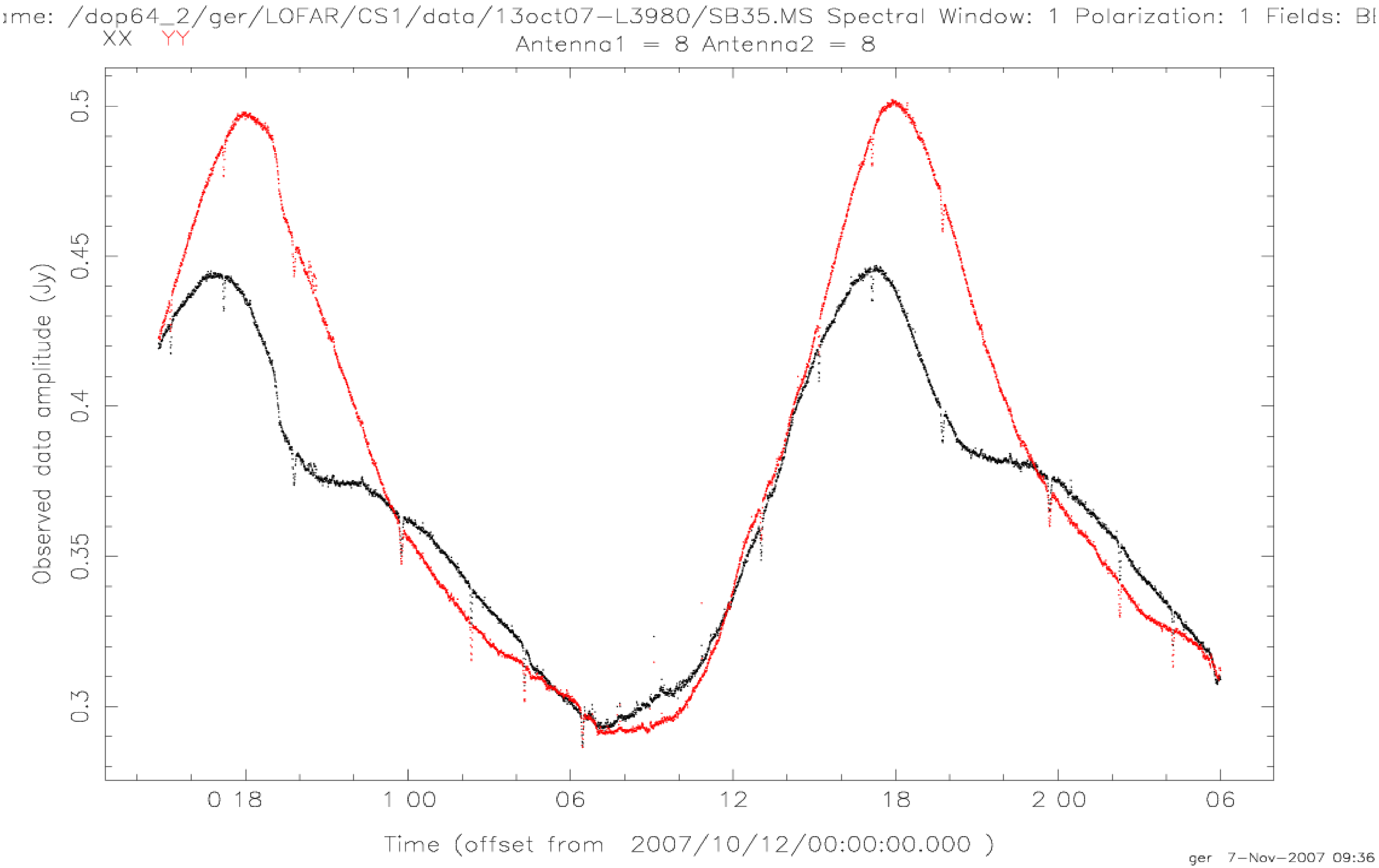
A first order analysis of Total Power stability using a station beamformer

