Optimizing the Way We Interact with Scientific Data: The Dust Data Digger Application
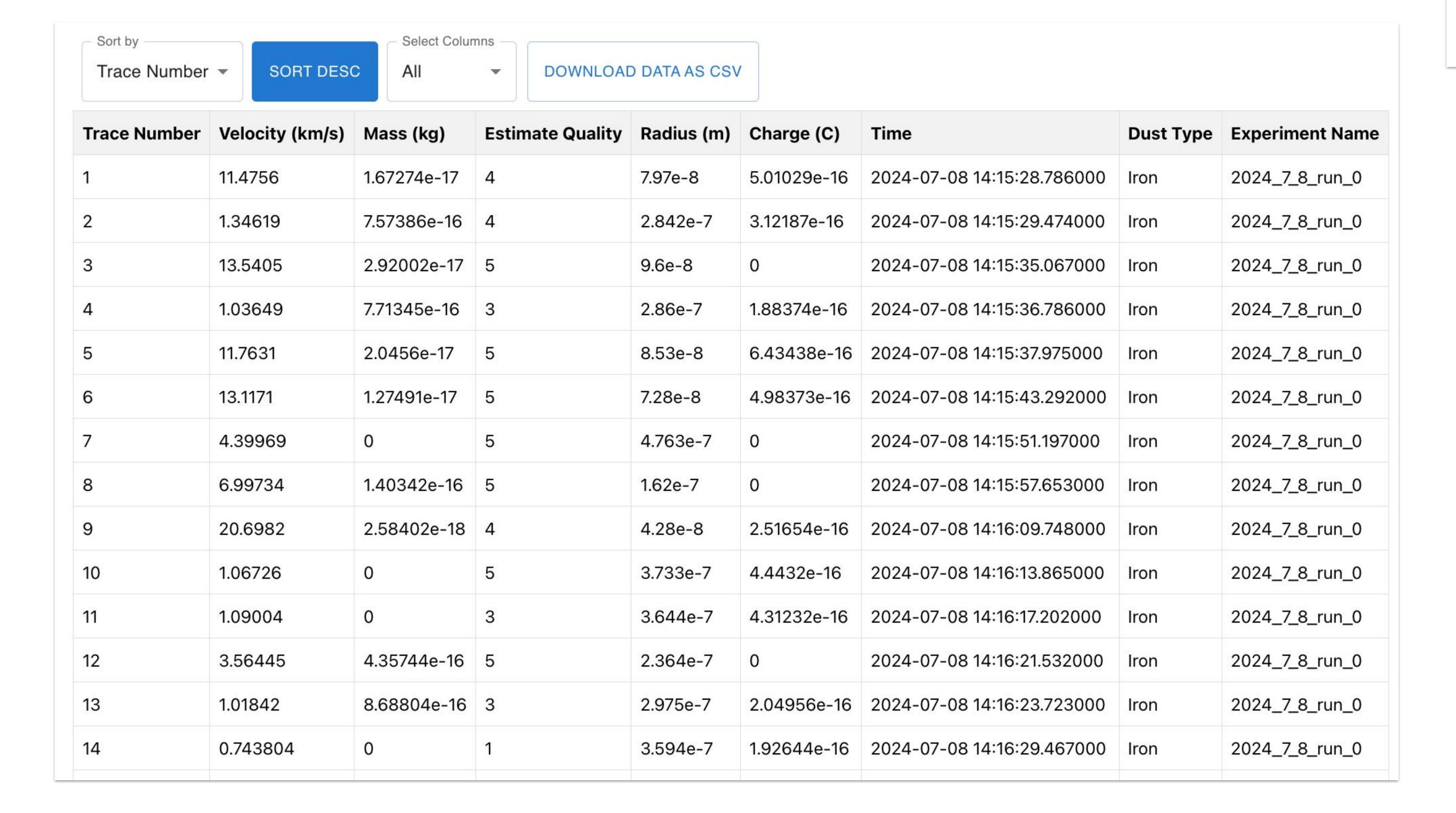
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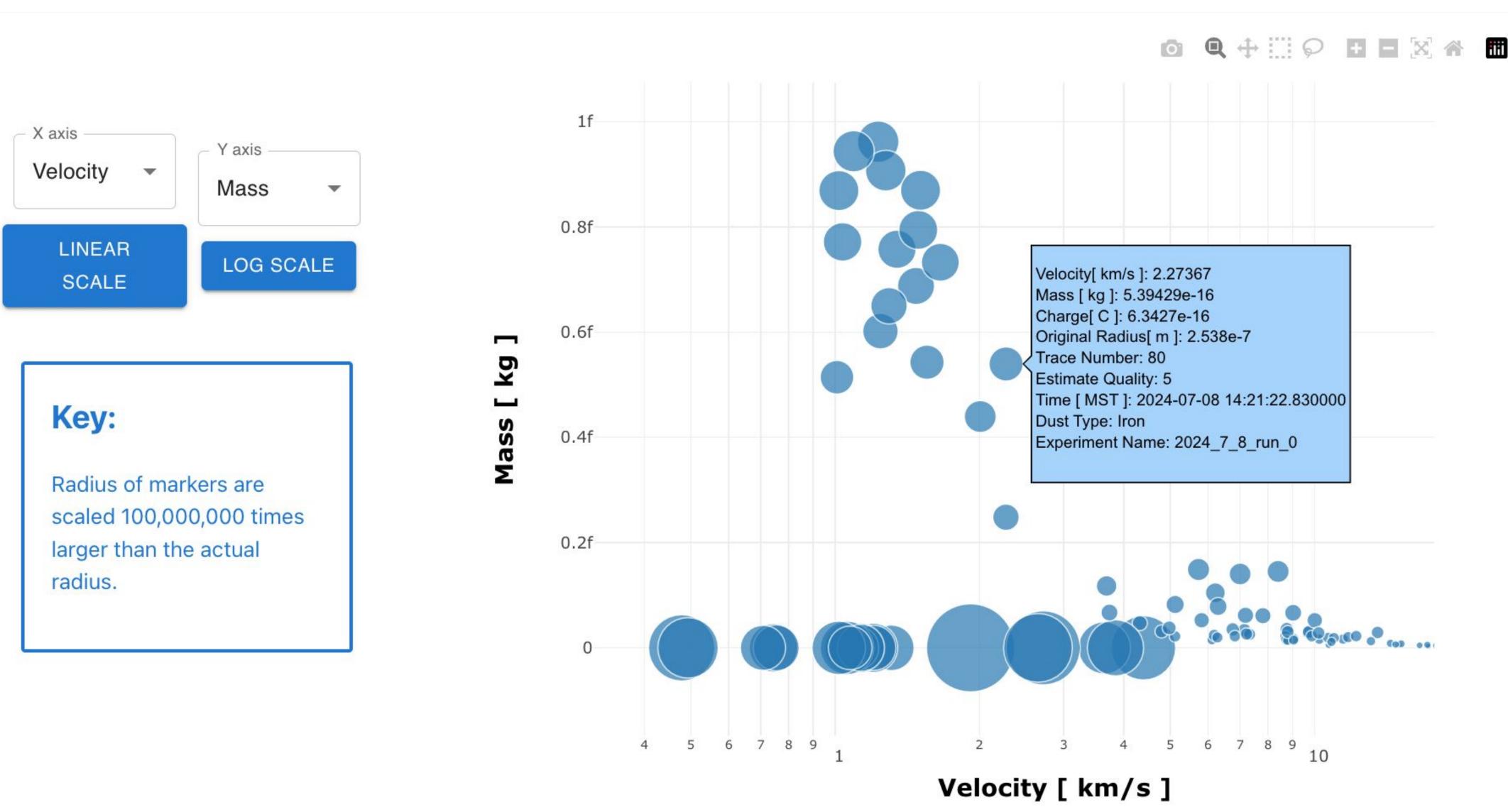
Scientific research requires quick access and visualization of data. Historically, accessing data from the Pelletron Accelerator at the IMPACT Lab required SQL queries and a single-instance LabVIEW software, limiting efficiency and accessibility. The Dust Data Digger is a full-stack web application which was designed to enhance data interaction for scientists at the IMPACT Lab, offering an intuitive web-based interface used for querying and plotting data.

