

The New updated Langmuir probe data analysis program

The program Langmuir is now updated to become more users friendly. The new program is called

$[Ne, Ni, Vp, Vf, Te, E, f] = \text{Analyze_Langmuir}(V, I, Area, Mass)$

V and I are the probe current and voltage data. Area represents the probe effective area in M^2 . Mi is the mass of the ions in atomic mass units. These should be available on the matlab work space.

The output arguments are

1. The electron number density Ne
2. The ion number density Ni
3. The plasma potential Vp
4. The floating potential Vf
5. The plasma electron temperature Te
6. E, and f are the electron energy distribution data.

The program fits the I-V data to the equation

$$I = \exp[a_1 \tanh\{(V + a_2) / a_3\}] + a_4$$

And calculated all the plasma parameters using standard procedures from the fitted values of a_1 to a_4

After performing the fit, the software stops waiting for user approval of the fit cross quality. If the fit is OK, just press enter. If the fit (red solid line) is not compatible with the experimental data (black dots) then press control C to stop the program and try to readjust the starting values of the fitting parameters on line

The out puts of the program are

1. The ion saturation current Iis
2. the electron saturation current Ies
3. The electron number density $/M^3$
4. The ion number density $/M^3$
5. The mean electron temperature Te in eV
6. The plasma potential Vp in Volts
7. The plasma floating potential in Volts

As a demonstration the experimental I-V data are included in the zip file these are the probe voltage V, and the probe current I.

Use the following to run the program (The I-V data are saved in I)

```
>>load('I')
```

```
>>[Ne,Ni,Vp,Vf,Te,E,f]=Analyze_Langmuir(V,I, 6.3*10^-7,40)
```

The out put of the program for this test case are

$I_{is} =$
 $-1.8951e-005$
 $I_{es} =$
 $2.3837e-004$
 $N_e =$
 $2.0276e+017$
 $N_i =$
 $1.0221e+017$
 $T_e =$
 5.1949
 $V_p =$
 12.0965
 $V_f =$
 2.8668

And the following plots

