

What has been done.

How i understand the code:

- CUPRAD ----> IR propagation in the medium

$$\partial_z U = \frac{\mathbf{i}}{2k_0} \mathcal{T}^{-1} \Delta_{\perp} U + \mathbf{i} \mathcal{D}_2 U + \mathbf{i} \frac{\omega_0}{c} n_2 \mathcal{T} |U|^2 U - \frac{\mathbf{i} e^2 k_0}{2 n_0^2 \omega_0^2 m_e \varepsilon_0} \mathcal{T}^{-1} (\varrho_e U) - \frac{e^2 \nu_e}{2 m_e \varepsilon_0 n_0 c (\nu_e^2 + \omega^2)^2} \varrho_e U$$

- TDSE -----> Dipole at each points in the medium

$$H_L^{(1D)} = -\frac{1}{2} \frac{d^2}{dx^2} - \frac{1}{\sqrt{a^2 + x^2}} + \mathcal{E}(t)x$$

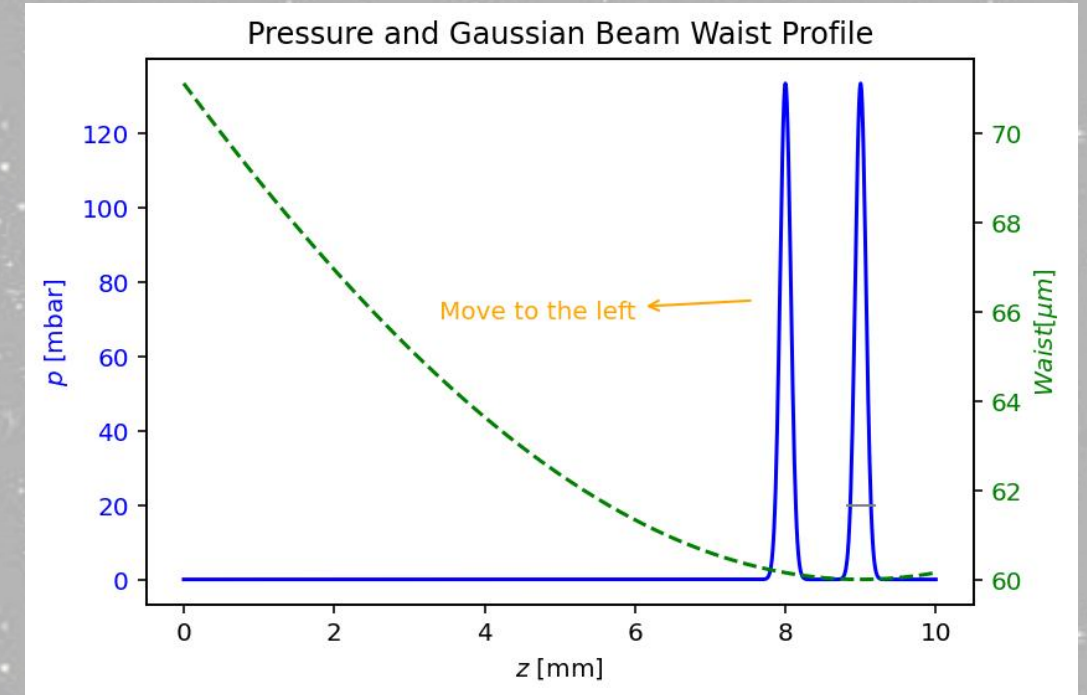
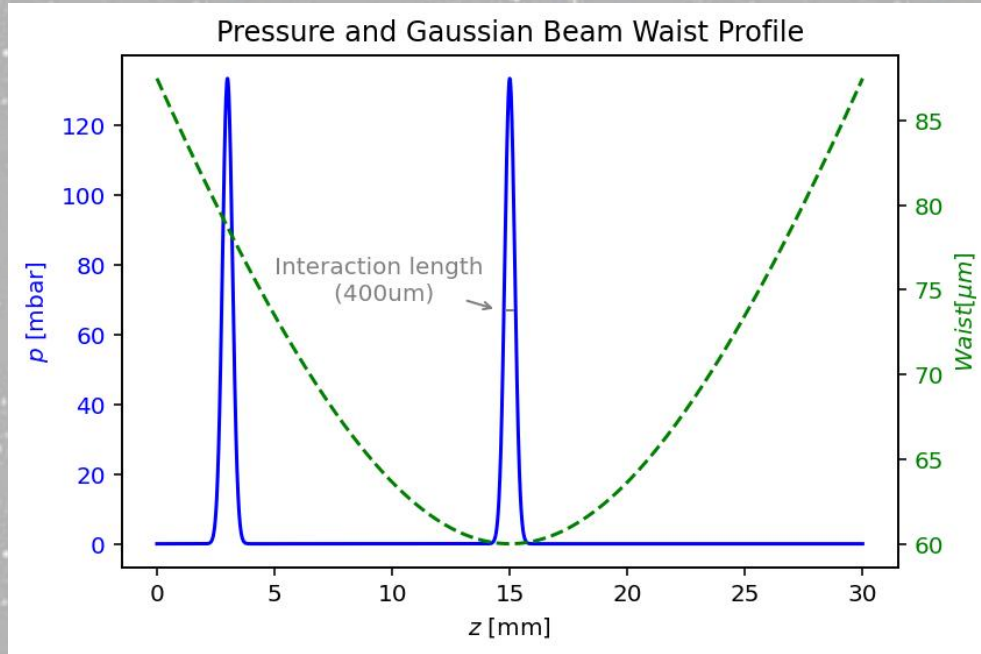
- Hankel ----> XUV in the far field

