

SPIRE System Level CS Test Procedure

Ref: SPIRE-RAL-PRC-003040

Issue: 1.0

Date: 20-02-2008

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1. Introduction

This test procedure details the Conducted Susceptibility test to be performed on the PFM SPIRE instrument integrated with the FM Herschel Spacecraft in the context of the SPT test programme.

This test was inserted into the SPIRE SPT test programme because a conducted susceptibility was identified during the ILT testing of the instrument (see RD 2). The purpose of this test is to determine/characterise the susceptibility (if it exists) in a flight-like environment when the instrument is integrated with the spacecraft.

The frequency range to be tested is 8-50MHz which brackets the frequencies of the main susceptibility seen during the ILT.

The disturbances are injected onto the SPIRE FCU 28V power harness, close to the PCDU. The length of this harness is such that it cannot be considered electrically short. In order to ascertain if significant resonance effects would seriously affect the levels injected close to the SPIRE interface, a pre-calibration test was carried out at RAL on the flight spare PSU with a flight representative harness and a bread board LCL (See RD 1). These tests indicated that the disturbance voltages developed at the FCU are more than a factor of two lower than the voltages developed close to the PCDU. This being the case and given that the test is being carried out on flight hardware, the test levels to be injected will be 12dB lower than the IID-A qualification levels: specifically;

- DM: 125mV RMS between the +28V and Return lines (AD 2: §5.14.3.3)
- CM: 500mV P-P (177mV rms) between the Return line and chassis

For more details, see RD 3.

The EMI seen on the SPIRE PMW detector array showed excess noise at ~1.5Hz on some channels. In order to identify spectral content of EMI on the detectors, the injection frequency will be stepped at $\Delta F/F$ steps of 4% (48 steps). At each step more than 2^{10} or 1024 samples will be ingested into the database which will allow noise spectra of each individual detector to be obtained. Since the nominal sampling frequency of the Photometer is 18Hz, more than 57 seconds of integration time is required to collect sufficient samples. The Spectrometer is sampled at 80Hz and thus requires more than 13 seconds to collect sufficient samples.

A QLA script has been written to analyse the data to produce spectra for each individual detector which will produce tables for inclusion in the test report. This analysis will be carried out in near real time so that the results will be available within two hours of the completion of the test.

The current procedure details the operations to be carried out during the initial phase of testing. Any follow-up tests to be inserted in the SPT1 campaign are not detailed.

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2. Reference and Applicable Documents

RD	Name	Doc Number
RD 1	SPIRE SPT EMC CS Pre-calibration test	SPIRE-RAL-REP-003039
RD 2	SPIRE PFM5 EMC Test Report	SPIRE-RAL-REP-002852
RD 3	SPIRE CS Test Levels for SPT	SPIRE-RAL-NOT-003041

RD	Name	Doc Number
AD 1	SPIRE IST Specific Performance Test Procedures	SPIRE-RAL-PRC-002704, Iss. 3
AD 2	Herschel/Planck IID-A, Iss 4.0	SCI-PT-IIDA-04624

3. Test Configuration

3.1 EUT

Item	Description
FPU	PFM
Cryoharness	FM
WIH	FM
DCU	PFM
PSU	PFM
FCU	PFM
DPU	PFM
DPU 28V Power Harness	PFM
FCU/PSU 28V Power Harness	PFM with in-line test adaptor
SVM	PFM
PCDU	PFM

3.2 Test Equipment

Item	Description
Test Adaptor	DB01-J04 as per Figure 1 and Figure 2
BCI Clamp	8-50MHz
Current Clamp Probe	8-50MHz
Signal generator	8-50MHz
RF Amplifier	8-50MHz
Spectrum Analyzer	
Digital Oscilloscope	With isolated inputs
Test equipment benches / supports etc.	Sufficient bench space and/or secure locations to mount the test equipment close to the Test Adaptor
N-N Coax cables	

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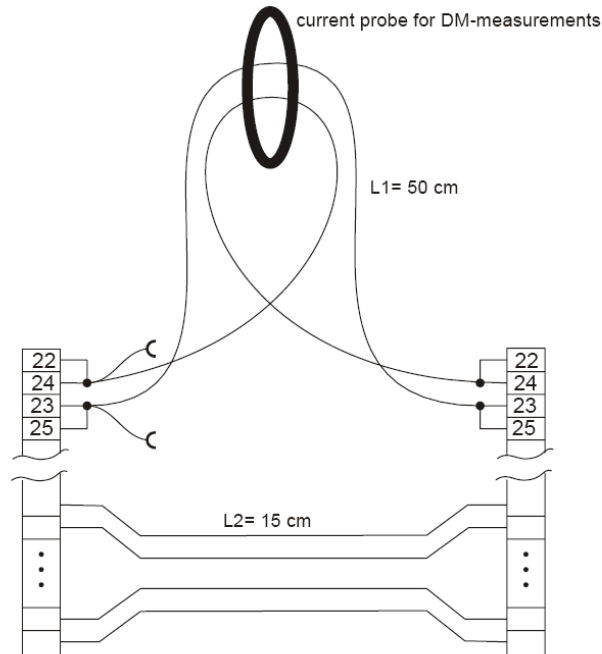


Figure 1 – Wires to be 20AWG

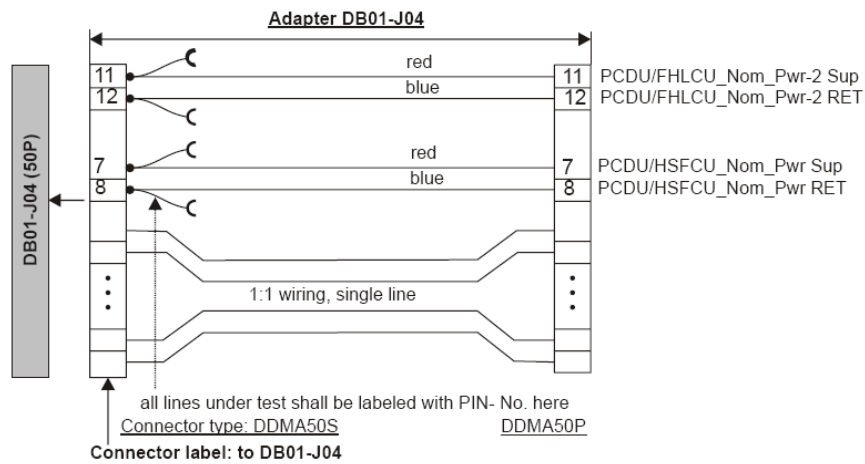


Figure 2 – Details of SPIRE test adaptor

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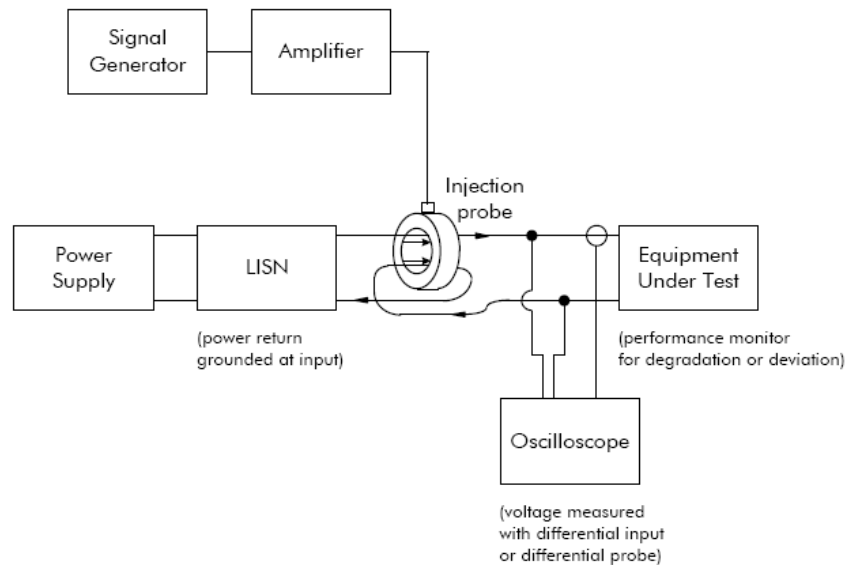


