Part 2
Lidar Setup

Mini-curso Lidar
Ceilometer

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Clouds

Aerosol

Back scattering

LIDAR Telescope

Laser pulses
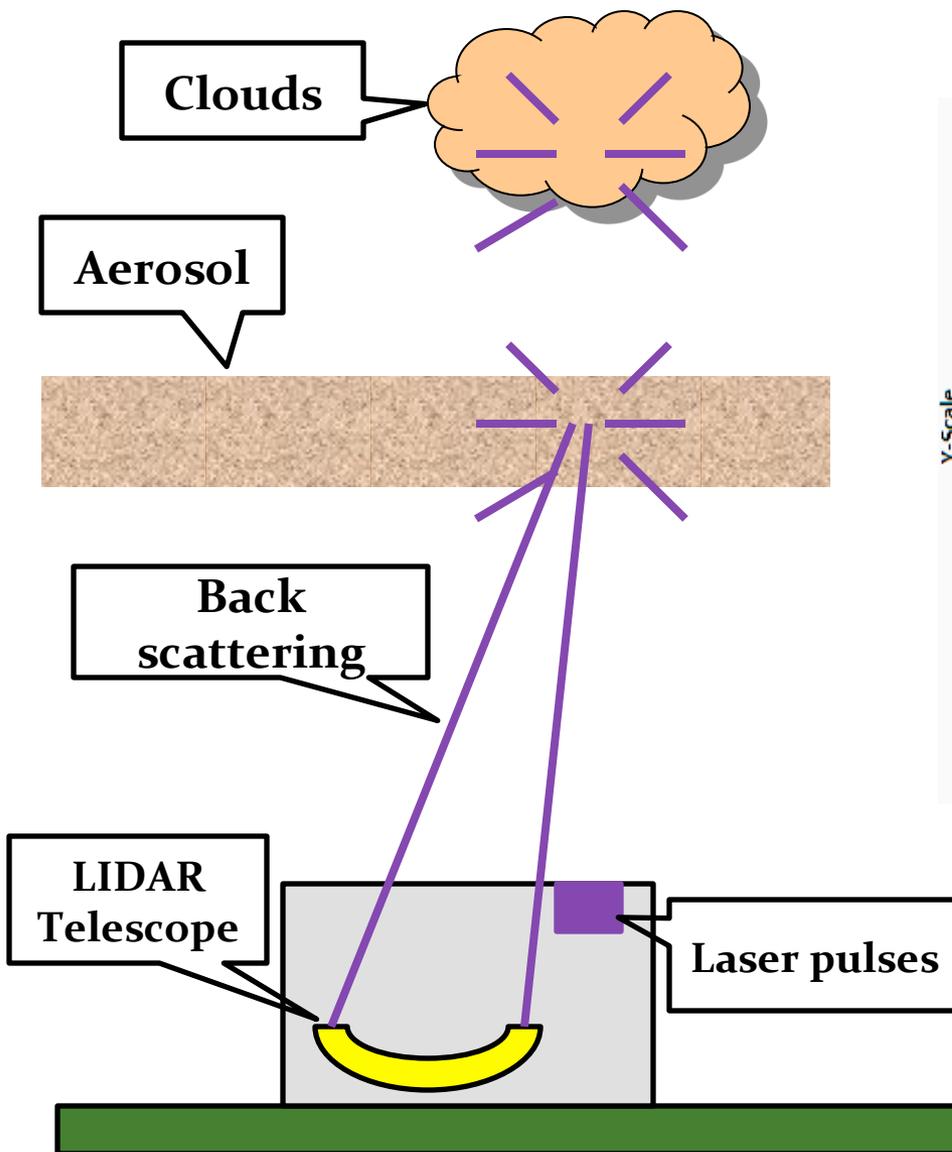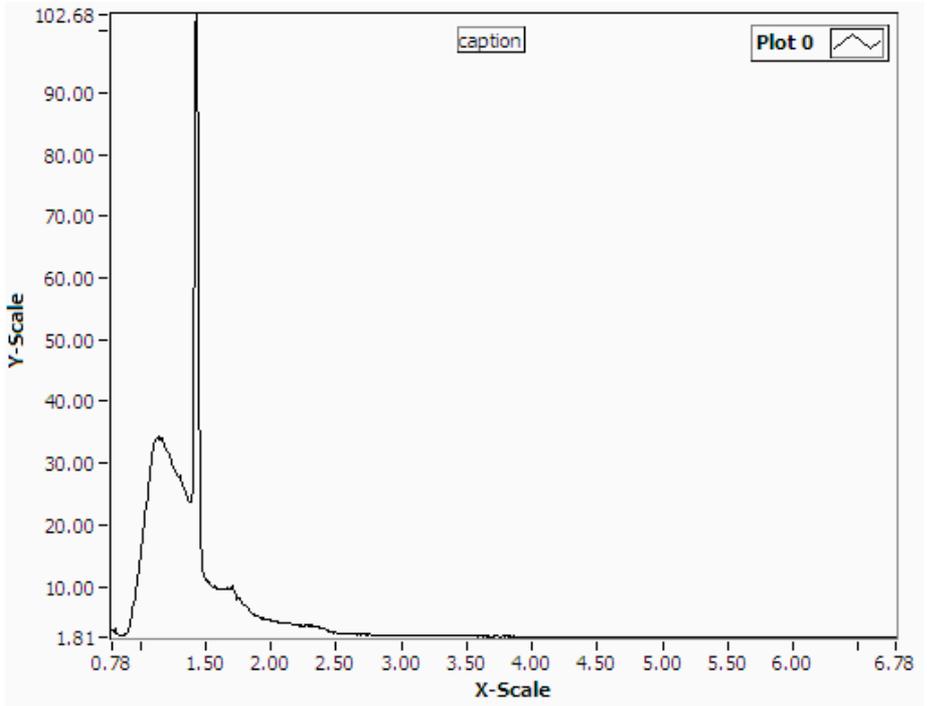
Data acquisition ~ **20Mhz**
Vertical resolution ~ **7.5m**

Typical setup
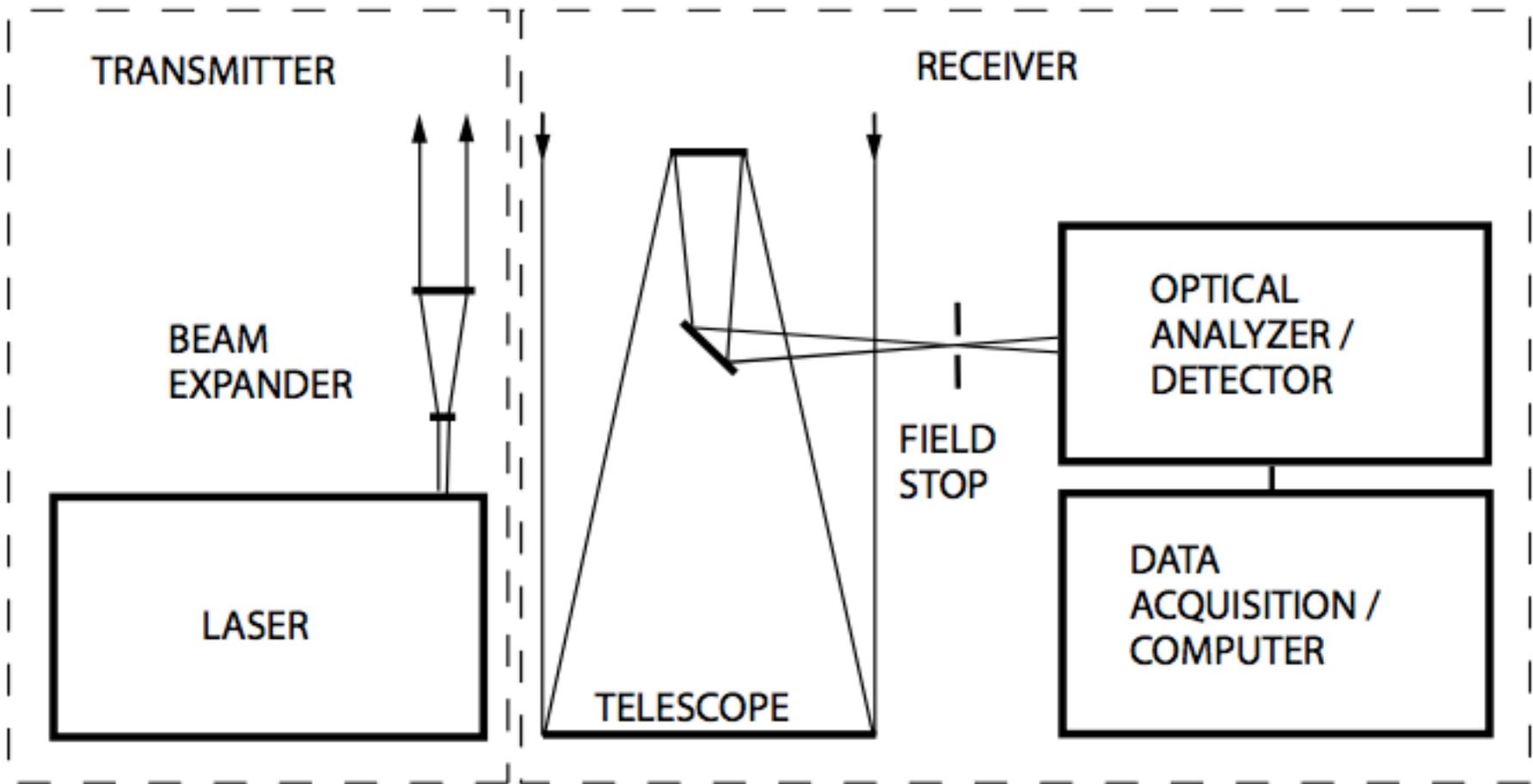
Fig. 1.1. Principle setup of a lidar system.

