



## SED Tool - Iris

### 1.1 Project Test Plan

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## 2 Goal

This document describes the details of how the Spectral Energy Distribution (SED) project *tool*, aka "Iris" will be tested. This application is the combination of several SED software components working together to perform discovery of and scientific analysis of SED data. As such, it represents the focal point for both Integration and User testing. This document details how this software will be tested through its life cycle for requirements to be implemented in Year 1 of the project.

## 3 References

- [Sherpa Modeling Package](#)
- [SPECView application](#)
- [SED Use case document](#)
- [SED PDD](#)
- [Main SED testing page](#). Contains links to other SED project test plans.

## 4 Project Description

Iris is an ensemble of the other SED software components which include SPECView, Sherpa SED models, SED SAMP application, and the SED Service. The SED Library underlays the SPECView application. It should be capable of executing year 1 target portions of the use cases (see document link above and test cases below).

Iris comprises an installation package which contains all of the needed software components for an end-user scientist to perform discovery and analysis of SEDs.

## 5 Test Environment, Tools and Execution Considerations

Tests shall be executed on Fedora Core 14 and OS X 10.6.x platforms using the supplied end-user software bundles.



## 6 Additional Information

To facilitate reporting of test results, all reporting must map test results back to test cases specified in this test plan.

## 7 Test Cases

### 7.1 Acceptance Tests

#### TestCase0 : Artifact Completeness

*Requirement Identifier:* ???

*Procedure:* Manual inspection of project artifacts.

The install package shall be checked for deliverable artifact completeness. The install package shall include both complete set of software to install and run the Iris tool. Documentation which allows the user to start working with the tool is also mandatory (it may contain pointers to further site documentation elsewhere).

Documentation (both in the install package and pointed to externally) shall be checked for completeness, accuracy and comprehensibility.

##### TestCase0.1 : User access to pre-computed SEDs

*Requirement Identifier:* SED.bui.3

*Procedure:* Manual inspection of application.

The user has access to precomputed SEDs which can come from several sources including Surveys and/or Collections and serve as examples shipped with the installation package. All of these example SEDs should load successfully within the application.

#### TestCase1 : Tool installation and starting execution

*Requirement Identifier:* SED.???

*Procedure:* Manual installation of project artifacts.

The install package shall be installed and executed on supported VAO platforms, Fedora Core 14 and OS X 10.6.x. This test shall check that the software loads into computer memory and presents the initial expected user interface.

#### TestCase2 : Scientific Suitability of SED models

*Requirement Identifier:* SED.an.???

*Procedure:* Manual execution of models on test SED data

The SED models (see SED Sherpa Test plan) shall be reviewed for suitability for scientific research.

#### TestCase3 : Use case Testing

*Requirement Identifier:* see sub-test cases below

*Procedure:* Manual test using Iris

These tests will check that use cases 1-4, year 1 target functionality is implemented.

##### TestCase3.0 : Tutorial Example

*Requirement Identifiers:* SED.bui.3.2.1, SED.bui.6, SED.vis.1, SED.vis.1.1, SED.vis.1.5, SED.bui.1.1, SED.bui.3.2.1., SED.vis.1.10

*Procedure:* Follow the Tutorial for model fitting of 3c273 data in Iris\_README.txt

The Iris\_README.txt document provides a tutorial for users getting to know the Iris tool. It should be tested

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to ensure that its working.

### **TestCase3.1 : Use Case 1**

*Requirement Identifiers:* SED.bui.3.2.1, SED.bui.6, SED.vis.1, SED.vis.1.1, SED.vis.1.5, SED.bui.1.1, SED.bui.3.2.1., SED.vis.1.10

*Procedure:* Manual test using Iris

*Pointer to the description of the UC:* paragraph 2.1 of the UCs document

The UC 1 is only partially relevant to the testing of the Year 1 release of the VAO SED tool (Iris). The core functionalities that can be tested (and associated to the requirements listed above) are summarized as follows: searching for all archival photometric data for a source named "A"; creation of the SED from archival data; plotting of the SED; interactive inspection of the metadata of the data points shown in the plot; upload of additional data stored in a ASCII file; over-plotting these points to the already shown SED; over-plotting multiple SEDs in the same window for a by-eyes qualitative comparison.

### **TestCase3.2 : Use Case 2**

*Requirement Identifiers:* SED.bui.1.1, SED.vis.1.1.1, SED.an.4.1, SED.an.4.4, SED.an.4.6, SED.an.4.7, SED.vis.1.3, SED.an.4.5, SED.vis.1, SED.vis.1.12

*Procedure:* Manual test using Iris

*Pointer to the description of the UC:* paragraph 2.2 of the UCs document

The UC 2 is only partially relevant to the testing of the Year 1 release of Iris. The core functionalities that can be tested (and associated to the requirements listed above) are summarized as follows: uploading to Iris an SED stored in an ASCII file; plotting the SED and changing the units of the plot; fit of a SED with a composite model obtained by algebraically assembling model functions available in the library of the tool; inspecting the goodness of fit and confidence levels associated to the fit; fit of a SED inside a user defined spectral range; over-plotting the curve generated by the best-fit model to the observed SED.

