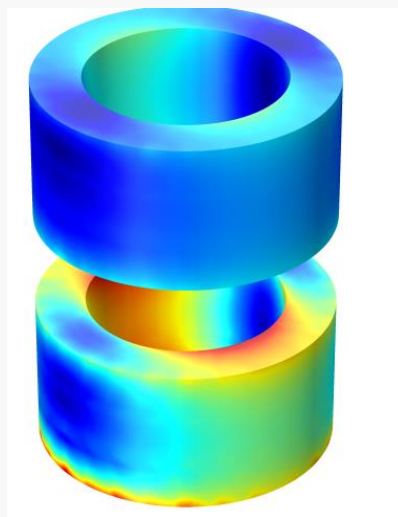
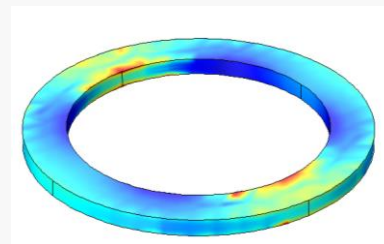


# Magneto-optical characteristics of Au-Ni metasurface

## 1. Gold ring structure

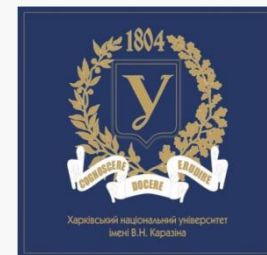
- One ring structure
- Double ring structure
- The design optimization



## 2. Hybrid Au-Ni ring structure

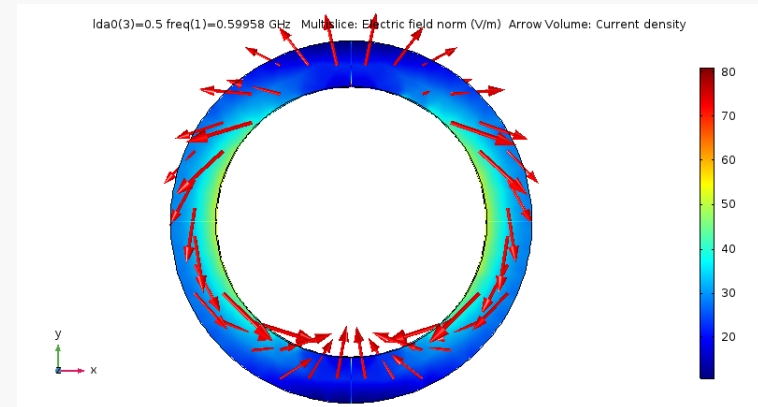
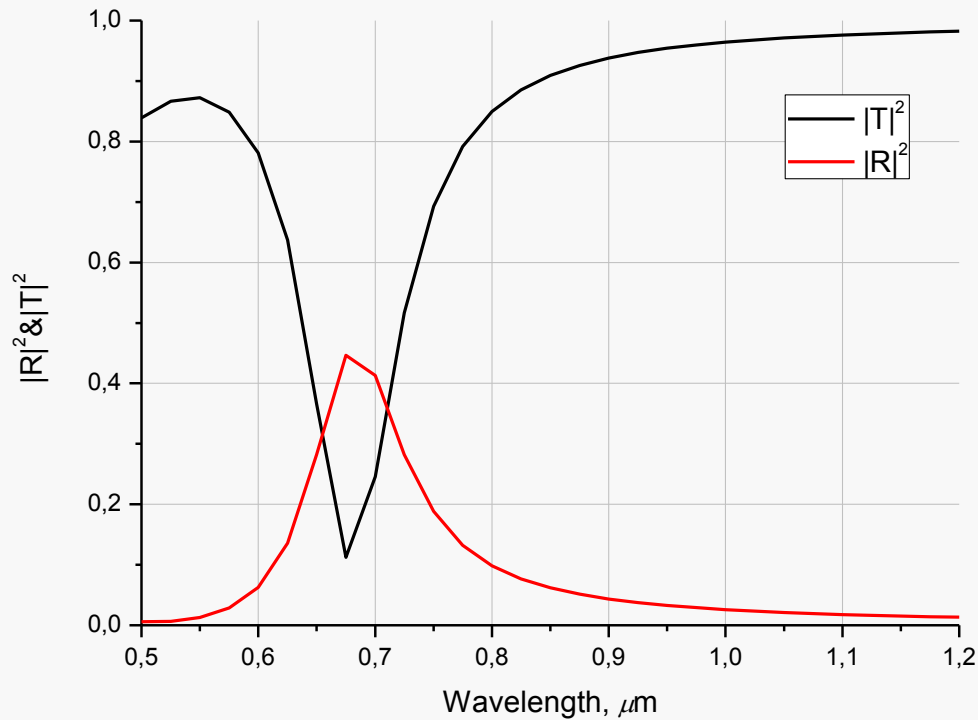
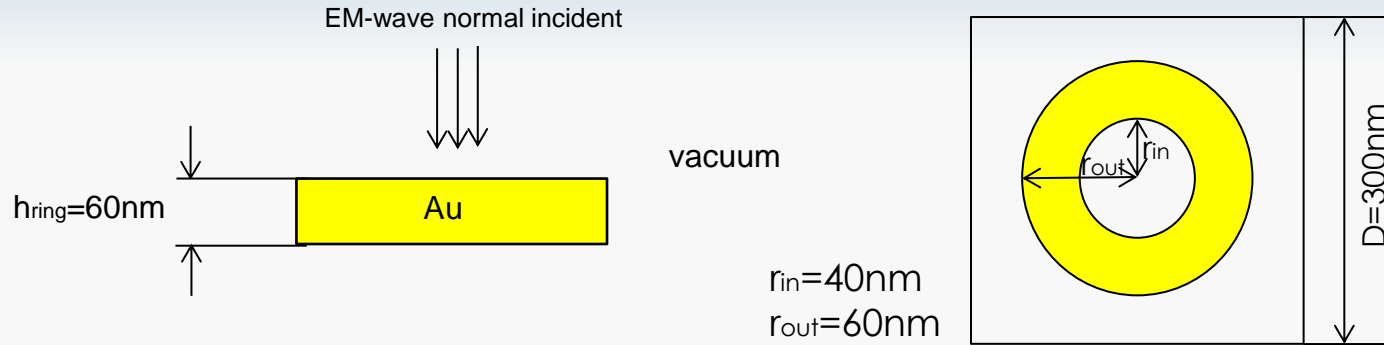
- The design optimization
- Magneto-optical characteristics