Mono- vs Bi-axial systems

Kovalev, "Elastic Lidar", chap. 3

An example:

Beam expander

mirror

laser

computer

electronics

telescope

Light sensors

cooling

Optical layout - Emission

Laser head

Beam expander

Alignment mirror

Cooling and control

Remote

CHK15k Ceilometer

Telescope

Beam expander

Laser alignment

Laser head

APD

Beam div x FOV tel

$X = 3$

D_{in} α_{in}

α_{out}
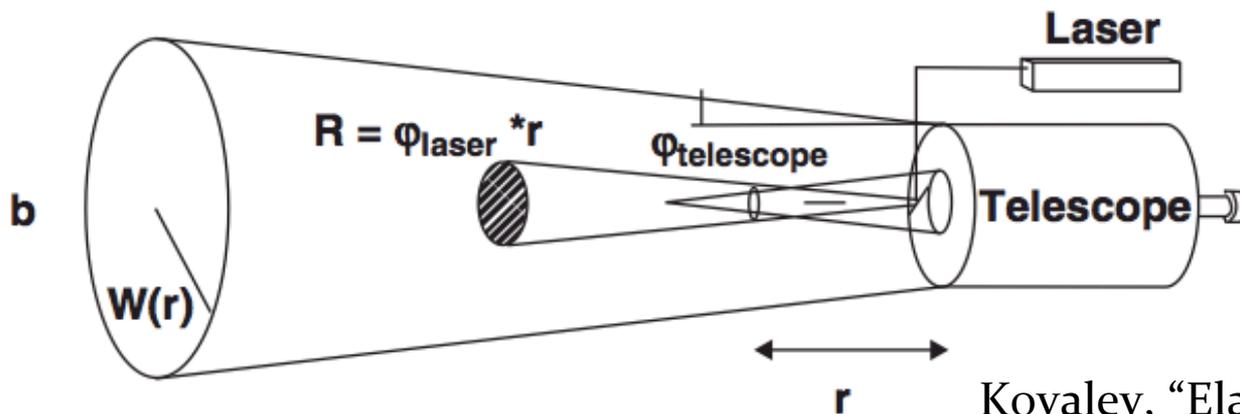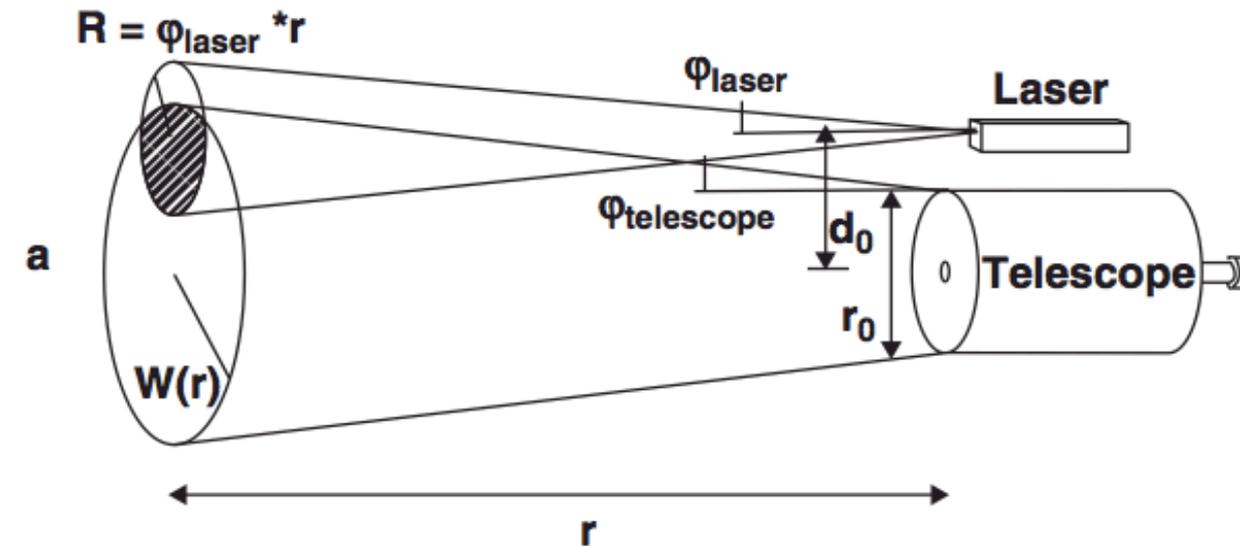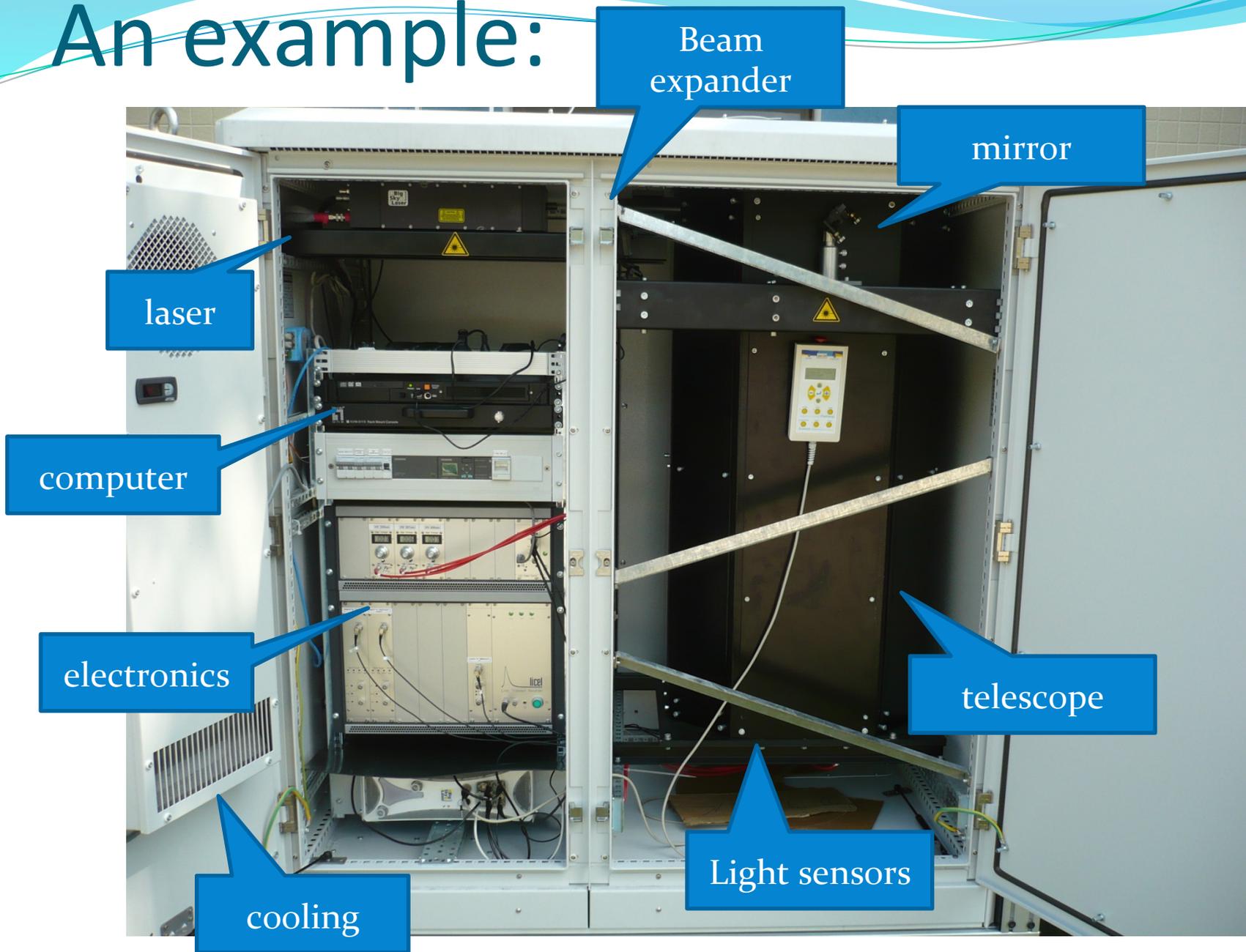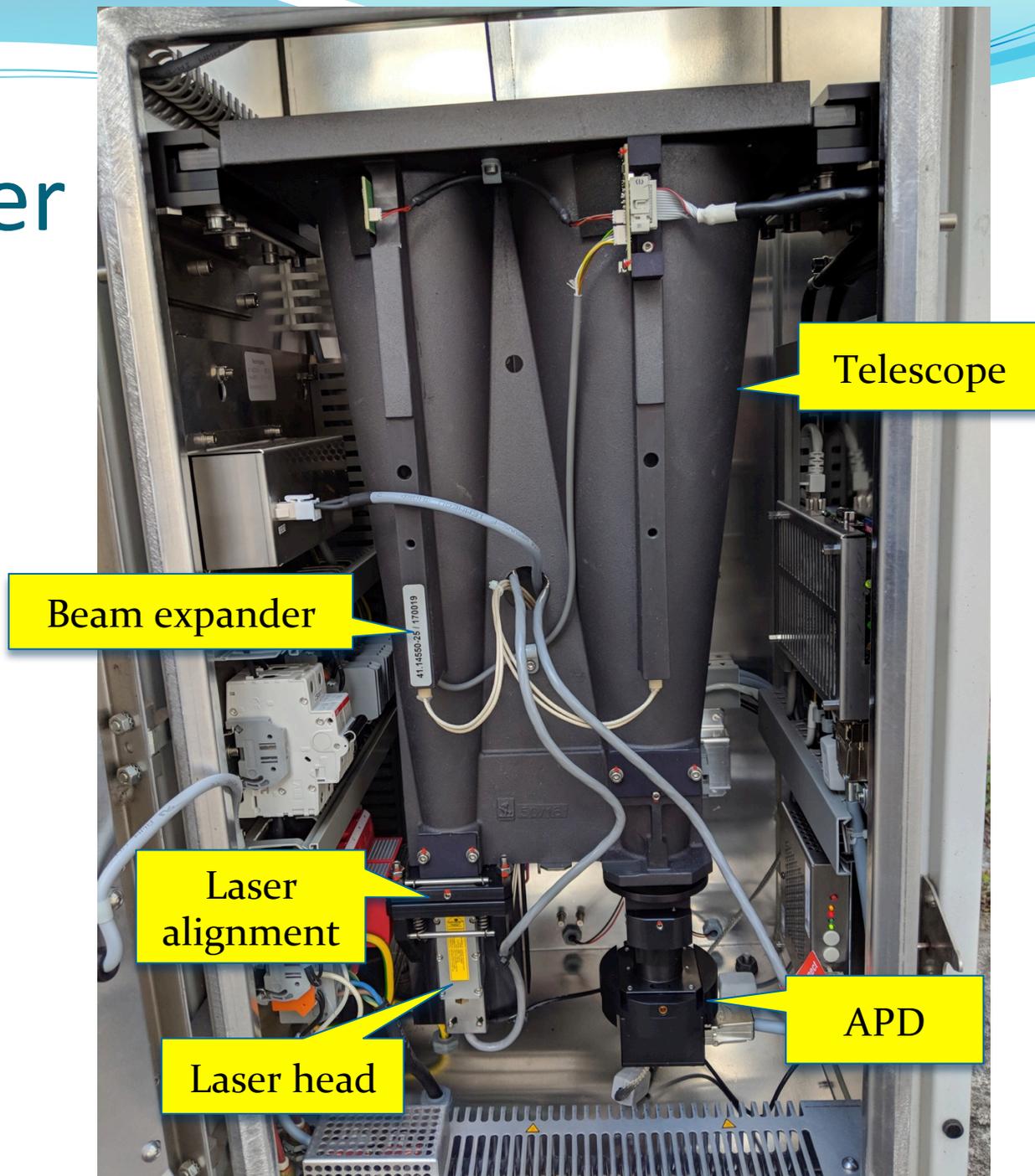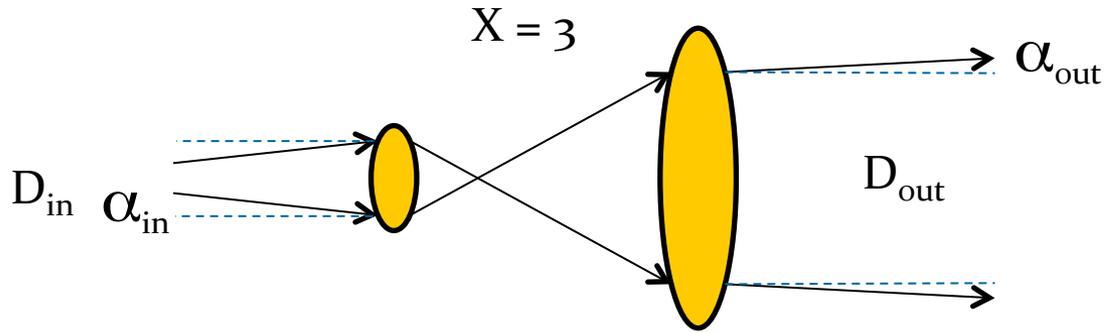
D_{out}