Figure 3 – DM configuration

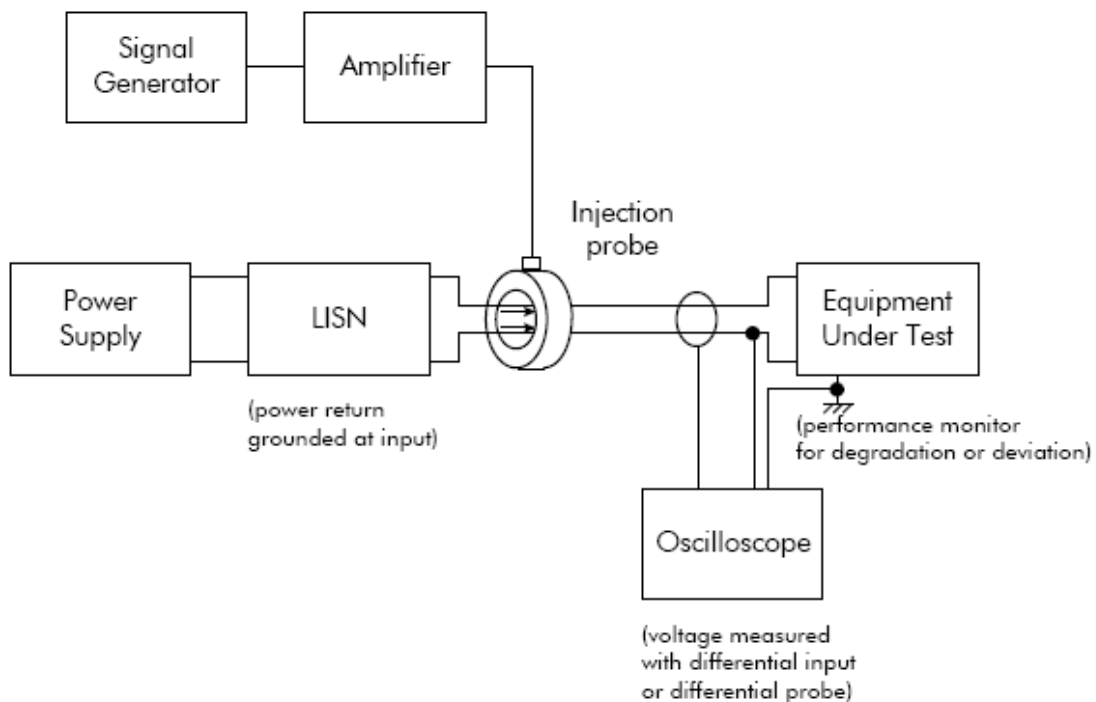


Figure 4 - CM configuration

4. Use of ObsID during testing

The SPIRE DPU housekeeping packets contain an Observation Identifier (ObsID) which is used to indicate the start and duration of a particular observation. During the SPT EMC CS test, this identifier will have to be set manually by the CCS operator. SPIRE will be responsible for maintaining a list of the ObsID which have been used during the test and ensuring that the identifier used for each test is unique. The range to be used for the tests is:

- 0xB0000400 - 0xB00007FF

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5. Test Sequence

1. DM Phot. mode
2. DM Spect. Mode
3. CM Phot. Mode
4. CM Spect. mode

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6. Test Procedure

6.1 *Differential Mode*

6.1.1 *Prerequisites / assumptions*

- The test adaptor as detailed in §3.2 and Figure 1 and Figure 2 has been installed on the spacecraft
- The cooler has been recycled and has sufficient predicted hold time to perform the test
- The test equipment is installed in the AIT clean room and has been checked out and is ready to be used prior to the commencement of the test steps. This includes
 - the mechanical securing of the BCI and Current Probes in the correct locations on/near the SVM
 - the connection of the leads to the equipment
- The orientation of the spacecraft is not important, apart from the fact that the test equipment must be able to be located close to the Test Adaptor and accessible by the AIT team
- There is radio communication between the CCS operator and the AIT staff operating the EMC test equipment
- The Current Clamp Probe calibration tables are programmed into a spreadsheet to allow real-time conversion of spectrum analyser voltage output to current
- The temperature of the cryostat cover is <50K and is stable to ± 1 K/hour drifts

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6.1.2 Detailed Procedure

Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
1	Switch off DRCU	03:00	00:03:00		
2	Switch off DPU	03:00	00:06:00		
3	Switch off SPIRE DRCU (FCU) LCL	02:00	00:08:00		
4	Switch off SPIRE DPU LCL	02:00	00:10:00		
5	Connect the Oscilloscope probe signal to test point on DB01-P4 Contact 7 (+28V-Red)	02:00	00:12:00		
6	Connect the Oscilloscope probe reference to test point on DB01-P4 Contact 8 (Return-Blue))	02:00	00:14:00		
7	Route the +28V and Return wires through the BCI probe as per Figure X	02:00	00:16:00		
8	Route the +28V wires through the current probe as per Figure Y	02:00	00:18:00		
9	Switch on SPIRE DPU	05:00	00:23:00		
10	Switch on SPIRE DRCU	05:00	00:28:00		
11	Turn on the Pump HS heater and wait for 300-mK temp to stabilise	30:00	00:58:00		
12	Switch instrument to Phot. Mode	02:00	01:00:00		
13	Switch on Oscilloscope	02:00	01:02:00		
14	Switch on Spectrum Analyser and tune to 8MHz, RBW< 20 kHz	02:00	01:04:00		
15	Switch on the Synthesiser and set level to minimum, F=8MHz	02:00	01:06:00		
16	Set power level of RF amplifier to minimum and switch on	02:00	01:08:00		
17	Adjust the level on the Power Amplifier until the injected level is 125mV rms (Note: -12dB from IID-A) Voltage measurement as indicated by oscilloscope	02:00	01:10:00		
18	Execute SPIRE-IST-EMC-SPOT.tcl (CCS operator) The ObsID to be used is supplied by the SPIRE Test Director	01:00	01:11:00		
19	Stop injecting current with BCI by setting the amplifier to standby	01:00	01:12:00		
20	Set the ObsID Step to: 1 (Reference step)	00:30	01:12:30		
21	Accumulate > 70 seconds of detector data	01:10	01:13:40		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
22	Set the ObsID Step to: 65535	00:30	01:14:10		
23	Switch on RF amplifier and adjust injection level to 125mV rms, and 8MHz	00:30	01:14:40		
24	Set the ObsID Step to: 2		01:14:40		
25	Record the injected current		01:14:40		
26	After 01:10 set the step to, 65535	01:10	01:15:50		
27	Adjust injection level to 125mV rms, and 8.32 MHz	00:30	01:16:20		
28	Set the ObsID Step to: 3		01:16:20		
29	Record the injected current		01:16:20		
30	After 01:10 set the step to, 65535	01:10	01:17:30		
31	Adjust injection level to 125mV rms, and 8.65 MHz	00:30	01:18:00		
32	Set the ObsID Step to: 4		01:18:00		
33	Record the injected current		01:18:00		
34	After 01:10 set the step to, 65535	01:10	01:19:10		
35	Adjust injection level to 125mV rms, and 8.99 MHz	00:30	01:19:40		
36	Set the ObsID Step to: 5		01:19:40		
37	Record the injected current		01:19:40		
38	After 01:10 set the step to, 65535	01:10	01:20:50		
39	Adjust injection level to 125mV rms, and 9.35 MHz	00:30	01:21:20		
40	Set the ObsID Step to: 6		01:21:20		
41	Record the injected current		01:21:20		
42	After 01:10 set the step to, 65535	01:10	01:22:30		
43	Adjust injection level to 125mV rms, and 9.72 MHz	00:30	01:23:00		
44	Set the ObsID Step to: 7		01:23:00		
45	Record the injected current		01:23:00		
46	After 01:10 set the step to, 65535	01:10	01:24:10		
47	Adjust injection level to 125mV rms, and 10.11 MHz	00:30	01:24:40		
48	Set the ObsID Step to: 8		01:24:40		
49	Record the injected current		01:24:40		
50	After 01:10 set the step to, 65535	01:10	01:25:50		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
51	Adjust injection level to 125mV rms, and 10.51 MHz	00:30	01:26:20		
52	Set the ObsID Step to: 9		01:26:20		
53	Record the injected current		01:26:20		
54	After 01:10 set the step to, 65535	01:10	01:27:30		
55	Adjust injection level to 125mV rms, and 10.93 MHz	00:30	01:28:00		
56	Set the ObsID Step to: 10		01:28:00		
57	Record the injected current		01:28:00		
58	After 01:10 set the step to, 65535	01:10	01:29:10		
59	Adjust injection level to 125mV rms, and 11.36 MHz	00:30	01:29:40		
60	Set the ObsID Step to: 11		01:29:40		
61	Record the injected current		01:29:40		
62	After 01:10 set the step to, 65535	01:10	01:30:50		
63	Adjust injection level to 125mV rms, and 11.81 MHz	00:30	01:31:20		
64	Set the ObsID Step to: 12		01:31:20		
65	Record the injected current		01:31:20		
66	After 01:10 set the step to, 65535	01:10	01:32:30		
67	Adjust injection level to 125mV rms, and 12.28 MHz	00:30	01:33:00		
68	Set the ObsID Step to: 13		01:33:00		
69	Record the injected current		01:33:00		
70	After 01:10 set the step to, 65535	01:10	01:34:10		
71	Adjust injection level to 125mV rms, and 12.77 MHz	00:30	01:34:40		
72	Set the ObsID Step to: 14		01:34:40		
73	Record the injected current		01:34:40		
74	After 01:10 set the step to, 65535	01:10	01:35:50		
75	Adjust injection level to 125mV rms, and 13.28 MHz	00:30	01:36:20		
76	Set the ObsID Step to: 15		01:36:20		
77	Record the injected current		01:36:20		
78	After 01:10 set the step to, 65535	01:10	01:37:30		
79	Adjust injection level to 125mV rms, and 13.81 MHz	00:30	01:38:00		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
80	Set the ObsID Step to: 16		01:38:00		
81	Record the injected current		01:38:00		
82	After 01:10 set the step to, 65535	01:10	01:39:10		
83	Adjust injection level to 125mV rms, and 14.36 MHz	00:30	01:39:40		
84	Set the ObsID Step to: 17		01:39:40		
85	Record the injected current		01:39:40		
86	After 01:10 set the step to, 65535	01:10	01:40:50		
87	Adjust injection level to 125mV rms, and 14.93 MHz	00:30	01:41:20		
88	Set the ObsID Step to: 18		01:41:20		
89	Record the injected current		01:41:20		
90	After 01:10 set the step to, 65535	01:10	01:42:30		
91	Adjust injection level to 125mV rms, and 15.52 MHz	00:30	01:43:00		
92	Set the ObsID Step to: 19		01:43:00		
93	Record the injected current		01:43:00		
94	After 01:10 set the step to, 65535	01:10	01:44:10		
95	Adjust injection level to 125mV rms, and 16.14 MHz	00:30	01:44:40		
96	Set the ObsID Step to: 20		01:44:40		
97	Record the injected current		01:44:40		
98	After 01:10 set the step to, 65535	01:10	01:45:50		
99	Adjust injection level to 125mV rms, and 16.78 MHz	00:30	01:46:20		
100	Set the ObsID Step to: 21		01:46:20		
101	Record the injected current		01:46:20		
102	After 01:10 set the step to, 65535	01:10	01:47:30		
103	Adjust injection level to 125mV rms, and 17.45 MHz	00:30	01:48:00		
104	Set the ObsID Step to: 22		01:48:00		
105	Record the injected current		01:48:00		
106	After 01:10 set the step to, 65535	01:10	01:49:10		
107	Adjust injection level to 125mV rms, and 18.14 MHz	00:30	01:49:40		
108	Set the ObsID Step to: 23		01:49:40		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
109	Record the injected current		01:49:40		
110	After 01:10 set the step to, 65535	01:10	01:50:50		
111	Adjust injection level to 125mV rms, and 18.86 MHz	00:30	01:51:20		
112	Set the ObsID Step to: 24		01:51:20		
113	Record the injected current		01:51:20		
114	After 01:10 set the step to, 65535	01:10	01:52:30		
115	Adjust injection level to 125mV rms, and 19.61 MHz	00:30	01:53:00		
116	Set the ObsID Step to: 25		01:53:00		
117	Record the injected current		01:53:00		
118	After 01:10 set the step to, 65535	01:10	01:54:10		
119	Adjust injection level to 125mV rms, and 20.39 MHz	00:30	01:54:40		
120	Set the ObsID Step to: 26		01:54:40		
121	Record the injected current		01:54:40		
122	After 01:10 set the step to, 65535	01:10	01:55:50		
123	Adjust injection level to 125mV rms, and 21.20 MHz	00:30	01:56:20		
124	Set the ObsID Step to: 27		01:56:20		
125	Record the injected current		01:56:20		
126	After 01:10 set the step to, 65535	01:10	01:57:30		
127	Adjust injection level to 125mV rms, and 22.05 MHz	00:30	01:58:00		
128	Set the ObsID Step to: 28		01:58:00		
129	Record the injected current		01:58:00		
130	After 01:10 set the step to, 65535	01:10	01:59:10		
131	Adjust injection level to 125mV rms, and 22.92 MHz	00:30	01:59:40		
132	Set the ObsID Step to: 29		01:59:40		
133	Record the injected current		01:59:40		
134	After 01:10 set the step to, 65535	01:10	02:00:50		
135	Adjust injection level to 125mV rms, and 23.84 MHz	00:30	02:01:20		
136	Set the ObsID Step to: 30		02:01:20		
137	Record the injected current		02:01:20		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
138	After 01:10 set the step to, 65535	01:10	02:02:30		
139	Adjust injection level to 125mV rms, and 24.78 MHz	00:30	02:03:00		
140	Set the ObsID Step to: 31		02:03:00		
141	Record the injected current		02:03:00		
142	After 01:10 set the step to, 65535	01:10	02:04:10		
143	Adjust injection level to 125mV rms, and 25.77 MHz	00:30	02:04:40		
144	Set the ObsID Step to: 32		02:04:40		
145	Record the injected current		02:04:40		
146	After 01:10 set the step to, 65535	01:10	02:05:50		
147	Adjust injection level to 125mV rms, and 26.79 MHz	00:30	02:06:20		
148	Set the ObsID Step to: 33		02:06:20		
149	Record the injected current		02:06:20		
150	After 01:10 set the step to, 65535	01:10	02:07:30		
151	Adjust injection level to 125mV rms, and 27.86 MHz	00:30	02:08:00		
152	Set the ObsID Step to: 34		02:08:00		
153	Record the injected current		02:08:00		
154	After 01:10 set the step to, 65535	01:10	02:09:10		
155	Adjust injection level to 125mV rms, and 28.97 MHz	00:30	02:09:40		
156	Set the ObsID Step to: 35		02:09:40		
157	Record the injected current		02:09:40		
158	After 01:10 set the step to, 65535	01:10	02:10:50		
159	Adjust injection level to 125mV rms, and 30.12 MHz	00:30	02:11:20		
160	Set the ObsID Step to: 36		02:11:20		
161	Record the injected current		02:11:20		
162	After 01:10 set the step to, 65535	01:10	02:12:30		
163	Adjust injection level to 125mV rms, and 31.32 MHz	00:30	02:13:00		
164	Set the ObsID Step to: 37		02:13:00		
165	Record the injected current		02:13:00		
166	After 01:10 set the step to, 65535	01:10	02:14:10		

