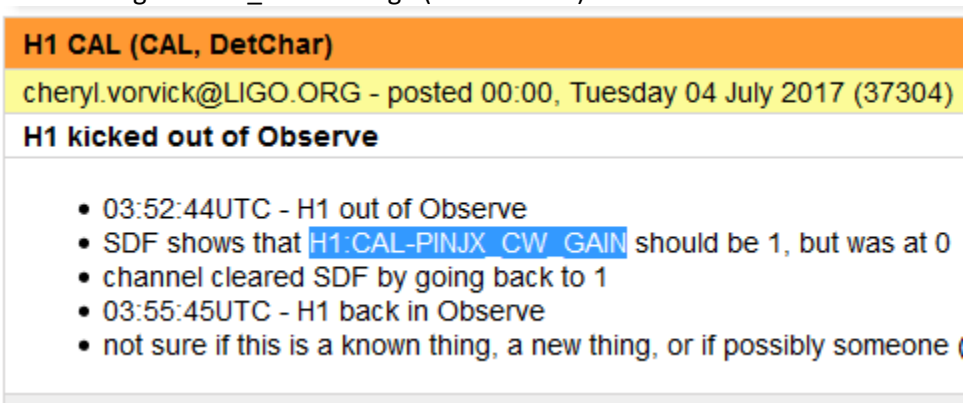
- Ask around about ghost CW_GAIN change (aLOG 37304)



H1 CAL (CAL, DetChar)

cheryl.vorvick@LIGO.ORG - posted 00:00, Tuesday 04 July 2017 (37304)

H1 kicked out of Observe

- 03:52:44UTC - H1 out of Observe
- SDF shows that H1:CAL-PINJX_CW_GAIN should be 1, but was at 0
- channel cleared SDF by going back to 1
- 03:55:45UTC - H1 back in Observe
- not sure if this is a known thing, a new thing, or if possibly someone (

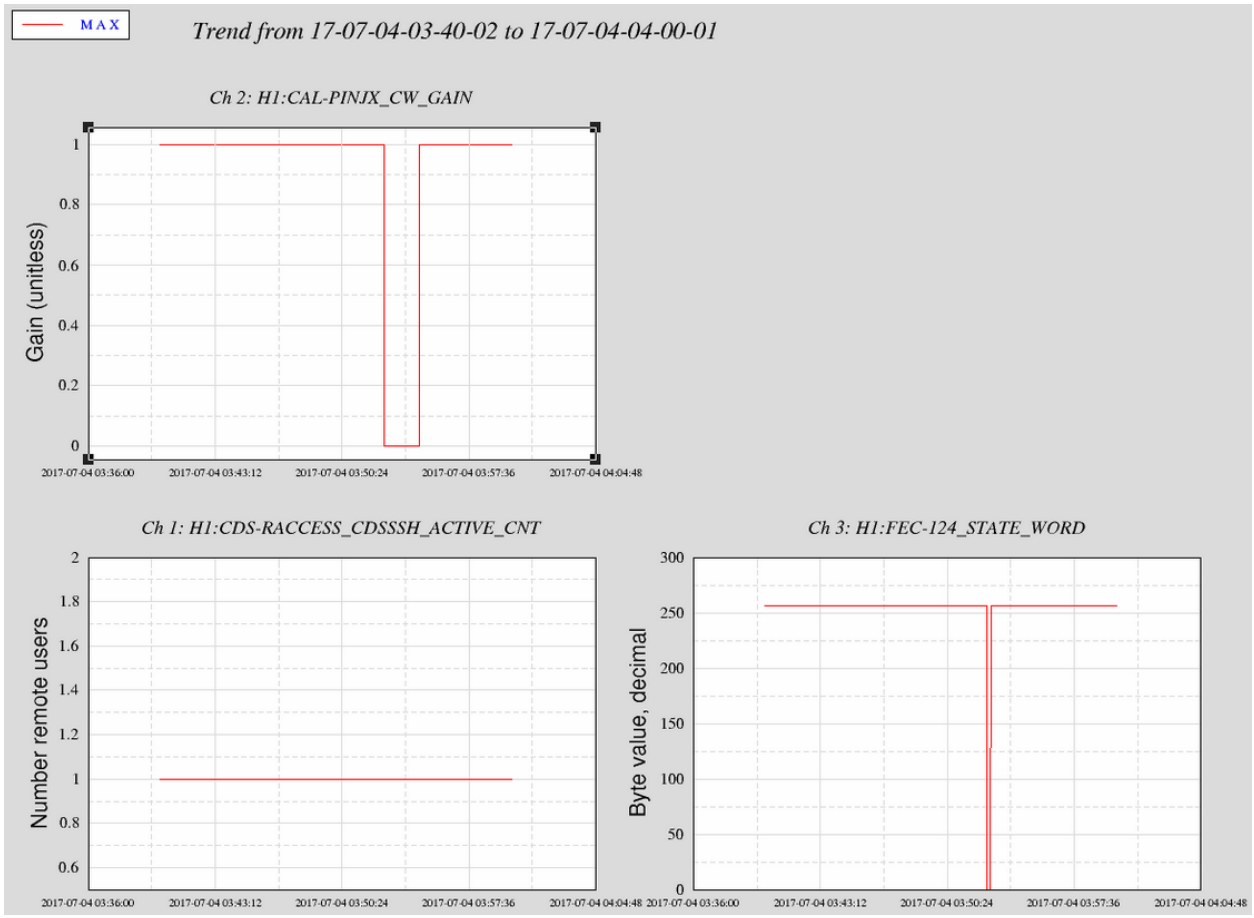
  - SDF = setpoint definition file system, linked to Guardian. It is the monitoring system for large proportion of control settings which typically remain unchanged once control loops are tuned.
  - Apparently the SDF system keeps logs in:

    For RCG V2.9 and later, a new directory needs to be created for the writing of EPICS and SDF log files. This directory in of the form: /opt/rtcds/<site>/<ifo>/log/<modelname>. Two log files will be written here:

    - iocIFO.log: This is the standard EPICS log file, which was previously written to the target/<modelname>/<modelname>epics directory. This file is created every time the FE code is started.
    - ioc.log: This is a new file used to write SDF code information. Unlike the iocIFO.log file, this is a persistent log, appended by the FE SDF code continuously. This file contains information about code restarts, SDF file reads/saves, etc.
  - Since CW_GAIN is part of H1CALEX model, pulled up IOC logs from that. There are entries prior to Jul 4 but no note of what changed; don't even know if entries in ioc.log mean anything:

```
Sat Jul  1 13:58:09 2017

************************************************
Sun Jul  2 20:01:53 2017

************************************************
Sun Jul  2 21:08:36 2017

************************************************
Tue Jul  4 15:14:45 2017

************************************************
Tue Jul  4 15:26:17 2017
```

  - Neither BURT .snap files nor IOC logs show changes since March
  - Looked a little deeper into SDF logs with Dave Barker; first, we confirmed that the event occurred since the logs show nothing:



Clearly, the gain is tripped and is then reset about 2 minutes later. The CDS-RACCESS channel denotes the number of remote users; since this occurred on a holiday and there was only one operator on site, we confirmed that a human didn't make the change. The "FEC state word" on right indicates the status of hardware injections to this system; these injections dropped out right when the gain dropped. While the injections recovered on the order of seconds, the gain didn't respond for over two minutes.

This is due to the code changes as enumerated in aLOG 23711. The script used to restart the continuous wave injections is given a two minute delay to ensure that the injections have begun:

```
#!/bin/bash
#
# System-V init script for pulsar injection
#
if [ -f /ligo/cdscfg/stdenv.sh ]; then
        . /ligo/cdscfg/stdenv.sh
fi

START_SCRIPT=/usr/local/home/hinj/Details/bin/x_start_psinject
STOP_SCRIPT=/usr/local/home/hinj/Details/bin/x_stop_psinject
PID_FILE=/usr/local/home/hinj/run/psinject.pid
CAPUT=/ligo/apps/sl6/epics/base/bin/linux-x86_64/caput
#
if [ $1 = "start" ]; then
    if [ -x $START_SCRIPT ]; then
        echo "Starting psinject"
        $CAPUT H1:CAL-PINJX_CW_TRAMP 0.0
        /bin/sleep 1
        $CAPUT H1:CAL-PINJX_CW_GAIN 0.0
        /bin/sleep 1
        $CAPUT H1:CAL-PINJX_CW_TRAMP 10.0
        su -c "$START_SCRIPT monit start >/dev/null" hinj &
        /bin/sleep 120
        $CAPUT H1:CAL-PINJX_CW_GAIN 1.0
```

Then the restart monitoring occurs every 3 minutes:

```
check process psinject with pidfile /usr/local/home/hinj/run/psinject.pid
        start program = "/etc/init.d/psinject start" with timeout 180 seconds
        stop program = "/etc/init.d/psinject stop" with timeout 120 seconds
        if 3 restarts within 5 cycles then timeout
        alert cdsadmin@ligo-wa.caltech.edu
```

At all times, the Guardian code is ensuring that, if certain channels are changed, the IFO is taken out of science mode (DIAG_EXC.py):

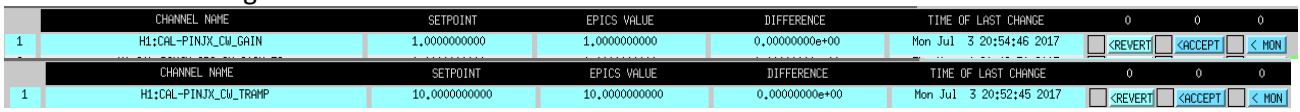
```
# add calex to exclude list, hardware injections can now run on PCAL-EX channels
# D.Barker LHO 13oct2015
import os
import re

import cdslib
from SYS_DIAG import *

################################################

FEMODELS = list(cdslib.get_active_models())

EXCLUDE_LIST = [
    'calex',
    ]

@SYSDIAG.register_test
def EXC():
    """active excitations"""
    for cm in FEMODELS:
        if cm.name in EXCLUDE_LIST:
            return
        if cm.excitation_active:
            yield '{sys} excitation!'.format(sys=cm.name)

################################################

if __name__ == '__main__':

    from ezca import Ezca
    Ezca().export()

    for m in EXC():
        print m
```

This hardware injection restart would not have been an issue since the CW_GAIN and CW_TRAMP values were not supposed to be monitored but, somewhere along the way, they were. Therefore, the injection restart caused Gaurdian to kick the IFO out of observing because Gain and Tramp changed values.

- We fixed this issue by returning these channels to unmonitored status in h1calex_safe.snap:

```
paul.marsh@zotws9: svn st
M       h1calex_safe.snap
paul.marsh@zotws9: svn di
Index: h1calex_safe.snap
===================================================================
--- h1calex_safe.snap   (revision 15364)
+++ h1calex_safe.snap   (working copy)
@@ -233,12 +233,12 @@
 H1:CAL-PCALX_WS_PD_SW1S 1 2.000000000000000e+01 0xffffffff
 H1:CAL-PCALX_WS_PD_SW2S 1 1.536000000000000e+03 0xffffffff
 H1:CAL-PCALX_WS_PD_TRAMP 1 0.000000000000000e+00 1
-H1:CAL-PINJX_CW_GAIN 1 1.000000000000000e+00 1
+H1:CAL-PINJX_CW_GAIN 1 1.000000000000000e+00 0
 H1:CAL-PINJX_CW_LIMIT 1 0.000000000000000e+00 1
 H1:CAL-PINJX_CW_OFFSET 1 0.000000000000000e+00 1
 H1:CAL-PINJX_CW_SW1S 1 4.000000000000000e+00 0x1bfff
 H1:CAL-PINJX_CW_SW2S 1 1.536000000000000e+03 0x1bfff
-H1:CAL-PINJX_CW_TRAMP 1 1.000000000000000e+01 1
+H1:CAL-PINJX_CW_TRAMP 1 1.000000000000000e+01 0
 H1:CAL-PINJX_EXTTRIG_ALERT_QUERY_TIME 1 0.000000000000000e+00 0
 H1:CAL-PINJX_EXTTRIG_ALERT_TIME 1 0.000000000000000e+00 0
 H1:CAL-PINJX_HARDWARE_GAIN 1 1.000000000000000e+00 1
```

