

# MEO Shack-Hartmann

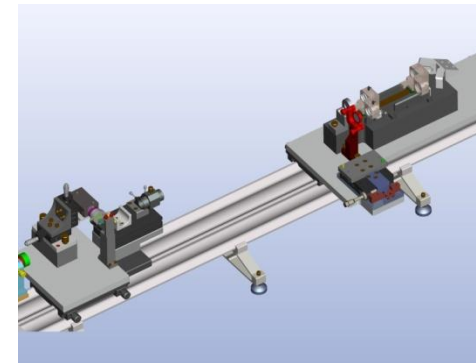
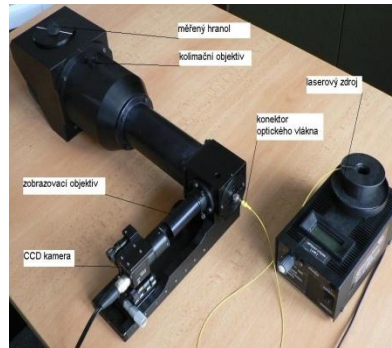
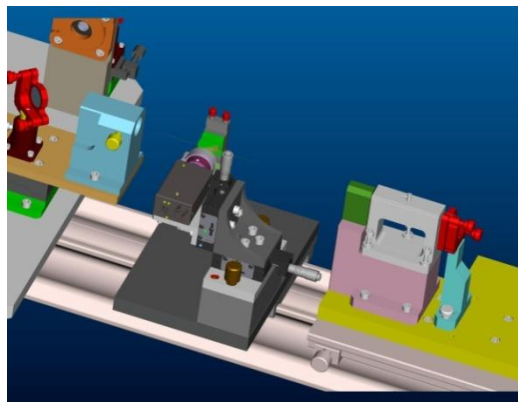
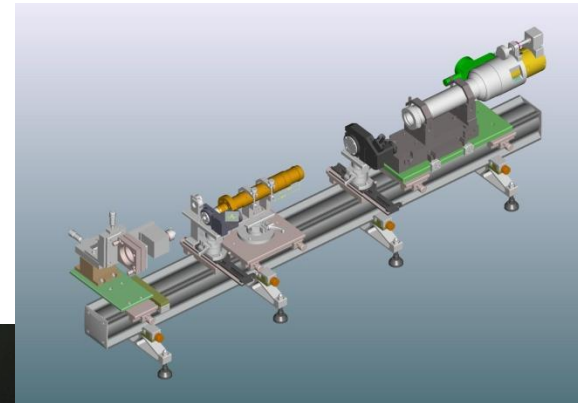
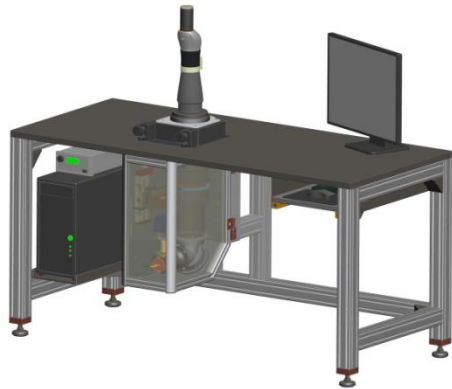
Tato prezentace vznikla v rámci práce na projektu **Centrum digitální optiky** (TE01020229), který je řešen s finanční podporou TA ČR.

Bohumil Stoklasa

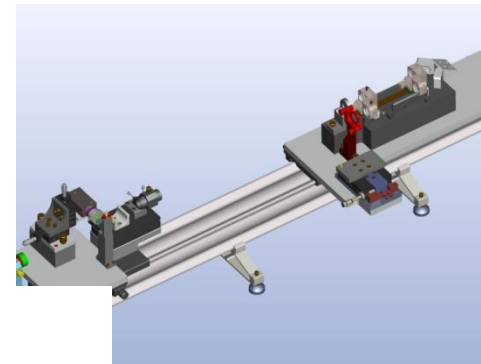
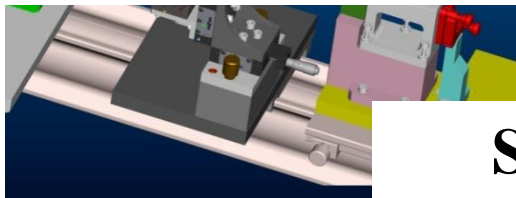
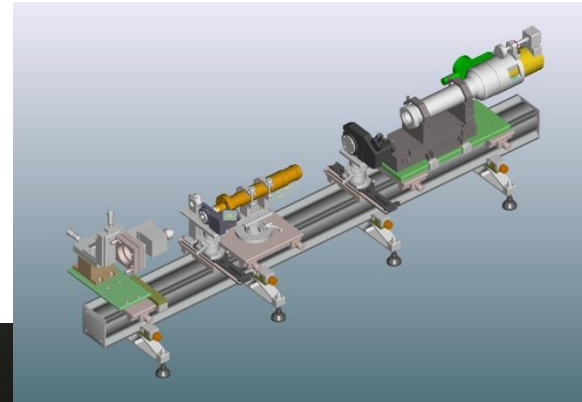
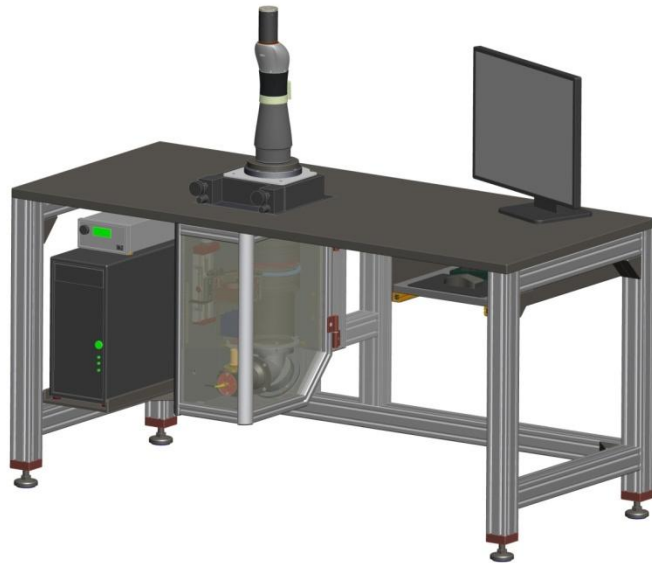


