Documentation Preamps testing

04.05.2021

0.1 Setup 0

For this testing the setup of the FOPRA was used. The preamps were tested on the big box with the five large crystals inside. The small box (with 8 small crystals) was used as reference to check if there are RCBus interferences. As the five crystals of the large box are connected to one single Sub-D connector, the signal processing from the APDs to the output of the MPRB could only be tested for 5 channels on the Preamp card 0. For all other channels the test was done solely using the pulser. As pulser signal a square signal shape (low end: 0mV, high end: 10mV, 50% duty) with frequency of 250 Hz.

0.2 Test Results

All following plots are uncalibrated lim_energy plots. The pulser peak can be identified as the most right peak in the plots.

0.2.1 Preamp 1, Max. Range 3pC/30pC

To repair: All channels in both cards noisy.

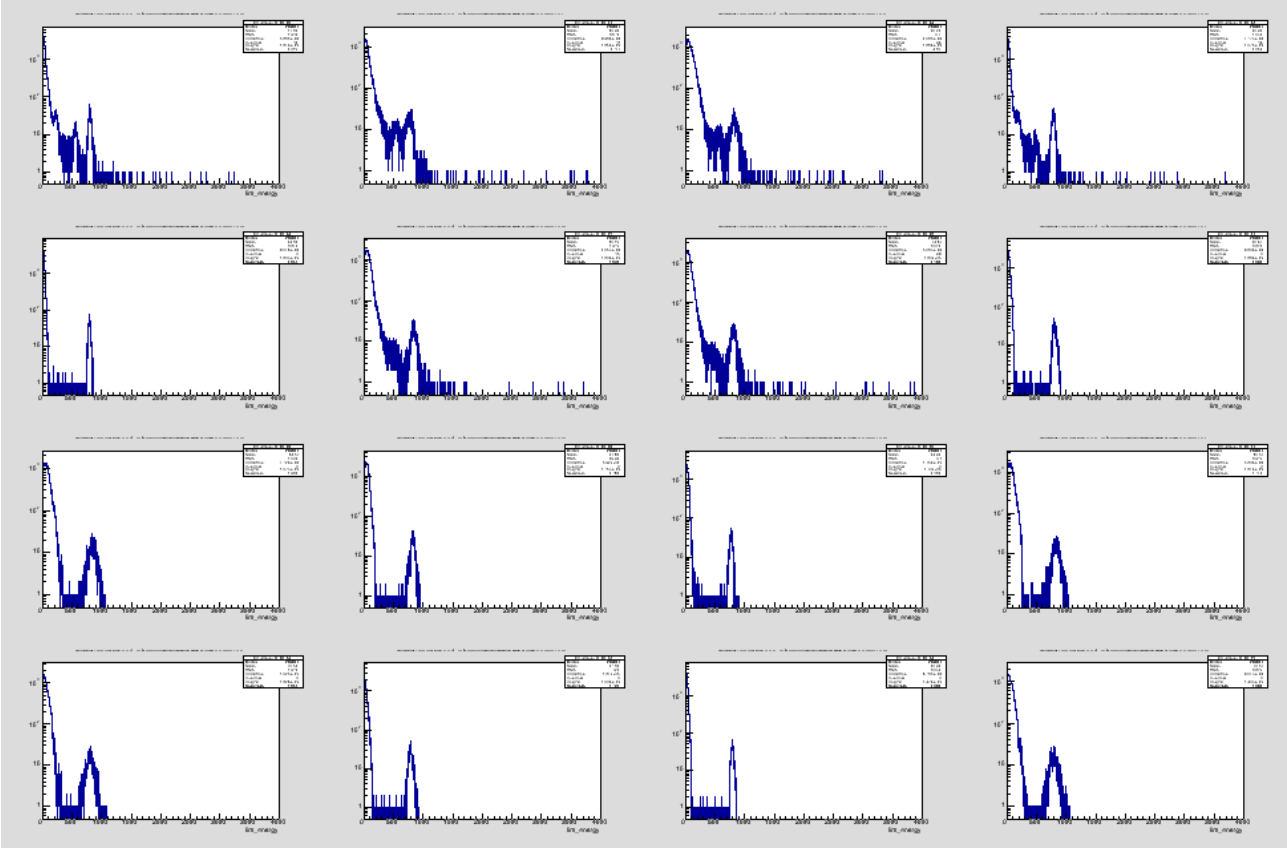

Abbildung 1: Preamp 1, card 0, all channels, Na22 source with pulser. All channels noisy.

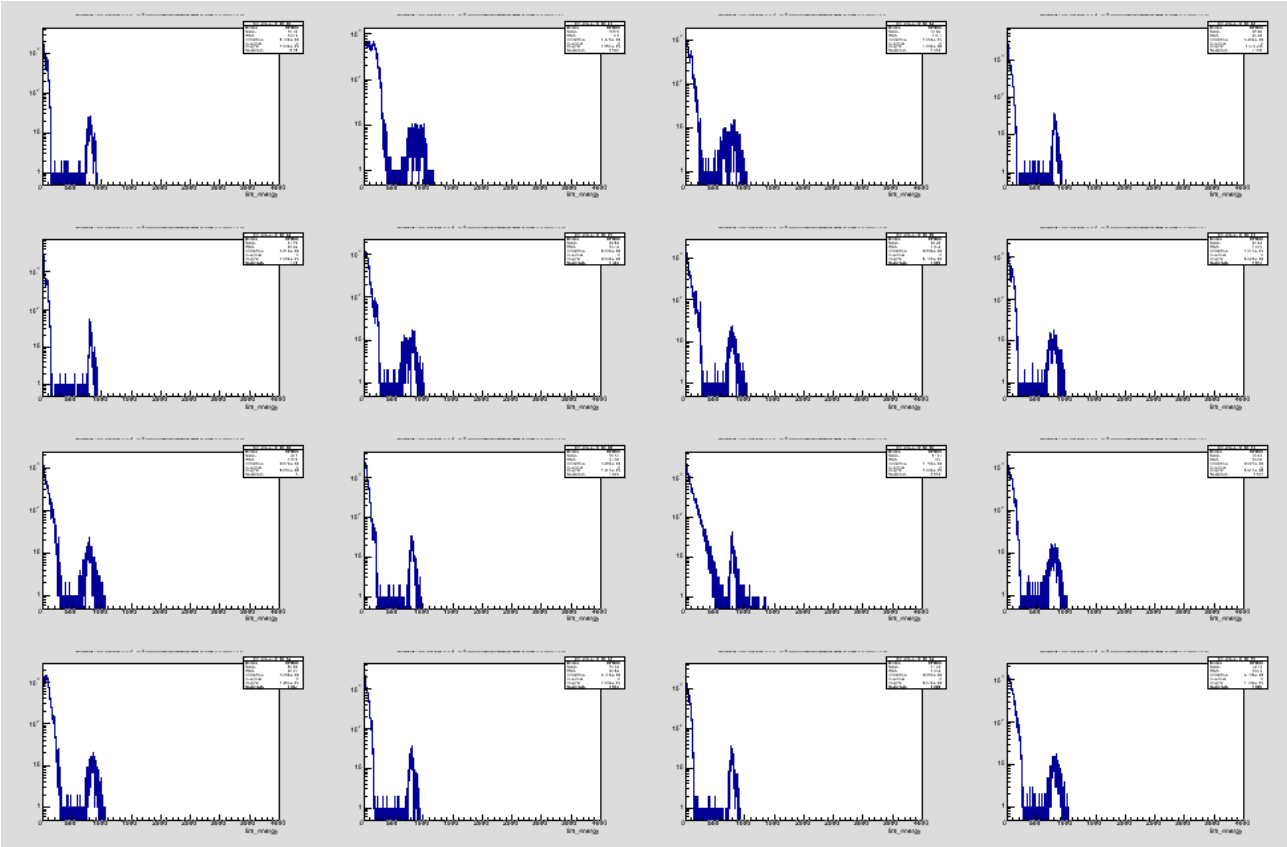

Abbildung 2: Preamp 1, card 1, all channels, no crystal, only pulser. All channels noisy.

0.2.2 Preamp 5, Max. Range 3pC/30pC

To repair: card 0, missing channels 2 and 16 (FEBEXCh.5 and 9).

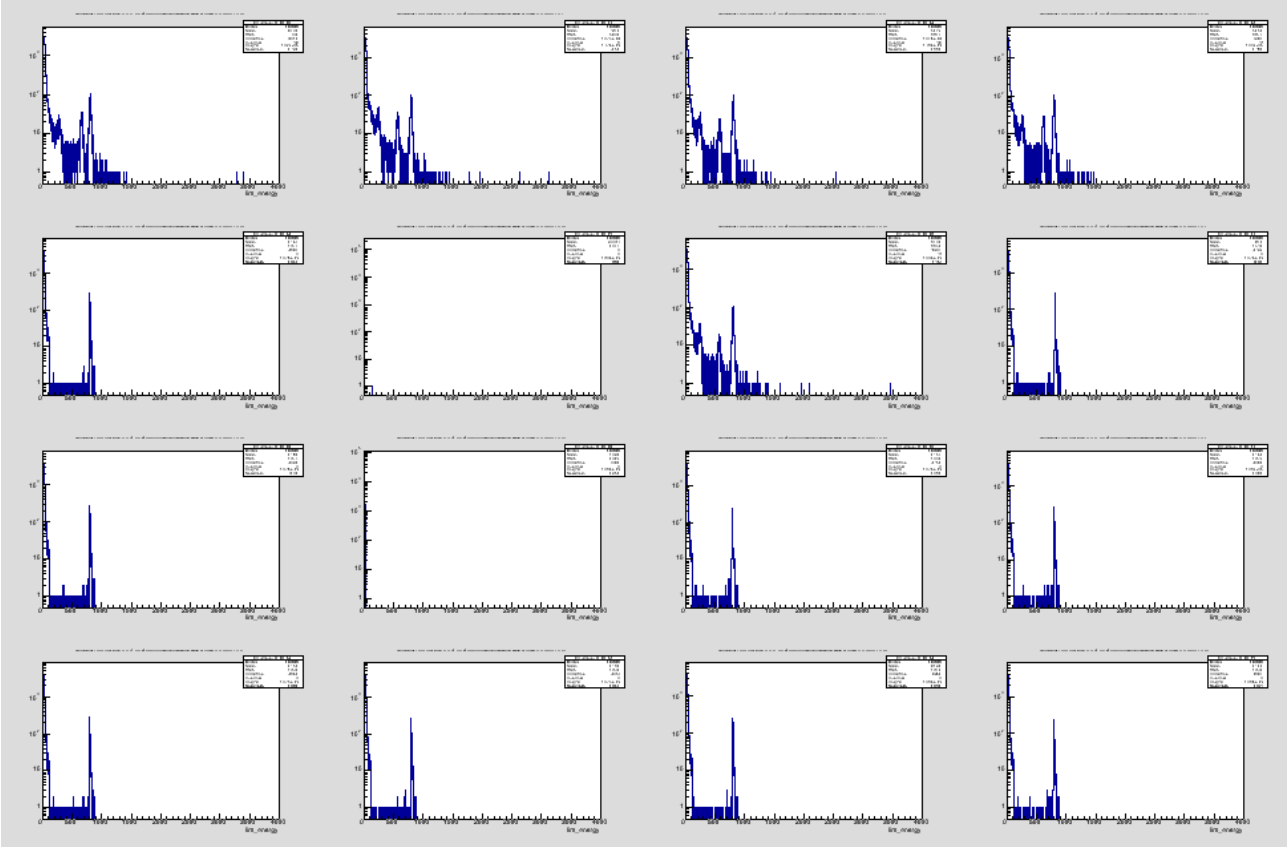

Abbildung 3: Preamp 5, card 0, all channels, Na22 source with pulser. Missing channels 2 and 16 (FEBEXCh.5 and 9).

0.2.3 Preamp 6 (Dual Range), Max. Range 3pC/30pC

To repair: card 0 channels 8,9,10,11,12,15 (FEBEXCh. 7,8,10,13,14,15) are noisy. card1 channels 7,8,9,10,11,12,13,15 (FEBEXCh. 0,7,8,10,12,13,14,15) are noisy.

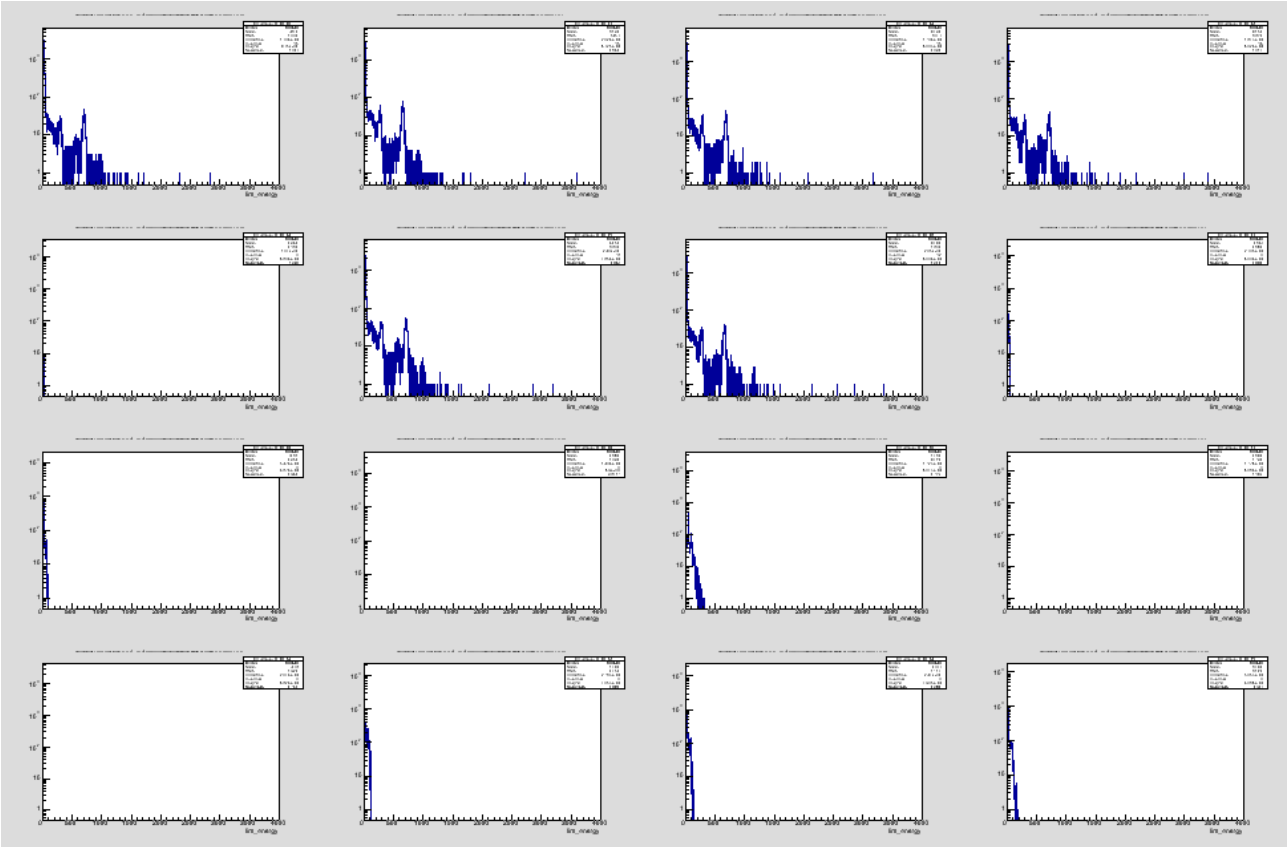

Abbildung 4: Preamp 6, card 0, all channels, Na22 source no pulser. Channels 8,9,10,11,12,15 (FEBEXCh. 7,8,10,13,14,15) are noisy

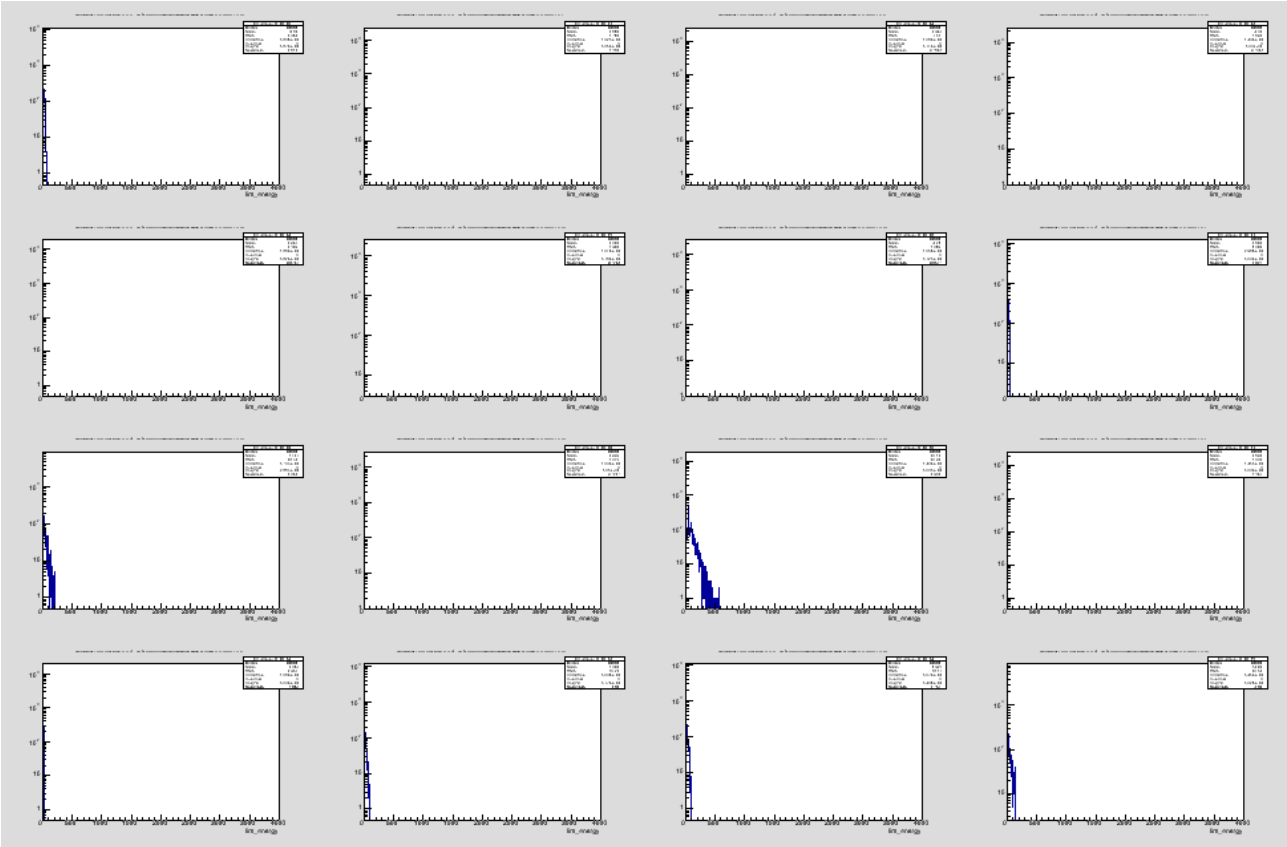

Abbildung 5: Preamp 6, card 1, all channels, Na22 source no pulser. Channels 7,8,9,10,11,12,13,15 (FEBEXCh. 0,7,8,10,12,13,14,15) are noisy.

0.2.4 Preamp 7 (Dual Range), Max. Range 3pC/30pC

To repair: card 1 channels 7,8,9,10,11,12,15 (FEBEXCh. 0,7,8,10,13,14,15) are noisy.

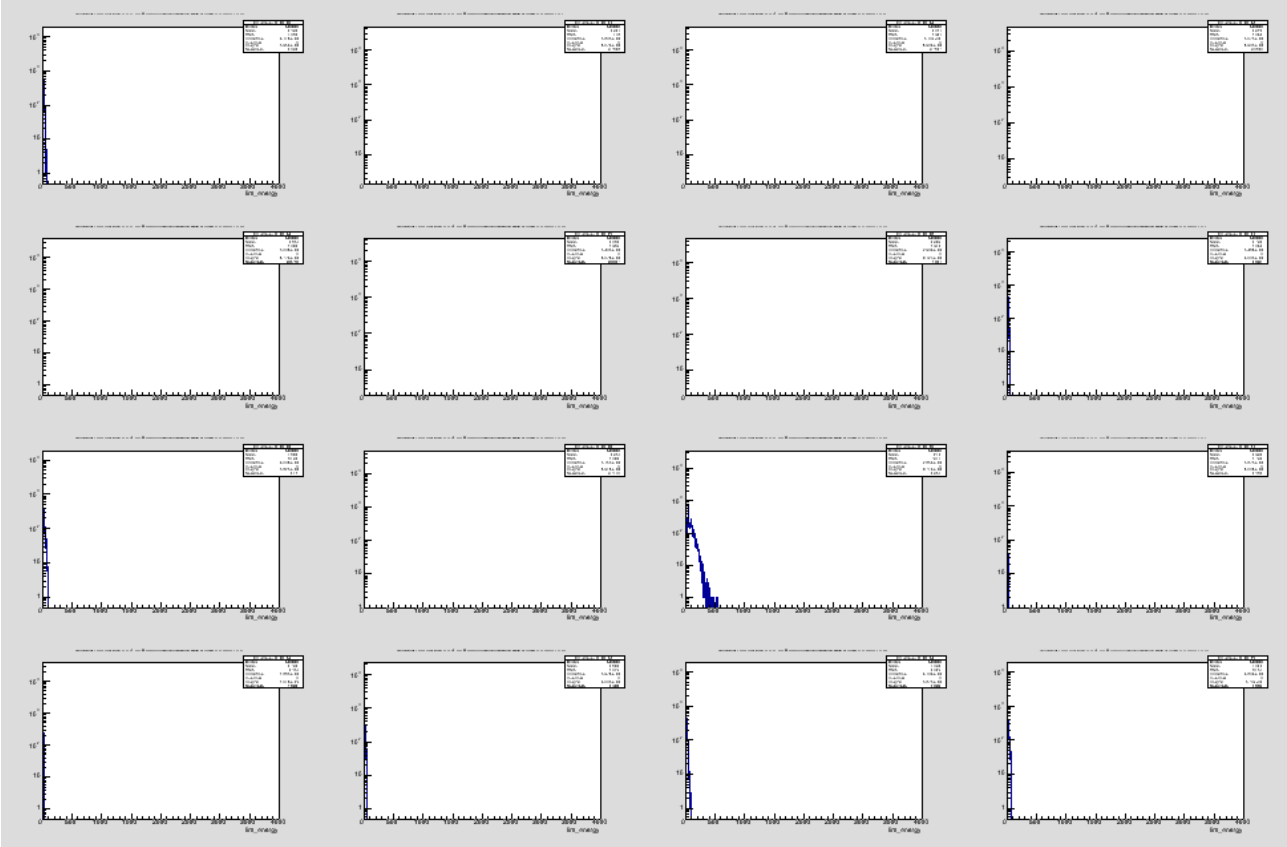

Abbildung 6: Preamp 7, card 1, all channels, Na22 source no pulser. Channels 7,8,9,10,11,12,15 (FEBEXCh. 0,7,8,10,13,14,15) are noisy.

0.2.5 Preamp 8 (Dual Range), Max. Range 3pC/30pC

To repair: card 0 all channels noisy. Card1 all channels are noisy.

