



SPS availability considerations -2021

V. Kain for the SPS team

SPS 2021 - not a good year for availability



Many faults because of broken systems:

- Vacuum system issues due to corrosion
- Dump kicker MKDV1: weak high voltage behaviour due to broken insulating ceramic spacer
- arcing in transmission lines for 2 RF cavities

Design issues:

- SEU for access system crates

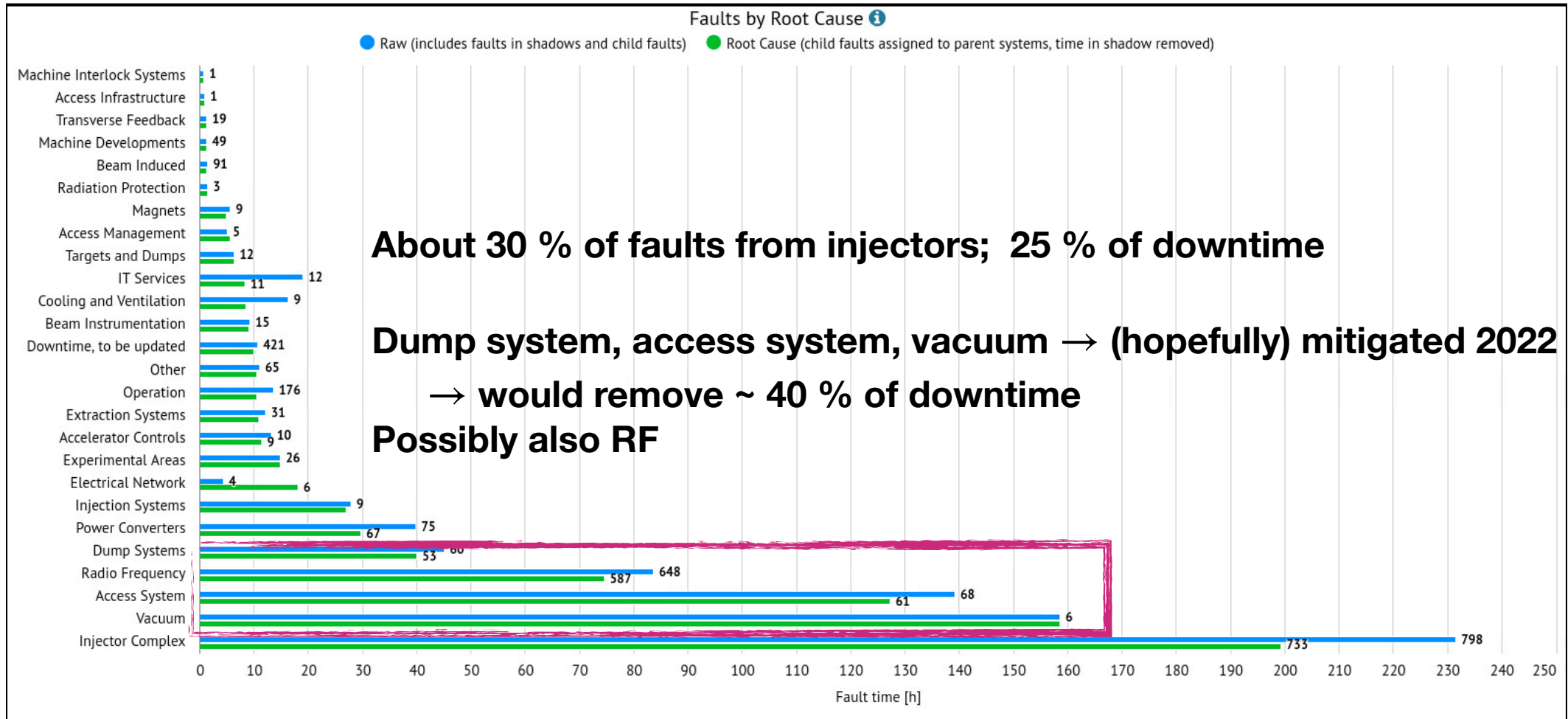
All of these will be addressed during the YETS.

Still many faults due to "operation" or "downtime to be updated": will have to be fine-tuned in 2022. Requires more stable operation...