Technická agentura  
České republiky

# MEO aplikace



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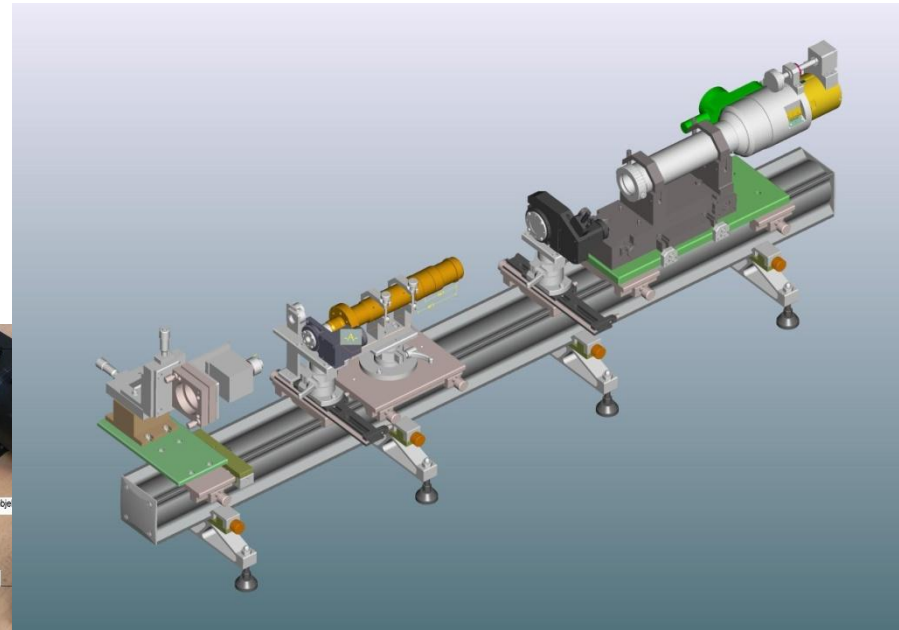
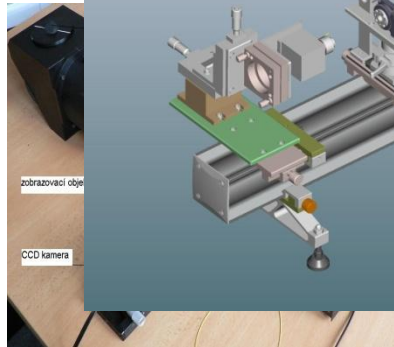
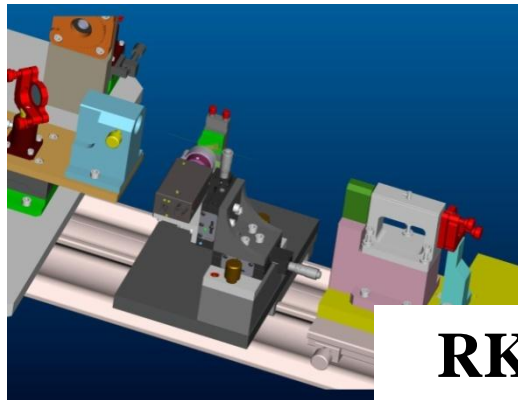
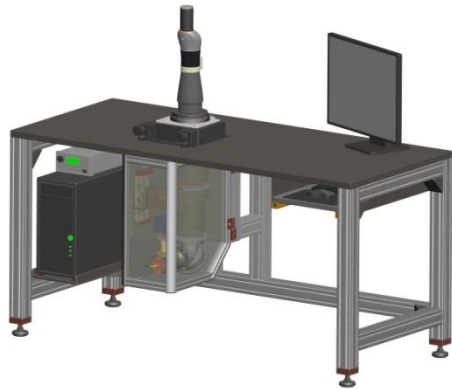


