

Summary of SiPM QA tests

NEWS General Meeting
November 4-5, 2019

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on the behalf of the photosensors group

Status of the Tests

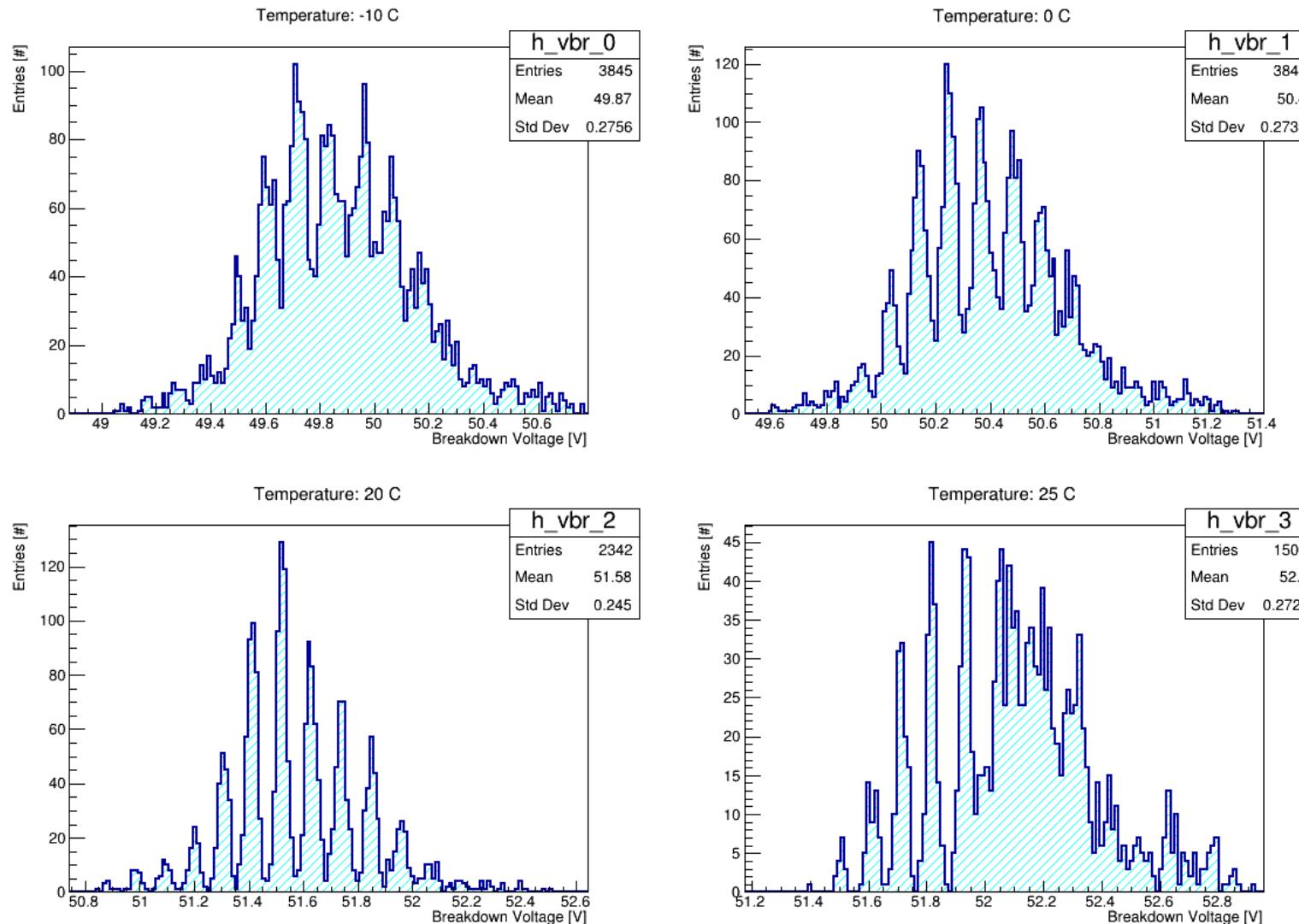
- SiPMs QA tests in SiDet end in June
- Data have been reprocessed and offline corrections applied
- So far 14 batches have been tested during a total of 225 runs



