

Characterization of the new camera WAT-910HX/RC

ESOP XXXII

**32nd European Symposium on
Occultation Projects**

Barcelona, 23rd to 25th August 2013

Gerhard Dangl – Videoconference

<http://www.dangl.at>

Hello from Nonndorf to ESOP in Barcelona!



WAT-910HX

(CCIR or EIA version available)



Video cameras comparison



WAT-910HX/RC

PC164CEX2

WAT-120N

WAT-902H2 Ultimate

WAT-910HX/RC

Function settings

OSD (On Screen Display operated by cable remote control)

Sensor

1/2-inch interline transfer CCD (size like WAT-902H2Ultimate, WAT-120N)

Integration times

x1, x2, x4, x8, x16, x32, x64, x128, x256 (video fields)
and several shorter exposure times down to 10 μ s

Gain

6 – 41 dB in 1 dB steps

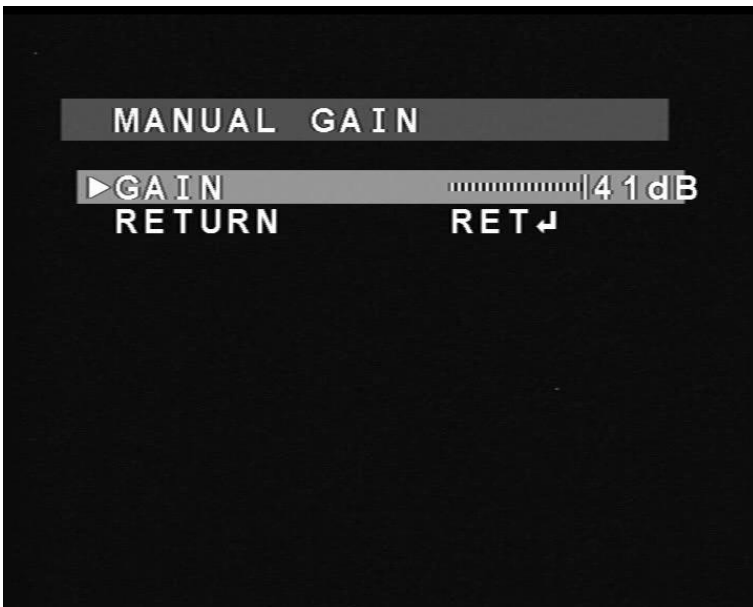
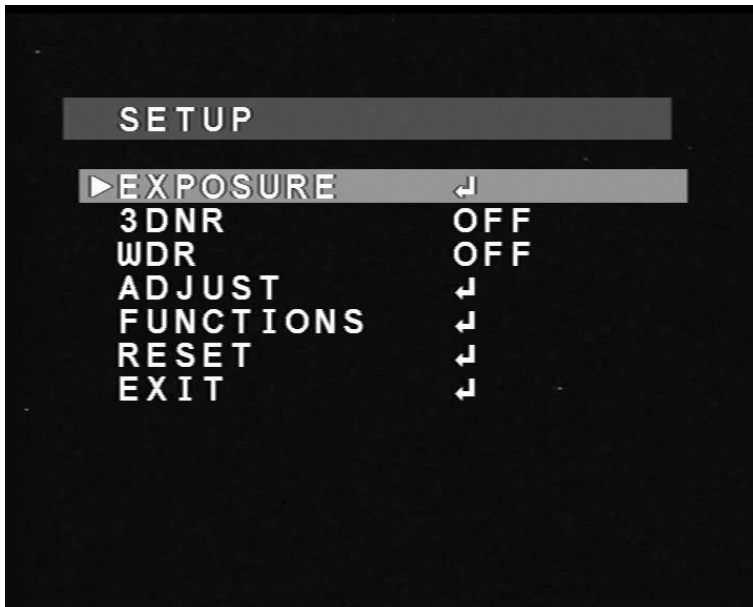
Gamma

0.05 - 1.00 (0.05 steps)

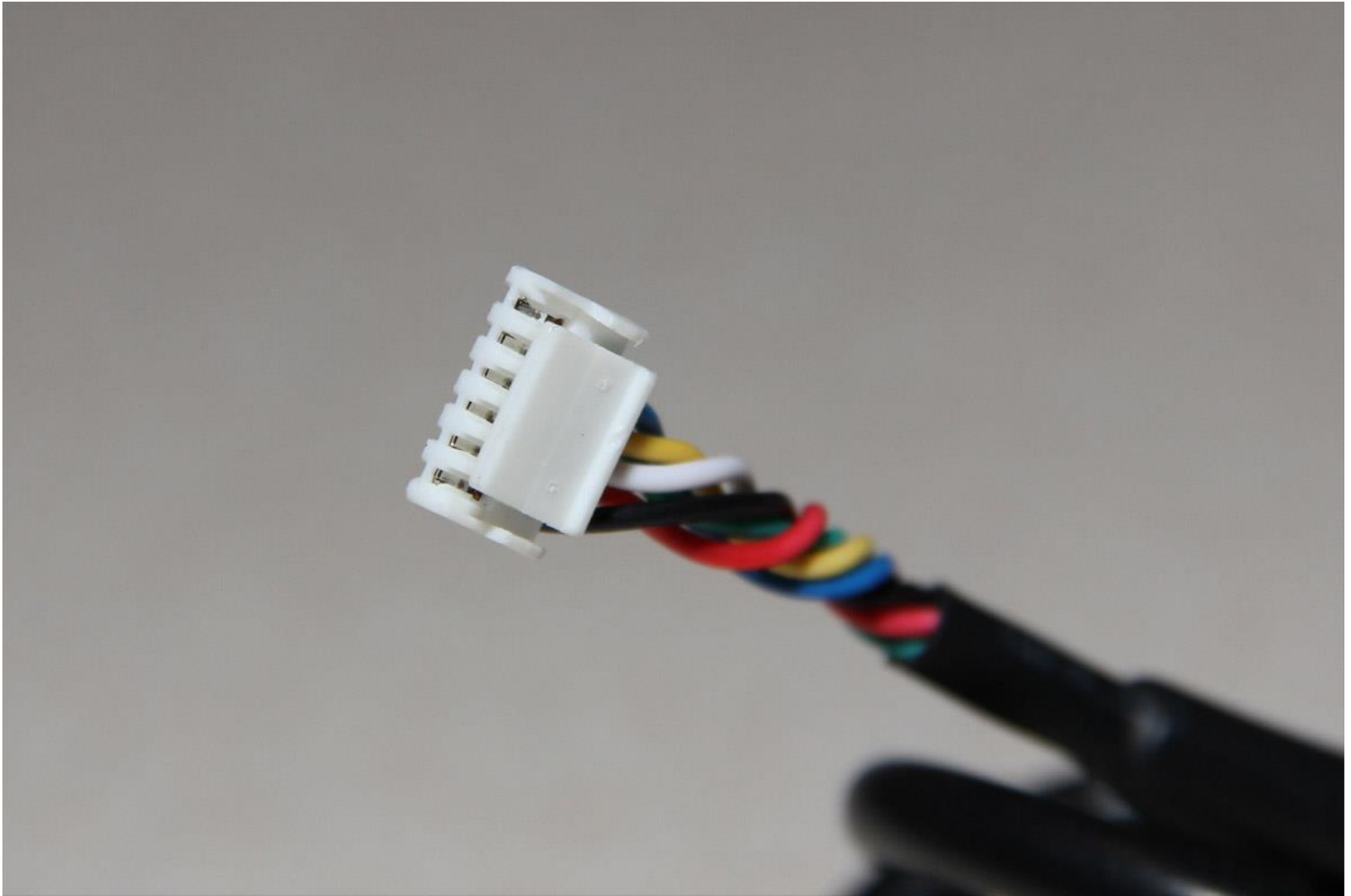
WAT-910HX/RC with cable remote control for OSD



