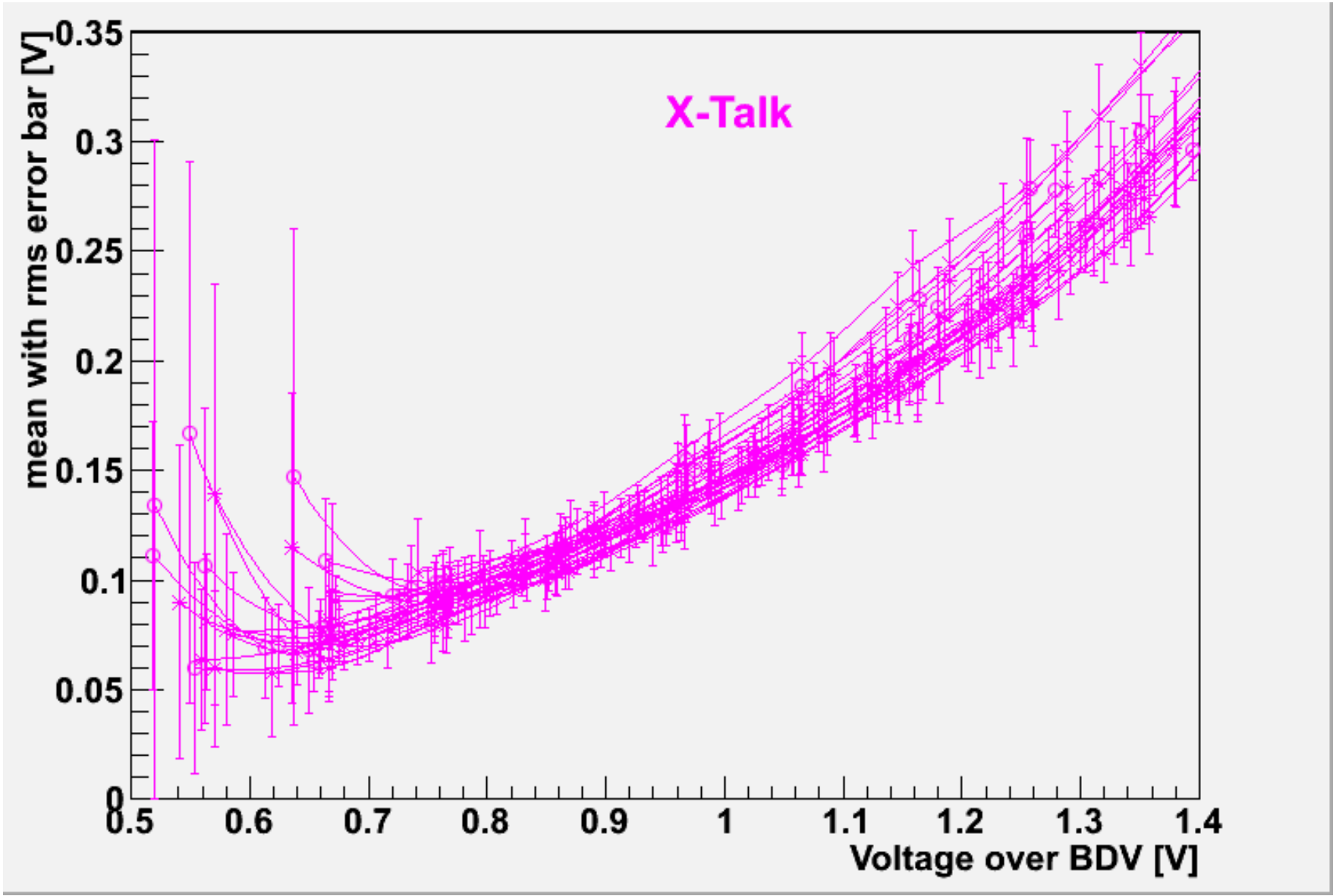
The operation point and X-talk.

