Summary on Run3 analysis

(May - August 2023)

Coimbra Group

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CYGNO Collaboration Meeting 2023
LNF, Frascati, Italy, 04 - 06 December 2023

# Analysis of background, pedestal and ^{55}Fe (in step 3 position) runs

| Start	Stop	Numbers			Description	Data runs	Data pics
2023-05-16 17:34:57	2023-05-16 18:11:26	19675	-	19691	Daily Calibration	-	-
Issue with the **booster**: sudden increase of humidity and too many hotspot to continue the data taking							
2023-05-20 11:16:18	2023-05-21 0:18:49	19704	-	19891	Stability	149	60005
2023-05-21 16:30:45	2023-05-22 16:17:07	19902	-	19908	Daily Calibration	-	-
2023-05-22 16:20:26	2023-05-23 12:31:49	19909	-	20067	Bkg	133	53455
2023-05-23 12:36:17	2023-05-23 13:26:35	20068	-	20074	Daily Calibration	-	-
2023-05-23 13:29:43	2023-05-24 14:59:51	20075	-	20277	Bkg	177	71138
2023-05-24 15:05:03	2023-05-24 15:46:29	20278	-	20284	Daily Calibration	-	-
2023-05-24 15:49:09	2023-05-25 9:06:39	20285	-	20415	Bkg	115	46184
Issue with the **pump**: it didn't restarted after technical intervention to fix the booster leakage							
2023-07-06 15:16:24	2023-07-07 18:52:12	20426	-	20816	Pedestal Study [GEMs OFF]	340	136940
2023-07-07 18:54:41	2023-07-12 10:10:41	20817	-	21041	Stability	112	45072
2023-07-12 14:47:29	2023-07-12 15:32:40	21049	-	21055	Daily Calibration	-	-
2023-07-12 15:37:53	2023-07-17 11:10:11	21056	-	22074	Bkg	862	346008
2023-07-17 11:14:10	2023-07-17 12:09:49	22075	-	22083	Daily Calibration	-	-
2023-07-17 12:29:04	2023-07-18 11:13:28	22084	-	22291	Bkg	184	74014
2023-07-18 11:16:48	2023-07-18 11:55:00	22292	-	22298	Daily Calibration	-	-
2023-07-18 12:00:51	2023-07-19 11:46:29	22299	-	22505	Bkg	182	73048
2023-07-19 11:48:55	2023-07-19 12:46:22	22506	-	22514	Daily Calibration	-	-
2023-07-19 12:51:52	2023-07-20 13:44:11	22515	-	22568	Stability	26	10493
Issue with the **pump**: it abruptly stopped working							
2023-07-25 12:15:46	2023-07-28 10:33:13	22570	-	22717	Stability	73	29432
2023-07-28 11:13:45	2023-07-28 11:51:10	22718	-	22724	Daily Calibration	-	-
2023-07-28 11:55:49	2023-07-31 12:11:05	22725	-	23350	Bkg	567	227938
2023-07-31 12:13:08	2023-07-31 12:50:11	23351	-	23357	Daily Calibration	-	-
2023-07-31 12:52:29	2023-08-01 14:42:19	23358	-	23579	Bkg	200	80382
2023-08-01 14:44:07	2023-08-01 15:27:10	23580	-	23586	Daily Calibration	-	-
2023-08-01 15:33:15	2023-08-02 11:54:39	23587	-	23760	Bkg	157	63111
2023-08-02 11:56:49	2023-08-02 12:41:09	23761	-	23767	Daily Calibration	-	-
2023-08-02 12:43:32	2023-08-02 14:50:34	23768	-	23800	Stability	29	11690

- Runs 19909 – 20415

- Runs 21049 – 22514
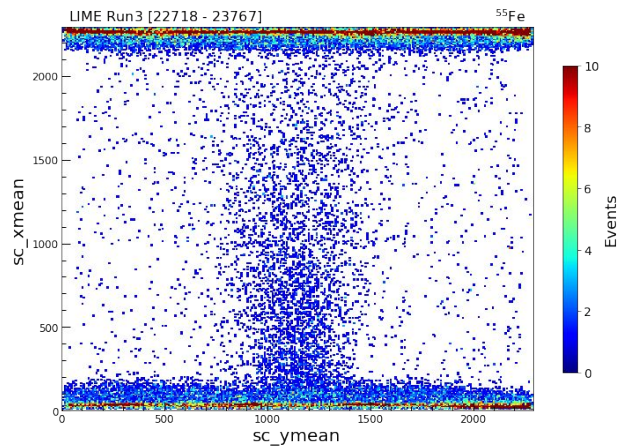
- Runs 22718 – 23767

Clusters occupancy: ^{55}Fe
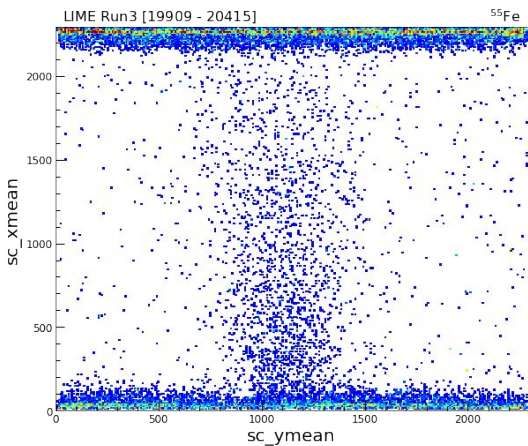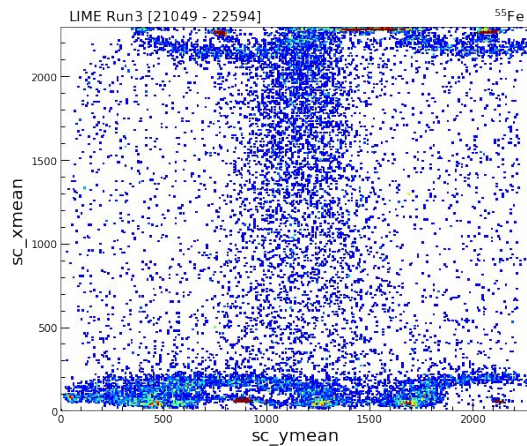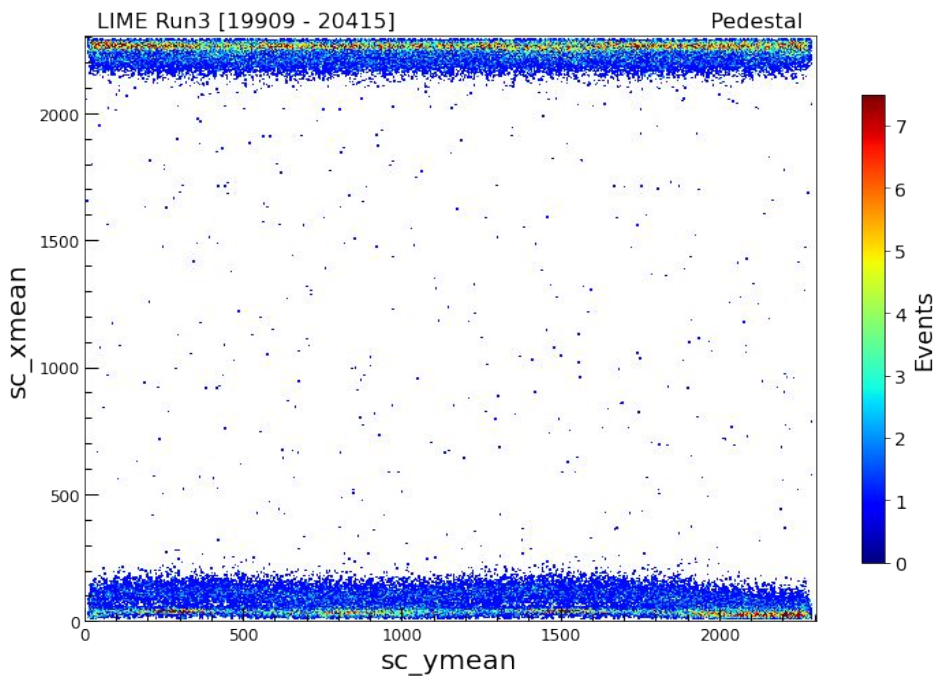

