Test and Assembly of the Outer Tracker C-frames and Detector Modules at Installation

July 14, 2008

Abstract

During installation of the Outer Tracker detector in 2006 and 2007 both the C-frame services and the detector modules were checked to verify proper functionality. This note describes the procedure and the results of those measurements.

LHCb Note

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Prepared by S. Bachmann, Y. Bagaturia, J. Knopf, R. Schwemmer, D. Wiedner
Physikalisches Institut, Heidelberg, Germany

F. Jansen, R. Arink, Th. Bauer, A. Berkien, L. Ceelie,
V. Lavrentyev, B. M'Charek, A. Pellegrino, O. van Petten
T. du Pree, H. Schuylenburg, T. Sluijk, N. Tuning
NIKHEF, Amsterdam, The Netherlands

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1 Introduction

The Outer Tracker (OT) detector for LHCb consists of three stations. Each OT-station consists of four C-frames, two on either side of the beampipe. Both frames can move independently. Together the four C-frames of one OT-station comprise four detector planes (X/U/V/X), each covering a surface of approximately 6×5 m^2 [1]. A picture of the C-frame and its services is shown in Fig. 1. The naming convention follows the scheme as outlined in Ref. [2], and their location is sketched in Fig. 2.

The C-frames were delivered at CERN preassembled with all services (HV and LV cables, optical fibers, gas and cooling system), but without the detector modules. The cables were checked during assembly at Nikhef before shipment [3], verifying that the whole distribution from front-end box to the patch panels at the side of the C-frame works correctly, and that the geometrical allocations were correct.

To assemble the C-frames with the detectors a special assembly steel structure was used, called "C-cage". The C-cage houses two C-frames for assembly and final tests. From there the C-frames were transported by crane to the OT support structure and inserted in their final position [4]. This note describes the final test procedure for the C-frames and detector modules that were performed during the assembly of the C-frames.

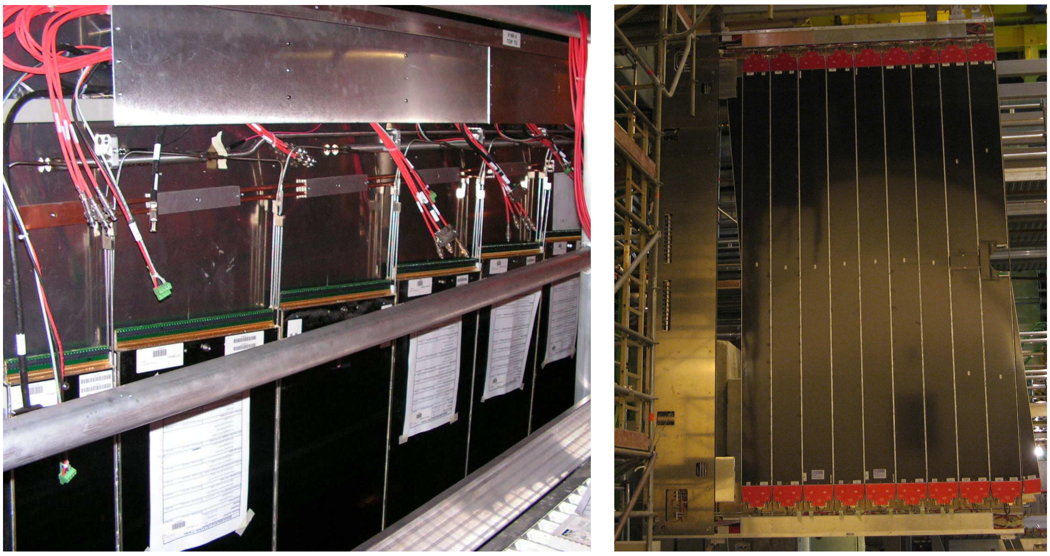


Figure 1: *(a) Picture of C-frame services. (b) Picture of C-frame T3-Q13-XU during installation in the experiment in January 2007. One x-layer of 7 F-modules and 2 coupled S-module pairs are visible.*

One C-frame supports 2 layers of 9 detector modules each, resulting in a total of 14 F-modules and 4 coupled S-module pairs. There are three types of S-modules: the S1-modules have the same width as the F-modules and are located next to the F-modules. The S2-modules are similar to the S1-modules, but are shorter to limit the occupancy close to the beampipe. The S3-modules are half the width of the S2-modules. The F-modules are readout on both ends by one front-end box on each side; the S-modules are readout only at one end by a single front-end box. This results in a total of 36 front-end (FE) boxes per C-frame. Each front-end box is connected by the following cables:

- 4 HV cables (2 for S3 modules);
- 1 LV cable;
- 1 optical fiber (per C-frame 3 spare fibers exist);
- 1 TFC cable;
- 1 ECS cable.

The services for a C-frame include the supply of the counting gas Ar/CO_2 and the cooling water for the front-end electronics.

The gas is supplied to the detectors by four input and four output lines. The input lines are at the bottom, the output lines at the top of the C-frame. Two lines provides gas for the S-modules on either side of the C-frame, whereas the other two lines provide gas for each layer of 7 F-modules. Cooling is provided by eight cooling pipes, four input lines and four output lines. The cooling pipes were tested at Nikhef [3], and were not retested at CERN during installation.

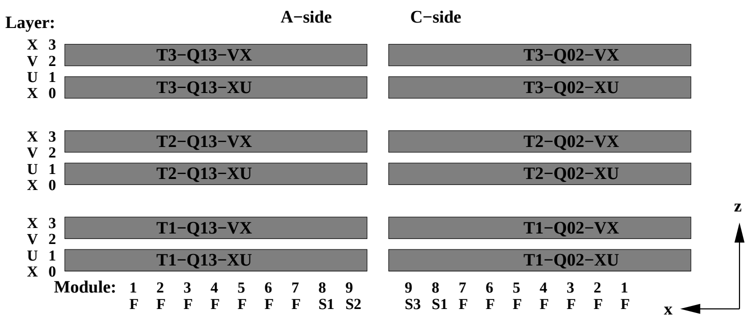


Figure 2: *The naming convention of the 12 C-frames, and their location in the experiment are sketched.*

2 Preparation of C-frames

Several modifications to the C-frames were performed before installation of the detector modules. This includes the installation of the gas and cooling pipes, the suspension of the frames and adaptations to guarantee the correct accurate positioning of the C-frame in the experiment. The check list for assembly of the C-frames is given below.

Check	
Install side spacers on trolley	
Install spacers between trolley and C-frame	
Prepare and install precision trolleys (use spacers!)	
Install stopper	
Install rollers on lower side	
Install horizontal gas pipes	
Install gas pipe extension for S-modules	
Install cooling pipes	
Apply cooling pasta	
Install dowel pins	
Check target holders on dowel pins	
Modify and install extension for S-modules	
Pull out optical fibres	
Install modules, first layer	
Install Rohacell bar	
Install modules, second layer (use spacers!)	
Install special spacers for module # 1	
Install 1.3mm distance pieces for S3-module	
Fix centre of S3-modules	
Test low voltage cables	
Test HV cables	
Test optical fibres	
Test gas-tightness horizontal pipes	
Connect modules and check gas-tightness	
Measure resistances with HV box	
Measure dark currents	
Fix cables inside C-frame boundary	

Table 1: *C-frame installation check list.*

The test results of the C-frame services are given in Section 3, During assembly of the detector modules each module was tested individually for gas-tightness and the signal response was measured with a ^{55}Fe source, see Section 4.

3 C-frame Services

3.1 Gas Lines

The four gas supply lines of each C-frame were tested with CO_2 for leaks by applying an overpressure and measuring its pressure decay after 4 minutes. An overpressure of approximately 10 mbar was applied. The pressure drop did not exceed a value of 1 mbar per minute, according to specifications [5], apart from 2 lines, which are very close to the specifications.

C-frame	Layer (X)				Layer (U/V)			
	L		U		L		U	
	F	S	F	S	F	S	F	S
T1-Q02-XU	0.6	0.6	0.3	0.3	1.5	0.8	0.3	0.3
T1-Q02-VX	0.45	0.8	0.3	0.4	0.5	0.75	0.2	0.5
T1-Q13-XU	0.00	0.2	0.0	0.05	0.1	0.25	0.1	0.1
T1-Q13-VX	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.1
T2-Q02-XU	0.3	0.4	0.2	0.2	0.2	0.2	0.1	0.6
T2-Q02-VX	0.7	1.0	1.5	1.2	0.8	0.5	0.5	2.8
T2-Q13-XU	0.0	0.2	0.0	0.05	0.1	0.25	0.1	0.1
T2-Q13-VX	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.1
T3-Q02-XU	3.3	2.5	0.9	1.25	4.8	2.7	1.0	1.0
T3-Q02-VX	2.0	3.6	1.2	3.6	1.9	2.5	1.1	5.0
T3-Q13-XU	0.35	0.35	0.3	0.3	0.35	0.5	0.2	0.2
T3-Q13-VX	0.2	0.3	0.2	0.1	0.1	0.2	0.2	0.1

Table 2: *The results of the gas-tightness of the C-frame supply lines is listed. The pressure decay dp/dt is given in mbar after 4 minutes, at an initial overpressure of approximately 10 mbar.*

3.2 HV test

The high voltage (HV) supply for one C-frame consists of four multipole connectors on the patch panel. Multiwire cables provide the voltage to junction boxes from where they are further routed to the FE-boxes. Four cables supply the HV for the 128 channels of one FE-box. The first test checked the connection from the multiwire connector to the front-end box by measuring the resistance for each cable [3]. Subsequently the high voltage stability was measured by applying 1800V to each cable of the multipole connector. The resulting dark current of four cables to a dummy FE-box was recorded and

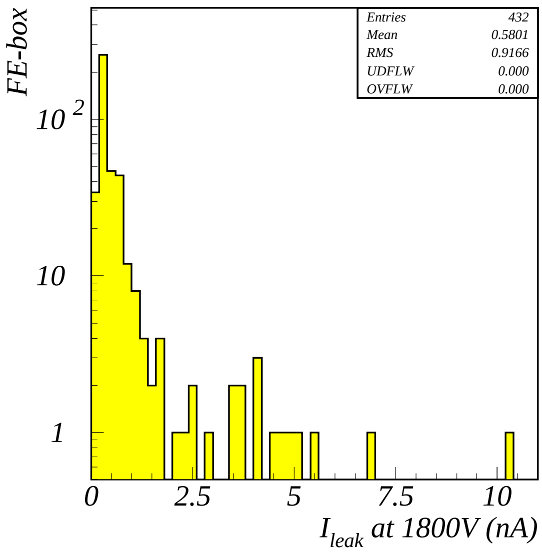


Figure 3: *Leakage current at 1800V.*

did not exceed 10 nA. The dark currents for all 432 groups of 4 cables in the 12 C-frames are shown in Fig. 3.

3.3 LV test

The low voltage (LV) for one C-frame is provided by 2x6 lines, six for the upper half and six for the lower half of the C-frames. Four of the six lines carry the positive bias of +6V, the remaining two lines carry the negative bias of -6V. The scheme of the LV distribution can be found elsewhere [3]. The test procedure was as follows.

- Place the fuses in the control box;
- Supply the system with a voltage of +7V/-7V;
- Connect the LV cable to a dummy load, simulating the presence of the frontend box (consisting of a resistor drawing a similar current);
- Measure the voltage on the LV cables, with a current of 4.1 A for the +7V and 2.1 A for -7V;

The voltage difference typically ranged between +6.0V and +6.5V for the positive bias, and between -6.75V and -6.5V for the negative bias. The measurements for all 432 cables in the 12 C-frames are shown in Fig. 4.

3.4 Optical Fiber Attenuation

Four groups of optical fibers (corresponding to the top and bottom rows on both sides of the C-frame) are connected to the patch panel in one C-frame.

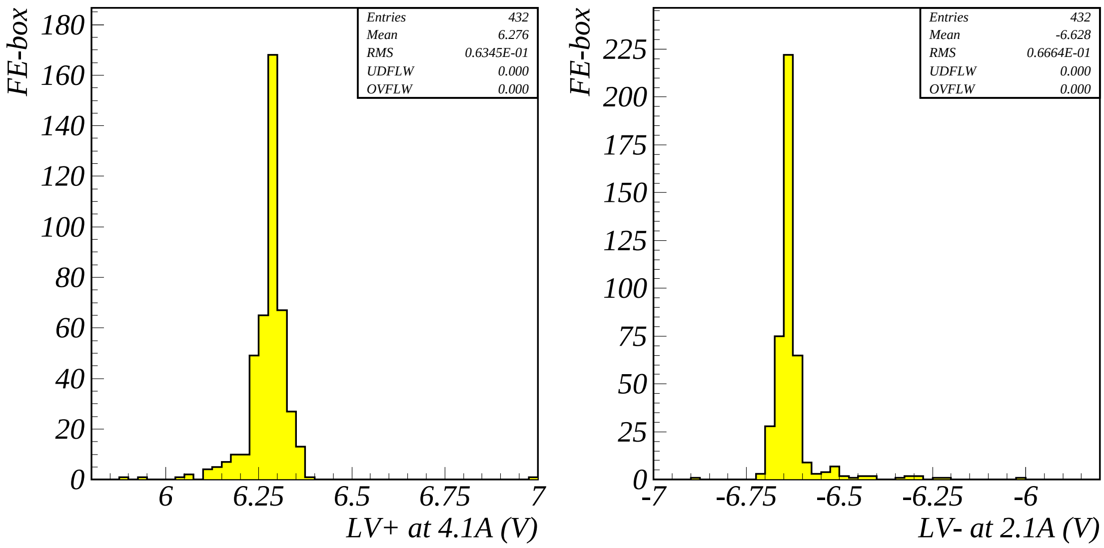


Figure 4: *Voltage with ±7V at input and a load of 4.1A and 2.1A for the positive and negative voltage, respectively.*

Twelve individual fibers are connected through a breakout fiber to the 9 FE-boxes, yielding 3 spare fibers per row of 9 FE-boxes. The power attenuation of a 850 μm light source was measured for each fiber [3]. A broken fiber typically would give a value around -50 dBm. The measured power attenuation did not exceed -30dB. The measurements for all 432 cables in the 12 C-frames are shown in Fig. 5. In addition, the bit-error rate was checked on station T3, for the lower quarter (Q0) of the X-layer (L0) [7].

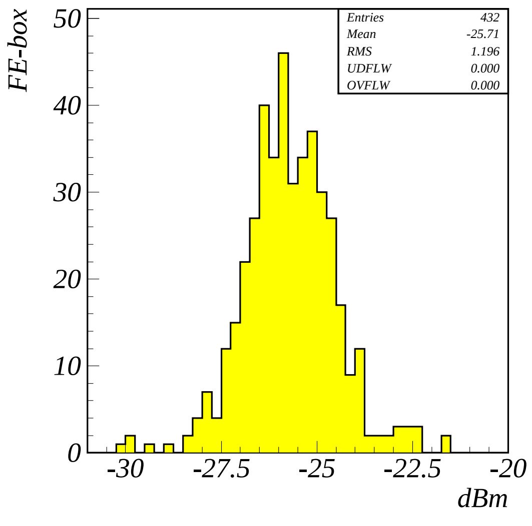


Figure 5: *The distribution of the attenuation for 432 optical fibers are shown.*

4 Module Tests

4.1 Measurement of dark currents

A voltage of 1600V was applied to all four HV-cables of one front-end box. The high voltage is supplied via the HV connectors of the frontend box to the module, which was flushed with CO_2. Each channel supplies 32 wires with HV. Typically the dark currents of one channel of 32 straw tubes did not exceed 100 nA. The total time that the high voltage was applied to the module did not exceed 3 minutes.

4.2 Gas-Tightness of Detector Modules

The gas-tightness of each detector module was confirmed directly after installation. Initially, the first module is connected to the C-frame and an overpressure between 5 and 6 mbar was applied. The pressure drop was measured during 9 minutes, after which the pressure decay per minute at 5 mbar was deduced. Subsequently, the next module was connected and the test was repeated, yielding the gas-tightness of the ensemble of all installed modules at that moment. The gas tightness of the last installed module is obtained after correcting for the gas tightness of all previously installed modules. This might occasionally lead to a negative value, reflecting the accuracy of the measurement.

The resulting gas-tightness per module is thus dependent on the sequence of the installation. The discrepancy of the gas-tightness results in T1-Q02-L1 and T2-Q02-L1 is attributed to a wrong assumption of the installation sequence of the modules. The discrepancy in the gas-tightness results for the S3-modules in station T2 are due to the fact that these S3-modules were connected to the neigbouring S1-module at the moment of the gas-tightness measurement. Therefore, the expansion coefficient of the summed volume is different with respect to the rigid S3-module alone as measured during production [8].

The pressure drop of each individual module is compared to the measured pressure drop at production. The results for each C-frame and its 18 modules are given in Figs. 7-9.

The following considerations give a limit to the pressure drop allowed for a single C-frame. During operation of the detector in the recirculating mode [1] the gas flow is expected to be adjusted such that the detector volume is exchanged every two hours. The nominal replenishing flow corresponds to about 5% of the total flow. The overpressure in the module is expected to

[1]The recirculating mode is foreseen in case the detector is operated with costly CF_4.

be approximately 2 mbar during operation [6]. Hence, the leak rate should not exceed 5% of the detector volume every two hours, i.e. $1.25\,10^{-4}$ l/s at 2 mbar overpressure. The leak rate and pressure drop are related according to:

$$R \approx \frac{V_0 H_0}{P_0}(1+\lambda)\frac{\Delta H}{H_0 + \Delta H/2}\frac{1}{\Delta t}, \tag{1}$$

with V_0 the total initial volume (18(9) l per (S3)-module), H_0 the initial overpressure, P_0 the atmospheric pressure, and ΔH the overpressure decay in the module during the period Δt [8]. The coefficient λ takes into account the bulging of the module and amounts to approximately 7.4. Using this relation the leak rate requirement of $1.25\,10^{-4}$ l/s at 2 mbar translates to $3.1\,10^{-4}$ l/s at 5 mbar, corresponding to a pressure decay of approximately 0.12 mbar/min, see Fig. 6. This is on average satisfied by most detector layers. However, this requirement can be relaxed if the detector is operated in the open mode, when the gas mixture Ar/CO_2 70/30 is used.

