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Main astronomical observatory of Ukrainian academy of science

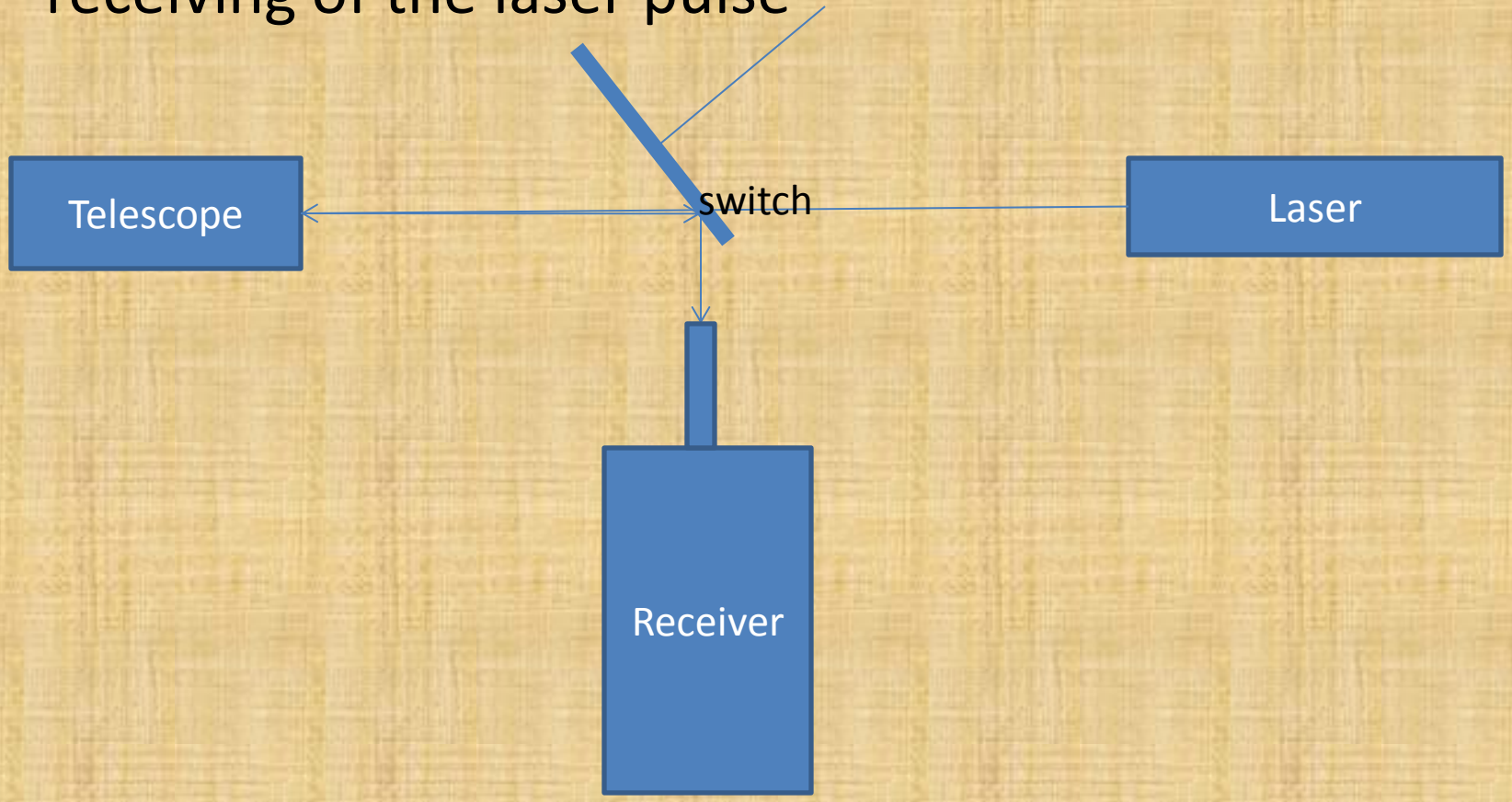
New external calibration target on 1824

Why do we need calibration

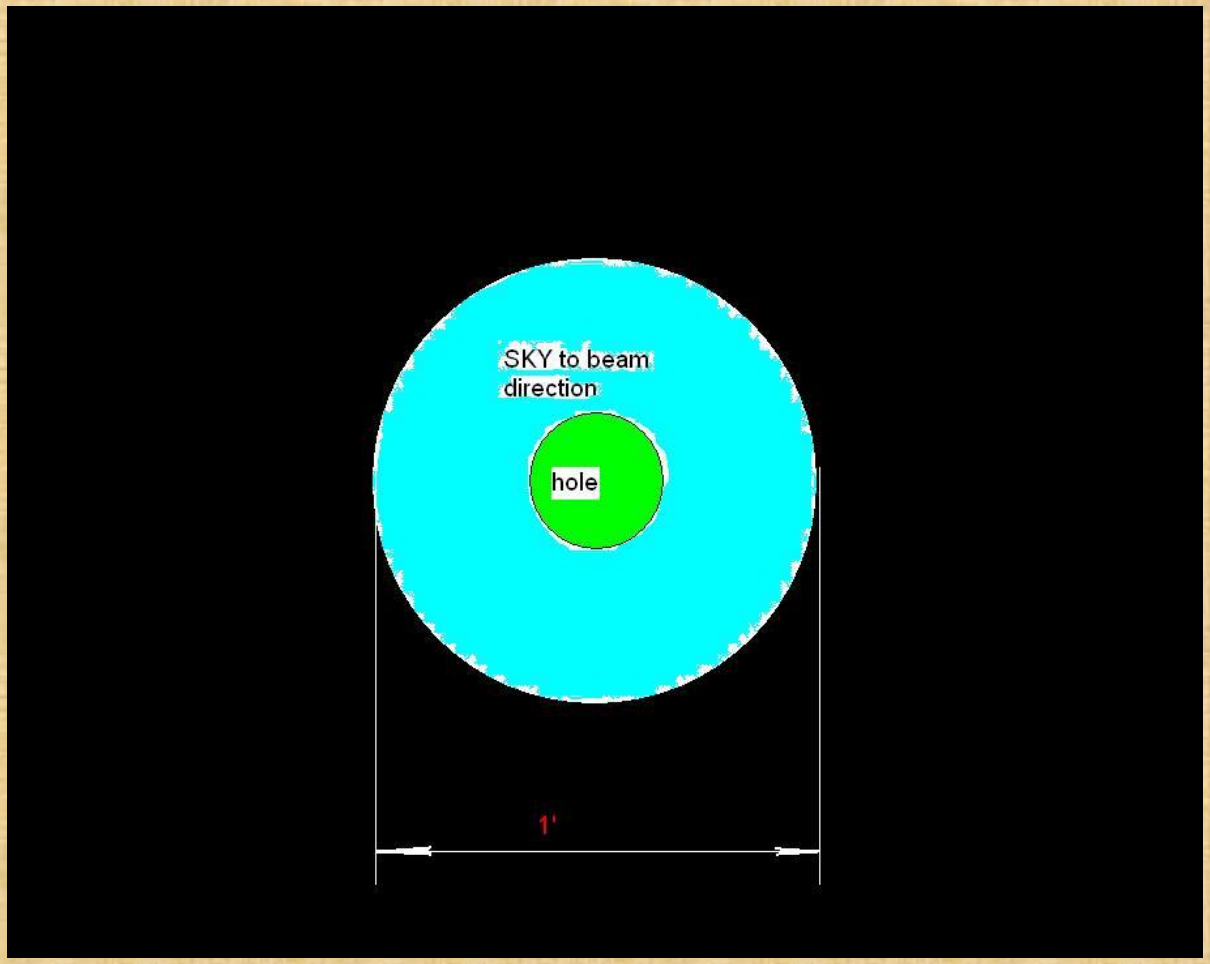
- - The main purpose of the calibration measurement has a systematic delay and its variation during the observation
- - Systematic delay consists of a constant component and a variable component