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167	Adjust injection level to 125mV rms, and 32.56 MHz	00:30	02:14:40		
168	Set the ObsID Step to: 38		02:14:40		
169	Record the injected current		02:14:40		
170	After 01:10 set the step to, 65535	01:10	02:15:50		
171	Adjust injection level to 125mV rms, and 33.86 MHz	00:30	02:16:20		
172	Set the ObsID Step to: 39		02:16:20		
173	Record the injected current		02:16:20		
174	After 01:10 set the step to, 65535	01:10	02:17:30		
175	Adjust injection level to 125mV rms, and 35.20 MHz	00:30	02:18:00		
176	Set the ObsID Step to: 40		02:18:00		
177	Record the injected current		02:18:00		
178	After 01:10 set the step to, 65535	01:10	02:19:10		
179	Adjust injection level to 125mV rms, and 36.60 MHz	00:30	02:19:40		
180	Set the ObsID Step to: 41		02:19:40		
181	Record the injected current		02:19:40		
182	After 01:10 set the step to, 65535	01:10	02:20:50		
183	Adjust injection level to 125mV rms, and 38.06 MHz	00:30	02:21:20		
184	Set the ObsID Step to: 42		02:21:20		
185	Record the injected current		02:21:20		
186	After 01:10 set the step to, 65535	01:10	02:22:30		
187	Adjust injection level to 125mV rms, and 39.57 MHz	00:30	02:23:00		
188	Set the ObsID Step to: 43		02:23:00		
189	Record the injected current		02:23:00		
190	After 01:10 set the step to, 65535	01:10	02:24:10		
191	Adjust injection level to 125mV rms, and 41.14 MHz	00:30	02:24:40		
192	Set the ObsID Step to: 44		02:24:40		
193	Record the injected current		02:24:40		
194	After 01:10 set the step to, 65535	01:10	02:25:50		
195	Adjust injection level to 125mV rms, and 42.78 MHz	00:30	02:26:20		