**S2 spektivy 633nm**

# MEO aplikace



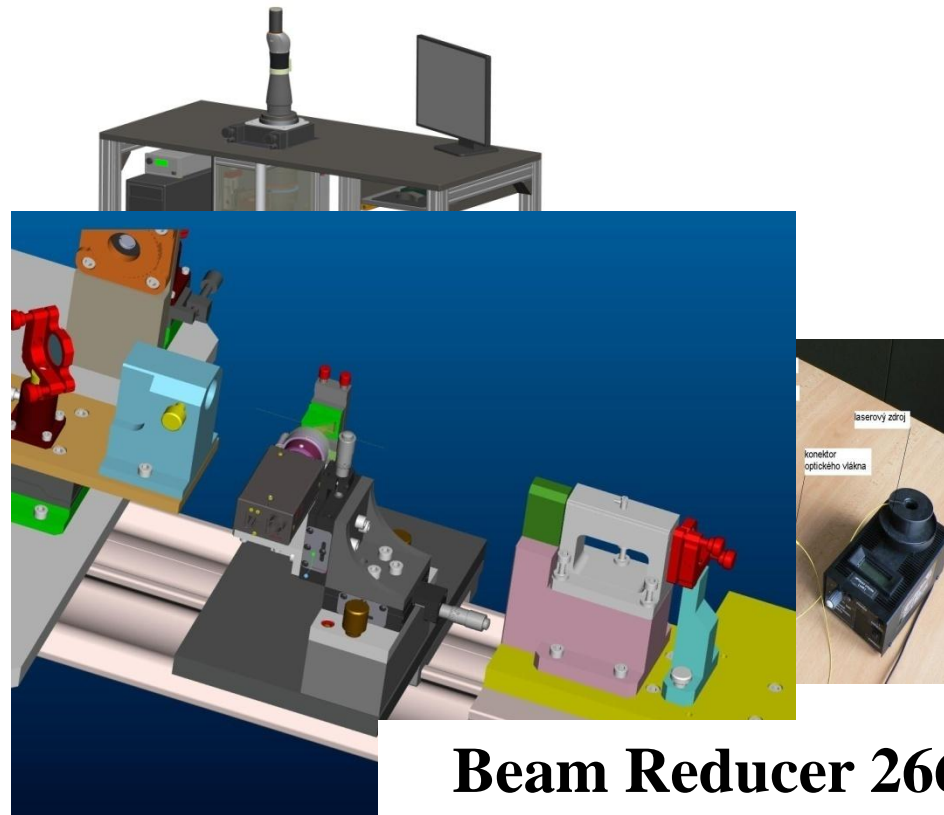
# MEO aplikace



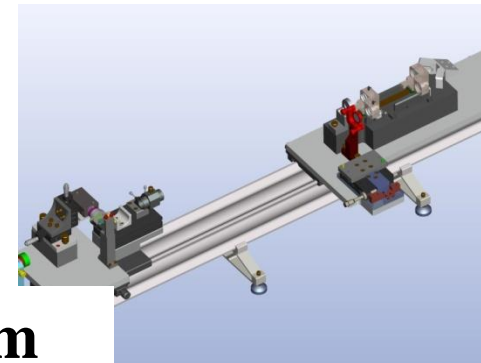
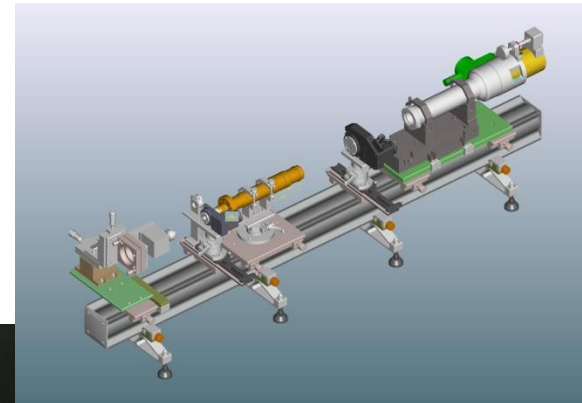
**RKB Corrector 473nm**



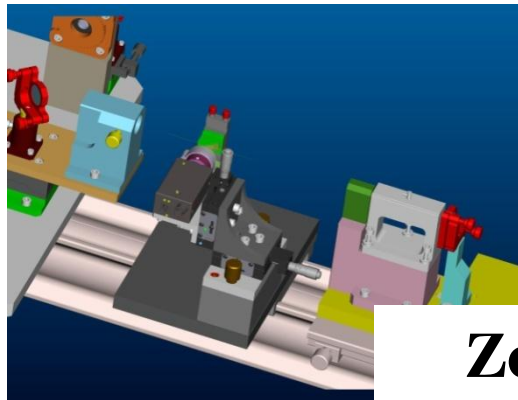
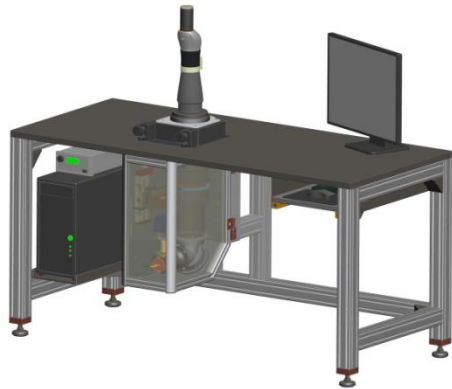
# MEO aplikace