Runs 19909 - 20415   Runs 21049 - 22594   Runs 22718 - 23767

^{55}Fe source seems flipped in the **run range 21049 - 22594, taken between 7th July and 20th July**
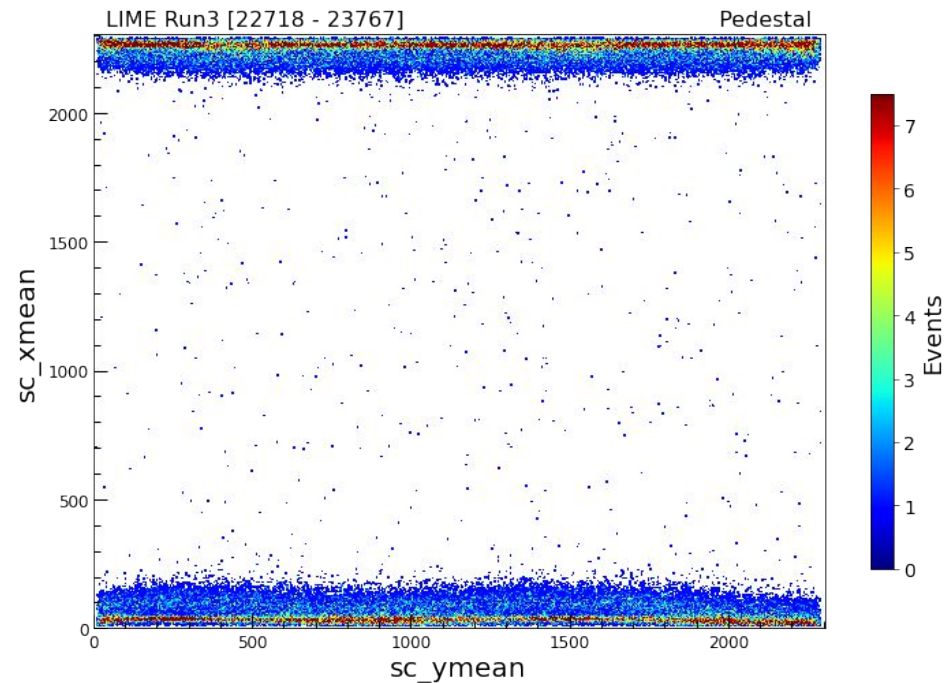
Rita A. investigated and realized that, in the reconstruction, there was an extra image rotation added in that period of time

Original data is safe, but a rerun is needed.
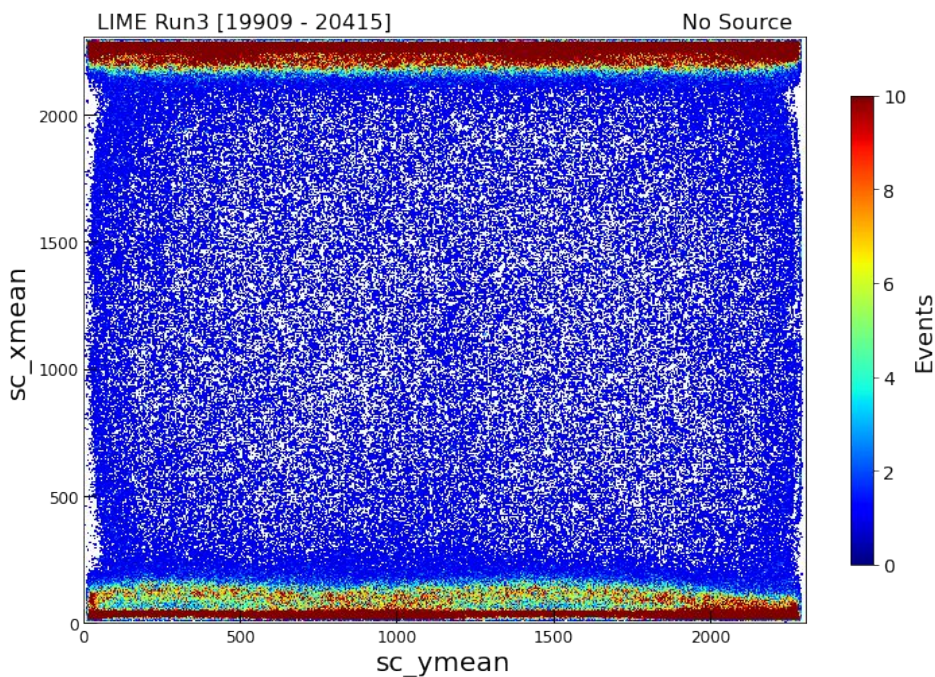
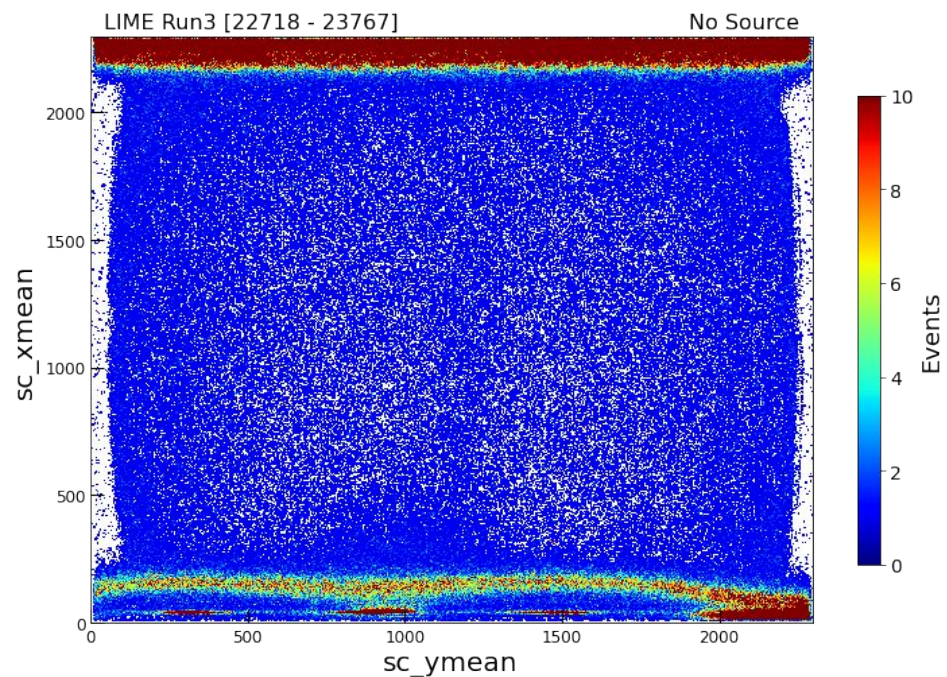# Clusters occupancy: Pedestal

