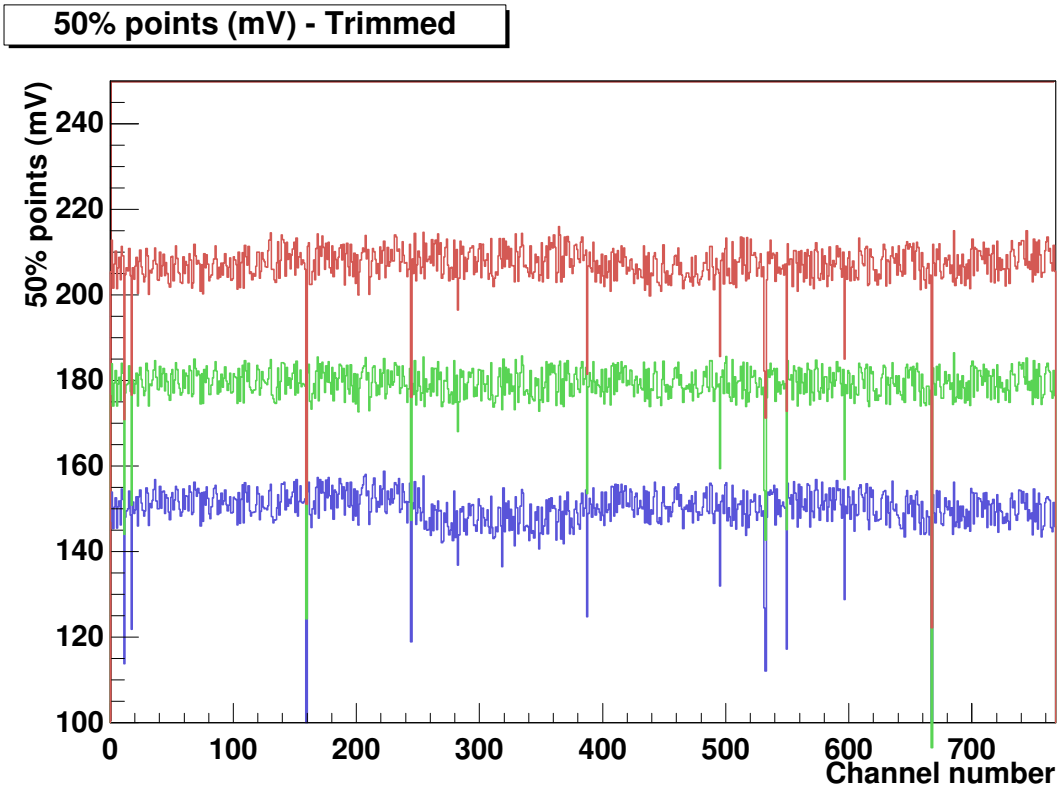
Some preliminary results from first single-sided module using ABCD2T chips