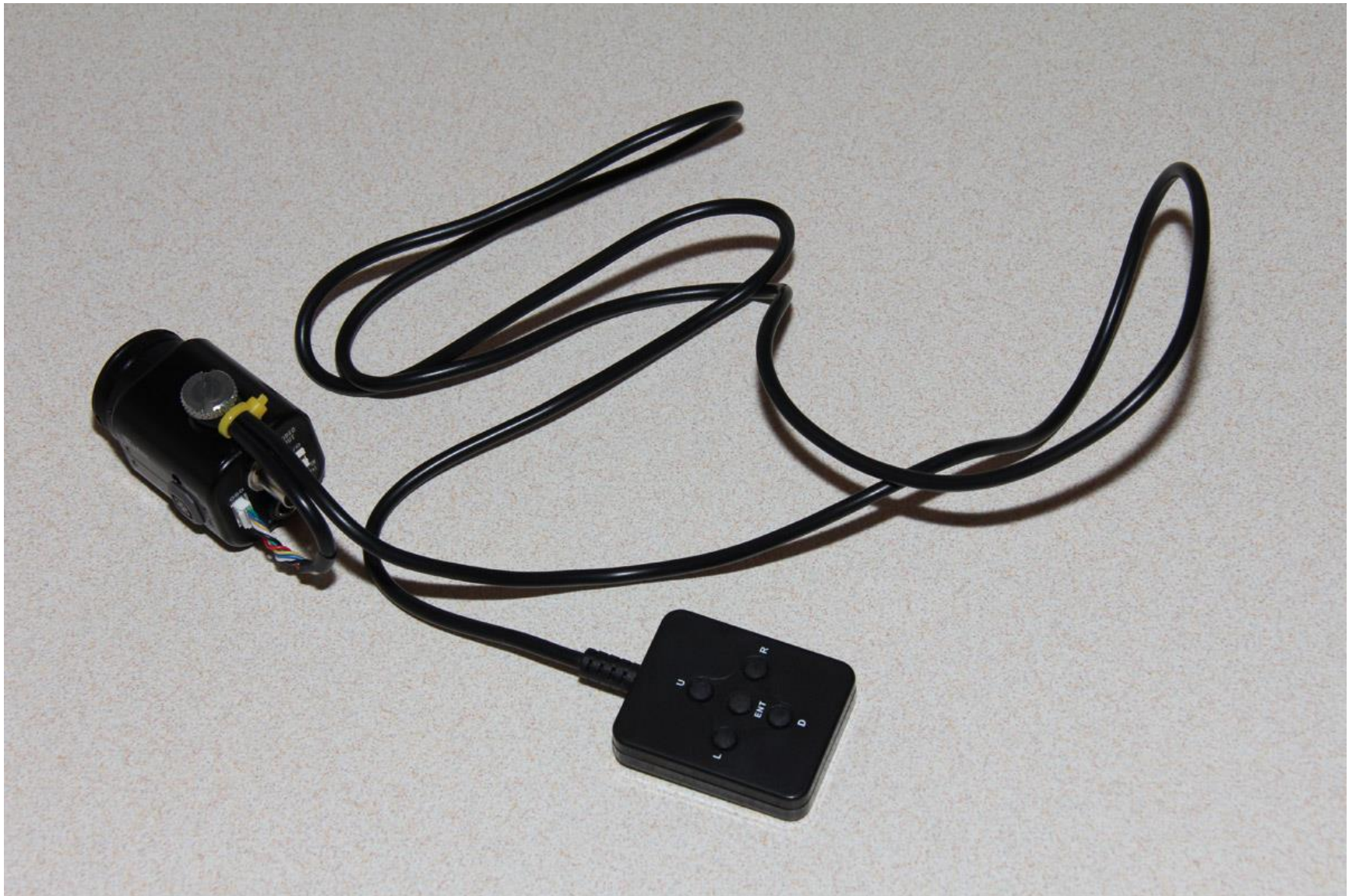
WAT-910HX/RC OSD Menue



Relative small and fragil cable connector



OSD control with cable clamp modification



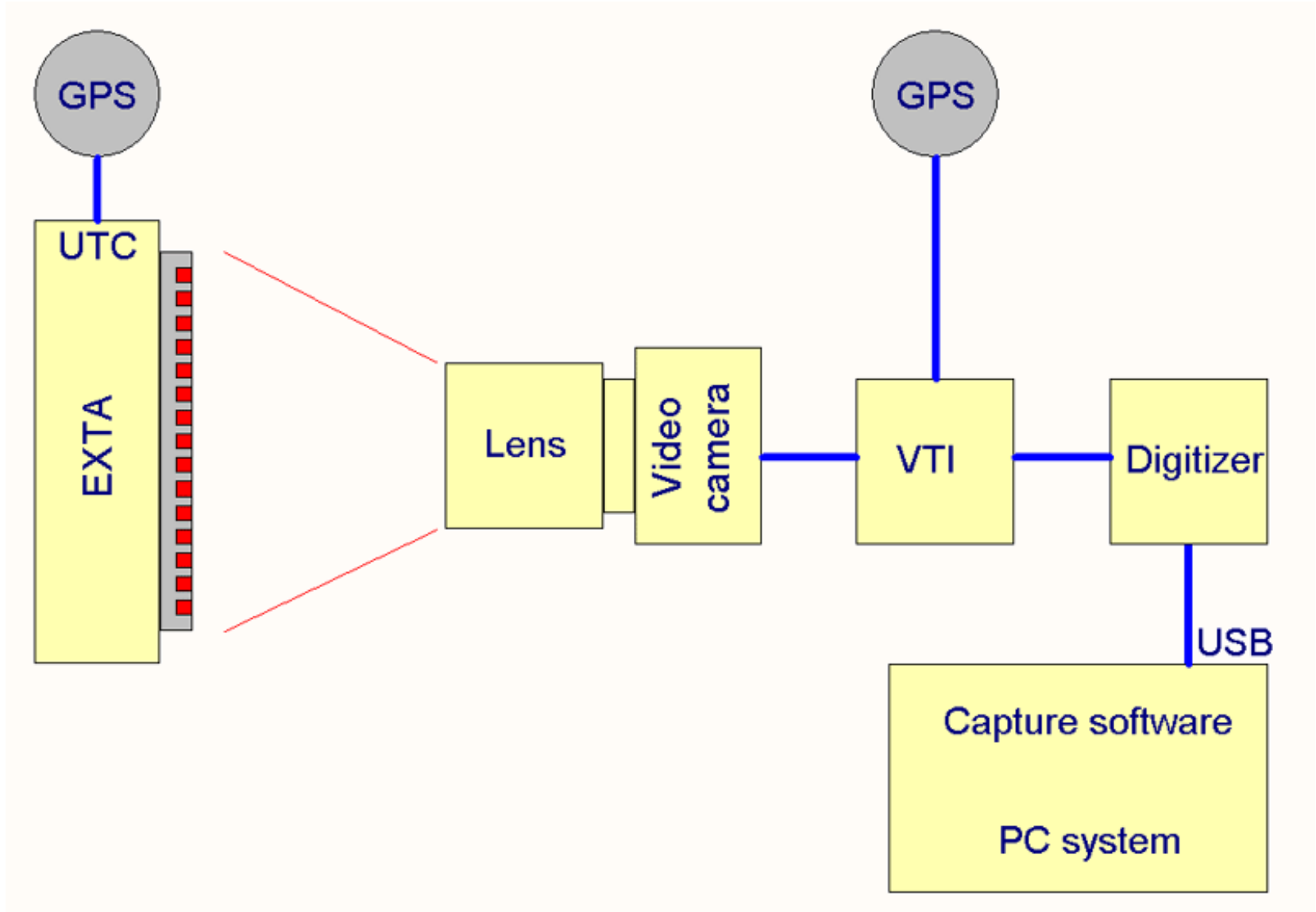
Cable clamp detail (Photo screw and cable strap)



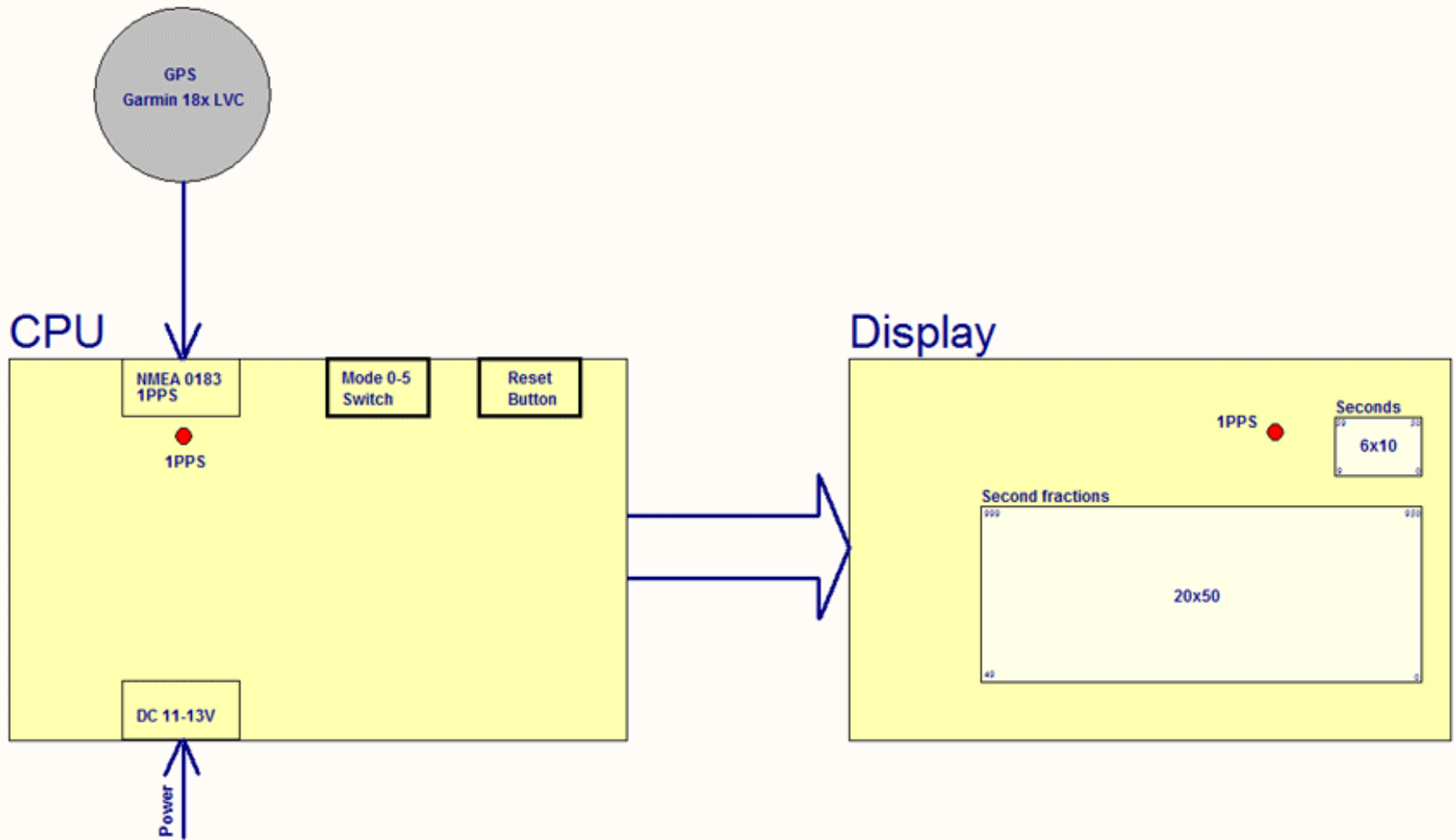
Characteristic measurements and tests on WAT-910HX/RC

- * Internal exposure/output timing
- * Linearity and sensitivity with artificial star system
- * Sensitivity on real sky object - star cluster M67
- * Dark images

