“Looking for Cosmic Ray data? The ASI CR Database"


See also the poster [CRD126]
Outline

- The Space Science Data Center (SSDC)
- The MultiMission Interactive Archive (MMIA)
- The Cosmic Ray Database (CRDB)
  - the DB content
  - the user interface
  - the DB data access
  - the CRDB output
- Conclusions & perspectives
The Space Science Data Center (SSDC) is a facility of the Italian Space Agency (ASI)

- provides support to several space missions
- acts as a multi-mission science operation, data processing and data archiving center.

The center is located in Rome, Italy, and operates since 2000.
SSDC collects datasets from several space missions:

- astrophysics and cosmology
- Solar System exploration
- cosmic rays

All the data are available through the Multi Mission Interactive Archive (MMIA)

http://www.asdc.asi.it
The Multi Mission Interactive Archive is a user-friendly interface that allows users to access this all-encompassing and diverse databases. It covers the entire electromagnetic spectrum and other channels, such as cosmic rays.
The Cosmic Ray Database (CRDB) provides tools for an easy and efficient access to published data from missions dedicated to charged Cosmic Ray measurements.

https://tools.asdc.asi.it/CosmicRays/
Originally developed to support the retrieval of PAMELA and AMS-02 results, it is now expanding to include more data sets from other experiments and evolving to provide new tools for data retrieval, visualization and download.

Data and their connections are organized and stored in a relational database, exploiting the MySQL server hosted at the Space Science Data Center.

- Input data are provided as *xml* files, containing the measurement information as reported in the original publication tables.

The main query structure is based on typical data presentation in scientific papers:

- the physical observable of interest (such as flux, etc...) as a function of a measured quantity (like rigidity, kinetic energy, etc...)
The User Interface

Consult the user manual or give us feedback.

Select the particle or the “plot”.

Select the experiment.

Special datasets such as trapped particles and solar flares can be searched separately.

COSMIC RAY database

Database for Charged Cosmic Ray measurements.

Version 2.0

It contains new data from more experiments - feedback welcome!

Download user Quick Guide

Contacts
DB access

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Selecting a primary particle or a measured “plot” available options and datasets will be displayed

Search parameters:

- Particle: [ALL]
- Plot: [value1] vs [value2]
- Experiment: PAMELA, AMS-02, Fermi-LAT, AMS-01, CREAM, BESS-Polar I, BESS-Polar II, TS93
- Special datasets: solar flare, trapped
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Selecting a primary particle or a measured “plot” available options and datasets will be displayed.

Search parameters:
- **Ex. Select e⁻**
- **Particle:** e⁻
- **Plot:** Flux

- **Experiment:**
  - PAMELA
  - AMS-02
  - Fermi-LAT
  - AMS-01
  - CREAM
  - BESS-Polar I
  - BESS-Polar II
  - TS93

- **Special datasets:**
  - solar flare
  - trapped

Low energy time dependent data (as e⁻) can be also displayed as a function of time.
DB access

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Selecting a primary particle or a measured “plot” available options and datasets will be displayed.

Search parameters:
Ex. Select e^-: Flux vs Kinetic Energy and the experiments

<table>
<thead>
<tr>
<th>Particle:</th>
<th>e^-</th>
<th>PAMELA</th>
<th>AMS-02</th>
<th>Fermi-LAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plot:</td>
<td>Flux vs Kinetic Energy</td>
<td>AMS-01</td>
<td>CREAM</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BESS-Polar I</td>
<td>BESS-Polar II</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TS93</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Special datasets: 
- solar flare
- trapped
Modify and refine the query
Show all entries
Sort the table output
Select the dataset
Update the refined search
Modify the table content
Click on the data subset to generate the corresponding plot
Link to the original publication
Visualization of selected data set

- e- PAMELA PRL (2011); 2006-07-15,2010-01-27;

Option panel to modify the graph

Choose a format and download the selected datasets
Once 1 or more dataset have been selected, a dedicated panel allows the user to select among different format as output file. All data are downloaded in a single zip file:

- **png** image of the plot displayed in the web interface.
- A ROOT file containing a `TGraphAsymErrors` for each selected subset, a `TMultiGraph` that includes all the graphs and a `TCanvas` as displayed in the web interface.
1 xml file for each data subset, containing a general description of the dataset, data points and corresponding systematical and statistical errors

a text file reporting the transcription of the data points (x, y, x error, y error) as plotted in the png. Errors are total errors (statistical and systematical added in quadrature when both available) or only statistical, depending on what required by the user in the Plot Panel Options.

an additional description file is provided if txt and/or xml files are required, reporting a list all the downloaded datasets.
The CRDB at SSDC is a tool for preserving and accessing research data.

It offers a simple and intuitive interface.

Started for PAMELA and AMS data retrieval, it is now growing including more and more experiments on charged cosmic rays.

Different output format can be downloaded, from the simple png plot to the ROOT or xml file, according to the user needs.
Additional graphic options will be implemented in the near future, to allow interactive graphical tools.

Additional output data formats are planned to be included.

User feedback is crucial to plan improvements and priorities. Please send us any comment to cosmic-rays-db@asdc.asi.it.
Already on the market

- Different online tools are already available to retrieve charged CR.
  - the LSPC Database of Charged Cosmic Rays
    https://lpsc.in2p3.fr/cosmic-rays-db/
- The CRDB @ SSDC has the unique feature to be included in a Multi Mission Archive, allowing a multi messenger data access, and contains PAMELA measurements of low energy particle flux as a function of time not yet published.
Visualization of selected data set

Option panel to modify the graph