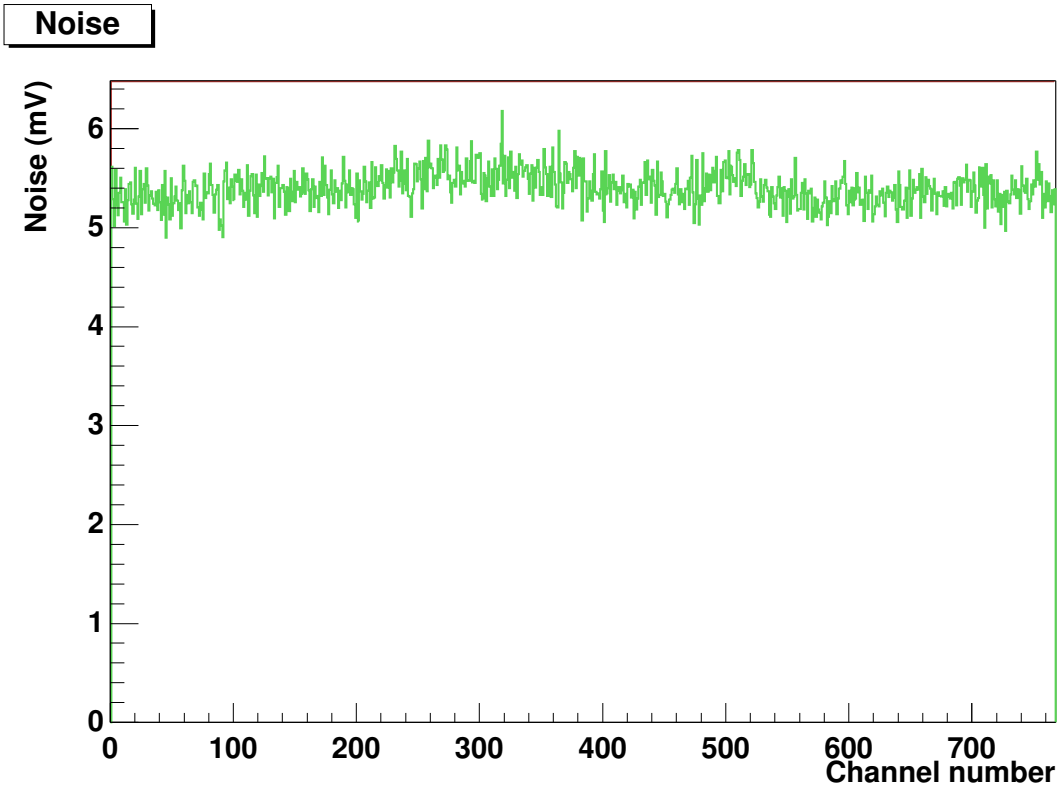
A first single-sided module with 12 cm detector has been built using 6 ABCD2T chips, thick and non-metalized. Basic set of measurements has been taken first for the fully populated hybrid and subsequently for the module with 2 daisy chained Hamamatsu barrel detectors in centre tap configuration. Bonding of the detectors was done at once in the following configuration: 5 chips bonded to 12 cm strips and for one chip in the middle 1/3 of channels to 6 cm, 1/3 of channels to 12 cm, and 1/3 of channels with open inputs. Some selected results, which demonstrate the noise and stability performance of the hybrid and module are shown below.

Hybrid results

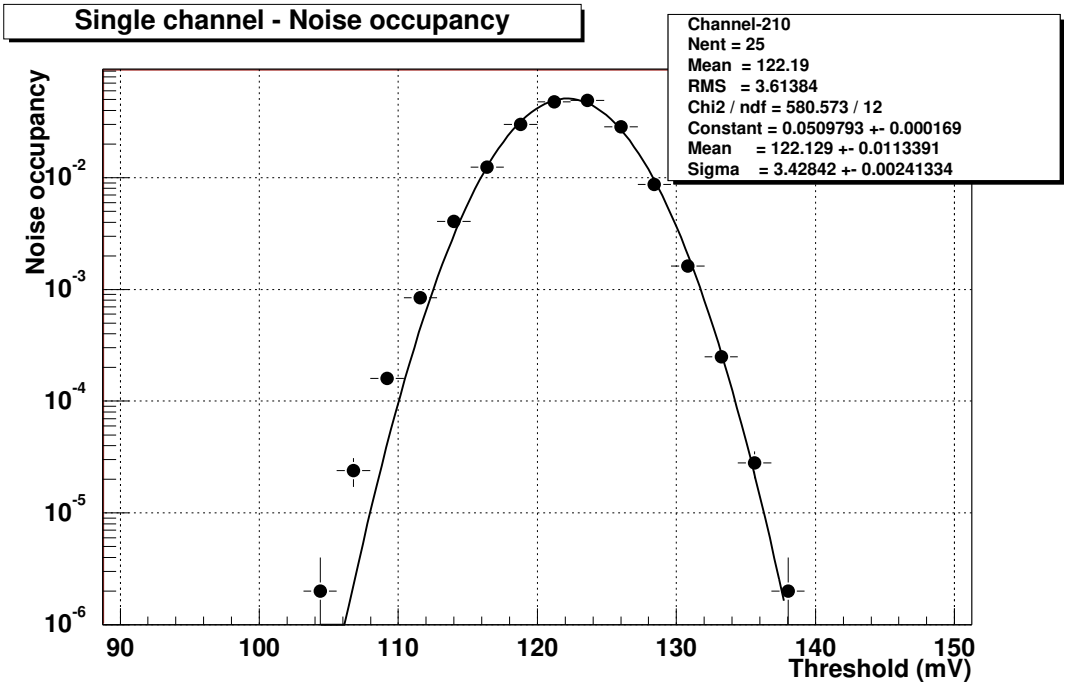
6 ABCD2T chips have been mounted of an evaluation ceramic hybrid with a common ground plane. The chips are thick and non-metalized.



