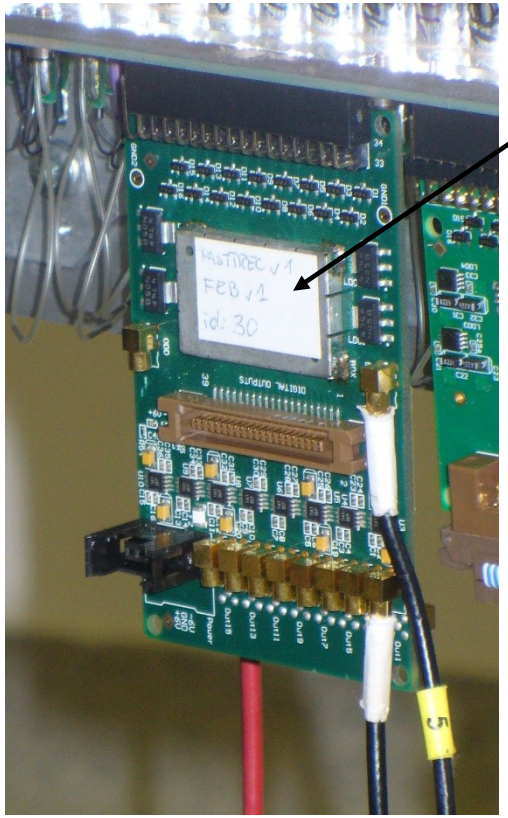
Measurement of noise in FEE card with pulse generator



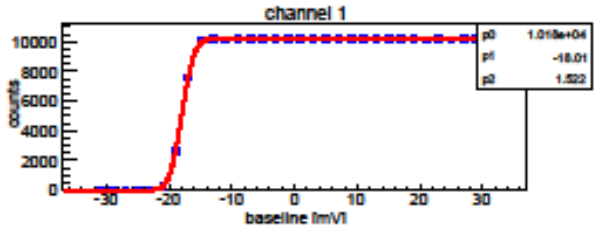
FEE board of B-type
- peaking time 20 ns,
- gain 4
- threshold 100 mV

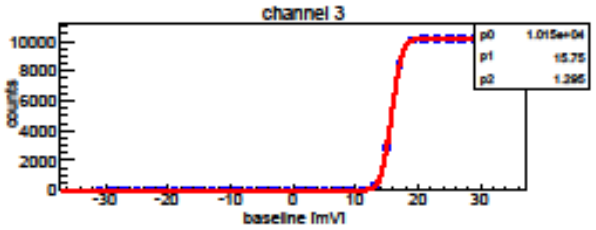
Pulse generator Keysight 33210A

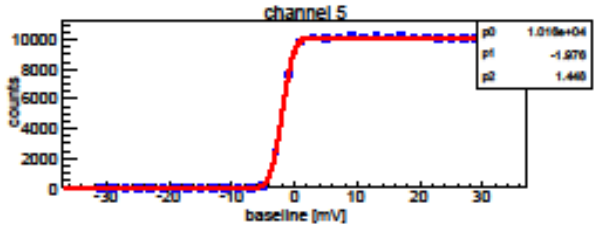
from pulse generator
to even channels

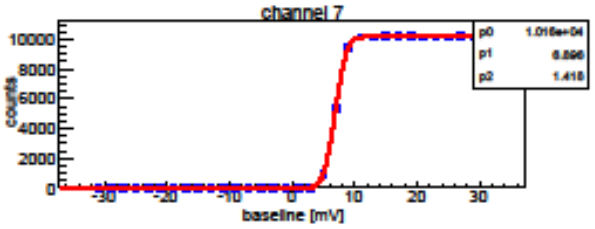
S-curve

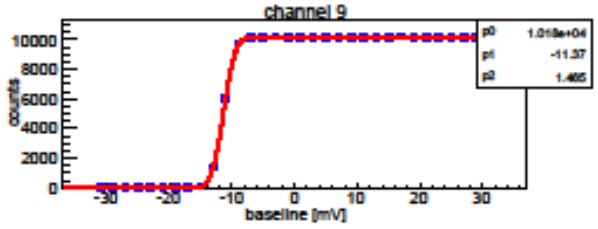
Counts at digital output of FEE board measured as a function of baseline level

