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| BROOKHAVEN NATIONAL LABORATORY | | Number: PO-P-ATF-0027 | Revision: 1 |
| PHYSICS DEPARTMENT | | Effective: 08/13/2004 | Page 1 of 26 |
| Subject: Test Procedure for ATF Laser Interlock | | Prepared by: Marcus Babzien | |
| Reviewed by ES&H Coordinator:  | Approved by ATF Head:  | Approved by Department Chair:  | |

Test Procedure for ATF Laser Interlock
Friday, August 13, 2004

Notify the control room operator that an interlock test is being performed and request that it be logged in the daily control room logbook. _____

Date _____

Time testing begins _____ Test personnel _____

Reason for test _____

Gun Hutch

Turn off HV pulsing on the YAG laser power supplies (2).
 Amp HV SWITCH DOWN _____
 Preamp HV key OFF _____
 MASTER OSC KEY OFF or MANUAL SHUTTER CLOSED _____

1. Enter the Gun Hutch and observe that the SOR Latch led is illuminated, if not, reset with the SOR key. Check that the control room emergency stop led for the Gun Hutch is out. _____
2. Press the emergency stop located outside the Gun Hutch. Observe that the SOR Latch led is out and the ES light is illuminated in the Gun Hutch. _____
3. Observe that the control room emergency stop led for the Gun Hutch is illuminated. _____
4. Reset the Emergency Stop button and observe that the ES led in the Gun Hutch goes out. _____
5. Observe that the SOR Latch led and the control room Gun Emergency stop led is illuminated. _____
6. Reset the SOR Latch with the key and observe that the control room Emergency stop led is out and the SOR led in the Gun Hutch is illuminated. _____
7. Repeat steps 2 to 6 for the Emergency Stop button inside the Gun Hutch. _____
8. Enter the Gun Hutch and close the door, observe the Door OK led is illuminated. _____

9. Press the Start Search button, observe that the led on the button box illuminates when the button is pressed. _____
10. Exit the room and close the door, press the Complete Search button and observe that the audible warning sounds and the strobe flashes for a minimum of 15 seconds. _____
11. Observe that the led on the Complete Search button box illuminates when the button is pressed. _____
12. Observe that the Interlocked sign is illuminated. _____
13. Observe that the control room Gun Hutch secured led is out. _____
14. Observe that at the end of the warning period the Gun Hutch Secured led in the Gun Hutch and in the control room is illuminated. _____
15. Open the door and observe the following:
 - The Interlocked sign goes out. _____
 - The control room Gun Hutch secured led goes out. _____
 - The secured led in the Gun Hutch goes out. _____
 - The led on the Complete Search button box goes out. _____
 - A beeping audible alarm in the Gun Hutch for 5 seconds. _____
 - A beeping audible alarm I the control room for 5 seconds. _____
 - While the door is open the Door OK led is out. _____
16. Close the door normally used for entrance and the fixed door, observe that the Door OK led is illuminated. _____
17. Secure the area, open the fixed door and observe that the interlock drops out. _____
18. Secure the Gun Hutch and then press an emergency stop, observe that the interlocked sign goes out and the Secured led goes out in the gun hutch. _____
19. Reset the emergency stop button and attempt to secure the room, observe the room does not secure. _____
20. Reset the SOR latch and attempt to secure the room, observe that the room does secure. _____
21. Press the Interlock Off button and open the door, observe that the beeping audible alarm does not sound and the Interlocked sign goes out. _____

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- 22. Press the start search button and observe the led stays on for no more than 60 seconds. _____
- 23. Press the complete search button and observe that the interlock does not make. _____
- 24. Secure the area and before the timeout, open the door, close the door and press the complete search button, observe that the interlock does not make. _____

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YAG Room

25. Enter the YAG room and observe that the SOR Latch led is illuminated, if not, reset with the SOR key. Check that the control room emergency stop led for the YAG room is out. _____
26. Press the emergency stop located outside the YAG room. Observe that the SOR Latch led is out and the ES light is illuminated in the YAG room. _____
27. Observe that the control room emergency stop led for the YAG room is illuminated. _____
28. Reset the Emergency Stop button and observe that the ES led in the YAG room goes out. _____
29. Observe that the SOR Latch led is not illuminated and the control room YAG Emergency stop led is illuminated. _____
30. Reset the SOR Latch with the key and observe that the control room Emergency stop led is out and the SOR led in the YAG room is illuminated. _____
31. Repeat steps 26 to 30 for the Emergency Stop button inside the YAG room. _____
32. Press the Start Search button and observe that the led stays on for no more than 60 sec. _____
33. Press the Complete search button and observe that the interlock does not make. _____
34. Enter the YAG room and close the door, observe the Door OK led is illuminated. _____
35. Press the Start Search button, observe that the led on the button box illuminates when the button is pressed. _____
36. Exit the room and close the door, press the Complete Search button and observe that the audible warning sounds and the strobe flashes for a minimum of 15 seconds. _____
37. Observe that the led on the Complete Search button box illuminates when the button is pressed. _____
38. Observe that the Interlocked sign is illuminated. _____
39. Observe that the control room and YAG room secured led is on. _____
40. Observe that at the end of the warning period the YAG room Secured led in the YAG room and in the control room is illuminated. _____