- - The main reason for changing the delay signal there are external conditions (temperature, humidity, atmospheric pressure), the amplitude of the optical and electrical signal

TPL-1
optical switch schems

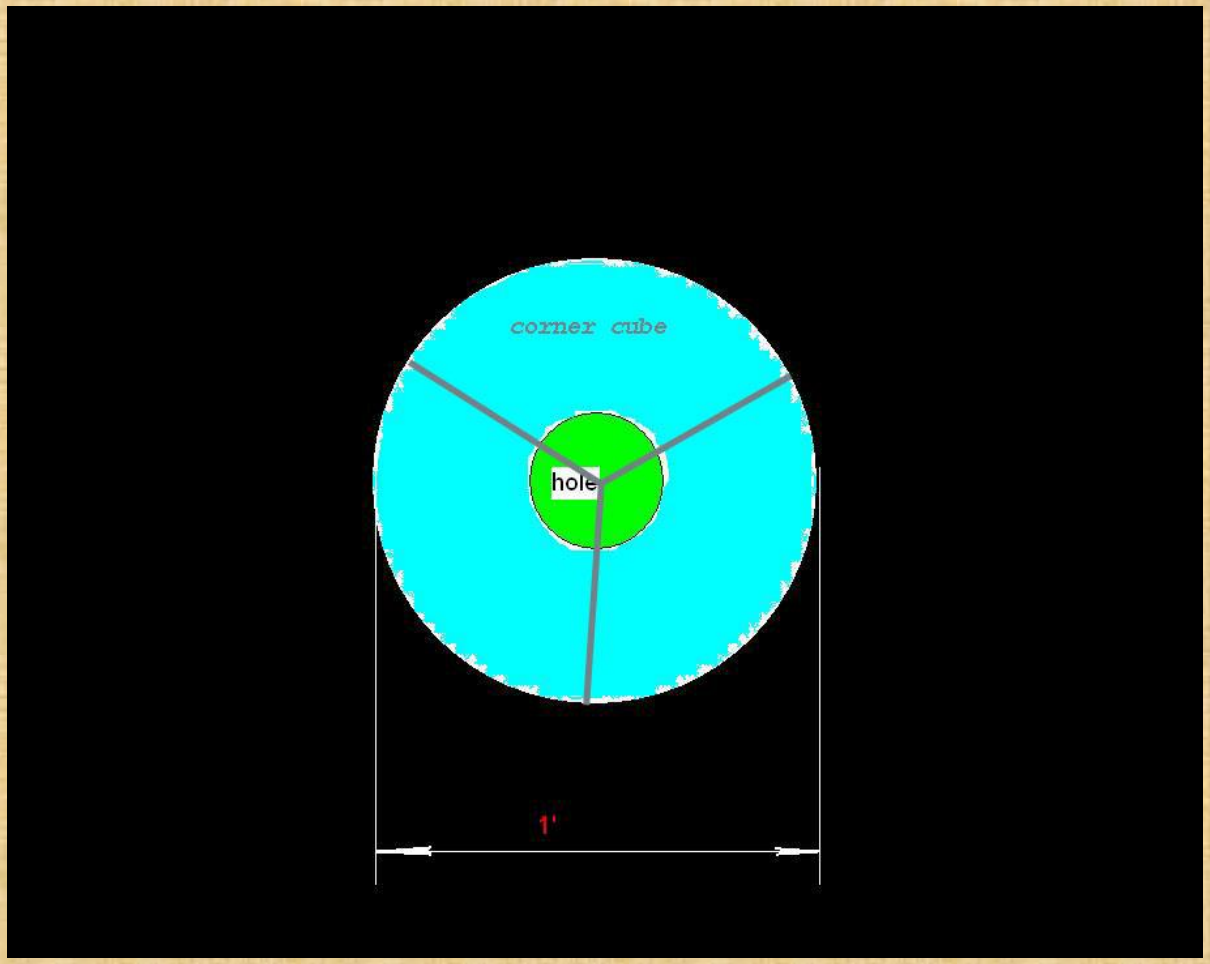
- The possibility of the external calibration on 1824
- This telescope is used for one way transmission and receiving of the laser pulse