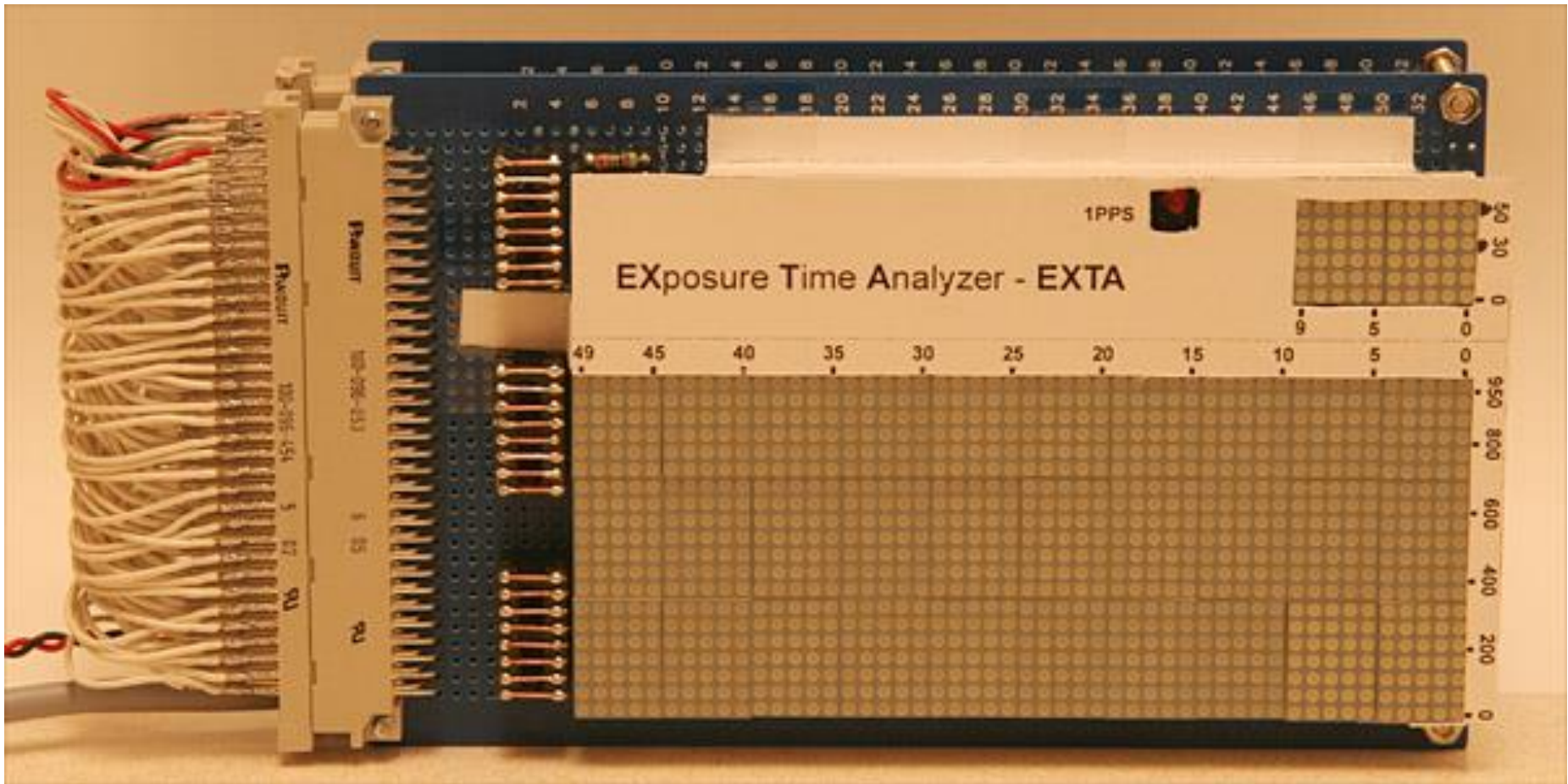
Timing characteristic measurement with EXTA