Kateryna Domina

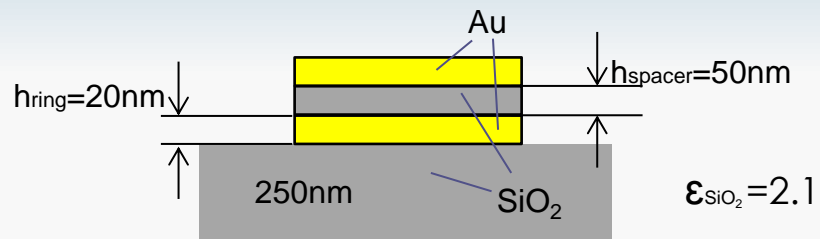


# 1. Gold ring structure

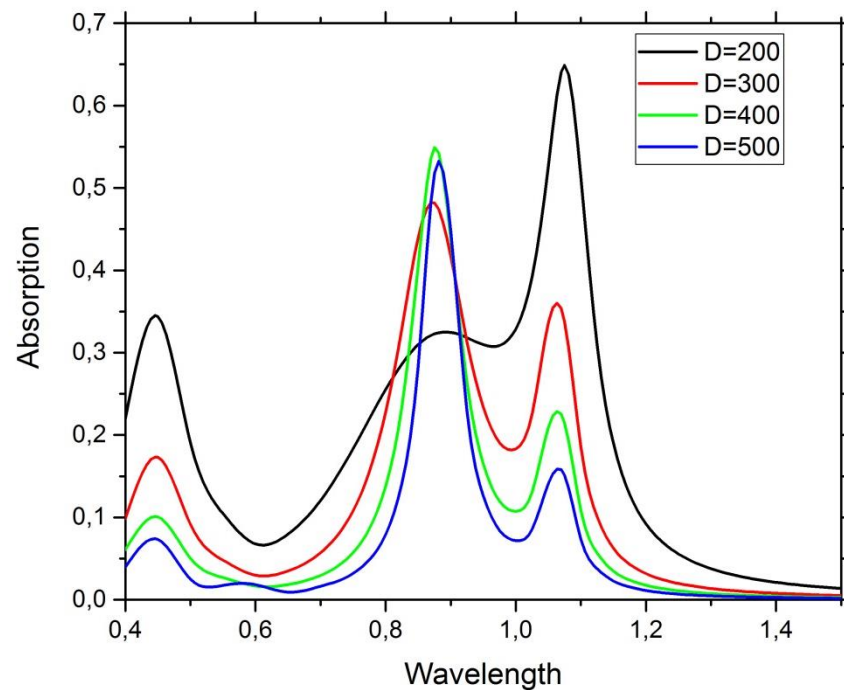
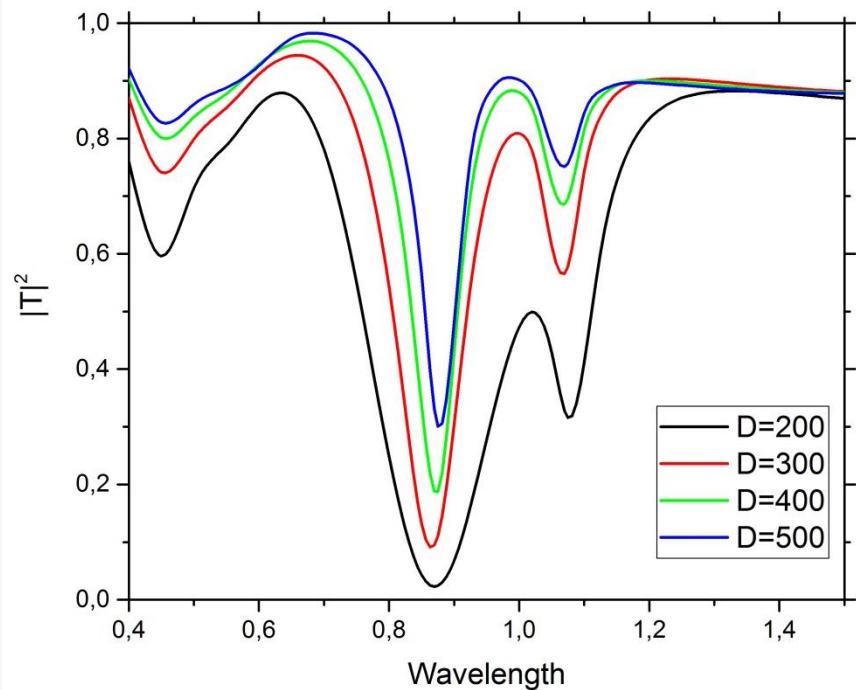
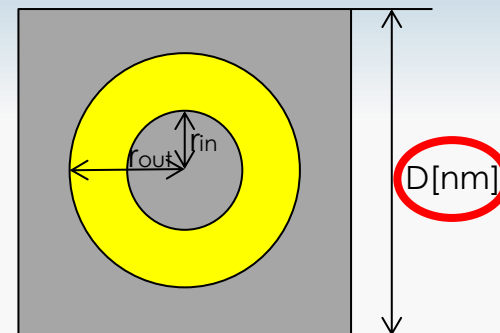
## One ring structure



# Double gold ring structure



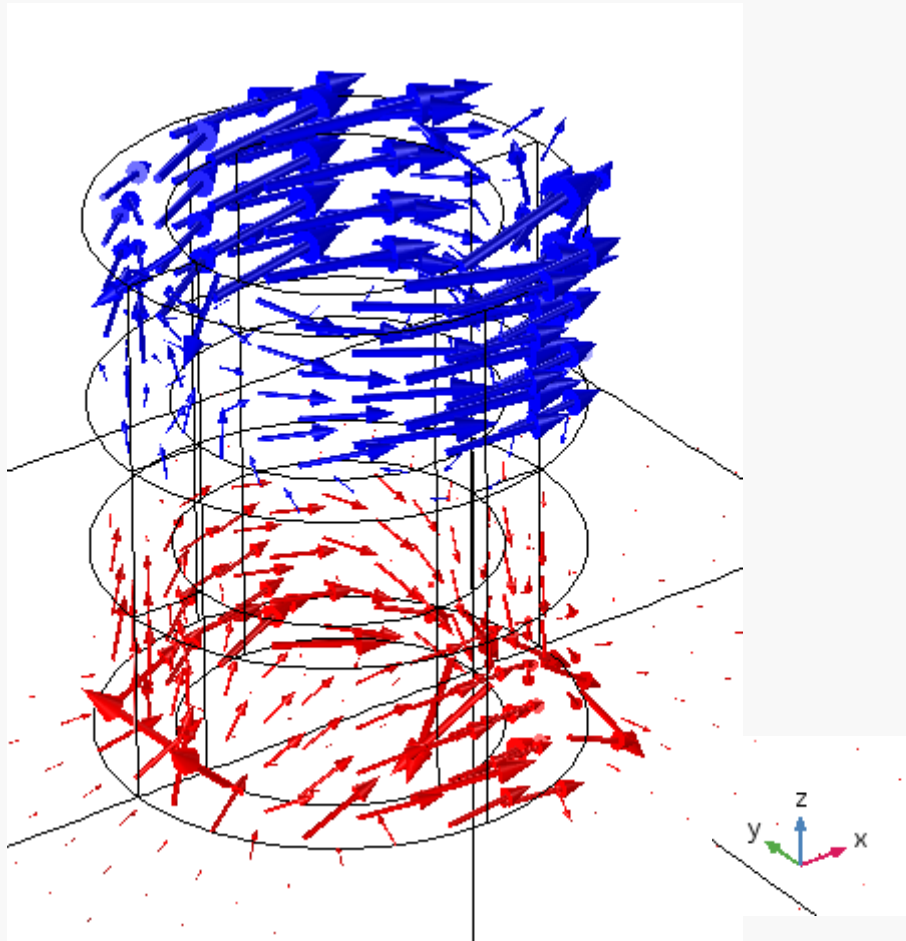
$r_{in}=40\text{nm}$   
 $r_{out}=60\text{nm}$