The PMT view on corner cube



The PMT view on corner cube



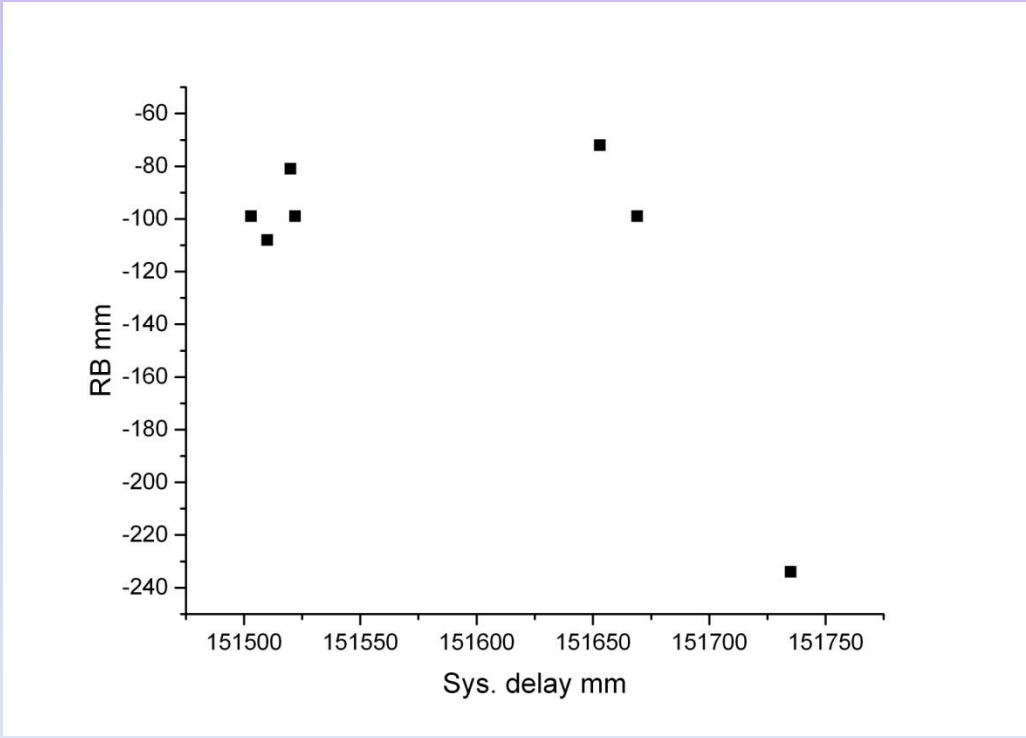
The reasons of the new target

- - old was destroyed by unknown persons **twice**
- - old target system has systematic error

Old target was place
(125m distance)