Runs 19909 - 20415

Runs 22718 - 23767

High concentration of clusters at the top and bottom bands.

Clusters occupancy: Background

Runs 19909 - 20415

Runs 22718 - 23767

**High concentration of clusters at the top and bottom bands.**

Lower concentration at the lateral bands in the run range 22718 - 23767.

Data selection

Noise:

- sc_rms > 6
- sc_tgausssigma*0.152 > 0.5

Geometrical cut:

- sc_xmin > 250 & sc_xmax < 2050
- sc_ymin > 300 & sc_ymax < 2000

Length spectrum

Runs 19909 - 20415

Runs 22718 - 23767

Before cuts
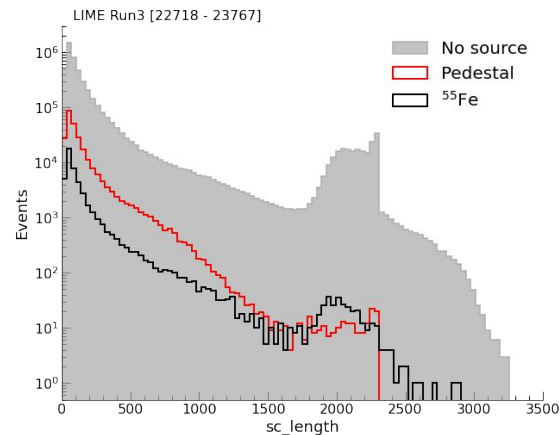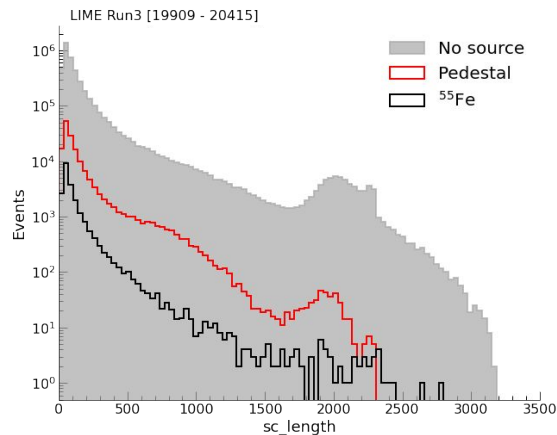
After cuts
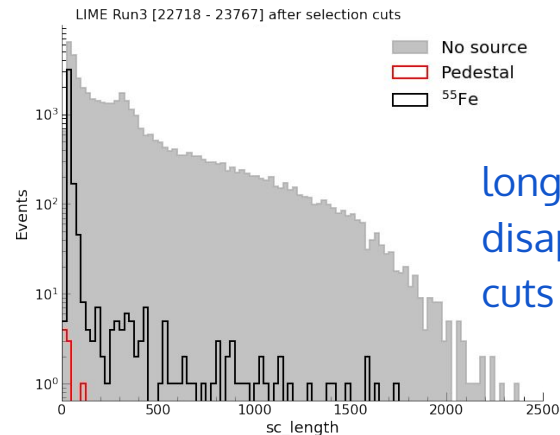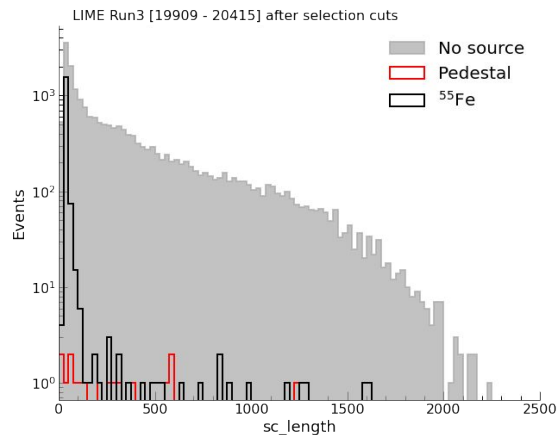
long "fake tracks" disappear after the cuts are applied

Energy spectrum: runs 19909 - 20415 (May)

