Justification

We use the PIC code LSP, a commercial simulation code from Voss Scientific. It is well established and we have maintained a service contract for roughly six years providing updates and technical support. Purchase of the code includes the entire source code and we routinely modify the code. For example, our recent publication in Scientific Reports was only possible because we added a multiphoton ionization model.

Recent usage

For 2016 I was awarded 244,000 RUs███████████████ (including 4000 RUs for my students' awards and presentations at last year's user meeting). This was exhausted mid-September. To complete the year at the same pace, a good estimate would be:

244,000 * (2.5 months remaining/9.5 months used) = 64,000 RUs

However, we have a running experiment to complete and two manuscripts to write based on existing results. Taking this into account, a Major proposal for 30,000 RUs should be sufficient. A more traditional justification follows, but this discussion is offered to add perspective.

Planned usage

We require machine time to complete two studies both of which will result in publication (as described in the proposal): (1) Comparison of experimental damage morphology to our new model for computational laser damage and (2) Analysis of laser driven ion acceleration data.

(1) Laser damage: We have shown that the damage morphology work can be done in 2D but 1 3D run will be required for a focused study on sub-surface structures formed during damage. For 2D runs, it is typical to use 300 processors.

3D run: 5,000 RU	Study of void formation after laser heating
2D runs: 6 x 2000 RU	5 fs laser excitation (3), long wavelength excitation (3)
sub-total: 17,000 RU	

(2) Ion acceleration: We have shown that this work must be done in 3D for quantitative comparison to experiment whereas the standard in the literature is still 2D. 2D is still useful for tuning of simulation parameters and study of trends, however. Both 2D and 3D runs use almost 400 processors, because we use larger targets and focal spots in our 2D runs.

3D runs: 6 x 1500 RU	Scan of target thickness (3 thicknesses, 2 polarizations)
2D run: 6 x 750 RU	Development for 3D, study of target size
sub-total: 13,500 RU	

Total: 30,500 RUs

Requested: 30,000 RU