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Status Report of the LHC UFO Buster

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MPP

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Acknowledgements: B. Holzer, S. Jackson, E. Nebot, A. Nordt, J. Wenninger, C. Zamantzas

- **Online UFO Buster:**
 - Searches for UFO pattern in Concentrator BLM data. ✓
 - triggers freeze of UFO Buffer.
- **BLM UFO Buffer** ($43000 \cdot 80\mu\text{s} \approx 3.5\text{s}$) ✓
- **Data Selector and Extractor**
 - Analyzes data in UFO Buffer to determine the UFO timestamp.
 - Stores the data (e.g. 2000 values) in the PM database.



LHC UFO Buster

The screenshot displays the UFO Buster software interface, which is used for monitoring and managing Unwanted Fast Oscillations (UFOs) in the LHC. The interface is divided into several sections:

- Acquisition:** Contains control buttons for starting and stopping the acquisition, and a dropdown menu for 'Concentrator Acquisition'.
- Settings:** A section for configuring acquisition parameters.
- Algorithm:** Features a dropdown menu for the detection algorithm (currently set to 'Neobot Algorithm') and settings for UFO thresholds for TCP/TCSG BLMs (6.0E-4) and for all remaining BLMs (2.0E-4). It also includes a 'Use running sum' option set to 4.
- Found UFOs:** A list of detected UFOs with columns for 'Time (local)' and 'Observed Element'. The list shows several events from 2011-03-24, with the most recent one at 10:28:05.0.
- Plot:** A detailed plot titled 'Total Losses: 0.1207 [Gray / s]' showing 'Losses [Gray / s]' on a logarithmic scale (from 1E-7 to 1E2) across various sectors (Sector 1-2 to Sector 8-1). The plot includes a green histogram representing 'Monitors' and a red line representing 'Optics Elements'. The plot is dated '24.03.2011 09:53:55'.

At the bottom of the interface, there are buttons for 'Remove' and 'Remove all', and a status message: '10:28:46 - All acquisitions terminated.'

LHC Console Manager -> Fixed Displays -> BLM -> UFO Buster

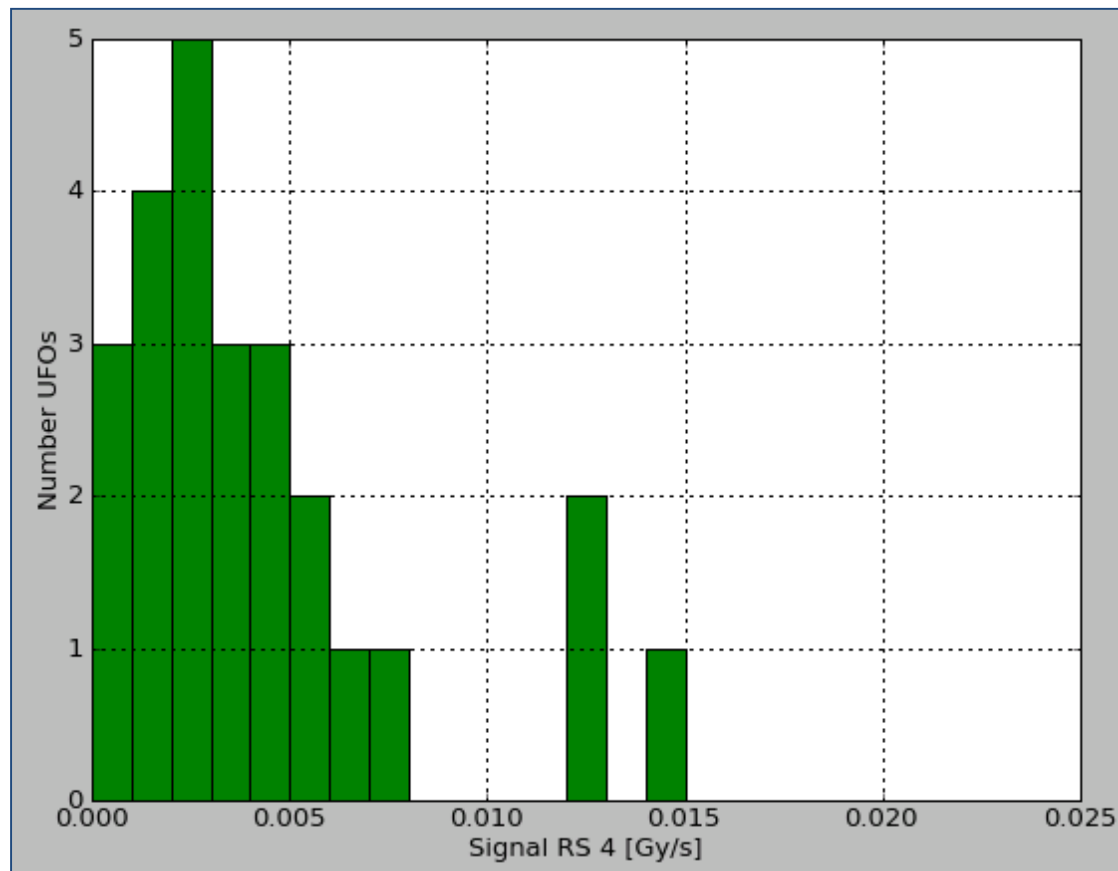
26 UFOs found in Fill 1642, 1645 and 1647 (total runtime about 17h)



