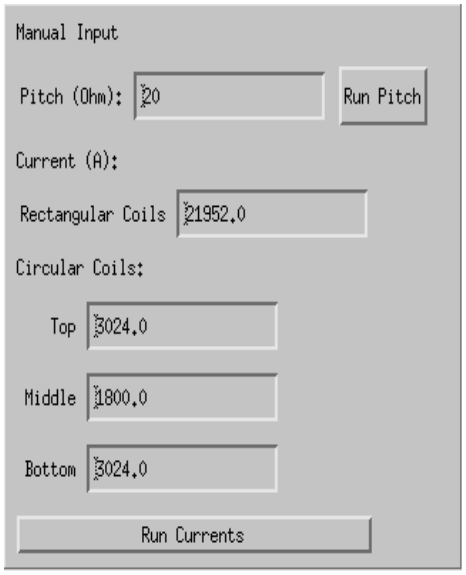
Vacuum Magnetic Field Lines in Helimak

I. Overview

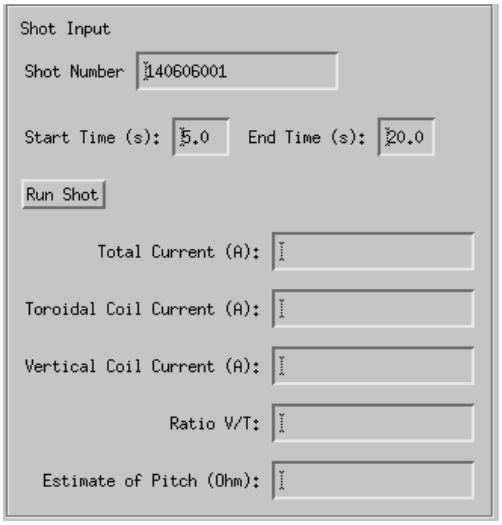
An IDL widget was created to make a simple interface that accepts user input for the code that creates a 3D plot of the magnetic field lines inside the helimak. The parameters of the plot are either entered through a manual input into field entries or extracted from the data saved on the machine MDSPlus tree when a shot number is specified. The widget is separated into four sections: the plot window, manual input window, shot input window and field line entry window. The IDL procedure is *fields.pro.*

II. User Input



The user input section contains entry boxes for the pitch in ohms and the currents in amps in all the rectangular coils and three vertical coils. The field entries are restricted to only accept floating-point values in order to prevent errors. The widget has a choice of whether to run the plot with the values of the currents or the value of the pitch, by pressing either the 'Run Currents' button or 'Run Pitch' button. Since the plotting procedure only accepts currents as input, if the pitch is sent, it is used in an interpolation procedure to give the values of the vertical and toroidal currents. Then the currents are displayed in their corresponding field entries and passed into the plotting procedure. If instead the currents are sent, they are directly passed into the plotting procedure. A value for the pitch is also interpolated and displayed in the field entry. After the values are passed, the plot is created.

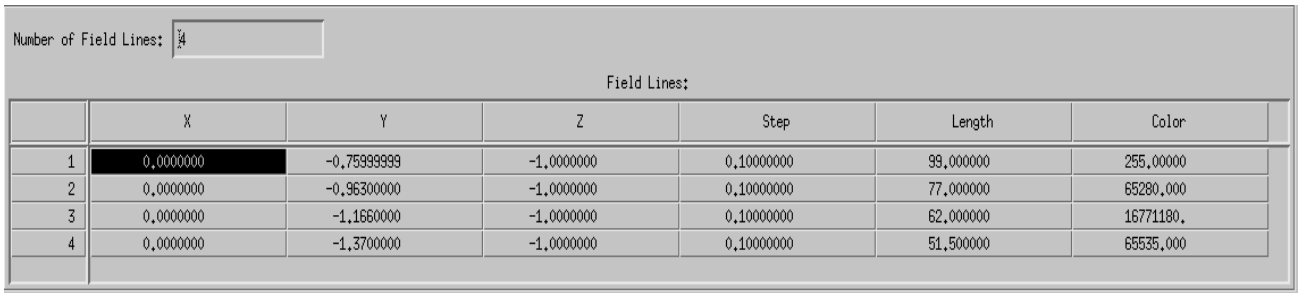
III. Shot Input



The shot input section contains a field entry box to enter the shot number and a button to run it. The field entry for the shot number is restricted to be a 'long' data type. If an invalid shot number is given, an error window is displayed. After the shot is run, the data from the machine MDSPlus tree is extracted and the current is averaged over a default time window from 5.00s to 20.0s, at which the current is relatively stable (the time window can be changed). Then, the values of the currents are displayed and the other non-editable field entries in the shot input section are filled with their corresponding values. After the values are passed, the plot is created.

