```
################################
####### GENERAL PARAMETERS ######
################################
# Below define rmin,rmax,zmin,zmax
my_constants.rmi=0.0
my_constants.rma=15.0e-6
my_constants.zmi=-5.0e-6
my_constants.zma=25.0e-6
############################
my_constants.ccc=3.0e8 # speed of light
my_constants.l_wl = 0.82       # laser wavelength in um
my_constants.nc=1.1e27/(l_wl**2) # critical density in units of particles per m^3, see https://cds.cern.ch/record/2203630/files/1418884_51-65.pdf

amr.n_cell = 1024 1024
amr.max_grid_size = 1024   # maximum size of each AMReX box, used to decompose the domain
amr.blocking_factor = 32 # minimum size of each AMReX box, used to decompose the domain
geometry.dims = RZ
geometry.prob_lo     =   rmi   zmi    # physical domain of r, z.
geometry.prob_hi     =   rma   zma
amr.max_level = 0 # Maximum level in hierarchy (1 might be unstable, >1 is not supported)

stop_time = 100.0e-15

warpx.n_rz_azimuthal_modes = 4

#### Below are mesh refinement ##########
########################################
amr.max_level = 1  # Level of mesh, currently only 0 and 1 are supported
#amr.ref_ratio = 4  # this applies the same ratio (as specified) per level for all directions
amr.ref_ratio_vect = 2 2 # this is similar to ref_ratio, but allow different ratio for x,y ; x,y,z ; or r,z
warpx.fine_tag_lo = 0.0e-6 18.0e-6 # x,y; x,y,z; or r,z
warpx.fine_tag_hi = 15.0e-6 22.0e-6
warpx.do_subcycling = 1 # 0 means all t-step are the same at each level (this might violate CFL), 1 allow them to be different.
########################################



boundary.field_lo = none absorbing_silver_mueller
boundary.field_hi = absorbing_silver_mueller absorbing_silver_mueller
#
########################################

#
#################################################################
############ NUMERICS ###########
################################
warpx.verbose = 1
warpx.do_dive_cleaning = 0
warpx.use_filter = 1
warpx.filter_npass_each_dir = 0 1
warpx.cfl = 1. # if 1., the time step is set to its CFL limit


# Order of particle shape factors
algo.particle_shape = 3

```

```
57  ################################
58  # Target Profile
59  #  foam (approx. with Hygroden) + al
60
61  #   definitions for target extent and pre-plasma
62  my_constants.L    = 20.0e-6            # [m] length of the target in z
63  my_constants.Lw = 10.0e-6               # [m] radius or half-thickness
64  my_constants.temp = 300.           # temperature in Kelvin
65  my_constants.mass_al = 13.*938.272+14.*939.565  # al (#_proton + #_neutron) mass in MeV
66  my_constants.mass_e = 0.511 # e- mass in MeV
67  my_constants.mass_p = 938.272 # proton mass in MeV
68  my_constants.MeV_to_kg = 1.79e-30 # 1 MeV=1.79*10**(-30) Kg
69  my_constants.c = 3.e8 # speed of light in [m/s]
70  my_constants.al_density = 2.7*1000./(mass_al*MeV_to_kg) # 2.7 is [g/cm^3], convert to #
    density [m^-3]
71  my_constants.e_al_density = al_density*13. # each Al has 13 e-, here assume all e- have
    been ionized
72
73
74  my_constants.length_al = 50.e-9 # Jerry: length of the al layer (placed after foam)
75
76  particles.species_names = aluminium electrons p qspal qspe qspp dummy_ele dummy_pos
77
78  particles.photon_species = qspal qspe qspp
79
80
81  # particle species
82  aluminium.species_type = aluminium
83  aluminium.injection_style = NUniformPerCell
84  aluminium.num_particles_per_cell_each_dim = 8 10 8 # for RZ, the three axis are radius,
    theta, and z and that the recommended number of particles per theta is at least two times
    the number of azimuthal modes requested
85  aluminium.momentum_distribution_type = "maxwell_boltzmann"
86  aluminium.theta = 8.6e-11*temp/mass_al
87  # minimum and maximum z position between which particles are initialized
88  # --> should be set for dense targets limit memory consumption during initialization
89  aluminium.zmin = L
90  aluminium.zmax = L+length_al
91  aluminium.xmin = -0.5*Lw
92  aluminium.xmax = 0.5*Lw
93
94
95
96  aluminium.profile = constant
97  aluminium.density = al_density
98
99  ##########QED#####################
100 aluminium.do_qed_quantum_sync = 1
101 aluminium.qed_quantum_sync_phot_product_species = qspal
102 ################################
103
104
105 p.species_type = proton
106 p.injection_style = NUniformPerCell
107 p.num_particles_per_cell_each_dim = 8 10 8 # 8 8
108 p.momentum_distribution_type = "maxwell_boltzmann"
109 p.theta = 8.6e-11*temp/mass_p
110 # minimum and maximum z position between which particles are initialized
111 # --> should be set for dense targets limit memory consumption during initialization
112 p.zmin = 0.
