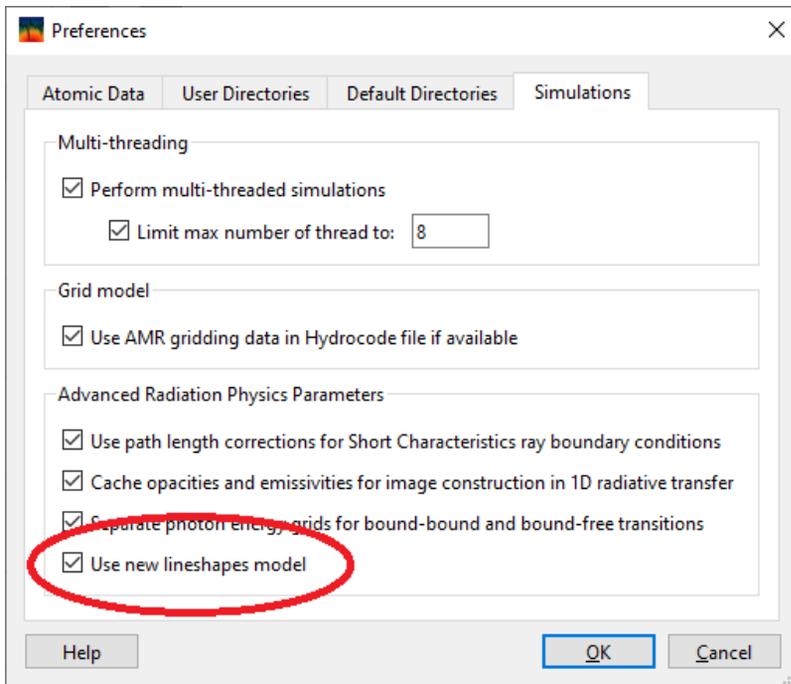


Spect3D user's guide

SPECT3D 20.0.0

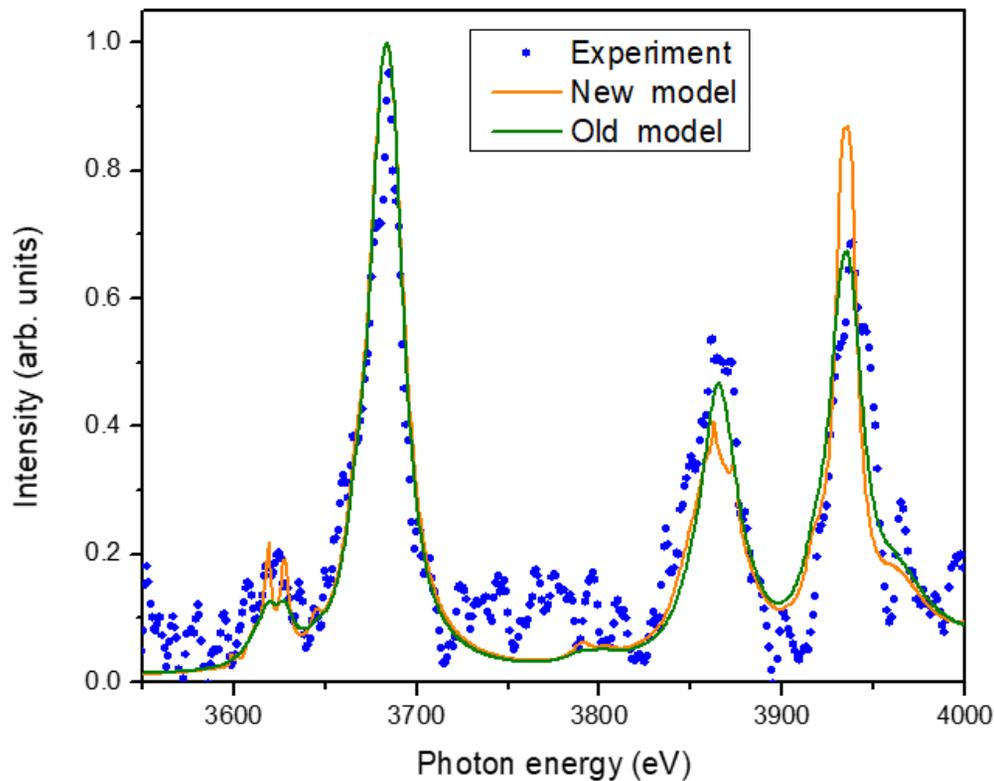
SPECT3D:

- This version is built with a new version of Qt - a cross-platform framework for creating user interfaces and graphics. This is a major upgrade to the long-term support version of Qt 6.2.x. It was required to ensure stable operation of Prism software the most recent Windows, Mac, and Linux operating systems. Please note that all applications distributed with SPECT3D were also updated with the exception of Visualizer that is built against Qt4. Visualizer is a legacy application that is being replaced by SpectraPLOT. Prism no longer plans to distribute Visualizer in the future releases of SPECT3D. If there are any Visualizer features that you would like to be ported to SpectraPLOT, please let us know.
- New Stark broadening models were implemented based on the semi-empirical approach detailed in Gu and Beiersdorfer (Phys. Rev. A, 101, 032501). Users of Prism software can control whether to use the old or the new Stark broadening model in preferences for each application. The default option is to use the new model. For more information on the models please refer to a appendix in the documentation titled "Stark Broadening Models in Prism Codes".

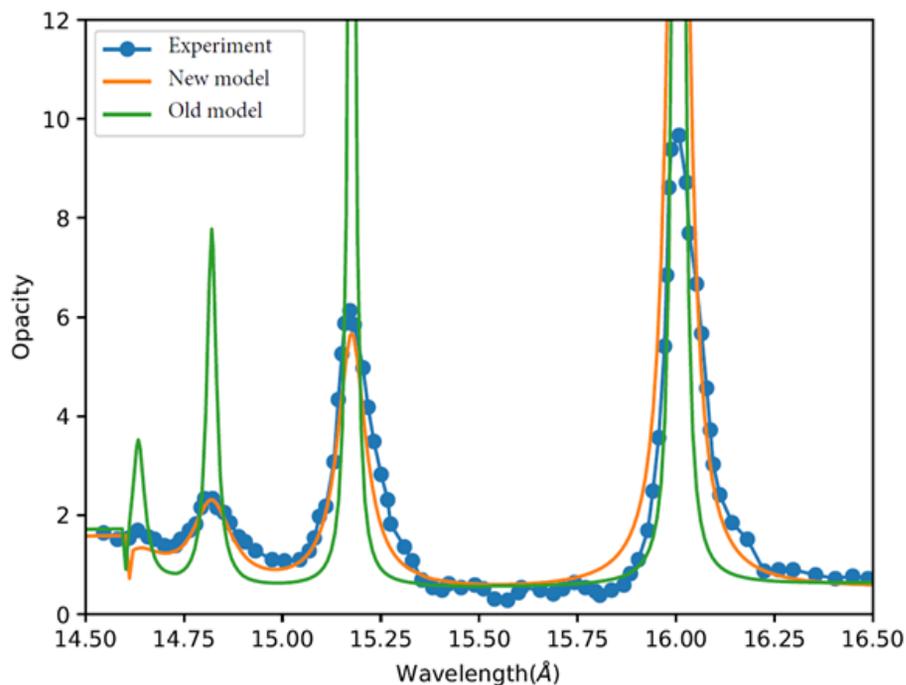


Depending upon plasma conditions and composition, the new Stark broadening model may have a significant impact on the spectral distribution. Figures below show the results of the simulations for:

Typical Ar K-shell emission spectrum from ICF implosions



Calculations of Oxygen opacities



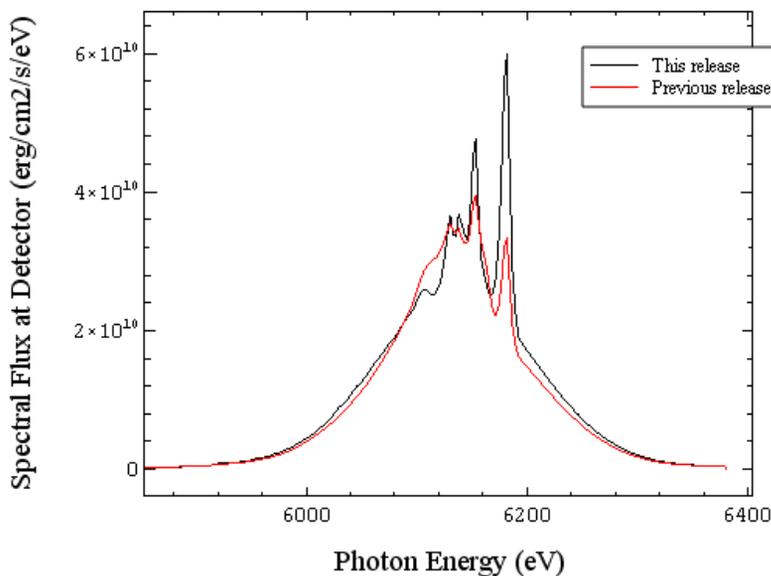
- Additional improvements were made for computational efficiency of calculations in 1D Geometries with high-resolution images, caching of opacities and emissivities is now supported for simulations that include Doppler shifts.
- For X-Ray Thomson Scattering (XRTS), average ionization of each atomic species is now derived from the hydro file. Previously, the first listed atomic species in the Atomic Data page would have its average ionization taken from the "Override mean charge (Z-free)" field, whether or not its checkbox was checked. Furthermore,

subsequent atomic species in the list previously had their average ionization set to their atomic number minus

1. Beginning with this release:

- the first atomic species in the Atomic Data list has its average ionization overridden by the value in the "Override mean charge (Z-free)" field *only* if its checkbox is checked.
- subsequent species in the Atomic Data list will determine their average ionization from the hydro file no matter what.

In some cases, this change will result in different XRTS spectra, however the new version will be more physical. The following example shows a difference in the XRTS spectrum for a CH plasma at 100 eV and 0.25 g/cc, where C is the 2nd element in the Atomic Data list. Thus, for the previous release, C would be treated as having an average ionization of 5.0, while in this release, it gets that value from Spect3D. Furthermore, this example does not have the "Override mean charge (Z-free)" box checked, and its field value has nothing in it. Thus, for the previous release, H would be treated as having an average ionization on 0.0, while in this release, it gets that value from Spect3D:



- For XRTS, the option to output an input deck for the stand-alone code will now create an input deck for ALL zones which participate in scattering. Previously it would only create a file for one zone, and all zones which had errors returned from the XRTS code.
- Hot electron data is now supported for native Lilac HDF5 hydro files. When reading a Lilac file, Spect3D will look for variables named zone/fast_electron_temperature and zone/fast_electron_density.
- Bug fixes:
 - A bug was introduced in version 19.0.0: on some platforms a table with backlighter parameters was not properly displayed in the user interface. This issue is fixed now. Please note that the problem only affected the user interface, the simulation for the problems with backlighters were performed correctly.

VISUALIZER:

- *Known issue:* Drill-down in *Visualizer* 20.0.0 and beyond may produce inconsistent results when done on calculations that include new line width models. This is *not* an issue for *SpectraPLOT*.

SpectraPLOT:

- Plot data for streaked spectra can now be viewed and exported when a spectral resolution is applied.
- Bug fixes:
 - Fixed many irregular plot window behaviors on MacOS such as window ordering and windows blurring together on rare occasions.