

# Lawrence Berkeley National Laboratory

## Recent Work

**Title**

LHC IR Quad Wedge Inspection Procedures

**Permalink**

<https://escholarship.org/uc/item/107890sm>

**Author**

Higley, Hugh C.

**Publication Date**

1998-02-18

LBNL 41430  
SC MAG 636



Lawrence Berkeley National Laboratory

Hugh C. Higley

One Cyclotron Road, MS: 46-161

Berkeley, California 94720

Tel: (510) 486-5815

Fax: (510) 486-5310

EM: HCHigley@lbl.gov

Subject: LHC IR QUAD WEDGE INSPECTION PROCEDURES

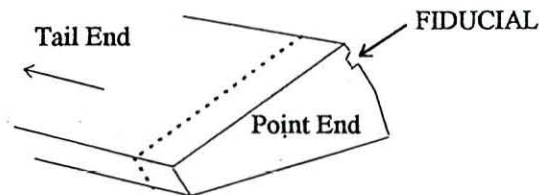
Date: Wednesday, February 18, 1998

Wedges were received from Precision Wire & Shapes in crates 11 ft long. The crates, made of 1"x6" pine, showed signs of damage and were replaced for shipment to FNAL with 2"x4" fir construction, 3 pcs., with a 5/8" plywood lid.

The wedges were not marked, so as they were removed from the box they were given consecutive numbers 1...26 using a blue felt pen.

Samples were cut from each end using a wet abrasive saw. The samples were 2.5mm long ea. The saw curf was 2mm for each cut. This reduced the overall length of each wedge from 140" (3.556m) to 139.65" (3.547m).

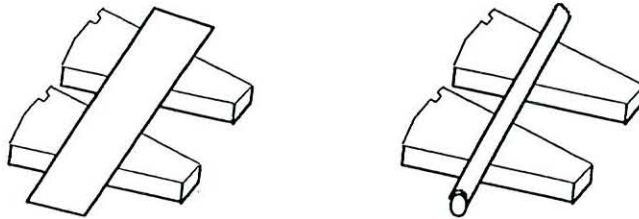
Samples were taken first from the "Point End" the end with the same orientation as the FNAL drawings. These were marked with a blue felt pen. A piece was then cut from the "Tail End" opposite. The two samples were then placed in a Sample bag and the LBNL wedge # was written on the bag.



Pre printed labels with the FNAL Drawing-# and the LBNL ID# were put on the wedges and in the sample bags.

## LHC IR QUAD WEDGE INSPECTION PROCEDURES

Two methods of preparing the samples were used. The first samples made had a copper strip  $\frac{1}{4}$ " x .015" soldered on there backs to keep them in the proper orientation, with one point end and one tail end sample from each wedge. They were then cast in Bakelite. This procedure had problems because the copper strip bent down into the bottom plain when the Bakelite was pressurized. This obscured the inspection surface.



The second method giving better results was to solder a heavy gage Cu wire to the back surfaces. This allowed the Bakelite powder to flow around and under .

We also tried two types of casting compound. The first, used for electron microscopy has a high carbon content and gave a nice black contrasting surface, but was relatively soft and allowed the copper wedges to form a burred edge when sanded.

We then tried a harder compound of Bakelite (green) and it gave better results.

The samples were progressively sanded to 600 grit. A date and sample # were engraved on the back as well as affixing the preprinted label.

The samples were then sent to Jerome Cummings at the inspection department in Bldg. 77 where he compared each crossection to a theoretical data set. The comparison was done with the View Precies 3000 an optical scanning inspection machine, with a circular resolution of  $\pm .005$ mm over the dimensions of our part.

The data sets for each wedge section was emailed to me by Jerome as they were completed. A copy of a data set is on the next page.

i 22a

-0.123477  
0.12054  
-0.078719  
0.189752  
-0.251343  
1.629031  
-0.512666  
3.103574  
-0.802918  
4.471825  
-1.057729  
5.662142  
-1.09204  
5.849622  
-1.163565  
6.006114  
-1.24975  
6.025543  
-1.311376  
6.046431  
-1.787606  
6.012333  
-4.238102  
5.421694  
-7.177961  
4.70957  
-10.123926  
3.986667  
-13.065724  
3.268212  
-15.700733  
2.618351  
-15.996554  
2.547324  
-16.07732  
2.487654  
-16.095169  
2.363872  
-15.947379  
1.607448  
-15.788911  
0.847967  
-15.59739  
0.099018  
-15.543387  
0.053671  
-15.490054  
0.033729  
-15.191669  
0.000664  
-12.424225  
-0.004691  
-9.357693  
0.000003  
-6.290237  
0.001241  
-3.224572  
0.00079  
-0.501724  
-0.0054  
-0.158522  
0.072687

Raw data set as delivered from Jerome Cummings.

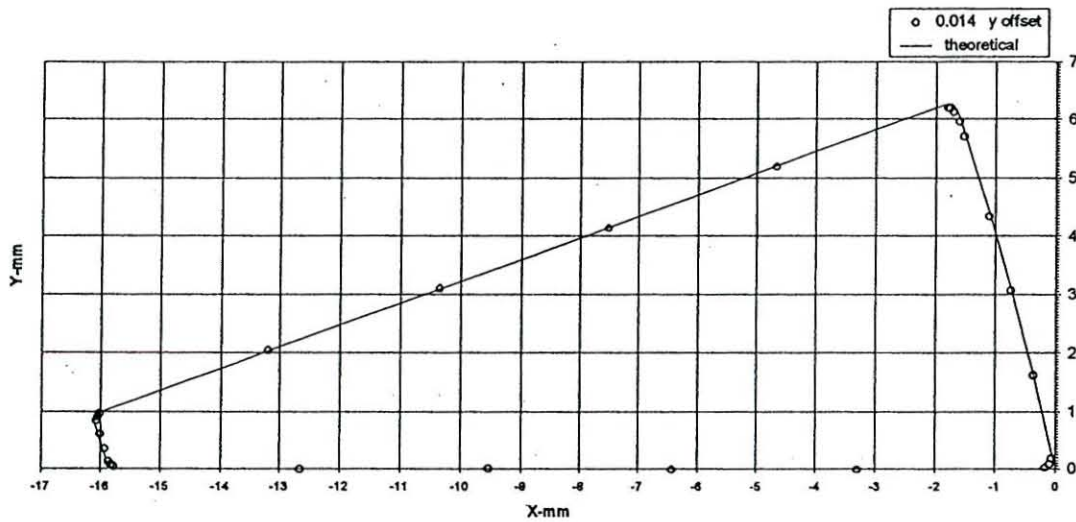
Data is in single column x.y.x.y.x.y

Data for Inner wedge #22 Point "a" being in top position.  
of sample pair. There were 102 data sets 2 ea from 56 wedges.

The data sets were parsed and graphed on top of the theoretical data set. Two files were created {Wedge insp. Inners.xls and Wedge insp. Outers.xls} using MS Excell 7.0 These two files contain all the data sets and wedge graphs as workbook pages.

There were a total of 102 data sets and graphs.

Example inner wedge inspection:



Example Outer wedge inspection:

