFERENCE

 Systems

 Institutions

 Users & Groups

 Activity Log

Dashboard
ePIC Hardware Database overview

Components

11

Catalog entries

Inventory

27

Physical Items

Designs

1

Assemblies

Log Entries

26

Events recorded

Institutions

4

Collaborating sites

Recent Activity

Sept. 1, 2026, 10:22 p.m. · **Inventory**

BTOF-READOUT-002 moved from BNL / Bldg.510A to UIC / Test Lab by Maxim Potekhin (batch update).

Sept. 1, 2026, 10:22 p.m. · **Inventory**

BTOF-READOUT-004 moved from BNL / Bldg.510A to UIC / Test Lab by Maxim Potekhin (batch update).

Sept. 1, 2026, 10:05 p.m. · **Inventory**

BTOF-READOUT-002 moved from unassigned to BNL / Bldg.510A by Maxim Potekhin.

Sept. 1, 2026, 10:02 p.m. · **Inventory**

BTOF-READOUT-002 moved from BNL / Bldg.510A to unassigned by Maxim Potekhin (batch update).

Sept. 1, 2026, 10:01 p.m. · **Inventory**

BTOF-READOUT-002 moved from CUA / Storage Room to BNL / Bldg.510A by Maxim Potekhin (batch update).

Sept. 1, 2026, 10:01 p.m. · **Inventory**

BTOF-READOUT-004 moved from CUA / Storage Room to BNL / Bldg.510A by Maxim Potekhin (batch update).

Sept. 1, 2026, 9:59 p.m. · **Inventory**

Ownership of BTOF-READOUT-002 transferred from Grigory Nigmatkulov to Maxim Potekhin by Maxim Potek...

Sept. 1, 2026, 9:59 p.m. · **Inventory**

Ownership of BTOF-READOUT-004 transferred from Grigory Nigmatkulov to Maxim Potekhin by Maxim Potek...

Institutions

BNL Brookhaven National Laboratory
Upton, NY, USA

CUA Catholic University of America
Washington, DC, USA

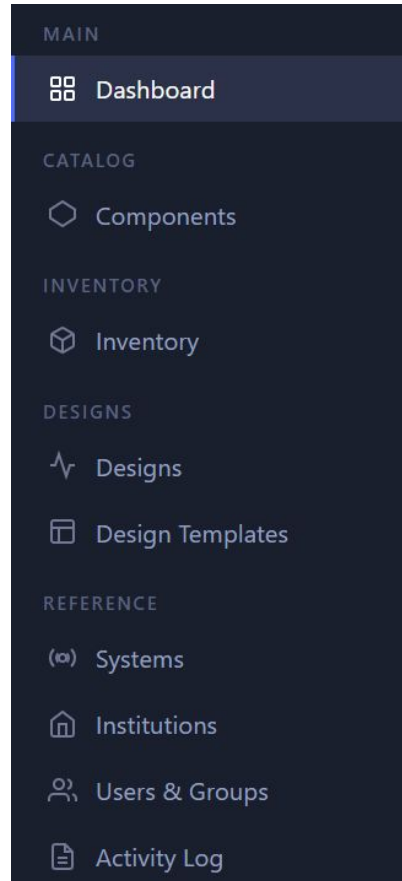
UH University of Hawaii
Honolulu, HI, USA

UIC University of Illinois Chicago
Chicago, USA

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Hardware Database: details of the navigation bar



The Component Catalog (“shopping catalog”)

