Ladder tests with ^{90}Sr at BNL

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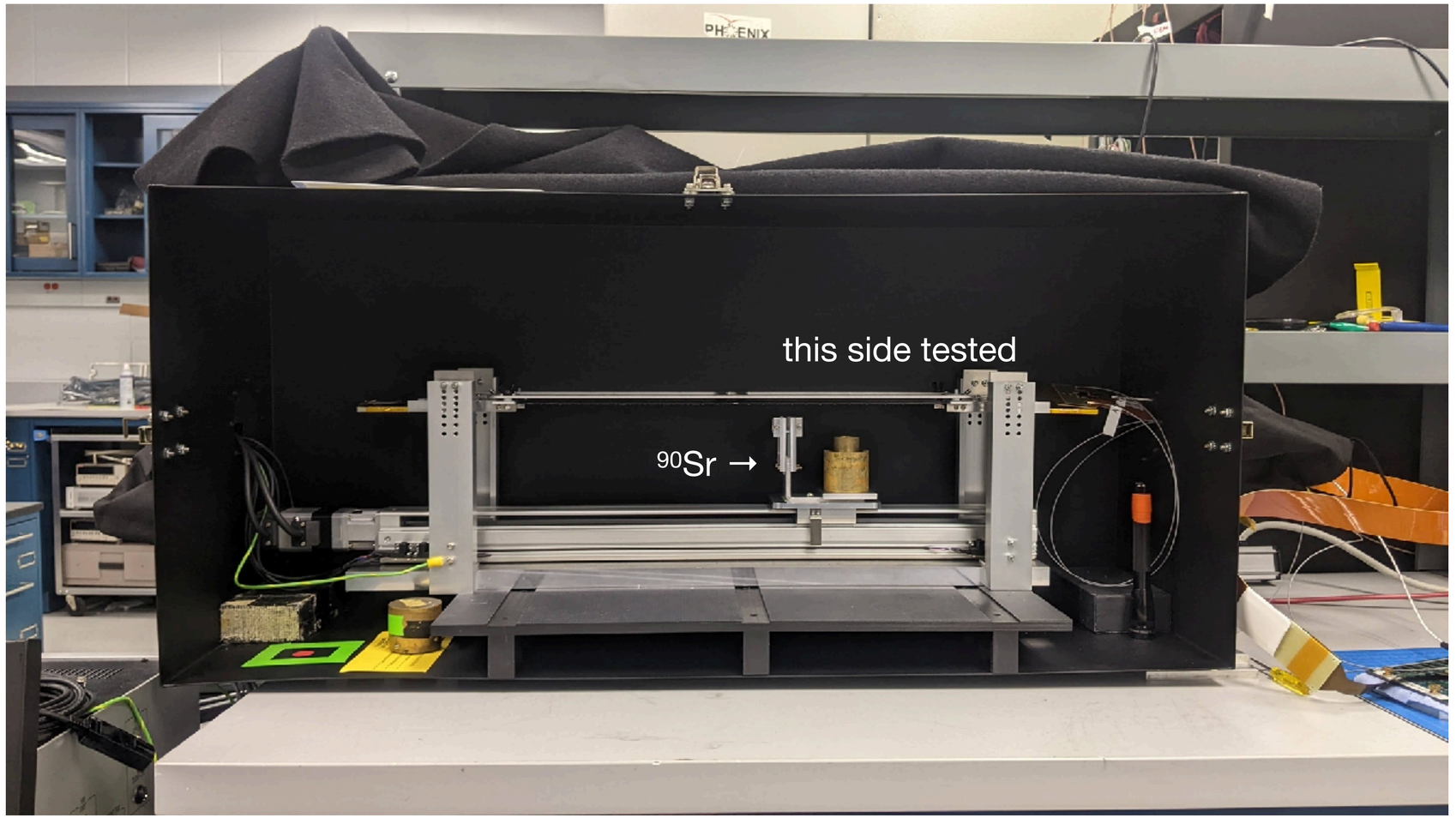
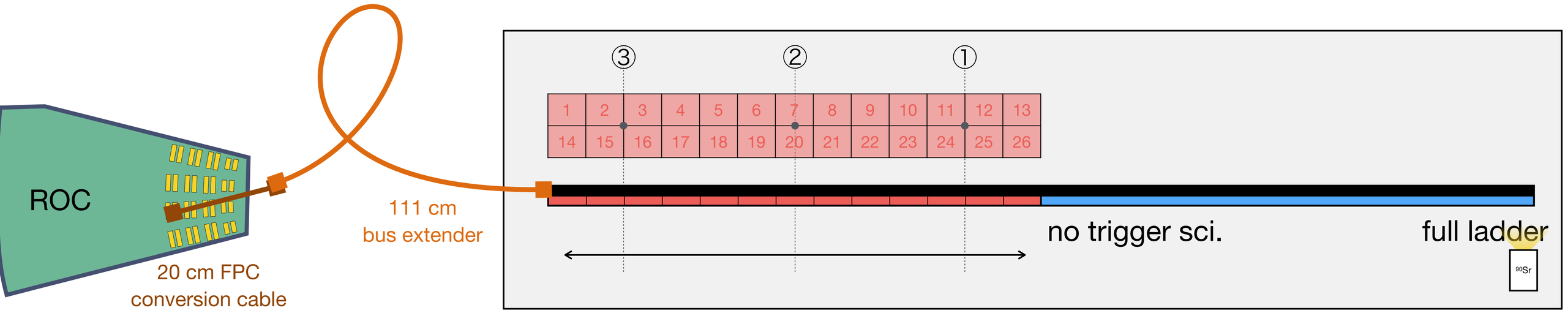
Testing mass production ladders with a radiation source