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196	Set the ObsID Step to: 45		02:26:20		
197	Record the injected current		02:26:20		
198	After 01:10 set the step to, 65535	01:10	02:27:30		
199	Adjust injection level to 125mV rms, and 44.48 MHz	00:30	02:28:00		
200	Set the ObsID Step to: 46		02:28:00		
201	Record the injected current		02:28:00		
202	After 01:10 set the step to, 65535	01:10	02:29:10		
203	Adjust injection level to 125mV rms, and 46.25 MHz	00:30	02:29:40		
204	Set the ObsID Step to: 47		02:29:40		
205	Record the injected current		02:29:40		
206	After 01:10 set the step to, 65535	01:10	02:30:50		
207	Adjust injection level to 125mV rms, and 48.09 MHz	00:30	02:31:20		
208	Set the ObsID Step to: 48		02:31:20		
209	Record the injected current		02:31:20		
210	After 01:10 set the step to, 65535	01:10	02:32:30		
211	Adjust injection level to 125mV rms, and 50.00 MHz	00:30	02:33:00		
212	Set the ObsID Step to: 49		02:33:00		
213	Record the injected current		02:33:00		
214	After 01:10 set the step to, 65535	01:10	02:34:10		
215	Switch off RF amplifier	00:30	02:34:40		
216	Set the ObsID Step to: 50		02:34:40		
217	After 01:10 Exit the SPIRE-IST-EMC-SPOT.tcl (CCS operator)		02:34:40		
218	Change to Spectrometer mode	05:00	02:39:40		
219	Switch on RF amplifier and injection frequency to 8.00 MHz	02:00	02:41:40		
220	Adjust the level on the Power Amplifier until the injected level is 125mV rms (Note: -12dB from IID-A) Voltage measurement as indicated by oscilloscope	01:00	02:42:40		
221	Execute SPIRE-IST-EMC-SPOT.tcl (CCS operator) The ObsID to be used is supplied by the SPIRE Test Director	01:00	02:43:40		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
222	Stop injecting current with BCI by setting the amplifier to standby	01:00	02:44:40		
223	Set the ObsID Step to: 1 (Reference step)	00:30	02:45:10		
224	Accumulate > 70 seconds of detector data	00:20	02:45:30		
225	Set the ObsID Step to: 65535	00:30	02:46:00		
226	Switch on RF amplifier and adjust injection level to 125 mV rms, and 8MHz	00:30	02:46:30		
227	Set the ObsID Step to: 2		02:46:30		
228	Record the injected current		02:46:30		
229	After 00:20 set the step to, 65535	00:20	02:46:50		
230	Adjust injection level to 125mV rms, and 8.32 MHz	00:30	02:47:20		
231	Set the ObsID Step to: 3		02:47:20		
232	Record the injected current		02:47:20		
233	After 00:20 set the step to, 65535	00:20	02:47:40		
234	Adjust injection level to 125mV rms, and 8.65 MHz	00:30	02:48:10		
235	Set the ObsID Step to: 4		02:48:10		
236	Record the injected current		02:48:10		
237	After 00:20 set the step to, 65535	00:20	02:48:30		
238	Adjust injection level to 125mV rms, and 8.99 MHz	00:30	02:49:00		
239	Set the ObsID Step to: 5		02:49:00		
240	Record the injected current		02:49:00		
241	After 00:20 set the step to, 65535	00:20	02:49:20		
242	Adjust injection level to 125mV rms, and 9.35 MHz	00:30	02:49:50		
243	Set the ObsID Step to: 6		02:49:50		
244	Record the injected current		02:49:50		
245	After 00:20 set the step to, 65535	00:20	02:50:10		
246	Adjust injection level to 125mV rms, and 9.72 MHz	00:30	02:50:40		
247	Set the ObsID Step to: 7		02:50:40		
248	Record the injected current		02:50:40		
249	After 00:20 set the step to, 65535	00:20	02:51:00		
250	Adjust injection level to 125mV rms, and 10.11 MHz	00:30	02:51:30		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
251	Set the ObsID Step to: 8		02:51:30		
252	Record the injected current		02:51:30		
253	After 00:20 set the step to, 65535	00:20	02:51:50		
254	Adjust injection level to 125mV rms, and 10.51 MHz	00:30	02:52:20		
255	Set the ObsID Step to: 9		02:52:20		
256	Record the injected current		02:52:20		
257	After 00:20 set the step to, 65535	00:20	02:52:40		
258	Adjust injection level to 125mV rms, and 10.93 MHz	00:30	02:53:10		
259	Set the ObsID Step to: 10		02:53:10		
260	Record the injected current		02:53:10		
261	After 00:20 set the step to, 65535	00:20	02:53:30		
262	Adjust injection level to 125mV rms, and 11.36 MHz	00:30	02:54:00		
263	Set the ObsID Step to: 11		02:54:00		
264	Record the injected current		02:54:00		
265	After 00:20 set the step to, 65535	00:20	02:54:20		
266	Adjust injection level to 125mV rms, and 11.81 MHz	00:30	02:54:50		
267	Set the ObsID Step to: 12		02:54:50		
268	Record the injected current		02:54:50		
269	After 00:20 set the step to, 65535	00:20	02:55:10		
270	Adjust injection level to 125mV rms, and 12.28 MHz	00:30	02:55:40		
271	Set the ObsID Step to: 13		02:55:40		
272	Record the injected current		02:55:40		
273	After 00:20 set the step to, 65535	00:20	02:56:00		
274	Adjust injection level to 125mV rms, and 12.77 MHz	00:30	02:56:30		
275	Set the ObsID Step to: 14		02:56:30		
276	Record the injected current		02:56:30		
277	After 00:20 set the step to, 65535	00:20	02:56:50		
278	Adjust injection level to 125mV rms, and 13.28 MHz	00:30	02:57:20		
279	Set the ObsID Step to: 15		02:57:20		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
280	Record the injected current		02:57:20		
281	After 00:20 set the step to, 65535	00:20	02:57:40		
282	Adjust injection level to 125mV rms, and 13.81 MHz	00:30	02:58:10		
283	Set the ObsID Step to: 16		02:58:10		
284	Record the injected current		02:58:10		
285	After 00:20 set the step to, 65535	00:20	02:58:30		
286	Adjust injection level to 125mV rms, and 14.36 MHz	00:30	02:59:00		
287	Set the ObsID Step to: 17		02:59:00		
288	Record the injected current		02:59:00		
289	After 00:20 set the step to, 65535	00:20	02:59:20		
290	Adjust injection level to 125mV rms, and 14.93 MHz	00:30	02:59:50		
291	Set the ObsID Step to: 18		02:59:50		
292	Record the injected current		02:59:50		
293	After 00:20 set the step to, 65535	00:20	03:00:10		
294	Adjust injection level to 125mV rms, and 15.52 MHz	00:30	03:00:40		
295	Set the ObsID Step to: 19		03:00:40		
296	Record the injected current		03:00:40		
297	After 00:20 set the step to, 65535	00:20	03:01:00		
298	Adjust injection level to 125mV rms, and 16.14 MHz	00:30	03:01:30		
299	Set the ObsID Step to: 20		03:01:30		
300	Record the injected current		03:01:30		
301	After 00:20 set the step to, 65535	00:20	03:01:50		
302	Adjust injection level to 125mV rms, and 16.78 MHz	00:30	03:02:20		
303	Set the ObsID Step to: 21		03:02:20		
304	Record the injected current		03:02:20		
305	After 00:20 set the step to, 65535	00:20	03:02:40		
306	Adjust injection level to 125mV rms, and 17.45 MHz	00:30	03:03:10		
307	Set the ObsID Step to: 22		03:03:10		
308	Record the injected current		03:03:10		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
309	After 00:20 set the step to, 65535	00:20	03:03:30		
310	Adjust injection level to 125mV rms, and 18.14 MHz	00:30	03:04:00		
311	Set the ObsID Step to: 23		03:04:00		
312	Record the injected current		03:04:00		
313	After 00:20 set the step to, 65535	00:20	03:04:20		
314	Adjust injection level to 125mV rms, and 18.86 MHz	00:30	03:04:50		
315	Set the ObsID Step to: 24		03:04:50		
316	Record the injected current		03:04:50		
317	After 00:20 set the step to, 65535	00:20	03:05:10		
318	Adjust injection level to 125mV rms, and 19.61 MHz	00:30	03:05:40		
319	Set the ObsID Step to: 25		03:05:40		
320	Record the injected current		03:05:40		
321	After 00:20 set the step to, 65535	00:20	03:06:00		
322	Adjust injection level to 125mV rms, and 20.39 MHz	00:30	03:06:30		
323	Set the ObsID Step to: 26		03:06:30		
324	Record the injected current		03:06:30		
325	After 00:20 set the step to, 65535	00:20	03:06:50		
326	Adjust injection level to 125mV rms, and 21.20 MHz	00:30	03:07:20		
327	Set the ObsID Step to: 27		03:07:20		
328	Record the injected current		03:07:20		
329	After 00:20 set the step to, 65535	00:20	03:07:40		
330	Adjust injection level to 125mV rms, and 22.05 MHz	00:30	03:08:10		
331	Set the ObsID Step to: 28		03:08:10		
332	Record the injected current		03:08:10		
333	After 00:20 set the step to, 65535	00:20	03:08:30		
334	Adjust injection level to 125mV rms, and 22.92 MHz	00:30	03:09:00		
335	Set the ObsID Step to: 29		03:09:00		
336	Record the injected current		03:09:00		
337	After 00:20 set the step to, 65535	00:20	03:09:20		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
338	Adjust injection level to 125mV rms, and 23.84 MHz	00:30	03:09:50		
339	Set the ObsID Step to: 30		03:09:50		
340	Record the injected current		03:09:50		
341	After 00:20 set the step to, 65535	00:20	03:10:10		
342	Adjust injection level to 125mV rms, and 24.78 MHz	00:30	03:10:40		
343	Set the ObsID Step to: 31		03:10:40		
344	Record the injected current		03:10:40		
345	After 00:20 set the step to, 65535	00:20	03:11:00		
346	Adjust injection level to 125mV rms, and 25.77 MHz	00:30	03:11:30		
347	Set the ObsID Step to: 32		03:11:30		
348	Record the injected current		03:11:30		
349	After 00:20 set the step to, 65535	00:20	03:11:50		
350	Adjust injection level to 125mV rms, and 26.79 MHz	00:30	03:12:20		
351	Set the ObsID Step to: 33		03:12:20		
352	Record the injected current		03:12:20		
353	After 00:20 set the step to, 65535	00:20	03:12:40		
354	Adjust injection level to 125mV rms, and 27.86 MHz	00:30	03:13:10		
355	Set the ObsID Step to: 34		03:13:10		
356	Record the injected current		03:13:10		
357	After 00:20 set the step to, 65535	00:20	03:13:30		
358	Adjust injection level to 125mV rms, and 28.97 MHz	00:30	03:14:00		
359	Set the ObsID Step to: 35		03:14:00		
360	Record the injected current		03:14:00		
361	After 00:20 set the step to, 65535	00:20	03:14:20		
362	Adjust injection level to 125mV rms, and 30.12 MHz	00:30	03:14:50		
363	Set the ObsID Step to: 36		03:14:50		
364	Record the injected current		03:14:50		
365	After 00:20 set the step to, 65535	00:20	03:15:10		
366	Adjust injection level to 125mV rms, and 31.32 MHz	00:30	03:15:40		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
367	Set the ObsID Step to: 37		03:15:40		
368	Record the injected current		03:15:40		
369	After 00:20 set the step to, 65535	00:20	03:16:00		
370	Adjust injection level to 125mV rms, and 32.56 MHz	00:30	03:16:30		
371	Set the ObsID Step to: 38		03:16:30		
372	Record the injected current		03:16:30		
373	After 00:20 set the step to, 65535	00:20	03:16:50		
374	Adjust injection level to 125mV rms, and 33.86 MHz	00:30	03:17:20		
375	Set the ObsID Step to: 39		03:17:20		
376	Record the injected current		03:17:20		
377	After 00:20 set the step to, 65535	00:20	03:17:40		
378	Adjust injection level to 125mV rms, and 35.20 MHz	00:30	03:18:10		
379	Set the ObsID Step to: 40		03:18:10		
380	Record the injected current		03:18:10		
381	After 00:20 set the step to, 65535	00:20	03:18:30		
382	Adjust injection level to 125mV rms, and 36.60 MHz	00:30	03:19:00		
383	Set the ObsID Step to: 41		03:19:00		
384	Record the injected current		03:19:00		
385	After 00:20 set the step to, 65535	00:20	03:19:20		
386	Adjust injection level to 125mV rms, and 38.06 MHz	00:30	03:19:50		
387	Set the ObsID Step to: 42		03:19:50		
388	Record the injected current		03:19:50		
389	After 00:20 set the step to, 65535	00:20	03:20:10		
390	Adjust injection level to 125mV rms, and 39.57 MHz	00:30	03:20:40		
391	Set the ObsID Step to: 43		03:20:40		
392	Record the injected current		03:20:40		
393	After 00:20 set the step to, 65535	00:20	03:21:00		
394	Adjust injection level to 125mV rms, and 41.14 MHz	00:30	03:21:30		
395	Set the ObsID Step to: 44		03:21:30		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
396	Record the injected current		03:21:30		
397	After 00:20 set the step to, 65535	00:20	03:21:50		
398	Adjust injection level to 125mV rms, and 42.78 MHz	00:30	03:22:20		
399	Set the ObsID Step to: 45		03:22:20		
400	Record the injected current		03:22:20		
401	After 00:20 set the step to, 65535	00:20	03:22:40		
402	Adjust injection level to 125mV rms, and 44.48 MHz	00:30	03:23:10		
403	Set the ObsID Step to: 46		03:23:10		
404	Record the injected current		03:23:10		
405	After 00:20 set the step to, 65535	00:20	03:23:30		
406	Adjust injection level to 125mV rms, and 46.25 MHz	00:30	03:24:00		
407	Set the ObsID Step to: 47		03:24:00		
408	Record the injected current		03:24:00		
409	After 00:20 set the step to, 65535	00:20	03:24:20		
410	Adjust injection level to 125mV rms, and 48.09 MHz	00:30	03:24:50		
411	Set the ObsID Step to: 48		03:24:50		
412	Record the injected current		03:24:50		
413	After 00:20 set the step to, 65535	00:20	03:25:10		
414	Adjust injection level to 125mV rms, and 50.00 MHz	00:30	03:25:40		
415	Set the ObsID Step to: 49		03:25:40		
416	Record the injected current		03:25:40		
417	After 00:20 set the step to, 65535	00:20	03:26:00		
418	Set the RF amplifier to standby		03:26:00		
419	Set the ObsID Step to: 50		03:26:00		
420	After 01:10 exit SPIRE-IST-EMC-SPOT.tcl (CCS operator)	01:10	03:27:10		
421	Switch off RF amplifier	00:30	03:27:40		
422	Shut down DRCU	05:00	03:32:40		
423	Shut down DPU	05:00	03:37:40		
	End of DM Tests				