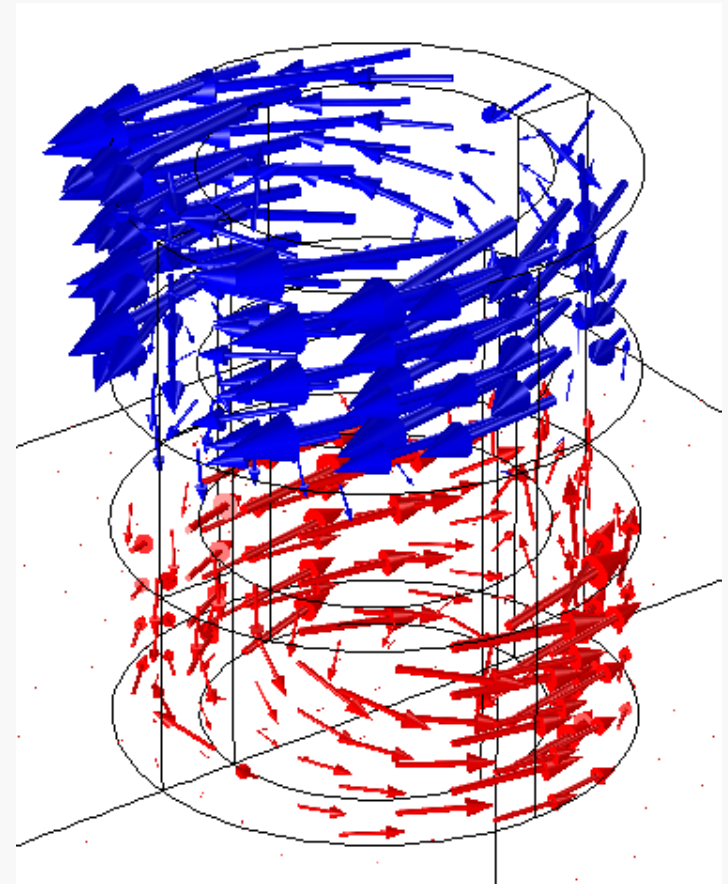
# Double gold ring structure

Current density distribution at resonances

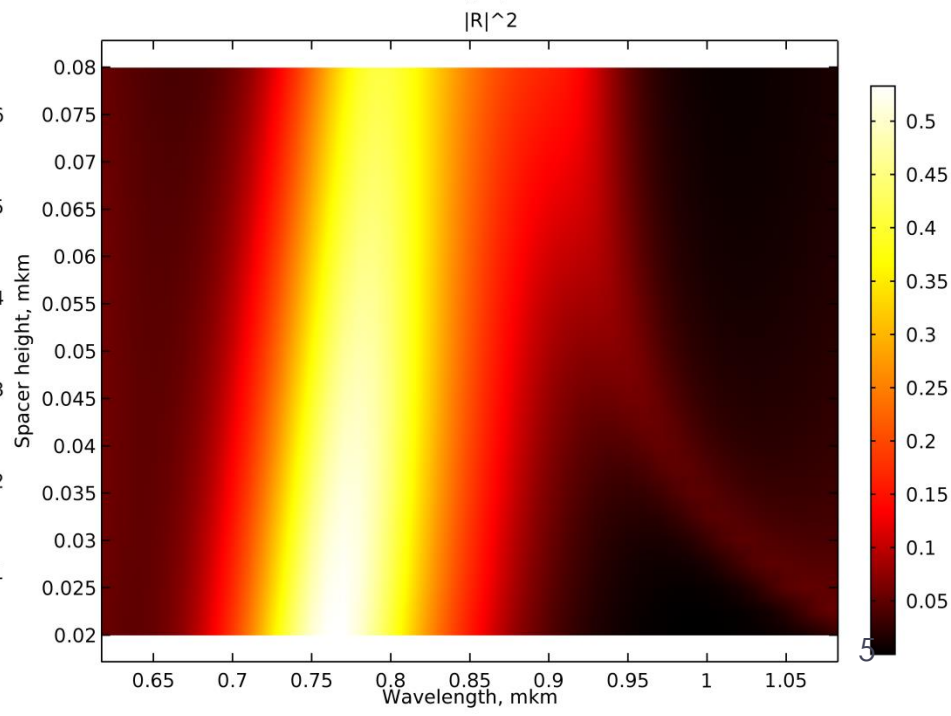
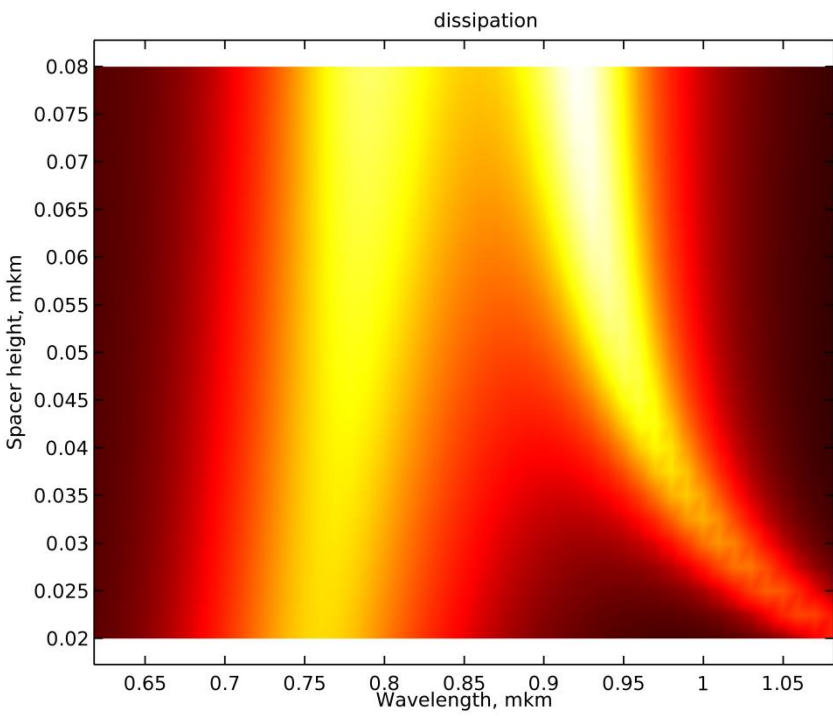
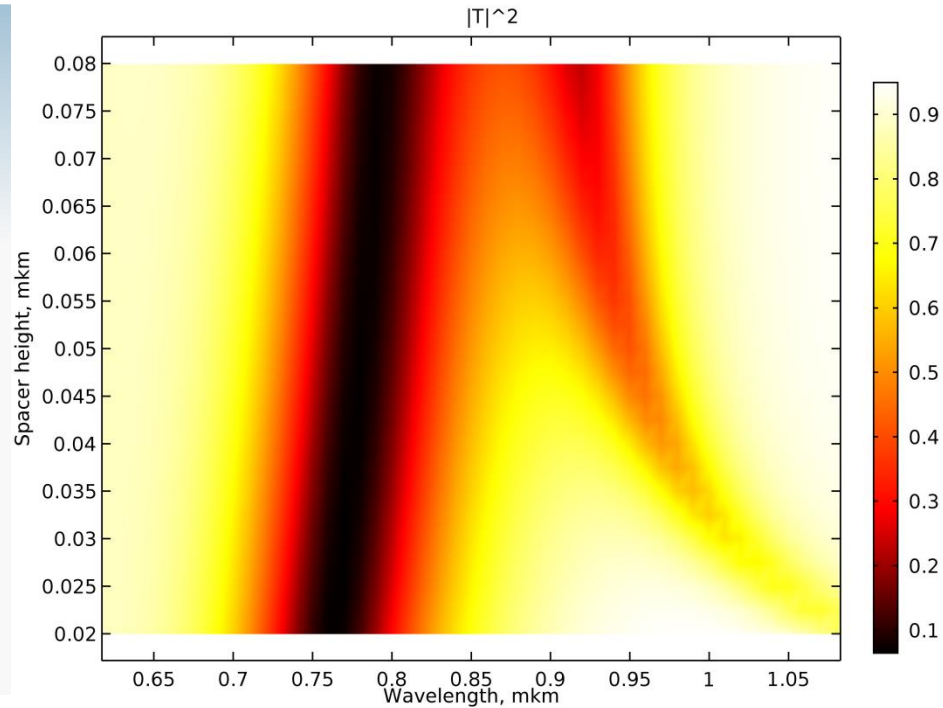
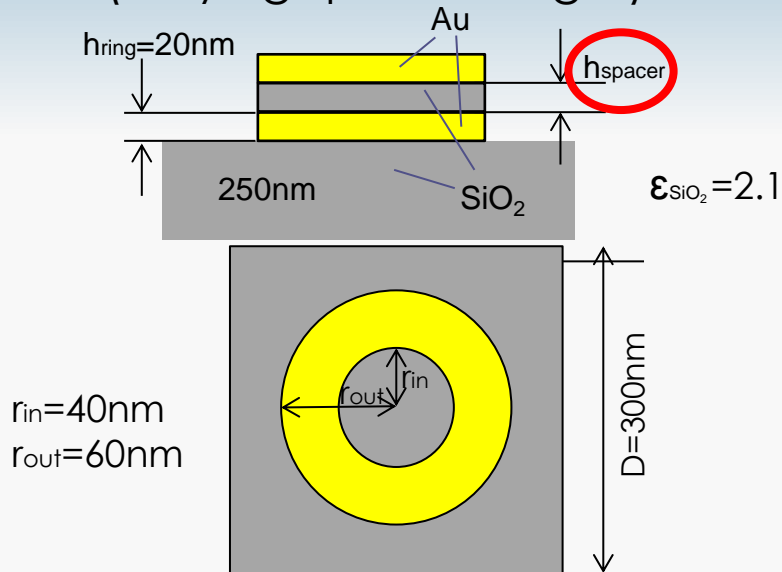
Symmetrical mode