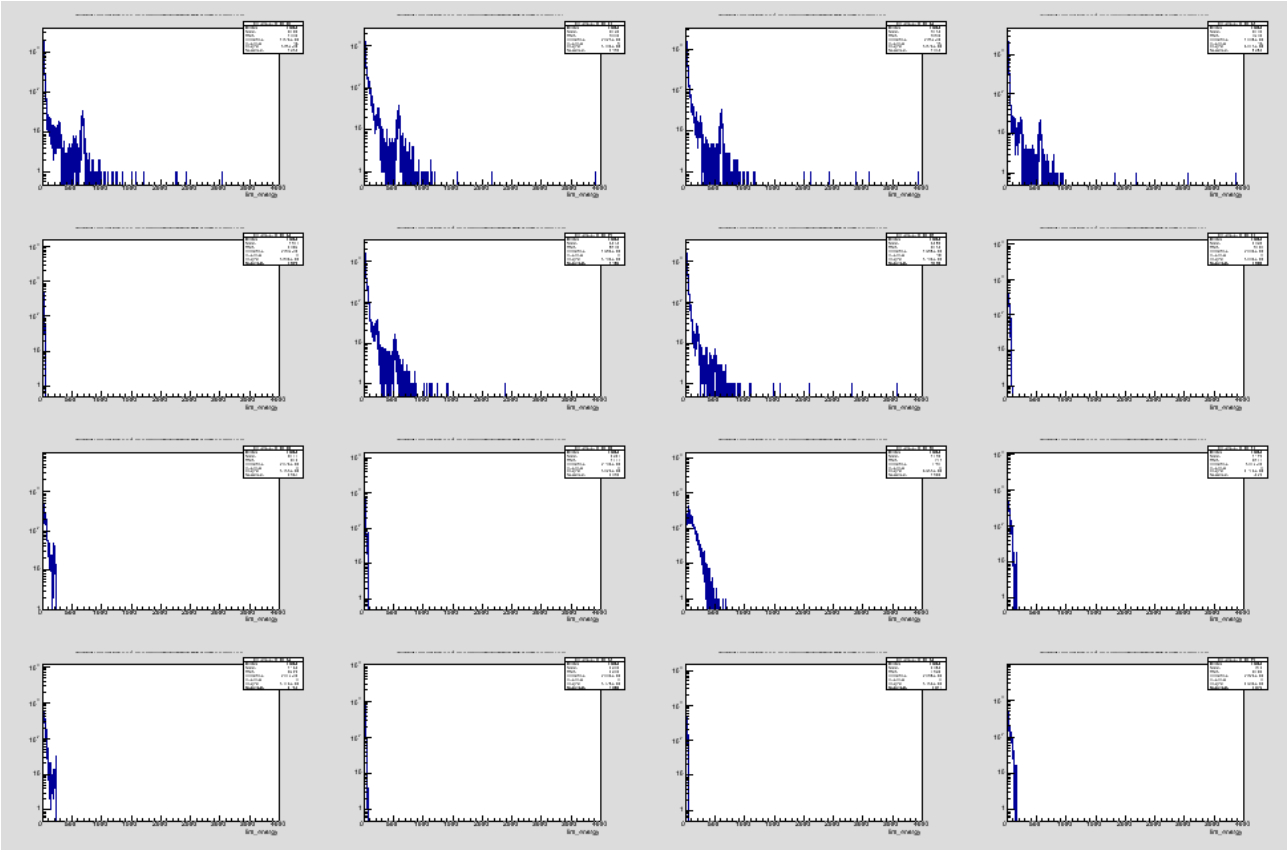

Abbildung 7: Preamp 8, card 0, all channels, Na22 source no pulser. All channels are noisy.

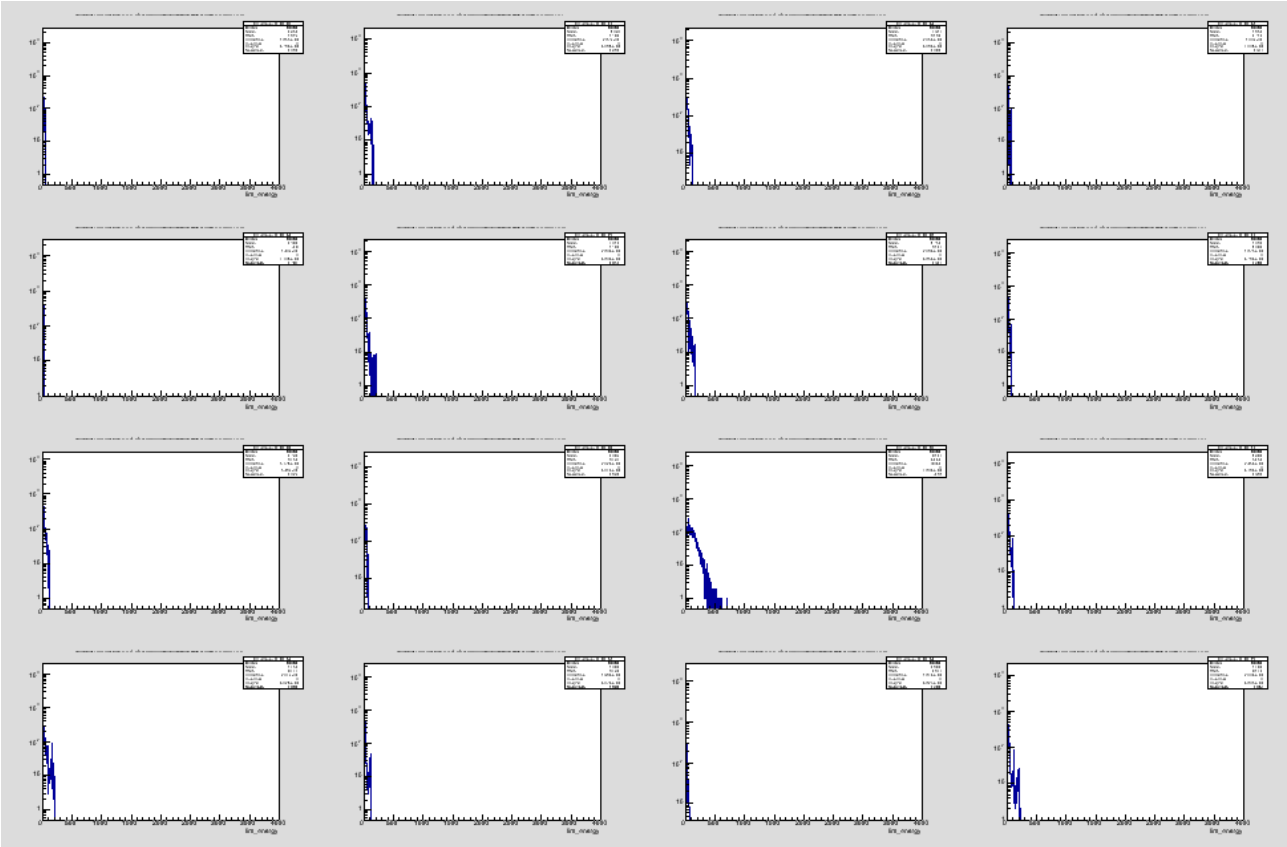

Abbildung 8: Preamp 8, card 1, all channels, Na22 source no pulser. All channels are noisy.

0.2.6 Preamp 9 (Dual Range), Max. Range 3pC/30pC

To repair: card1, channels 5,6,8,9,10,11,12,15 (FEBEXCh. 1,2,7,8,10,13,14,15) noisy. This can only be seen when lowering the "gamma_discr_threshold" from 500 to 100. More details in the RC-Bus Test.

0.2.7 Preamp 10, Max. Range 1pC/10pC

To repair: card0 channels 8,9,10,11,12,15 (FEBEXCh. 7,8,10,13,14,15) are noisy.

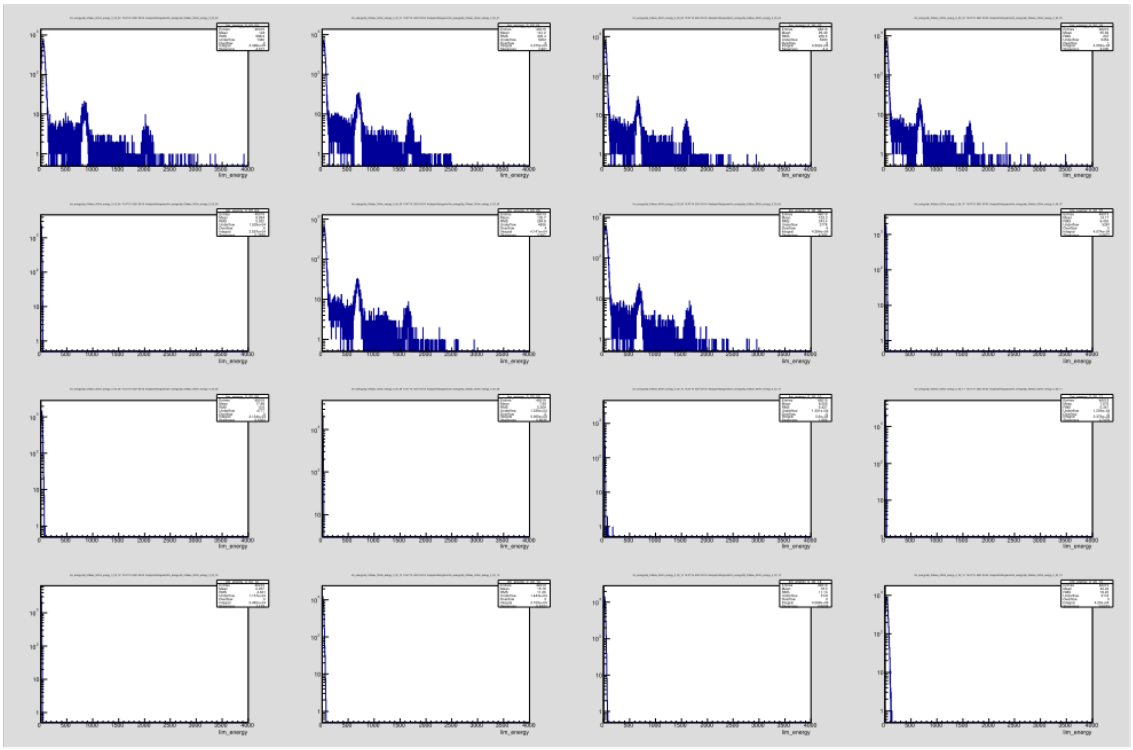

Abbildung 9: Preamp 10, card 0, all channels, Na22 source no pulser. Channels 8,9,10,11,12,15 (FEBEXCh. 7,8,10,13,14,15) are noisy.

0.3 RC-Bus Test - Setup

For this test the preamps were detached from the detectors, they were operated free-standing. The gamma_discr_threshold was lowered to 100 (instead of 500, as before) to be able to identify more accurately noise caused from remote control requests. For the remote control requests a small python script using the pySerial API was employed. For the test all available preamp parameters were read individually, in a row and other combinations. All preamps were affected by noise when requesting the "Temp_slope " or "Temp_offset " parameter, or when requesting both of them in a loop. When putting "Temp_slope " or "Temp_offset " parameter in front of a requesting loop (e.g.: ask Temp_slope, Voltage 8, Sum current) the noise effect was also observed. Setting the "Temp_slope" or "Temp_offset" parameter read request not in front of a requesting loop (e.g: ask Voltage 8,Temp_slope,Sum current), no noise was observed.
The following plots show the noise effect in the preamp channels when requesting "Temp_offset" with a frequency of 5 Hz. In all preamps the channels 1,2,3 (FEBEXCh. 6,5,4) are affected by the remote control request in decreasing magnitude.

0.3.1 Preamp 1, Max. Range 3pC/30pC

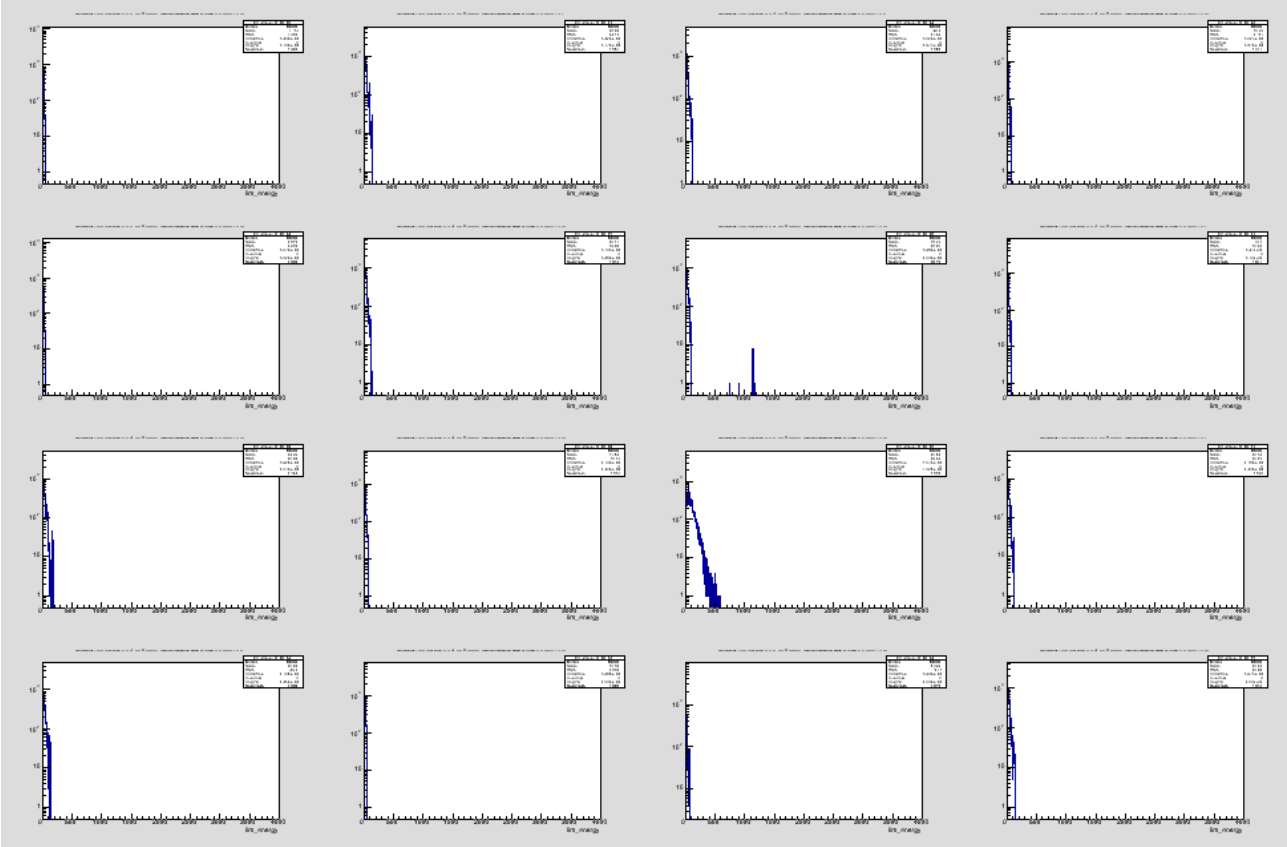

Abbildung 10: Preamp 1, card 0, all channels, preamp detached. Overall noise, nevertheless noise from parameter read request in channel 1 (FEBEXCh. 6) can clearly be identified.

