MRO Delay Line ICD

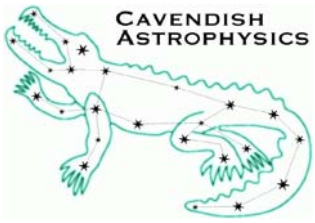
Delay Line to Vacuum System

ICD INT-406-VEN-0011

The Cambridge Delay Line Team

rev 0.2

18 Jan 2008



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UK

1 ICD Description

Specific entry from the ICD N^2 Table contained in FDR document:

ICD Number	Sub-systems		Org	Owner	Brief description and preliminary contents
INT-406-VEN-0011	Delay line	Vacuum system	MRAO	MF	Defines the mechanical interfaces on the delay line pipe required to connect to the vacuum system. Should also include electrical interfaces if any are identified. • Vacuum port connection

2 Change Record

Revision	Date	Authors	Changes
0.1	2007-08-10	MF	First draft version
0.2	2008-01-18	MF	Interface details and drawings added

3 Notification List

The following people should be notified by email that a new version of this document has been issued:

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MRAO: **Chris Haniff**
David Buscher
Martin Fisher

Table of Contents

4 Scope

This document defines the connection between the MROI supplied vacuum system and the port machined into the delay line pipe. Although the MROI vacuum system is described and depicted here it is only a representation and not in any way definitive.

5 Acronyms and Abbreviations

Acronyms and Abbreviations

BCA Beam Combining Area

BCF Beam Combining Facility

BRS Beam Relay System

DL Delay Line

DLA Delay Line Area

ICD Interface Control Document

ICS Interferometer Control System (now SCS)

MROI Magdelena Ridge Observatory

Interferometer

MRAO Mullard Radio Astronomy Observatory

NMT New Mexico Tech

OPD Optical Path Delay

SCS Supervisory Control System

TBC To be confirmed

TBD To be determined

6 Applicable Documents

DRAWINGS

AD01 MROI-084-03.pdf

REFERENCE DOCUMENTS

RD1 Top-level requirements INT-406-TSP-0002

RD2 Delay line to BCF infrastructure (building) (INT-406-VEN-0009)

7 Introduction

This ICD describes the connection interface between the MROI vacuum system and the delay line pipes. A vacuum pipe manifold is situated above the delay lines in the DLA area about 1.5m from the outer BCA wall, i.e. There will be a vacuum pipe brought down to each delay line from this manifold which will couple by a flexible connection to an assembly which mounts on the top surface of the delay line pipe. The assembly consists of a gate valve and pressure monitoring devices and is based on a two inch system.

8 Requirements

The requirements of the vacuum system that are applicable to the delay line are defined in RD1 and reference to vacuum design features can be found in RD2. The requirements of the interface are for the pipe to accept a standard centring ring together with a means of clamping the ring to achieve an appropriate vacuum seal. The position of the port along the pipe is not critical because of the flexible connection from the vacuum manifold but it should be positioned so that it is reasonably close to the vertical drop from the overhead vacuum pipe.

9 Design

9.1 Interface description

The vacuum port is based on a 2 inch feed and connects to a four way cross adaptor specified in the vacuum subsystem. The interface is defined at the pipe which is machined to receive a 2 inch centring O-ring seal, held in position by a specially designed sectional clamp. The arrangement is depicted in Figure 3. A flat surface is machined into the top of the pipe and a hole is bored to receive the centring seal. Blind holes are drilled into the pipe at places where the pipe thickness is preserved and are tapped to receive ‘heli-coil’ inserts. The sectional clamp, which fits around the conical stub of the four-way cross is held in place by three M5 screws on each half and these are tightened so that the centring ring seal is seated and clamped to the pipe.

9.2 Interface location

A plan view of the area of the BCF in which the vacuum manifold is situated is shown in Figure 1. The service pipe from the vacuum system terminates just inside the DLA near the doors into the outer BCA. The vacuum manifold which spans the delay lines is mounted close to the outer wall of the BCA such that the individual drops will terminate at the pipes just clear of the last pipe support stand. The manifold provided by MROI is expected to be 4 inches in diameter and the drop pipes are to be 2 inches in diameter, terminating in the 4-way cross.

