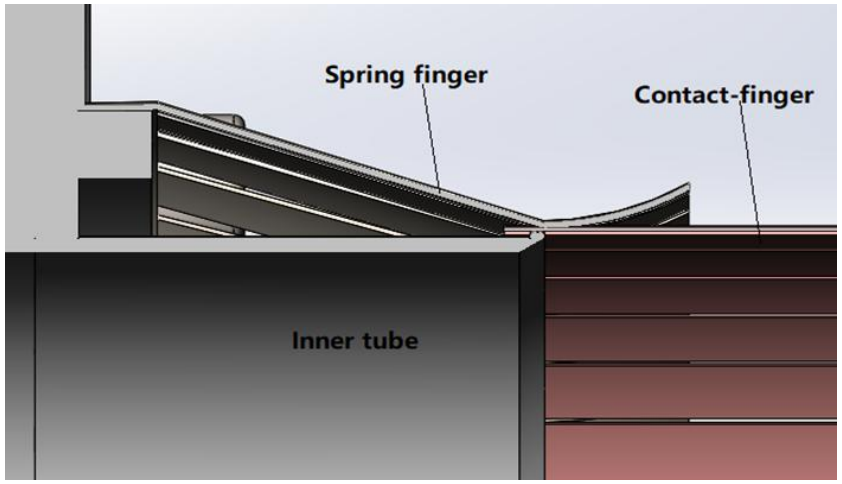
Research and Development Progress of CEPC RF Shield Bellows

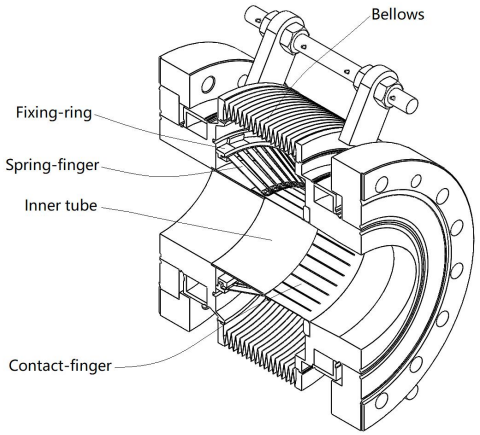
Introduce

- RF shield bellows is a key component to ensure good vacuum conditions and reach the best possible machine performance.
- The primary function of RF shield bellows is to allow for thermal expansion of the chambers and for lateral,longitudinal and angular offsets due to tolerances and alignment, while providing a uniform chamber cross section to reduce the impedance seen by beam.
- The usual RF-shield is done with many narrow Be-Cu fingers that slide along the inside of the beam passage as the bellows is being compressed
- There are many other types of RF shielding structures in the world, such as comb type, pls type, etc

Design Features and Performance Specifications

- The RF shielding structure of cepc bellows consists of three parts: spring finger, contact finger and inner tube.
- The spring finger provides contact force to ensure good electrical contact between the inner tube and beryllium copper finger.