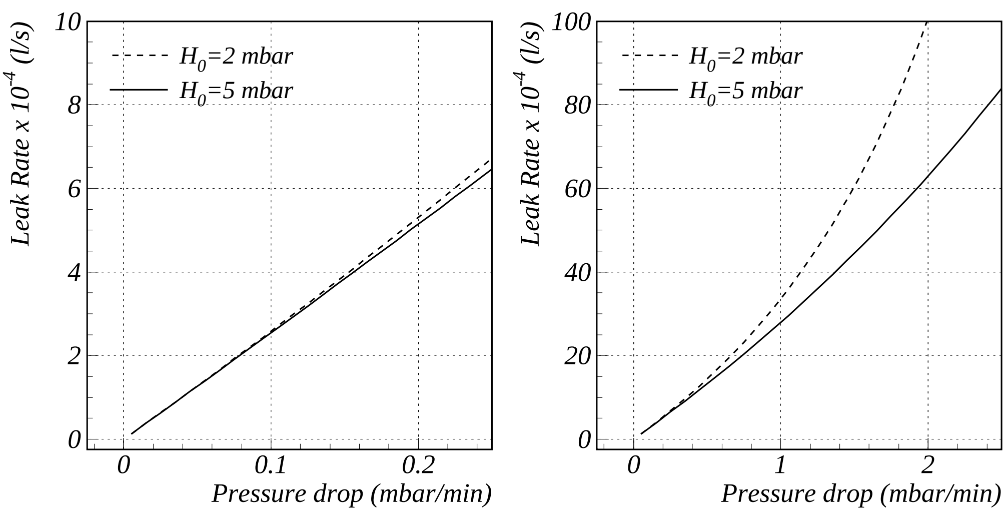


Figure 6: *The relation between pressure drop and leak rate is shown, according to Eq. 1, for two different values of the initial overpressure.*

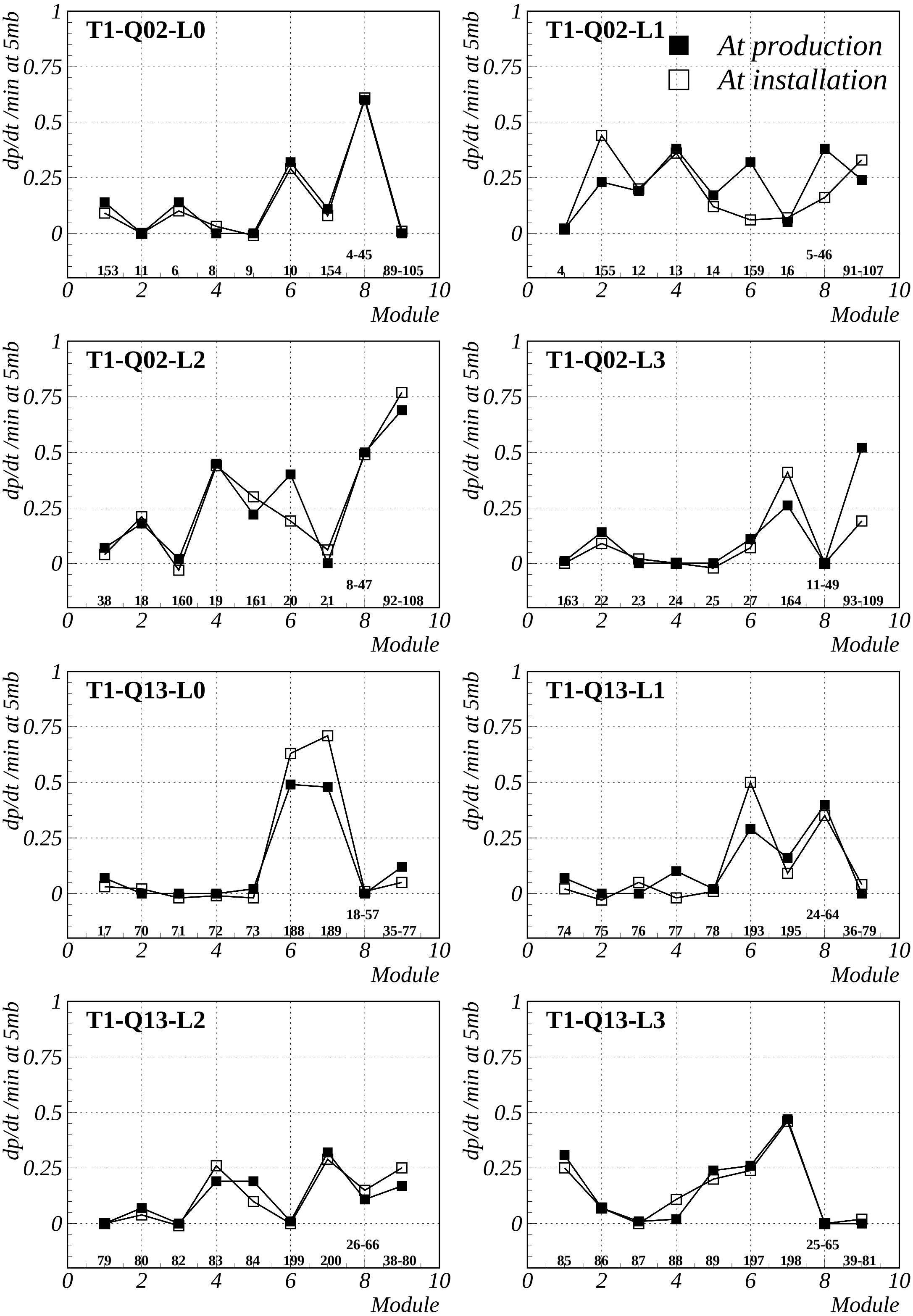


Figure 7: *The pressure decay for the modules of station T1 are given, both the value after production, and at installation. Also the modules' serial number is shown.*

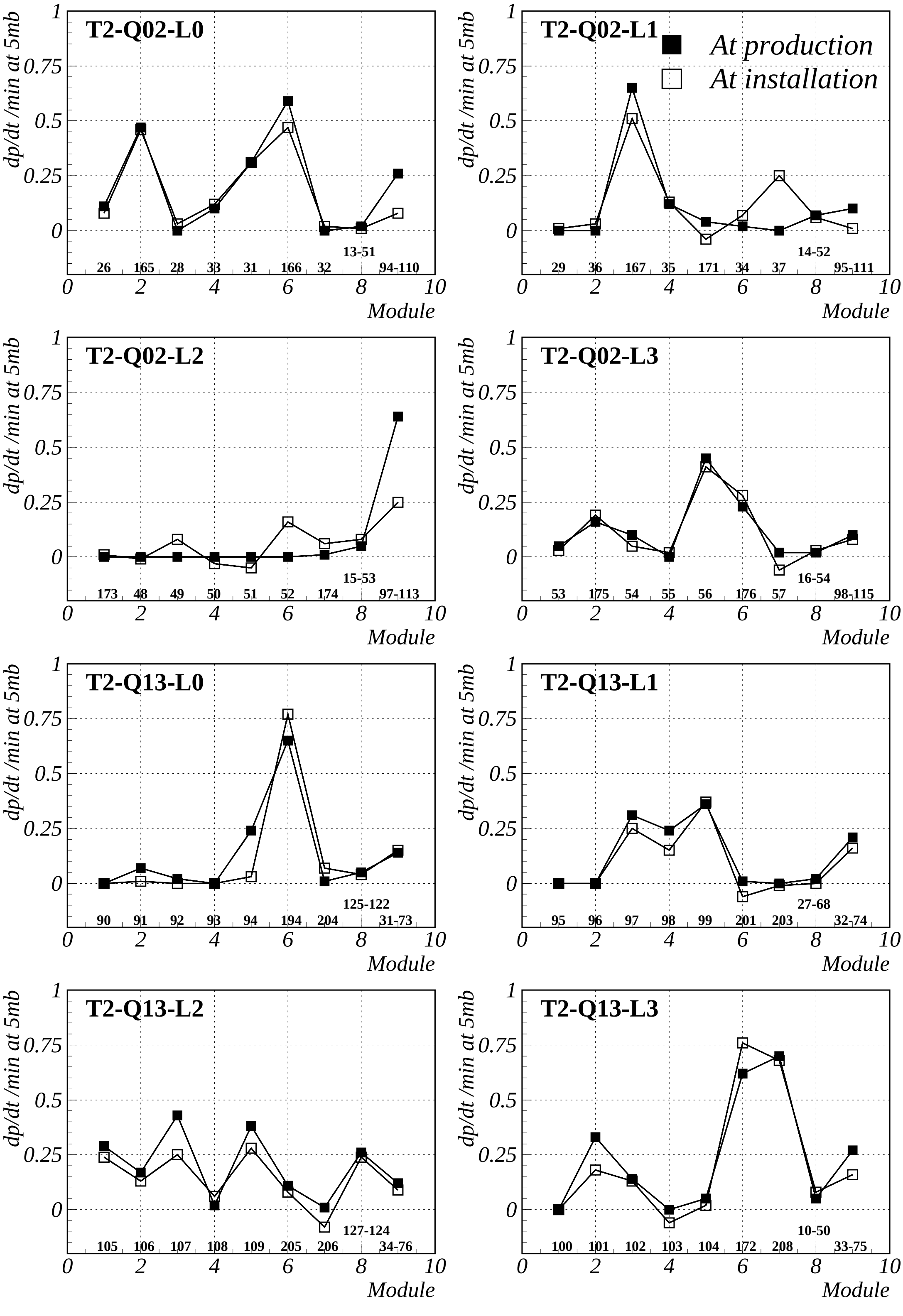


Figure 8: *The pressure decay for the modules of station T1 are given, both the value after production, and at installation. Also the modules' serial number is shown.*

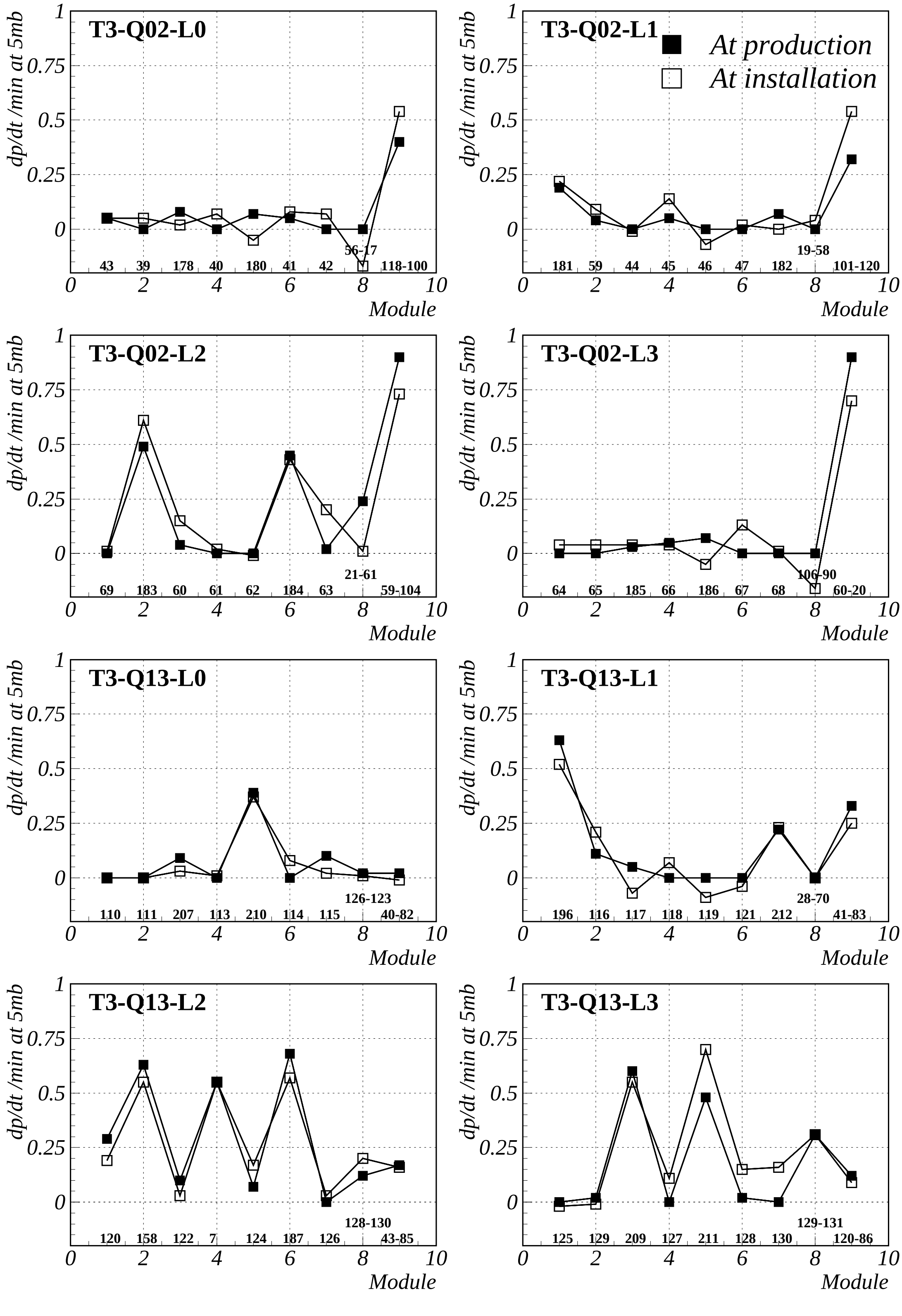


Figure 9: *The pressure decay for the modules of station T1 are given, both the value after production, and at installation. Also the modules' serial number is shown.*

4.3 Detector Response with ^{55}Fe

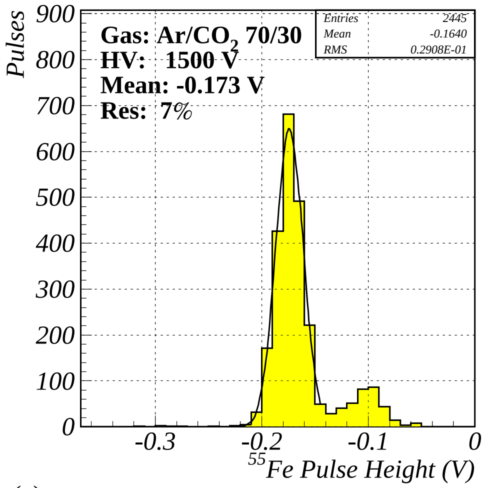
To verify proper operation of the detector, the individual straws were tested using a ^{55}Fe source, prior to installation, in the period from January 2007 to April 2007. The functionality test of the straws was fully automised after the installation of the C-frames on the C-side in the LHCb detector. Therefore, only the A-side of the Outer Tracker was (almost) fully tested.

4.3.1 ^{55}Fe test setup

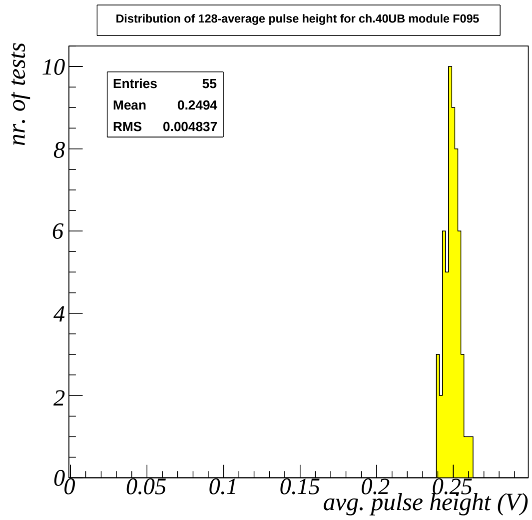
To measure the detector response, a setup was used that consists of:

- a temporary gas system that provided the modules with a 70:30 mixture of Ar/CO_2, at a flow rate of approximately 3 l/hr/mod [10];
- a 12 MBq ^{55}Fe monochromatic source;
- a Caen power supply to provide the sense wires with 1520 V;
- a test circuit board, manufactured in Heidelberg, connected to one monolayer of 64 straws [9] with 2 amplifiers for straw 1-32 and 33-64, respectively, see Fig. 10;
- a Tektronix TDS 200 digital real-time oscilloscope to collect the single straw amplified pulses;
- a pc running Labview to remotely operate the test circuit board and oscilloscope and to read out the oscilloscope and store the data to file.

Figure 10: *Photograph of the preamplifer board connected to a module.*



(a)



(b)

Figure 11: *(a) The pulse height spectrum from ^{55}Fe at 1500 V. (b) The average pulse height at 1520 V of 128 triggers, repeated 55 times, shows the reproducibility of the method: the average pulse height of a randomly chosen channel (ch 40BU of mod F095) varies with ± 5 mV.*

The monochromatic ^{55}Fe source emits photons of 5.9 keV that produce a constant charge of approximately 220 primary electrons in argon. The height of the corresponding pulse is proportional to the gas gain, independent of the material traversed by the photon. The pulse height spectrum at 1500 V is shown in Fig. 11a).

The ^{55}Fe source was placed in front of the module at a distance of approximately 40 cm from the module read-out, see Fig. 10. The source was placed close to the module to guarantee a high pulse rate, and illuminated about 10 straws. Therefore, the source had to be repositioned along the width of the module while testing the monolayer. For a typical distance of around 10 cm between source and module, the pulses were recorded at a rate of approximately 100 Hz for the front layer of straws and around 20 Hz for the rear monolayer. The rate of background pulses like cosmics and spurious noise was measured to be less than 1 Hz.

The test circuit board was connected to one layer of 64 straws at a time. Apart from the grounding and high voltage connection of the straws, the test circuit board houses a relais and two preamplifier boards. The relais switched between the 64 channels. It was remotely operated to switch between the straws, thereby allowing single straw readout. The preamplifier boards were developed at the *Physikalisches Institut in Heidelberg* [9]. These VV50 amplifiers are low noise charge amplifiers, meaning that the output voltage is proportional to the charge from the wire. They are mounted on the test circuit board, connecting to 64 decoupling capacitors and 1 MΩ resistors. The test-board is divided in two groups of 32 channels, each connected to one pre-amplifier. The VV50 boards are selected such, that the response of the two amplifiers is equal within approximately 2%. The amplifier saturates for ^{55}Fe pulses at values of the high voltage around 1550 V corresponding to a gain of about 5.10^5 [9]. The pulse heights after amplification typically range between -200 mV to -300 mV.

