CorAL User's Guide

David Brown and Mike Heffner
Lawrence Livermore National Laboratory, Livermore, CA 94550 USA
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I. INTRODUCTION

CorAL rules!
We work in the Bertsch-Pratt coordinates in the pair center of mass frame.

II. GLOBAL PARAMETERS

Global parameters are set upon creation of the global-parameters class, using the following scheme:

1. Check command line for name of user's global parameter file
2. failing that, check for "prefs.dat"
3. failing that, default to settings in constructor

Table Itable.1 lists all of the global parameters used by the code. You can put others in your prefs.dat file, but they will be ignored by the code.
The syntax for the file is as follows. Each entry is put in like:

```
<option> = <setting>
```

III. INPUT COMMAND FILE

There is a front-end for CorAL called reefer. reefer takes a text file as input and attempts to carry out the commands listed in this file. The commands all have the following syntax:

```
<action> <input_string> <output_string> {
    [options]
}
```

Note that the different tokens are separated by whitespace and any or all of a line may be commented out with the comment string (by default this is set to "#", but may be changed in the global preferences). Here <input_object> and <output_object> are either Objects, such as a correlations or a sources, or file names. Table IItable.2 is a complete list of commands and what things they act on.

When a new object is created, CorAL attempts to create it with reasonable defaults. When a reefer command is executed, reefer uses these defaults unless overidden in the input file. To control the way a new object is made, add a section after a command as follows:

```
<action> <input_string> <output_string>{
    [option 1] = <value 1>
    [option 2] = <value 2>
    .
    .
    .
    <datablock> {
        <data in columns>
        .
        .
        .

    }
    <string_list> {
        <string>
        .
        .
        .

    }
}
```

Objects are also described in this manner, but with a few additions. The main difference being that Object descriptions may have nested sections:

```
<object> {
    [option 1] = <value 1>
    [option 2] = <value 2>
    .
```

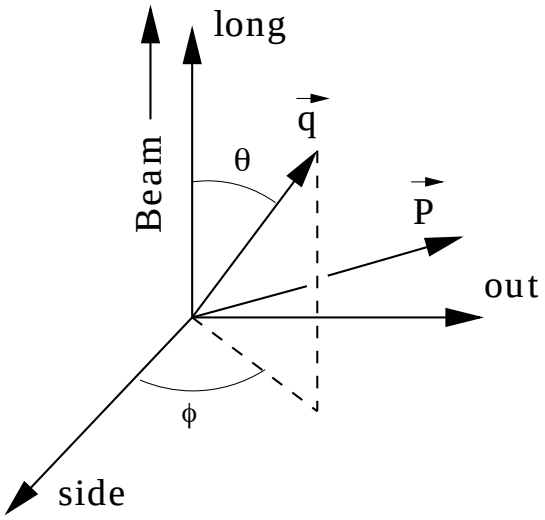

FIG. 1: The Bertsch-Pratt coordinates.

Option	Default Value	Description
messaging_level	0	description
momentum_units	MeV	description
distance_units	fm	description
comment_string	#	description

TABLE I: Global settings.

```
    .
    .
    <datablock> {
        <data in columns>
        .
        .
        .

    }
    <string_list> {
        <string>
        .
        .
        .

    }
    .
    .
    .
}
```

The purpose of such subsections is to store the actual data of the object. They are described in each `object`'s description.

IV. COMMAND OPTIONS

In this section, we list all of the options available to each command and the defaults.

A. `read`

Reads in an `Object` named `<object_name>` from file `<file_name>` and inserts it into the `ObjectMap`. It is invoked by:

```
read <object_name> <file_name>
```

B. `write`

Writes an `Object` named `<object_name>` from the `ObjectMap` to file `<file_name>`. It is invoked by:

```
write <object_name> <file_name>
```

