5/2/2000 J. Seger
Modified 5/25/2001 S. Klein
Modified 12/09/2002 S. Klein Version 2.0, with
     vector meson interference
     nuclear breakup in two-photon interactions
     bug fixes

The STARlight Monte Carlo models 2-photon and photon-Pomeron interactions in peripheral heavy ion collisions. The physics approach for the 2-photon interactions is described in STAR Note 243. That for the photon-Pomeron interactions is described in Klein and Nystrand, Phys. Rev. C60, 014903 (1999), with the p_t spectrum (including vector meson interference) discussed by Klein and Nystrand in Phys. Rev. Lett. 84, 2330 (2000).

STARlight has several input files, all of which are expected to be in the same directory as the starlight code. User-specified input parameters are read from a file named "starlight.in"; these parameters are described below. The file "starlight.dat" contains a table of differential luminosity values. STARlight checks this file to see whether or not a change in input parameters requires the values to be recalculated; if so, this file is over-written with the new values. If there is no existing starlight.dat file, STARlight will produce one. The data file "jet.dat" contains modified branching ratios for jetset.

The output of the STARlight Monte Carlo can be written to an ascii file named "starlight.out". The format of the text output can be chosen so that it can be read by GSTAR. Alternatively, the output can be chosen to be placed in a zipped PAW ntuple (currently the preferred interface with GSTAR), "evgen.1.nt.gz". The file can be unzipped and looked at directly using PAW, or converted to a root file using the h2root utility. (Type "h2root evgen.1.nt filenameyoulike.root"-- currently this works only in pro.)

How to use:

   1) copy contents of src directory to your own src directory

   2) copy jet.dat and starlight.in from the bin directory into your own bin directory

   3) edit the Makefile to use the appropriate lines depending on whether you are compiling on Linux or Solaris; then type "make" to compile-- the executable "starlight" will be placed in the bin directory
(there are three places to edit-- one is in choosing the appropriate include file, another is either including or not the source ludata.F, and the last is in choosing the appropriate line for the target definition)

4) edit starlight.in to reflect your preferred choice of input parameters-- see starlight.doc in the src directory for an explanation of input parameters

5) in the bin directory, type "starlight" to run; if you selected either text output format, the output will be written to the file starlight.out in the bin directory; if you selected ntuple output, the output will be written to the file evgen.1.nt.gz, and will need to be unzipped (type "gunzip evgen.1.nt.gz")

The contents of a sample starlight.in file are listed below, with explanation. The user should modify this file according to his or her needs.

```
79  197        // Z, A of the colliding ions (symmetric
     collisions are assumed)
100        // gamma for the colliding ions
4.0 -1 50   // maximum and minimum values for w (the gamma-gamma center of mass
     energy, w = 4(E1)(E2), (a -1 tells STARlight to use the default values
     specified in setConst.f; otherwise, specific wmin here, and the number
        of w bins in the lookup tables
3.0 30    // maximum value for y (y is the rapidity, y = 0.5 ln(E1/E2) ) and the
        number of y-bins in the cross section calculation
1    // gg or gP switch -- A 1 here will produce 2-photon channels, a
     // 2 here will produce vector meson channels with a narrow
     //resonance, and a 3 here will produce vector meson channels with
     //a wide (Breit-Wigner) resonance.
10000     // number of events to produce
331  // channel of interest (in PDG notation); currently supported
     options listed below
345738    // random number seed
2    // The form of the output.  A 1 here generates a simple text file.
        '2' generates a text file in the gstar format
        '3' generates a PAW ntuple.
1    // This number controls the nuclear breakup
        // Note that this option only works for lead or gold; it should work at
any energy
     1 = hard sphere nuclei (b>2R)
     2 = both nuclei break up (XnXn)
     3 = a single neutron from each nucleus (1n1n)
     4 = require that neither nucleon break up (with b>2R)
     5 = require that there be no hadronic break up
          (This is similar to option 1, but with the actual hadronic interaction
          probability)
1       0 = no interference (i.e. turned off), 1= interference turned on
```

```
0.5     when interference is turned on, this gives the %age interference 0=
        none, 1=full
0.24.   when interference is turned on, this is the maximum pt considered
120     when interference is turned on, this is the number of pt bins

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Currently supported 2-photon channel options:
      jetset id          particle
   ---------------------------------
     221       eta
     331       eta-prime
     441       eta-c
     10221          f0(975)
     225       f2(1270)
     115       a2(1320)
     335       f2(1525)
     33        rho0 pair
     11        e+/e- pair
     13        mu+/mu- pair
     15        tau+/tau- pair

Currently supported vector meson options:
      jetset id          particle
   ---------------------------------

     113       rho0
     223       omega
     333       phi
     443       J/psi
     913       rho0 + direct pi+pi- (with interference)
The direct pi+pi- fraction is from the ZEUS results
```