Before cuts

After cuts

⁵⁵Fe peak fit

height = 100.2+/-1.8
centroid = 9642+/-25
sigma = 1226+/-25
fwhm = (2.89+/-0.06)e+03
eres = 29.9+/-0.6%
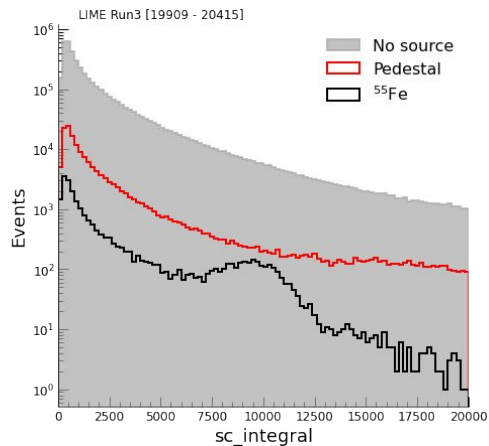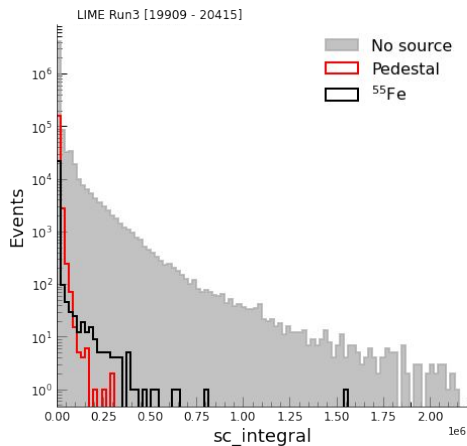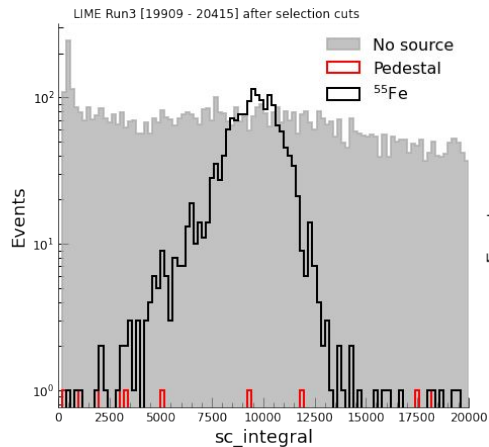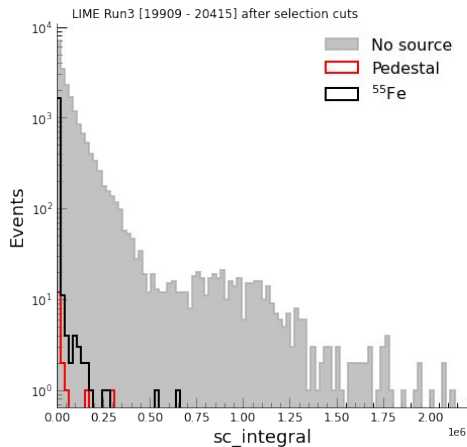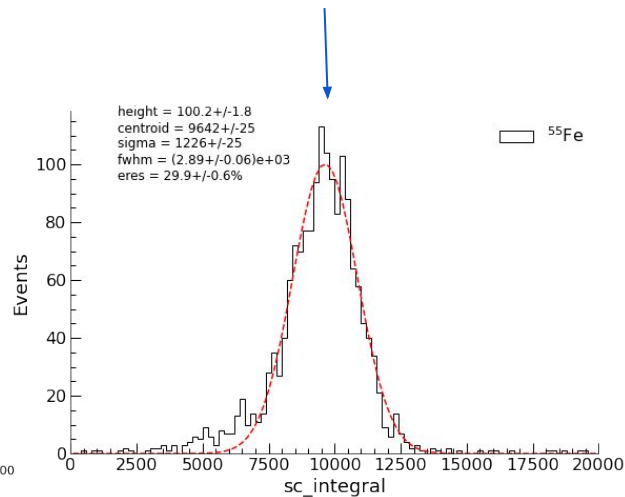
Energy spectrum: runs 22718 - 23767 (late July - beginning of August)

Before cuts
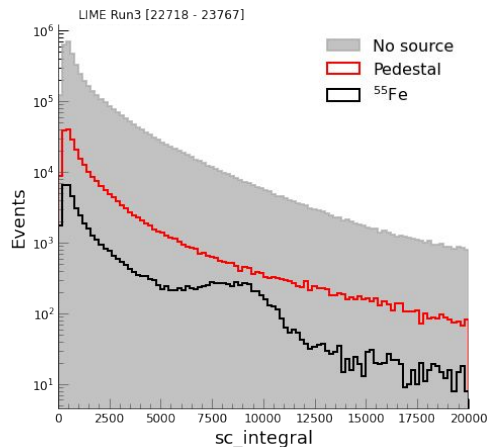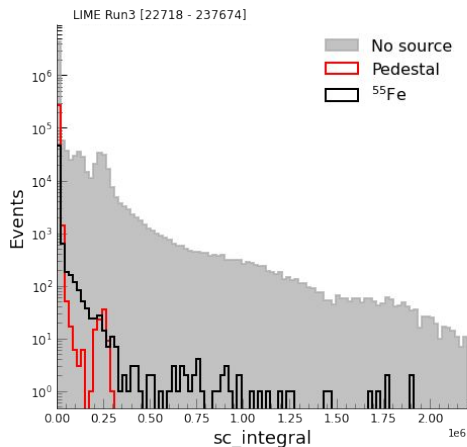
After cuts

In comparison with the data taken in May, there was a **decrease in the ^{55}Fe peak centroid**, followed by an **energy resolution degradation**

height = 175.7+/-2.1
centroid = 8581+/-20
sigma = 1462+/-20
fwhm = (3.44+/-0.05)e+03
eres = 40.1+/-0.6%
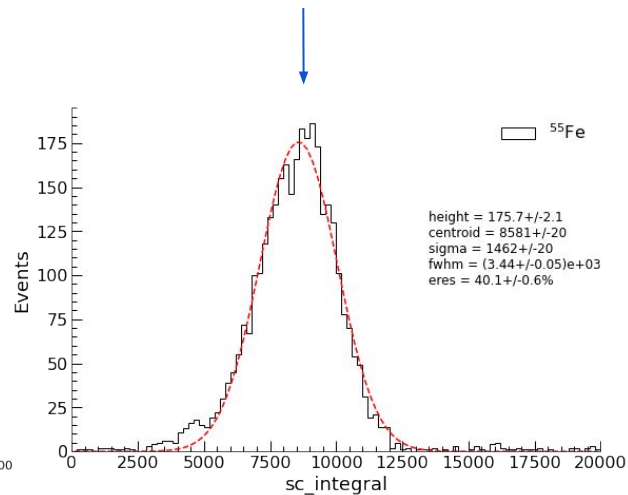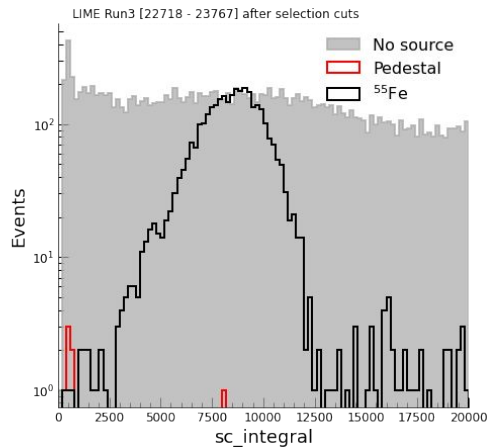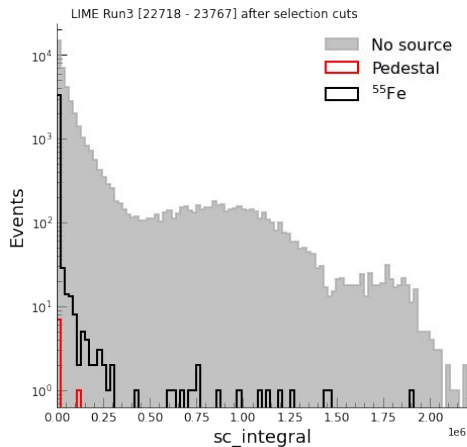
Background