Distribution of 50% points for 6 ABCD2T chips on the hybrid after trimming for input charges of 1fC, 1.5fC and 2 fC. Notice that because the threshold correction is applied the scale of the main threshold is shifted and the zero effective threshold corresponds now to a setting about 120 mV.



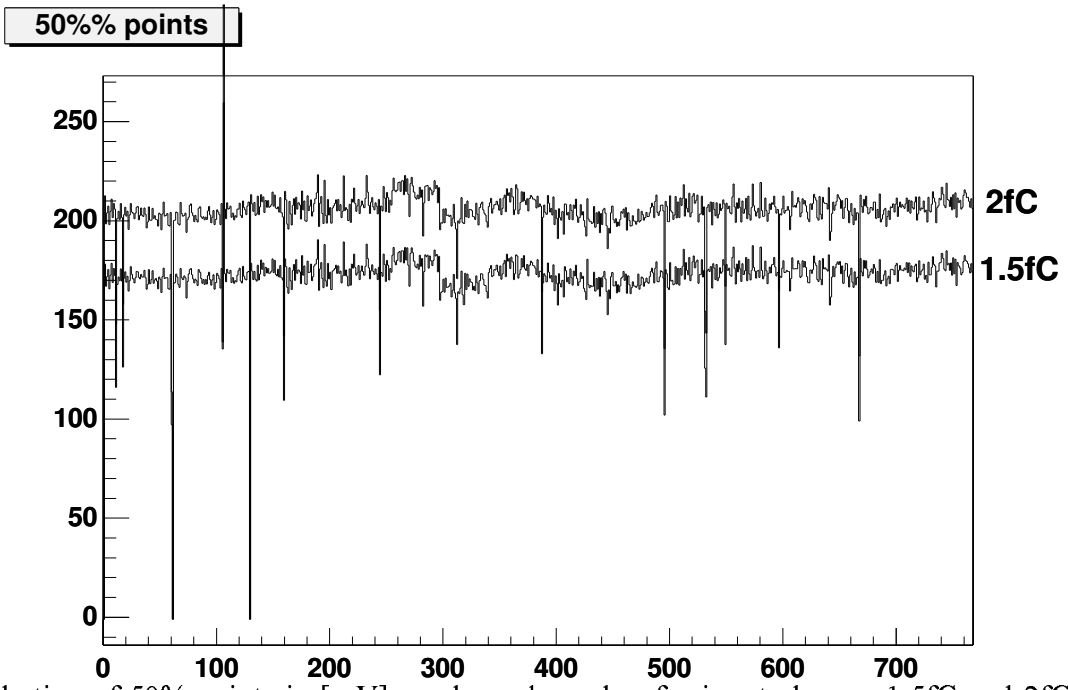
Distribution of noise extracted from S-curves as measured for a charge of 1.5 fC. Given the average gain about 60 mV/fC the measured noise corresponds to 550 el. rms.