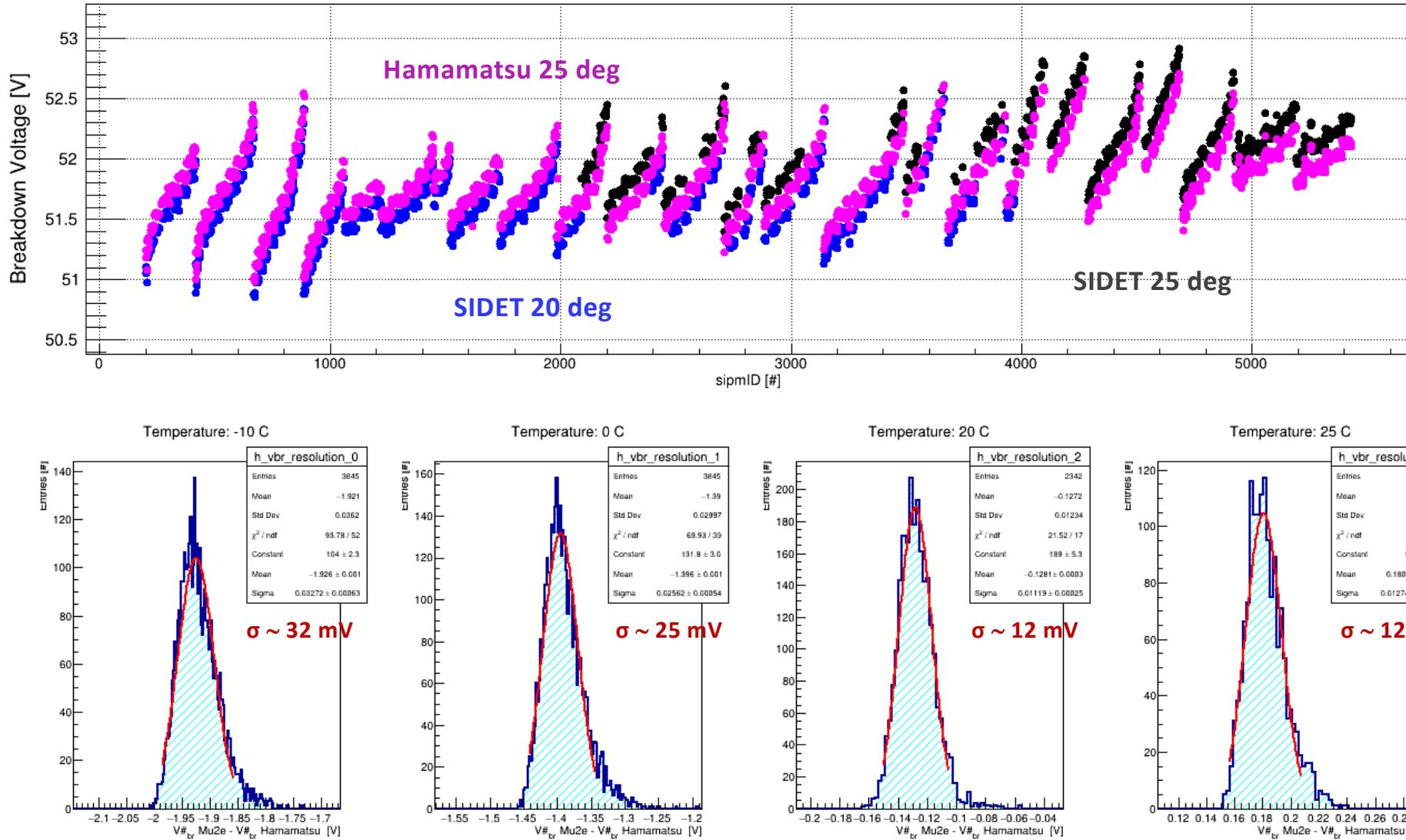
3875 SiPMs tested

- 45 used for the MTTF but not tested in the QA station
- 26 sensors rejected for construction problem (dimensions, IV test failed..)
- So far, 4 sensors missing..
- Only 22 SiPMs have been rejected for too large dark current RMS
- Temperature instabilities in batches 13-14 at 25 C:
 - The breakdown voltage has been extrapolated at the nominal temperature
 - One run (20 sensors) needs to be repeated..