The amplified pulses of a single straw were read out from the test circuit board by a digital oscilloscope. The oscilloscope was set to register pulses below a threshold of -40 mV to filter out noise. Upon a remotely given trigger, the oscilloscope collected 128 pulses within a 10 s timeout window and returned the average pulse height. This average pulse height was then read out from the oscilloscope and stored to file. To determine the reproducebility of the result, multiple measurements on two straws were performed. The intrinsic accuracy is approximately 5 mV and is shown (for one of the two straws) in Fig. 11b).

4.3.2 Results of ^{55}Fe Pulse Height Measurements

The gas gain in a straw, and therefore the pulse height, depends on a large number of parameters, like gas composition, applied high voltage, atmospheric pressure, and temperature [2]. Neither the exact value of the high voltage, nor the temperature and pressure, nor the gas composition and flushing times were recorded during the ^{55}Fe test. Due to these uncertainties, the ^{55}Fe test should be considered as a functionality test of the straws, rather than a quantitative measurement of the straw performance.

The results of the average pulse heights of the 576 straws in one upper monolayer of C-frame T1-Q13-VX, layer-V are shown in Fig. 12a). In this example a few features can be observed:

- The S-modules have a higher response than the F-modules. Presumably this originates from the fact that they are attached to a different gas-line in the C-frame and that these 2 modules were measured one week later, on 07/03/2007. As a consequence both the atmospheric pressure, and the gas composition might have been different (ie. not having reached its equilibrium).

[2]For example, a gas mixture with Ar/CO_2 71/29 has 12% larger gain compared to 70/30, and the addition of 1% of nitrogen reduces the gain by 17% [11]. A decrease in atmospheric pressure of 10 mbar results in a larger gain of 5%.

- Dead channel 21(AU) of F-module 200, which was disconnected before shipment to Cern.

- S2U-module 038 shows 3 bad channels. These channels showed a large dark current at the ^{90}Sr scan at Nikhef before shipment to Cern, see Fig. 12b). The low average pulse height is due to the contribution of a large number of spurious pulses with smaller pulse height (noise).

- S1U-module 026 has 2 channels on the edge of the module with low pulse height. This is caused by bad gas flow through those straws, as was seen in the ^{90}Sr scan before shipment, see Fig. 12c).

The results for the average pulse heights of almost all 27648 channels in the 6 C-frames on the A-side are shown in Appendix B. From the measurements of the average pulse height the bad channels can be identied, and are listed in Table 3. Most bad channels were measured twice. If the channel showed a normal pulse height at the second measurement, it is not listed in the Table. In the figures in Appendix B the average of both measurements is shown.

Various categories of bad channels can be defined:

- Dead channels: typically channels that could not stand the high voltage after production. (Some channels did not respond due to faulty or broken 1st channel (ie. ch0) on the test board.)

- Low signal: this is caused by either a noisy channel, where the large nr of low noise-pulses decrease the average pulse height, or by channels with glue blocking the gas flow.

- High signal: this is causes by noise or discharges that increase the average pulse height.

Most problematic channels were identified at the production sites, as is listed in Table 3.

C-frame	Layer	Module		Monolayer		Ch	Sign.	Categorie
		Pos	Serial nr	A/B	Z+/-			(history)
T1-Q13-XU	L1(U)	3	F 076	B	+	0L	dead	bent pin on test board (?)
T1-Q13-XU	L1(U)	4	F 077	A	-	0L	dead	bent pin on test board (?)
T1-Q13-XU	L1(U)	7	F 195	B	+	48L	dead	?
T1-Q13-XU	L1(U)	8	S1U 024	B	+	22U	high	?
T1-Q13-XU	L1(U)	8	S1L 064	A	-	46L	high	noisy at Nikhef
T1-Q13-XU	L1(U)	8	S1L 064	A	-	55L	high	noisy at Nikhef
T1-Q13-XU	L1(U)	9	S2L 079	B	+	44L	dead	no signal at Nikhef
T1-Q13-VX	L2(V)	3	F 082	B	-	10L	low	?
T1-Q13-VX	L2(V)	3	F 082	B	-	11L	low	?
T1-Q13-VX	L2(V)	7	F 200	A	+	21U	dead	disconnected in Heidelberg
T1-Q13-VX	L2(V)	8	S1U 026	A	+	0U	low	?
T1-Q13-VX	L2(V)	9	S2U 038	B	+	34U	low	noisy at Nikhef
T1-Q13-VX	L2(V)	9	S2U 038	B	+	47U	low	noisy at Nikhef
T1-Q13-VX	L2(V)	9	S2U 038	B	+	52U	low	noisy at Nikhef
T1-Q13-VX	L3(X)	8	S1L 065	A	-	36L	dead	no signal at Nikhef
T1-Q13-VX	L3(X)	8	S1L 065	A	-	59L	low	noisy at Nikhef
T2-Q13-XU	L0(X)	8	S1U 125	A	-	20L	dead	no signal at Nikhef
T2-Q13-XU	L1(U)	6	F 201	A	-	4L	dead	?
T2-Q13-XU	L1(U)	8	S1L 068	B	+	63L	low	bad gas flow at Nikhef
T2-Q13-VX	L2(V)	8	S1U 010	A	+	0U	low	noisy at Nikhef
T2-Q13-VX	L2(V)	8	S1U 010	A	+	12U	dead	no signal at Nikhef
T2-Q13-VX	L2(V)	8	S1U 010	A	+	32U	low	noisy at Nikhef
T2-Q13-VX	L2(V)	8	S1U 010	A	+	34U	dead	no signal at Nikhef
T2-Q13-VX	L2(V)	8	S1U 010	A	+	57U	high	noisy at Nikhef
T3-Q13-XU	L1(U)	9	S2U 041	A	-	59U	dead	no signal at Nikhef
T3-Q13-VX	L2(V)	1	F 120	B	-	0U	dead	bent pin on test board (?)
T3-Q13-VX	L2(V)	2	F 158	A	+	0U	dead	bent pin on test board (?)
T3-Q13-VX	L2(V)	4	F 007	B	-	U	high	noisy at Nikhef
T3-Q13-VX	L2(V)	4	F 007	B	-	L	high	noisy at Nikhef
T3-Q13-VX	L3(X)	2	F 129	A	-	63L	low	bad gas flow at Nikhef
T3-Q13-VX	L3(X)	2	F 129	A	-	0U	low	bad gas flow at Nikhef
T3-Q13-VX	L3(X)	6	F 128	B	+	63L	high	noisy at Nikhef

Table 3: *The list of bad channels as determined with the* ^{55}*Fe pulse height measurement.*

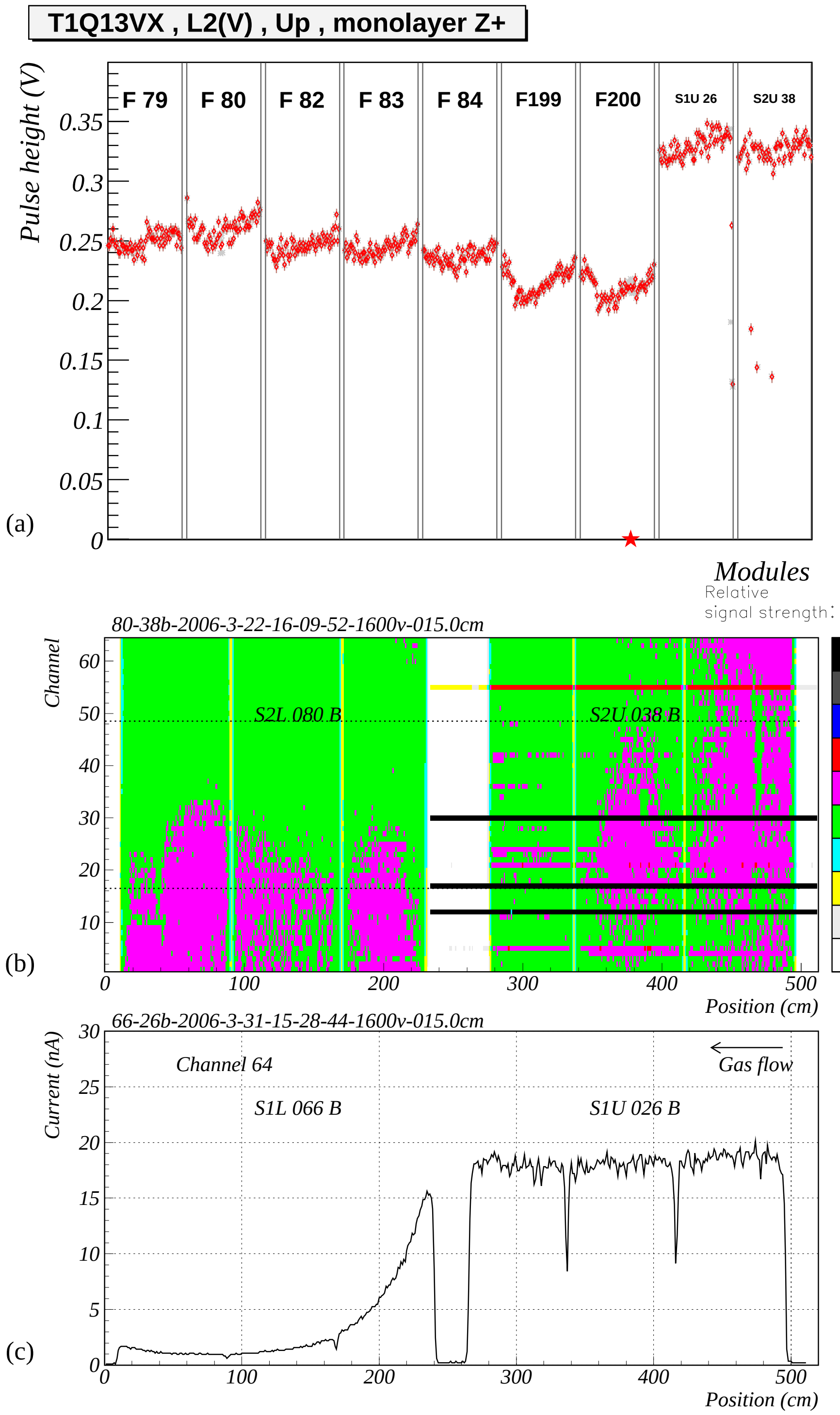


Figure 12: *(a) The average ^{55}Fe pulse heights of 576 straws in one upper monolayer of C-frame T1-Q13-VX, layer-V are shown. (b) The 3 channels in S2U 038 with low average signal response suffer from large noise rate, as can be seen from the ^{90}Sr scan at Nikhef as channels with large dark current. (c) The 2 channels in S2U 026 with low average signal response suffer from bad gas flow, as can be seen from the ^{90}Sr scan at Nikhef. Therefore the 2 channels on the side of S2U 026 need more time to reach the correct gas composition.*

5 Conclusion

During the installation of the Outer Tracker detector in 2006 and 2007 both the services on the C-frames and the repsonse of the individual straws have been carefully tested. The quality tests carried out on the detector modules show an excellent reproducibility of the results that were obtained at the production sites before shipment to Cern.

A Table with C-frame Measurements

Table 4: Results of the measurements on the C-frame services.

Station	Layer	Qua.	Module		L/U	dBm	dB	I (nA)	LV+ (V)	LV- (V)
T1-Q02-XU	0(X)	2	1	153	(U)	-26.70	-5.70	0.3	6.28	-6.65
T1-Q02-XU	0(X)	2	2	011	(U)	-29.80	-8.70	0.7	6.29	-6.65
T1-Q02-XU	0(X)	2	3	006	(U)	-24.30	-3.30	0.4	6.26	-6.65
T1-Q02-XU	0(X)	2	4	008	(U)	-24.00	-3.00	0.5	6.28	-6.66
T1-Q02-XU	0(X)	2	5	009	(U)	-24.60	-3.60	0.3	6.29	-6.65
T1-Q02-XU	0(X)	2	6	010	(U)	-29.90	-8.90	0.6	6.28	-6.66
T1-Q02-XU	0(X)	2	7	154	(U)	-24.20	-3.20	0.2	6.28	-6.65
T1-Q02-XU	0(X)	2	8	004	(U)	-24.90	-3.90	0.6	6.28	-6.65
T1-Q02-XU	0(X)	2	9	089	(U)	-24.50	-3.50	0.3	6.30	-6.65
T1-Q02-XU	0(X)	0	1	153	(L)	-25.15	1.26	0.4	6.18	-6.64
T1-Q02-XU	0(X)	0	2	011	(L)	-25.89	0.52	0.5	6.26	-6.64
T1-Q02-XU	0(X)	0	3	006	(L)	-23.82	2.58	0.4	6.29	-6.63
T1-Q02-XU	0(X)	0	4	008	(L)	-26.18	0.22	0.4	6.29	-6.65
T1-Q02-XU	0(X)	0	5	009	(L)	-25.62	0.78	0.3	6.29	-6.64
T1-Q02-XU	0(X)	0	6	010	(L)	-24.84	1.56	0.4	6.25	-6.64
T1-Q02-XU	0(X)	0	7	154	(L)	-24.86	1.55	0.2	6.24	-6.64
T1-Q02-XU	0(X)	0	8	045	(L)	-25.28	1.13	0.4	6.28	-6.64
T1-Q02-XU	0(X)	0	9	105	(L)	-25.08	1.33	0.4	6.29	-6.64
T1-Q02-XU	1(U)	2	1	004	(U)	-25.79	0.64	0.2	6.27	-6.65
T1-Q02-XU	1(U)	2	2	155	(U)	-26.32	0.09	0.5	6.27	-6.65
T1-Q02-XU	1(U)	2	3	012	(U)	-24.83	1.57	0.2	6.27	-6.64
T1-Q02-XU	1(U)	2	4	013	(U)	-25.77	0.67	0.8	6.27	-6.65
T1-Q02-XU	1(U)	2	5	014	(U)	-23.77	2.64	0.2	6.24	-6.63
T1-Q02-XU	1(U)	2	6	159	(U)	-25.92	0.49	0.3	6.28	-6.65
T1-Q02-XU	1(U)	2	7	016	(U)	-24.6	1.81	0.2	6.26	-6.65
T1-Q02-XU	1(U)	2	8	005	(U)	-25.18	1.22	0.3	6.27	-6.65
T1-Q02-XU	1(U)	2	9	091	(U)	-25.07	1.34	0.2	6.26	-6.65
T1-Q02-XU	1(U)	0	1	004	(L)	-26.4	0.01	0.3	6.27	-6.64
T1-Q02-XU	1(U)	0	2	155	(L)	-26.62	-0.22	0.5	6.29	-6.64
T1-Q02-XU	1(U)	0	3	012	(L)	-26.66	-0.26	0.3	6.29	-6.64
T1-Q02-XU	1(U)	0	4	013	(L)	-24.59	1.85	0.4	6.29	-6.64
T1-Q02-XU	1(U)	0	5	014	(L)	-25.03	1.31	0.2	6.25	-6.64
T1-Q02-XU	1(U)	0	6	159	(L)	-24.02	2.39	0.4	6.29	-6.64
T1-Q02-XU	1(U)	0	7	016	(L)	-23.99	2.43	0.2	6.28	-6.64
T1-Q02-XU	1(U)	0	8	046	(L)	-25.75	0.65	0.3	6.29	-6.64
T1-Q02-XU	1(U)	0	9	107	(L)	-25.13	1.27	0.2	6.29	-6.62
T1-Q02-VX	0(V)	2	1	038	(U)	-26.09	0.31	0.3	6.3	-6.65
T1-Q02-VX	0(V)	2	2	018	(U)	-27.95	-1.54	3.7	6.32	-6.64
T1-Q02-VX	0(V)	2	3	160	(U)	-25.99	0.42	0.5	6.31	-6.65