- The application has built in tools for selecting the number of values being queried, the experiment group, experiment name, dust type (composition), velocity range, mass range, charge range, radius range, estimate quality range, and date range.

- After submission, the interactive plot is generated. The plot has tools for selecting the axes and toggling between linear and log scale, as well as for navigating the table by zooming and panning. The plot can also be instantly downloaded as a .png using the camera button.

Trace Number	Velocity (km/s)	Mass (kg)	Estimate Quality	Radius (m)	Charge (C)	Time	Dust Type	Experiment Name
1	11.4756	1.67274e-17	4	7.97e-8	5.01029e-16	2024-07-08 14:15:28.786000	Iron	2024_7_8_run_0
2	1.34619	7.57386e-16	4	2.842e-7	3.12187e-16	2024-07-08 14:15:29.474000	Iron	2024_7_8_run_0
3	13.5405	2.92002e-17	5	9.6e-8	0	2024-07-08 14:15:35.067000	Iron	2024_7_8_run_0
4	1.03649	7.71345e-16	3	2.86e-7	1.88374e-16	2024-07-08 14:15:36.786000	Iron	2024_7_8_run_0
5	11.7631	2.0456e-17	5	8.53e-8	6.43438e-16	2024-07-08 14:15:37.975000	Iron	2024_7_8_run_0
6	13.1171	1.27491e-17	5	7.28e-8	4.98373e-16	2024-07-08 14:15:43.292000	Iron	2024_7_8_run_0
7	4.39969	0	5	4.763e-7	0	2024-07-08 14:15:51.197000	Iron	2024_7_8_run_0
8	6.99734	1.40342e-16	5	1.62e-7	0	2024-07-08 14:15:57.653000	Iron	2024_7_8_run_0
9	20.6982	2.58402e-18	4	4.28e-8	2.51654e-16	2024-07-08 14:16:09.748000	Iron	2024_7_8_run_0
10	1.06726	0	5	3.733e-7	4.4432e-16	2024-07-08 14:16:13.865000	Iron	2024_7_8_run_0
11	1.09004	0	3	3.644e-7	4.31232e-16	2024-07-08 14:16:17.202000	Iron	2024_7_8_run_0
12	3.56445	4.35744e-16	5	2.364e-7	0	2024-07-08 14:16:21.532000	Iron	2024_7_8_run_0
13	1.01842	8.68804e-16	3	2.975e-7	2.04956e-16	2024-07-08 14:16:23.723000	Iron	2024_7_8_run_0
14	0.743804	0	1	3.594e-7	1.92644e-16	2024-07-08 14:16:29.467000	Iron	2024_7_8_run_0

- A data table is produced in the application. This table has buttons for limiting the columns shown and for sorting the table by column as well as in descending or ascending order. Additionally there is a button for downloading the table as a .csv file.

References:

Sternovsky, Z., Amyx, K., Bano, G., Landgraf, M., Horanyi, M., Knappmiller, S., Robertson, S., Grün, E., Srama, R., & Auer, S. (2007). Large area mass analyzer instrument for the chemical analysis of interstellar dust particles. *Review of Scientific Instruments, 78*(1), 014501. https://doi.org/10.1063/1.2431089

Thomas, E., Simolka, J., DeLuca, M., Horányi, M., Janches, D., Marshall, R. A., Munsat, T., Plane, J. M. C., & Sternovsky, Z. (2017). Experimental setup for the laboratory investigation of micrometeoroid ablation using a dust accelerator. *Review of Scientific Instruments, 88*(3), 034501. https://doi.org/10.1063/1.4977832