51. Close the YAG to Gun shutter and observe the laser power light illuminate after resetting with the SOR key. _____
52. Secure the YAG room and open the YAG Laser shutter, note that the laser power light is illuminated. Break security for the YAG room and observe that the YAG Laser shutter closes and that the YAG laser power light remains illuminated. _____
53. Secure the YAG room and open YAG laser shutter. Note that the laser power light is illuminated, manually hold the shutter in the open position and break security for the YAG room. Observe that the laser power indicator goes out. _____
- Close the YAG laser shutter.
Reset the Laser power with the SOR key and observe the Laser Power light is on. _____
54. Secure the YAG room. Observe that the laser power indicator is illuminated. Press the control room Emergency stop and observe YAG Laser power indicator goes out. _____
55. Repeat step 54 except press the Gun hutch emergency stop and observe that the YAG laser power indicator goes out. _____
56. Repeat step 54 except press the CO2 main emergency stop and observe that the YAG Laser power indicator goes out. Amp. _____ Main _____
57. Repeat step 54 except press the FEL emergency stop and observe that the YAG Laser power indicator goes out. _____
58. Repeat step 54 except press the EH emergency stops (5) and observe that the YAG Laser power indicator goes out. _____
- _____ NE SE NW S SW
59. Secure the YAG room and CO2 Main room, Open the YAG to CO2 Main shutter and the YAG Laser shutter, note that the YAG laser power indicator is illuminated. Break security in the CO2 main Room and observe that the YAG to CO2 Main shutter closes and the YAG laser power indicator remains illuminated. _____
60. Secure the YAG room and the CO2 main room, Open the YAG to CO2 main shutter. Block the shutter from closing. Observe that the laser power indicator is illuminated. Break security in the CO2 main room and observe the YAG laser power indicator goes out. _____
61. Secure the YAG room, FEL room and EH room, Open the YAG to FEL shutter and the YAG Laser shutter, note that the YAG laser power indicator is illuminated. Break security in the FEL Room and observe that the YAG to FEL shutter closes and the YAG laser power indicator remains illuminated. _____
- NA

- 62. Secure the YAG room, FEL room and EH room, Open the YAG to FEL shutter and the YAG Laser shutter, note that the YAG laser power indicator is illuminated. Break security in the EH Room and observe that the YAG to FEL shutter closes and the YAG laser power indicator remains illuminated. _____ NA _____
- 63. Secure the YAG room, FEL room and the EH room, Open the YAG to FEL shutter and block it open. Observe that the laser power indicator is illuminated. Break security in the FEL room and observe the YAG laser power indicator goes out. _____ NA _____
- 64. Secure the YAG room, FEL room and the EH room, Open the YAG to FEL shutter. Observe that the laser power indicator is illuminated. Break security in the EH room and observe the YAG laser power indicator goes out. _____ NA _____

Note: 61 – 64 beam transport and shutter not installed skip these steps.

- 65. Secure the YAG room, after requesting the operator to turn on the laser power supplies observe that the two power supplies turn on and are pulsing. _____
- 66. Press the Emergency stop located outside the YAG room and observe that the two power supplies for the laser turn off. Pre amp _____ Amp. _____
- Observe that the Master Osc. Turns off. _____
- 67. Reset the Emergency stop and observe that the power supplies and Osc. remain off. _____
- 68. Reset the YAG SOR and observe that the power supplies do come on. _____
- 69. Press the start search button and observe the led stays on no more than 60 seconds. _____
- 70. Secure the Gun hutch, press the passage button for the Gun hutch then open the vestibule door and the Gun door, observe that the security for the Gun hutch drops out. _____
- 71. Secure the YAG room, press the passage button for the YAG room then open the vestibule door and the YAG door, observe that the YAG security drops out. _____
- 72. Secure the YAG room, press the passage button for the YAG room then open the Gun door and the YAG door, observe that the YAG security drops out. _____
- 73. Secure the YAG room, press the passage button for the YAG room then open the Laser Lab door and the YAG door, observe that the YAG security drops out. _____
- 74. Secure the Gun Hutch, press the passage button for the Gun hutch then open the Gun door and the YAG door, observe that the Gun security drops out. _____
- 75. Secure the gun hutch, press the passage button for the Gun hutch then open the Laser Lab door _____

and the Gun door, observe that the Gun security drops out. _____

76. Secure the Gun hutch, press the passage button for the Gun hutch, open the door, Observe that the time from when the button is pressed to the time that the interlock drops out is no more than 20 seconds. _____

