

		STANFORD LINEAR ACCELERATOR CENTER	
		SPECIFICATION	
STANFORD SYNCHROTRON RADIATION LABORATORY			
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Author(s): Jack Tanabe, Nanyang Li		Date: Jan. 16, 2001	
First Line: SPEAR3			
Second Line: Magnet System			
Title: Horiz/Vert Corrector Magnet Core Production			
H/V Corrector Magnet CORE Specification 垂直 / 水平校正磁铁 铁芯 生产说明书		Approved: SLAC Project Engineer Richard Boyce Date:	
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Update / 修改			

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1. GENERAL 概况

This document is presented in both English and Chinese text; in case of differences, the English version shall be used.

本文含中英文两种文字，如有不符之处，以英文为准。

1.1 Scope of the Specification / 说明书范围

This specification outlines the minimum requirements governing the acquisition of sheet steel, lamination punching, step punching laminations for the core ends and the assembly of the cores for the SPEAR3 prototype and production cores for the SPEAR3 combined function corrector magnets. It defines the required inspection, and provides the general outline for the documentation required in order to maintain a quality assurance program during the fabrication.

本说明书概况了SPEAR3工程垂直/水平校正铁及其样机钢材，工装、芯片冲制，端部削斜半冲片-吞-组装的基本技术要求。规定了检验项目和在生产中实施质量检验和监督的文件要求。

1.1.1 Applicable Document 使-梦-

Drawing SA444-406-08 C0	Corrector Magnet Core Assembly
Drawing PF444-406-09 C0	Corrector Magnet Core Lamination

1.2 Scope of Work / 工作范围

IHEP shall procure all required tooling including a die set. IHEP shall stamp all the laminations, fabricate all required parts and assemble the cores required for a prototype magnet, and production quantities of corrector magnets called out in Attachment 5. IHEP shall develop inspection documentation (travelers) for quality assurance and perform all Quality Assurance (QA) procedures.

高能所应负责包括一套冲模在内的所有工装的设计、制造。应负责样机和附件5规定数量的批量校正铁所需芯片的冲制以及所有其他零部件的生产和铁芯组装。高能所还应制订质量管理的文件（跟踪卡）和实施质量检测及监督。

2. LAMINATION / 芯片

2.1 Steel Sheet 芯片材料

It is understood that the cut off from SPEAR3 dipole lamination steel sheet can be used for corrector prototype and production magnet laminations.

SLAC和高能所双方的共识是SPEAR3二极铁用钢板的剪裁边料可以用于校正铁样机和生产铁冲片的冲裁。

2.2 Die Set Inspection and Sample Laminations 冲模和样片的检验

The die set will be thoroughly inspected in order to assure that all dimensions and die and punch clearances are consistent with producing the full quantity of laminations required for the prototype and production quantity of corrector magnet cores to the dimensions, tolerances and burr specifications outlined in drawing PF444-406-09 C0. After inspection of the die set and approval of sample laminations at IHEP, an IHEP measurement report for at least three sample laminations shall be sent to SLAC and the same three laminations shall be delivered to SLAC for verification of dimensions. Punching of laminations for the prototype or for the production

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quantity of magnets using the die set shall not proceed until SLAC inspection is completed and approval has been obtained.

冲模应经详细检验，确保其尺寸和凸凹模间隙能够冲制醒蛻枋康某迤 1. 证它们符合图纸 PF444-406-09 C0尺寸和毛刺公差要求。高能所验模和通过样片检验之后，至少应向SLAC递交3张芯片的检验报告并将该三张样片寄SLAC核检。在SLAC完成核检发出生产批准书出来之前，样机和批量铁芯某遂撤得开始。

2.3 Lamination Stamping and Inspection / 芯片冲制和检验

2.3.1 Burr Inspection / 毛刺检验

Stamped laminations shall adhere to the burr requirements set forth in Drawing PF444-406-09 C0, Corrector Magnet Core Lamination. Burr inspections shall occur at frequencies determined by IHEP but not less than 2000 laminations. Should the burr exceed the drawing requirement, all laminations punched after last inspection shall either be rejected or deburred and the die and punch shall be re-sharpened.

芯片的毛刺要符合图纸 Drawing PF444-406-09 C0要求。毛刺检验周期由高能所出决定，但不得短于每2千片一检。如果毛刺超过标准，自前次检验以后所冲的芯片应予报废或去毛刺处理。模具刃口要修磨。

2.3.2 Inspection after Die Re-Sharpening / 修模后检验

Three (3) sample laminations shall be inspected after each die and/or punch re-sharpening. If IHEP determines that the sample laminations satisfy dimensional and burr tolerances, stamping may proceed without SLAC approval. All sample laminations and inspection records shall be forwarded to SLAC.

每次修模或修磨刃口后，高能所应全面检测三张芯片。如检测合格，高能所可自行决定开冲而不需获SLAC批准。所有样片和检测报告需送SSRL。

2.3.3 Inspection Record / 检验记录

For laminations inspected after die/punch re-sharpening, an inspection record shall be written. The inspection sheets (travelers) shall be devised by IHEP. The information in these travelers shall include at minimum the following data:

- Lamination Punching Serial Number.
- Burr size(s) if the tolerance is exceeded, its (their) location on the lamination.
- Names of inspector.
- Date of inspection.
- CMM report.

修模后检验的冲片应作记录。芯片检验跟踪卡应由高能所提供。芯片的跟踪卡至少应含以下内容：

- 芯片冲制序号
- 毛刺尺寸，如超差，图示在芯片上的位置
- 检验员姓名
- 检验日期
- 三坐标检验报告

2.3.4 Handling and Storage / 操作和存放

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Adequate care should be taken in order to avoid bending or otherwise damaging laminations during handling or storing. Laminations should not be stored on an uneven or soft surface. Bent, rusted or otherwise damaged laminations shall be discarded.