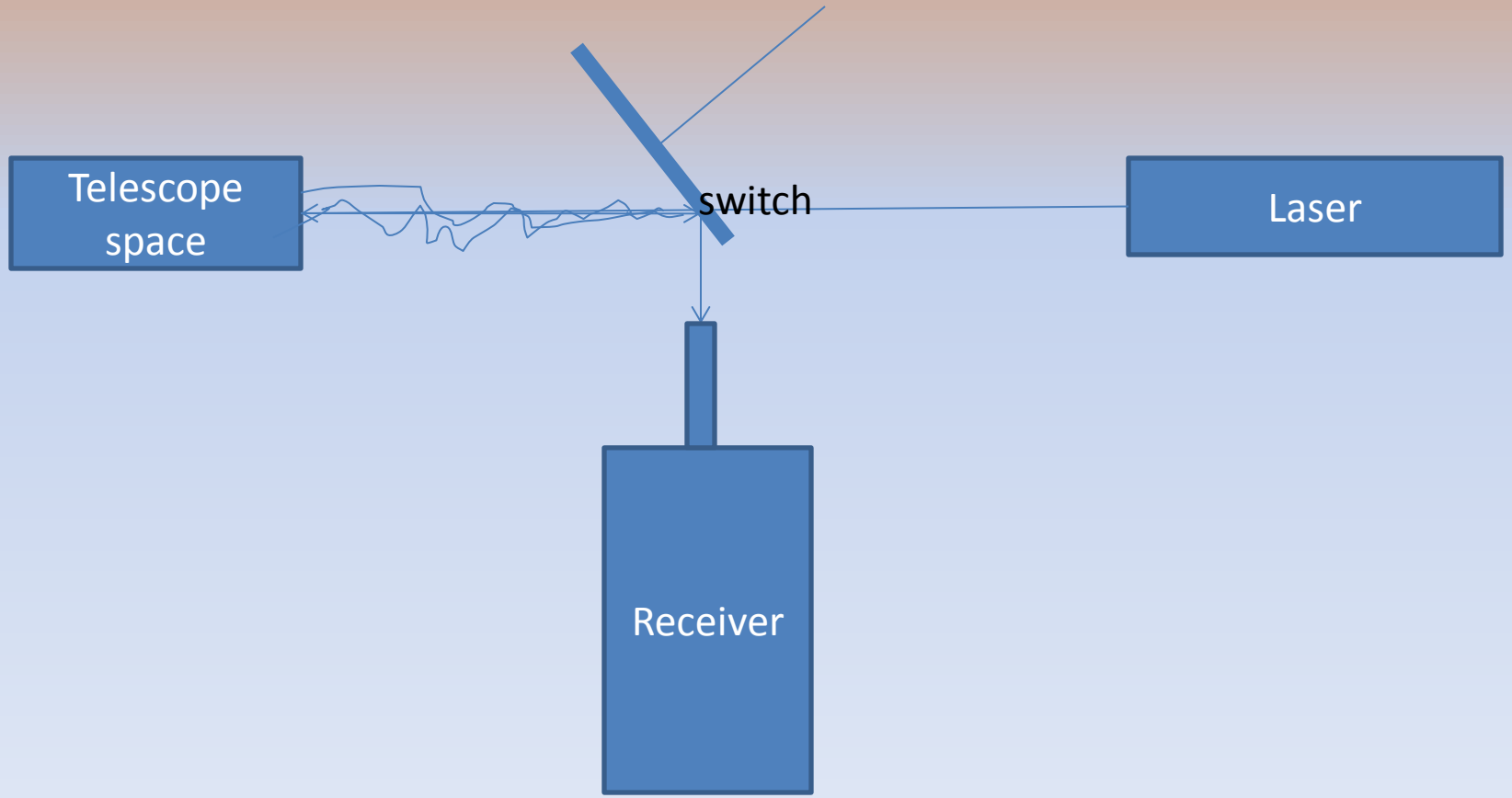
RB in 2012

```
#  1824 = KIEV
# sat site        date  time dur   rb mm   error        tb us    error    prec bad total  rms   pres  temp hum  sdelay shft  rms cfg r wlen
JAS2 1824 2012/12/14 15:35   3    -234 (    17 )       10.6 (   11.5 )     5   0 /  10   21 1011.7 267.3  99  151735    0   12 0 0 0  532
GL02 1824 2012/11/13 21:19   2     -99 (    27 )  -------.- ( ----.- )     4   0 /   2   19 1008.7 276.8  92  151669    0   12 0 0 0  532
LARS 1824 2012/10/21 17:46   7     -99 (    11 )       -3.4 (    3.3 )     4   0 /  13   20 1001.7 281.2  99  151522    0   16 0 0 0  532
AJI1 1824 2012/10/22 00:32   3     -81 (    12 )       -9.2 (    6.2 )     3   0 /   8   18 1000.6 281.5  99  151520    0   17 0 0 0  532
LAG2 1824 2012/10/11 17:01  15     -99 (    31 )       14.2 (   40.8 )    19   0 /   7   26  995.3 276.7   0  151503    0    6 0 0 0  532
LARS 1824 2012/10/12 17:37   4    -108 (    21 )        8.5 (    8.6 )     4   0 /  11   18  994.8 278.0  88  151510    0   11 0 0 0  532
LAG2 1824 2012/09/20 21:01   2     -72 (    10 )  -------.- ( ----.- )     2   0 /   3   20  993.3 287.9  70  151653    0   22 0 0 0  532
```

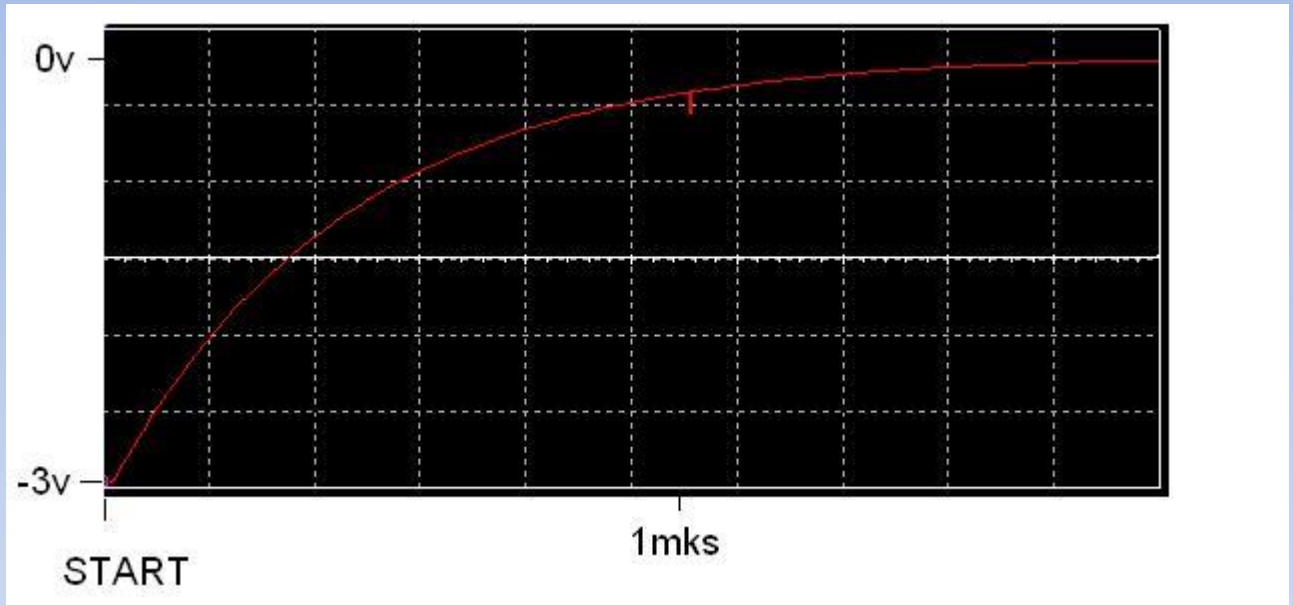


Why?

- A lot of photons from laser beam reflect from dust and optical surfaces come back to receiver! At first time.

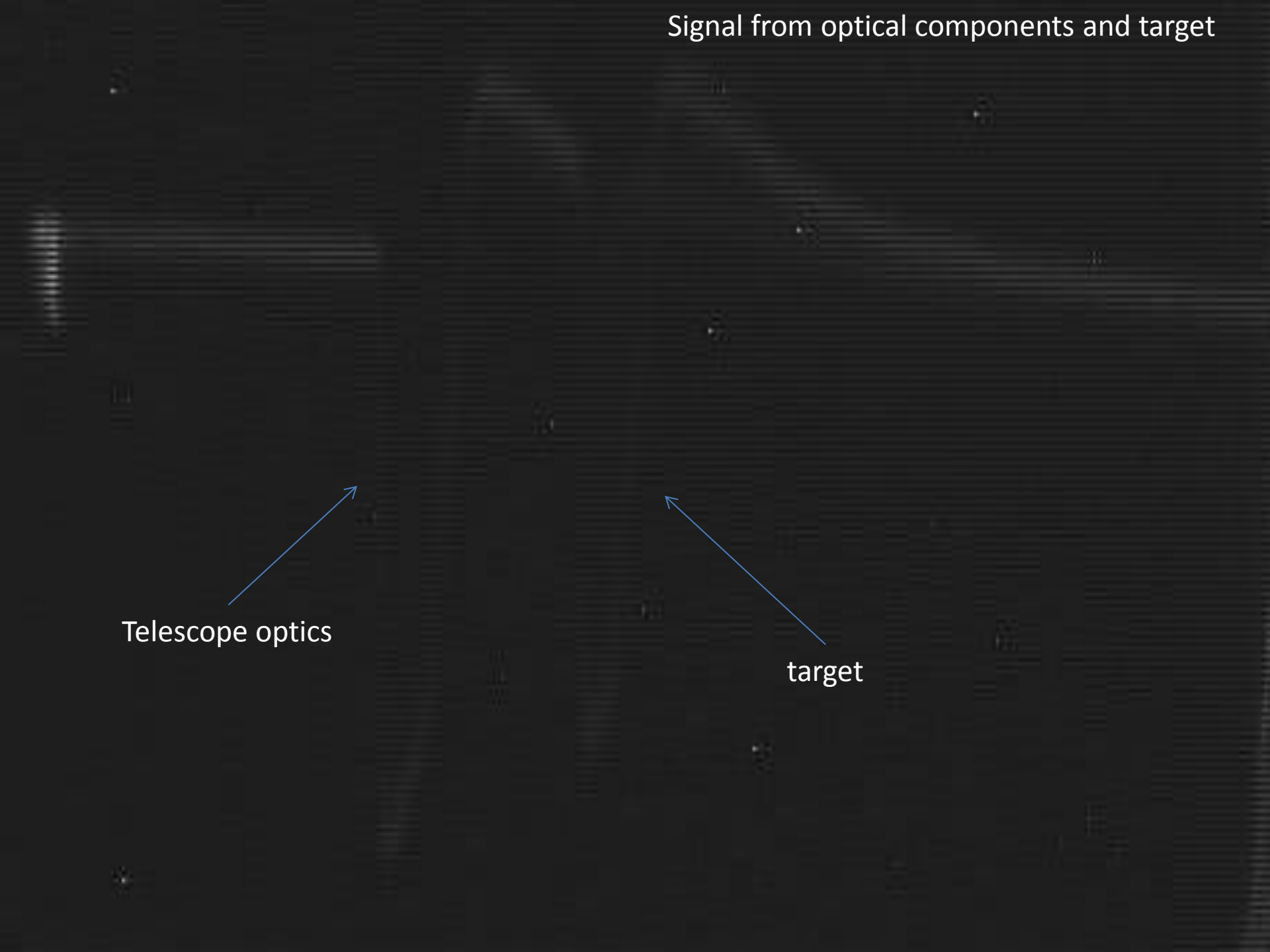


PMT output to CFD

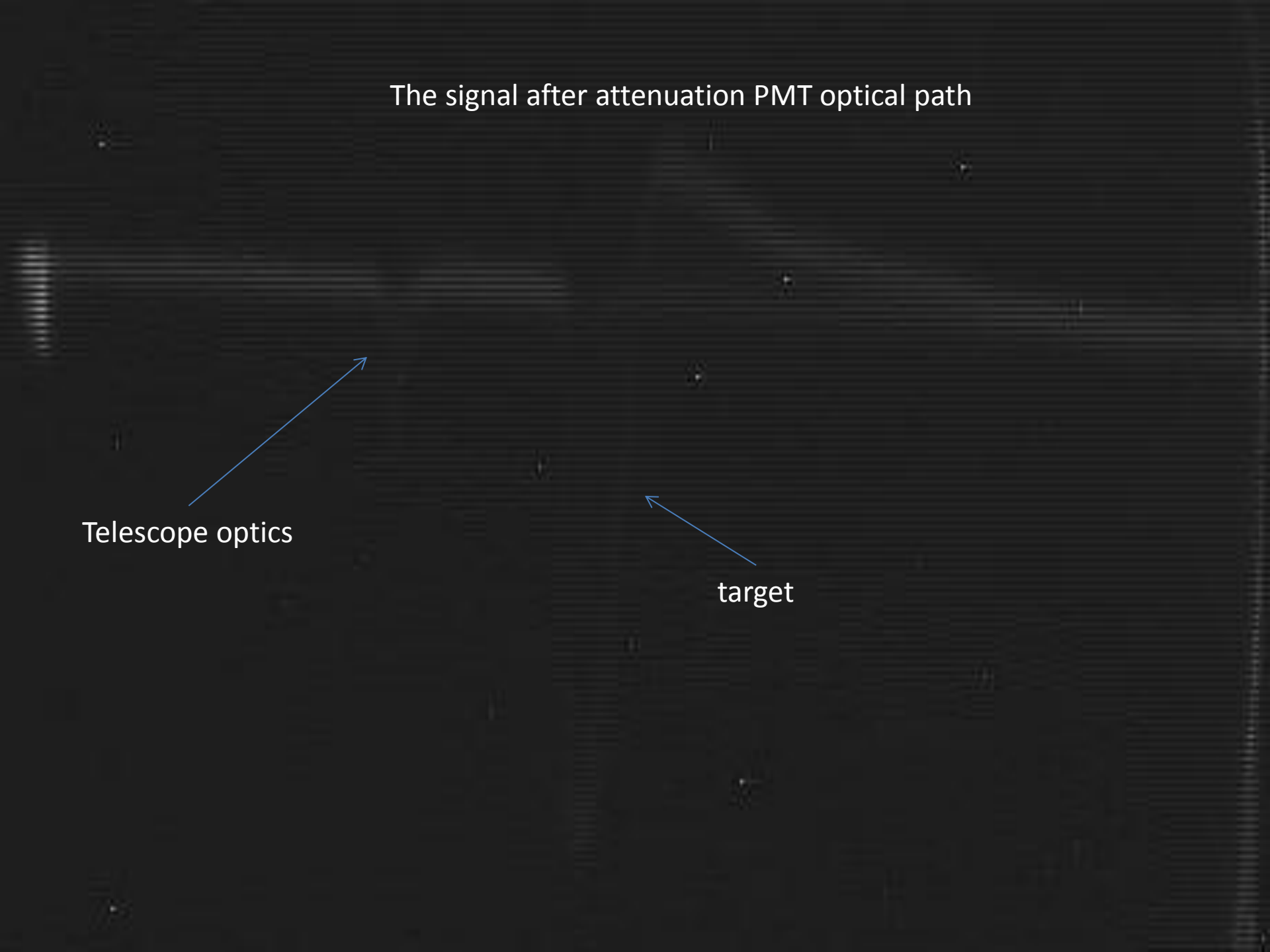


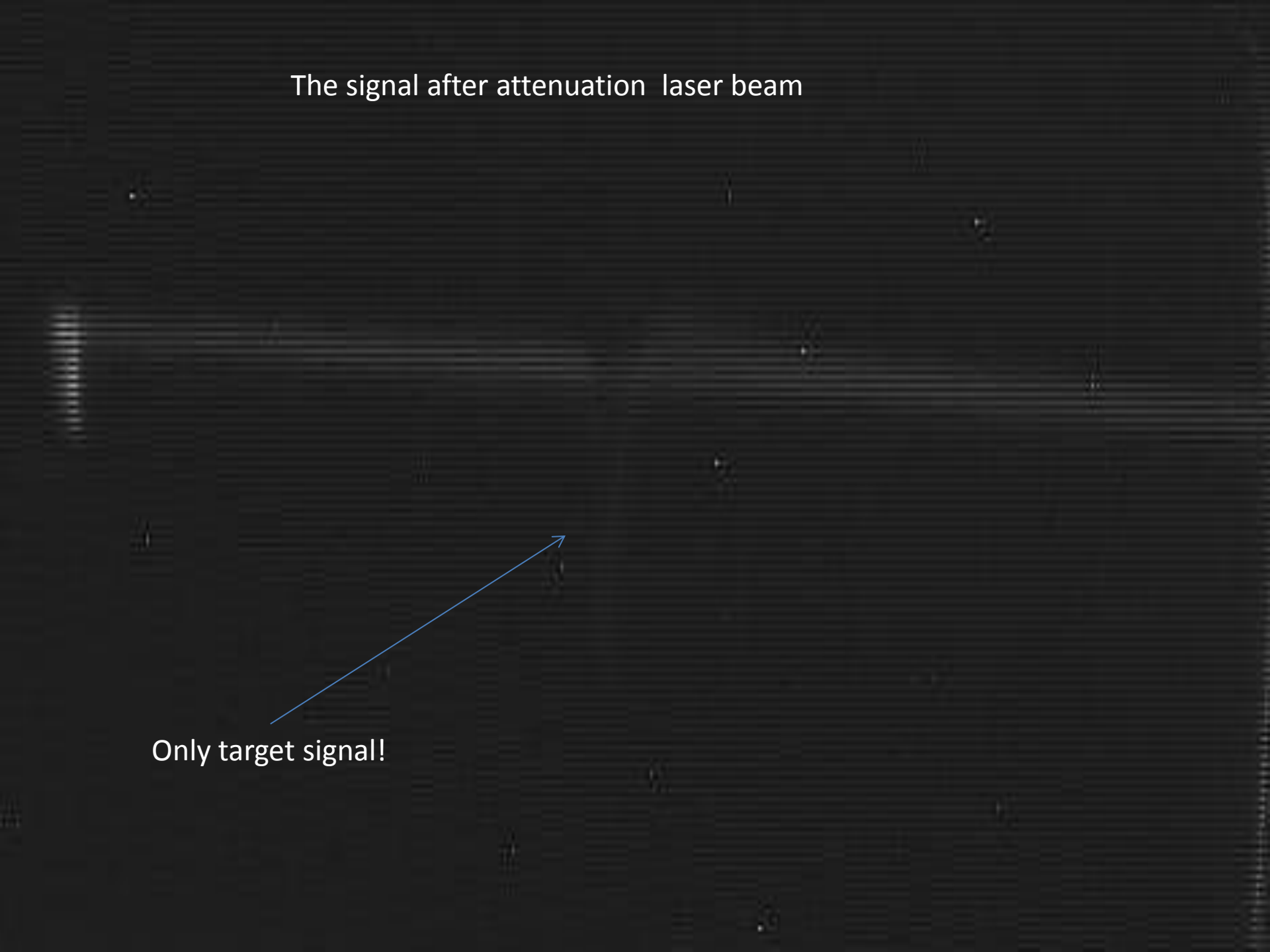
you can see the presence of a constant component of the voltage (about -0.4V) when the signal from the target