77. Secure the YAG room, press the passage button for the YAG room, open the door, Observe that the time from when the button is pressed to the time that the interlock drops out is no more than 20 seconds. _____

78. Secure the Laser Lab, press the passage button for the Laser Lab room, open the door, Observe that the time from when the button is pressed to the time that the interlock drops out is no more than 20 seconds. _____

79. Press the Complete search button and observe the interlock does not make. _____

80. Secure the area and before the timeout open the door, close the door and press the complete search button, observe the at the interlock does not make. _____

81. With the YAG and Gun hutch not secured open the YAG to Gun shutter and observe: _____

The YAG to Gun shutter opens. _____

The audible warning sounds for 1 second. _____

Secure the Gun Hutch and observe that the YAG to Gun shutter closes. _____

The YAG to Gun shutter cannot be opened. _____

Secure the YAG Room and observe that the YAG to Gun shutter can be opened. _____

With the YAG and CO2 Main not secured open the YAG to CO2 Main shutter and observe: _____

The YAG to CO2 Main shutter opens. _____

The audible warning sounds for 1 second. _____

Secure the CO2 Main and observe that the YAG to CO2 Main shutter closes. _____

The YAG to CO2 Main shutter cannot be opened. _____

Secure the YAG Room and observe that the YAG to CO2 Main shutter can be opened. _____

Laser Lab

Turn off HV pulsing on the YAG laser power supplies (2).

Amp HV SWITCH DOWN _____

Preamp HV key OFF _____

MASTER OSC KEY OFF. or MANUAL SHUTTER CLOSED _____

82. Enter the Laser Lab and observe that the SOR Latch led is illuminated, if not, reset with the SOR key. Check that the control room emergency stop led for the Laser Lab is out. _____
83. Press the emergency stop located outside the Laser Lab. Observe that the SOR Latch led is out and the ES light is illuminated in the Laser Lab. _____
84. Observe that the control room emergency stop led for the Laser Lab is illuminated. _____
85. Reset the Emergency Stop button and observe that the ES led in the Laser Lab goes out. _____
86. Observe that the SOR led is out and the control room LL Emergency stop led is illuminated. _____
87. Reset the SOR Latch with the key and observe that the control room Emergency stop led is out and the SOR led in the Laser Lab is illuminated. _____
88. Repeat steps 83 to 87 for the Emergency Stop buttons inside the Laser Lab. _____
89. Enter the Laser Lab and close the door, observe the Door OK led is illuminated. _____
90. Press the Start Search button, observe that the led on the button box illuminates when the button is pressed. _____
91. Exit the room and close the door, press the Complete Search button and observe that the audible warning sounds and the strobe flashes for a minimum of 15 seconds. _____
92. Observe that the led on the Complete Search button box illuminates when the button is pressed. _____
93. Observe that the Interlocked sign is illuminated. _____
94. Observe that the control room Laser Lab secured led is out. _____
95. Observe that at the end of the warning period the Laser Lab Secured led in the Laser Lab and in the control room is illuminated. _____

- 96. Open the door and observe the following:
 - The Interlocked sign goes out. _____
 - The control room Laser Lab secured led goes out. _____
 - The secured led in the Laser Lab goes out. _____
 - The led on the Complete Search button box goes out. _____
 - A beeping audible alarm in the Laser Lab for 5 seconds. _____
 - A beeping audible alarm I the control room for 5 seconds. _____
 - The door is open the Door OK led is out. _____
- 97. Close the door normally used for entrance and the fixed door, observe that the Door OK led is illuminated. _____
- 98. Secure the area open the fixed door and observe that the interlock drops out. _____
- 99. Secure the Laser Lab and then press an emergency stop, observe that the interlocked sign goes out and the Secured led goes out in the control room. _____
- 100. Reset the emergency stop button and attempt to secure the room, observe the room does not secure. _____
- 101. Reset the SOR latch and attempt to secure the room, observe that the room does secure. _____
- 102. Press the Interlock Off button and open the door, observe that the beeping audible alarm does not sound and the Interlocked sign goes out. _____
- 103. Press the start search button and observe the led stays on for no more than 60 seconds. _____
- 104. Press the complete search button and observe that the interlock does not make. _____
- 105. Secure the area and before the timeout, open the door, close the door and press the complete search button, observe that the interlock does not make. _____
- 106. Secure the Laser Lab and open the LL to YAG shutter. Observe that the YAG laser power indicator is on. Break security in the Laser lab and observe that the YAG laser power indicator stays on. _____
- 107. Secure the Laser Lab and open the LL to YAG shutter. Block it open. Observe that the YAG laser power indicator is on. Break security in the Laser lab and observe that the YAG laser power indicator goes out. _____