$$\hat{\mathcal{E}}(\omega, \rho, z) \approx -\frac{\mu_0 e^{\mathbf{i}k(\omega)z}}{4\pi} \int_{z_{\text{entry}}}^{z_{\text{exit}}} \frac{e^{-\mathbf{i}k(\omega)z'} e^{\mathbf{i} \frac{k(\omega)\rho^2}{2(z-z')}}}{z-z'} \int_{\Delta_T} e^{\mathbf{i} \frac{k(\omega)(\rho')^2}{2(z-z')}} \left(\widehat{\frac{\partial \mathbf{j}_Q}{\partial t}} \right) J_0 \left(\frac{k(\omega)\rho\rho'}{z-z'} \right) \rho' d\rho' dz'.$$

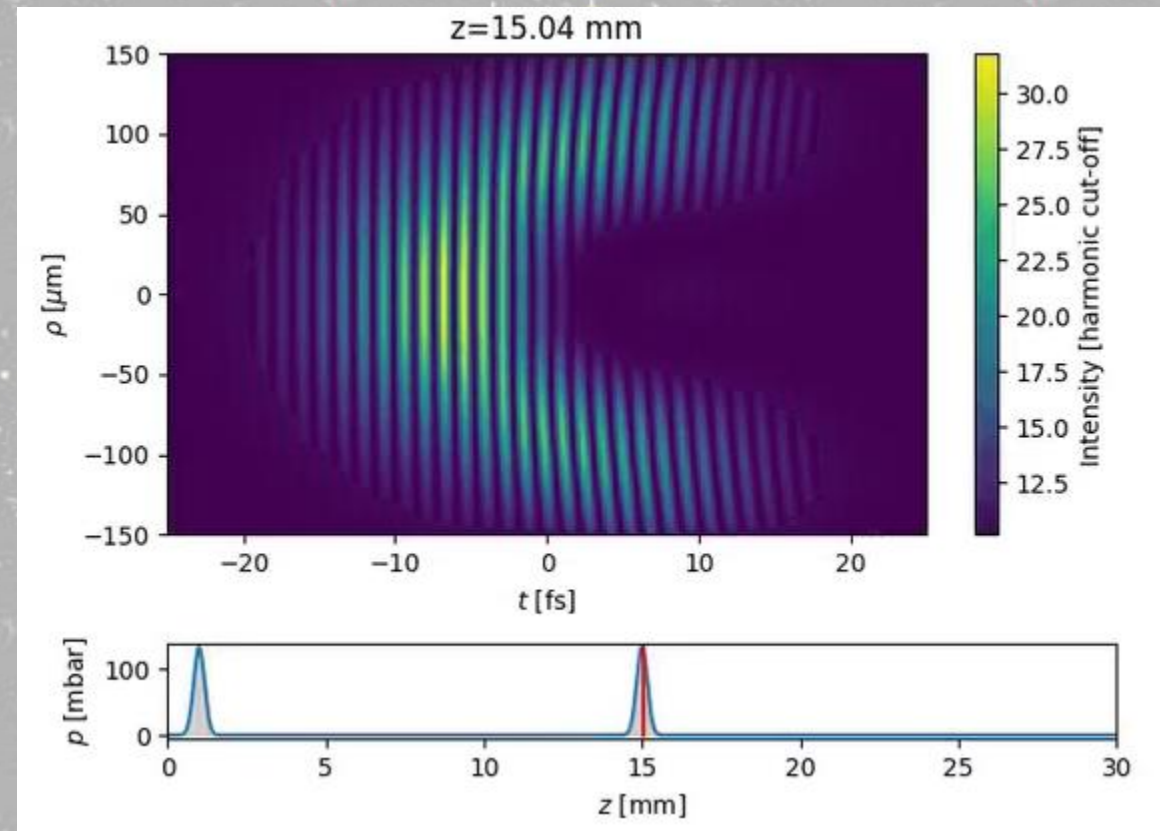
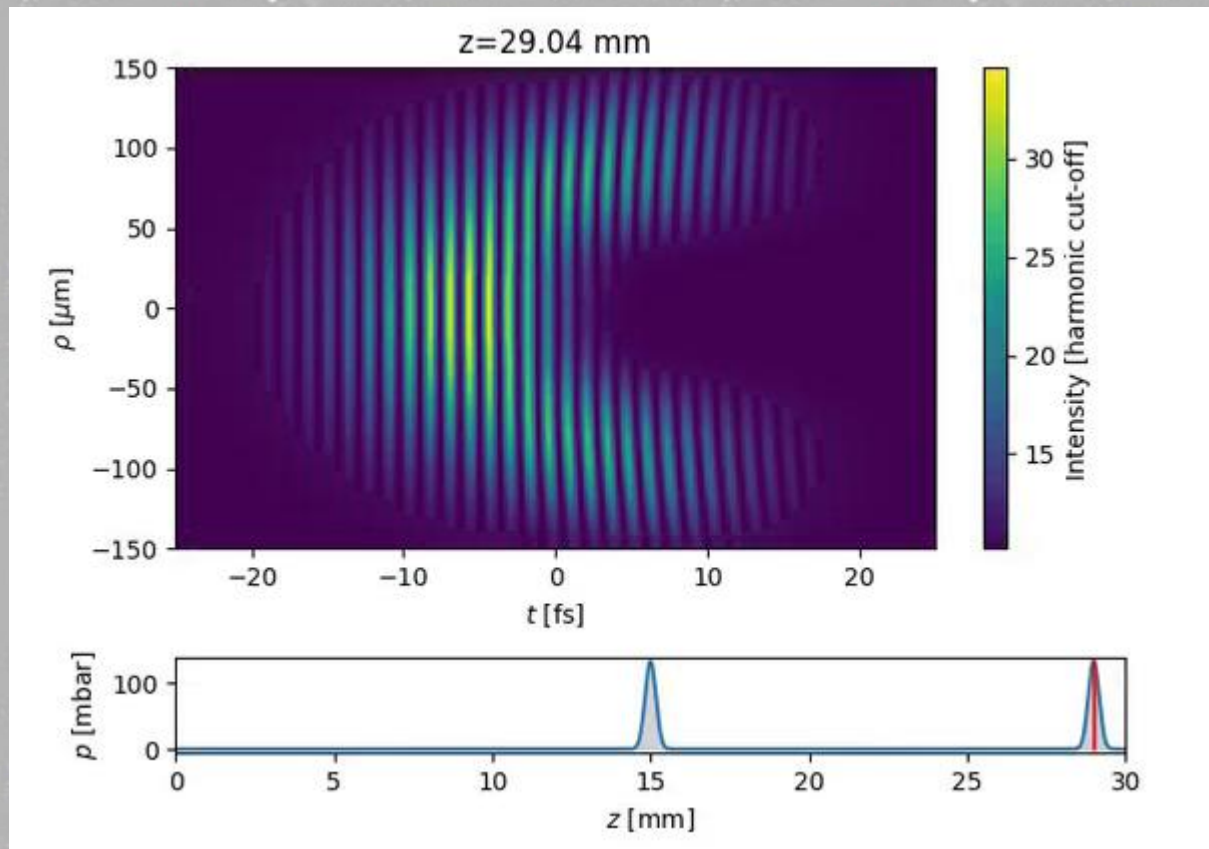
noabsorbtion considered in the second jet?