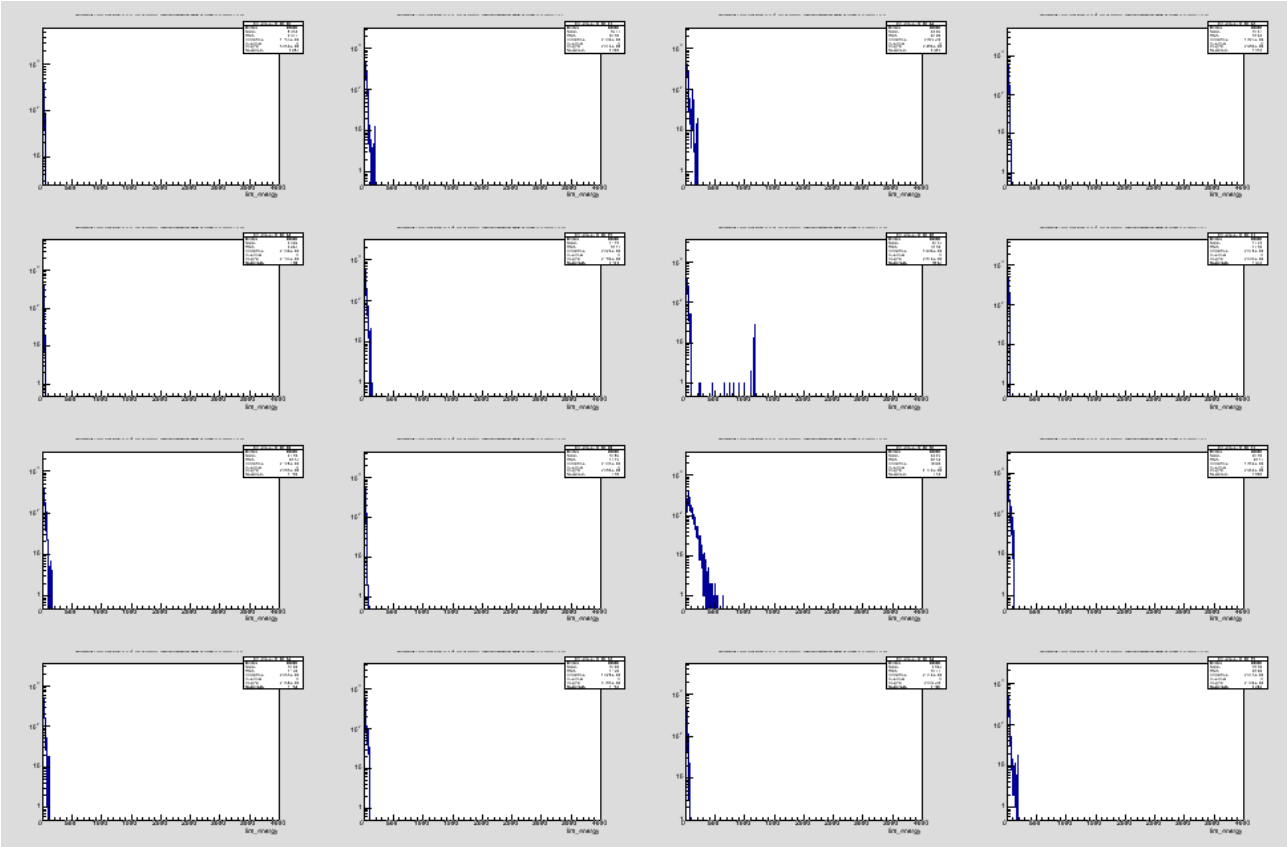

Abbildung 11: Preamp 1, card 1, all channels, preamp detached. Overall noise, nevertheless noise from parameter read request in channel 1 (FEBEXCh. 6) can clearly be identified.

0.3.2 Preamp 5, Max. Range 3pC/30pC

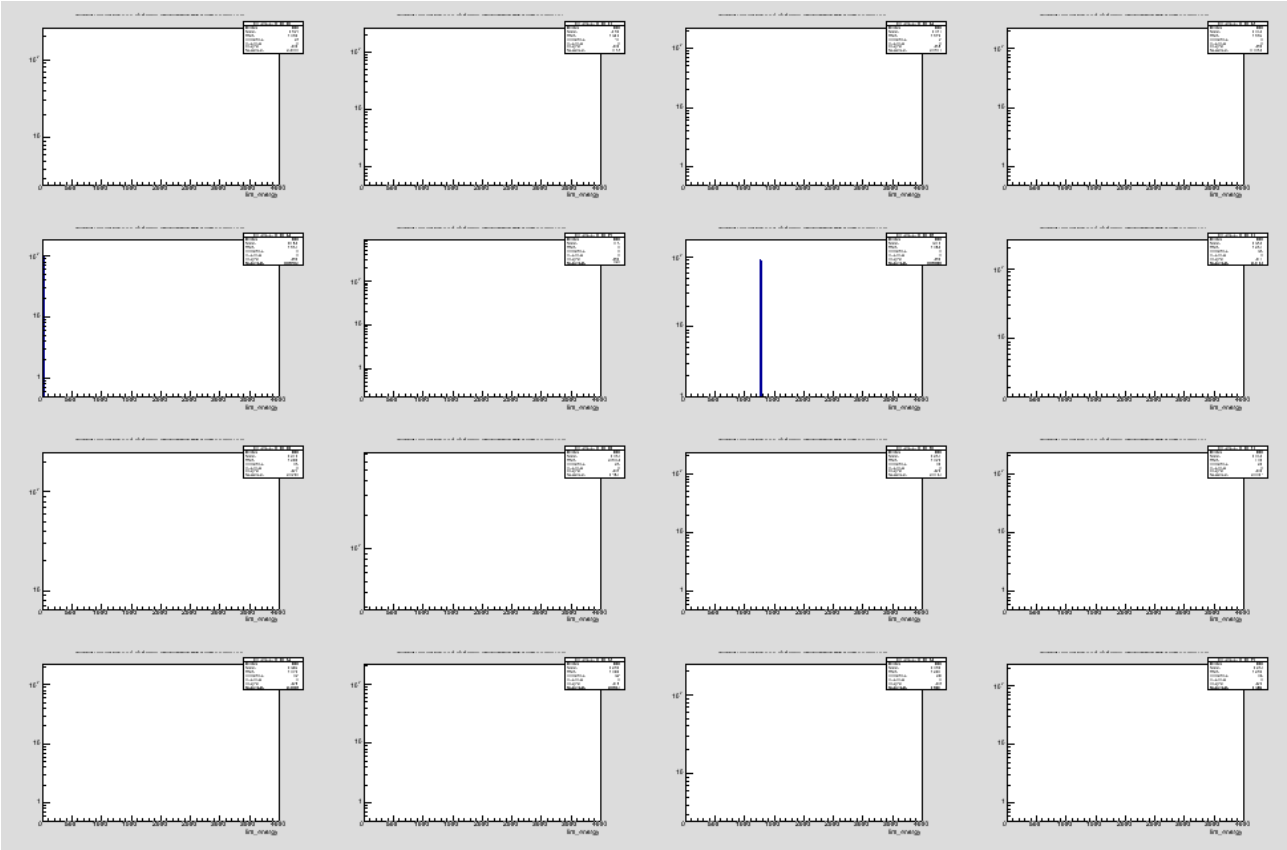

Abbildung 12: Preamp 5, card 0, all channels, preamp detached. Noise from parameter read request in channel 1,3 (FEBEXCh. 6,4).

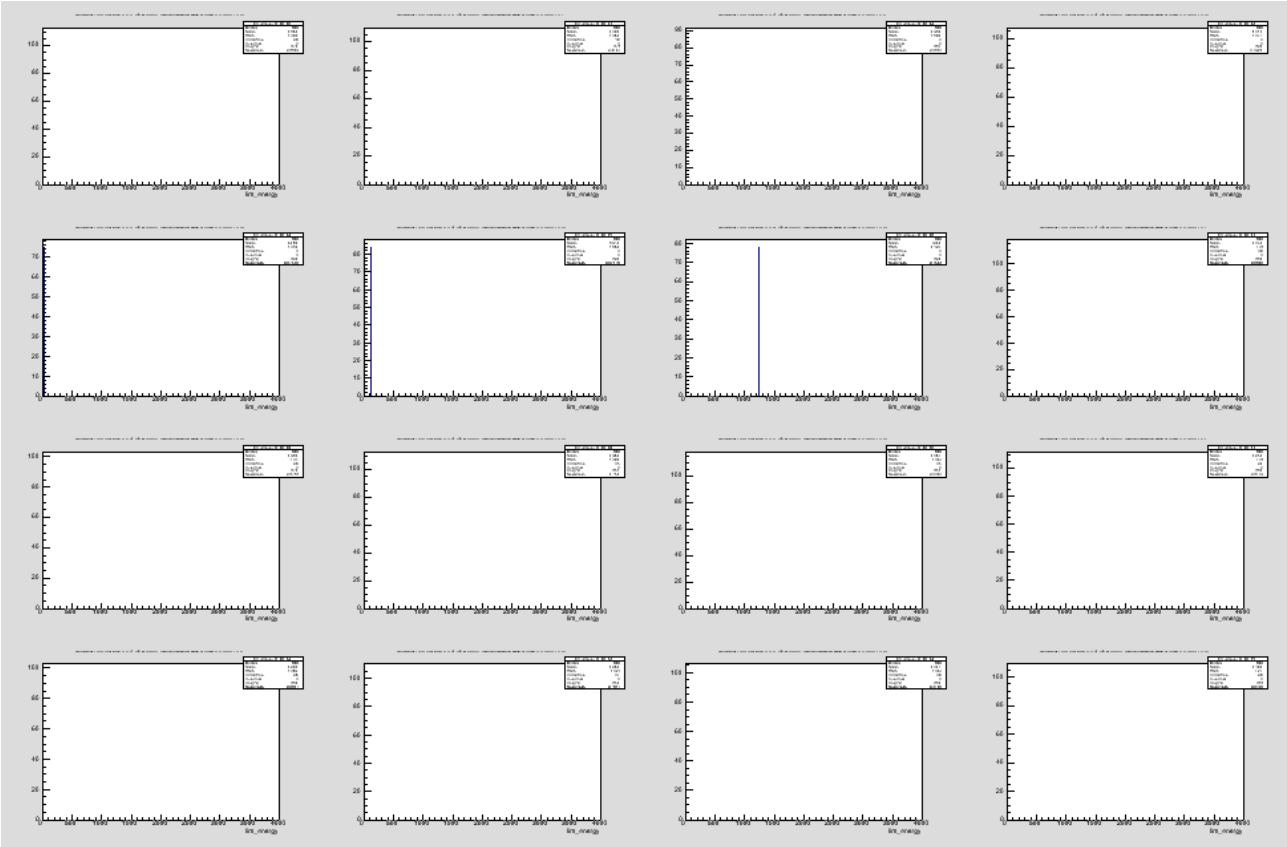

Abbildung 13: Preamp 5, card 1, all channels, preamp detached. Noise from parameter read request in channel 1,2,3 (FEBEXCh. 6,5,4).