$$D_{out} = x \cdot D_{in} = 3 \cdot 1mm = 3mm$$

$$\alpha_{out} = \frac{\alpha_{in}}{x} = \frac{0.75mrad}{3} = 0.25mrad$$

Telescope FOV

Laser divergence

Total overlap

Partial overlap

No overlap

0.25 mrad

3mm
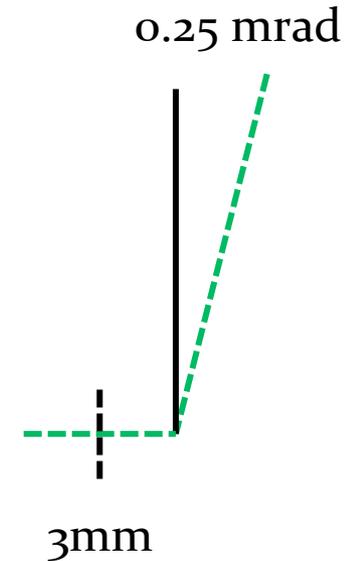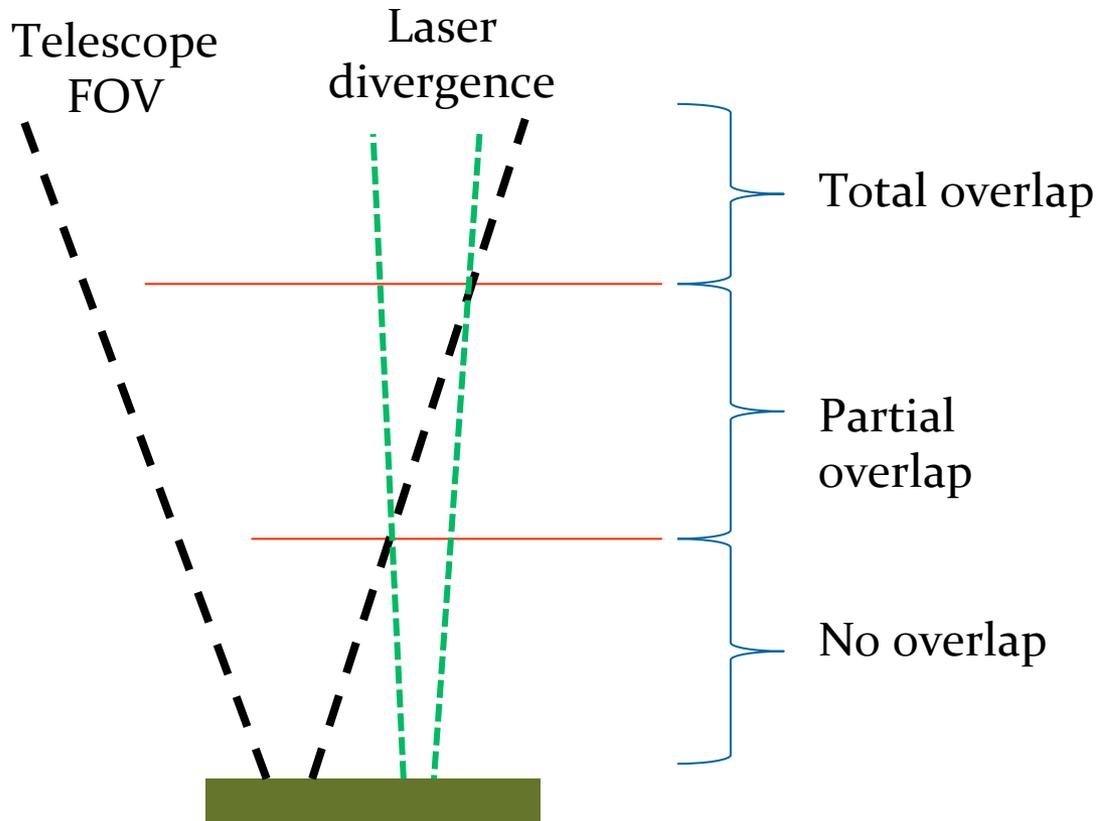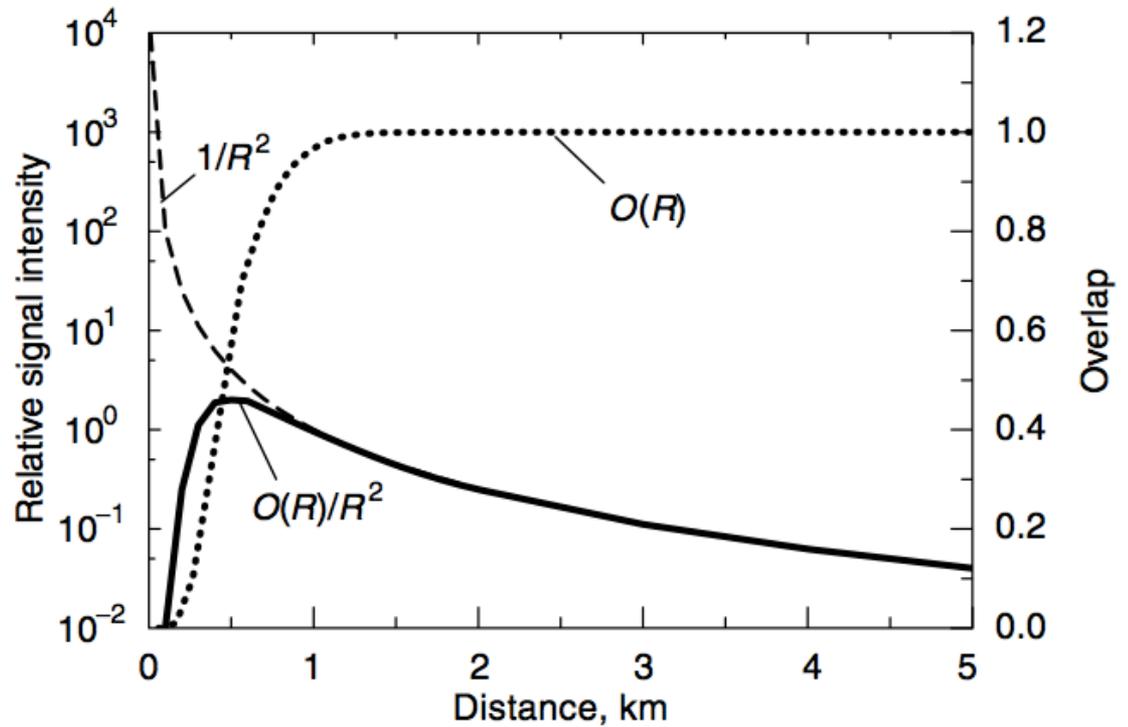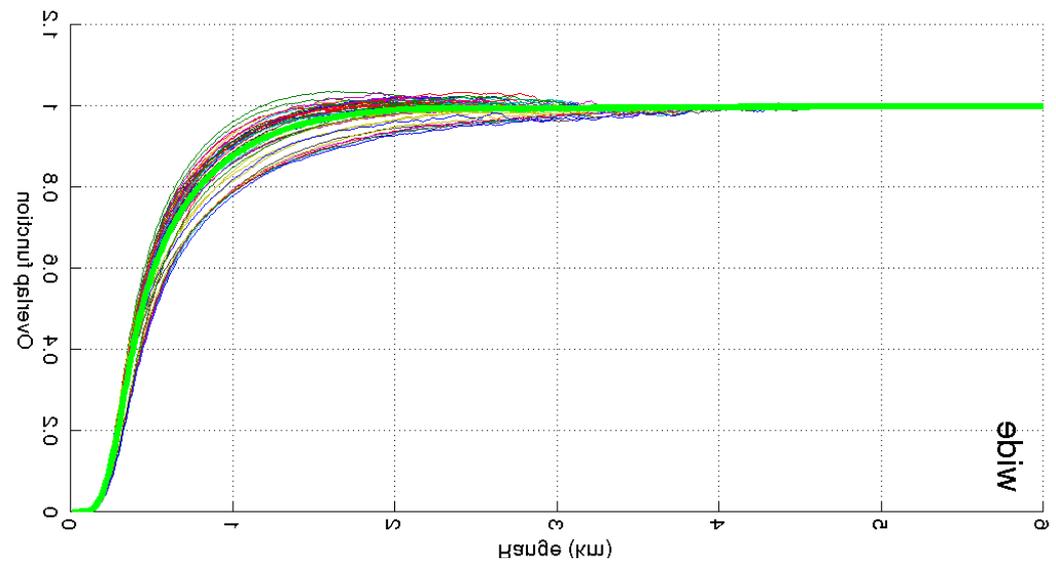
Overlap function

Fig. 1.3. Influence of the overlap function on the signal dynamics.