 **ePIC**

Hardware Database

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Component Catalog

Reference library of component types

All Systems

All Groups

Search

+ New Component

NAME	MODEL NO.	SYSTEM	INSTANCES	GROUP	OWNER	DESCRIPTION
AC-LGAD Sensor	AC-LGAD-v1	BTOF-Sensor	2	BTOF	Grigory Nigmatkulov	AC-coupled Low Gain Avalanche Diode sensor for BTOF.
BTOF Carbon Honeycomb Support	BTOF-SUPPORT-01	BTOF-Mechanical	0	BTOF	—	Stave backbone structure, carbon honeycomb, active-cooling ...
BTOF Cooling Pipe Segment	BTOF-COOL-01	BTOF-Mechanical	0	BTOF	—	Half-stave-length active cooling pipe, carbon-honeycomb emb...
BTOF Flex Cable (FPC)	BTOF-FPC-01	BTOF-Mechanical	0	BTOF	—	Flexible printed circuit, stavelet-to-half-stave signal/pow...
BTOF Half-Stave	BTOF-HALFSTAVE-R1	BTOF-Mechanical	1	BTOF	Grigory Nigmatkulov	1316 mm BTOF half-stave, 8 stavelets (see BTOF Half-Stave t...
BTOF Interposer Board	BTOF-INT-01	BTOF-Mechanical	0	BTOF	—	Sensor-to-FCFD interposer board for one BTOF stavelet chann...
BTOF Peripheral Board	BTOF-PERIPH-01	BTOF-Mechanical	0	BTOF	—	Half-stave edge peripheral board -- power distribution and ...
BTOF Stavelet	BTOF-STAVELET-R1	BTOF-Mechanical	0	BTOF	—	162 mm double-sided AC-LGAD stavelet module (see BTOF Stave...
FCFDv2 Readout	FCFDv2	BTOF-Readout	5	BTOF	Grigory Nigmatkulov	Fast Constant-Fraction Discriminator readout ASIC for BTOF.
Hamamatsu S14160-3010PS	S14160-3010PS	BEMC-PM	16	BEMC	Casey Crafts	3x3mm 10um-pitch SiPM photosensor for BEMC readout.
PbWO4 Crystal	PWO-BEMC-01	BEMC-CRYSTAL	3	BEMC	Casey Crafts	Lead tungstate scintillating crystal for the Backward EMCal.

Component page in the catalog – an example

The screenshot shows the ePIC Hardware Database interface. On the left is a dark sidebar with navigation links: ePIC, Hardware Database, MAIN, Dashboard, CATALOG, Components (selected), INVENTORY, Inventory, DESIGNS, Designs, Design Templates, REFERENCE, Systems, Institutions, Users & Groups, and Activity Log.

The main content area is titled 'Hamamatsu S14160-3010PS' with links for BEMC-PM and ePIC. It is divided into several sections:

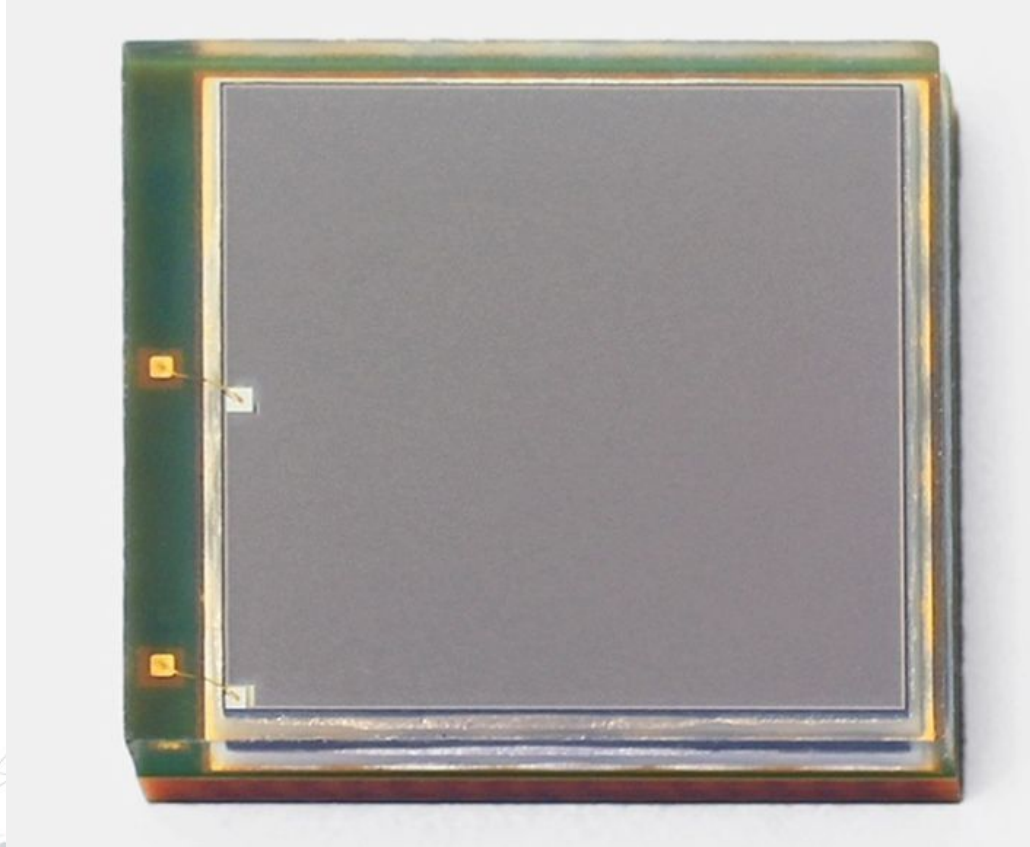
- Details:** Contains model number (S14160-3010PS), description (3x3mm 10um-pitch SiPM photosensor for BEMC readout), owner group (BEMC), current owner (Casey Crafts), and creation date (Aug. 5, 2026).
- Properties:** A panel on the right with a '+ Add Property' button. It contains three sections: 'G' (Weight: 2.1 g), 'MM' (Length: 3 mm, Width: 3 mm), and 'NO UNITS' (Image: [Image of component]). Each section has a 'Save' button and a close 'X' button. A red arrow points to this panel.
- Sources:** A section indicating 'No sources recorded'.
- Log Entries:** A section indicating 'No log entries'.
- Inventory Instances (16):** A table with columns 'TAG' and 'LOCATION'. It lists 16 instances, all with the location 'CUA / Main building / Storage Room'. A red arrow points to this table.

