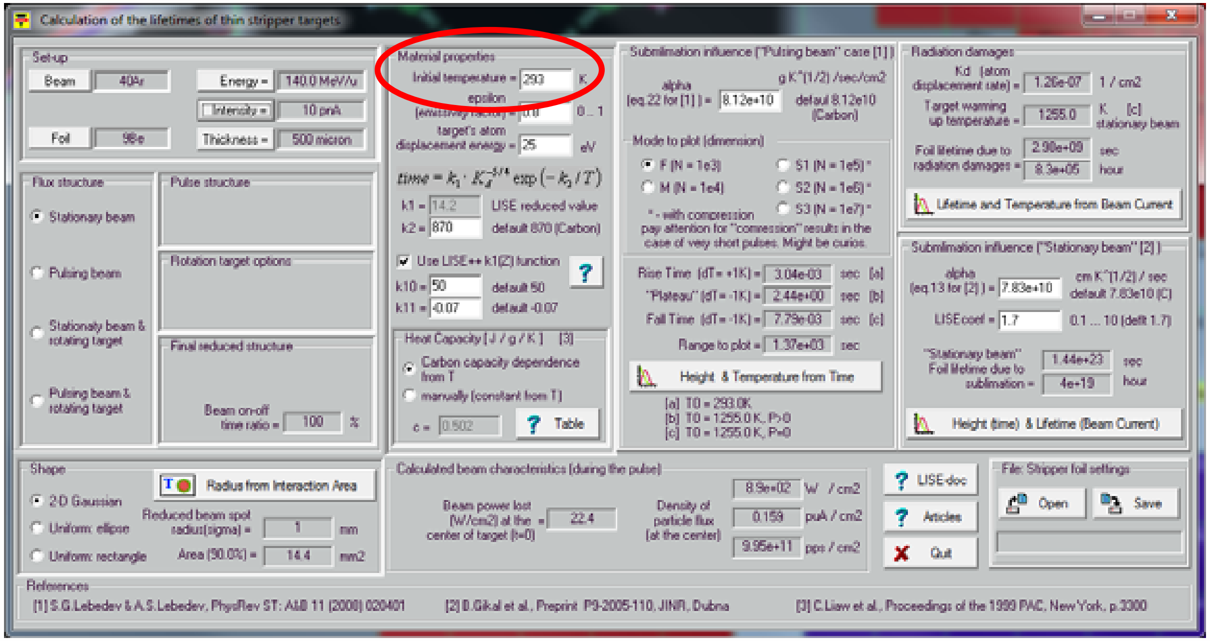
Update of the Stripper lifetime utility (9.2.38)

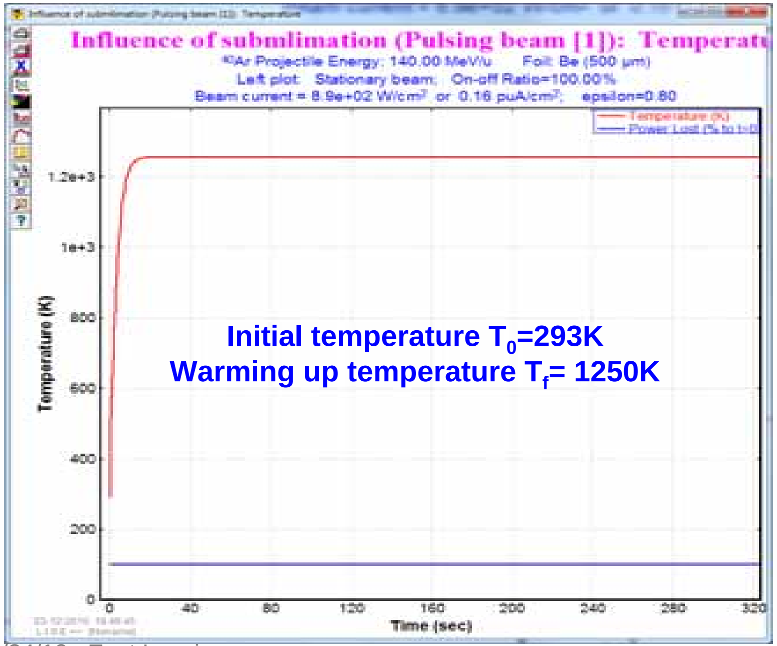
See
"The Stripper foil lifetime utility" part 1 (v.8.3.6) at: http://groups.nscl.msu.edu/lise/8_3/foil_lifetime_v8_3_6.pdf
"Update of the Stripper foil lifetime utility" part 2 (v.8.3.13) at: http://groups.nscl.msu.edu/lise/8_3/foil_lifetime_v8_3_13.pdf