Main Inputs for our purpose

- Medium (Gas, Length, **pressure profile**)
- Laser (Waist, duration, focus position)



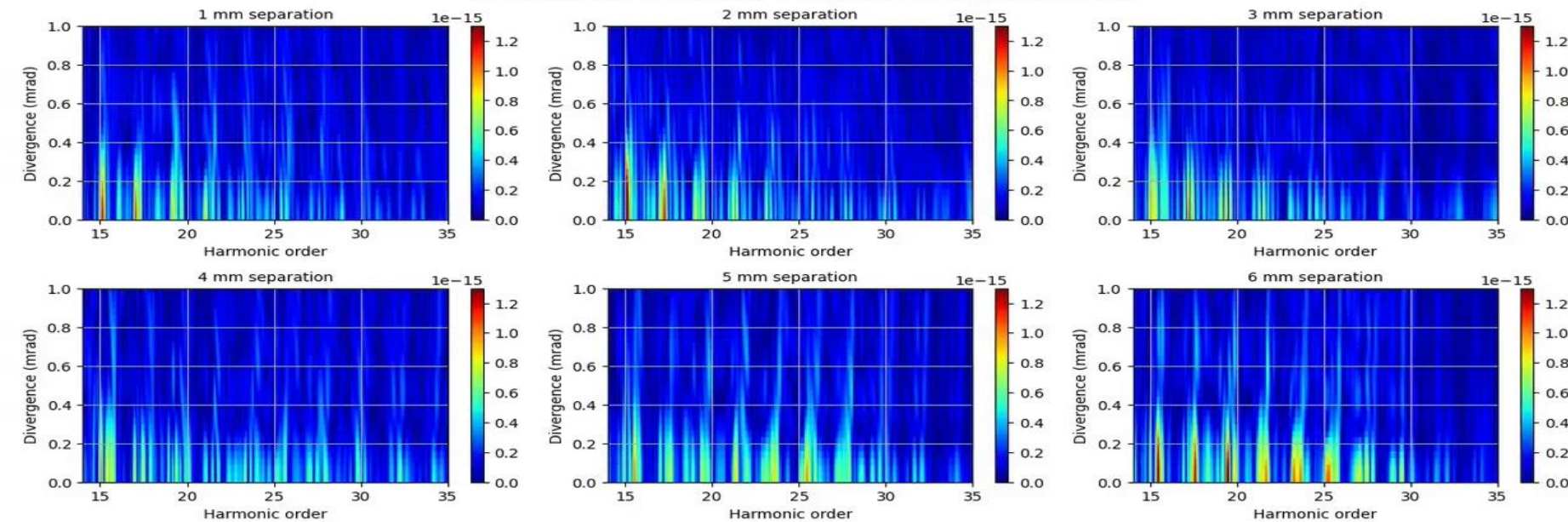
- Dcretization in r and z
- (Computational time)
(z_{step} always $\sim 10\mu\text{m}$)
- ($r_{\text{step}}=10$, $Nr_{\text{max}}=200$)



