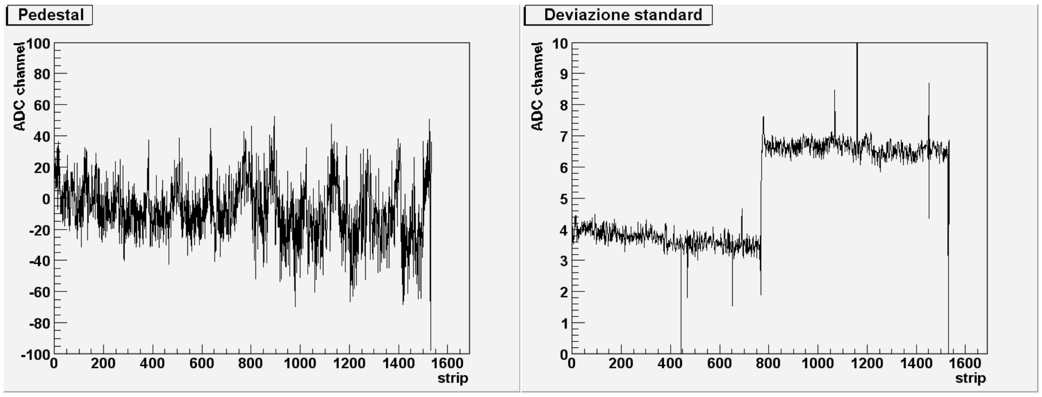

Figura 4.7: Pedestal and standard deviation values for each strip in a noise run. The first 768 strips are the P-side ones while the others are the N-side ones. The not working strips have standard deviation equal to zero.

Once it was calculated, the pedestal is subtracted to each strip readout event by event. If we recalculate the mean signal for each strip after the pedestal subtraction, we'll obtain values near to zero, while th estandard deviation doesn't change (figure 4.8).

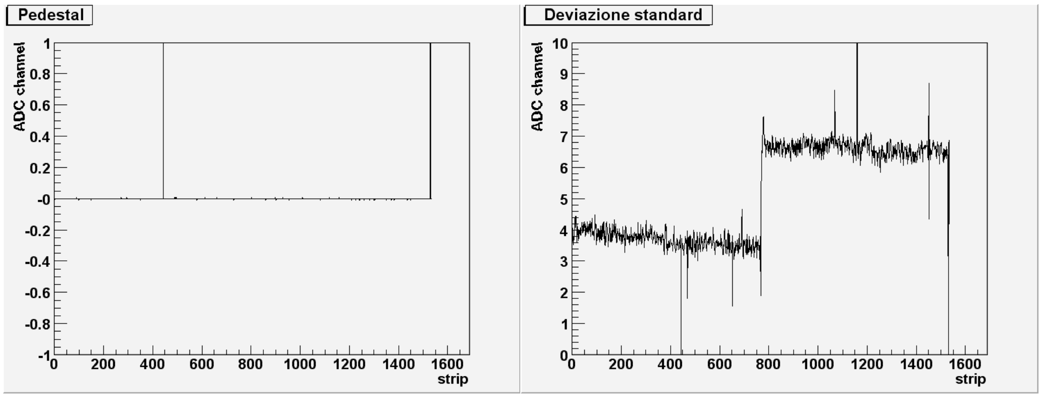

Figura 4.8: Pedestal and standard deviation values for each strip in a noise run after pedestal subtraction

The standard procedure says that the so obtained pedestal values are the reference ones for the next analysis of signal run, under the hypothesis they only depend on the woking conditions, taken costant. As we will see in the paragraph 4.3.3, the iteration procedure previous decribed leads to the development of a signal analysis method which doesn't need any beginning noise run.

Calculus and subtrction of the common mode

Common mode is an offset changing due to che readout chip, not to the strip, and it changes event by event. So, after pedestal subtraction and not working strips identification, the common mode must be calculated for each event and each chip. As seen in the paragraph 2.3.3, 12 chip are connected to the SSD module, 6 ones a side, each of them reads 128 strips.

Common mode is calculated averaging the signals of all the strips read by the same chip, except the ones producing a too high signal; as in the pedestal calculus, the signal is too high if it goes over four times the strip noise.

Moreover, to calculate better the common mode, noisy strip are not consedered. A strip is said *noisy* if its noise is at least 3σ over the average noise. Also the strips whose noise is at least 3σ under the mean noise are considered as *noisy*, beacuse too low noise level are connected to problem in the strip work.

The pedestal is obtain averanging over all the events, but the common mode is calculated event by event; so it is not possible to use a noise run to analyze the common mode of a signal run.

Since the common mode fluctuations are in average null, common mode subtraction doesn't affect pedestal. The standard deviation, instead, becomes smaller beacuse we take off a souce of statistical errors; the standard deviation values obtained after the common mode subtraction are the noise of the module strips (see figure 4.9). On N-side the noise is about twice than on P-side; this is because of different capacities between the strips and the readout chip on the two sides; a bigger capacity on N-side causes, douring the readout, a higher noise.

As an example, figure 4.10 shows the noise for M1 module, on which are implanted different readout chip. You can see the 128 strips blocks, each of them with a different noise level.