Weitkamp, chap 1

Optical layout - Detection

Received light

Telescope

2nd mirror

Primary mirror
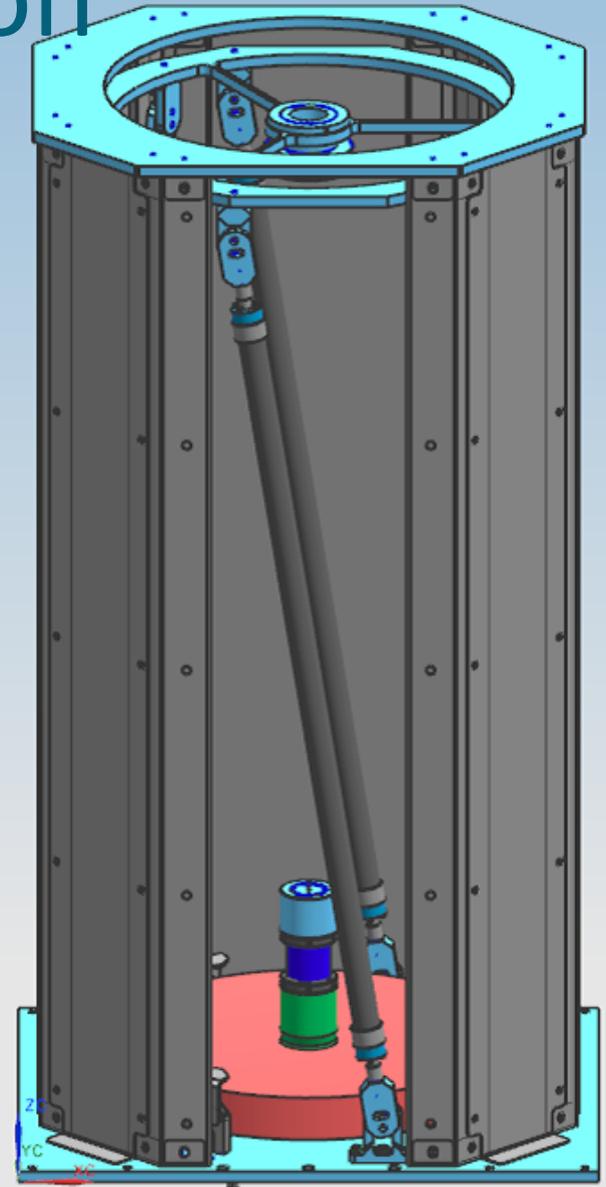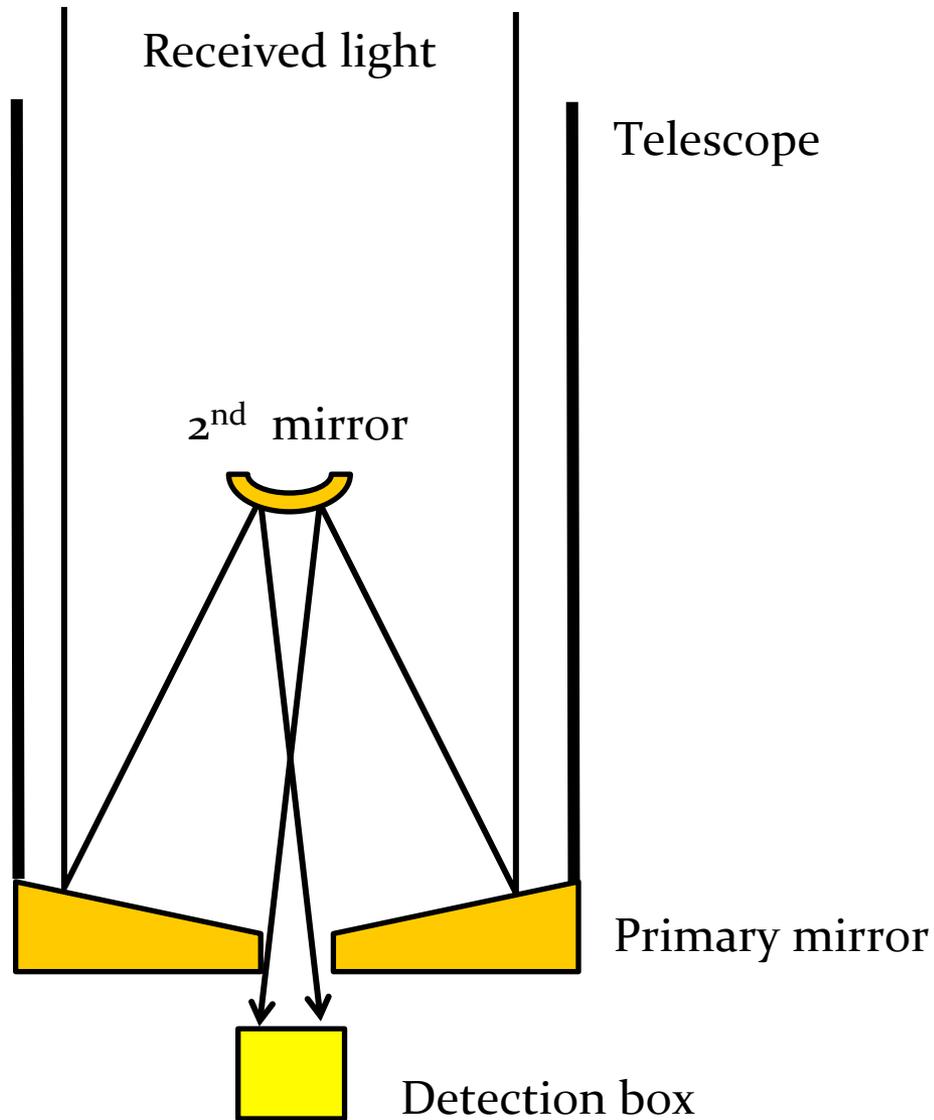
Detection box