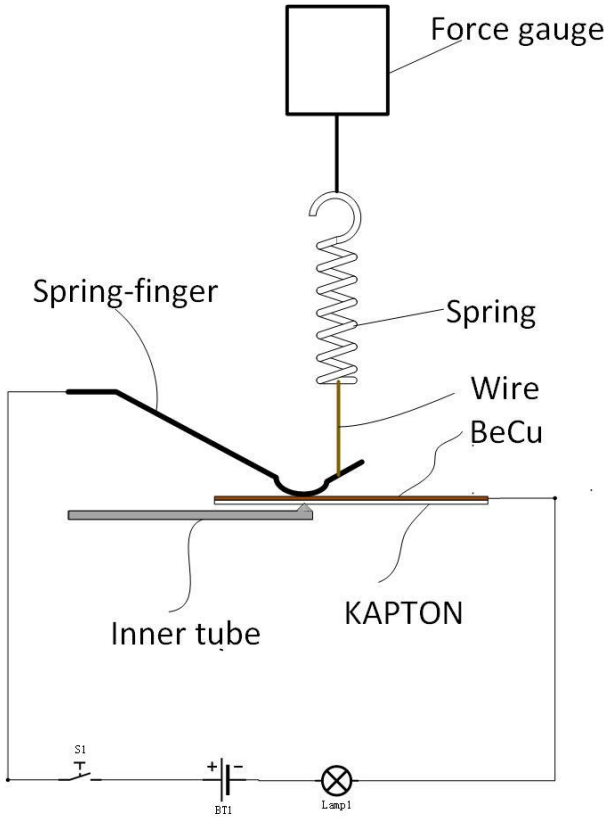




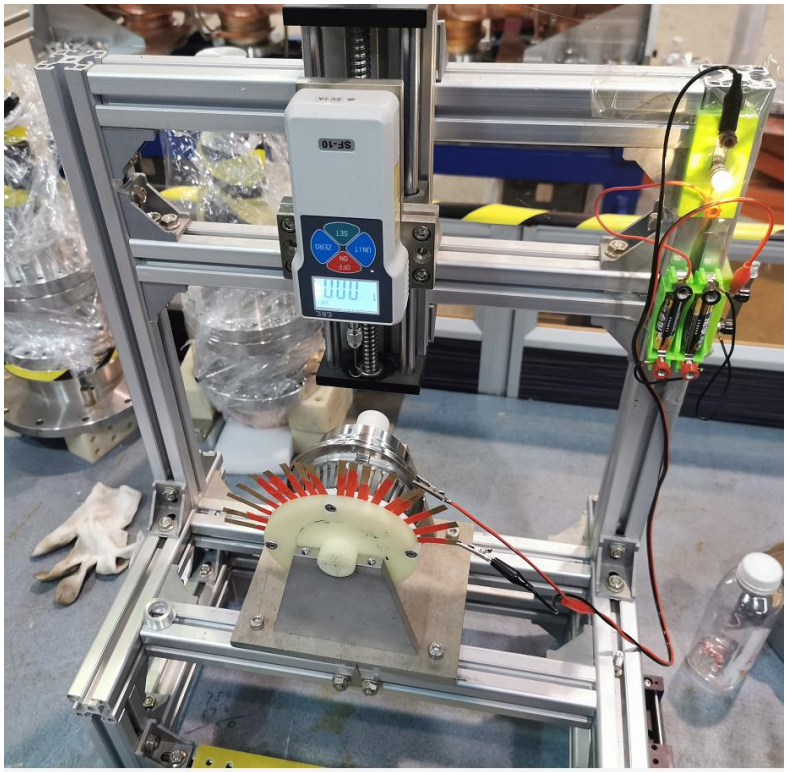
Total length	Expansion	Contraction	Ellipse cross section	Contact force	Maximum radial offset
140mm	5mm	12mm	75mm×56mm	125g	2mm

Contact Force Testing Device

Contact force between the spring fingers and the contact fingers is a key parameter.In order to reduce the human factors in the test, a test device is designed.The control precision of test tension can reach 0.01N.



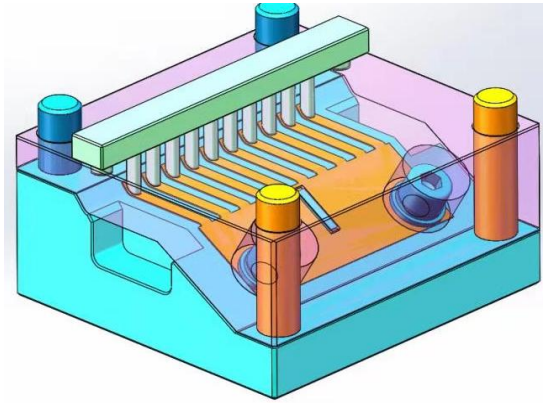
Schematic diagram of the test device

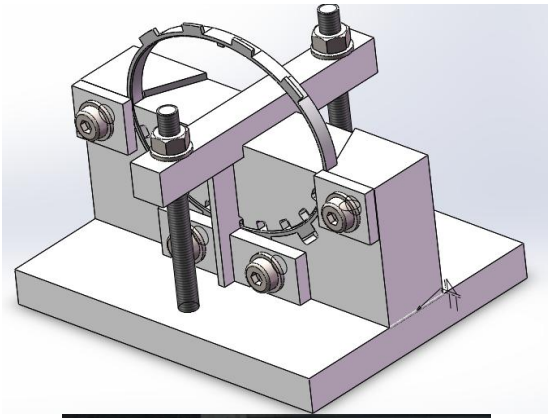


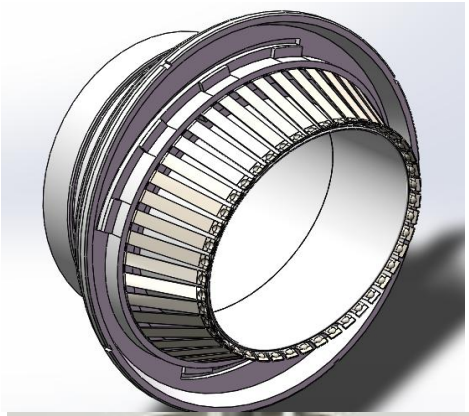
Actual picture of the device

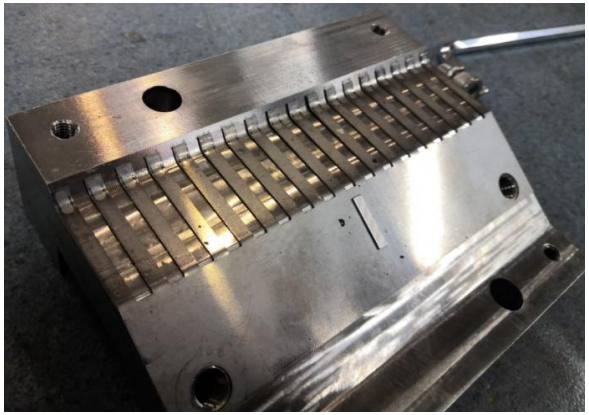
Forming of Spring Finger

In order to achieve the required contact force, the mold and welding tooling of the spring finger are constantly optimized, and the pre bending angle is also constantly adjusted.