0.3.3 Preamp 6 (Dual Range), Max. Range 3pC/30pC

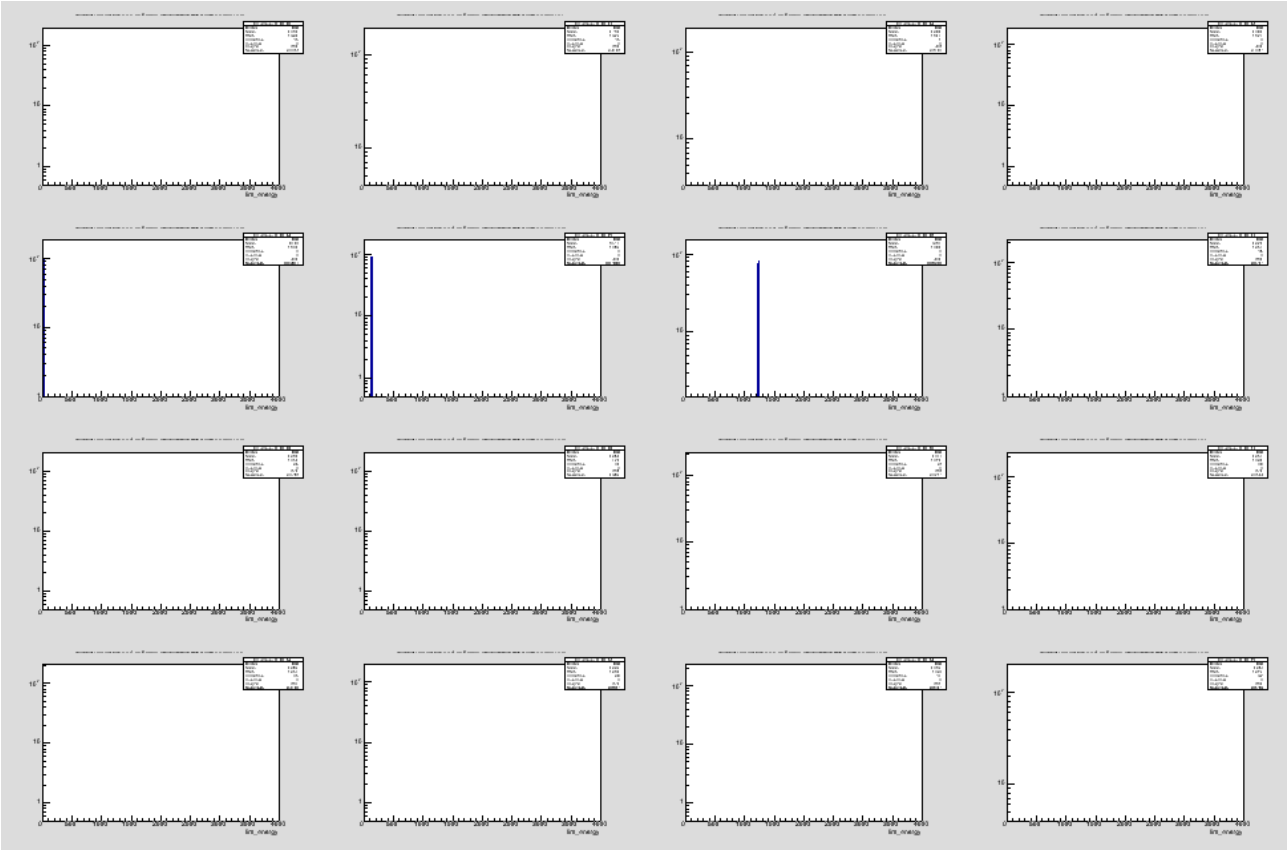

Abbildung 14: Preamp 6, card 0, all channels, preamp detached. Noise from parameter read request in channel 1,2,3 (FEBEXCh. 6,5,4,).

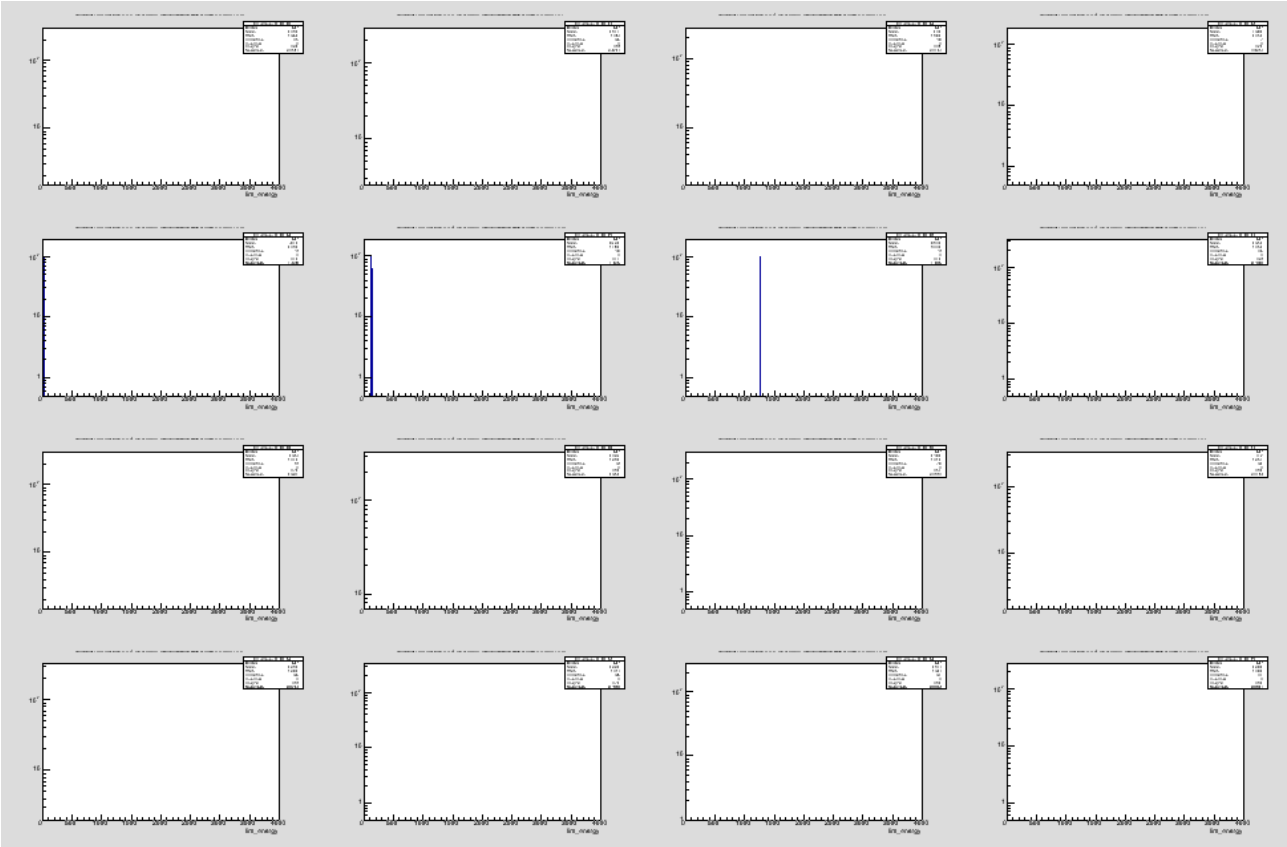

Abbildung 15: Preamp 6, card 1, all channels, preamp detached. Noise from parameter read request in channel 1,2,3 (FEBEXCh. 6,5,4,).

0.3.4 Preamp 7 (Dual Range), Max. Range 3pC/30pC

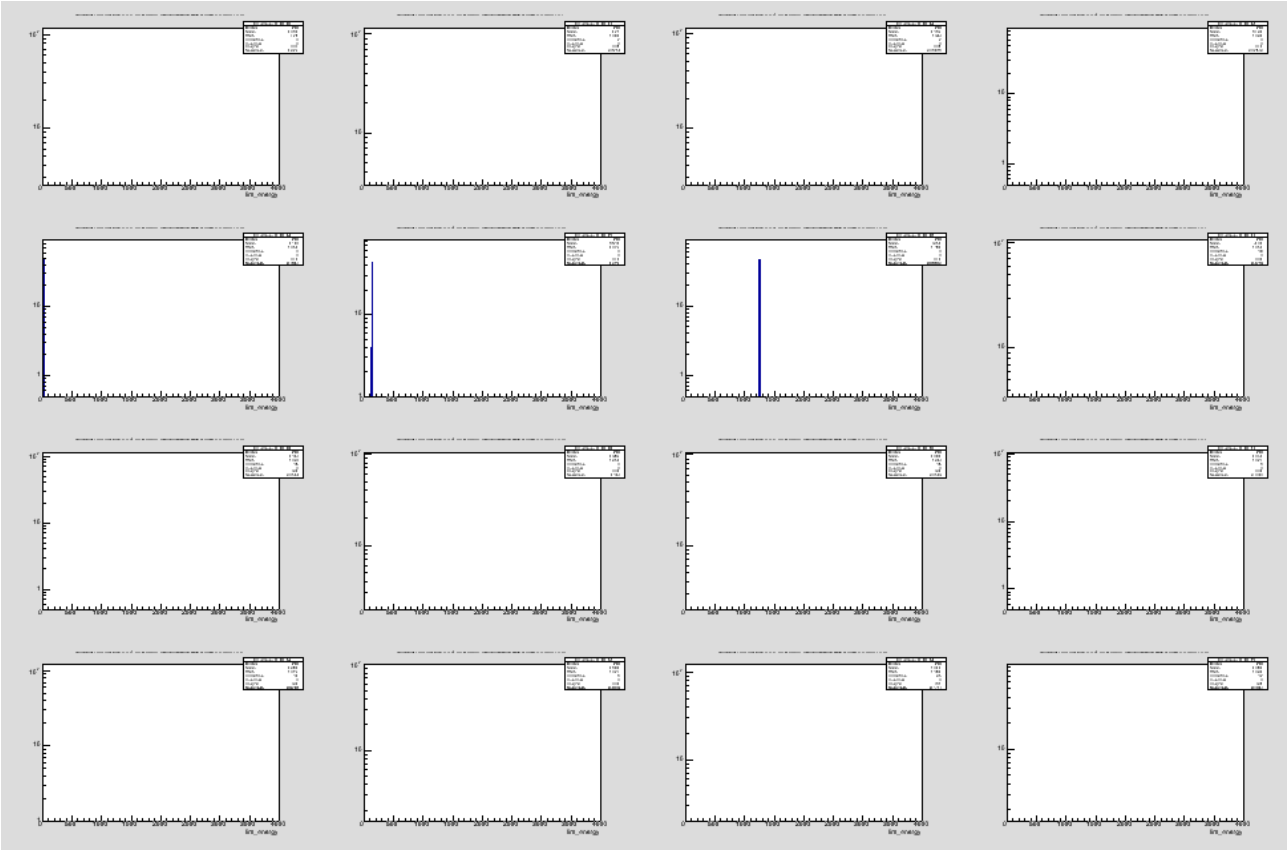

Abbildung 16: Preamp 7, card 0, all channels, preamp detached. Noise from parameter read request in channel 1,2,3 (FEBEXCh. 6,5,4,).

