dopsp_difdop

1.0

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Contents

1 dopsp_difdop suite

1.1 Introduction

Here is the documentation for dopsp_difdop suite, which is a collection of matlab scripts, functions and graphical user interfaces. The documentation here may not be up to date even though it is automatically generated by doxygen. This is because matlab structures do not have well defined types and they have to be written by hand into the documentation.

Also there may be functions which are not documented. Hopefully we will be updating these documentations in regular intervals.

1.2 Primary Functions

- Initialization Functions
  - dopsp_difdop.m
  - dopsp_loaddop.m
- Graphical User Interface
  - gui_difdop.m

2 Directory Hierarchy

2.1 Directories

This directory hierarchy is sorted roughly, but not completely, alphabetically:

3 Class Index

3.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

4 File Index

4.1 File List

Here is a list of all documented files with brief descriptions:

5 Directory Documentation

5.1 dopsp_fit/ Directory Reference

Files

- file **dopsp_check_fit.m**
- file **dopsp_check_fit_all.m**
- file **dopsp_chisqr.m**
- file **dopsp_chisqr_lin.m**
- file **dopsp_chisqr_log.m**

- file **dopsp_fit_all.m**
- file **dopsp_fit_doublegaussian.m**
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- file **dopsp_fit_g.m**
- file **dopsp_fit_gaussian.m**
- file **dopsp_fit_gaussian_init.m**
- file **dopsp_fit_gg.m**
- file **dopsp_fit_l.m**
- file **dopsp_fit_ll.m**
- file **dopsp_fit_lorentzian.m**
- file dopsp_fit_pwlin.m

  function out = dopsp_fit_pwlin(in,f,n)

- file **dopsp_fit_t.m**
- file **dopsp_fit_taylor.m**
- file **dopsp_fit_taylor_init.m**
- file **dopsp_fit_triplegaussian.m**
- file **dopsp_fit_tt.m**
- file **dopsp_fit_tt_init.m**
- file **dopsp_fit_ttt.m**
- file **dopsp_fit_ttt_init.m**
- file **dopsp_gaussian.m**
- file **dopsp_iterate_fit.m**
- file **dopsp_lorentzian.m**
- file dopsp_pwlin.m

  function out = dopsp_pwlin(pars,f,n)

- file dopsp_taylor.m

  out = dopsp_taylor ([x],f,in)

5.2 gui/ Directory Reference

Files

- file **dene.m**
- file **electron.m**
- file **electron42770.m**
- file **electron42772.m**
- file gui_difdop.m

  function varargout = gui_difdop(varargin)

- file gui_difdop_true.m

  function varargout = gui_difdop_true(varargin)

- file **gui_fitdlg.m**

5.3 utils/ Directory Reference

Files

- file **affect.m**
- file **difdop_get_cor.m**
- file dopsp_build_profs.m

  function [dop_out]= dopsp_build_profs (dop_in)

- file dopsp_build_specs.m

  function dop_out = dopsp_build_specs (dop_in)

- file dopsp_difdop.m

  function [difdop_info dop]=dopsp_difdop(in)

- file **dopsp_find_allpeaks.m**
- file dopsp_find_central.m

  function [outm0 outm1] = dopsp_find_central(sk, mesk(opt), sm_lvl(opt))

- file dopsp_find_forwsc_all.m

  function out = dopsp_find_forwsc_all(in,d1,d2)

- file dopsp_find_forwsclm.m

  function out = dopsp_find_forwsclm(in,l,m,d1,d2)

- file dopsp_find_peaks.m

  function [out] = dopsp_find_peaks(sk)

- file dopsp_find_validrange_all.m

  function out = dopsp_find_validrange_all(in,n)

- file dopsp_get_freq.m

  function out = dopsp_get_freq(in)

- file dopsp_get_fwsrange.m

  function out = dopsp_get_fwsrange(in,l,m)

- file **dopsp_get_mode.m**
- file dopsp_get_noise_lvl.m

  function out = dopsp_get_noise_lvl(in,f)