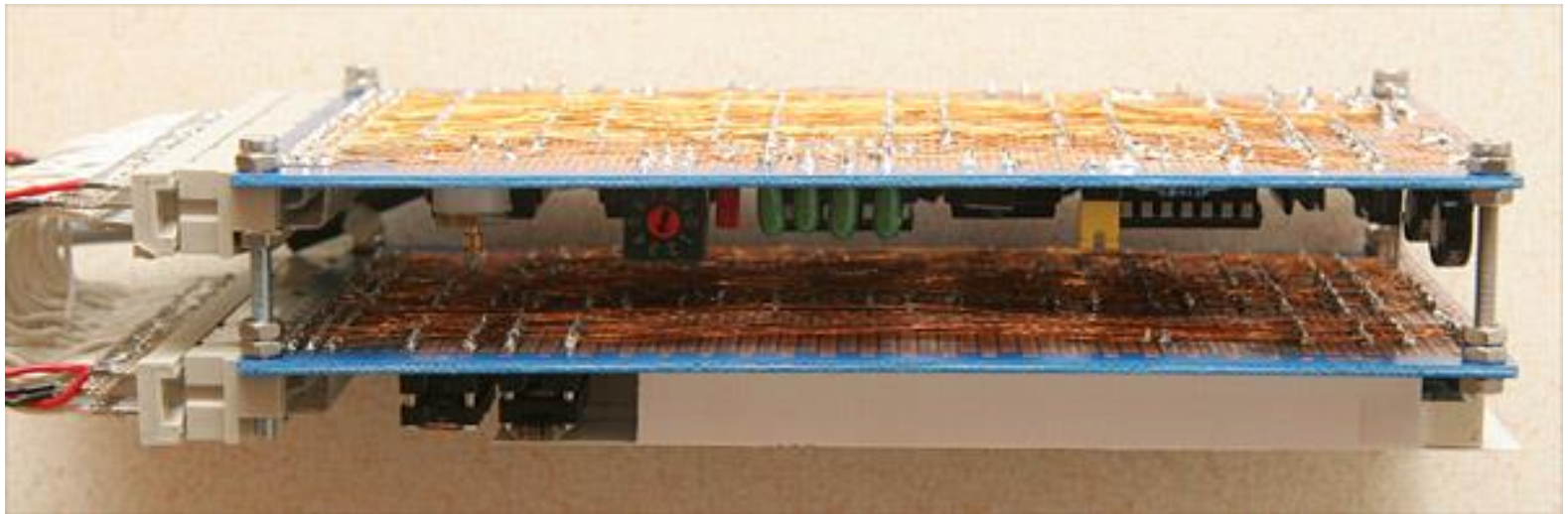
EXTA – function diagram



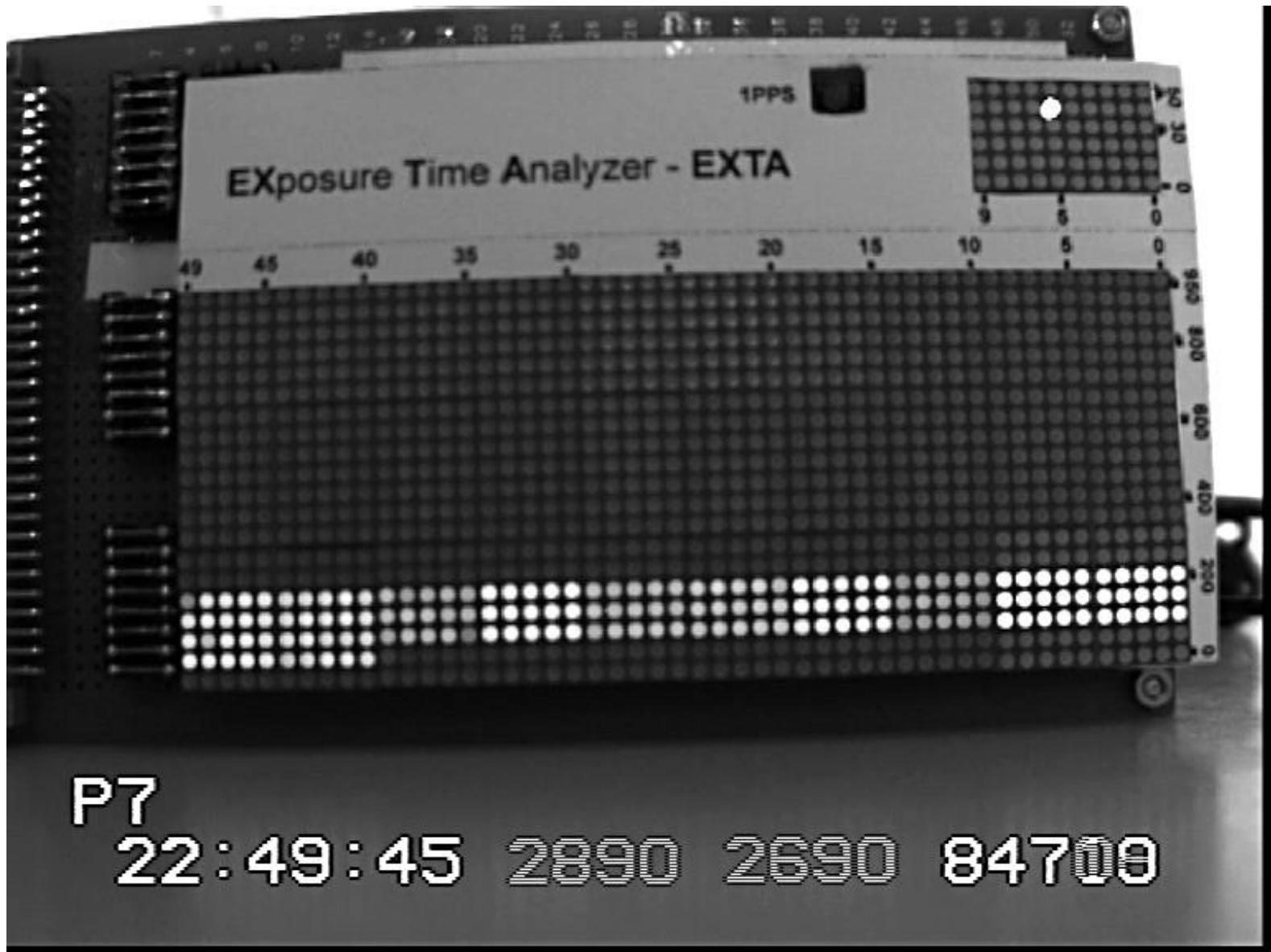
EXposure Time Analyzer - EXTA



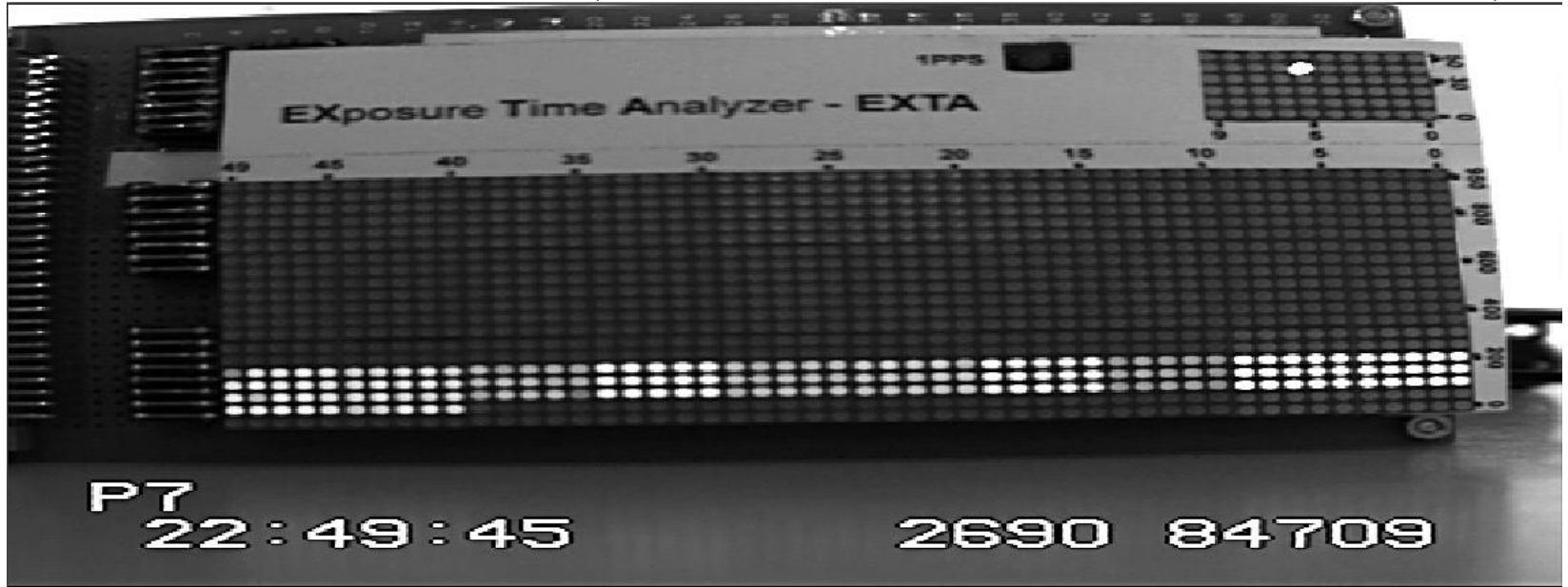
EXposure Time Analyzer - EXTA



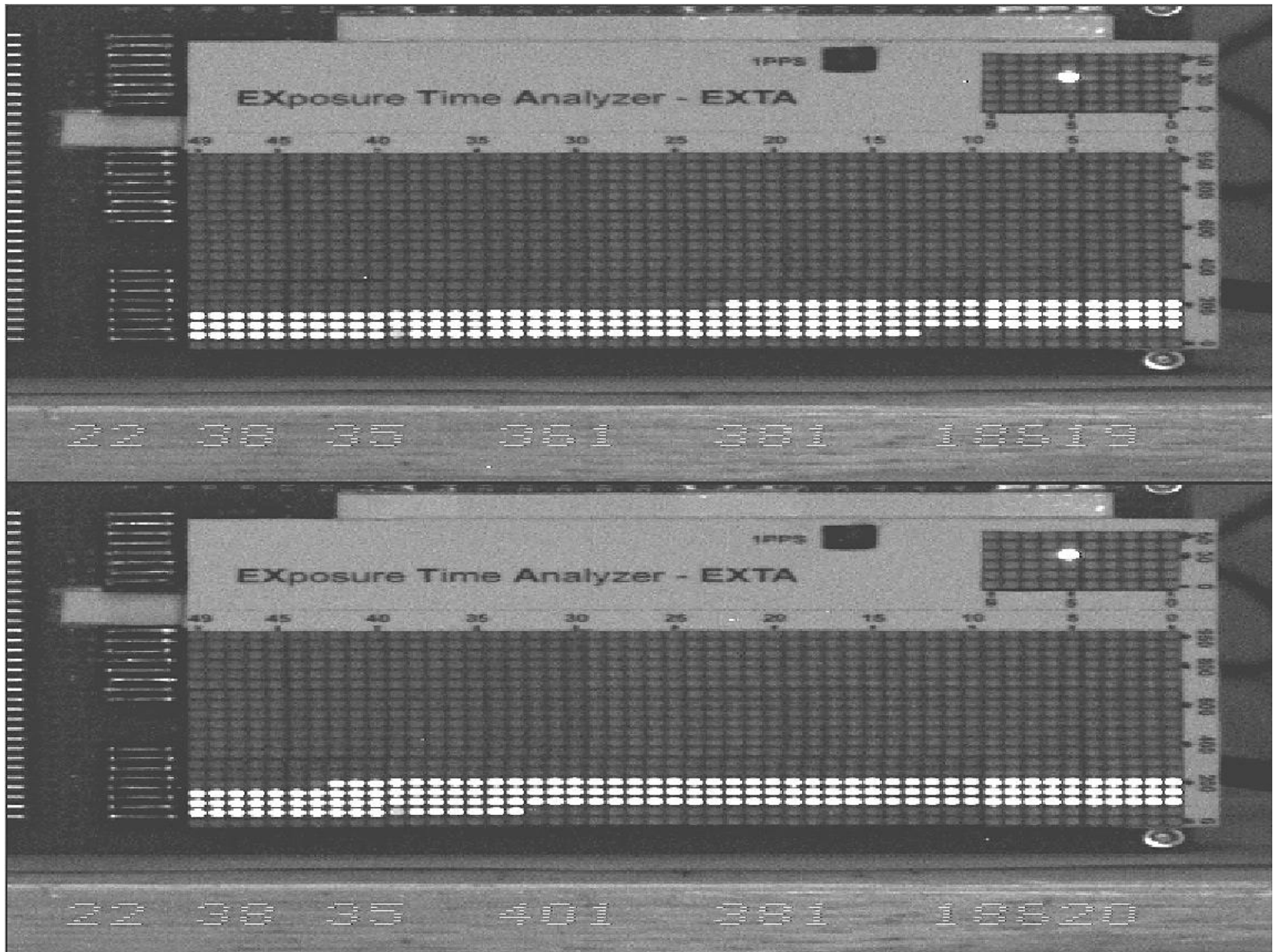
EXTA – video frame (WAT-910HX in mode x8, It=160ms)



EXTA – video fields (WAT-910HX in mode x8, It=160ms)



EXTA – video fields (WAT-120N in mode x4, $I_t=160\text{ms}$)



Timing diagrams WAT-910HX and WAT-120N, It=4 frames

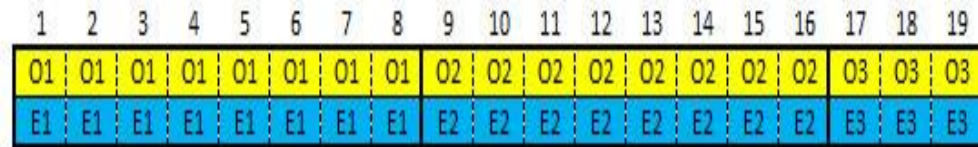
WAT-910HX

mode X8

Real time segment

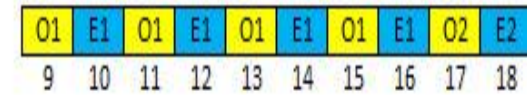
Camera odd field exposure sequence

Camera even field exposure sequence



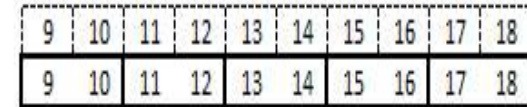
Contents of camera output field sequence

VTI time stamping of output fields



VTI time correction and tolerance for evaluation in field resolution -4.5 fields (+/- 4.0 fields)

VTI time correction and tolerance for evaluation in frame resolution -5.0 fields (+/- 4.0 fields)



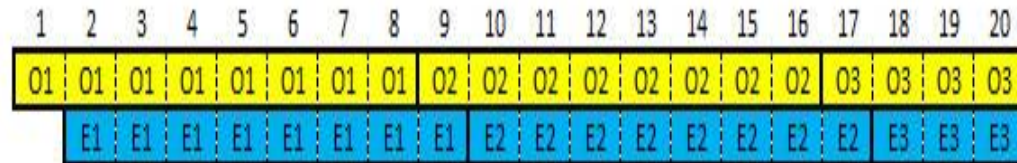
WAT-120N

Mode 4

Real time segment

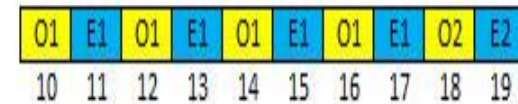
Camera odd field exposure sequence

Camera even field exposure sequence



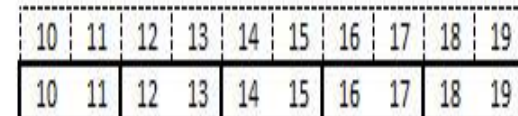
Contents of camera output field sequence