C. `create`

```
create <object_name> <object_type>
```

D. `expand`

```
expand <3d_cart corr name> <3d_sphr corr name>
```

E. `unexpand`

```
unexpand <3d_sphr corr name> <3d_cart corr name>
```

F. `image`

```
image <corr_name> <source_name>
```

G. `unimage`

```
unimage <source_name> <corr_name>
```

H. `chi2`

```
chi2 <corr1>  <corr2>
```

I. `gaussparam`

```
gaussparam <source_name>
```

J. `intbump`

```
intbump <object_name>
```

K. `powpec`

```
powspec <object_name>
```

L. `fit`

```
fit <corr_name>
```

Command	First Argument	Second Argument	Short Description
Input/Output Commands			
`read`	object name	file name	Reads `Object` from file
`write`	object name	file name	Writes `Object` to file
`create`	object name	object type	Creates an `Object`
Correlation/Source Processing Commands			
`expand`	name of a `corr_3d_cart`	name of a `corr_3d_sphr`	Expands correlation in $Y_{\ell m}$'s
`unexpand`	name of a `corr_3d_sphr`	name of a `corr_3d_cart`	Converts a correlation from spherical to cartesian coords. (inverse of `expand`)
`image`	name of a correlation	name of a source	Images a correlation
`unimage`	name of a source	name of a correlation	Reconstructs correlation from imaged source (inverse of `image`)
Commands for Characterizing Correlation/Sources			
`gaussparam`	name of a source	n/a	Does a cheezy "fit" to a Gaussian
`intbump`	object name	n/a	Integrates the volume under the bump of a corr or source
`powspec`	name of a `corr_3d_sphr`	n/a	Computes power spectrum of source as function of ℓ
Plotting Commands			
`slicerad`	object name	file name	description
`slices`	object name	file name	description
`sliceo`	object name	file name	description
`slicel`	object name	file name	description
`sliceso`	object name	file name	description
`slicesl`	object name	file name	description
`sliceol`	object name	file name	description
Misc. Commands			
`stop`	n/a	n/a	Stops script execution and exits program
`exit`	n/a	n/a	Alias for `stop`
`quit`	n/a	n/a	Alias for `stop`
`list`	n/a	n/a	Lists all objects in the Object Registry
`help`	n/a	n/a	Lists all of the `reefer` commands
`help`	command name	n/a	Help for specific command
`delete`	object name	n/a	Deletes object from Object Registry
`setprefix`	object name	new prefix	Renames the file prefix of all terms in a 3d object
`rename`	old object name	new object name	Renames an object
`typeof`	object name	n/a	Prints type of object
`print`	object name	n/a	Prints object
`import`	file name	n/a	imports and processes `file name`
`preferences`	n/a	n/a	Prints global preferences
Unimplemented Commands			
`copy`	object name 1	object name 2	Copies object 1 to 2
`copyterm`	object name 1	object name 2	Copies on term of object 1 to 2
`cd`	directory	n/a	Changes working directory
`fit`	??	??	unimplemented
`fixtail`	name of a correlation	n/a	unimplemented
`chi2`	name of a correlation	name of a correlation	unimplemented
`boost`	object name	n/a	unimplemented
			description

TABLE II: `reefer` commands.

Object	Short Description
Source Functions	
`source_1d_term`	description
`source_3d_sphr`	description
`source_1d_gaussian`	description
`source_1d_2gaussian`	description
`source_1d_blastwave`	description
`source_3d_gaussian`	description
`source_3d_blastwave`	description
`source_1d_crab`	description
`source_3d_crab`	description
Correlation Functions	
`corr_1d_term`	description
`corr_3d_cart`	description
`corr_3d_sphr`	description
Emission Functions	
`emissfunc_blastwave`	description
	description

TABLE III: `reefer` objects.

M. fixtail

```
fixtail <corr_name>
```

N. list

```
list
```

O. delete

```
delete <object_name>
```

P. rename

```
rename <old_name> <new_name>
```

Q. help

```
help
```

R. quit, stop, exit

```
stop
```

S. import

```
import <filename>
```

T. cd

```
cd <directory>
```

U. slicerad

Makes a file called `<file_name>` containing a slice of the object along the angle θ =`theta`, ϕ =`phi` in the Bertsch-Pratt coordinates. Here θ is the angle with respect to the longitudinal axis (the z-axis) and ϕ is the angle with respect to the sidewards axis (the x-axis). It is invoked by:

```
slicerad <object_name> <file_name> {
    theta = <angle in rad>
    phi = <angle in rad>
}
```

The output from this command is a file which contains a few lines of header information and 5 columns of data. As is, the file can be plotted using the package `xmgrace`.

V. slices, sliceo, slicel

W. sliceso, slicesl, sliceol

V. OBJECT OPTIONS

In this section, we list all of the options available to each object and the defaults.

A. source_1d_term

B. source_3d_sphr

C. source_1d_gaussian

D. source_3d_gaussian

E. source_1d_crab

F. source_3d_crab

G. corr_1d_term

H. corr_3d_cart

I. corr_3d_sphr

VI. KERNELS

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APPENDIX A: EXTENDING SOURCE AND CORRELATION CLASSES

APPENDIX B: SOURCE AND CORRELATION TEMPLATES

[1] `CorAL` Code Reference.

[2] testentry