

```

mirrors; close all;
path(genpath('Classes'));

('-----
('          OSCAR V3.30
(' ')

define the grid for the simulation: 256 X 256, 40 cm X 40 cm
= Grid(512,0.4);

define the incoming beam outside the cavity (beam radius 4.3 cm,
wavefront curvature 1034 m, mode Laguerre Gauss 3,3)
input = E_Field(G1,'w',0.043,'R',-1034,'mode','LG 3 3');

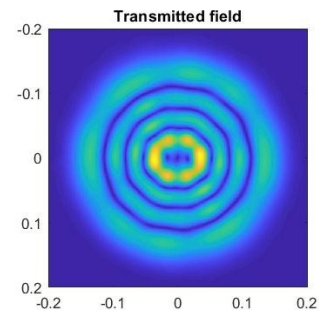
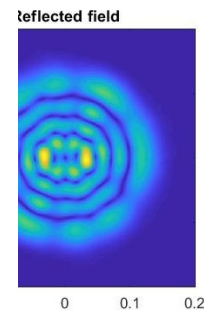
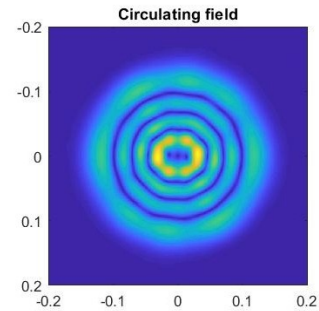
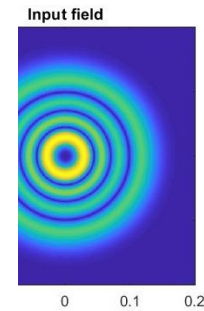
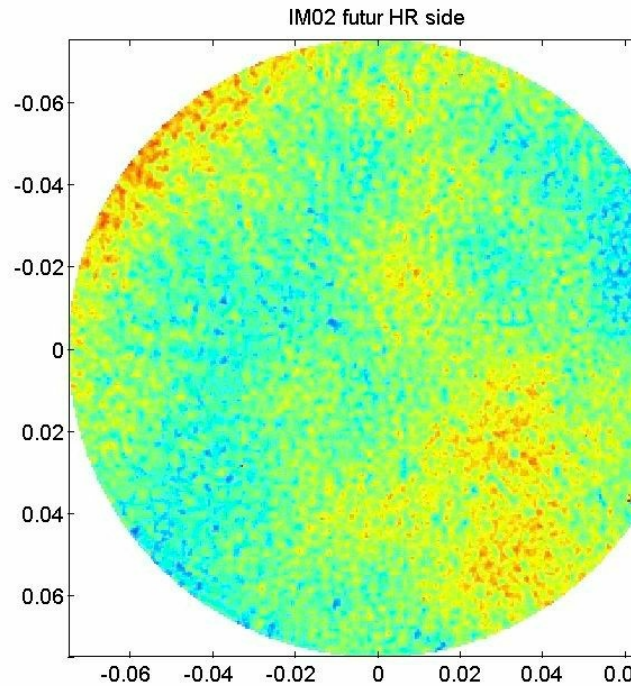
define the 2 mirrors, RoC_IM = 1500m, RoC_EM = 1700m, 30 cm in
radius, transmission 2% for the input mirror, almost perfectly
reflective for the end
= loss

= Interface(G1,'RoC',1500,'CA',0.4,'T',0.02);
= Interface(G1,'RoC',1700,'CA',0.4,'T',2E-6);

load the mirror maps
param_PSD = [0.02 -1.4];
Virtual_map_IM = Do_Virtual_Map(G1,param_PSD);
Virtual_map_EM = Do_Virtual_Map(G1,param_PSD);

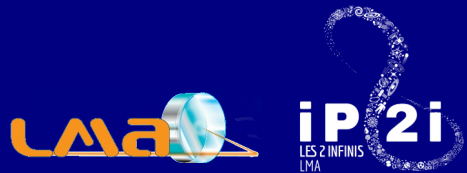
add with 1 nm RMS on the central part
= Add_Map(IM,Virtual_map_IM,'reso',G1.Step,'remove_tilt_focus',0.150,'
= Add_Map(EM,Virtual_map_EM,'reso',G1.Step,'remove_tilt_focus',0.150,'

```



# Développement simulations optiques (OSCAR)

J. Degallaix

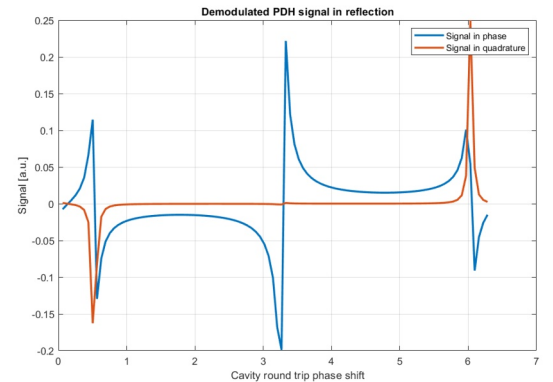
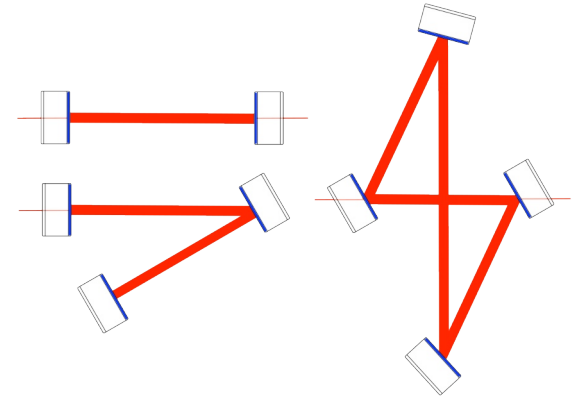