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6.2 Common Mode

6.2.1 Prerequisites / assumptions

- The test adaptor as detailed in §3.2 and Figure 1 and Figure 2 has been installed on the spacecraft
- The cooler has been recycled and has sufficient predicted hold time to perform the test
- The test equipment is installed in the AIT clean room and has been checked out and is ready to be used prior to the commencement of the test steps. This includes
 - the mechanical securing of the BCI and Current Probes in the correct locations on/near the SVM
 - the connection of the leads to the equipment
- The orientation of the spacecraft is not important, apart from the fact that the test equipment must be able to be located close to the Test Adaptor and accessible by the AIT team
- There is radio communication between the CCS operator and the AIT staff operating the EMC test equipment
- The Current Clamp Probe calibration tables are programmed into a spreadsheet to allow real-time conversion of spectrum analyser voltage output to current
- The temperature of the cryostat cover is <50K and is stable to ± 1 K/hour drifts

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6.2.2 Detailed Procedure

Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
1	Reconfigure the BCI to inject CM current as per Figure 4	01:00	03:38:40		
2	Reconfigure the Current Clamp Probe to measure CM current as per Figure 4	05:00	03:43:40		
3	Connect the Oscilloscope probe signal to test point on DB01-P4 Contact 8 (Return-Blue)	01:00	03:44:40		
4	Connect the Oscilloscope probe reference to Spacecraft chassis	01:00	03:45:40		
5	Switch on SPIRE DPU	05:00	03:50:40		
6	Switch on SPIRE DRCU	05:00	03:55:40		
7	Turn on the Pump HS heater and wait for 300-mK temp to stabilise	30:00	04:25:40		
8	Switch instrument to Phot. Mode	02:00	04:27:40		
9	Switch on Oscilloscope	02:00	04:29:40		
10	Switch on Spectrum Analyser and tune to 8MHz, RBW< 20 kHz	02:00	04:31:40		
11	Switch on the Synthesiser and set level to minimum, F=8MHz	02:00	04:33:40		
12	Set power level of RF amplifier to minimum and switch on	02:00	04:35:40		
13	Adjust the level on the Power Amplifier until the injected level is 177mV rms (Note: -12dB from IID-A) Voltage measurement as indicated by oscilloscope	02:00	04:37:40		
14	Execute SPIRE-IST-EMC-SPOT.tcl (CCS operator) The ObsID to be used is supplied by the SPIRE Test Director	01:00	04:38:40		
15	Stop injecting current with BCI by setting the amplifier to standby	01:00	04:39:40		
16	Set the ObsID Step to: 1 (Reference step)	00:30	04:40:10		
17	Accumulate > 70 seconds of detector data	01:10	04:41:20		
18	Set the ObsID Step to: 65535	00:30	04:41:50		
19	Switch on RF amplifier and adjust injection level to 177mV rms, and 8MHz	00:30	04:42:20		
20	Set the ObsID Step to: 2		04:42:20		
21	Record the injected current		04:42:20		
22	After 01:10 set the step to, 65535	01:10	04:43:30		
23	Switch on RF amplifier and adjust injection level to 177 mV rms, and 8.32MHz	00:30	04:44:00		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
24	Set the ObsID Step to: 3		04:44:00		
25	Record the injected current		04:44:00		
26	After 01:10 set the step to, 65535	01:10	04:45:10		
27	Switch on RF amplifier and adjust injection level to 177 mV rms, and 8.65MHz	00:30	04:45:40		
28	Set the ObsID Step to: 4		04:45:40		
29	Record the injected current		04:45:40		
30	After 01:10 set the step to, 65535	01:10	04:46:50		
31	Switch on RF amplifier and adjust injection level to 177 mV rms, and 8.99MHz	00:30	04:47:20		
32	Set the ObsID Step to: 5		04:47:20		
33	Record the injected current		04:47:20		
34	After 01:10 set the step to, 65535	01:10	04:48:30		
35	Switch on RF amplifier and adjust injection level to 177 mV rms, and 9.35MHz	00:30	04:49:00		
36	Set the ObsID Step to: 6		04:49:00		
37	Record the injected current		04:49:00		
38	After 01:10 set the step to, 65535	01:10	04:50:10		
39	Switch on RF amplifier and adjust injection level to 177 mV rms, and 9.72MHz	00:30	04:50:40		
40	Set the ObsID Step to: 7		04:50:40		
41	Record the injected current		04:50:40		
42	After 01:10 set the step to, 65535	01:10	04:51:50		
43	Switch on RF amplifier and adjust injection level to 177 mV rms, and 10.11MHz	00:30	04:52:20		
44	Set the ObsID Step to: 8		04:52:20		
45	Record the injected current		04:52:20		
46	After 01:10 set the step to, 65535	01:10	04:53:30		
47	Switch on RF amplifier and adjust injection level to 177 mV rms, and 10.51MHz	00:30	04:54:00		
48	Set the ObsID Step to: 9		04:54:00		
49	Record the injected current		04:54:00		
50	After 01:10 set the step to, 65535	01:10	04:55:10		
51	Switch on RF amplifier and adjust injection level to 177 mV rms, and 10.93MHz	00:30	04:55:40		
52	Set the ObsID Step to: 10		04:55:40		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
53	Record the injected current		04:55:40		
54	After 01:10 set the step to, 65535	01:10	04:56:50		
55	Switch on RF amplifier and adjust injection level to 177 mV rms, and 11.36MHz	00:30	04:57:20		
56	Set the ObsID Step to: 11		04:57:20		
57	Record the injected current		04:57:20		
58	After 01:10 set the step to, 65535	01:10	04:58:30		
59	Switch on RF amplifier and adjust injection level to 177 mV rms, and 11.81MHz	00:30	04:59:00		
60	Set the ObsID Step to: 12		04:59:00		
61	Record the injected current		04:59:00		
62	After 01:10 set the step to, 65535	01:10	05:00:10		
63	Switch on RF amplifier and adjust injection level to 177 mV rms, and 12.28MHz	00:30	05:00:40		
64	Set the ObsID Step to: 13		05:00:40		
65	Record the injected current		05:00:40		
66	After 01:10 set the step to, 65535	01:10	05:01:50		
67	Switch on RF amplifier and adjust injection level to 177 mV rms, and 12.77MHz	00:30	05:02:20		
68	Set the ObsID Step to: 14		05:02:20		
69	Record the injected current		05:02:20		
70	After 01:10 set the step to, 65535	01:10	05:03:30		
71	Switch on RF amplifier and adjust injection level to 177 mV rms, and 13.28MHz	00:30	05:04:00		
72	Set the ObsID Step to: 15		05:04:00		
73	Record the injected current		05:04:00		
74	After 01:10 set the step to, 65535	01:10	05:05:10		
75	Switch on RF amplifier and adjust injection level to 177 mV rms, and 13.81MHz	00:30	05:05:40		
76	Set the ObsID Step to: 16		05:05:40		
77	Record the injected current		05:05:40		
78	After 01:10 set the step to, 65535	01:10	05:06:50		
79	Switch on RF amplifier and adjust injection level to 177 mV rms, and 14.36MHz	00:30	05:07:20		
80	Set the ObsID Step to: 17		05:07:20		
81	Record the injected current		05:07:20		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
82	After 01:10 set the step to, 65535	01:10	05:08:30		
83	Switch on RF amplifier and adjust injection level to 177 mV rms, and 14.93MHz	00:30	05:09:00		
84	Set the ObsID Step to: 18		05:09:00		
85	Record the injected current		05:09:00		
86	After 01:10 set the step to, 65535	01:10	05:10:10		
87	Switch on RF amplifier and adjust injection level to 177 mV rms, and 15.52MHz	00:30	05:10:40		
88	Set the ObsID Step to: 19		05:10:40		
89	Record the injected current		05:10:40		
90	After 01:10 set the step to, 65535	01:10	05:11:50		
91	Switch on RF amplifier and adjust injection level to 177 mV rms, and 16.14MHz	00:30	05:12:20		
92	Set the ObsID Step to: 20		05:12:20		
93	Record the injected current		05:12:20		
94	After 01:10 set the step to, 65535	01:10	05:13:30		
95	Switch on RF amplifier and adjust injection level to 177 mV rms, and 16.78MHz	00:30	05:14:00		
96	Set the ObsID Step to: 21		05:14:00		
97	Record the injected current		05:14:00		
98	After 01:10 set the step to, 65535	01:10	05:15:10		
99	Switch on RF amplifier and adjust injection level to 177 mV rms, and 17.45MHz	00:30	05:15:40		
100	Set the ObsID Step to: 22		05:15:40		
101	Record the injected current		05:15:40		
102	After 01:10 set the step to, 65535	01:10	05:16:50		
103	Switch on RF amplifier and adjust injection level to 177 mV rms, and 18.14MHz	00:30	05:17:20		
104	Set the ObsID Step to: 23		05:17:20		
105	Record the injected current		05:17:20		
106	After 01:10 set the step to, 65535	01:10	05:18:30		
107	Switch on RF amplifier and adjust injection level to 177 mV rms, and 18.86MHz	00:30	05:19:00		
108	Set the ObsID Step to: 24		05:19:00		
109	Record the injected current		05:19:00		
110	After 01:10 set the step to, 65535	01:10	05:20:10		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
111	Switch on RF amplifier and adjust injection level to 177 mV rms, and 19.61MHz	00:30	05:20:40		
112	Set the ObsID Step to: 25		05:20:40		
113	Record the injected current		05:20:40		
114	After 01:10 set the step to, 65535	01:10	05:21:50		
115	Switch on RF amplifier and adjust injection level to 177 mV rms, and 20.39MHz	00:30	05:22:20		
116	Set the ObsID Step to: 26		05:22:20		
117	Record the injected current		05:22:20		