The motor controller →

ROC here

Testing mass production ladders with a radiation source



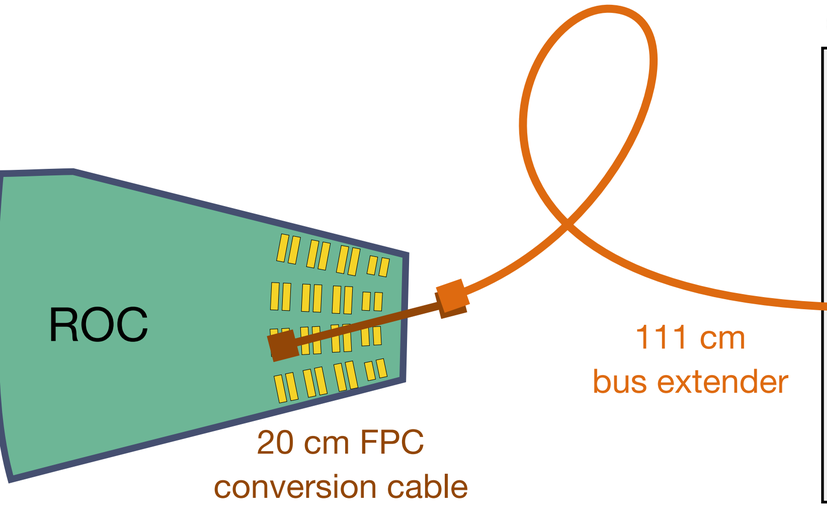
Procedure

1. Setting and connecting the tested side to port C2
2. Taking calibration data
3. Changing to port C3
4. Moving ^{90}Sr below ①
5. Starting radiation measurement in the external trigger mode with continues TTL high signal to FEM external trigger input
6. After 15 min, masking all chips, moving ^{90}Sr below ②, turn the motor control unit off, unmask all chip
7. Restarting measurement for 15 min

