Module Interface Specification for Program Name

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1 Revision History

Date	Version	Notes
November 21, 2017	1.0	Initial draft

2 Symbols, Abbreviations and Acronyms

See SRS Documentation at [give url —SS]

[Also add any additional symbols, abbreviations or acronyms —SS]

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3 Introduction

The following document details the Module Interface Specifications for [Fill in your project name and description —SS]

Complementary documents include the System Requirement Specifications and Module Guide. The full documentation and implementation can be found at . . . . [provide the url for your repo —SS]

4 Notation

[You should describe your notation. You can use what is below as a starting point. —SS]

The structure of the MIS for modules comes from **?**, with the addition that template modules have been adapted from **?**. The mathematical notation comes from Chapter 3 of **?**. For instance, the symbol := is used for a multiple assignment statement and conditional rules follow the form $(c_1 \Rightarrow r_1|c_2 \Rightarrow r_2|...|c_n \Rightarrow r_n)$.

The following table summarizes the primitive data types used by Program Name.

Data Type	Notation	Description
character	char	a single symbol or digit
integer	$\mathbb{Z}$	a number without a fractional component in (-∞, ∞)
natural number	$\mathbb{N}$	a number without a fractional component in [1, ∞)
real	$\mathbb{R}$	any number in (-∞, ∞)

The specification of Program Name uses some derived data types: sequences, strings, and tuples. Sequences are lists filled with elements of the same data type. Strings are sequences of characters. Tuples contain a list of values, potentially of different types. In addition, Program Name uses functions, which are defined by the data types of their inputs and outputs. Local functions are described by giving their type signature followed by their specification.

5 Module Decomposition

The following table is taken directly from the Module Guide document for this project.

Level 1	**Level 2**
Hardware-Hiding	
Behaviour-Hiding	Input Parameters Output Format Output Verification Temperature ODEs Energy Equations Control Module Specification Parameters Module
Software Decision	Sequence Data Structure ODE Solver Plotting

Table 1: Module Hierarchy

6 MIS of Hardware Hiding Module

[Use labels for cross-referencing —SS]

6.1 Module

HardwareHiding

6.2 Uses

6.3 Syntax

6.3.1 Exported Access Programs

Name	In	Out	Exceptions
[accessProg —SS]	-	-	-

6.4 Semantics

6.4.1 State Variables

6.4.2 Access Routine Semantics

[accessProg —SS]():

- transition: [if appropriate —SS]
- output: [if appropriate —SS]
- exception: [if appropriate —SS]

7 MIS of Behaviour Hiding Module

[Use labels for cross-referencing —SS]

7.1 Module

BehaviourHiding

7.2 Uses

7.3 Syntax

7.3.1 Exported Access Programs

Name	In	Out	Exceptions
[accessProg —SS]	-	-	-

7.4 Semantics

7.4.1 State Variables

7.4.2 Access Routine Semantics

[accessProg —SS]():

- transition: [if appropriate —SS]
- output: [if appropriate —SS]
- exception: [if appropriate —SS]

8 MIS of Import csv Module

[Use labels for cross-referencing —SS]

8.1 Module

ImportCSV

8.2 Uses

8.3 Syntax

8.3.1 Exported Access Programs

Name	In	Out	Exceptions
[accessProg —SS]	-	-	-

8.4 Semantics

8.4.1 State Variables

8.4.2 Access Routine Semantics

[accessProg —SS]():

- transition: [if appropriate —SS]
- output: [if appropriate —SS]
- exception: [if appropriate —SS]

9 MIS of Import dm3 Module

9.1 Module

ImportDM3

9.2 Uses

- Array data structure
- Hardware hiding
- Data Spectrum Image

9.3 Syntax

9.3.1 Exported Access Programs

Name	In	Out	Exceptions
ReadDM3	filename: string	SI: $\mathbb{R}^{X \times Y \times E}$, metadata: dict	NO FILE, WRONG FILETYPE, NO DATA FOUND

9.4 Semantics

9.4.1 State Variables

9.4.2 Environment Variables

- filedm3

9.4.3 Access Routine Semantics

ImportDM3():

