

Function GET_MW – single-thread version

Calling syntax:

```
res = call_external(libname, 'GET_MW', Lparms, Rparms, Parms, $  
T_arr, DEM_arr, DDM_arr, RL)
```

Function parameters:

0. Lparms – 5-element long integer array of dimensions and global (for all voxels) integer parameters (see below).
1. Rparms – 3-element double array of global (for all voxels) real parameters (see below).
2. Parms – array of LOS parameters, $15 \times N_z$ elements, double. Parms[* , i] represents the parameters for *i*th voxel (see below).
3. T_arr – array of temperatures where DEM/DDM are specified, N_T elements, double, in K. The temperature grid is assumed to be the same in all voxels, and the same for both DEM and DDM.
4. DEM_arr – array of DEMs, $N_T \times N_z$, double, in $\text{cm}^{-6} \text{K}^{-1}$. DEM_arr[* , i] represents the DEM for *i*th voxel.
5. DDM_arr – array of DDMs, $N_T \times N_z$, double, in $\text{cm}^{-3} \text{K}^{-1}$. DDM_arr[* , i] represents the DDM for *i*th voxel.
6. RL – input/output array, $7 \times N_f$, double. RL[* , i] corresponds to *i*th frequency (see below).

Array of dimensions and global integer parameters Lparms:

Lparms = [Nz, Nf, NT, DEM_key, DDM_key]

0. Nz – number of voxels along LOS;
1. Nf – number of frequencies in the spectrum;
2. NT – number of temperatures in the T_arr array; must be ≥ 2 – otherwise DEM/DEM are ignored;
3. DEM_key – global DEM on/off key.
 - a. 0: DEM is enabled: it can be used in all or some voxels, depending on the local DEM on/off keys (see below).
 - b. $\neq 0$: DEM is disabled for all voxels, regardless of the local DEM on/off keys.
4. DDM_key – global DDM on/off key: same as above, but for DDM.

Array of global real parameters Rparms:

Rparms = [S, f_0 , Δf]

0. S – visible source area, in cm^2 .
1. f_0 – starting frequency of the spectrum, in Hz:
 - a. is used, only if $f_0 > 0$;
 - b. if $f_0 \leq 0$, the frequencies are taken from the RL[0, *] array.
2. Δf – logarithmic frequency step (is used only if $f_0 > 0$).

Array of parameters Parms (for a single voxel, 15 parameters):

0. Parms[0] = Δz – voxel length, in cm.
1. Parms[1] = T_0 – plasma temperature, in K (is used if DEM or DDM are not specified).
2. Parms[2] = n_0 – either electron concentration or total atomic concentration (depending on other parameters), in cm^{-3} (is used if DEM or DDM are not specified).
3. Parms[3] = B – magnetic field strength, in G.
4. Parms[4] = θ – viewing angle, in degrees.
5. Parms[5] = φ – magnetic field azimuthal angle, in degrees.
6. Parms[6] – emission mechanism flag (rounded to the nearest integer):
 - a. 0: all emission mechanisms (gyroresonance + free-free + contribution of neutrals) are included;
 - b. 1: gyroresonance is off;
 - c. 2: free-free is off;
 - d. 4: contribution of neutrals is off.

Several flags can be combined by usual or bitwise summation: e.g., mechanism flag = 2 + 4 turns off both free-free and contribution of neutrals, etc.
7. Parms[7] = s_{\max} – maximum cyclotron harmonic number.
8. Parms[8] = n_p – proton concentration, in cm^{-3} (is used if DEM or DDM are not specified, and the temperature is low).
9. Parms[9] = n_{H} – neutral hydrogen concentration, in cm^{-3} .
10. Parms[10] = n_{He} – neutral helium concentration, in cm^{-3} .
11. Parms[11] – local DEM on/off key:
 - a. 0: DEM is used (provided that $NT \geq 2$ and DEM is enabled by the global key);
 - b. $\neq 0$: DEM in this voxel is ignored even if it is specified; T_0 and n_0 are used instead.
12. Parms[12] – local DDM on/off key: same as above, but for DDM.
13. Parms[13] – element abundance model:
 - a. 0: coronal (*default*);
 - b. 1: photospheric (Caffau);
 - c. 2: photospheric (Scott).
14. Parms[14] = Vox_ID – voxel type (coronal / chromospheric / etc.), currently ignored.

Input/output array RL:

0. First row (RL[0, *]) – emission frequencies, in GHz. On input, this array is used if $f_0 = \text{Rparms}[1] \leq 0$; otherwise, the frequencies are computed using the f_0 and Δf parameters: $f_1 = f_0 10^{\Delta f}$, $f_2 = f_1 10^{\Delta f}$, etc. On output, this array contains the computed or pre-defined emission frequencies.

Other rows – emission intensities, as observed from the Earth, in sfu:

1. RL[1, *] – left polarization, weak mode coupling;
2. RL[2, *] – right polarization, weak mode coupling;
3. RL[3, *] – left polarization, strong mode coupling;
4. RL[4, *] – right polarization, strong mode coupling;
5. RL[5, *] – left polarization, exact mode coupling.
6. RL[6, *] – right polarization, exact mode coupling.

On input, these arrays specify the emission intensities at the start of the line-of-sight; on output, they contain the emission intensities at the end of the line-of-sight.

Return value: currently, -1 if the input was incorrect (insufficient number of parameters); 0 otherwise.

Function GET_MW_SLICE – multi-thread version

Calling syntax:

```
res = call_external(libname, 'GET_MW_SLICE', Lparms_M, Rparms_M, $  
    Parms_M, T_arr, DEM_arr_M, DDM_arrM, RL_M)
```

Function parameters:

0. Lparms_M – 6-element long integer array of dimensions and global (for all voxels and all LOSs) integer parameters (see below).
 1. Rparms_M – array of real parameters common for all voxels within each LOS, $3 \times \text{Npix}$, double (see below).
 2. Parms_M – array of voxel parameters, $15 \times \text{Nz} \times \text{Npix}$ elements, double (see below).
 3. T_arr – array of temperatures where DEM/DDM are specified, NT elements, double, in K. This parameter is the same as in the GET_MW function: the temperature grid is assumed to be the same in all voxels and all LOSs, and the same for both DEM and DDM.
 4. DEM_arr_M – array of DEMs, $\text{NT} \times \text{Nz} \times \text{Npix}$, double, in $\text{cm}^{-6} \text{K}^{-1}$ (see below).
 5. DDM_arr_M – array of DDMs, $\text{NT} \times \text{Nz} \times \text{Npix}$, double, in $\text{cm}^{-3} \text{K}^{-1}$ (see below).
 6. RL_M – input/output array, $7 \times \text{Nf} \times \text{Npix}$, double (see below).

Array of dimensions and global integer parameters Lparms_M:

Lparms_M = [Npix, Nz, Nf, NT, DEM_key, DDM_key]

0. Npix – number of LOSs.

Other elements (1st to 5th) are the same as the 0th to 4th elements of the Lparms array in the GET_MW function. In particular:

 - a. all LOSs have the same number of voxels Nz;
 - b. the number of frequencies Nf is the same for all LOSs;
 - c. the global DEM and DDM on/off keys are related to all voxels within all LOSs.

Other parameters: sub-arrays Rparms_M[* , i], Parms_M[* , * , i], DEM_arr_M[* , * , i], DDM_arr_M[* , * , i] and RL_M[* , * , i] correspond respectively to the parameters Rparms, Parms, DEM_arr, DDM_arr and RL of the single-thread GET_MW function, for ith LOS.

Return value: currently, -1 if the input was incorrect (insufficient number of parameters); 0 otherwise.