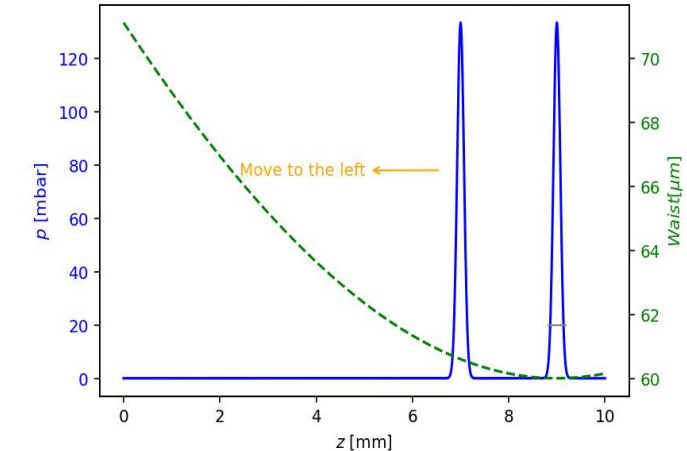
Because I want to reduce the medium length for saving time.

I don't know whether they put the focus in the middle on purpose.
So I gave some small run parameters and put the focus in different position to test whether the pulse remain the same.

Spatially and spectrally resolved harmonic spectrum

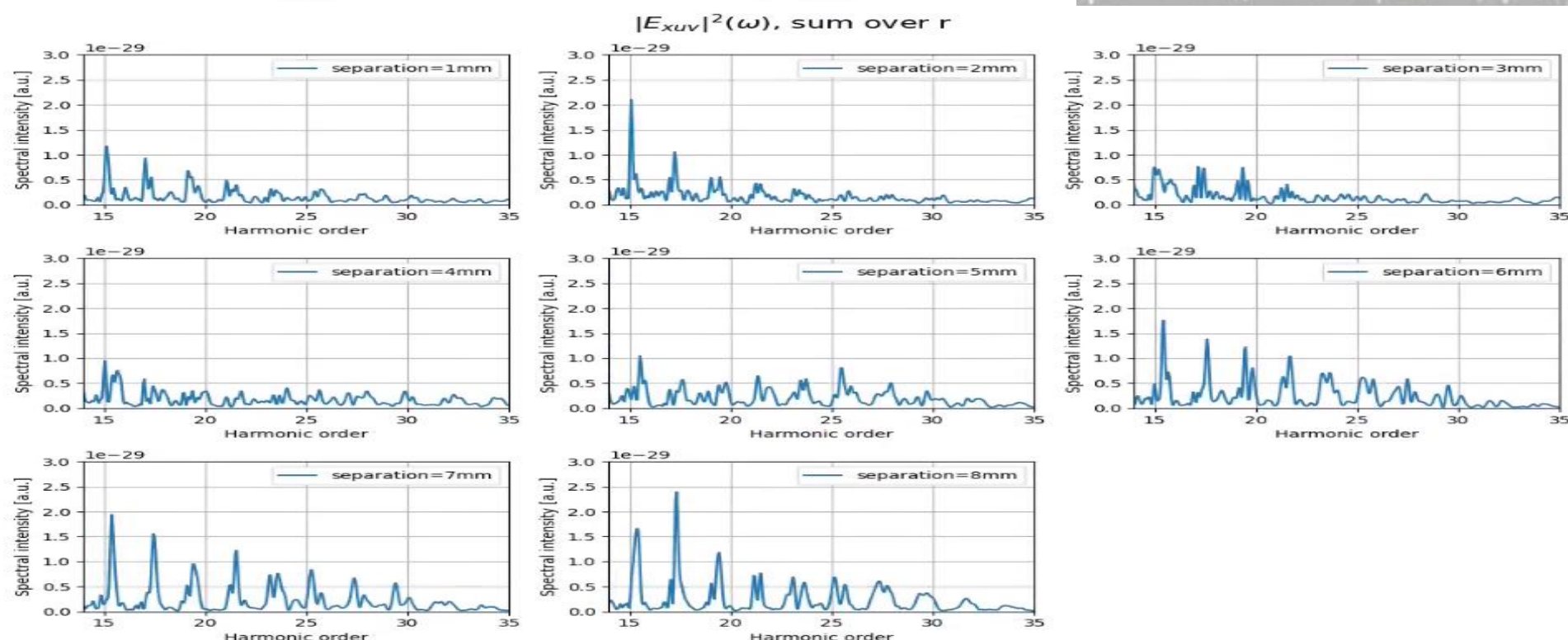
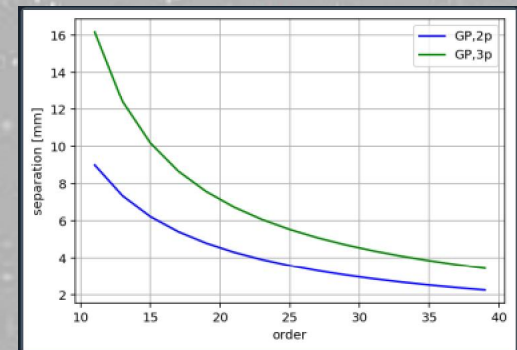


