

Description of ALIGN software

ALIGN determines the complex modulation efficiency of a misaligned cube corner interferometer. All contributions inside the field of view are superimposed taking into account their correct phase relations.

$$M_C(x_{opt}, \nu_0) = \frac{p\Delta\nu x}{\sin(p\Delta\nu x)} \exp(-pix\Delta\nu) \frac{\int_{FOV} T \exp\{2\pi i \nu_0 [(1+x_E)x_{opt} + 2y_E y_M + 2z_E z_M]\} d\Omega}{\int_{FOV} T \exp\{4\pi i \nu_0 [y_E y_M + z_E z_M]\} d\Omega}$$

with

$\Delta\nu = 0.5\nu_0 a_{\max}^2$ width of self apodisation boxcar

$(x_M, y_M(x_M), z_M(x_M))$ position of movable cube corner

(x_E, y_E, z_E) vector of unit length describing direction in FOV

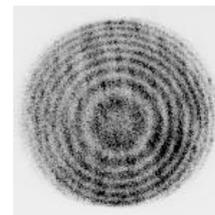
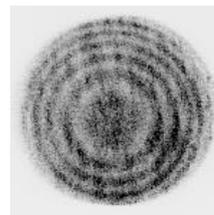
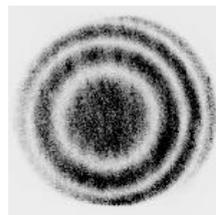
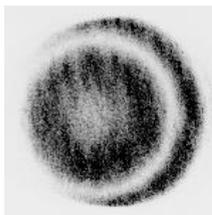
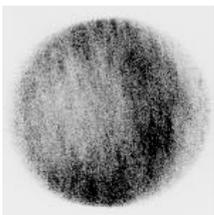
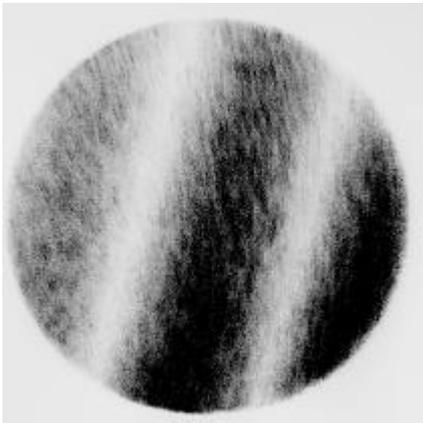
$T(x_E, y_E, z_E)$ transmission function describing FOV

In case of ideal instrument, the movable cube corner goes along $(x_M, 0, 0)$. The circular FOV is centered on the direction $(-1, 0, 0)$ with sharp rim.

ALIGN parameters: Irradiated wave number ν_0 , center of circular FOV, radius of FOV, linear blur of FOV rim and lateral shift of movable cube corner at 20 equidistant positions along interferogram

Note: Above equation assumes undisturbed sampling, but the sampling positions defined by the laser fringes are also disturbed . ALIGN takes this effect into account.

Observed Haidinger fringes



Haidinger fringes for opd 0, 10, 25, 50, 100, 150, 200 and 250 cm

(Instrument: New 120HR as aligned by Bruker)

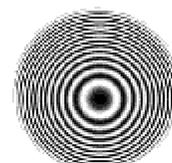
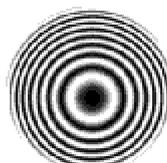
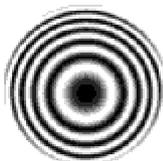
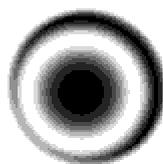
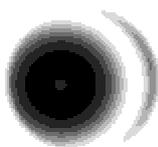
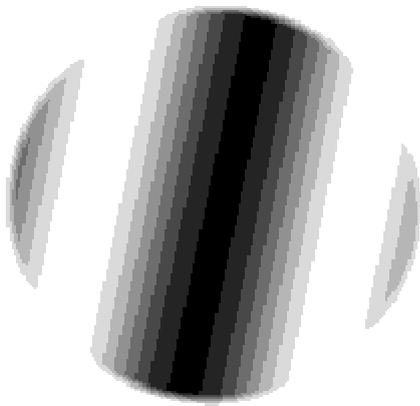
Observed fringes are decentered:

- due to lateral retroreflector offset (most important near zpd)
- entrance aperture offset (leading at opd_{max})

Moreover, the rim of the entrance aperture is slightly blurred

Haidinger fringes as calculated by ALIGN

A coarse adjustment of ALIGN parameters has been done to fit the observed fringe
fringe displacement of the retroreflector (~ 0.05 mm), a lateral
displacement (~ 0.3 mrad) and a slight blur (~ 0.3 mrad).



ALIGN: Predicted ILS from Haidinger fringes

ALIGN also calculates the ILS for a given wavenumber in the infrared region. The predicted modulation efficiency can serve as the “best guess” constraints used for the ILS retrieval (e.g. use slope of predicted modulation and phase orientation instead of zero values).

Black: ALIGN Red LINEFIT6 Green LINEFIT8