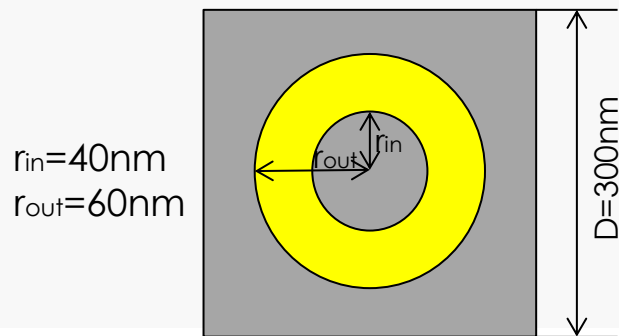
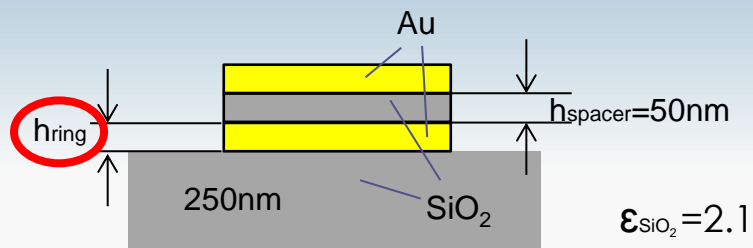
Asymmetrical mode



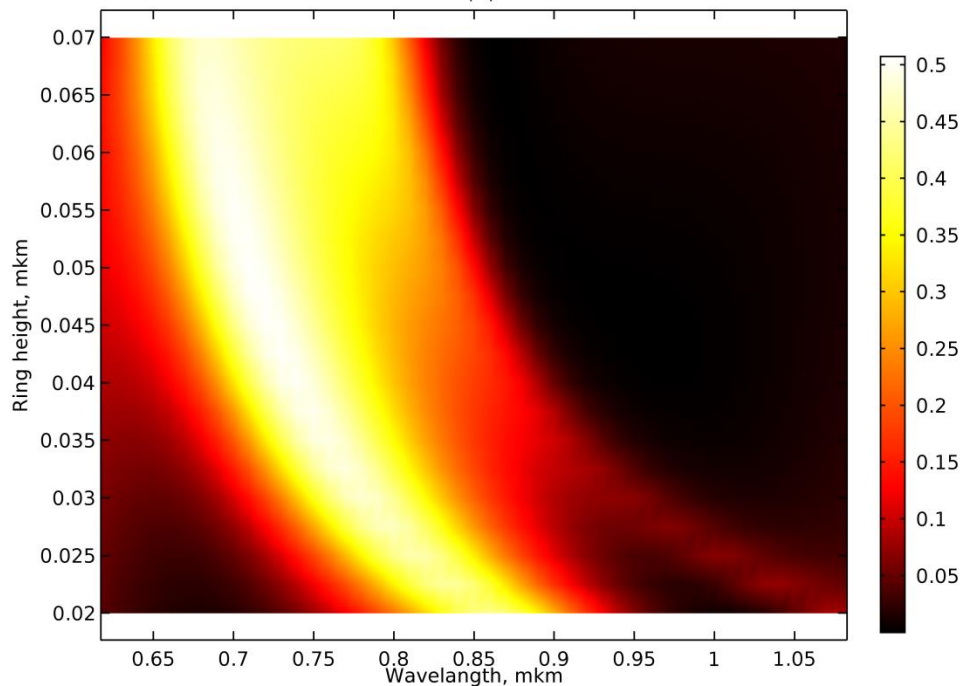
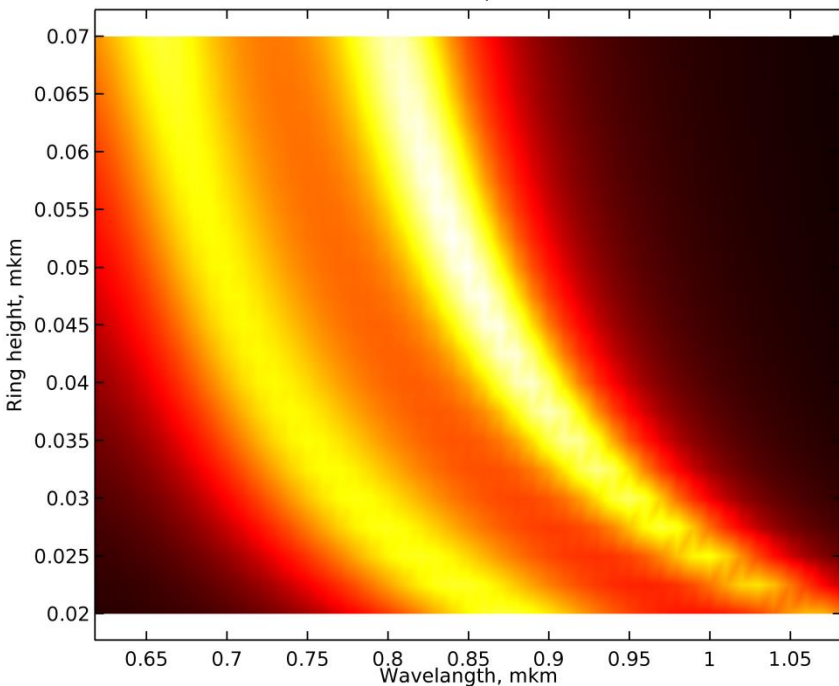
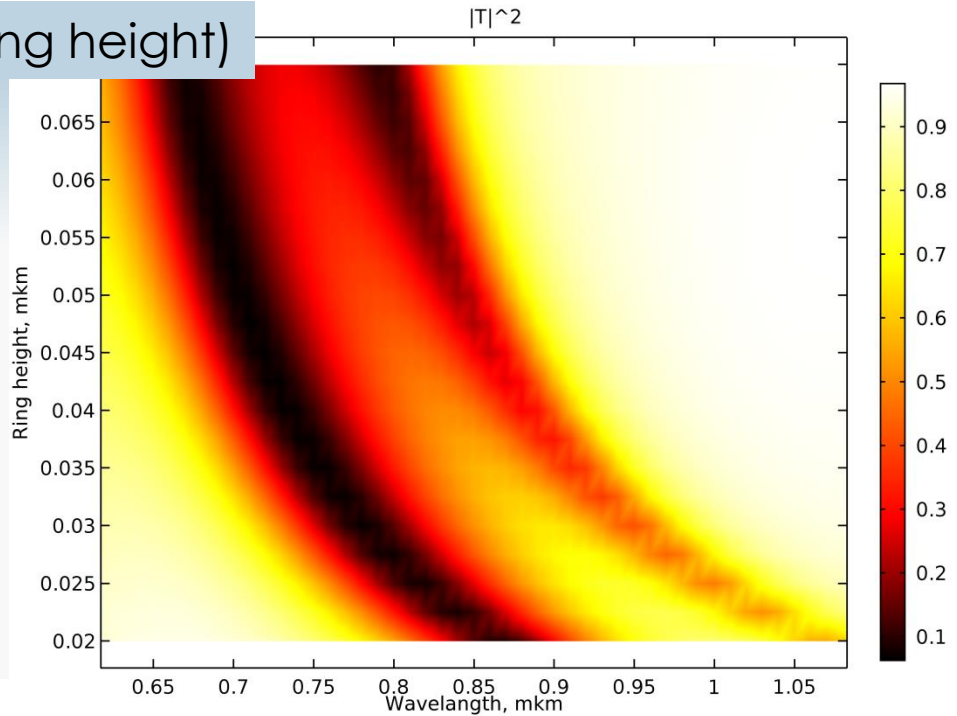
# 2 Au rings on Silica substrate (varying spacer height)



