# 3 phase measurements. For the case of signal changing

The interference E with the reference B for 3 fields. Phase is added to the signal (E):

We now substitute C in the first yellow equesion

(1)

+ (2)

Substituting 1 in 2 :

-= (incorrect)

-= (correct)

== The case of signal changing

This is the field E with a reference that is a plane wave with uniform phase.

# For the case of reference changing

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== The case of signal changing

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# Sinusoidal phase grating

An example of Fraunhofer diffraction calculation from Godman 4.4.4 consider a phase grating

We assume that the grating is bounded by a rectangle aperture of ,. The parameter m represent the peak to peak excursion of phase delay.

The grating is illuminated with a plane wave (not the experimental case).

In order to Furrier transform we use the identity:

Where is a Bessel function of the first kind, **order q**. Thus

And

Using the Fraunhofer approximation, the observed field can be found:

If we assume that there are many periods of the grating within the bounding aperture , there is a negligible overlap of the various diffraction terms, and the corresponding intensity pattern becomes:

The introduction of the grating deflected energy out of the zero order into multitude of higher orders. The peak intensity of the *qth* order is while the displacement of the order from the center of the diffraction is . The largest possible diffraction in a first order is 33.8%.

# Square wave phase grating

We now define a square wave phase grating with period L such that the phase of the reflected light varies from 0 to .

We begin by writing an equation for the amplitude transmittance of the grating:

Where for the proof was defined such that it will look like a Fourier transform of a rect (that is analytical):

So now we can Fourier transform the transmission

Using the Fraunhofer approximation, the observed field can be found:

And the efficiency at the first diffraction order n=1 is

And its maximum is for .

# Square wave phase grating with another grating

We begin by writing an equation for the amplitude transmittance of the grating with an additional phase , that is a lower frequency phase that is the hadamart pattern:

Where for the proof was defined such that it will look like a Fourier transform of a rect ( that is analytical):

So now we can Fourier transform the transmission

Using the Fraunhofer approximation, the observed field can be found:

And the efficiency at the first diffraction order n=1 is

And its maximum is for .