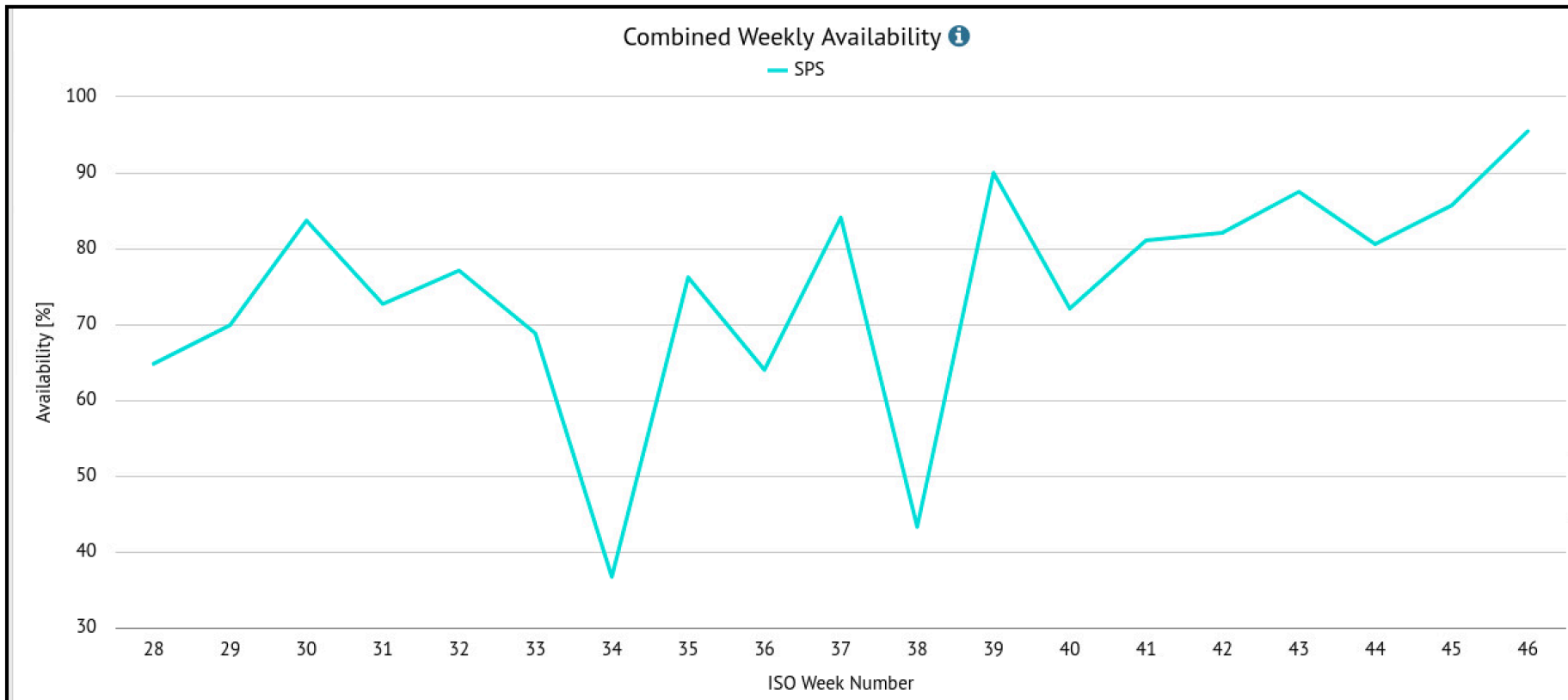
Fault distribution 2021



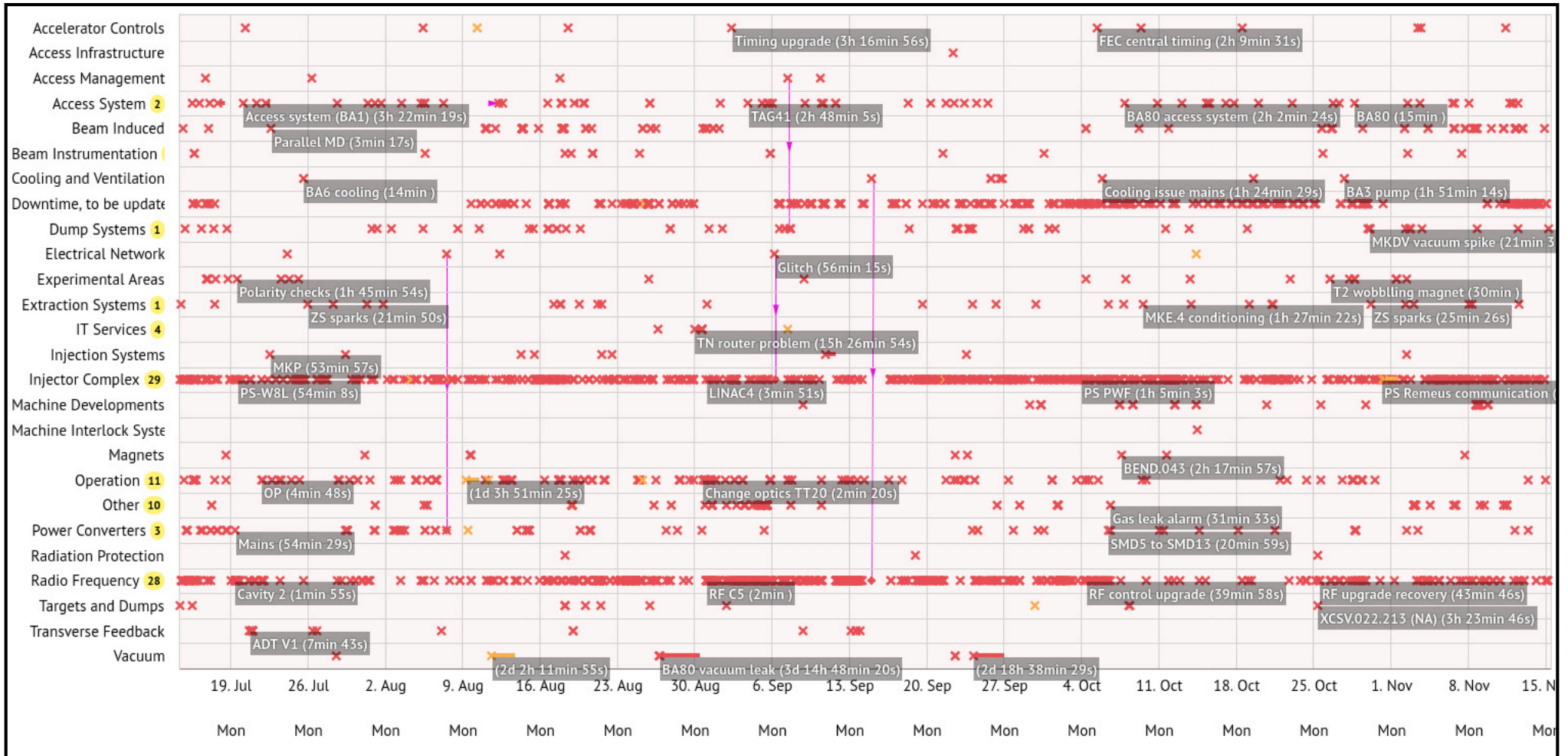
2623 faults, total fault duration 885.3 h Average availability 73.4 %



Weekly Availability



Faults Timeline by System



2022: Upgrades to fault tracking in the SPS



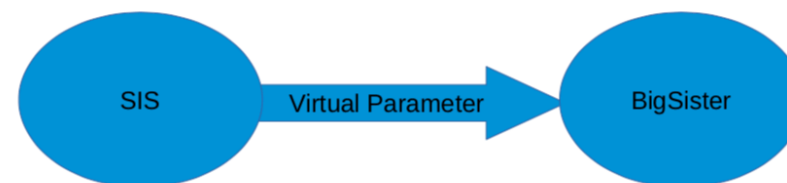
Big Sister will track faults also according to destination.

Prototype out to track not only downtime, but also which system caused it AUTOMATICALLY. Thanks, Eric...

Should cover 60 % of all faults out of the box.