sc_integral / sc_length, to try to identify the presence of different populations
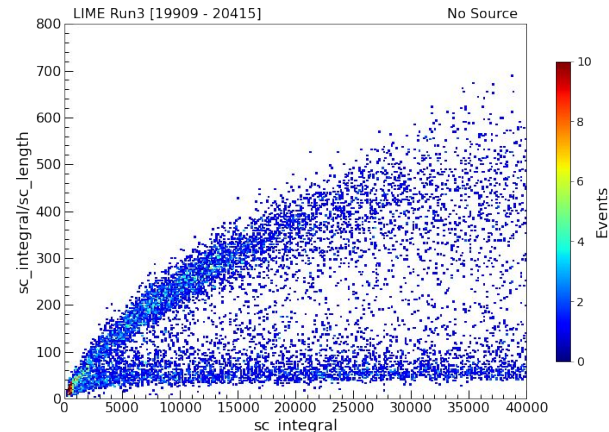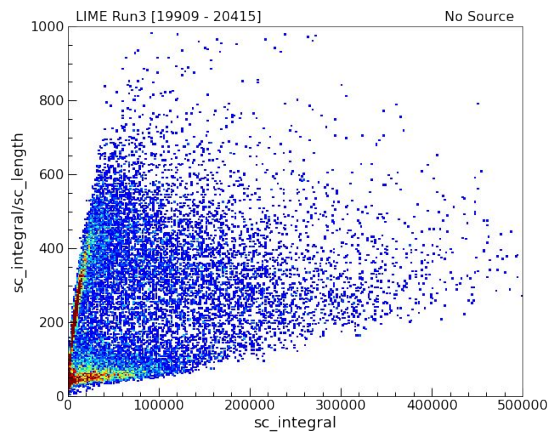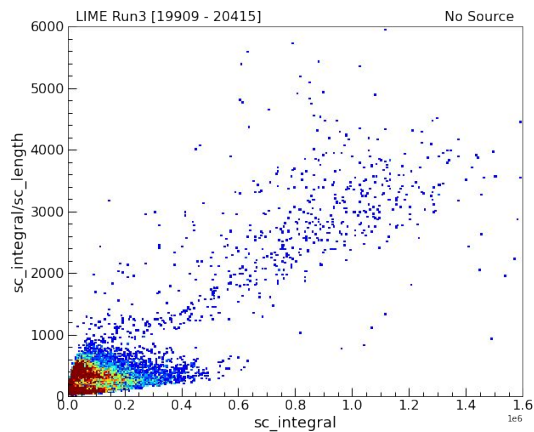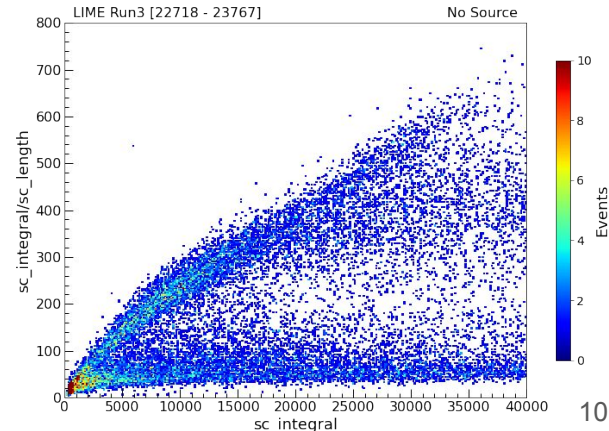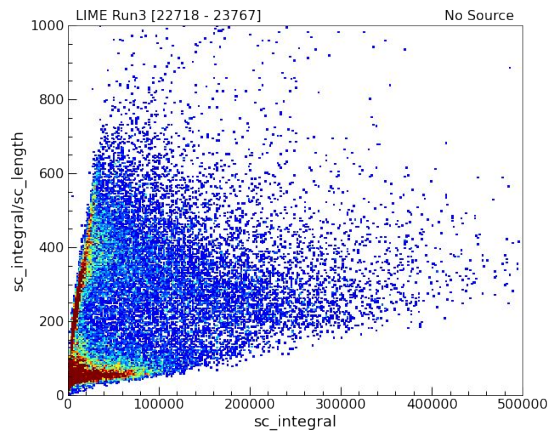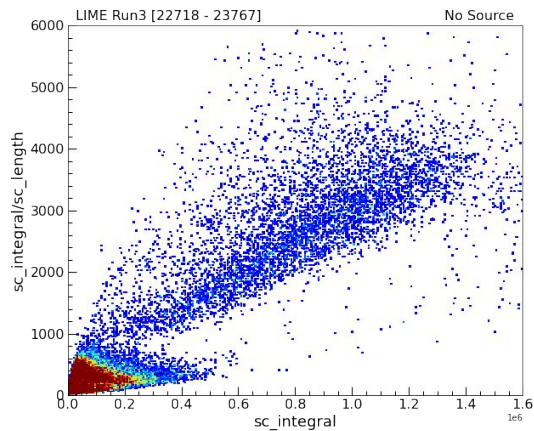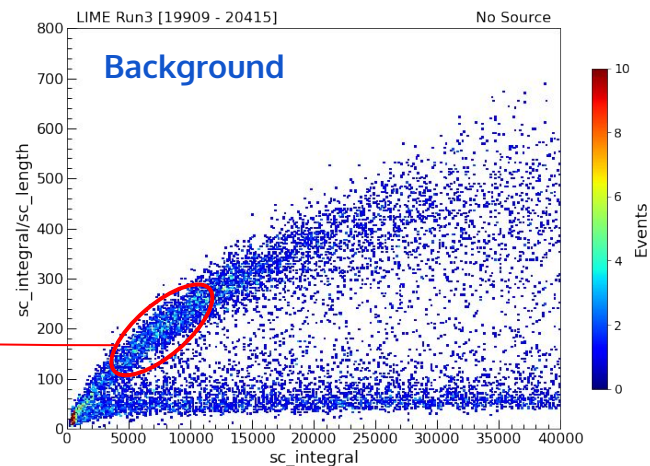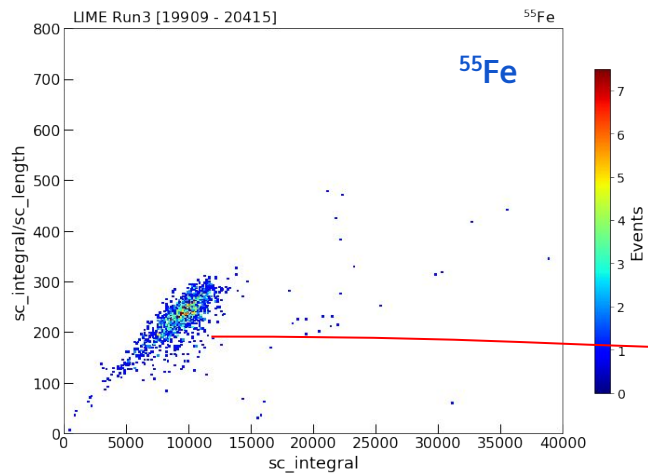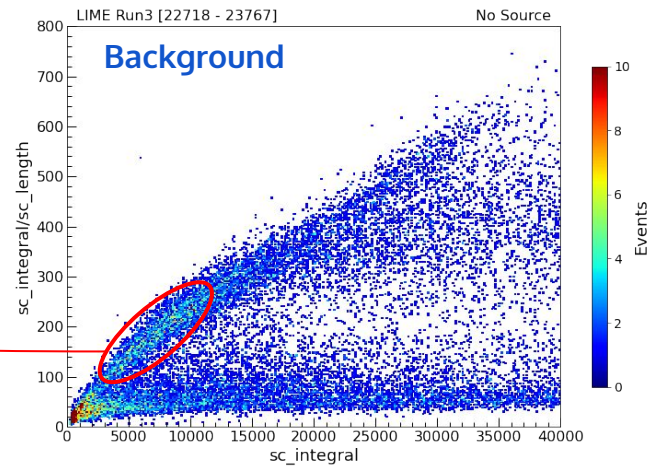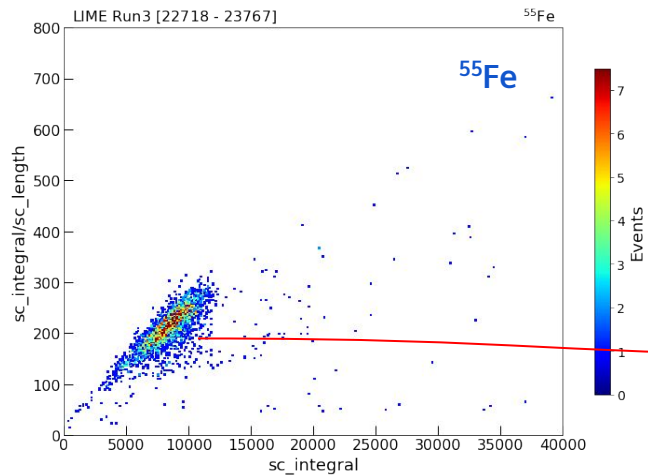
^{55}Fe

Background - light density

Runs 19909 - 20415
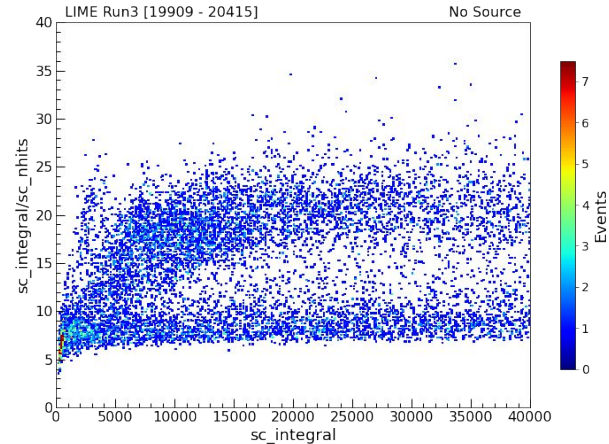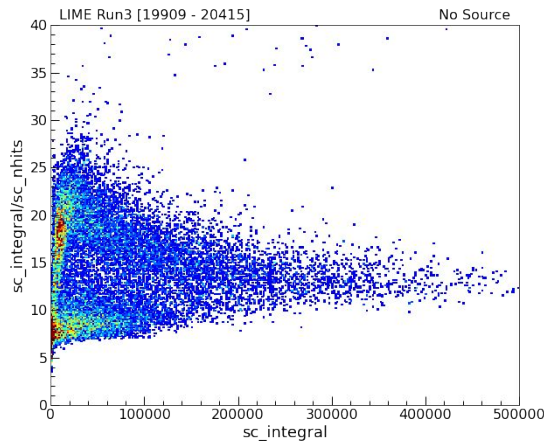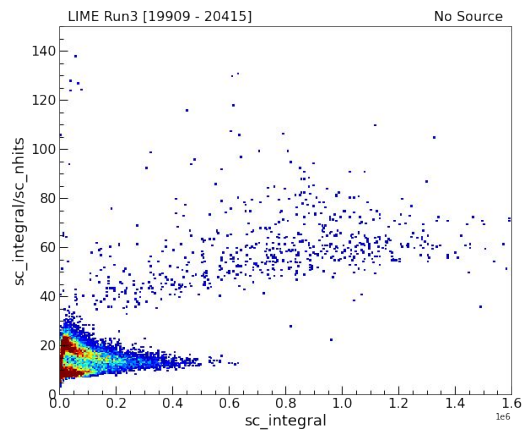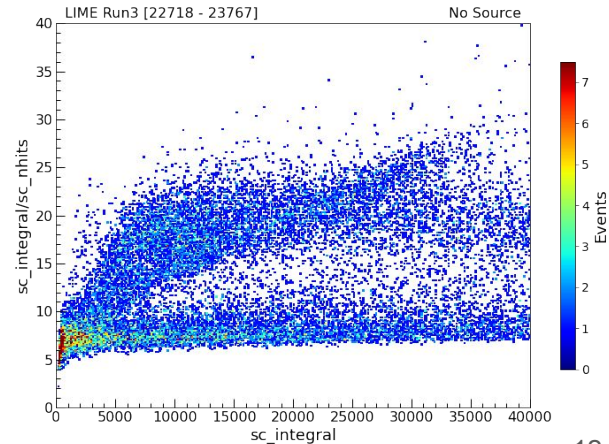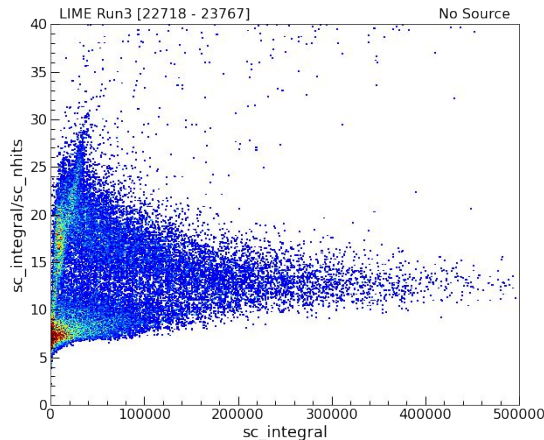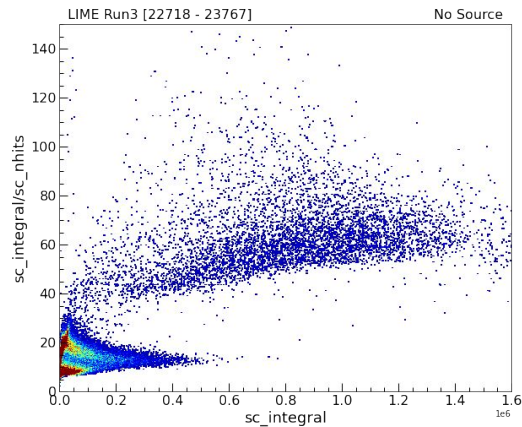
Runs 22718 - 23767