```

```
113  p.zmax = L
114  p.xmin = -0.5*Lw
115  p.xmax = 0.5*Lw
116
117  p.profile = constant
118  p.density = 10.0*nc # 10*nc
119
120  ##########QED####################
121  p.do_qed_quantum_sync = 1
122  p.qed_quantum_sync_phot_product_species = qspp
123  ################################
124  #
125  electrons.species_type = electron
126  electrons.injection_style = NUniformPerCell
127  electrons.num_particles_per_cell_each_dim = 8 10 8 # 8 8
128  electrons.momentum_distribution_type = "maxwell_boltzmann"
129  electrons.theta = 8.6e-11*temp/mass_e
130  # minimum and maximum z position between which particles are initialized
131  # --> should be set for dense targets limit memory consumption during initialization
132  electrons.zmin = 0.
133  electrons.zmax = L+length_al
134  electrons.xmin = -0.5*Lw
135  electrons.xmax = 0.5*Lw
136
137  #electrons_foam.profile = constant
138  #electrons_foam.density = nc*0.1
139  electrons.profile = parse_density_function
140  electrons.density_function(x,y,z) = "(z<=0.)*0.+(z>0.)*(z<=L)*10.0*nc+
     (z>L)*(z<L+length_al)*e_al_density+(z>=L+length_al)*0."
141  ##########QED####################
142  electrons.do_qed_quantum_sync = 1
143  electrons.qed_quantum_sync_phot_product_species = qspe
144  ################################
145
146
147  ################################
148
149  ### PRODUCT SPECIES ###
150  qspal.species_type = "photon"
151  qspal.injection_style = "none"
152  qspal.do_qed_breit_wheeler = 1
153  qspal.qed_breit_wheeler_ele_product_species = dummy_ele
154  qspal.qed_breit_wheeler_pos_product_species = dummy_pos
155
156  qspp.species_type = "photon"
157  qspp.injection_style = "none"
158  qspp.do_qed_breit_wheeler = 1
159  qspp.qed_breit_wheeler_ele_product_species = dummy_ele
160  qspp.qed_breit_wheeler_pos_product_species = dummy_pos
161
162  qspe.species_type = "photon"
163  qspe.injection_style = "none"
164  qspe.do_qed_breit_wheeler = 1
165  qspe.qed_breit_wheeler_ele_product_species = dummy_ele
166  qspe.qed_breit_wheeler_pos_product_species = dummy_pos
167
168
169  ################################
170
171  dummy_ele.species_type = "electron"
```

```
dummy_ele.injection_style = "none"

dummy_pos.species_type = "positron"
dummy_pos.injection_style = "none"

#################################

##########QED TABLES###################
qed_bw.chi_min = 0.001

qed_bw.lookup_table_mode = "builtin"


qed_qs.chi_min = 0.001

qed_qs.lookup_table_mode = "builtin"

qed_qs.photon_creation_energy_threshold = 0.0









#################################
# Laser Pulse Profile
#my_constants.l_wl = 0.82       # laser wavelength in um
my_constants.I0 = 3.e21/1.e18 # laser intensity in 10^18 W/cm^2
#
lasers.names        = laser1
laser1.position     = 0. 0. -4.0e-6     # point the laser plane (antenna)
laser1.direction    = 0. 0. 1.          # the plane's (antenna's) normal direction
laser1.polarization = 0. 1. 0.          # the main polarization vector
laser1.a0           = 0.85*sqrt(I0)*l_wl              # maximum amplitude of the laser
field [V/m]
laser1.wavelength   = l_wl*1.e-6            # central wavelength of the laser pulse [m]
laser1.profile      = Gaussian
laser1.profile_waist = 2.5e-6            # beam waist (E(w_0)=E_0/e) [m]
laser1.profile_duration = 25.e-15/1.1774 # pulse length (E(tau)=E_0/e; tau=tau_E=FWHM_I/
1.17741) [s]
laser1.profile_t_peak = 2.*25.e-15/1.1774 # time until peak intensity reached at the laser
plane[s]
laser1.profile_focal_distance = 4.0e-6  # focal distance from the antenna [m]

# Diagnostics
#
# Diagnostics (Remove for timing Runs)
diagnostics.diags_names = diag1 #diag2 diag_p diag_e diag_r diag_ra
diag1.intervals = 1:500:200,500 #20
diag1.diag_type = Full
diag1.fields_to_plot = Er Et Ez rho_aluminium rho_electrons rho_p rho_qspe #rho_qspp
rho_qspal

diag1.file_prefix = /data/jerry/warpx/foam_test/plotfiles/plt
```