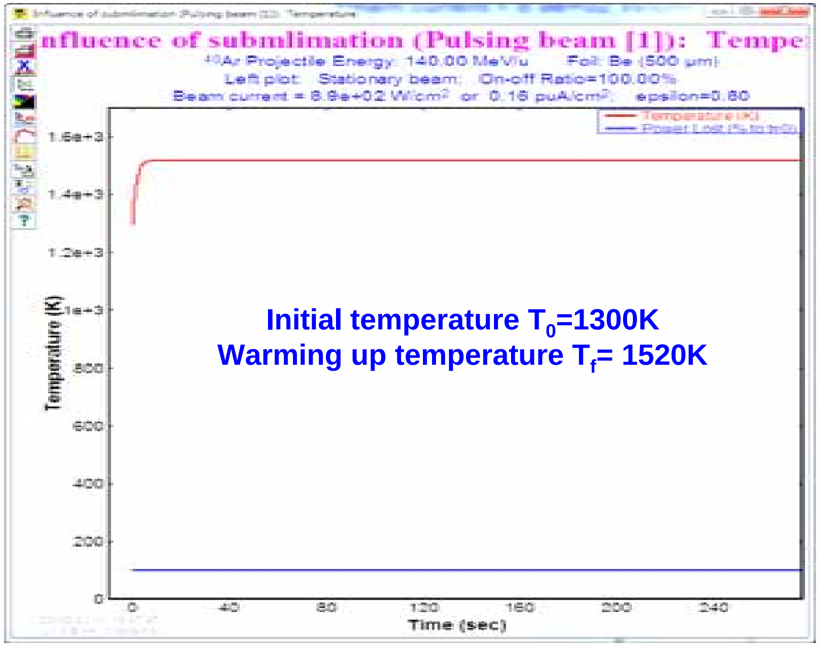
Stripper Lifetime utility *(version 9.2.38)*

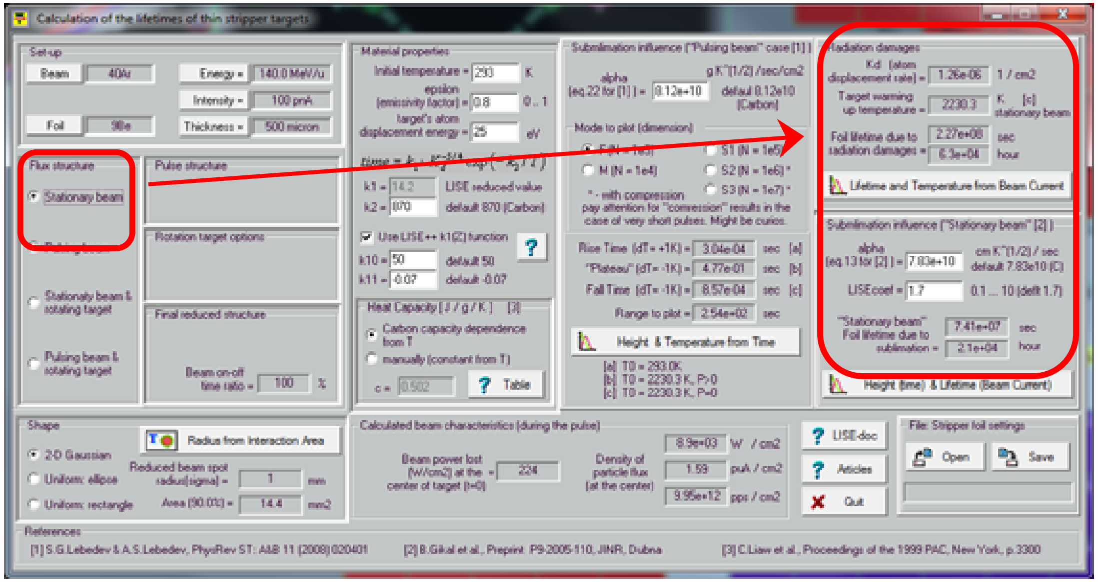
- Target initial temperature
- Modification for "stationary beam" models in the case of pulsing beams
- Rotation target: modifications for a reduced beam pulse length
- New flux structure: Pulsing beam & rotating target