- file **dopsp_get_nval.m**
- file dopsp_get_nval_all.m

  function out = dopsp_get_nval_all(dop)

- file **dopsp_get_urange.m**
- file **dopsp_get_vrange.m**
- file **dopsp_get_wappspec.m**
- file dopsp_loaddop.m

  function [difdop_info dop]=dopsp_loaddop(filename,pathname(opt),gui_on(opt))

- file dopsp_loadstruct.m

  function out=dopsp_loadstruct(filename)

- file **dopsp_nulle_interp_all.m**
- file **dopsp_pars_gtof.m**
- file dopsp_probe.m

  function out = dopsp_probe(in,f)

- file **dopsp_raytrace.m**
- file dopsp_read_acqui.m

  function difdop_acqui = dopsp_read_acqui(numchoc)

- file dopsp_read_lent.m

  function difdop_lent lent = dopsp_read_lent (numchoc)

- file dopsp_read_tdifdop.m

  TDIFDOP = dopsp_read_tdifdop (shot_no).

- file dopsp_read_tsinfo.m

  difdop_tsinfo = dopsp_read_tsinfo (shot_no)

- file dopsp_read_verin.m

  function difdop_verin = dopsp_read_verin(numchoc)

- file **dopsp_sangle.m**
- file **dopsp_savedop.m**
- file **dopsp_scptodifdop.m**
- file dopsp_str2ws.m

  this is a script, which uses dopsp_strvar variable and brings all its fields to the current working space.

- file **dopsp_transfer.m**
- file **dopsp_update_mode.m**
- file **dopsp_wapp.m**
- file **dopsp_wapp_lin.m**
- file dopsp_wavedec.m

  function [wC wL] = dopsp_wavedec(in,dec_lvl,wavelet_type) does wavelet decomposition of the log10(in).

- file dopsp_wavedec_all.m

  function [out] = dopsp_wavedec_all(in,dec_lvl,wavelet_type)

- file dopsp_wavedec_lin.m

  function [wC wL] = dopsp_wavedec_lin(in,dec_lvl,wavelet_type) does linear wavelet decomposition.

- file **find_doppler_max.m**
- file **get_difdop_cor.m**
- file **question.m**
- file **rbrect.m**
- file **setstrl.m**
- file **smooth.m**

6 Class Documentation

6.1 difdop_acqui Struct Reference

the structure, which contain information about acquisition.

6.1.1 Detailed Description

```
struct difdop_acqui {
   Angle_Ini     : Initial angle
}
```

The documentation for this struct was generated from the following file:

- utils/dopsp_read_acqui.m

6.2 difdop_info Struct Reference

Primary difdop structure containing everything else.

6.2.1 Detailed Description

```
struct difdop_info {
   numchoc               : Shot number.
   date                  : date.
   heure                 : time.
   outlevel              : Level of output -> 0->none >=3->a lot.
   gui_on                : specifies whether the gui is on or not.
   struct difdop_verin    verin   : structure which contain information about ve
     rin.
   struct difdop_lent     lent    : structure about beam.
   struct difdop_acqui    acqui   : structure about acquisition.
   struct difdop_tsinfo   tsinfo  : structure with time series information.
   struct difdop_spectra  spec    : the main data structure with everything abou
     t spectra.
}
```

The documentation for this struct was generated from the following file:

- utils/dopsp_difdop.m

6.3 difdop_lent Struct Reference

structure, which contains information about the beam.

6.3.1 Detailed Description

```
struct difdop_lent {
   Polarisation : X or O mode
   svideo       :
   srms         :
   sfreq        : measurement of the angle by the inclinometry
   tlent        :
   wsfreq       : smoothed version of sfreq
}
```

The documentation for this struct was generated from the following file:

- utils/dopsp_read_lent.m

6.4 difdop_tsinfo Struct Reference

difdop structure containing time series information.