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108. With the YAG and LL not secured open the YAG to LL shutter and observe:

The YAG to LL shutter opens. _____

The audible warning sounds for 1 second. _____

Secure the YAG room and observe that the YAG to LL shutter closes. _____

The YAG to LL shutter can not be opened. _____

Secure the LL Room and observe that the YAG to LL shutter can be opened. _____

CO2 Amplifier Room

109. Enter the CO2 Amp room and observe that the SOR Latch led is illuminated, if not, reset with the SOR key. Check that the control room emergency stop led for the CO2 Amp room is out. _____
110. Press the emergency stop located inside the CO2 Amp room. Observe that the SOR Latch led is out and the ES light is illuminated in the CO2 Amp room. _____
111. Observe that the control room emergency stop led for the CO2 Amp room is illuminated. _____
112. Reset the Emergency Stop button and observe that the ES led in the CO2 Amp room goes out. _____
113. Observe that the SOR led is out and the control room Emergency stop led is illuminated. _____
114. Reset the SOR Latch with the key and observe that the control room Emergency stop led is out and the SOR led in the CO2 Amp room is illuminated. _____
115. reserved
116. Press the start search button and observe that the led stays on no more than 60 sec. _____
117. Press the complete search and observe that the interlock does not make. _____
118. Enter the CO2 Amp room and close the door, observe the Door OK led is illuminated. _____
119. Press the Start Search button, observe that the led on the button box illuminates when the button is pressed. _____
120. Exit the room and close the door, press the Complete Search button and observe that the audible warning sounds and the strobe flashes for a minimum of 15 seconds. _____
121. Observe that the led on the Complete Search button box illuminates when the button is pressed. _____
122. Observe that the Interlocked sign is illuminated. _____
123. Observe that the control room CO2 Amp room secured led is out. (during warning) _____
124. Observe that at the end of the warning period the CO2 Amp room Secured led in the CO2 Amp room and in the control room are illuminated. _____
125. Open the Amp to Main door and observe the following:

The Interlocked sign on the Amp to Main door goes out. _____

The control room CO2 Amp secured led goes out. _____

The secured led in the CO2 Amp room goes out. _____

The led on the Complete Search button box goes out. _____

A beeping audible alarm in the CO2 Amp room for 5 seconds. _____

A beeping audible alarm in the control room for 5 seconds. _____

126. Close the CO2 Main to CO2 Amp. Door, the Maintenance door and the CO2 Amp. Exit door and observe that the Door OK led is illuminated. _____

127. Secure the CO2 Amp area and open each door one at a time and observe that the interlock drops goes out. _____

High Bay _____

Main to Amp _____

Maintenance _____

128. Secure the CO2 Amp. room and then press an emergency stop, observe that the interlocked sign goes out and the Secured led goes out in the CO2 Amp. room. _____

129. Reset the emergency stop button and attempt to secure the room, observe the room does not secure. _____

130. Reset the SOR latch and attempt to secure the room, observe the room does secure. _____

131. Press the Interlock Off button and open the door, observe that the beeping audible alarm does not sound and the Interlocked sign goes out. _____

132. Secure the CO2 Amp. room, press the passage button for the CO2 Amp to Main door., open the door, Observe that the time from when the button is pressed to the time that the interlock drops out is no more than 20 seconds. _____

133. Secure the CO2 Main and CO2 Amp areas, open the YAG to CO2 main shutter and press the passage button to the CO2 Amp to Main. Observe that the YAG to CO2 main shutter closes. _____

133a. With the CO2 Amp room not secured close all doors and press the HeNe shutter reset button located inside the CO2 Amp room.

Observe the HeNe laser shutter opens. NA

Open the CO2 Amp to CO2 Main door and observe the shutter closes. NA

Close the door and observe the shutter does not re open. NA

Repeat this test for the Maintenance door and the South exit door. NA NA

Note: 133a - hardware not in use - skip these steps.