### **TestCase3.3 : Use Case 3**

*Requirement Identifiers:* SED.bui.3.2.3, SED.vis.1, SED.vis.1.1, SED.vis.1.8.1, SED.an.4.3, SED.an.4.4, SED.an.4.1, SED.vis.1

*Procedure:* Manual test using Iris

*Pointer to the description of the UC:* paragraph 2.3 of the UCs document

The UC 3 is entirely relevant to the testing of the Year 1 release of Iris. The core functionalities that can be tested (and associated to the requirements listed above) are summarized as follows: performing a "cone search" for sources with SED around a given position in the sky with a given radius search; plotting multiple SEDs returned by the cone search in the same graphical window; changing units at once in the graphical window for all SEDs; fitting one SED with a composite model obtained by assembling functions in the tool library; constraining model parameters ranges and starting values; choosing one fitting methods and statistics from a library of available methods and statistics; saving fitting diagnostics (goodness-of-fit values, best fit parameters value and associated uncertainties, confidence levels for best-fit parameter) to ASCII file; over-plotting the curve generated by the best fitting model to the observed SEDs.

### **TestCase3.4 : Use Case 4**

*Requirement Identifiers:* SED.an.1, SED.vis.1, SED.an.4.1, SED.an.4.5, SED.an.4.4, SED.an.4.7

*Procedure:* Manual test using Iris

*Pointer to the description of the UC:* paragraph 2.4 of the UCs document

The UC 4 is only partially relevant to the testing of the Year 1 release of Iris. The core functionalities that can be tested (and associated to the requirements listed above) are summarized as follows: uploading to the tool the SED of a source stored in a votable file; plotting the SED; fitting a model to the SED within a user-defined spectral interval with the reference fitting method and statistics; evaluating the n-sigma

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confidence level (where n is a natural number defined by the user) for the best-fitting parameters of the model; saving the confidence levels to a file in a human-readable format (ASCII); saving the curve associated to the best-fit model to an ASCII file.

### TestCase4 : Application User Interface

*Requirement Identifier:* see sub-test cases below

*Procedure:* Manual inspection of application.

The tool shall be inspected by manual use for the following required user interface characteristics and behavior. Each of these requirements forms a sub-testcase of this one.

**TestCase4.1** : User access to SAMP protocol, and connectivity to common SAMP enabled applications

*Requirement Identifier:* SED.bui.4

*Procedure:* Manual inspection of application.

The user has access via IVOA SAMP protocol to interoperate between the SED application and other SAMP-enabled applications. The following applications will be tested for this: TOPCAT, and Aladin.

**TestCase4.2** : User can inspect SED metadata

*Requirement Identifier:* SED.viz.1.7

*Procedure:* Manual inspection of application.

The user can interactively inspect metadata (e.g. time of the observation, aperture, photometric system, reference in the literature, name of the PI, parameters of the reduction of the data,...) associated to each single photometric point or spectral segment composing the SED.

**TestCase4.3** : User can inspect SED metadata by hover

*Requirement Identifier:* SED.viz.1.7.1

*Procedure:* Manual inspection of application.

The user interaction to access metadata is by hovering the pointer over any data element.

**TestCase4.4** : User can inspect SED metadata by hover

*Requirement Identifier:* SED.viz.1.9

*Procedure:* Manual inspection of application.

The user can plot the modified version of a SED or any section defined in spectral coordinates in a new visualization window. **{Need clarification on this...I have no idea what this actually means, what modifications are possible? where is that stated??}**

**TestCase4.5** : User can save SED plots in graphical format

*Requirement Identifier:* SED.viz.1.11

*Procedure:* Manual inspection of application.

The user can save SED plots in different graphical formats. This means 'jpeg' and 'png'.

### TestCase5 : Application scientific data visualization

*Requirement Identifier:* see sub-test cases below

*Procedure:* Manual inspection of application.

The user can visualize one or more aggregate or rebinned SEDs. Visualize means that the tool must be capable of plotting these data in a manner which allow scientific analysis to occur (axes are readable, plot may be rescaled to either see entire range or zoomed into areas of interest for close inspection and so on) Not all usability requirements may have been specified and test team may encounter more. See following test cases for some enumerated requirements.

**TestCase5.1** : User can plot SEDs

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*Requirement Identifier:* SED.viz.1.1

*Procedure:* Manual inspection of application.

The user can plot the SED as “generic flux” versus spectral coordinates and interactively convert between multiple representations of the SED with a variety of units. (Units listed in Section 2.1)

**TestCase5.2** : User can select spectral region

*Requirement Identifier:* SED.viz.1.2

*Procedure:* Manual inspection of application.

The user can interactively select a spectral region and the re-plotting of the SED in this region.

**TestCase5.3** : User can rescale plotted SED

*Requirement Identifier:* SED.viz.1.3

*Procedure:* Manual inspection of application.

The user can interactively zoom in and out of a SED. Rescaling should be sufficient to enable scientific inspection of all data (e.g. ability to view and select individual datum is critical as is ability to view entire dynamic range of any SED, note this requirement overlaps next test case in this regard).