6.4.1 Detailed Description

```
struct difdop_tsinfo {
   igintron : time offset (e.g. tnl_Real=ignitron+tnl)
   tIp      : times vector for poloidal current.
   Ip       : poloidal current time series
   tItor    : times vector for toroidal current.
   Itor     : toroidal current time series
   tnl      : times vector for density
   nl       : plasma density
   tfci     : times vector for ion cyclotron heating.
   fci      : ion cyclotron heating power (units?) time series
   thyb     : times vector for lower hybrid heating
   hyb      : lower hybrid heating power time series.
   tq       : times vector for safety factor?
   SQPSI    : safecty factor time series.
   cq       :
   tmin     :
   tmax     :
   SAMIN    :
   ta       :
   ca       :
   tR       : times of measurements for plasma major radius.
   SRMAJ    : plasma major raduis time series.
   cR       :
   tZ       : Shafranov shift??
   SZPOS    :
   cZ       :
   tgne     :
   GNE      :
   tidn     :
   idn      :
   ttece    :
   Tece     :
   kece     :
   duree_ip :
}
```

The documentation for this struct was generated from the following file:

- utils/dopsp_read_tsinfo.m

6.5 difdop_verin Struct Reference

the structure, which contain information about verin.

6.5.1 Detailed Description

```
struct difdop_verin {
   Angle_Ini     : Initial angle
```

```
    NbDecl_verin  : Number of sweeps
    Angle_Decl    : Angles of these sweeps
    VitAng_Decl   : Speeds of these sweeps
    Angle_Top     : Angle defined in Top?
    sposverin     : time series of internal angle measurements.
    sangle        : corrected time series.
}
```

The documentation for this struct was generated from the following file:

- utils/dopsp_read_verin.m

7 File Documentation

7.1 dopsp_fit/dopsp_fit_pwlin.m File Reference

function out = dopsp_fit_pwlin(in,f,n)

7.1.1 Detailed Description

fits a piecewise linear function of n points using fminsearch.

Parameters:

in : data

f : frequency

n : number of points

Returns:

out : the parameters corresponding to the piecewise linear function, namely out(1:n) -> m values(/1000), out(n:2n) -> y values.

7.2 dopsp_fit/dopsp_pwlin.m File Reference

function out = dopsp_pwlin(pars,f,n)

7.2.1 Detailed Description

the piecewise linear function.

Parameters:

pars : the parameters, pars(1:n) -> m/1000, pars(n+1:2n) -> F(m), where f(m) are the frequencies at which the derivative changes.

f : frequencies

n : number of points

Returns:

out : the values of the function for all f.

7.3 dopsp_fit/dopsp_taylor.m File Reference

out = dopsp_taylor ([x],f,in)

Functions

- ret **dopsp_taylor** (type x, type f, type mesk)

7.3.1 Detailed Description

Parameters:

x(1) = k2u2

x(2) = Amplitude

x(3) = fc : central frequency

x(4) = taul : lagrangian correlation time

in = dop.spec

in order to obtain a $\sim$ gaussian you need to put x(4) ->1 and x(1)=4∗pi^2∗width^2 x(2)=sqrt(2∗pi)∗width∗ampl where width is the width ampl is tha amplitude of the gaussian [i.e. x(1) and x(2) of dopsp_gaussian].

7.4 gui/gui_difdop.m File Reference

function varargout = gui_difdop(varargin)

Functions

- void **remreg_delfcn** (type src, type eventdata)

7.4.1 Detailed Description

This is the main gui file which uses all the other functions. It can be run at nashira.cad.cea.fr in order to view things. or at difdop.polytechnique.fr or any other computer with matlab and with the datafiles, where some functionality would be disabled. Currently it is in pre-alpha development state and is seeing rapid development.

it is started simply by typing

```
gui_difdop
```

in matlab prompt.

Here is the matlab GUIDE's help about this function:

GUI_DIFDOP M-file for gui_difdop.fig GUI_DIFDOP, by itself, creates a new GUI_DIFDOP or raises the existing singleton∗.

H = GUI_DIFDOP returns the handle to a new GUI_DIFDOP or the handle to the existing singleton∗.