Table 4 (continued): *Results of the measurements on the C-frame services.*

Station	Layer	Qua.	Module		L/U	dBm	dB	I (nA)	LV+ (V)	LV- (V)
T1-Q02-VX	0(V)	2	4	19	(U)	-25.25	1.15	0.7	6.3	-6.66
T1-Q02-VX	0(V)	2	5	161	(U)	-26.26	0.15	0.4	6.28	-6.66
T1-Q02-VX	0(V)	2	6	20	(U)	-24.43	1.97	0.8	6.3	-6.66
T1-Q02-VX	0(V)	2	7	21	(U)	-24.73	1.68	0.3	6.3	-6.65
T1-Q02-VX	0(V)	2	8	08/47	(U)	-24.91	1.48	0.6	6.28	-6.65
T1-Q02-VX	0(V)	2	9	92/108	(U)	-24.52	1.89	0.3	6.31	-6.65
T1-Q02-VX	0(V)	0	1		(L)	-24.61	1.80	3.5	6.29	-6.65
T1-Q02-VX	0(V)	0	2		(L)	-27.2	-0.79	6.9	6.29	-6.66
T1-Q02-VX	0(V)	0	3		(L)	-25.85	0.55	4.1	6.31	-6.65
T1-Q02-VX	0(V)	0	4		(L)	-25.13	1.27	2.3	6.28	-6.66
T1-Q02-VX	0(V)	0	5		(L)	-25.95	0.47	1.8	6.23	-6.63
T1-Q02-VX	0(V)	0	6		(L)	-24.07	2.34	2.9	6.29	-6.65
T1-Q02-VX	0(V)	0	7		(L)	-24.73	1.68	1.5	6.31	-6.66
T1-Q02-VX	0(V)	0	8		(L)	-24.95	1.45	1.4	6.28	-6.65
T1-Q02-VX	0(V)	0	9		(L)	-25.43	0.97	1.7	6.30	-6.65
T1-Q02-VX	1(X)	2	1	163	(U)	-25.99	0.44	0.4	6.3	-6.64
T1-Q02-VX	1(X)	2	2	022	(U)	-24.78	1.63	4.0	6.25	-6.65
T1-Q02-VX	1(X)	2	3	023	(U)	-24.47	1.94	0.6	6.31	-6.65
T1-Q02-VX	1(X)	2	4	024	(U)	-24.49	1.93	0.9	6.31	-6.65
T1-Q02-VX	1(X)	2	5	025	(U)	-24.85	1.56	0.4	6.28	-6.66
T1-Q02-VX	1(X)	2	6	027	(U)	-27.26	-0.84	0.8	6.26	-6.66
T1-Q02-VX	1(X)	2	7	164	(U)	-26.56	-0.16	1.1	6.28	-6.71
T1-Q02-VX	1(X)	2	8	11/49	(U)	-25.69	-0.73	0.6	6.29	-6.65
T1-Q02-VX	1(X)	2	9	093/109	(U)	-26.76	-0.36	0.5	6.29	-6.64
T1-Q02-VX	1(X)	0	1		(L)	-25.01	1.39	3.8	6.3	-6.62
T1-Q02-VX	1(X)	0	2		(L)	-27.68	-1.28	5.0	6.17	-6.63
T1-Q02-VX	1(X)	0	3		(L)	-25.47	0.94	4.6	6.3	-6.65
T1-Q02-VX	1(X)	0	4		(L)	-25.05	-1.71	0.7	6.31	-6.65
T1-Q02-VX	1(X)	0	5		(L)	-24.65	1.75	2.6	6.21	-6.65
T1-Q02-VX	1(X)	0	6		(L)	-24.44	1.99	0.9	6.26	-6.64
T1-Q02-VX	1(X)	0	7		(L)	-25.05	1.35	1.6	6.3	-6.66
T1-Q02-VX	1(X)	0	8		(L)	-24.57	1.82	1.5	6.29	-6.65
T1-Q02-VX	1(X)	0	9		(L)	-23.88	2.53	2.5	6.29	-6.65
T1-Q13-XU	1(X)	3	1	17	(U)	-27.32	-4.74	0.2	6.158	-6.634
T1-Q13-XU	1(X)	3	2	70	(U)	-26.98	-4.39	0.2	6.261	-6.634
T1-Q13-XU	1(X)	3	3	71	(U)	-26.40	-3.80	0.2	6.299	-6.638
T1-Q13-XU	1(X)	3	4	72	(U)	-26.50	-3.91	0.2	6.223	-6.448
T1-Q13-XU	1(X)	3	5	73	(U)	-27.18	-4.58	0.2	6.235	-6.518
T1-Q13-XU	1(X)	3	6	188	(U)	-26.98	-4.40	0.2	6.225	-6.499
T1-Q13-XU	1(X)	3	7	189	(U)	-26.58	-4.00	0.1	6.348	-6.635
T1-Q13-XU	1(X)	3	8	18	(U)	-25.45	-2.87	0.2	6.246	-6.406
T1-Q13-XU	1(X)	3	9	35	(U)	-26.30	-3.75	0.2	6.354	-6.629
T1-Q13-XU	1(X)	1	1	17	(L)	-26.2	-3.51	0.2	6.27	-6.290
T1-Q13-XU	1(X)	1	2	70	(L)	-26.48	-4.54	0.2	6.072	-6.433

Table 4 (continued): *Results of the measurements on the C-frame services.*

Station	Layer	Qua.	Module		L/U	dBm	dB	I (nA)	LV+ (V)	LV- (V)
T1-Q13-XU	1(X)	1	3	71	(L)	-25.22	-3.29	0.2	6.242	-6.308
T1-Q13-XU	1(X)	1	4	72	(L)	-25.35	-3.40	0.3	6.179	-6.494
T1-Q13-XU	1(X)	1	5	73	(L)	-26.25	-4.37	0.2	6.285	-6.630
T1-Q13-XU	1(X)	1	6	188	(L)	-26.36	-4.42	0.2	6.261	-6.515
T1-Q13-XU	1(X)	1	7	189	(L)	-26.00	-4.06	0.1	6.29	-6.511
T1-Q13-XU	1(X)	1	8	57	(L)	-24.71	-2.77	0.2	6.292	-6.514
T1-Q13-XU	1(X)	1	9	77	(L)	-25.66	-3.73	0.3	6.247	-6.512
T1-Q13-XU	2(U)	3	1	74	(U)	-25.19	-2.60	0.2	6.24	-6.593
T1-Q13-XU	2(U)	3	2	75	(U)	-25.52	-3.43	0.2	6.24	-6.346
T1-Q13-XU	2(U)	3	3	76	(U)	-25.85	-3.25	0.2	6.13	-6.25
T1-Q13-XU	2(U)	3	4	77	(U)	-25.16	-2.57	0.2	6.2	-6.573
T1-Q13-XU	2(U)	3	5	78	(U)	-25.80	-3.22	0.2	6.074	-6.521
T1-Q13-XU	2(U)	3	6	193	(U)	-25.51	-2.93	0.2	6.138	-6.46
T1-Q13-XU	2(U)	3	7	195	(U)	-26.69	-4.10	0.1	6.033	-6.564
T1-Q13-XU	2(U)	3	8	24	(U)	-24.53	-1.94	0.2	6.15	-6.526
T1-Q13-XU	2(U)	3	9	36	(U)	-26.72	-4.13	0.2	6.24	-6.289
T1-Q13-XU	2(U)	1	1	74	(L)	-25.20	-2.60	0.2	6.13	-6.608
T1-Q13-XU	2(U)	1	2	75	(L)	-23.87	-1.29	0.2	6.152	-6.634
T1-Q13-XU	2(U)	1	3	76	(L)	-24.27	-1.68	0.2	6.293	-6.53
T1-Q13-XU	2(U)	1	4	77	(L)	-25.70	-3.12	0.2	6.292	-6.62
T1-Q13-XU	2(U)	1	5	78	(L)	-25.81	-3.23	0.2	6.278	-6.62
T1-Q13-XU	2(U)	1	6	193	(L)	-24.81	-2.80	0.1	6.276	-6.631
T1-Q13-XU	2(U)	1	7	195	(L)	-25.20	-2.62	0.2	6.278	-6.644
T1-Q13-XU	2(U)	1	8	64	(L)	-25.83	-3.24	0.2	6.292	-6.632
T1-Q13-XU	2(U)	1	9	79	(L)	-25.32	-2.68	0.2	6.292	-6.633
T1-Q13-VX	1(V)	3	1	79	(U)	-25.35	-3.08	0.3	6.292	-6.691
T1-Q13-VX	1(V)	3	2	80	(U)	-25.14	-2.80	0.3	6.281	-6.712
T1-Q13-VX	1(V)	3	3	82	(U)	-25.70	-3.42	0.2	6.342	-6.664
T1-Q13-VX	1(V)	3	4	83	(U)	-26.00	-3.74	0.3	6.281	-6.549
T1-Q13-VX	1(V)	3	5	84	(U)	-25.53	-3.24	0.2	6.366	-6.668
T1-Q13-VX	1(V)	3	6	199	(U)	-25.90	-3.62	0.1	6.196	-6.690
T1-Q13-VX	1(V)	3	7	200	(U)	-25.14	-2.80	0.2	6.258	-6.695
T1-Q13-VX	1(V)	3	8	26	(U)	-26.68	-4.41	0.2	6.334	-6.688
T1-Q13-VX	1(V)	3	9	38	(U)	-26.45	-4.19	0.3	6.350	-6.673
T1-Q13-VX	1(V)	1	1	79	(L)	-25.40	-2.90	0.2	6.27	-6.69
T1-Q13-VX	1(V)	1	2	80	(L)	-26.60	-4.30	0.3	6.26	-6.69
T1-Q13-VX	1(V)	1	3	82	(L)	-26.80	-4.27	0.2	6.35	-6.7
T1-Q13-VX	1(V)	1	4	83	(L)	-25.25	-2.99	0.3	6.33	-6.69
T1-Q13-VX	1(V)	1	5	84	(L)	-25.96	-3.69	0.2	6.33	-6.7
T1-Q13-VX	1(V)	1	6	199	(L)	-26.35	-4.07	0.2	6.32	-6.69
T1-Q13-VX	1(V)	1	7	200	(L)	-26.71	-4.44	0.1	6.280	-6.68
T1-Q13-VX	1(V)	1	8	66	(L)	-26.33	-4.07	0.2	6.28	-6.68
T1-Q13-VX	1(V)	1	9	80	(L)	-28.04	-5.79	0.3	6.28	-6.68
T1-Q13-VX	2(X)	3	1	85	(U)	-26.56	-3.62	0.2	6.35	-6.71

Table 4 (continued): *Results of the measurements on the C-frame services.*

Station	Layer	Qua.	Module		L/U	dBm	dB	I (nA)	LV+ (V)	LV- (V)
T1-Q13-VX	2(X)	3	2	86	(U)	-26.25	-3.47	0.3	6.37	-6.68
T1-Q13-VX	2(X)	3	3	87	(U)	-29.40	-7.10	0.2	6.36	-6.69
T1-Q13-VX	2(X)	3	4	88	(U)	-26.20	-3.20	0.3	6.28	-6.69
T1-Q13-VX	2(X)	3	5	89	(U)	-28.50	-5.60	0.2	6.32	-6.69
T1-Q13-VX	2(X)	3	6	197	(U)	-30.02	-7.09	0.2	6.27	-6.69
T1-Q13-VX	2(X)	3	7	198	(U)	-26.50	-3.56	0.1	6.26	-6.67
T1-Q13-VX	2(X)	3	8	25	(U)	-26.14	-3.20	0.2	6.36	-6.7
T1-Q13-VX	2(X)	3	9	39	(U)	-28.41	-5.48	0.3	6.3	-6.69
T1-Q13-VX	2(X)	1	1	85	(L)	-26.06	-3.79	0.3	6.240	-6.676
T1-Q13-VX	2(X)	1	2	86	(L)	-26.14	-3.83	0.3	6.291	-6.672
T1-Q13-VX	2(X)	1	3	87	(L)	-26.12	-3.83	0.2	6.220	-6.880
T1-Q13-VX	2(X)	1	4	88	(L)	-25.98	-3.74	0.3	6.338	-6.697
T1-Q13-VX	2(X)	1	5	89	(L)	-26.29	-4.00	0.2	6.259	-6.693
T1-Q13-VX	2(X)	1	6	197	(L)	-25.65	-3.39	0.2	6.298	-6.697
T1-Q13-VX	2(X)	1	7	198	(L)	-26.62	-4.35	0.1	6.366	-6.681
T1-Q13-VX	2(X)	1	8	65	(L)	-25.08	-2.82	0.2	6.333	-6.681
T1-Q13-VX	2(X)	1	9	81	(L)	-26.63	-4.36	0.3	6.325	-6.695
T2-Q02-XU	0(X)	2	1	026	(U)	-25.5	0.90	0.4	6.27	-6.64
T2-Q02-XU	0(X)	2	2	165	(U)	-25.6	0.80	1.4	6.30	-6.63
T2-Q02-XU	0(X)	2	3	028	(U)	-26.1	0.30	0.8	6.28	-6.64
T2-Q02-XU	0(X)	2	4	033	(U)	-24	2.30	0.6	6.28	-6.63
T2-Q02-XU	0(X)	2	5	031	(U)	-25.2	1.20	0.4	6.30	-6.64
T2-Q02-XU	0(X)	2	6	166	(U)	-25	1.40	0.2	6.28	-6.63
T2-Q02-XU	0(X)	2	7	032	(U)	-26.4	0.1	0.2	6.23	-6.64
T2-Q02-XU	0(X)	2	8	013	(U)	-25.8	0.6	0.2	6.29	-6.64
T2-Q02-XU	0(X)	2	9	94	(U)	-25.8	0.6	0.6	6.25	-6.65
T2-Q02-XU	0(X)	0	1	026	(L)	-26.4	0.05	0.4	6.17	-6.62
T2-Q02-XU	0(X)	0	2	165	(L)	-27	-0.6	1	6.24	-6.63
T2-Q02-XU	0(X)	0	3	028	(L)	-25.4	1	1.1	6.25	-6.63
T2-Q02-XU	0(X)	0	4	033	(L)	-26.3	0.13	0.3	6.27	-6.63
T2-Q02-XU	0(X)	0	5	031	(L)	-24	2.4	0.5	6.28	-6.62
T2-Q02-XU	0(X)	0	6	166	(L)	-24.5	2.1	0.3	6.23	-6.63
T2-Q02-XU	0(X)	0	7	032	(L)	-25.2	1.20	0.3	6.25	-6.63
T2-Q02-XU	0(X)	0	8	051	(L)	-24.1	2.40	0.3	6.27	-6.63
T2-Q02-XU	0(X)	0	9	110	(L)	-25.4	1.00	0.8	6.25	-6.6
T2-Q02-XU	1(U)	2	1	029	(U)	-24.9	1.60	0.5	6.29	-6.41
T2-Q02-XU	1(U)	2	2	036	(U)	-27.4	-1.20	1.7	6.31	-6.64
T2-Q02-XU	1(U)	2	3	167	(U)	-24.8	1.60	1.0	6.3	-6.64
T2-Q02-XU	1(U)	2	4	035	(U)	-25.4	0.90	0.6	6.31	-6.64
T2-Q02-XU	1(U)	2	5	171	(U)	-26.9	-0.40	0.6	6.3	-6.63
T2-Q02-XU	1(U)	2	6	034	(U)	-24.7	1.60	0.2	6.31	-6.64
T2-Q02-XU	1(U)	2	7	037	(U)	-25.1	1.30	0.2	6.31	-6.64
T2-Q02-XU	1(U)	2	8	014	(U)	-25.4	1	0.2	6.3	-6.64
T2-Q02-XU	1(U)	2	9	095	(U)	-24.7	1.7	0.7	6.3	-6.64

Table 4 (continued): *Results of the measurements on the C-frame services.*

Station	Layer	Qua.	Module		L/U	dBm	dB	I (nA)	LV+ (V)	LV- (V)
T2-Q02-XU	1(U)	0	1	029	(L)	-26.8	-0.30	1.0	6.27	-6.64
T2-Q02-XU	1(U)	0	2	036	(L)	-26.6	-0.20	0.6	6.28	-6.64
T2-Q02-XU	1(U)	0	3	167	(L)	-25.8	0.60	0.3	6.11	-6.64
T2-Q02-XU	1(U)	0	4	035	(L)	-24.8	1.60	0.3	6.28	-6.64
T2-Q02-XU	1(U)	0	5	171	(L)	-25.9	0.50	0.4	6.27	-6.64
T2-Q02-XU	1(U)	0	6	034	(L)	-26.8	-0.50	0.2	6.27	-6.64
T2-Q02-XU	1(U)	0	7	037	(L)	-26.4	-0.10	0.3	6.28	-6.64
T2-Q02-XU	1(U)	0	8	052	(L)	-28.2	-1.80	0.2	6.25	-6.64
T2-Q02-XU	1(U)	0	9	111	(L)	-26.5	-0.10	0.3	6.28	-6.64
T2-Q02-VX	2(V)	2	1	173	(U)	-24.2	-4.56	0.4	5.89	-6.64
T2-Q02-VX	2(V)	2	2	048	(U)	-24.82	-5.18	4.2	6.3	-6.64
T2-Q02-VX	2(V)	2	3	049	(U)	-23.83	-4.19	0.9	6.3	-6.65
T2-Q02-VX	2(V)	2	4	050	(U)	-24.27	-4.63	1.0	6.31	-6.65
T2-Q02-VX	2(V)	2	5	051	(U)	-24.27	-4.81	0.7	6.31	-6.65
T2-Q02-VX	2(V)	2	6	052	(U)	-25.45	-5.81	0.3	6.3	-6.65
T2-Q02-VX	2(V)	2	7	0174	(U)	-24.82	-5.18	0.2	6.3	-6.65
T2-Q02-VX	2(V)	2	8	015	(U)	-25.53	-5.88	0.2	6.29	-6.65
T2-Q02-VX	2(V)	2	9	097	(U)	-25.48	-5.83	0.7	6.3	-6.65
T2-Q02-VX	2(V)	0	1	173	(L)	-23.70	-0.70	0.5	6.28	-6.63
T2-Q02-VX	2(V)	0	2	048	(L)	-24.20	-1.20	5.6	6.26	-6.64
T2-Q02-VX	2(V)	0	3	049	(L)	-23.00	0.00	3.5	6.29	-6.63
T2-Q02-VX	2(V)	0	4	050	(L)	-22.70	0.40	0.4	6.29	-6.64
T2-Q02-VX	2(V)	0	5	051	(L)	-23.40	-0.40	10.3	6.28	-6.63
T2-Q02-VX	2(V)	0	6	052	(L)	-24.80	-1.70	0.4	6.26	-6.64
T2-Q02-VX	2(V)	0	7	0174	(L)	-21.70	1.30	0.2	6.24	-6.64
T2-Q02-VX	2(V)	0	8	053	(L)	-21.70	1.30	1.4	6.99	-6.64
T2-Q02-VX	2(V)	0	9	113	(L)	-22.60	0.40	0.7	6.28	-6.63
T2-Q02-VX	3(X)	2	1	053	(U)	-25.51	-5.86	0.3	6.25	-6.7
T2-Q02-VX	3(X)	2	2	175	(U)	-24.78	-5.14	4.9	6.24	-6.65
T2-Q02-VX	3(X)	2	3	054	(U)	-24.08	-4.44	0.8	6.26	-6.65
T2-Q02-VX	3(X)	2	4	055	(U)	-24.45	-4.81	0.3	6.25	-6.65
T2-Q02-VX	3(X)	2	5	056	(U)	-24.81	-5.16	0.6	6.23	-6.65
T2-Q02-VX	3(X)	2	6	176	(U)	-24.67	-5.02	0.3	6.26	-6.65
T2-Q02-VX	3(X)	2	7	057	(U)	-23.71	-4.06	0.6	6.25	-6.65
T2-Q02-VX	3(X)	2	8	016	(U)	-22.26	-2.61	0.2	6.26	-6.65
T2-Q02-VX	3(X)	2	9	098	(U)	-23.18	-3.53	0.9	6.24	-6.65
T2-Q02-VX	3(X)	0	1	053	(L)	-23.27	-0.23	0.7	6.27	-6.63
T2-Q02-VX	3(X)	0	2	175	(L)	-24.45	-1.40	4.7	6.29	-6.63
T2-Q02-VX	3(X)	0	3	054	(L)	-22.46	0.50	1.4	6.27	-6.63
T2-Q02-VX	3(X)	0	4	055	(L)	-22.71	0.33	0.4	6.29	-6.63
T2-Q02-VX	3(X)	0	5	056	(L)	-24.71	-1.66	0.7	5.93	-6.63
T2-Q02-VX	3(X)	0	6	176	(L)	-22.78	0.26	0.4	6.28	-6.63
T2-Q02-VX	3(X)	0	7	057	(L)	-22.83	0.22	0.2	6.26	-6.63
T2-Q02-VX	3(X)	0	8	054	(L)	-22.48	0.57	2.0	6.29	-6.63