S.Kuleshov

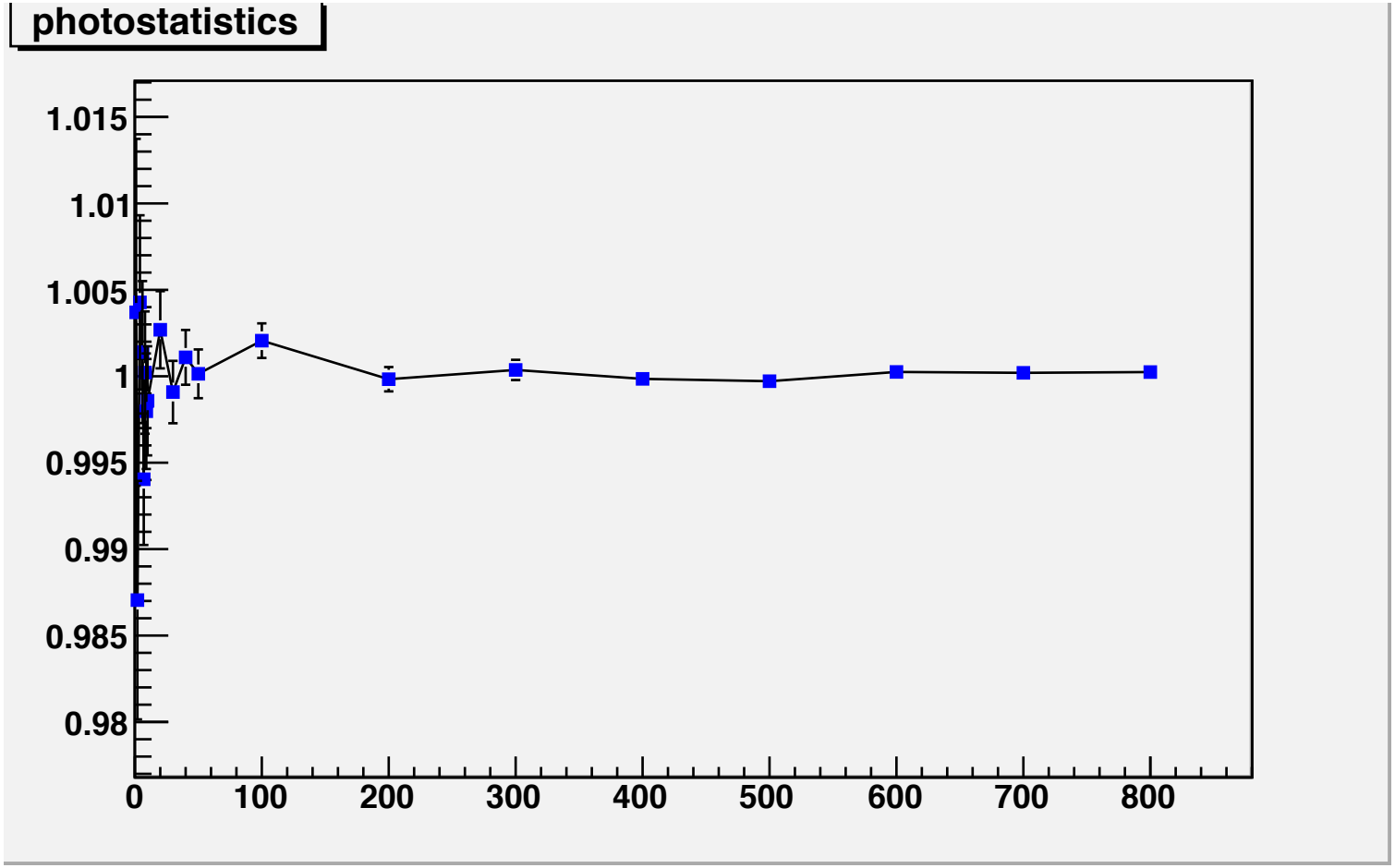
UTFSM's measurements.