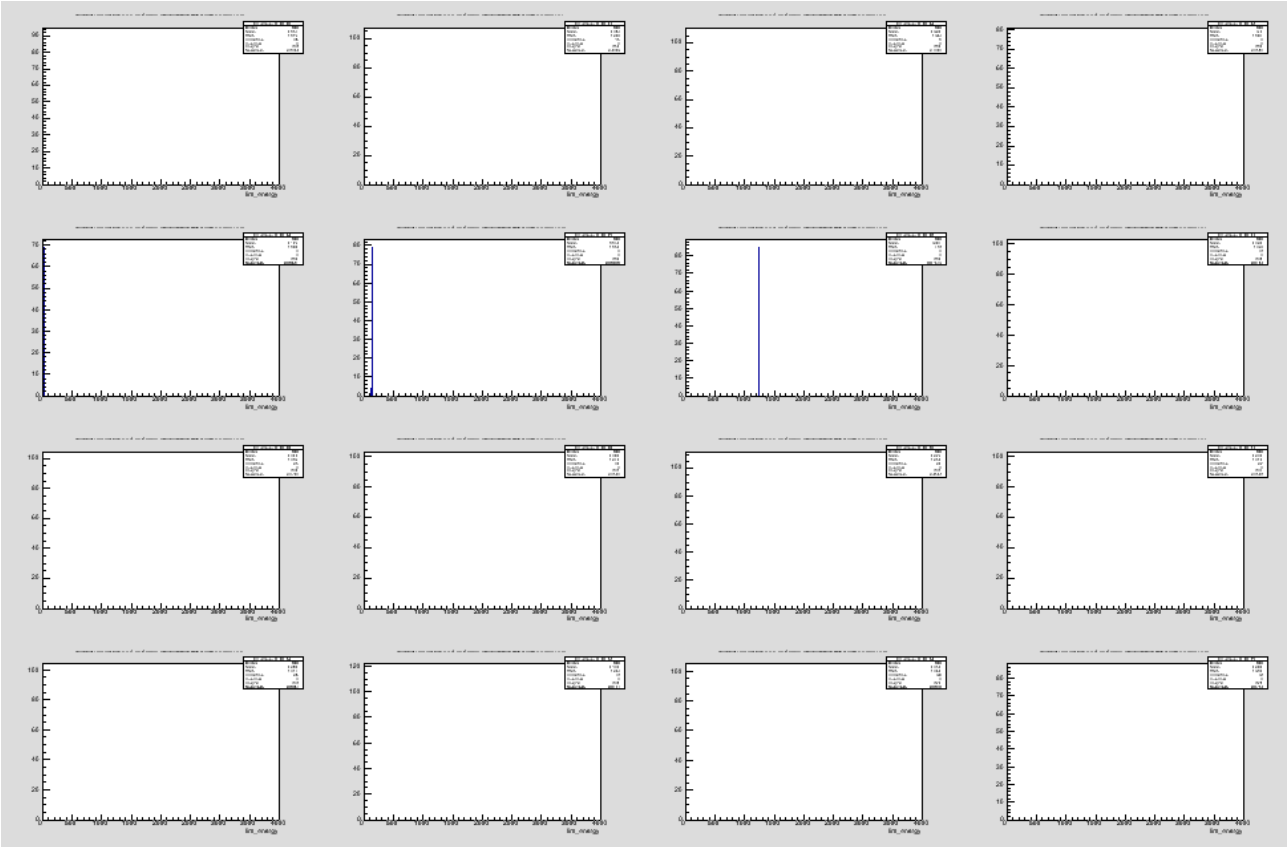

Abbildung 17: Preamp 7, card 1, all channels, preamp detached. Noise from parameter read request in channel 1,2,3 (FEBEXCh. 6,5,4,).

0.3.5 Preamp 8 (Dual Range), Max. Range 3pC/30pC

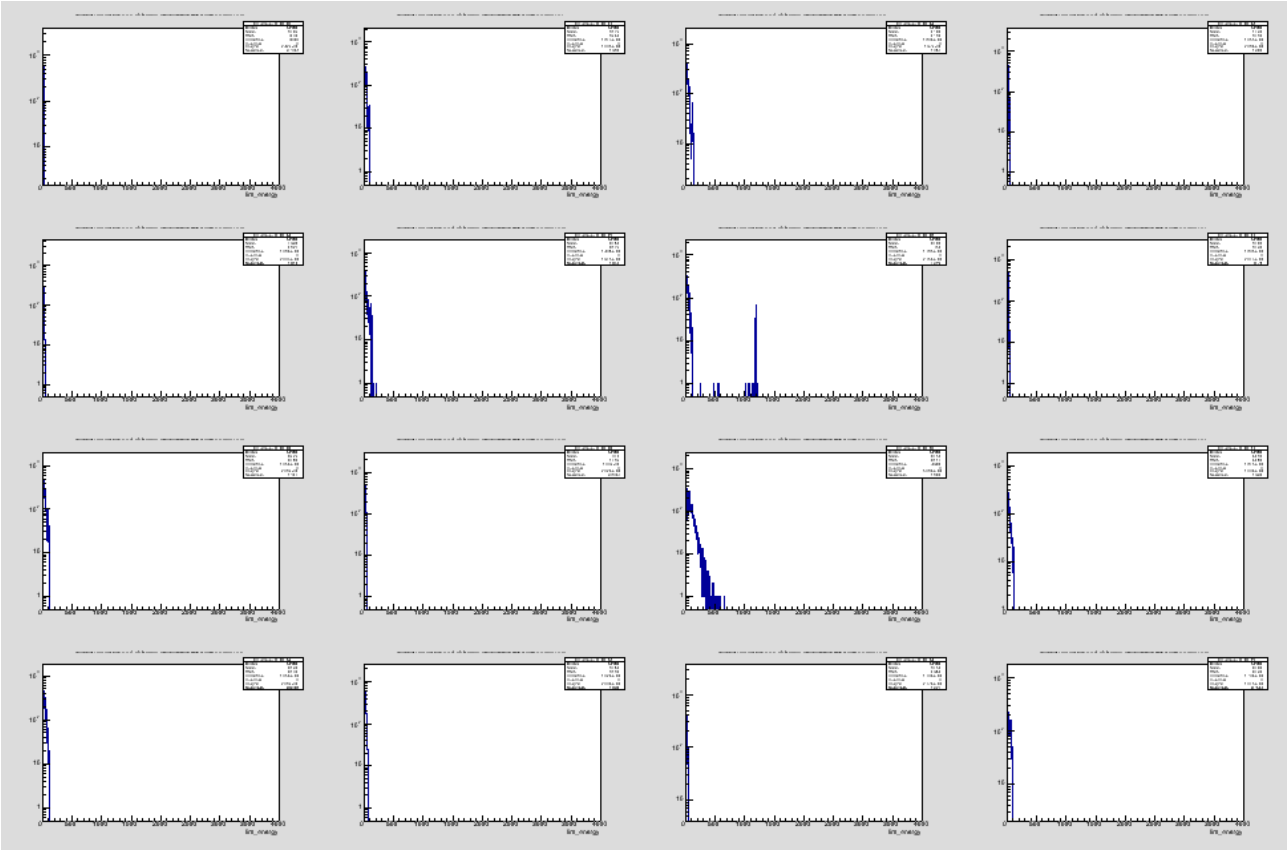

Abbildung 18: Preamp 8, card 0, all channels, preamp detached. Overall noise, nevertheless noise from parameter read request in channel 1 (FEBEXCh. 6) can clearly be identified.

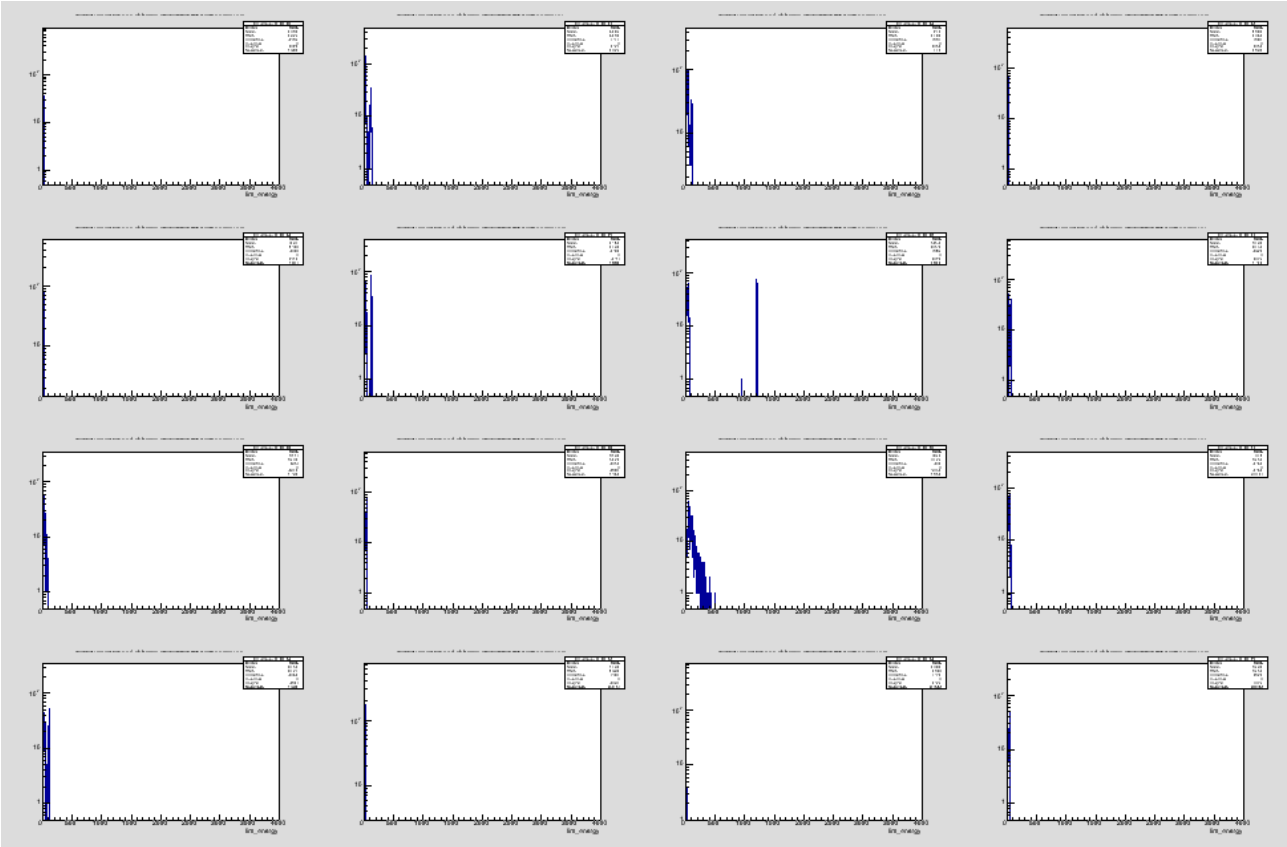

Abbildung 19: Preamp 8, card 1, all channels, preamp detached. Overall noise, nevertheless noise from parameter read request in channel 1,2 (FEBEXCh. 6,5) can clearly be identified.

0.3.6 Preamp 9 (Dual Range), Max. Range 3pC/30pC

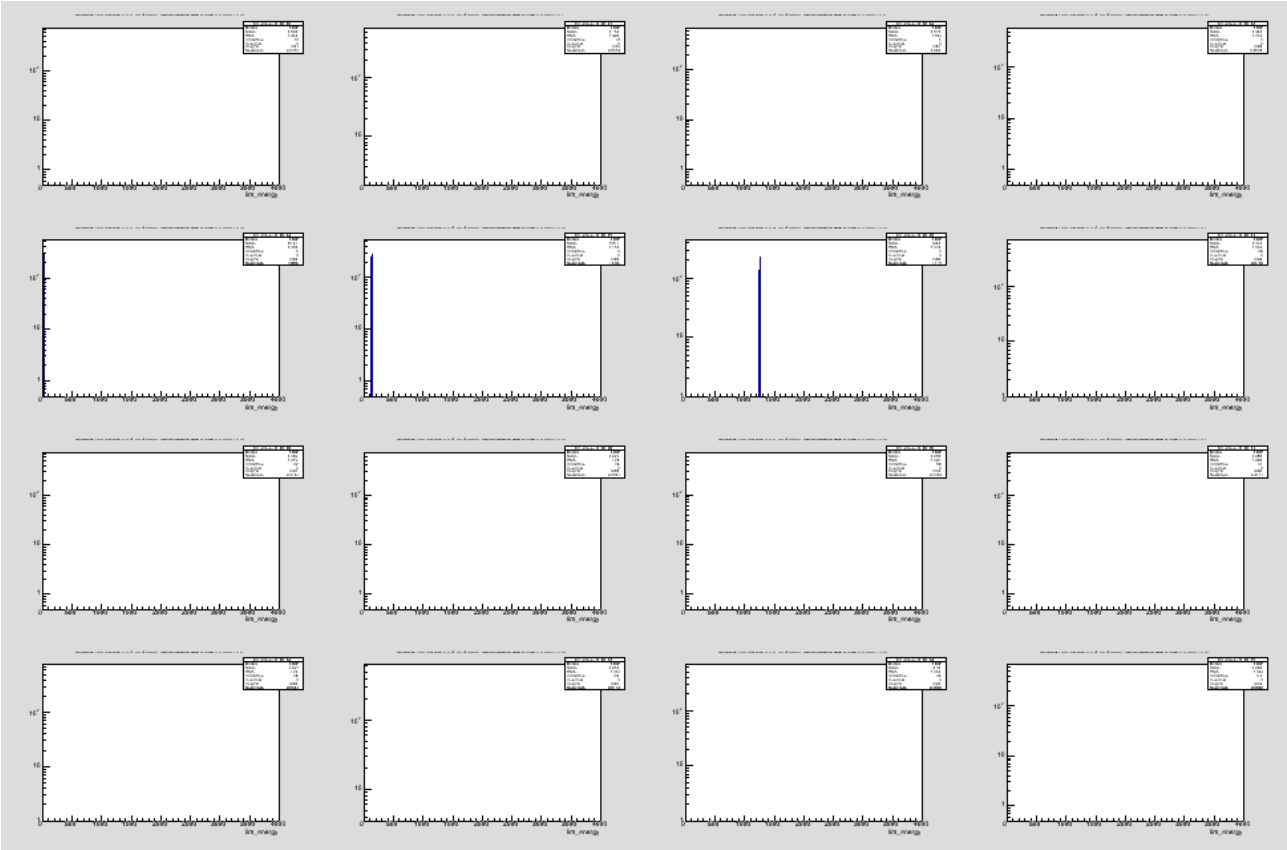

Abbildung 20: Preamp 9, card 0, all channels, preamp detached. Noise from parameter read request in channel 1,2,3 (FEBEXCh. 6,5,4).