UFOs 2011

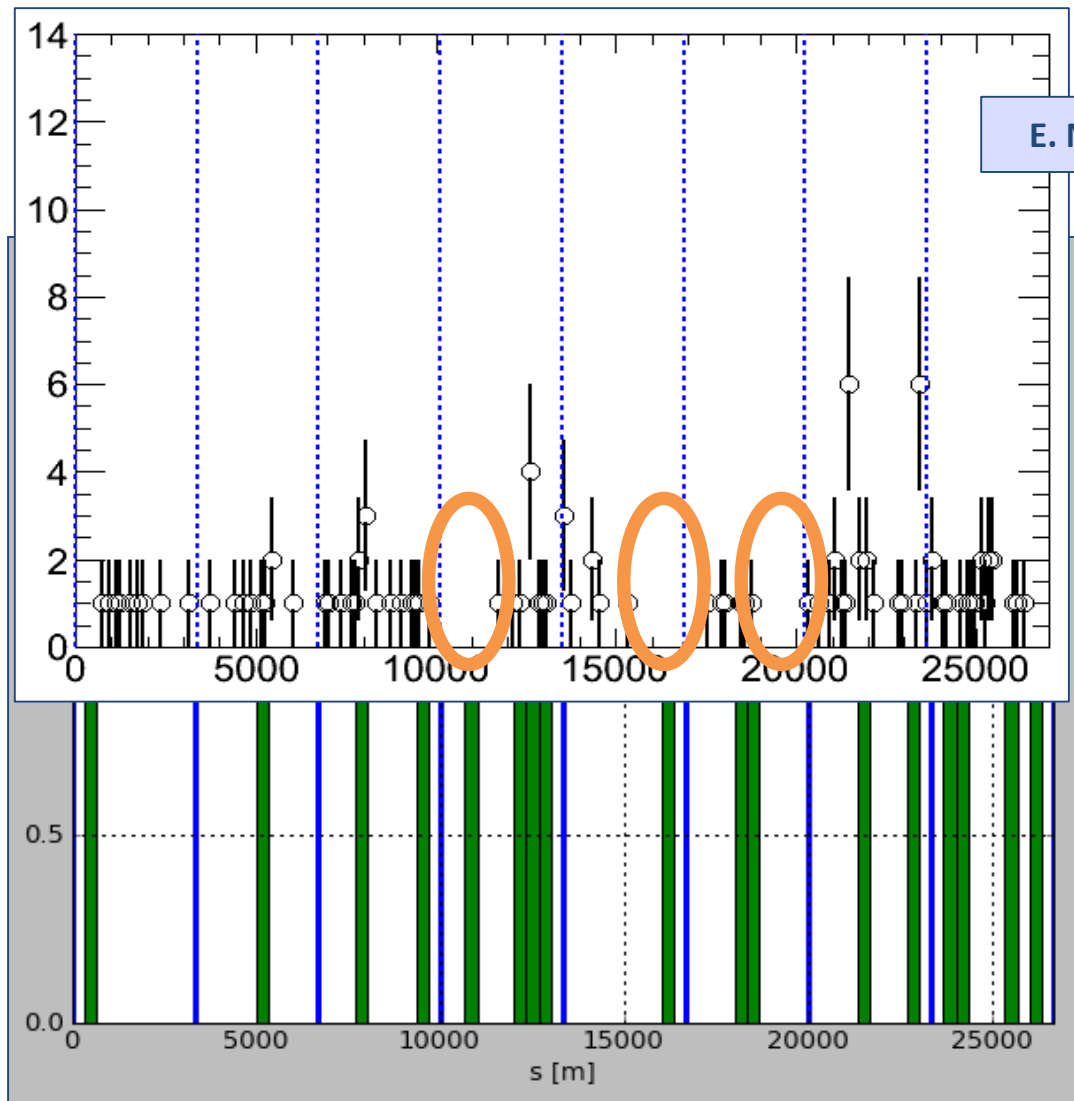
Timestamp	UFO BLM	Dcum [m]	Sig RS4 [Gy/s]	Sig RS5 [Gy/s]	Thresh RS5 [Gy/s]
21.03.2011 20:34:07	BLMQI.33R1.B1E10_MQ	1611.59	7.74E-03		
21.03.2011 21:24:53	BLMQI.28R8.B2E10_MQ	24673.84	5.41E-03		
23.03.2011 00:33:26	BLMQI.20L1.B2E10_MQ	25742.84	3.83E-03		
23.03.2011 00:35:38	BLMQI.26R8.B2E10_MQ	24566.94	4.61E-03		
23.03.2011 01:26:02	BLMQI.25R3.B2E10_MQ	7852.12	2.50E-03		
23.03.2011 01:34:33	BLMQI.19R3.B1I10_MQ	7528.01	1.91E-03		
23.03.2011 02:06:26	BLMQI.23L5.B1I10_MQ	12249.64	1.45E-02		
23.03.2011 02:35:09	BLMQI.32L5.B1I10_MQ	11768.59	1.24E-02		
23.03.2011 04:24:54	BLMQI.23R8.B2E10_MQ	24406.59	4.89E-03		
24.03.2011 00:04:36	BLMQI.31R7.B1E10_MQ	21498.85	3.12E-03	7.93E-04	1.34E-01
24.03.2011 00:48:10	BLMQI.29R6.B2I10_MQ	18062.57	1.27E-03	3.65E-04	1.34E-01
24.03.2011 01:52:01	BLMQI.13L8.B1E10_MQ	22781.65	6.10E-03	1.64E-03	1.34E-01
24.03.2011 05:16:16	BLMQI.16L5.B1I10_MQ	12623.79	1.93E-03	7.68E-04	1.34E-01