**Beam Reducer 266nm**

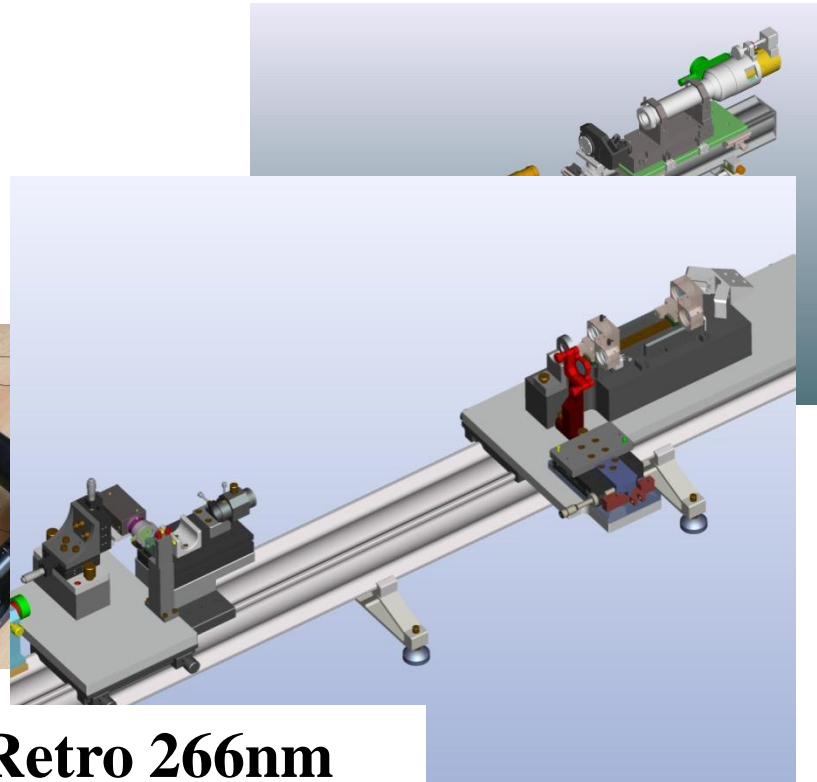


# MEO aplikace










zobrazovací objektiv

CCD kamera



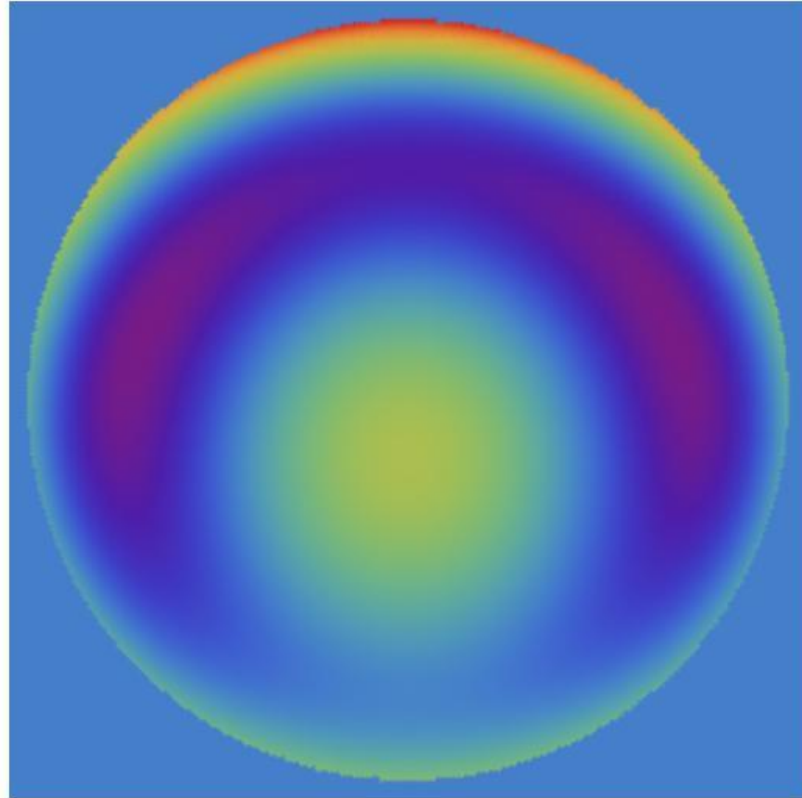
**Zoom&Retro 266nm**

# SH v. Digitální interferometrie

	Fizeau Phase Shift	Shack-Hartmann
Cena		
Vlnová délka		
Koherence zdroje		
Přesnost		
Rozlišení		
Rychlost		
Odolnost metody		

