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Beam Dump utility Documentation

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U.S. DEPARTMENT OF
ENERGY

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Science

Goals

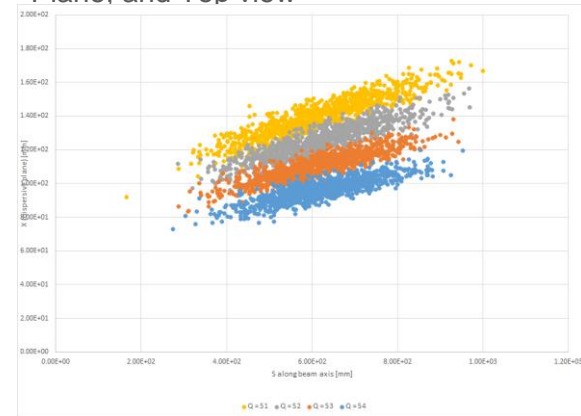
Charge State Calculations

- Get the Charge state probabilities
- Get the Power per Charge

q=54	75.26%	1.58E+03 W
q=53	22.99%	4.84E+02 W
q=52	1.74%	3.66E+01 W
q=51	6.19E-05	1.30E-01 W

Beam Dump Plots

- Calculate the initial parameters from the various inputs
- Use the parameters and rays generated from the Monte Carlo Ray generator to get X and Y coordinates
- Create plots of the beam dump 6 Degree plane, Mid Plane, and Top view



Mid Plane View

UI

Changes to Consider

- Initial Distance isn't currently being used in any calculations, so its removal is advised.
- Delta and 6 Deg Top/Bottom Delta should probably be removed
 - From my understanding the compare the 20 degree and 6 degree settings, but the 20 degree settings have been removed
- Currently the Number of charge states is editable, and set by the number of charge states with a probability greater than 1%. Both can and probably should be changed.
- Updates to the design of the table
 - Like 0 el. Being longer than everything else

The screenshot displays the ARIS Beam Dump software interface with several settings panels:

- Beam Dump (BD) Settings:** Includes fields for AFTER BLOCK (FSD1_SCD1), Initial Distance (1.500 mm), Longitudinal Distance (616.548888 mm), BD Angle (6.000 Deg), BD Width (0.104719 Rad), BD Center (177.8 mm), BD Bottom (130 mm), and BD Top (41.100 mm).
- Charge Settings:** A table showing parameters for 0 el., 1 el., and 2 el. charge states.
- 6 Degree Settings:** Includes Dump Transverse (8.34 mm), Dump Longitudinal (79.350 mm), Downstream Straight Longitudinal (172.460 mm), Upstream Straight Longitudinal (172.510 mm), Downstream Straight Plane (173.410 mm), and Upstream Straight Plane (173.460 mm).
- Delta Settings:** Includes Delta (25.548888 mm), 6 Deg Top Delta, 6 Deg Bottom Delta, and Number of Rays.
- Plots:** Options for 2D (X vs P, X vs L, Y vs L) and 3D (X - Y - P, X - Y - L) plots.

Buttons at the bottom include Make Default, , , and .

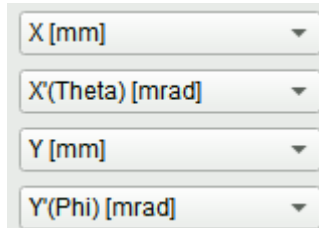
under construction!!

	0 el.	1 el.	2 el.
Z-q = 0	0.846153	0.147544	0.00628986
Power(W)	1781	310.555	13.2391

Calculations

Currently done

- The power before and after the target
- The average charge and the charge state probabilities.
- Updates to the beam dump parameters when changes are made
- The basic framework for calculating position



The Data doCalculations needs to be fed.

Still under construction

- Reading in data from the Monte Carlo ray generator
- Using the MC data along with doCalculations to get the x and y data
- Doing this for different Charge states
- Using the data to make the Beam Dump plots
- The charge calculations differ from the excel sheet

```
double TBeamDump::doCalculations(double X, double Y, double XPrime, double YPrime) // does the calculations for l,p,x, and y
{
    double longDist = ui->L_LongDist->text().toDouble();
    double angle = ui->LE_BDAngleDeg->text().toDouble();

    double l = longDist*qTan(angle)-Y/(qTan(YPrime/1000))+qTan(angle);
    double p = l-longDist/qCos(angle);
    double x = X+l*qTan(XPrime/1000);
    double y = Y+l*qTan(YPrime/1000);

    return l,p,x,y;
}
```

△ Left ope

Further Explanations

Charge2

- Code:
 - `double* chargeProb = charges2(beam, MeV, Ct, true);`
- Charges2 is a modified version of Charges but it instead returns q
- The last four lines of Charges2 can be seen the only change is the returned variable
- The method this is done in should be changed this was just done in a fairly janky way

```
_iQmax = Zb - _iQmax;  
opt->EquilibriumMode = saveEquilibrium;  
  
if(Zb != ce->Z()) return 0;  
return q;
```

```
}
```