

# GammaLib SRS

## Software Requirement Specification

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# 1 Introduction

## 1.1 Product Overview

The **GammaLib** is a versatile toolbox for the high-level analysis of astronomical gamma-ray data. It is implemented as a C++ library that is fully scriptable in the Python scripting language. The library provides core functionalities such as data input and output, interfaces for parameter specifications, and a reporting and logging interface. It implements instrument specific functionalities such as instrument response functions and data formats. Instrument specific functionalities share a common interface to allow for extension of the **GammaLib** to include new gamma-ray instruments. The **GammaLib** provides an abstract data analysis framework that enables simultaneous multi-mission analysis.

The **GammaLib** is designed as an open source library that is made available at <http://gammalib.sourceforge.net/>.

## 1.2 Purpose

The **GammaLib** provides all functionalities required to perform a high-level analysis of astronomical gamma-ray data. High-level analysis means that the data are expected to be calibrated (energy, arrival direction or detector position) and time tagged. The **GammaLib** is not designed for preprocessing of data or data calibration purposes.

## 1.3 Scope

The **GammaLib** is designed for the high-level analysis of astronomical gamma-ray data. For the purpose of the **GammaLib**, gamma rays are defined as photons with energies above few  $\sim 100$  keV. The **GammaLib** both applies to data collected by space-based and ground-based instruments. So far it allows for the analysis of data collected by the following instruments: CTA.

## 1.4 Reference

## 1.5 Definition and Abbreviations

The following abbreviations have been employed in this document:

**COMPTEL** Compton Telescope (flown aboard CGRO 1991-2000)

**CTA** Cherenkov Telescope Array

**Fermi** Fermi Gamma-Ray Space Telescope (launched in 2007)

**INTEGRAL** International Gamma Ray Laboratory (launched in 2002)

**IRAF**

**SPI** Spectrometer on INTEGRAL

## 2 Specific Requirements

### 2.1 External Interface Requirements

#### 2.1.1 User Interfaces

The `GammaLib` is to designed as C++ API library of which all modules are designed as classes. A Python interface allows for scripting of library components.

The `GammaLib` supports 2 user interface formats for parameter input: the IRAF parameter interface (which is also employed for the `ftools` and the INTEGRAL and Fermi data analysis frameworks) and a XML interface (which is also used within the Fermi data analysis framework).

The `GammaLib` provides also a reporting and logging interface that provides the user with human-readable information about code execution

#### 2.1.2 Hardware Interfaces

No hardware interfaces are foreseen.

#### 2.1.3 Software Interfaces

#### 2.1.4 Communication Protocols

#### 2.1.5 Memory Constraints

#### 2.1.6 Operation

#### 2.1.7 Product function

#### 2.1.8 Assumption and Dependency

The `GammaLib` should be designed as a standalone package except for a link to the HEASARC `cfitsio` library.

## **2.2 Software Product Features**

## **2.3 Software System Attributes**

### **2.3.1 Reliability**

### **2.3.2 Availability**

### **2.3.3 Security**

### **2.3.4 Maintainability**

### **2.3.5 Portability**

### **2.3.6 Performance**

## **2.4 Database requirements**

## **3 Additional Material**