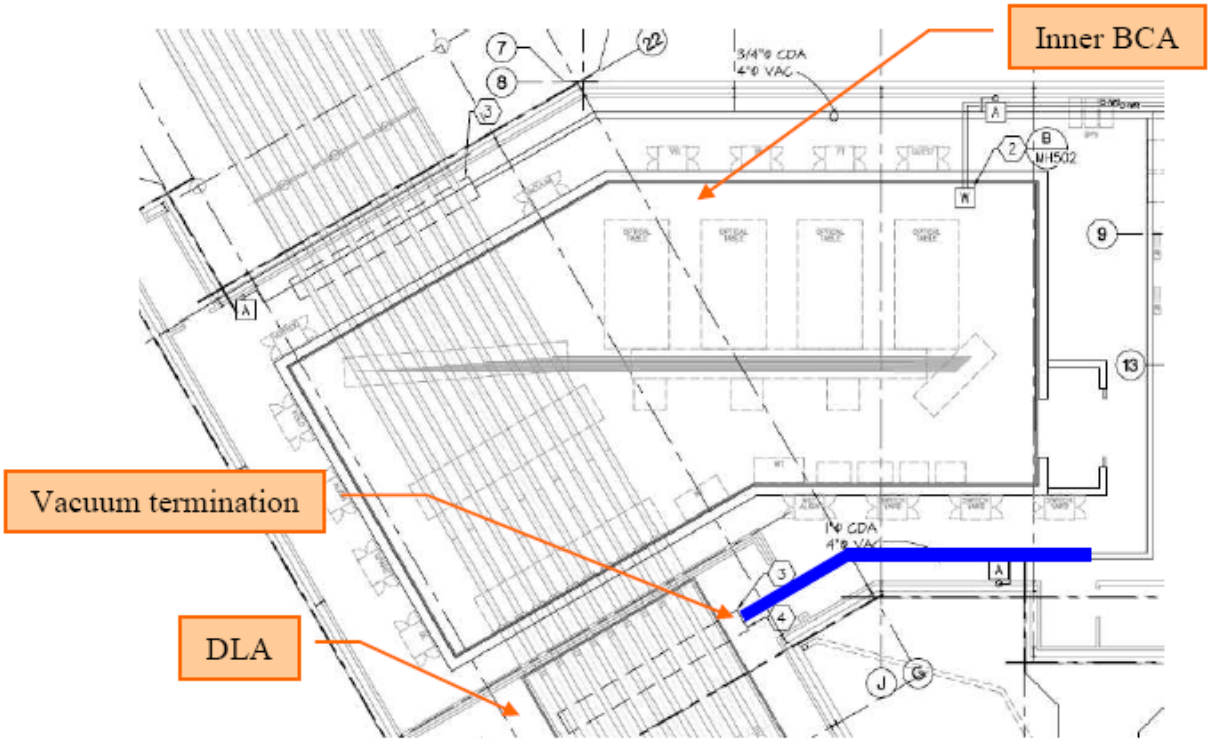


Figure 1: Layout of the vacuum system within the BCF

The provisional scheme depicting the arrangement of the vacuum port assembly for one delay line is shown in Figure 2 and a 3-D view of the actual pipe connection is shown in Figure 3.