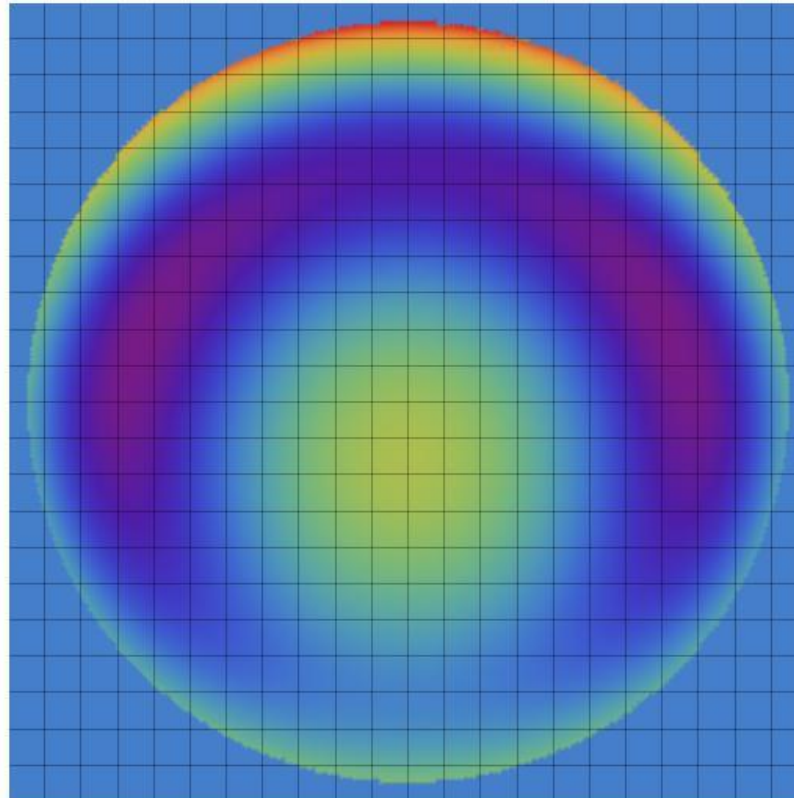


# Princip metody



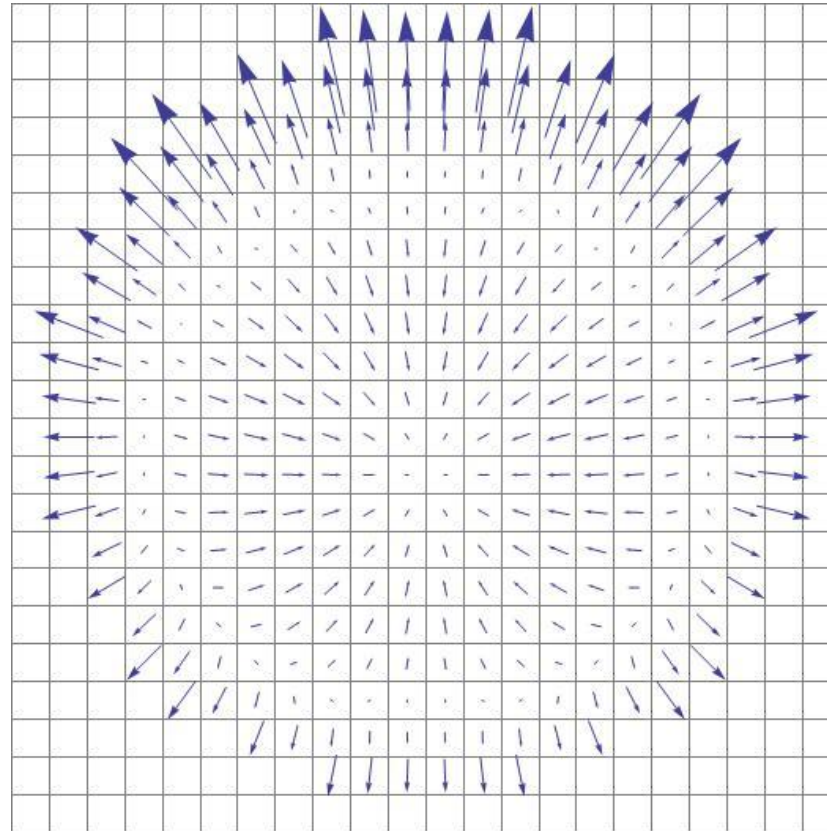
Vlnoplocha

# Princip metody



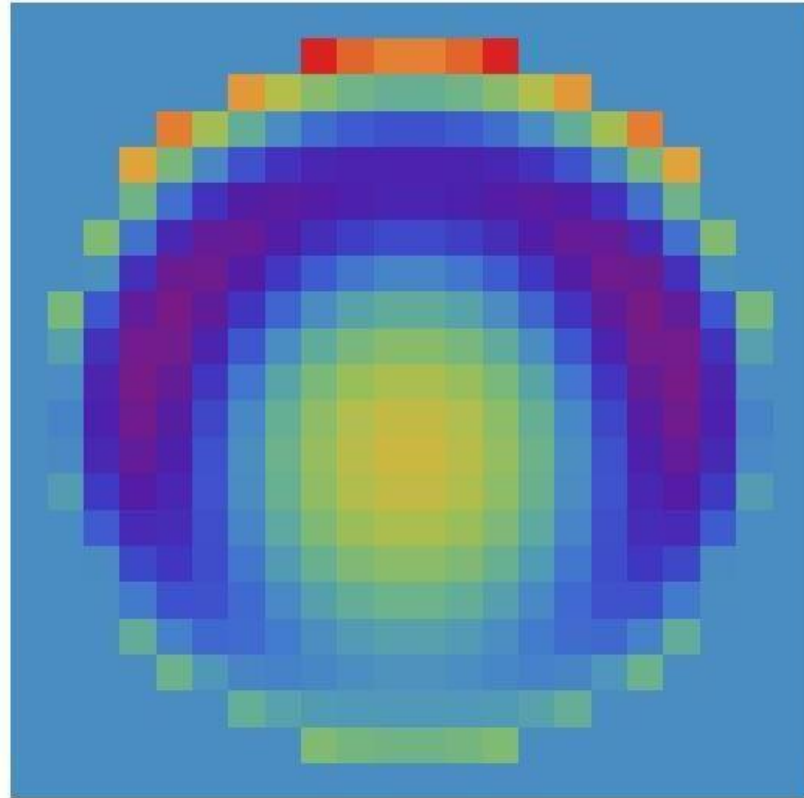
Subapertury-samplování

# Princip metody



Měření-gradientsy

# Princip metody



Výsledek-rekonstrukce vlnoplochy

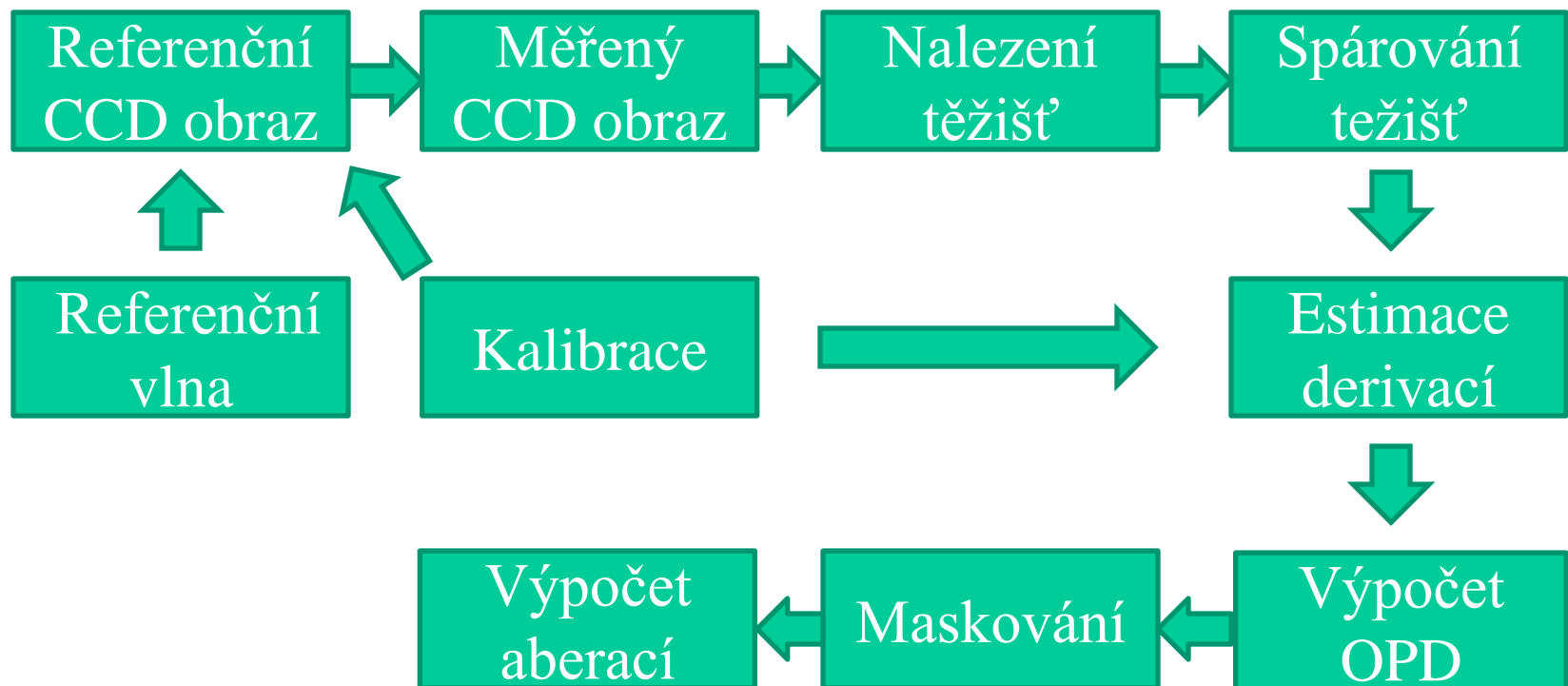
# První fáze projektu

Maximalizovat know-how MEOPTY v oblasti Shack-Hartmannova detektoru a vylepšit stávající MEO software (tvoří většinu cenu detektoru). Použít zejména:

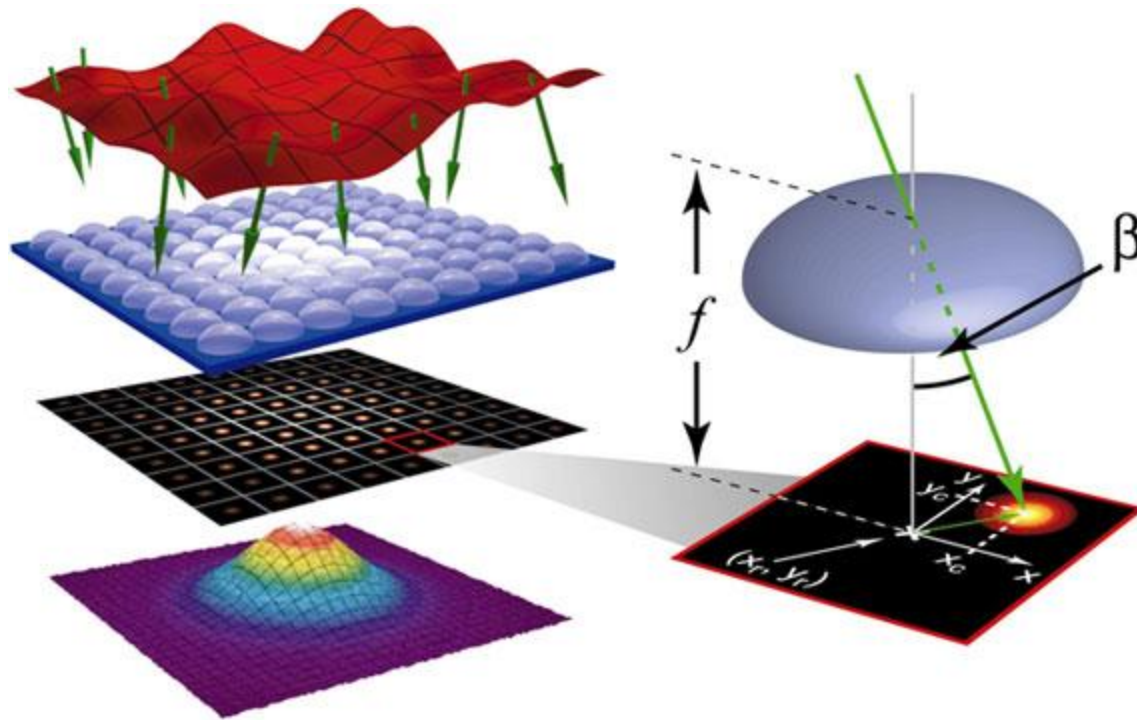
- Zkušenosti s vlastními měřicími stanicemi
- Studium současné odborné literatury
- Analýza komerčních systémů (Imagine optics, OKO)