● Properties

● Images

● Links to inventory

Component page: image detail



Properties

- © **Properties** can be added, deleted and modified by authorized personnel (currently defined by the group membership).
- © There is no hard limit on the number of properties to be assigned to any given entity.
- © Images, documents – anything can be added. A caveat: *HDB is not a content storage and delivery service. For that reason, large documents and files should be committed to other storage solutions including [Invenio](#), and a link provided. The Hardware Database has some local storage in the system intended for small or medium sized files, and it should be used as such. Using a system like Invenio provides the important versioning capability.*

Users, groups, systems

- © Users and groups are supported organically in Django, with possibilities of customization at every level – we take advantage of that.
- © There is a powerful “admin interface” already baked into the system, allowing the administrators to perform maintenance and sensitive operations on the database without additional security risk.
- © Users can only perform operations allowed for his/her group and if necessary, limited to a particular account. If necessary, this can also be used to control items’ visibility.
- © Since individual subsystems are still fairly large, there is an additional qualifier in the database, called “technical system”. For example, the BEMC group is responsible for multiple components of this detector. One can access technical systems such as BEMC-Crystal, BEMC-SiPM, BEMC-mechanical etc. This makes accessing and modifying information easier.

Users and groups

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 **Users & Groups**

Users

Click on a table row to see the inventory owned by the user.

All Groups ▾

All Institutions ▾

Filter

FIRST NAME	LAST NAME ^{TL}	INSTITUTION ^{TL}	GROUPS	EMAIL
Alexander	Kiselev	BNL	PFRICH	ayk@bnl.gov
Brian	Page	BNL	PFRICH	bpage@bnl.gov
Casey	Crafts	CUA	BEMC	crafts@cua.edu
Grigory	Nigmatkulov	UIC	BTOF	gnigmat@uic.edu
Jennifer	Ott	UH	BTOF	ottjenni@hawaii.edu
Maxim	Potekhin	BNL	—	potekhin@bnl.gov
Thomas	Ullrich	BNL	BEMC BTOF	thomas.ullrich@bnl.gov

Click on a user shows the inventory owned by them

 **ePIC**
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Inventory: Grigory Nigmatkulov

Component instances owned by **gnigmat**

[← Institutions](#)