118	After 01:10 set the step to, 65535	01:10	05:23:30		
119	Switch on RF amplifier and adjust injection level to 177 mV rms, and 21.20MHz	00:30	05:24:00		
120	Set the ObsID Step to: 27		05:24:00		
121	Record the injected current		05:24:00		
122	After 01:10 set the step to, 65535	01:10	05:25:10		
123	Switch on RF amplifier and adjust injection level to 177 mV rms, and 22.05MHz	00:30	05:25:40		
124	Set the ObsID Step to: 28		05:25:40		
125	Record the injected current		05:25:40		
126	After 01:10 set the step to, 65535	01:10	05:26:50		
127	Switch on RF amplifier and adjust injection level to 177 mV rms, and 22.92MHz	00:30	05:27:20		
128	Set the ObsID Step to: 29		05:27:20		
129	Record the injected current		05:27:20		
130	After 01:10 set the step to, 65535	01:10	05:28:30		
131	Switch on RF amplifier and adjust injection level to 177 mV rms, and 23.84MHz	00:30	05:29:00		
132	Set the ObsID Step to: 30		05:29:00		
133	Record the injected current		05:29:00		
134	After 01:10 set the step to, 65535	01:10	05:30:10		
135	Switch on RF amplifier and adjust injection level to 177 mV rms, and 24.78MHz	00:30	05:30:40		
136	Set the ObsID Step to: 31		05:30:40		
137	Record the injected current		05:30:40		
138	After 01:10 set the step to, 65535	01:10	05:31:50		
139	Switch on RF amplifier and adjust injection level to 177 mV rms, and 25.77MHz	00:30	05:32:20		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
140	Set the ObsID Step to: 32		05:32:20		
141	Record the injected current		05:32:20		
142	After 01:10 set the step to, 65535	01:10	05:33:30		
143	Switch on RF amplifier and adjust injection level to 177 mV rms, and 26.79MHz	00:30	05:34:00		
144	Set the ObsID Step to: 33		05:34:00		
145	Record the injected current		05:34:00		
146	After 01:10 set the step to, 65535	01:10	05:35:10		
147	Switch on RF amplifier and adjust injection level to 177 mV rms, and 27.86MHz	00:30	05:35:40		
148	Set the ObsID Step to: 34		05:35:40		
149	Record the injected current		05:35:40		
150	After 01:10 set the step to, 65535	01:10	05:36:50		
151	Switch on RF amplifier and adjust injection level to 177 mV rms, and 28.97MHz	00:30	05:37:20		
152	Set the ObsID Step to: 35		05:37:20		
153	Record the injected current		05:37:20		
154	After 01:10 set the step to, 65535	01:10	05:38:30		
155	Switch on RF amplifier and adjust injection level to 177 mV rms, and 30.12MHz	00:30	05:39:00		
156	Set the ObsID Step to: 36		05:39:00		
157	Record the injected current		05:39:00		
158	After 01:10 set the step to, 65535	01:10	05:40:10		
159	Switch on RF amplifier and adjust injection level to 177 mV rms, and 31.32MHz	00:30	05:40:40		
160	Set the ObsID Step to: 37		05:40:40		
161	Record the injected current		05:40:40		
162	After 01:10 set the step to, 65535	01:10	05:41:50		
163	Switch on RF amplifier and adjust injection level to 177 mV rms, and 32.56MHz	00:30	05:42:20		
164	Set the ObsID Step to: 38		05:42:20		
165	Record the injected current		05:42:20		
166	After 01:10 set the step to, 65535	01:10	05:43:30		
167	Switch on RF amplifier and adjust injection level to 177 mV rms, and 33.86MHz	00:30	05:44:00		
168	Set the ObsID Step to: 39		05:44:00		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
169	Record the injected current		05:44:00		
170	After 01:10 set the step to, 65535	01:10	05:45:10		
171	Switch on RF amplifier and adjust injection level to 177 mV rms, and 35.20MHz	00:30	05:45:40		
172	Set the ObsID Step to: 40		05:45:40		
173	Record the injected current		05:45:40		
174	After 01:10 set the step to, 65535	01:10	05:46:50		
175	Switch on RF amplifier and adjust injection level to 177 mV rms, and 36.60MHz	00:30	05:47:20		
176	Set the ObsID Step to: 41		05:47:20		
177	Record the injected current		05:47:20		
178	After 01:10 set the step to, 65535	01:10	05:48:30		
179	Switch on RF amplifier and adjust injection level to 177 mV rms, and 38.06MHz	00:30	05:49:00		
180	Set the ObsID Step to: 42		05:49:00		
181	Record the injected current		05:49:00		
182	After 01:10 set the step to, 65535	01:10	05:50:10		
183	Switch on RF amplifier and adjust injection level to 177 mV rms, and 39.57MHz	00:30	05:50:40		
184	Set the ObsID Step to: 43		05:50:40		
185	Record the injected current		05:50:40		
186	After 01:10 set the step to, 65535	01:10	05:51:50		
187	Switch on RF amplifier and adjust injection level to 177 mV rms, and 41.14MHz	00:30	05:52:20		
188	Set the ObsID Step to: 44		05:52:20		
189	Record the injected current		05:52:20		
190	After 01:10 set the step to, 65535	01:10	05:53:30		
191	Switch on RF amplifier and adjust injection level to 177 mV rms, and 42.78MHz	00:30	05:54:00		
192	Set the ObsID Step to: 45		05:54:00		
193	Record the injected current		05:54:00		
194	After 01:10 set the step to, 65535	01:10	05:55:10		
195	Switch on RF amplifier and adjust injection level to 177 mV rms, and 44.48MHz	00:30	05:55:40		
196	Set the ObsID Step to: 46		05:55:40		
197	Record the injected current		05:55:40		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
198	After 01:10 set the step to, 65535	01:10	05:56:50		
199	Switch on RF amplifier and adjust injection level to 177 mV rms, and 46.25MHz	00:30	05:57:20		
200	Set the ObsID Step to: 47		05:57:20		
201	Record the injected current		05:57:20		
202	After 01:10 set the step to, 65535	01:10	05:58:30		
203	Switch on RF amplifier and adjust injection level to 177 mV rms, and 48.09MHz	00:30	05:59:00		
204	Set the ObsID Step to: 48		05:59:00		
205	Record the injected current		05:59:00		
206	After 01:10 set the step to, 65535	01:10	06:00:10		
207	Switch on RF amplifier and adjust injection level to 177 mV rms, and 50.00MHz	00:30	06:00:40		
208	Set the ObsID Step to: 49		06:00:40		
209	Record the injected current		06:00:40		
210	After 01:10 set the step to, 65535	01:10	06:01:50		
211	Switch off RF amplifier	00:30	06:02:20		
212	Set the ObsID Step to: 50		06:02:20		
213	After 01:10 Exit the SPIRE-IST-EMC-SPOT.tcl (CCS operator)		06:02:20		
214	Change to Spectrometer mode	05:00	06:07:20		
215	Switch on RF amplifier and injection frequency to 8.00 MHz	02:00	06:09:20		
216	Adjust the level on the Power Amplifier until the injected level is 177mV rms (Note: -12dB from IID-A) Voltage measurement as indicated by oscilloscope	01:00	06:10:20		
217	Execute SPIRE-IST-EMC-SPOT.tcl (CCS operator) The ObsID to be used is supplied by the SPIRE Test Director	01:00	06:11:20		
218	Stop injecting current with BCI by setting the amplifier to standby	01:00	06:12:20		
219	Set the ObsID Step to: 1 (Reference step)	00:30	06:12:50		
220	Accumulate > 70 seconds of detector data	00:20	06:13:10		
221	Set the ObsID Step to: 65535	00:30	06:13:40		
222	Switch on RF amplifier and adjust injection level to 177 mV rms, and 8.00MHz	00:30	06:14:10		
223	Set the ObsID Step to: 2		06:14:10		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
224	Record the injected current		06:14:10		
225	After 01:10 set the step to, 65535	00:20	06:14:30		
226	Switch on RF amplifier and adjust injection level to 177 mV rms, and 8.32MHz	00:30	06:15:00		
227	Set the ObsID Step to: 3		06:15:00		
228	Record the injected current		06:15:00		
229	After 01:10 set the step to, 65535	00:20	06:15:20		
230	Switch on RF amplifier and adjust injection level to 177 mV rms, and 8.65MHz	00:30	06:15:50		
231	Set the ObsID Step to: 4		06:15:50		
232	Record the injected current		06:15:50		
233	After 01:10 set the step to, 65535	00:20	06:16:10		
234	Switch on RF amplifier and adjust injection level to 177 mV rms, and 8.99MHz	00:30	06:16:40		
235	Set the ObsID Step to: 5		06:16:40		
236	Record the injected current		06:16:40		
237	After 01:10 set the step to, 65535	00:20	06:17:00		
238	Switch on RF amplifier and adjust injection level to 177 mV rms, and 9.35MHz	00:30	06:17:30		
239	Set the ObsID Step to: 6		06:17:30		
240	Record the injected current		06:17:30		
241	After 01:10 set the step to, 65535	00:20	06:17:50		
242	Switch on RF amplifier and adjust injection level to 177 mV rms, and 9.72MHz	00:30	06:18:20		
243	Set the ObsID Step to: 7		06:18:20		
244	Record the injected current		06:18:20		
245	After 01:10 set the step to, 65535	00:20	06:18:40		
246	Switch on RF amplifier and adjust injection level to 177 mV rms, and 10.11MHz	00:30	06:19:10		
247	Set the ObsID Step to: 8		06:19:10		
248	Record the injected current		06:19:10		
249	After 01:10 set the step to, 65535	00:20	06:19:30		
250	Switch on RF amplifier and adjust injection level to 177 mV rms, and 10.51MHz	00:30	06:20:00		
251	Set the ObsID Step to: 9		06:20:00		
252	Record the injected current		06:20:00		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
253	After 01:10 set the step to, 65535	00:20	06:20:20		
254	Switch on RF amplifier and adjust injection level to 177 mV rms, and 10.93MHz	00:30	06:20:50		
255	Set the ObsID Step to: 10		06:20:50		