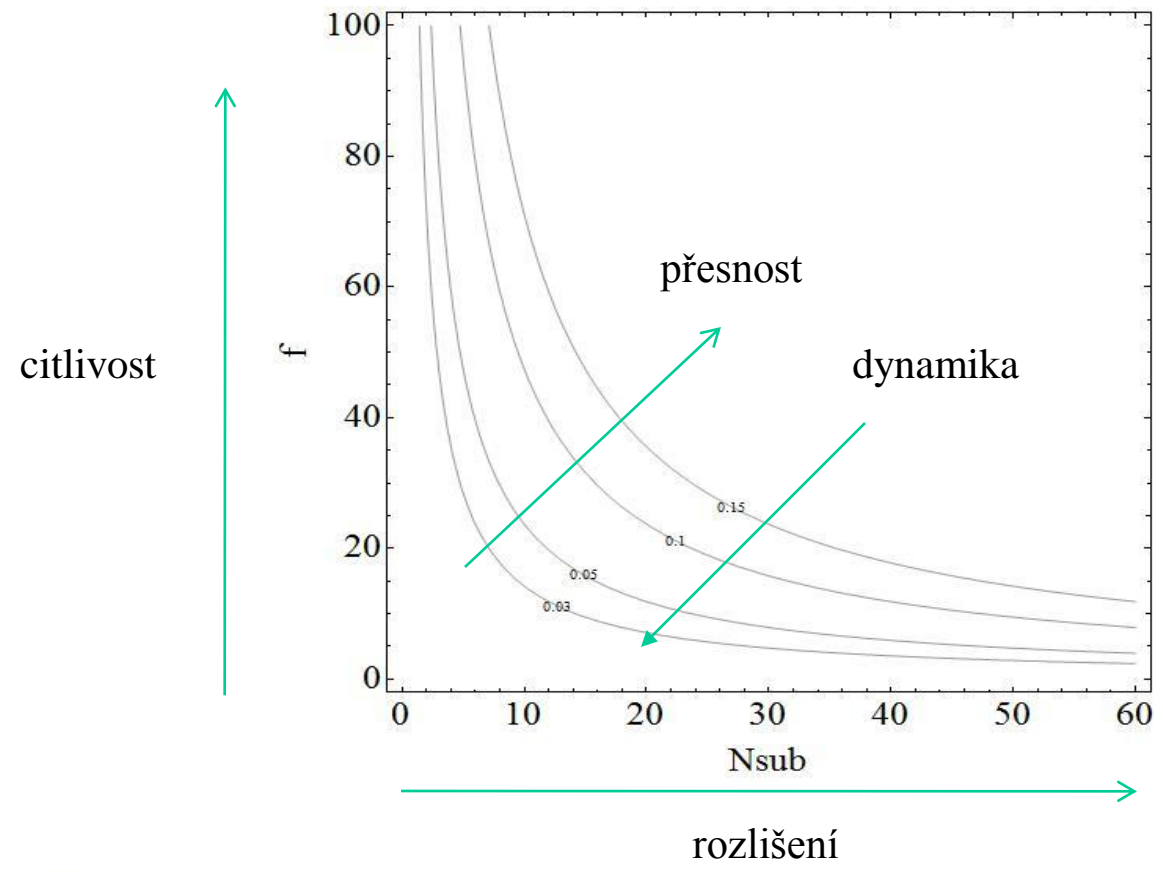
# Proces měření



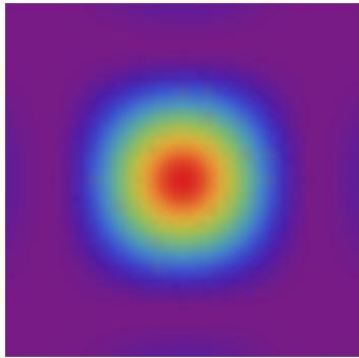
# Konstrukční parametry



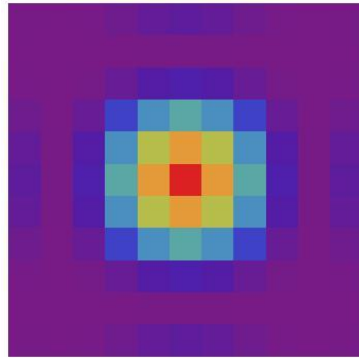
# Konstrukční parametry



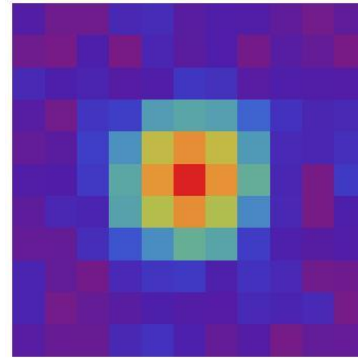
# Přesnost: Zpracování CCD



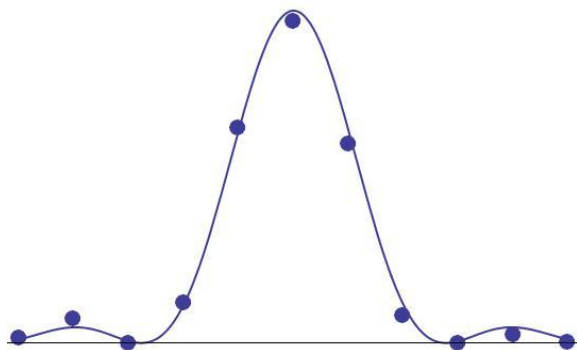
PSF



Diskretizace a kvantizace



Šum a pozadí



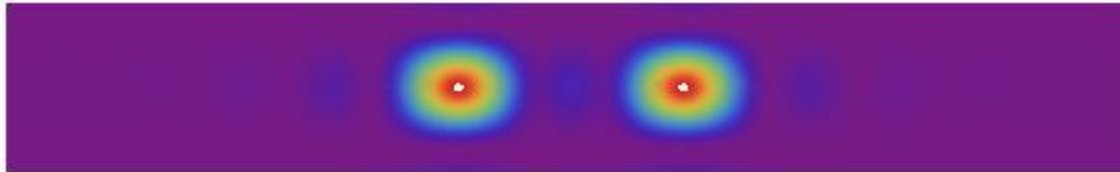
$$x_c = \frac{\sum_i \sum_j x_{ij} I_{ij}}{\sum_i \sum_j I_{ij}}$$

$$y_c = \frac{\sum_i \sum_j y_{ij} I_{ij}}{\sum_i \sum_j I_{ij}}$$

# Dynamický rozsah



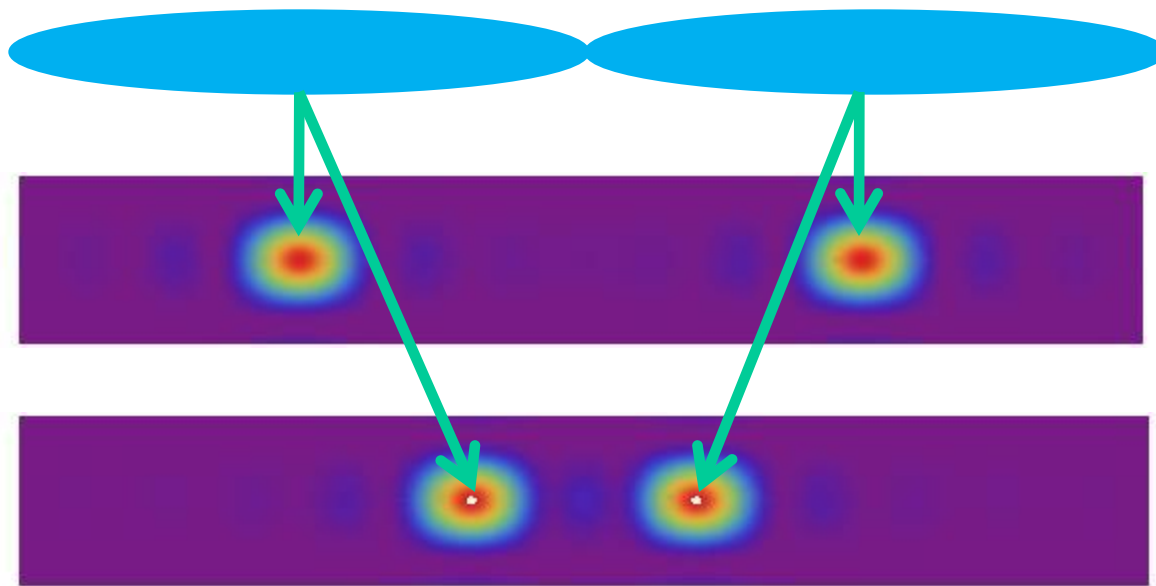
Kalibrace



Měření



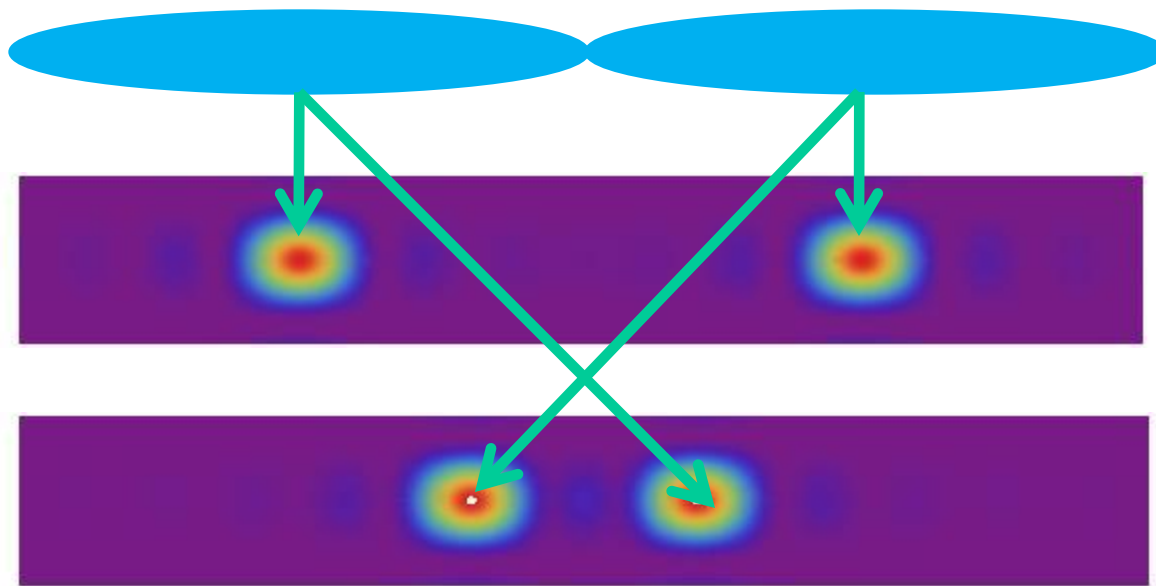
# Dynamický rozsah



Spárování težišť

?