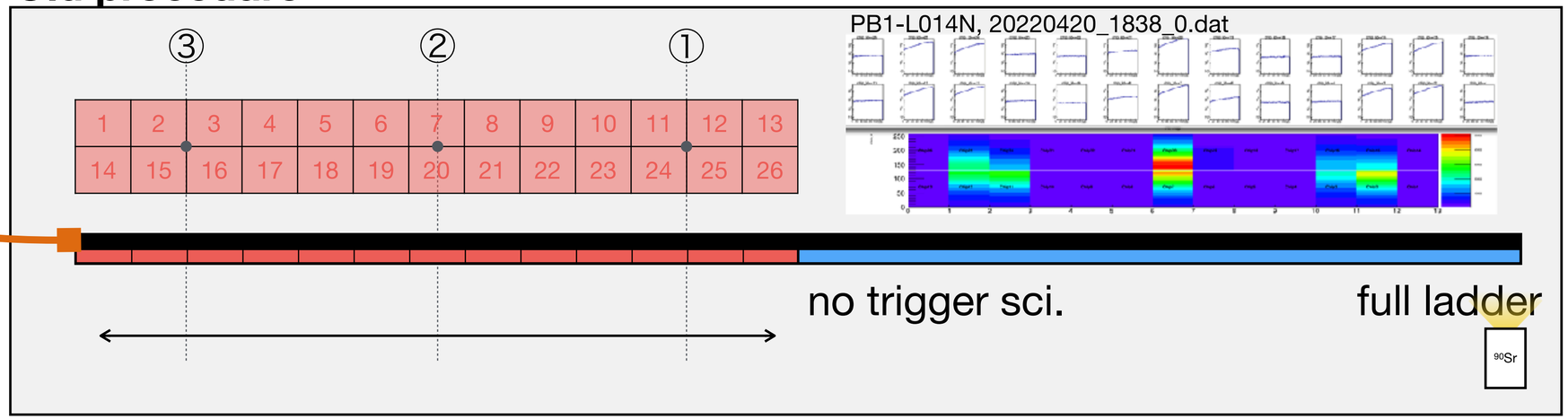
changed

8. After 15 min, masking all chips, moving ^{90}Sr below ③, turning the motor control unit off, unmask all chip
9. Restarting measurement for 15 min, then finishing the radiation measurement.
10. Turning bias off, removing ^{90}Sr
11. Start radiation measurement without ^{90}Sr for 10 min.
12. Start radiation measurement without ^{90}Sr with low DAC setting (DAC0=15, DAC1=30) for 5 min.
13. Changing port C3
14. Taking calibration data