24.03.2011 05:43:15	BLMQI.23L5.B1I10_MQ	12249.64	4.56E-03	1.34E-03	1.34E-01
24.03.2011 06:04:55	BLMQI.13R8.B2E10_MQ	23872.09	3.77E-03	1.15E-03	1.34E-01
24.03.2011 06:40:27	BLMQI.20R4.B1I10_MQ	10913.39	2.51E-03	7.18E-04	1.34E-01
24.03.2011 08:11:28	BLMQI.11L6.B2I10_MQ	16228.49	2.12E-03	8.17E-04	1.34E-01
24.03.2011 08:56:11	BLMQI.21R8.B2E30_MQ	24293.19	6.11E-04	2.21E-04	9.14E-02
24.03.2011 09:07:38	BLMQI.25L1.B1I10_MQ	25472.18	1.12E-03	3.28E-04	1.34E-01
24.03.2011 09:12:58	BLMQI.12L1.B1I10_MQ	26167.03	2.57E-03	9.93E-04	1.34E-01
24.03.2011 09:27:36	BLMQI.13L4.B1I30_MQ	9458.12	4.02E-04	1.19E-04	9.14E-02
24.03.2011 09:30:54	BLMQI.10R1.B2I10_MQML	386.29	5.33E-03	1.91E-03	1.17E-01
24.03.2011 09:53:55	BLMQI.27R3.B2E10_MQ	7959.02	3.59E-02	1.50E-02	1.34E-01
24.03.2011 09:54:48	BLMQI.31L7.B2I10_MQ	18490.17	1.21E-02	4.75E-03	1.34E-01
24.03.2011 10:04:07	BLMEI.11L5.B2E23_MBA	12913.2	4.64E-04	1.65E-04	3.07E-01
24.03.2011 10:28:05	BLMQI.31L3.B1I10_MQ	5157.32	2.69E-03	8.99E-04	1.34E-01