133b. Secure the CO2 Amp. room, press the passage button for the CO2 Amp to High bay door, open the door, Observe that the time from when the button is pressed to the time that the interlock drops out is no more than 20 seconds. _____

133c. Secure the CO2 Main area and open the CO2 main to CO2 amp shutter, press the passage button for the CO2 amp to High Bay door and observe that the CO2 main to CO2 Amp shutter closes. _____

CO2 Main Room

Turn off the CO2 laser AC power disconnect switch. _____

134. Secure the CO2 amp room. Using the passage button enter the CO2 amp room, turn on the alignment laser, Open the CO2 amp to CO2 main door observe that the alignment laser power goes off. _____ NA

135. Secure the CO2 amp room. Using the passage button enter the CO2 amp room, turn on the alignment laser, Press an emergency stop button, observe that the alignment laser power goes off. _____ NA

Note: 134 -135 - hardware not in use - skip these steps.

136. Enter the CO2 Main room and observe that the SOR Latch led is illuminated, if not, reset with the SOR key. Check that the control room emergency stop led for the CO2 Main room is out. _____

137. Press the emergency stop located inside the CO2 Main room. Observe that the SOR Latch led is out and the ES light is illuminated in the CO2 Main room. _____

138. Observe that the control room emergency stop led for the CO2 Main room is illuminated. _____

139. Reset the Emergency Stop button and observe that the ES led in the CO2 Main room goes out. _____

140. Observe that the SOR Latch led is not illuminated and the control room Emergency stop led is on. _____

141. Reset the SOR Latch with the key and observe that the control room Emergency stop led is out and the SOR led in the CO2 Main room is illuminated. _____

142. Repeat steps 138 to 143 for the other Emergency Stop button inside the CO2 Main Room. _____

143. Press the start search button and observe that the led stays on no more than 60 sec. _____

144. Press the complete search and observe that the interlock does not make. _____

145. Enter the CO2 Main room and close the door, observe the Door OK led is illuminated. _____

146. Press the Start Search button, observe that the led on the button box illuminates when the button is pressed. _____

- 158. Reset the emergency stop button and attempt to secure the room, observe the room does not secure. _____
 - 159. Reset the SOR latch and attempt to secure the room, observe the room does secure. _____
 - 160. Press the Interlock Off button and open the door, observe that the beeping audible alarm does not sound and the Interlocked sign goes out. _____
 - 161. Secure the CO2 Main room, press the passage button for the CO2 Main to CO2 Amp door, open the door and, Observe that the time from when the button is pressed to the time that the interlock drops out is no more than 20 seconds. _____
 - 162. Secure the CO2 Main room, press the passage button for the CO2 Main to Vestibule door, open the door and, Observe that the time from when the button is pressed to the time that the interlock drops out is no more than 20 seconds. _____
 - 163. Secure the CO2 Main room and the EH. Observe that the CO2 Osc shutter ready indicator does not light until the CO2 Main warning sound stops. _____
 - 164. Open the CO2 Main to EH shutter and the CO2 Laser shutter, note that the CO2 laser power indicator is illuminated. Break security in the EH and observe that the CO2 Main to EH shutter closes and the laser power indicator remains illuminated. _____
 - 165. Secure the CO2 Main room and the EH. Open the CO2 laser shutter and open the CO2 to EH shutter. Block the shutter open. Break security in the EH and observe that the laser power light goes out. _____
 - 166. Unblock the shutter and allow it to close observe the laser power light illuminate when reset with the SOR key. _____
 - 166a. Secure the CO2 Main and CO2 Amp rooms. Open the CO2 Osc. and CO2 Main to CO2 Amp shutter. Block the Main to Amp shutter open and break security in the Amp room. Observe that the laser power light goes out. _____
- Unblock the shutter and allow it to close observe the laser power light illuminate when reset with the SOR key. _____
- Energize the AC to the CO2 laser and inhibit the pulsing by turning on the power supplies but leave the power switches off.
- 167. Secure the CO2 Main room and open the CO2 Laser shutter, note that the laser power light and the two Interlock OK lights on the laser enclosure are illuminated. Break security for the CO2 Main room and observe that the CO2 Laser shutter closes and that the CO2 laser power light remains illuminated. _____