Secondary mirror
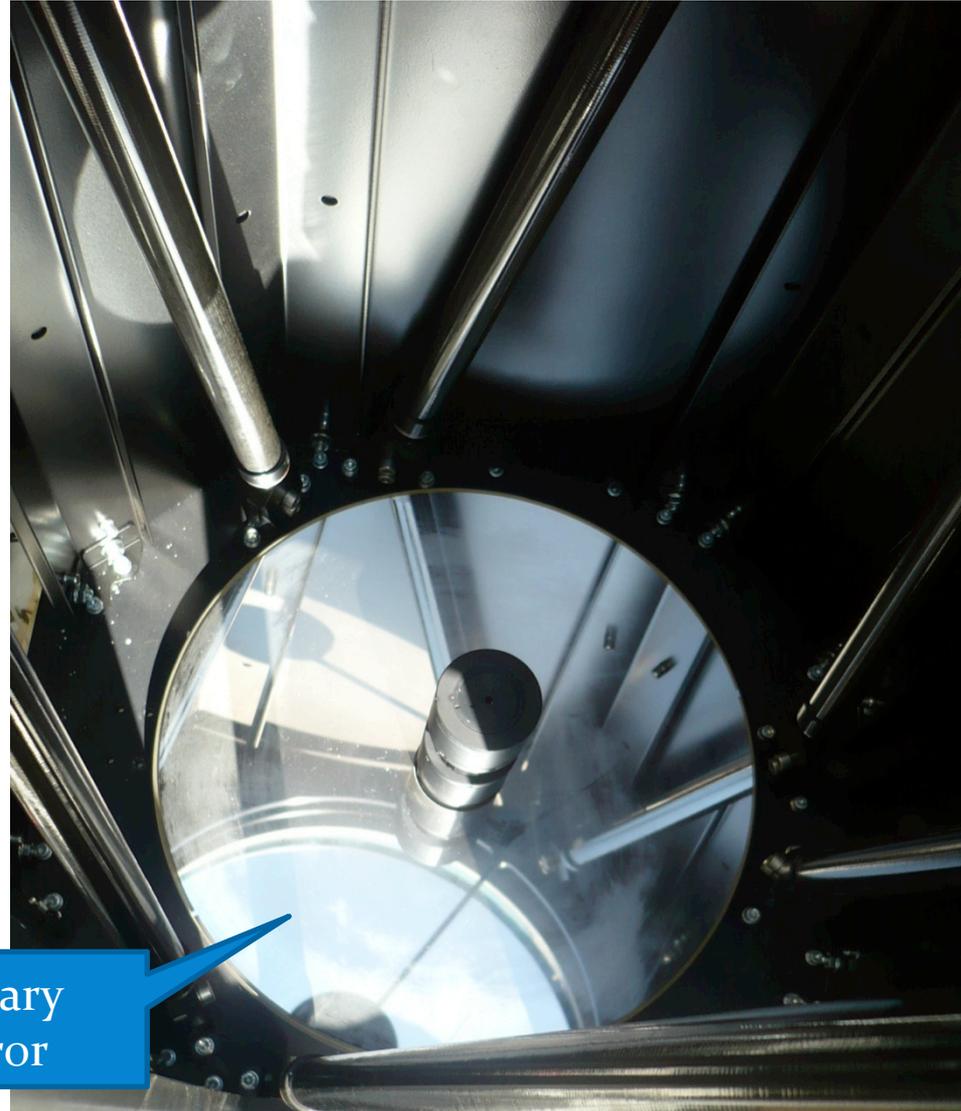
Primary mirror

Optical layout - Detection

Received light

Telescope

2nd mirror

Primary mirror

Detection box

PMT#2

387nm

Detection box

355nm

408nm

PMT#1

PMT#3

A/D Converter

Computer
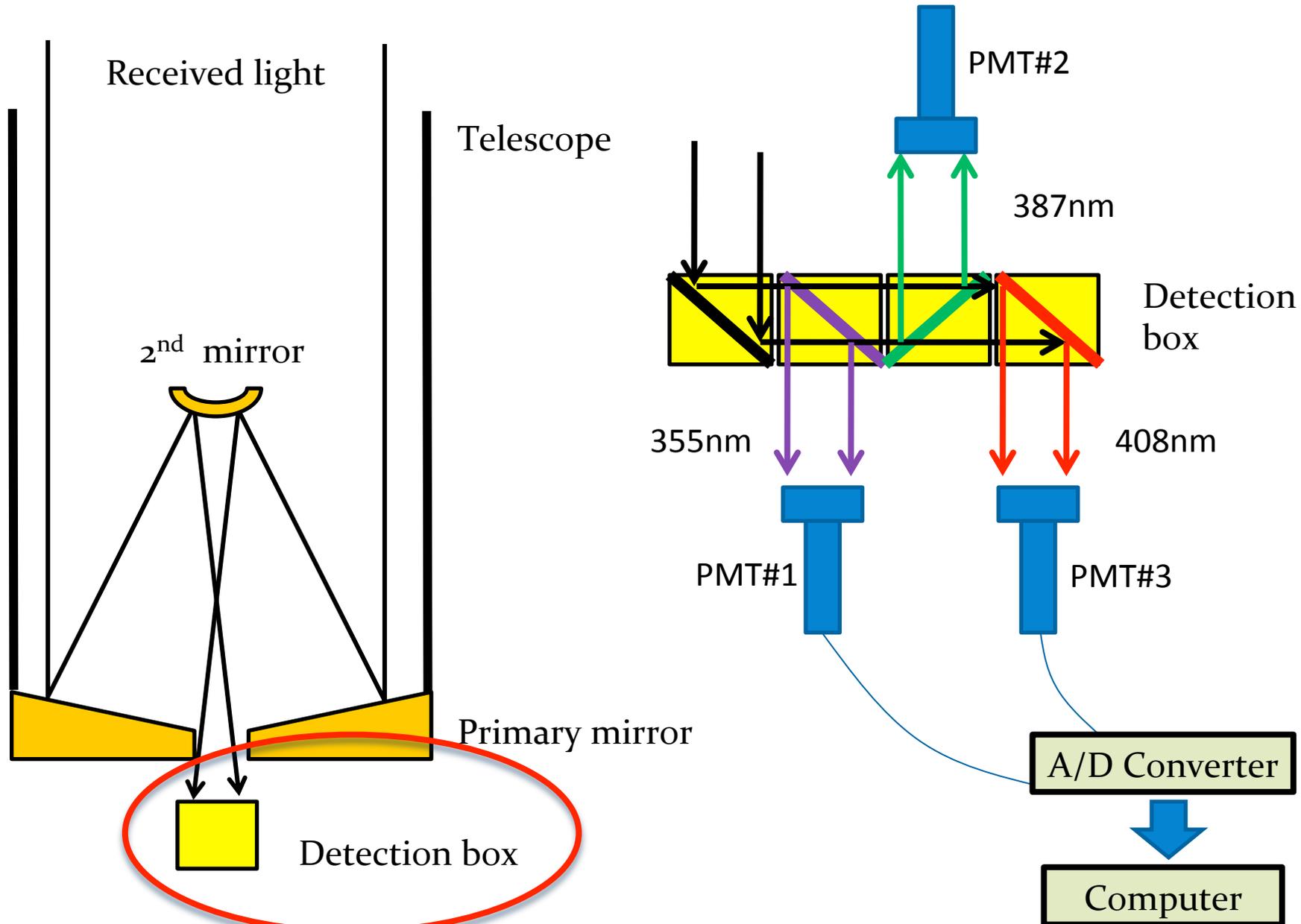