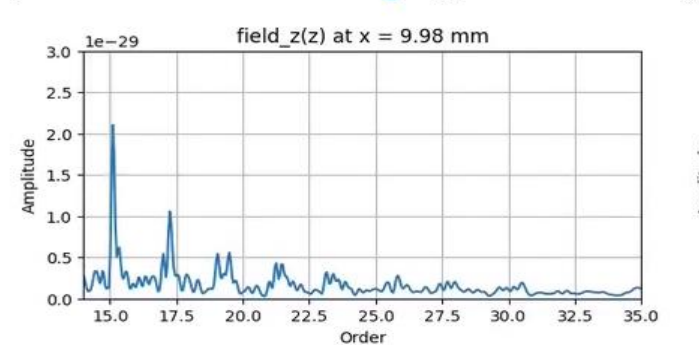
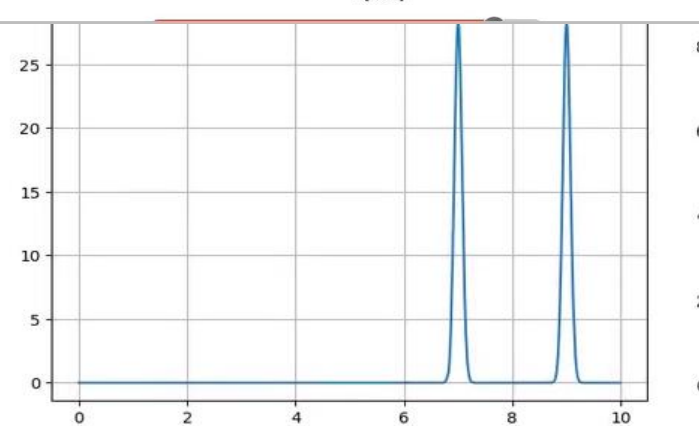
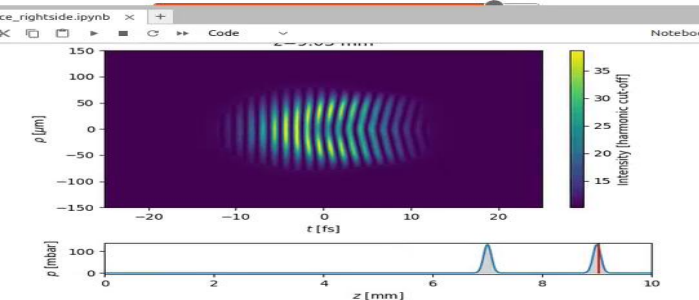
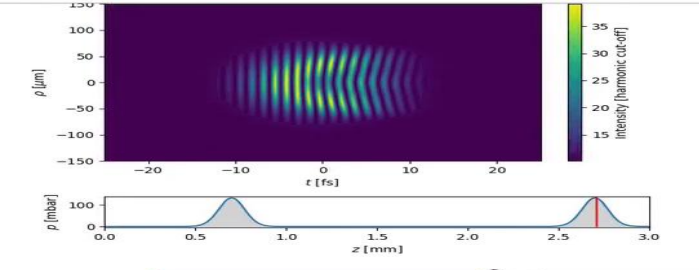
Pressure and Gaussian Beam Waist Profile



(no residual pressure.)