The new target place

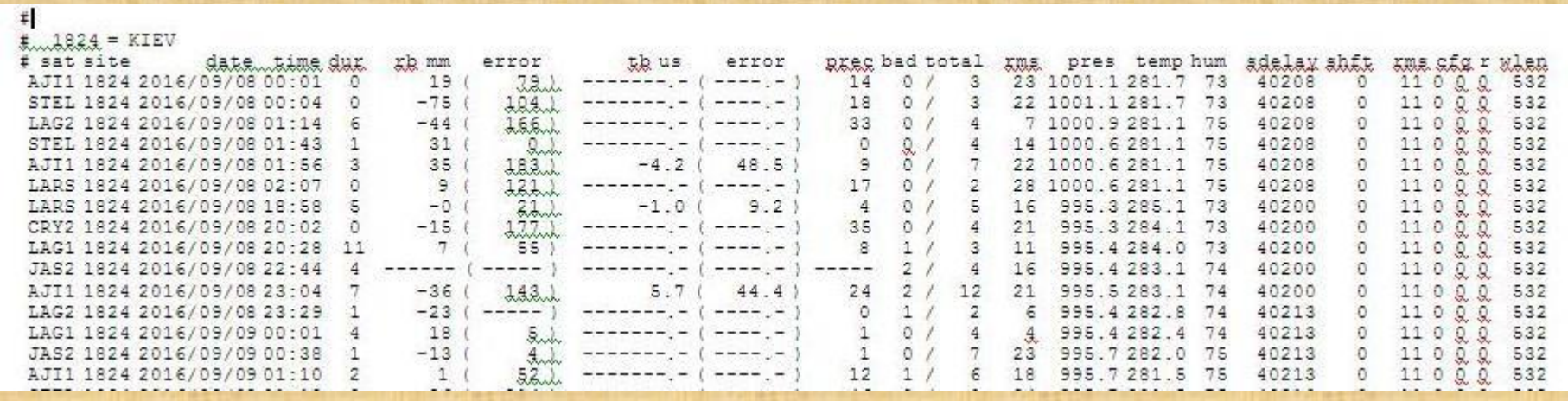

Signal from optical components and target
Telescope optics
target

The signal after attenuation PMT optical path



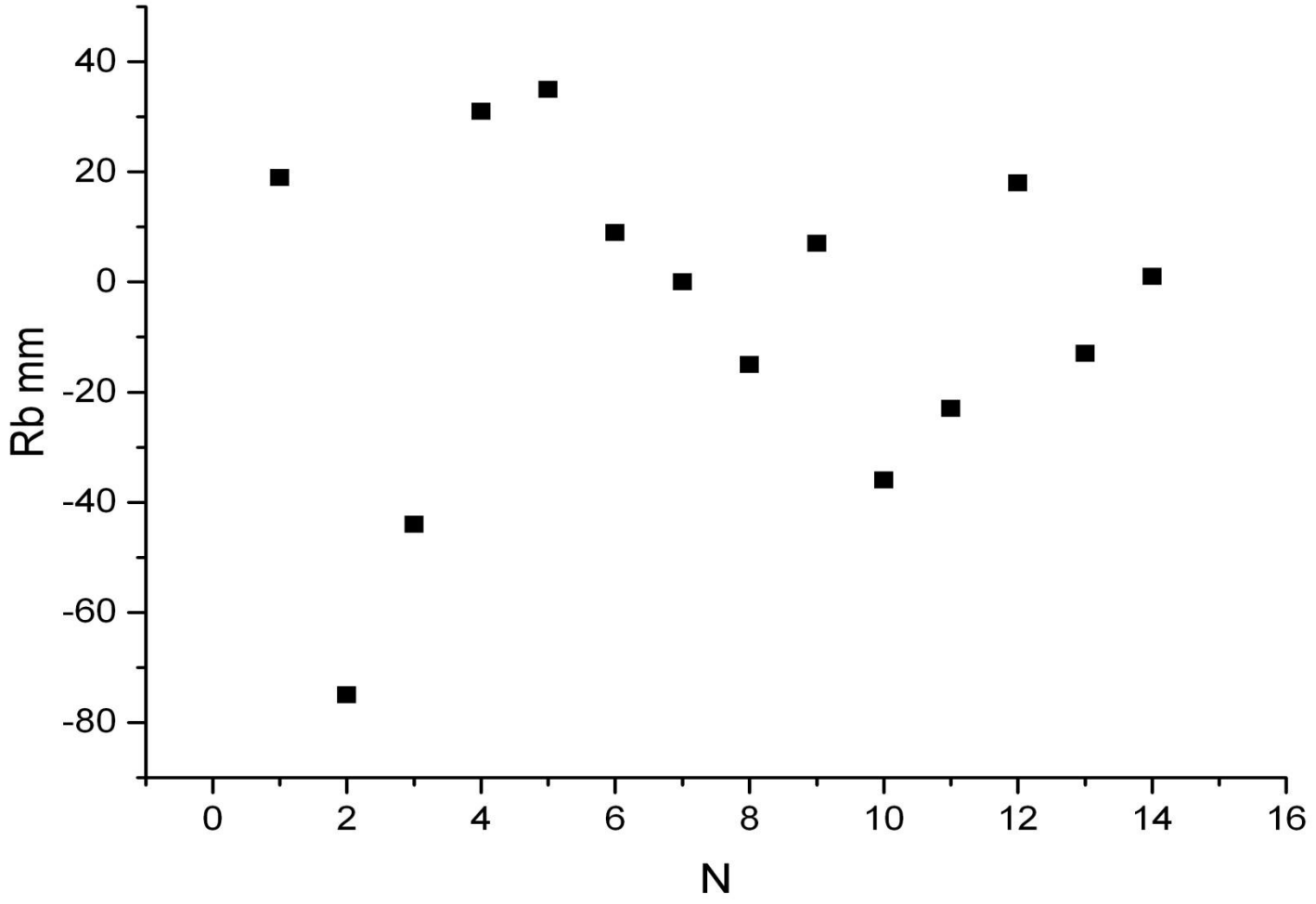

The signal after attenuation laser beam
Only target signal!

RB in 2016



```
#
#  1824 = KIEV
# sat site       date  time dur   rb mm   error       tb us    error    prec bad total  rms   pres  temp hum  sdelay shft  rms cfg r wlen
 AJI1 1824 2016/09/08 00:01   0      19 (    79 )  -------.- ( ----.- )    14   0 /   3   23 1001.1 281.7  73   40208    0   11 0 0 0  532
 STEL 1824 2016/09/08 00:04   0     -75 (   104 )  -------.- ( ----.- )    18   0 /   3   22 1001.1 281.7  73   40208    0   11 0 0 0  532
 LAG2 1824 2016/09/08 01:14   6     -44 (   166 )  -------.- ( ----.- )    33   0 /   4    7 1000.9 281.1  75   40208    0   11 0 0 0  532
 STEL 1824 2016/09/08 01:43   1      31 (     0 )  -------.- ( ----.- )     0   0 /   4   14 1000.6 281.1  75   40208    0   11 0 0 0  532
 AJI1 1824 2016/09/08 01:56   3      35 (   183 )      -4.2 (   48.5 )     9   0 /   7   22 1000.6 281.1  75   40208    0   11 0 0 0  532
 LARS 1824 2016/09/08 02:07   0       9 (   121 )  -------.- ( ----.- )    17   0 /   2   28 1000.6 281.1  75   40208    0   11 0 0 0  532
 LARS 1824 2016/09/08 18:58   5      -0 (    21 )      -1.0 (    9.2 )     4   0 /   5   16  995.3 285.1  73   40200    0   11 0 0 0  532
 CRY2 1824 2016/09/08 20:02   0     -15 (   177 )  -------.- ( ----.- )    35   0 /   4   21  995.3 284.1  73   40200    0   11 0 0 0  532
 LAG1 1824 2016/09/08 20:28  11       7 (    55 )  -------.- ( ----.- )     8   1 /   3   11  995.4 284.0  73   40200    0   11 0 0 0  532
 JAS2 1824 2016/09/08 22:44   4  ------ ( ----- )  -------.- ( ----.- ) -----   2 /   4   16  995.4 283.1  74   40200    0   11 0 0 0  532
 AJI1 1824 2016/09/08 23:04   7     -36 (   143 )       5.7 (   44.4 )    24   2 /  12   21  995.5 283.1  74   40200    0   11 0 0 0  532
 LAG2 1824 2016/09/08 23:29   1     -23 ( ----- )  -------.- ( ----.- )     0   1 /   2    6  995.4 282.8  74   40213    0   11 0 0 0  532
 LAG1 1824 2016/09/09 00:01   4      18 (     5 )  -------.- ( ----.- )     1   0 /   4    4  995.4 282.4  74   40213    0   11 0 0 0  532
 JAS2 1824 2016/09/09 00:38   1     -13 (     4 )  -------.- ( ----.- )     1   0 /   7   23  995.7 282.0  75   40213    0   11 0 0 0  532
 AJI1 1824 2016/09/09 01:10   2       1 (    52 )  -------.- ( ----.- )    12   1 /   6   18  995.7 281.5  75   40213    0   11 0 0 0  532
```

RB in 2016



The main problem of 1824 station is precision!

- solutions:
- - install the event timer;
- -install the high speed PMT;

Thank you for your attention!

- A lot of thanks Riga & Potsdam teams for technical support!

Thank you for your attention!