VTI time stamping of output fields

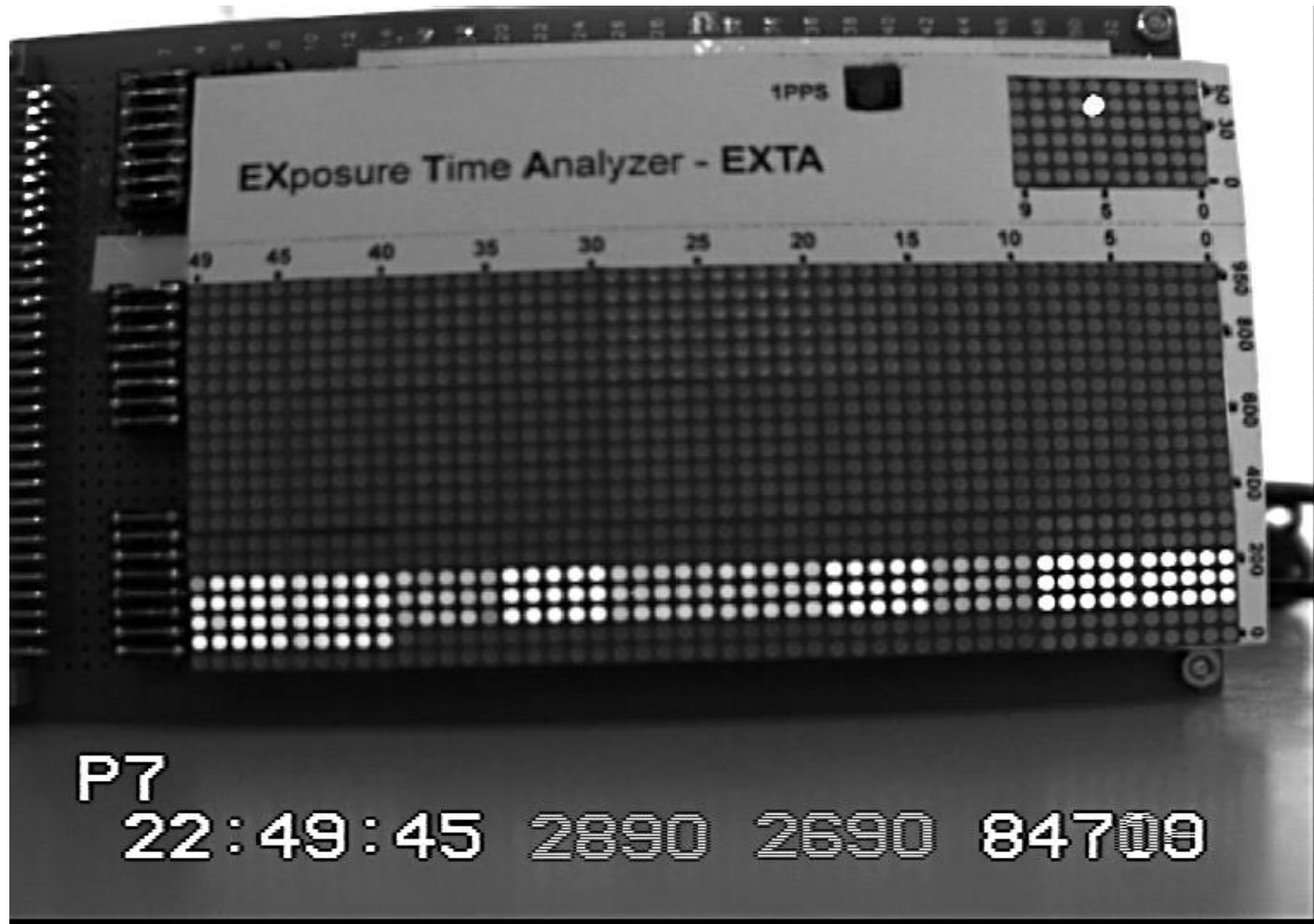


VTI time correction and tolerance for evaluation in field resolution -5.5 fields (+/- 4.0 fields)

VTI time correction and tolerance for evaluation in frame resolution -5.5 fields (+/- 4.5 fields)



EXTA – video frame (WAT-910HX in mode x8, It=160ms)



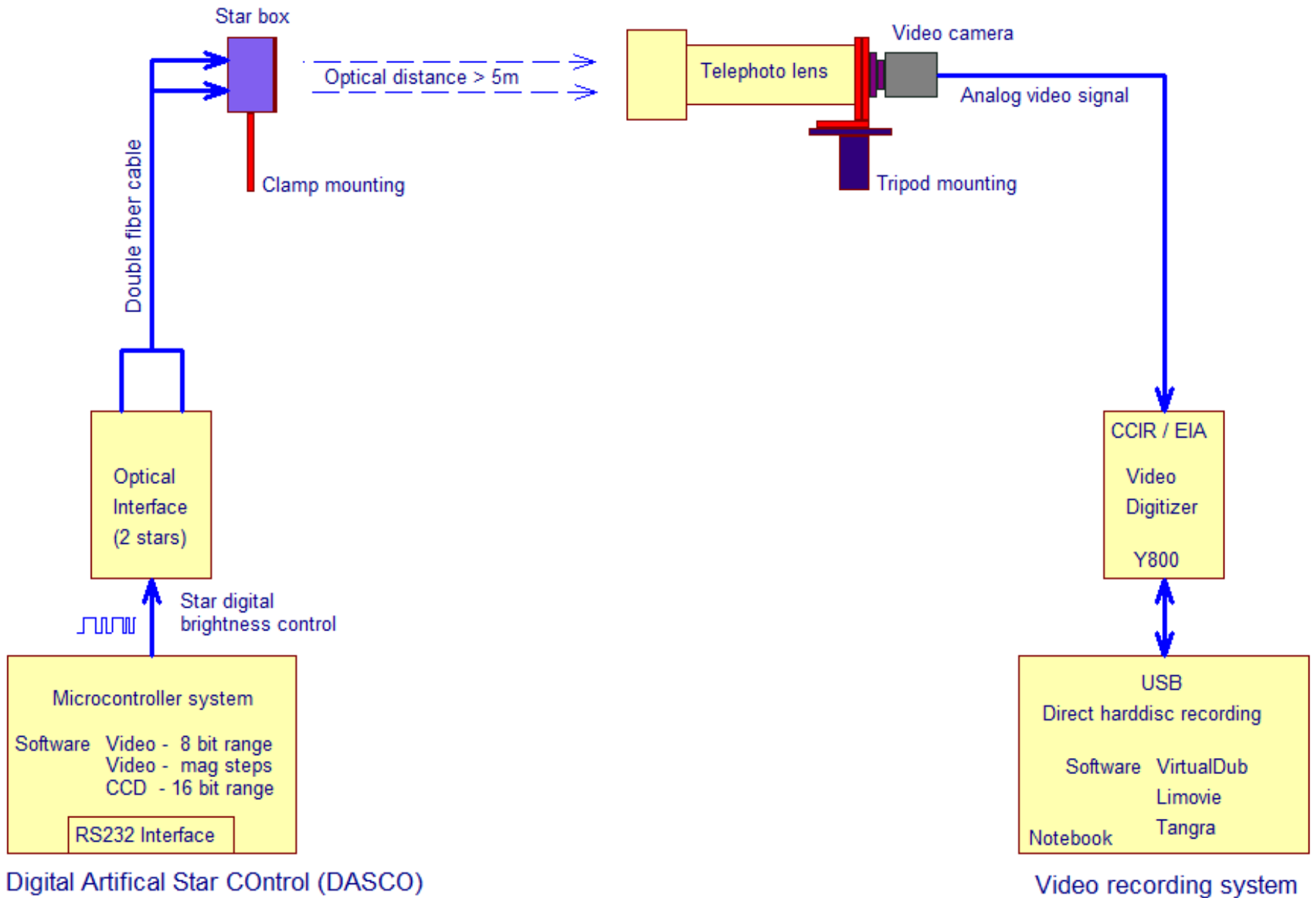
VTI output frame time stamp: 22:49:45.249 – 289, frame mid time: 22:49:45.269
Correction value from table: - 0.100s, real It sequence mid time 22:49:45.169
Real exposure start – end time 22:49:45.090 - 22:49:45.249

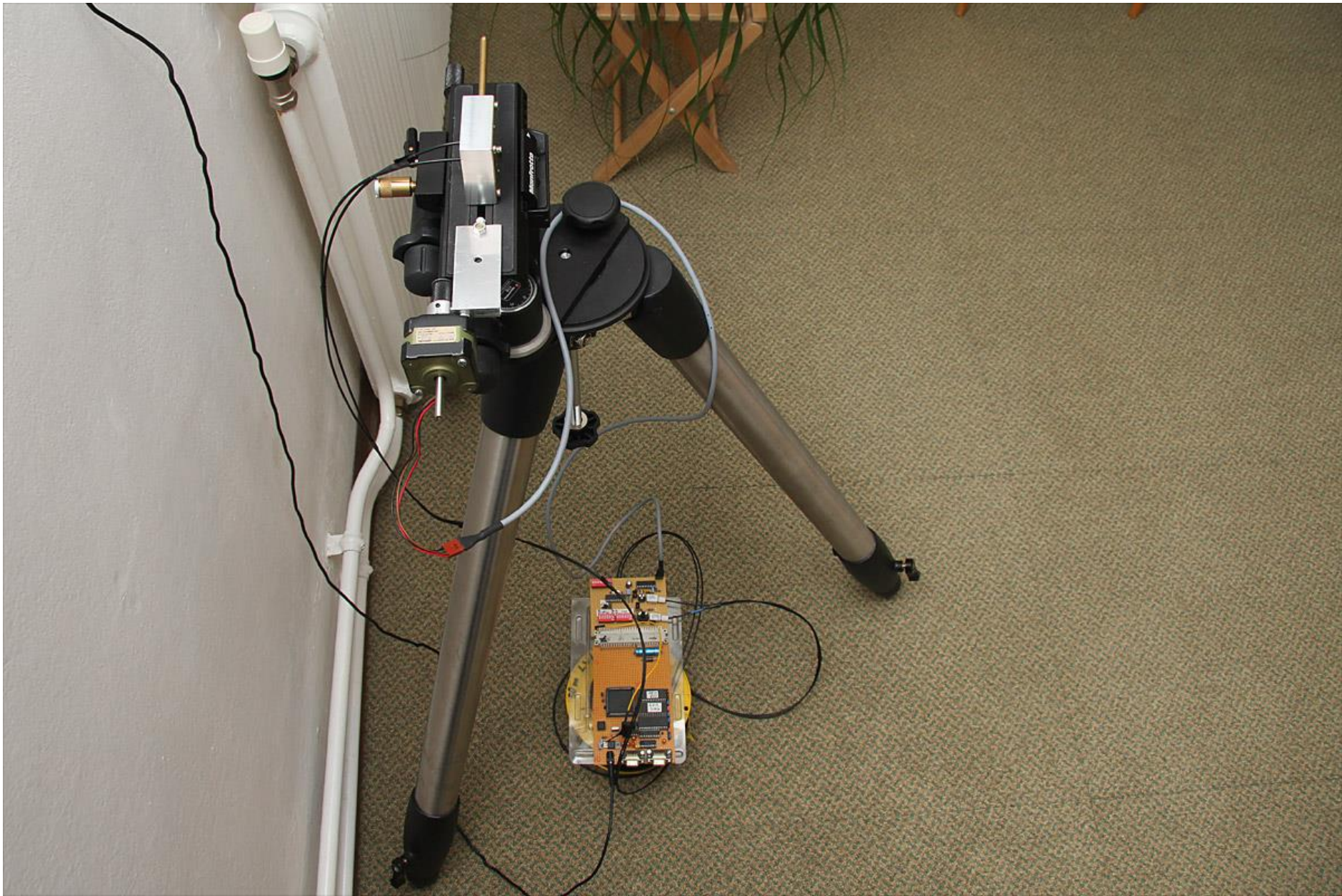
Timing measurement results for several cameras