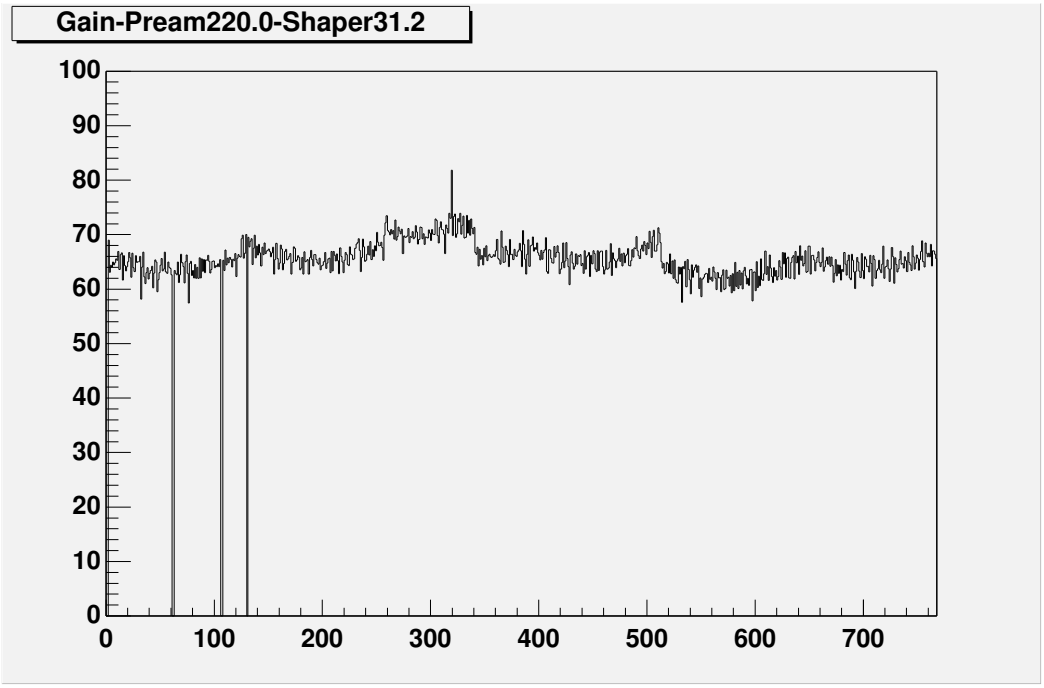
Noise occupancy of a single channel. Pure gaussian noise is measured down to a level of $1e10^{-6}$ and no deviation from gaussian distribution is observed around threshold equal to 0. The threshold setting of 122 mV corresponds to the effective threshold equal to 0 and the range below 122 mV corresponds to negative thresholds. These results demonstrate clearly that there is no sign of any internal pick-up or crosstalk in the chips between the digital part and the front-end.

Module results

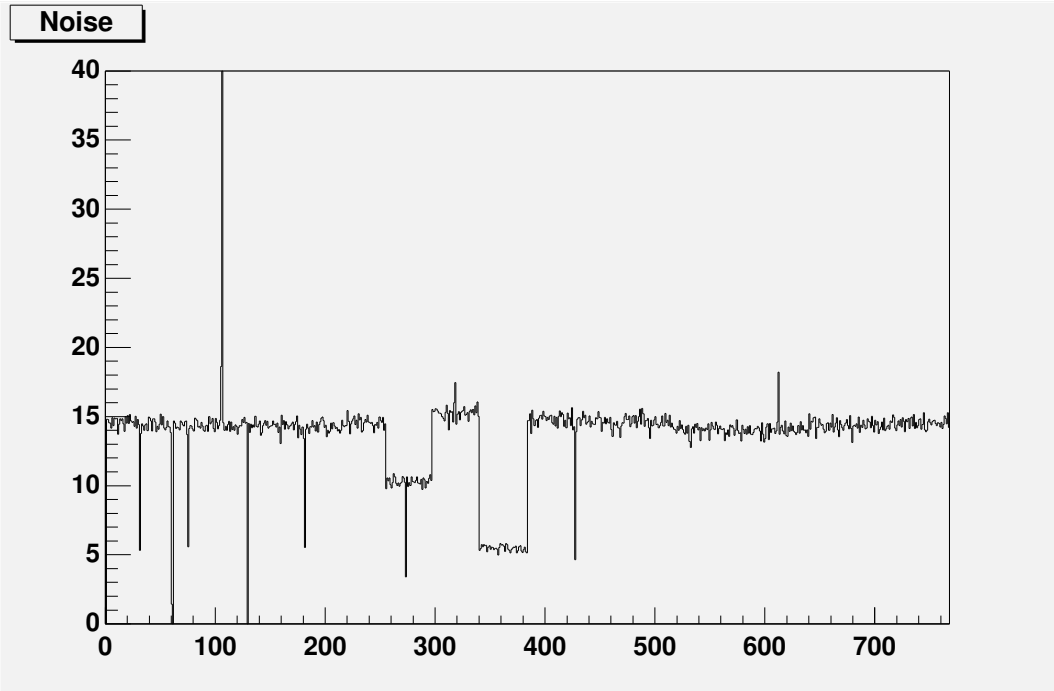
Chips # 1, 2, 4, 5, and 6 are bonded to 12 cm strips, for chip #3 1/3 of channels is bonded to 6 cm, 1/3 of channels to 12 cm, and 1/3 of channels is left open.