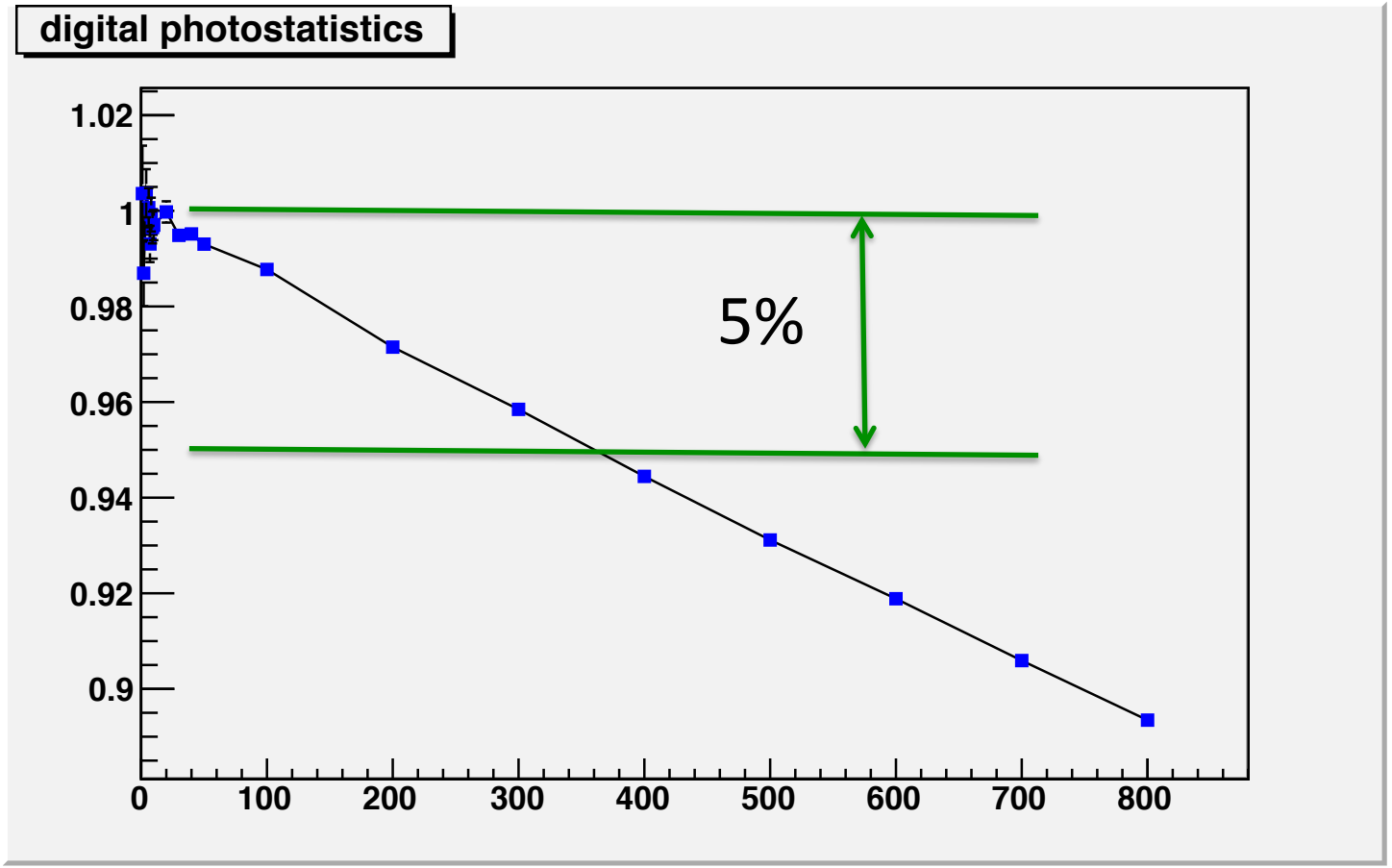
The SiPM model

- MPPC cell is a matrix 60x60 pixels.
- For selected N or averaged number of photons on the surface of the MPPC Poisson generator provided the number of “photons” Nph for each event.
- “photons” were strewn over the matrix with the uniform distribution. One or more photons in a pixel made the pixel fired. Npixin – number initialized pixels for each event.
- 8 pixels around each fired pixel were considered to be fired with probability “8 pixel-talk”/8. If pixel had been fired before it was excluded from the consideration. Npixout- the number fired pixels.
- “8 pixel-talk” (X-talk)= 0.10 (0.105), 0.15 (0.165), 0.20 (0.24), 0.25 (0.31), 0.30(0.40), 0.40(0.51), 0.50(0.81)
- N=1,2,4,6,7,8,9,10,20,30,40,50,100,200,300,400,500,600,700,800
- 10000 events in each point