- input:
- transition:
- output:
- exception:

10 MIS of Import h5 Module

10.1 Module

ImportH5

10.2 Uses

10.3 Syntax

10.3.1 Exported Access Programs

Name	In	Out	Exceptions
[accessProg —SS]	-	-	-

10.4 Semantics

10.4.1 State Variables

10.4.2 Access Routine Semantics

[accessProg —SS]():

- transition: [if appropriate —SS]
- output: [if appropriate —SS]
- exception: [if appropriate —SS]

11 MIS of Import rpl Module

[Use labels for cross-referencing —SS]

11.1 Module

ImportRPL

11.2 Uses

11.3 Syntax

11.3.1 Exported Access Programs

Name	In	Out	Exceptions
[accessProg —SS]	-	-	-

11.4 Semantics

11.4.1 State Variables

11.4.2 Access Routine Semantics

[accessProg —SS]():

- transition: [if appropriate —SS]
- output: [if appropriate —SS]
- exception: [if appropriate —SS]

12 MIS of Export csv Module

[Use labels for cross-referencing —SS]

12.1 Module

ExportCSV

12.2 Uses

12.3 Syntax

12.3.1 Exported Access Programs

Name	In	Out	Exceptions
WriteCSV	-	-	-
FormatCSV	-	-	-
Verify1D	-	-	-

12.4 Semantics

12.4.1 State Variables

12.4.2 Access Routine Semantics

WriteCSV():

- transition: Writes data to csv file
- output: csv file
- exception:

FormatCSV():

- transition: Formats data to prepare it to write to csv file
- output: formatted data
- exception:

Verify1D():

- transition: Verifies that the input data is of the correct format (a 1D spectrum) and has a spectral range and an intensity array of equal length
- output: formatted data
- exception:

13 MIS of Export h5 Module

[Use labels for cross-referencing —SS]

13.1 Module

ExportH5

13.2 Uses

13.3 Syntax

13.3.1 Exported Access Programs

Name	In	Out	Exceptions
[accessProg —SS]	-	-	-

13.4 Semantics

13.4.1 State Variables

13.4.2 Access Routine Semantics

[accessProg —SS]():

- transition: [if appropriate —SS]
- output: [if appropriate —SS]
- exception: [if appropriate —SS]

14 MIS of Export png Module

[Use labels for cross-referencing —SS]

14.1 Module

ExportPNG

14.2 Uses

14.3 Syntax

14.3.1 Exported Access Programs

Name	In	Out	Exceptions
[accessProg —SS]	-	-	-

14.4 Semantics

14.4.1 State Variables

14.4.2 Access Routine Semantics

[accessProg —SS]():

- transition: [if appropriate —SS]
- output: [if appropriate —SS]
- exception: [if appropriate —SS]

15 MIS of Export rpl Module

[Use labels for cross-referencing —SS]

15.1 Module

ExportRPL

15.2 Uses

15.3 Syntax

15.3.1 Exported Access Programs

Name	In	Out	Exceptions
[accessProg —SS]	-	-	-

15.4 Semantics

15.4.1 State Variables

15.4.2 Access Routine Semantics

[accessProg —SS]():

- transition: [if appropriate —SS]
- output: [if appropriate —SS]
- exception: [if appropriate —SS]

16 MIS of Data Processing Richardson-Lucy Deconvolution Module

16.1 Module

RLDeconvolution

16.2 Uses

Array Data Structure

16.3 Syntax

16.3.1 Exported Access Programs

Name	In	Out	Exceptions
RLDeconvolution	-	-	-
SIDeconvolution	-	-	-

16.4 Semantics

16.4.1 State Variables

- iterations
- PSF
- spectrum
- threads

16.4.2 Access Routine Semantics

RLDeconvolution():

- transition: Performs the RL deconvolution algorithm on the input spectrum, using the input PSF and number of iterations
- output: deconvolved spectrum
- exception:

SIDeconvolution():

