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兰州重离子加速器大型真空室

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摘要 已建成的兰州重离子加速器的真空室是一个大型整体结构的超高真空容器,直径约10m,高4.5m,重65000 kg,内表面积211m~2,容积100m~3,工作真空度为5×10~(-5)Pa。 采用有限单元法在计算机上用SAP-5C程序对真空室受力分析进行了计算。真空室结构材料选用瑞典 Uddeholm钢厂生产的 316 L 超低碳不锈钢。 承制此大型容器的是航天工业部风华机器厂。由于结构庞大,首先将真空室分成八大块和几小块在工厂制造,然后运至现场焊制成一整体容器并进行机械加工。所有密封焊缝均用着色渗透液,X-射线探伤和氦质谱探漏仪进行检查和探漏。

关键词 整体结构 相对导磁率

分类号

A LARGE VACUUM CHAMBER OF THE SSC FOR HIRFL

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Abstract The Vacuum chamber of the Separated Sector Cyclotron for Heavy IonResearch Facility Lanzhou to have been built is described. It is a large monolithicultra-high vacuum vessel with 10 m in diameter and 4.5 m high, weighing 65 tn.The total volume is about 100 m~3. There are 234 ports on it for various purpose. The mechanical analysis of the vacuum chamber is completed using a finiteelement method by means of the procedure SAP-5 C on a computer. Uddholm 316 L super-low carbon stainless steel made in Sweden was selectedas a structure material. Because of very big size, the monolithic vacuum chamber is divided intoeight bigger and several smaller pieces to fabricate in the factory. Then it istransported by a train and a truck to our institute. Finally it is welded as asingle vessel and machined in situ. In the interests of economy. The manualelectric arc welding is the best choice in our case. It is paid great attention tostrict technological process during welding. Owing to high requirements for ultra-high vacuum, all of tight welded seams are inspected and checked by liquidpenetration testing, X-ray examination and helium mass spectrometer detecting.All of the flanges are machined before welding as far as possible at the factory.Some big flanges are cut by special way in situ. The pressure of 8×10~(-6) Pa for sufficient beam transmission in the vacuumchamber is abtained in September of 1986.

Key words Whole structure Relative magnetic Permeability

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