Table 4 (continued): *Results of the measurements on the C-frame services.*

Station	Layer	Qua.	Module		L/U	dBm	dB	I (nA)	LV+ (V)	LV- (V)
T2-Q02-VX	3(X)	0	9	115	(L)	-23.14	-0.10	1.1	6.28	-6.64
T2-Q13-XU	1(X)	3	1	90	(U)	-25.72	-2.34	0.6	6.278	-6.622
T2-Q13-XU	1(X)	3	2	91	(U)	-26.51	-3.12	0.6	6.292	-6.020
T2-Q13-XU	1(X)	3	3	92	(U)	-28.03	-4.68	0.6	6.358	-6.639
T2-Q13-XU	1(X)	3	4	93	(U)	-26.18	-2.81	0.6	6.277	-6.637
T2-Q13-XU	1(X)	3	5	94	(U)	-26.98	-3.59	0.6	6.343	-6.610
T2-Q13-XU	1(X)	3	6	194	(U)	-28.85	-5.47	0.6	6.291	-6.626
T2-Q13-XU	1(X)	3	7	204	(U)	-26.2	-2.93	0.3	6.351	-6.627
T2-Q13-XU	1(X)	3	8	125	(U)	-27.79	-4.42	0.3	6.298	-6.639
T2-Q13-XU	1(X)	3	9	31	(U)	-26.82	-3.44	0.7	6.318	-6.631
T2-Q13-XU	1(X)	1	1	90	(L)	-26.89	-4.11	0.4	6.187	-6.636
T2-Q13-XU	1(X)	1	2	91	(L)	-27.31	-4.53	0.4	6.287	-6.636
T2-Q13-XU	1(X)	1	3	92	(L)	-25.56	-2.77	0.3	6.327	-6.638
T2-Q13-XU	1(X)	1	4	93	(L)	-26.70	-3.93	0.4	6.233	-6.632
T2-Q13-XU	1(X)	1	5	94	(L)	-26.20	-3.44	0.4	6.284	-6.617
T2-Q13-XU	1(X)	1	6	194	(L)	-26.10	-3.26	0.2	6.293	-6.637
T2-Q13-XU	1(X)	1	7	204	(L)	-25.84	-3.14	0.2	6.312	-6.632
T2-Q13-XU	1(X)	1	8	122	(L)	-26.10	-3.34	0.3	6.275	-6.611
T2-Q13-XU	1(X)	1	9	73	(L)	-26.42	-3.63	0.8	6.343	-6.651
T2-Q13-XU	2(U)	3	1	95	(U)	-26.8	-3.24	0.4	6.257	-6.629
T2-Q13-XU	2(U)	3	2	96	(U)	-27.6	-4.19	0.5	6.293	-6.613
T2-Q13-XU	2(U)	3	3	97	(U)	-26.26	-2.78	0.5	6.298	-6.636
T2-Q13-XU	2(U)	3	4	98	(U)	-28.09	-4.58	0.6	6.345	-6.605
T2-Q13-XU	2(U)	3	5	99	(U)	-26.33	-3.88	0.6	6.294	-6.607
T2-Q13-XU	2(U)	3	6	201	(U)	-27.96	-4.56	0.3	6.257	-6.641
T2-Q13-XU	2(U)	3	7	203	(U)	-25.45	-2.07	0.3	6.214	-6.636
T2-Q13-XU	2(U)	3	8	27	(U)	-25.14	-1.76	0.4	6.290	-6.636
T2-Q13-XU	2(U)	3	9	32	(U)	-25.83	-2.45	1	6.280	-6.619
T2-Q13-XU	2(U)	1	1	95	(L)	-27.84	-4.42	0.3	6.235	-6.623
T2-Q13-XU	2(U)	1	2	96	(L)	-27.16	-3.78	0.5	6.257	-6.612
T2-Q13-XU	2(U)	1	3	97	(L)	-27.49	-4.10	0.4	6.269	-6.631
T2-Q13-XU	2(U)	1	4	98	(L)	-27.36	-3.95	0.3	6.285	-6.634
T2-Q13-XU	2(U)	1	5	99	(L)	-26.80	-3.41	0.4	6.288	-6.638
T2-Q13-XU	2(U)	1	6	201	(L)	-27.08	-3.69	0.2	6.300	-6.633
T2-Q13-XU	2(U)	1	7	203	(L)	-27.44	-4.07	0.2	6.217	-6.628
T2-Q13-XU	2(U)	1	8	68	(L)	-26.60	-3.30	0.2	6.255	-6.632
T2-Q13-XU	2(U)	1	9	74	(L)	-27.24	3.83	0.8	6.286	-6.621
T2-Q13-VX	1(X)	3	1	105	(U)	-27.21	-4.83	0.2	6.342	-6.638
T2-Q13-VX	1(X)	3	2	106	(U)	-25.45	-3.10	0.3	6.284	-6.631
T2-Q13-VX	1(X)	3	3	107	(U)	-25.73	-3.36	0.2	6.286	-6.635
T2-Q13-VX	1(X)	3	4	108	(U)	-27.20	-4.83	0.3	6.241	-6.625
T2-Q13-VX	1(X)	3	5	109	(U)	-24.89	-2.52	0.2	6.250	-6.626
T2-Q13-VX	1(X)	3	6	205	(U)	-25.97	-3.60	0.2	6.243	-6.635
T2-Q13-VX	1(X)	3	7	206	(U)	-26.26	-3.89	0.1	6.280	-6.630

Table 4 (continued): *Results of the measurements on the C-frame services.*

Station	Layer	Qua.	Module		L/U	dBm	dB	I (nA)	LV+ (V)	LV- (V)
T2-Q13-VX	1(X)	3	8	127	(U)	-25.97	-3.58	0.2	6.200	-6.629
T2-Q13-VX	1(X)	3	9	034	(U)	-25.15	-2.77	0.3	6.260	-6.605
T2-Q13-VX	1(X)	1	1	105	(L)	-27.04	-4.29	0.2	6.237	-6.624
T2-Q13-VX	1(X)	1	2	106	(L)	-24.82	-2.08	0.2	6.217	-6.626
T2-Q13-VX	1(X)	1	3	107	(L)	-27.95	-5.20	0.2	6.278	-6.631
T2-Q13-VX	1(X)	1	4	108	(L)	-27.43	-4.68	0.3	6.333	-6.624
T2-Q13-VX	1(X)	1	5	109	(L)	-27.03	-4.29	0.2	6.272	-6.607
T2-Q13-VX	1(X)	1	6	205	(L)	-26.94	-4.20	0.2	6.291	-6.619
T2-Q13-VX	1(X)	1	7	206	(L)	-24.32	-1.57	0.2	6.361	-6.628
T2-Q13-VX	1(X)	1	8	124	(L)	-26.38	-3.64	0.2	6.340	-6.624
T2-Q13-VX	1(X)	1	9	76	(L)	-26.13	-3.39	0.3	6.331	-6.604
T2-Q13-VX	2(V)	3	1	100	(U)	-26.75	-4.38	0.2	6.230	-6.631
T2-Q13-VX	2(V)	3	2	101	(U)	-25.91	-3.55	0.3	6.224	-6.571
T2-Q13-VX	2(V)	3	3	102	(U)	-25.60	-3.23	0.2	6.284	-6.616
T2-Q13-VX	2(V)	3	4	103	(U)	-26.50	-4.12	0.3	6.292	-6.620
T2-Q13-VX	2(V)	3	5	104	(U)	-26.23	-3.86	0.2	6.277	-6.640
T2-Q13-VX	2(V)	3	6	172	(U)	-26.25	-3.87	0.2	6.275	-6.601
T2-Q13-VX	2(V)	3	7	208	(U)	-24.60	-2.22	0.1	6.351	-6.618
T2-Q13-VX	2(V)	3	8	10	(U)	-26.02	-3.65	0.2	6.248	-6.609
T2-Q13-VX	2(V)	3	9	33	(U)	-27.16	-4.79	0.4	6.289	-6.624
T2-Q13-VX	2(V)	1	1	100	(L)	-24.99	-2.24	0.2	6.237	-6.618
T2-Q13-VX	2(V)	1	2	101	(L)	-25.18	-2.43	0.3	6.217	-6.634
T2-Q13-VX	2(V)	1	3	102	(L)	-23.95	-1.20	0.2	6.278	-6.632
T2-Q13-VX	2(V)	1	4	103	(L)	-24.82	-2.06	0.3	6.333	-6.641
T2-Q13-VX	2(V)	1	5	104	(L)	-24.60	-1.77	0.2	6.272	-6.622
T2-Q13-VX	2(V)	1	6	172	(L)	-24.38	-1.62	0.2	6.291	-6.621
T2-Q13-VX	2(V)	1	7	208	(L)	-24.50	-1.75	0.1	6.361	-6.640
T2-Q13-VX	2(V)	1	8	50	(L)	-24.58	-1.83	0.2	6.340	-6.619
T2-Q13-VX	2(V)	1	9	75	(L)	-25.09	-2.35	0.3	6.331	-6.626
T3-Q02-XU	0(X)	2	1	043	(U)	-25.00	-3.47	0.3	6.27	-6.63
T3-Q02-XU	0(X)	2	2	039	(U)	-25.77	-4.26	0.7	6.28	-6.63
T3-Q02-XU	0(X)	2	3	178	(U)	-25.95	-4.44	0.3	6.28	-6.64
T3-Q02-XU	0(X)	2	4	040	(U)	-25.45	-3.94	0.6	6.27	-6.64
T3-Q02-XU	0(X)	2	5	180	(U)	-24.48	-2.94	0.3	6.29	-6.62
T3-Q02-XU	0(X)	2	6	041	(U)	-24.75	-3.21	0.5	6.27	-6.63
T3-Q02-XU	0(X)	2	7	042	(U)	-25.11	-3.58	0.2	6.29	-6.64
T3-Q02-XU	0(X)	2	8	017	(U)	-24.20	-2.69	0.6	6.3	-6.59
T3-Q02-XU	0(X)	2	9	100	(U)	-25.27	-3.75	0.4	6.29	-6.64
T3-Q02-XU	0(X)	0	1	043	(L)	-25.61	-4.12	0.3	6.29	-6.6
T3-Q02-XU	0(X)	0	2	039	(L)	-25.46	-3.95	0.7	6.29	-6.63
T3-Q02-XU	0(X)	0	3	178	(L)	-24.64	-3.11	0.3	6.28	-6.64
T3-Q02-XU	0(X)	0	4	040	(L)	-26.21	-4.71	0.6	6.28	-6.64
T3-Q02-XU	0(X)	0	5	180	(L)	-25.41	-3.90	0.3	6.3	-6.59
T3-Q02-XU	0(X)	0	6	041	(L)	-26.32	-4.81	0.7	6.3	-6.63

Table 4 (continued): *Results of the measurements on the C-frame services.*

Station	Layer	Qua.	Module		L/U	dBm	dB	I (nA)	LV+ (V)	LV- (V)
T3-Q02-XU	0(X)	0	7	042	(L)	-24.65	-3.14	0.2	6.27	-6.64
T3-Q02-XU	0(X)	0	8	056	(L)	-24.74	-3.23	0.6	6.28	-6.64
T3-Q02-XU	0(X)	0	9	118	(L)	-24.89	-3.38	0.3	6.25	-6.63
T3-Q02-XU	1(U)	2	1	181	(U)	-26.41	-4.90	0.3	6.28	-6.63
T3-Q02-XU	1(U)	2	2	059	(U)	-26.34	-4.84	0.6	6.28	-6.65
T3-Q02-XU	1(U)	2	3	044	(U)	-25.02	-3.49	0.2	6.29	-6.64
T3-Q02-XU	1(U)	2	4	045	(U)	-25.68	-4.18	0.6	6.29	-6.63
T3-Q02-XU	1(U)	2	5	046	(U)	-24.26	-2.75	0.2	6.28	-6.64
T3-Q02-XU	1(U)	2	6	047	(U)	-25.70	-4.20	0.5	6.28	-6.64
T3-Q02-XU	1(U)	2	7	182	(U)	-24.61	-3.09	0.2	6.28	-6.64
T3-Q02-XU	1(U)	2	8	018	(U)	-25.78	-4.29	0.6	6.28	-6.64
T3-Q02-XU	1(U)	2	9	101	(U)	-24.87	-3.35	0.3	6.29	-6.64
T3-Q02-XU	1(U)	0	1	181	(L)	-25.09	-3.22	0.3	6.29	-6.64
T3-Q02-XU	1(U)	0	2	059	(L)	-26.95	-5.1	0.6	6.28	-6.64
T3-Q02-XU	1(U)	0	3	044	(L)	-26.42	-4.57	0.3	6.3	-6.63
T3-Q02-XU	1(U)	0	4	045	(L)	-26.82	-4.94	0.6	6.3	-6.64
T3-Q02-XU	1(U)	0	5	046	(L)	-25.85	-4	0.3	6.27	-6.64
T3-Q02-XU	1(U)	0	6	047	(L)	-26.62	-4.76	0.6	6.29	-6.63
T3-Q02-XU	1(U)	0	7	182	(L)	-27.82	-5.96	0.2	6.29	-6.64
T3-Q02-XU	1(U)	0	8	057	(L)	-26.91	-5.06	0.6	6.29	-6.65
T3-Q02-XU	1(U)	0	9	120	(L)	-25.83	-3.97	0.3	6.3	-6.63
T3-Q02-VX	1(V)	2	1	069	(U)	-26.7	-4.85	0.3	6.24	-6.64
T3-Q02-VX	1(V)	2	2	183	(U)	-27.85	-6.05	0.2	6.29	-6.65
T3-Q02-VX	1(V)	2	3	060	(U)	-25.72	-3.86	0.2	6.28	-6.64
T3-Q02-VX	1(V)	2	4	061	(U)	-27.58	-5.74	0.2	6.29	-6.64
T3-Q02-VX	1(V)	2	5	062	(U)	-23.98	-2.13	0.2	6.28	-6.65
T3-Q02-VX	1(V)	2	6	184	(U)	-24.73	-2.84	0.2	6.30	-6.64
T3-Q02-VX	1(V)	2	7	063	(U)	-25.78	-3.94	0.2	6.29	-6.64
T3-Q02-VX	1(V)	2	8	021-061	(U)	-25.22	-3.38	0.2	6.28	-6.64
T3-Q02-VX	1(V)	2	9	059-104	(U)	-24.6	-2.7	0.2	6.29	-6.64
T3-Q02-VX	1(V)	0	1		(L)	-25.11	-3.26	0.3	6.27	-6.64
T3-Q02-VX	1(V)	0	2		(L)	-26.54	-4.70	0.2	6.27	-6.63
T3-Q02-VX	1(V)	0	3		(L)	-25.64	-3.81	0.3	6.25	-6.64
T3-Q02-VX	1(V)	0	4		(L)	-25.05	-3.21	0.2	6.30	-6.65
T3-Q02-VX	1(V)	0	5		(L)	-25.36	-3.57	0.3	6.24	-6.64
T3-Q02-VX	1(V)	0	6		(L)	-25.27	-3.42	0.2	6.30	-6.64
T3-Q02-VX	1(V)	0	7		(L)	-26.36	-4.50	0.2	6.31	-6.64
T3-Q02-VX	1(V)	0	8		(L)	-24.78	-2.94	0.2	6.30	-6.64
T3-Q02-VX	1(V)	0	9		(L)	-25.39	-3.55	0.4	6.29	-6.63
T3-Q02-VX	2(X)	2	1	064	(U)	-27.63	-5.91	0.2	6.27	-6.63
T3-Q02-VX	2(X)	2	2	065	(U)	-26.25	-4.50	0.2	6.29	-6.64
T3-Q02-VX	2(X)	2	3	185	(U)	-26.19	-4.89	0.2	6.29	-6.64
T3-Q02-VX	2(X)	2	4	066	(U)	-26.19	-4.33	0.2	6.28	-6.63
T3-Q02-VX	2(X)	2	5	186	(U)	-26.8	-4.60	0.2	6.27	-6.64

