NCRA internal report

Monitoring and studying GMRT antenna control parameters: III Temperature Monitoring

S. N. Katore* & N. G. Kantharia
NCRA-TIFR
*snk@gmrt.ncra.tifr.res.in

4 August 2014

Abstract

Several web-based control data monitoring tools are being developed for enabling (1) statistical study of antenna control parameters (2) study of individual antenna peculiarities over time and waveband (3) plotting tools to provide a quick way to detect a problem and thus enable its solution. In this note, we study the effect of the change in the temperature of the shell at the antenna base to the change in the self power recorded by the correlator . The temperature is being recorded since 2011. We keep the ALC off and study data collected at 325 MHz, 610 MHz and 1420 MHz. While qualitatively, the effect has been suggested before, here we show the quantitative comparison of the same. An anti-correlation between the shell temperature and the self power in noticed in 17 antennas at 325 MHz, 11 antennas at 610 MHz and 13 antennas at 1420 MHz out of the working antennas on the days when the data were taken. Thus many antennas at all the wavebands show this variation indicating that the change in the self power is likely to be caused by gain variation in the IF or RF amplifier in the antenna base shell. A quick look at the data acquired using the upgraded system in a few antennas shows that a similar change in the self power with temperature is recorded by the GWB which suggests that the gain variation might be in the RF amplifier.

Antenna base electronics: Each antenna base has a shell. Inside the shell there are various electronics system like antenna base computer, servo computer, servo electronics, antenna base receiver, fps electronics, local oscillator system and optical fiber communication system.

Air conditioning: For the proper functioning of antenna base electronics two air conditioning units are provided at the antenna shell. These units switch automatically every ~ 30 minutes but the switching time may vary depending on the surrounding temperature. AC units maintain the shell temperature in the range of 20 to 25 deg Celsius at all times.

Temperature sensor and antenna safety control: There is a safety control system installed at the antenna shell by the Observatory to protect the antenna base electronics form overheating or burning due to an increase in the temperature due to any AC failures or any other fault. The temperature is measured by this system which is then monitored. This system detects the high shell temperature and shuts down the shell power supply and protects the electronics from any damage.

Temperature monitoring: Temperature readings from each antenna base are sent to the control room through control and monitor system. The data is continuously recorded on the disk. Real time display window from ONLINE (ondisp) is available in the control room to monitor the temperature readings. Alarm is provided in the control room to detect high temperature at antenna base. Over and above this, web based tools are being made available to monitor the temperature readings remotely. One can monitor the current temperature status or can plot the old readings to see the history of readings (http://gmrt.ncra.tifr.res.in/~astrosupp/) and use it in their study. This report which is third in the series outlines the tools that have been developed for monitoring the variation and comparing with the correlator data.

Temperature Monitor as a Health indicator: Faulty hardware may generate heat and can damage the other systems too. So temperature monitoring gives some idea of proper functioning of the systems.

Effect of temperature variation on total(self) power: When we compare the antenna shell temperature with antenna self power in ALC OFF mode, it is seen that the self power increases by some noticeable amount when the temperature is low and the self power decreases when the temperature is high. We have studied the behavior at 325, 610 and

1420 MHz bands. Below we give brief summary of our results at the three bands which are summarized in Table 1 and Figures.

325 MHz (Plot # 1 – 30)

On 3 November 2013, data at 325 MHz were recorded from 0h to 8h IST (see Plots 1 to 30). ALCs were turned off and the self powers at 130 MHz and 175 MHz were recorded along with the variation in the temperature of the antenna shell. A few notable features in the plots are: (1) in most cases, the antenna shell temperature varies by 1 to 2 degrees Celsius. (2) the 130 and 175 MHz self powers show in-phase variation but differ in absolute values by 15%-40%. In some cases, the self (in some cases the two channels) also show distinct behaviors and it is likely not related to the temperature change e.g. C13 (130), C12 (175), C09 (130), C05 (175 MHz), C03, C02 (130 MHz), E03 (130 MHz), W03 (130 MHz) at 325 MHz. The variation in self power is different for different antennas. Antennas C01, C02, C04, C06, C09, C12, C13, E03, E04, E05, S01, S06, W01, W03, W04 and W06 (16 nos) show variation in total power with temperature variation.

Antennas C03, C05, E02 and E06 (4 nos) show variation in self power but we do not have proper temperature readings as seen in the plots and hence we cannot comment on these.

Antenna C08 has no proper temperature readings and the self power is not within the suitable range.

Antenna C00, C10, C11, C14, S02, S03, S04,W02 and W05 (9 nos) either show less variation or no variation in total power.

610 MHz (Plot # 31 – 60)

The data of 15 July 2014 from 4.5h to about 9.5h IST which was part of an observation taken with the ALC off was used to study the behavior of the self power with the temperature variation in the antenna shell. As shown in the plots, antennas C01, C02, C04, C06, C10, C13, E04, E06, S02, S06, and W04 show the variation in total power which anti-correlates with the temperature change. The variation in the self power is not so noticeable in the rest of the antennas.

1420 MHz (Plot # 61 – 90)

The data of 27 July 2014 around 0h to 5h observed with ALC off at 1420 MHz was used to study the behavior of the self power with the shell temperature. Antennas C01, C02, C06, C10, C13, E04, E06, S02, S06, W01, W04, W05 and W06 show the variation in total power which anti-correlates with the temperature change . The variation in the self power is not so noticeable in the rest of the antennas.

Upgraded Wide Band Correlator (Plot # 91 - 94)

The data taken on 15 July 2014 at 610 MHz. and on 27 July 2014 at 1420 MHz. This data was recorded at GMRT Wide Band correlator (GWB) system.

Offline plotting tools: This exercise used the web-based monitoring tools that have now been enabled on the GMRT web page (http://www.gmrt.ncra.tifr.res.in/~astrosupp). Moreover offline plotting tools were also developed for presenting the results in this report and these are available to the interested user at gsbm4 machine (~gsbuser/LTA) . You can also write to snk@gmrt.ncra.tifr.res.in for further details or help.

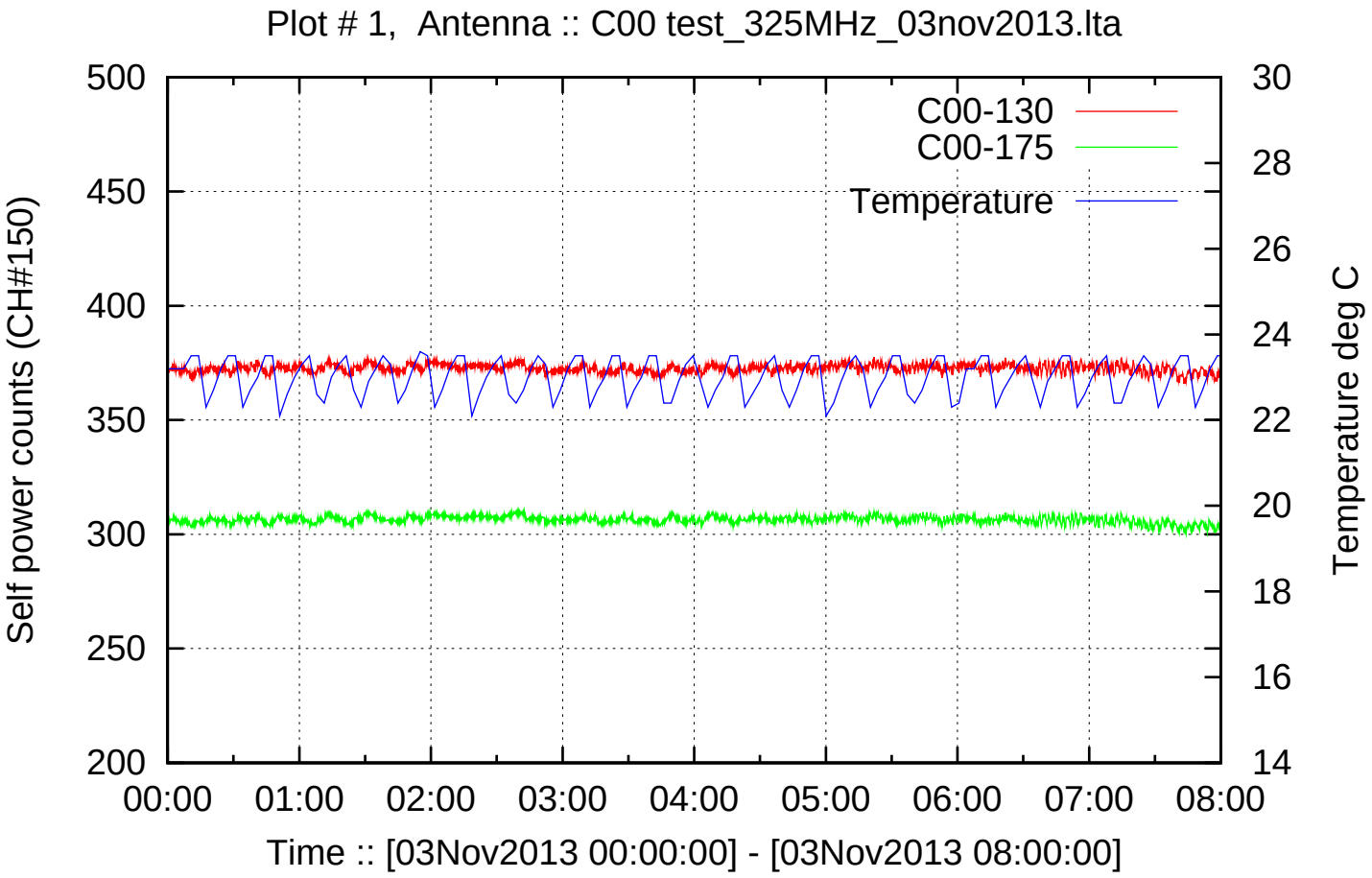
Conclusion: Temperature monitoring is good to maintain the system health. The observed anti-correlation between the antenna shell temperature and the self power recorded by the correlator indicates that the gain of the IF or RF system is sensitive and changes with respect to the shell temperature. The variation in the self power is recorded at all the three wavebands that were monitored namely 325, 610 and 1420 MHz. The antennas which are fitted with the upgraded wide band system also show similar behavior in the self power. This tends to indicate that the gain variation might be in the RF amplifier at the antenna base.

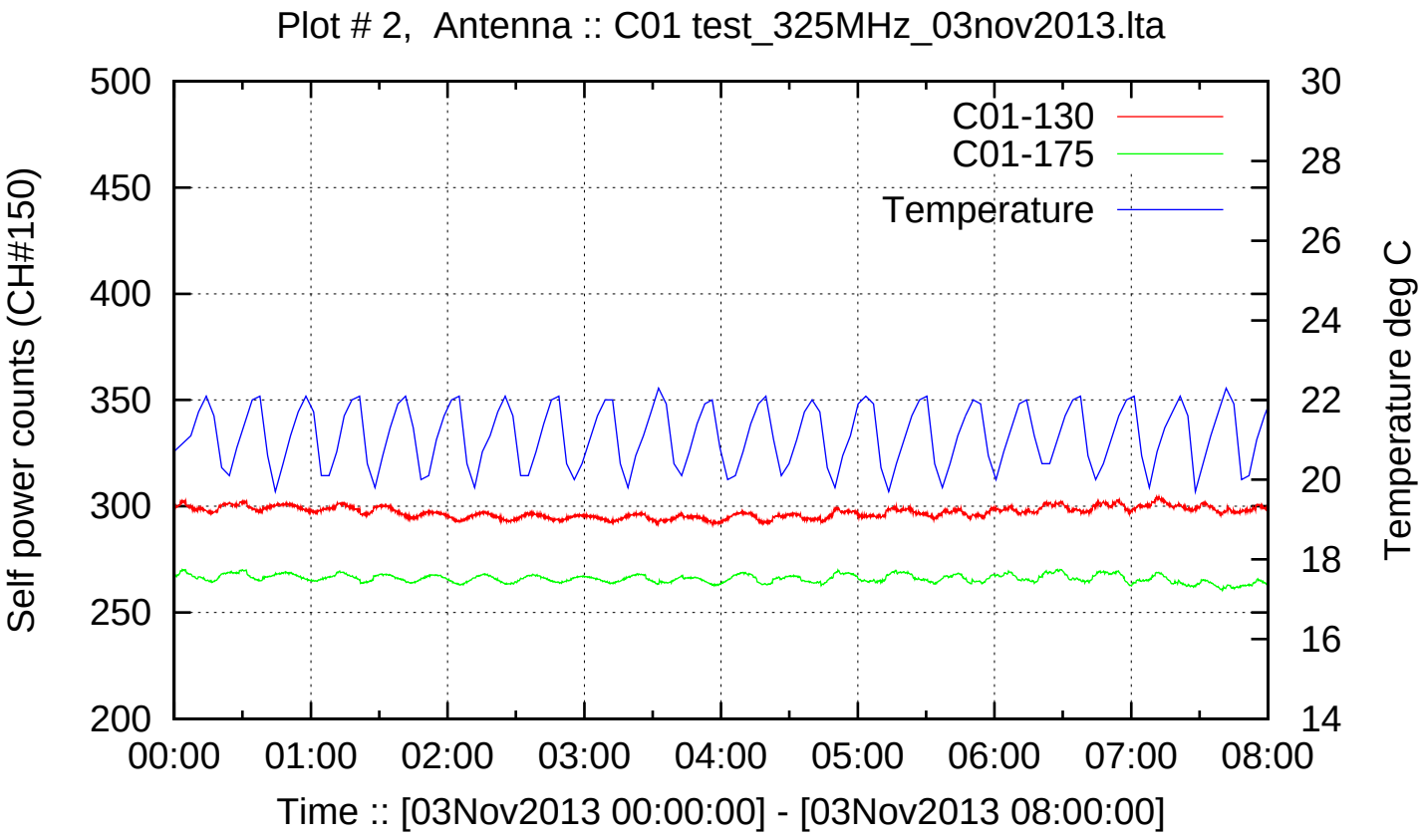
Acknowledgements:

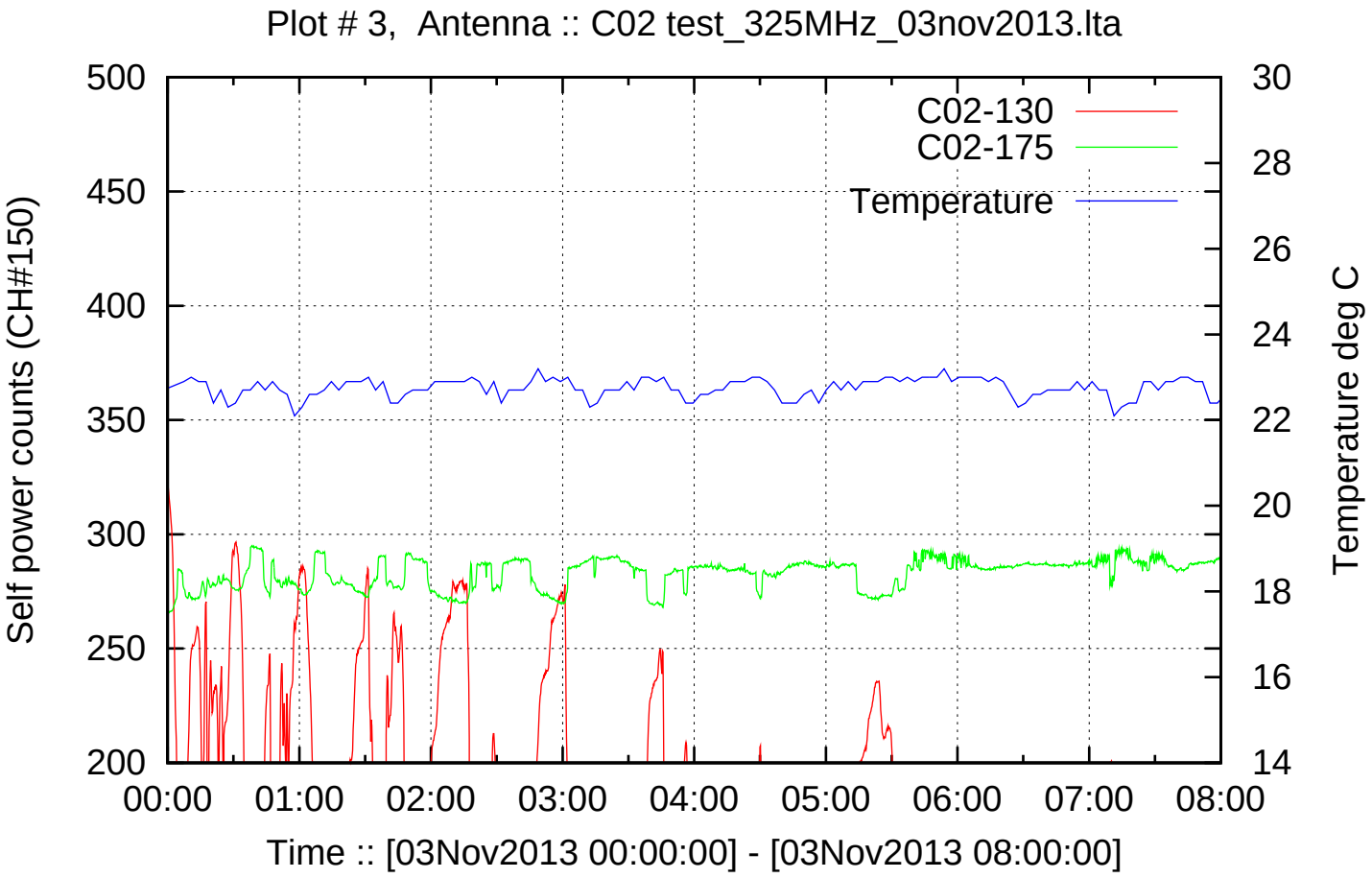
We thank to Prof. Govind Swarup, Prof. Yashwant Gupta, Praveen Kumar and Ajith Kumar for discussions.

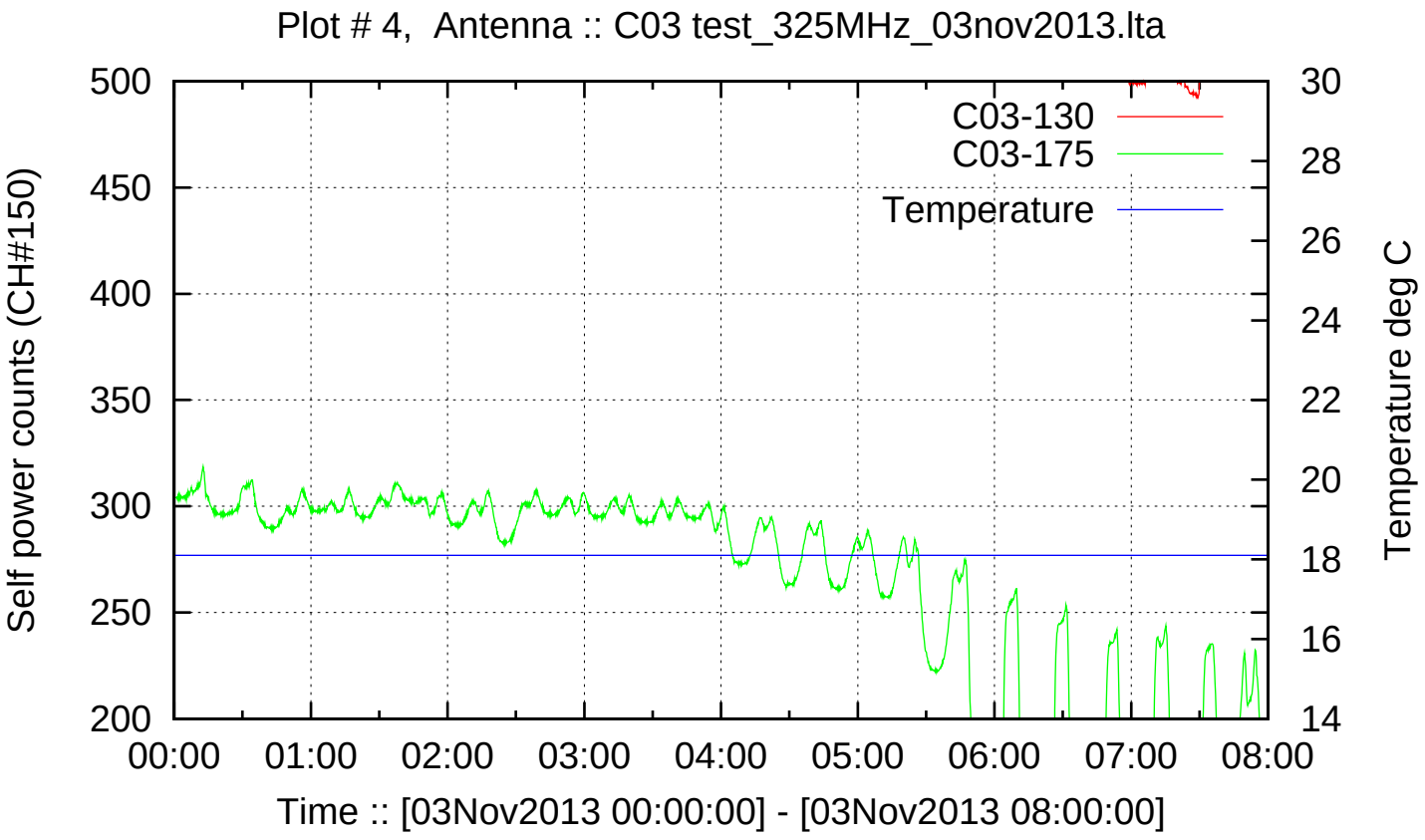
Table 1 : *temperature and self power change*

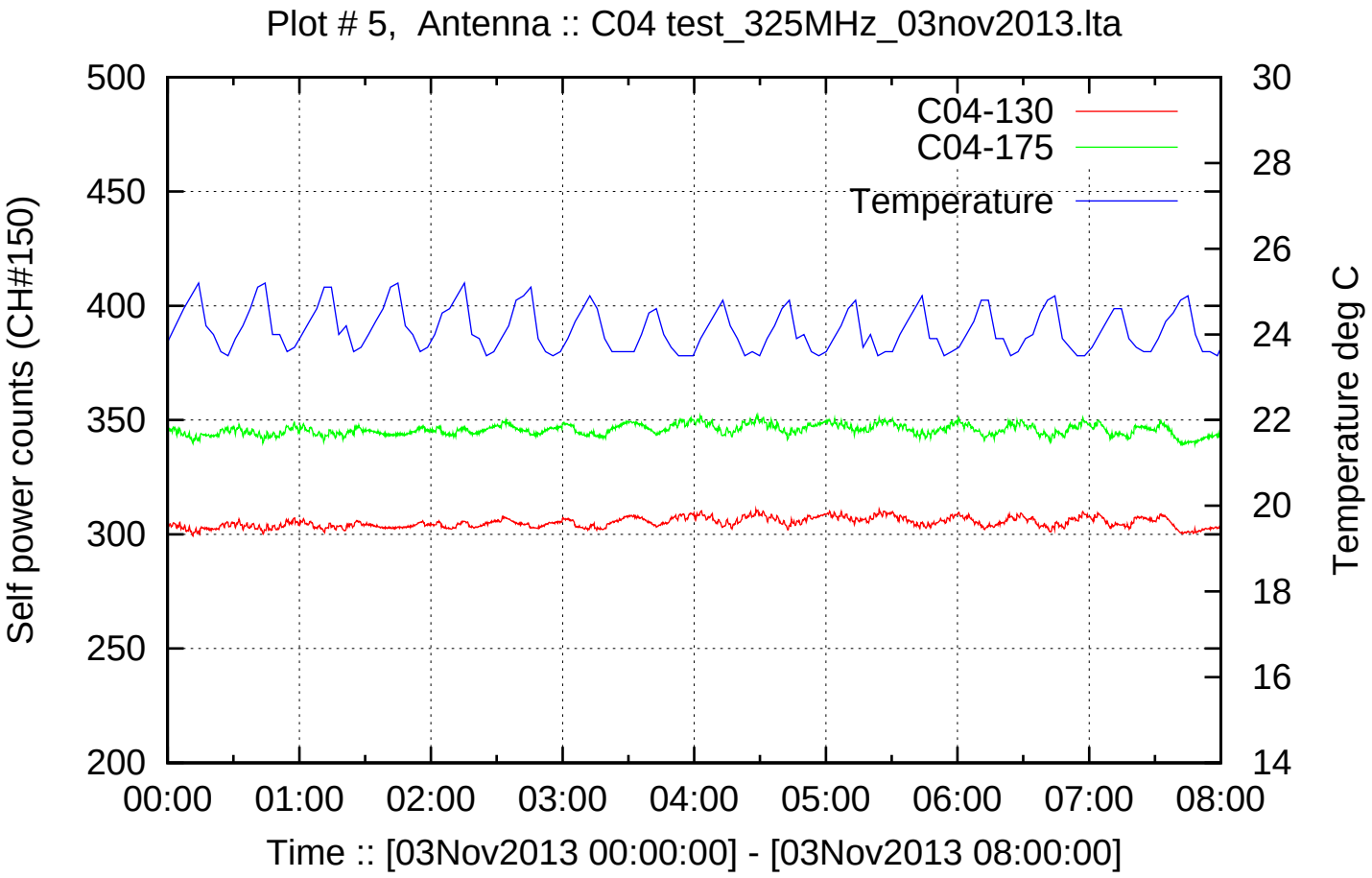
Antenna	325 MHz.		610 MHz.		1420 MHz.	
	self	temp	self	temp	self	temp
C00	no	yes	no	yes	no	yes
C01	yes	yes	yes	yes	yes	yes
C02	yes	yes	yes	yes	yes	yes
C03	yes	no record	yes	no record	yes	no record
C04	yes	yes	yes	yes	no	yes
C05	yes	no record	yes	no record	no	no record
C06	yes	yes	yes	yes	yes	yes
C08	no record	no record	small	yes	no	yes
C09	yes	yes	no	yes	no record	yes
C10	no	no	yes	yes	yes	yes
C11	no	yes	no	yes	small	yes
C12	yes	yes	no	yes	yes	yes
C13	yes	yes	yes	yes	small	yes
C14	no	no	no	no	small	small
E02	yes	no record	small	no record	yes	no record
E03	yes	yes	no	yes	no	yes
E04	yes	yes	yes	yes	yes	yes
E05	yes	yes	no record	no record	no	no record
E06	yes	no record	yes	yes	yes	yes
S01	yes	yes	no	yes	small	yes
S02	no	yes	yes	yes	yes	yes
S03	small	yes	small	small	no	no record
S04	no	no	no	no	no	small
S06	yes	yes	yes	yes	yes	yes
W01	yes	yes	no record	no record	yes	yes
W02	no	yes	no	yes	no	yes
W03	yes	yes	small	yes	small	yes
W04	yes	yes	yes	yes	small	yes
W05	yes	yes	small	yes	yes	yes
W06	yes	yes	yes	no record	yes	yes

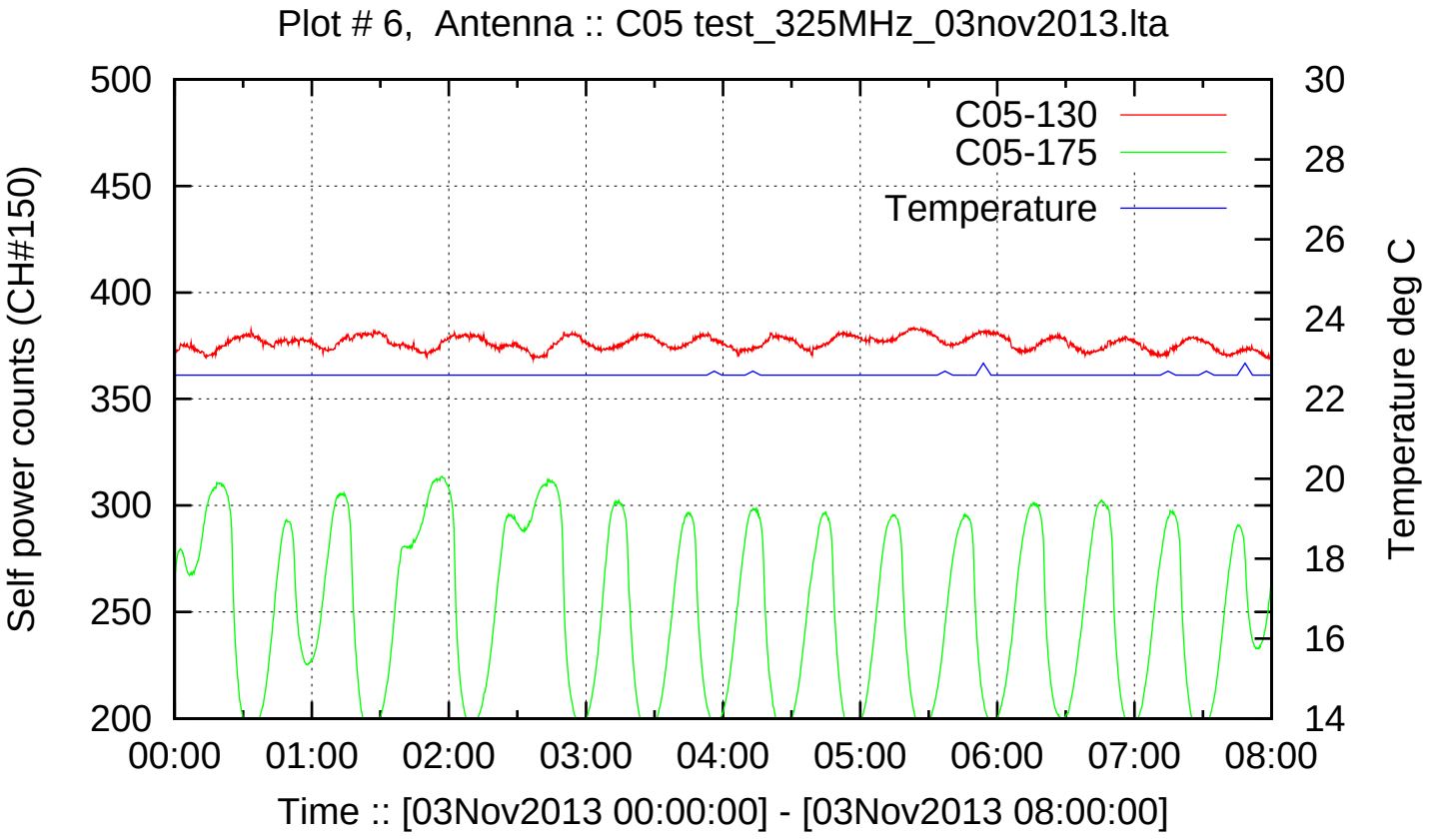

Plot # 1, Antenna :: C00 test_325MHz_03nov2013.lta
C00-130
C00-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

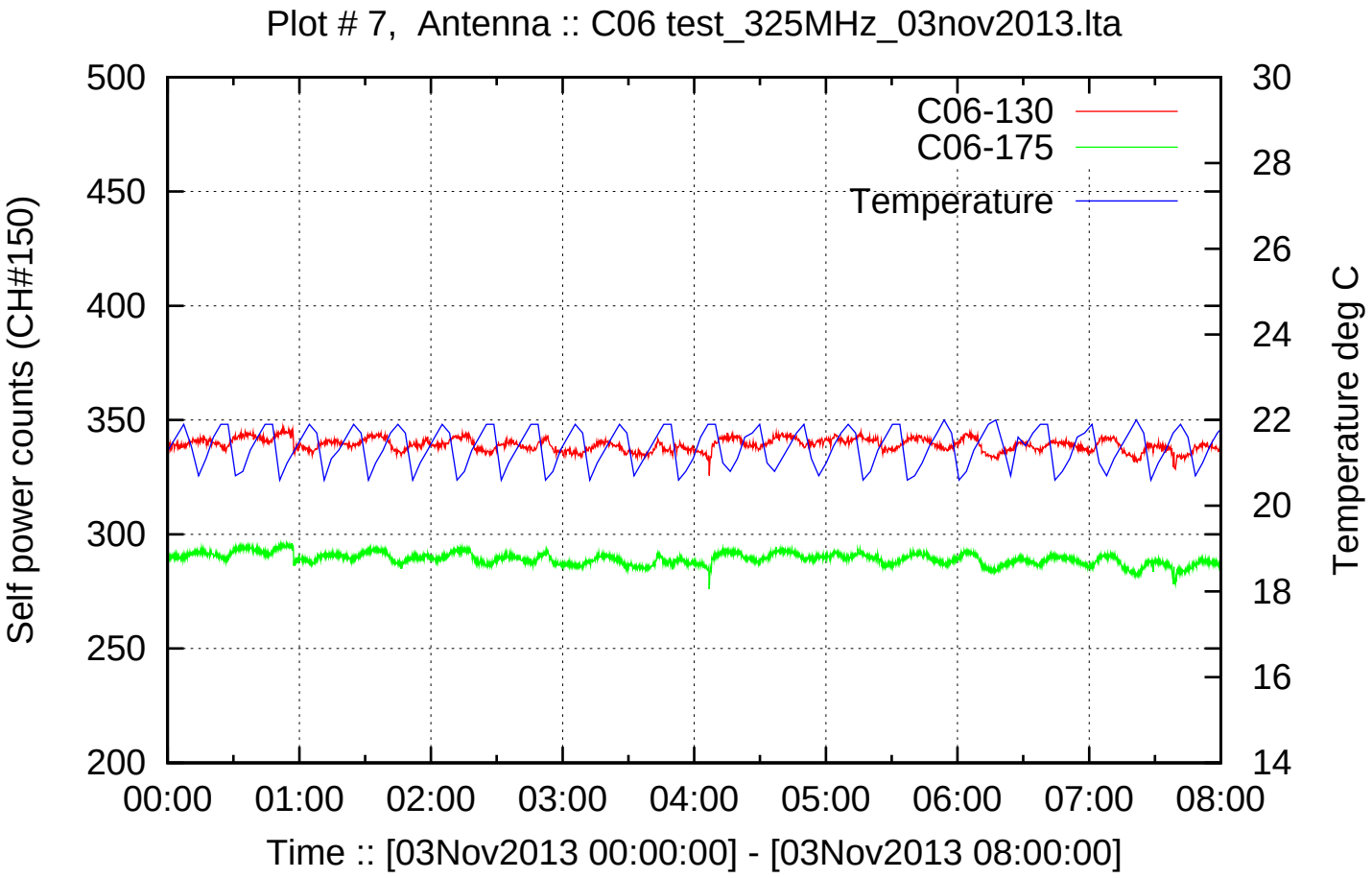

Plot # 2, Antenna :: C01 test_325MHz_03nov2013.lta
C01-130
C01-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

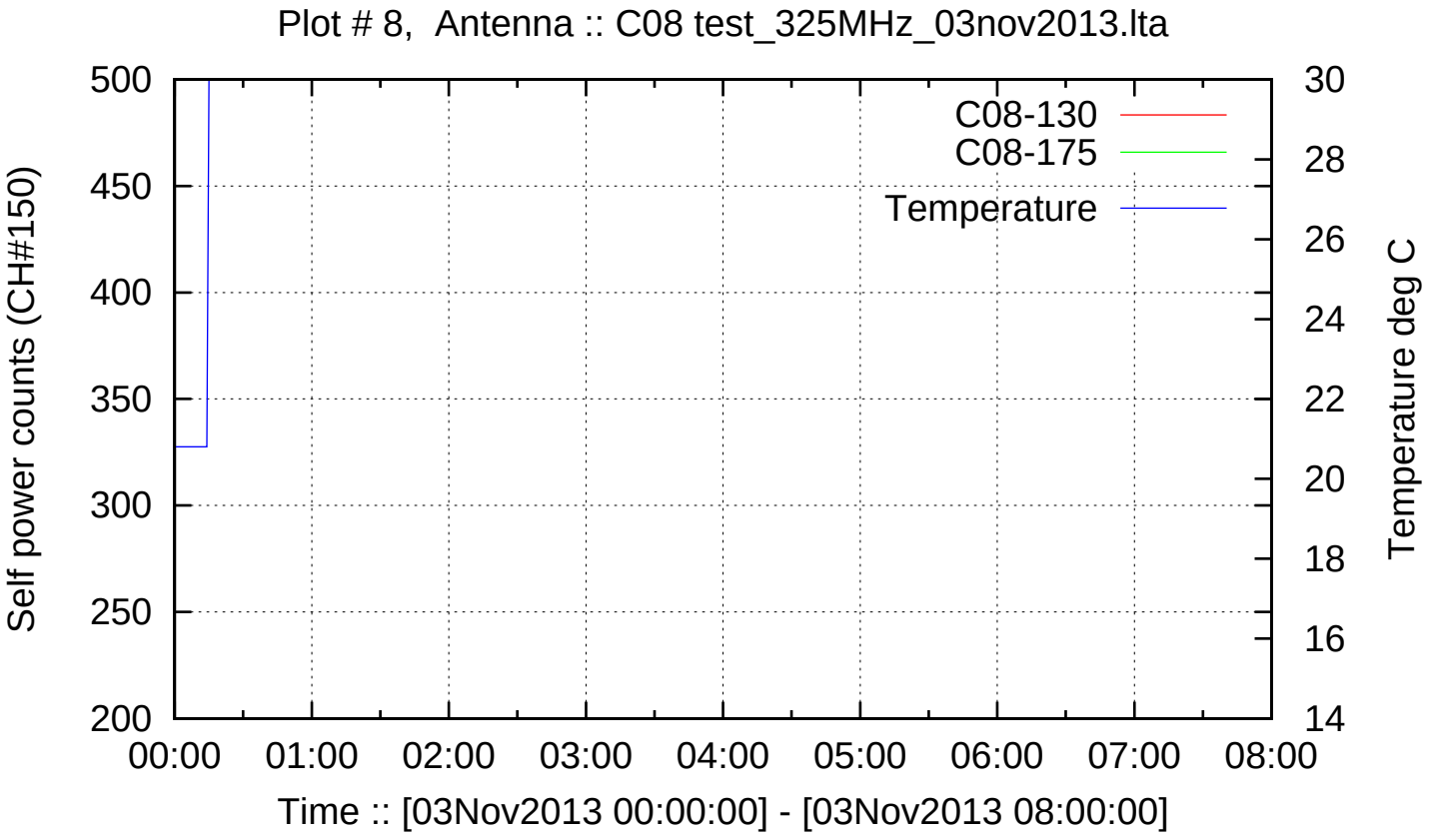

Plot # 3, Antenna :: C02 test_325MHz_03nov2013.lta
C02-130
C02-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

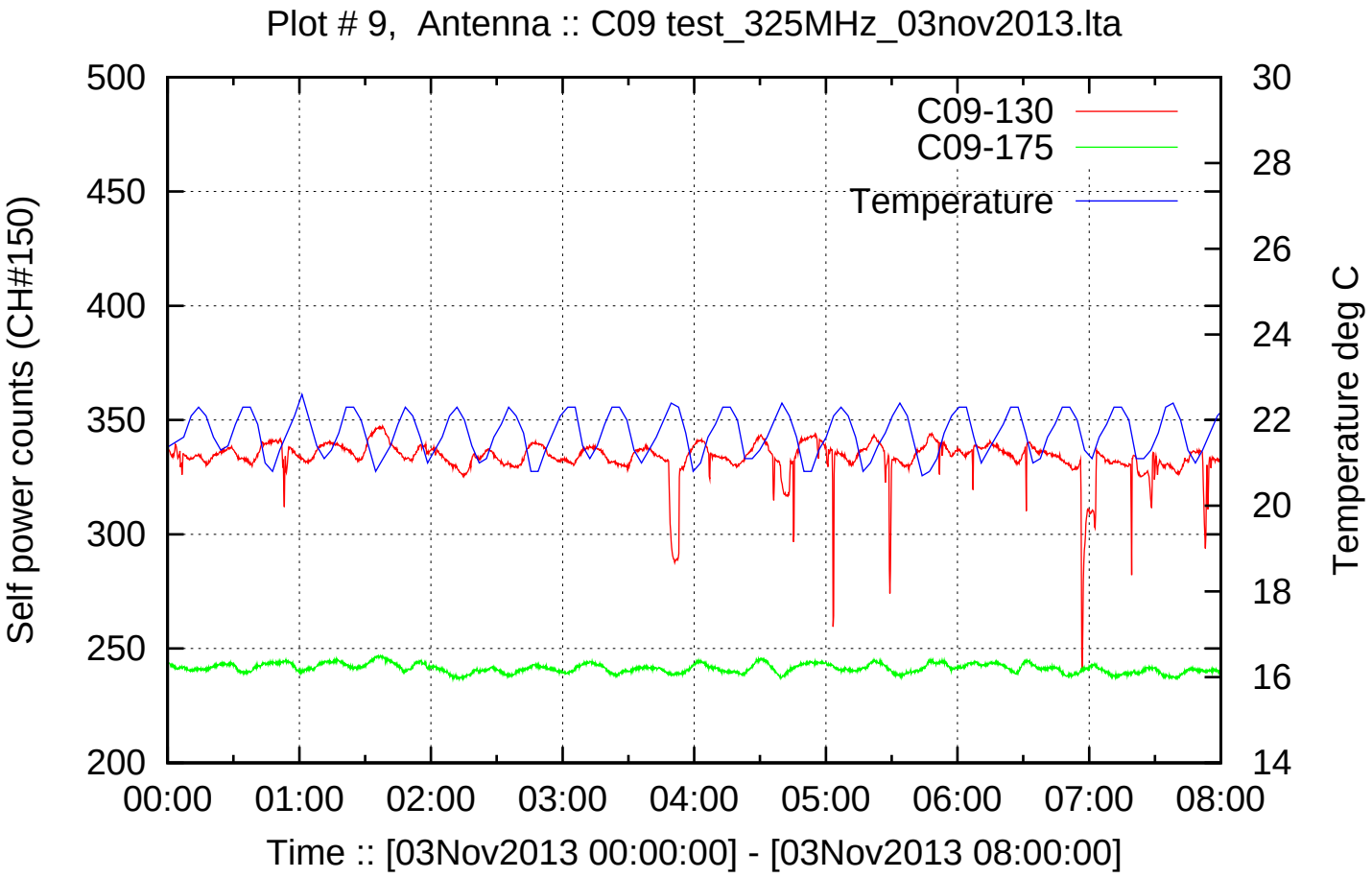

Plot # 4, Antenna :: C03 test_325MHz_03nov2013.lta
C03-130
C03-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

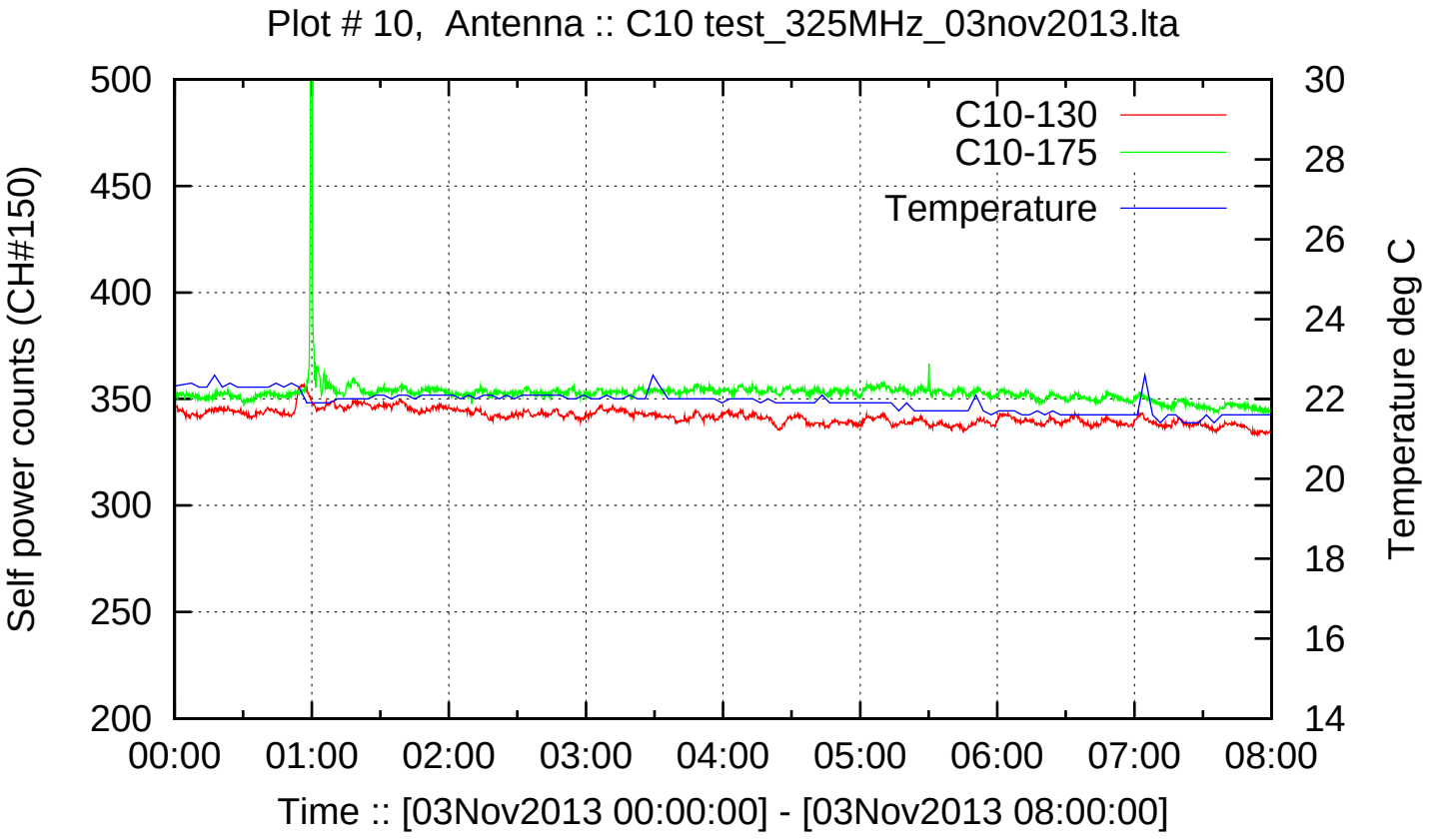

Plot # 5, Antenna :: C04 test_325MHz_03nov2013.lta
C04-130
C04-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