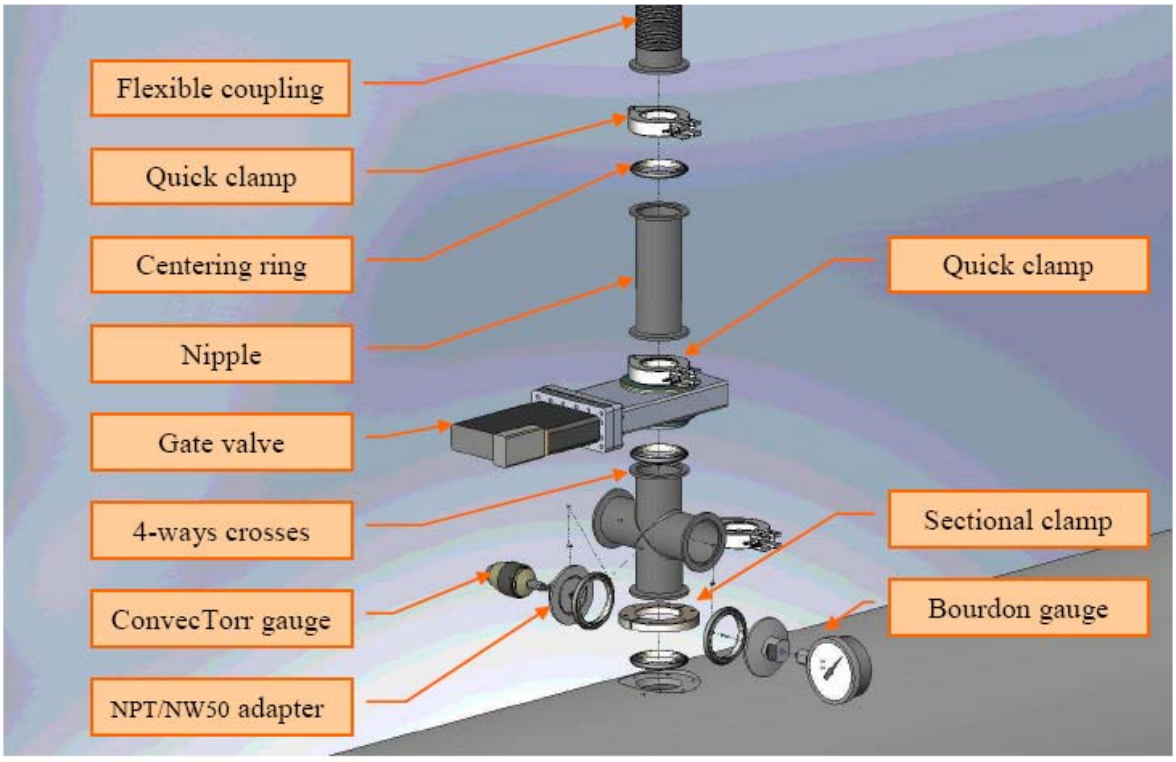


Figure 2: An exploded view of the proposed assembly which connects to each delay line pipe.

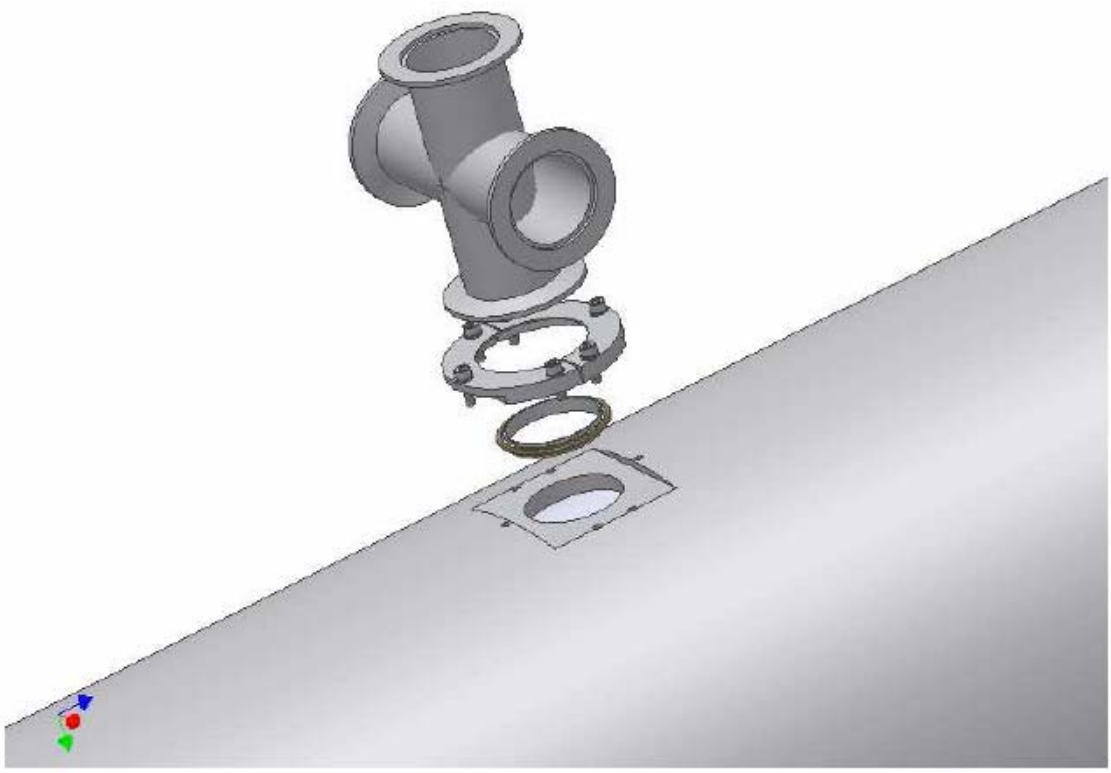


Figure 3: The interface of the 4-way cross to the pipe port.

The location of the vacuum port connection within the DLA is depicted in Figure 4.

