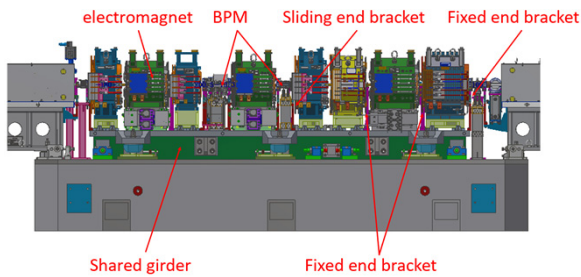


Abstract

The storage ring of high energy photon source (HEPS) has about 1536 vacuum tubes, which need different supports to align them to the desired position and keep their stability. According to the operational requirements of the storage ring vacuum tubes, this article introduces 3 types support structure of vacuum tubes. And finite element thermal-stress analysis was conducted on the vacuum tube and vacuum tube bracket. The result of the analysis provides a reliable theoretical basis for the design of the vacuum tubes support.

REQUIREMENTS FOR VACUUM TUBES

- ◆ Compact layout of electromagnets, BPM and other equipment
- ◆ Various small equipment alignment brackets are supported by a shared girder

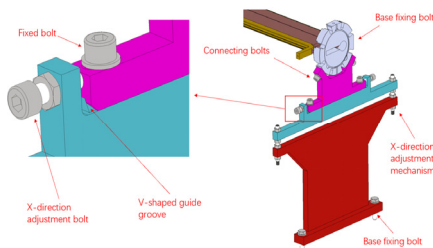


- ◆ Realizing the collimation adjustment in the XY directions
- ◆ The position of the vacuum tube remains unchanged before and after hot baking(200°C)

Direction	Amount	Accuracy
X	±5mm	0.2mm
Y	±5mm	0.2mm

FIXED END VACUUM TUBE BRACKET

- ◆ Connected to the flange by fastening bolts
- ◆ Using screws realizes the alignment adjustment
- ◆ Narrow plate support structure in beam direction
- ◆ V-shaped groove guide structure in X-direction
- ◆ Using bolts to fixing the bracket to the girder



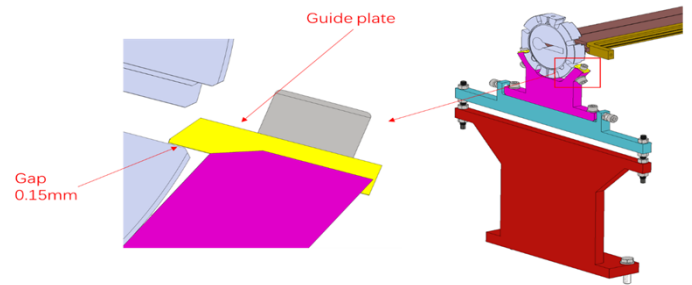
SLIDING END VACUUM TUBE BRACKET

- ◆ Most of the structures are consistent with the fixed end

CONCLUSION

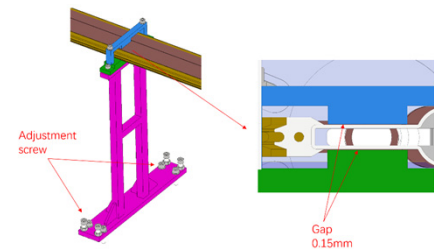
The fixed end vacuum box bracket, sliding end vacuum box bracket, and auxiliary support structure described above can achieve the alignment requirements of the vacuum tubes. Through finite element analysis and simulation of the usage status of the vacuum tubes, three types supports meet the requirements for guiding and limiting the vacuum tubes under hot baking conditions. The position measurement results after hot baking show that the Supporting structure meets the requirements for use.

- ◆ A mechanism similar to a guide rail is designed
- ◆ The gap between the guide plate and the flange is 0.15mm
- ◆ The side bolts should be removed during hot baking



Auxiliary support

- ◆ Most vacuum tubes are slender structures
- ◆ The auxiliary support is located in the middle section of the vacuum tube
- ◆ Supporting the weight of the vacuum tube
- ◆ Preventing the vacuum tube from bending downwards
- ◆ The gap between bracket and the vacuum tube body is 0.15mm



THE ALIGNMENT OF 18 VACUUM TUBES WITHIN A SECTIONG

- ◆ The vast majority meet the requirements
- ◆ Very few positions require further fine-tuning