^{55}Fe - light density

Runs 19909 - 20415

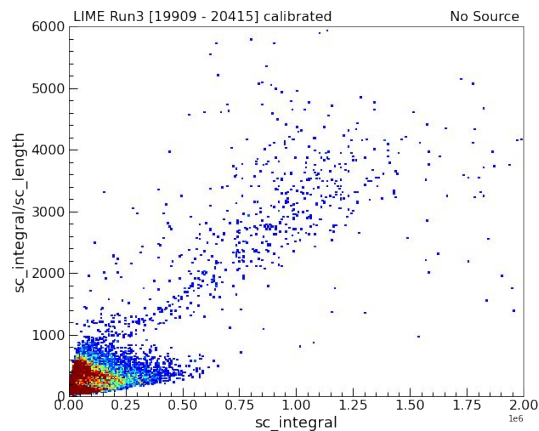Runs 22718 - 23767

13
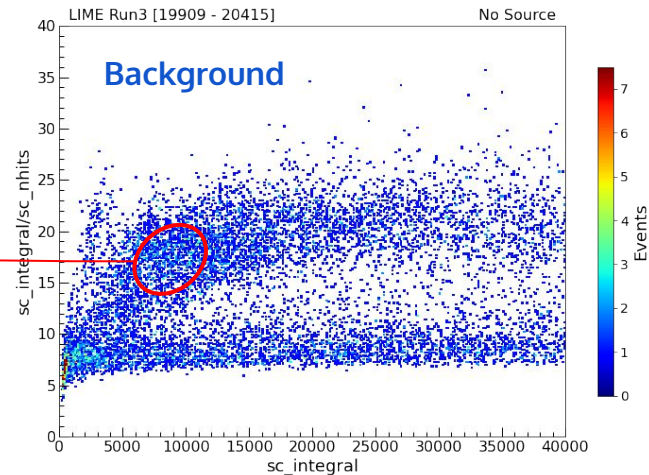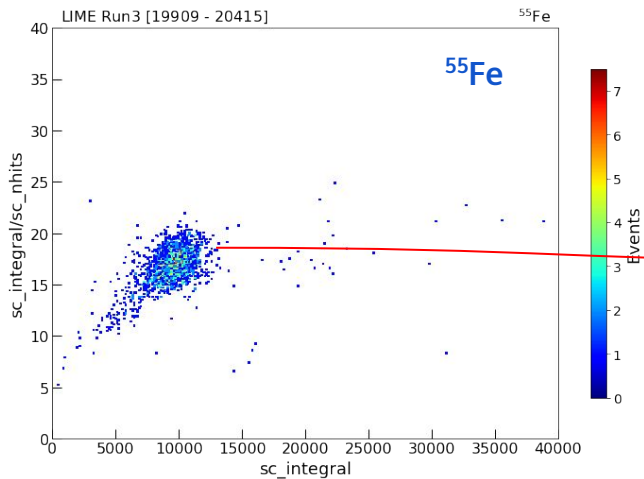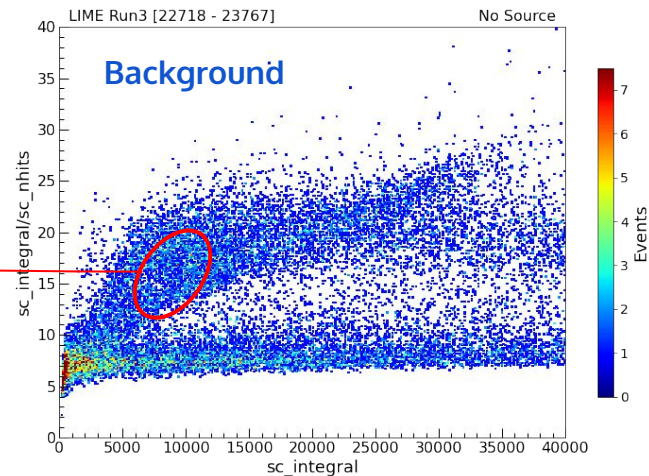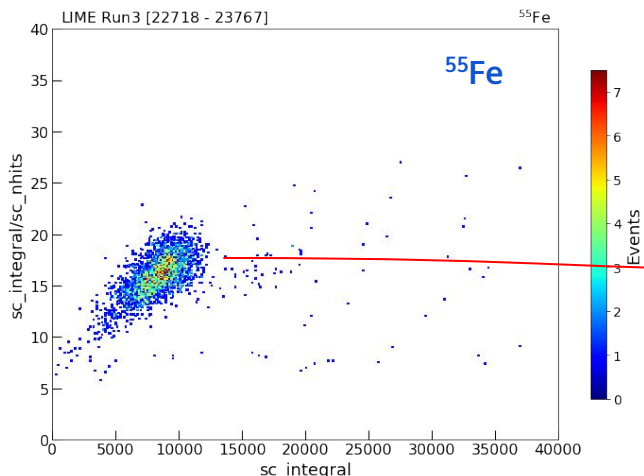
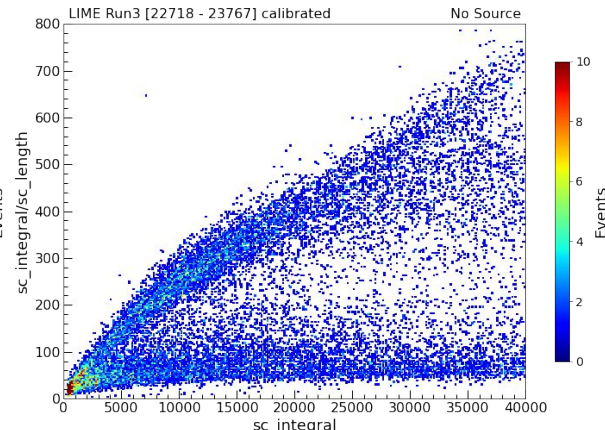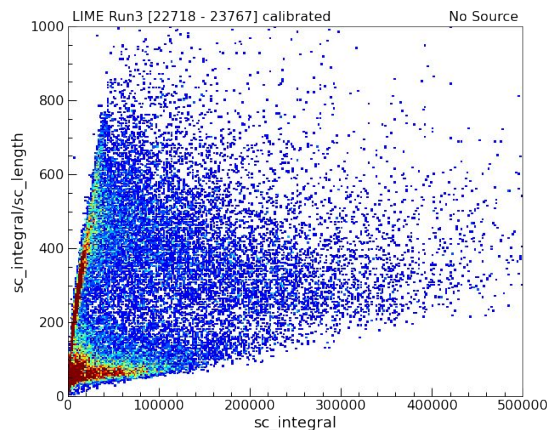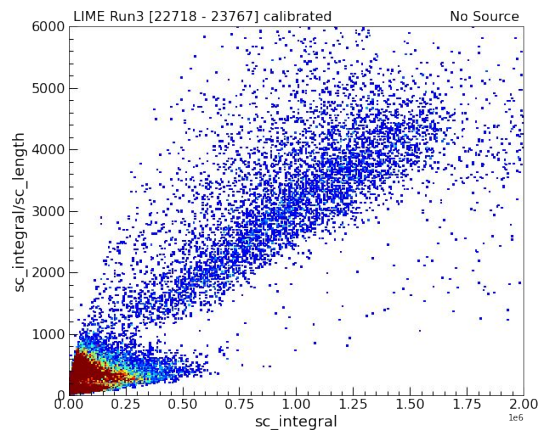# Background: sc_integral/sc_length - using Rita/Davide calibration