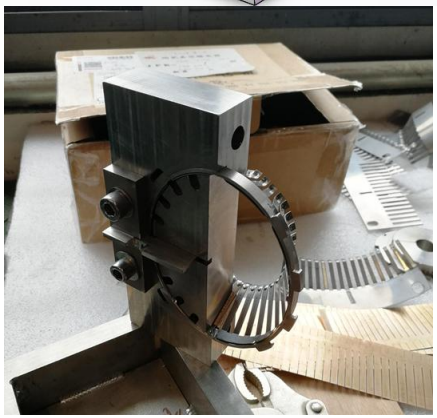








Mould of contact fingers adjustment

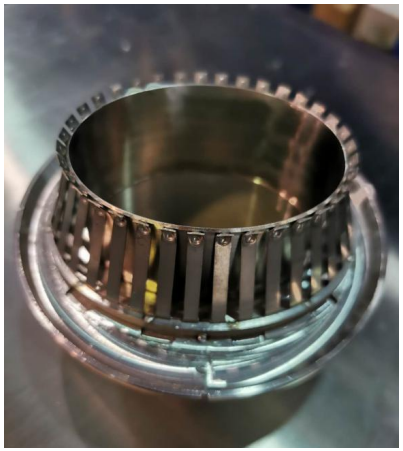


Mould of compression ring

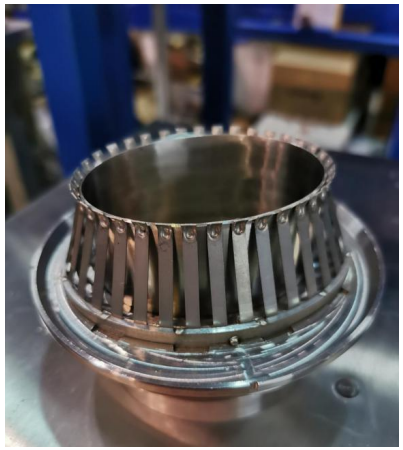
Assembled of contact and spring fingers

Forming of Spring Finger

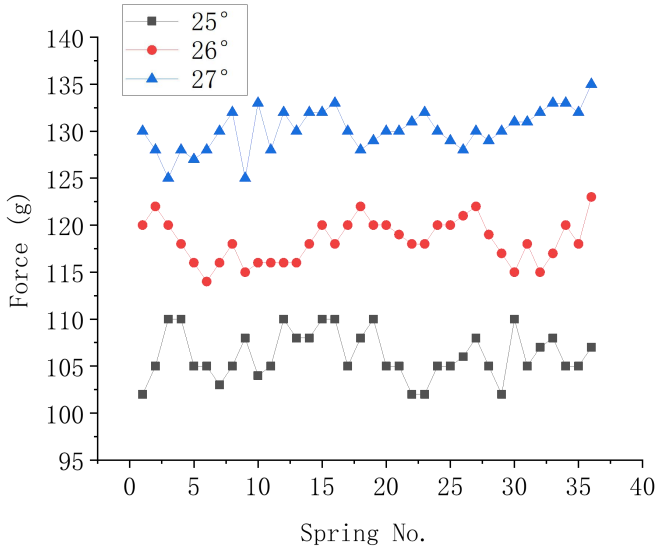
- Contact force is determined by pre-bending angle of the spring fingers. Different pre-bending angles of 25°,26°,27°,31° have been tested which shows that 27°is best.
- 27°is chosen and which forces between the spring fingers and the contact fingers is uniformly from different fingers and is about 125±5g, which meets 125±25g.

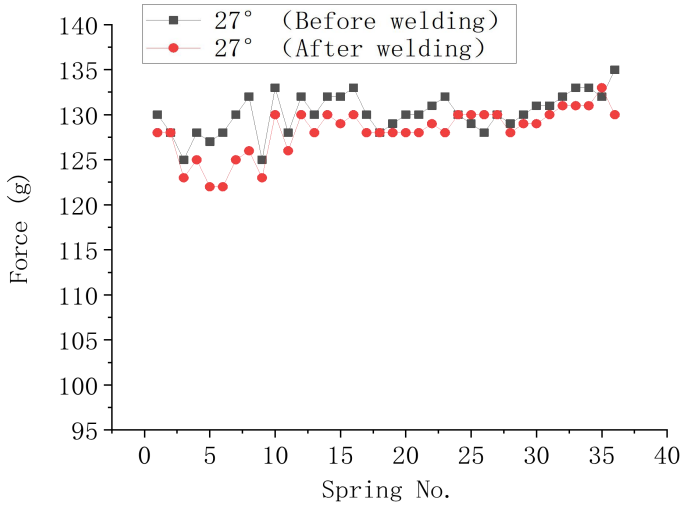


Before weld



After weld





Prototype of RF Shielding Bellows

prototype Ⅰ:

prototype Ⅱ: