PLT_SPEC

General purpose program for comparing CMFGEN/CMF_FLUX spectral data with observational data. Options are provide to redden the model, smooth the model, and to apply rotational broadening. The philosophy of PLT_SPEC is that the model data is altered to match the observations. Although all care has been taken, it is the users responsibility to check that options perform as indicated.

PLT_SPEC contains a single buffer. Data in this buffer can be changed by PLT_SPEC options, and can be sent (sometimes with changes) to the plotting package (and its buffers). The buffer in PLT_SPEC has no connection to the buffers in the plot package. Commonly used options are RD_MOD (read in CMFGEN model data), RD_OBS (read observational data), and FLAM (apply a correction for reddening and distance, and send buffer data to plot package).

Options are ordered under subject. Associated with each option are requested inputs. Some inputs are not prompted for, and can only be changed from their default values by specifying them in the call, e.g.,

RD_MOD(OVER=T)

Such inputs are placed in ( ).

There are five types of options:

(1) Options such as lx which change plotting style or units.
(2) Option such as RD_MOD(OVER=F) which pass data directly to the plot program.
(3) Option such as RD_MOD(OVER=T) which place data into the (single) buffer where it can be operated on by other commands.
(4) Options such as CNVLV & ROT that operate on the data in the buffer. In some cases the data is left in the buffer -- in other cases (e.g. NORM) it might be sent to the plot package.
(5) Options which call the plot package. This is the default option if data has already been passed to the plot package. If data is only in the PLT_SPEC buffer, use the FLAM command to send it to the plotting buffer.

SVE file:

A text file containing options (transparent and hidden) used in the execution of a command
Default is to write a file 'command.sve' (e.g., rd_mod.sve) containing the options used when a command is executed.
Case is important for the name of the sve file but not for the option.

To execute a previous command, enter .command (e.g., .rd_mod). Options can be changed by supplying the in () after the sve file name., e.g.,

.rd_mod(over=t)

NB: rd_obs, RD_OBS and RD_OBS1 (etc) are treated as the same option in PLT_SPEC, but write different sve files with distinct names.

BOX file:

A text file (e.g., myseq.box) containing an ordered sequence of commands as specified by .sve files, e.g.,

.rd_mod
.cnvlv
.norm

Type box=filename to write a .box file containing several .sve files, or simply use a text editor.

Type #filename to use the box file in PLT_SPEC.

Particularly useful for reading in multiple observational data sets etc.

Typical commands:

A typical series of commands designed to compare model with an observational data set might be as follows:

RD_MOD(OVER=T)	Read in model data in to PLT_SPEC buffer.
ROT	Rotationally broaden buffer spectrum.
CNVLV	Adjust buffer spectrum for instrumental resolution.
NORM	Rectify buffer data if comparing with normalized data and send it to the plot package. For non - rectified data, use FLAM.
RD_OBS_OPT	Read in observational data set (_OPT to create unique sve file).
RD_OBS_UV	Read in observational data set (_UV to create unique sve file).
	Hit enter/return to enter plot package.

Observational Data Files

These are ascii files in column format. All lines at the top of the file are ignored until the key FLUX_UNIT= is found. Additional keywords must follow on consecutive lines, and must contain an =. Only the key FLUX_UNIT must be present. Available keywords, and their corresponding parameters (not case sensitive) are described below. Subroutine that reads in data is $cmfdist/spec_plt/subs/rd_obs_data_v2.f.

FLUX_UNIT	ergs/cm^2/s/Ang ergs/cm^2/s/Hz mJy milli-Jansky Jansky Norm (normalized data)
WAVE_UNIT	Angstroms Um micrometers Hz
AIR_LAM	True (default if $\lambda > 2000$A) False
SCALE_FACTOR	Factor to scale flux values.
DATA_FORM	HR_IUE (IUE data format). Single column format.
LAM_ST	Start wavelength (IUE data format only)
DEL_LAM	Increment (IUE data format only).

Multiple data sets can be included in a single file. These MUST be separated by at least one row of '**********'. Each data set must also have its own set of keywords that MUST begin with FLUX_UNIT=.

Input/output:

RD_CONT	Reads in a model continuum spectrum. The data is sent directly to the plotting package unless OVER=.TRUE. This option can be used to read in a continuum. (Similar to option RD_MOD) [WR]: Write data to file (logical). Default is FALSE. [SCALE]: Value to multiply data by.
RD_EW	Read in EW file. To plot EW as a function of Lambda.
RD_MOD	Reads in a different model spectrum (as contained in OBSFLUX). The data is sent directly to the plotting package unless OVER=.TRUE. [OVER]=T: Reads in a new model spectrum replacing the existing buffer spectrum. No plots are done. [SCALE] : Value to normalize the model data by [Logical].(not done if OVER=T)
RD_OBS	READ in an observation and plot it using existing switch settings. [SCALE]: Value to normalize data by [Logical]. [CLEAN]: Remove data points with zero flux. Useful for operating on UV data [Logical]. Simply averages the neighboring data points. Option could be easily improved. [SMOOTH]: Indicates whether data is to be smoothed. Only option presently available is HAN. If the data is not monotonic (e.g., for overlapping echelle orders) each section is smoothed separately. [RAD_VEL]: Specifies a radial velocity. +ve refers to object moving away. After correction, wavelengths will be smaller. [OVER]: Write observations into buffer. The observations can then, for example, be reddened, or dereddened (formerly TREAT_AS_MOD). [WR]: Write data to file (unit 50).
NORM	Read in a spectrum, and divide the present buffer spectrum by it. The existing model spectrum is not corrupted. Wavelength scales need not be identical. [RD_OBS]: Red in continuum from file in column format. [LIN]: When TRUE, linear interpolation is used. The default is to use monotonic cubic interpolation. [WR]: Write data to file. [OVER]: When set to T, the normalized spectrim is placed in the buffer

	(instead of sending to plot package). [ADD]: Add poissonian noise to spectrum. If TRUE, mean continuum counts and wavelength range are requested.

Axis/Unit Options

LX or LOGX or LINX	Switch between logarithmic and linear X-AXIS (i.e., do the opposite to current setting)
XU XUNITS	Choices: Hz, um, Ang, AA (air Ang), eV, keV, km/s, mm/s (case not important).
LY or LOGY or LINY	Switch between logarithmic and linear Y-AXIS (i.e., do the opposite to current setting)
YU YUNITS	Choices: FLAM <=> ergs/cm^2/s/Ang FNU <=> Jy NU_FNU <=> ergs/cm^2/s
HZ_IN	Switches frequency input units to 10^15 Hz (def)
KEV_IN	Switches frequency input units to KeV
ANG_IN	Switches frequency input units to Angstroms
GR	Enter plot package.
GRNL	Enter plot package -- no labels are passed
EX	Exit program

Spectral options

BB	Sends a Blackbody spectrum. normalized by the radius or the flux at a particular wavelength, to the plotting package. OVER: When TRUE, places spectrum in buffer.
CUM	Creates the cumulative luminosity as function of lambda, and passes the data to the plot package.
CNVLV	Smooth the spectrum using a Gaussian. Used for macroturbulance and instrumental broadening. The smoothing may be carried out either in wavelength space (i.e., with fixed dλ) or in velocity space (i.e., with fixed dV). INST_RES - Resolution in A. RES - Resolution (λ/dλ) or dV(km/s) WAVE_MIN - Specify wavelength region WAVE_MAX - Upper wavelength bound MIN_RES - Minimum resolution of model spectrum (km/s) FFT - Use FFT for convolution
EBMV	Plots A(Lambda) as a function of X unit. R_EXT --- (==A(V)/EBMV) There are 4 interstellar extinction laws available: Galactic: Clayton, Cardelli, and Mathis (λ > 1000Å) Galactic: Howarth (1983, MNRAS, 203, 301) (λ > 912Å) LMC: Howarth (1983, MNRAS, 203, 301)(λ > 912Å) SMC: Gordon et al. (2003, ApJ, 594, 279)
EXT	Extract a spectrum (from buffer spectrum) at fixed resolution. Buffer spectrum is overwritten. Prior to this command it may be necessary to smooth the buffer spectrum to ensure Nyquist sampling theorem is satisfied.
FLAM	Passes data in the buffer to plot program; command control is then passed to the plot package. The type of axes are determined by the X and Y axis options. E(B-V) [see EBMV option for options] and a distance are requested. Defaults are zero and 1kpc
FNU	Same as FLAM
GEN	Combination of RD_MOD. ROT, ISABS & NORM

ISABS	Applies interstellar line absorption (primarily HI and H_2) to buffer spectrum. The following parameters are requested: T_IN_K - Excitation temperature (km/s). V_TURB - Turbulent velocity. Used with T_IN_K to compute absoption profile. LOG_NTOT - HI column density (cm-2) LOG_H2_NTOT - H2 column density (cm-2) HI_ABS - Allow for HI absorption (logical) H2_ABS - Allow for H_2 absorption (lgical) V_R - Radial velocity offset (km/s) WAVE_MIN - Specifies region to be changed WAVE_MAX MIN_RES - Minimum model resolution in km/s.
ROT	Rotationally broaden the spectrum. A simple convolution is performed. Required: Vsini In km/s. Eps Limb-darkening parameter -- default=0.5): $I(\mu) = 1 - \varepsilon + \mu\varepsilon$
WRFL	Same as FLAM except data is written to unit 50.

Miscellaneous Options

DV	Plots the coefficients for the cubic polynomial used to interpolate the buffer spectrum.
FILT	
MAG	Output approximate magnitudes in various filter systems.
ZAN	Output Zanstra parameters. For example, the number of photons emitted shortward of the Lyman limit.