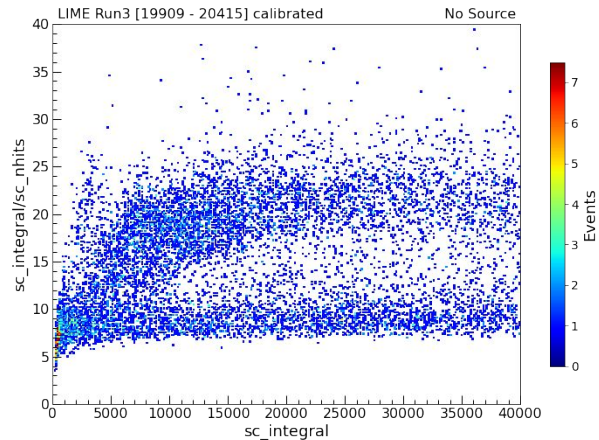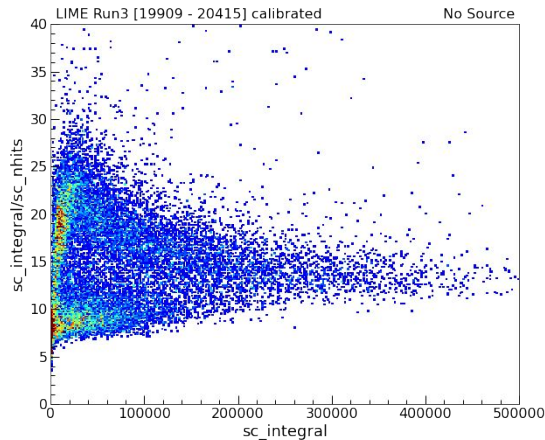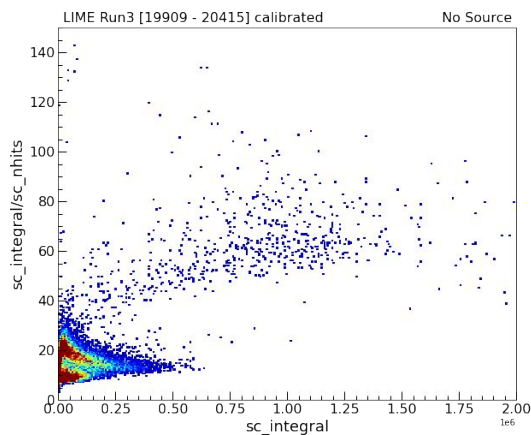# Background: sc_integral/sc_nhits - using Rita/Davide calibration
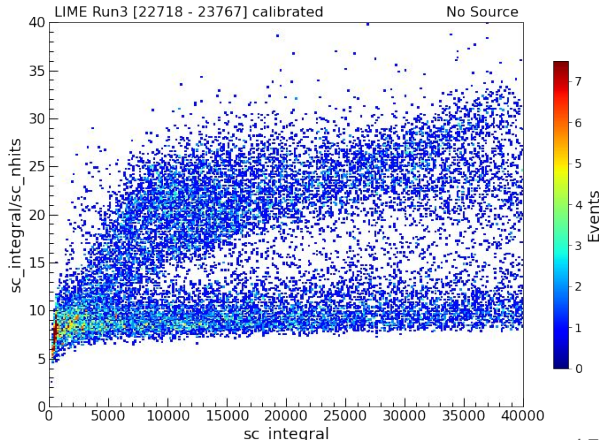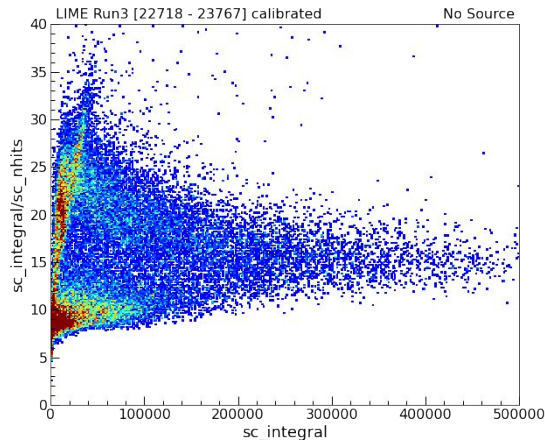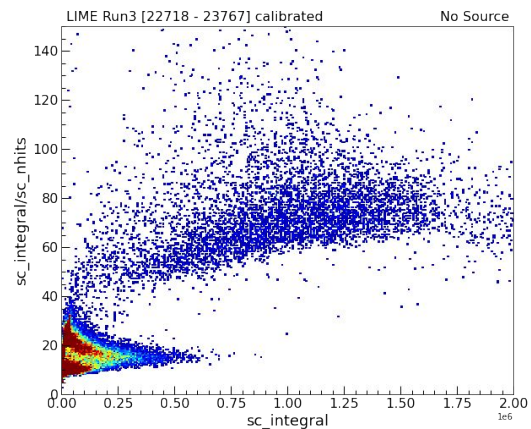

Runs 19909 - 20415

Runs 22718 - 23767

Future work

- Run1 and Run2 analysis.

Thank you for your attention!

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