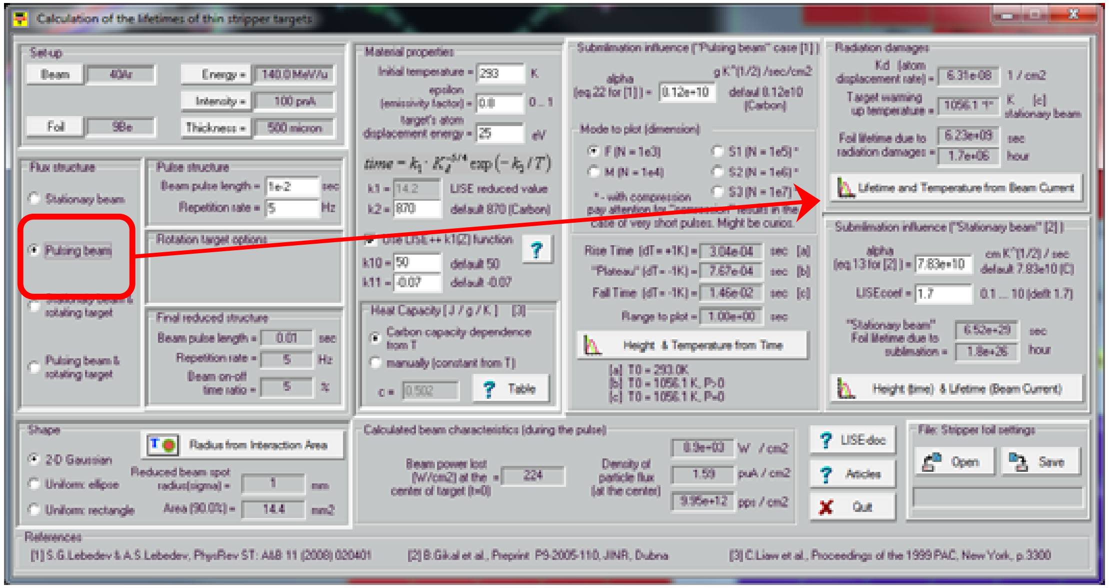
Initial temperature









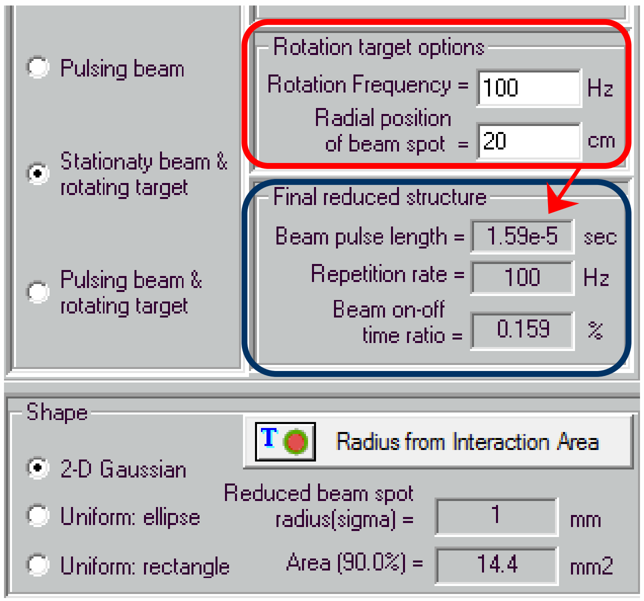


In version 9.2.38 LISE++ takes the reduced value

$$\text{Flux}_{\text{reduced}} = \text{Flux}_{\text{during the pulse}} * \text{Ratio}_{\text{beam on-off\_time}}$$

for calculations in “Stationary beam” models

Reduced beam pulse length in the case of "Rotating target and Stationary beam" mode



Pulse	**= Reduced beam pulse length**	**[sec]**
R	**= Rotation target radius**	**[mm]**
ν	**= Rotation target frequency**	**[Hz]**
W	**= Beam spot horizontal size**	**[mm]**
υ	**= Linear velocity**	**[mm/sec]**

$$\upsilon = 2 \pi R \nu$$

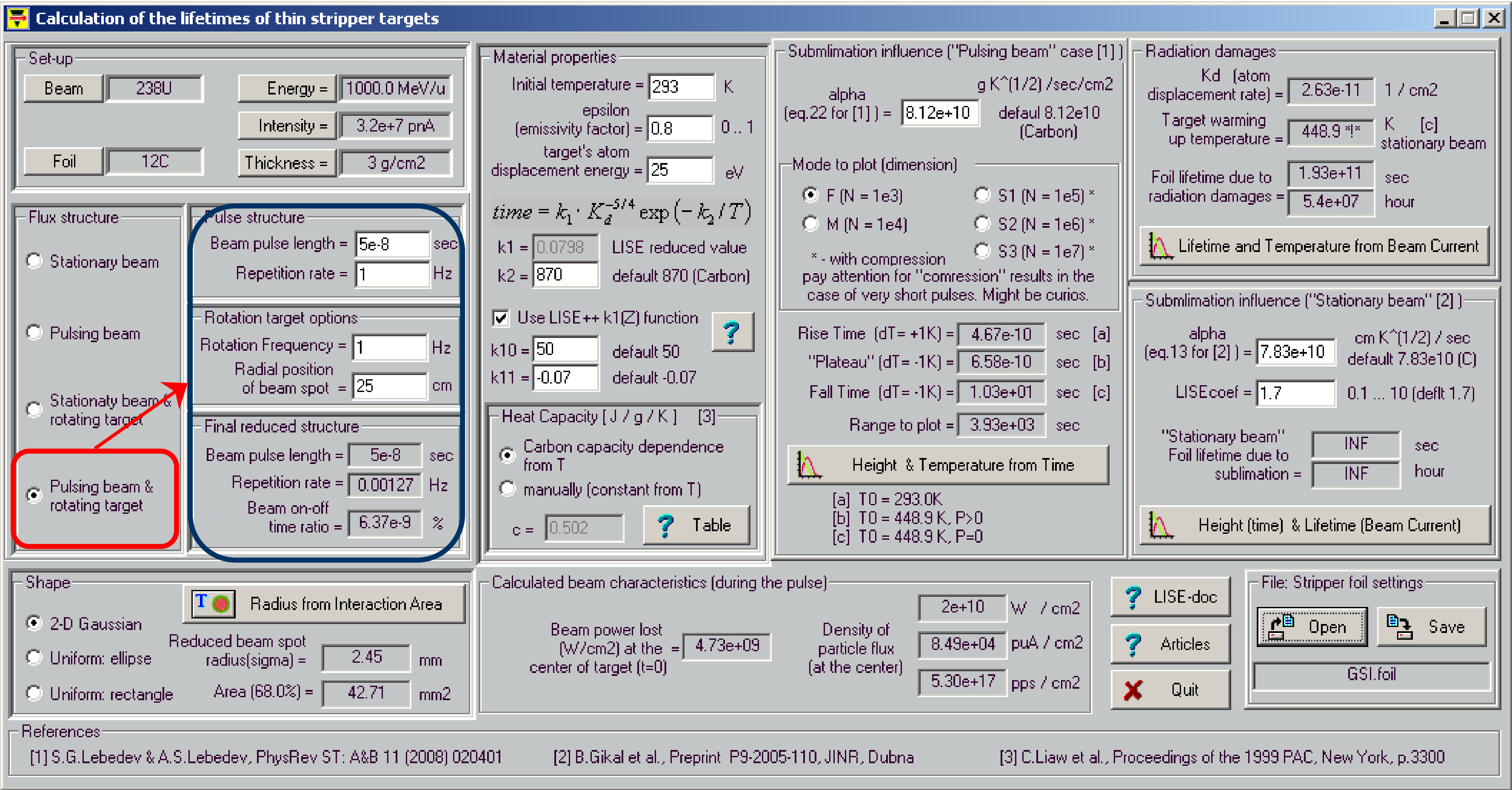
$$Pulse = W / \upsilon$$

Where W is

2D-gaussian: $x_{spot} = 2\,\sigma_x$
Uniform Ellipse: x_{spot} **= 2 * seminor axis "x"**
Uniform Rectangle: x_{spot} **= Width**

$$Ratio_{beam\ on\text{-}off\_time} = Pulse * \text{Rotation target frequency}$$

New flux structure: Pulsing beam & rotating target

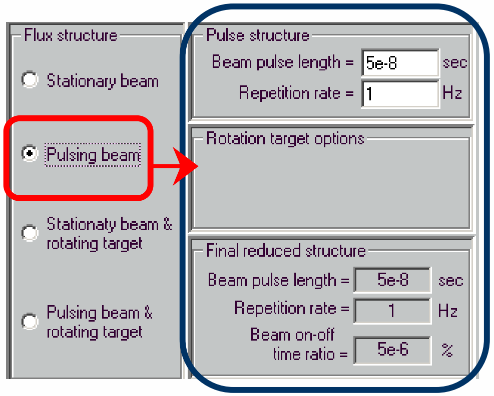


Parameters have been taken from "Calculations of high-power production target and beam dump for the GSI future Super-FRS for a fast extraction scheme at the FAIR Facility", N.A.Tahir et al., J. Phys. D: Appl. Phys. 38 (2005) 1828–1837.

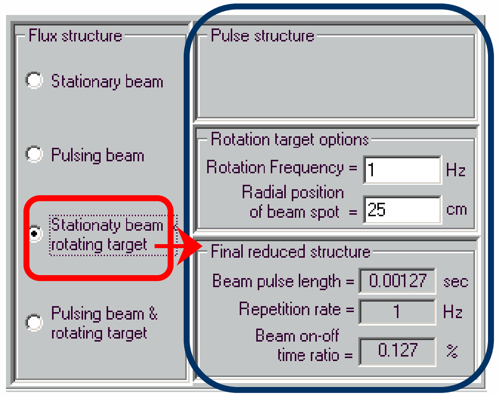
Beam current was set to 2e17 pps in order correspond to 1e10 particle per 50 ns pulse

Use the LISE++ foil file: http://groups.nscl.msu.edu/lise/9_2/9_2_38/GSI.foil

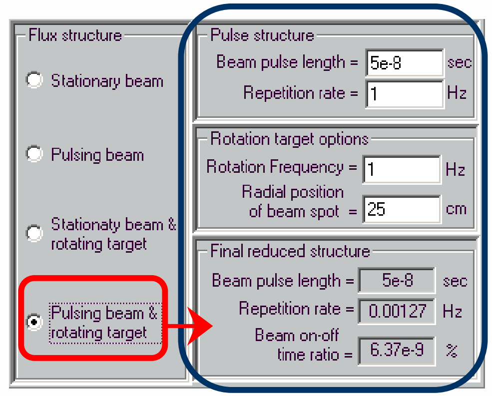
Pulsing beam



Rotating target



Pulsing beam + Rotating target



Probability with rotating target Is defined as X-spot size / Target Length = 0.127%,

where the target length is 2 Pi R,

Therefore distance between reduced "pulses" is 787 seconds, with the pulse length equal to 50 ns

N.A.Tahir et al., J. Phys. D: Appl. Phys. 38 (2005) 1828–1837.

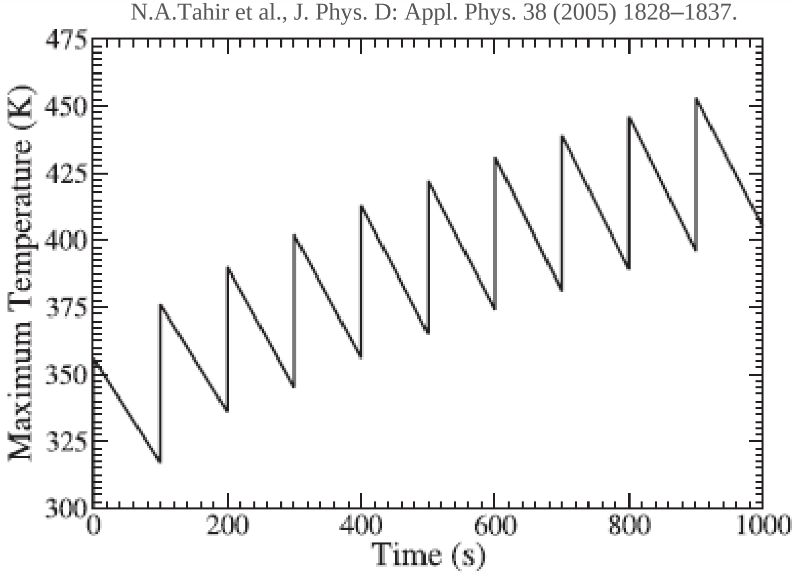
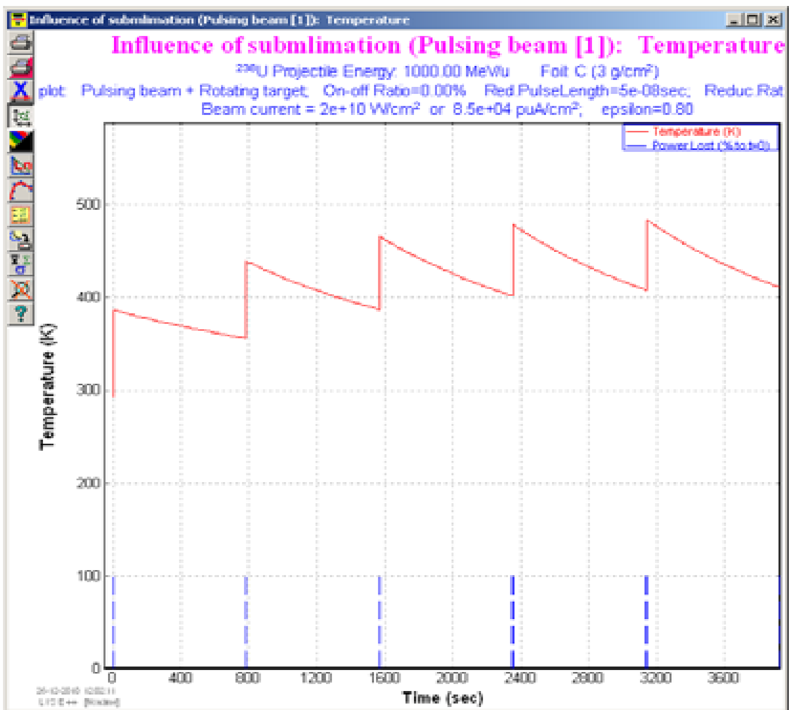
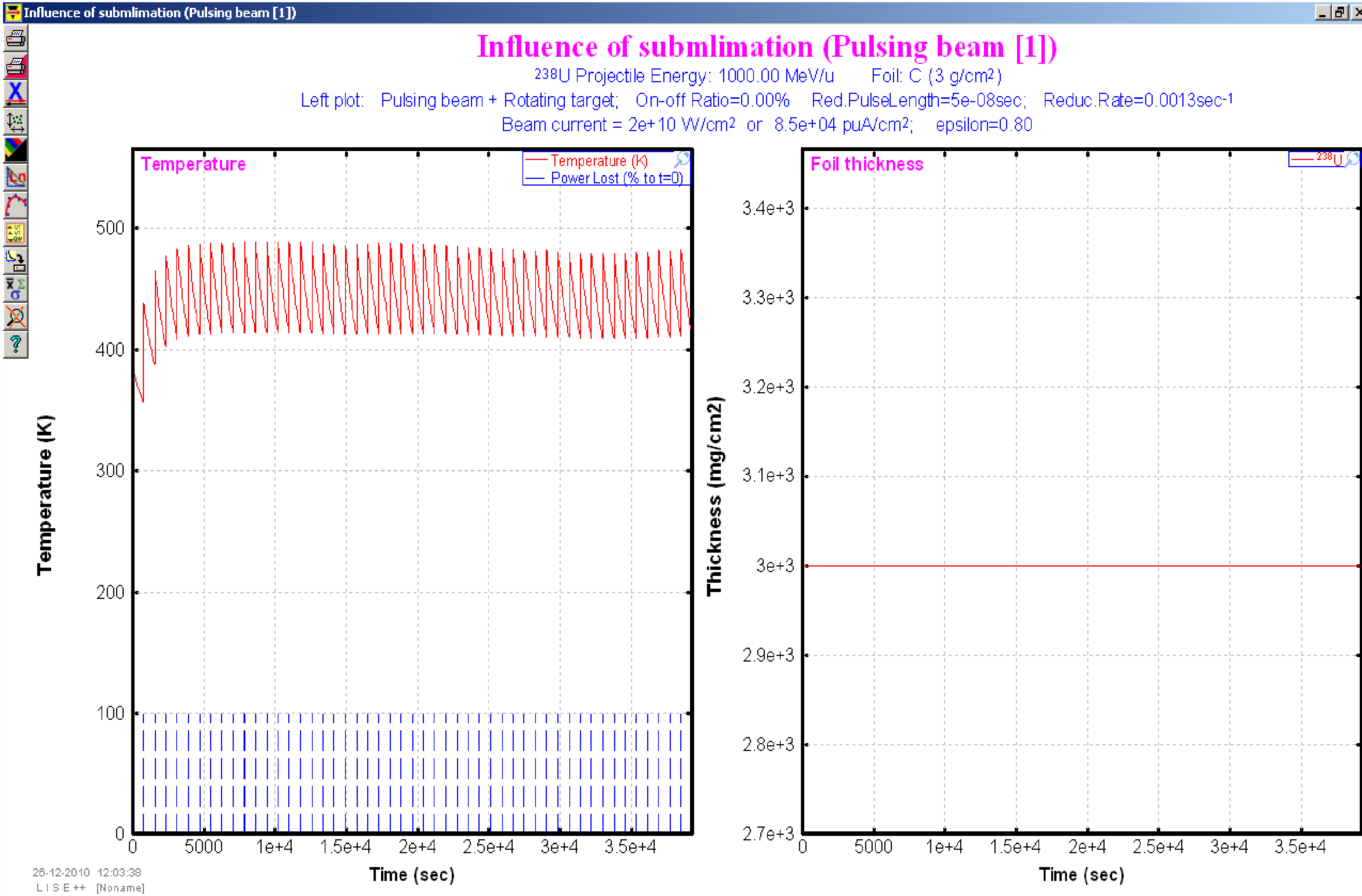


Figure 5. (*a*) Temperature versus time in the target during 1000 irradiations by a 1 GeV u^{-1} U bunch with $N = 10^{10}$ and $\tau = 50$ ns, $\sigma_x = 1$ mm and $\sigma_y = 6$ mm.

LISE++




Influence of submlimation (Pulsing beam [1])
Influence of submlimation (Pulsing beam [1])
238U Projectile Energy: 1000.00 MeV/u Foil: C (3 g/cm2)
Left plot: Pulsing beam + Rotating target; On-off Ratio=0.00% Red.PulseLength=5e-08sec; Reduc.Rate=0.0013sec-1
Beam current = 2e+10 W/cm2 or 8.5e+04 puA/cm2; epsilon=0.80
Temperature
Temperature (K)
Power Lost (% to t=0)
Temperature (K)
Time (sec)
Foil thickness
238U
Thickness (mg/cm2)
Time (sec)
26-12-2010 12:03:38
L I S E ++ [Noname]