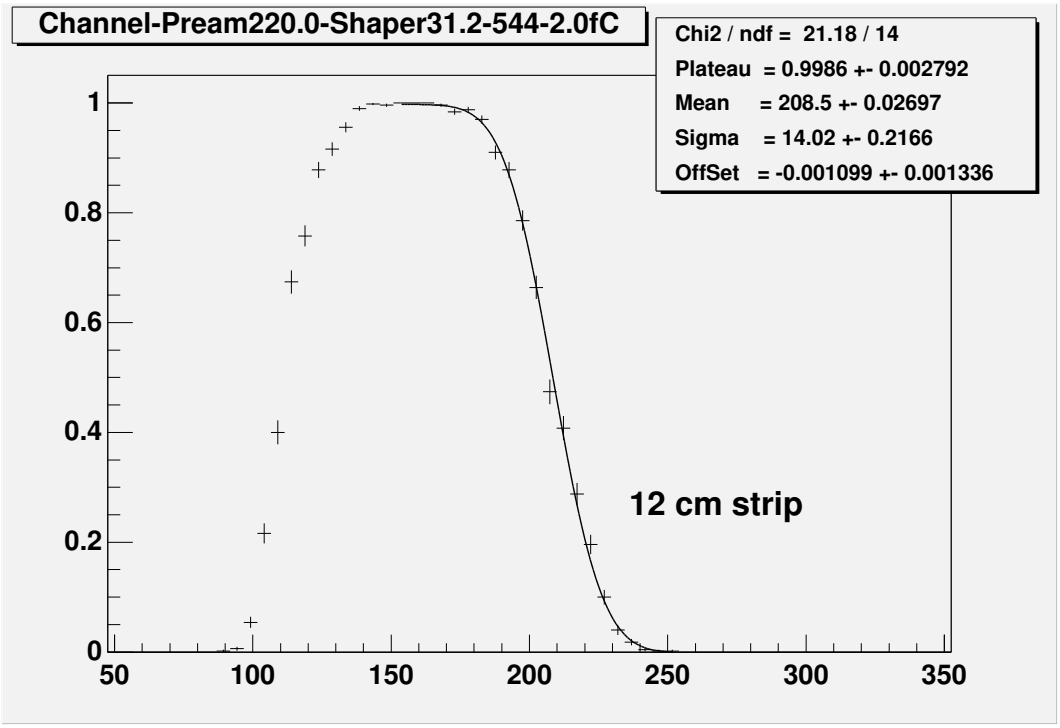
Distribution of 50% points in [mV] vs channel number for input charges 1.5fC and 2fC. The trim DAC measurements were not repeated and the trim correction factors were used as those obtained from the hybrid measurements.



Distribution of gain in [mV/fC] vs channel number. The gain is obtained from a linear fits using 3 points: 1.5 fC, 1.75fC, 2fC.



Distribution of noise in [mV] vs channel number. The noise values were extracted from S-curves as measured for a charge of 1.5 fC. Notice the noise levels for chip #3 for 6 cm, 12 cm and no strips connected. Given the average gain about 65 mV/fC (measured at a higher shaper current compared to measurement shown for the hybrid) the measured noise correspond to 530, 990 and 1380 el. rms., for 0, 6 and 12 cm strips respectively. These measurements are based on internal calibration circuitry so that absolute values should be considered as accurate +/- 10%. The value of 530 el. rms. for open channels is consistent with high value of the current gain factor β ~250 in the present batch. The values for 0, 6 and 12 cm are also consitent and indicate that the module works perfectly stable.



Example of a S-curve measured for a channel connected to 12 cm strip. Again one does not see any sign of extra noise or oscillation even a threshold equal 0.