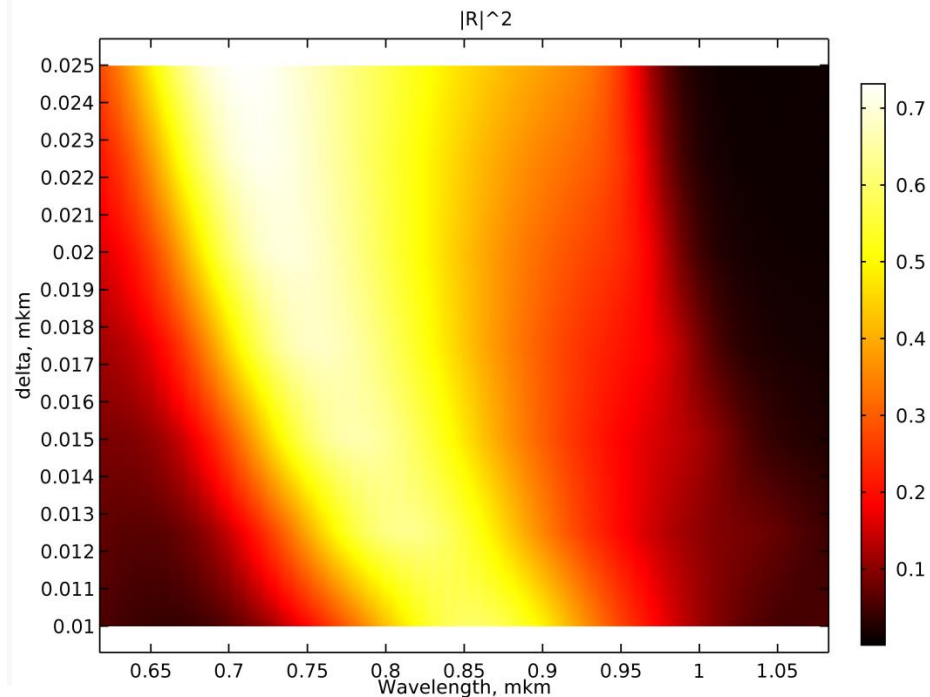
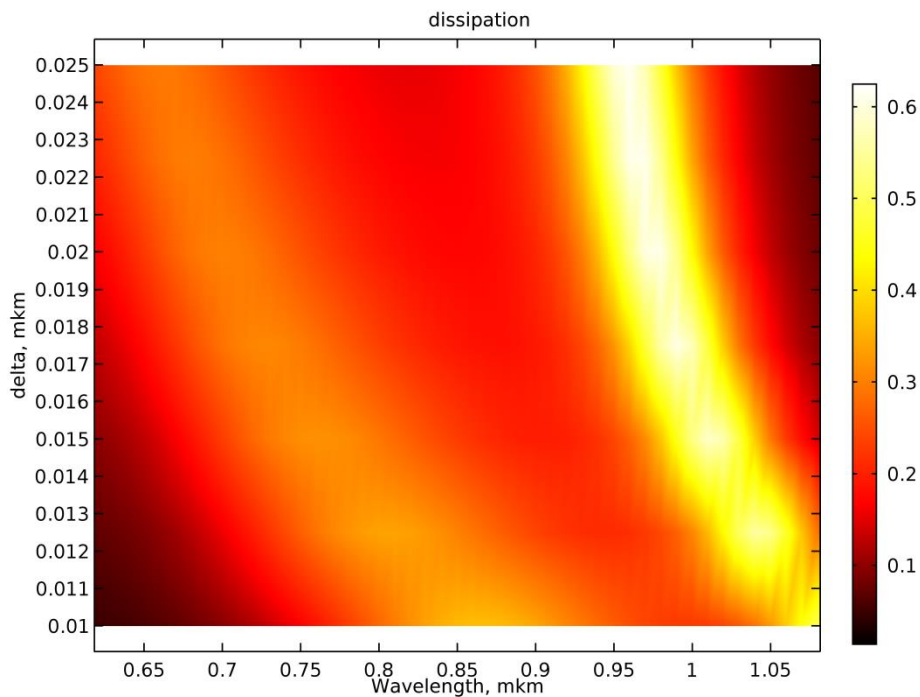
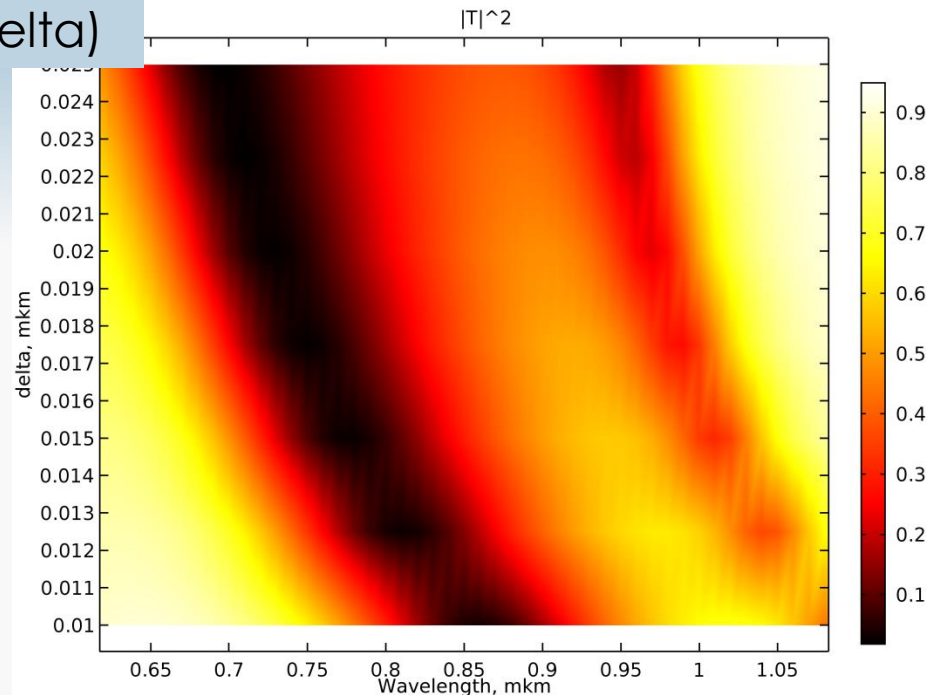
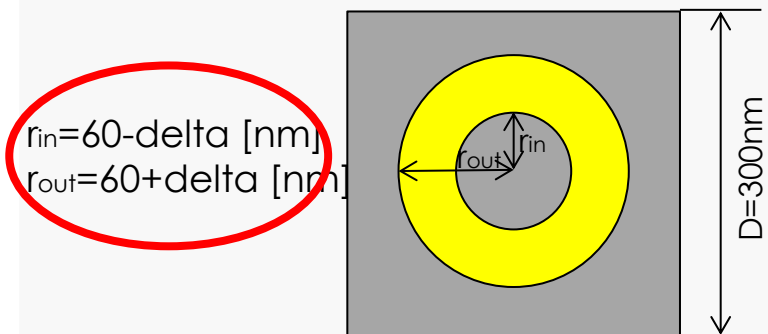
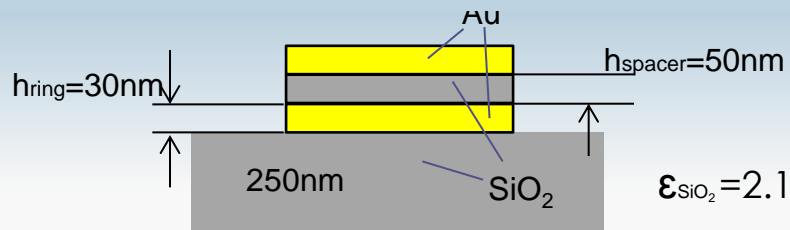
# 2 Au rings on Silica substrate (varying ring height)



