

Terebizh Catadioptric Telescope

Model: TEC300VT-7DEG

Brief description

The telescope has been designed to match the optical images with the widely-spread now CCDs with the pixels size 9-12 μm and the sensor size 36.9 x 36.9mm (diagonal 52mm)

In particular, the FLI PL 16803 cameras based on the KAF-16803 chip with the 4096×4096 pixels of 9 μm Another known detector, FLI PL 09000, includes the KAF-09000 chip with the 3056×3056 pixels of 12 μm size (36.67 mm \times 36.67 mm), the diagonal length is 51.9 mm.

Indeed, the telescope's optical layout provides images of the stars in the integral visual light (454nm-836nm) of diameter less than 9 μm , i.e. not larger than one pixel, all over the field.

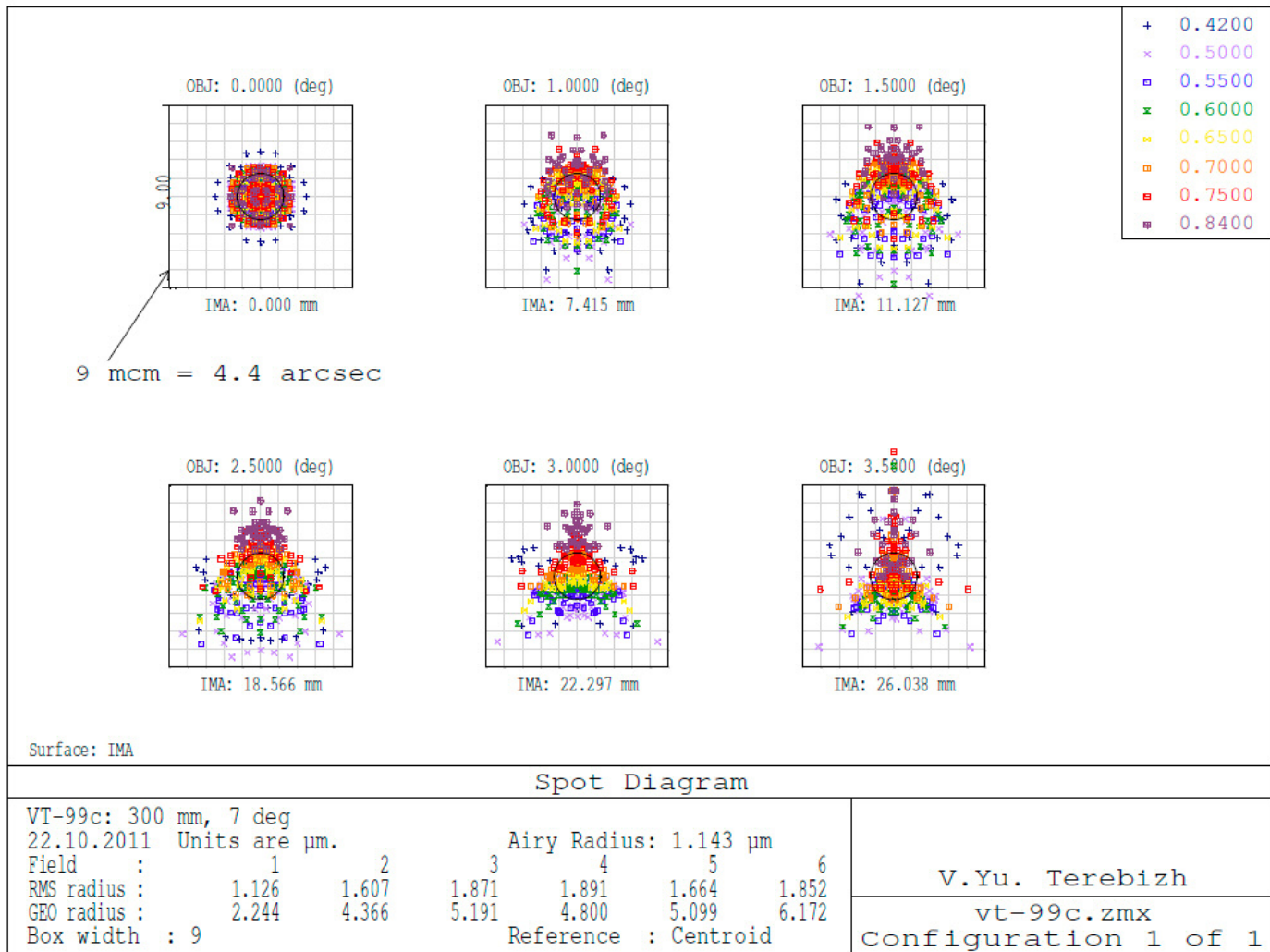
Secondly, the effective focal length of the telescope, $F = 425$ mm, and the angular diameter of the field of view, $2w = 7^\circ.0$, provide the linear field of diameter 52.1 mm.