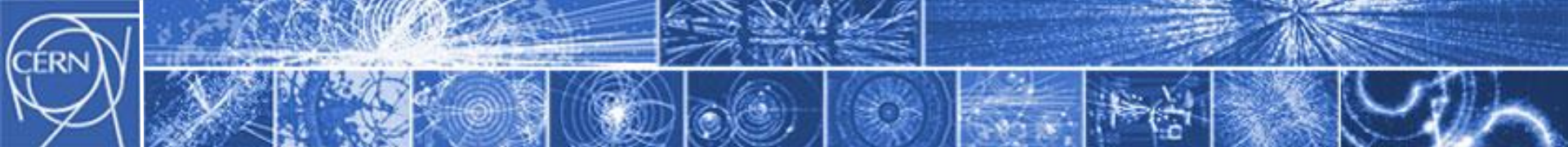
BLM signal



Arc threshold RS04 (640 μ s): 0.37 – 0.54 Gy/s

UFO positions





Thank you for your Attention

Tobias Baer

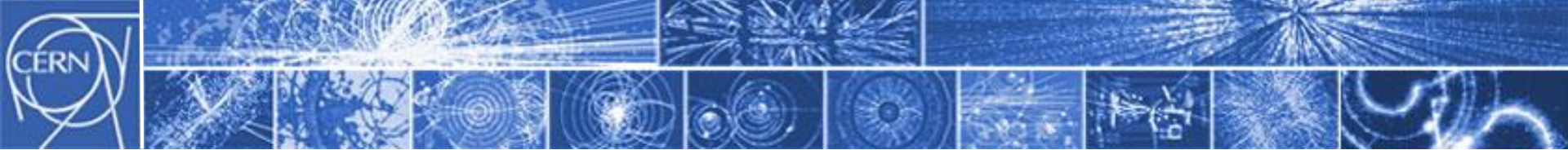
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Further information:

- E.B. Holzer, "Losses away from collimators: statistics and extrapolation", LHC Beam Operation Workshop, Evian, Dec. 2010.



Backup slides



Motivation

- E. Nebot found in 2010 **113 UFOs** below threshold in logging database.
- But: The information in the LDB is extremely concentrated – especially almost no time resolution.

Algorithm

1. Losses (RS 4) of one BLM at TCP/TCSG are above THRESHOLD_1.
2. Losses (RS 4) of at least two BLMs within 40m are above THRESHOLD_2.
 - A BLM is not taken into account if
 - It is at a TCT
 - It is in IP3, IP6 or IP7
 - $RS\ 2 / RS\ 1 < 0.6$
 - $RS\ 3 / RS\ 2 < 0.4$
3. The BLMs fulfilling condition 1 and 2 must be assigned to the same beam.