GUI_DIFDOP('CALLBACK',hObject,eventData,handles,...) calls the local function named CALLBACK in GUI_DIFDOP.M with the given input arguments.

GUI_DIFDOP('Property','Value',...) creates a new GUI_DIFDOP or raises the existing singleton∗. Starting from the left, property value pairs are applied to the GUI before gui_difdop_OpeningFunction gets called. An unrecognized property name or invalid value makes property application stop. All inputs are passed to gui_difdop_OpeningFcn via varargin.

∗See GUI Options on GUIDE's Tools menu. Choose "GUI allows only one instance to run (singleton)".

See also: GUIDE, GUIDATA, GUIHANDLES

7.5 gui/gui_difdop_true.m File Reference

function varargout = gui_difdop_true(varargin)

Functions

- void **button_down** (type src, type eventdata)

7.5.1 Detailed Description

This is the main gui file which uses all the other functions. It can be run at nashira.cad.cea.fr in order to view things. or at difdop.polytechnique.fr or any other computer with matlab and with the datafiles, where some functionality would be disabled. Currently it is in pre-alpha development state and is seeing rapid development.

it is started simply by typing

```
gui_difdop_true
```

in matlab prompt.

Here is the matlab GUIDE's help about this function:

GUI_DIFDOP_TRUE M-file for gui_difdop_true.fig GUI_DIFDOP_TRUE, by itself, creates a new GUI_DIFDOP_TRUE or raises the existing singleton∗.

H = GUI_DIFDOP_TRUE returns the handle to a new GUI_DIFDOP_TRUE or the handle to the existing singleton∗.

GUI_DIFDOP_TRUE('CALLBACK',hObject,eventData,handles,...) calls the local function named CALLBACK in GUI_DIFDOP_TRUE.M with the given input arguments.

GUI_DIFDOP_TRUE('Property','Value',...) creates a new GUI_DIFDOP_TRUE or raises the existing singleton∗. Starting from the left, property value pairs are applied to the GUI before gui_difdop_OpeningFunction gets called. An unrecognized property name or invalid value makes property application stop. All inputs are passed to gui_difdop_true_OpeningFcn via varargin.

∗See GUI Options on GUIDE's Tools menu. Choose "GUI allows only one instance to run (singleton)".

See also: GUIDE, GUIDATA, GUIHANDLES

7.6 utils/dopsp_build_profs.m File Reference

function [dop_out]= dopsp_build_profs (dop_in)

Functions

- rets **dopsp_build_profs** (type in)

7.6.1 Detailed Description

Parameters:

difdop_info dop_in : input structure. difdop_info dop_out : the output structure

7.7 utils/dopsp_build_specs.m File Reference

function dop_out = dopsp_build_specs (dop_in)

7.7.1 Detailed Description

Parameters:

dop_in : initial structure (it should be combined after running dopsp_read_∗ functions)

: output structure with "spec" substructure added to it.

7.8 utils/dopsp_difdop.m File Reference

function [difdop_info dop]=dopsp_difdop(in)

7.8.1 Detailed Description

This is the main function to call for filling the "dop" structure. Currently it will read everything we need from the tore supra database calling various other functions to read different parts of the data and calling dopsp_build_spec for building the spectra as we will need them. It can be called in two ways:

```
dop=dopsp_difdop(numchoc)
```

Parameters:

numchoc the shot number

or

```
dop.numchoc=39596
dop=dopsp_difdop(dop)
```

where dop is a structure which is already populated (at least dop.numchoc has to be defined).

difdop_info : dop

7.9 utils/dopsp_find_central.m File Reference

function [outm0 outm1] = dopsp_find_central(sk, mesk(opt), sm_lvl(opt))

7.9.1 Detailed Description

finds the central region of the given function assuming it has a peak near the center.

Parameters:

sk : the spectrum (e.g. dop.spec.mode.Sk{1}(:,1)

sm_lvl(opt) : the smoothing level (default 16)

mesk : the mask

7.10 utils/dopsp_find_forwsc_all.m File Reference

function out = dopsp_find_forwsc_all(in,d1,d2)

7.10.1 Detailed Description

calls dopsp_find_forwsc for each element.