- transition: Splits a spectrum image into its composite spectra, so each spectrum can be deconvolved separately, according to the number of threads used. Sets up multi-threading to prepare large datasets for RLDeconvolution.
- output: Decomposed spectrum image
- exception:

17 MIS of Data Processing Normalization Module

[Use labels for cross-referencing —SS]

17.1 Module

Normalization

17.2 Uses

17.3 Syntax

17.3.1 Exported Access Programs

Name	In	Out	Exceptions
[accessProg —SS]	-	-	-

17.4 Semantics

17.4.1 State Variables

17.4.2 Access Routine Semantics

[accessProg —SS]():

- transition: [if appropriate —SS]
- output: [if appropriate —SS]
- exception: [if appropriate —SS]

18 MIS of Data Processing Gain Correction Module

[Use labels for cross-referencing —SS]

18.1 Module

GainCorr

18.2 Uses

18.3 Syntax

18.3.1 Exported Access Programs

Name	In	Out	Exceptions
[accessProg —SS]	-	-	-

18.4 Semantics

18.4.1 State Variables

18.4.2 Access Routine Semantics

[accessProg —SS]():

- transition: [if appropriate —SS]
- output: [if appropriate —SS]
- exception: [if appropriate —SS]

19 MIS of Data Processing Background Correction Module

[Use labels for cross-referencing —SS]

19.1 Module

BackgroundCorr

19.2 Uses

19.3 Syntax

19.3.1 Exported Access Programs

Name	In	Out	Exceptions
[accessProg —SS]	-	-	-

19.4 Semantics

19.4.1 State Variables

19.4.2 Access Routine Semantics

[accessProg —SS]():

- transition: [if appropriate —SS]
- output: [if appropriate —SS]
- exception: [if appropriate —SS]

20 MIS of Data Extraction 1D Slice Module

[Use labels for cross-referencing —SS]

20.1 Module

Slice1D

20.2 Uses

20.3 Syntax

20.3.1 Exported Access Programs

Name	In	Out	Exceptions
CreateMask	-	-	-
ApplyMask	-	-	-

20.4 Semantics

20.4.1 State Variables

- Mask (2D array of booleans)

20.4.2 Access Routine Semantics

CreateMask():

- transition: Creation of the mask for a 2d dataset - relies on user interaction
- output:
- exception:

[should this be here, or in display? —Author]
ApplyMask():

- transition: Applies 2d mask to dataset
- output:
- exception:

21 MIS of Data Extraction 2D Mask Module

[Use labels for cross-referencing —SS]

21.1 Module

Mask2D

21.2 Uses

21.3 Syntax

21.3.1 Exported Access Programs

Name	In	Out	Exceptions
[accessProg —SS]	-	-	-

21.4 Semantics

21.4.1 State Variables

21.4.2 Access Routine Semantics

[accessProg —SS]():

- transition: [if appropriate —SS]
- output: [if appropriate —SS]
- exception: [if appropriate —SS]

22 MIS of Data Extraction 3D Mask Module

[Use labels for cross-referencing —SS]

22.1 Module

Mask3D

22.2 Uses

22.3 Syntax

22.3.1 Exported Access Programs

Name	In	Out	Exceptions
[accessProg —SS]	-	-	-

22.4 Semantics

22.4.1 State Variables

mask3d

22.4.2 Access Routine Semantics

[accessProg —SS]():

- transition: [if appropriate —SS]
- output: [if appropriate —SS]
- exception: [if appropriate —SS]

23 MIS of Display 1D Spectrum Module

[Use labels for cross-referencing —SS]

23.1 Module

Disp1D

23.2 Uses

23.3 Syntax

23.3.1 Exported Access Programs

Name	In	Out	Exceptions
[accessProg —SS]	-	-	-

23.4 Semantics

23.4.1 State Variables

23.4.2 Access Routine Semantics

[accessProg —SS]():

- transition: [if appropriate —SS]
- output: [if appropriate —SS]
- exception: [if appropriate —SS]

24 MIS of Display 2D Image Module

[Use labels for cross-referencing —SS]