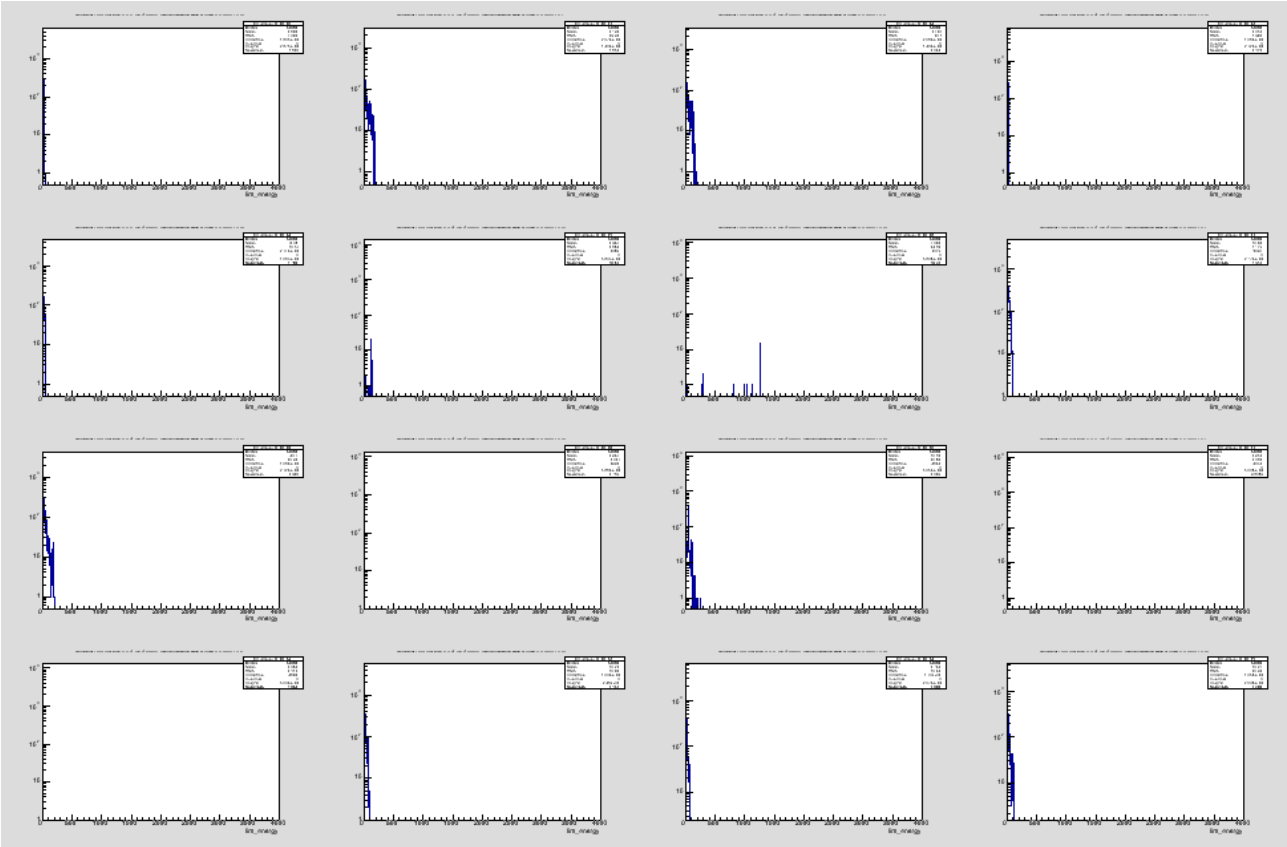

Abbildung 21: Preamp 9, card 1, all channels, preamp detached. Channels 5,6,8,9,10,11,12,15 (FEBEXCh. 1,2,7,8,10,13,14,15), nevertheless noise from parameter read request in channel 1,2,3 (FEBEXCh. 6,5,4).

0.3.7 Preamp 10, Max. Range 1pC/10pC

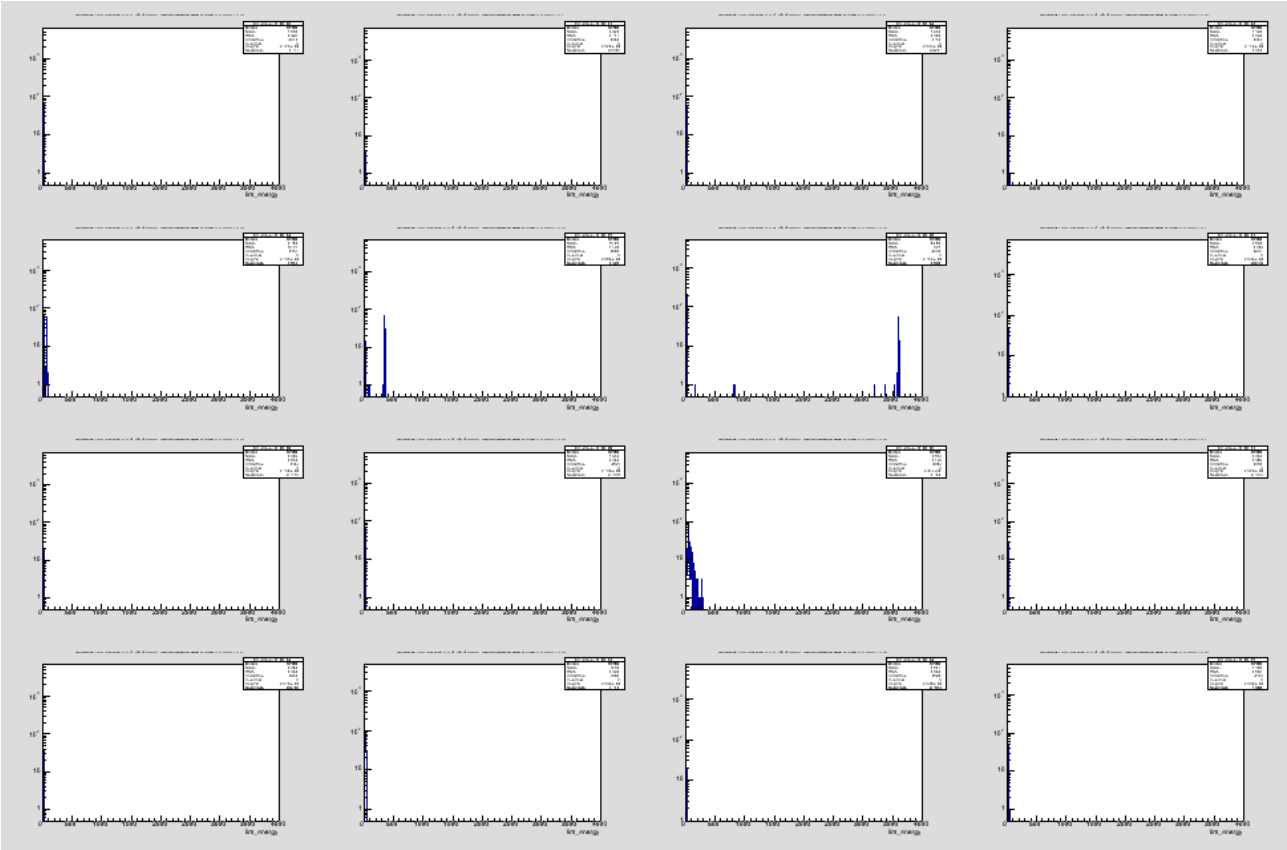

Abbildung 22: Preamp 10, card 0, all channels, preamp detached. Channel 15 (FEBEXCh.10) noisy, nevertheless noise from parameter read request in channel 1,2,3 (FEBEXCh. 6,5,4) can clearly be identified.

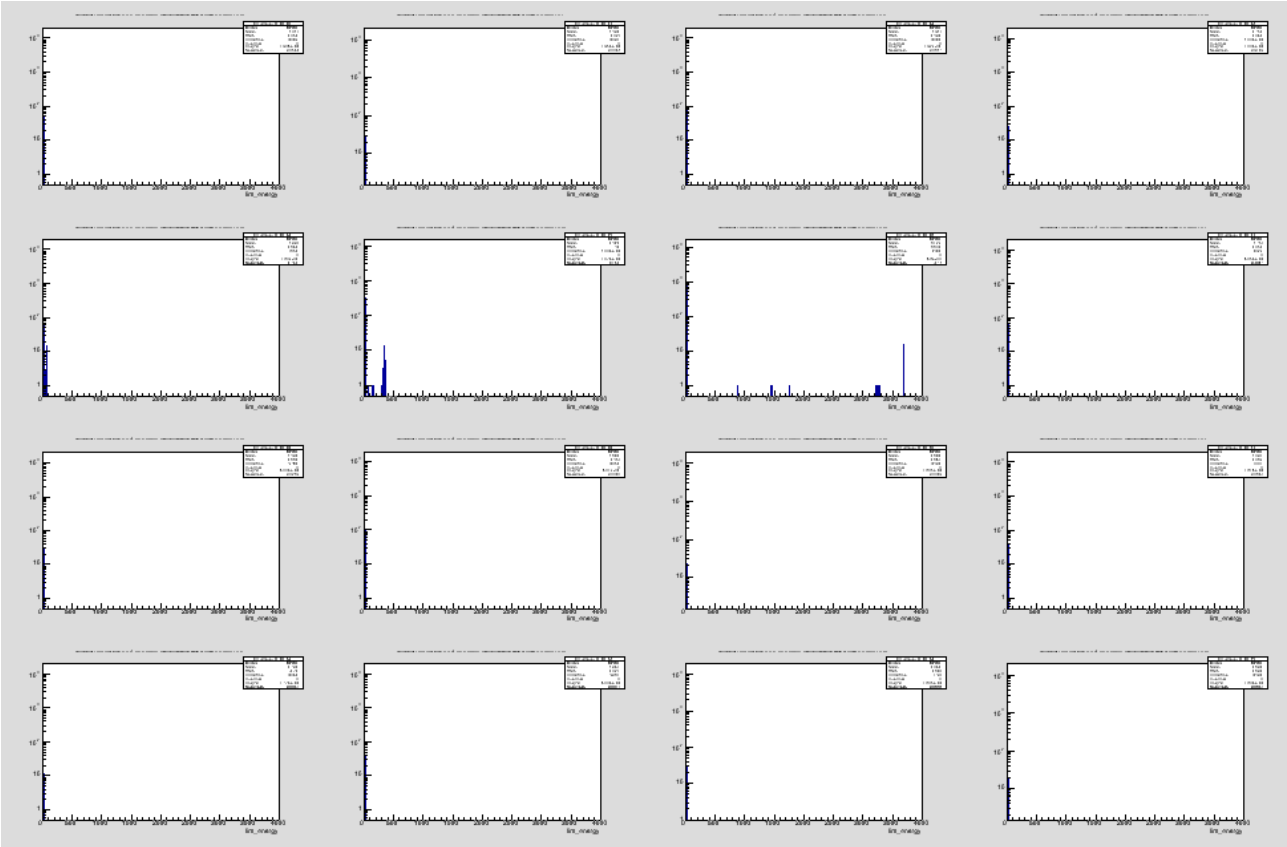

Abbildung 23: Preamp 10, card 1, all channels, preamp detached. Noise from parameter read request in channel 1,2,3 (FEBEXCh. 6,5,4).