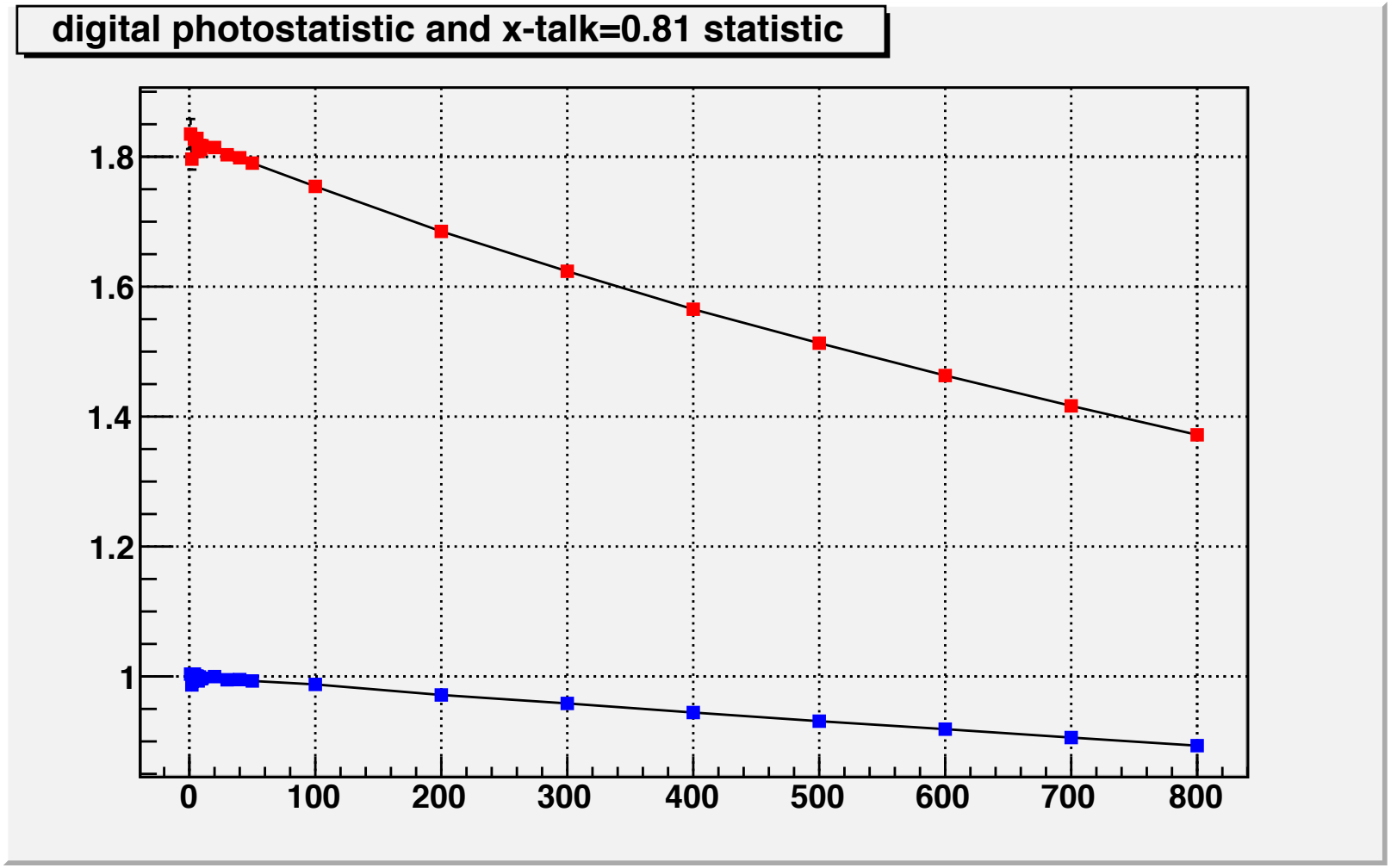
<N ph.>/N vs. N


photostatistics
1.015
1.01
1.005
1
0.995
0.99
0.985
0.98
0
100
200
300
400
500
600
700
800