24.1 Module

Disp2D

24.2 Uses

24.3 Syntax

24.3.1 Exported Access Programs

Name	In	Out	Exceptions
[accessProg —SS]	-	-	-

24.4 Semantics

24.4.1 State Variables

24.4.2 Access Routine Semantics

[accessProg —SS]():

- transition: [if appropriate —SS]
- output: [if appropriate —SS]
- exception: [if appropriate —SS]

25 MIS of Display 3D Spectrum Image Module

[Use labels for cross-referencing —SS]

25.1 Module

Disp3D

25.2 Uses

- Data
- Plotting library

- 2D image plot
- 1D spectrum plot

25.3 Syntax

25.3.1 Exported Access Programs

Name	In	Out	Exceptions
[accessProg —SS]	-	-	-

25.4 Semantics

25.4.1 State Variables

- axis2D image
- axis1D spectrum
- axis2D mask
- axis1D contrast
- axis colourbar
- polygons
- slicer

[do polygons and slicer belong here, or in the mask2d and slice1d modules? —Author]

25.4.2 Environment Variables

- Plotting window displayed on screen
- Keyboard keys and mouse buttons

25.4.3 Access Routine Semantics

[accessProg —SS]():

- transition: [if appropriate —SS]
- output: [if appropriate —SS]
- exception: [if appropriate —SS]

26 MIS of Data 1D Spectrum Module

[Use labels for cross-referencing —SS]

26.1 Module

Spectrum

26.2 Uses

26.3 Syntax

26.3.1 Exported Access Programs

Name	In	Out	Exceptions
[accessProg —SS]	-	-	-

26.4 Semantics

26.4.1 State Variables

26.4.2 Access Routine Semantics

[accessProg —SS]():

- transition: [if appropriate —SS]
- output: [if appropriate —SS]
- exception: [if appropriate —SS]

27 MIS of Data 2D Image Module

[Use labels for cross-referencing —SS]

27.1 Module

Image

27.2 Uses

27.3 Syntax

27.3.1 Exported Access Programs

Name	In	Out	Exceptions
[accessProg —SS]	-	-	-

27.4 Semantics

27.4.1 State Variables

27.4.2 Access Routine Semantics

[accessProg —SS]():

- transition:
- output:
- exception:

28 MIS of Data 3D Spectrum Image Module

28.1 Template Module

SI

28.2 Uses

- Array Data Structure

28.3 Syntax

28.3.1 Exported Types

Routine Name	In	Out	Exceptions
			-

[Need to think on this more, if I treat this as a template module, does it have exported access programs? —Author]

28.4 Semantics

28.4.1 State Variables

- data: $\mathbb{R}^{X \times Y \times K}$
- Imcal: $\mathbb{R}$
- dispersion: $\mathbb{R}$
- Srange: $\mathbb{R}^{K}$
- ZLP: $\mathbb{Z}$
- size: $\mathbb{N}^{3}$
- Slabel: string
- Sunit: string
- metadata: dict

28.4.2 State Invariant

28.4.3 Assumptions

28.4.4 Access Routine Semantics

FindFW():

- transition:
- output:
- exception:

29 MIS of Array Data Structure Module

[Use labels for cross-referencing —SS]

29.1 Module

Array

29.2 Uses

29.3 Syntax

29.3.1 Exported Access Programs

Name	In	Out	Exceptions
[accessProg —SS]	-	-	-

29.4 Semantics

29.4.1 State Variables

29.4.2 Access Routine Semantics

[accessProg —SS]():

- transition: [if appropriate —SS]
- output: [if appropriate —SS]
- exception: [if appropriate —SS]

30 MIS of Plotting Library Module

[Use labels for cross-referencing —SS]

30.1 Module

Plotting

30.2 Uses

30.3 Syntax

30.3.1 Exported Access Programs

Name	In	Out	Exceptions
[accessProg —SS]	-	-	-

30.4 Semantics

30.4.1 State Variables

30.4.2 Access Routine Semantics

[accessProg —SS]():

- transition: [if appropriate —SS]
- output: [if appropriate —SS]
- exception: [if appropriate —SS]

31 Appendix

[Extra information if required —SS]