- 181. Reset the SOR Latch with the key and observe that the control room Emergency stop led is out and the SOR led in the FEL Room is illuminated. _____
- 182. Repeat steps 177 to 181 for the Emergency Stop button inside the FEL Room. _____
- 183. Press the start search button and observe that the led stays on no more than 60 sec. _____
- 184. Press the complete search and observe that the interlock does not make. _____
- 185. Enter the FEL Room and close the door, observe the Door OK led is illuminated. _____
- 186. Press the Start Search button, observe that the led on the button box illuminates when the button is pressed. _____
- 187. Press the Complete Search button and observe that the audible warning sounds and the strobe flashes for a minimum of 15 seconds. _____
- 188. Observe that the led on the Complete Search button box illuminates when the button is pressed. _____
- 189. Observe that the Interlocked sign is illuminated. _____
- 190. Observe that the control room FEL Room secured led is out. _____
- 191. Observe that at the end of the warning period the FEL Room Secured led in the FEL Room and in the control room is illuminated. _____
- 192. Open the FEL to EH door and observe the following:
 - The Interlocked sign goes out. _____
 - The control room FEL Room secured led goes out. _____
 - The secured led in the FEL Room goes out. _____
 - The led on the Complete Search button box goes out. _____
 - A beeping audible alarm in the FEL Room for 5 seconds. _____
 - A beeping audible alarm in the control room for 5 seconds. _____

While the Vestibule to FEL door or the FEL to EH door is open the Door OK led is out. _____
- 193. Secure the FEL room and then press an emergency stop, observe that the interlocked sign goes out and the Secured led goes out in the FEL room. _____

- 194. Reset the emergency stop button and attempt to secure the room, observe the room does not secure. _____
- 195. Reset the SOR latch and attempt to secure the room, observe the room does secure. _____
- 196. Press the Interlock Off button and open the door, observe that the beeping audible alarm does not sound and the Interlocked sign goes out. _____
- 197. Secure the FEL room, press the passage button for the FEL to Vestibule door, open the door and, Observe that the time from when the button is pressed to the time that the interlock drops out is no more than 20 seconds. _____
- 198. Secure the FEL room, press the passage button for the FEL to EH door, open the door and, Observe that the time from when the button is pressed to the time that the interlock drops out is no more than 20 seconds. _____
- 199. Secure the area and before the timeout open the door, close the door and press the complete search button, observe that the interlock does not make. _____
- 200. Secure the FEL room, press the passage button for the FEL to Vestibule door and open the door, then open the East Exit door and observe the interlock drops out. _____
- 200a. Secure the FEL room, press the pass through button for the FEL to vestibule door and open the door, then open the CO2 Main door and observe the FEL interlock drops out. _____

Experimental Hall (EH)

- 201. Enter the EH and observe that the SOR Latch led is illuminated, if not, reset with the SOR key. Check that the control room emergency stop led for the EH Room is out. _____
- 202. Press the emergency stop located inside the labyrinth. Observe that the SOR Latch led is out and the ES light is illuminated in the EH Room. _____
- 203. Observe that the control room emergency stop led for the EH Room is illuminated. _____
- 204. Reset the Emergency Stop button and observe that the ES led in the EH Room goes out. _____
- 205. Observe that the SOR led is out and the control room EH Emergency stop led is illuminated. _____
- 206. Reset the SOR Latch with the key and observe that the control room Emergency stop led is out and the SOR led in the EH Room is illuminated. _____
- 207. Repeat steps 202 to 206 for each Emergency Stop button inside the EH Room.

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| NW | NE | SE | S |
- 208. Press the complete search and observe that the interlock does not make. _____
- 209. Enter the EH Room and close the door, observe the Door OK led is illuminated. _____
- 210. Press the Start Search button, observe that the led on the button box illuminates when the _____
- 211. Press the CS-1 button, observe that the led on the button box illuminates when the button is pressed. _____
- 212. Press the CS-2 button, observe that the led on the button box illuminates when the button is pressed. _____
- 213. Exit the room and close the door, press the Complete Search button and observe that the audible warning sounds and the strobe flashes for a minimum of 15 seconds. _____
- 214. Observe that the led on the Complete Search button box illuminates when the button is pressed. _____
- 215. Observe that the Interlocked sign is illuminated. _____
- 216. Observe that the control room EH Room secured led is out. _____
- 217. Observe that at the end of the warning period the EH Room Secured led in the EH Room and in the control room are illuminated. _____

218. Open the door and observe the following:
- The Interlocked sign goes out. _____
 - The control room EH Room secured led goes out. _____
 - The secured led in the EH Room goes out. _____
 - The led on the Complete Search button box goes out. _____
 - A beeping audible alarm in the EH Room for 5 seconds. _____
 - A beeping audible alarm in the control room for 5 seconds. _____
 - While the EH South Door or the FEL to EH door is open the Door OK led is out. _____

219. Secure the EH room and then press the emergency stop located inside the labyrinth, observe that the interlocked sign goes out and the Secured led goes out in the EH room. _____

Repeat this step for the remaining four emergency stop buttons.