Testing mass production ladders with a radiation source

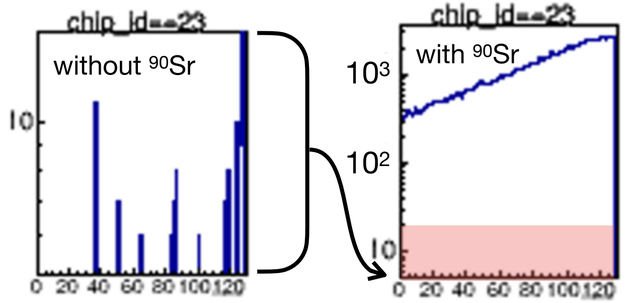


Old procedure

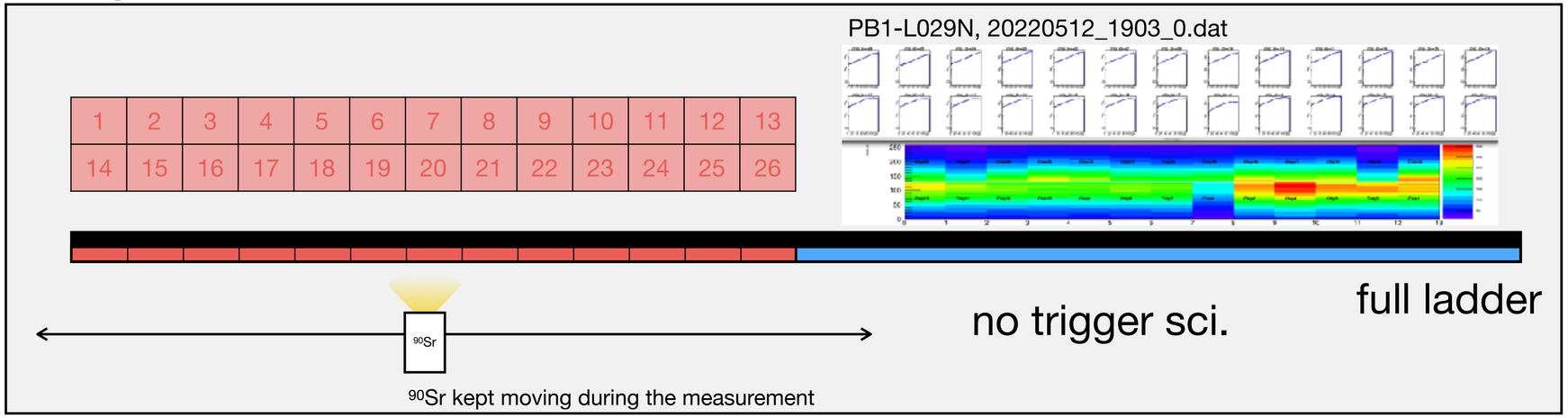


15 + 15 + 15 min needed

Since noise from the motor controller could be decreased low enough (or I didn't investigate well), I can take radiation data with ^{90}Sr moving along the ladder. It means only 10 min is needed to have enough amount of data for all channels while 15 + 15 + 15 min was needed with the old procedure.