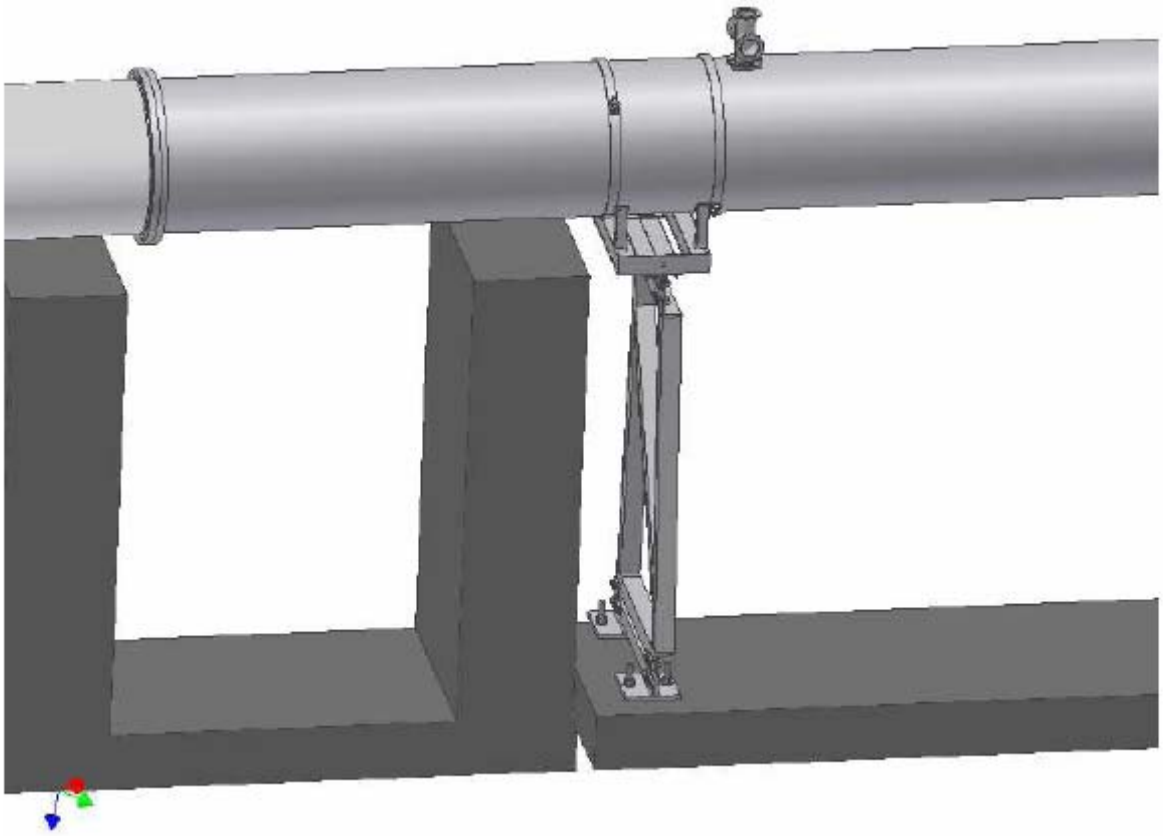
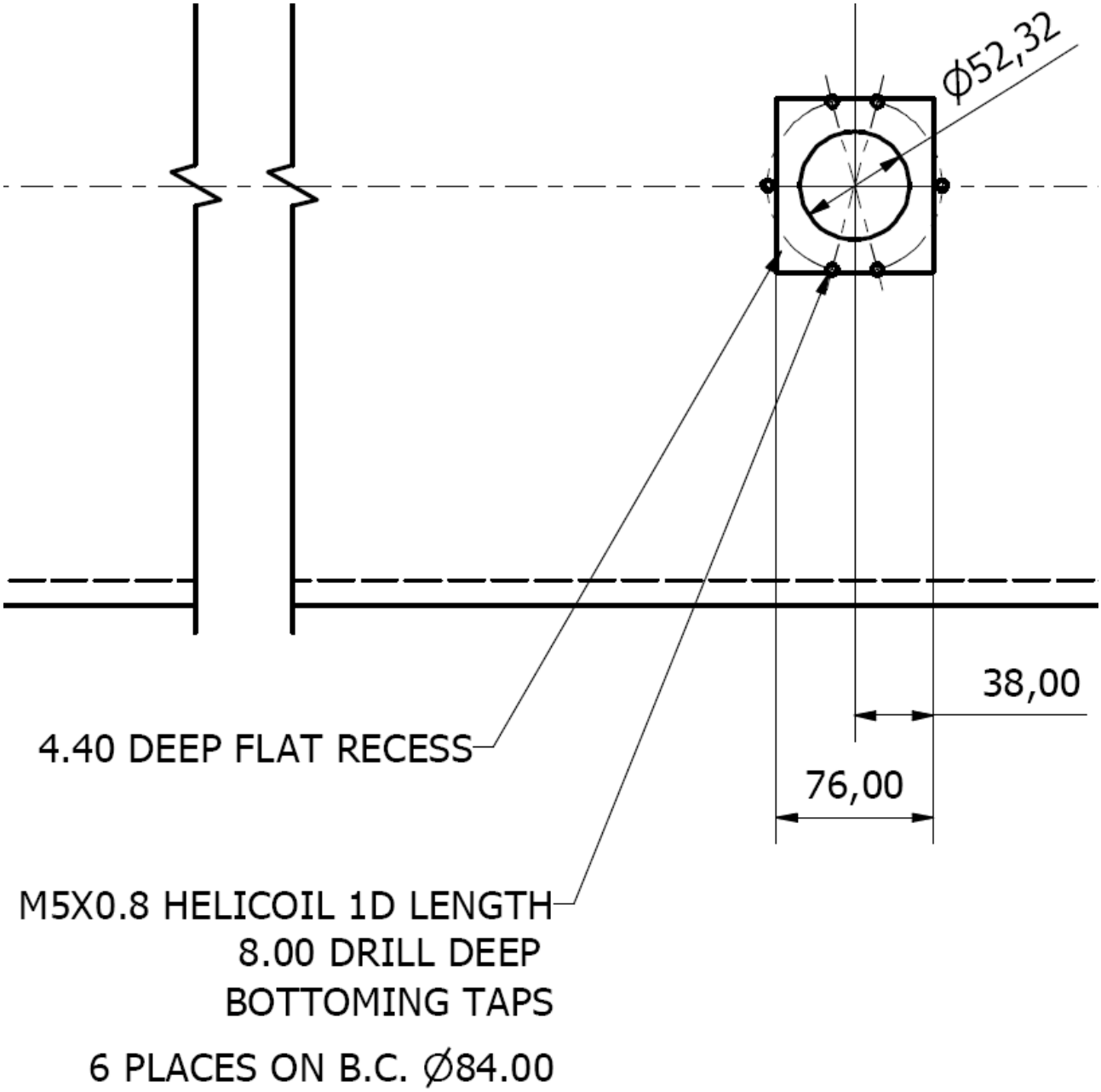