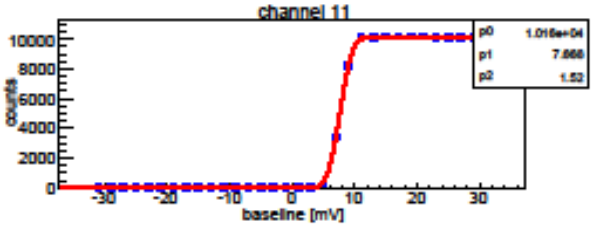


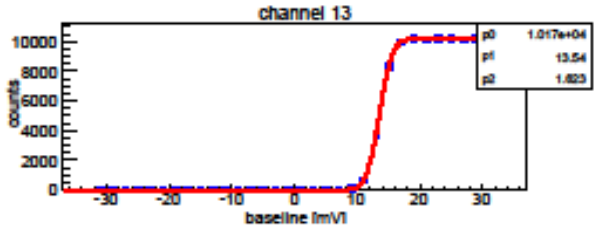


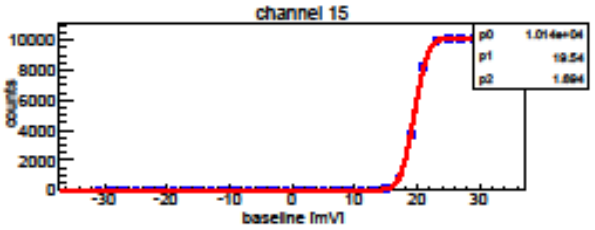












Fitted function

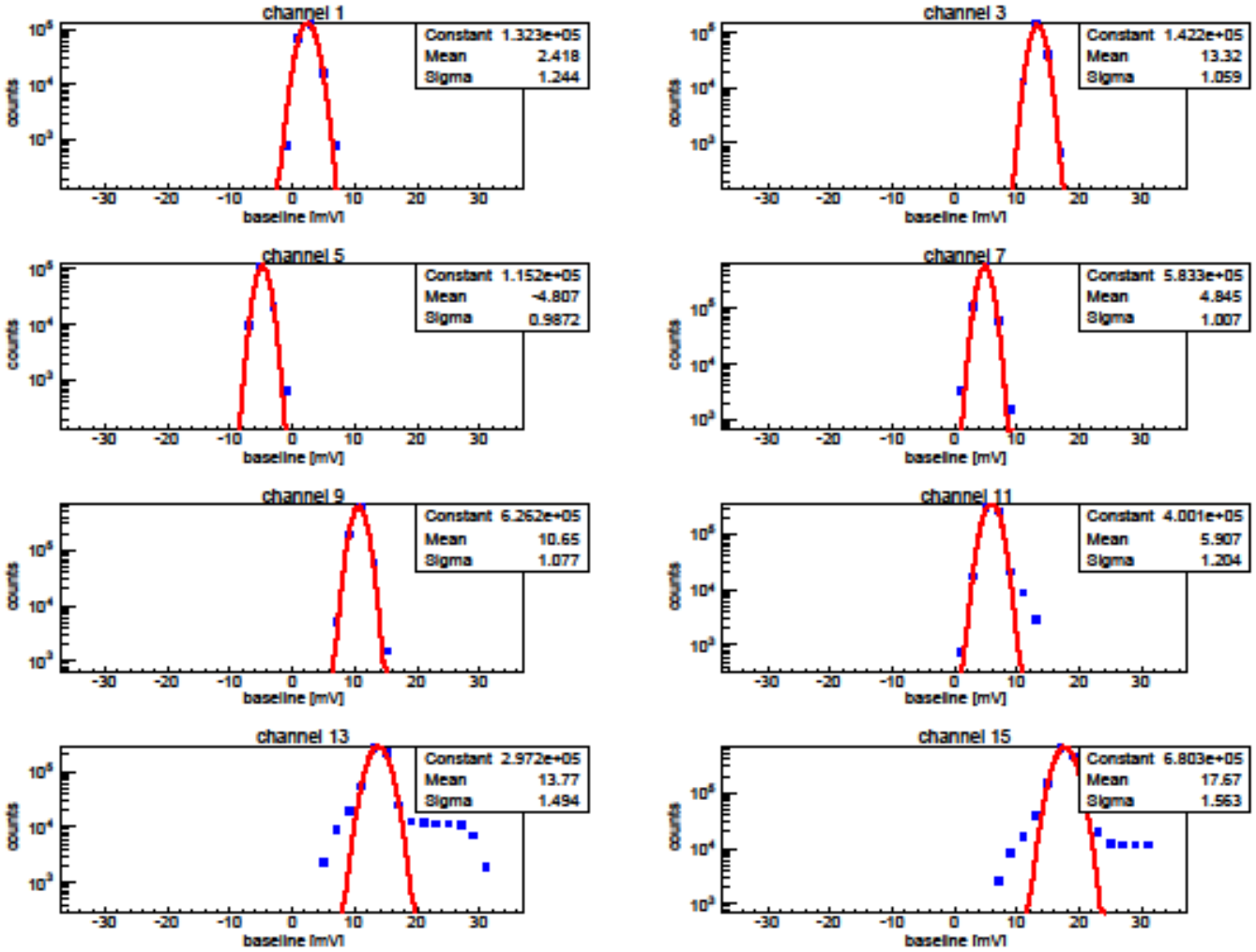
$$S(x') = A \int_{-\infty}^{x'} \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2} dx$$

$$= A\frac{1}{2}\left[1 + \mathrm{erf}\left(\frac{x'-\mu}{\sqrt{2}\sigma}\right)\right]$$

$$¿\, A\frac{1}{2}\left[1 + erf\left(\frac{x'-\mu}{\sqrt{2}\sigma}\right)\right]$$

$$S(x') = A\int_{-\infty}^{x'} \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(x\right.}$$

Baseline scan at threshold = 0 mV (no pulse generator)



Noise level

Channel	Baseline scan at thr = 0 mV		Pules generator
	σ(gaussian fit) [mV]	standard dev. [mV]	σ(error func. fit) [mV]
1	1.24	1.231	1.52
3	1.06	1.05	1.30
5	0.99	0.96	1.45
7	1.01	0.99	1.42
9	1.08	1.10	1.47
11	1.20	1.45	1.52
13	1.49	3.79	1.62
15	1.56	2.79	1.69

Conclusions

- For 5 out of 8 tested FEE channels, the baseline scans with thr = 0 mV show gaussian distribution, for the remaining 3 asymmetric tails are observed
- σ of noise obtained from gaussian fit of the baseline scan is by about 30% smaller than one obtained from the S-curve fit; discrepancy is not understood