## 7.2 Functional and Integration Tests

**TestCase6** : User can perform point and extended source aperture correction

*Requirement Identifier:* SED.bui.7

*Procedure:* Manual inspection of application.

The user can perform point and extended source aperture correction on photometric points. The algorithm utilizes metadata optionally available in photometric SEDs compliant with the IVOA photometry data model (**Document of format?; these data should be drawn from a common test data set for SED project and be validated at least once**).

**TestCase6.1** : User can perform simple aperture correction

*Requirement Identifier:* SED.bui.7.1

*Procedure:* Manual inspection of application.

The user can perform a simple aperture correction to the flux of a photometric point following the equation in section 2.1(2) (**Document??**) allowing the user to choose the ApFrac? parameter in the range of [0.0, 1.0].

**TestCase7: User session/state**

*Requirement Identifier:* SED.is.2, SED.vis.2.2

*Procedure:* Manual test using Iris

See description below.

**TestCase7.1** : User can save session operations and re-run them

*Requirement Identifier:* SED.viz.2

*Procedure:* Manual inspection of application.

The user has access a mechanism to record session operations performed during the work session in order to repeat such analysis and reduction steps in a non-interactive way. This test case requires round-tripping of the session (e.g. save session and output data, reload session instructions and starting data, and then compare first and second session data products output)

**TestCase7.2** : User can get reports of session

*Requirement Identifier:* SED.viz.2.2

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*Procedure:* Manual inspection of application.

The user has access to simple reports of interactive sessions containing only the description of the analysis steps performed during an interactive work session by the user and the references to saved files containing the SED data.

### **TestCase8 : SED data modelling and compatibility with Sherpa**

*Requirement Identifier:* SED.an.1, SED.an.4.3, SED.an.4.4, SED.an.4.5, SED.an.4.6, SED.an.4.7

*Procedure:* Manual test using Iris

This test will check that models specified in Iris and passed to Sherpa and back with results which are of scientific utility.

These tests shall encompass loading each of the SED models shipped with the installation package and additional selected data into the tool environment and reporting user experience. This test case shall exercise Iris to check that each of the indicated models (see Additional information section above) have indeed been loaded, and when executed with test SED data (see Additional information section above) and take the appropriate input and produce the expected output. Finally, this test shall also check that Sherpa can convert the units of measure of the SED for both spectral and flux coordinates.

#### **TestCase8.1 : Fitting of spectral models to a SED and estimation of integrated quantities**

*Requirement Identifier:* SED.an.4

*Procedure:* Manual test using Iris

This test shall test that user can fit SEDs with analytical and tabular functions as source models by identifying the parameter values which give the optimum value of the fit statistic. A list of SED models is included SED Sherpa test plan.

#### **TestCase8.2 : Fitting of aggregate SED with spectral models**

*Requirement Identifier:* SED.an.4.1, SED.an.4.7

*Procedure:* Manual test using Iris

The user can fit an aggregate SEDs and return the best-fit parameter values and the reduced statistic value. Furthermore, the user can estimate the confidence levels for the fit parameters at a user-defined standard-deviation. This test case shall check running each of the SED models against a set of test data and verify the result (fitted parameters of the models, as well as their errors) are as expected.

#### **TestCase8.3 : Goodness of fit**

*Requirement Identifier:* SED.an.4.6

*Procedure:* Manual test using Iris

The user can estimate the goodness-of-fit of the model and specify among a small number of reference fit statistics of his choosing. For example,  $\chi^2$  statistics and some of the specific statistics derived by the maximum likelihood principle.

#### **TestCase8.4 : Modeling language in tool**

*Requirement Identifier:* SED.an.4.4

*Procedure:* Manual test using Iris

The user has access to a modeling language to support algebraic composition of multiple individual models from a standard library. Arithmetic operators are to be supported along with arbitrary functions to be applied to specific model components.

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### TestCase9 : SED discovery

*Requirement Identifier:* SED.bui.3, SED.bui.3.2

*Procedure:* Manual test using Iris

The user has specific access to pre-computed SEDs from the NED SED Service. This test will check that Iris enables SED discovery from the SED service. There should be a capability to search for SED data both by coordinate position of desired target as well as by common name (e.g. name resolution, "3c273" search should discover data).

### TestCase10 : Application Performance

*Requirement Identifier:* Prj. 10

*Procedure:* Manual inspection of application performance.

The SPECView performance requirements for year 1 are a best effort. This means that the tool, once it is installed on a VAO compliant platform and all of its component software are properly configured, must be capable of performing a load, plotting, selection, modeling and analysis of example SED within a *reasonable* timescale. Reasonable means that scientific analysis by the user is not impeded significantly by tool performance.

## 8 Schedule

Activity	Task	Dependencies	Responsible party	Start Date	End Date	Comments
Functional & Integration Tests	execution	Model List and SED data specified for testing	SED Service PD Team	April 2011	Jul 2011	Verify deliverables during beta test 1,2 and at delivery
Acceptance Test	execution	Passed prior testing	QA&T team	April 2011	Jul 2011	Have acceptance testers interact with SED models and data to report suitability for scientific research