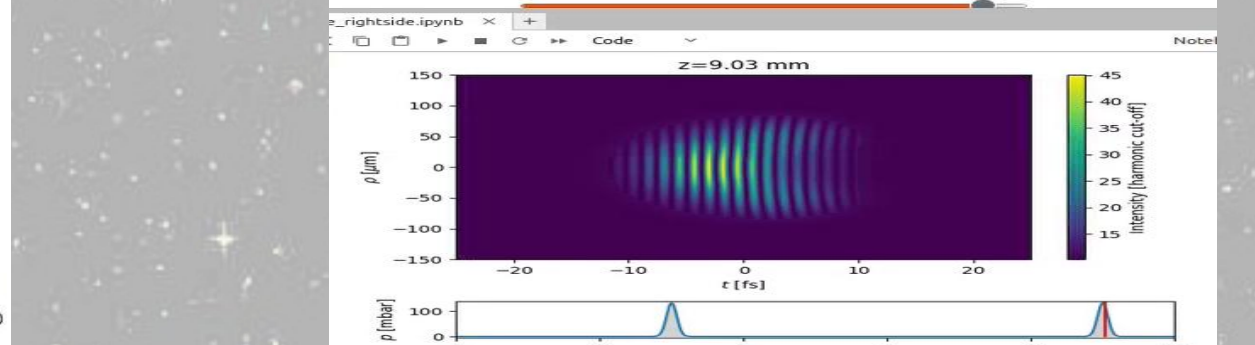
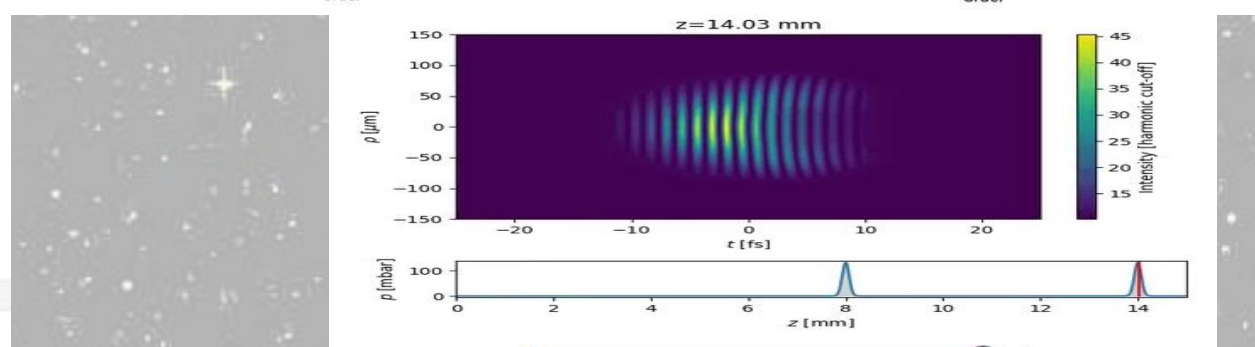
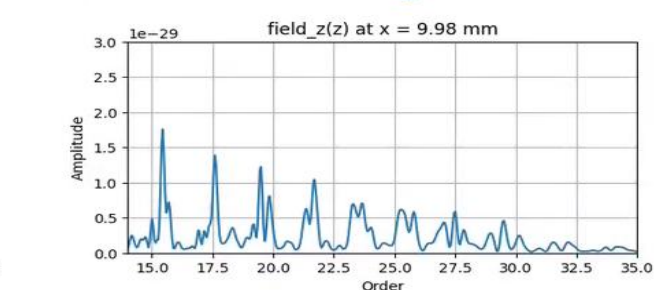
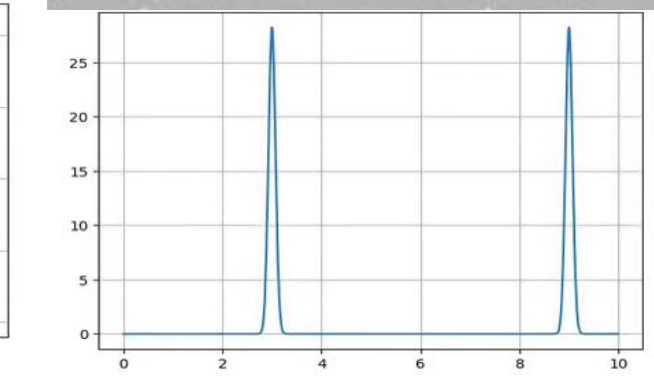
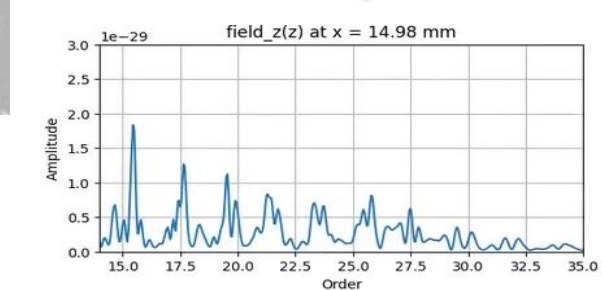
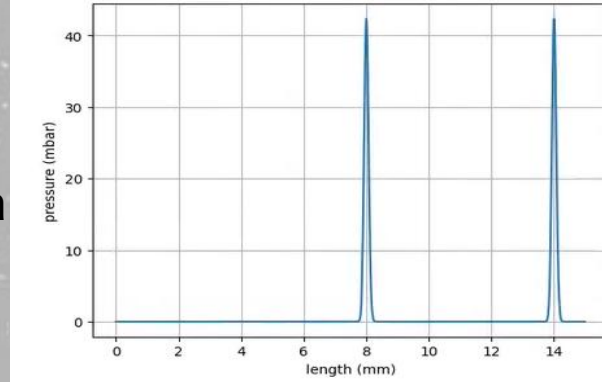
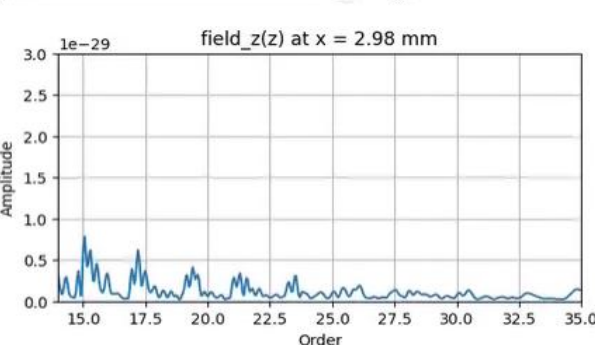
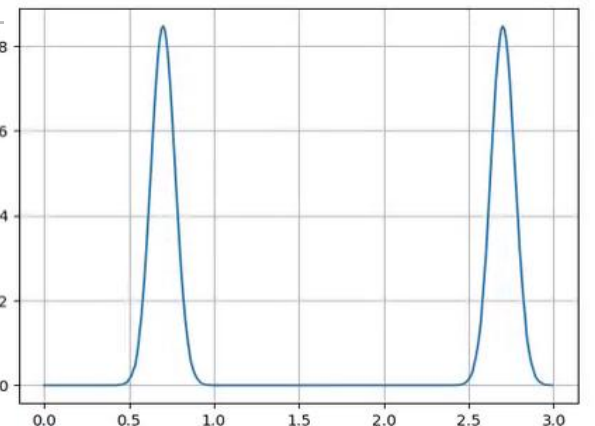
theoretical:

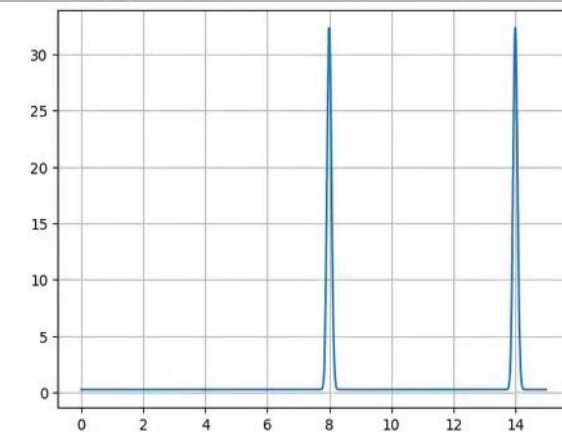
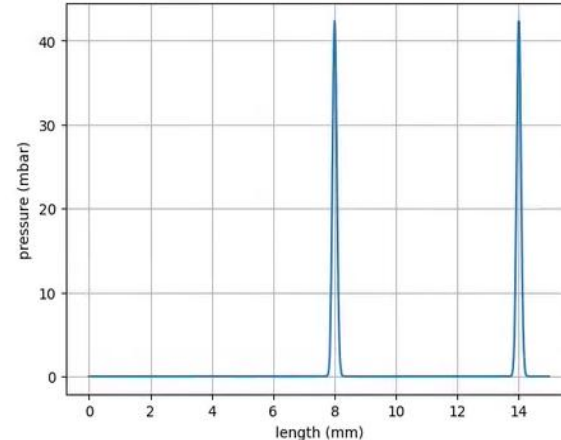
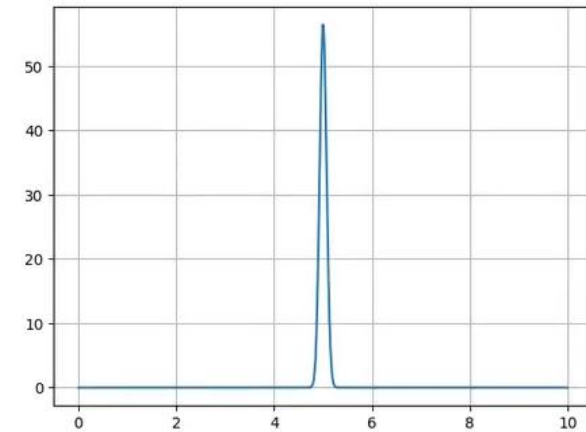
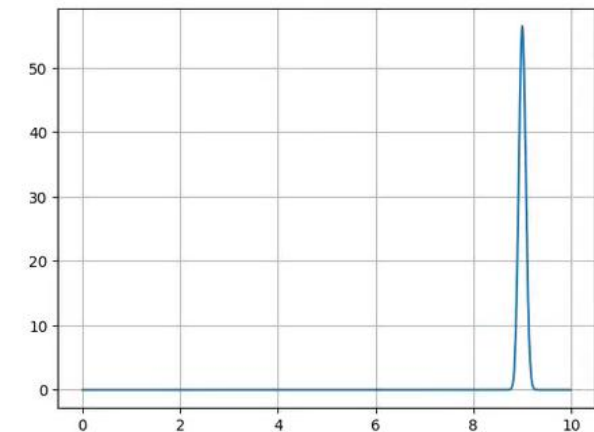




same gas configuration
different medium length
Different result
then which one should
i use?

(no residual)





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# print(len(zgrid)) ***
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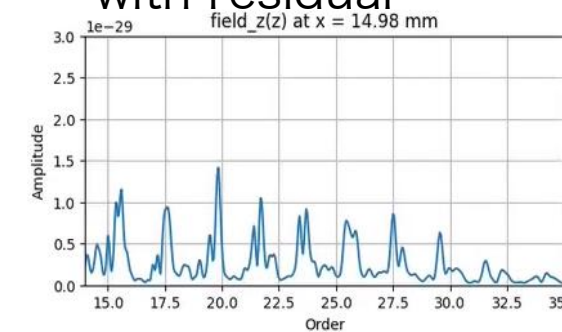
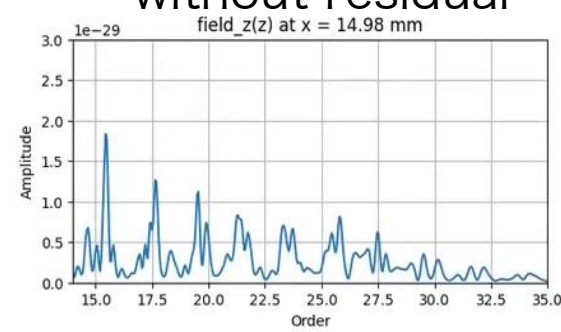
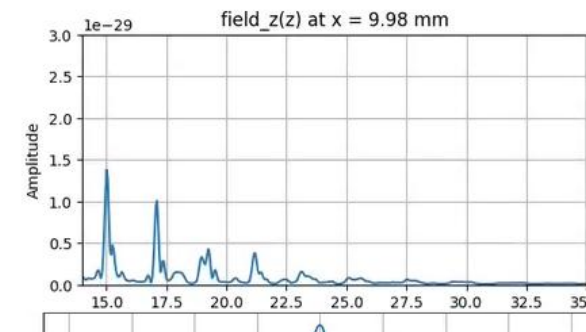
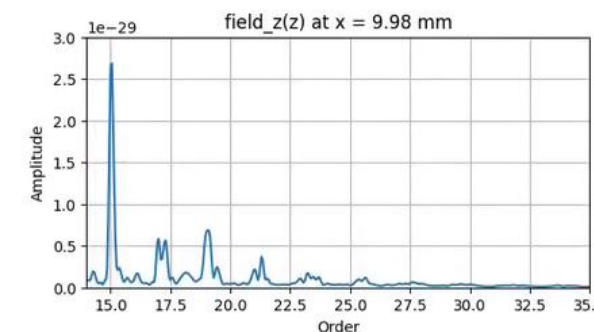
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# print(len(zgrid)) ***
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x 998