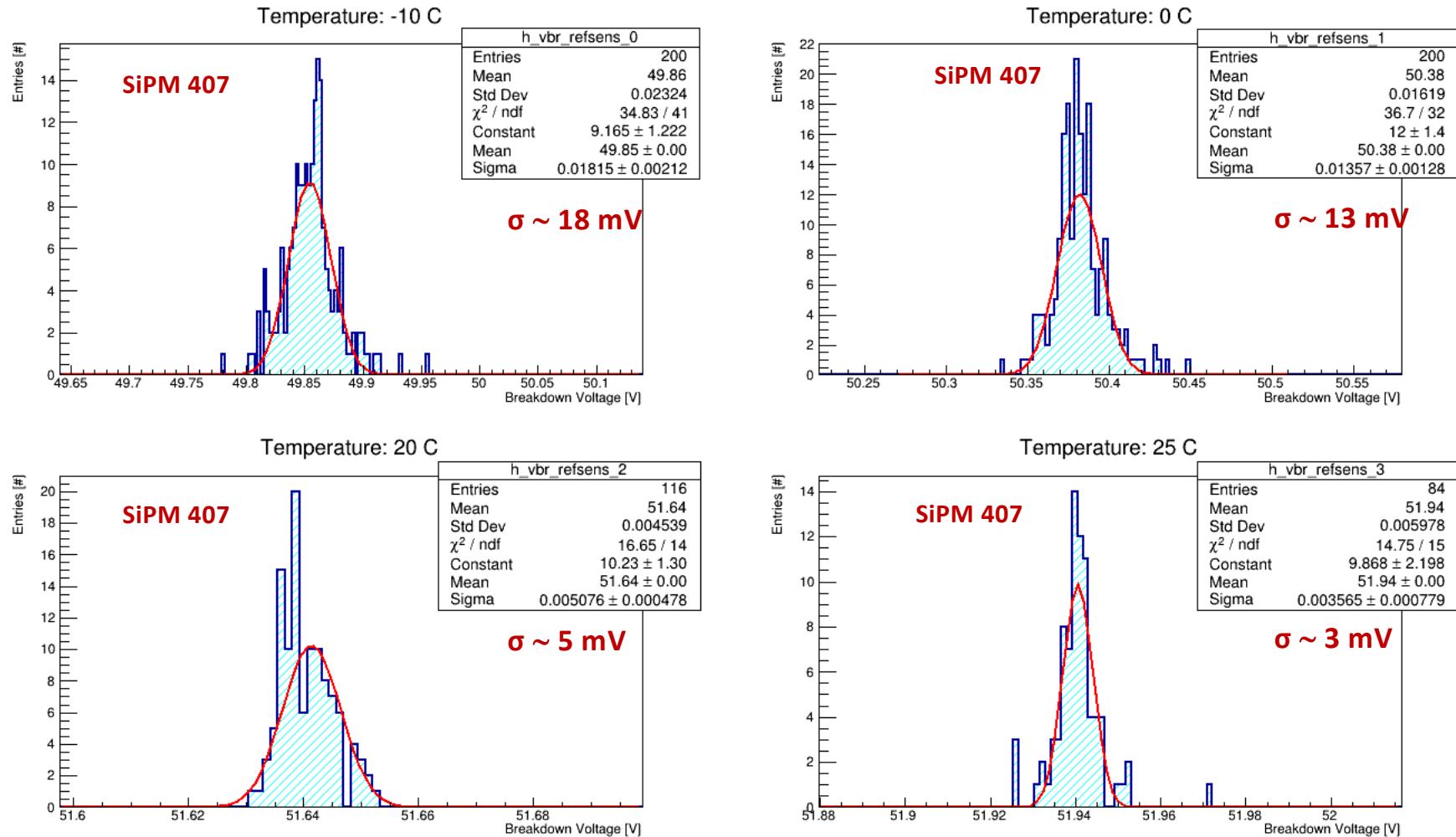
Distribution of the Breakdown Voltage



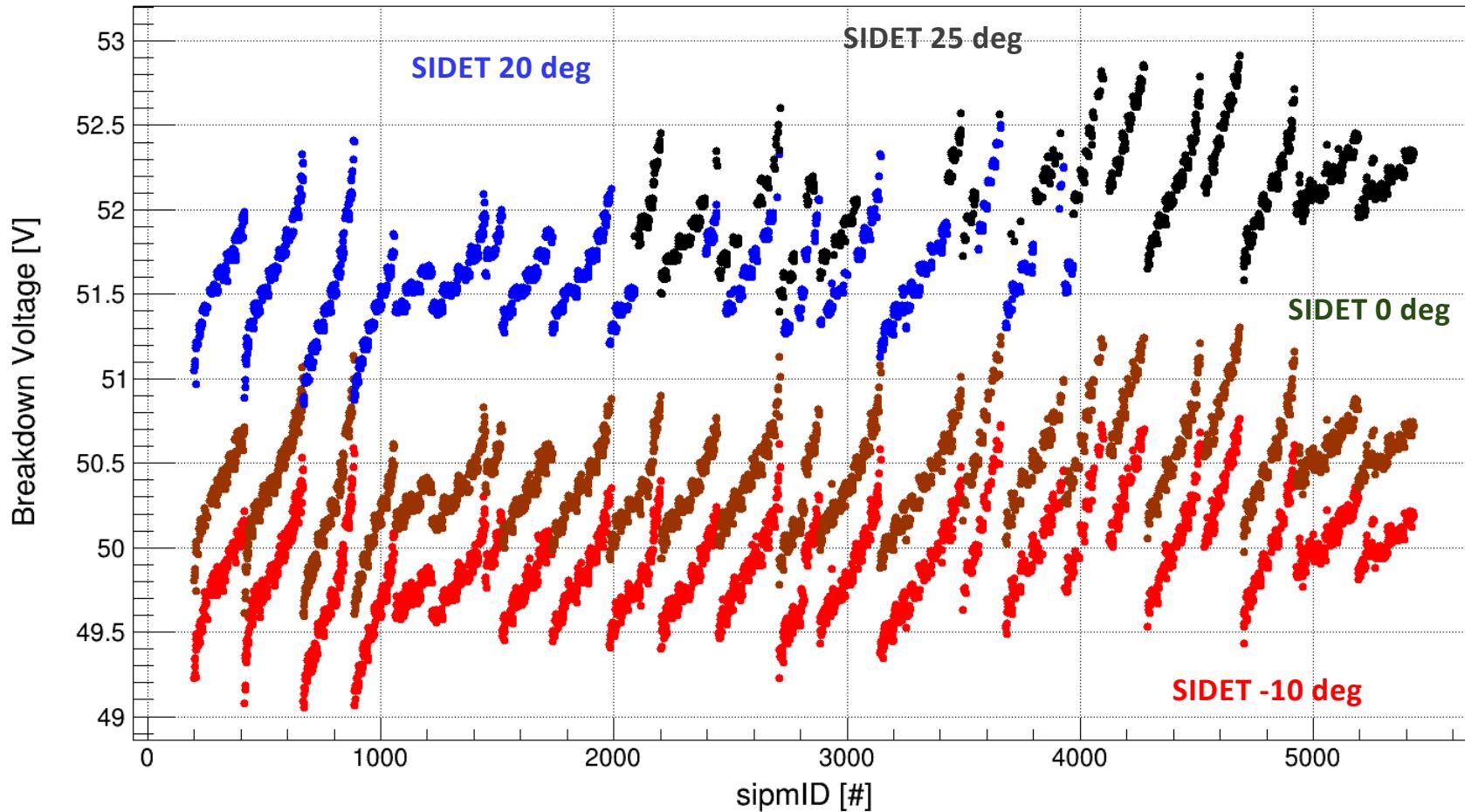
Comparison with Hamamatsu