Table 4 (continued): *Results of the measurements on the C-frame services.*

Station	Layer	Qua.	Module		L/U	dBm	dB	I (nA)	LV+ (V)	LV- (V)
T3-Q02-VX	2(X)	2	6	067	(U)	-25.8	-3.94	0.2	6.30	-6.65
T3-Q02-VX	2(X)	2	7	068	(U)	-25.6	-3.77	0.2	6.29	-6.64
T3-Q02-VX	2(X)	2	8	106-090	(U)	-24.24	-2.40	0.2	6.28	-6.64
T3-Q02-VX	2(X)	2	9	060-020	(U)	-26.02	-4.04	0.3	6.28	-6.63
T3-Q02-VX	2(X)	0	1		(L)	-25.96	-4.12	0.2	6.28	-6.63
T3-Q02-VX	2(X)	0	2		(L)	-26.04	-4.20	0.3	6.30	-6.64
T3-Q02-VX	2(X)	0	3		(L)	-25.3	-3.44	0.2	6.30	-6.64
T3-Q02-VX	2(X)	0	4		(L)	-24.58	-2.71	0.2	6.29	-6.65
T3-Q02-VX	2(X)	0	5		(L)	-23.85	-2.01	0.2	6.30	-6.60
T3-Q02-VX	2(X)	0	6		(L)	-25.3	-3.43	0.1	6.29	-6.63
T3-Q02-VX	2(X)	0	7		(L)	-26.14	-4.27	0.2	6.30	-6.65
T3-Q02-VX	2(X)	0	8		(L)	-26.02	-4.17	0.2	6.28	-6.64
T3-Q02-VX	2(X)	0	9		(L)	-25.87	-4.02	0.3	6.29	-6.63
T3-Q13-XU	1(X)	3	1	110	(U)	-26.48	-4.10	0.2	6.253	-6.62
T3-Q13-XU	1(X)	3	2	111	(U)	-27.09	-4.72	0.2	6.283	-6.639
T3-Q13-XU	1(X)	3	3	207	(U)	-25.65	-3.30	0.3	6.275	-6.619
T3-Q13-XU	1(X)	3	4	113	(U)	-27.01	-4.65	0.2	6.278	-6.636
T3-Q13-XU	1(X)	3	5	210	(U)	-26.52	-4.16	0.2	6.169	-6.633
T3-Q13-XU	1(X)	3	6	114	(U)	-25.72	-3.32	0.2	6.272	-6.633
T3-Q13-XU	1(X)	3	7	115	(U)	-27.00	-4.65	0.1	6.165	-6.639
T3-Q13-XU	1(X)	3	8	126	(U)	-26.29	-3.94	0.3	6.293	-6.627
T3-Q13-XU	1(X)	3	9	40	(U)	-27.30	-4.93	0.3	6.294	-6.635
T3-Q13-XU	1(X)	1	1	110	(L)	-26.34	-3.99	0.2	6.281	-6.633
T3-Q13-XU	1(X)	1	2	111	(L)	-26.41	-4.04	0.2	6.281	-6.622
T3-Q13-XU	1(X)	1	3	207	(L)	-25.9	-3.54	0.2	6.29	-6.636
T3-Q13-XU	1(X)	1	4	113	(L)	-26	-3.64	0.2	6.299	-6.584
T3-Q13-XU	1(X)	1	5	210	(L)	-25.7	-3.34	0.2	6.291	-6.618
T3-Q13-XU	1(X)	1	6	114	(L)	-24.67	-2.31	0.1	6.142	-6.636
T3-Q13-XU	1(X)	1	7	115	(L)	-25.81	-3.45	0.1	6.279	-6.633
T3-Q13-XU	1(X)	1	8	123	(L)	-25.89	-3.53	0.2	6.108	-6.636
T3-Q13-XU	1(X)	1	9	82	(L)	-26.48	-4.12	0.2	6.266	-6.637
T3-Q13-XU	2(U)	3	1	196	(U)	-25.29	-2.93	0.2	6.294	-6.634
T3-Q13-XU	2(U)	3	2	116	(U)	-26.55	-4.19	0.2	6.266	-6.634
T3-Q13-XU	2(U)	3	3	117	(U)	-25.31	-2.96	0.2	6.3	-6.636
T3-Q13-XU	2(U)	3	4	118	(U)	-26.53	-4.16	0.2	6.292	-6.636
T3-Q13-XU	2(U)	3	5	119	(U)	-25.54	-3.18	0.2	6.297	-6.645
T3-Q13-XU	2(U)	3	6	121	(U)	-25.21	-2.85	0.1	6.329	-6.641
T3-Q13-XU	2(U)	3	7	212	(U)	-26.13	-3.78	0.1	6.18	-6.628
T3-Q13-XU	2(U)	3	8	28	(U)	-25.33	-2.96	0.1	6.305	-6.636
T3-Q13-XU	2(U)	3	9	041	(U)	-25.98	-3.62	0.3	6.125	-6.637
T3-Q13-XU	2(U)	1	1	196	(L)	-26.59	-4.22	0.2	6.254	-6.639
T3-Q13-XU	2(U)	1	2	116	(L)	-26.91	-4.54	0.2	6.289	-6.634
T3-Q13-XU	2(U)	1	3	117	(L)	-26.17	-3.81	0.2	6.190	-6.549
T3-Q13-XU	2(U)	1	4	118	(L)	-25.2	-2.84	0.2	6.300	-6.643

Table 4 (continued): *Results of the measurements on the C-frame services.*

Station	Layer	Qua.	Module		L/U	dBm	dB	I (nA)	LV+ (V)	LV- (V)
T3-Q13-XU	2(U)	1	5	119	(L)	-25.63	-3.27	0.1	6.102	-6.639
T3-Q13-XU	2(U)	1	6	121	(L)	-25.88	-3.51	0.1	6.231	-6.63
T3-Q13-XU	2(U)	1	7	212	(L)	-26.4	-4.04	0.1	6.285	-6.636
T3-Q13-XU	2(U)	1	8	70	(L)	-26.59	-4.22	0.2	6.276	-6.634
T3-Q13-XU	2(U)	1	9	083	(L)	-26.08	-3.71	0.2	6.296	-6.635
T3-Q13-VX	1(V)	3	1	120	(U)	-26.97	-4.61	0.2	6.307	-6.610
T3-Q13-VX	1(V)	3	2	158	(U)	-26.99	-4.63	0.3	6.336	-6.623
T3-Q13-VX	1(V)	3	3	122	(U)	-24.97	-2.62	0.3	6.340	-6.626
T3-Q13-VX	1(V)	3	4	007	(U)	-26.01	-3.65	0.3	6.361	-6.220
T3-Q13-VX	1(V)	3	5	124	(U)	-27.35	-4.99	0.2	6.321	-6.631
T3-Q13-VX	1(V)	3	6	187	(U)	-25.88	-3.52	0.1	6.165	-6.622
T3-Q13-VX	1(V)	3	7	126	(U)	-27.31	-4.95	0.1	6.180	-6.629
T3-Q13-VX	1(V)	3	8	128-130	(U)	-25.82	-3.45	0.1	6.260	-6.622
T3-Q13-VX	1(V)	3	9	43-85	(U)	-26.31	-3.94	0.4	6.363	-6.618
T3-Q13-VX	1(V)	1	1	120	(L)	-26.63	-3.05	0.2	6.233	-6.618
T3-Q13-VX	1(V)	1	2	158	(L)	-26.49	-2.92	0.3	6.241	-6.624
T3-Q13-VX	1(V)	1	3	122	(L)	-25.95	-2.37	0.3	6.195	-6.624
T3-Q13-VX	1(V)	1	4	007	(L)	-25.21	-1.63	0.2	6.246	-6.622
T3-Q13-VX	1(V)	1	5	124	(L)	-25.39	-1.72	0.2	6.219	-6.624
T3-Q13-VX	1(V)	1	6	187	(L)	-25.08	-1.50	0.1	6.247	-6.600
T3-Q13-VX	1(V)	1	7	126	(L)	-24.96	-1.37	0.1	6.308	-6.624
T3-Q13-VX	1(V)	1	8	128-130	(L)	-25.46	-1.88	0.1	6.274	-6.621
T3-Q13-VX	1(V)	1	9	43-85	(L)	-24.88	-1.29	0.2	6.271	-6.627
T3-Q13-VX	2(X)	3	1	125	(U)	-25.64	-3.28	0.2	6.340	-6.624
T3-Q13-VX	2(X)	3	2	129	(U)	-27.3	-4.93	0.2	6.280	-6.611
T3-Q13-VX	2(X)	3	3	209	(U)	-27.1	-4.75	0.2	6.324	-6.628
T3-Q13-VX	2(X)	3	4	127	(U)	-27.1	-4.64	0.3	6.383	-6.310
T3-Q13-VX	2(X)	3	5	211	(U)	-26.14	-3.78	0.2	6.334	-6.629
T3-Q13-VX	2(X)	3	6	128	(U)	-25.62	-3.26	0.1	6.305	-6.623
T3-Q13-VX	2(X)	3	7	130	(U)	-26.47	-4.10	0.1	6.290	-6.583
T3-Q13-VX	2(X)	3	8	129-131	(U)	-25.87	-3.52	0.1	6.316	-6.621
T3-Q13-VX	2(X)	3	9	120-86	(U)	-24.78	-2.42	0.3	6.329	-6.629
T3-Q13-VX	2(X)	1	1	125	(L)	-25.5	-3.14	0.2	6.241	-6.614
T3-Q13-VX	2(X)	1	2	129	(L)	-25.76	-3.41	0.2	6.254	-6.601
T3-Q13-VX	2(X)	1	3	209	(L)	-26.24	-3.88	0.2	6.279	-6.623
T3-Q13-VX	2(X)	1	4	127	(L)	-27.2	-4.85	0.2	6.283	-6.621
T3-Q13-VX	2(X)	1	5	211	(L)	-25.48	-3.13	0.1	6.261	-6.619
T3-Q13-VX	2(X)	1	6	128	(L)	-25.39	-3.03	0.1	6.282	-6.625
T3-Q13-VX	2(X)	1	7	130	(L)	-26.43	-4.07	0.1	6.283	-6.607
T3-Q13-VX	2(X)	1	8	129-131	(L)	-26.33	-3.97	0.1	6.235	-6.607
T3-Q13-VX	2(X)	1	9	120-86	(L)	-25.53	-3.16	0.3	6.283	-6.521

B Results of ^{55}Fe Measurements

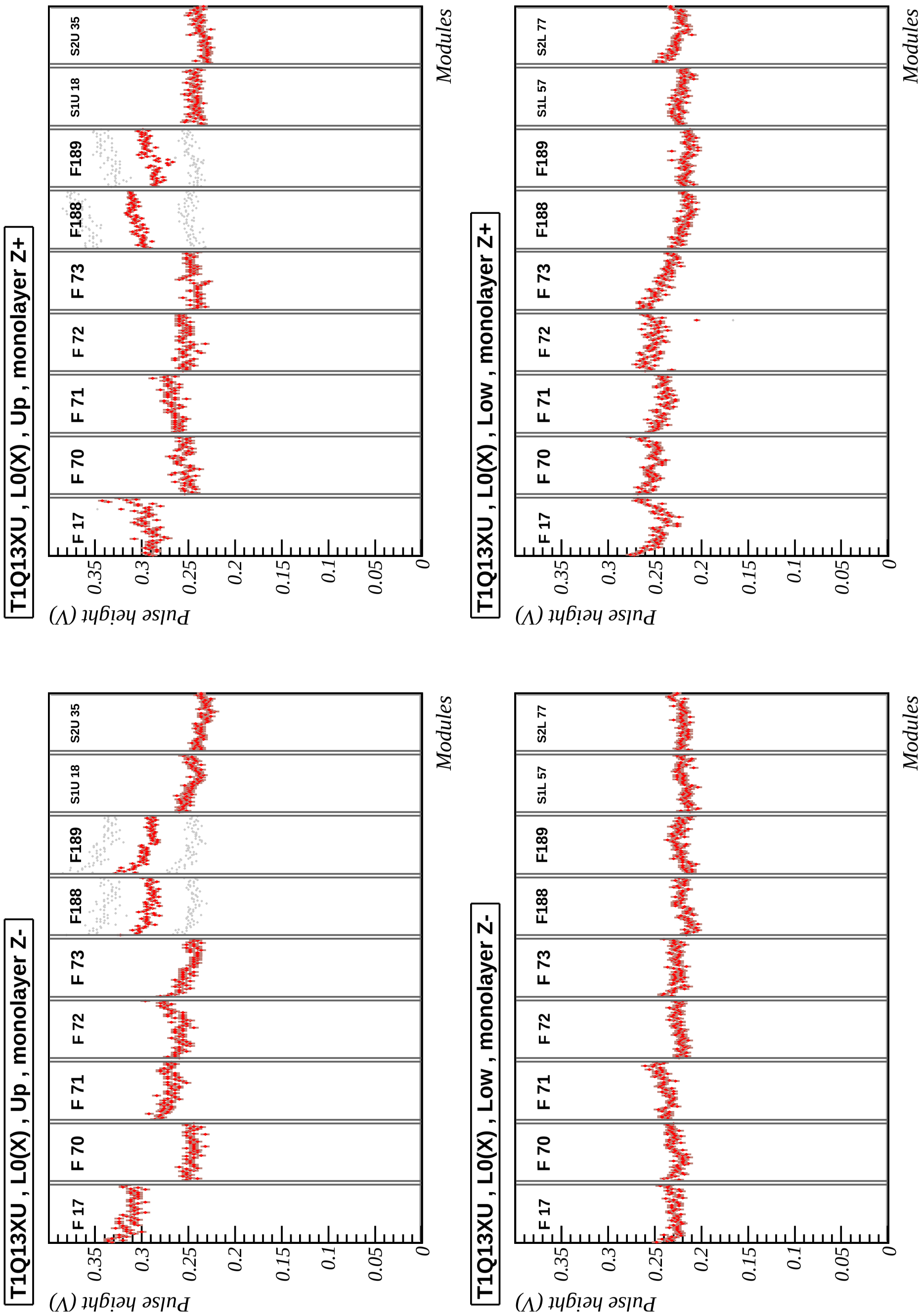


Figure 13: *Average ^{55}Fe pulse heights of all 2304 channels of the 9 modules of layer X of T1-Q13-XU.*

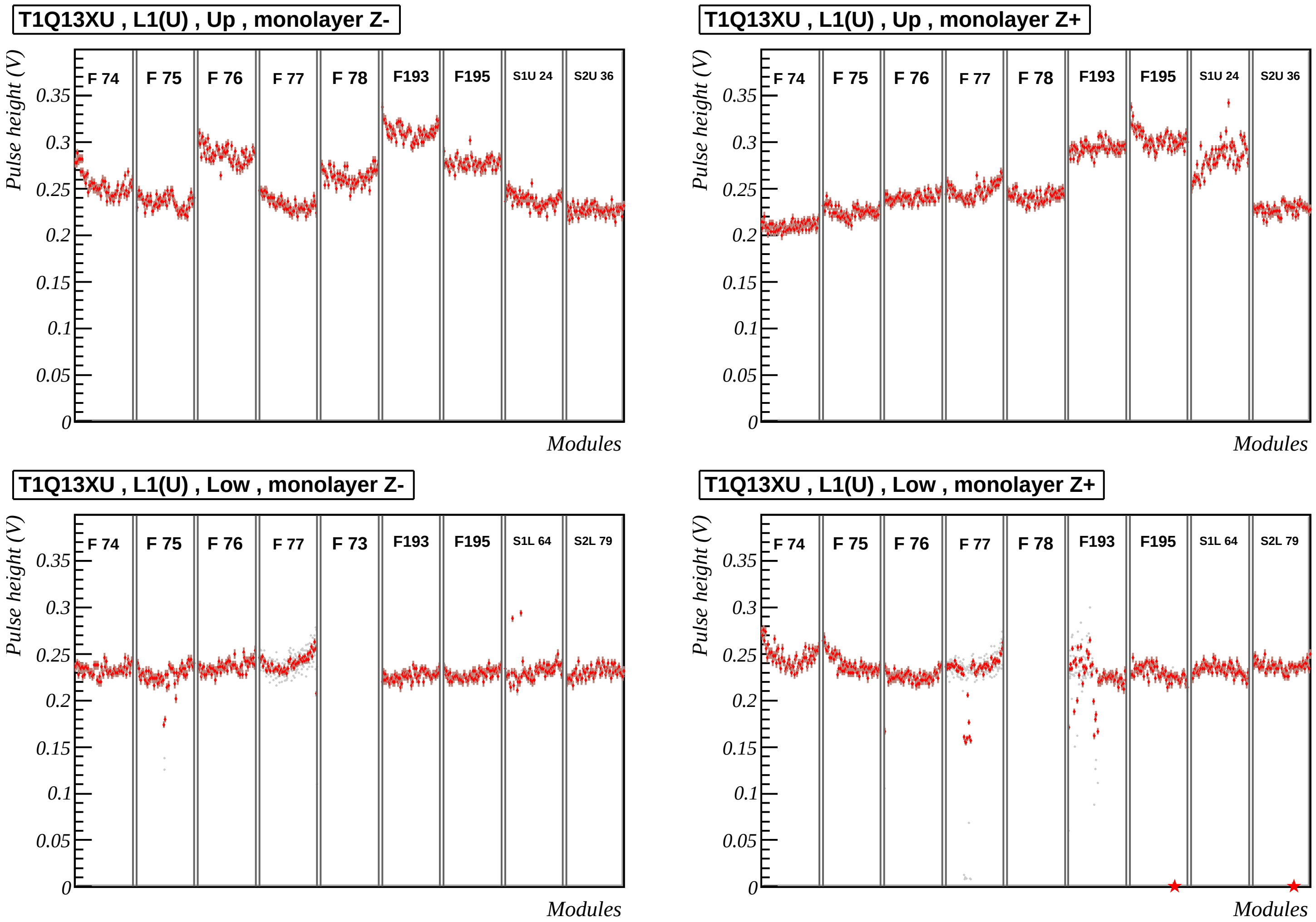


Figure 14: *Average* ^{55}*Fe pulse heights of all but 128 channels of the 9 modules of layer U of T1-Q13-XU. A few channels in module F077 were badly measured initially, but OK at the second try.*