Will commission and fine-tune it during the early commissioning HWC and BC

Eric's Interlocking Super Agent (ISA) based on SIS, virtual parameter publication and subscription by BigSisters



SIS Exporter in SIS

Exporters

- One exporter for each permit
- Permits defined for each destination or beam
- List for AFT fault system defined in SIS

```
258 <!-- ***** SPS ring ***** -->
259
260 <Permit id="SPS_RING_SW_PERMIT" latchable="false" maskable="false">
261   <logicalCondition>
262     <Test raiid="POWER_CONVERTERS_DCT_SEXTUPOLES" />
263     <Test raiid="POWER_CONVERTERS_SPSRING_DEFAULT_OFF" />
264     <Test raiid="POWER_CONVERTERS_SPSRING_COD" />
265     <Test raiid="IM_CONVERTERS_LS55" />
266     <Test raiid="SPS_SCRAPER_LS51" />
267     <Test raiid="H40_CRYSTAL_LS52_LS55" />
268     <Test raiid="BEAM_INSTRUMENTATION" />
269     <Test raiid="DUMPS_SPSRING" />
270     <Test raiid="SBS_SPSRING" />
271     <Test raiid="KICKERS_SPSRING" />
272     <Test raiid="BIS_STATE_SPSRING" />
273     <Test raiid="RF_POWER_STATE" />
274     <Test raiid="RF_LOW_LEVEL_CHECK" />
275     <Test raiid="EXTRACTION_WEST_SAFE" />
276     <Test raiid="EXTRACTION_EAST_SAFE" />
277     <Test raiid="EXTRACTION_BUMPERS_SAFE_FOR_RING" />
278     <Test raiid="EXTRACTION_TSCA_SAFE_FOR_RING" />
279     <Test raiid="EXTRACTION_NORTH_SAFE" />
280     <Test raiid="TIMING_NORTH_AREA" />
281     <Test raiid="CRAB_CAVITY_TABLE" />
282   </LogicalCondition>
283   <Exporters>
284     <!-- Exported permit to BIC BA3 -->
285     <BICExporter target="CIB_BA3_S3" />
286     <!-- Exported to timing -->
287     <!-- Timing exporter target="EC_150_CTM" -->
288     <TimingExporter target="I_S_SIS_RING" />
289     <!-- Exporter beamName="ring@igSisterExporter" />
290     <Exporter beamName="ring@igSisterExporter" />
291   </Exporters>
292   <Alarmer />
293 </Exporters>
294 <updateEvent type="KTDI" value="SPS_USER.{SPTI.*}|LHCI.*|AWAKE.*|HBI.*|KIRADMTI.*" /> <!-- PSL_FCY-RRDBE-CT* delay="750" ZERO user excluded -->
295 </Permit>
296
```

```
public void init() {
  keys.put("POWER_CONVERTER", "Power Converters/Auxiliary PC");
  keys.put("BLM", "Beam Instrumentation/BLM");
  keys.put("BTV", "Beam Instrumentation/BTV");
  if (getParameterName().contains("RING")) {
    keys.put("CAV_", "Radio Frequency/Hardware");
    keys.put("BLP", "Beam Instrumentation/BLM");
    keys.put("SBS", "Dump Systems/RKD soft start");
    keys.put("RKE", "Extraction Systems/Kickers");
    keys.put("RKO", "Dump Systems/Kickers");
    keys.put("RKP", "Injection Systems/Kickers");
  } else if (getParameterName().contains("TT20")) {
    keys.put("RBE", "Power Converters/Auxiliary PC");
    keys.put("ZS", "Extraction Systems/Septa");
    keys.put("NORTH_MS", "Extraction Systems/Septa");
    keys.put("NORTH_TARGET", "Targets and Dumps/Absorbers");
  }
}
```

ISA...