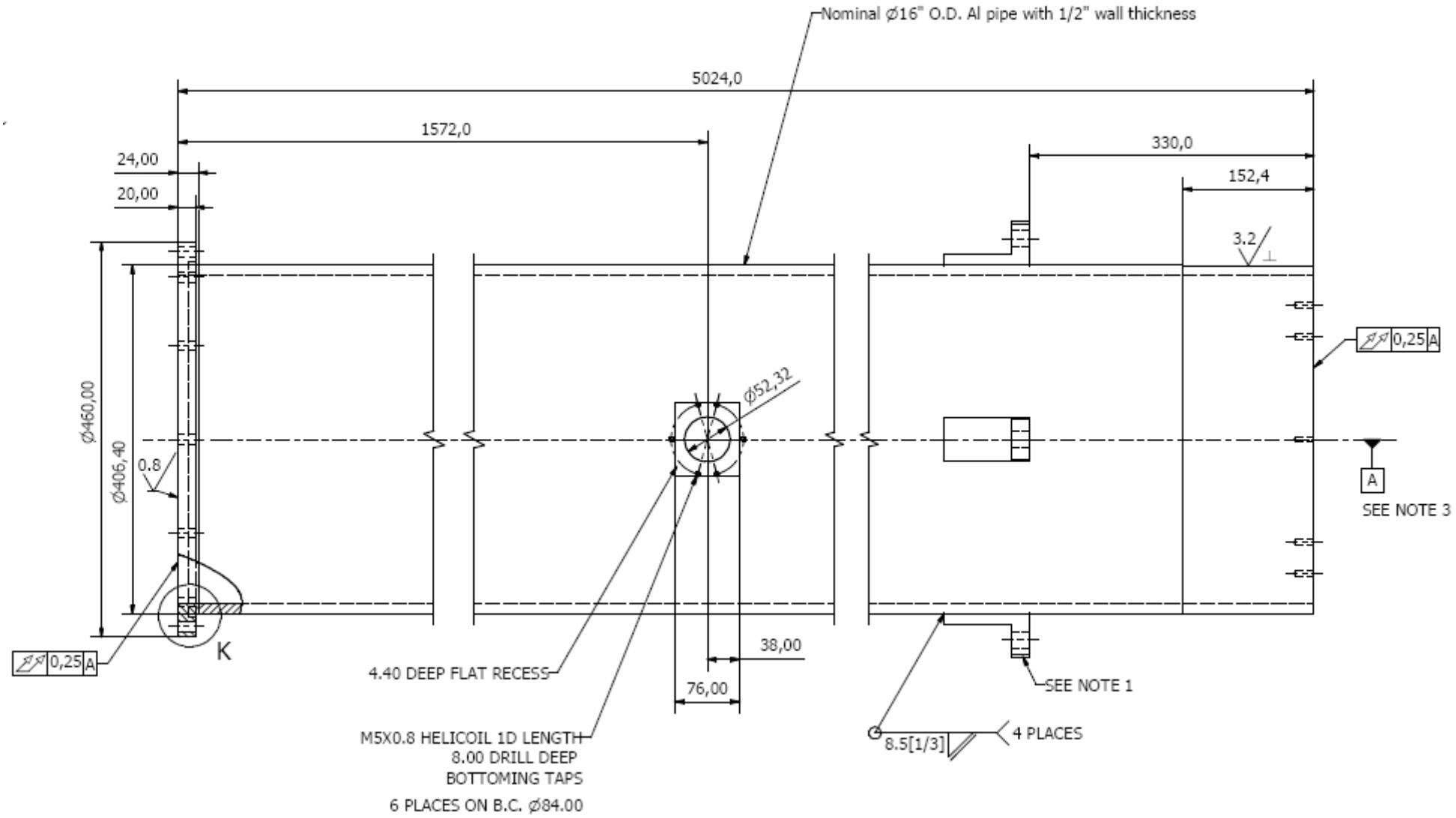