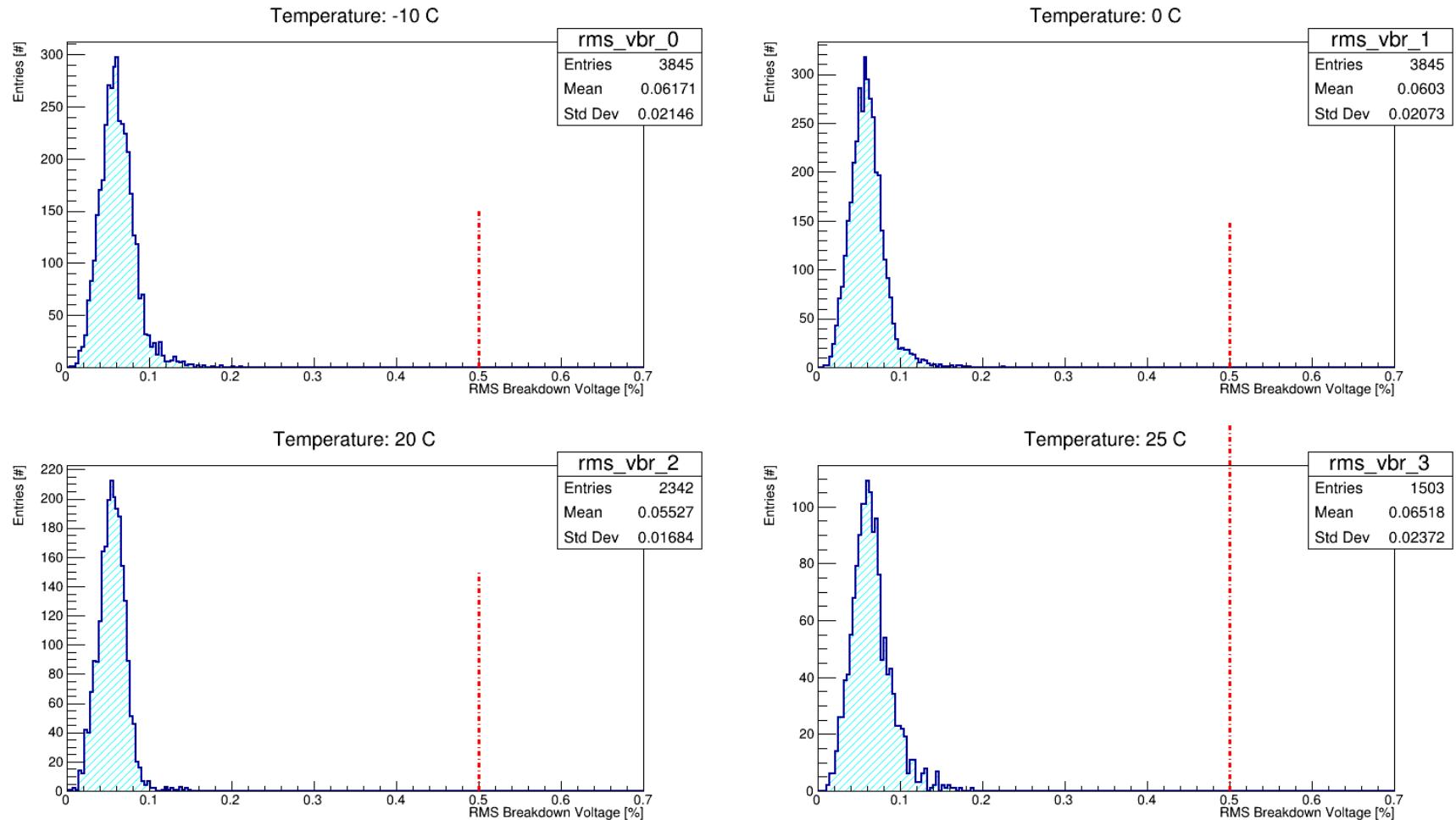
Stability of Breakdown Voltage



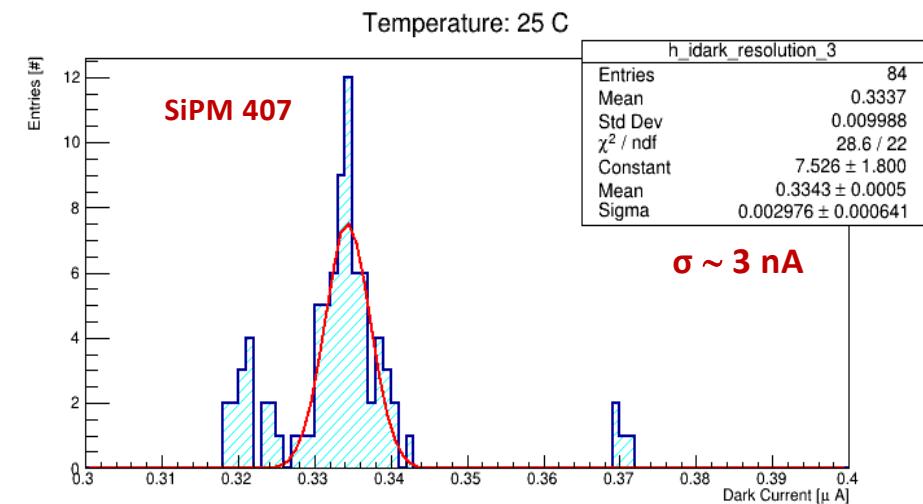