http://www.dangl.at/ausruest/vid_tim/vid_tim1.htm

http://www.dangl.at/exta/exta_e.htm

Video camera linearity and sensitivity measurement setup





2013/08/25

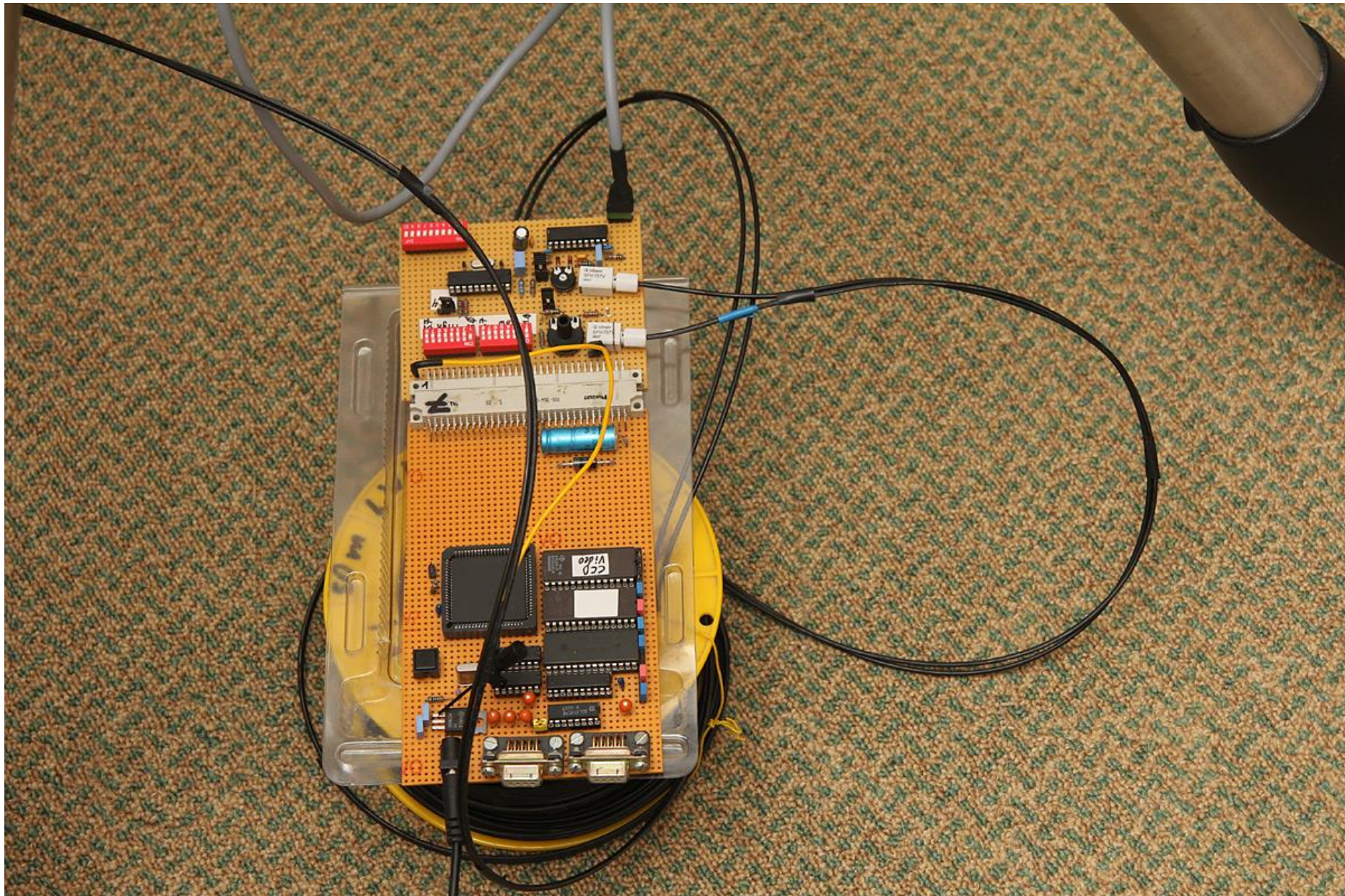
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DASCO – slider and star box