Observation L3980 12-14 October 2007

Ger de Bruyn

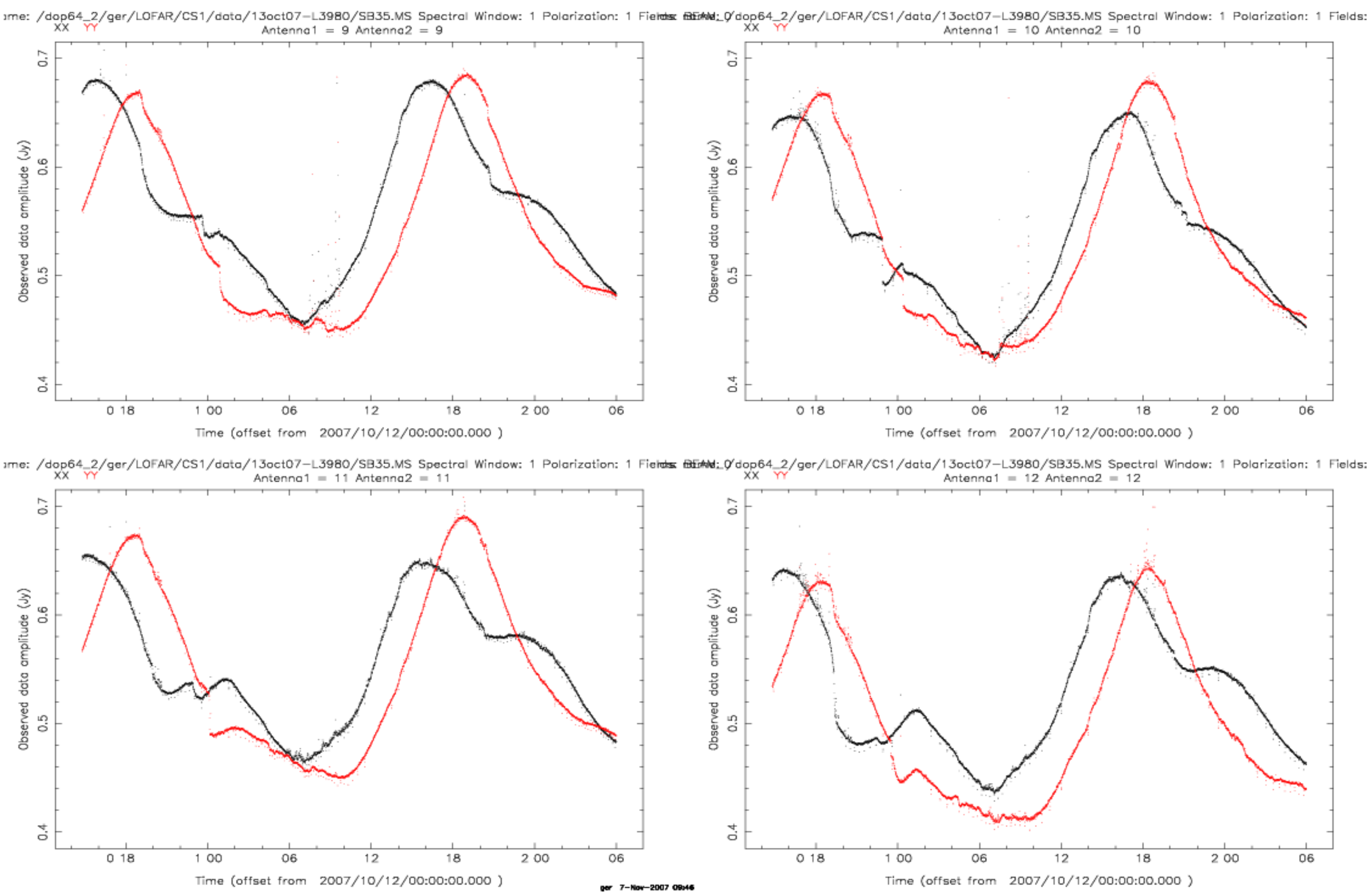
Analysis of observation L3980 (36h LBA from 12-14 Oct07)

Total Power on 1 dipole

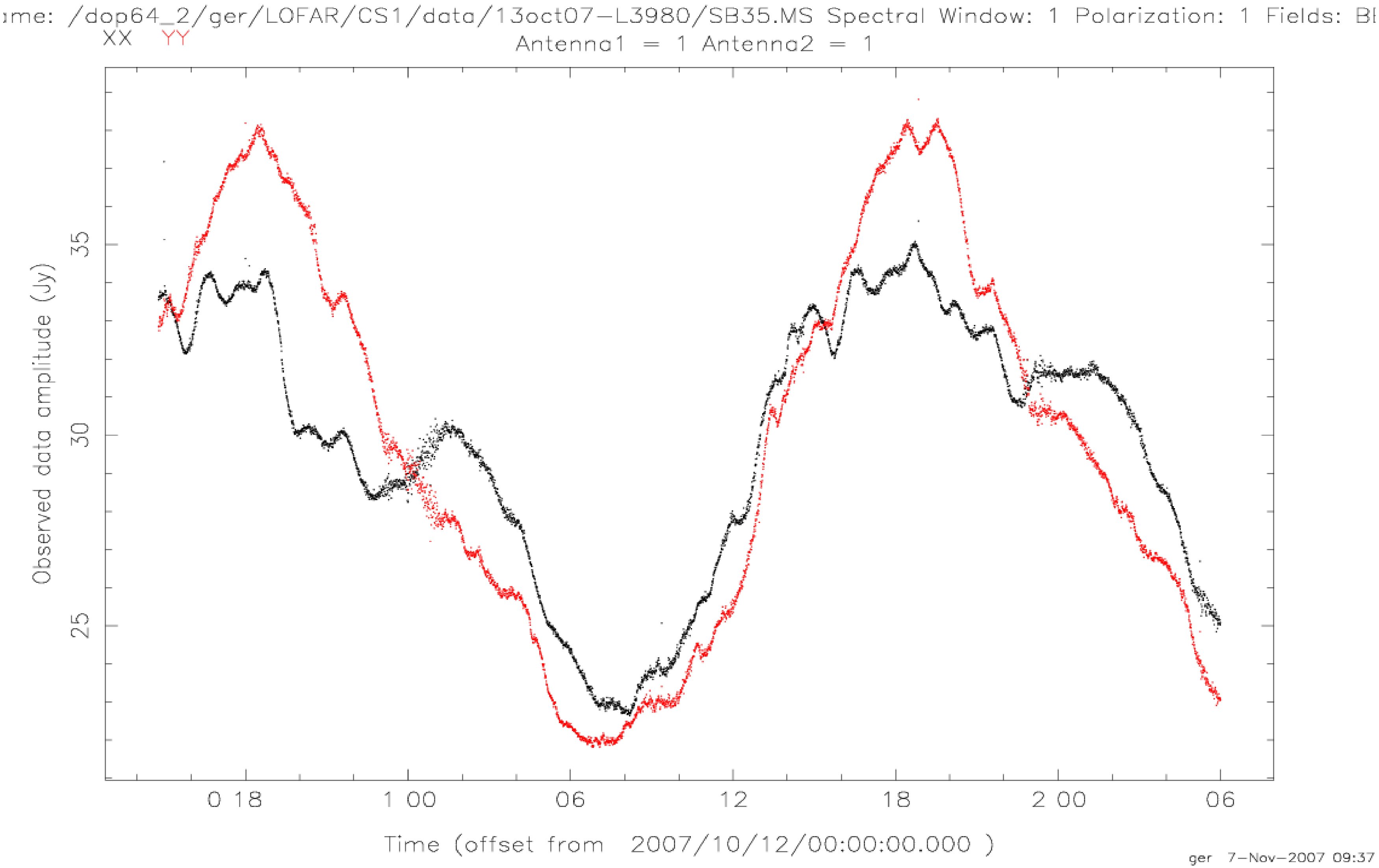


Analysis of observation L3980 (36h LBA from 12-14 Oct07)