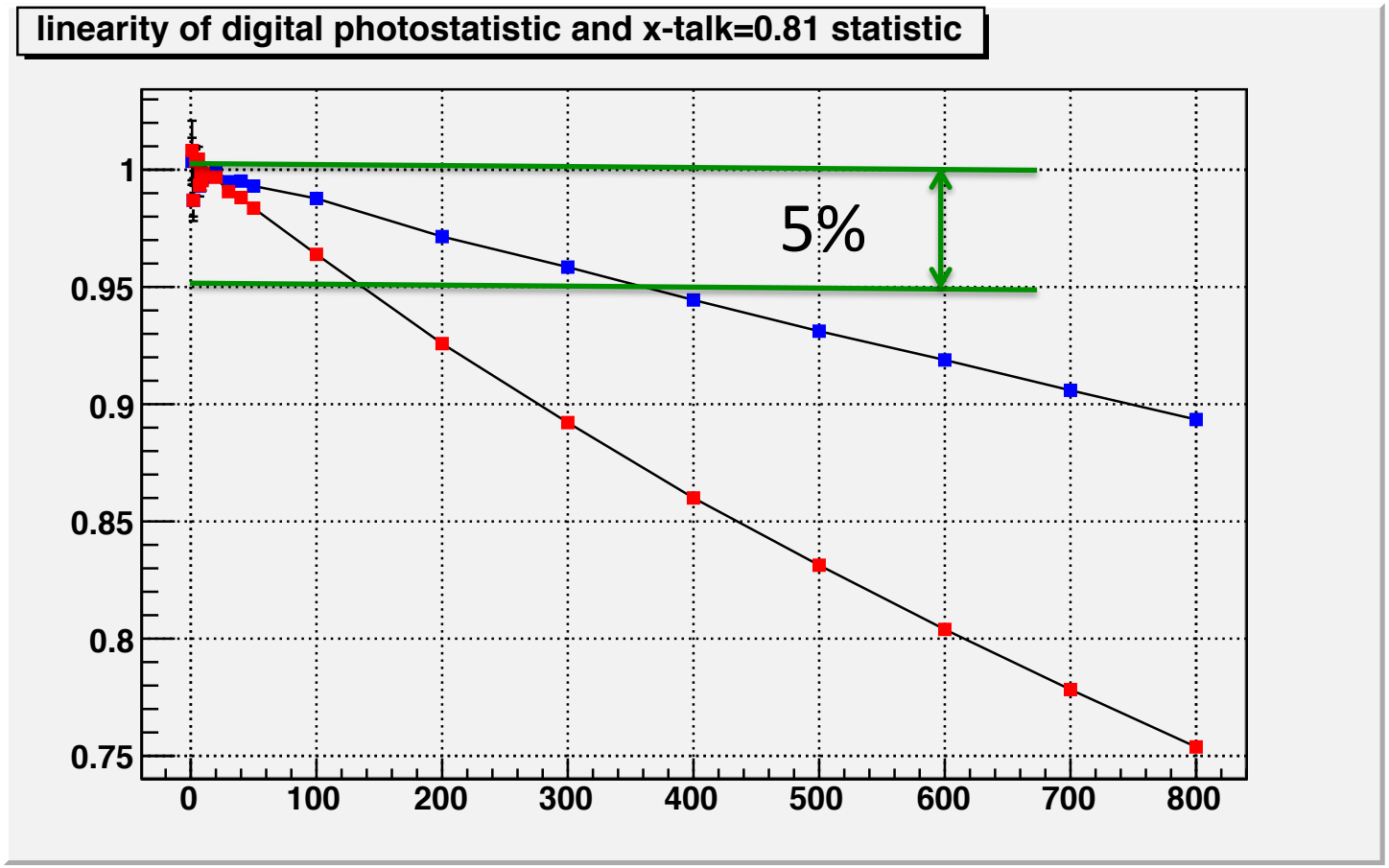
The effect of surface pixelation
<N pixin>/N vs. N



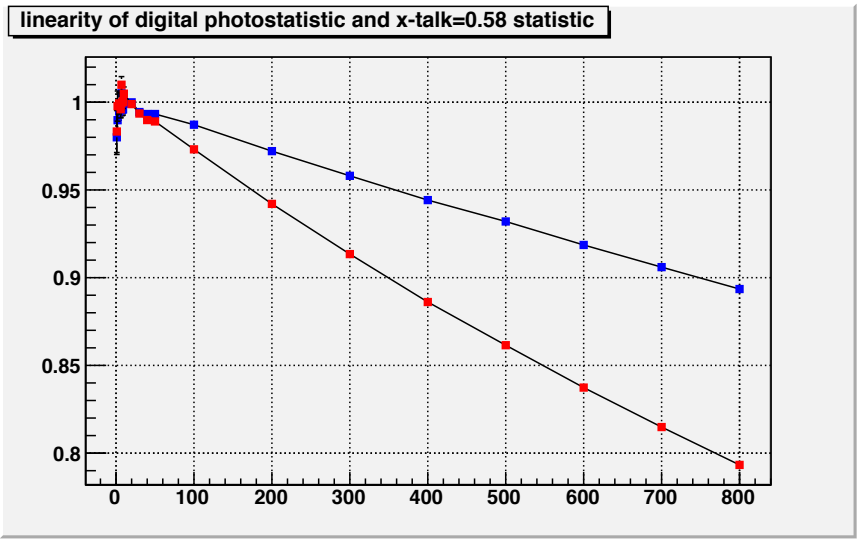
The pixelation and X-talk effects. Blue points: <N pixin>/N vs. N. Red points: <N pixout>/N vs. N. X-talk=0.81.

