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Gravity Probe B Relativity Mission

Magnetic Screening of the SM Gyroscope in the Large Scale Magnetics Testing Facility

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Magnetic Screening of the SM Gyroscope in the Large Scale Magnetics Testing Facility

This procedure is to be performed only by persons listed as certified operators of the large scale magnetics testing facility.

Equipment: Large Scale Magnetics Facility
dc SQUID readout
Chart recorder

Cleanliness precautions: The gyro is to be left in the poly bag when it is installed into the screening probe. This is to minimize handling of the gyroscope. It is still necessary to install the gyro on a clean bench into the holder.

ESD precautions: Follow only accepted ESD procedures.

***CAUTION*:** Do not allow the sample rod or baffle rod to be sucked in.Keep the sample rod or baffle rod clamped tight when not moving. Insert a brass screw or pin into the sample rod or baffle rod end whenever possible.

Preparation:

SQUID Controller

1. Set Range to 5S.
2. Set Reset to OFF.
3. Set Select to 1K

Chart Recorder

1. Set CHART SPEED to 2 cm/min.
2. Set RANGE to 1V, 200mV, or 100 mV as required.

Transport Mechanism

1. Push - , 1, and the up arrow twice to move the sample down.
2. Push 1 and the up arrow twice to move the sample up.

Installation

1. Place the stainless steel gyroscope container on the clean laminar flow bench.

2. Put on clean room latex gloves.

3. Open the stainless gyro container and lift out the delrin basket containing the gyroscope.

4. Remove the gyro from the basket. ***Do not remove the gyro from the poly bag***.

5. Insert the gyroscope into the cotton sample bag attached to the transport rod.

6. Install the transport rod into the vacuum flange and install the flange onto the probe airlock.

Sample Measurement

0. Check probe calibration by applying a current to probe Helmholtz coil and monitoring SQUID response.10μA in Helmholtz coil should produce a 1.32 V SQUID signal on the 5 and 5s control ranges. (Primary system calibration is performed periodically using a small movable dipole current loop.)

1. Hold the baffle rod with one hand and loosen the rod clamp and compression nut with the other hand.

2. Withdraw baffle approximately 12 inches and tighten the rod clamp and compression nut.

3. Remove the pin from the end of the baffle rod.

4. Hold the baffle rod with one hand and loosen the rod clamp and compression nut with the other hand.

5. Withdraw the baffle until it stops.

6. Tighten the rod clamp and compression nut.

7. Close the large plastic ball valve.

8. Close both vacuum pump valves.

9. Open the backfill valve to backfill with Helium gas.

10. When he backfill pressure pops the flange off the airlock, remove the flange with the baffle.

11. Cover the opening of the airlock with a plastic plate.

12. Turn off the backfill.

13. Remove the rod clamp, loosen the compression nut and remove the baffle rod from the flange.

14. Tie the sample to the sample rod or insert the sample in a cotton sample bag and tie the bag to the sample rod.

15. Install the sample rod into the flange and tighten the compression nut.

16. Install the rod clamp and tighten.

17. Install a brass screw into the end of the sample rod.

18. Turn on the backfill and remove the plastic plate.

19. Install the flange with the sample rod and sample onto the airlock.

20. Turn off the backfill.

21. Open the vacuum pump valves and pump the airlock down to at least 5x10-1 Torr.

22. Open the large plastic ball valve.

23. While holding the sample rod with one hand, loosen the rod clamp and compression nut with the other hand.

24. Slowly lower the sample rod until the end of the rod is within 12 inches of the rod clamp, then tighten the rod clamp and compression nut. Watch the flowmeter and slow the rate of lowering if the boiloff is excessive.

25. Remove the brass screw at the end of the sample rod and attach the second section of sample rod.

26. Insert a brass screw into the end of the second sample rod.

27. While holding the sample rod with one hand, loosen the rod clamp and compression nut with the other hand.

28. Continue to lower the sample rod until the end of the second sample rod is below the transport mechanism. Watch the flowmeter and slow the rate of lowering if the boiloff is excessive.

29. Tighten the rod clamp and compression nut on the sample rod.

30. Remove the brass screw from the end of the second sample rod and attach the third section of sample rod (this section should be connected to the transport mechanism).