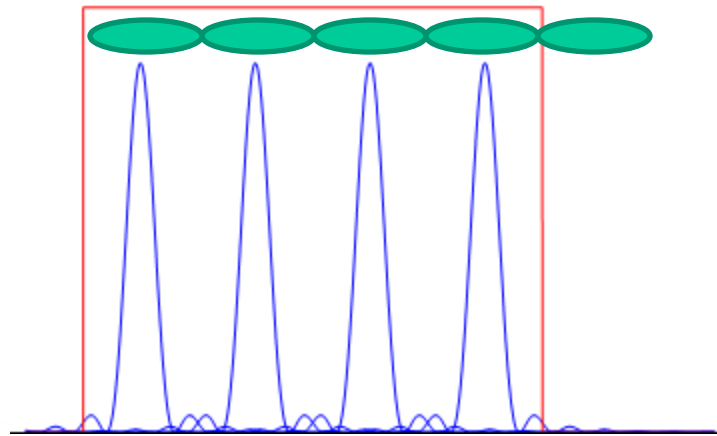
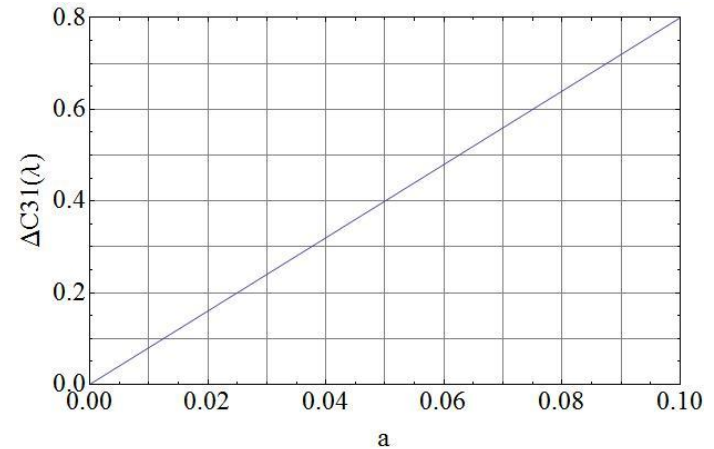
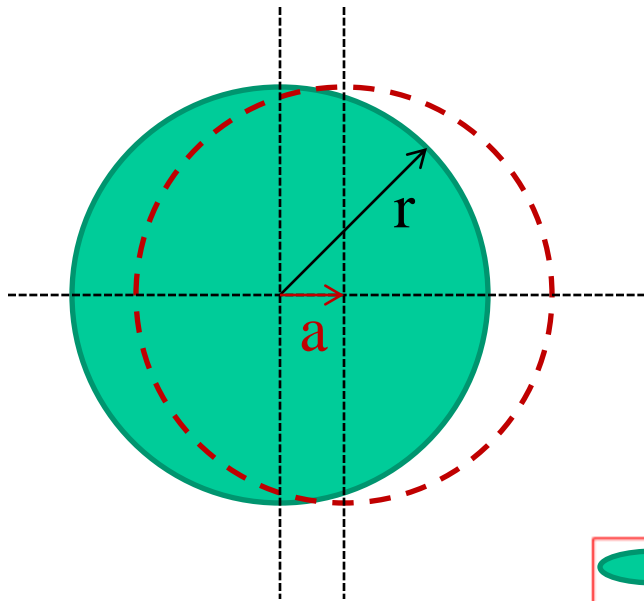
# Dynamický rozsah



Spárování težišť

?

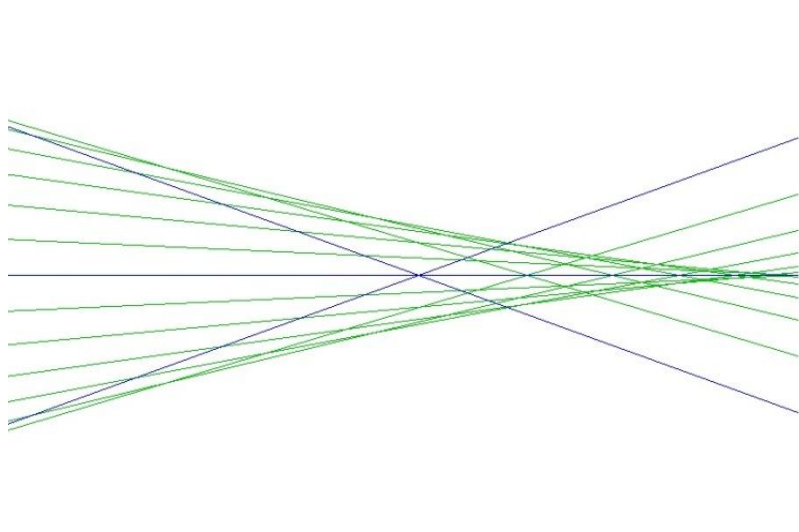
# Problém maskování



# Kalibrace

- Možnosti kalibrace
  - Rovinná vlna o známém úhlu (gonio, kolimátor)
  - Sférické vlny o známém středu křivosti
- Určování parametrů
  - $f$
  - $\Delta$ pixel, rozteč mikročoček
  - Zbytkové aberace mikročoček

# Aplikace: Měření paraxiálních ohnisek



Zaostření svazku s SA3

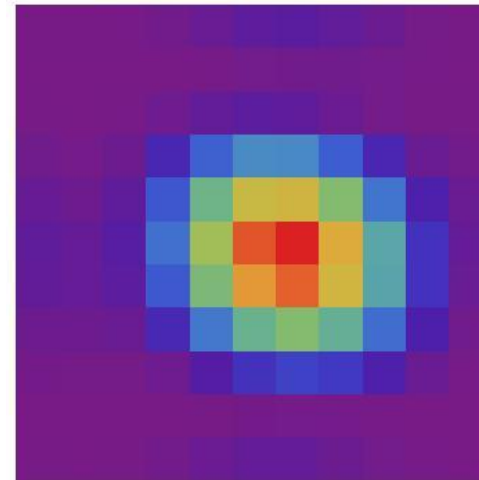
Metoda měření  
ohnisek ze  
zobrazovací rovnice

$$\Delta z_1 \Delta z_2 = f^2$$



# Nový algoritmus

- Modová charakterizace optického pole
- Singulární optika
  - Mikromanipulace
  - Přenos informace



Následující přednáška