New procedure



10 min needed

Status

Ladder	Side	Date	Class	#bad ch from the classifier	Calibrations	Source	BG	BG(low DAC)	Noisy ch	Dead ch	other bad ch	Channels need to be masked	Description
PB1-L001	N	2022/04/05	1	20	chip25 always half is good	good	good	as usual	no	no	no		chip25 always get half entries in calibration measurements. To be retested.
PB1-L001	S	2022/04/05	1		good	good	good	as usual	no	no	no		good half-ladder
PB1-L002	N		4	153									class-4
PB1-L002	S		4										class-4
PB1-L003	N		4	149									class-4
PB1-L003	S		4										class-4
PB1-L004	N	2022/4/7	1	33	dead: 3-X	dead: 3-102, 3-104	good	as usual	no	3-102, 3-104	no		good half-ladder
PB1-L004	S	2022/4/7	1		dead: 19-102	dead: 19-102	good	as usual	no	19-102	no		Channels around ch19 ch102 in the radiation measurement have less hits than expected, good half-ladder. It can go to the barrel.
PB1-L005	N	2022/4/7	1	14	good	good	good	as usual	no	no	no		good half-ladder
PB1-L005	S	2022/4/8	1		good	good	good	as usual	no	no	no		good half-ladder
PB1-L006	N	2022/4/8	1	14	good	noisy: 15 46	good	see description	15 46	no	no		All chan have the uniform noise about 100 hits maybe due to the readout. Chip15 chan46&11 are noisy. Chip25 ch126&127 are noisy as well. Actually, masking 1-36 was enough in the source measurement. Good
PB1-L006	S	2022/4/15	1		no sy: ?	noisy: 1-35, 7-35, 7-9	good	as usual	1-35, 7-35, 7-99	no	no		good half-ladder
PB1-L007	N	2022/4/11	1	25	good	good	good	as usual	no	no	no		good half-ladder
PB1-L007	S	2022/4/14	1		no sy: 1-36	mask: 1514-35	good	as usual	1-36	no	no	1-36	good half-ladder
PB1-L008	N	2022/4/15	1	16	good	good	<19	as usual	no	no	no		good half-ladder
PB1-L008	S	2022/4/15	1		Dead: 1-35, 1-68, No	Dead: 1-35, 1-68, No	Noisy: 1-36	as usual	1-36	1-35, 1-68	no		good half-ladder
PB1-L009	N	2022/4/18	1	16	good	good	<15	as usual	no	no	no		good half-ladder
PB1-L009	S	2022/4/18	1		good	good	<15	as usual	no	no	no		good half-ladder
PB1-L010	N	2022/4/18	1	10	good	good	<15	as usual	no	no	no		good half-ladder
PB1-L010	S	2022/4/18	1		good	Noisy: 80-110, less 2(	<20	as usual	1-36, 1-37	no	no		The noisy channels generated fake hits. They need to be masked. Good half-ladder. It can go to the barrel.
PB1-L011	N	2022/4/19	1	17	no sy: 18 70	Mask: 5&18 70	<8	as usual	18 70	no	no	18 70	good half-ladder
PB1-L011	S	2022/4/19	1		good		<17	as usual					retest?
PB1-L012	N	2022/4/20	1	24	good	dead: 21 99	<17	as usual	no	21 99	no		good half-ladder
PB1-L012	S	2022/4/20	1		dead: 1-38, 1-43, noi	dead: 1-38, 1-43, 1-9	<10	as usual	1-42, 1-44	1-38, 1-43, 1-99	no	1-38, 1-43 (or more)	good half-ladder
PB1-L013	N	2022/4/20	1	11	OK	OK	<15	as usual	no	no	no	no	good half-ladder
PB1-L013	S	2022/4/20	1		OK	OK	<15	as usual	no	no	no	no	good half-ladder
PB1-L014	N	2022/4/20	1	16	OK	OK	<20	as usual	no	no	no	no	good half-ladder
PB1-L014	S	2022/4/21	1		OK	OK	<15	as usual	no	no	no	no	good half-ladder
PB1-L015	N	2022/4/21	1	18	OK	OK	<15	as usual	no	no	no	no	good half-ladder
PB1-L015	S	2022/4/22	1		OK	OK	<15	as usual	no	no	no	no	good half-ladder
PB1-L016	N	2022/5/10	1	20	bad: 1-106	bad: 1-106	<28	noisy: 1-106	no	no	1-106	no	1-105 is less efficient basically. Other channels are good. Good half-ladder
PB1-L016	S	2022/5/10	1		OK	OK	<17	as usual	no	no	no	no	good half-ladder
PB1-L017	N	2022/4/25	1	18	OK	OK	<15	very low	no	no	no	no	good half-ladder
PB1-L017	S	2022/4/27	1		OK	OK	<15	as usual	no	no	no	no	good half-ladder
PB1-L018	N	2022/4/29	1	24	OK	OK	<20	as usual	no	no	no	no	good half-ladder
PB1-L018	S	2022/4/25	1		OK	OK	<17	noisy: 23 11	no	no	no	no	good half-ladder
PB1-L019	N		4	140									class-4
PB1-L019	S		4										class-4
PB1-L020	N	2022/4/29	1	15	OK	OK	<15	as usual	no	no	no	no	good half-ladder
PB1-L020	S	2022/4/29	1			OK	<15	as usual	no	no	no	no	good half-ladder
PB1-L021	N	2022/4/25	1	16	chip17 half	17 0 noisy	<15, 17 0 noisy	as usual, except 17 0 17 0	no	no	no	17 01	chip17 ch0 is noisy. Noise can be taken when all chips are masked. So masking chip17 ch0 doesn't help. Bad half-ladder. To be retested.
PB1-L021	S	2022/5/5	1		OK	OK	<15	as usual	no	no	no	no	good half-ladder
PB1-L022	N	2022/5/6	1	17	no sy: 16 94	OK	<17, 16 94 noisy	noisy: 16 94	16 94	no	no	6 94	16 94 need to be masked when DAC8 is 16. Otherwise good half-ladder
PB1-L022	S	2022/5/6	1		no sy: 21-125	noisy: 21-125	<25, noisy: 21-125	noisy: 21-125	21-125	no	no	no	good half-ladder. no need to mask the noisy channel since only the channels is affected
PB1-L023	N	2022/5/6	1	17	OK	OK	OK	noisy: 9-120	9-120?	no	no	no	good half-ladder. 9-120 was noisy for the moment but not reproduced, so no mask is needed.
PB1-L023	S	2022/5/6	1		no sy: 23 118	noisy: 1 0, 23 54, 23	<14, noisy: 1 0, 23 54	noisy: 23 118	23 118	no	no	23 118	Noise of 1 0 and 23 54 may be due to the noisy channel 23 118. Good half-ladder. It can go to the barrel
PB1-L024	N	2022/5/6	1	22	OK	OK	OK	as usual	no	no	no	no	good half-ladder
PB1-L024	S	2022/5/9	1		OK	noisy: 18 44, dead: 18	<20	as usual	18 44	18 75	no	no	The noisy and dead channels can be seen only in radiation measurements. No mask needed. Good half-ladder
PB1-L025	N	2022/5/9	1	28	no sy: 9-127	OK	<20	as usual	9-127	no	no	9-127	9-127 should be masked. Good half-ladder.
PB1-L025	S	2022/5/9	1		Dead: 25-114, 25-115	Dead: 25-115	<20	as usual	no	25-115	no	no	25-115 was dead. 25-114 was dead in the calibration measurements but alive in the source measurement. Channels around the dead chan
PB1-L026	N	2022/5/10	1	18	no sy: 9 101	OK	<28	noisy: 9 101	9 101	no	no	no	9 101 is noisy when low DAC setting. Good half-ladder.
PB1-L026	S	2022/5/10	1		OK	OK	<17	as usual	no	no	no	no	good half-ladder
PB1-L027	N	2022/5/11	1	14	OK	OK	<17	as usual	no	no	no	no	good half-ladder
PB1-L027	S	2022/5/11	1		OK	OK	<25	noisy: 16-122		no	no	16-122	16-122 is noisy when the low DAC setting. 16-122 was not noisy in the last calibration measurement somehow. Good half-ladder.
PB1-L028	N	2022/5/12	1	17	no sy: 16-108, 23-118	noisy: 16-108	<20	noisy: 16-108, 23-118	16-108, 23-118	no	no	23-118	23-118 needs to be masked. 16-108 is noisy when low DAC setting, but masking is not needed because it's not too bad. Good half-ladder.
PB1-L028	S	2022/5/12	1		less: 2 24	noisy: 2 24	<20, noisy: 2 24	noisy: 2 24	no	no	2 24	no	2 24 had less data in the calibration but noisy in the source test. No mask is needed. Good half-ladder.
PB1-L029	N	2022/5/12	1	21	OK	OK	<15	as usual	no	no	no	no	good half-ladder
PB1-L029	S	2022/5/12	1		no sy: 3-115, 3-116, 3	noisy: 3-115, 3-116, 3	<20, noisy: 3-115, 3-	noisy: 3-115, 3-116, 3	3-115, 3-116, 3-117	no	no	3-115, 3-116, 3-117	Masks are needed. Good half-ladder.

All class-1 ladders can take radiation hits successfully. Only a few dead/noisy channels were found while ~20 channels were mentioned by the ladder classification. I sometimes face strange behavior, but it's due to the operation/readout system. The class-4 ladders were not tested.

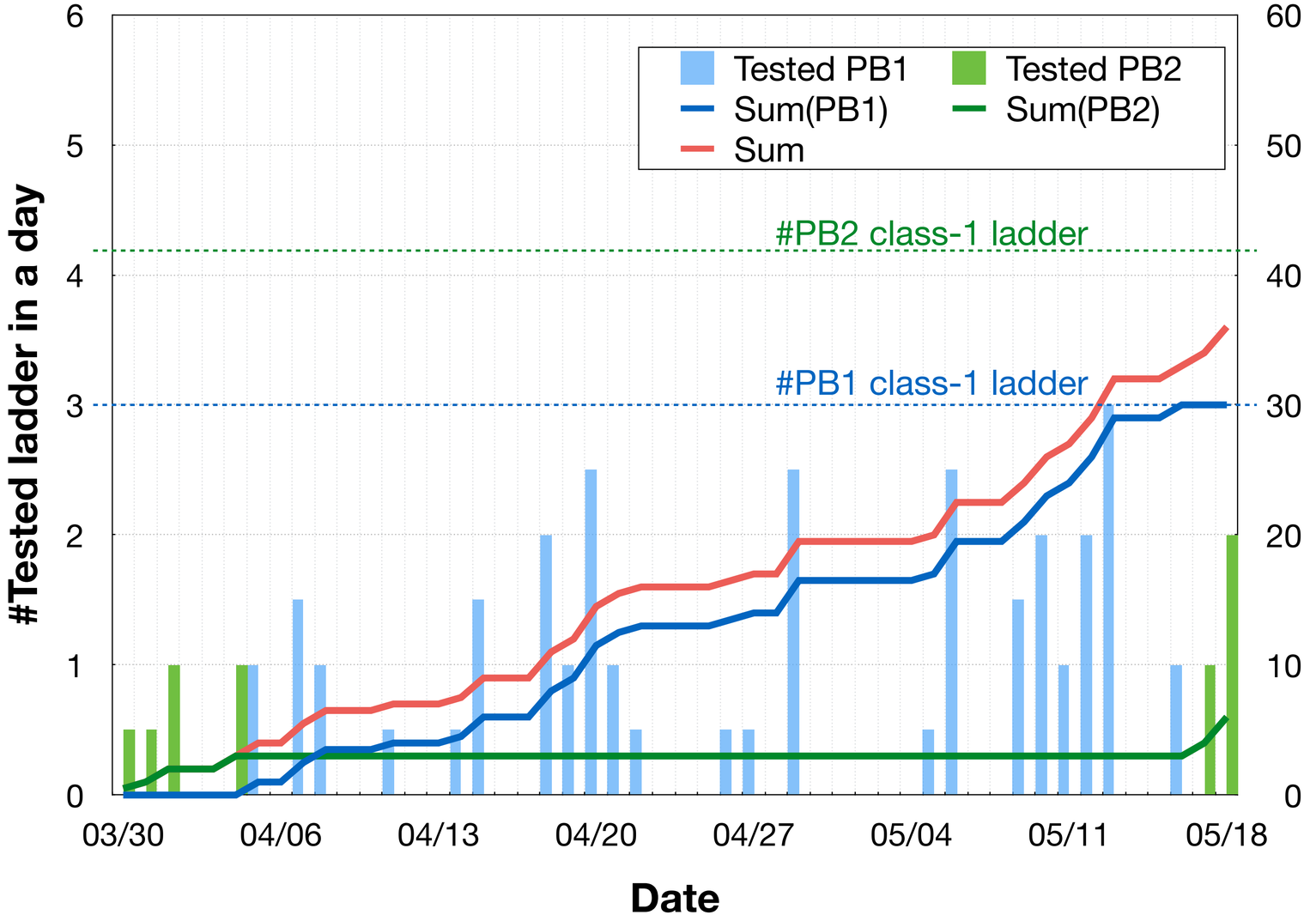
Green: Good

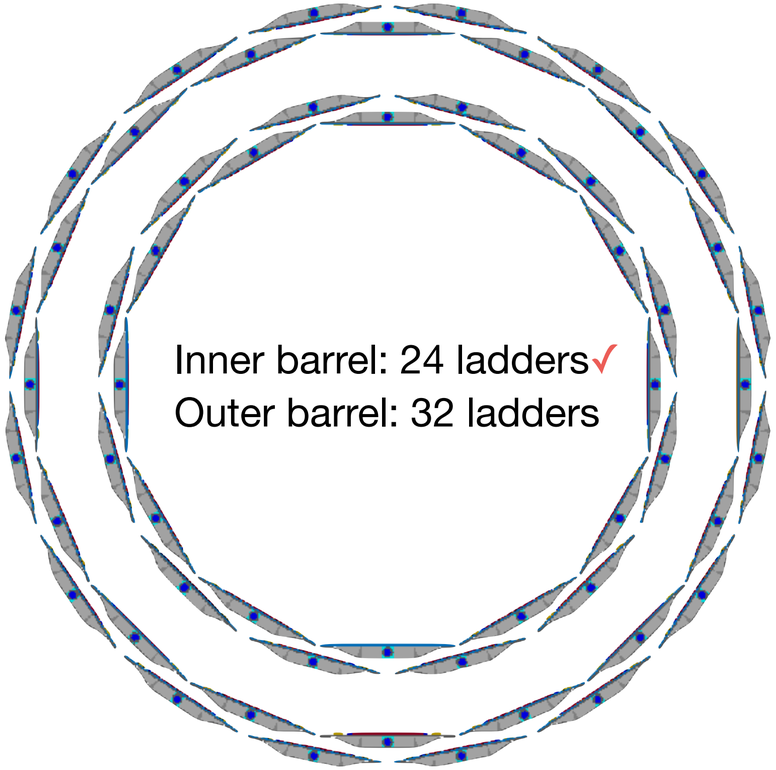
Red: Bad (nothing found for the moment)

Black: Class-4

Purple: To be tested again

Status, statistics





The number of the tested class-1 ladders is

- PB1: 30/30, all tested
- PB2: 6/42

Testing 1.5-2 ladders/weekday is possible. To test all ladders to be assembled, 26(20) ladders remain. 10-17 working days are needed to test them.