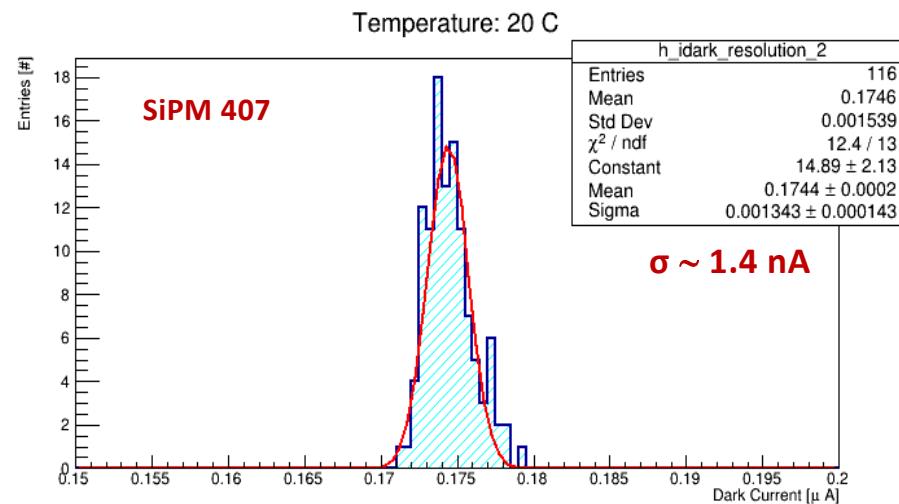
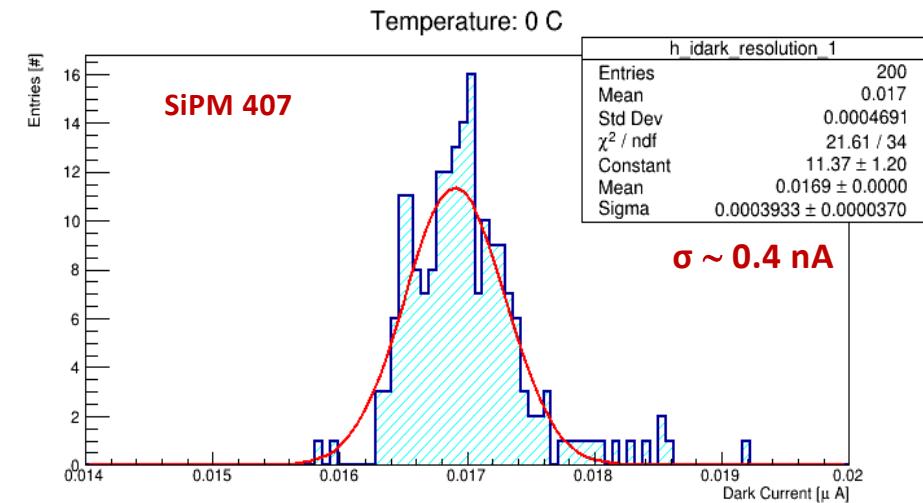
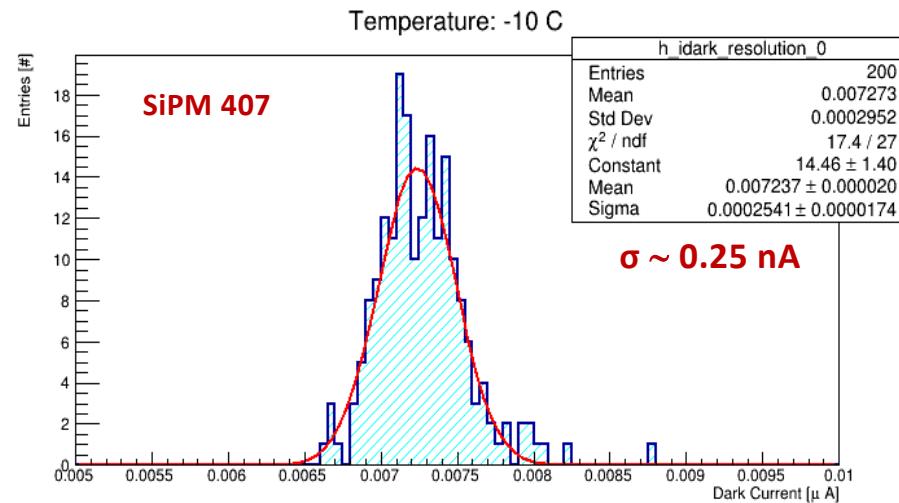
Breakdown Voltage Vs sipmID