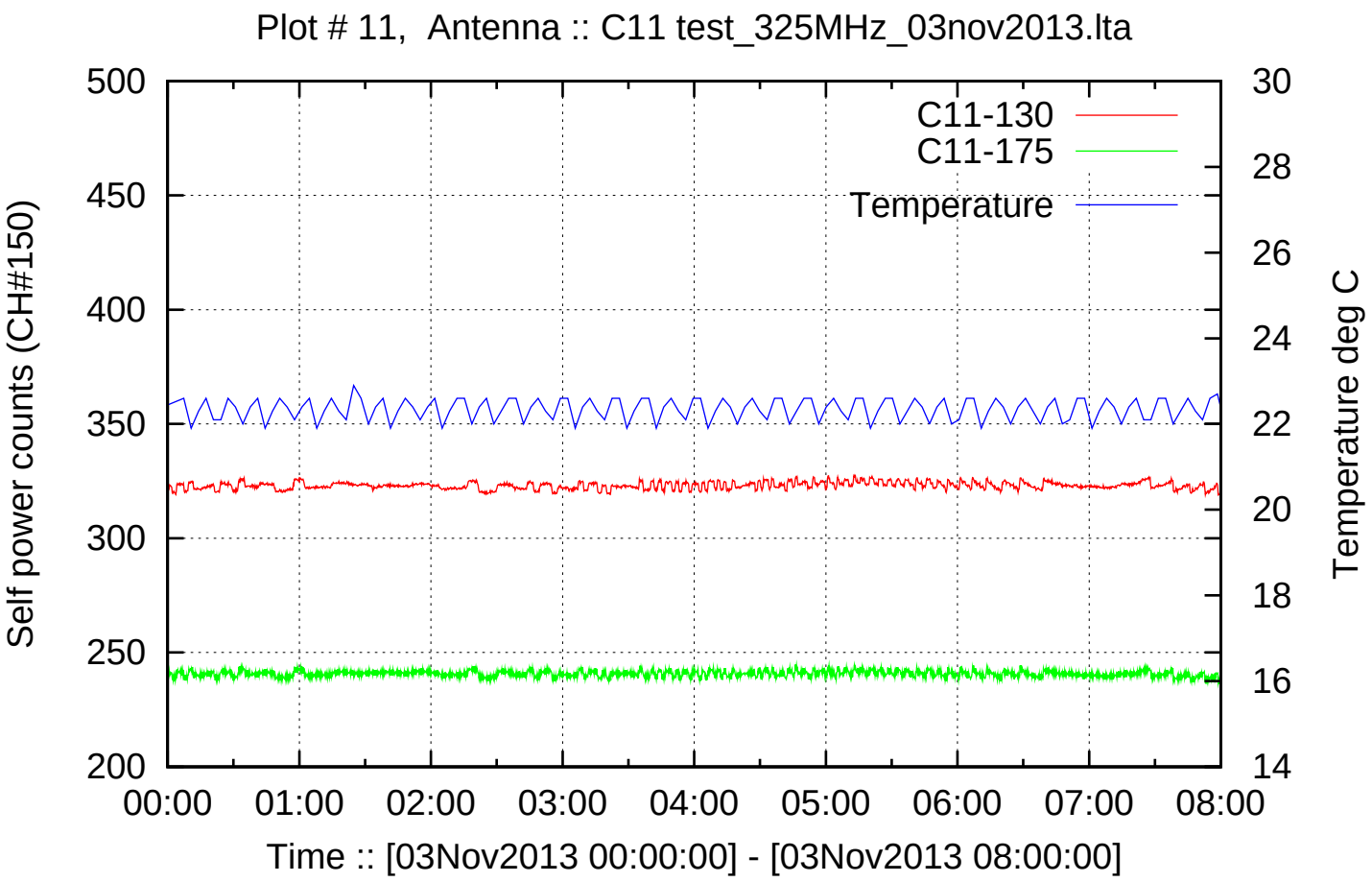

Plot # 6, Antenna :: C05 test_325MHz_03nov2013.lta
C05-130
C05-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

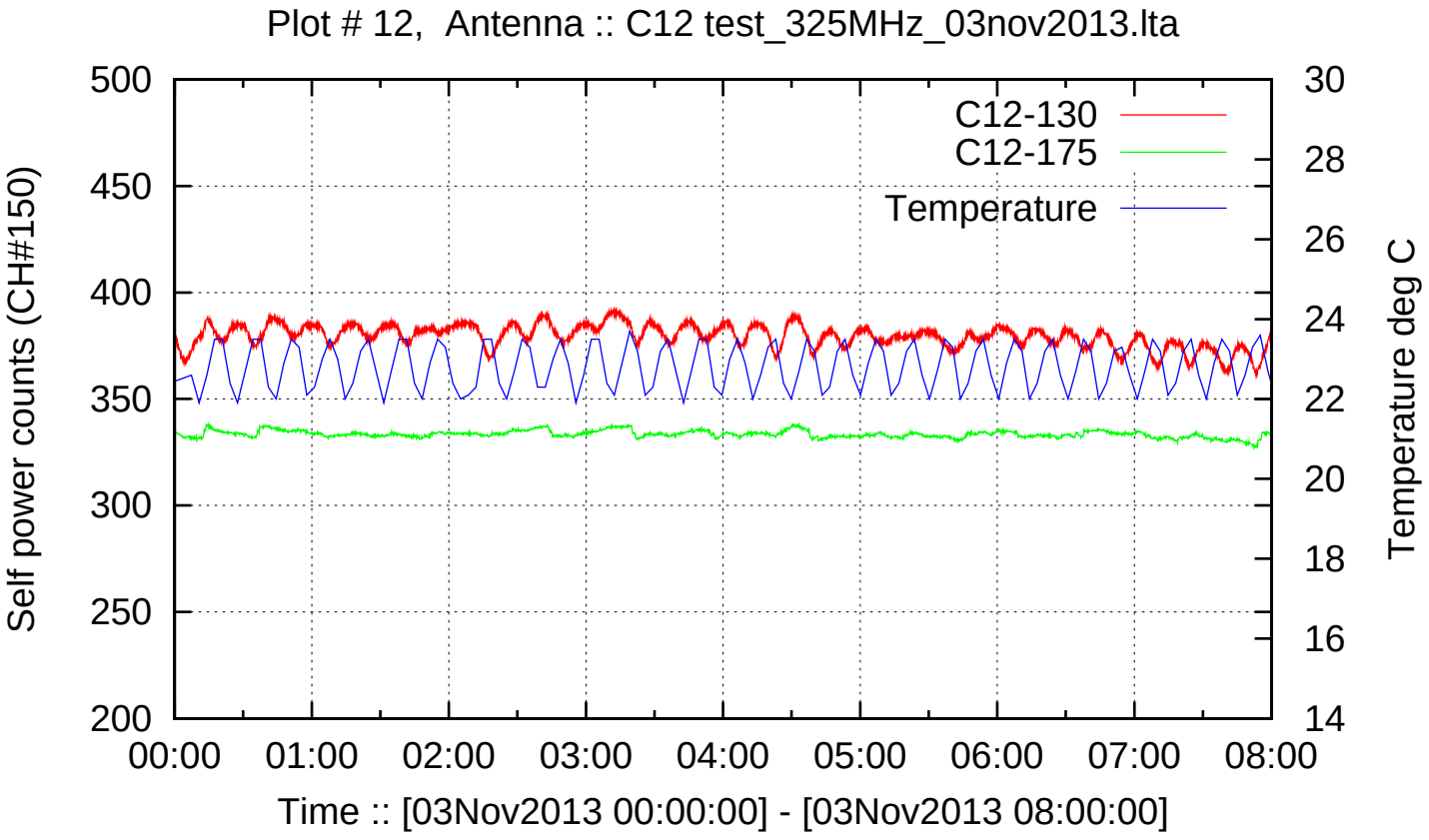

Plot # 7, Antenna :: C06 test_325MHz_03nov2013.lta
C06-130
C06-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

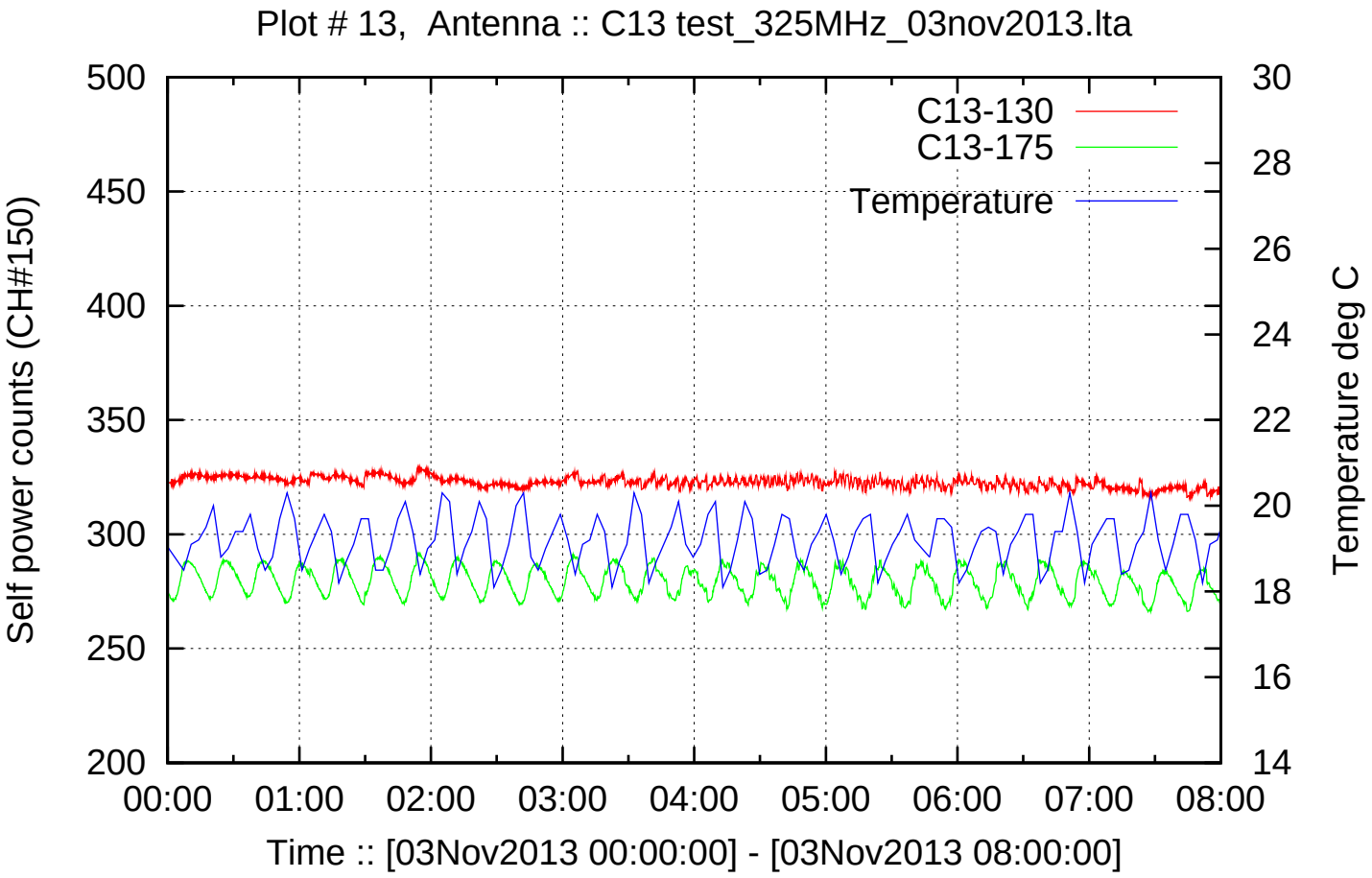

Plot # 8, Antenna :: C08 test_325MHz_03nov2013.lta
C08-130
C08-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

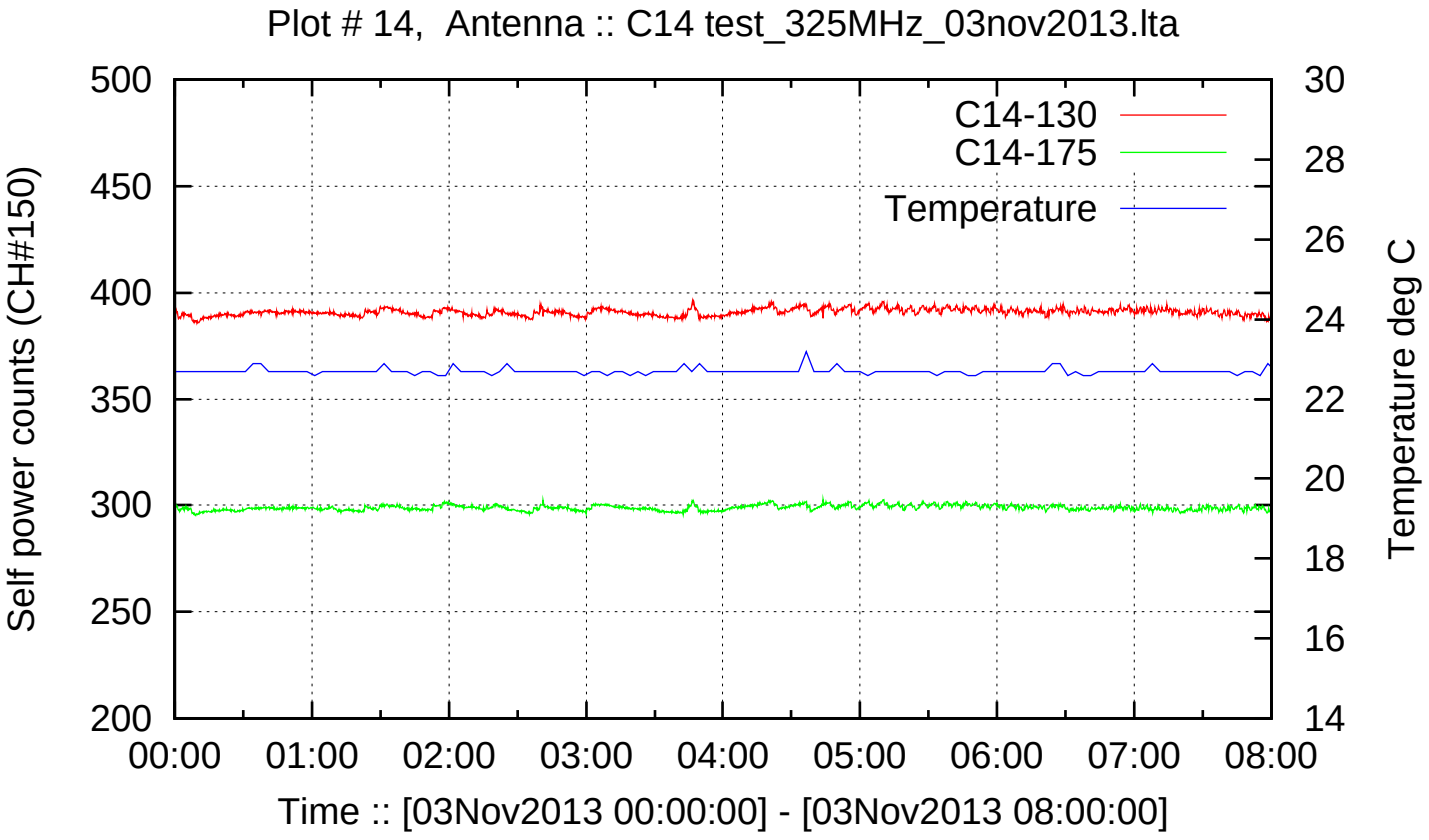

Plot # 9, Antenna :: C09 test_325MHz_03nov2013.lta
C09-130
C09-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

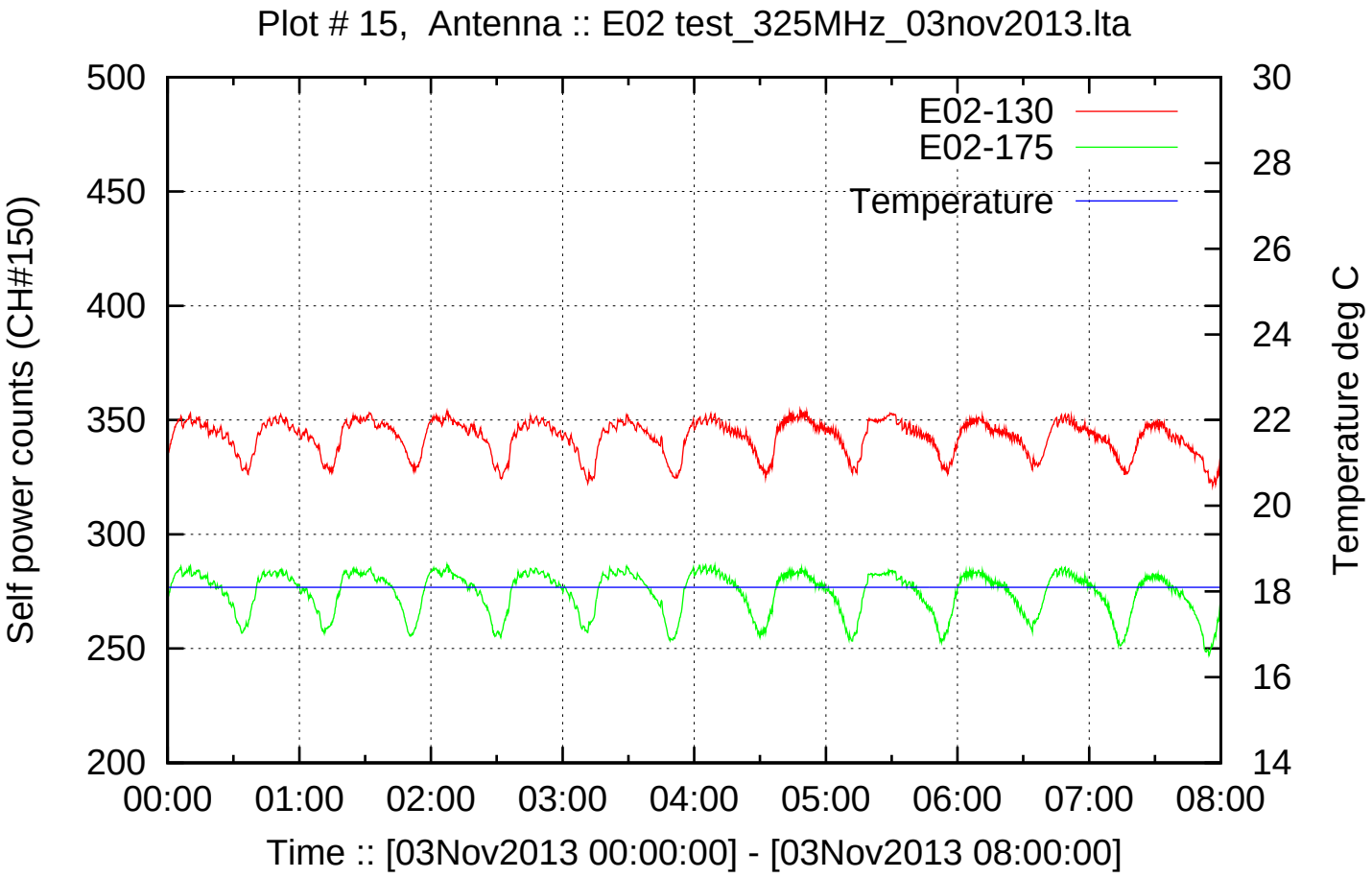

Plot # 10, Antenna :: C10 test_325MHz_03nov2013.lta
C10-130
C10-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

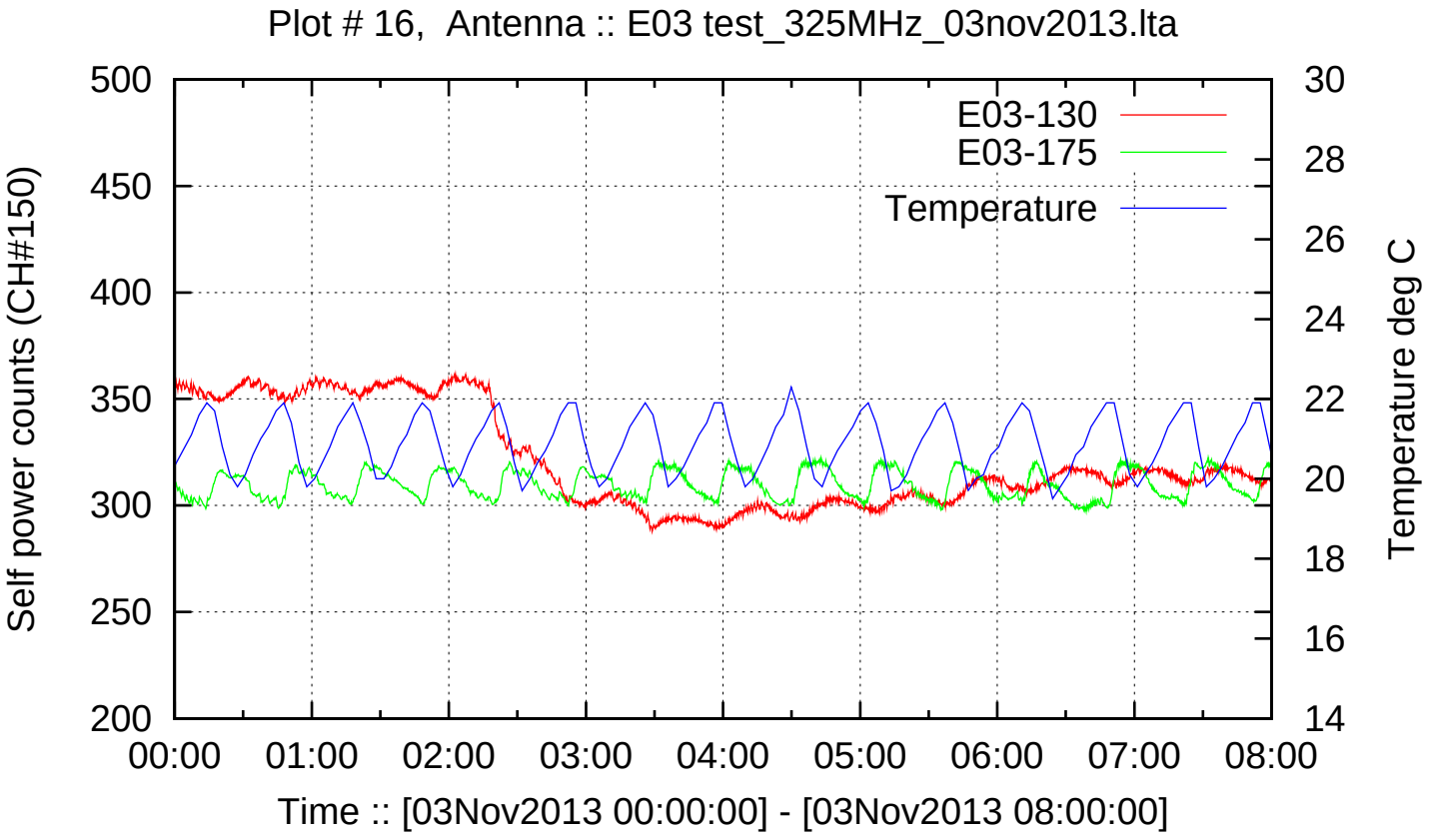

Plot # 11, Antenna :: C11 test_325MHz_03nov2013.lta
C11-130
C11-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

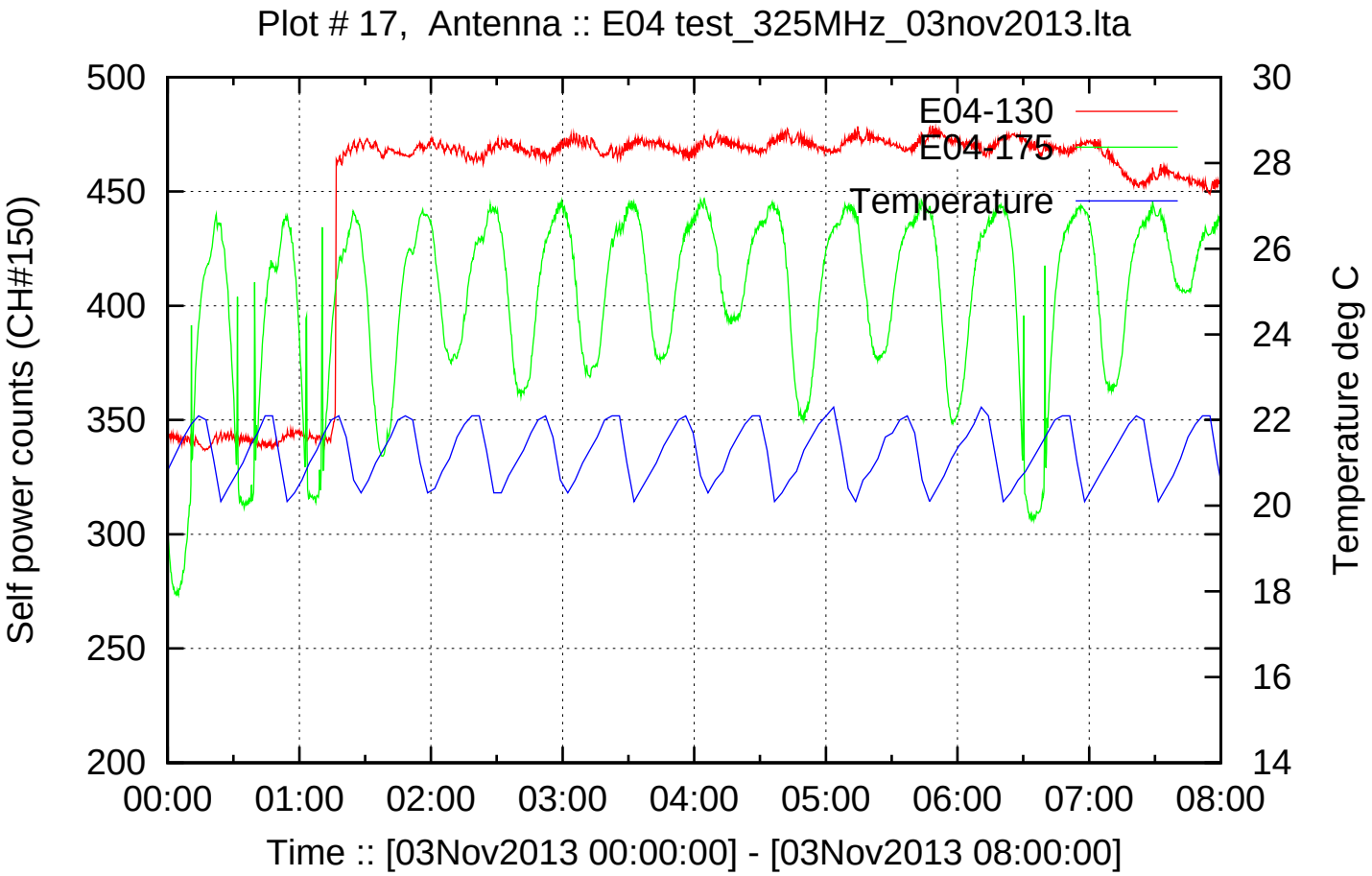

Plot # 12, Antenna :: C12 test_325MHz_03nov2013.lta
C12-130
C12-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

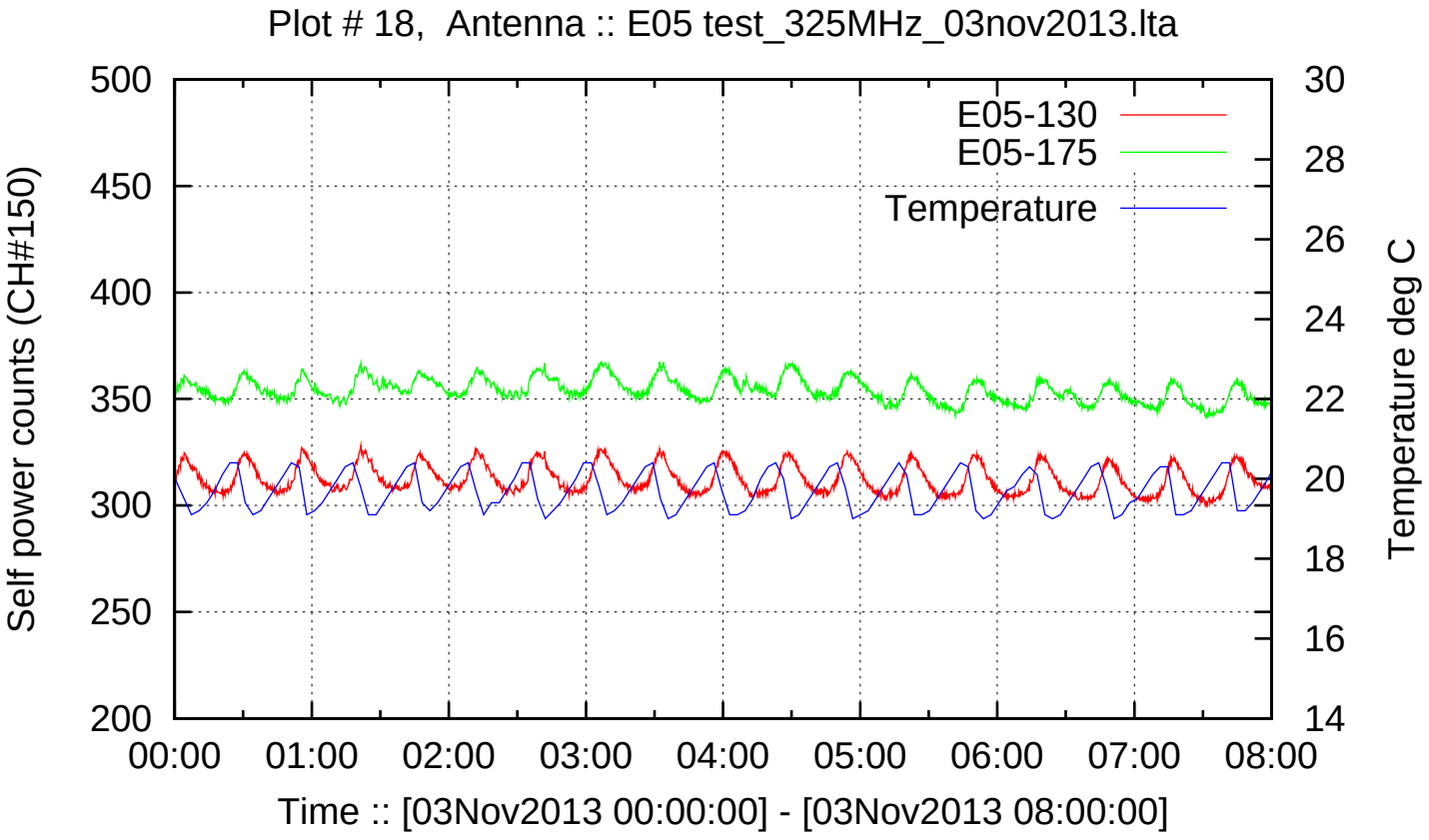

Plot # 13, Antenna :: C13 test_325MHz_03nov2013.lta
C13-130
C13-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

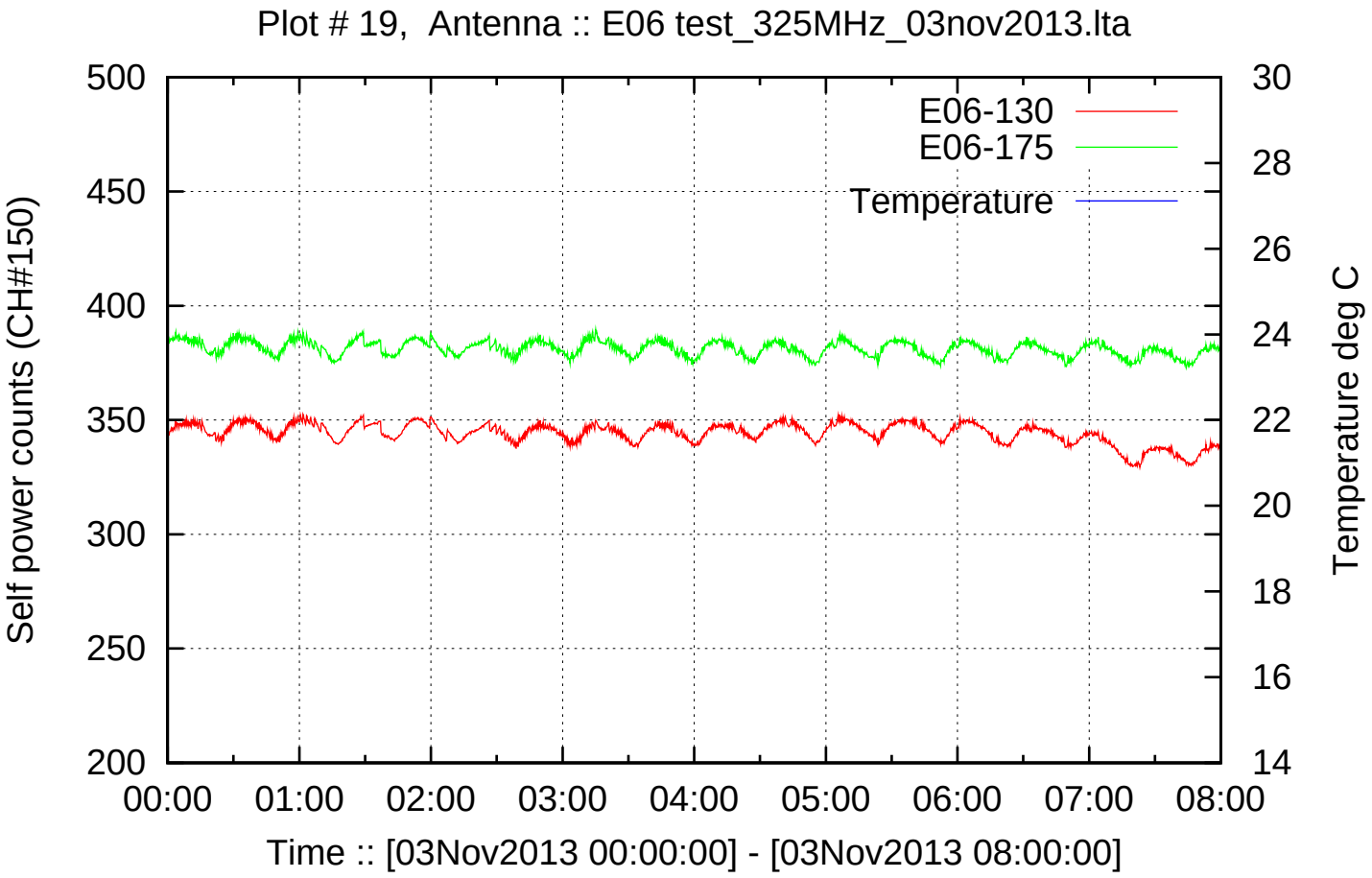

Plot # 14, Antenna :: C14 test_325MHz_03nov2013.lta
C14-130
C14-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

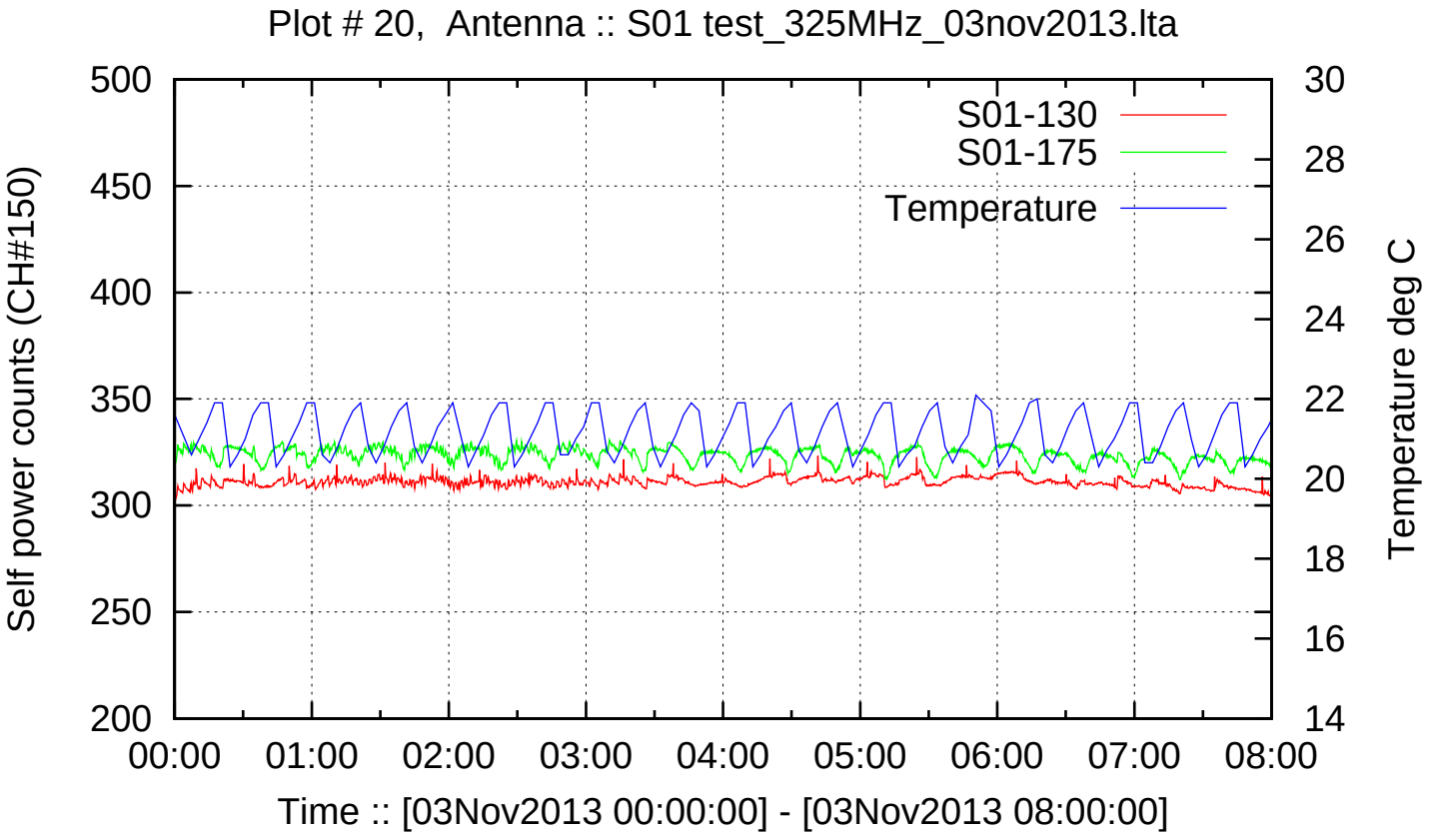

Plot # 15, Antenna :: E02 test_325MHz_03nov2013.lta
E02-130
E02-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

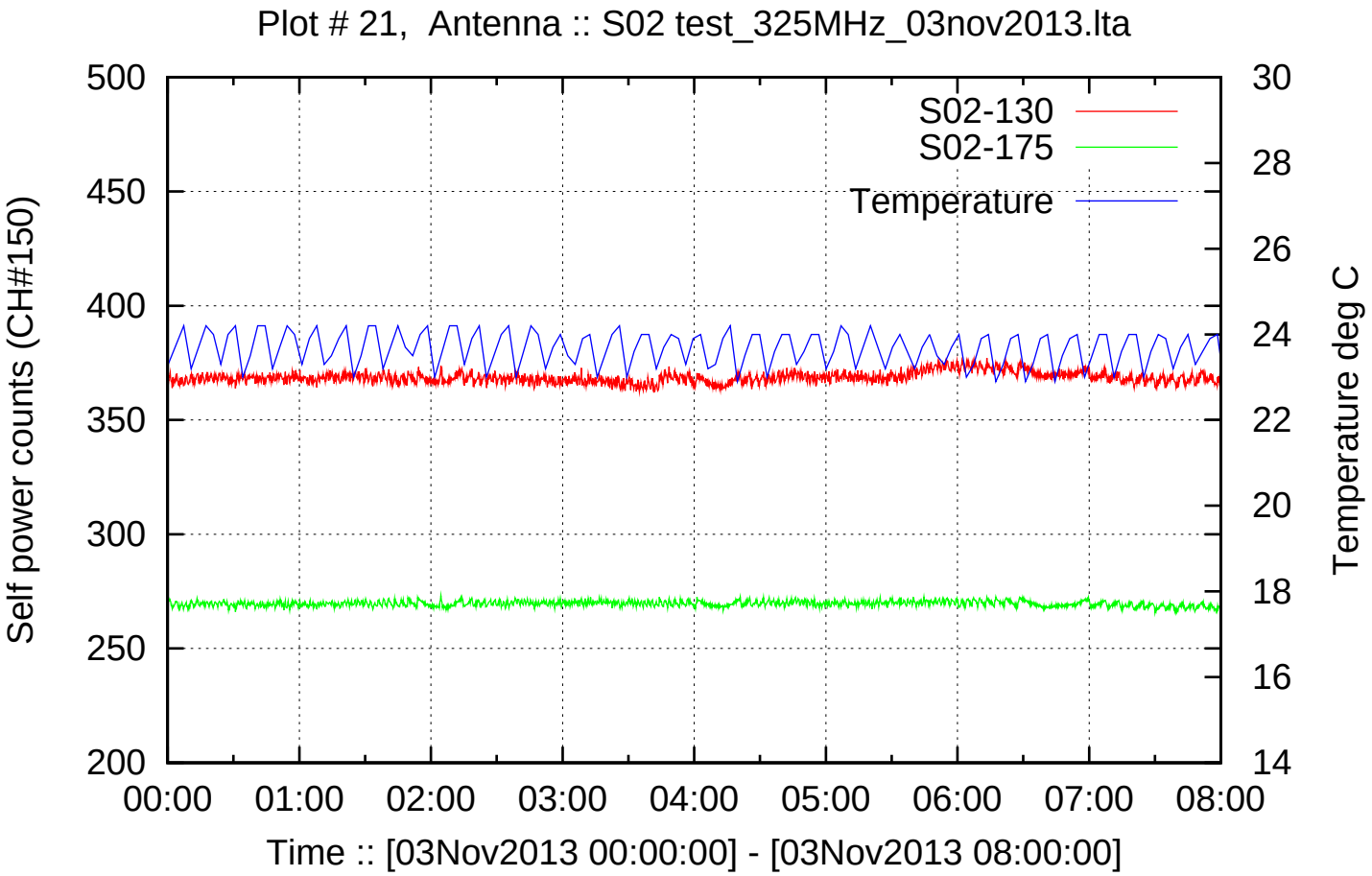

Plot # 16, Antenna :: E03 test_325MHz_03nov2013.lta
E03-130
E03-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

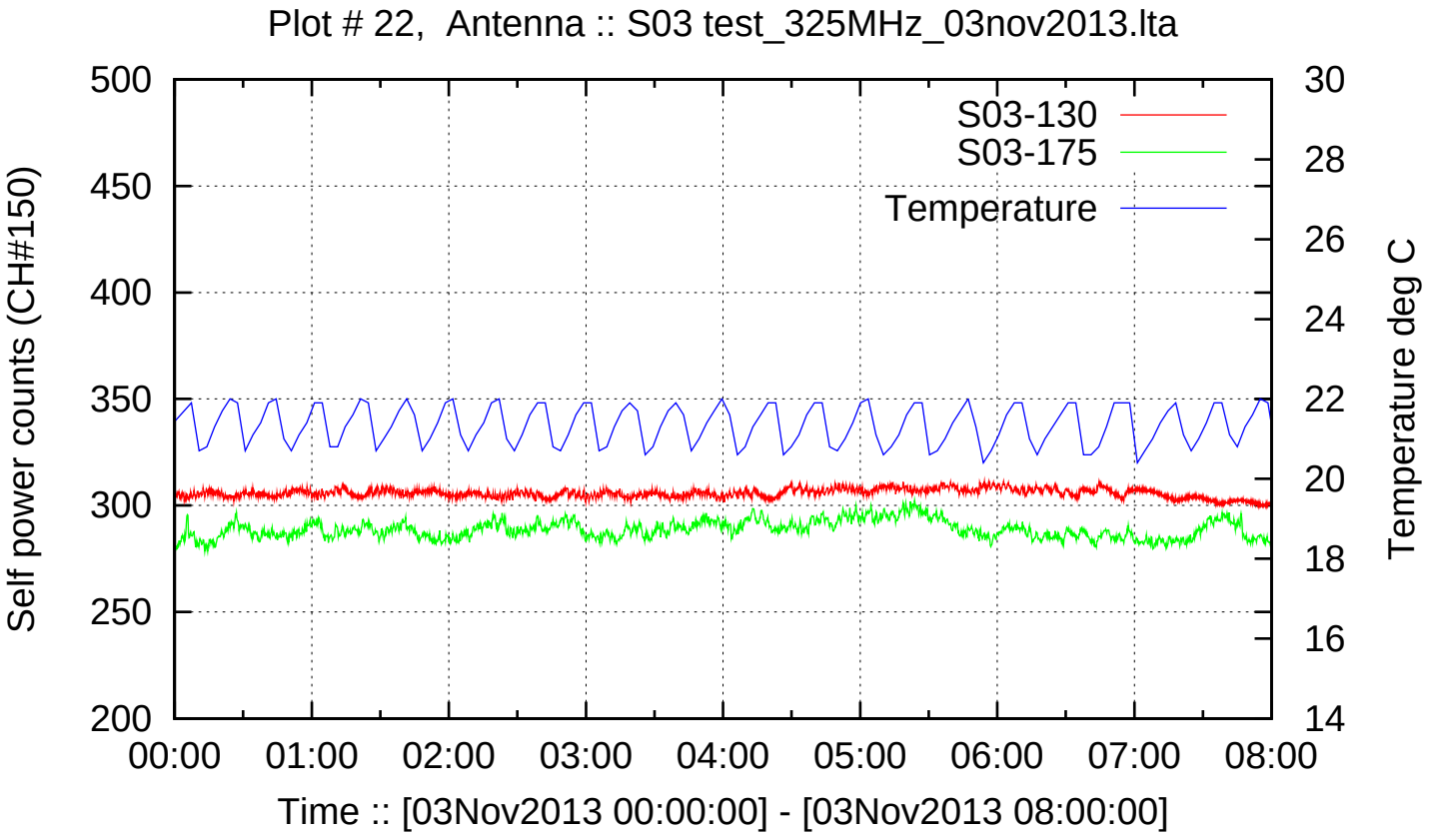

Plot # 17, Antenna :: E04 test_325MHz_03nov2013.lta
E04-130
E04-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