芯片的冲制及存放过程应十分小心。芯片绝不应堆放在不平或松软的表面。弯折、锈蚀或有其他损伤的芯片应报废。

3. END CHAMFER 端部削斜

3.1 End Chamfer Procedure 端部削斜方案

IHEP shall develop a procedure to trim the individual laminations to produce the end chamfer. The procedure shall be supplied to SLAC for review one month before the prototype fabrication. A cut type number identifying the lamination position in the core assembly shall be marked on the cut laminations.

高能所应制定一个加工端部削斜所需的半切冲片的方案。该方案应在样机制造开始前一个月交SLAC审核。按其在削斜中的位置，不同半切的冲片应分别标明适当号码以便区别。

3.2 Cutting Die 切口模

Depending on the procedure that IHEP selects for the end chamfering, IHEP may need to design a cutting die to step cut the laminations for the end chamfer.

根据高能所选择的端部削斜工艺，高能所可能需要制造一个切口模，步进切裁铁芯端部削斜部分的冲片。

4. CORE FABRICATION 铁芯组装

4.1 Stacking Fixture 叠装机

IHEP shall design and fabricate a fixture to stack, compress and glue the core to the required tolerances defined in drawing number SA444-406-08 C0. The conceptual design of the stacking fixture shall be supplied to SLAC for review.

高能所应设计和制造叠片工装，工装应保证按图纸SA444-406-08C0技术要求叠片，压紧和粘接铁芯。叠装机的设计方案应交SLAC审阅。

4.2 Stacking and Gluing 叠压和粘接

Before the stacking, the laminations that have been partially cut for the chamfering shall be carefully counted and laid aside according to their cut type position number in the chamfer. The laminations for each corrector magnet shall be carefully cleaned to remove any oil or grease, coated using thermal setting epoxy and compressed from the stack of laminations for each magnet core. The laminations shall be flipped about their centerline according to the drawing SA444-406-08 C0. The laminations at the interfaces between flipped laminations shall be deburred to assure good compression at the interface where burrs face each other and cannot nest. The glued core shall be cured using IHEP suggested curing cycle for the IHEP selected epoxy formulation.

叠装开始之前，半切的用于削斜端部的冲片需小心地一一选出，并按其标明的在端部削斜中的位置序号，顺序码放在一边等待使用。每个校正铁的铁芯芯片应取自为该铁芯一备

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的芯片，粘接前应彻底去油污，热固化环氧涂膜处理，然后叠压。所用芯片应按照图纸 SA444-406-08 C0要求以中心线为轴翻转以保证叠装的对称性。为保证叠压精度，翻转擦之间，面面相对的芯片应去毛刺，以避免毛刺相对难以压紧。粘接好的铁芯应按高能所为其所选环氧制订的固化工艺进行固化处理。

4.3 Painting 喷漆

All corrector magnet core assemblies shall be painted. All surfaces except the pole shall be primed with Rustoleum or Chinese equivalent metal primer before application of the final colored coat. The corrector magnet color is YELLOW. A sample shall be delivered to SLAC on a painted 6 x 6 (cm) piece of lamination steel for approval prior to painting the prototype core. The non-painted surfaces shall be protected with Lps-3 rust preventative oil.

校正铁铁芯都需喷漆。除极面外所有表面都需喷漆。在上色漆之前，应加涂 Rustoleum 或中国等同成分的防锈底漆。校正铁漆色为黄色。一块6X6喷漆样品应在样机铁芯正式喷漆开始之前交SLAC核准。不喷漆表面应涂Lps3防锈油。

4.4 Identification 身份号

Each corrector magnet core shall be identified with a unique production serial number. The number shall be marked on a location, which shall be visible after the magnet assembly.

每块校正铁铁芯应指定一归其独有的身份号。该身份号为其生产序号，应打在总装后可见的位置。

5. TRAVELER 跟踪卡

The information in the core traveler shall include at minimum the following data. The traveler shall be filled out, signed and dated by the technicians performing the core assembly and/or inspection and signed and dated by the technician supervisor signifying approval of the core for final magnet assembly.

- Partial cut lamination cut type number and number of each type.
- Core serial number.
- Number and weight of laminations.
- Computed packing fraction.
- Compression pressure.
- Core length.
- Pole flatness.
- Core squareness.
- Names of technicians assembling the core.
- Date of Core assembly.

铁芯跟踪卡应至少包括如下内容。跟踪卡应由生产和检验人员填写并签字，并经有关一人签批转磁铁总装工序。

- 半切冲片号码和每种片数
- 铁芯序号
- 芯片数量和重量
- 计算叠装系数
- 最终叠装压力
- 铁芯长度

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- 极面平直度
- 铁芯矩形度
- 操作人姓名
- 实施日期

5.1 Filling out the Traveler / 填写跟踪卡

The traveler shall be filled out, signed and dated by the technicians performing the assembly and/or inspection of the core and signed and dated by the technician supervisor signifying approval of the core for final magnet assembly.

跟踪卡应由生产和检验人员填写并签字，并经有关负责人签批转磁铁总装工序。

5.2 Traveler Original / 原始文件

The original of the completed, signed and approved traveler shall accompany the core until final magnet assembly. After magnet assembly, the completed original traveler should be filed at IHEP.

填写和签批完毕的原始跟踪卡应随铁芯周转，直至最后的总装工序。在磁铁总装完后，原始文件-

5.3 Traveler Copies / 复印件

A copy of a traveler for each core shall be packaged with other completed travelers for each completed magnet and delivered to SLAC along with the magnet.

每块铁芯的跟踪卡的复印件应与完工磁铁的其他跟踪卡的复印件一并汇总，随磁铁发往SLAC。