31. Make sure the compression nut on the transport mechanism is loose, then lower the transport mechanism.

32. While holding the sample rod with one hand, loosen the rod clamp and compression nut with the other hand.

33. Lower the sample rod until the end of the sample rod is 7 inches above the compression nut of the transport mechanism. Watch the flowmeter and slow the rate of lowering if the boiloff is excessive.

34. Tighten the rod clamp and compression nut on the sample rod.

35. Tighten the transport mechanism compression nut.

36. Loosen the rod clamp and compression nut on the sample rod.

37. Record the date, run number, sample, part number, request number, and voltage range on the chart.

38. Remove the pen cap, lower the pen and turn on the chart drive.

39. Record the direction the transport mechanism will be moving on the chart.

40. Verify that the rod clamp and compression nut are loose.

41. Run the transport mechanism (sample) up.

42. Observe the plot and adjust the voltage range of the chart recorder if necessary.

43. If the SQUID Controller needs to be reset, turn off the chart recorder input until the voltage has stabilized. This will prevent the chart pen drive mechanism from being damaged.

44. Continue running the transport mechanism up and down, recording the voltage peaks of the sample and direction of travel until the readings are consistent.

45. It may help to introduce some exchange gas to increase the cooling rate of the sample. Pressure may be increased to 5x10-1 Torr by backfilling with helium gas.

46. When the readings are consistent, run the transport mechanism up, stop the chart, lift and cap the pen.

47. Tighten the rod clamp and compression nut .

48. Loosen the compression nut on the transport mechanism.

49. Unscrew the top sample rod and store it on the transport mechanism base.

50. Insert a brass screw into the end of the sample rod.

51. While holding the sample rod with one hand, loosen the rod clamp and compression nut with the other hand.

52. Withdraw the sample rod a few inches at a time, pausing to tighten the rod clamp and compression nut and allow the sample rod to warm up.

53. Continue this process until the joint of the first and second sample rods is approximately 12 inches above the rod clamp.

54. Remove the second sample rod and insert a brass screw into the end of the first sample rod.

55. Continue to withdraw the sample rod a few inches at a time, pausing to tighten the compression nut and rod clamp and allow the rod warm up until the sample rod is fully withdrawn.

56. Close the large plastic ball valve.

57. Close the vacuum pump valves.

58. Backfill the airlock with Helium gas.

59. When the backfill pressure pops the flange off the airlock, remove the flange with the sample rod.

60. Cover the opening with a plastic plate and turn off the backfill.

61. If no more samples are to be run, reinstall the baffle.

62. Remove the screw and rod clamp from the sample rod.

63. Loosen the compression nut and remove the sample rod from the flange.

64. Remove and store the sample.

65. Install the baffle rod into the flange and tighten the compression nut.

66. Install and tighten the rod clamp on the baffle rod.

67. Turn on the backfill.

68. Remove the plastic plate.

69. Install the flange with the baffle onto the airlock.

70. Turn off the backfill.

71. Open the vacuum pump valves to pump down the airlock.

72. When the pressure is less than 5x10-1 Torr, open the large plastic ballvalve.

73. With one hand holding the baffle rod, loosen the compression nut and rod clamp with the other hand.

74. Carefully lower the baffle rod until the end is approximately 12 inches above the rod clamp.

75. Tighten the rod clamp and compression nut and install a pin in the end of the baffle rod.

76. With one hand holding the baffle rod, loosen the rod clamp and compression nut with the other hand.

77. Lower the baffle rod until the end is within 1 inch of the rod clamp.

78. Tighten the rod clamp and compression nut.

79. Recheck probe calibration by applying a current to probe Helmholtz coil and monitoring SQUID response.

80. Complete Magnetic Screening Test Report and provide this report to the engineer requesting the measurement.

81. The engineer who requested the test needs to enter the result of the magnetic screening into F.G.T. #1.

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Post Measurement checklist.

1. Baffle installed.
2. Liquid helium level O.K.
3. Liquid helium level sample interval set a 3 minuets.
4. Fill hole plugged.
5. Liquid helium level dipstick lowered.
6. Helium gas cylinder valved off.
7. Liquid nitrogen level O.K.
8. Liquid nitrogen valve on.
9. Liquid nitrogen fill power on.
10. Auto dialer on.