At last, the pixels are small enough, so their projections on the sky are not large, $4_{11}^{24} - 6_{11}^{24}$. As a result, the sky background does not prevent to reach the high signal-to-noise ratio at observations of faint objects.

Specs

Design	Terebizh Catadioptric
Design version	VT99c
Entrance pupil diameter	300 mm
Effective focal length	425 mm
Working focal ratio	1.44
Scale in the focal plane	2.06 $\mu\text{m}/\text{arcsec}$
Primary spectral waveband	0.42 – 0.84 μm
Angular field of view	$7^\circ.0$
Field curvature	Flat
Linear diameter of field	52.1 mm

Fraction of unvignetted light	
Optical axis	0.70
Edge of field	0.57
Effective aperture diameter	
Optical axis	250mm
Edge of field	227mm
Back focal length (last lens surface – detector)	70 mm
RMS spot diameter (Drms) in the integral spectral range, center/edge	2.3 / 3.8 μ m
Diameter of circle that contains 80% of energy in a star image (D80), integral light, center/edge	5.5 / 7.1 μ m
Maximum distortion	<0.20 %
Harmful ghosts	Absent
Axial length of the system	
First – last surface	373mm
First surface – detector	443mm



Optical tube assembly

Weight incl. FLI camera ~40 kg
Full length 1030mm

Mechanical design features:
A-thermal Titanium cells

Invar rods assembly for thermal
stability of the focus

Orthogonal tip-tilt adjustment of
the camera focal plane,
adjustment range 0.25 deg.



Optical design by Professor Valery Terebizh, Sternberg Astronomical Institute,
Moscow State University, Russia
OTA opto-mechanical design and optics by Yuri Petrunin, TEC

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Astronomische Nachrichten* 332, 714-742, 2011.

Telescope Engineering Company
15730 W. 6-th Ave., Golden, CO. 80401. USA
www.telescopengineering.com
tec@idcomm.com
Phone 303 273 9322

ADDENDUM

Instrument sky survey ability

TELESCOPE & DETECTOR	
Entrance pupil diameter, mm	300
Effective focal length, mm	425
Angular field of view, deg	7
Telescope transparency	0.65
Fraction of unvignetted rays	0.65
Telescope D ₈₀ , arcsec	3.1
Detector	PL 16803
Quantum efficiency, counts/photon	0.6
Pixel size, um	9

OBSERVATIONS

Atmosphere D ₈₀ , arcsec	1.5
Sky background, mag/sq.arcsec	21
Object zenith angle, degrees	20
Bandwidth, um	0.45
Read-out time, sec	5
Threshold S/N value	10

CALCULATED VALUES

Telescope effective diameter, mm	241.9
Image scale, um/arcsec	2.06
Angular pixel size, arcsec	4.368
Delivered image quality, arcsec	5.56
Atmosphere transparency	0.727
Total transparency	0.472
Sky survey rate, Herschel	0.0572

Target	half of sky per night	whole sky per night
Particular exposure time, sec	70	35
Particular limiting magnitude	19.54	19.16
Particular survey speed, sq.deg/sec	0.513	0.962