SIS Exporter in SIS

Exporters

- One exporter for each permit

```
258 <!-- ***** SPS ring ***** -->
259
260 <Permit id="SPS_RING_SW_PERMIT" latchable="false" notifiable="false">
261   <logicalCondition>
262     <Test rfid="POWER_CONVERTERS_DCT_SEXTUPOLES" />
263     <Test rfid="POWER_CONVERTERS_SPSRING_DEFAULT_OFF" />
264     <Test rfid="POWER_CONVERTERS_SPSRING_COD" />
265     <Test rfid="PM_CONVERTERS_LS55" />
266     <Test rfid="SPS_SCRAPER_LS51" />
267     <Test rfid="H49_CRYSTAL_LS52_LS55" />
268     <Test rfid="BEAM_INSTRUMENTATION" />
269     <Test rfid="DUMPS_SPSRING" />
270     <Test rfid="SBS_SPSRING" />
271     <Test rfid="KICKERS_SPSRING" />
272     <Test rfid="BIS_STATE_SPSRING" />
273     <Test rfid="BE_SPSRING" />
274   </logicalCondition>
275 </Permit>
```

```
public void init() {
  keys.put("POWER_CONVERTER", "Power Converters/Auxiliary PC");
  keys.put("BLM", "Beam Instrumentation/BLM");
  keys.put("BTM", "Beam Instrumentation/BTM");
  if (getParameterName().contains("RING")) {
    keys.put("CAV_", "Radio Frequency/Hardware");
    keys.put("BLM", "Beam Instrumentation/BLM");
    keys.put("SBS", "Dump Systems/MKO soft start");
    keys.put("MKE", "Extraction Systems/Kickers");
    keys.put("MKD", "Dump Systems/Kickers");
    keys.put("MKP", "Injection Systems/Kickers");
  } else if (getParameterName().contains("TT20")) {
    keys.put("MBE", "Power Converters/Auxiliary PC");
    keys.put("ZS", "Extraction Systems/Septa");
    keys.put("NORTH_MS", "Extraction Systems/Septa");
    keys.put("NORTH_TARGET", "Targets and Dumps/Absorbers");
  }
}
```

Permit ID	SPS SW and BIC status	Category	Sub-category
SPS RING	false	Radio Frequency	Hardware
TT10	false	Beam Instrumentation	BTM
TT20	true		

Information :

[Radio Frequency]Hardware, CAV_SIEMENS_2, CAV_SIEMENS_1, CAV_PHILIPS_2, CAV_PHILIPS_1, CAV_THALES_2, CAV_THALES_1]

CIB.BA1.S1	false	CIB.BA2.S2	false
CIB.BA3.S3	false	CIB.BA4.S4	false
CIB.BA5.S5	false	CIB.BA6.S6	false

ISA...



SIS Exporter in SIS

The screenshot displays the @SPS control interface. The main window shows a log viewer with several entries from December 1st, 2021. The log entries include messages like "Bean back for SFTPRO1, LSA : SFT_PRO_MTE_L4780_2021_V1" and "No bean detected for user : SFTPRO1, LSA : SFT_PRO_MTE_L4780_2021_V1". The log viewer is overlaid on a background dashboard that shows various system components and their status.

On the right side of the interface, there is a "Faults" table with the following columns: StartTime, endTime, and Duration. The table contains several rows of fault data:

	StartTime	endTime	Duration
1	01-12-21 10:33:53	01-12-21 11:07:01	33min 8s
2	01-12-21 11:46:56	01-12-21 11:47:30	34s
3	01-12-21 11:48:07	01-12-21 11:54:39	6min 32s
4	01-12-21 11:48:17	01-12-21 11:48:34	17s
5	01-12-21 11:49:02	01-12-21 11:49:17	15s
6	01-12-21 11:55:04	01-12-21 11:55:31	27s
7	01-12-21 11:57:58	01-12-21 11:58:19	21s
8	01-12-21 12:13:24	01-12-21 12:14:02	38s
9	01-12-21 12:14:47	01-12-21 12:14:59	12s

Below the faults table, there is an "Activities" section showing two active tasks: "SFT_PRO_MTE_L4780_2021_V1" and "MO_26_L60_Q20_2021_V1", both with a status of "RUN".

At the bottom right, there is a "Todo List" section with the text "Type your task" and a note "No user excluded ->".