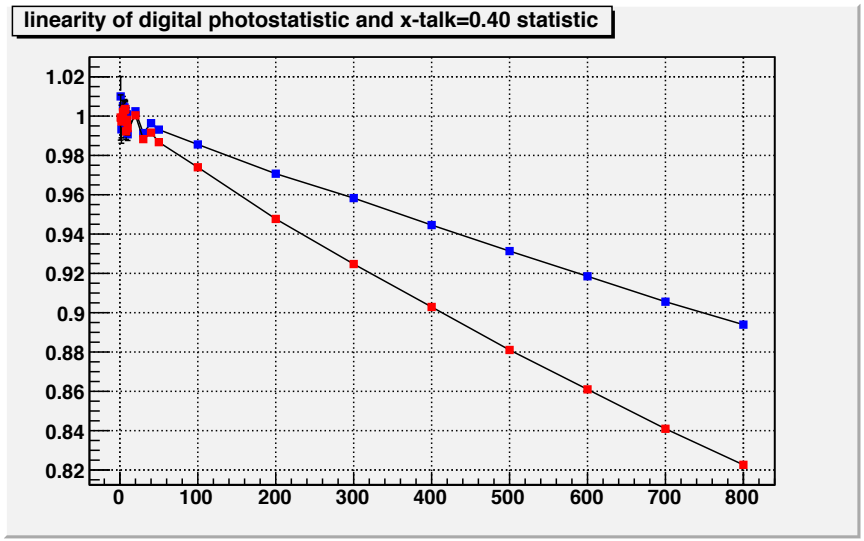


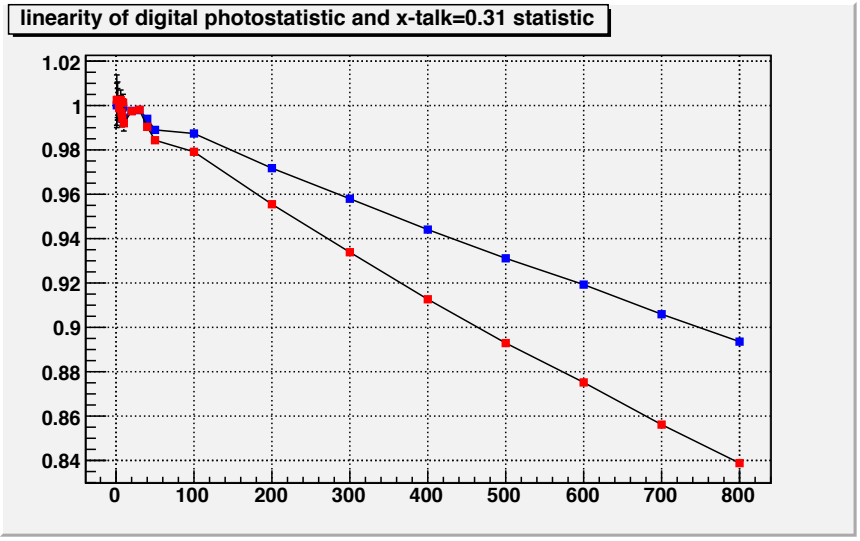
The pixelation and X-talk effects. Blue points: <N pixin>/N vs. N. Red points: <N pixout>/(N x (1.+X-talk)) vs. N. X-talk=0.81.