Optical layout – Detection

PMT

Detection box
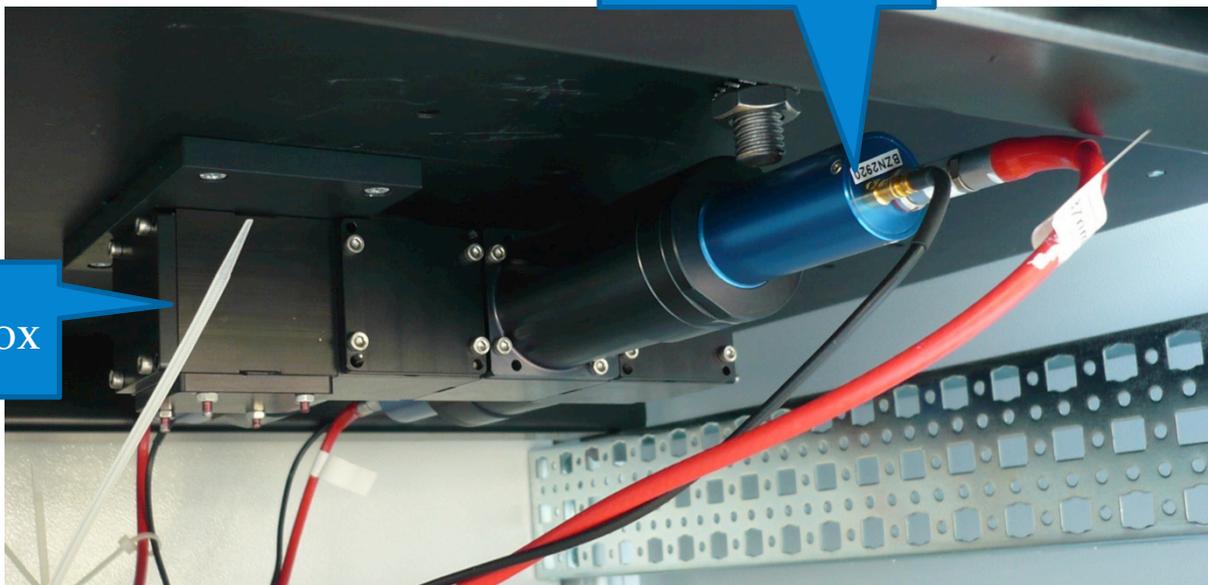
HV control
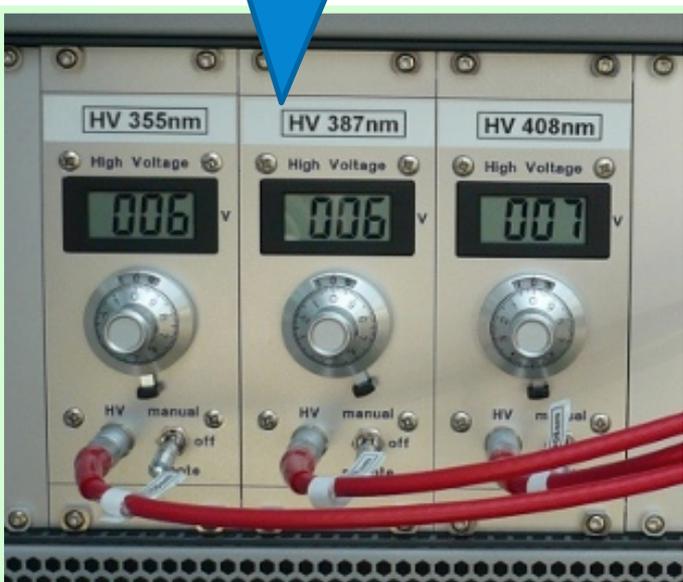
Transient recorder A/D
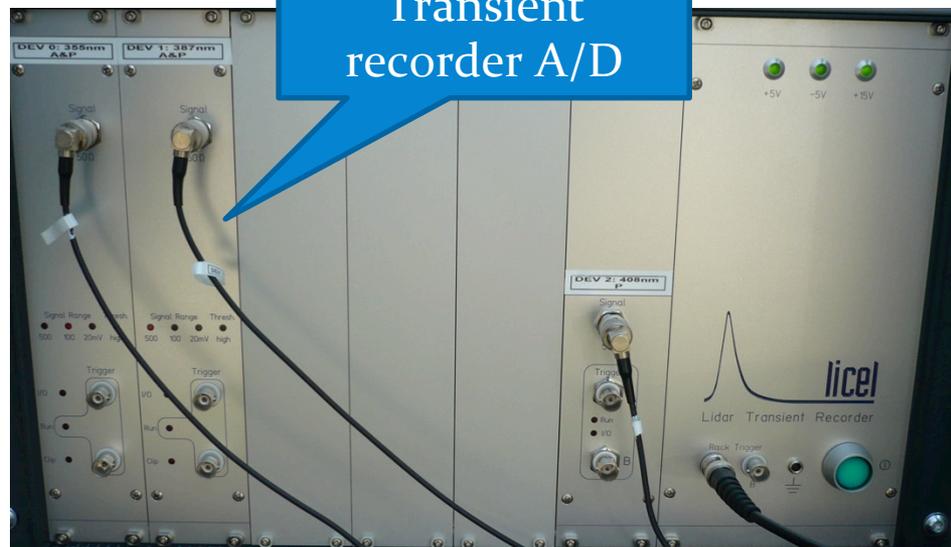
Optical layout - Detection
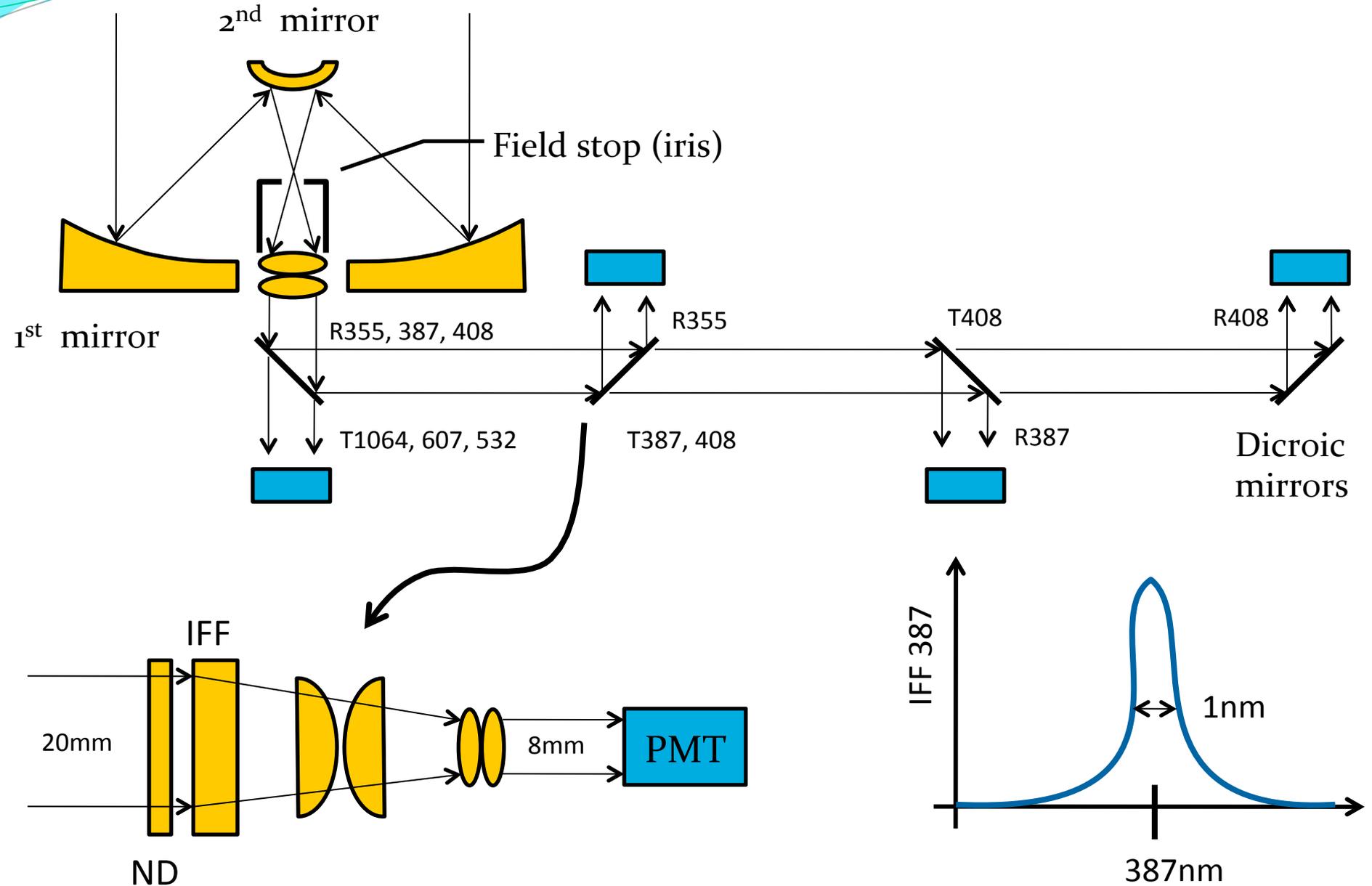
SPECTRAL RESPONSE