NW NE SE S

220. Reset the emergency stop button and attempt to secure the room, observe the room does not secure. _____
221. Reset the SOR latch and attempt to secure the room, observe the room does secure. _____
222. Press the Interlock Off button and open the door, observe that the beeping audible alarm does not sound and the Interlocked sign goes out. _____
223. With the EH to FEL door open press the Start Search button and observe that the start search button does not light. _____
224. Press the start search button and observe the light illuminates on the button box, the time from when the button was pressed to when the light goes out should be no more than 4 minutes. _____
225. With the EH secured press the Alignment Laser power reset and note the Alignment laser power permit illuminate. Press the passage button for the EH to FEL door and open the door. Close the door and observe that the Alignment laser power permit led is out. _____ NA
226. Reset the Alignment laser power permit with the reset button and note the permit light is on. Break security in the EH and observe the Alignment laser power permit led goes out. _____ NA

Note: 225-226 - hardware not in use - skip these steps.

- 227. Secure the FEL room and the EH. Observe that the BL1, BL2 and BL3 shutter ready indicators do not light until the EH warning sound stops. _____
- 228. Secure the EH, press the passage button for the FEL to EH door, open the door and, Observe that the time from when the button is pressed to the time that the interlock drops out is no more than 20 seconds. _____
- 229. Secure the EH, press the passage button for the EH South Door, open the door and, Observe that the time from when the button is pressed to the time that the interlock drops out is no more than 20 seconds. _____
- 230. Secure the area and before the timeout open the door, close the door and press the complete search button, observe that the interlock does not make. _____
- 231. Secure the EH, CO2 Main and FEL rooms, press the EH to FEL passage button and observe that the BL1,2,3 shutters and the CO2 Main to EH shutter close. _____

| | | | |
|-------|-----------|-----------|-----------|
| _____ | <u>NA</u> | <u>NA</u> | <u>NA</u> |
| CO2 | BL1 | BL2 | BL3 |

Note: 231 – some hardware not in use.

- 232. With the CO2 Main and EH not secured open the CO2 Main to EH shutter and observe:
 - The CO2 Main to EH shutter opens. _____
 - The audible warning sounds for 1 second. _____
 - Secure the EH and observe that the CO2 Main to EH shutter closes. _____
 - The CO2 Main to EH shutter cannot be opened. _____
 - Secure the CO2 Main and observe that the CO2 Main to EH shutter can be opened. _____
- With the EH and FEL hutch not secured open the BL1,2,3 to FEL shutter and observe:
 - The BL1,2,3 to FEL shutter opens.

| | | | |
|-------|-----------|-----------|-----------|
| _____ | <u>NA</u> | <u>NA</u> | <u>NA</u> |
|-------|-----------|-----------|-----------|
 - The audible warning sounds for 1 second.

| | | | |
|-------|-----------|-----------|-----------|
| _____ | <u>NA</u> | <u>NA</u> | <u>NA</u> |
|-------|-----------|-----------|-----------|
 - Secure the EH and observe that the BL1,2,3 to FEL shutter closes.

| | | | |
|-------|-----------|-----------|-----------|
| _____ | <u>NA</u> | <u>NA</u> | <u>NA</u> |
|-------|-----------|-----------|-----------|
 - The BL1,2,3 to FEL shutter can not be opened.

| | | | |
|-------|-----------|-----------|-----------|
| _____ | <u>NA</u> | <u>NA</u> | <u>NA</u> |
|-------|-----------|-----------|-----------|

Secure the FEL Room and observe that the BL1,2,3 to FEL shutter can be opened.

NA NA NA

Note: 232 – some hardware not in use.