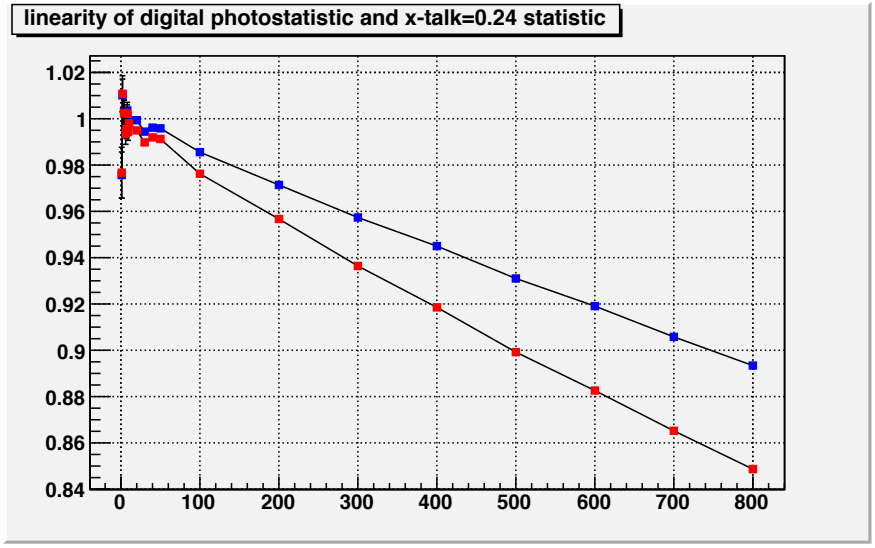


X-talk=0.58, 0.40, 0.31, 0.24

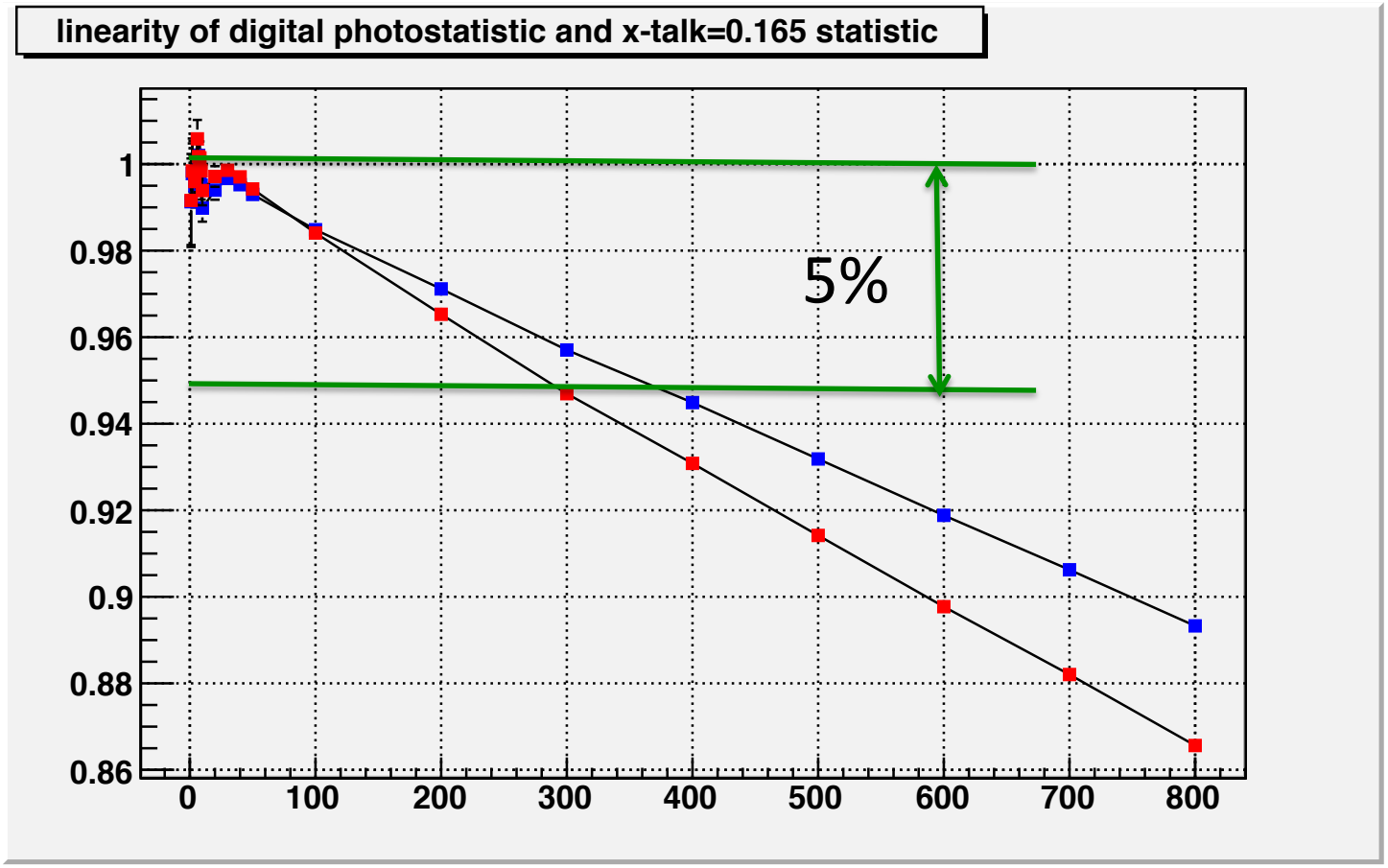




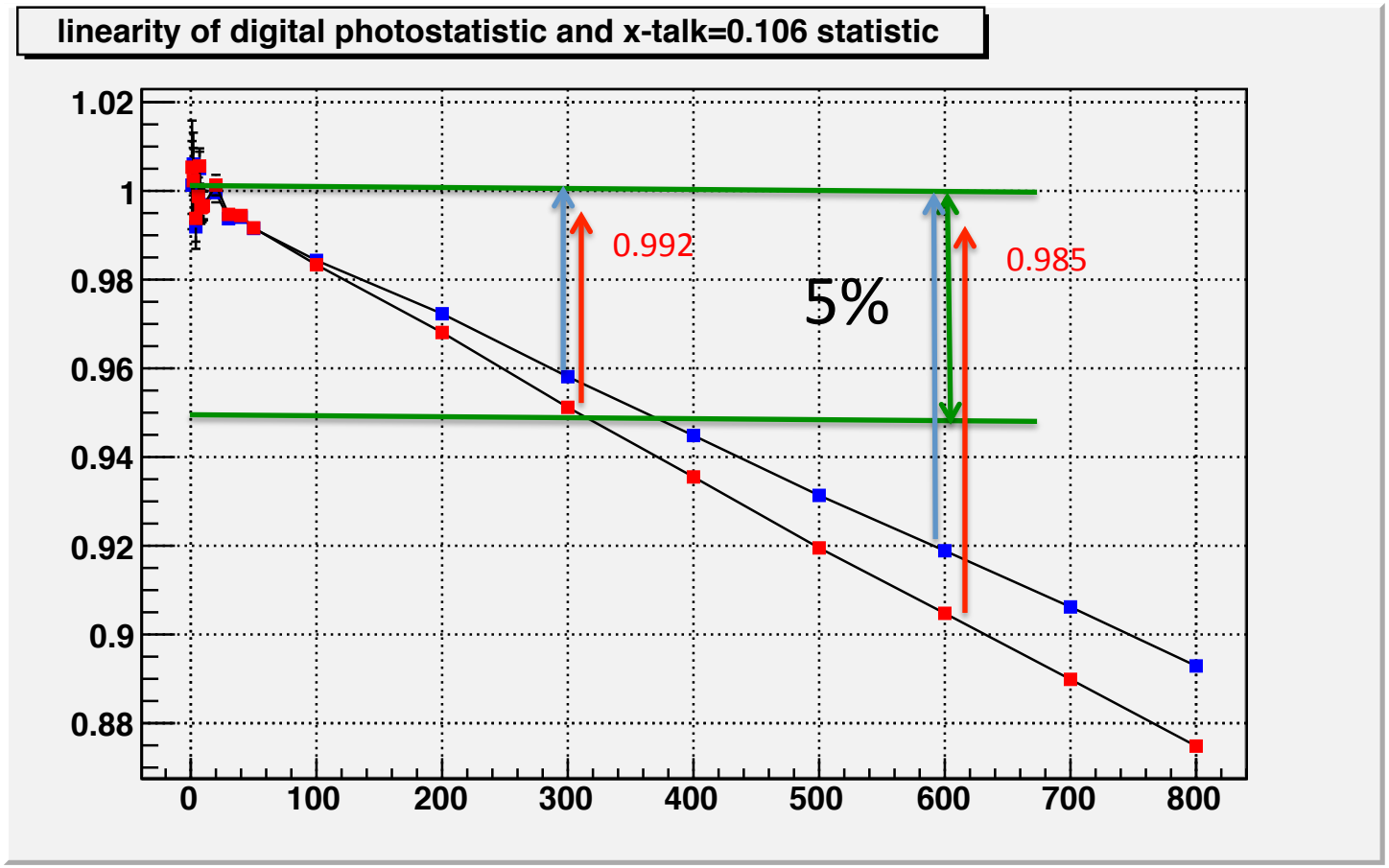




X-talk=0.165


linearity of digital photostatistic and x-talk=0.165 statistic
1
0.98
0.96
0.94
0.92
0.9
0.88
0.86
0
100
200
300
400
500
600
700
800
5%

X-talk=0.105


linearity of digital photostatistic and x-talk=0.106 statistic
1.02
1
0.98
0.96
0.94
0.92
0.9
0.88
0
100
200
300
400
500
600
700
800
0.992
0.985
5%

Let's suppose that we compensated the nonlinearity. Rms(x-talk)/x-talk=10% will bring an additional term to the energy resolution:???