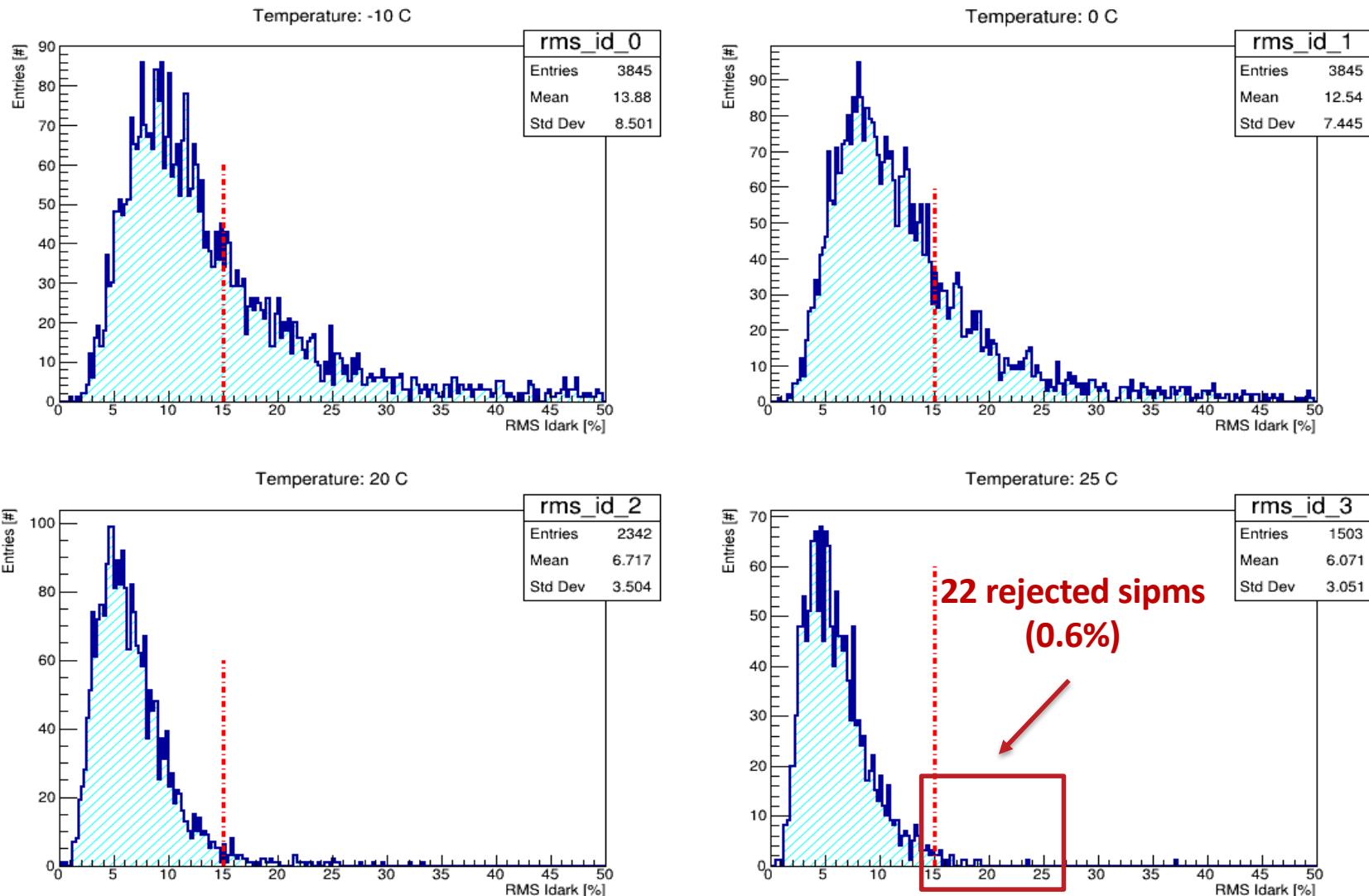
Breakdown Voltage RMS



Stability of Dark Current



Dark Current RMS

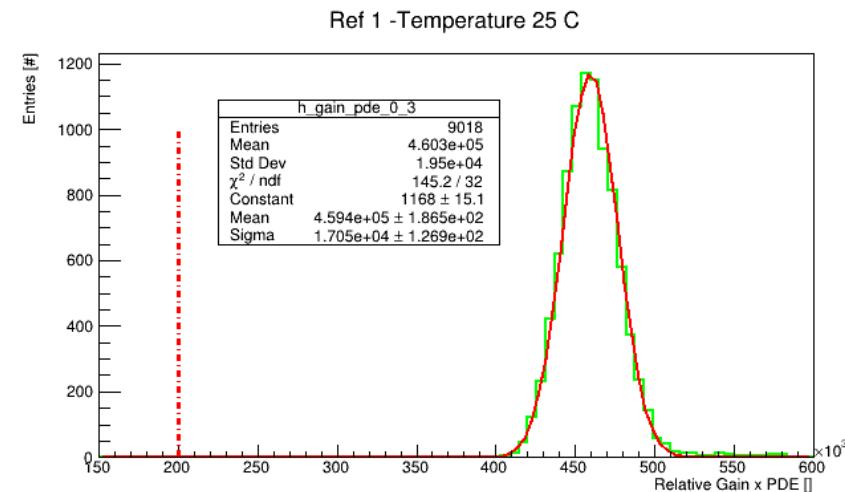
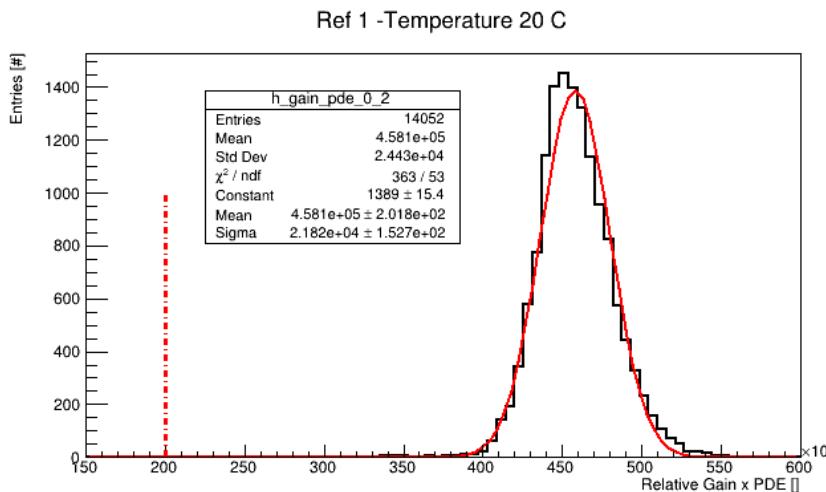
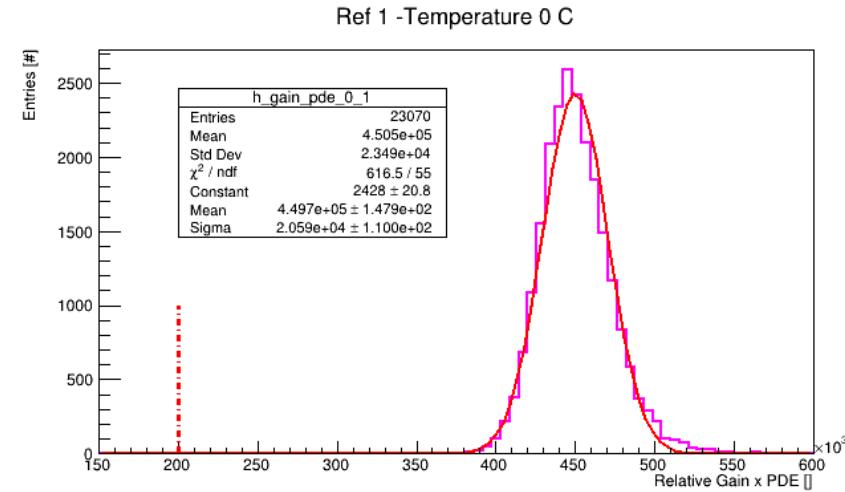
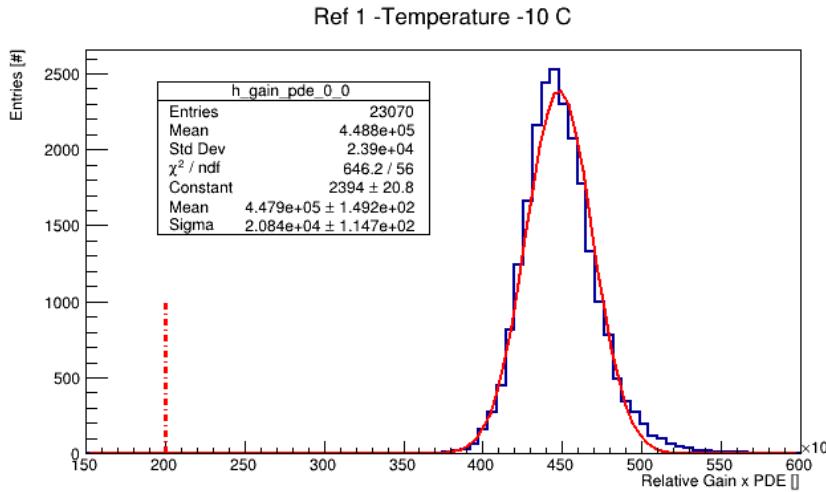


Gain x PDE

Refsens n.1, ID = 301

G x PDE ref = 4.e10^5

$\sigma / \mu \sim 5\%$



Database Update

- Working with Simona and Anna Maria to update the entries in the database..
- Entries table is ready and python script to modify the FNAL database is under development..

