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Gravity Probe B Relativity Mission

Room Temperature Gyroscope Spin-Up Procedure

GP-B P0321 Rev -2

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Room Temperature Gyroscope Spin-Up Procedure

Purpose:

Spin-up a levitated Gyroscope in a Room Temperature testing facility.

Process Conditions:

- Vacuum in Test Facility Chamber is $\leq 1.0 \times 10^{-5}$ Torr
- Exhaust pump base pressure $\leq 7.0 \times 10^{-3}$ Torr
- Adequate supply of He gas to spin rotor
- Computer system to acquire spin data using an FFT algorithm
- Signal from either suspension system or IR from the fiber optic cables
- Gyroscope is levitated

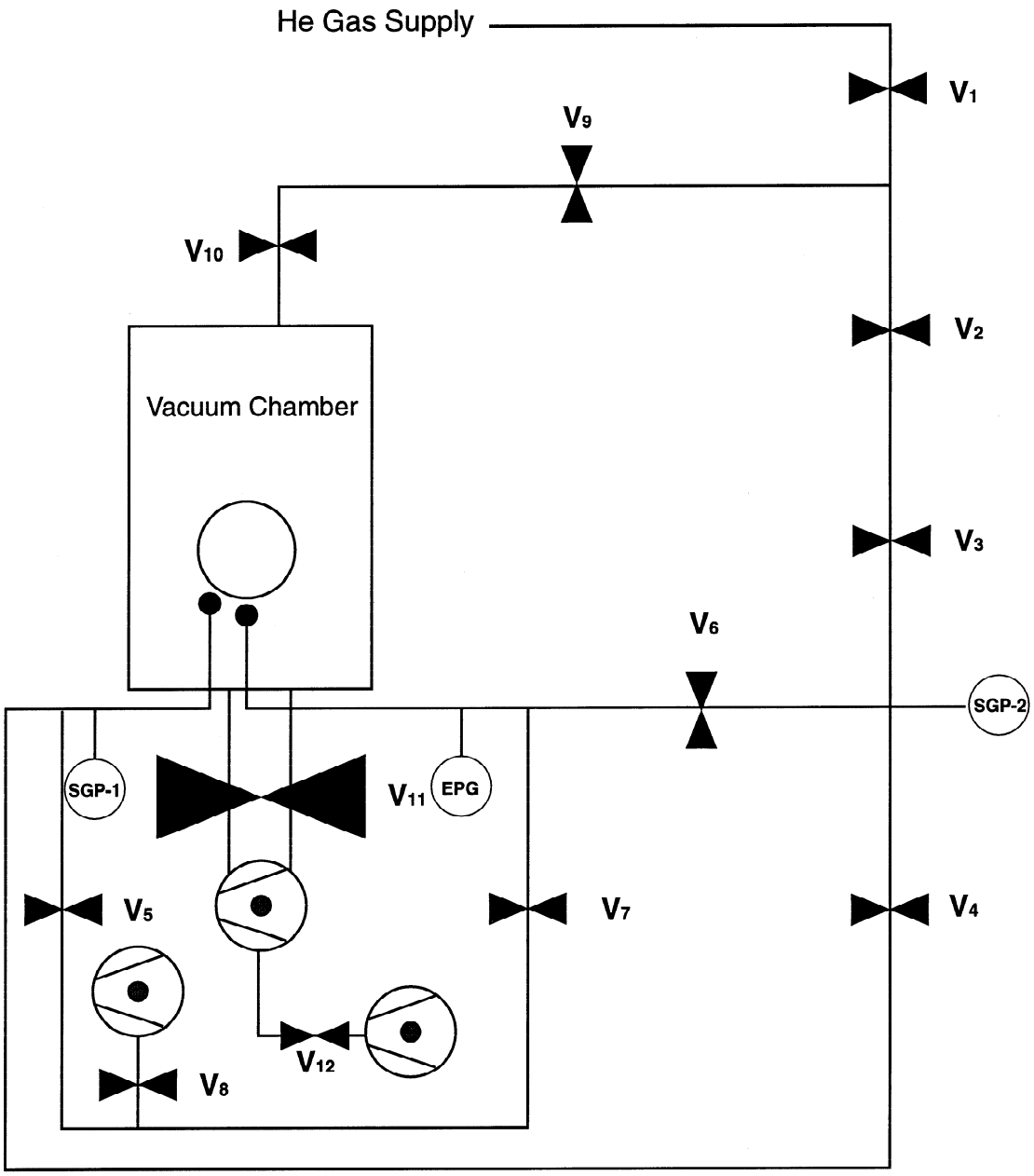
Procedure:

I. Room Temperature System 3

1. Log all parameters of gyro levitation from suspension system.
2. Zero mass flow display
3. Check that valves V11 (gatevalve) and V12 (foreline) are open.
4. Confirm exhaust pressure is $\leq 7.0 \times 10^{-3}$ Torr.
5. Open V3 (pneumatic valve gas supply manifold)
6. Open V2 (gas metering valve)
7. Open V9
8. Very slowly open V10 (metering valve) to evacuate the spin-up manifold into the vacuum chamber. Monitor the system pressure and do not let the pressure exceed 2.0×10^{-4} Torr. This can be controlled by adjusting V10 (metering valve). Pump on the manifold until a pressure of $\approx$ 50 milliTorr is achieved.
9. Open V4
10. Close V2 (gas metering valve)
11. Close V9
12. Close V10 (metering valve)
13. Start the data acquisition program and check that both channels are connected to either the "signal out" on the suspension system or the infrared optical system.
14. Open V1 (He gas supply)
15. Open V8 (exhaust pump manifold)

16. Open V7 (gyroscope exhaust manifold)
17. Slowly open V2 (spin-up gas metering valve) until a gas flow of 1.0 sccm is displayed on the mass flow display.
18. Monitor spin speed on the data acquisition.
19. As the rotor spin speed approaches the target spin speed, close V1. Next, slowly close V2.
20. After the rotor is spinning at the target spin speed, open V5 (spin-up manifold exhaust valve) to evacuate the gas in the spin-up line and gyroscope cavity.
21. After the pressures in SGP-1 and EPG $\approx 5 \times 10^{-3}$ Torr, close V4 and then V5 and V7.
22. Close V8 (exhaust pump manifold)
23. Log all parameters of gyro levitation from suspension system, spin speed, and data acquisition file name in lab notebook.

Room Temperature System 3



II. Room Temperature System 4

1. Log all parameters of gyro levitation from suspension system.
2. Zero mass flow display
3. Check that valves V13 (gatevalve) and V14 (foreline) are open.
4. Confirm exhaust pressure is $\leq 7.0 \times 10^{-3}$ Torr.
5. Open V3 (pneumatic valve gas supply manifold)
6. Open V9
7. Open V11
8. Very slowly open V10 (metering valve) to evacuate the spin-up manifold into the vacuum chamber. Monitor the system pressure and do not let the pressure exceed 2.0×10^{-4} Torr. This can be controlled by adjusting V10 (metering valve). Pump on the manifold until a pressure of ≈ 50 milliTorr is achieved.
9. Open V4
10. Close V9
11. Close V10 (metering valve)
12. Close V11
13. Start the data acquisition program and check that both channels are connected to either the "signal out" on the suspension system or the infrared optical system.
14. Open V1 (He gas supply)
15. Open V8 (exhaust pump manifold)
16. Slowly open V2 (spin-up gas metering valve) until a gas flow of 1.0 sccm is displayed on the mass flow display.
17. Monitor spin speed on the data acquisition
18. As the rotor spin speed approaches the target spin speed, close V1. Next, slowly close V2.
19. After the rotor is spinning at the target spin speed, open V5 (spin-up manifold exhaust valve) to evacuate the gas in the spin-up line and gyroscope cavity.
20. After the pressures in SGP-1 and EPG ≈ 5×10^{-3} Torr, close V4 and then V5,V6, and V7.
21. Close V8 (exhaust pump manifold)
22. Log all parameters of gyro levitation from suspension system, spin speed, and data acquisition file name in lab notebook.

Room Temperature System 4