DASCO – star and slider control



Video camera measurement setup



Video camera WAT-910HX on C-mount/T2 adapter and T2/Canon adapter

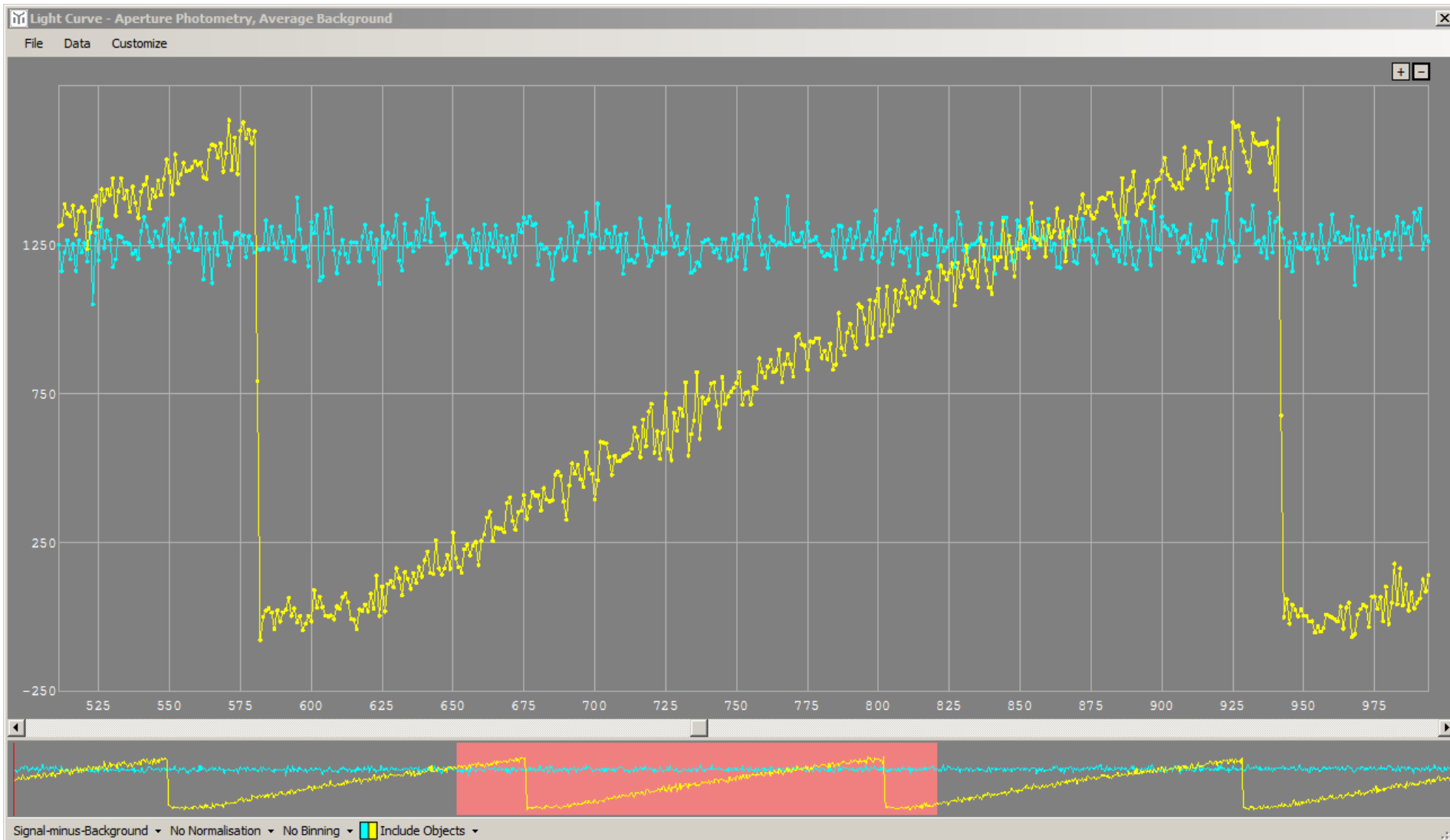


2013/08/25

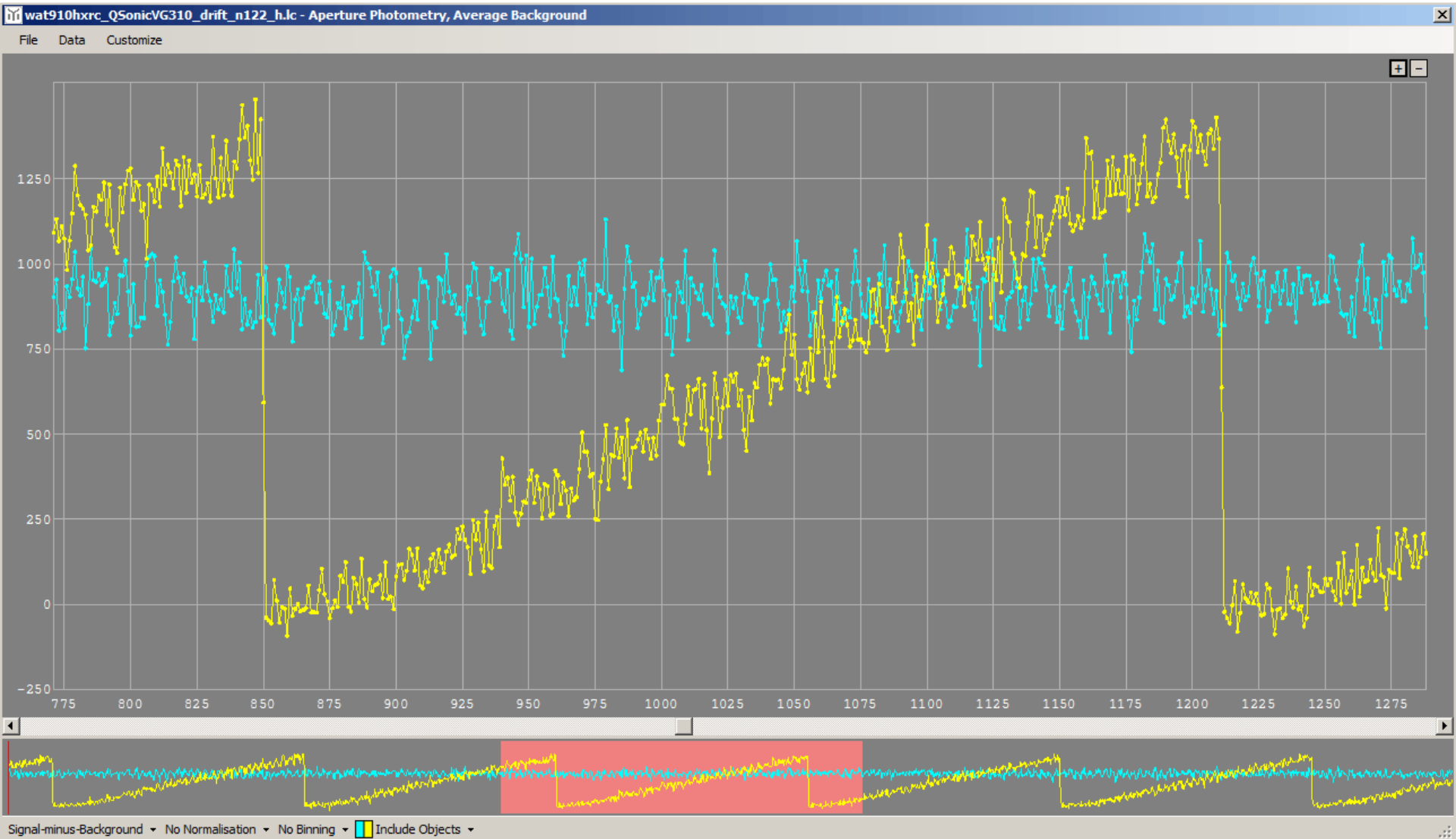
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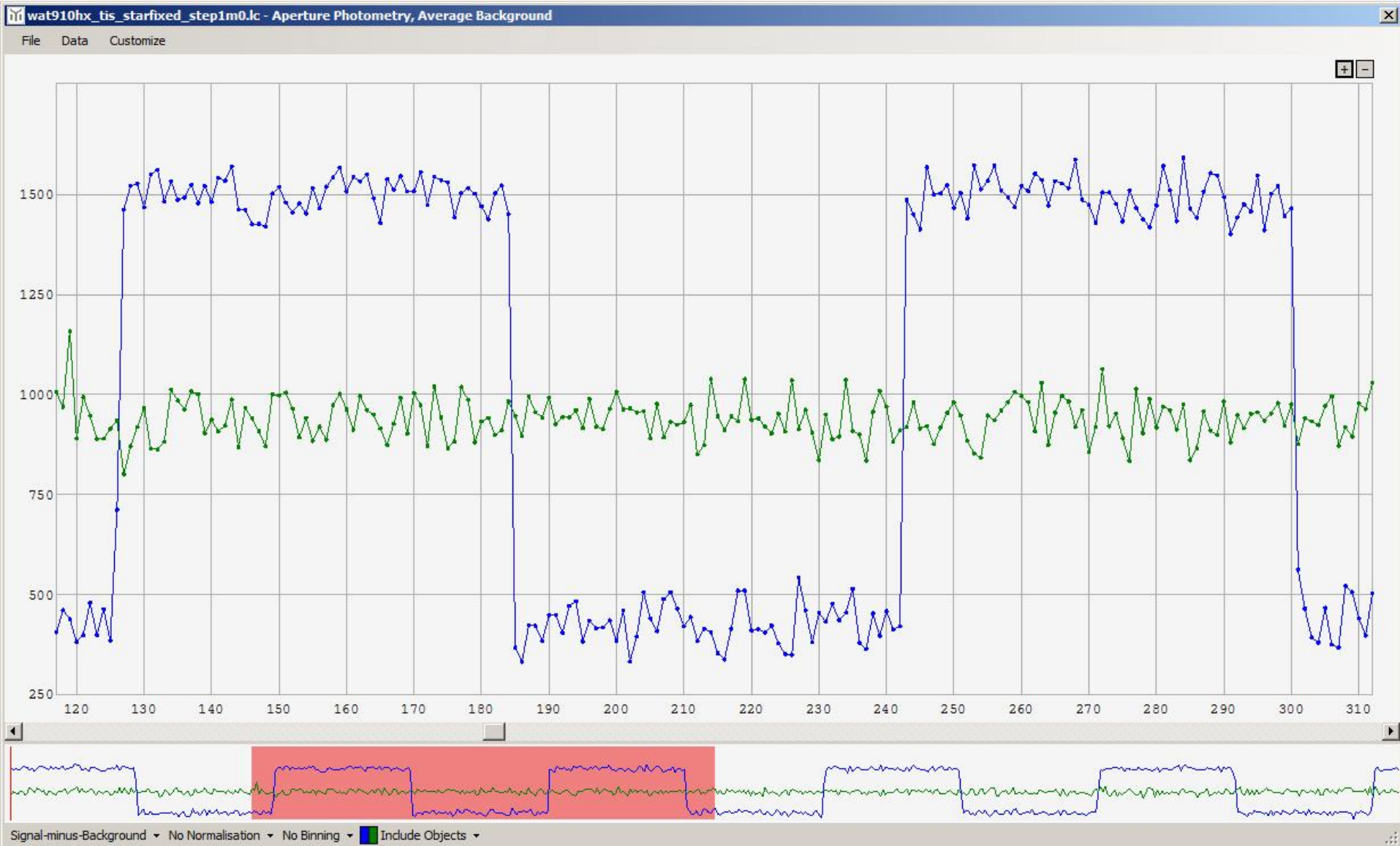
WAT-910HX saw tooth linearity diagram – star fixed (50fps)



WAT-910HX saw tooth linearity diagram – star H drifting (50fps)



WAT-910HX 1.0mag brightness step diagram (50fps)




WAT-910HX 0.1mag brightness step diagram (50fps)



WAT-120N recording of M67 (50fps, Gain=38dB)

WAT-120N 38dB off 20ms



WAT-910HX recording of M67 (50fps, Gain=38dB)

WAT-910HX/RC 38dB 1/50s 20ms



WAT-120N recording of M67 (It=160ms, Gain=38dB)

WAT-120N 38dB mode4 160ms



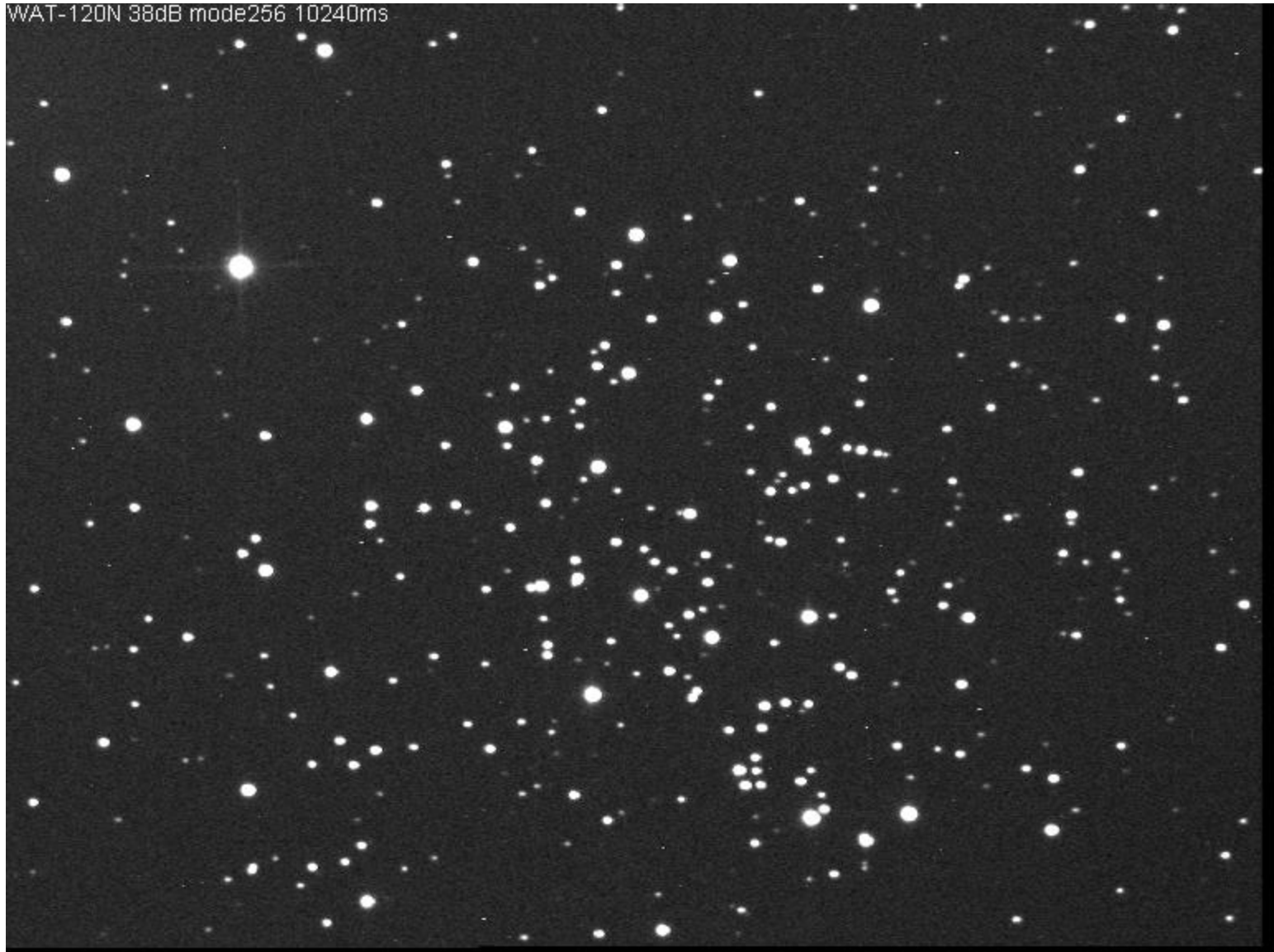
WAT-910HX recording of M67 (It=160ms, Gain=30dB)

