

Assembly of TPS Beam Position Monitor

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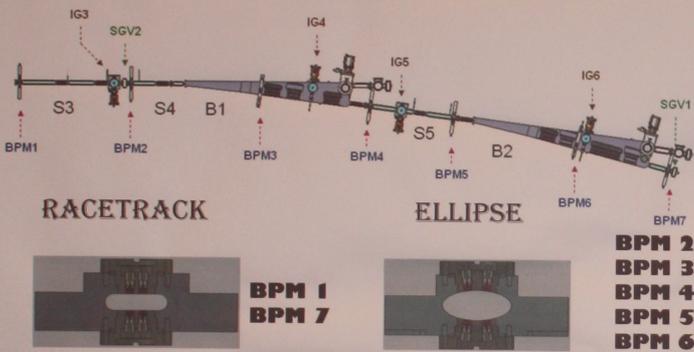
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INTRODUCTION

Beam position monitors (BPM) of two types have been fabricated and are installed in the chamber of the storage ring of TPS; one is of elliptical type and the other is of racetrack type. Both contain one beam duct and two flanges; each flange has two pieces of feedthrough that was designed and manufactured to have a small reflection coefficient. A diamond-edged gasket is selected to seal to obtain an ultra-high vacuum. The advantages of two (feedthroughs) in one (flange) design are ease of assembly and satisfactory control of dimensions.

LAYOUT OF BPM FOR ONE CELL OF TPS



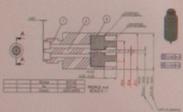
CO2 LASER BEAM WELDING



Ⓞ To alleviate the rate of failure of CO₂ welding, the flange is designed to leave a protrusion of length 3 mm and thickness 0.75 mm. The heat is supposed to be concentrated on leaving an air gap adjacent to the feedthrough, but much heat concentration could induce a thermal strain inside the feedthrough. Many cases are detected after welding with a CO₂ laser beam such that a helium leak is found when the BPM flange suffers from thermal shock rather than the CO₂ laser beam welding, and the leak occurs in regions at sites of ceramic/metal brazing. Although decreasing the power of the CO₂ laser might improve that situation, the quality of welding becomes debased.

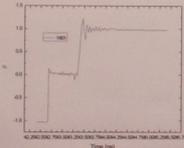
LOW REFLECTION FEEDTHROUGH

Feedthrough drawing



The impedance of each section of the feedthrough is designed to be about 50 Ω. The feedthrough with an unexpected TDR spectrum at the interface indicates that its structure differs from the original design.

TDR Spectrum



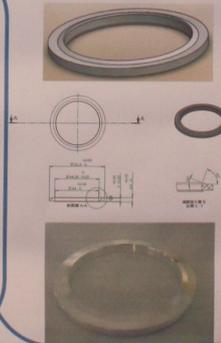
The button is then welded by YAG laser beam welding



YAG laser



DIAMOND GASKET SEALING

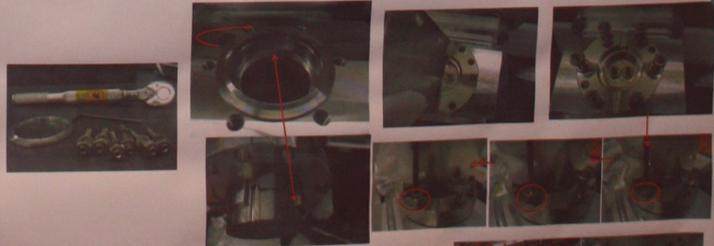


Ⓞ Al 1050H14 is selected for a diamond-edge gasket; it requires less torque than a copper gasket because of its smaller hardness. SS304 is the suggested material for nuts and screws as its thermal expansion coefficient is smaller than that of aluminium. A leak is typically discovered when cooling from 150 oC to 25 oC; a way to avoid that leak is to re-torque the nuts about 100, 80 and 50 oC.

PREPARATIONS FOR BRAZING



STEPS TO MOUNT A FLANGE INTO A BPM CHAMBER



- Ⓞ (1) place the flange inside the hole of the chamber.
- Ⓞ (2) stop slightly rotating the flange until two faces contact each other.
- Ⓞ (3) tighten every nut to 70 kg-cm gradually and equally.

Ⓞ Evacuation curve for a BPM mounted on one cell