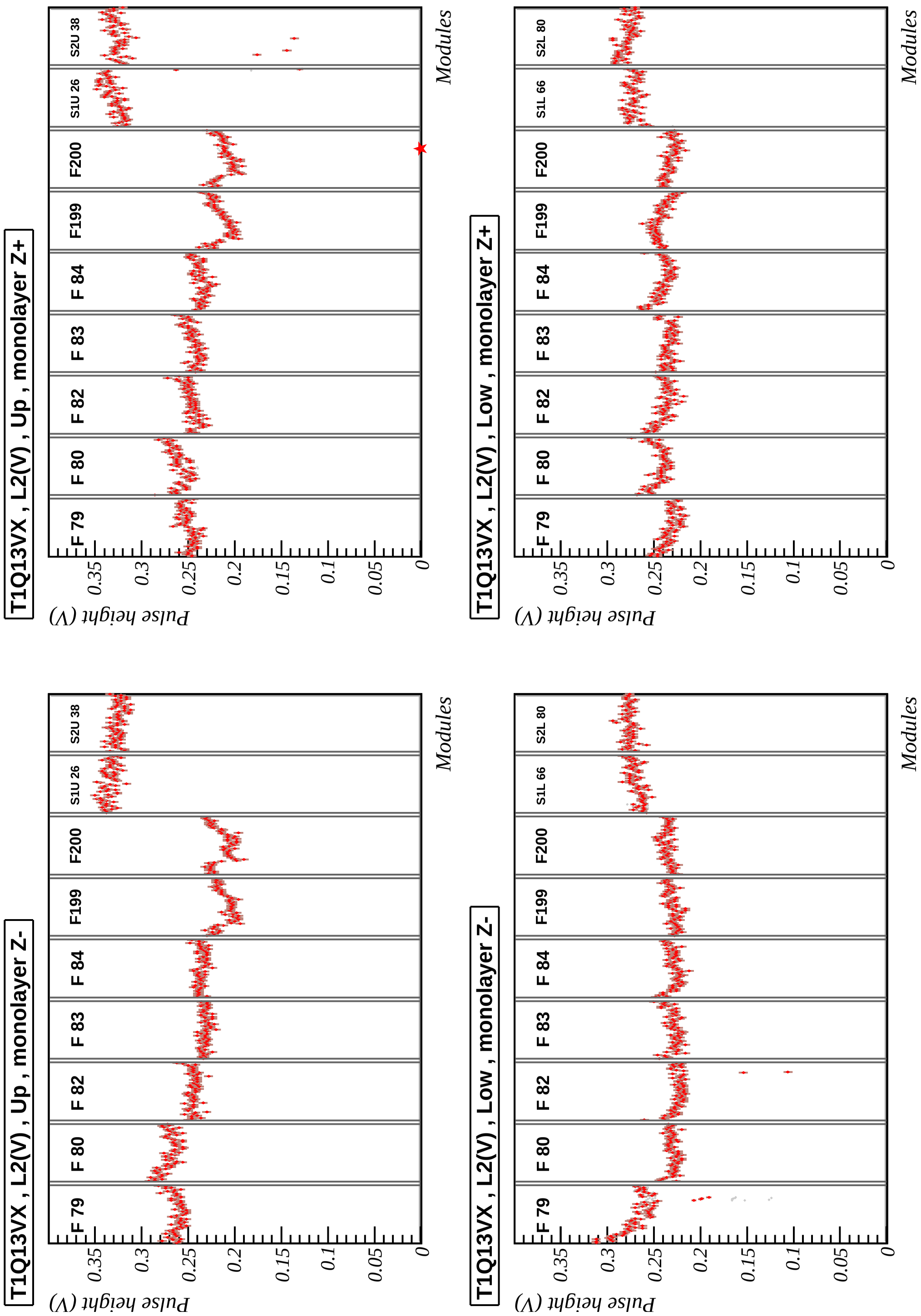


Figure 15: *Average* ^{55}*Fe pulse heights of all 2304 channels of the 9 modules of layer V of T1-Q13-VX.*

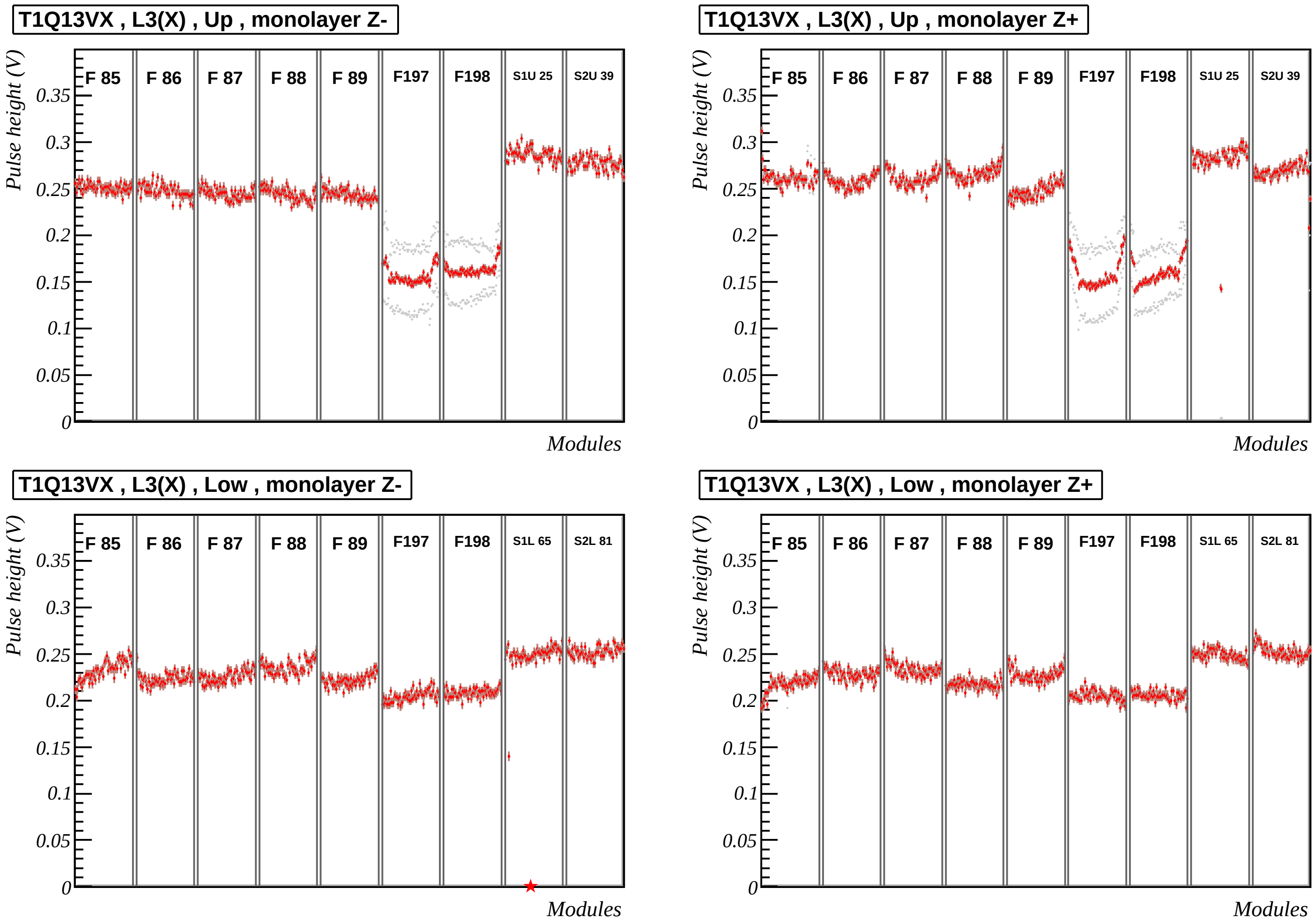


Figure 16: *Average* ^{55}*Fe pulse heights of all 2304 channels of the 9 modules of layer X of T1-Q13-VX. The pulse height in modules F197 and F198 increased at the second measurement, presumably due to worse gas flow, but this is not understood.*

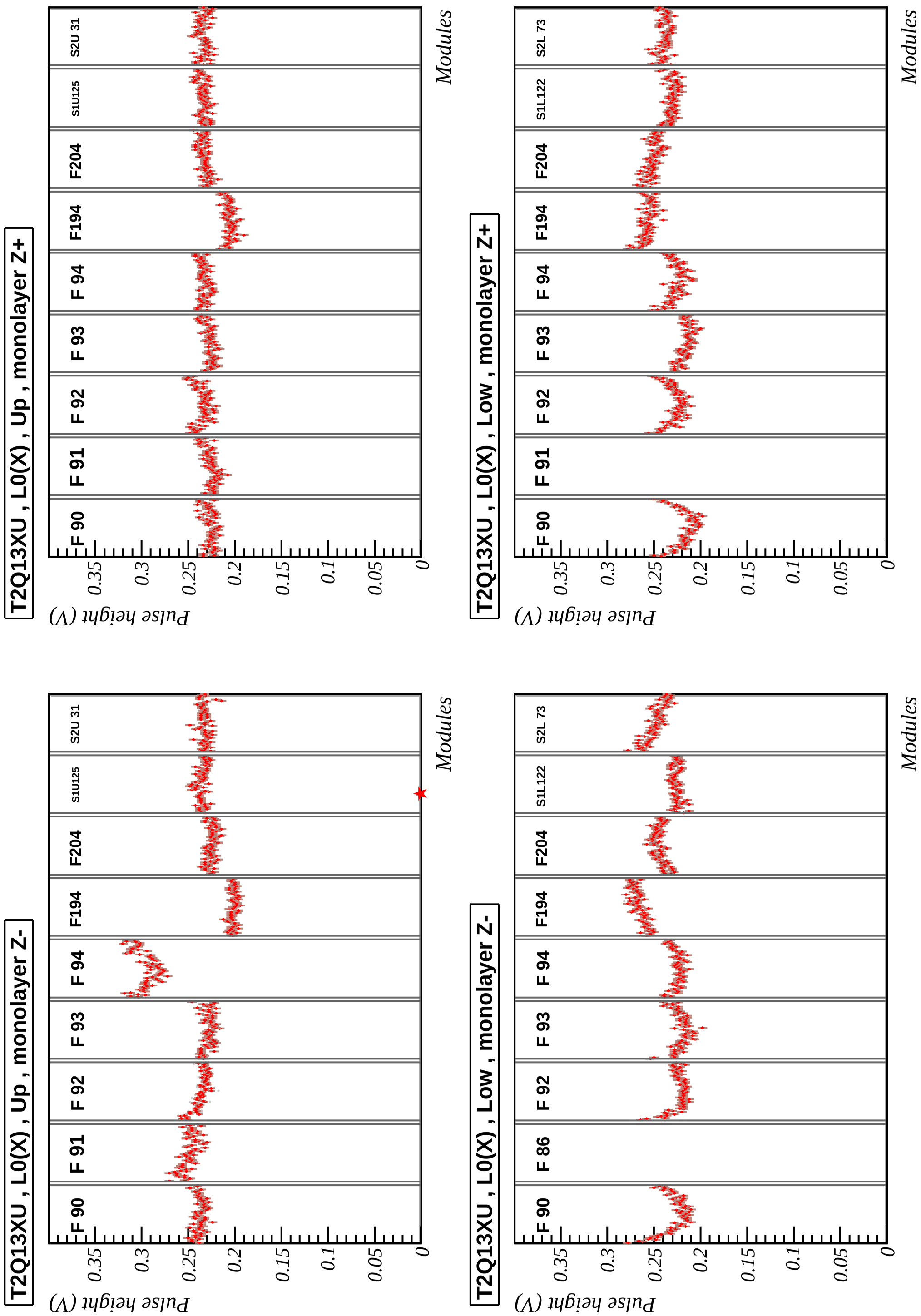


Figure 17: *Average* ^{55}*Fe pulse heights of all but 128 channels of the 9 modules of layer X of T2-Q13-XU.*

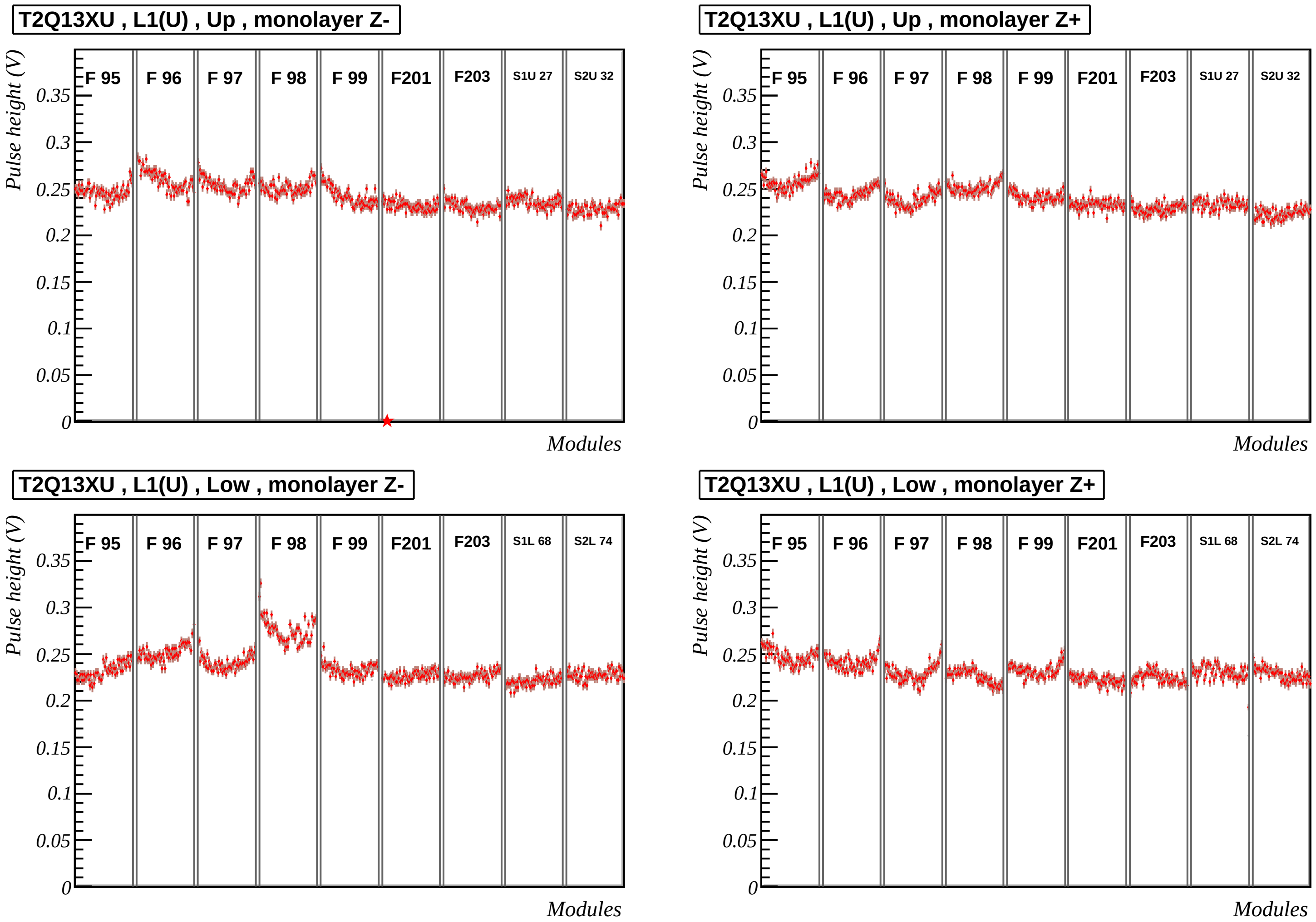


Figure 18: *Average* ^{55}*Fe pulse heights of all 2304 channels of the 9 modules of layer U of T2-Q13-XU.*

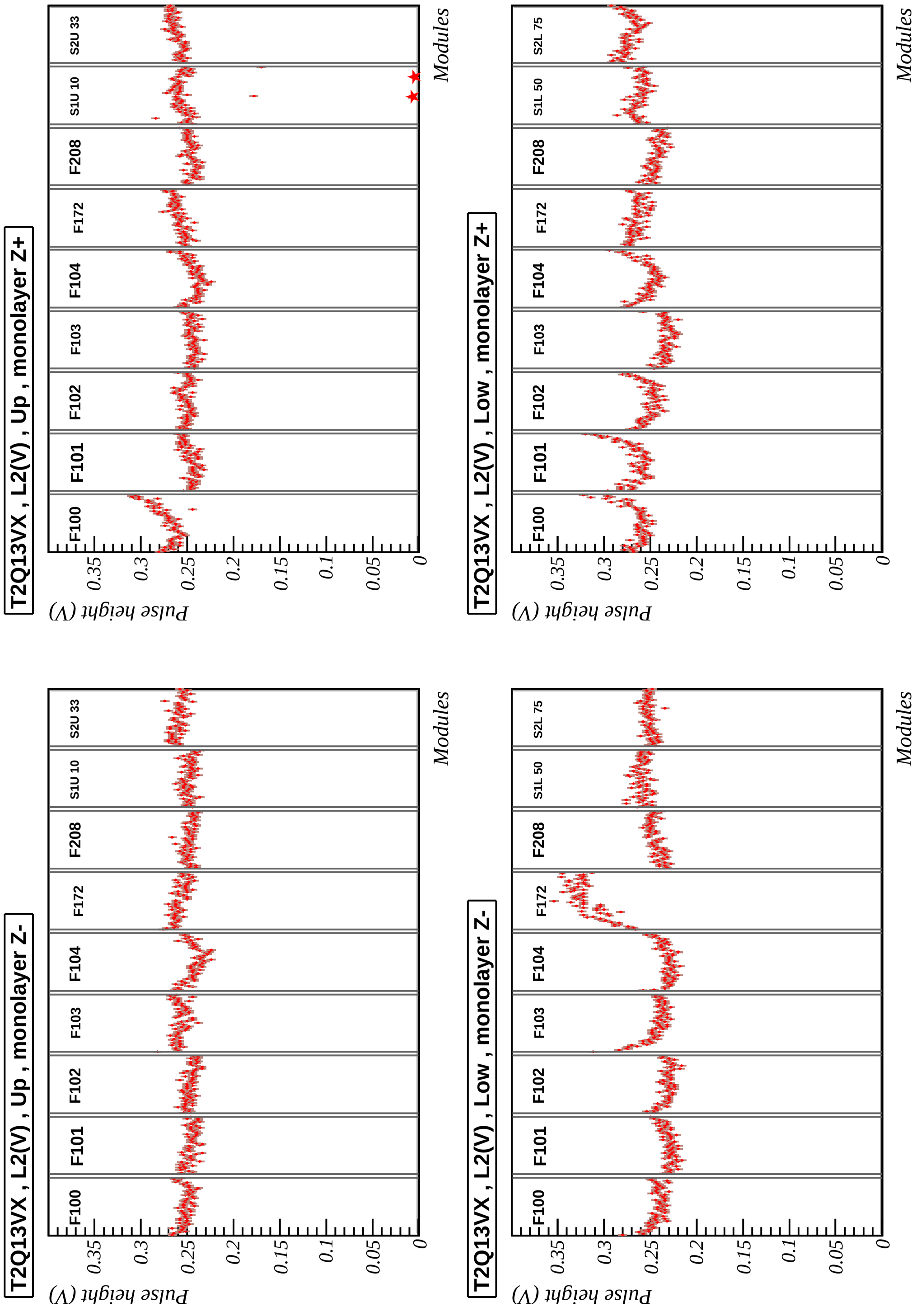


Figure 19: *Average ^{55}Fe pulse heights of all 2304 channels of the 9 modules of layer V of T2-Q13-VX.*

