**Regular output:**

**- Header/Introduction**

On the start of the program, Magboltz will print the running version of Magboltz, the gases used and their percentages, the gas temperature and pressure, its energy integration from 0.0 to the entered value in 4000 steps, and the inclusion or the exclusion of Penning effects in this simulation. Please note that most of these output values are not calculated, as they are the user’s input.

Magboltz will calculate the upper energy level automatically if specified by the user.

For example,

“PROGRAM MAGBOLTZ 2 VERSION 11.3

MONTE CARLO SOLUTION FOR MIXTURE OF 2 GASES.

------------------------------------------------------

GASES USED PERCENTAGE USED

ARGON ANISOTROPIC 2014 80.0000

CO2 2015 ANISOTROPIC 20.0000

GAS TEMPERATURE = 20.0 DEGREES CENTIGRADE.

GAS PRESSURE = 760.0 TORR.

INTEGRATION FROM 0.0 TO 50.00 EV. IN 4000 STEPS.

PENNING EFFECTS NOT INCLUDED.”

**- Use of Anisotropic scattering**

Magboltz will print the type of models/x-sections that it will use. Nonetheless, Magboltz is hard coded to use type 2 (Version 11.3).

There is three potential outputs in this case.

1) “ISOTROPIC SCATTERING X-SECTIONS USE.”

2) “ANISOTROPIC SCATTERING TYPE 1 (CAPITELLI/LONGO) USED IF AVAILABLE.”

3) “ANISOTROPIC SCATTERING TYPE 2 (OKHRIMOVSKYY) USED IF AVAILABLE.” This is the default Magboltz state.

**- Decorrelation step and length**

Using the input given, Magboltz will determine the decorrelation step and length. Magboltz uses two decorrelation length values 400,000 and 2,000,000. Upon that, Magboltz will use a long decorrelation length if there is pure or almost pure Argon, Krypton and/or Xenon. Regardless, Magboltz will not use a long decorrelation length for the above gases if they are in a high electric field.

The two potential outputs are,

1) “ LONG DECORRELATION LENGTH =2000000 COLLISIONS.”

2) “ SHORT DECORRELATION LENGTH = 400000 COLLISIONS.”

**- The inclusion of the thermal gas motion**

Magboltz will print the following if the thermal motion of gas is included. This output depends on the input specified by the “Gas Motion Assumed To Be At O Kelvin (Static Gas)” checkbox.

The two potential outputs are,

1) “ THERMAL MOTION OF GAS INCLUDED.”

2) “ THERMAL MOTION OF GAS NOT INCLUDED.”

**- Electric and magnetic fields**

Magboltz will print the values of the electric and magnetic fields. It will also print the angle between them. Please note that these values are given by the user input.

Sample output,

“ ELECTRIC FIELD = $E VOLTS/CM.

MAGNETIC FIELD = $B KILOGAUSS.

ANGLE BETWEEN ELECTRIC AND MAGNETIC FIELD = $th DEGREES.”

**- Cyclotron Frequency**

Using the following equation, W = (q \* B)/(m), where m is the mass of the electron, q is the charge of the electron, and B is the magnetic field. Magboltz finds an prints out the Cyclotron Frequency.

Sample output,

“ CYCLOTRON FREQ. = $CF RADIANS/PICOSECOND.”

**- Initial electron energy**

Magboltz calculates the initial electron energy by dividing the entered/calculated value of the electron energy upper limit over 50. Estart = Efinal/50.

Sample output,

“ INITIAL ELECTRON ENERGY = $Estart EV.”

**- Total number of real collisions**

Magboltz, will calculate and print the total number of real collision. Magboltz will use the input given -$NMAX- by the “Number of real collisions(multiple of 10^7).” Please note that this might trigger an error (check Errors division).

“ TOTAL NUMBER OF REAL COLLISIONS = ($NMAX \*40000000).”

**Warnings:**

**- Negative collision frequency warning**

After checking the calculated collision frequency, if the value is a negative number Magboltz will print “WARNING NEGATIVE COLLISION FEQUENCY = $CF KGAS = $gas IE = $IE IF = $IF IARRY= $IARRY EIN= $EIN.”

- **Negative null collision frequency**

After checking the calculated null collision frequency, if the value is a negative number Magboltz will print “ WARNING NEGATIVE NULL COLLISION FREQUENCY= $CF KGAS = $gas IE = $IE IF = $IF IARRY= $IARRY EIN= $EIN.”

**Errors:**

**- Inputting a huge value for the number of real collisions**

After checking the entered value, if the value is a negative number (integer overflow) Magboltz will print “ERROR IN INPUT : NMAX TOO LARGE OVERFLOWED THE ALLOWED INTEGER RANGE OF THE COMPUTER OR COMPILER.”

**- Inputting a wrong value**

After checking the entered value, magboltz will print an error message if the number of gases is less than 0 or bigger than 6, the fraction of one of the gases is 0, and if the total sum of gases fractions is not 100.

This error message will start with “ ERROR IN GAS INPUT : NGAS= $number\_of\_gases”.

This error message will also list the fractions of six gases (it will print 0 for the values of the non existent gases)

**- Isotropy control error**

Magboltz uses a variable named NANISO, the value of this variable should be in the range of 0 – 2. If this values is not in that range, Magboltz will print “INPUT ERROR FOR ISOTROPY CONTROL,PROGRAM STOPPED.” This values is a hard coded value. In other words, to change it one will have to dig into the code and change the assigned value.