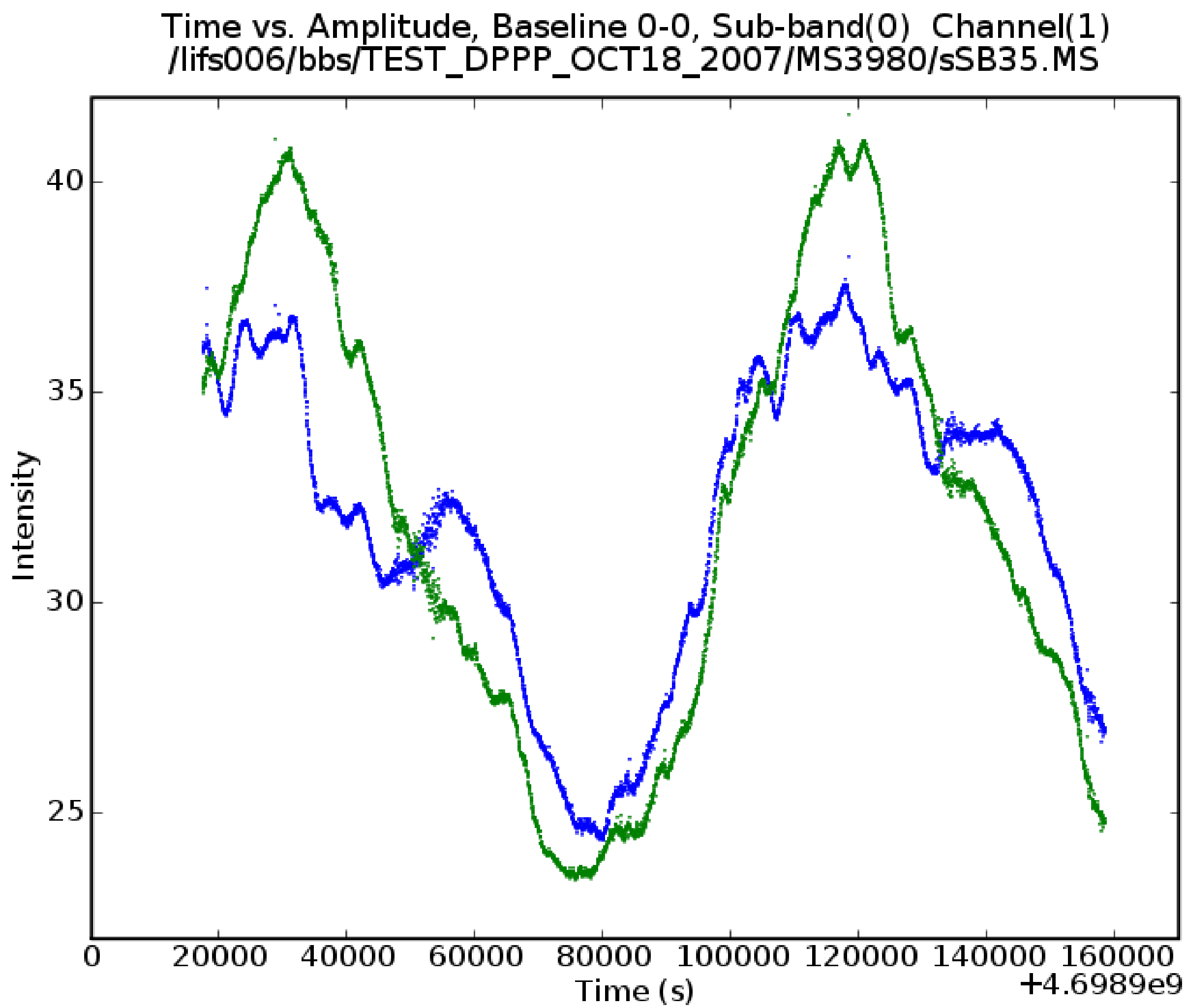
Total Power on 4 dipoles in CS008

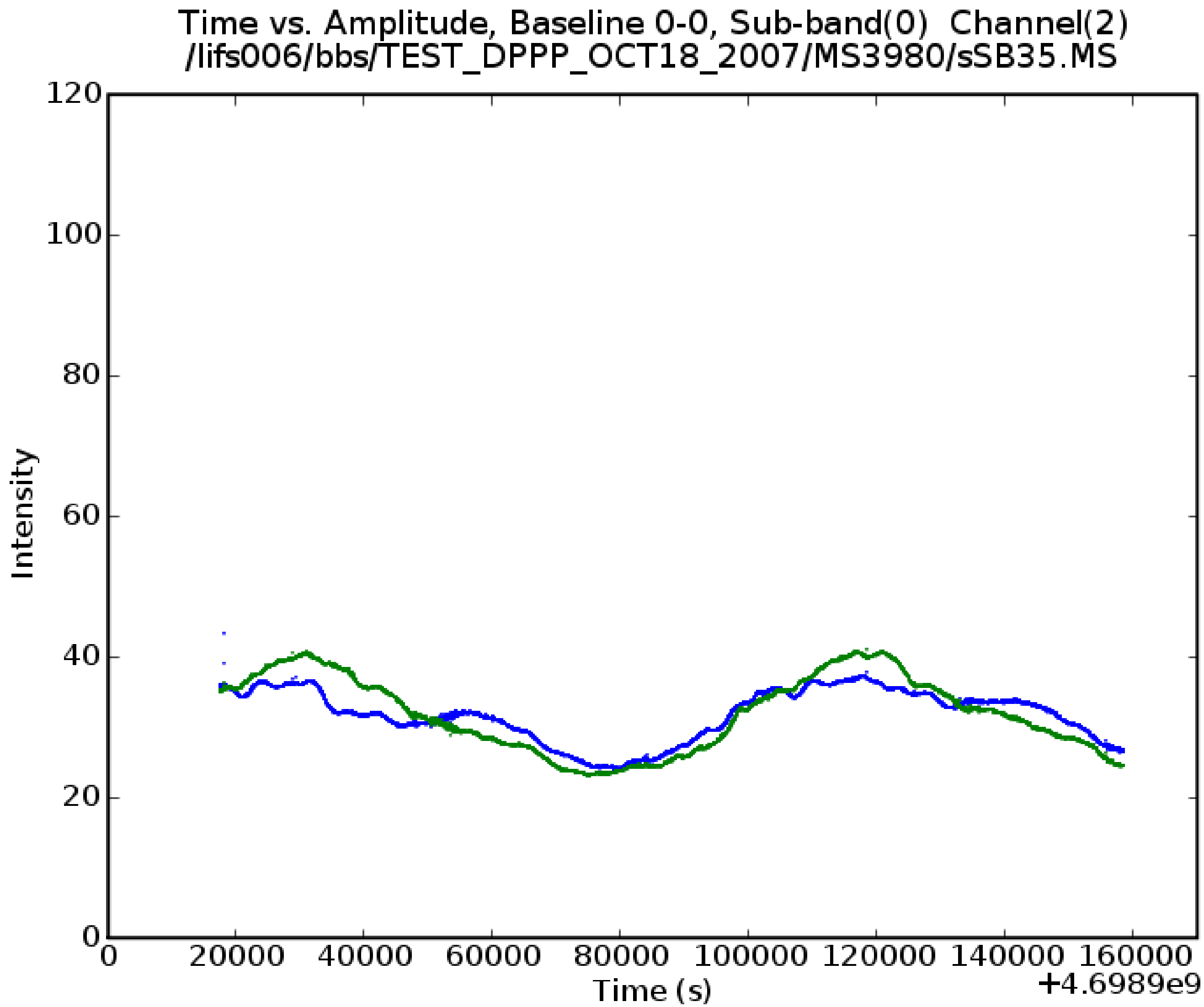