WAT-910HX/RC 30dB x8 160ms



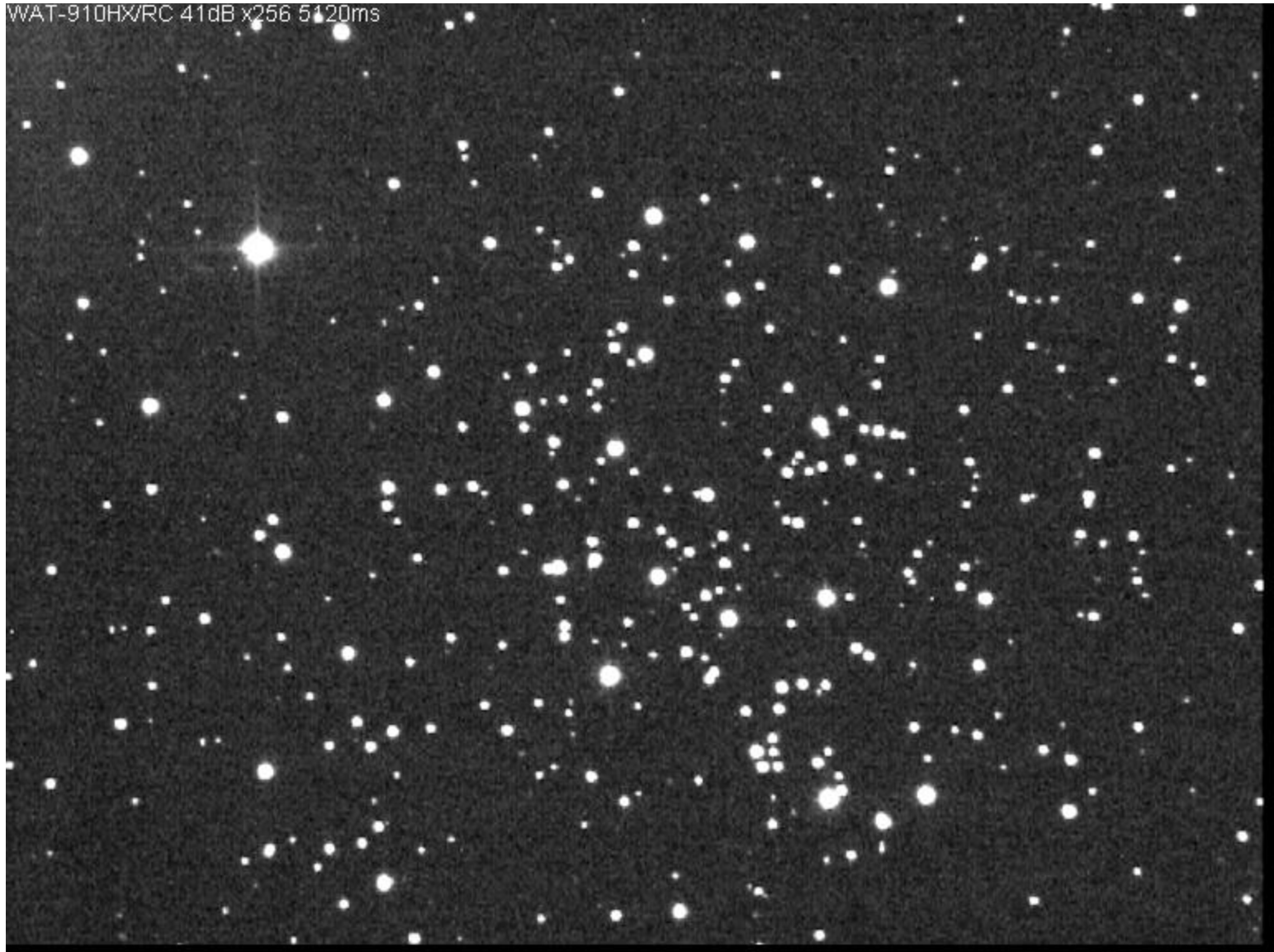
WAT-120N recording of M67 (It=10240ms, Gain=38dB)

WAT-120N 38dB mode256 10240ms



WAT-910HX recording of M67 (It=5120ms, Gain=41dB)

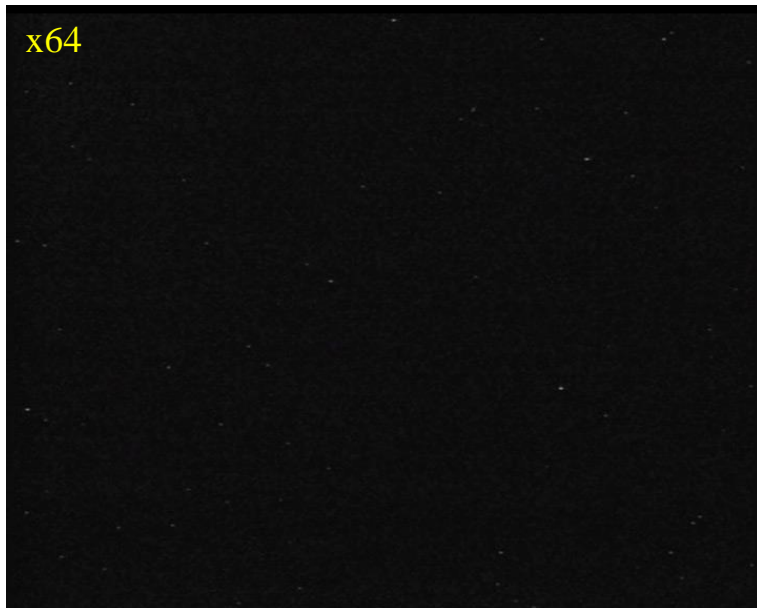
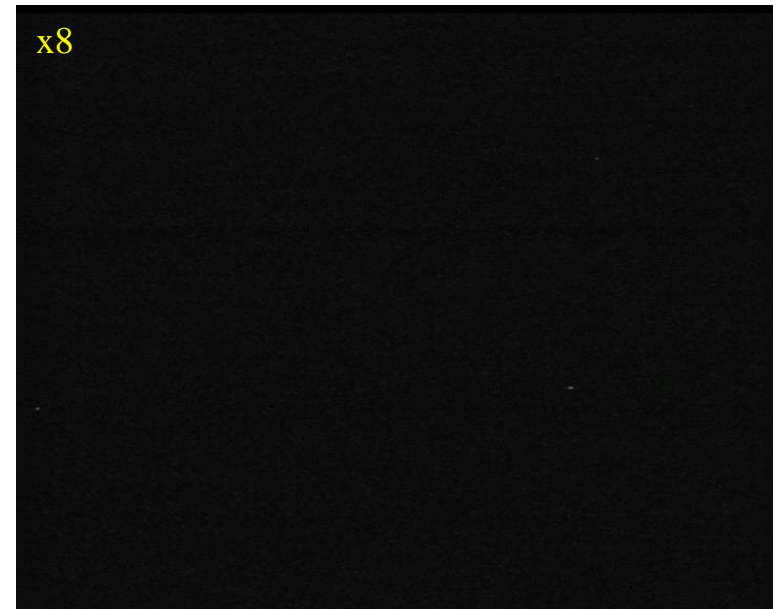
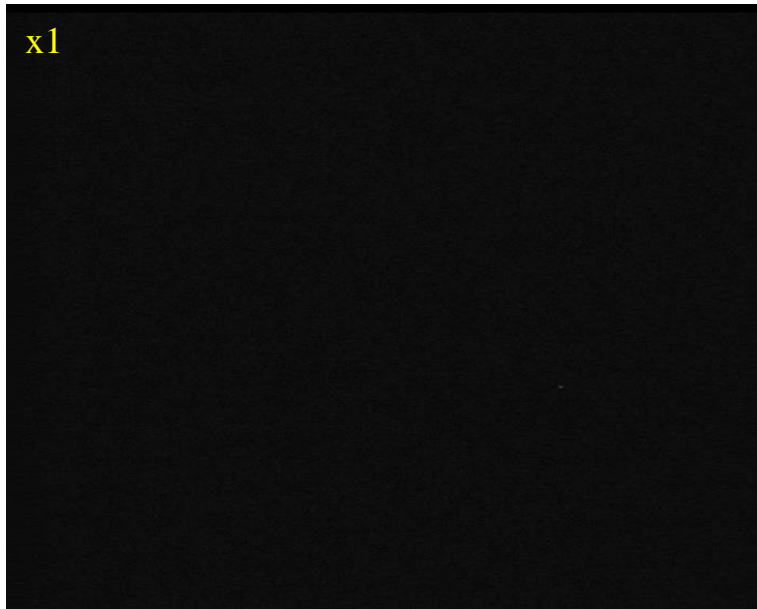
WAT-910HX/RC 41dB x256 5120ms



Video camera compare test images of star cluster M67

http://www.dangl.at/ausruest/cam_comp/cam_comp.htm

WAT-910HX darks



Thank you for your attention in Barcelona



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