

Magnet Block Specification for a 185 mm PPM Undulator

6.8.25.2 Rev. 0

Date: 02-04-25

Copyright 2002, Canadian Light Source Inc. This document is the property of Canadian Light Source Inc. (CLSI). No exploitation or transfer of any information contained herein is permitted in the absence of an agreement with CLSI, and neither the document nor any such information may be released without the written consent of CLSI.

Canadian Light Source Inc.
101 Perimeter Road
University of Saskatchewan
Saskatoon, Saskatchewan Canada

Signature

Date

Original on File – Signed by:

Author

Ingvar Blomqvist

02-04-25

Reviewer #1

Dan Lowe

Reviewer #2

Lucas Smith

Approver

Emil Hallin

BLANK PAGE

REVISION HISTORY

<i>Revision</i>	<i>Date</i>	<i>Description</i>	<i>Author</i>
A	02-03-25	Original Draft	Ingvar Blomqvist
B	02-04-08	Drawings added, text expanded	Ingvar Blomqvist
0	02-04-25	Approved	Emil Hallin

BLANK PAGE

TABLE OF CONTENTS

1.0	INTRODUCTION.....	3
2.0	REQUIREMENTS	3
3.0	SAFETY AND ENVIRONMENTAL	4
4.0	APPLICABLE CODES, STANDARDS AND PROCEDURES	4
5.0	QUALITY ASSURANCE	5
6.0	INSPECTION, TESTING AND COMMISSIONING.....	5
7.0	OTHER REQUIREMENTS AND CONSTRAINTS	5
8.0	REFERENCES	5

BLANK PAGE

1.0 INTRODUCTION

1.1 PURPOSE

A Pure Permanent Magnet Undulator with a period length of 185 mm and a peak field of > 0.71 T at 25 mm gap is under development at Canadian Light Source, Inc (CLS).

A fixed price quotation is requested for the manufacture, machining, coating, magnetization and measurements of the permanent magnet blocks for the undulator.

1.2 SCOPE

This specification covers the manufacture, machining, coating, and magnetization of the NdFeB blocks, measurement of the three components of the average magnetization, the provision of all packing material and cases, and delivery to CLS.

2.0 REQUIREMENTS

2.1 QUANTITY

2.1.1 A total of 160 permanent magnet blocks are required. They are divided into 2 categories as shown in the following table.

Magnet Identifier	Number of Blocks	Drawing Number
H	154	SR1/ME/MAG/0050001
E	6	SR1/ME/MAG/0050002

Table 1. Magnet types used for the undulator.

2.2 PHYSICAL AND MAGNETIC PROPERTIES

- 2.2.1** The blocks of the types H and E shall be made from transverse die-pressed permanent magnet material. The remanence (B_r) shall be > 1.22 T and the intrinsic coercive field (H_{cJ}) associated to the magnetization curve shall not be less than 1670 kA/m at 20°C. For all blocks of these types, the distribution of magnetization shall be less than ± 1.5 %. More precisely, no magnet block of the types H, HE, V and VE shall have an absolute magnetization different by more than 3 % from any other block.
- 2.2.2** For the 2 types of blocks, the magnetization shall be precisely parallel to the appropriate faces, as shown on the attached drawings, the maximum deviation angle shall be less than $\pm 1.5^\circ$.
- 2.2.3** The permanent magnet block surface shall be coated with 10-15 μ m of Nickel. The measures and tolerances given in the drawings are valid for the blocks before the coating.
- 2.2.4** For each magnet block, the measurements of the three components of the average magnetization made by the supplier shall be delivered to CLS.
- 2.2.5** Each magnet block shall be assigned a serial number in addition to the magnet identifier listed in Table 1.
- 2.2.6** Each magnet block shall be marked with the magnet identifier, the serial number and the direction of the easy axis.

3.0 SAFETY AND ENVIRONMENTAL

- 3.1** All magnet blocks shall be packaged to protect the blocks against moisture during shipping and storage.
- 3.2** The nominal operating temperature of the magnet blocks is expected to be between 20°C and 40°C. The expected normal ambient temperature inside the storage ring tunnel is 27°C \pm 0.1°C.
- 3.3** The magnet blocks shall be able to withstand a relative humidity range from 0% to 90%. The expected relative humidity limits under operating conditions are from 25% in the winter months to 50% during the summer months.

4.0 APPLICABLE CODES, STANDARDS AND PROCEDURES

Not applicable.

5.0 QUALITY ASSURANCE

The Proponent shall maintain and apply a quality assurance program compliant with ISO-9001 for the design, manufacture and testing of all magnet blocks.

6.0 INSPECTION, TESTING AND COMMISSIONING

The successful proponent shall develop inspection sheets to be filled out, signed and dated by the technicians the tests and inspections listed below. Tests may be repeated at CLS prior to acceptance.

- 6.1** Inspector shall inspect important surfaces for surface defects (cracks, broken edges, non-uniform coating). Blocks showing such defects shall be rejected.
- 6.2** Dimensions and tolerances shall be checked and conform to the drawings listed in Table 1.
- 6.3** Magnetic measurements of the three magnetization components shall be made and be within specification.

7.0 OTHER REQUIREMENTS AND CONSTRAINTS

Tolerances, where not defined or difficult to achieve, are subject to negotiations.

7.1 PREPARATION FOR SHIPMENT AND DELIVERY

- 7.1.1** Shipping crates shall be designed such that they can be moved using standard handling devices (forklift and pallet jacks).
- 7.1.2** The magnet blocks shall be packed in the shipping crates in such a way that they are protected against moisture. It shall be possible to safely remove and replace a given magnet block without affecting the other magnet blocks in the crate.
- 7.1.3** If more than one shipping crate is used, the magnet identifiers and serial numbers for the blocks in each crate shall be shown in the packing list.

8.0 REFERENCES

I. Blomqvist, Canadian Light Source, Saskatoon, SK. CLS Conceptual Design Report 6.2.25.1, Magnetic Design of a 185 mm PPM Undulator for the CLS.