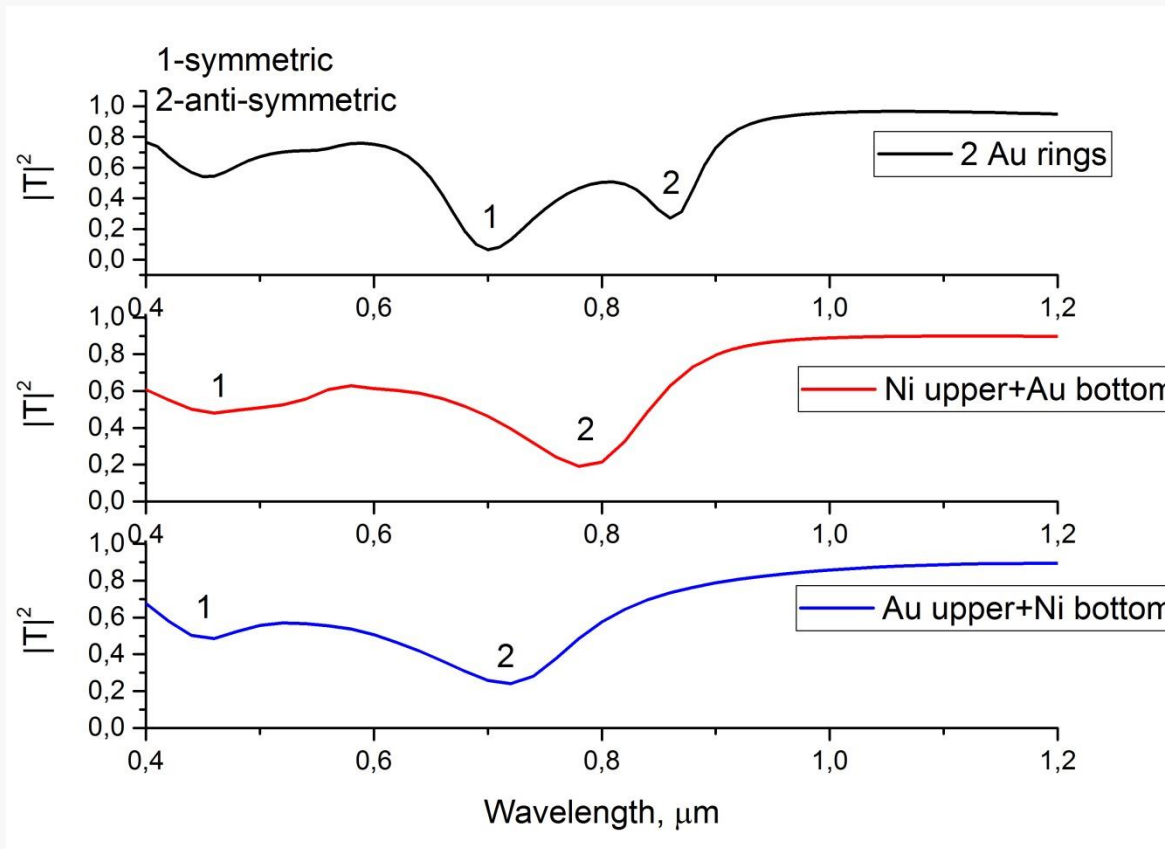
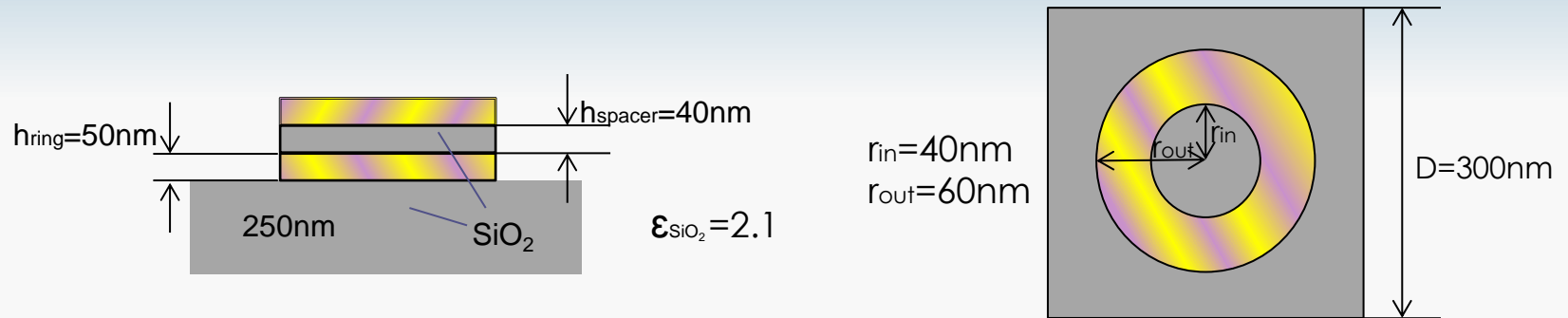
dissipaton