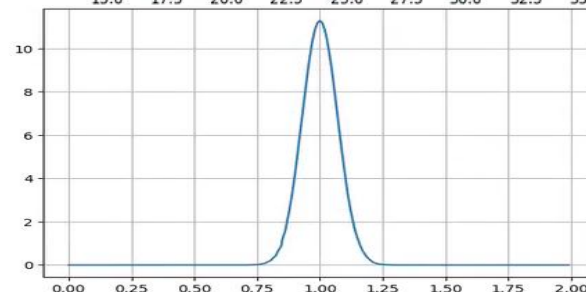
x 998

x 1498

x 1498

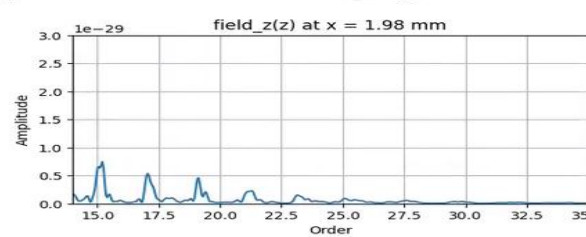


right focus

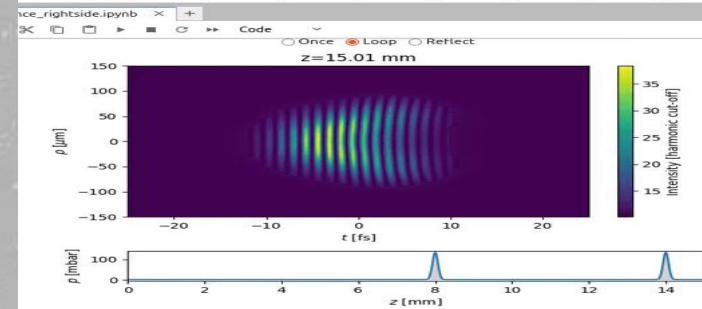
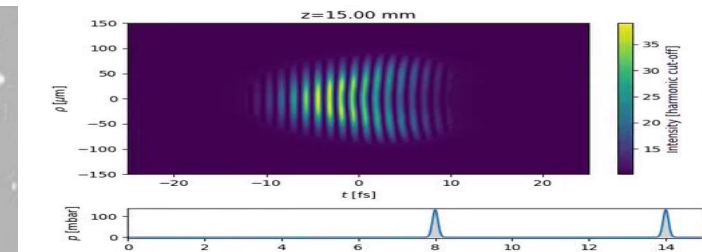


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# print(len(zgrid)) ***
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x 198

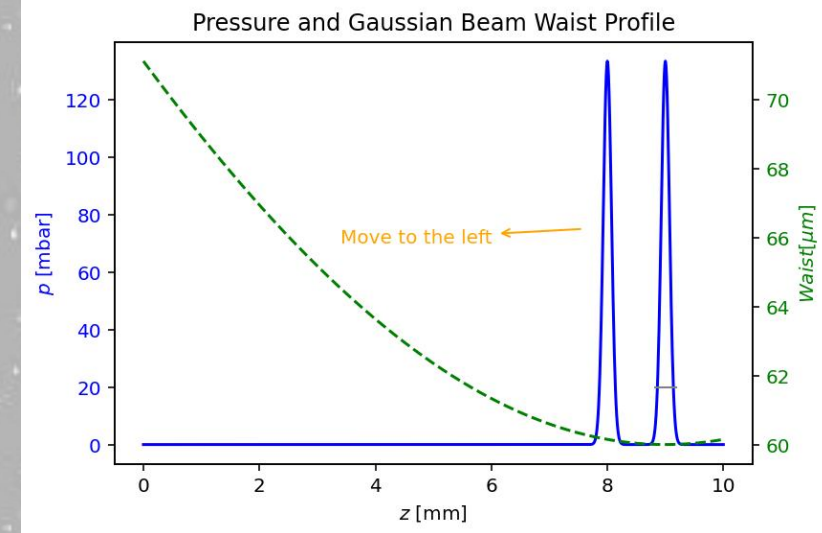


middle focus



Questions

- which part not handel well? why residual?
- TDSE: $Nr_{\text{max}}=200$, $rstep=10$ Reasonable?
- Cutoff~70+ , Hankel 30+ ? Normal?
- e.g 3mm , 10mm, same gas configuration, different Hankel? Make sense?
- Hrange[14,60] takes 30mins , I tried [1,45], more than 20h? is it divergent or ?
- does the Hankel T consider the absorbtion in the second gas jet?
- what do you think the serveral side peaks in one big peak are? error or real?



thanks bye.