Parameters:

in : input spectrum structure

d1 : coarse graining strength for details

d2 : coarse graining strength for trends

Returns:

out : output spectrum structure

7.11 utils/dopsp_find_forwsclm.m File Reference

function out = dopsp_find_forwsclm(in,l,m,d1,d2)

7.11.1 Detailed Description

finds the region around zero, possibly corresponding to the reflected forward scattering.

Parameters:

in : the spectrum

l : angle no

m : step no

d1 : coarse graining strength for details

d2 : coarse graining strength for trends

Returns:

out: [lower limit, upper limit] (in units of frequency.) if the input data is such that the second derivative does not change sign left of zero, and empty matrix is returned.

7.12 utils/dopsp_find_peaks.m File Reference

function [out] = dopsp_find_peaks(sk)

Functions

- rets **dopsp_find_peaks** (type sk, type mesk)

7.12.1 Detailed Description

finds and returns two peaks, the first one is the central peak, the second one is the doppler peak.

Parameters:

sk : the input spectrum.
out(1:3) : gaussian parameters (with range 1:length(sk)) for the central peak (A, x0, w)
out(4:6) : gaussian parameters (with range 1:length(sk)) for the doppler peak (A, x0, w)

7.13 utils/dopsp_find_validrange_all.m File Reference

function out = dopsp_find_validrange_all(in,n)

7.13.1 Detailed Description

finds the region of general validity removing the leftmost and rightmost regions where the derivative starts to increase.

Parameters:

in : input spectrum structure
n : precentage of the maximum derivative that will be allowed.

Returns:

: output spectrum structure. the result is saved in vlims cell. first element being the left hand limit and the second being the right hand limit.

7.14 utils/dopsp_get_freq.m File Reference

function out = dopsp_get_freq(in)

7.14.1 Detailed Description

returns the frequency vector.

Parameters:

in : spectrum structure.

Returns:

f=(-nfft/2:nfft/2-1)/nfft/(round(dtDifdop∗1e9)/1e9);

7.15 utils/dopsp_get_fwsrange.m File Reference

function out = dopsp_get_fwsrange(in,l,m)

7.15.1 Detailed Description

returns the frequency range of the forward scattering region, that was previously identified by find_forwsc_-all();

Parameters:

in : input spectrum structure

l : angle no.

m : step no.

Returns:

out : a vector of the frequencies in the forward scattering region.

7.16 utils/dopsp_get_noise_lvl.m File Reference

function out = dopsp_get_noise_lvl(in,f)

7.16.1 Detailed Description

returns the noise level for given spectrum data.

Parameters:

in : data

f : frequency

Returns:

out : noise level

7.17 utils/dopsp_get_nval_all.m File Reference

function out = dopsp_get_nval_all(dop)

7.17.1 Detailed Description

runs dopsp_get_nval for each angle and step using the fitted taylor distribution parameters.

Parameters:

dop : the input dopsp structure

Returns:

out : the processes dopsp structure.

7.18 utils/dopsp_loaddop.m File Reference

function [difdop_info dop]=dopsp_loaddop(filename,pathname(opt),gui_on(opt))

7.18.1 Detailed Description

This is the function for loading a dop structure from file. Normally one would give the name of the xml file as the filename. However this file contains the names of 4 other files saved in hdf5 format. Those files should exist as indicated in the xml file.

Parameters:

filename : name of the xml file

pathname : optional pathname for the xml file, if this is not specified,

gui_on : do you want the wait bar. the current directory is used.

7.19 utils/dopsp_loadstruct.m File Reference

function out=dopsp_loadstruct(filename)

7.19.1 Detailed Description

loads a .mat file as a structure. Each variable in the mat file is loaded as a field of the structure. For instance if we have a variable called 'x' in the mat file. it is loaded into 'out.x'.

Parameters:

filename : the name of the file to be loaded

Returns:

out : the resulting struct.