# 2 Au rings on Silica substrate (varying delta)



## 2. Hybrid Au-Ni ring structure

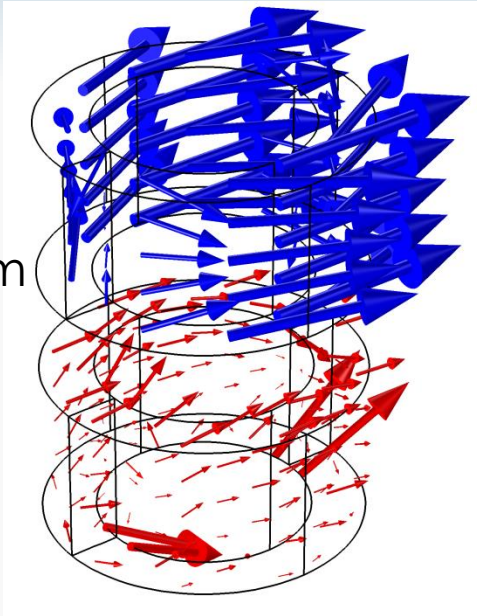




# Current density distribution at resonances

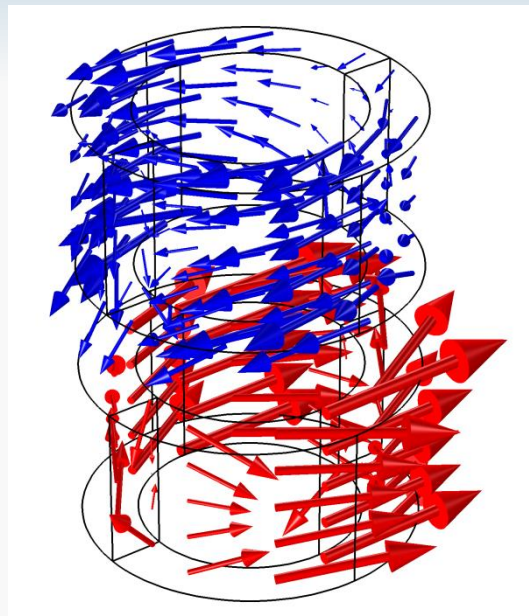
Ni upper+Au bottom

$\lambda=0,46\mu\text{m}$



1

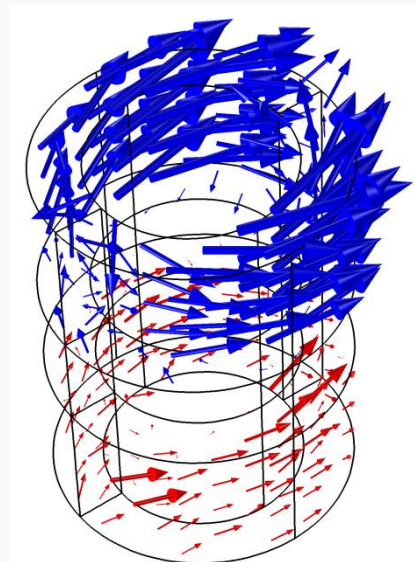
$\lambda=0,78\mu\text{m}$



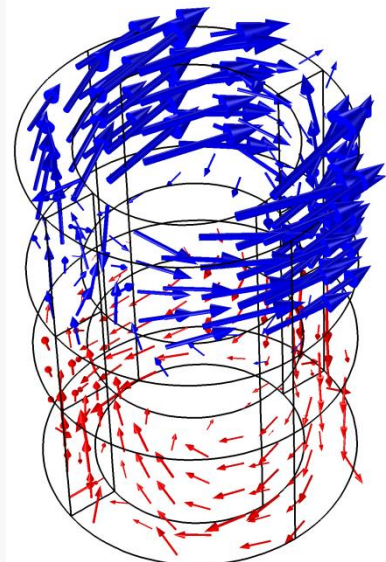
2

Au upper+Ni bottom

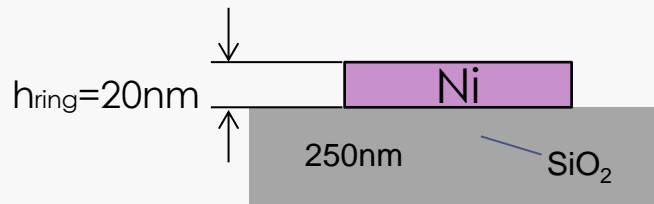
$\lambda=0,46\mu\text{m}$



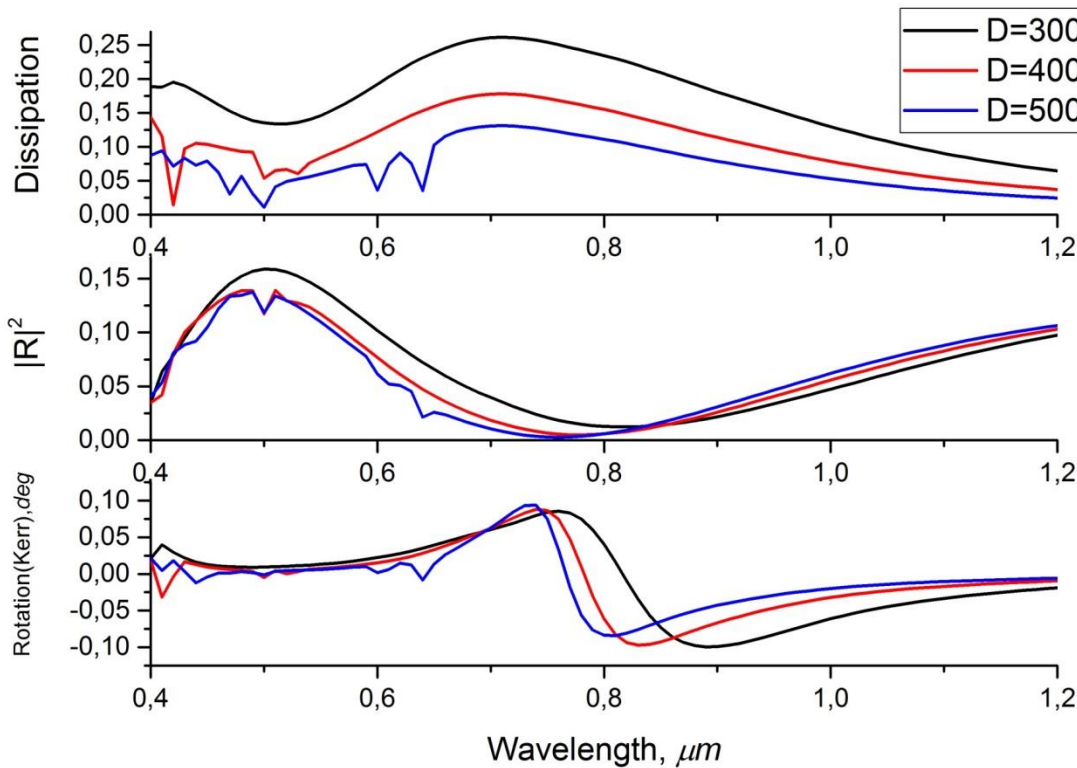
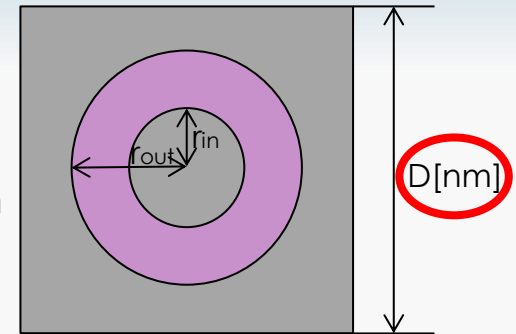
$\lambda=0,74\mu\text{m}$