ID	TAG	COMPONENT	SYSTEM	SERIAL NO.	LOCATION	GROUP
130ae1a1...	BTOF-SENSOR-001	AC-LGAD Sensor	BTOF-Sensor	LGAD-0001	UIC / Main building / Test Lab	BTOF
2027e3dd...	BTOF-SENSOR-002	AC-LGAD Sensor	BTOF-Sensor	LGAD-0002	CUA / Main building / Storage Room	BTOF
28766297...	TEST	BTOF Half-Stave	BTOF-Mechanical	1	BNL / Bldg,510A	BTOF
e0d4599a...	BTOF-READOUT-001	FCFDv2 Readout	BTOF-Readout	FCFD-0001	UIC / Main building / Test Lab	BTOF
a4c7f245...	BTOF-READOUT-003	FCFDv2 Readout	BTOF-Readout	FCFD-0003	UIC / Main building / Test Lab	BTOF
a49a23c8...	BTOF-READOUT-005	FCFDv2 Readout	BTOF-Readout	FCFD-0005	UIC / Main building / Test Lab	BTOF

6 items

Institutions and locations

 **ePIC**
Hardware Database

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Institutions & Locations

Collaborating labs and physical location hierarchy

BNL

Brookhaven National Laboratory
Upton, NY, USA · <https://www.bnl.gov>

2 locations

USERS

[Thomas Ulrich](#) · ulrich: view owned items
[Maxim Potekhin](#) · maxim: view owned items
[Brian Page](#) · bpage: view owned items
[Alexander Kiselev](#) · ayk: view owned items

LOCATIONS

Building **Bldg.510A**

Room **Receiving**

+ Add Location

Bldg.510A

Save

CUA

Catholic University of America
Washington, DC, USA · <https://www.cua.edu>

2 locations

USERS

[Casey Crafts](#) · crafts: view owned items

LOCATIONS

Building **Main building**

Room **Storage Room**

+ Add Location

Main building

Save

UH

University of Hawaii
Honolulu, HI, USA · <https://www.hawaii.edu>

0 locations

USERS

[Jennifer Ott](#) · ottjenni: view owned items

LOCATIONS

No locations yet

+ Add Location

UIC

University of Illinois Chicago
Chicago, USA · <https://www.uic.edu>

2 locations

USERS

[Grigory Nigmatulov](#) · grigmat: view owned items

LOCATIONS

Building **Main building**

Room **Test Lab**

+ Add Location

Main building

Save

Institutions and locations – detail

 **ePIC**
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Institutions & Locations

Collaborating labs and physical location hierarchy

BNL

Brookhaven National Laboratory
Upton, NY, USA · <https://www.bnl.gov>

2 locations

USERS

- Thomas Ullrich ullrich: view owned items
- Maxim Potekhin maxim: view owned items
- Brian Page bpage: view owned items
- Alexander Kiselev ayk: view owned items

LOCATIONS

+ Add Location

Building	Bldg,510A
Room	Receiving

→ Bldg,510A Save

Adding locations

Add Location — Brookhaven National Laboratory

Name *

Type

Room

Parent Location

— None (top level) —

— None (top level) —

BNL / Bldg,510A

BNL / Bldg,510A / Receiving

Cancel

Create

Locations

al location hierarchy

National Laboratory

<https://www.bnl.gov>

w owned items

ew owned items

owned items

y owned items

University of America

Washington, DC, USA · <https://www.cua.edu>

 Users & Groups

 Activity Log

The Inventory


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Component Inventory

Physical component instances

+ Add Inventory Item

Search by tag, serial number, component... All Locations All Systems All Groups All Users All Designs Search

☐	TAG	COMPONENT	SYSTEM	SERIAL NO.	LOCATION	USED IN DESIGN	GROUP	OWNER	CREATED
☐	BTOF-SENSOR-001	AC-LGAD Sensor	BTOF-Sensor	LGAD-0001	UIC / Main building / Test Lab	—	BTOF	Grigory Nigmatkulov	2026-08-05
☐	BTOF-SENSOR-002	AC-LGAD Sensor	BTOF-Sensor	LGAD-0002	CUA / Storage Room	—	BTOF	Grigory Nigmatkulov	2026-08-05
☐	TEST	BTOF Half-Stave	BTOF-Mechanical	1	BNL / Bldg.510A	—	BTOF	Grigory Nigmatkulov	2026-08-08
☐	BTOF-READOUT-001	FCFDv2 Readout	BTOF-Readout	FCFD-0001	UIC / Main building / Test Lab	—	BTOF	Grigory Nigmatkulov	2026-08-05
☐	BTOF-READOUT-002	FCFDv2 Readout	BTOF-Readout	FCFD-0002	UIC / Main building / Test Lab	—	BTOF	Maxim Potekhin	2026-08-05
☐	BTOF-READOUT-003	FCFDv2 Readout	BTOF-Readout	FCFD-0003	UIC / Main building / Test Lab	—	BTOF	Grigory Nigmatkulov	2026-08-05
☐	BTOF-READOUT-004	FCFDv2 Readout	BTOF-Readout	FCFD-0004	UIC / Main building / Test Lab	—	BTOF	Maxim Potekhin	2026-08-05
☐	BTOF-READOUT-005	FCFDv2 Readout	BTOF-Readout	FCFD-0005	UIC / Main building / Test Lab	—	BTOF	Grigory Nigmatkulov	2026-08-05
☐	BEMC-PM-001	Hamamatsu S14160-3010PS	BEMC-PM	HAM-0001	BNL / Bldg.510A	bemc2	BEMC	Casey Crafts	2026-08-05
☐	BEMC-PM-002	Hamamatsu S14160-3010PS	BEMC-PM	HAM-0002	BNL / Bldg.510A	bemc2	BEMC	Casey Crafts	2026-08-05
☐	BEMC-PM-003	Hamamatsu S14160-3010PS	BEMC-PM	HAM-0003	BNL / Bldg.510A	bemc2	BEMC	Casey Crafts	2026-08-05
☐	BEMC-PM-004	Hamamatsu S14160-3010PS	BEMC-PM	HAM-0004	BNL / Bldg.510A	bemc2	BEMC	Casey Crafts	2026-08-05
☐	BEMC-PM-005	Hamamatsu S14160-3010PS	BEMC-PM	HAM-0005	CUA / Storage Room	—	BEMC	Casey Crafts	2026-08-05
☐	BEMC-PM-006	Hamamatsu S14160-3010PS	BEMC-PM	HAM-0006	CUA / Storage Room	—	BEMC	Casey Crafts	2026-08-05

Inventory Detail

 **ePIC**

Hardware Database

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BTOF - READOUT - 005

FCFDv2 Readout BTOF

Delete

View Component ↗

Instance Details

ID

a49a23c8-f97d-4e1e-a98e-e8709c03ca08 

COMPONENT

[FCFDv2 Readout](#)

SYSTEM

BTOF-Readout

TAG

BTOF-READOUT-005

SERIAL NUMBER

FCFD-0005

INSTITUTION

University of Illinois Chicago ▼

LOCATION

UIC / Main building / Test Lab ▼

Save

OWNER GROUP

BTOF

CURRENT OWNER

Grigory Nigmatkulov ▼

Save

CREATED

Aug. 5, 2026

Properties

+ Add / Override

No properties

Inventory Detail: QR integration

QR Code



a49a23c8-f97d-4e1e-a98e-e8709c03ca08

Close

REFERENCE

Systems

Institutions

Users & Groups

Activity Log

SERIAL NUMBER

FCFD-0005

INSTITUTION

University of Illinois Chicago

LOCATION

UIC / Main building / Test Lab

Save

OWNER GROUP

BTOF

CURRENT OWNER

Grigory Nigmatkulov

Save

CREATED

Aug. 5, 2026

Delete

Properties

No properties

Technical Systems – for more structured access:

One group can manage multiple systems

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- Systems**
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Technical Systems

Engineering subsystems — click one to browse its inventory

All Groups

SYSTEM	DESCRIPTION	GROUP	COMPONENTS	INVENTORY ITEMS	
BEMC-CRYSTAL		BEMC	1	3	View inventory →
BEMC-PM		BEMC	1	16	View inventory →
BTOF-Mechanical		BTOF	7	1	View inventory →
BTOF-Readout		BTOF	1	5	View inventory →
BTOF-Sensor		BTOF	1	2	View inventory →
PFRICH-HRPPD		PFRICH	0	0	View inventory →

“Designs”: aggregate entities

 **ePIC**
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bemc2

BEMC

Delete Design

Bill of Materials

Assembly Location:

COMPONENT	TAG	TYPE	QUANTITY
Crystal — COMPONENT PbWO4 Crystal MODEL PW0-BEMC-01	TAG BEMC-CRYSTAL-001	Instance 1/1	×1
SiPM — COMPONENT Hamamatsu S14160-3010PS MODEL S14160-3010PS	TAG BEMC-PM-001	Instances 4/4	×4
	TAG BEMC-PM-002		
	TAG BEMC-PM-003		
	TAG BEMC-PM-004		

Description

One BEMC tower: a PbWO4 crystal read out by four SiPMs.

Template

Instantiated from **BEMC tower**

Properties

+ Add Property

No properties

Log Entries

Aug. 31, 2026, 10:15 p.m. · design · Maxim Potekhin

Element SiPM: inventory instance BEMC-PM-004 installed (4 of 4) by Maxim Potekhin.

Aug. 31, 2026, 10:15 p.m. · design · Maxim Potekhin

Element SiPM: inventory instance BEMC-PM-003 installed (3 of 4) by Maxim Potekhin.

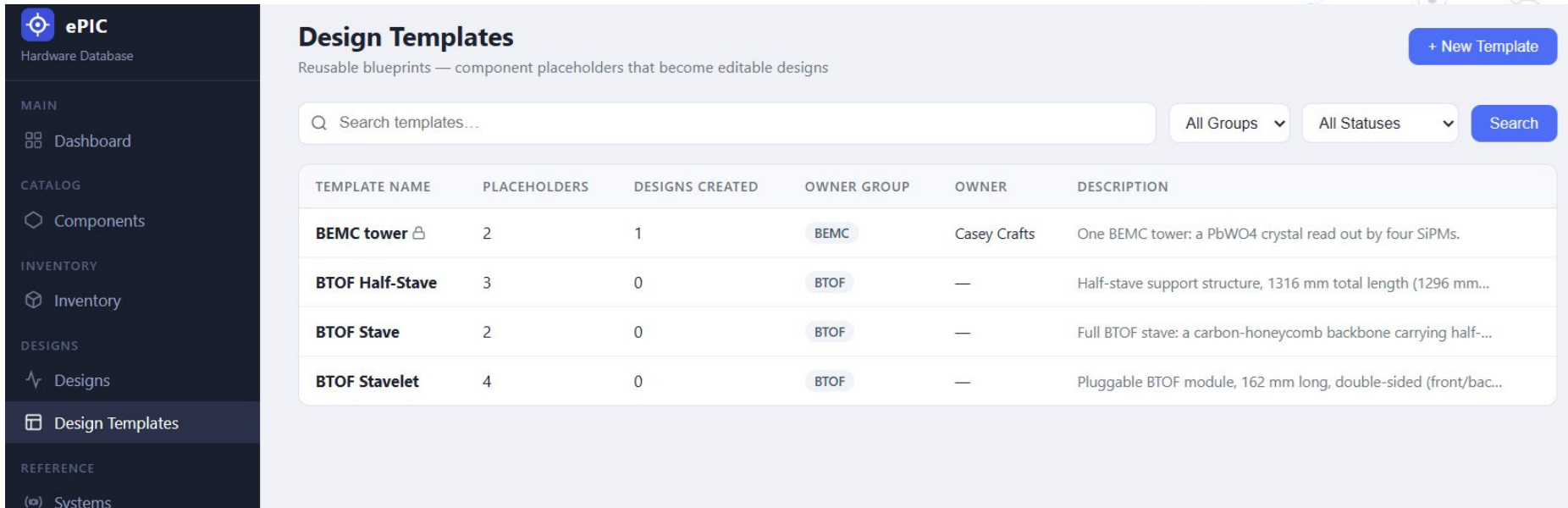
Aug. 31, 2026, 10:15 p.m. · design · Maxim Potekhin

Element SiPM: inventory instance BEMC-PM-002 installed (2 of 4) by Maxim Potekhin.

CREATED
Aug. 31, 2026

LAST MODIFIED
Aug. 31, 2026

Design templates and version control



ePIC
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Design Templates

Reusable blueprints — component placeholders that become editable designs

+ New Template

Q Search templates...

All Groups ▾ All Statuses ▾ Search

TEMPLATE NAME	PLACEHOLDERS	DESIGNS CREATED	OWNER GROUP	OWNER	DESCRIPTION
BEMC tower 🔒	2	1	BEMC	Casey Crafts	One BEMC tower: a PbWO4 crystal read out by four SiPMs.
BTOF Half-Stave	3	0	BTOF	—	Half-stave support structure, 1316 mm total length (1296 mm...
BTOF Stave	2	0	BTOF	—	Full BTOF stave: a carbon-honeycomb backbone carrying half-...
BTOF Stavelet	4	0	BTOF	—	Pluggable BTOF module, 162 mm long, double-sided (front/bac...

- Referential integrity of designs is critically important
- Templates are managed with strict version control, and kept in a system like GitHub
- The format of the template definition is in YAML — no editing in GUI, for that reason

Logs

- ◎ The system has built-in support for logging.
- ◎ Any user action can be logged, if necessary, such as additions and deletions of items, modifications of the data etc.
- ◎ For ease of navigation, there are “topic” defined for the logs.
- ◎ In addition to the master “Activity Log” page, recent logs have their own panel on the landing page for quick reference.



Recent Activity

Sept. 1, 2026, 10:22 p.m. · inventory

BTOF-READOUT-002 moved from BNL / Bldg.510A to UIC / Test Lab by Maxim Potekhin (batch update).

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Sept. 1, 2026, 10:02 p.m. · inventory

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Ownership of BTOF-READOUT-004 transferred from Grigory Nigmatkulov to Maxim Potekhin by Maxim Potekhin.

Activity Log

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 **Activity Log**

Activity Log

Maintenance, inspection, and lifecycle events

All Topics ▾

All Groups ▾

FROM mm/dd/yyyy  - TO mm/dd/yyyy 

Search

DATE	TOPIC	ENTRY	LOGGED BY	RELATED
Sept. 1, 2026 10:22 p.m.	inventory	BTOF-READOUT-002 moved from BNL / Bldg,510A to UIC / Test Lab by Maxim Potekhin (batch update).	Maxim Potekhin	BTOF-READOUT-002
Sept. 1, 2026 10:22 p.m.	inventory	BTOF-READOUT-004 moved from BNL / Bldg,510A to UIC / Test Lab by Maxim Potekhin (batch update).	Maxim Potekhin	BTOF-READOUT-004
Sept. 1, 2026 10:05 p.m.	inventory	BTOF-READOUT-002 moved from unassigned to BNL / Bldg,510A by Maxim Potekhin.	Maxim Potekhin	BTOF-READOUT-002
Sept. 1, 2026 10:02 p.m.	inventory	BTOF-READOUT-002 moved from BNL / Bldg,510A to unassigned by Maxim Potekhin (batch update).	Maxim Potekhin	BTOF-READOUT-002
Sept. 1, 2026 10:01 p.m.	inventory	BTOF-READOUT-002 moved from CUA / Storage Room to BNL / Bldg,510A by Maxim Potekhin (batch update).	Maxim Potekhin	BTOF-READOUT-002
Sept. 1, 2026 10:01 p.m.	inventory	BTOF-READOUT-004 moved from CUA / Storage Room to BNL / Bldg,510A by Maxim Potekhin (batch update).	Maxim Potekhin	BTOF-READOUT-004
Sept. 1, 2026 9:59 p.m.	inventory	Ownership of BTOF-READOUT-002 transferred from Grigory Nigmatkulov to Maxim Potekhin by Maxim Potekhin (batch update).	Maxim Potekhin	BTOF-READOUT-002
Sept. 1, 2026 9:59 p.m.	inventory	Ownership of BTOF-READOUT-004 transferred from Grigory Nigmatkulov to Maxim Potekhin by Maxim Potekhin (batch update).	Maxim Potekhin	BTOF-READOUT-004
Aug. 31, 2026	design	Element SiPM inventory instance BEMC-DM-004 installed (4 of 4) by Maxim Potekhin	Maxim	home?