256	Record the injected current		06:20:50		
257	After 01:10 set the step to, 65535	00:20	06:21:10		
258	Switch on RF amplifier and adjust injection level to 177 mV rms, and 11.36MHz	00:30	06:21:40		
259	Set the ObsID Step to: 11		06:21:40		
260	Record the injected current		06:21:40		
261	After 01:10 set the step to, 65535	00:20	06:22:00		
262	Switch on RF amplifier and adjust injection level to 177 mV rms, and 11.81MHz	00:30	06:22:30		
263	Set the ObsID Step to: 12		06:22:30		
264	Record the injected current		06:22:30		
265	After 01:10 set the step to, 65535	00:20	06:22:50		
266	Switch on RF amplifier and adjust injection level to 177 mV rms, and 12.28MHz	00:30	06:23:20		
267	Set the ObsID Step to: 13		06:23:20		
268	Record the injected current		06:23:20		
269	After 01:10 set the step to, 65535	00:20	06:23:40		
270	Switch on RF amplifier and adjust injection level to 177 mV rms, and 12.77MHz	00:30	06:24:10		
271	Set the ObsID Step to: 14		06:24:10		
272	Record the injected current		06:24:10		
273	After 01:10 set the step to, 65535	00:20	06:24:30		
274	Switch on RF amplifier and adjust injection level to 177 mV rms, and 13.28MHz	00:30	06:25:00		
275	Set the ObsID Step to: 15		06:25:00		
276	Record the injected current		06:25:00		
277	After 01:10 set the step to, 65535	00:20	06:25:20		
278	Switch on RF amplifier and adjust injection level to 177 mV rms, and 13.81MHz	00:30	06:25:50		
279	Set the ObsID Step to: 16		06:25:50		
280	Record the injected current		06:25:50		
281	After 01:10 set the step to, 65535	00:20	06:26:10		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
282	Switch on RF amplifier and adjust injection level to 177 mV rms, and 14.36MHz	00:30	06:26:40		
283	Set the ObsID Step to: 17		06:26:40		
284	Record the injected current		06:26:40		
285	After 01:10 set the step to, 65535	00:20	06:27:00		
286	Switch on RF amplifier and adjust injection level to 177 mV rms, and 14.93MHz	00:30	06:27:30		
287	Set the ObsID Step to: 18		06:27:30		
288	Record the injected current		06:27:30		
289	After 01:10 set the step to, 65535	00:20	06:27:50		
290	Switch on RF amplifier and adjust injection level to 177 mV rms, and 15.52MHz	00:30	06:28:20		
291	Set the ObsID Step to: 19		06:28:20		
292	Record the injected current		06:28:20		
293	After 01:10 set the step to, 65535	00:20	06:28:40		
294	Switch on RF amplifier and adjust injection level to 177 mV rms, and 16.14MHz	00:30	06:29:10		
295	Set the ObsID Step to: 20		06:29:10		
296	Record the injected current		06:29:10		
297	After 01:10 set the step to, 65535	00:20	06:29:30		
298	Switch on RF amplifier and adjust injection level to 177 mV rms, and 16.78MHz	00:30	06:30:00		
299	Set the ObsID Step to: 21		06:30:00		
300	Record the injected current		06:30:00		
301	After 01:10 set the step to, 65535	00:20	06:30:20		
302	Switch on RF amplifier and adjust injection level to 177 mV rms, and 17.45MHz	00:30	06:30:50		
303	Set the ObsID Step to: 22		06:30:50		
304	Record the injected current		06:30:50		
305	After 01:10 set the step to, 65535	00:20	06:31:10		
306	Switch on RF amplifier and adjust injection level to 177 mV rms, and 18.14MHz	00:30	06:31:40		
307	Set the ObsID Step to: 23		06:31:40		
308	Record the injected current		06:31:40		
309	After 01:10 set the step to, 65535	00:20	06:32:00		
310	Switch on RF amplifier and adjust injection level to 177 mV rms, and 18.86MHz	00:30	06:32:30		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
311	Set the ObsID Step to: 24		06:32:30		
312	Record the injected current		06:32:30		
313	After 01:10 set the step to, 65535	00:20	06:32:50		
314	Switch on RF amplifier and adjust injection level to 177 mV rms, and 19.61MHz	00:30	06:33:20		
315	Set the ObsID Step to: 25		06:33:20		
316	Record the injected current		06:33:20		
317	After 01:10 set the step to, 65535	00:20	06:33:40		
318	Switch on RF amplifier and adjust injection level to 177 mV rms, and 20.39MHz	00:30	06:34:10		
319	Set the ObsID Step to: 26		06:34:10		
320	Record the injected current		06:34:10		
321	After 01:10 set the step to, 65535	00:20	06:34:30		
322	Switch on RF amplifier and adjust injection level to 177 mV rms, and 21.20MHz	00:30	06:35:00		
323	Set the ObsID Step to: 27		06:35:00		
324	Record the injected current		06:35:00		
325	After 01:10 set the step to, 65535	00:20	06:35:20		
326	Switch on RF amplifier and adjust injection level to 177 mV rms, and 22.05MHz	00:30	06:35:50		
327	Set the ObsID Step to: 28		06:35:50		
328	Record the injected current		06:35:50		
329	After 01:10 set the step to, 65535	00:20	06:36:10		
330	Switch on RF amplifier and adjust injection level to 177 mV rms, and 22.92MHz	00:30	06:36:40		
331	Set the ObsID Step to: 29		06:36:40		
332	Record the injected current		06:36:40		
333	After 01:10 set the step to, 65535	00:20	06:37:00		
334	Switch on RF amplifier and adjust injection level to 177 mV rms, and 23.84MHz	00:30	06:37:30		
335	Set the ObsID Step to: 30		06:37:30		
336	Record the injected current		06:37:30		
337	After 01:10 set the step to, 65535	00:20	06:37:50		
338	Switch on RF amplifier and adjust injection level to 177 mV rms, and 24.78MHz	00:30	06:38:20		
339	Set the ObsID Step to: 31		06:38:20		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
340	Record the injected current		06:38:20		
341	After 01:10 set the step to, 65535	00:20	06:38:40		
342	Switch on RF amplifier and adjust injection level to 177 mV rms, and 25.77MHz	00:30	06:39:10		
343	Set the ObsID Step to: 32		06:39:10		
344	Record the injected current		06:39:10		
345	After 01:10 set the step to, 65535	00:20	06:39:30		
346	Switch on RF amplifier and adjust injection level to 177 mV rms, and 26.79MHz	00:30	06:40:00		
347	Set the ObsID Step to: 33		06:40:00		
348	Record the injected current		06:40:00		
349	After 01:10 set the step to, 65535	00:20	06:40:20		
350	Switch on RF amplifier and adjust injection level to 177 mV rms, and 27.86MHz	00:30	06:40:50		
351	Set the ObsID Step to: 34		06:40:50		
352	Record the injected current		06:40:50		
353	After 01:10 set the step to, 65535	00:20	06:41:10		
354	Switch on RF amplifier and adjust injection level to 177 mV rms, and 28.97MHz	00:30	06:41:40		
355	Set the ObsID Step to: 35		06:41:40		
356	Record the injected current		06:41:40		
357	After 01:10 set the step to, 65535	00:20	06:42:00		
358	Switch on RF amplifier and adjust injection level to 177 mV rms, and 30.12MHz	00:30	06:42:30		
359	Set the ObsID Step to: 36		06:42:30		
360	Record the injected current		06:42:30		
361	After 01:10 set the step to, 65535	00:20	06:42:50		
362	Switch on RF amplifier and adjust injection level to 177 mV rms, and 31.32MHz	00:30	06:43:20		
363	Set the ObsID Step to: 37		06:43:20		
364	Record the injected current		06:43:20		
365	After 01:10 set the step to, 65535	00:20	06:43:40		
366	Switch on RF amplifier and adjust injection level to 177 mV rms, and 32.56MHz	00:30	06:44:10		
367	Set the ObsID Step to: 38		06:44:10		
368	Record the injected current		06:44:10		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
369	After 01:10 set the step to, 65535	00:20	06:44:30		
370	Switch on RF amplifier and adjust injection level to 177 mV rms, and 33.86MHz	00:30	06:45:00		
371	Set the ObsID Step to: 39		06:45:00		
372	Record the injected current		06:45:00		
373	After 01:10 set the step to, 65535	00:20	06:45:20		
374	Switch on RF amplifier and adjust injection level to 177 mV rms, and 35.20MHz	00:30	06:45:50		
375	Set the ObsID Step to: 40		06:45:50		
376	Record the injected current		06:45:50		
377	After 01:10 set the step to, 65535	00:20	06:46:10		
378	Switch on RF amplifier and adjust injection level to 177 mV rms, and 36.60MHz	00:30	06:46:40		
379	Set the ObsID Step to: 41		06:46:40		
380	Record the injected current		06:46:40		
381	After 01:10 set the step to, 65535	00:20	06:47:00		
382	Switch on RF amplifier and adjust injection level to 177 mV rms, and 38.06MHz	00:30	06:47:30		
383	Set the ObsID Step to: 42		06:47:30		
384	Record the injected current		06:47:30		
385	After 01:10 set the step to, 65535	00:20	06:47:50		
386	Switch on RF amplifier and adjust injection level to 177 mV rms, and 39.57MHz	00:30	06:48:20		
387	Set the ObsID Step to: 43		06:48:20		
388	Record the injected current		06:48:20		
389	After 01:10 set the step to, 65535	00:20	06:48:40		
390	Switch on RF amplifier and adjust injection level to 177 mV rms, and 41.14MHz	00:30	06:49:10		
391	Set the ObsID Step to: 44		06:49:10		
392	Record the injected current		06:49:10		
393	After 01:10 set the step to, 65535	00:20	06:49:30		
394	Switch on RF amplifier and adjust injection level to 177 mV rms, and 42.78MHz	00:30	06:50:00		
395	Set the ObsID Step to: 45		06:50:00		
396	Record the injected current		06:50:00		
397	After 01:10 set the step to, 65535	00:20	06:50:20		