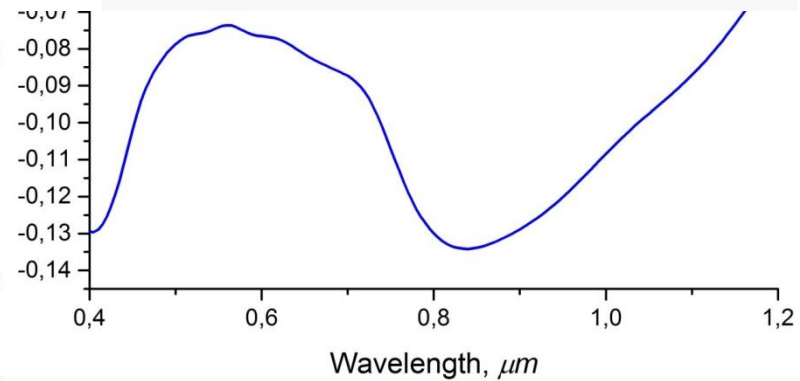
# One Ni ring per period



$r_{in}=40\text{nm}$   
 $r_{out}=60\text{nm}$



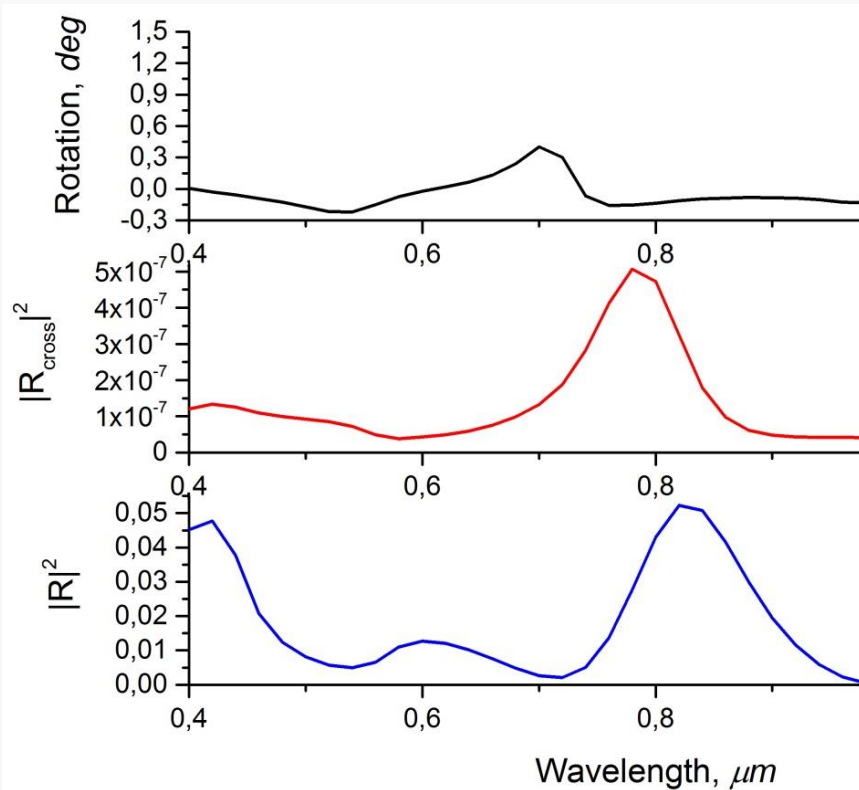
Kerr rotation for 500 nm Ni film



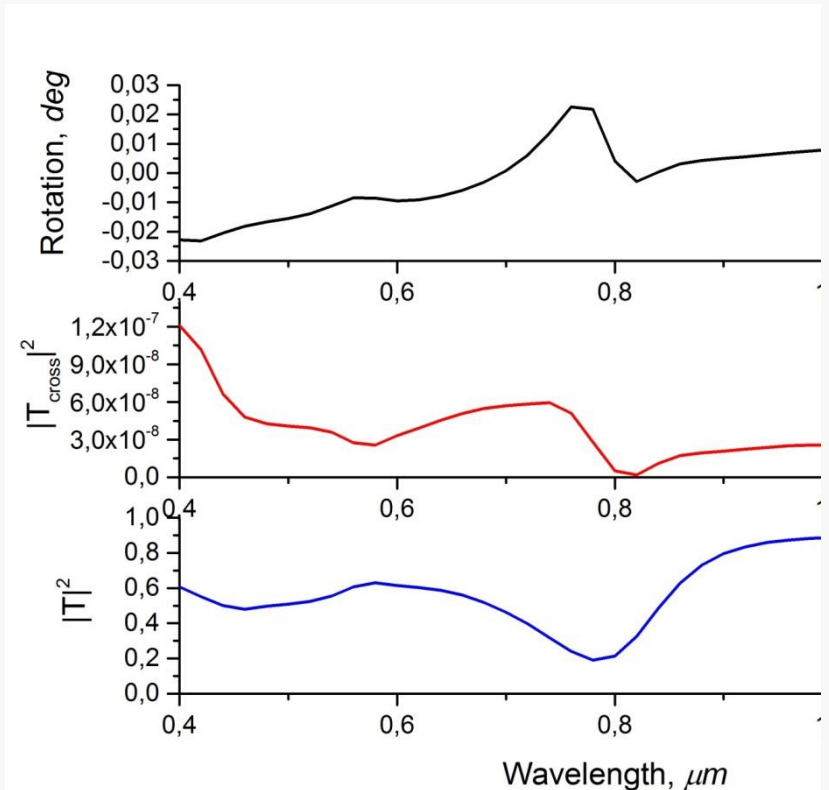
$h_{\text{ring}}=60\text{nm}$   
 $h_{\text{spacer}}=40\text{nm}$   
 $r_{\text{in}}=40\text{nm}$   
 $r_{\text{out}}=60\text{nm}$   
 $D=300\text{nm}$

Ni upper+Au bottom

MOKE



Faraday effect



Optimized design of hybrid Au-Ni structure provides

- excitation of asymmetrical mode resonance in the optical range
- obtaining Kerr rotation of ring structure with a filling factor  $\approx 7\%$  comparable to Kerr rotation of bulk Ni
- changing the direction of polarization rotation without changing the direction of magnetization