Command-line interface

- © For system integration, such as in the QA process done in a lab, it is important to have CLI capabilities.
- © Currently the HDB has a CLI client which runs on the server machine.
- © Network/REST API version in the development pipeline.
- © The client has robust search capabilities across the DB domains.
- © And for future development, there is a prototype of a MCP server that can be used for integration with AI agents, if needed. Not a priority now.

Current status of the Hardware Database

- © The prototype already has rich functionality, supporting the full cycle of procurement, inventory management and assembly tracking.
- © Groups and users management is in place.
- © Provision of custom “properties” (including documents) is in place – crucial for QA.
- © It is now possible to modify and improve the functionality and the UI as we see fit.
- © For more information, please see the detailed README file in the repository:
<https://github.com/BNLNPPS/epic-hdb>

Towards the deployment

- © We need an instance of this system accessible to users, so they can “kick the tires” and provide feedback on features and functions.
- © SCDF recently provided to us a VM which is now being configured for this role, and it contains a RDBMS (Postgres) and a Web server (Apache).
- © Auth/auth mechanisms (federated login etc) need to be put in place. We are currently working on adding CManage which would allow users from designated institutions to have federated access. Work in progress.
- © Help from SCDF is greatly appreciated. Note that this work on their part is completely unfunded, which creates friction even at this stage. This needs resolution.
- © Plan: to have a running and accessible instance within weeks, enlist help from expert users (Crafts, Nigmatkulov, others)



Backup Slides

Object model: the three domains

Component Catalog

What type of component is it?

- ▶ One entry per unique component type or design
- ▶ Covers both custom-fabricated and COTS items (can be complex by design)
- ▶ Stores: name, project, owner, owner group – at a minimum
- ▶ May (and should) include model, description, vendor sources, images, and optional “properties”
- ▶ Think of it like an online store catalog

Component Inventory

Which specific units do we have?

- ▶ Each physical item procured or fabricated
- ▶ Every instance gets a unique ID code
- ▶ Tracks location: building, room etc
- ▶ Refers to its Catalog entry
- ▶ Stores inspection, testing, and maintenance data

System Designs

Where does it go in the (sub) system?

- ▶ Placeholders for components at specific locations
- ▶ References inventory items (unit installed). The Inventory item installed at a location will change as components fail or age
- ▶ Supports hierarchical designs
- ▶ Enables Bill of Materials generation

Design and features we want to keep

- ◎ A simple but functional object model, which allows to properly represent
 - descriptions of items (catalog)
 - an inventory of their physical instances
 - assemblies (called “designs”) – [see the backup slide](#)
- ◎ Ability to create [custom properties for items](#) stored in the database, and attach [documents/files in arbitrary formats](#); optional QR capability.
 - Crucial for QA, with potential connection to later calibrations, and also installation and maintenance
- ◎ Managing users, groups, roles, item location and custody.
- ◎ Integrity of assemblies (all items in same location)
- ◎ Custody transfer, change of location etc

Properties and attached data

- ◎ It is important that entities in the database can be assigned measured or calculated properties, of arbitrary nature.
- ◎ Examples: weight, linear dimensions, electrical characteristics.
- ◎ This can be naturally extended to data artifacts such as datasheets accompanying electronic components, images, documents, QA records etc.
- ◎ This was an important feature in the ANL CDB and it has been implemented in the new app.
- ◎ Property types are defined in the DB by the system admins, after that they can be attached to any item in the database. Properties of a component (e.g. found in the catalog) can be overwritten where appropriate in the inventory instance – cf. nominal resistance vs measured value.

Interfacing/migrating to different databases

- © The new DB can be equipped with import/export facilities in any convenient format.
- © This would still require to build interfaces if data exchange is needed.