



# EUROPEAN SOUTHERN OBSERVATORY

Organisation Européenne pour des Recherches Astronomiques dans l'Hémisphère Austral  
Europäische Organisation für astronomische Forschung in der südlichen Hemisphäre

## VERY LARGE TELESCOPE

### Technical specifications for the iodine cell of the PRIMA Metrology Laser Assembly

Doc. No. VLT-SPE-ESO-15731-3140

Issue 1.0

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Technical specifications for the iodine cell for the frequency stabilization of the PRIMA Metrology system laser

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## Change Record

Issue / Rev.	Date	Section / Page. affected	Reason/Remarks
1.0	22/09/03	all	First Issue



## 1 Scope

This document defines the technical specifications for the iodine cell of the PRIMA Metrology Laser Assembly.

## 2 Applicable documents

- AD 1 Characterization of iodine transitions around 659.5nm  
 VLT-TRE-ESO-15731-3064, issue 1, 26 May 2003
- AD 2 Iodine Spectroscopy and Absolute Frequency Stabilization with the Second Harmonic of the 1319-nm Nd:YAG Laser, A. Arie, Optics Letters, October 93, Vol. 18, No. 20

## 3 System definition

The laser of the PRIMA metrology system will be frequency stabilized on an absorption line of iodine around 659.5 nm.

An iodine cell must be procured to generate a transition of typically 25% line depth and 800MHz line width with a minimum loss due to the windows of the cell. The iodine cell must be temperature controlled and mounted in a dedicated mechanical housing.

## 4 Specifications for the iodine cell

Table 1 Specifications for the iodine cell

Parameters	Specifications	Comments
Application	Laser frequency stabilization at 659.5nm using Pound-Drever-Hall method (FM spectroscopy) on a typically 25% line depth and 800MHz line width transition	Transitions that may be used (AD 1,AD 2): R(55)6-6, P(49)6-6, P(48)6-6
Length	150mm<L<200mm	Goal: D=150mm
Clear Aperture	25mm<D<75mm	Goal: D=50mm
Iodine Vapor Pressure	4 Torr	To get around 25% absorption with D=50mm, L=150mm around 55°C (AD 2)
Transmission λ=659.5nm	T>90%	Contribution of the optical window without gas absorption



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Table 1 Specifications for the iodine cell

Parameters	Specifications	Comments
AR coating at 659.5nm	no	AR coating is not necessary if the input beam is linearly polarized and the cell's window oriented at the Brewster angle.
Windows at Brewster angle	yes	Incident beam linearly polarized (vertically)
Optical quality of the windows	1 /10	Over any 10mm diameter sub-pupils within the clear aperture

## 5 Option: Specification for the Mechanical housing and temperature control

Table 2 Specifications for the mechanical housing and temperature control of the iodine cell

Parameters	Specifications	Comments
Temperature controller	Newport CN-77352-C4 (RS-485 communication)	Defined by the ESO Standard. The temperature regulation is performed by an auto tunable PID used with an analog output (0-10 Volt, 0.2W max). This output needs to be amplified to efficiently warm up the cell.
Temperature sensor	Pt 100	
Mechanical housing	To be defined by the contractor.	The mechanical housing must be fixed on an interface plate with 6.2mm diameter holes such that it can be screwed on an optical table having a M6 hole pattern on a 25 mm square grid. The height between the optical table and the center of the entrance window must be 100mm (to be confirmed).
Heating blanket	To be defined by the contractor	During operation, the temperature of cell's windows must be slightly higher than the cell's body to avoid condensation of Iodine on the windows.
Thermal insulation	To be defined by the contractor	