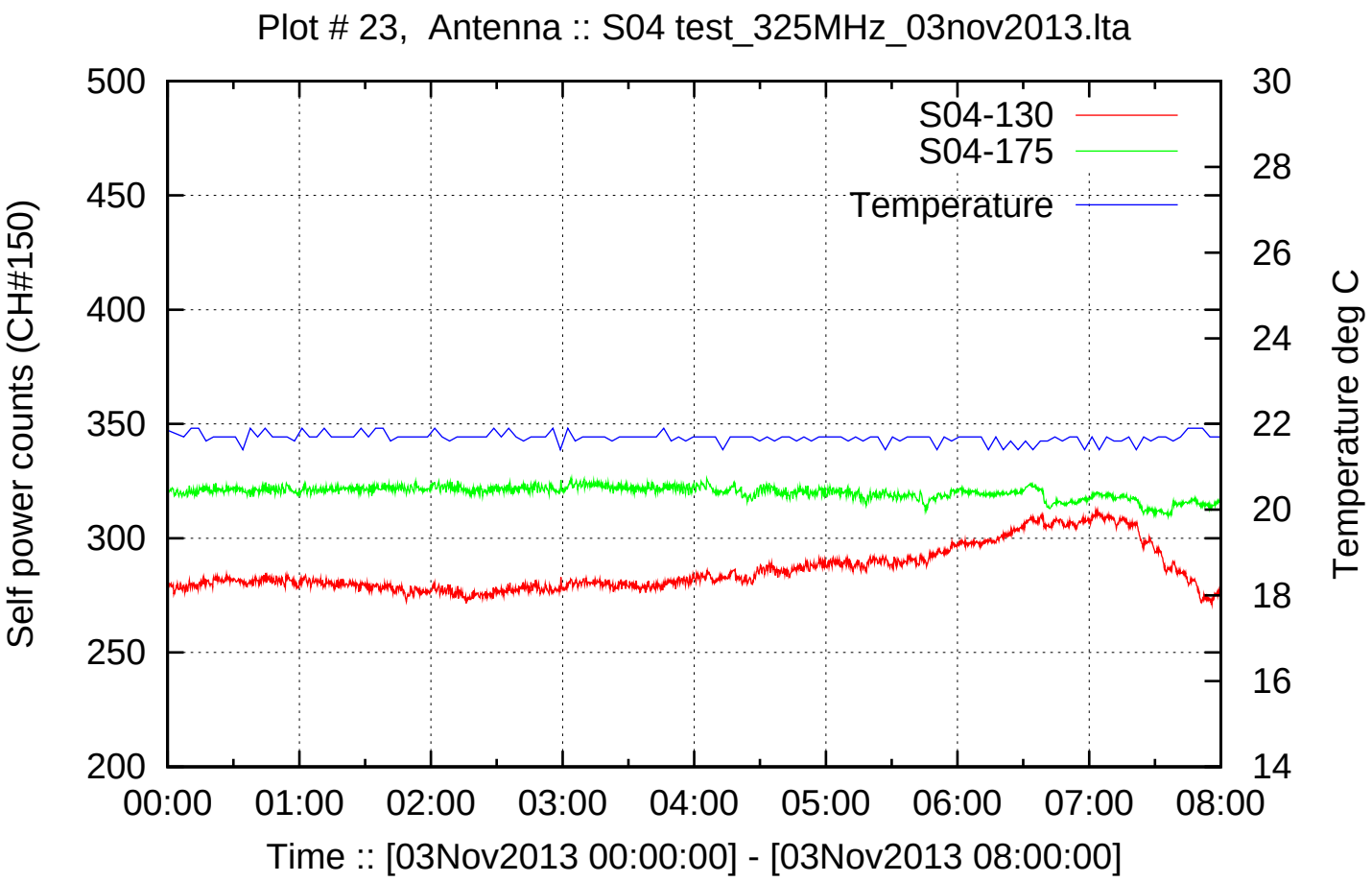

Plot # 18, Antenna :: E05 test_325MHz_03nov2013.lta
E05-130
E05-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

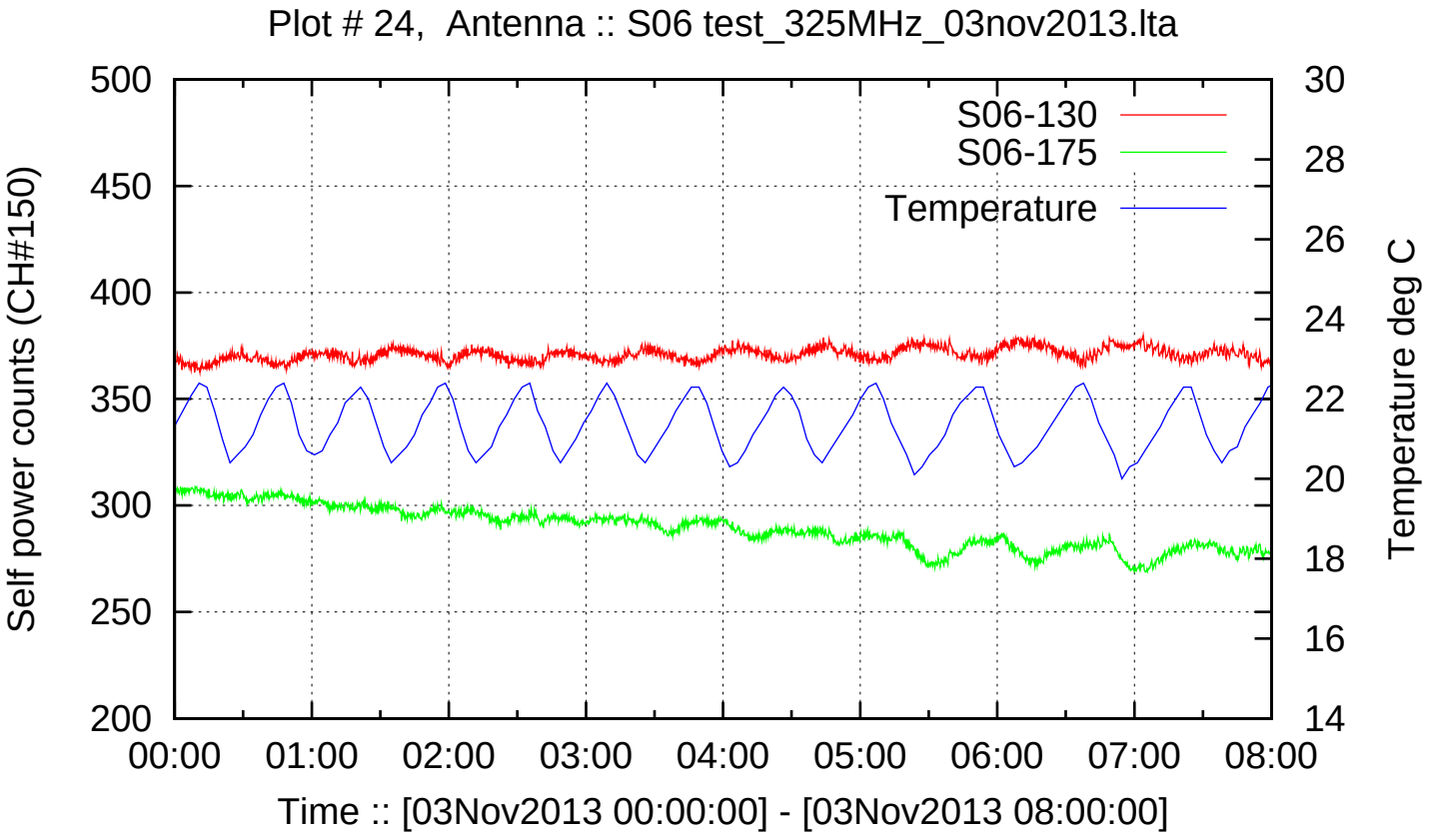

Plot # 19, Antenna :: E06 test_325MHz_03nov2013.lta
E06-130
E06-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

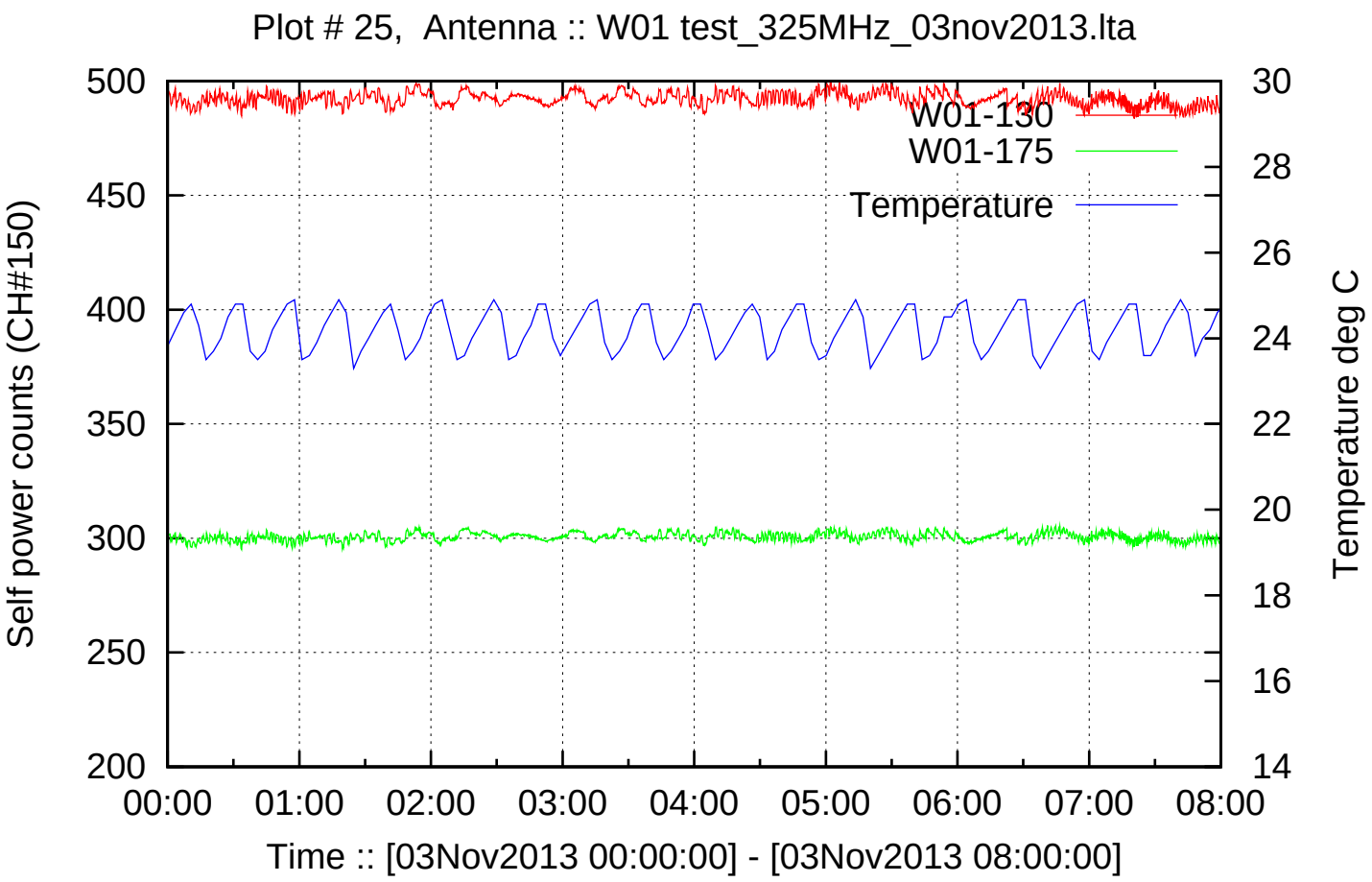

Plot # 20, Antenna :: S01 test_325MHz_03nov2013.lta
S01-130
S01-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

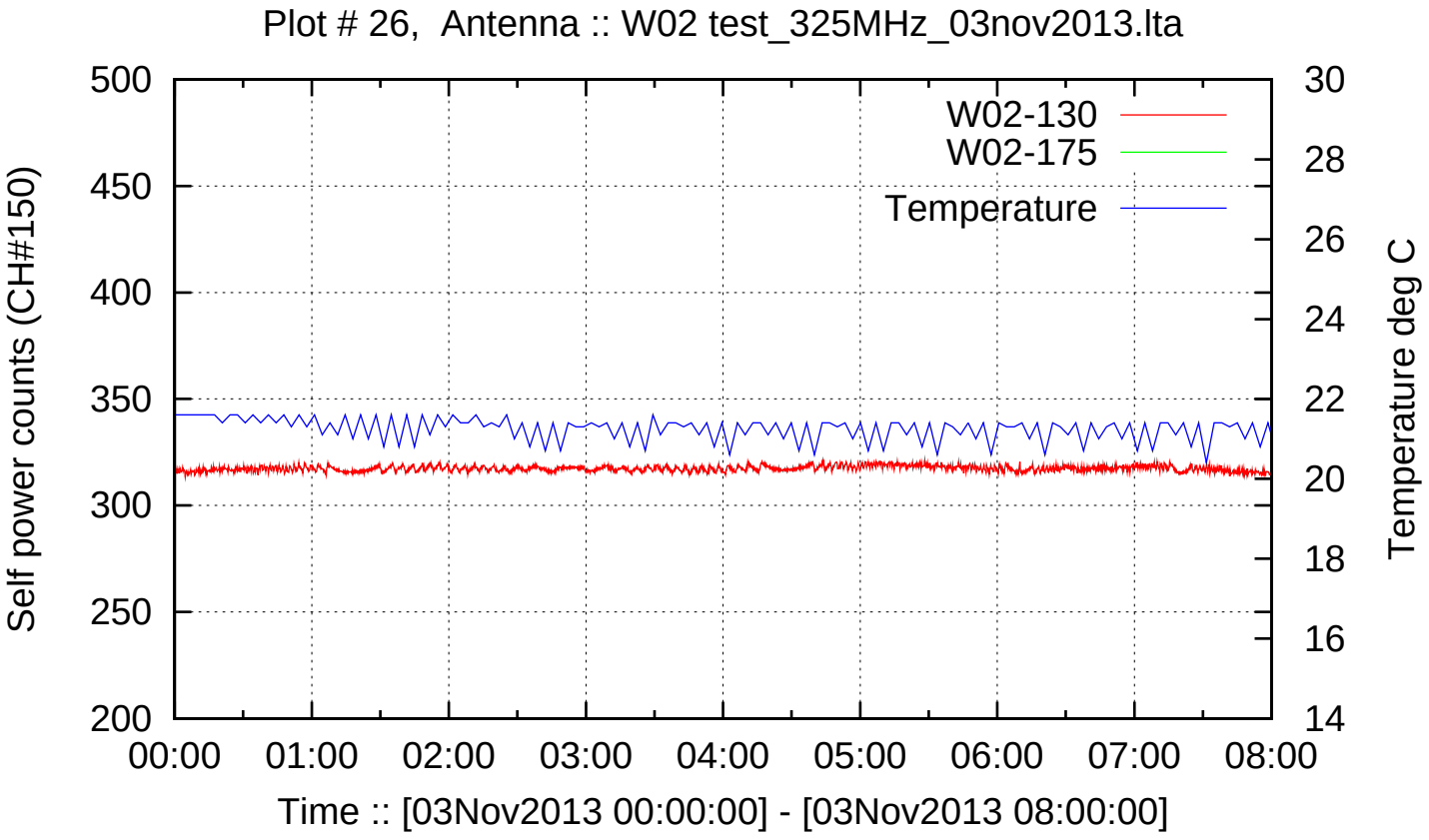

Plot # 21, Antenna :: S02 test_325MHz_03nov2013.lta
S02-130
S02-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

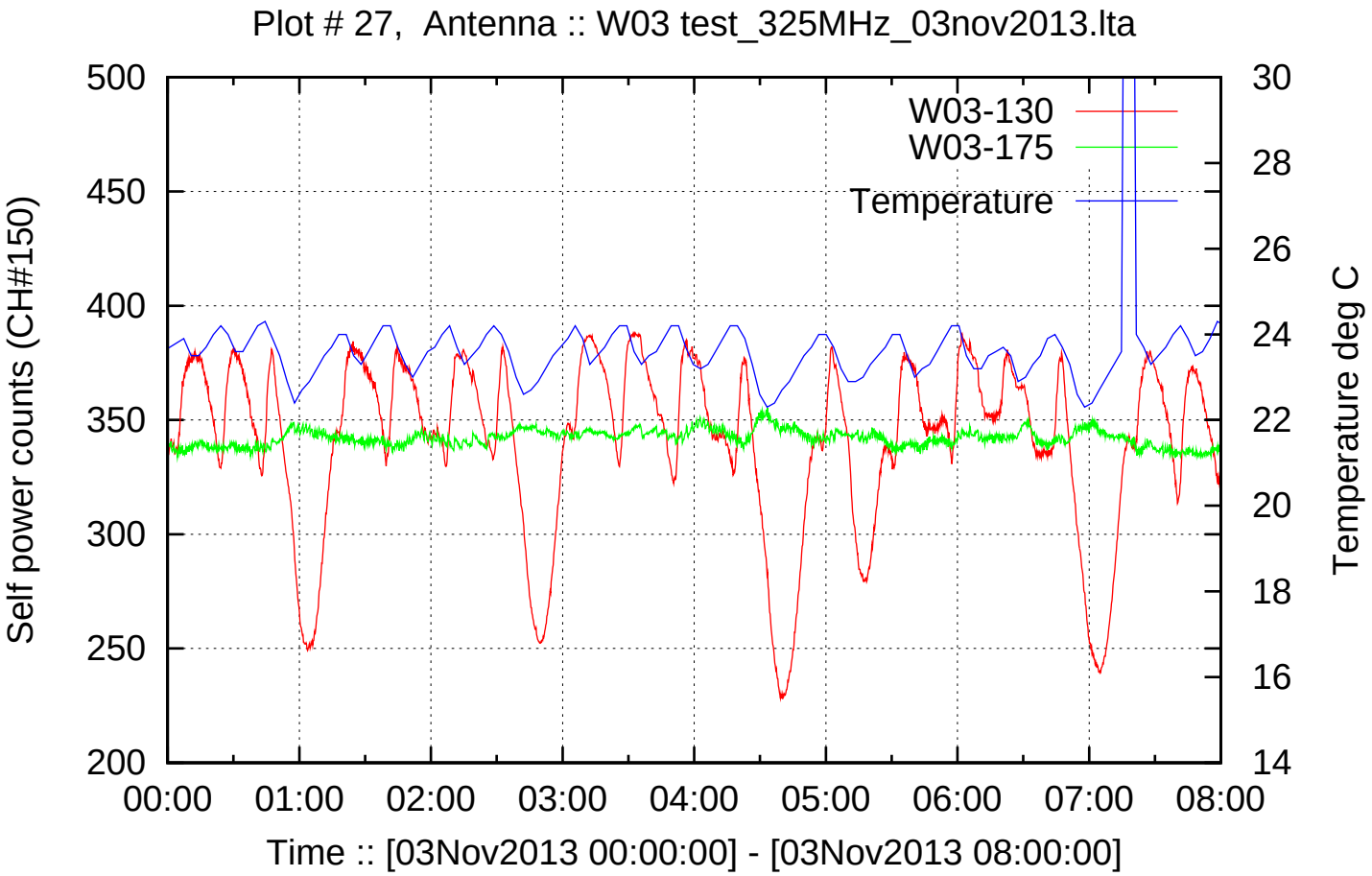

Plot # 22, Antenna :: S03 test_325MHz_03nov2013.lta
S03-130
S03-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

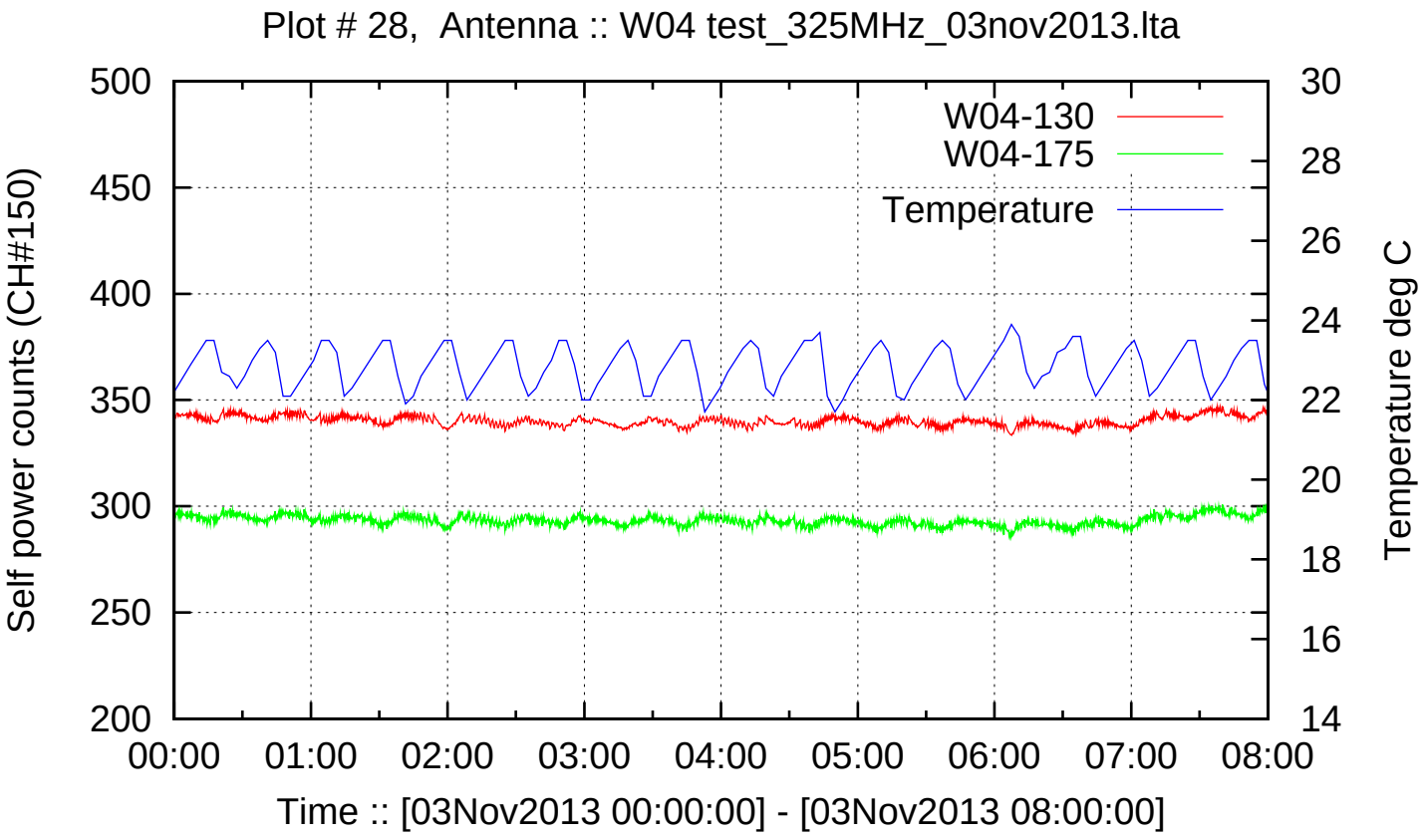

Plot # 23, Antenna :: S04 test_325MHz_03nov2013.lta
S04-130
S04-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

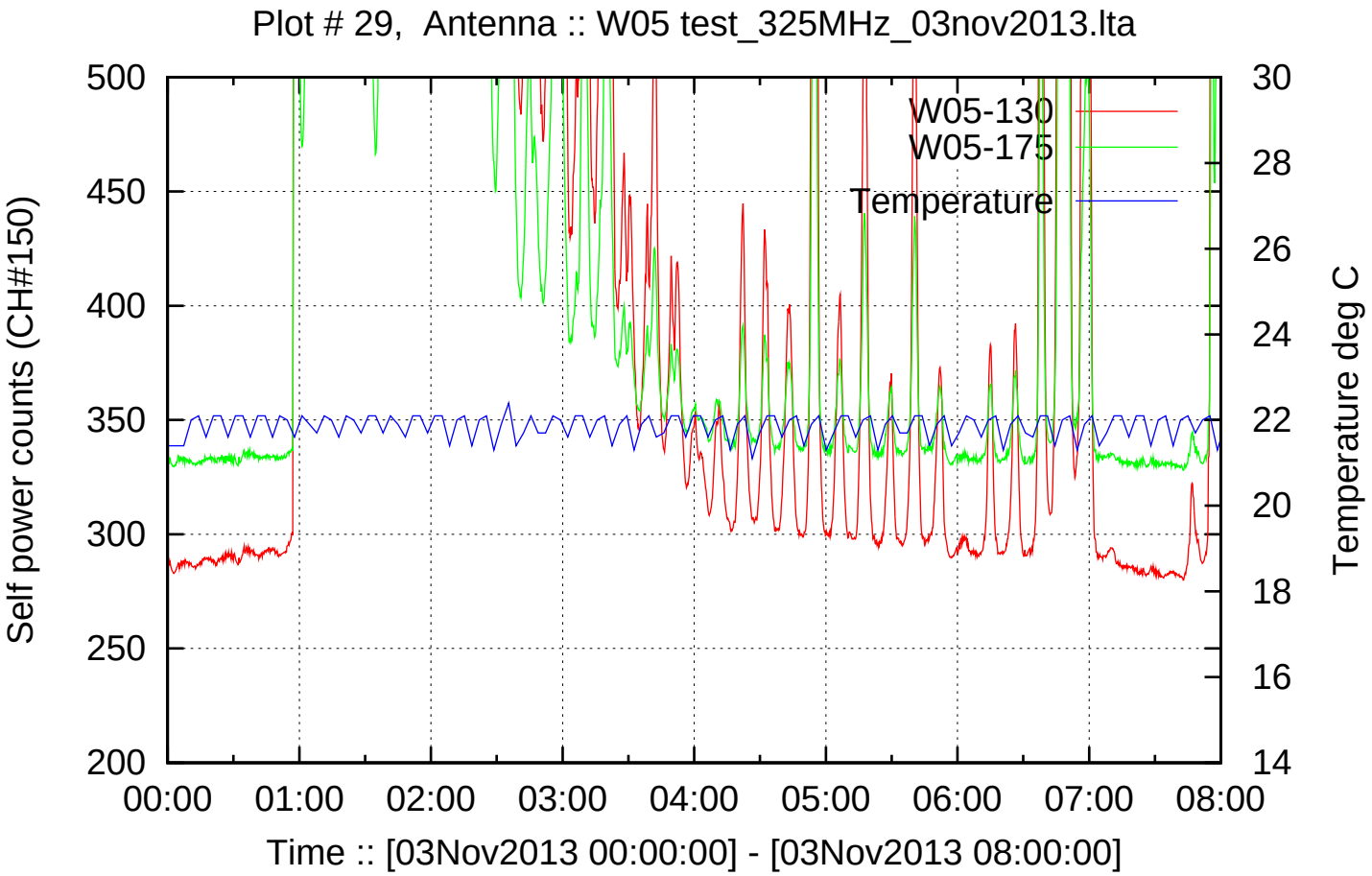

Plot # 24, Antenna :: S06 test_325MHz_03nov2013.lta
S06-130
S06-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

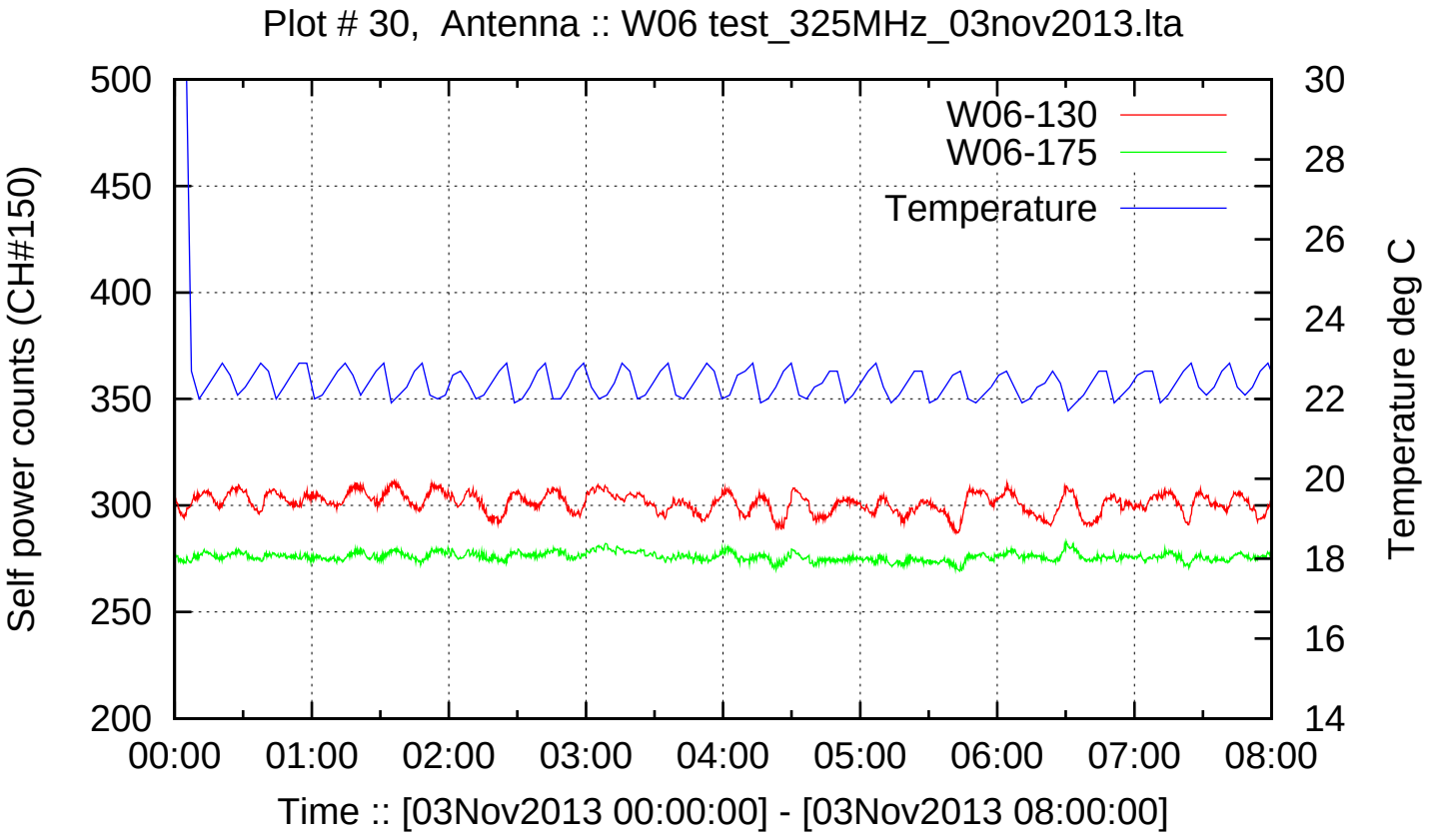

Plot # 25, Antenna :: W01 test_325MHz_03nov2013.lta
Self power counts (CH#150)
Temperature deg C
W01-130
W01-175
Temperature
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

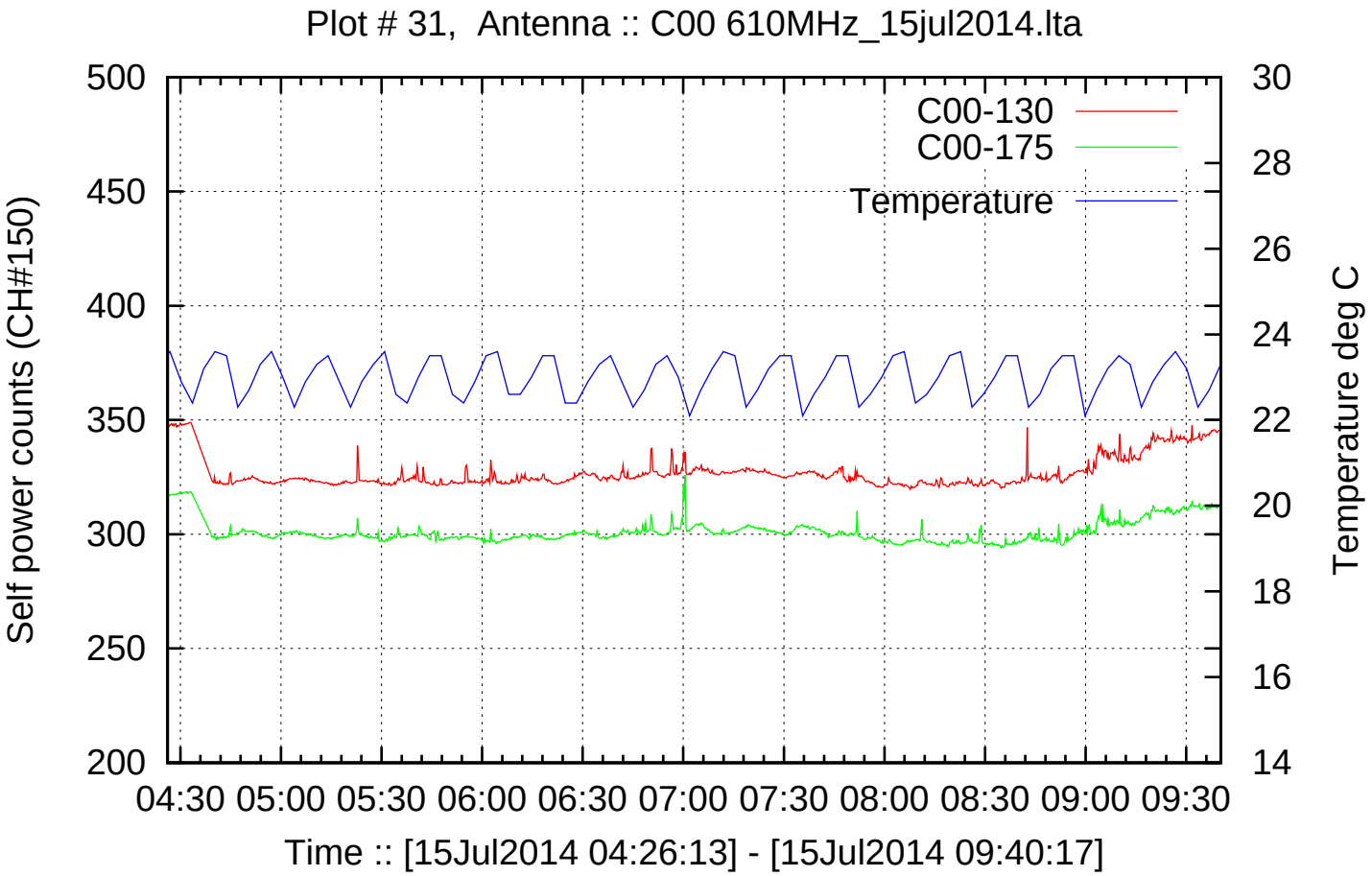

Plot # 26, Antenna :: W02 test_325MHz_03nov2013.lta
Self power counts (CH#150)
Temperature deg C
W02-130
W02-175
Temperature
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

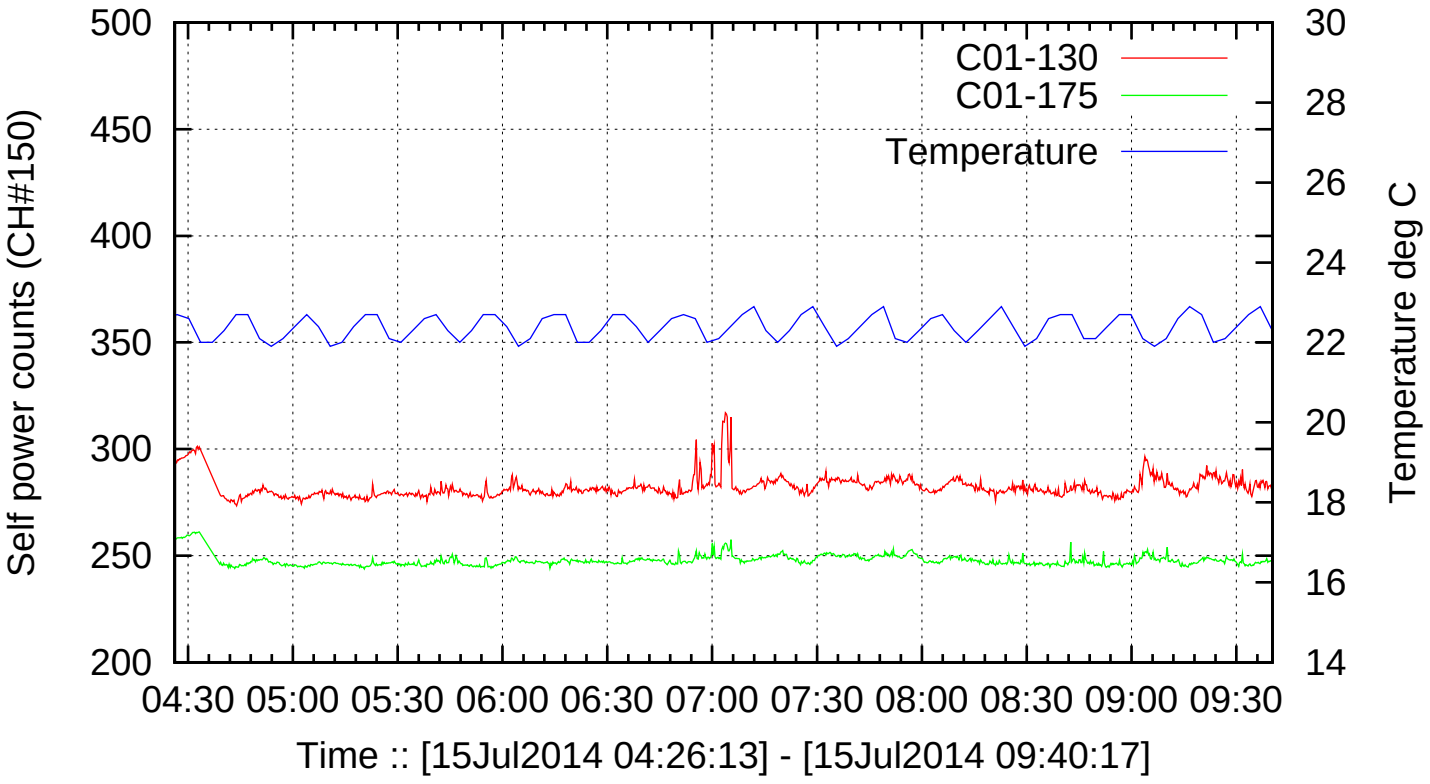

Plot # 27, Antenna :: W03 test_325MHz_03nov2013.lta
W03-130
W03-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

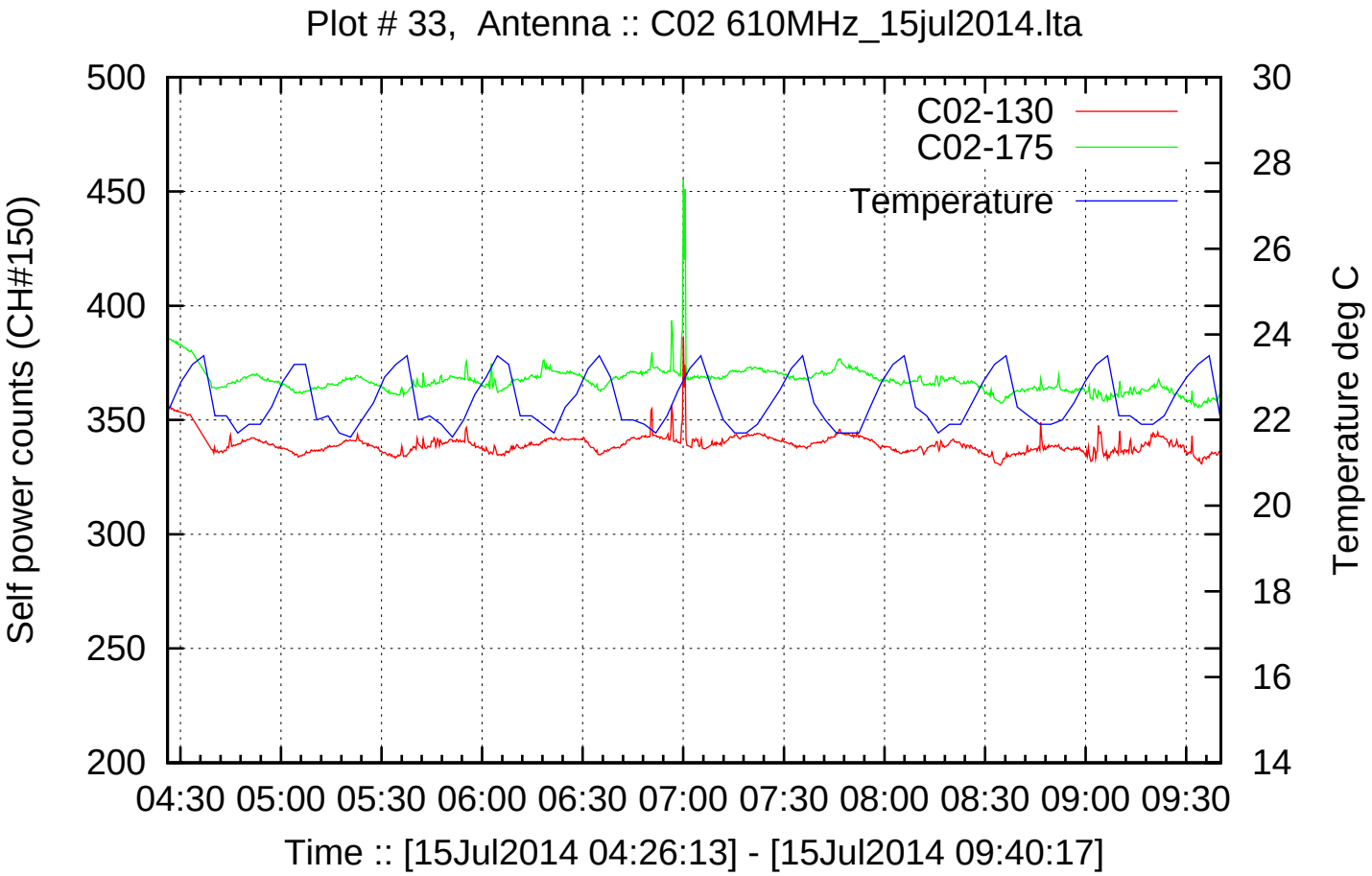

Plot # 28, Antenna :: W04 test_325MHz_03nov2013.lta
W04-130
W04-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

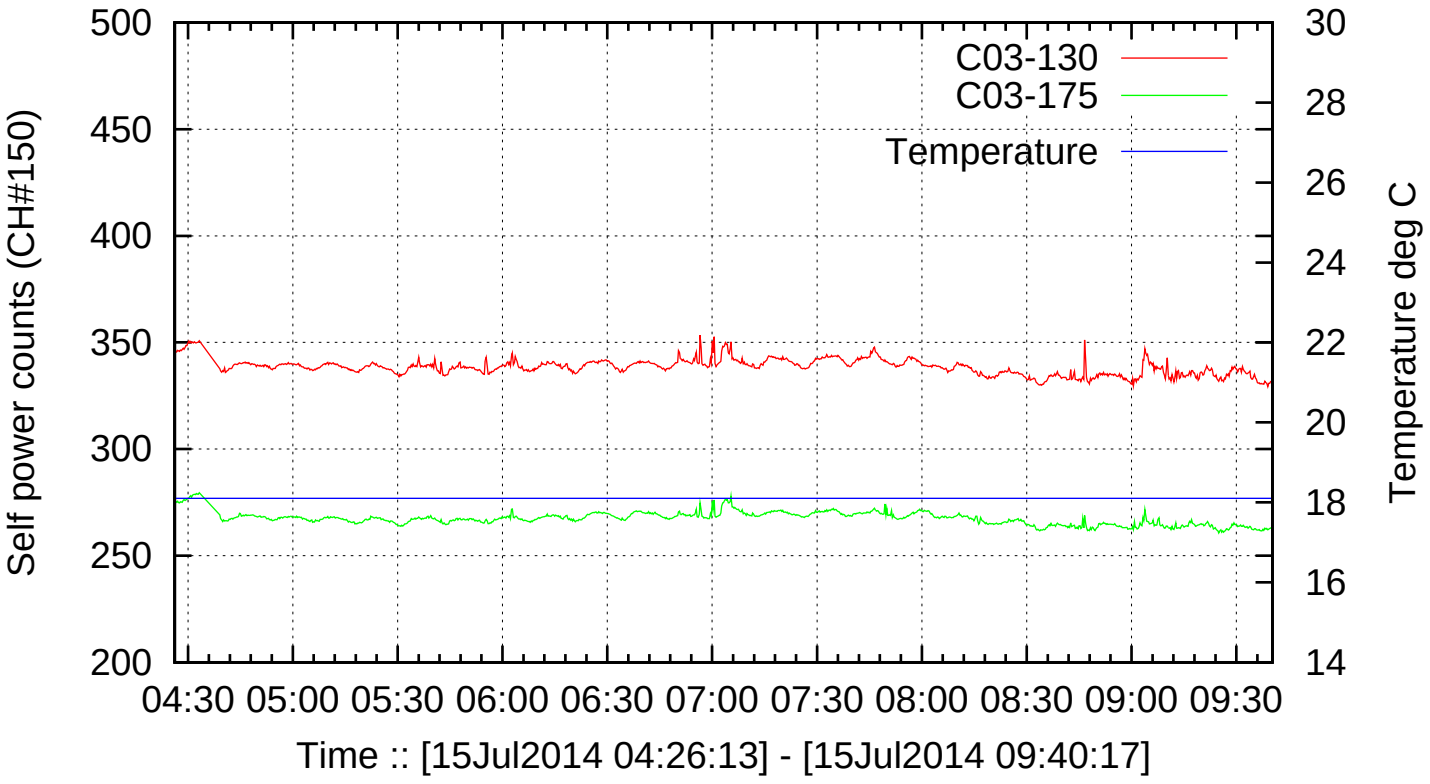

Plot # 29, Antenna :: W05 test_325MHz_03nov2013.lta
W05-130
W05-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