0.4 Summary - repair demand

Preamp 1, seems to be noisy in both cards (0,1), bad resolultion.
Preamp 5, card 0: here we have missing channels 2 and 16.
Preamp 6, card 0: 8,9,10,11,12,15 channels are noisy. card 1: 7,8,9,10,11,12,13,15 channels are noisy.
Preamp 7, card 1: 7,8,9,10,11,12,15 channels are noisy
Preamp 8, card0: all channels are noisy. card1: all channels noisy
Preamp 9, card1: 5,6,8,9,10,11,12,15 are noisy.
Preamp10,card 0: 8,9,10,11,12,15 channels noisy.

0.5 Backup

With the same two setup the FOPRA Preamp(Max. Range 1pC/10pC) was tested. Even though it has a noisy/broken channel 15 (FEBEXCh. 10) on card1 it cannot be brought to repair, as we need it for the FOPRA. (The good thing is that the broken channel does not affect the FOPRA experiment, as for the FOPRA only card0 is used).

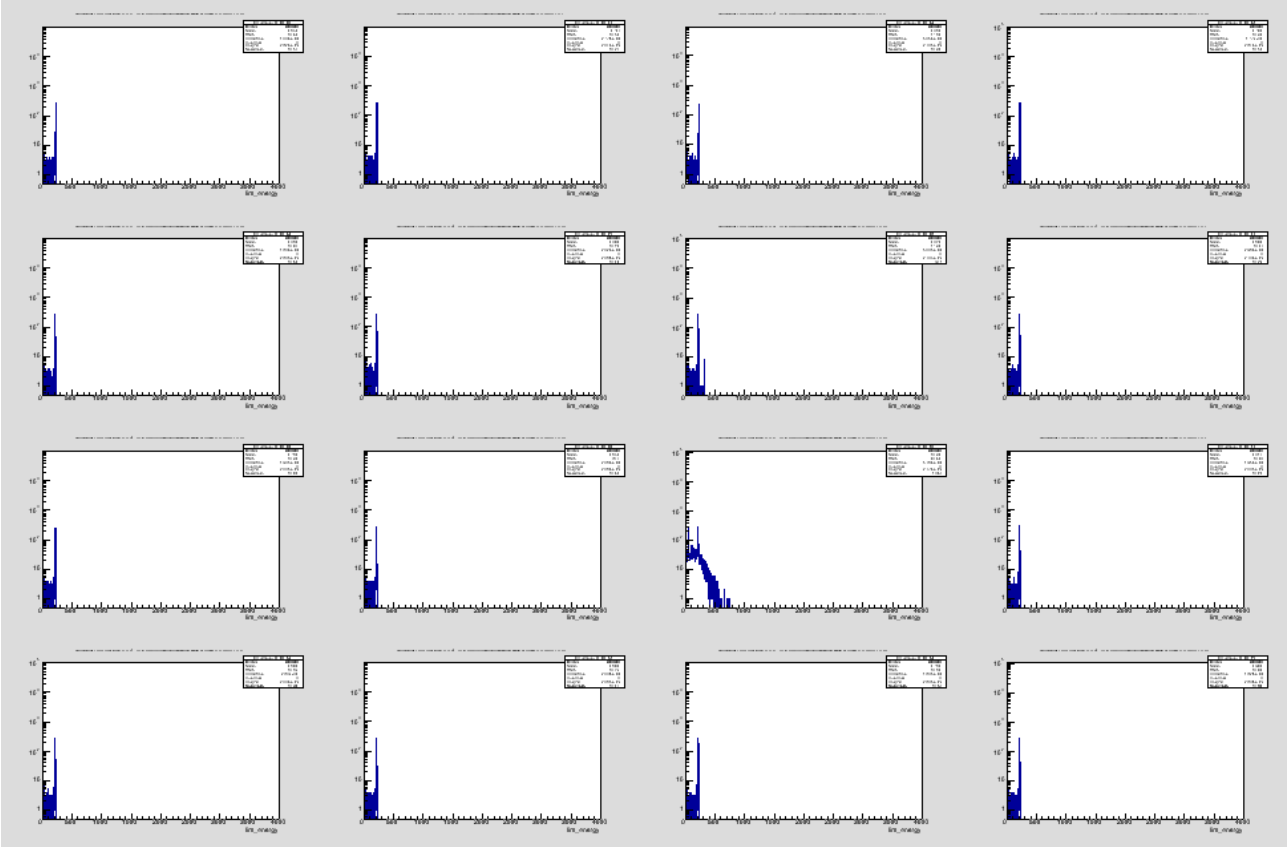

Abbildung 24: Setup 0 with pulser. FOPRA Preamp, card 1, all channels, no crystal, only pulser. Channel 15 (FEBEXCh. 10) noisy/broken.

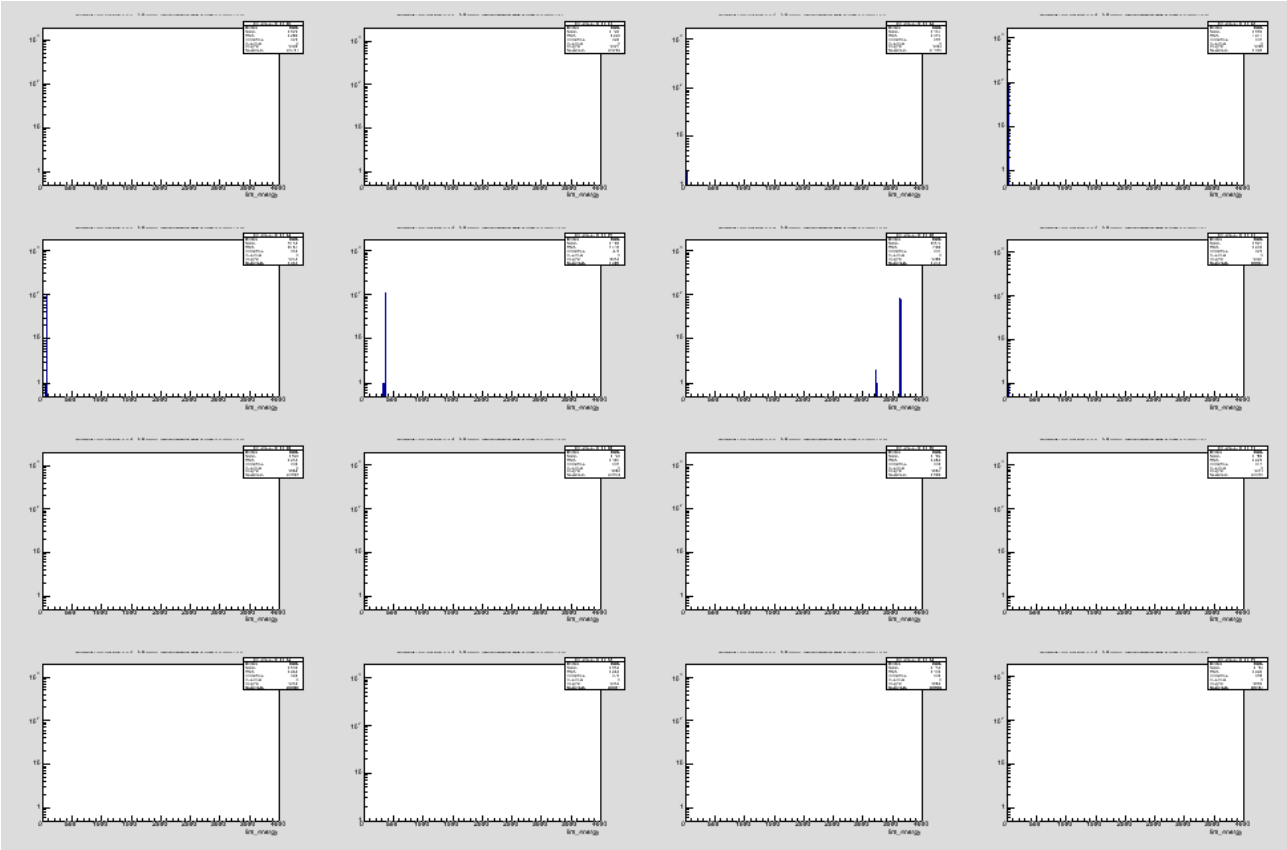

Abbildung 25: RC-Bus-Setup. Preamp FOPRA, card 0, all channels, preamp detached. Noise from parameter read request in channel 1,2,3,4 (FEBEXCh. 6,5,4,3).

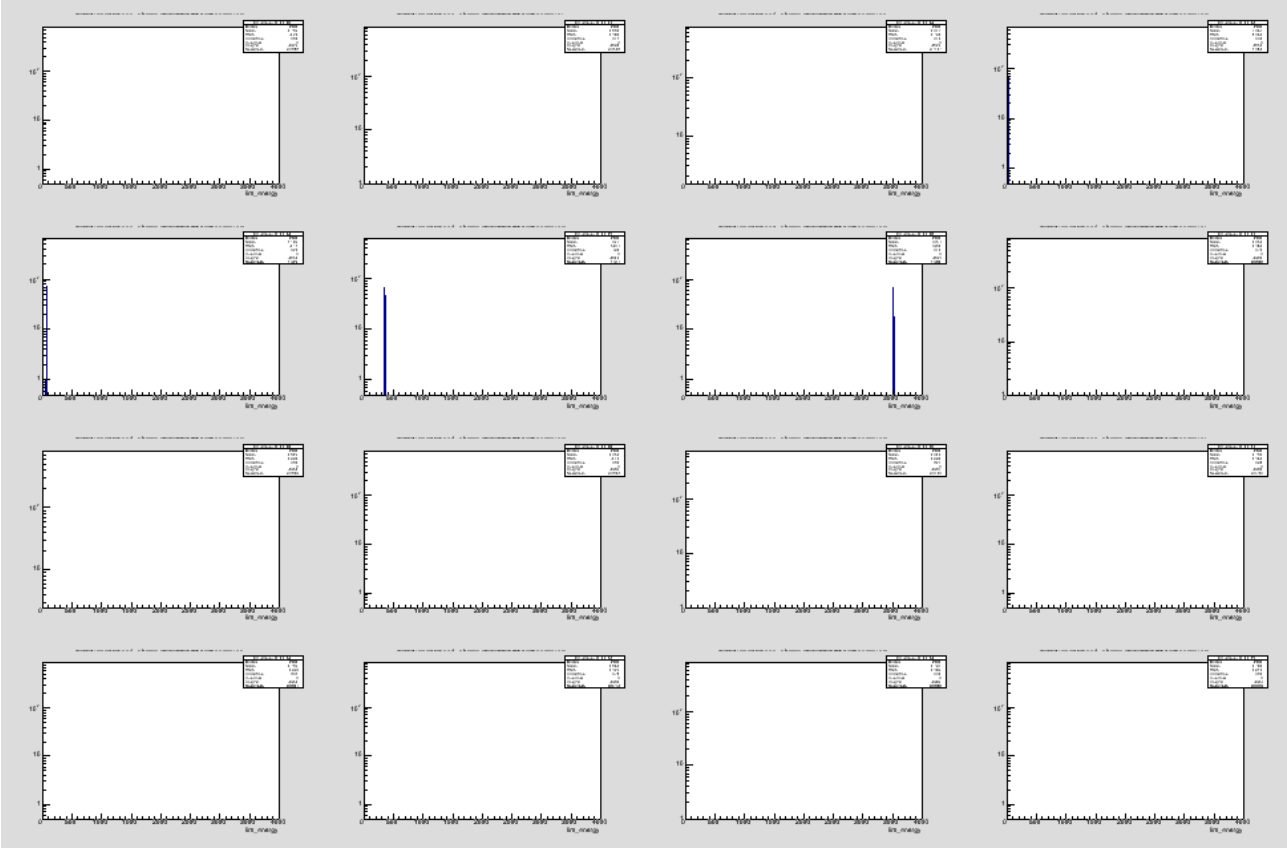

Abbildung 26: RC-Bus-Setup. Preamp FOPRA, card 1, all channels, preamp detached. Noise from parameter read request in channel 1,2,3,4 (FEBEXCh. 6,5,4,3).