- 233. Secure the CO2 Main, Amp and FEL rooms. Amplifier-to-Main pickoff mirror M2 is in place. Open the CO2 Main to CO2 Amp Shutter, Reset the CO2 Power Permit. Press an E stop in the FEL room. Observe that the CO2 Main to CO2 Amp shutter closes. _____
- 234. Reset the EH E stop, open the shutter and then press an E stop in the CO2 Main. Observe that the CO2 Main to CO2 Amp shutter closes. _____
- 235. Reset the CO2 Main E stop and re secure the CO2 Main room, open the shutter and then press an E stop in the CO2 Amp. Observe that the CO2 Main to CO2 Amp shutter closes. _____
- 236. Reset the CO2 Amp E stop and re-secure the FEL room, open the shutter and then press the pass through from the CO2 Main to the CO2 Amp room. Observe that the CO2 Main to CO2 Amp shutter closes and then re opens when the pass through is canceled. _____
- 237. Activate the pass through from the Highbay to the CO2 Amp room. Observe that the CO2 Main to CO2 Amp shutter closes and then re opens when the pass through is canceled. _____
- 238. Activate the pass through from the FEL to the EH room. Observe that the CO2 Main to CO2 Amp shutter closes and then re opens when the pass through is canceled. _____
- 239. Remove the Amplifier-to-Main pickoff mirror M2 Secure the CO2 Main, Amp and FEL rooms. Open the CO2 Main to CO2 Amp Shutter, Reset the CO2 Power Permit. Press the Interlock Off button in the FEL room. Observe that the CO2 Main to CO2 Amp shutter closes when the interlock turns off. _____
Observe the CO2 laser power permit does not trip. _____
- 240. Replace the Amplifier-to-Main pickoff mirror M2. Secure the CO2 Main and Amp rooms, FEL not secure. Open the CO2 Main to CO2 Amp Shutter, Remove the M2 mirror. Observe that the CO2 Main to CO2 Amp shutter closes. _____
Observe the CO2 laser power permit does not trip. _____
- 241. Secure the CO2 Main, Amp and FEL rooms. Open the CO2 Main to CO2 Amp Shutter, Reset the CO2 Power Permit. Place an object in the path of the shutter to block the shutter from closing all the way, a pencil will do. Press the Interlock Off button in the FEL room. Observe that the CO2 Main to CO2 Amp shutter closes to the pencil when the interlock turns off. _____
- 242. Observe the CO2 laser power permit trips. _____
The power permit cannot be reset with the shutter blocked open. _____

Replace M2 mirror.

Bring the interlock systems to the ground state and return to normal operation.

243. With the CO2 Amplifier-to-Main pickoff mirror removed to allow beam to the FEL room, and with the CO2 Main, CO2 Amp, and FEL not secured open the CO2 Main to CO2 Amp shutter and observe:

The CO2 Main to CO2 Amp shutter opens. _____

The audible warning sounds for 1 second. _____

Secure the CO2 Amp and observe that the CO2 Main to CO2 Amp shutter closes. _____

The CO2 Main to CO2 Amp shutter cannot be opened. _____

Secure the CO2 Main Room and observe that the CO2 Main to CO2 Amp shutter cannot be opened. _____

Secure the FEL Room and observe that the CO2 Main to CO2 Amp shutter can be opened. _____

244. With the CO2 Amplifier-to-Main pickoff mirror removed to allow beam to the FEL room, and with the CO2 Main, CO2 Amp, and FEL Rooms secured open the CO2 Main to CO2 Amp shutter and observe that the shutter opens. _____

245. Break security in the CO2 Amplifier Room and observe that the CO2 Amp-to-Main shutter closes. _____

246. Repeat steps 244 and 245 breaking security in the CO2 Main and FEL Rooms _____
CO2 Main FEL

247. With the CO2 Amplifier-to-Main pickoff mirror inserted to divert beam to the CO2 Main Room, and with the CO2 Main and CO2 Amp Rooms not secured open the CO2 Main to CO2 Amp shutter and observe:

The CO2 Main to CO2 Amp shutter opens. _____

The audible warning sounds for 1 second. _____

Secure the CO2 Amp and observe that the CO2 Main to CO2 Amp shutter closes. _____

The CO2 Main to CO2 Amp shutter cannot be opened. _____

Secure the CO2 Main Room and observe that the CO2 Main to CO2 Amp shutter can be opened. _____

248. With the CO2 Amplifier-to-Main pickoff mirror inserted to divert beam to the CO2 Main

| | | | |
|------------------------------|--------------------|------------------------------|----------------------|
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Room, and with the CO2 Main and CO2 Amp Rooms secured open the CO2 Main to CO2 Amp shutter and observe that the shutter opens. _____

249. Break security in the CO2 Amplifier Room and observe that the CO2 Amp-to-Main shutter closes. _____

250. Repeat steps 248 and 249 breaking security in the CO2 Main Room. _____
CO2 Main

251. Place the radiation interlock system into the "Maintenance Mode" and attempt to secure the EH laser interlock. The interlock cannot be secured. _____

252. Request the operator restore the system to normal operation, and inform the control room operator or person in charge of operations that the test is complete and request that this test be noted in the operations log book. _____

Time complete _____