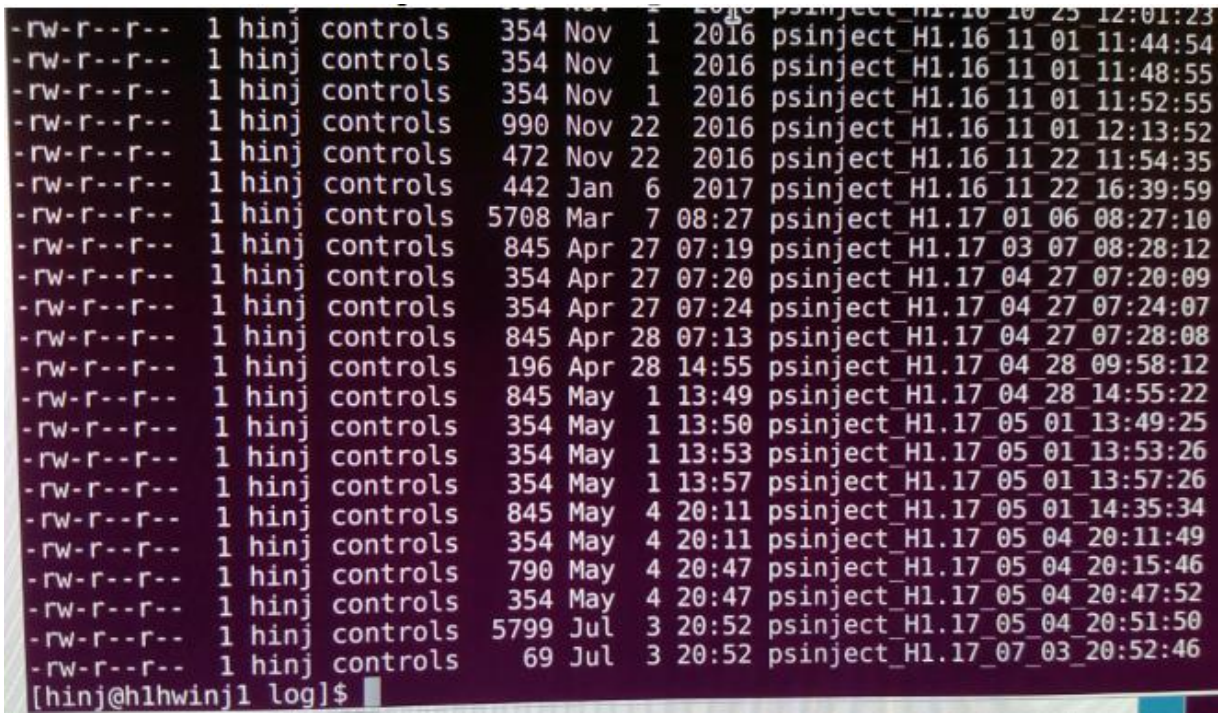
And then committing their values in the SDF tables:



	CHANNEL NAME	SETPOINT	EPICS VALUE	DIFFERENCE	TIME OF LAST CHANGE	0	0	0
1	H1:CAL-PINJX_CW_GAIN	1.0000000000	1.0000000000	0.00000000e+00	Mon Jul 3 20:54:46 2017		<REVERT	<ACCEPT	< MON

	CHANNEL NAME	SETPOINT	EPICS VALUE	DIFFERENCE	TIME OF LAST CHANGE	0	0	0
1	H1:CAL-PINJX_CW_TRAMP	10.0000000000	10.0000000000	0.00000000e+00	Mon Jul 3 20:52:45 2017		<REVERT	<ACCEPT	< MON

- As a note, 6 restarts of psinject have occurred in O2:



There may be further investigation necessary to determine causes of each and look for repeated causes.