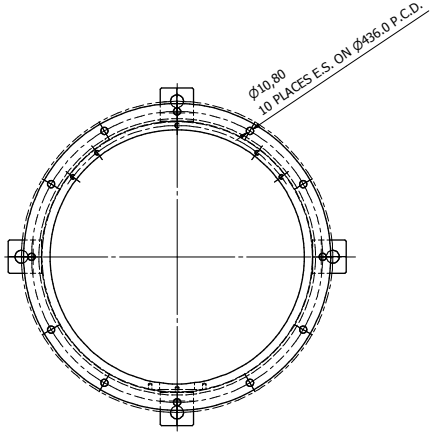
Figure 4: Location of the vacuum port with respect the DLA/BCA wall and the last support stand.

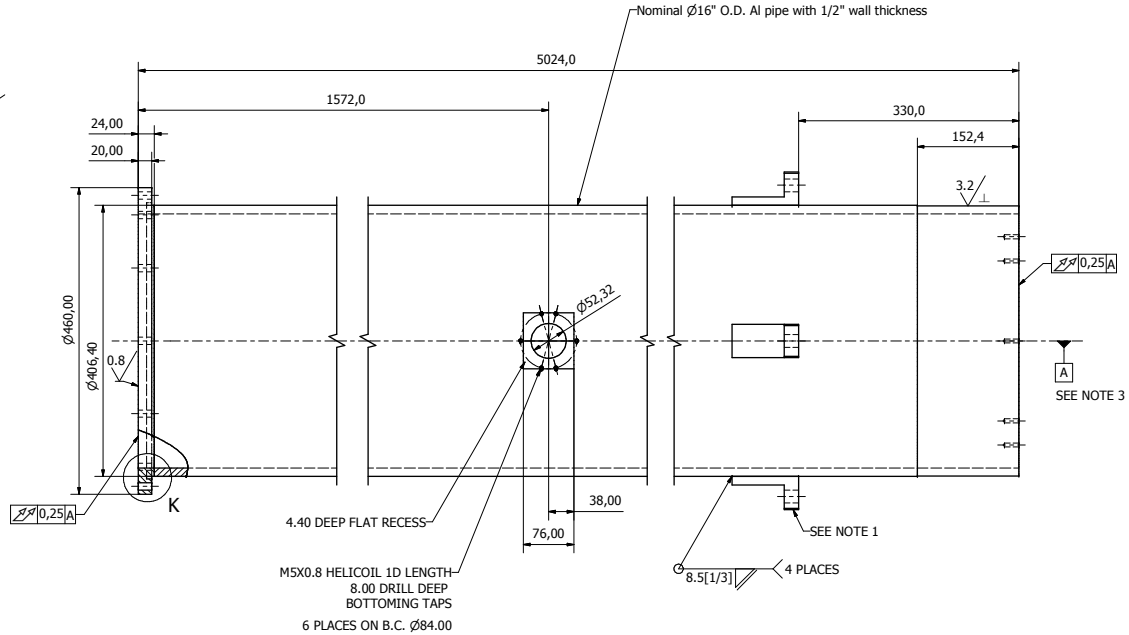
10 Appendix

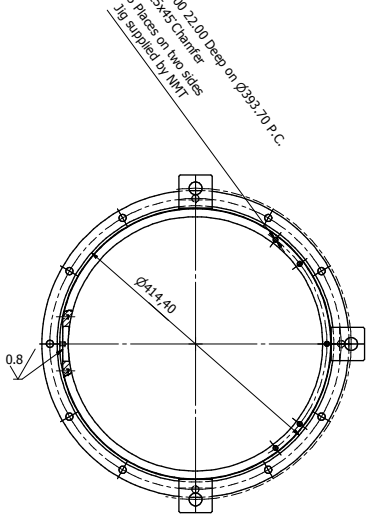
The precise interface requirements are captured in the following two drawings extracted from the engineering drawing specified in AD01.




Nominal Ø16" O.D. Al pipe with 1/2" wall thickness
5024,0
1572,0
330,0
152,4
24,00
20,00
3.2
Ø460,00
Ø406,40
0.8
Ø52,32
0,25 A
A
SEE NOTE 3
K
0,25 A
4.40 DEEP FLAT RECESS
38,00
76,00
SEE NOTE 1
M5X0.8 HELICOIL 1D LENGTH
8.00 DRILL DEEP
BOTTOMING TAPS
6 PLACES ON B.C. Ø84.00
8.5[1/3]
4 PLACES







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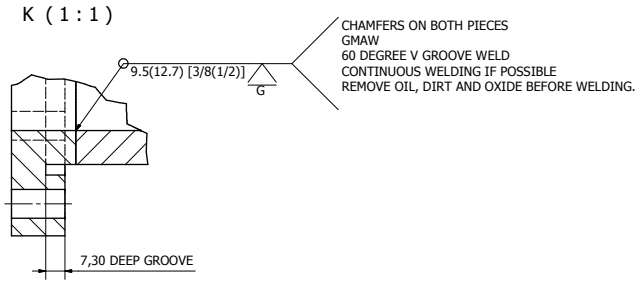

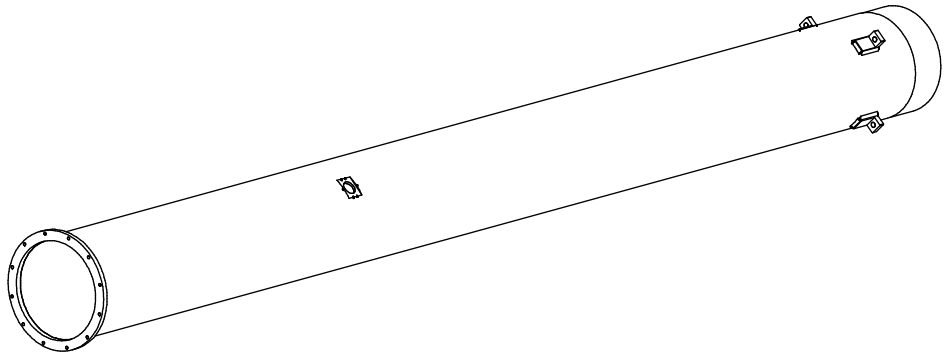

Notes:

1. See drawing No. MROI-086. 4 Places. Location of brackets is not critical, but shall be within ± 1mm in location (longitudinally and circumferencially) and ± 0.2˚ in perpendicularity of the face of the bracket to the normal axis of the pipe (See note 3). Mounting jig will be supplied by NMT.
2. Ends to be machined or ground using some appropriate process for removing scratches and burrs with no longitudinal effects. The chamfers of the inner edges at both pipe ends should not be larger than 0.25x45˚.
3. The nominal axis is defined by a line joining the centre of each end of pipe.

SI	Material: BS1470 6061	Tolerances: x ± 1.0; .xx ± 0.12; .xxx ± 0.05 Angular ± 0.3˚	Drawn by: X S	Date: 20/01/08	Quantity: 1 off for each DL	Drg. No. MROI-084-03
	University of Cambridge, Department of Physics		Title: Pipe Section 3			
	CAVENDISH LABORATORY		Project: MROI		Scale: 1:4	Size: A1