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Procedure Step	Action	Time (mm:ss)	Cumulative (hh:mm:ss)	Injected Current	Comment
398	Switch on RF amplifier and adjust injection level to 177 mV rms, and 44.48MHz	00:30	06:50:50		
399	Set the ObsID Step to: 46		06:50:50		
400	Record the injected current		06:50:50		
401	After 01:10 set the step to, 65535	00:20	06:51:10		
402	Switch on RF amplifier and adjust injection level to 177 mV rms, and 46.25MHz	00:30	06:51:40		
403	Set the ObsID Step to: 47		06:51:40		
404	Record the injected current		06:51:40		
405	After 01:10 set the step to, 65535	00:20	06:52:00		
406	Switch on RF amplifier and adjust injection level to 177 mV rms, and 48.09MHz	00:30	06:52:30		
407	Set the ObsID Step to: 48		06:52:30		
408	Record the injected current		06:52:30		
409	After 01:10 set the step to, 65535	00:20	06:52:50		
410	Switch on RF amplifier and adjust injection level to 177 mV rms, and 50.00MHz	00:30	06:53:20		
411	Set the ObsID Step to: 49		06:53:20		
412	Record the injected current		06:53:20		
413	After 01:10 set the step to, 65535	00:20	06:53:40		
414	Set the RF amplifier to standby		06:53:40		
415	Set the ObsID Step to: 50		06:53:40		
416	After 01:10 exit SPIRE-IST-EMC-SPOT.tcl (CCS operator)	01:10	06:54:50		
417	Switch off RF amplifier	00:30	06:55:20		
418	Shut down DRCU	05:00	07:00:20		
419	Shut down DPU	05:00	07:05:20		
420	Disconnect BCI and Current Clamp Probe	05:00	07:10:20		
421	Disconnect Oscilloscope probe	05:00	07:15:20		
	End of CM Tests				