7.20 utils/dopsp_probe.m File Reference

function out = dopsp_probe(in,f)

7.20.1 Detailed Description

Probes the data to find out basic properties of the data, such as how many peaks it has, what are the basic trends (symetric vs. not symmetric) etc. Can create a "probe_file" which will speed up consequent fits with the same data and/or allows direct editing of the initialization parameters by hand if necessary.

Parameters:

in input data

f frequency

ncut(optional) the number of points in the piecewise linear fit.

Returns:

out : structure describing the probe info.

7.21 utils/dopsp_read_acqui.m File Reference

function difdop_acqui = dopsp_read_acqui(numchoc)

7.21.1 Detailed Description

Reads information related to acquisition.

Parameters:

numchoc the shot number difdop_acqui

7.22 utils/dopsp_read_lent.m File Reference

function difdop_lent lent = dopsp_read_lent (numchoc)

7.22.1 Detailed Description

Reads information related to the beam.

Parameters:

numchoc : the shot number difdop_lent : lent

7.23 utils/dopsp_read_tdifdop.m File Reference

TDIFDOP = dopsp_read_tdifdop (shot_no).

Functions

- rets **dopsp_read_tdifdop** (type numchoc)

7.23.1 Detailed Description

Reads TDIFDOP variable. (shot_no>32305 && shot_no <32945) not implemented yet!

Parameters:

shot_no : the shot number TDIFDOP : Time(s) for difdop

7.24 utils/dopsp_read_tsinfo.m File Reference

difdop_tsinfo = dopsp_read_tsinfo (shot_no)

7.24.1 Detailed Description

Reads time series information, i.e. information on triggers, acqusition mode and frequencies etc.

Parameters:

shot_no : the shot number difdop_tsinfo

7.25 utils/dopsp_read_verin.m File Reference

function difdop_verin = dopsp_read_verin(numchoc)

7.25.1 Detailed Description

Reads information related to verin.

Parameters:

numchoc the shot number difdop_verin

7.26 utils/dopsp_str2ws.m File Reference

this is a script, which uses dopsp_strvar variable and brings all its fields to the current working space.

7.26.1 Detailed Description

Note that nothing is declared global. so the script can be called from a function and the actual working space remain unmodified.

example usage:

dopsp_strvar=dop.plasma; dopsp_str2ws;

Parameters:

dopsp_strvar :

7.27 utils/dopsp_wavedec.m File Reference

function [wC wL] = dopsp_wavedec(in,dec_lvl,wavelet_type) does wavelet decomposition of the log10(in).

7.27.1 Detailed Description

Parameters:

in : raw data

dec_lvl : possible minimum resolution (1/2^dec_lvl)

wavelet_type : type of wavelet 'haar', 'db8' etc.

Returns:

[wC,WL] : wavelet coefficients as returned by wavedec.

7.28 utils/dopsp_wavedec_all.m File Reference

function [out] = dopsp_wavedec_all(in,dec_lvl,wavelet_type)

7.28.1 Detailed Description

---------- simply does a 'haar' wavelet decomposition and saves the result in [Skw_WC,Skw_wL]

Parameters:

in : input spectum structure

dec_lvl : usually 5, minimum_resolution that may possibly be needed. i.e. min_Resolution->Resolution/2^(dec_lvl)

wavelet_type : 'haar', 'db3' etc. If 'haar' we also do spline interpolation if you don't want splines use 'db1' instead.

Returns:

out : output spectrum structure

Note that we actually store the wavelet transform of the logarithm however the get_wappspec returns 10^(inv_wavelet_transform);

7.29 utils/dopsp_wavedec_lin.m File Reference

function [wC wL] = dopsp_wavedec_lin(in,dec_lvl,wavelet_type) does linear wavelet decomposition.

7.29.1 Detailed Description

Parameters:

in : raw data

dec_lvl : possible minimum resolution (1/2^dec_lvl)

wavelet_type : type of wavelet 'haar', 'db8' etc.

Returns:

[wC,WL] : wavelet coefficients as returned by wavedec.

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