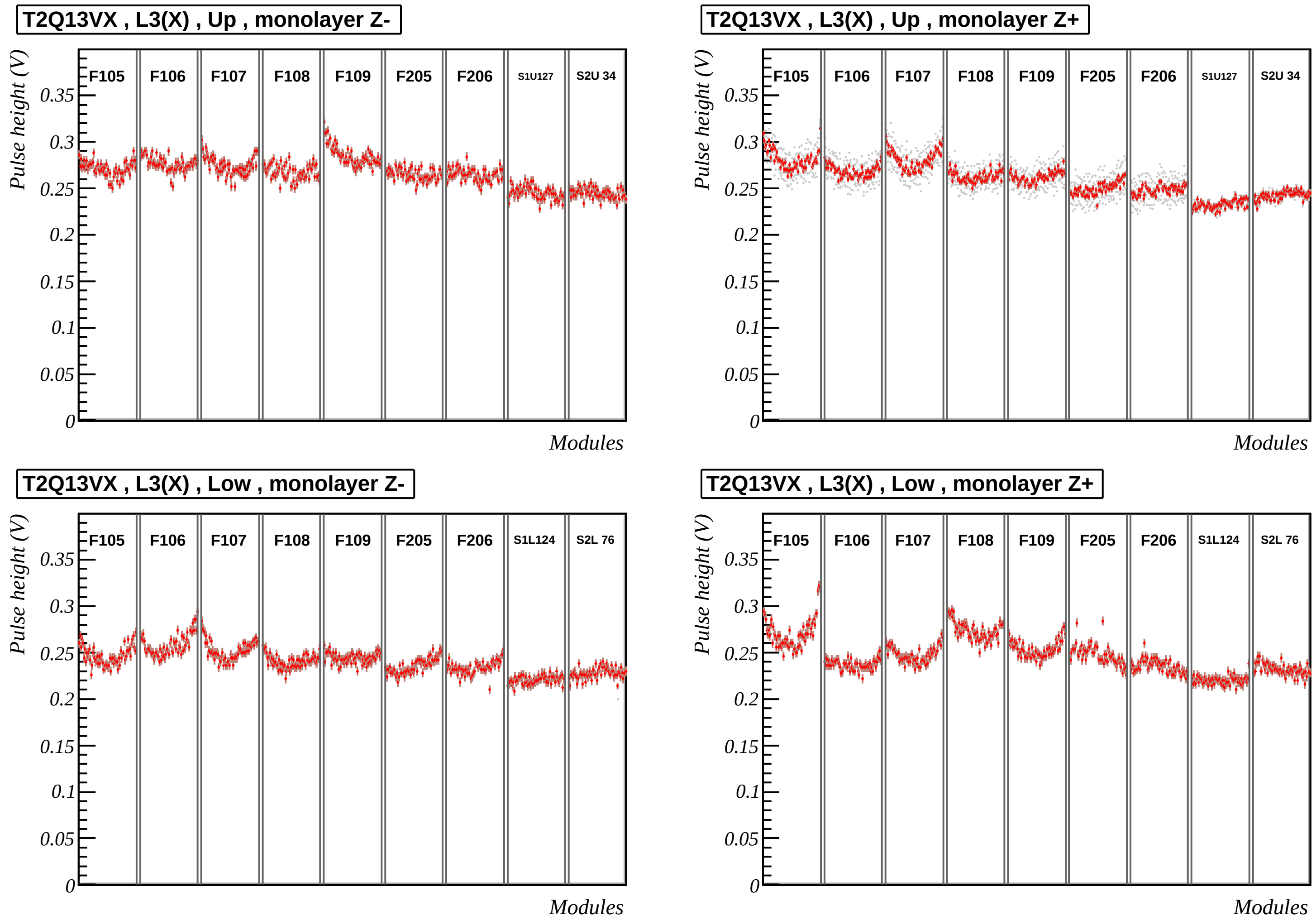


Figure 20: *Average ^{55}Fe pulse heights of all 2304 channels of the 9 modules of layer X of T2-Q13-VX.*

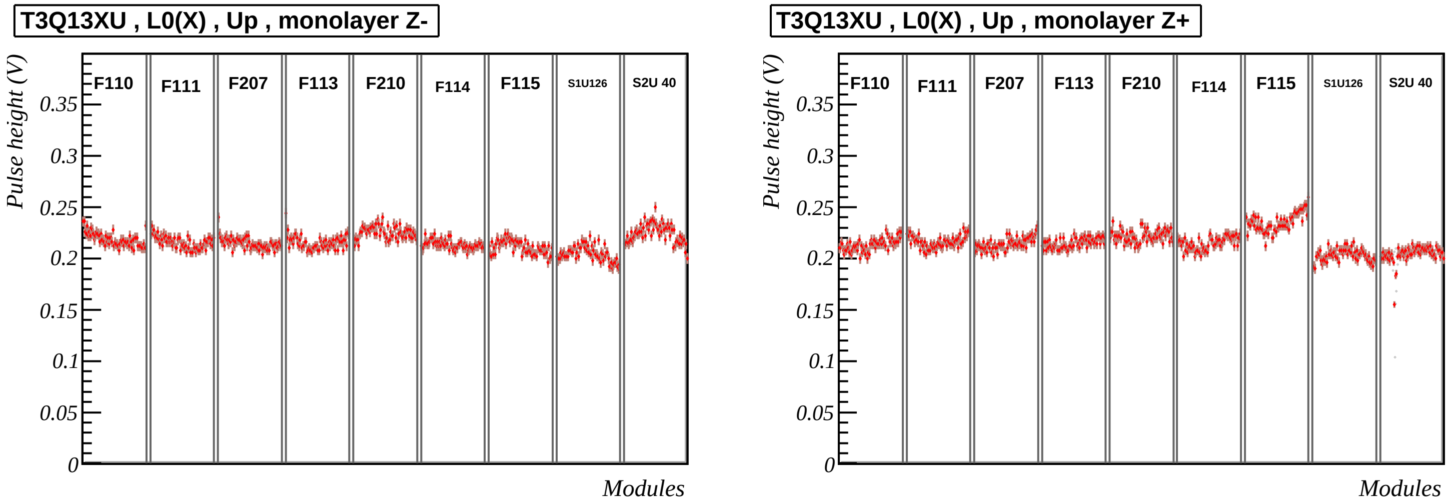


Figure 21: *Average ^{55}Fe pulse heights of the upper channels of the 9 modules of layer X of T3-Q13-XU.*

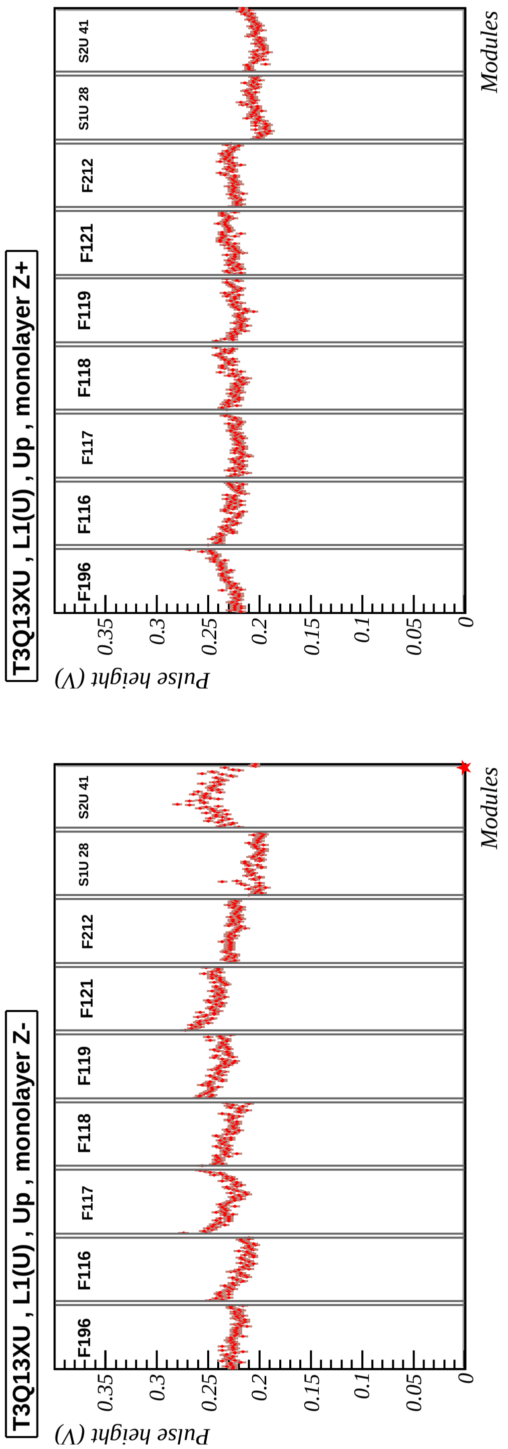


Figure 22: *Average* ^{55}*Fe pulse heights of the upper channels of the 9 modules of layer U of T3-Q13-XU.*

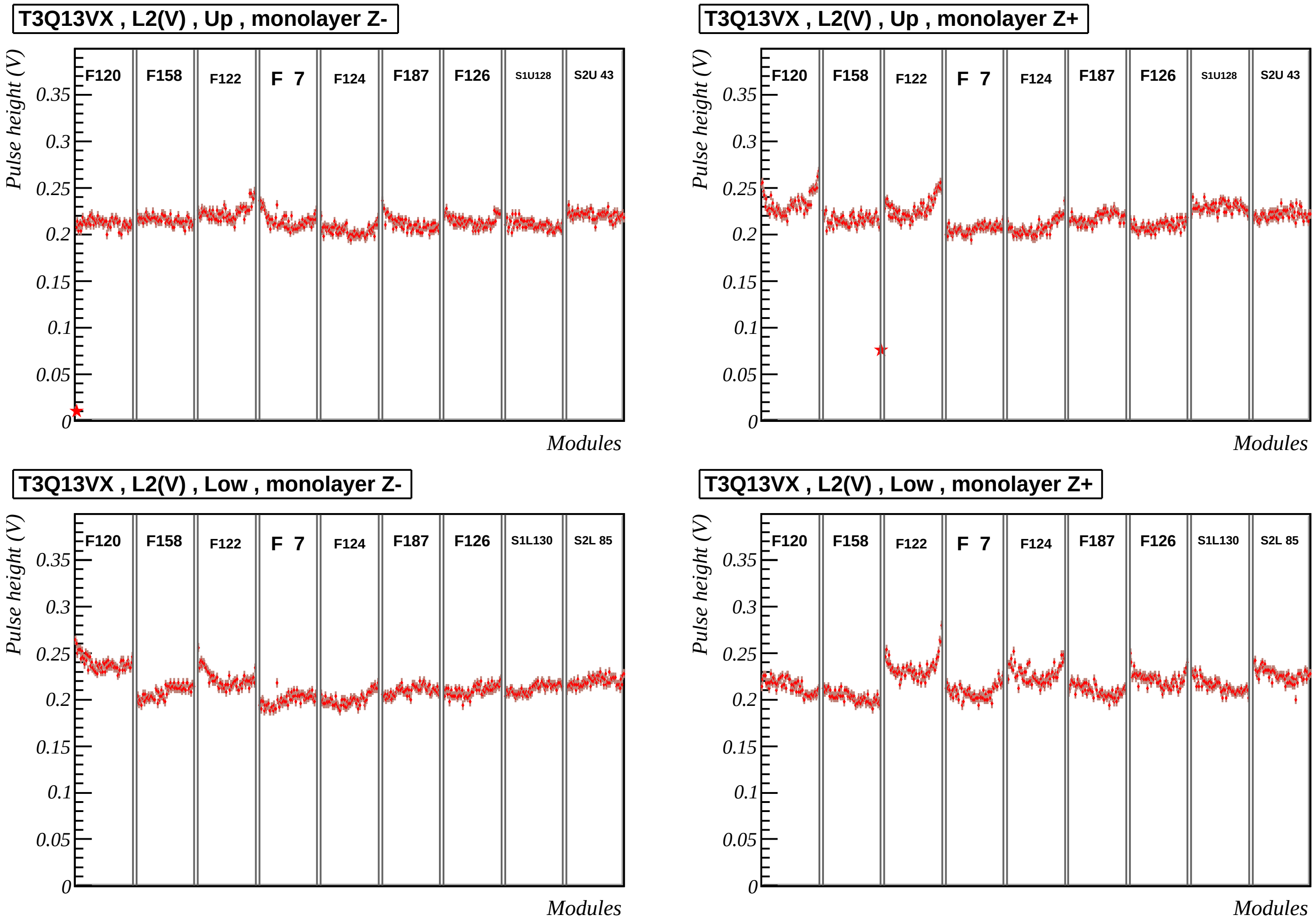


Figure 23: *Average ^{55}Fe pulse heights of all 2304 channels of the 9 modules of layer V of T3-Q13-VX.*

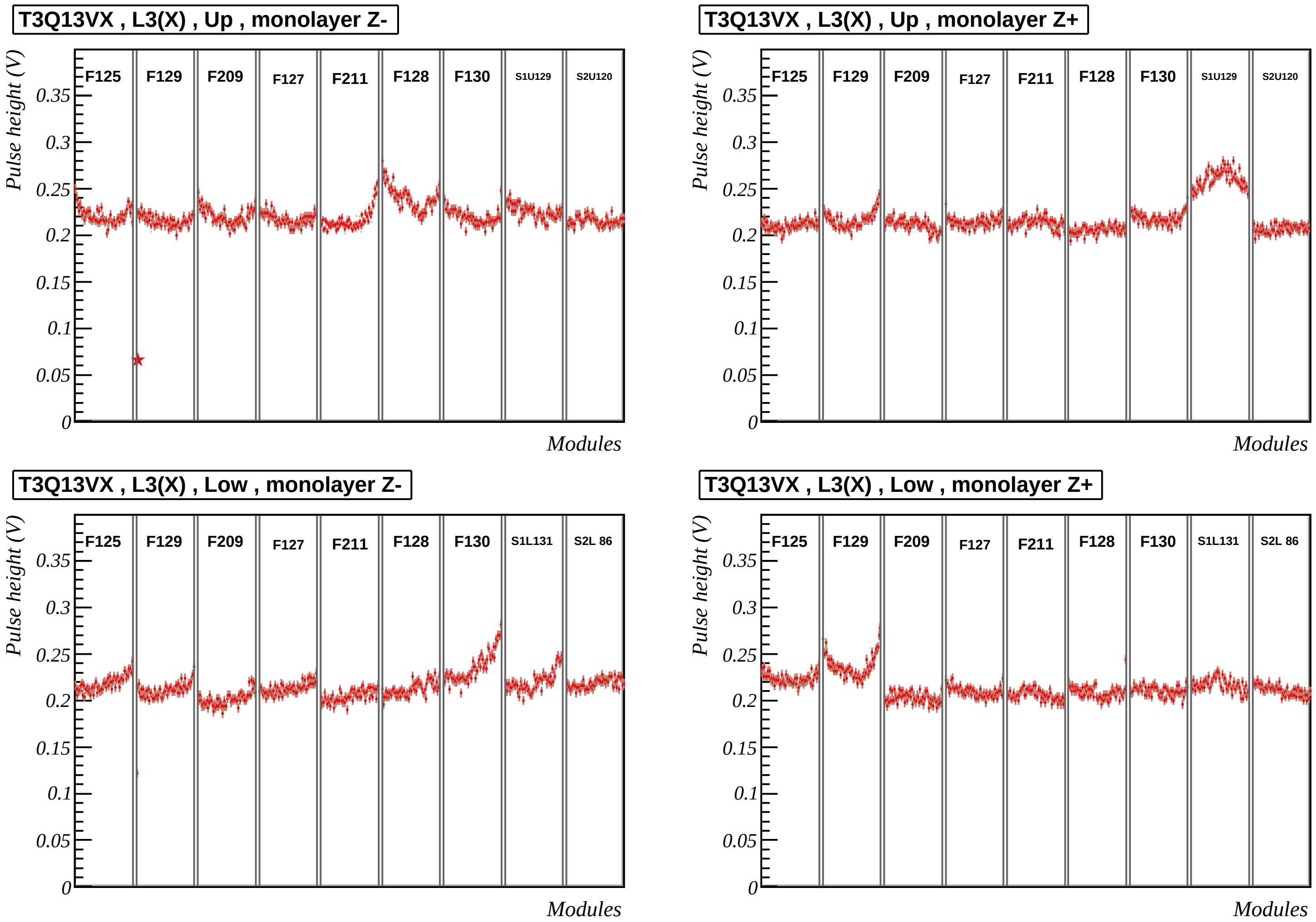


Figure 24: Average ^{55}Fe pulse heights of all 2304 channels of the 9 modules of layer X of T3-Q13-VX.

References

[1] The LHCb Collaboration, P.R.Barbosa *et al.*,*Outer Tracker Techical Design Report*, CERN/LHCC 2001-024, Sep. 2001.

[2] U. Uwer, D. Wiedner and A. Pellegrino, *Address scheme for the Outer Tracker FE electronics*, LHCb-2003-041, May 2003.

[3] E. Simioni *et al.*, *Procedures for the Service-Test on the LHCb Outer Tracker C-Frame* , LHCb-2006-029, Jun. 2006.

[4] F. Eisele, *Assembly of Outer Tracker Half Stations of LHCb and Installation*, EDMS ID 733873, see `https://edms.cern.ch/document/733873/1`

[5] S. Bachmann, *Specifications of the drift gas quality of the outer tracking system*, LHCb-2002-031, May 2002.

[6] F. Hahn, *Design proposal for the Outer Tracker Gas System of LHCb*, EDMS No. 414246

[7] J. Knopf, M. Nedos, R. Schwemmer, LHCb week 29 Nov 2006, see `http://indico.cern.ch/conferenceDisplay.py?confId=8973`

[8] P. Vankov *et al.*, *Gas-Tightness Tests of the LHCb Outer Tracker Modules Produced at NIKHEF*, LHCb-2004-092, Oct. 2004.

[9] G. van Apeldoorn *et al.*, *Outer Tracker Module Production at NIKHEF - Quality Assurance*, LHCb-2004-078, Oct. 2004.

[10] N. Tuning *et al.*, *Gas Propagation Studies in the Outer Tracker* , LHCb-2007-066, Apr. 2007.

[11] I. Mous *et al.*, *The Dependence of the Signal Strength on the Applied oltage and Gas Mixture of the LHCb Outer Tracker Detector* , LHCb-2005-093, Nov. 2005.