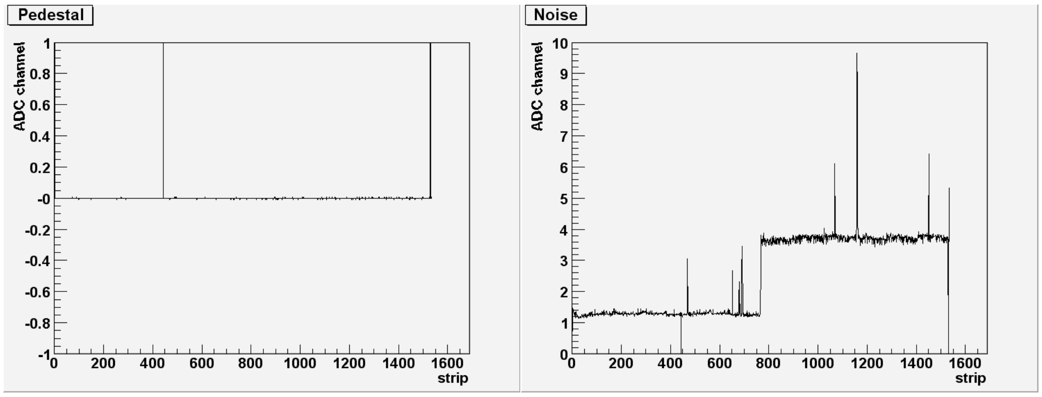

Figura 4.9: Pedestal and noise values for each strip after pedestal and common mode subtraction. The standard deviation decreased respect to figure 4.8, while pedestal values didn't change

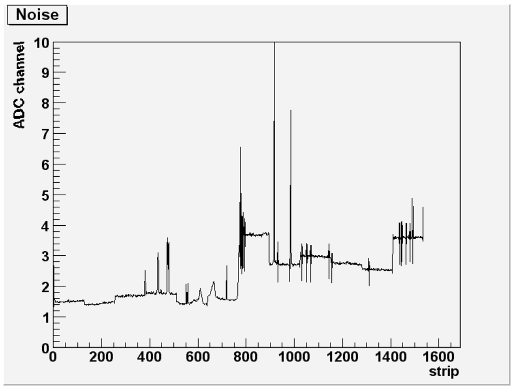

Figura 4.10: Module M1 noise. You can see the 128 strips blocks, each of them with a different noise level.

4.3.2 Noise as a function of power supply

As in paragraph 2.3.2, the SSD module have a particular depletion bias which is important to know. During the time, in fact, the power supply systems can provide a bias lower than the nominal one, and it is very important not to go under a value high enough to allow the right work of the module.

The right working bias corresponds to the minimum of the noise. Changing the bias, we obtained the plots 4.11, 4.12 and 4.13 for the three modules. For each side, the noise is the mean of the noise of this side strips.

We can see that with a bias of 25 V the working conditions are good for all the tested modules, and over 30 V the depletion is complete.

If there is only a partial depletion, there can be big (order of mm^2) areas

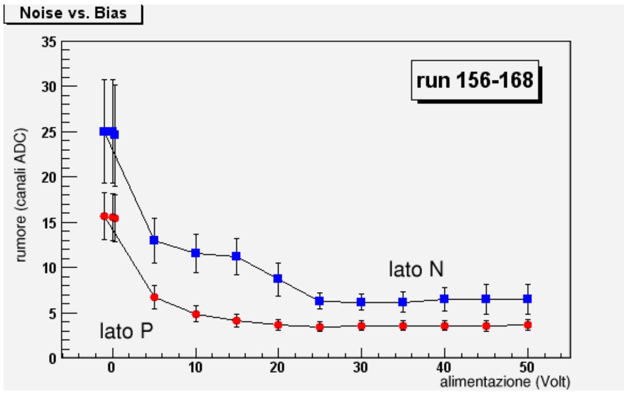

Figura 4.11: Noise ad bias function for the M1 SSD module. The P-side values are red, while the N-side ones are blue. The plotted values are, for each side, the average of the single strip noise, just calculated; the error is the standard deviation from the mean.

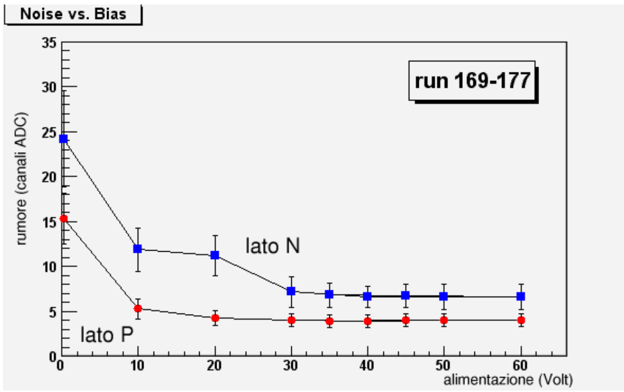

Figura 4.12: Noise as bias function for the M2 SSD module.

where the detector is not sensible. This fact would cause serious problem in the reconstruction of the tracks of the particles crossing these zones.