Nitrogen Filter Region
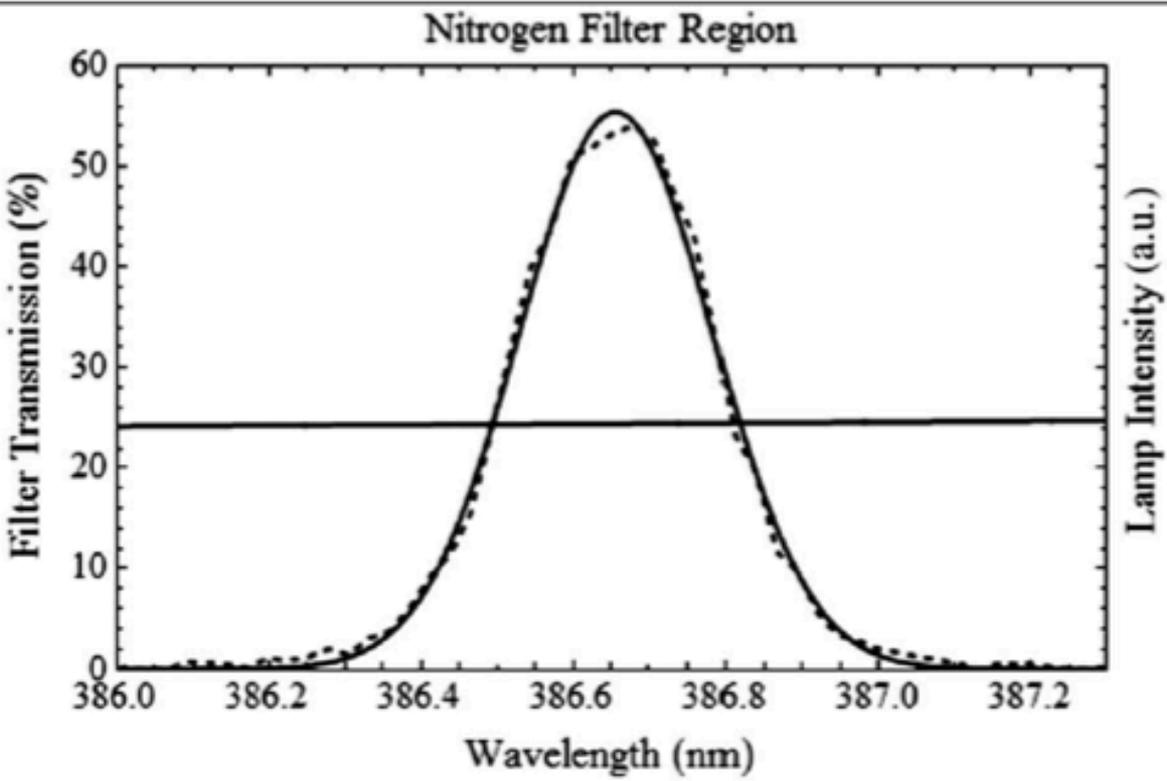
$$\mathcal{F}_{Gaus} = C_1 Exp\left[-\frac{1}{2}\left(2\sqrt{2\log_e[2]}\,\frac{x-C_2}{C_3}\right)^2\right]$$

Filter	λ_o (nm)	FWHM (nm)	Amplitude (%)
N	386.67	0.30	55.41
H	407.51	0.24	48.53

VENABLE et al.