IV. Field Line Entry

The field line entry section allows an input of the parameters of the field lines to be plotted. The parameters are: the starting point of the line, step size of plot (recommended 0.1), length of line, and color of line. The default number of field lines is set to be four but it can be modified. You specify the number you want in the entry box and press enter. Then, the number of rows, corresponding to the number of lines, will change accordingly. All new entries are defaulted to be zero but you can change them by selecting any cell and typing in a value. Be sure to press enter after entering a value on any cell, or else it won't register when you run the plot. All cells accept a value of data type 'double'. The 'Color' column, however, can also accept a string corresponding to the name of the color, besides accepting a number value that represents the color. However, only certain colors are supported; As indicated in the procedure, *col.pro,* all the supported color string names are: **black, red, orange, yellow, yellow green, dew, green, seafoam, green blue, cyan, sky blue, light blue, blue, violet, magenta, and purple.**

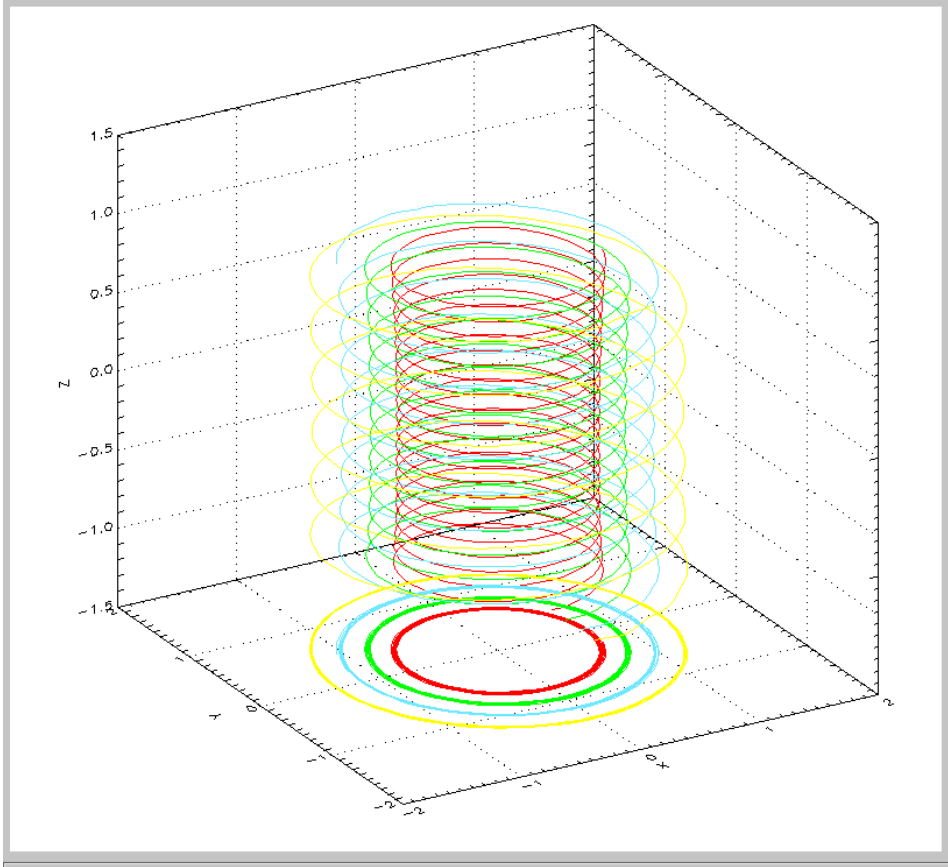


V. Usage

i. ssh into the shanghai server and add -X to allow xterm displays: **ssh -X helimak@shanghai.ph.utexas.edu**
ii. change directory: **cd /aldo/helimak_fields**
iii. start IDL: **idl**
iv. compile pertinent procedures: **@homer.bat**
v. run procedure: **fields**
vi. input parameters and run plots (plotting may take a few seconds)
vii. when finished, press 'quit' button

Notes by Aldo Carranza 07/10/14

Vacuum Magnetic Fields in Helimak



Shot Input

Shot Number: 140606001

Start Time (s): 5.0 End Time (s): 20.0

Run Shot

Total Current (A):

Toroidal Coil Current (A):

Vertical Coil Current (A):

Ratio V/T:

Estimate of Pitch (Ohm):

Manual Input

Pitch (Ohm): 5.00000 Run Pitch

Current (A):

Rectangular Coils: 21952.0

Circular Coils:

Top: 3024.0

Middle: 1800.0

Bottom: 3024.0

Run Currents

Quit

Number of Field Lines: 4

Field Lines:

	X	Y	Z	Step	Length	Color
1	0.0000000	-0.75999999	-1.0000000	0.10000000	99.000000	255.00000
2	0.0000000	-0.96300000	-1.0000000	0.10000000	77.000000	65280.000
3	0.0000000	-1.1660000	-1.0000000	0.10000000	62.000000	16771180.
4	0.0000000	-1.3700000	-1.0000000	0.10000000	51.500000	65535.000