

# Status of the EMC Production Database

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# Overview

- <https://ep1.ruhr-uni-bochum.de/endcapProductionDB/index.php>
- Central database for all data relevant for the construction of the forward endcap
- Inclusion of the barrel in progress
- Initial version launched 28<sup>th</sup> April 2014
- Access policy:
  - Read access free for everyone
  - Write access requires authentication
  - Request for account: Write to [tobias@ep1.ruhr-uni-bochum.de](mailto:tobias@ep1.ruhr-uni-bochum.de)

# New Features

- Data about irradiation in Gießen stored as properties of APDs
  - Comprehensive overview of irradiation, annealing, and shipment status of grids
  - Script to add new APDs automatically based upon Hamamatsu datasheets
  - Support for access via HTTPS
  - Tool to process results from VPTT magnet tests @ Bonn
  - Crystal data from Gießen database imported and joined into single table
- ⇒ Few duplicate entries, but colleagues from Gießen are working on it
- Current during APD irradiation

# Crystal List (1)

- Contains all data measured at BTCP, CERN, and JLU Gießen
- List can be filtered by crystal type (forward EC, backward EC, barrel)
- Caveat: Crystals of different type can have same serial number
- Crystals can be flagged as broken to be excluded from matching
- Location of each crystal can be stored with version history

## CRYSTAL LIST – FORWARD ENDCAP

Plant Number	Type	Location	Notes	Operation
<u>1</u>	EC	Bochum	Room: NB2/88-90, Lot: B-1, Palette: 4, Box: 80	<a href="#">Edit</a>
<u>2</u>	EC	unknown		<a href="#">Edit</a>
<u>3</u>	EC	unknown		<a href="#">Edit</a>
<u>4</u>	EC	Bochum	Room: NB2/88-90, Lot: B-1, Palette: 4, Box: 80	<a href="#">Edit</a>
<u>5</u>	EC	unknown		<a href="#">Edit</a>
<u>6</u>	EC	Bochum	Room: NB2/88-90, Lot: B-1, Palette: 4, Box: 80	<a href="#">Edit</a>

## Crystal List (2)

Data from BTCP:	
Length:	199.99 mm
Dimensions front:	AF: 24.33 mm, BF3: 24.32 mm, BF4: 24.31 mm, CF: 24.34 mm
Dimensions back:	AR: 25.96 mm, BR3: 25.95 mm, BR4: 25.94 mm, CR: 25.97 mm
Transmittance:	49.9 % at $\lambda = 360$ nm, 72.2 % at $\lambda = 420$ nm, 76.6 % at $\lambda = 620$ nm
Light yield:	18.9
$\Delta K$ :	$0.43 \text{ m}^{-1}$
Spread for T = 50 %:	0.93 nm
Lot:	B-1
ACCOS machine:	3
Specification passed:	Yes
Data from CERN:	
Length:	199.97 mm
Dimensions front:	AF: 24.336 mm, BF3: 24.352 mm, BF4: 24.35 mm, CF: 24.337 mm
Dimensions back:	AR: 25.965 mm, BR3: 25.994 mm, BR4: 25.992 mm, CR: 25.965 mm
Transmittance:	51.9 % at $\lambda = 360$ nm, 71.7 % at $\lambda = 420$ nm, 75.8 % at $\lambda = 620$ nm

- Updating location of many crystals via web interface costs time
- I can do a direct update of the database with a proper list

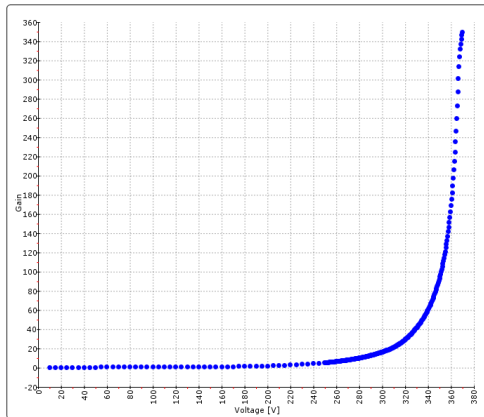
## Data stored for APDs

- Information from Hamamatsu
- Serial number of preamp
- Crystal-detector-preamp unit the APD has been built into
- Data on irradiation and annealing
- Characteristics for different temperatures and with constant and pulsed light sources
- Progression of the current curve during irradiation
- Version history of everything mentioned above:

### VERSION HISTORY

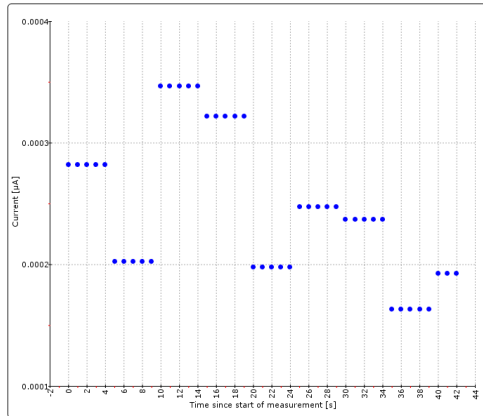
Time	Author	Change comment
<a href="#">15. Nov 2016 11:26:04 CET</a>	markus.moritz	Entered return for assembly date.
<a href="#">08. Sep 2016 13:37:59 CEST</a>	markus.moritz	Entered shipped after irradiation date.
<a href="#">24. Aug 2016 14:28:57 CEST</a>	christopher.l.hahn	Entered irradiation information.
<a href="#">24. Aug 2016 14:26:53 CEST</a>	christopher.l.hahn	Entered annealing information.
<a href="#">11. Aug 2016 11:49:06 CEST</a>	markus.moritz	Entered arrival for irradiation date.
<a href="#">01. Aug 2016 17:52:17 CEST</a>	Tobias	Assigned to grid via information extracted from APD DB.
<a href="#">23. Jun 2016 11:59:09 CEST</a>	Tobias	Imported from Hamamatsu datasheet.