PMT
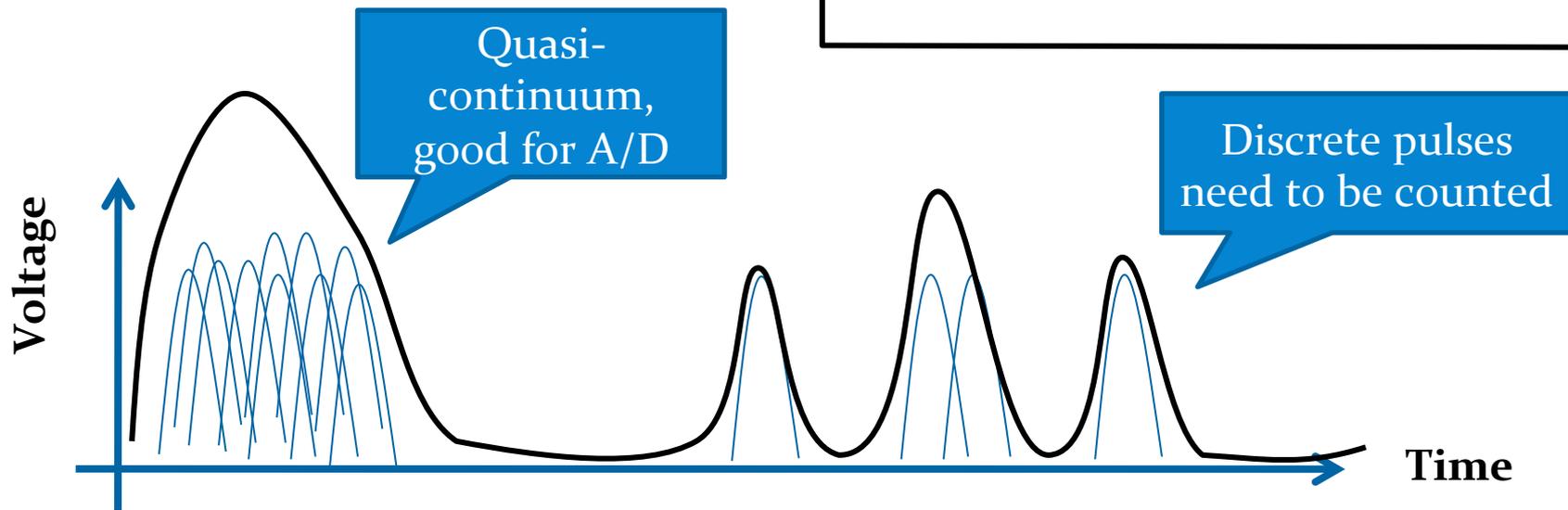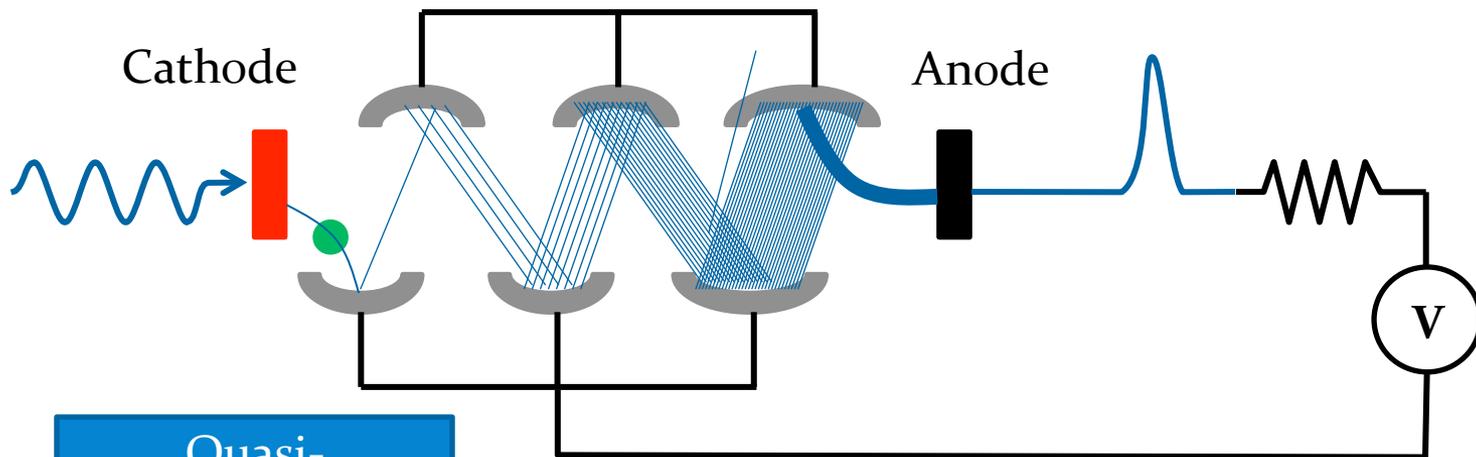
Figure 12(a): Transmission Mode Photocathodes
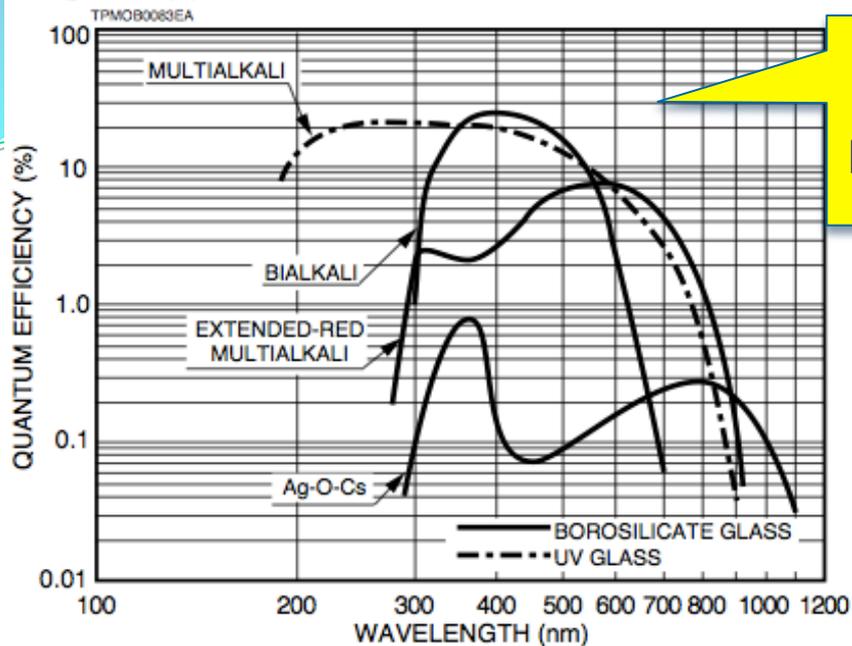
Efficiency < 30%
Hamamatsu, TECH 2001

Figure 12(b): Reflection Mode Photocathodes
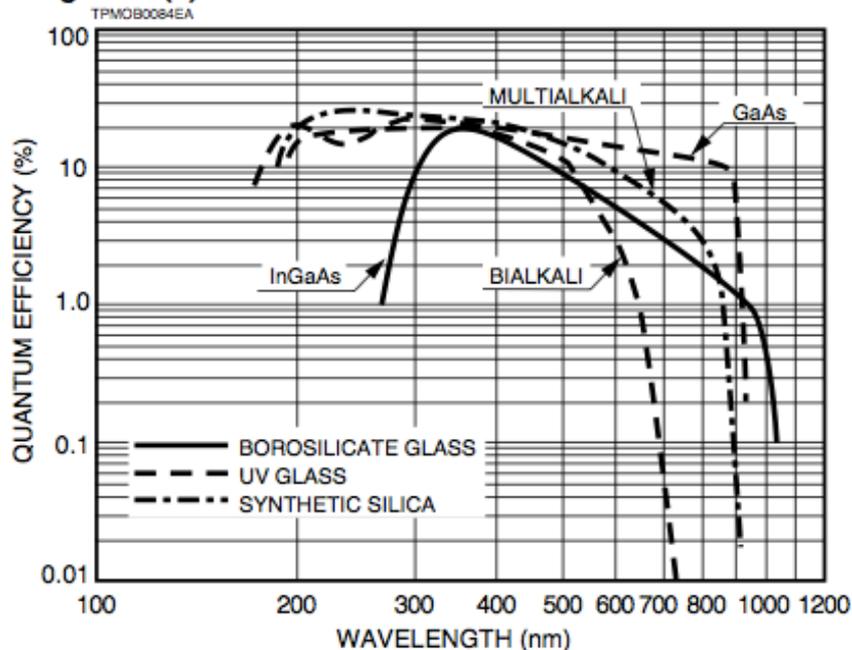
Efficiency is not uniform over Anode
Simeonov et al, Ap. Opt. 1999
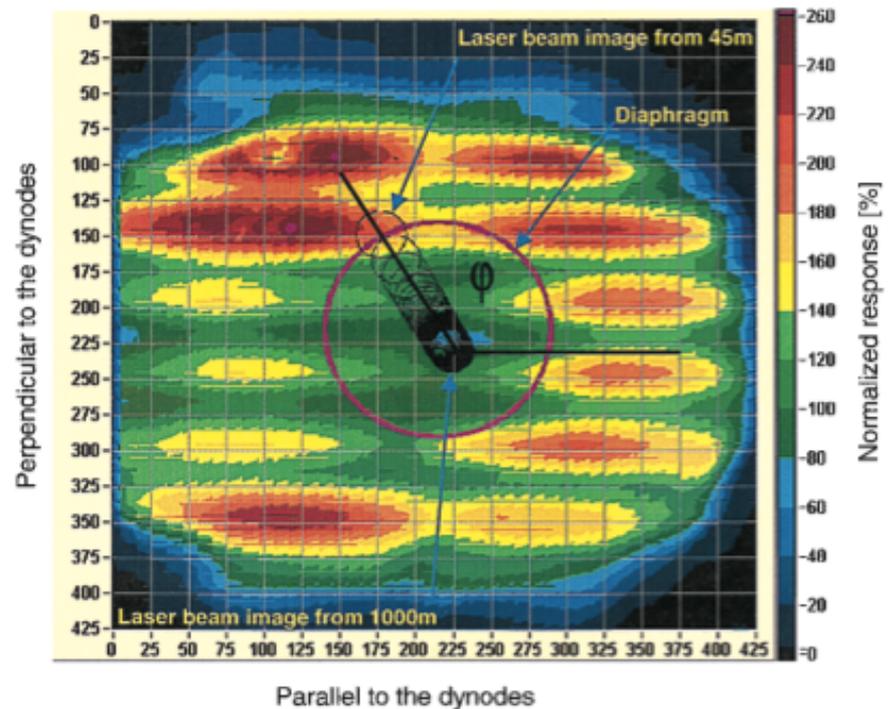
Fig. 3. Anode spatial uniformity from Fig. 1 with resolution enhanced ten times by two-dimensional interpolation (20×20 μm). A model image of the probing laser beam with a range resolution of 15 m (sequence of black circles) and the receiving telescope field stop (violet circle).