Workshop R&Ds  
Virgo & ET

# Présentation du code en une diapo



- Le cœur : possibilité de propagation de faisceaux arbitraires (numériquement basé sur la FFT 2D, en Matlab)
- Possibilité d'ajouter des distorsions (sous la forme de front d'onde 2D)
- Faire des cavités avec des miroirs réalistes
- Ajout de bandes latérales



# Support continu



- Corriger les bugs (dernière version on git)
- Ajout de nouvelles options
- Astuce sur un logbook
- Forum sur le site de Mathworks

★★★★★ (13)  
5.1K Downloads ⓘ  
Updated 11 Nov 2022

Jerome-LMA Update Add\_Map.m 09e47fb · 6 months ago 140 Commits

Classes	Update Add_Map.m	6 months ago
Examples	Update Example_HOM_with_maps.m	6 months ago
Manual	Update manual with the GPU calculations	2 years ago
.gitignore	Update the path in the example	2 years ago
README.md	Update README.md	6 months ago
RELEASE_NOTES.txt	Update RELEASE_NOTES.txt	2 years ago
Run_OSCAR.m	Big fix	2 years ago

README

## OSCAR

An optical FFT code to simulate Fabry Perot cavities with arbitrary mirror profiles

OSCAR: Mathworks

OSCAR is an optical FFT code used to calculate the steady state optical field circulating in Fabry-Perot cavities. The

### How to miscenter an aperture ?

126 Jerome Degataix 2 revisions  
2023-11-28 at 16:11 (last edited) 2023-11-28 at 16:13

The method is very similar to the transverse shift of a laser beam on the grid presented in this post. In this case, we will rather shift the aperture which is defined by the variable `I_mask` inside one instance `I` of the class `Interface`. Example:

Simulations How to Leave a comment

### GPU speed gain

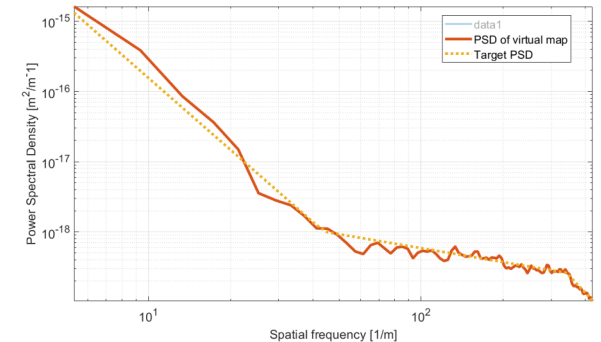
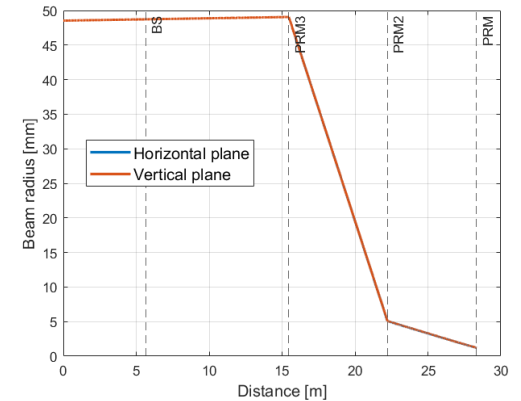
121 Jerome Degataix  
2023-09-30 at 16:36

In this post, we will see a comparison of the same calculation running on the CPU and GPU. The time taken by the simulations depends of course on your CPU and GPU, so the numbers presented here are not absolute. First example, calculation of the steady state high finesse cavity. Grid size Calculation time on [...]

# Les derniers développements



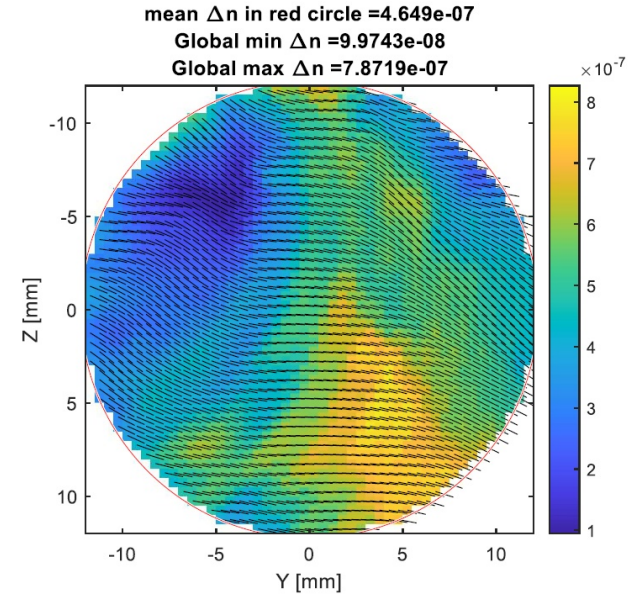
- Configuration pour les cavités de recyclage stables (configuration arbitraire)
- Matrices ABCD définies automatiquement pour calcul rapide (propagation, cavités)
- Nouveau calcul de la PSD de surface + cartes virtuelles (beaucoup plus rigoureux)



# Futur implémentation



- Simulation de la birefringence des substrats et des coatings →
- Génération du signal OG dans les bras  
(bande latérales dans le domaine audio)
- Monolithique cavité ?  
(comme l'OMC de Virgo)
- Code faster ?



# Conclusion



- Pour un usage régulier, bien comprendre comment le code fonctionne, les limites
- Code toujours en développement pour suivre les besoins
- Personnellement de moins en moins de temps pour implémenter des nouvelles fonctions  
→ aide toujours le bienvenue