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
	Institute	Vacuum level [bar]	Batch Id	SiPM ID	Cell ID	T1 [°C]	Vbreak T1 (V)	Idark T1 (uA)	Gain x PDE T1	T2 [°C]	Vbreak T2 (V)	Idark T2 (uA)	Gain x PDE T2	T3 [°C]	Vbreak T3 (V)	Idark T3 (uA)	MTTF id	Irradiation id	QA Result	Worker Barcode	SiPM Storage	
06/20/18	FNAL	0,1	05	1574	5	20,00	51,479	0,203	441788,53	0,00	50,203	0,021	450808,19	-10,00	49,649	0,008	423633,25	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1574	6	20,00	51,510	0,203	443852,44	0,00	50,199	0,020	442749,50	-10,00	49,648	0,007	419054,00	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1575	1	20,00	51,471	0,181	395527,78	0,00	50,200	0,018	397116,72	-10,00	49,665	0,007	368609,09	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1575	2	20,00	51,479	0,182	392166,78	0,00	50,206	0,018	392252,44	-10,00	49,665	0,007	363872,41	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1575	3	20,00	51,553	0,166	390756,81	0,00	50,283	0,015	392064,19	-10,00	49,746	0,006	365100,34	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1575	4	20,00	51,514	0,179	404260,53	0,00	50,236	0,017	404498,59	-10,00	49,693	0,007	375839,53	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1575	5	20,00	51,480	0,184	413848,19	0,00	50,206	0,019	414944,81	-10,00	49,659	0,008	385666,69	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1575	6	20,00	51,505	0,175	415953,16	0,00	50,234	0,016	418844,69	-10,00	49,695	0,006	389043,06	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1576	1	20,00	51,522	0,199	378350,12	0,00	50,218	0,020	374982,41	-10,00	49,668	0,008	351274,81	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1576	2	20,00	51,518	0,231	400406,56	0,00	50,206	0,032	392041,16	-10,00	49,660	0,015	372417,34	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1576	3	20,00	51,424	0,175	381807,19	0,00	50,148	0,016	386451,12	-10,00	49,607	0,006	362904,81	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1576	4	20,00	51,511	0,203	404048,22	0,00	50,199	0,028	400730,97	-10,00	49,658	0,013	374745,81	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1576	5	20,00	51,551	0,187	385324,81	0,00	50,242	0,018	384043,00	-10,00	49,693	0,007	358241,00	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1576	6	20,00	51,481	0,213	392268,88	0,00	50,213	0,029	398570,72	-10,00	49,667	0,012	373246,94	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1577	1	20,00	51,420	0,189	380576,94	0,00	50,148	0,019	387155,88	-10,00	49,608	0,007	364448,91	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1577	2	20,00	51,540	0,185	413451,56	0,00	50,233	0,018	410894,94	-10,00	49,696	0,007	387608,25	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1577	3	20,00	51,502	0,201	397977,00	0,00	50,256	0,023	405506,91	-10,00	49,704	0,009	380153,53	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1577	4	20,00	51,435	0,175	409672,62	0,00	50,185	0,017	418059,62	-10,00	49,644	0,007	395679,94	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1577	5	20,00	51,498	0,181	391636,31	0,00	50,207	0,017	392002,19	-10,00	49,672	0,007	372079,25	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1577	6	20,00	51,468	0,191	400090,91	0,00	50,143	0,019	397013,00	-10,00	49,604	0,008	374529,94	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1578	1	20,00	51,492	0,206	430370,75	0,00	50,188	0,021	426759,59	-10,00	49,646	0,008	404699,94	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1578	2	20,00	51,566	0,196	445988,97	0,00	50,257	0,019	442169,06	-10,00	49,714	0,008	419303,50	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1578	3	20,00	51,536	0,233	437324,12	0,00	50,245	0,021	434853,94	-10,00	49,695	0,008	409904,47	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1578	4	20,00	51,495	0,206	460304,78	0,00	50,217	0,022	462712,16	-10,00	49,671	0,009	436578,22	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1578	5	20,00	51,502	0,197	409449,03	0,00	50,206	0,020	410512,19	-10,00	49,670	0,008	388447,50	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1578	6	20,00	51,502	0,194	417975,31	0,00	50,239	0,020	424563,00	-10,00	49,697	0,008	400825,19	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1580	1	20,00	51,474	0,200	397405,12	0,00	50,176	0,020	395880,06	-10,00	49,635	0,008	371753,88	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1580	2	20,00	51,527	0,215	407009,72	0,00	50,246	0,023	407805,88	-10,00	49,683	0,009	377546,25	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1580	3	20,00	51,568	0,212	397388,78	0,00	50,285	0,023	396935,12	-10,00	49,747	0,009	371653,53	0	0	ok	wk-smueller01	5-A
06/20/18	FNAL	0,1	05	1580	4	20,00	51,465	0,194	389943,88	0,00	50,185	0,020	391011,12	-10,00	49,640	0,008	365377,56	0	0	ok	wk-smueller01	5-A

- Update will be done as soon as the last 20 sensors will be measured..

Mu2e

Where to Find Online Data

- Online database on dropbox where you can find:
 - All the **final plots** in .png and .C (ROOT macro) format
 - A **databaseAll.root** file that contains a TTree with all the info used to build the online database
 - A **calibAll.root** file that contains a Ttree with the specif info of each run

```
// Declaration of leaf types
Int_t      runID;
Int_t      rtime;
Int_t      rbatchID;
Float_t    mtemp[5][5][3];
Float_t    mvbr[5][5][3];
Float_t    midark[5][5][3];
Float_t    vbr_ref[5][3];
Float_t    rms_vbr_ref[5][3];
Float_t    idark_ref[5][3];
Float_t    rms_idark_ref[5][3];
```

calibAll.root variables

```
// Declaration of leaf types
Int_t      sipmID;
Int_t      batchID;
Int_t      time;
Int_t      sipm_flag;
Int_t      isTested;
Int_t      numTest;
Float_t   temp[3];
Float_t   nominaltemp[3];
Float_t   vbr[6][3];
Float_t   ham_vbr;
Float_t   ham_idark;
Float_t   idark[6][3];
Float_t   g_pde[5][6][3];
Float_t   rms_vbr[3];
Float_t   mean_vbr[3];
Float_t   rms_idark[3];
Float_t   mean_idark[3];
```

databaseAll.root variables

- d. A folder with the **.xls** files from Hamamatsu
- e. A folder with all the checklists filled by the shifters, sorted according to batch number..
- Send me an email for link and the password..