## Example of APD Characteristic



- Characteristic displayed as PNG image in the web browser
- Raw data downloadable as CSV, ROOT, and iPython file
- $M(U)$  and  $U(M)$  can be calculated by interpolation

# Example of Current Curve



- Test file from source position tests @ Gießen
- Raw data downloadable as CSV, ROOT, and iPython file
- Import procedure of data for many APDs to be discussed...



# XML-based API for M2M Communication

- Web interface intended for machine-to-human communication
  - Databases have to be accessed by other applications (e. g. matching crystals or APDs)
  - Parsing (X)HTML pages possible, but unnecessarily hard
- ⇒ Solution: API for machine-to-machine communication
- Based on HTTP(S) and XML

```
<productiondb>
  <request successful="true" error_number="0"/>
  <apd databaseID="14353" serial="2313025218">
    <comment/>
    <wafer_position>E07</wafer_position>
    <breakthrough_voltage>411</breakthrough_voltage>
    <gain100_voltage>382.7</gain100_voltage>
    <darkcurrent>3.8</darkcurrent>
    <gridnumber>694</gridnumber>
    <position_in_grid>0</position_in_grid>
    <arrival_for_irradiation>2016-08-11</arrival_for_irradiation>
    <irradiation_date>2016-08-23</irradiation_date>
```

# List of Available API Calls

- API calls already available:
  - List of temperature sensors in an alveole including their calibration parameters
  - The properties of a specific or all APDs including all the data displayed directly on the page of an APD in the web interface
  - The properties of a specific or all VPTTs including all the data displayed directly on the page of a VPTT in the web interface
  - List of all APDs in a specific grid as used during irradiation
- Detailed documentation available for every API call explaining the parameters of the request and the structure of the XML document in the response: (PANDA GitLab account required)  
<https://panda-repo.gsi.de/emc/ProductionDbApiDocu>
- New API calls can be added on request: Write to [tobias@ep1.ruhr-uni-bochum.de](mailto:tobias@ep1.ruhr-uni-bochum.de)

## Example: Set Voltages for APD Irradiation

- APD are operated at  $U(M = 100)$  during irradiation
- Manually entering up to 80 voltages wastes time and carries risk of typos
- Tool queries composition of grids and Hamamatsu data for each APD from database and sets voltages via EPICS
- Irradiation setup ready after  $\approx 20$  s

The screenshot shows a software window titled "Set APDs to gain 100 voltage". It contains four input fields labeled "Position 1:", "Position 2:", "Position 3:", and "Position 4:". Each field has a dropdown arrow and currently displays the word "empty". Below these fields is a text prompt: "Please enter the numbers of the grids that are connected to the irradiation setup." At the bottom left is a "Start" button. At the bottom right is a progress bar showing 0% completion.

# Status of Barrel Inclusion (1)

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PANDA (F)EMC PRODUCTION DATABASE

A · Z | OVERVIEW | SEARCH | CONTACT

**β**  
RUB

RUB » Physics » The Faculty » Chairs and Working Groups » EP1 » PANDA (F)EMC Production Database

Operator: tobias

**PRODUCTION DB**

**COMMONS**

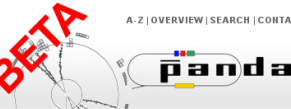
- Main Page
- Crystals
  - Forward Endcap
  - Backward Endcap
  - Barrel
- Subdetectors
  - Lot AP BT Nu U2  
U4 X5
- Temperature Sensors

**FORWARD ENDCAP**

- Alveoles
- Units
- Detectors

VPTT

**BETA**



**SHOW SLICE AT POSITION 1**

This is all the information about the slice at position 1. If it is wrong, edit the data.

Slice specification:	
Position:	1
Notes:	Testnotiz

**ALVEOLES ON THIS SLICE**

Type	a	b	c	d	e
11p	empty	empty	<u>Test1</u>	empty	<u>Test4</u>
10p	empty	empty	empty	empty	empty
9p	empty	empty	empty	empty	empty
8p	empty	empty	empty	empty	empty
7p	empty	empty	empty	empty	empty

- Slice overview from beta version of Production DB
- "Release when ready" policy

## Status of Barrel Inclusion (2)

- Already done:
  - ✓ Database structure for barrel objects
  - ✓ Naming convention for slice and alveole positions
  - ✓ New navigation bar
  - ✓ Show slice composition
  - ✓ Edit slice properties
  - ✓ Creating and listing of alveoles
  - ✓ Edit alveole properties
  - ✓ Versioning of all barrel objects
  - ✓ Inclusion in nightly on-site and off-site backup
- To do:
  - Unit management
  - Additional properties for units (e. g. APFEL S/N)
  - Workflow assistants (e. g. "assemble unit")
  - Make sure usage of common objects (APDs and temperature sensors) is mutually exclusive

# The End

Thank you for your attention!