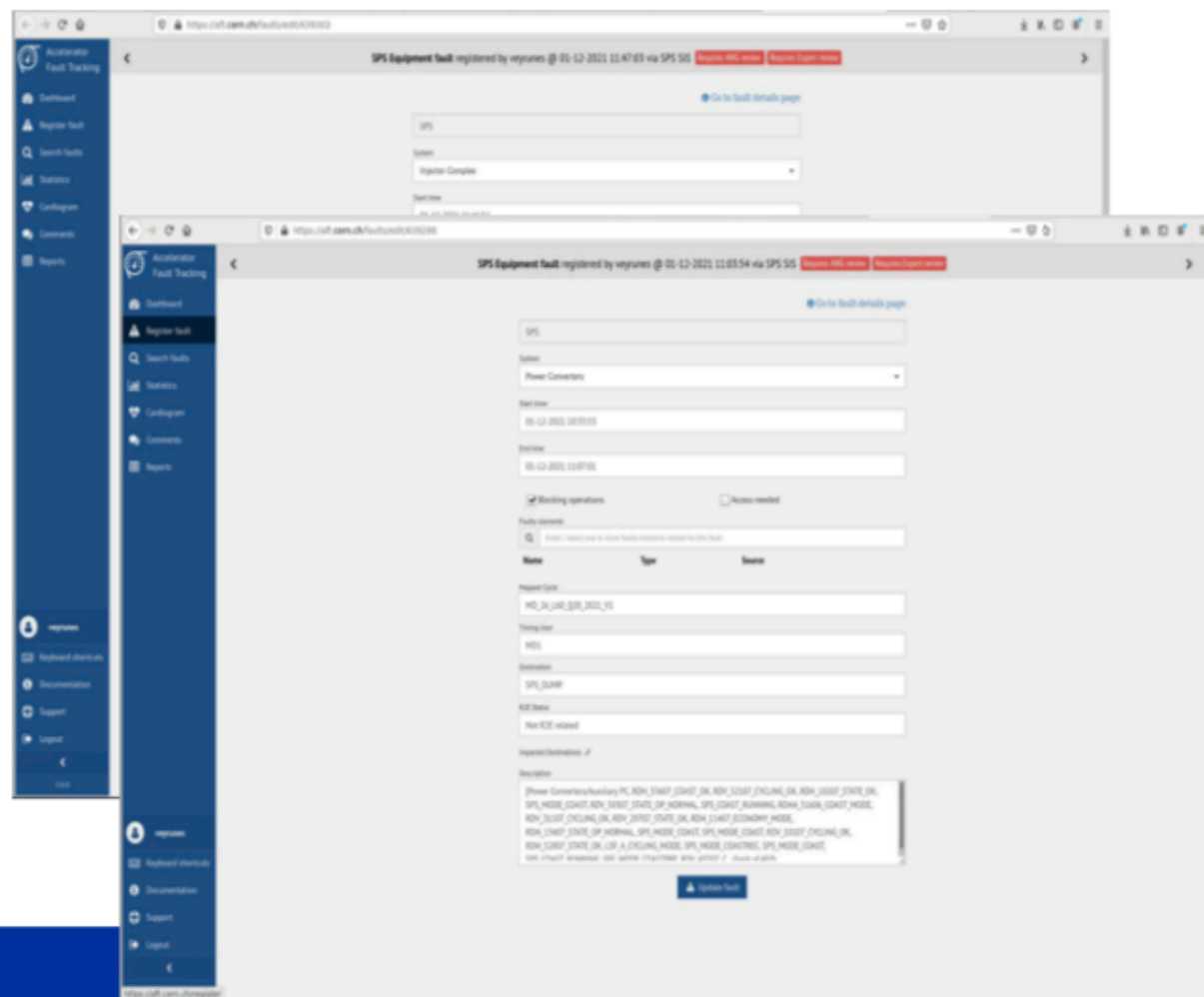
The SPS STATUS dashboard shows the following components and their status:

Component	Status
SPS RING	Red
TT10	Red
TT20	Green
[Radio Frequency]	Red
CIB.BA1.S1	Red
CIB.BA3.S3	Red
CIB.BA5.S5	Red
CIB.BA6.S6	Red

```
ters/Auxiliary PC");
e");
e");
{
  "dware";
  "yBLM";
  "oft start";
  "ickers";
  "e");
  "ckers";
  "T20"); {
  "iliary PC";
  "pta";
  "ems/Septa";
  "Dumps/Absorbers");
}
```

BigSister, logbook and AFT

- In case SIS OK
no beam from injectors
- No SIS Exporter received
“Downtime, to be updated”
- SIS Exporter “is in the list”
- SIS Exporter “is not in the list”
“Downtime, to be updated”



The screenshot displays the Accelerator Fault Tracking (AFT) web interface. It shows two overlapping windows of the 'SPS Equipment fault' registration form. The top window shows the initial form with fields for SPS, Injector Complex, Start time, and End time. The bottom window shows a more detailed form with fields for SPS, Power Converters, Start time, End time, Working operations, and a detailed description of the fault. The interface includes a sidebar with navigation options like Dashboard, Register fault, Search faults, Statistics, Configuration, Comments, Reports, Helpdesk, and Documentation.