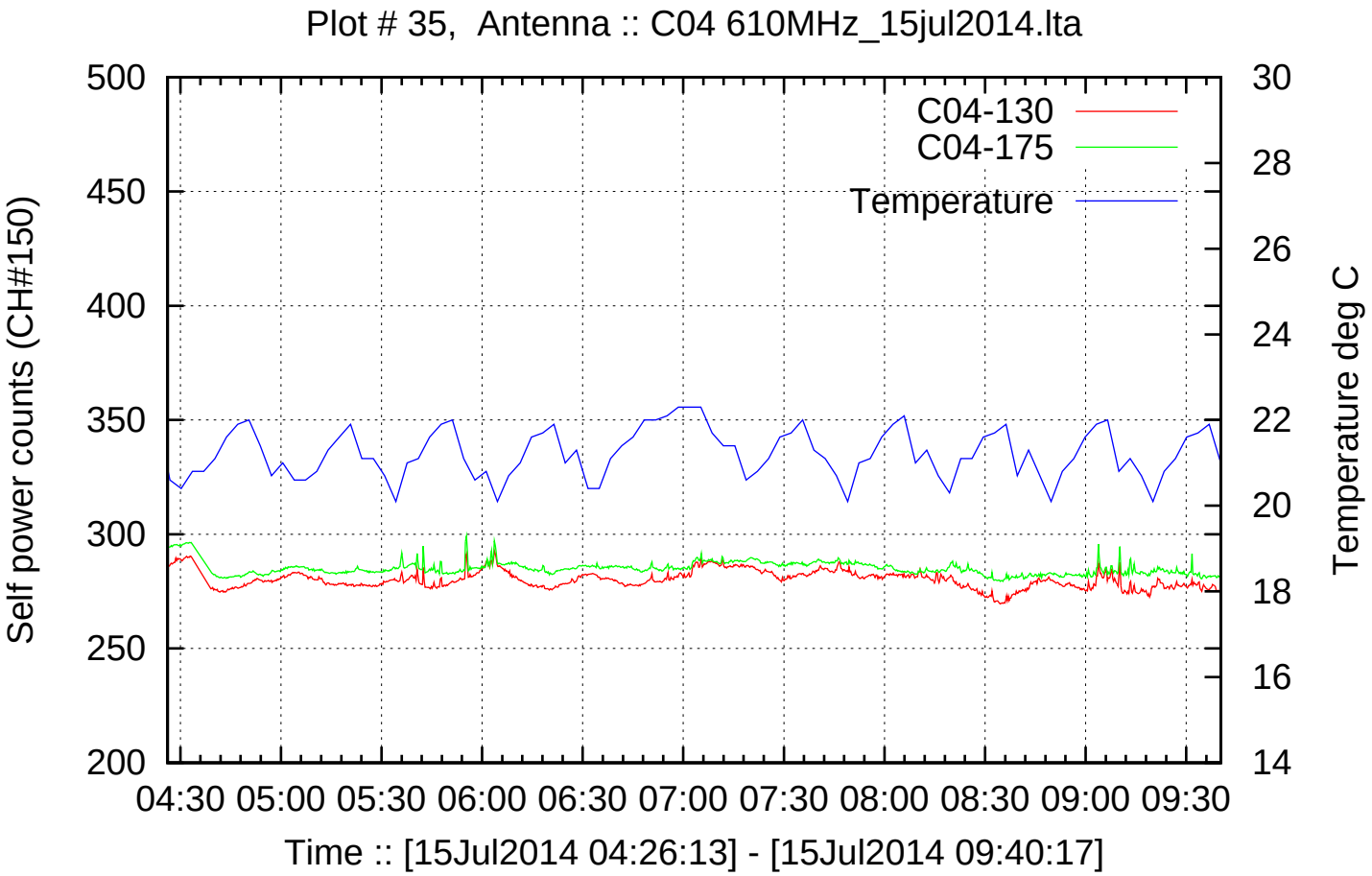

Plot # 30, Antenna :: W06 test_325MHz_03nov2013.lta
W06-130
W06-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
Time :: [03Nov2013 00:00:00] - [03Nov2013 08:00:00]

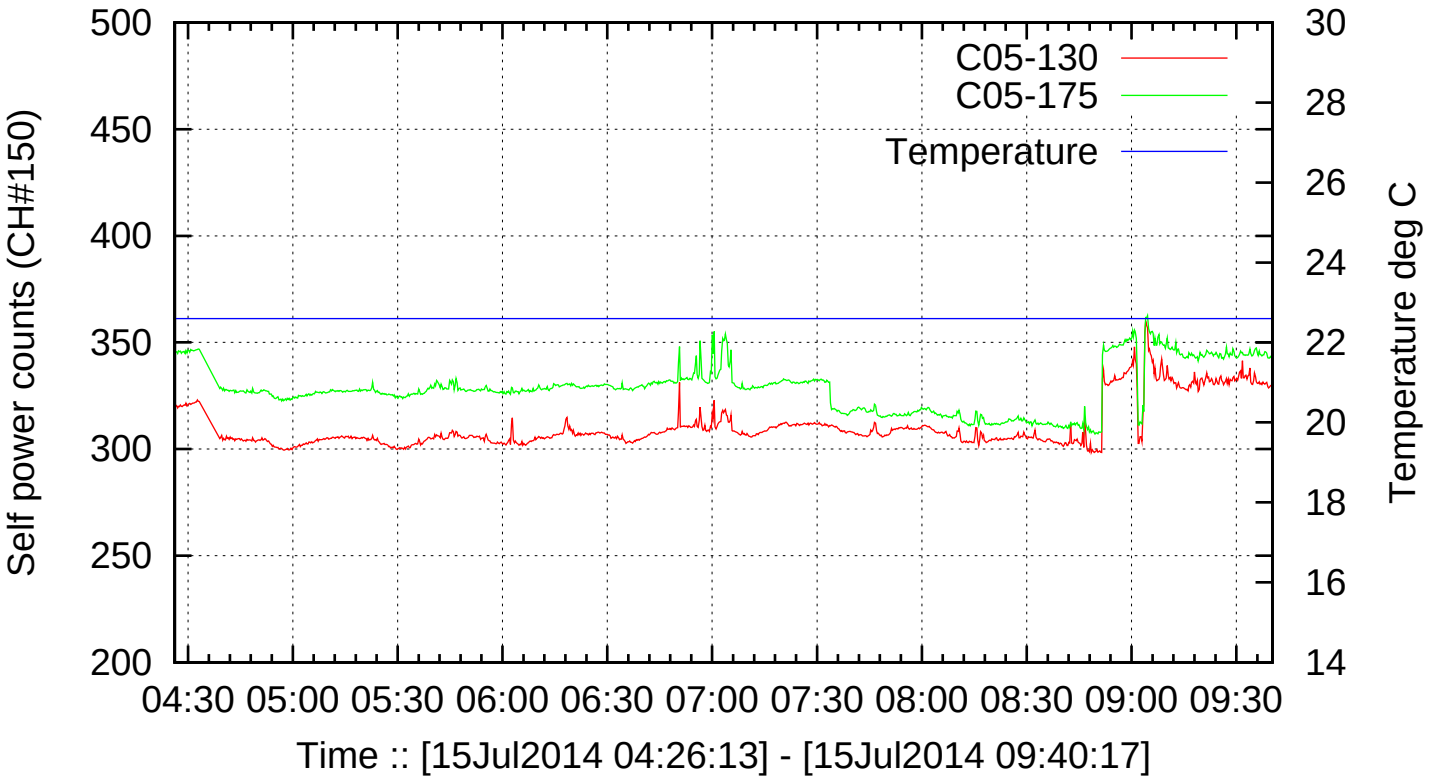

Plot # 31, Antenna :: C00 610MHz_15jul2014.lta
C00-130
C00-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

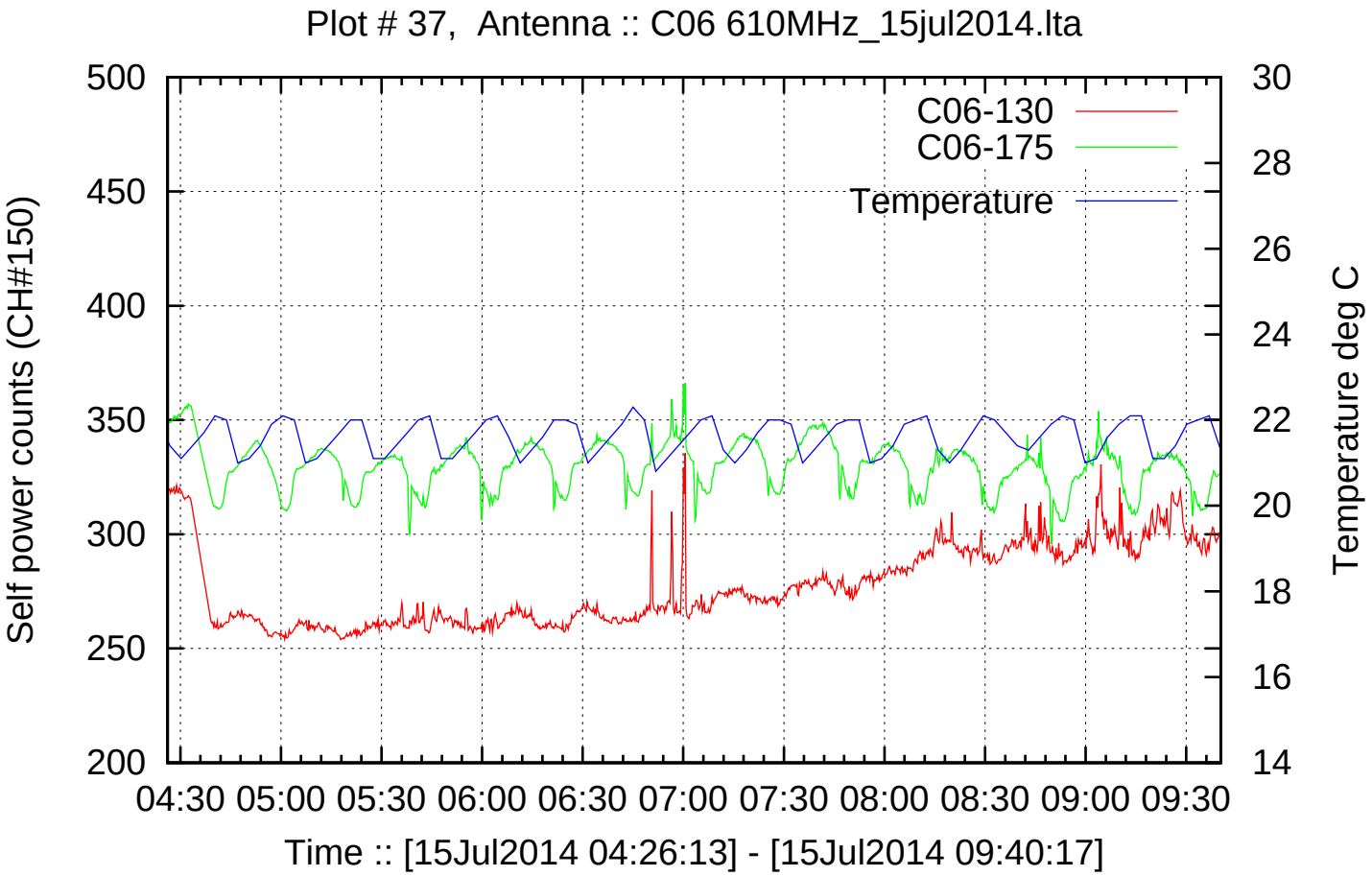

Plot # 32, Antenna :: C01 610MHz_15jul2014.lta
C01-130
C01-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

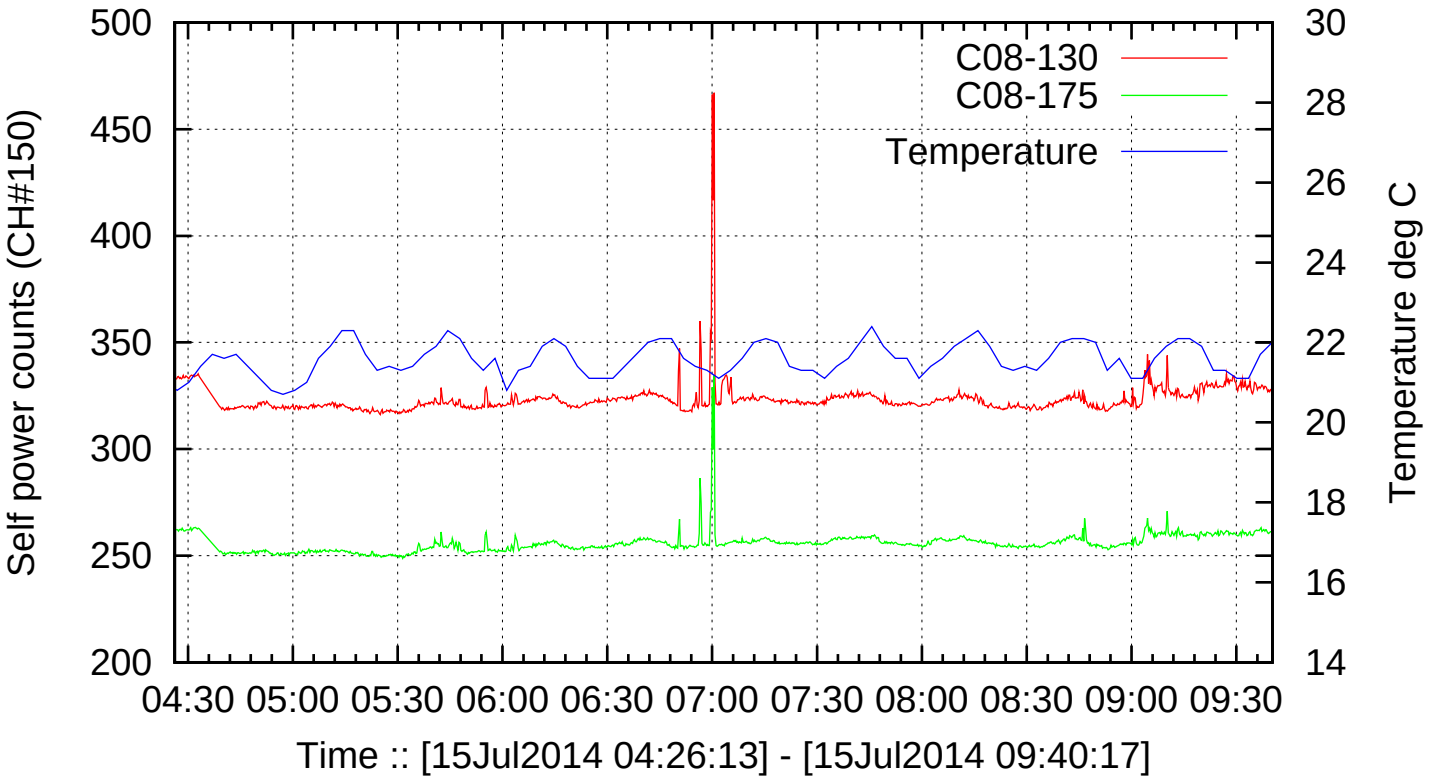

Plot # 33, Antenna :: C02 610MHz_15jul2014.lta
C02-130
C02-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

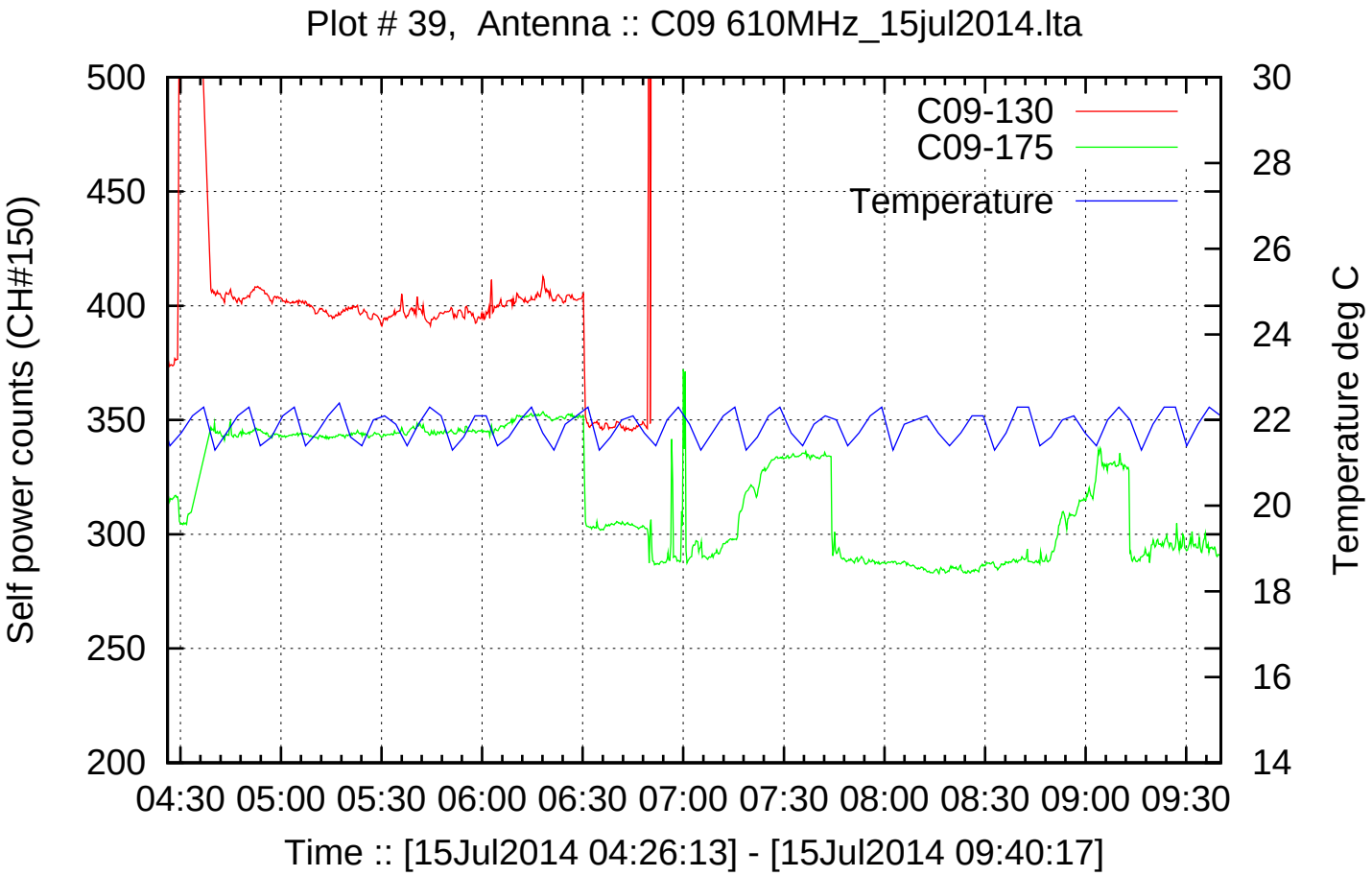

Plot # 34, Antenna :: C03 610MHz_15jul2014.lta
C03-130
C03-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

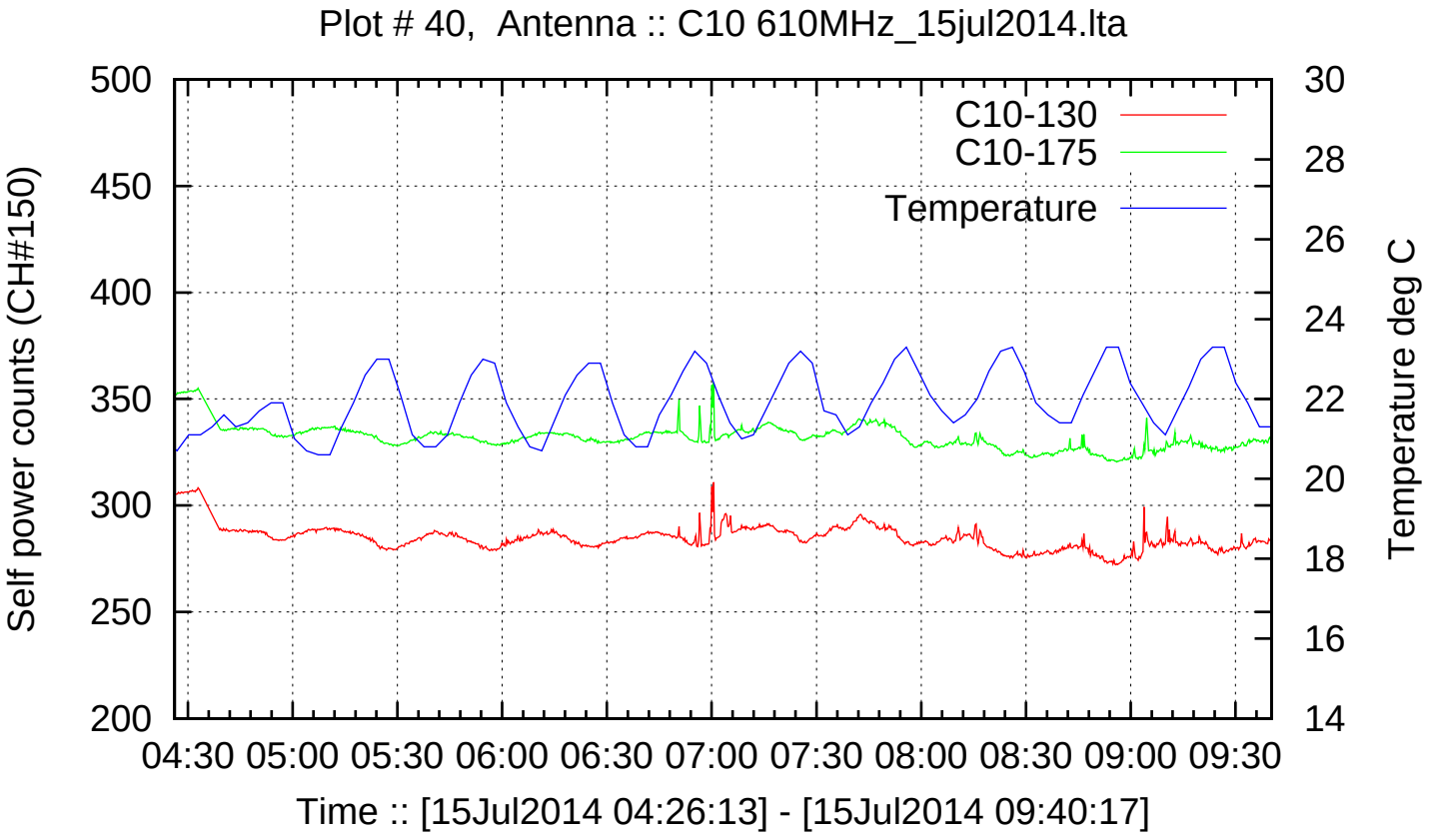

Plot # 35, Antenna :: C04 610MHz_15jul2014.lta
C04-130
C04-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

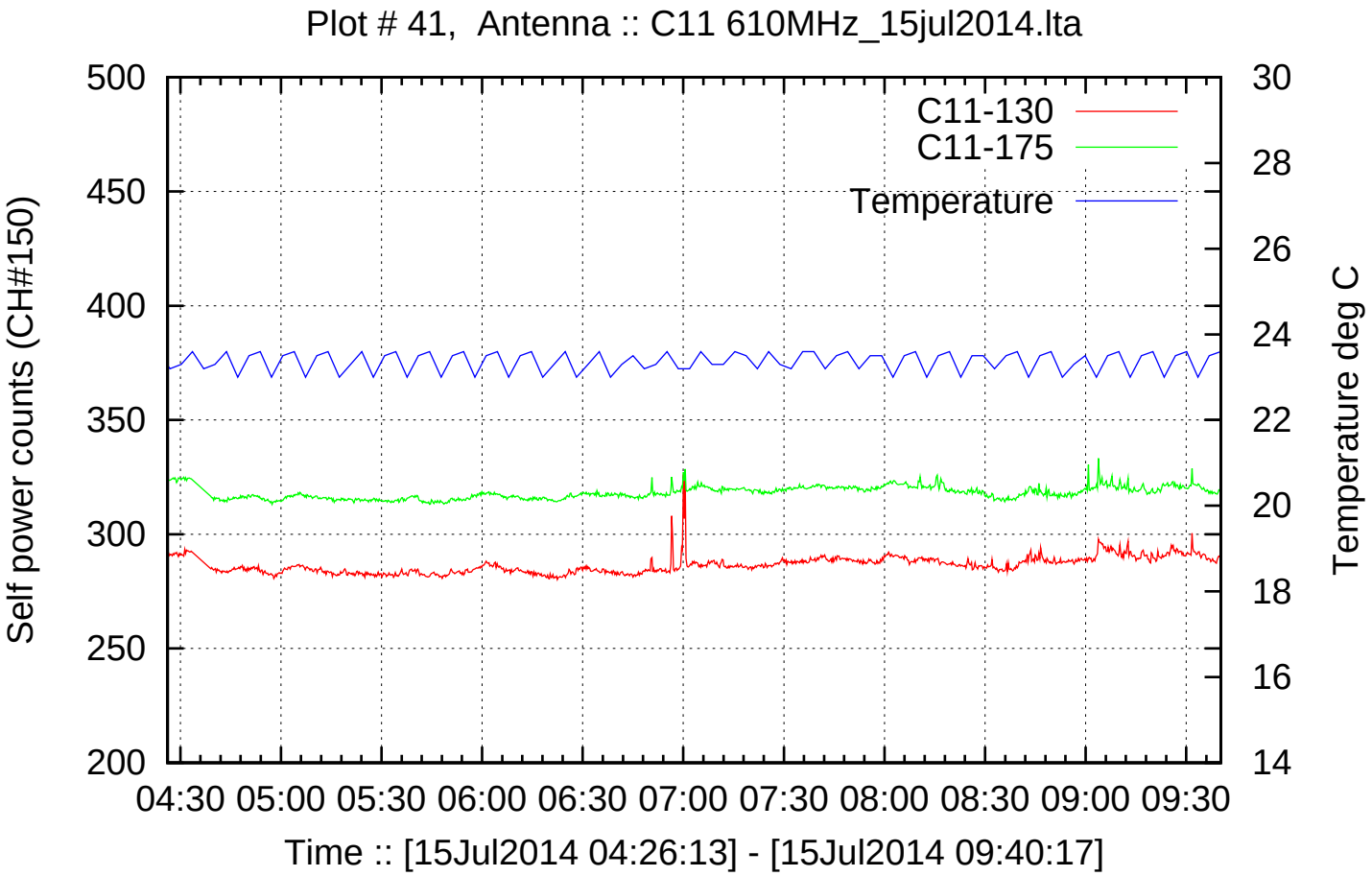

Plot # 36, Antenna :: C05 610MHz_15jul2014.lta
C05-130
C05-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

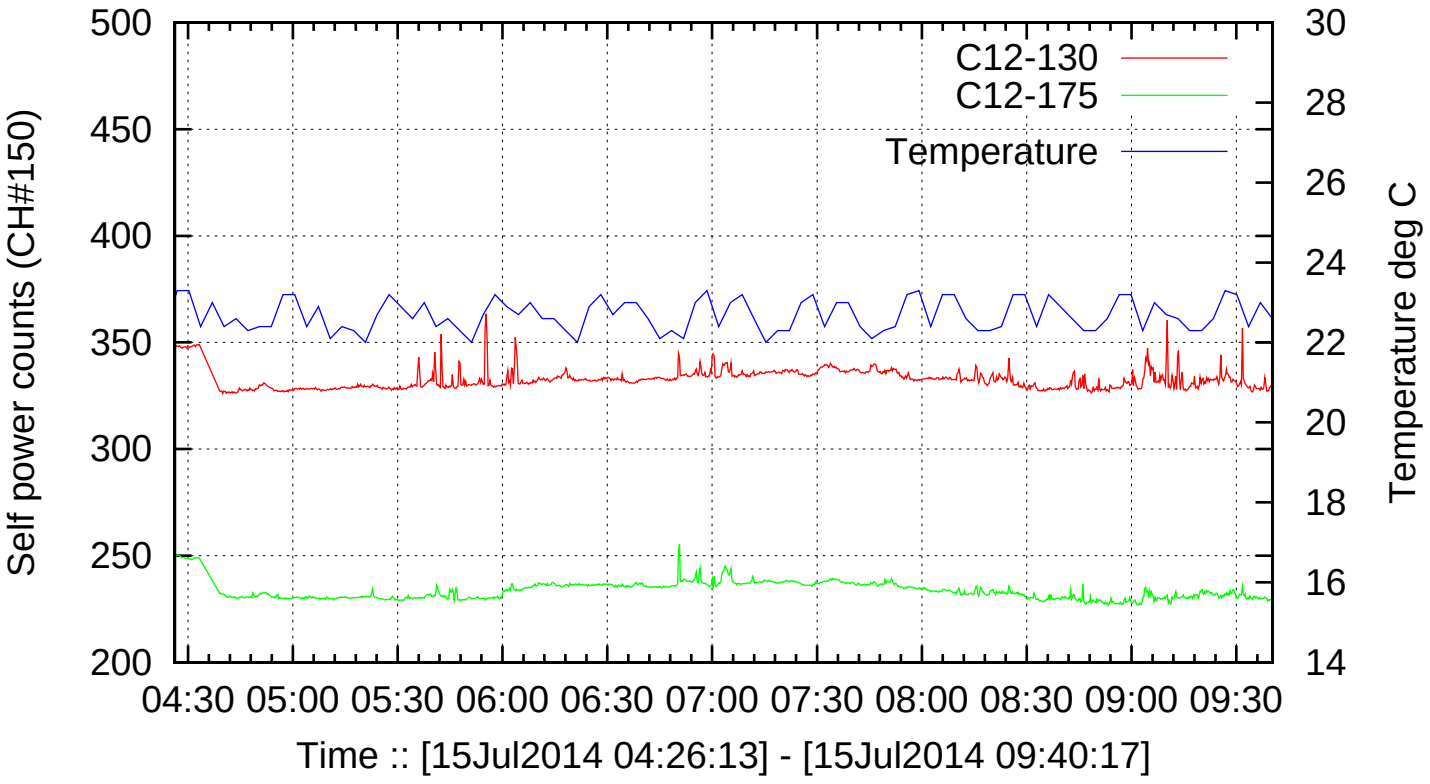

Plot # 37, Antenna :: C06 610MHz_15jul2014.lta
C06-130
C06-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

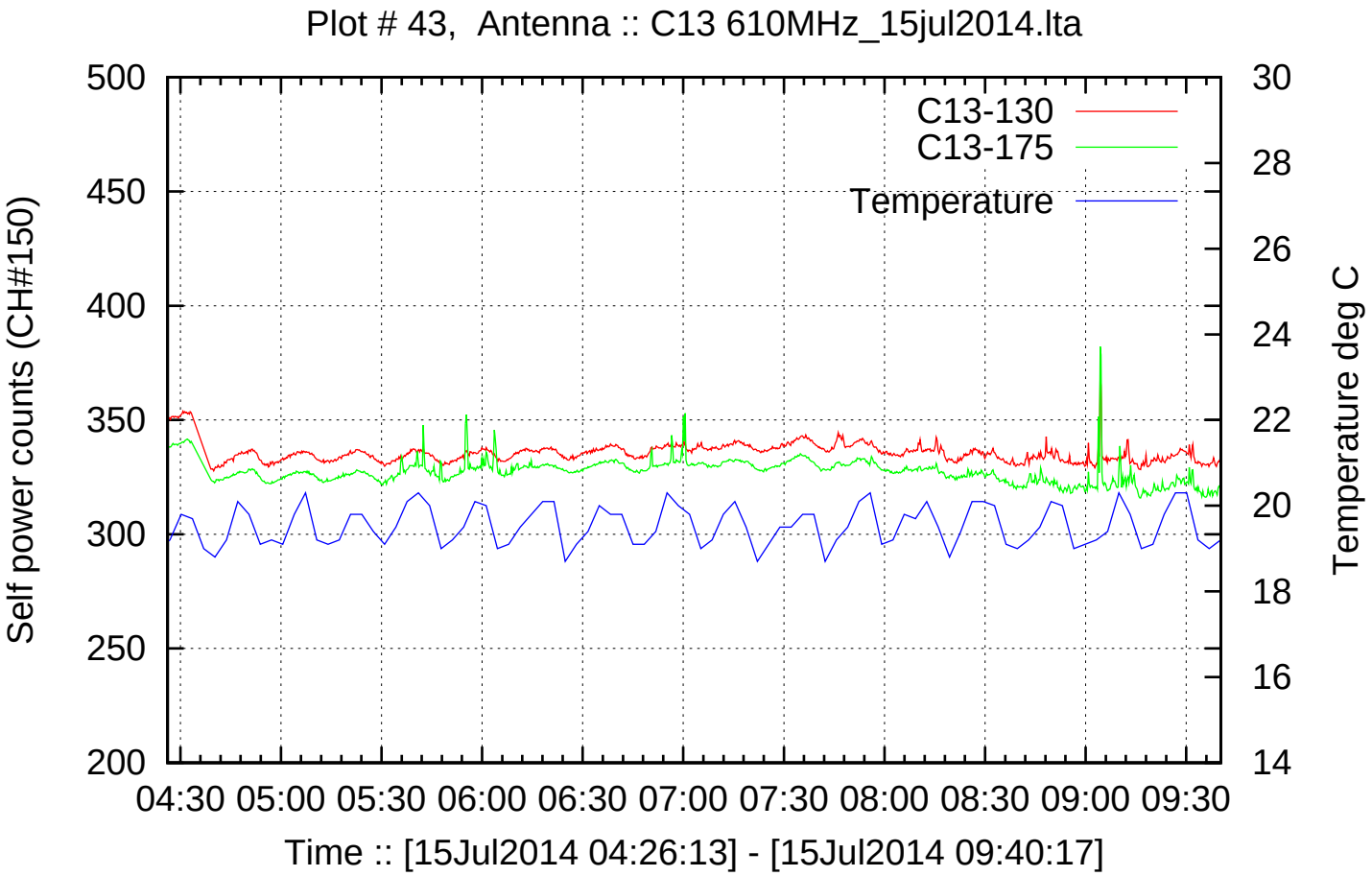

Plot # 38, Antenna :: C08 610MHz_15jul2014.lta
C08-130
C08-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

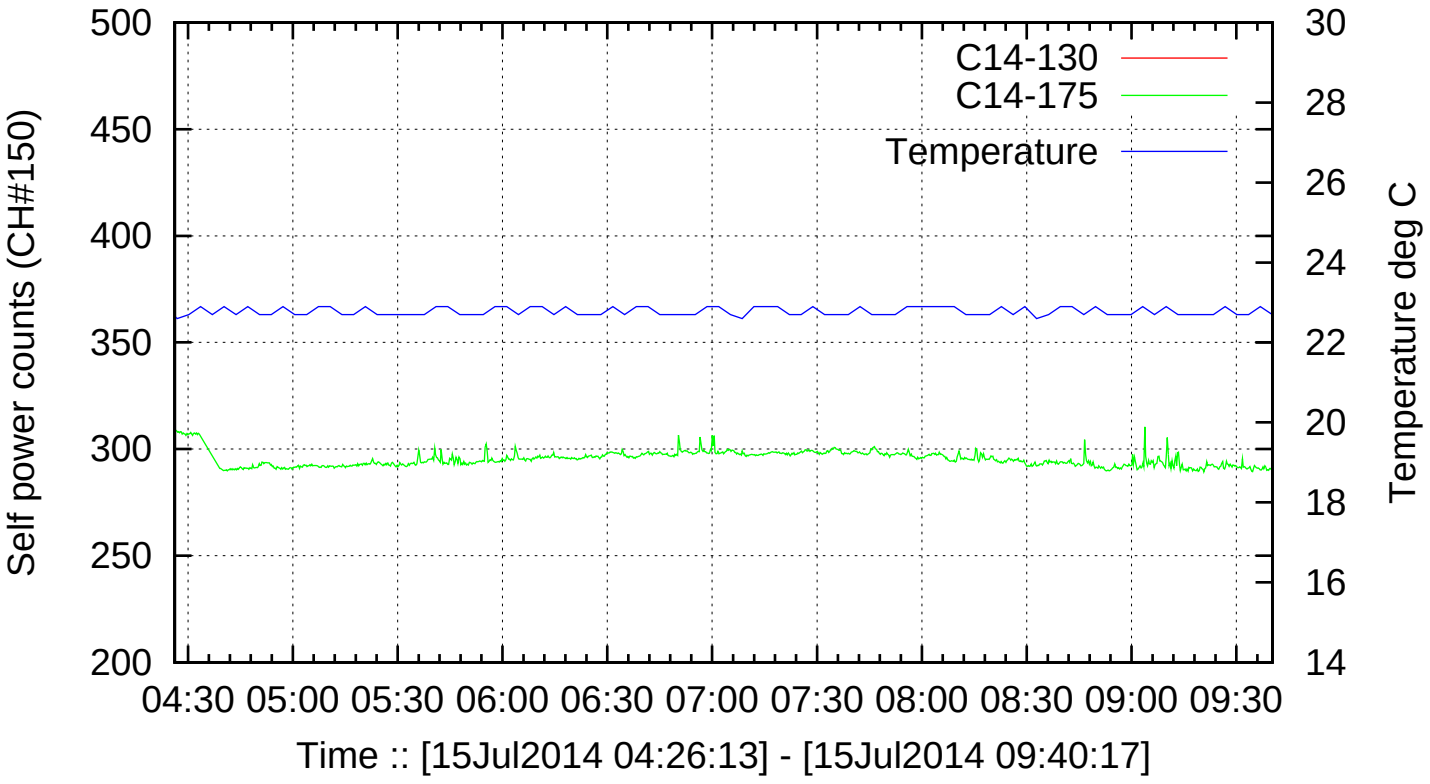

Plot # 39, Antenna :: C09 610MHz_15jul2014.lta
C09-130
C09-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

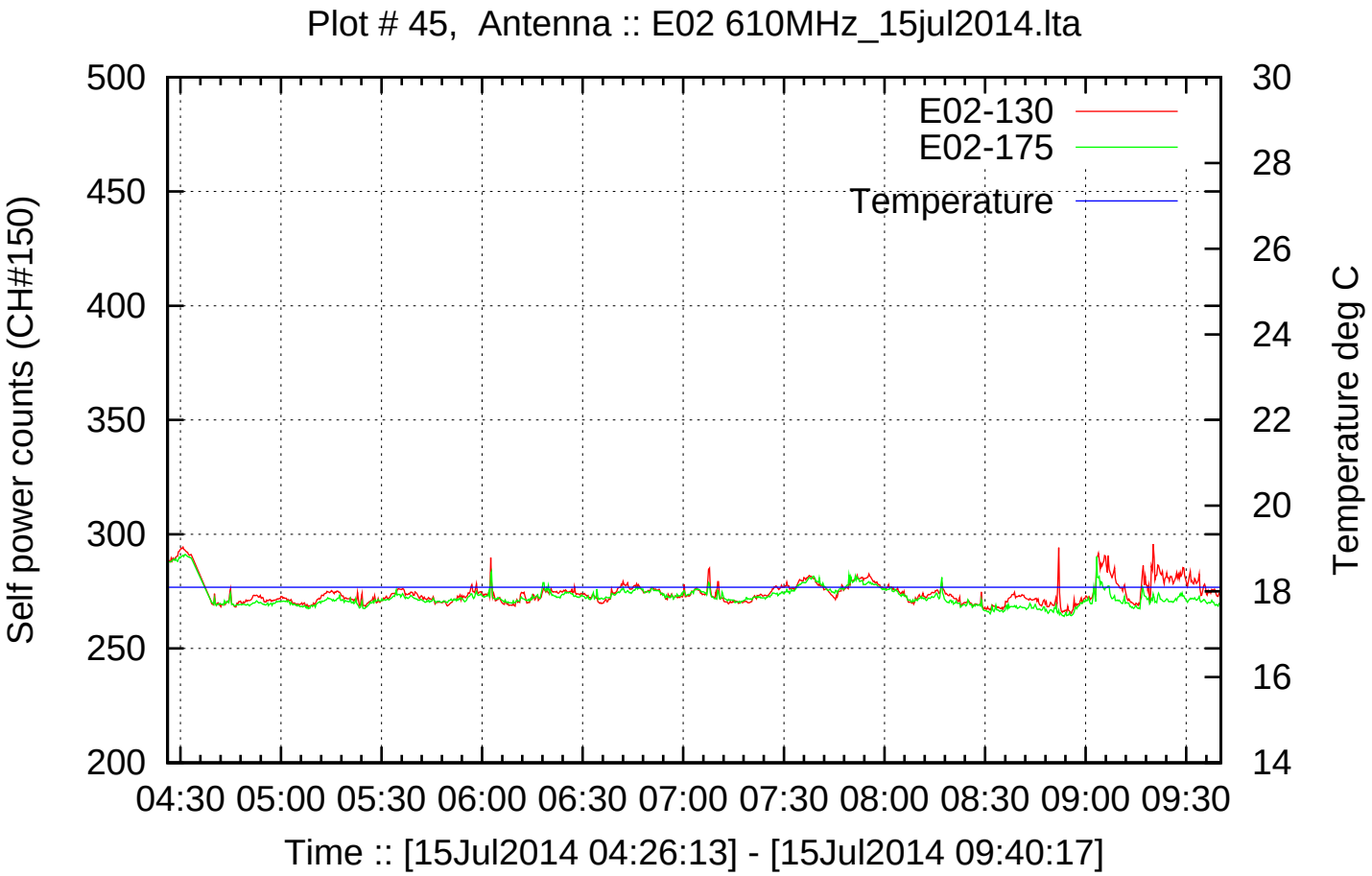

Plot # 40, Antenna :: C10 610MHz_15jul2014.lta
C10-130
C10-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

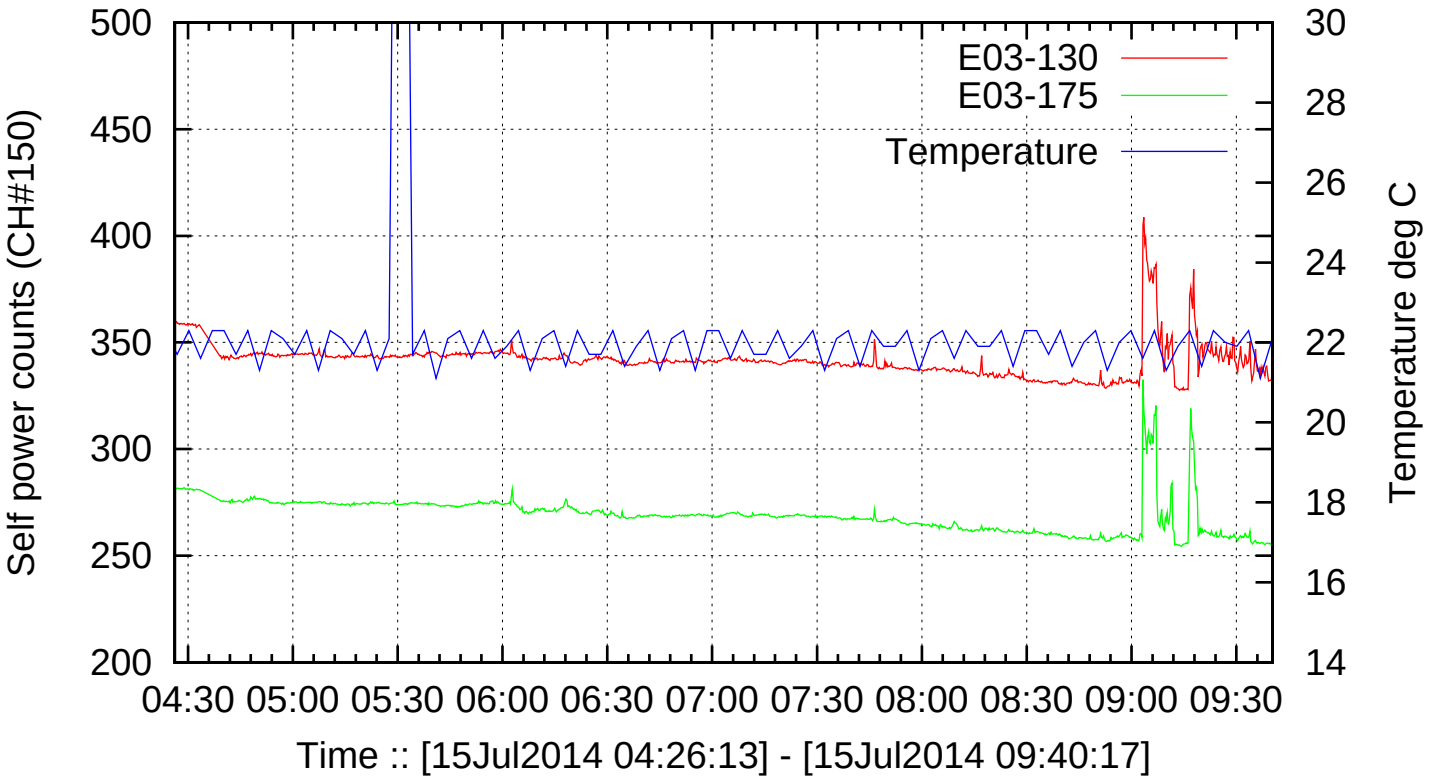

Plot # 41, Antenna :: C11 610MHz_15jul2014.lta
C11-130
C11-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

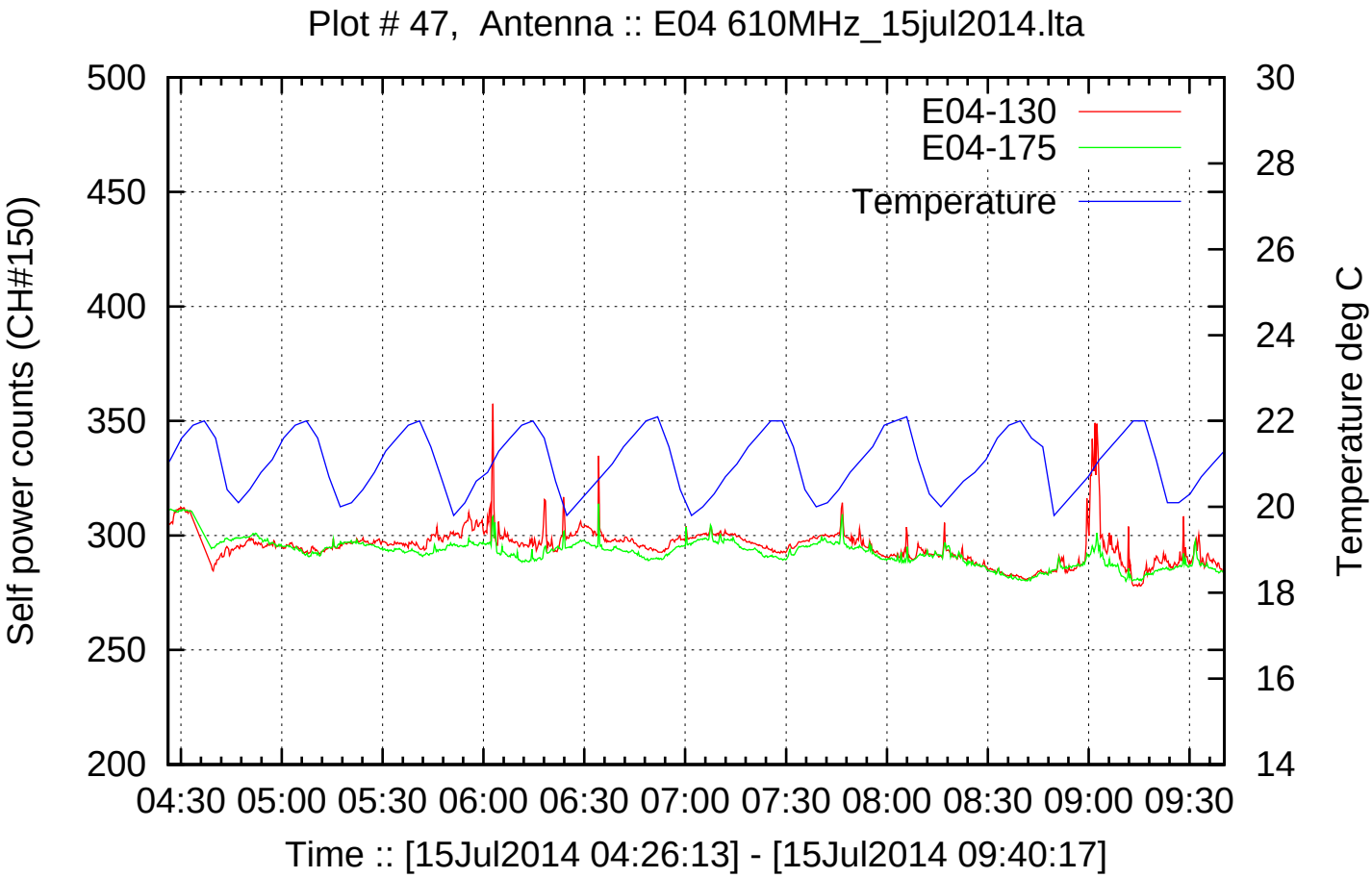

Plot # 42, Antenna :: C12 610MHz_15jul2014.lta
C12-130
C12-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

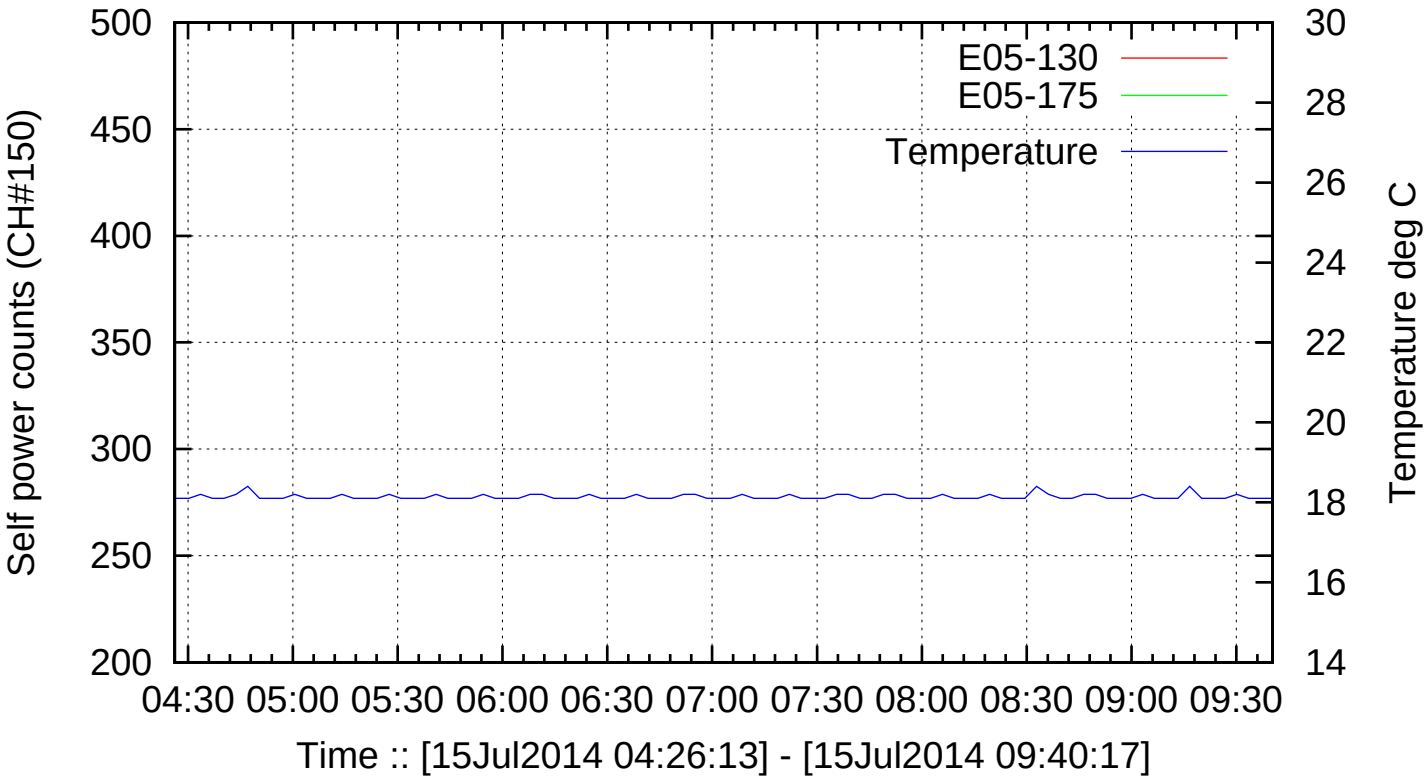

Plot # 43, Antenna :: C13 610MHz_15jul2014.lta
C13-130
C13-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

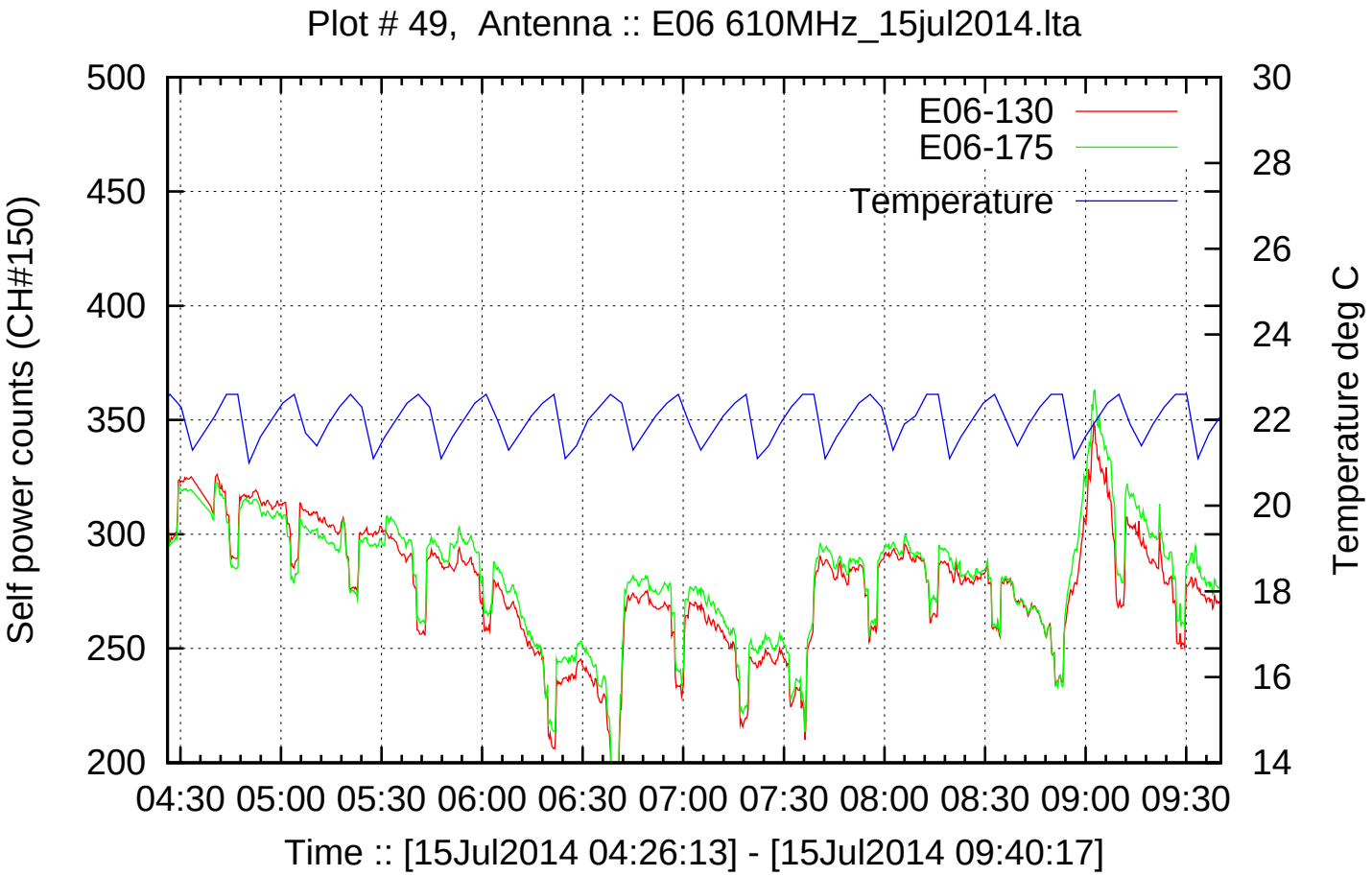

Plot # 44, Antenna :: C14 610MHz_15jul2014.lta
C14-130
C14-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

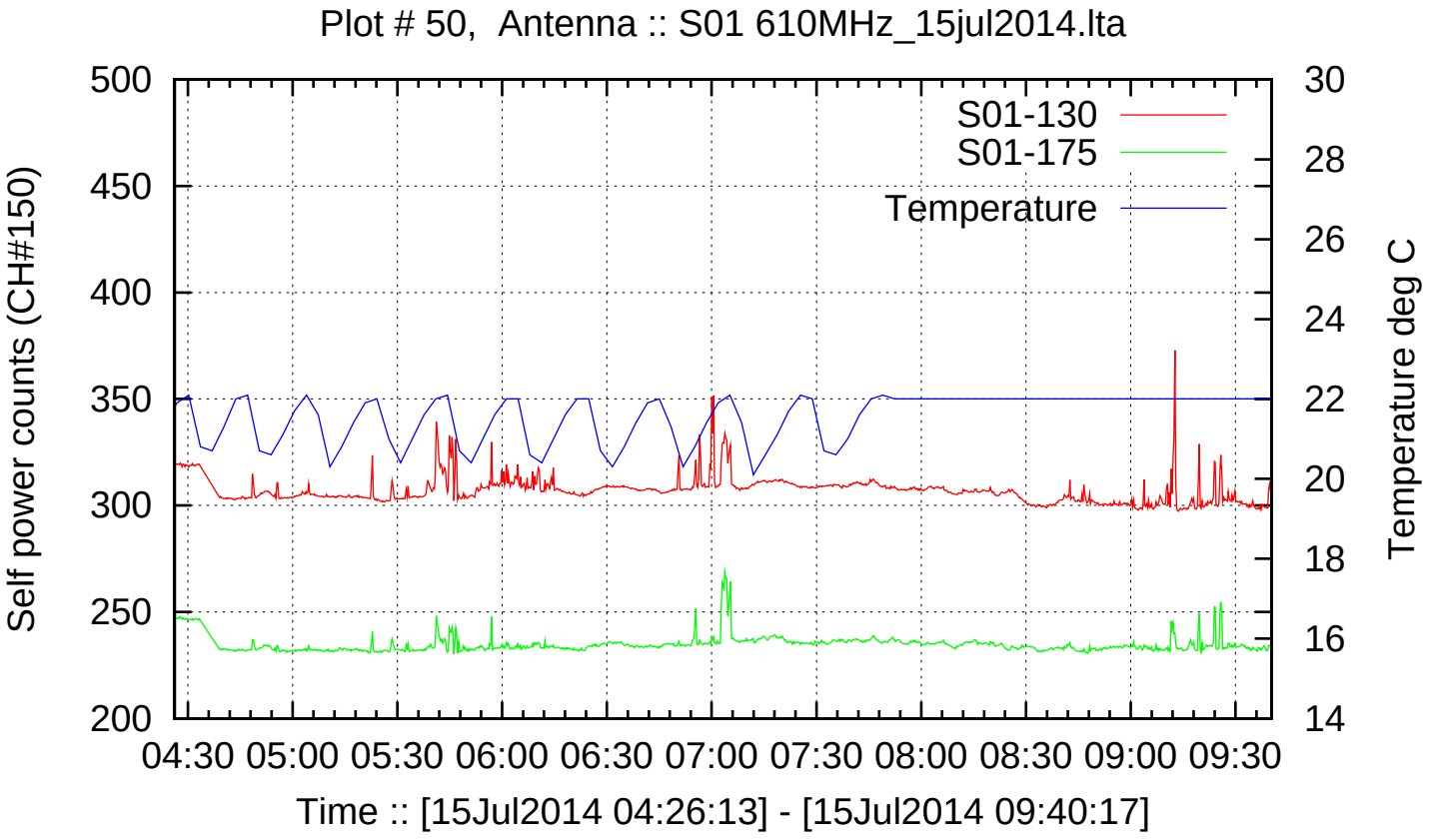

Plot # 45, Antenna :: E02 610MHz_15jul2014.lta
E02-130
E02-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

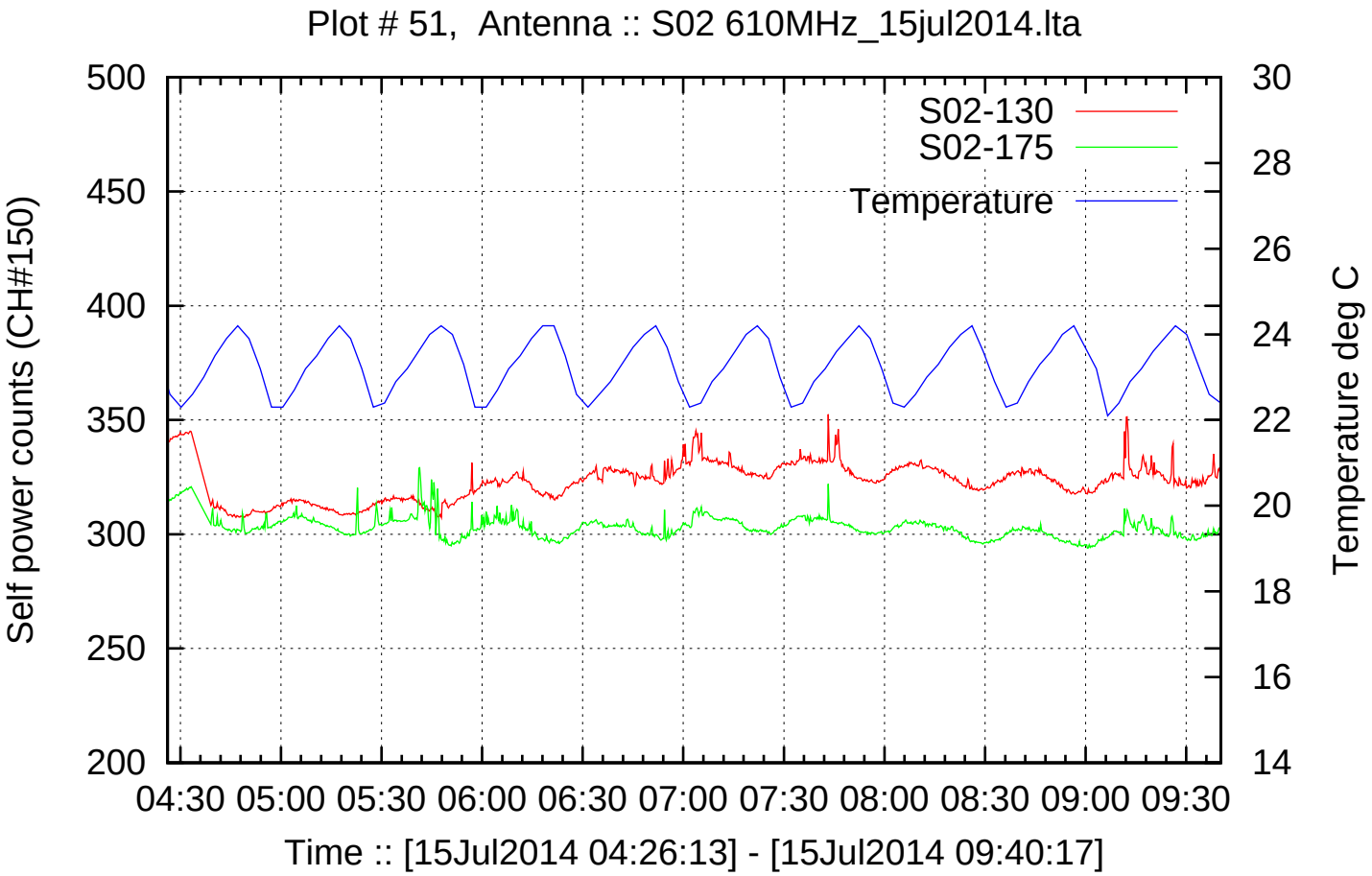

Plot # 46, Antenna :: E03 610MHz_15jul2014.lta
E03-130
E03-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

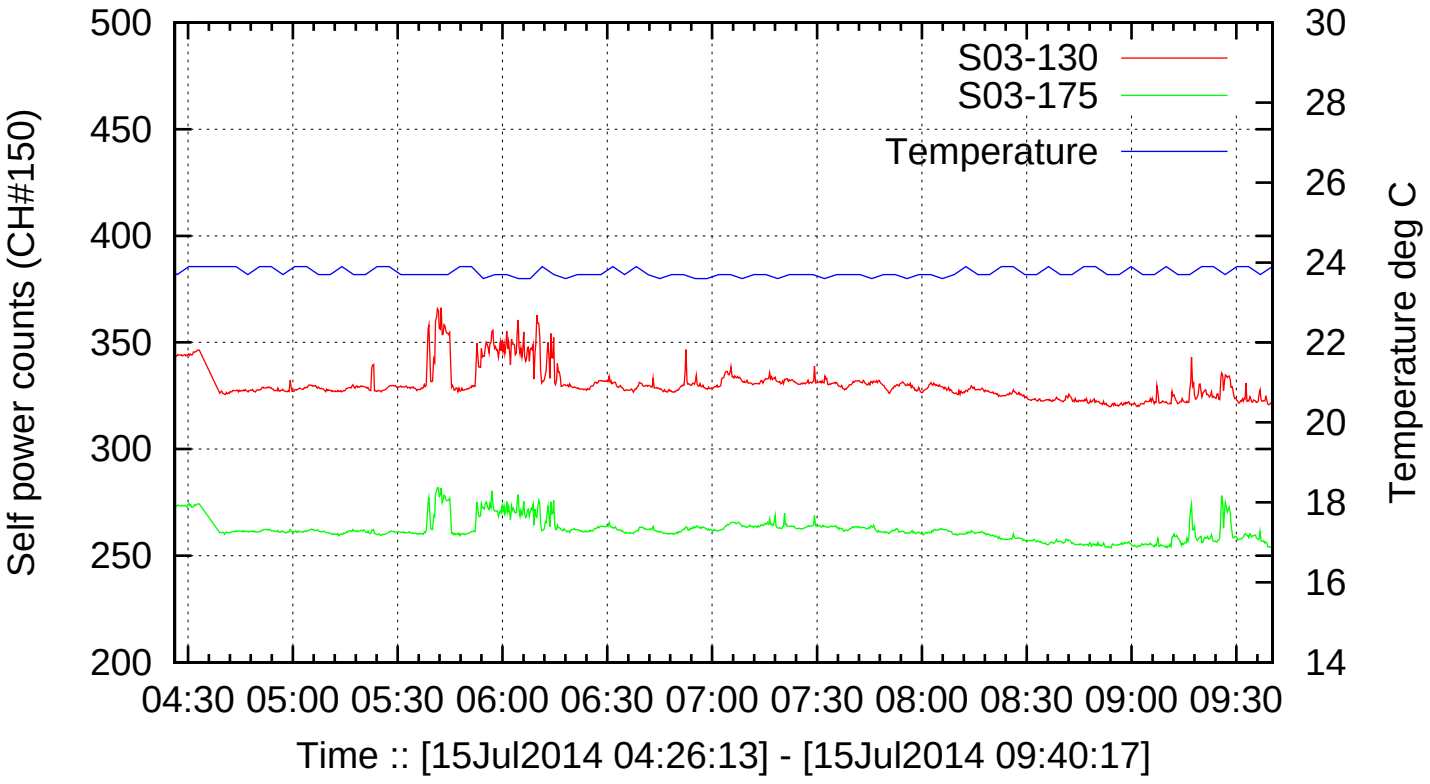

Plot # 47, Antenna :: E04 610MHz_15jul2014.lta
E04-130
E04-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

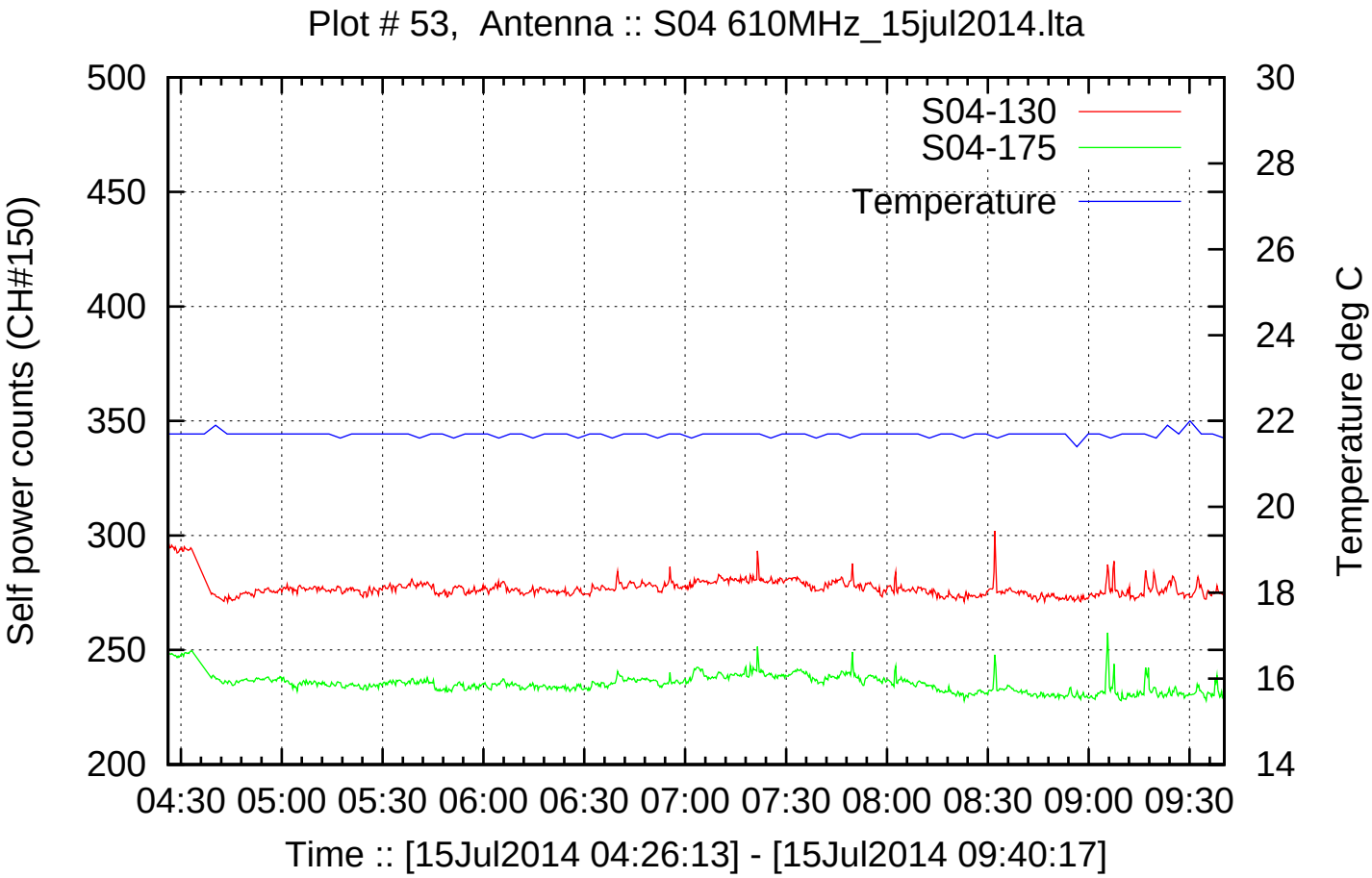

Plot # 48, Antenna :: E05 610MHz_15jul2014.lta
E05-130
E05-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

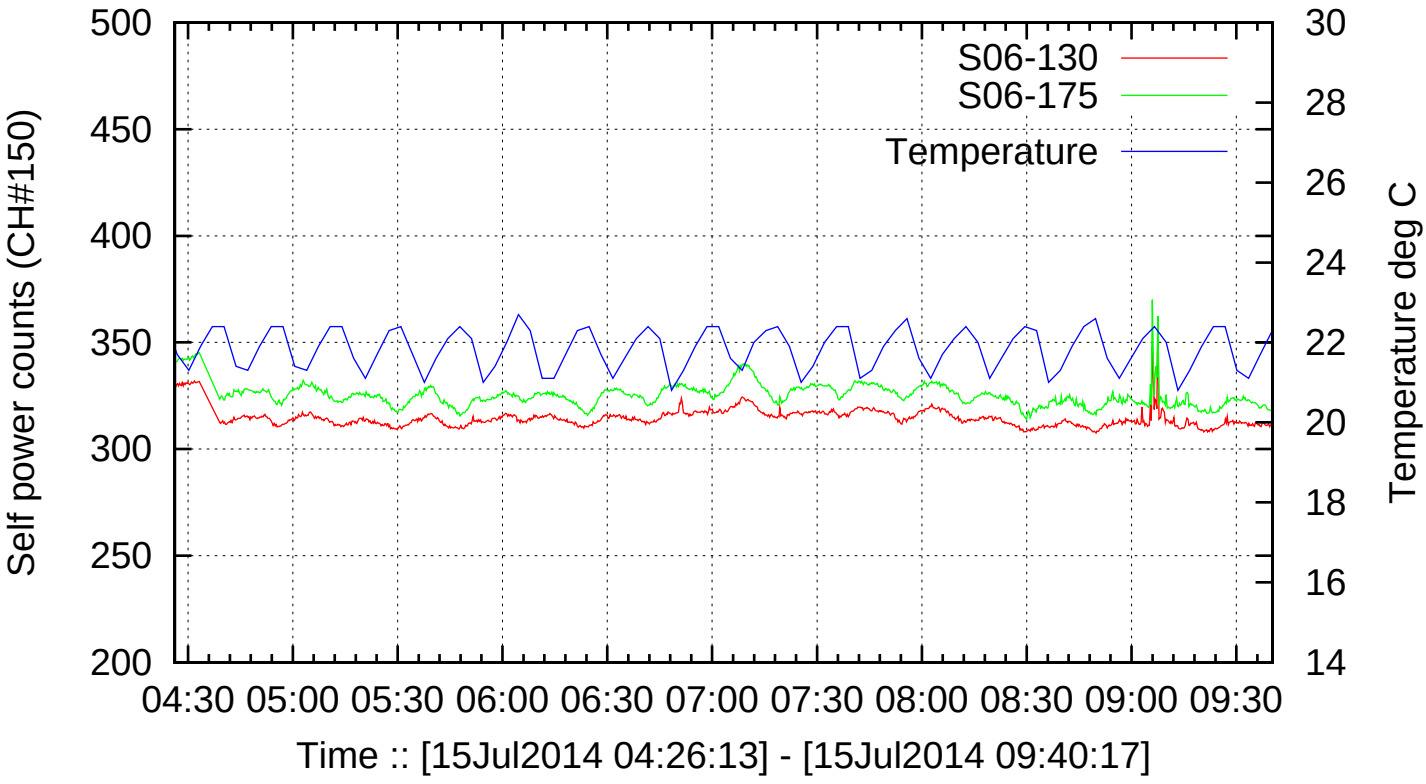

Plot # 49, Antenna :: E06 610MHz_15jul2014.lta
E06-130
E06-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

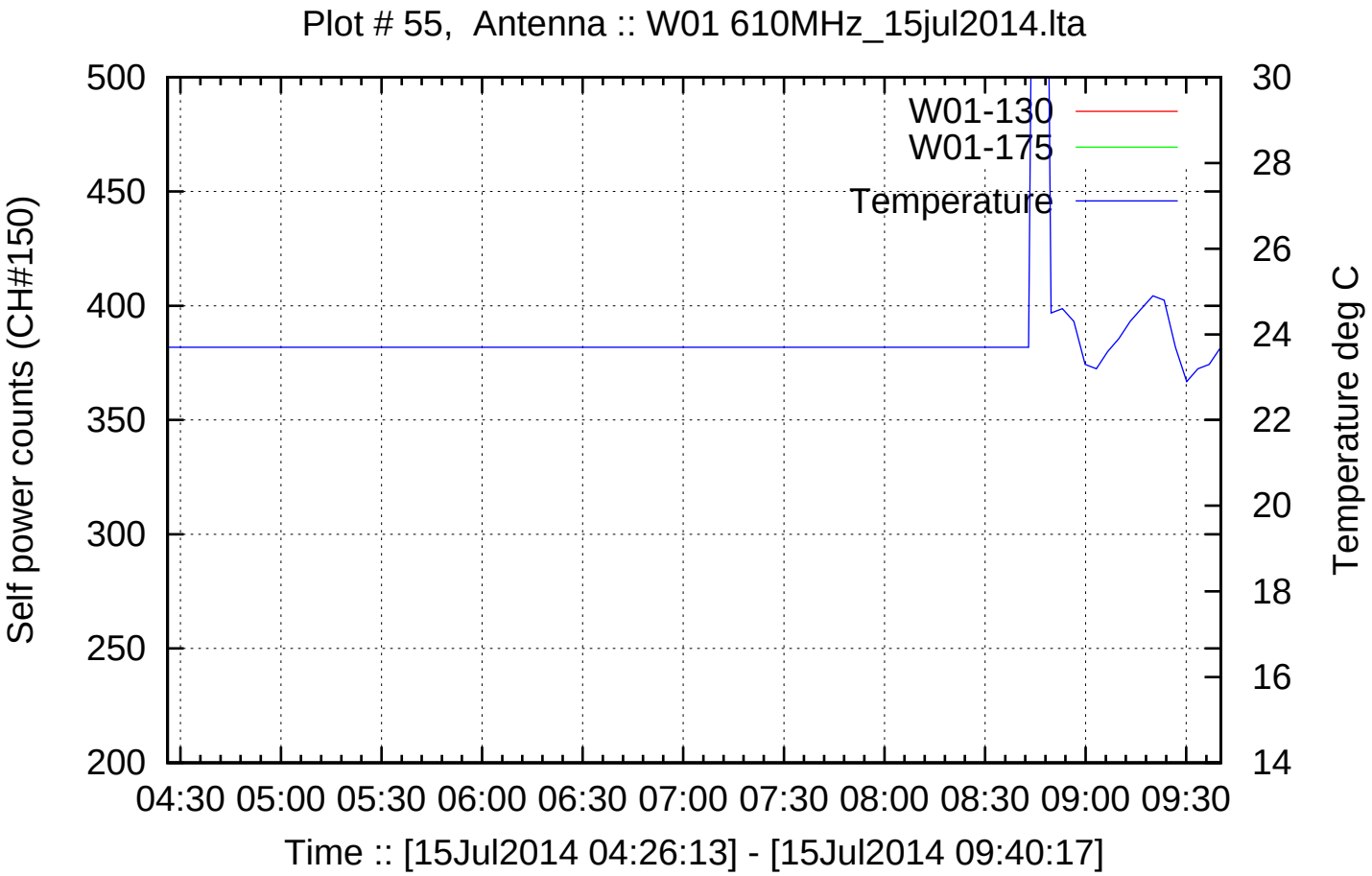

Plot # 50, Antenna :: S01 610MHz_15jul2014.lta
S01-130
S01-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

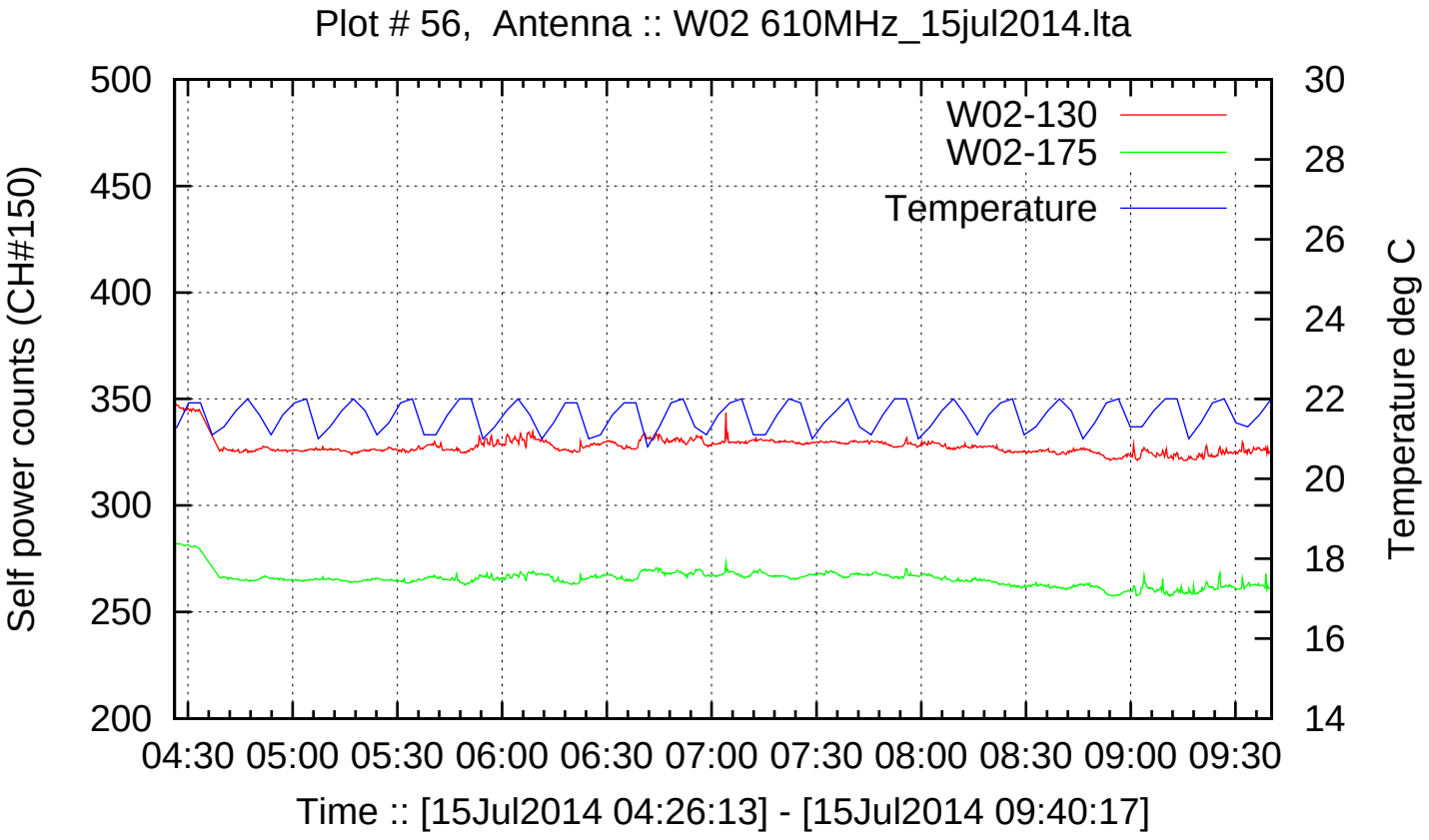

Plot # 51, Antenna :: S02 610MHz_15jul2014.lta
S02-130
S02-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

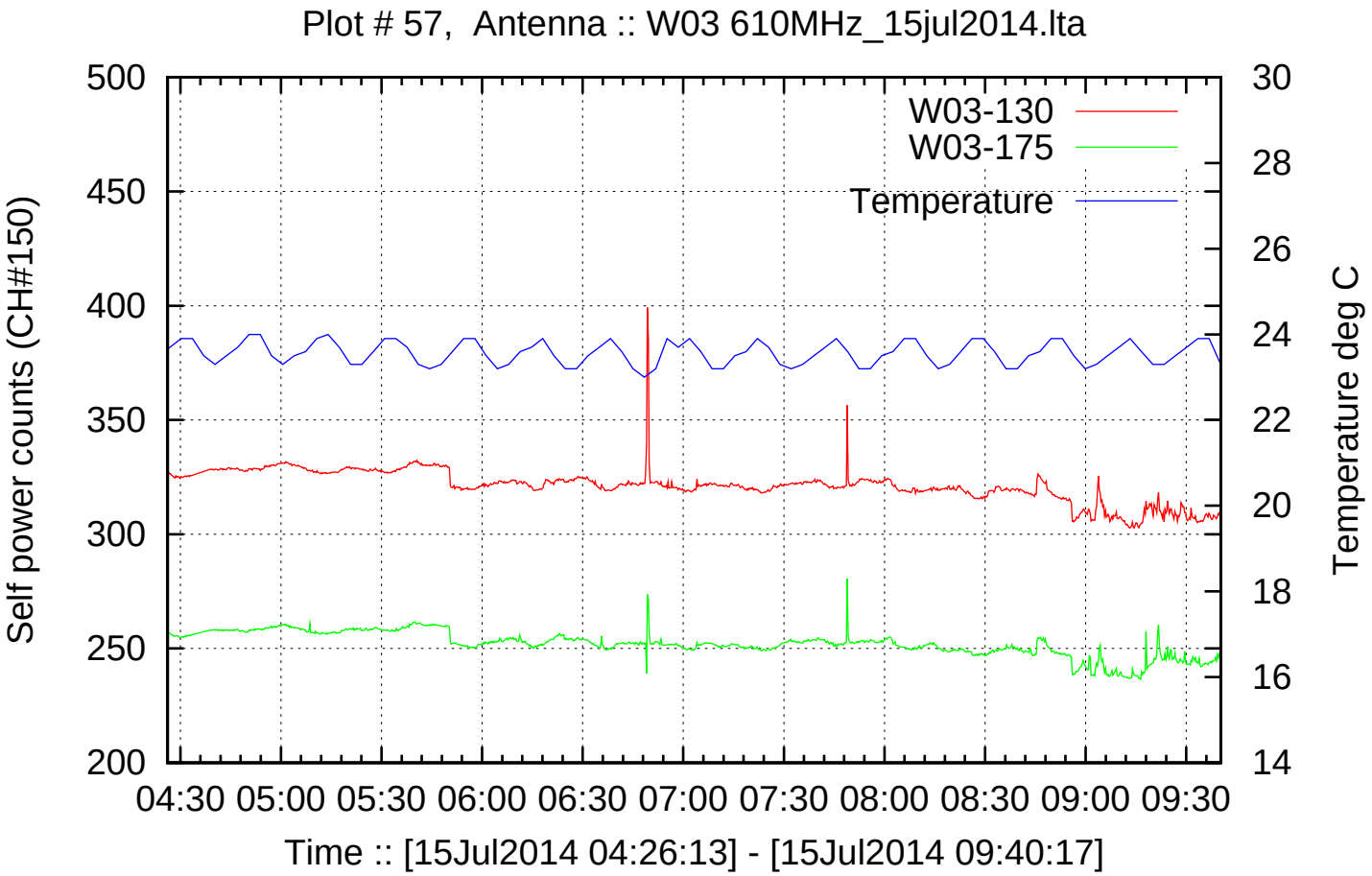

Plot # 52, Antenna :: S03 610MHz_15jul2014.lta
S03-130
S03-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

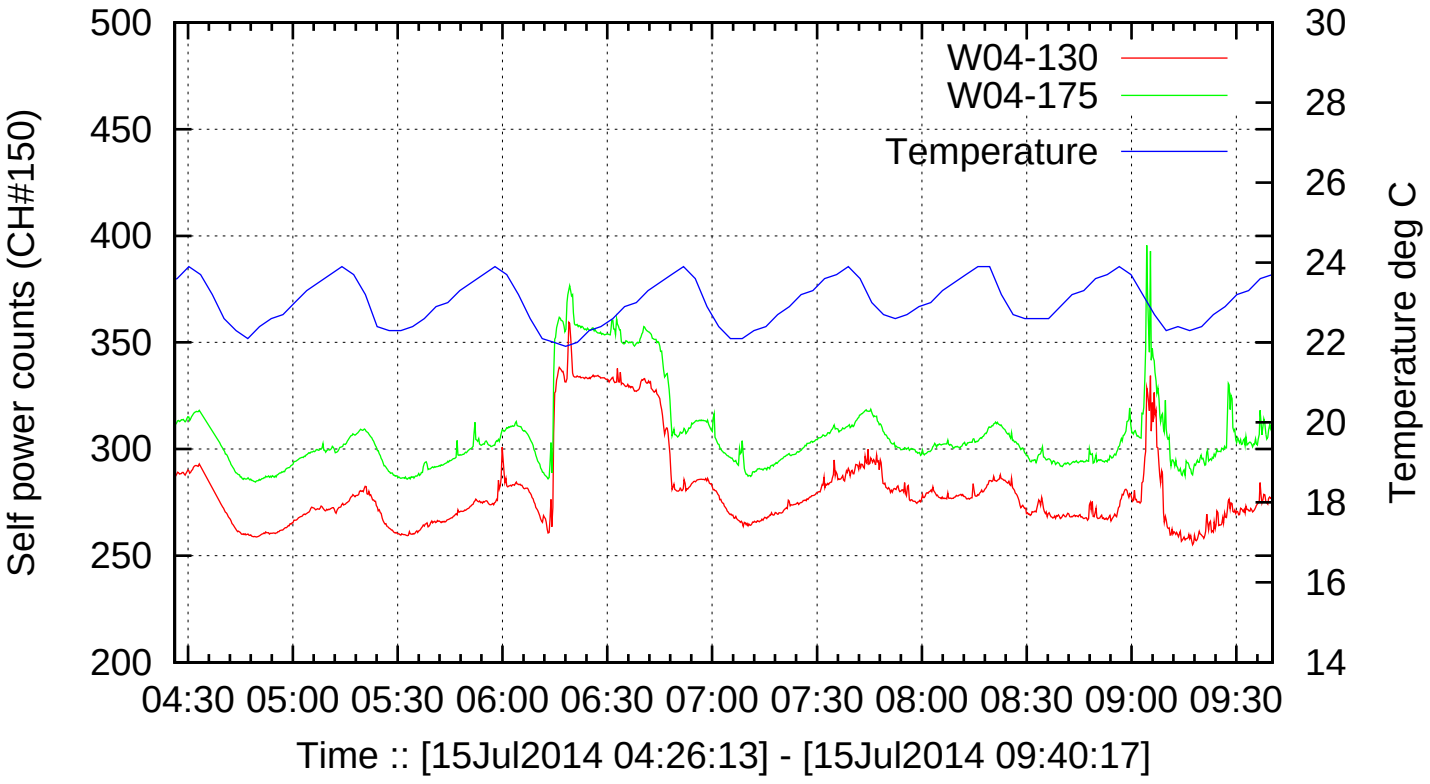

Plot # 53, Antenna :: S04 610MHz_15jul2014.lta
S04-130
S04-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

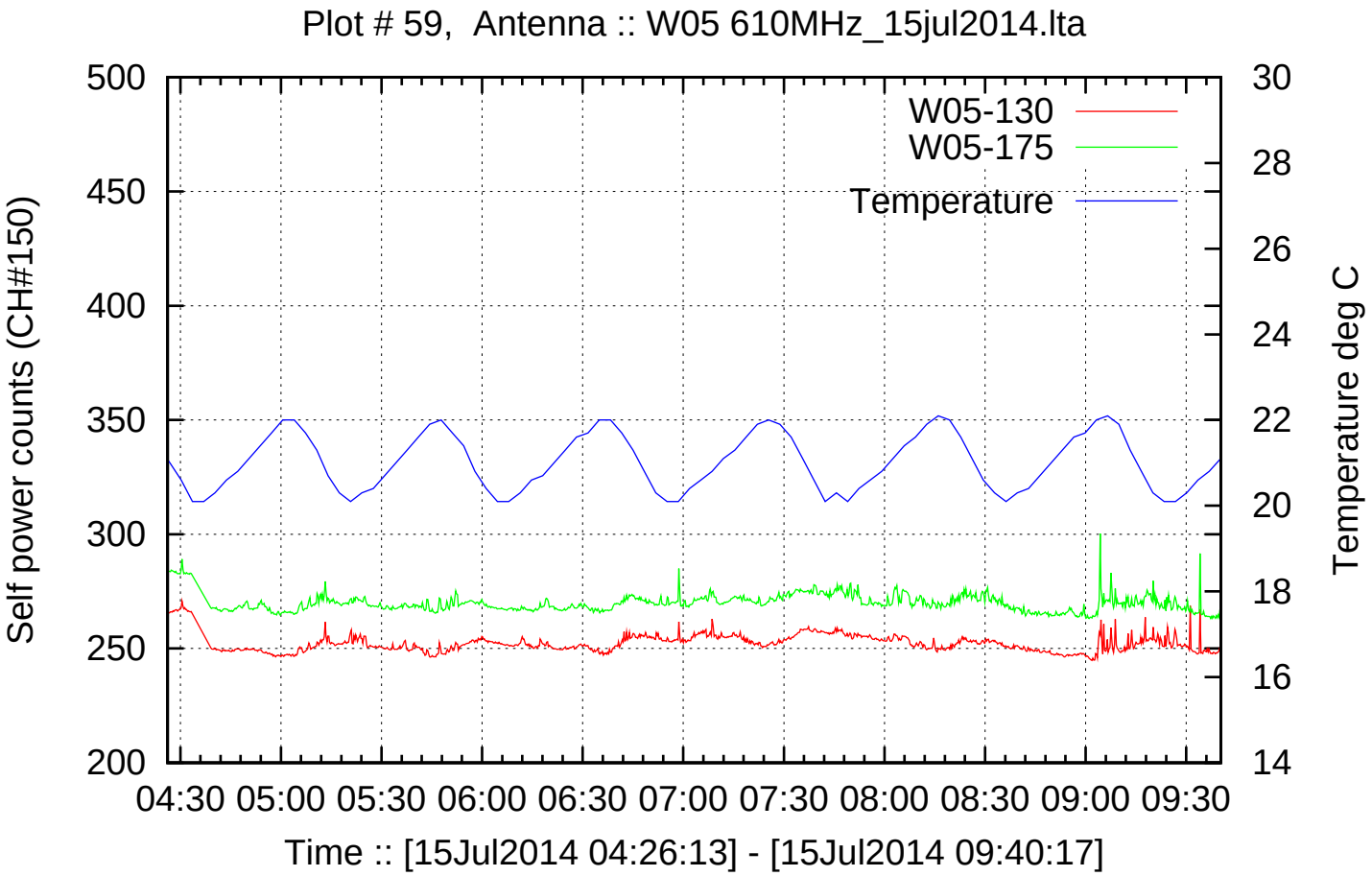

Plot # 54, Antenna :: S06 610MHz_15jul2014.lta
S06-130
S06-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

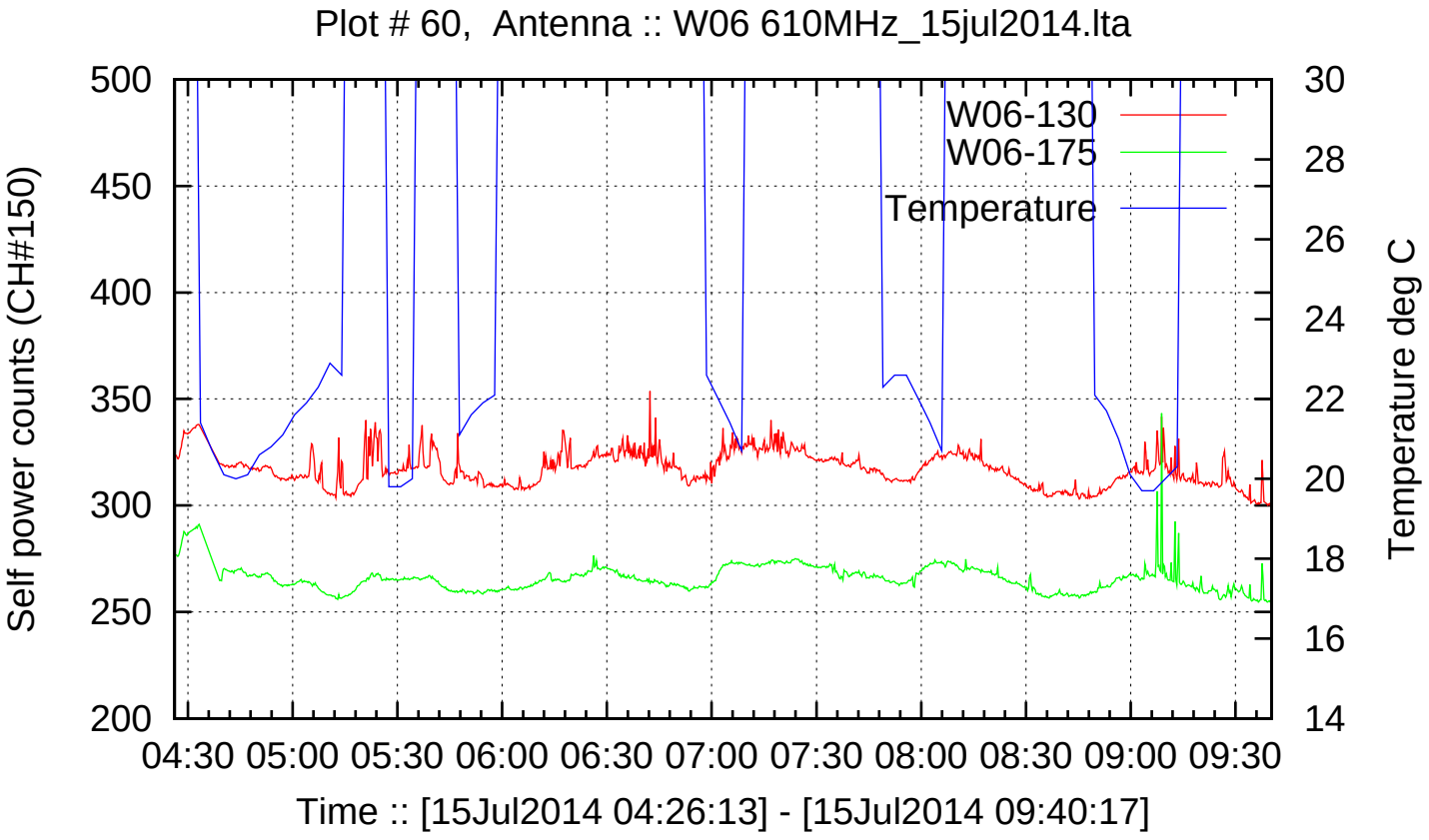

Plot # 55, Antenna :: W01 610MHz_15jul2014.lta
W01-130
W01-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

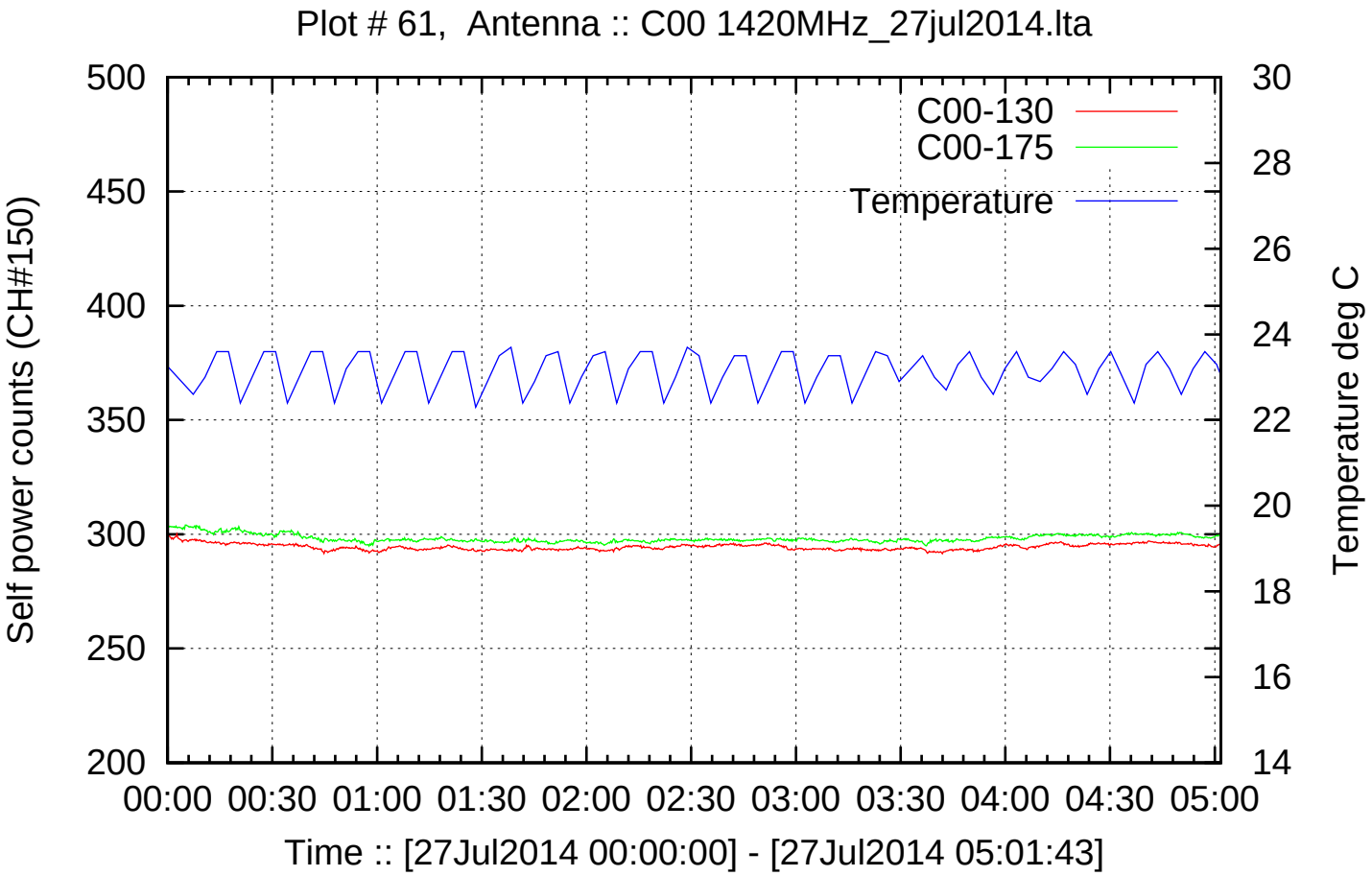

Plot # 56, Antenna :: W02 610MHz_15jul2014.lta
W02-130
W02-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

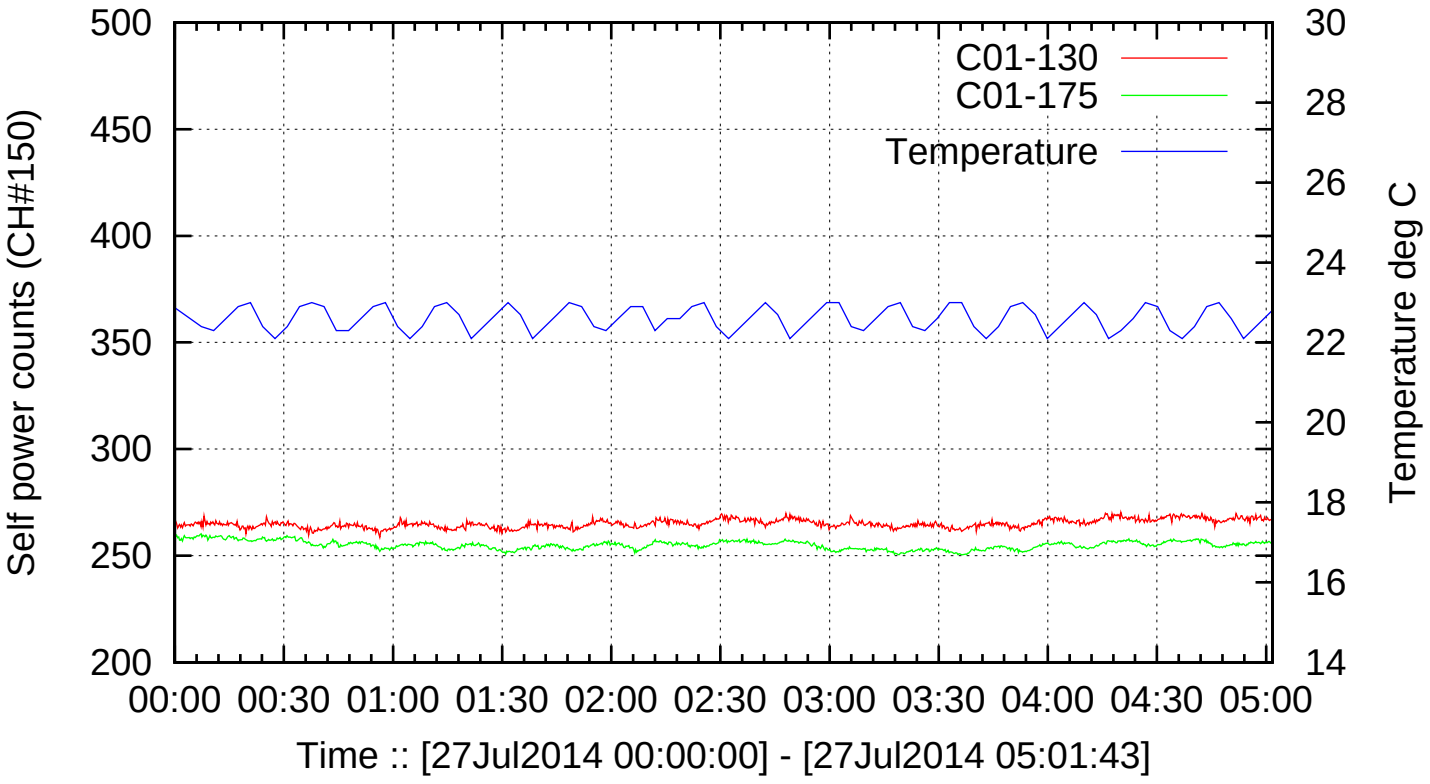

Plot # 57, Antenna :: W03 610MHz_15jul2014.lta
W03-130
W03-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

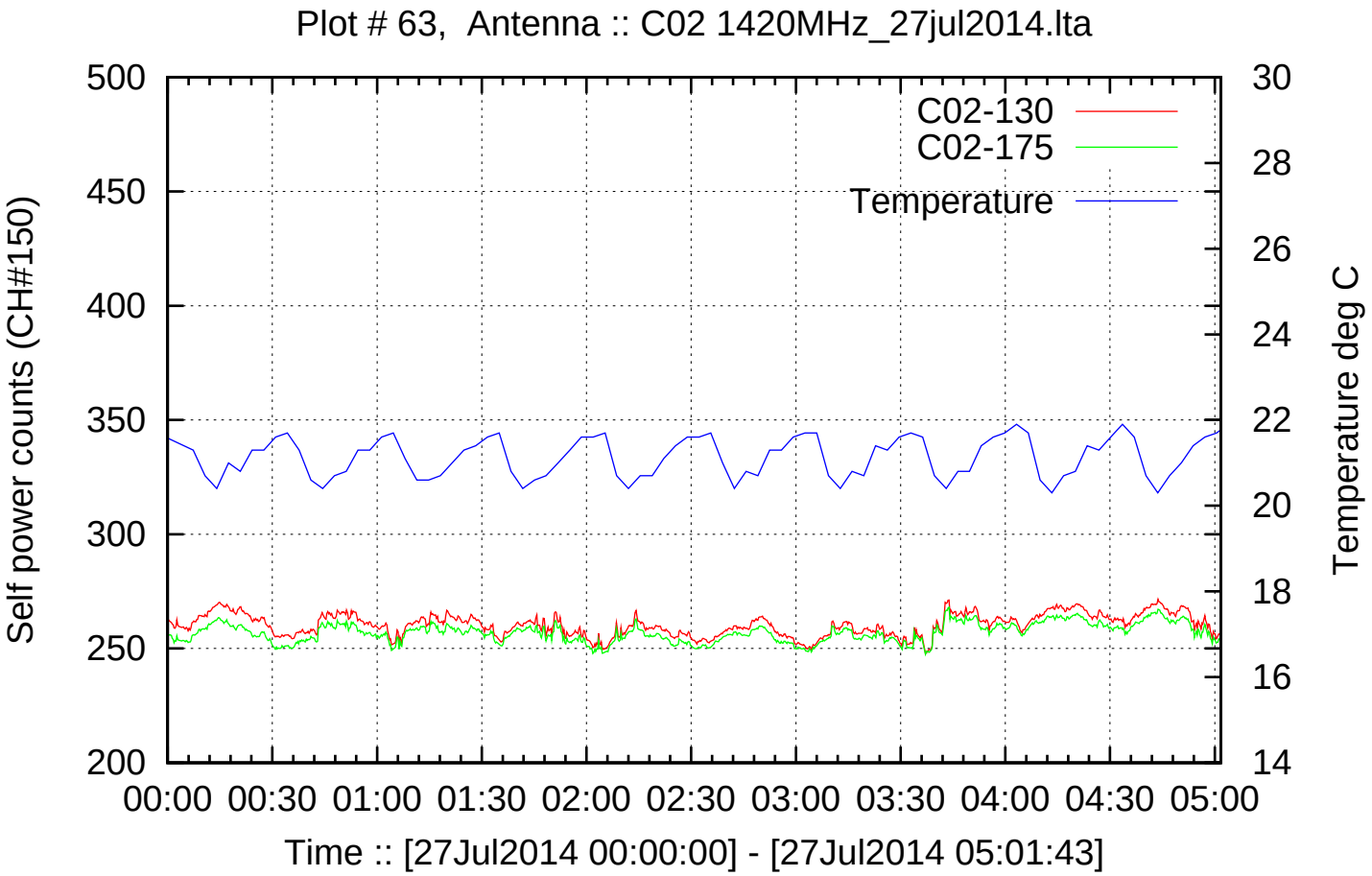

Plot # 58, Antenna :: W04 610MHz_15jul2014.lta
W04-130
W04-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

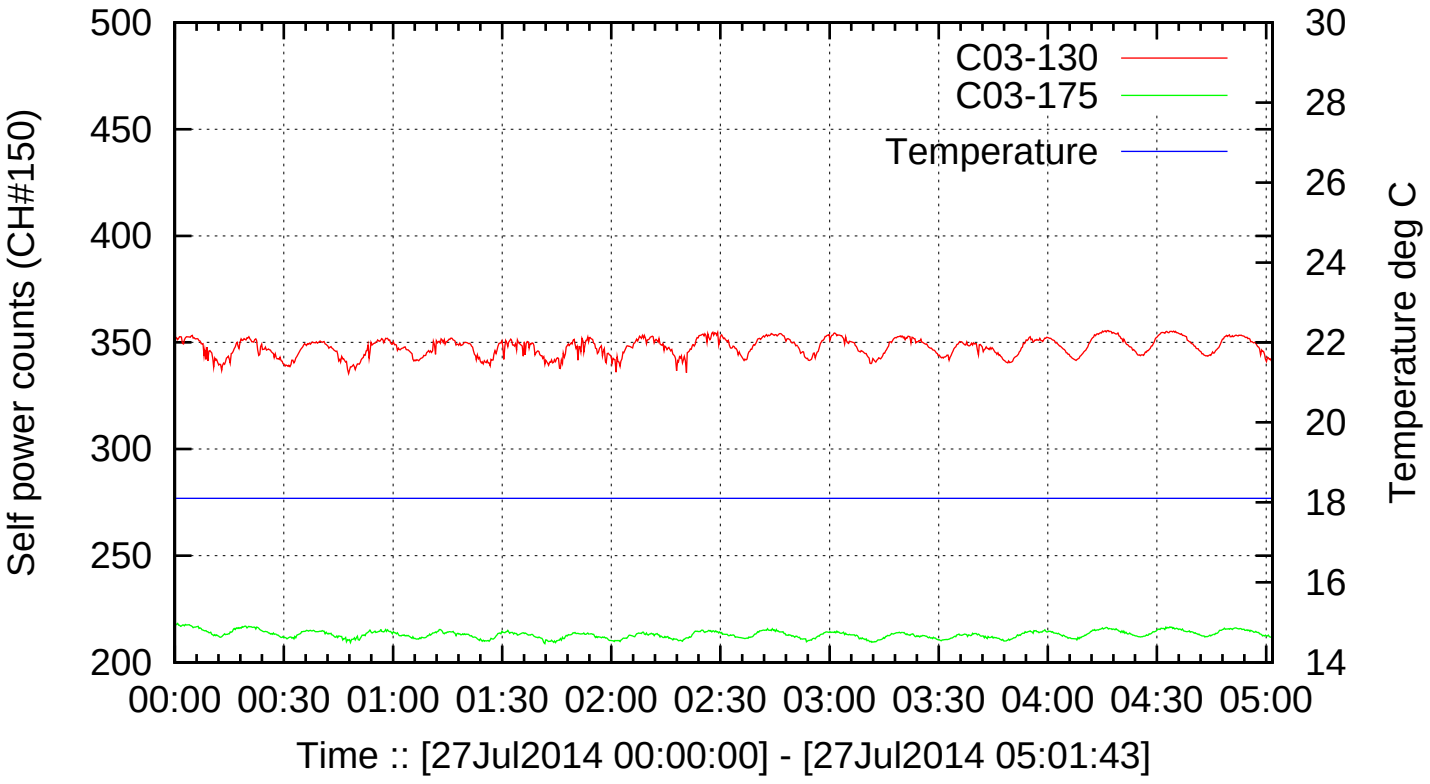

Plot # 59, Antenna :: W05 610MHz_15jul2014.lta
W05-130
W05-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

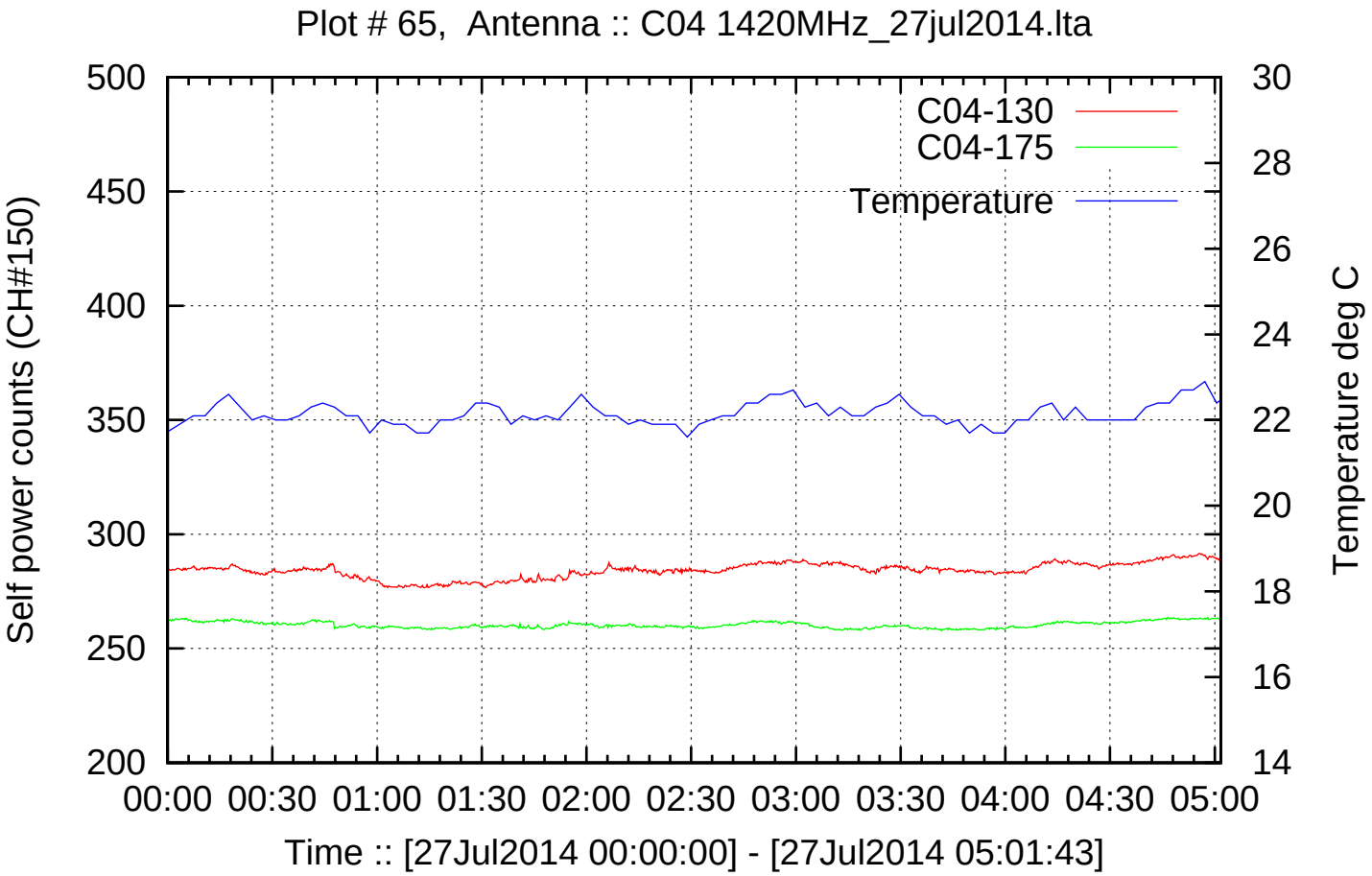

Plot # 60, Antenna :: W06 610MHz_15jul2014.lta
W06-130
W06-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:26:13] - [15Jul2014 09:40:17]

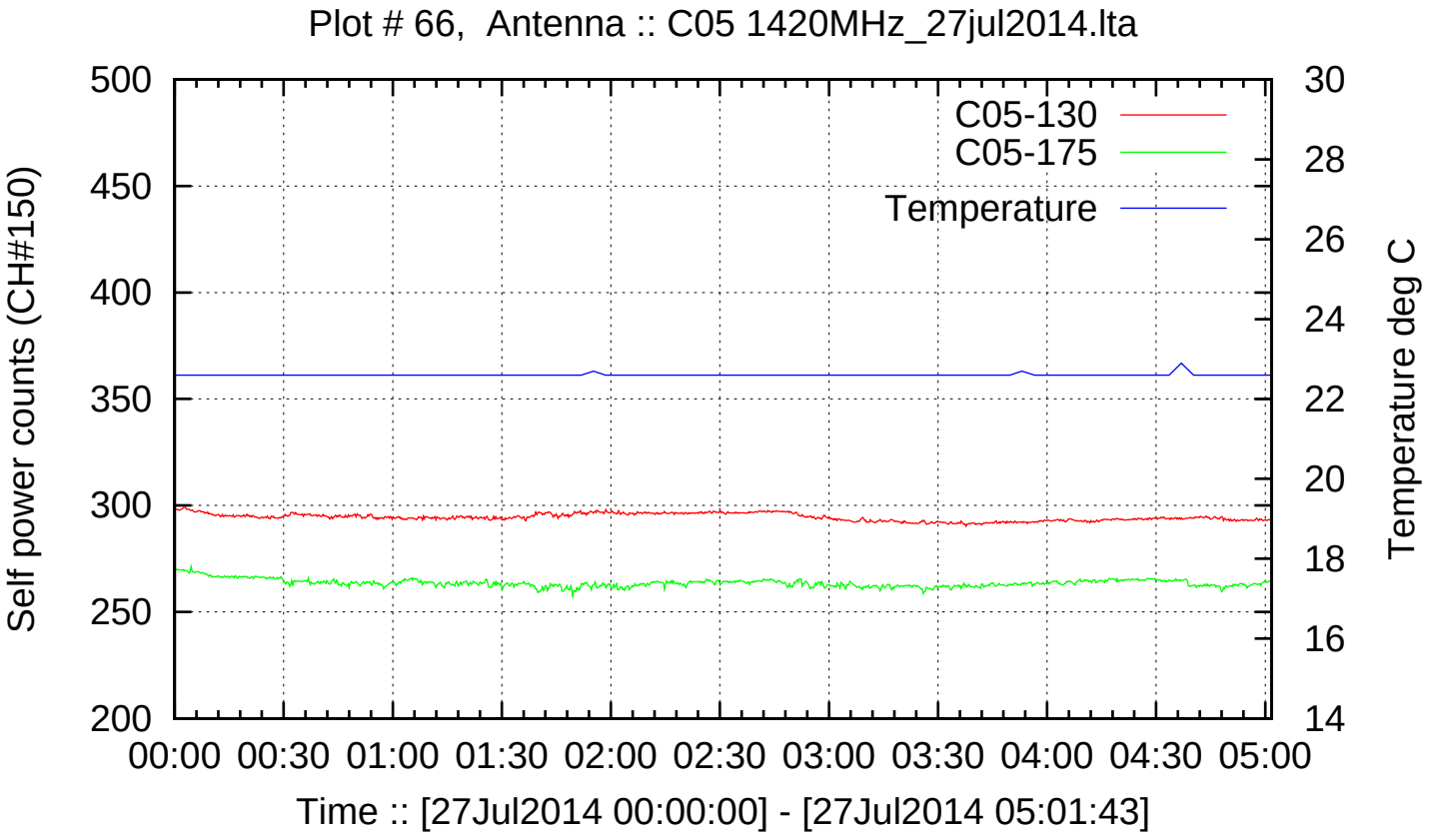

Plot # 61, Antenna :: C00 1420MHz_27jul2014.lta
C00-130
C00-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:01:43]


Plot # 62, Antenna :: C01 1420MHz_27jul2014.lta
C01-130
C01-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:01:43]

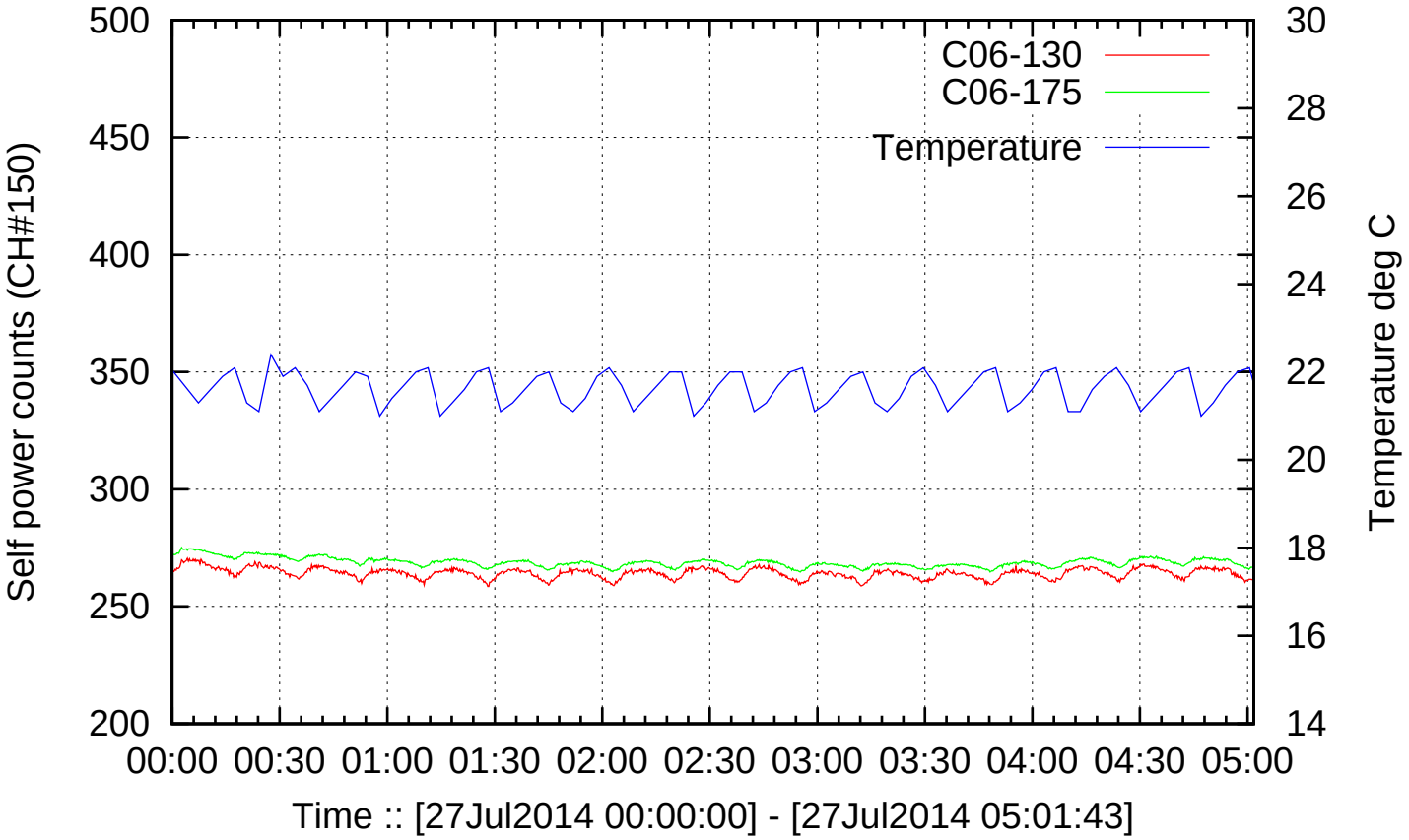

Plot # 63, Antenna :: C02 1420MHz_27jul2014.lta
C02-130
C02-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:01:43]


Plot # 64, Antenna :: C03 1420MHz_27jul2014.lta
C03-130
C03-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:01:43]

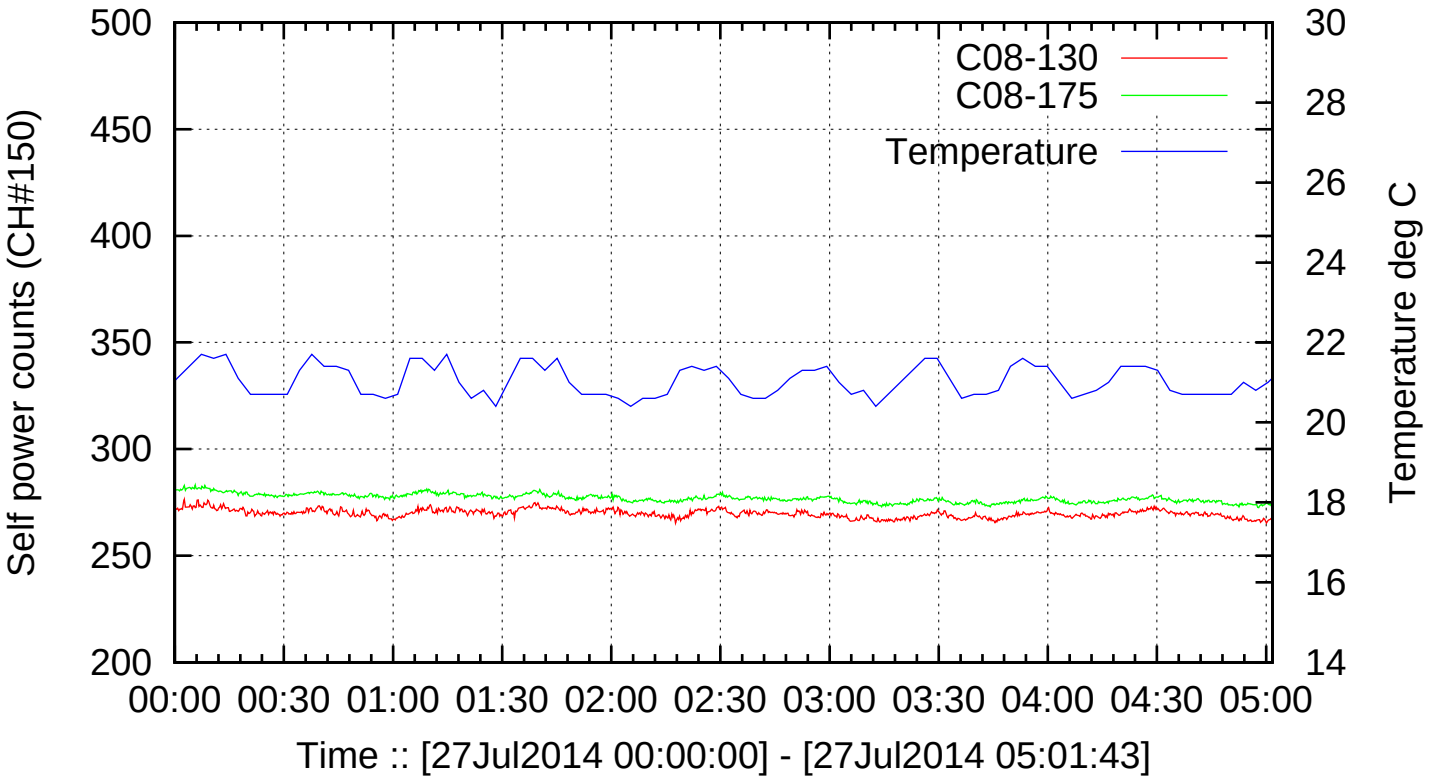

Plot # 65, Antenna :: C04 1420MHz_27jul2014.lta
C04-130
C04-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:01:43]

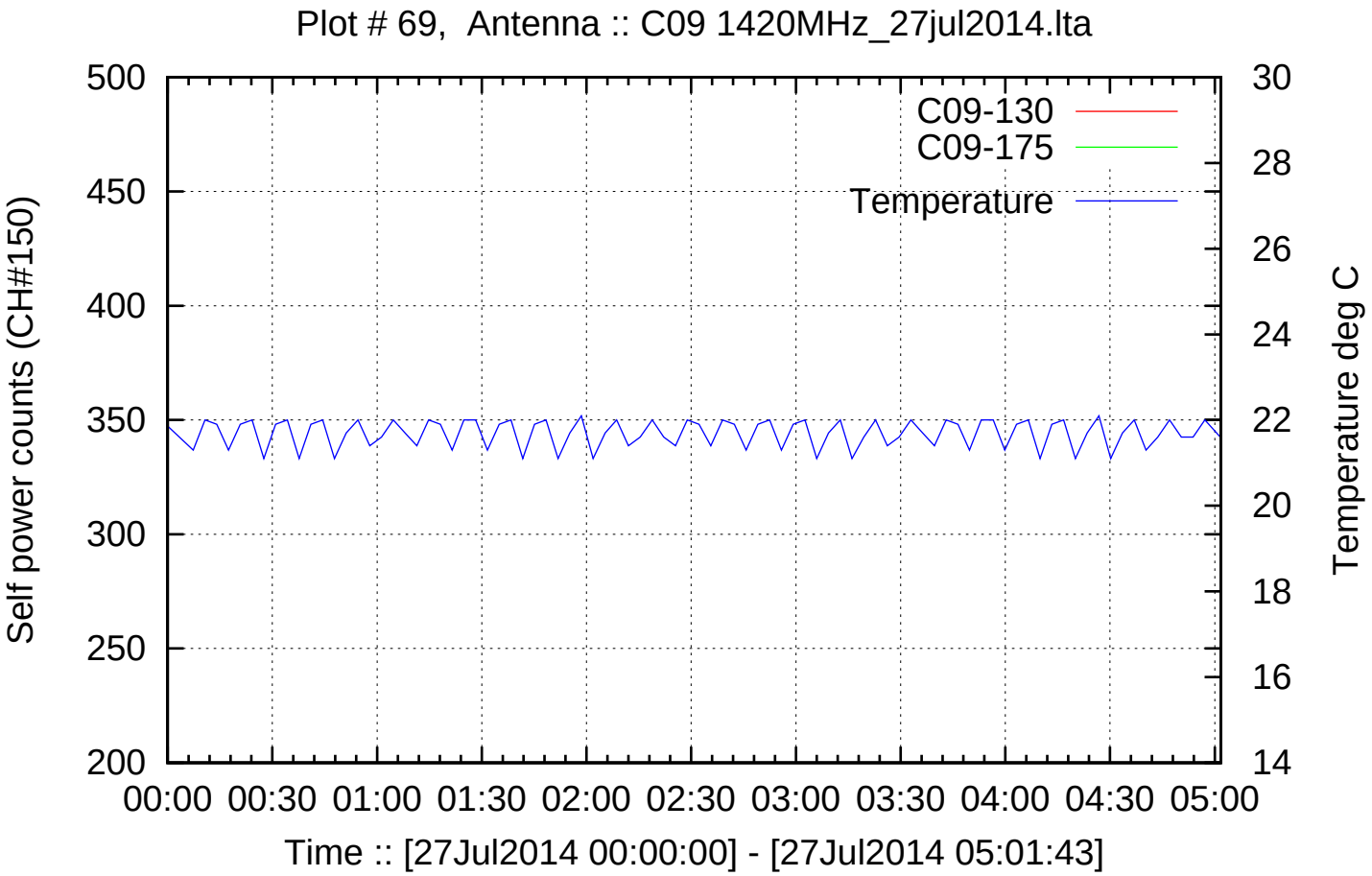

Plot # 66, Antenna :: C05 1420MHz_27jul2014.lta
C05-130
C05-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:01:43]

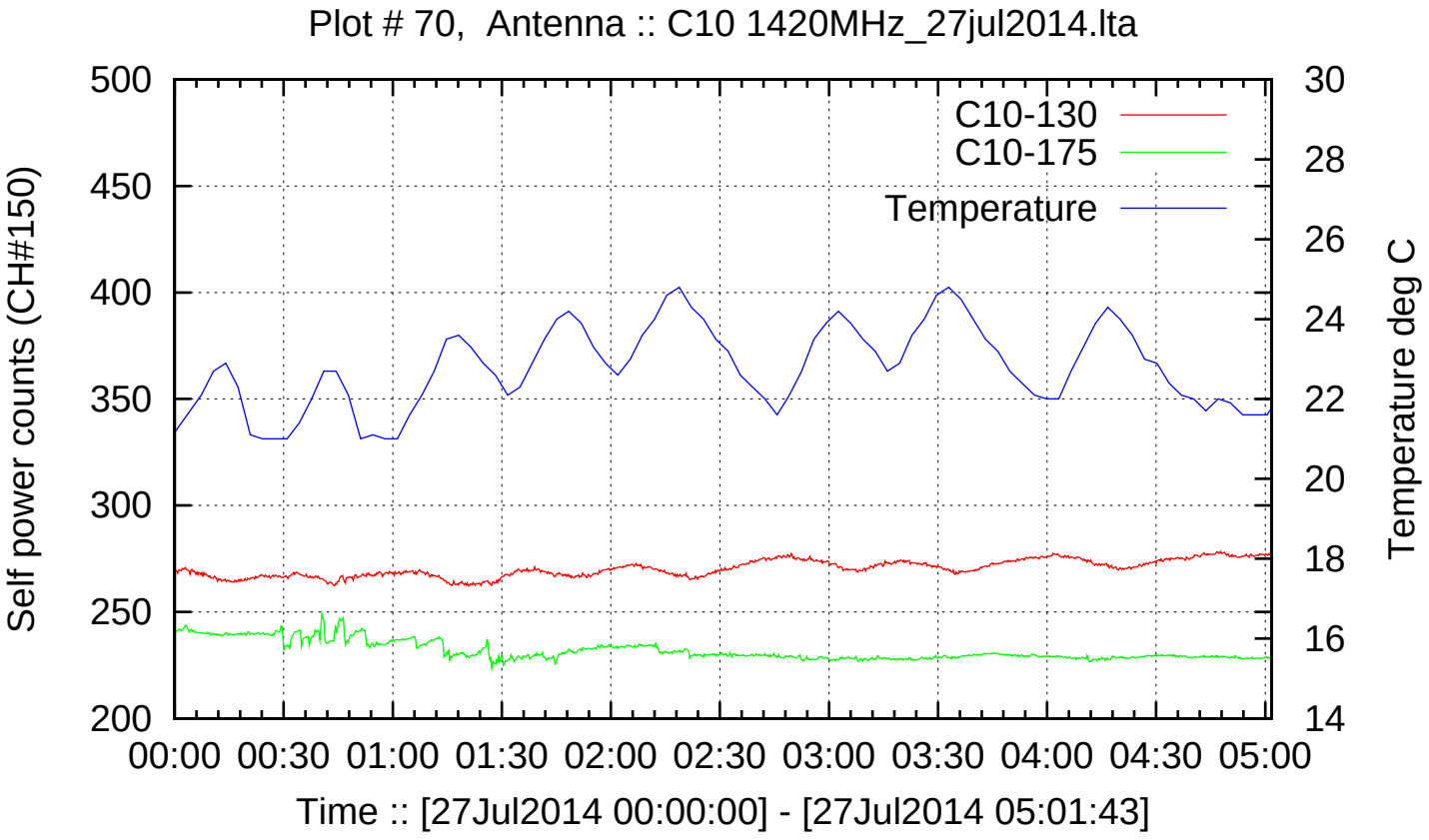
Plot # 67, Antenna :: C06 1420MHz_27jul2014.lta

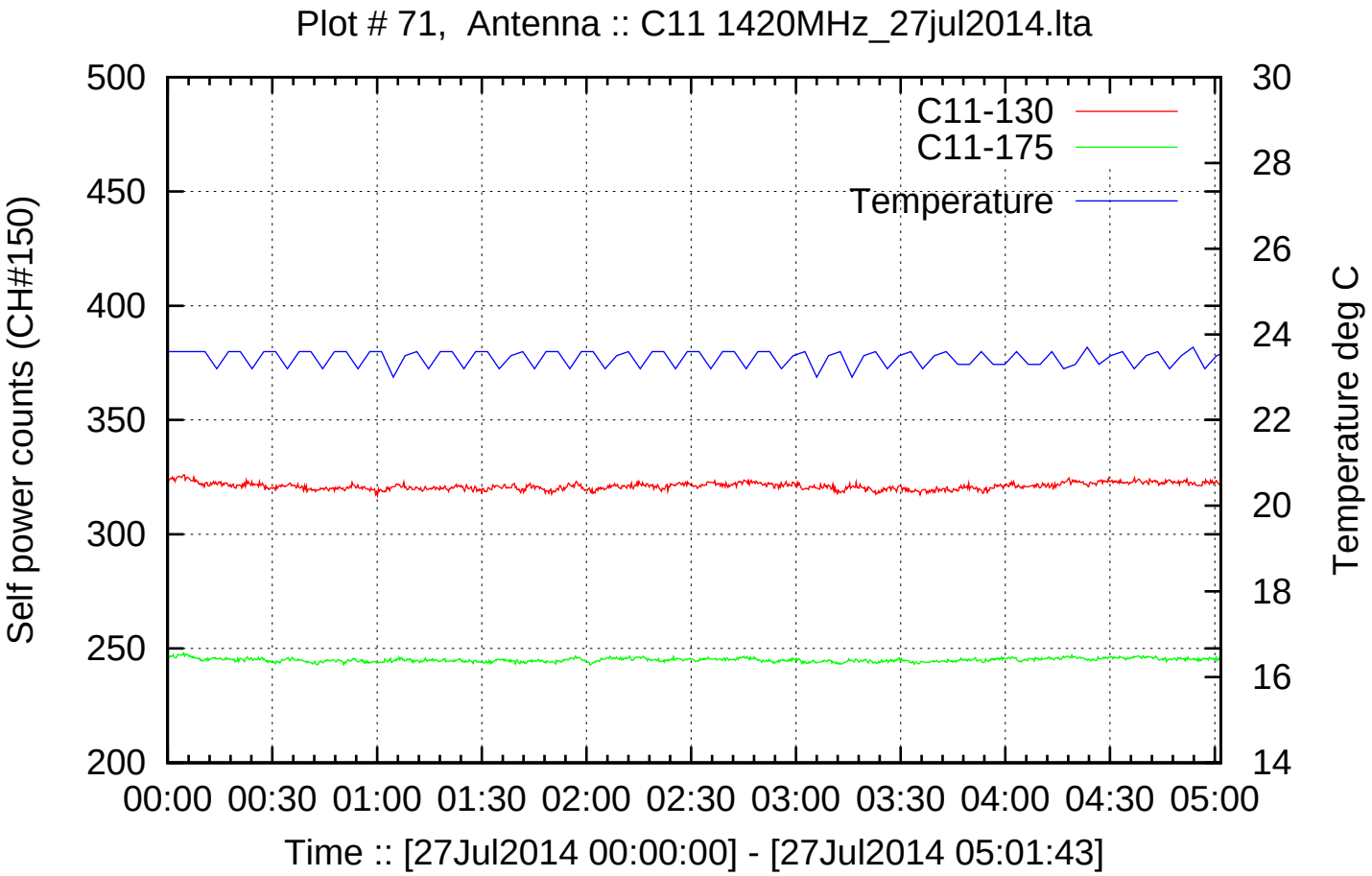


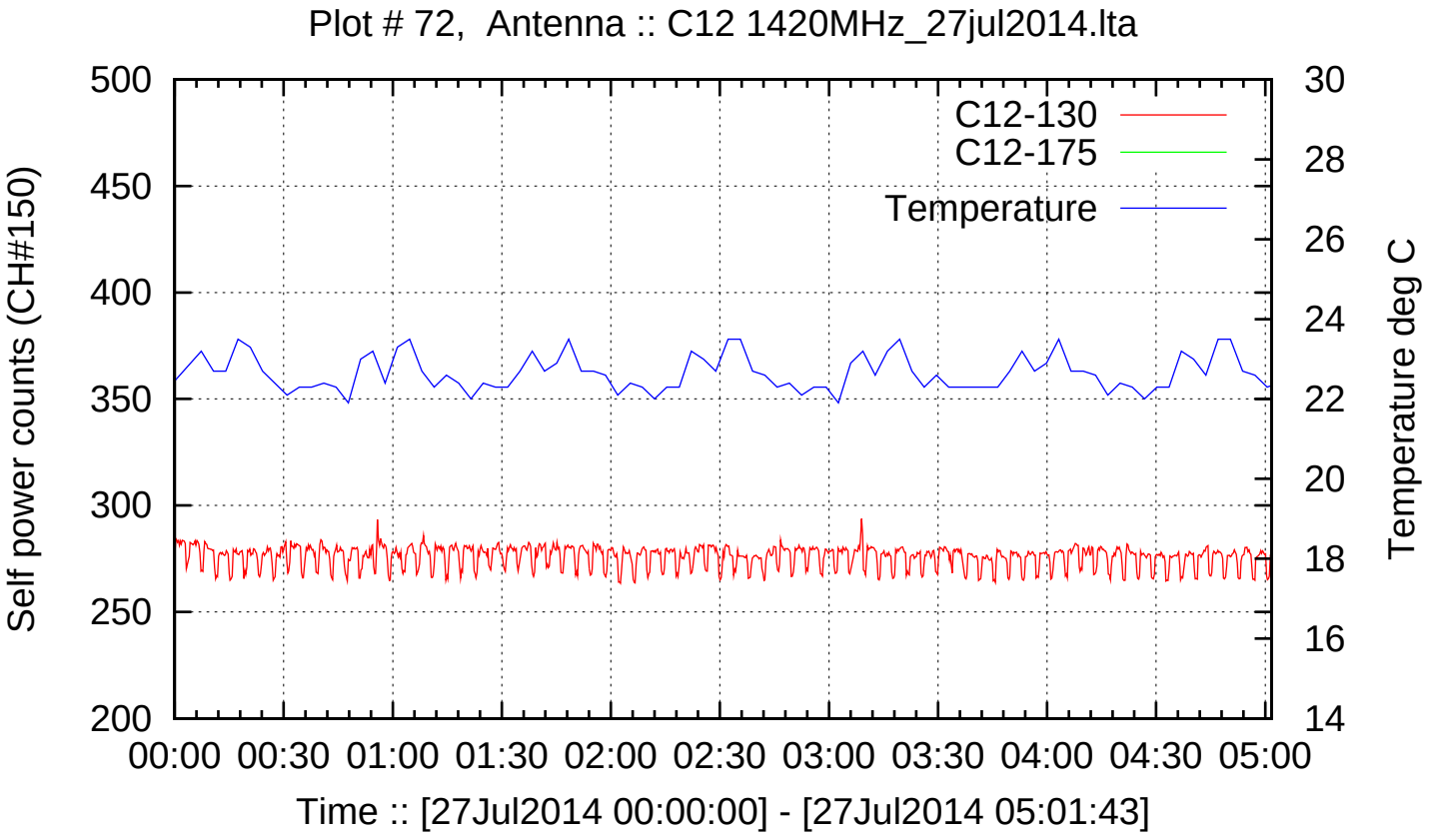
Plot # 68, Antenna :: C08 1420MHz_27jul2014.lta

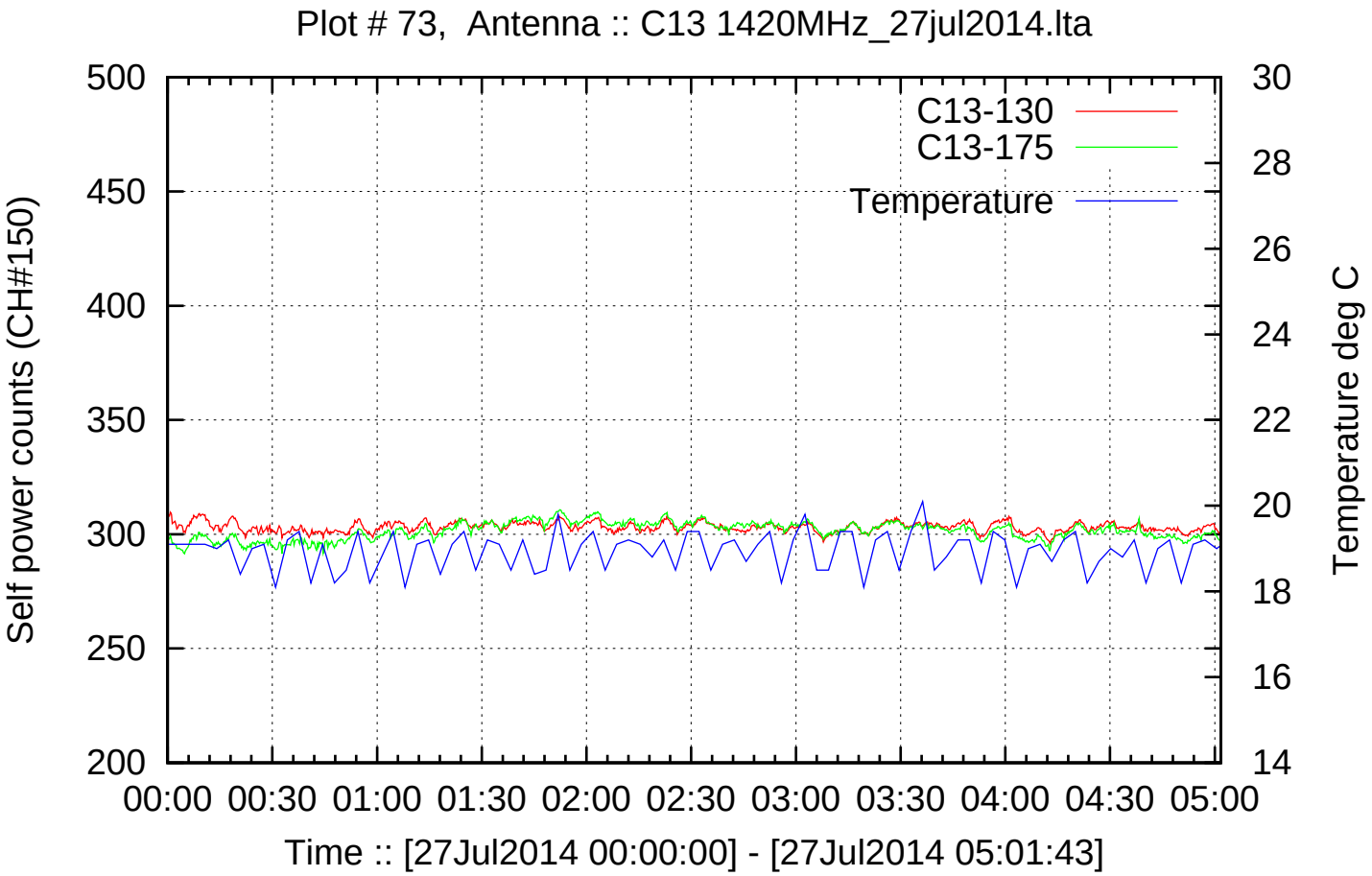


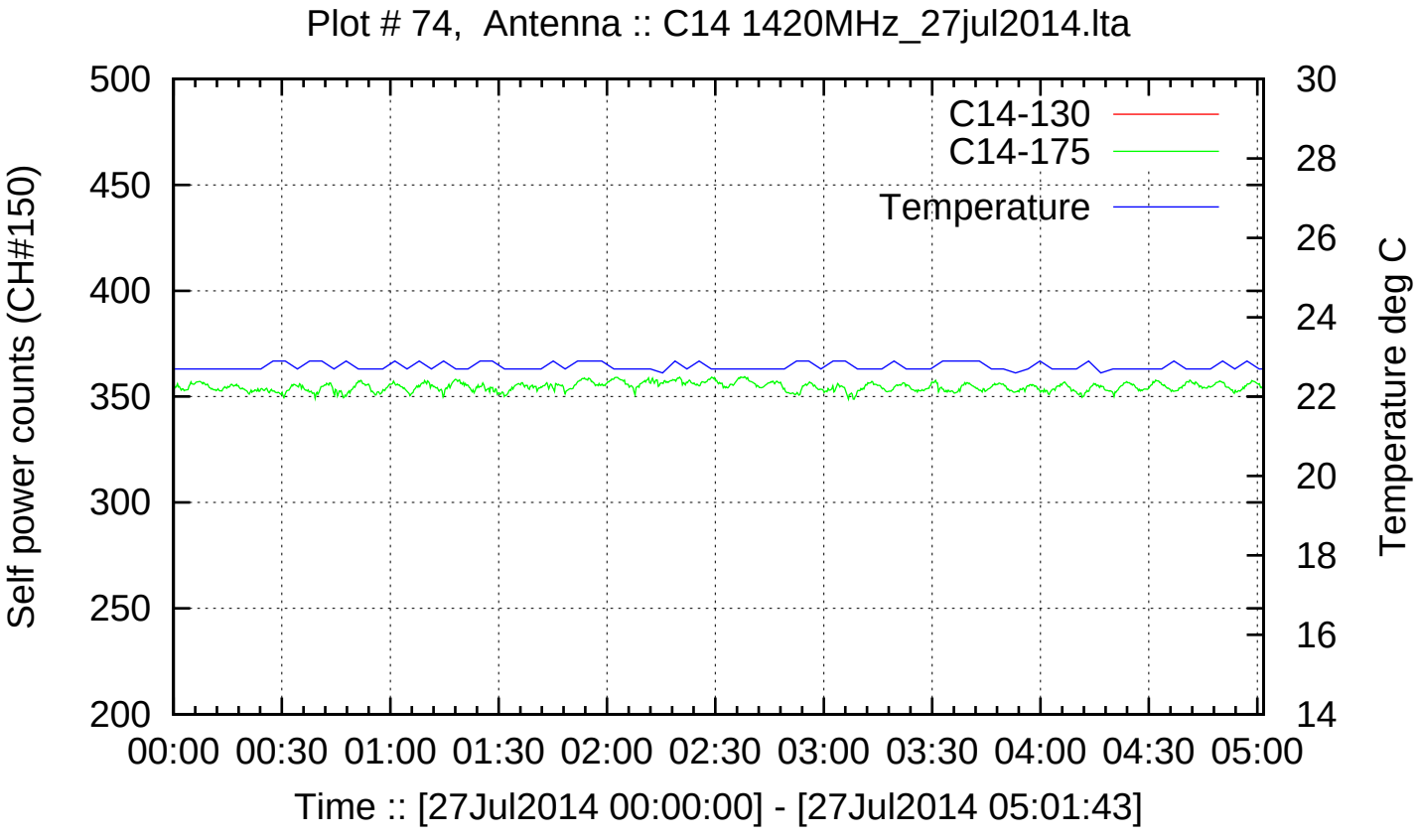

Plot # 69, Antenna :: C09 1420MHz_27jul2014.lta
C09-130
C09-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:01:43]

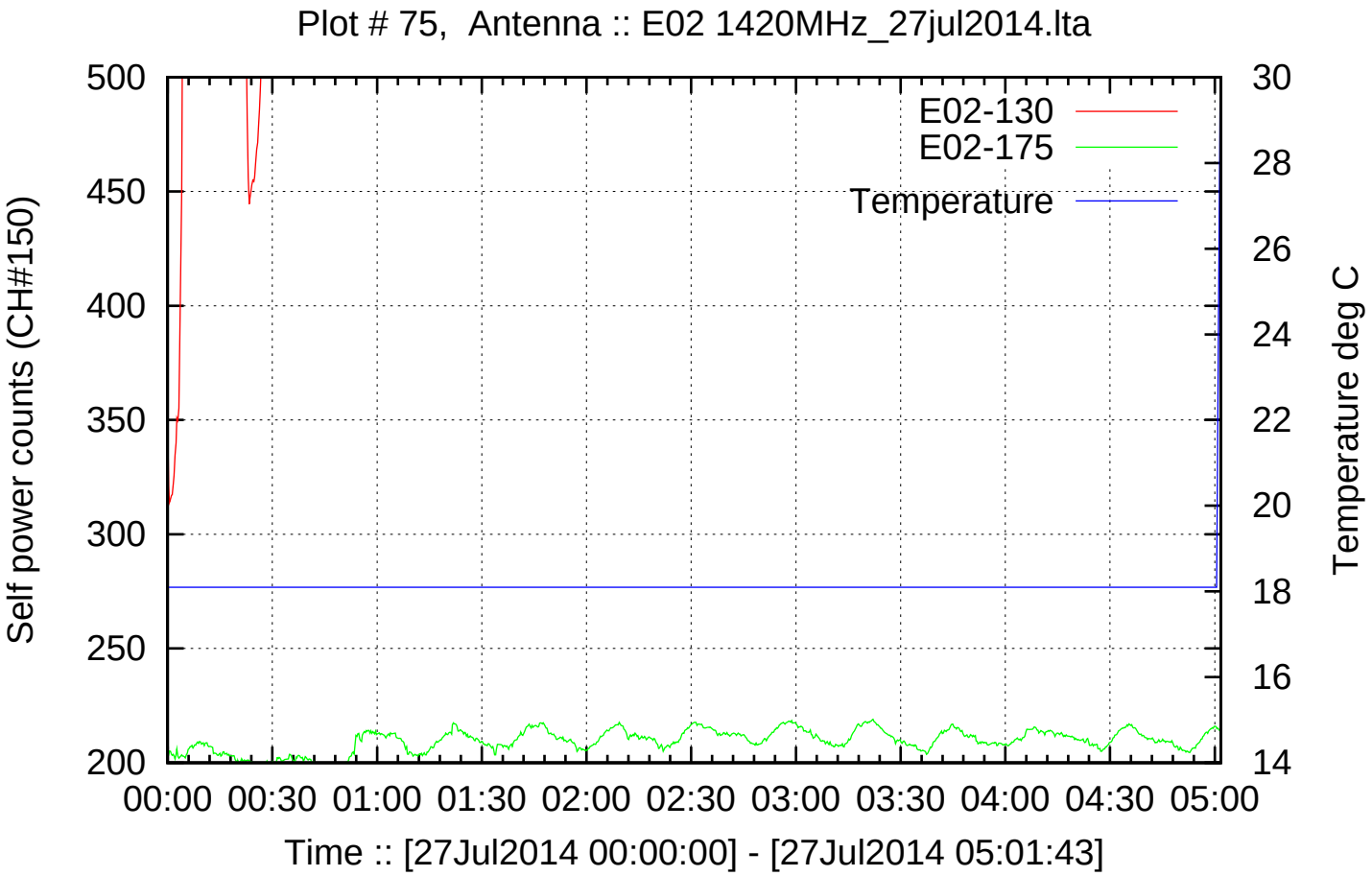

Plot # 70, Antenna :: C10 1420MHz_27jul2014.lta
C10-130
C10-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:01:43]

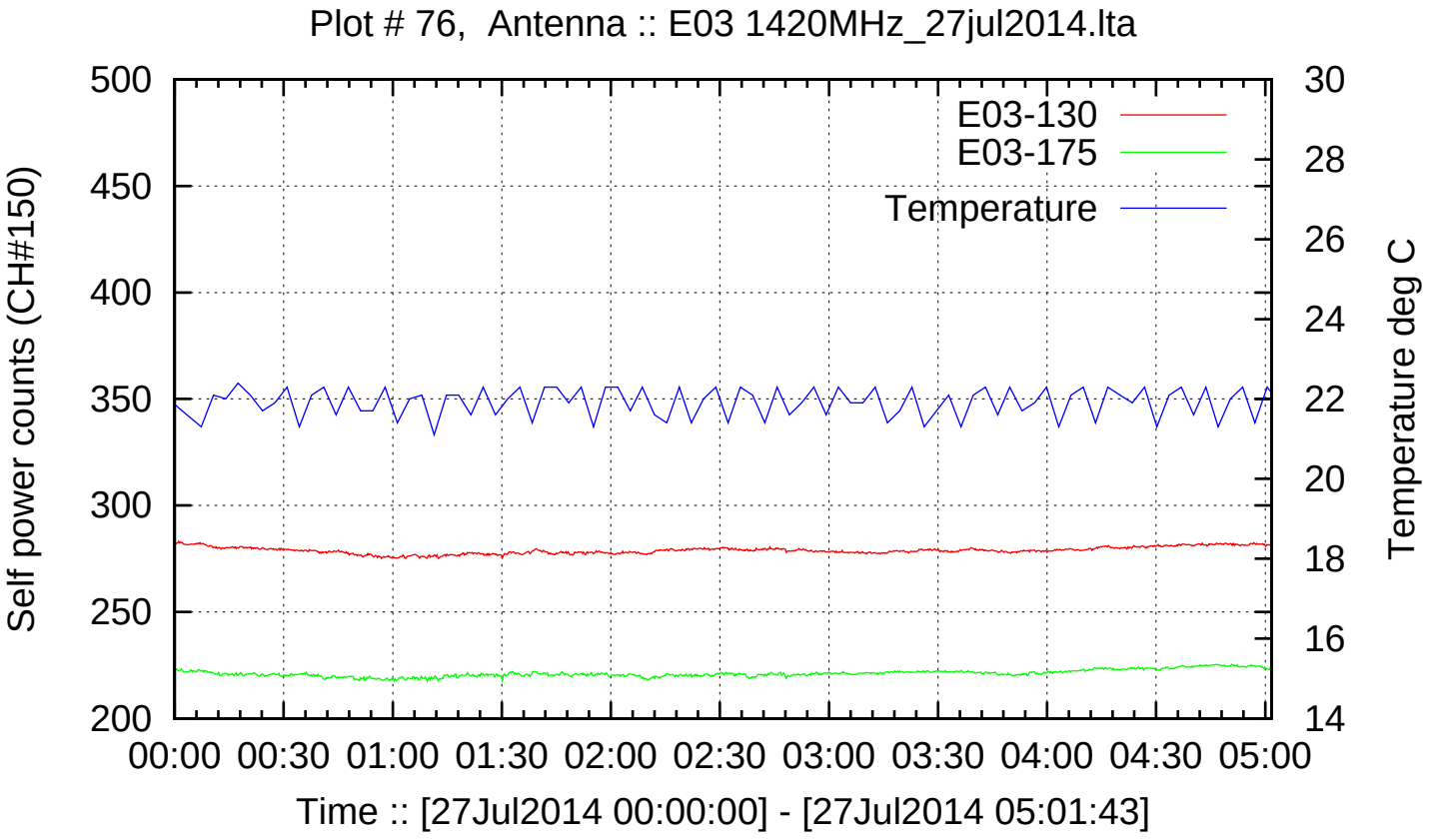

Plot # 71, Antenna :: C11 1420MHz_27jul2014.lta
C11-130
C11-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:01:43]


Plot # 72, Antenna :: C12 1420MHz_27jul2014.lta
C12-130
C12-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:01:43]

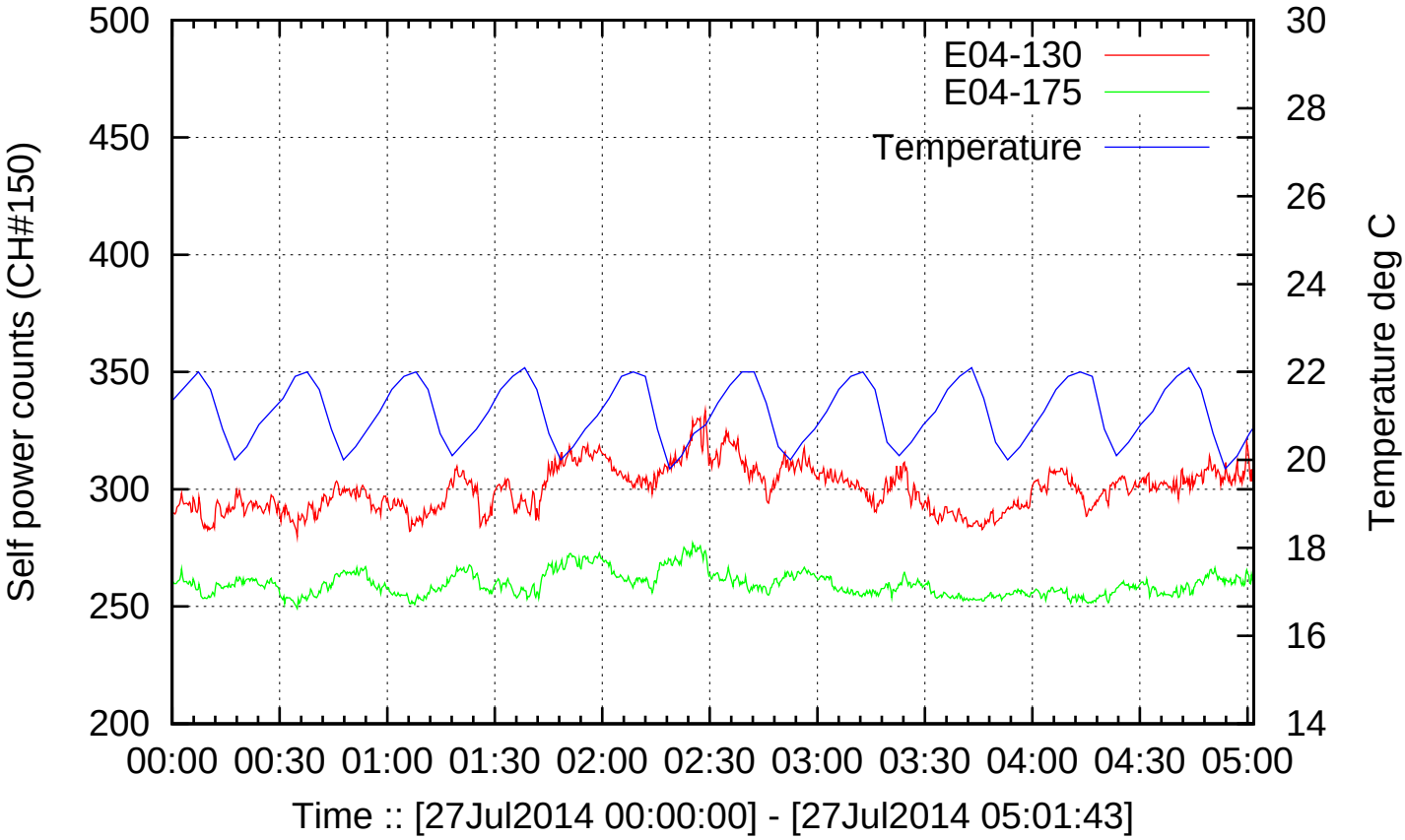

Plot # 73, Antenna :: C13 1420MHz_27jul2014.lta
C13-130
C13-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:01:43]


Plot # 74, Antenna :: C14 1420MHz_27jul2014.lta
C14-130
C14-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:01:43]

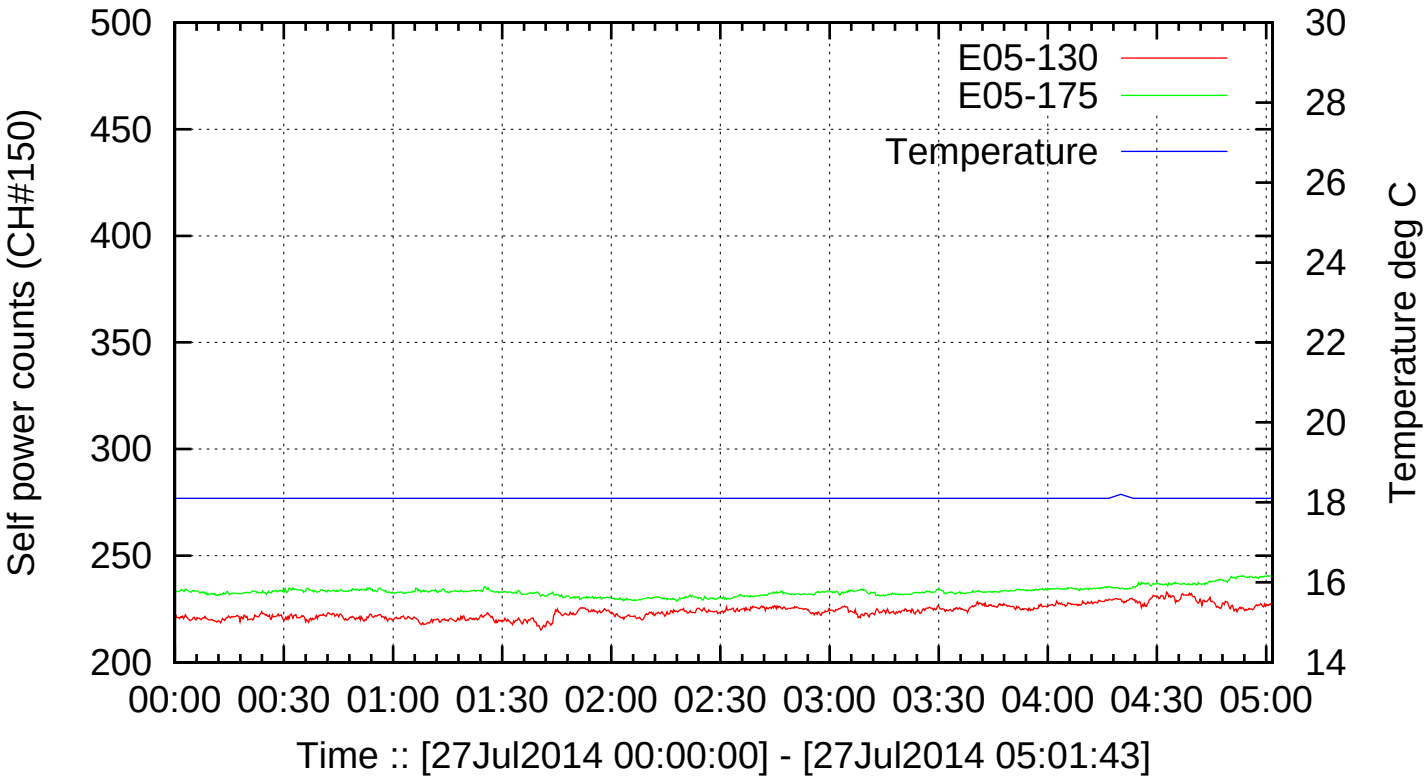

Plot # 75, Antenna :: E02 1420MHz_27jul2014.lta
E02-130
E02-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:01:43]

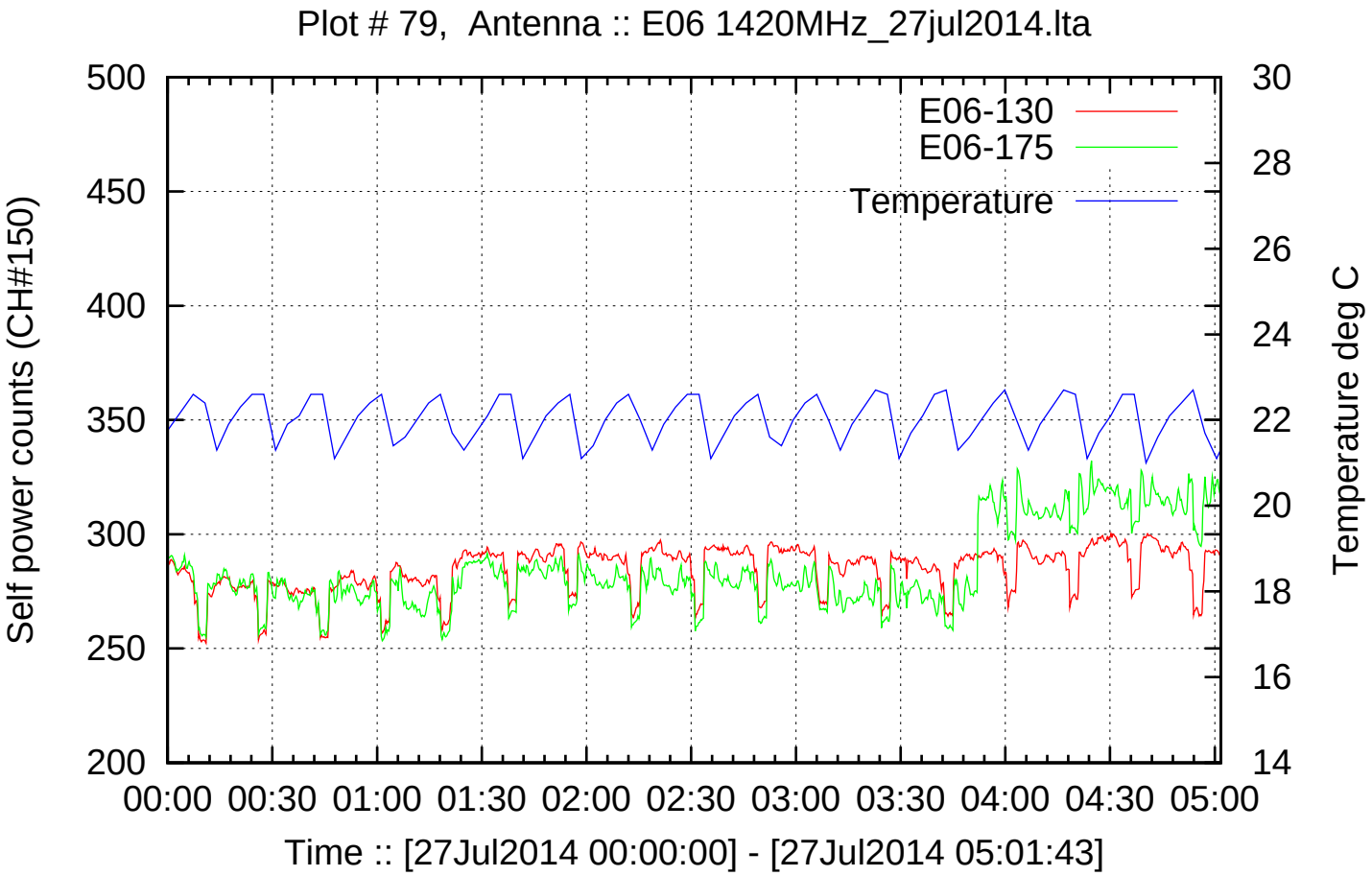

Plot # 76, Antenna :: E03 1420MHz_27jul2014.lta
E03-130
E03-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:01:43]

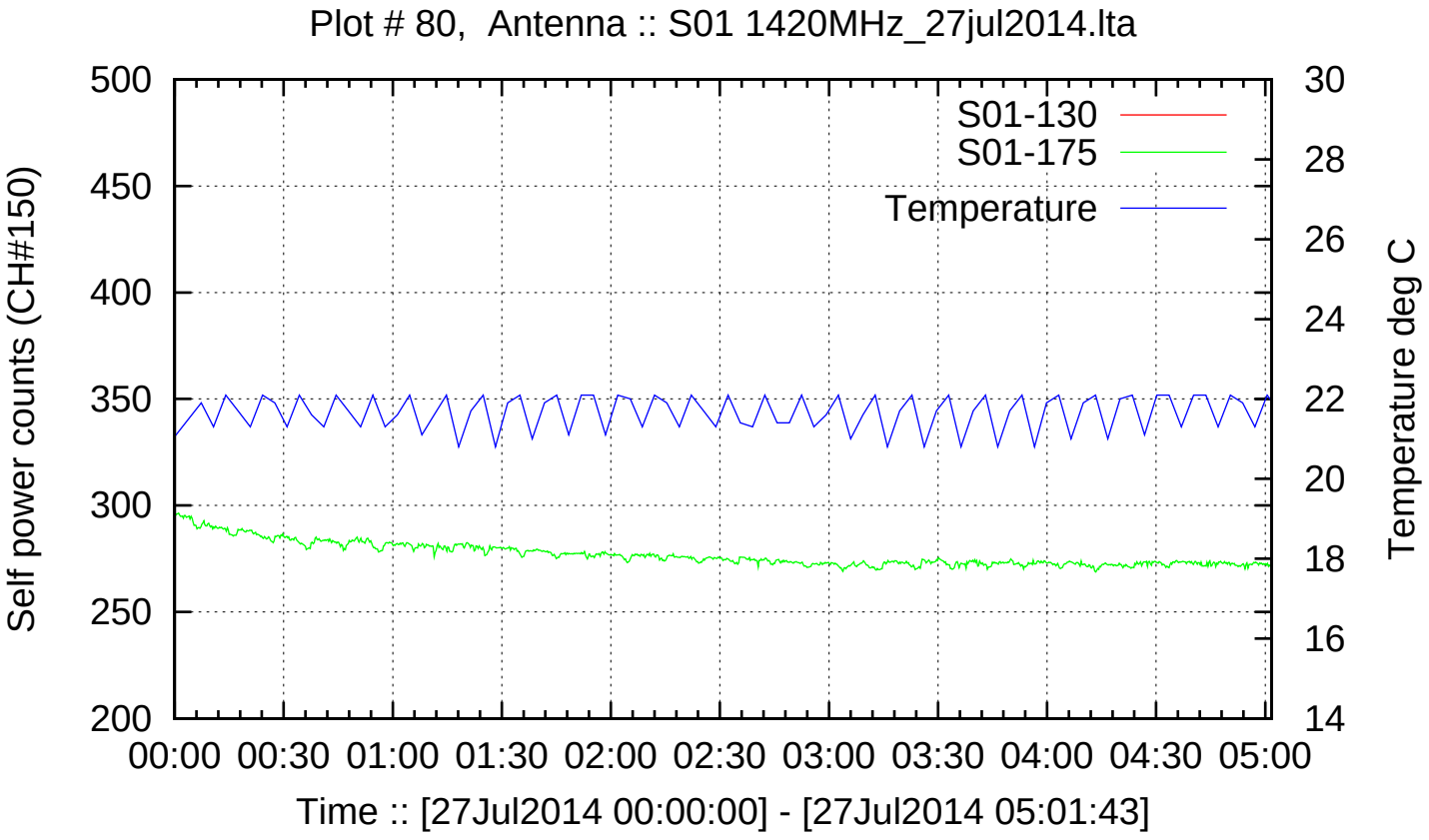
Plot # 77, Antenna :: E04 1420MHz_27jul2014.lta

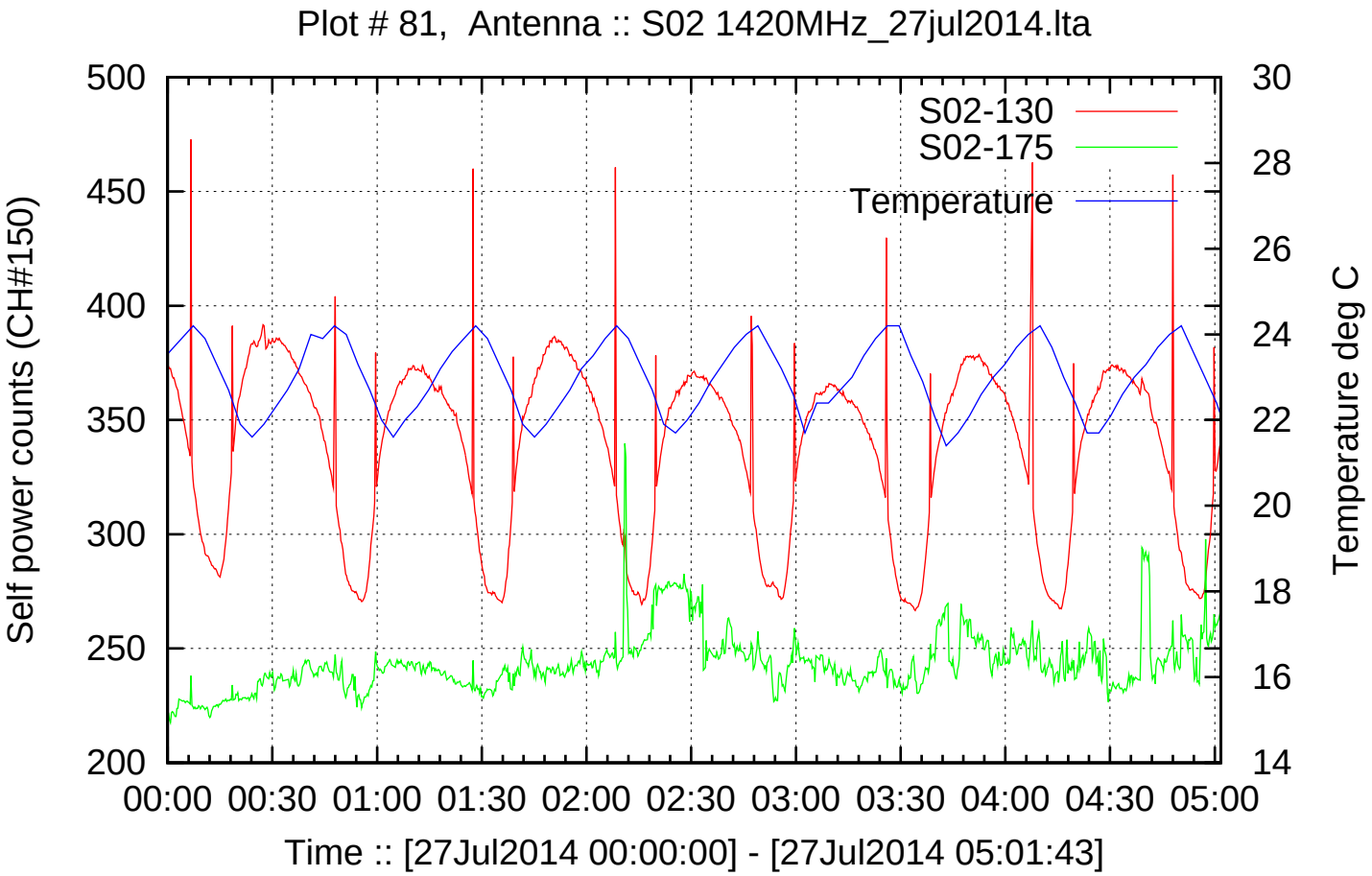


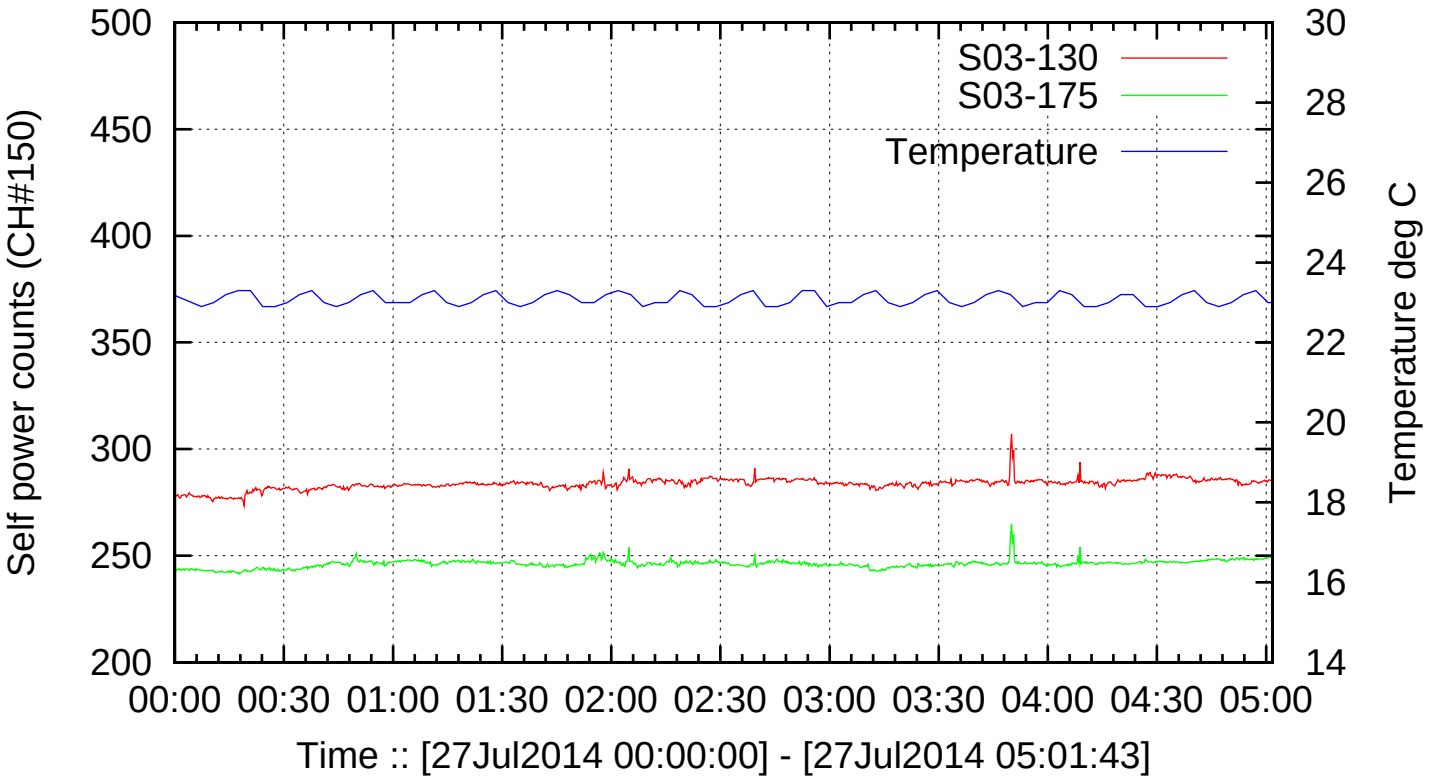
Plot # 78, Antenna :: E05 1420MHz_27jul2014.lta

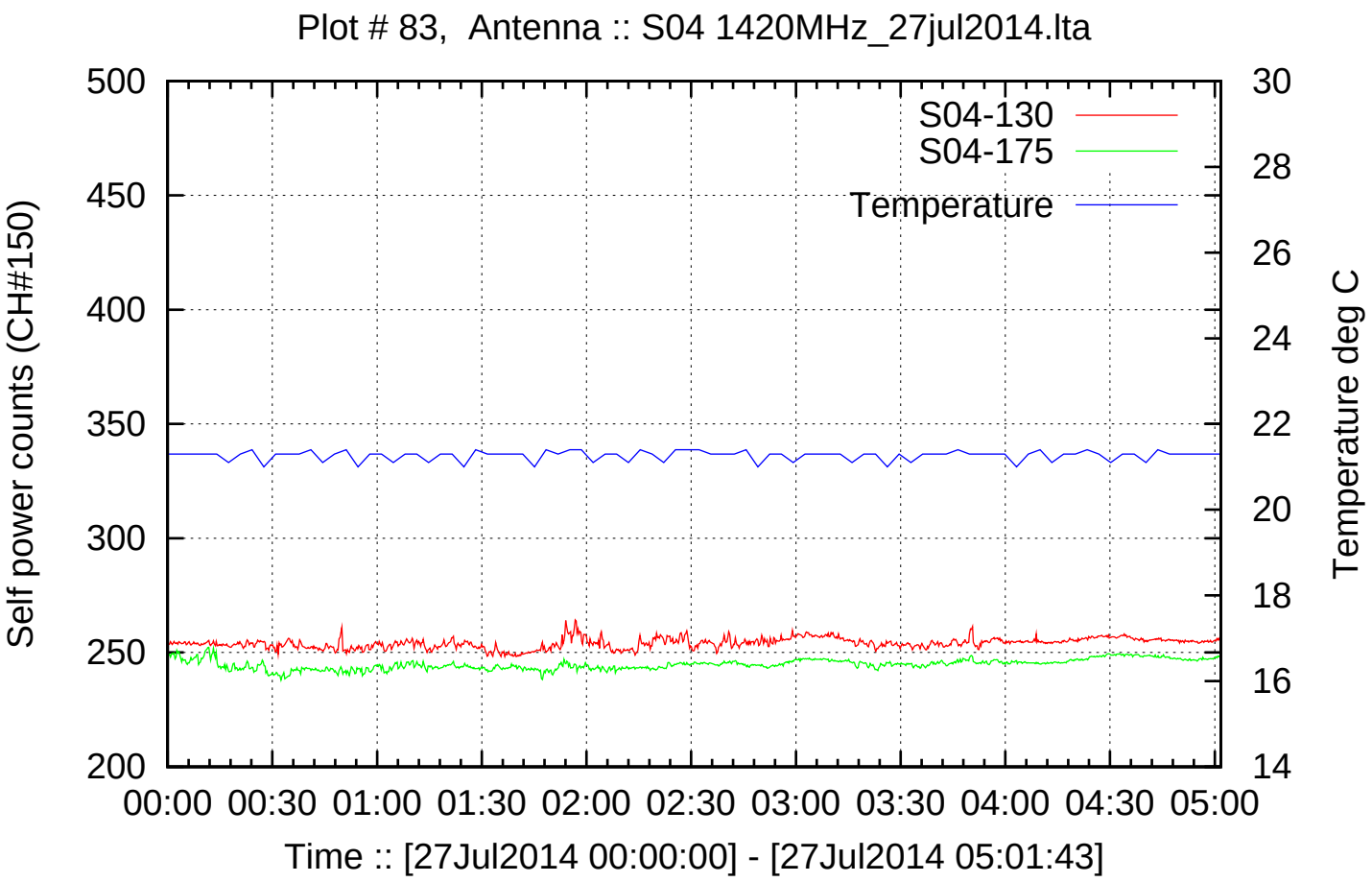


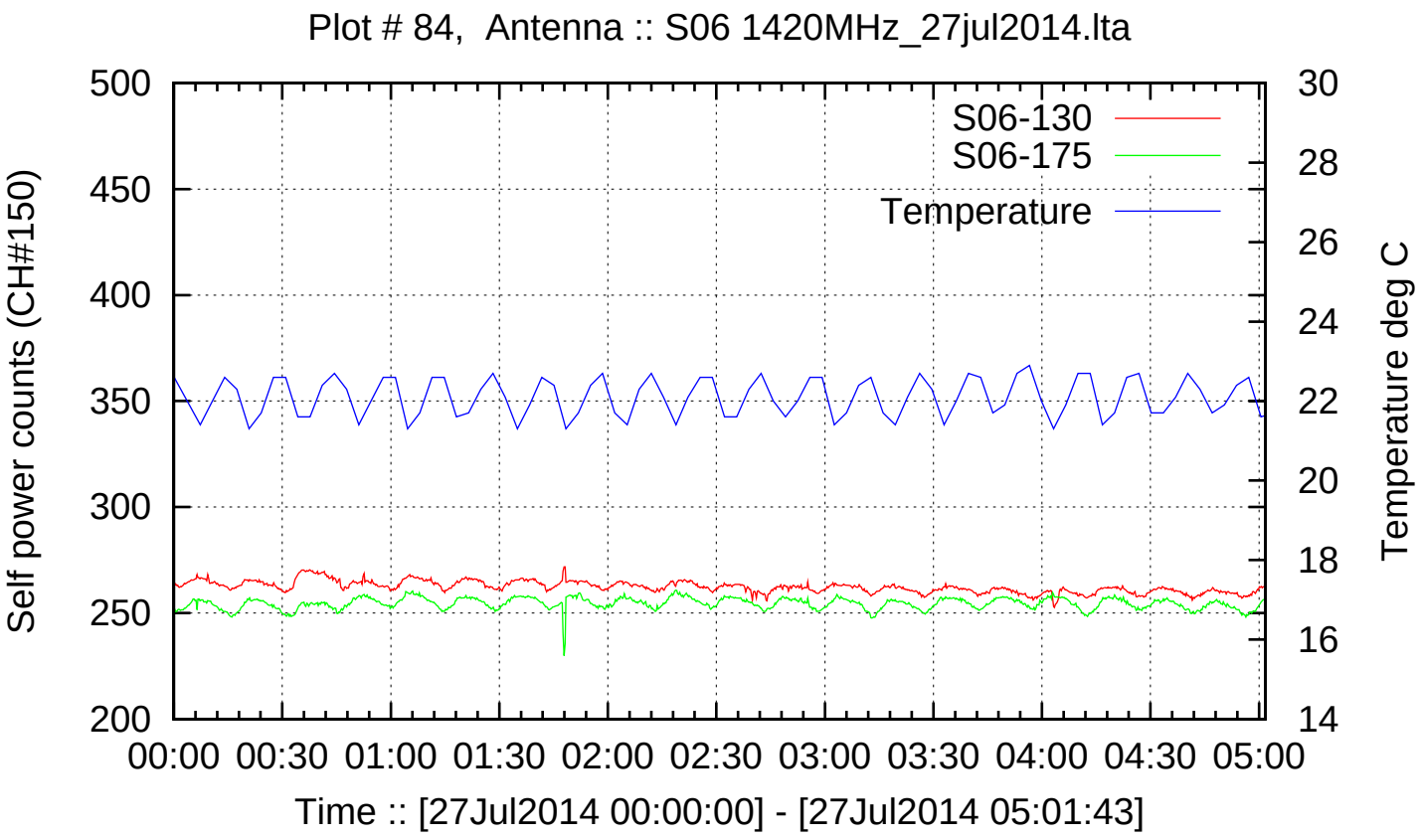

Plot # 79, Antenna :: E06 1420MHz_27jul2014.lta
E06-130
E06-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:01:43]

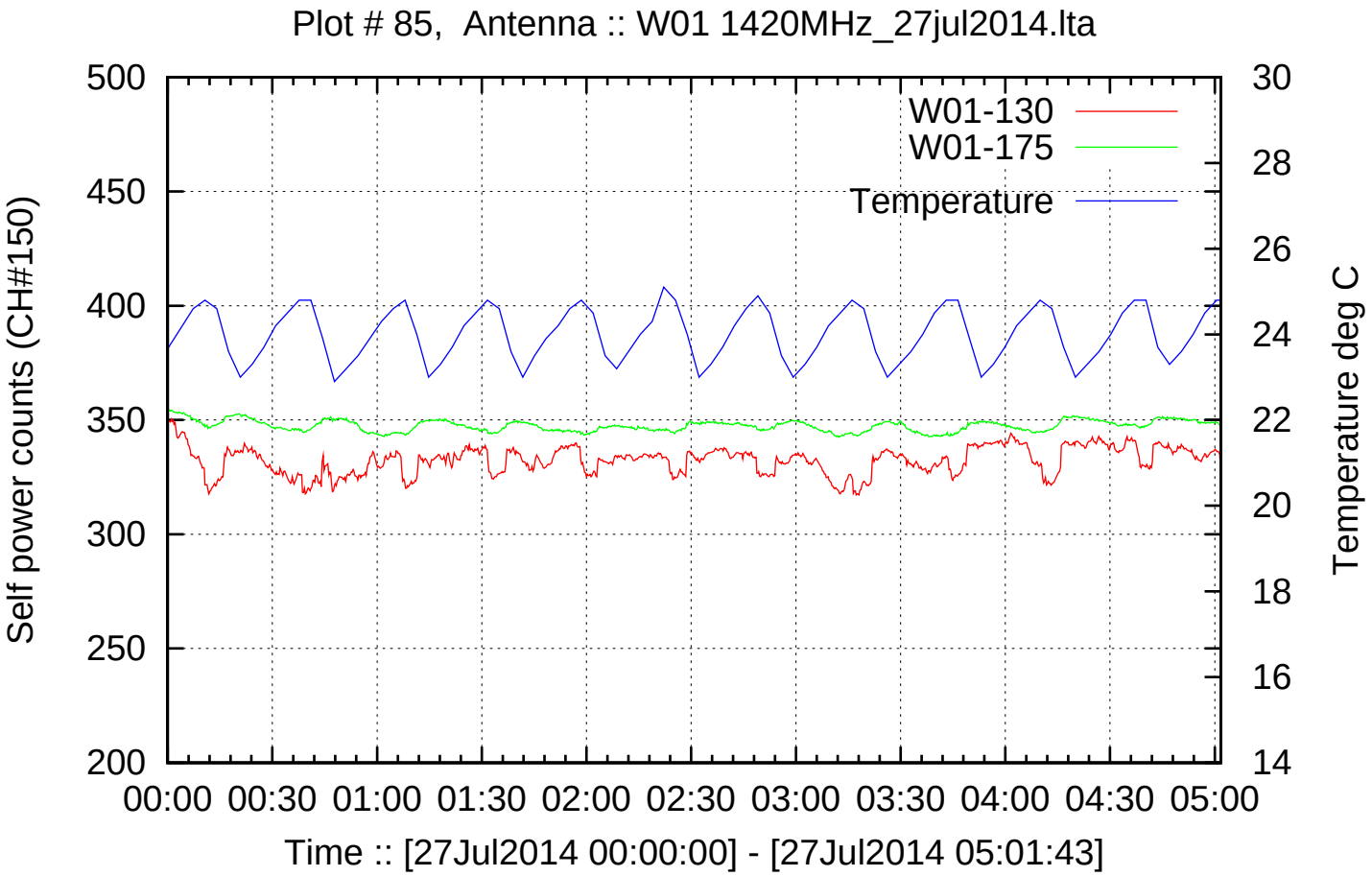

Plot # 80, Antenna :: S01 1420MHz_27jul2014.lta
S01-130
S01-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:01:43]

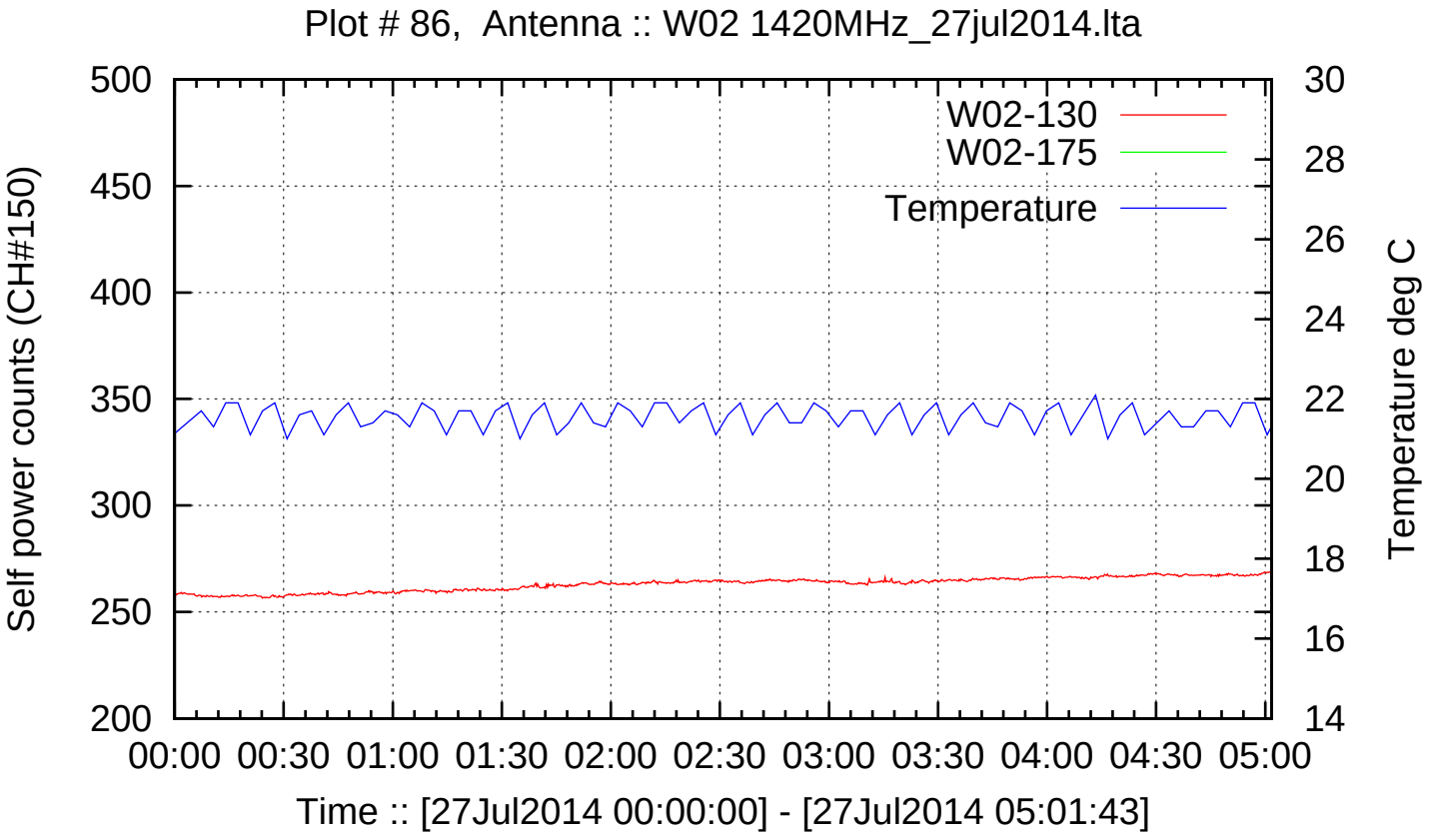

Plot # 81, Antenna :: S02 1420MHz_27jul2014.lta
S02-130
S02-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:01:43]


Plot # 82, Antenna :: S03 1420MHz_27jul2014.lta
S03-130
S03-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:01:43]

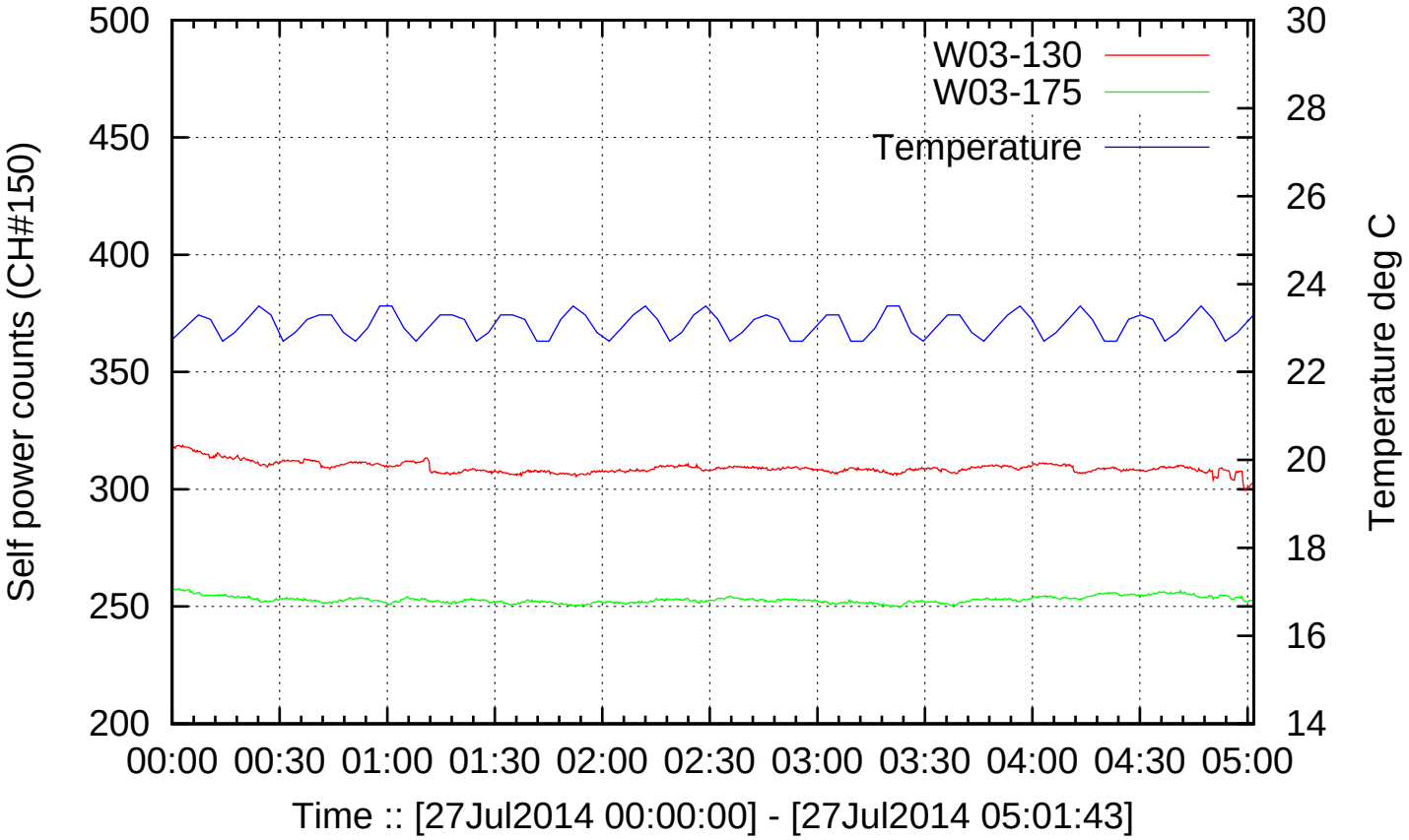

Plot # 83, Antenna :: S04 1420MHz_27jul2014.lta
S04-130
S04-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:01:43]


Plot # 84, Antenna :: S06 1420MHz_27jul2014.lta
S06-130
S06-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:01:43]

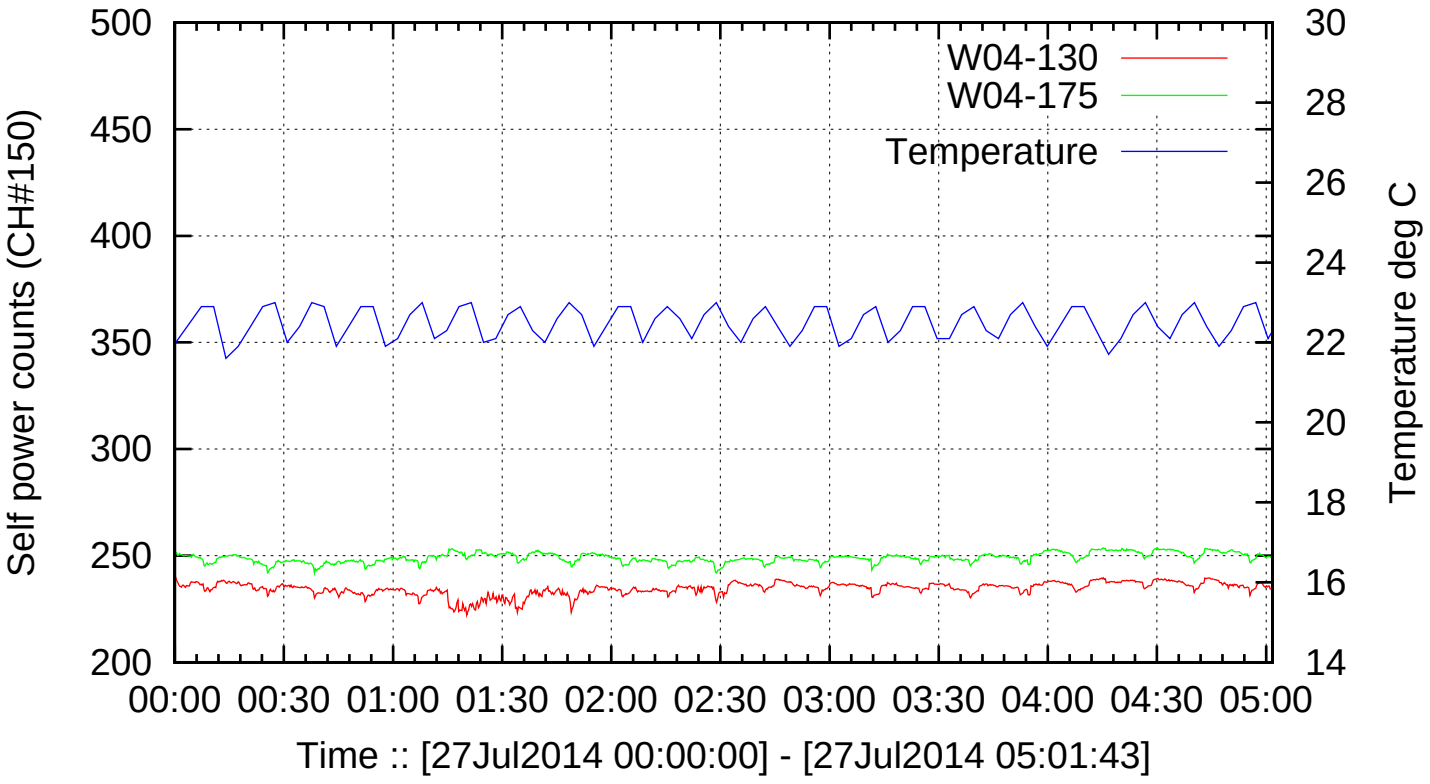

Plot # 85, Antenna :: W01 1420MHz_27jul2014.lta
W01-130
W01-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:01:43]

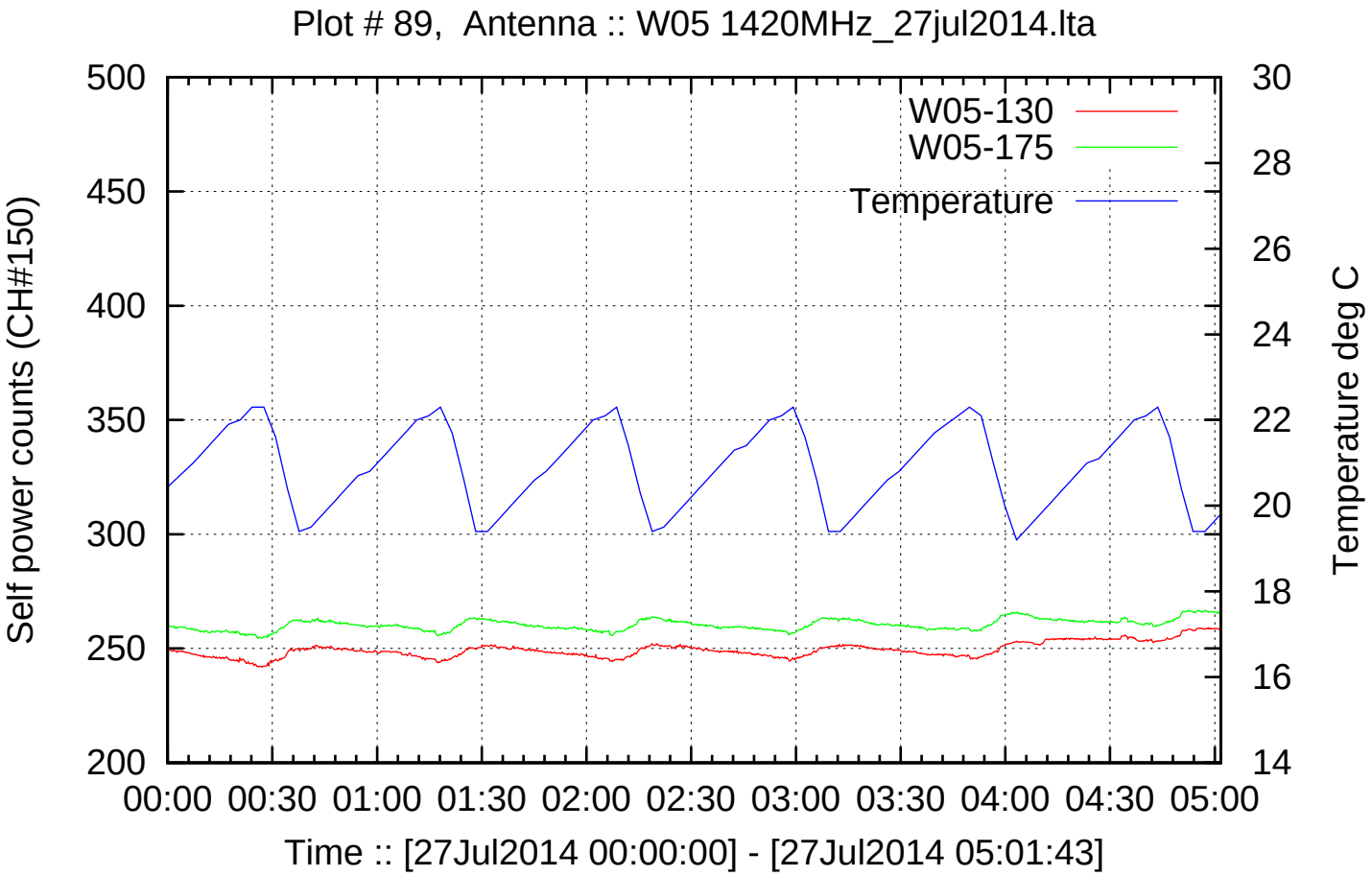

Plot # 86, Antenna :: W02 1420MHz_27jul2014.lta
W02-130
W02-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:01:43]

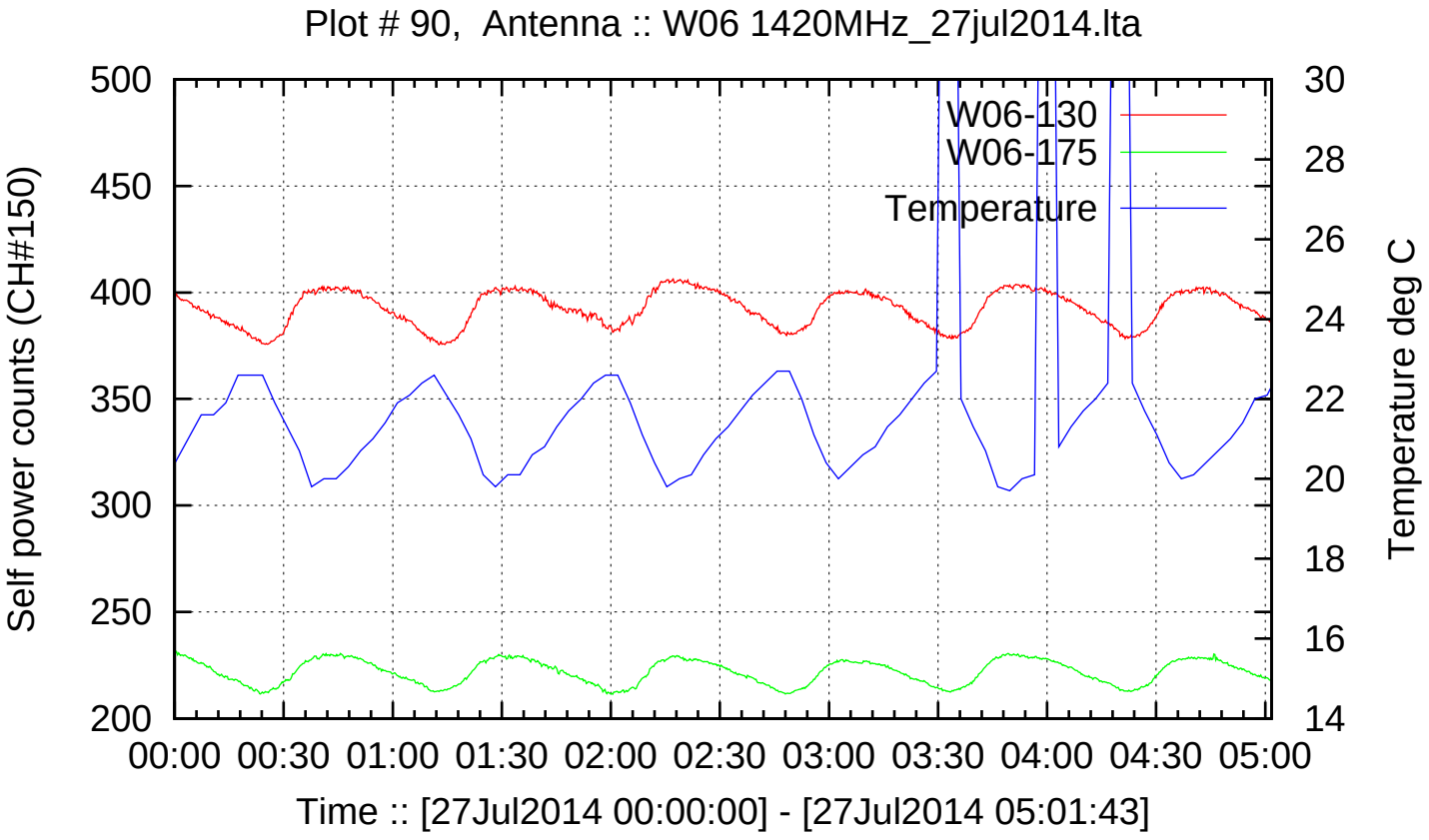
Plot # 87, Antenna :: W03 1420MHz_27jul2014.lta

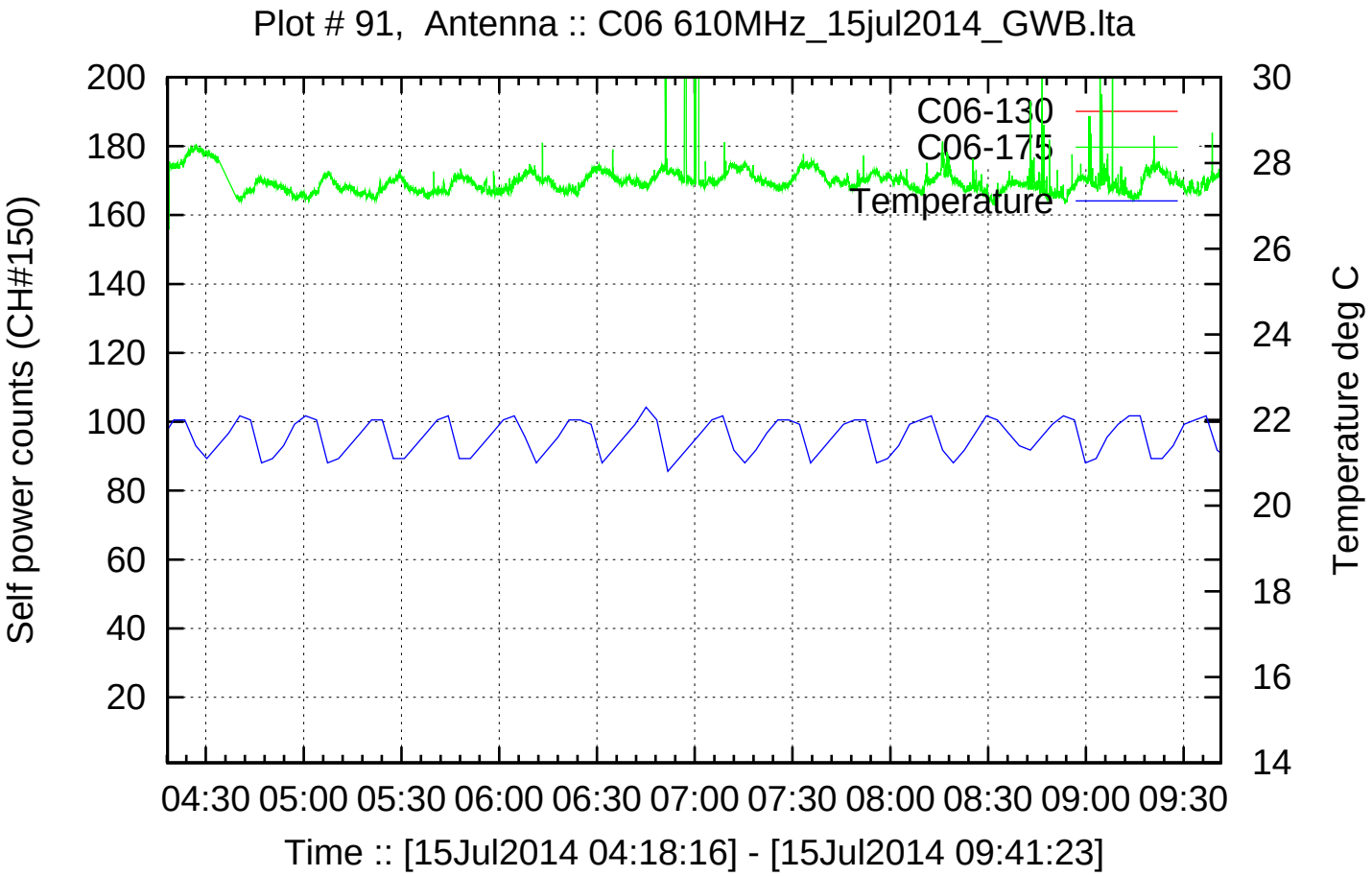


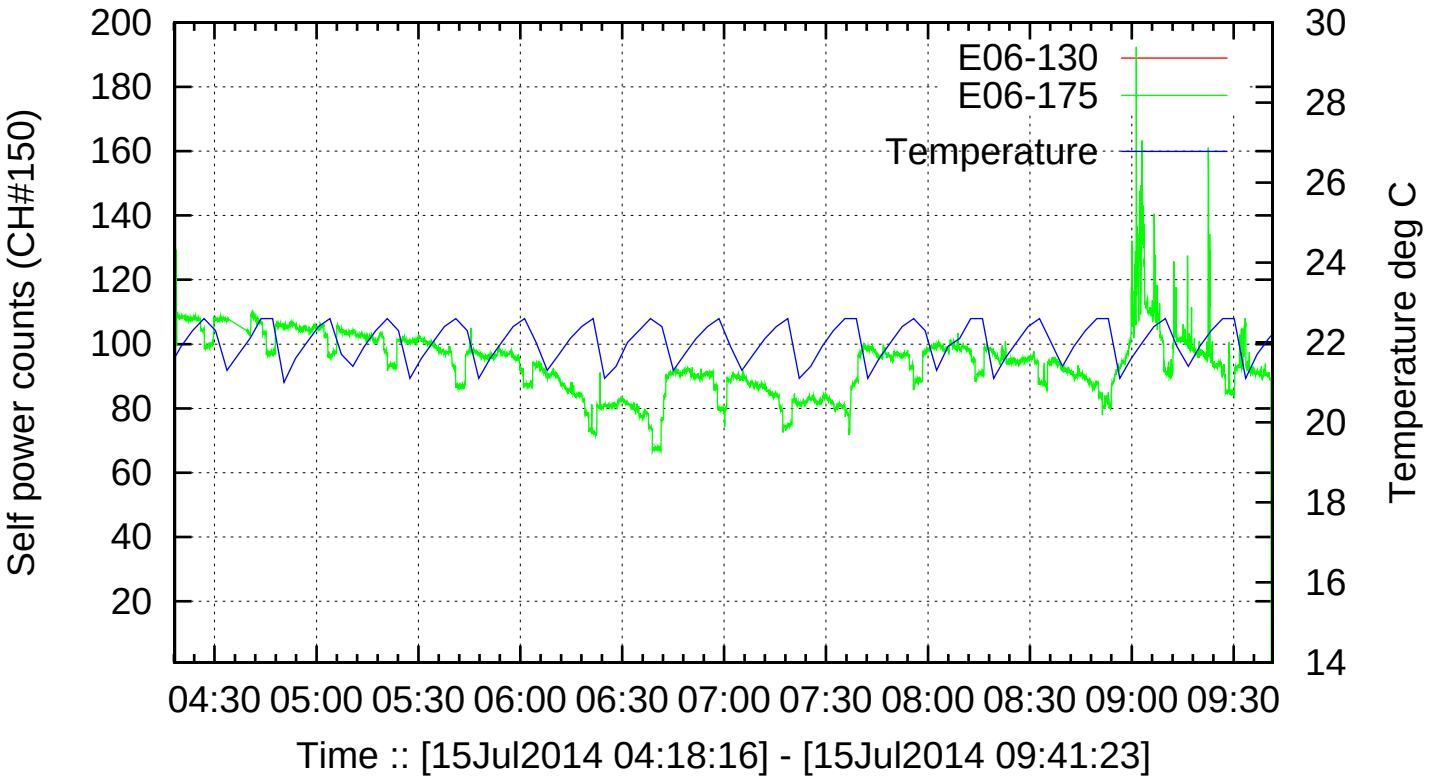
Plot # 88, Antenna :: W04 1420MHz_27jul2014.lta

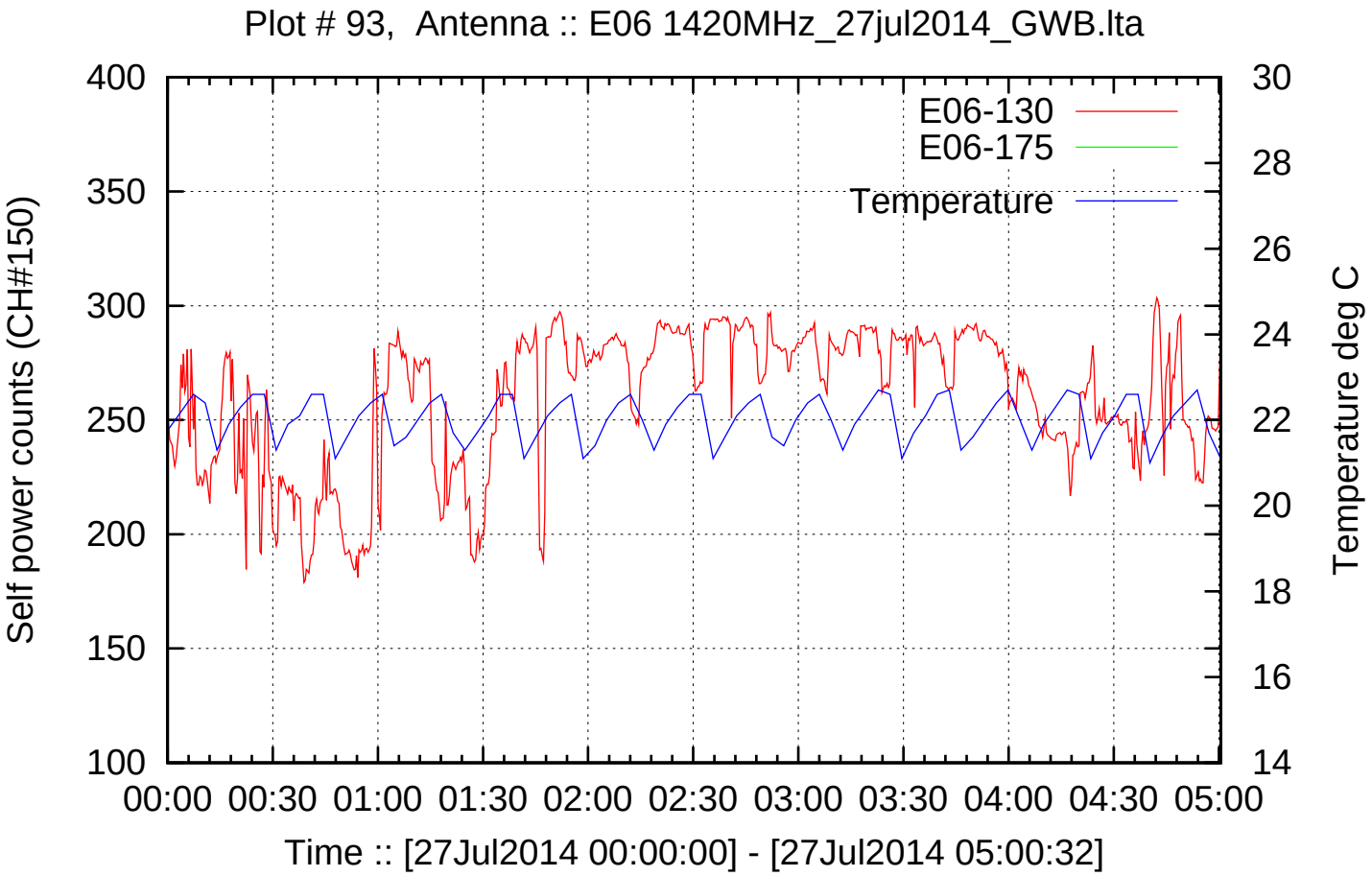


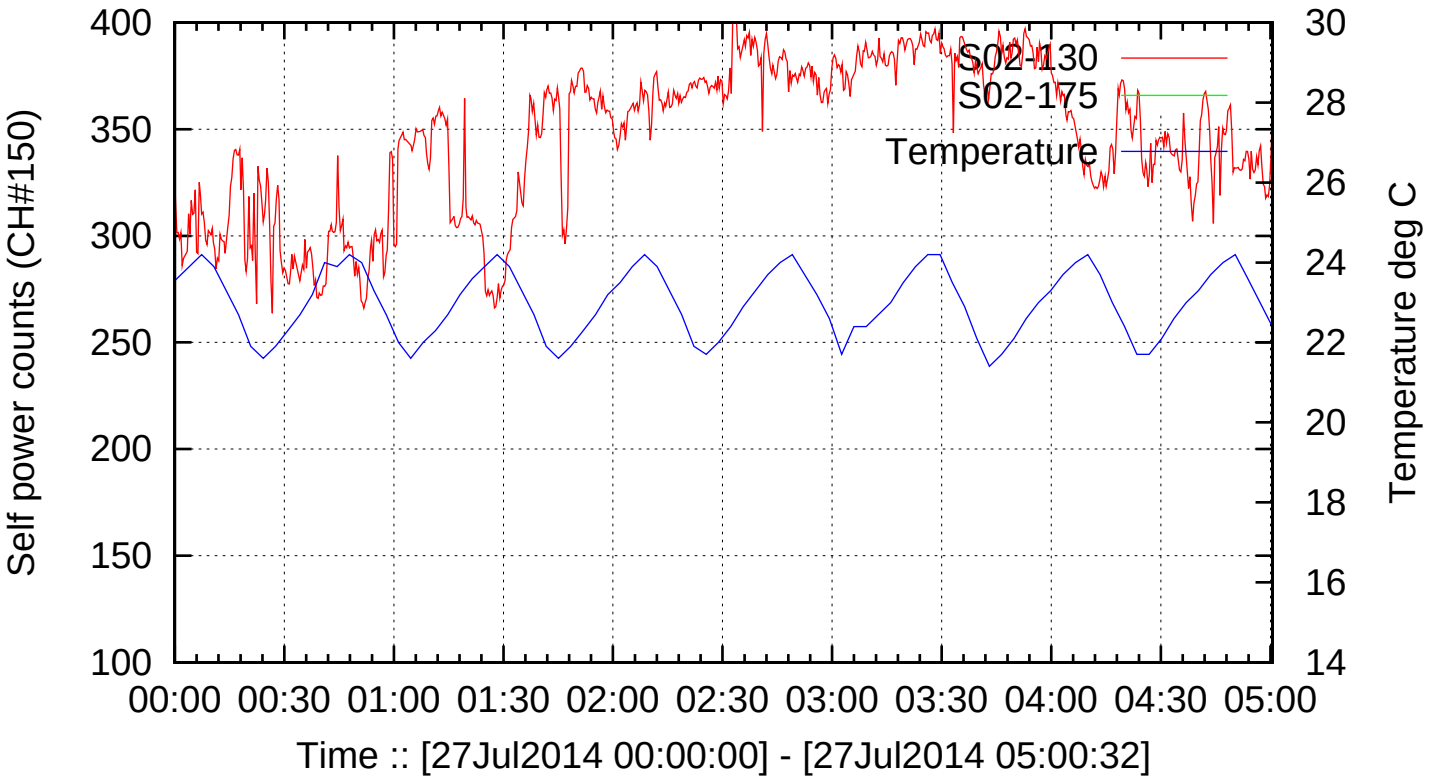

Plot # 89, Antenna :: W05 1420MHz_27jul2014.lta
W05-130
W05-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:01:43]


Plot # 90, Antenna :: W06 1420MHz_27jul2014.lta
W06-130
W06-175
Temperature
Self power counts (CH#150)
Temperature deg C
500
450
400
350
300
250
200
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:01:43]


Plot # 91, Antenna :: C06 610MHz_15jul2014_GWB.lta
C06-130
C06-175
Temperature
Self power counts (CH#150)
Temperature deg C
200
180
160
140
120
100
80
60
40
20
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:18:16] - [15Jul2014 09:41:23]


Plot # 92, Antenna :: E06 610MHz_15jul2014_GWB.lta
E06-130
E06-175
Temperature
Self power counts (CH#150)
Temperature deg C
200
180
160
140
120
100
80
60
40
20
30
28
26
24
22
20
18
16
14
04:30 05:00 05:30 06:00 06:30 07:00 07:30 08:00 08:30 09:00 09:30
Time :: [15Jul2014 04:18:16] - [15Jul2014 09:41:23]


Plot # 93, Antenna :: E06 1420MHz_27jul2014_GWB.lta
E06-130
E06-175
Temperature
Self power counts (CH#150)
Temperature deg C
400
350
300
250
200
150
100
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:00:32]


Plot # 94, Antenna :: S02 1420MHz_27jul2014_GWB.lta
S02-130
S02-175
Temperature
Self power counts (CH#150)
Temperature deg C
400
350
300
250
200
150
100
30
28
26
24
22
20
18
16
14
00:00 00:30 01:00 01:30 02:00 02:30 03:00 03:30 04:00 04:30 05:00
Time :: [27Jul2014 00:00:00] - [27Jul2014 05:00:32]