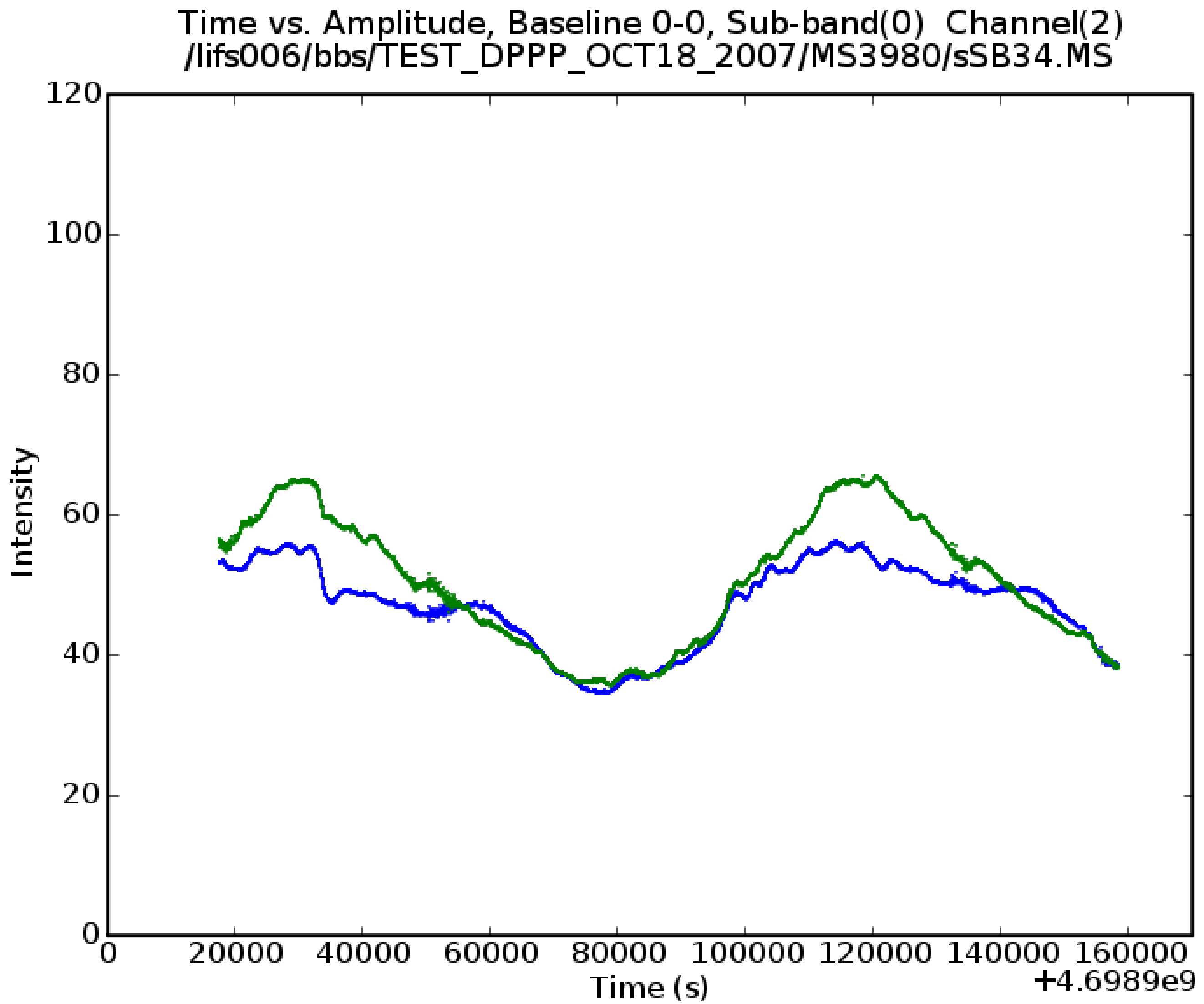
Total power on microstation 0 (Antenna 1, 48 dipole sum)



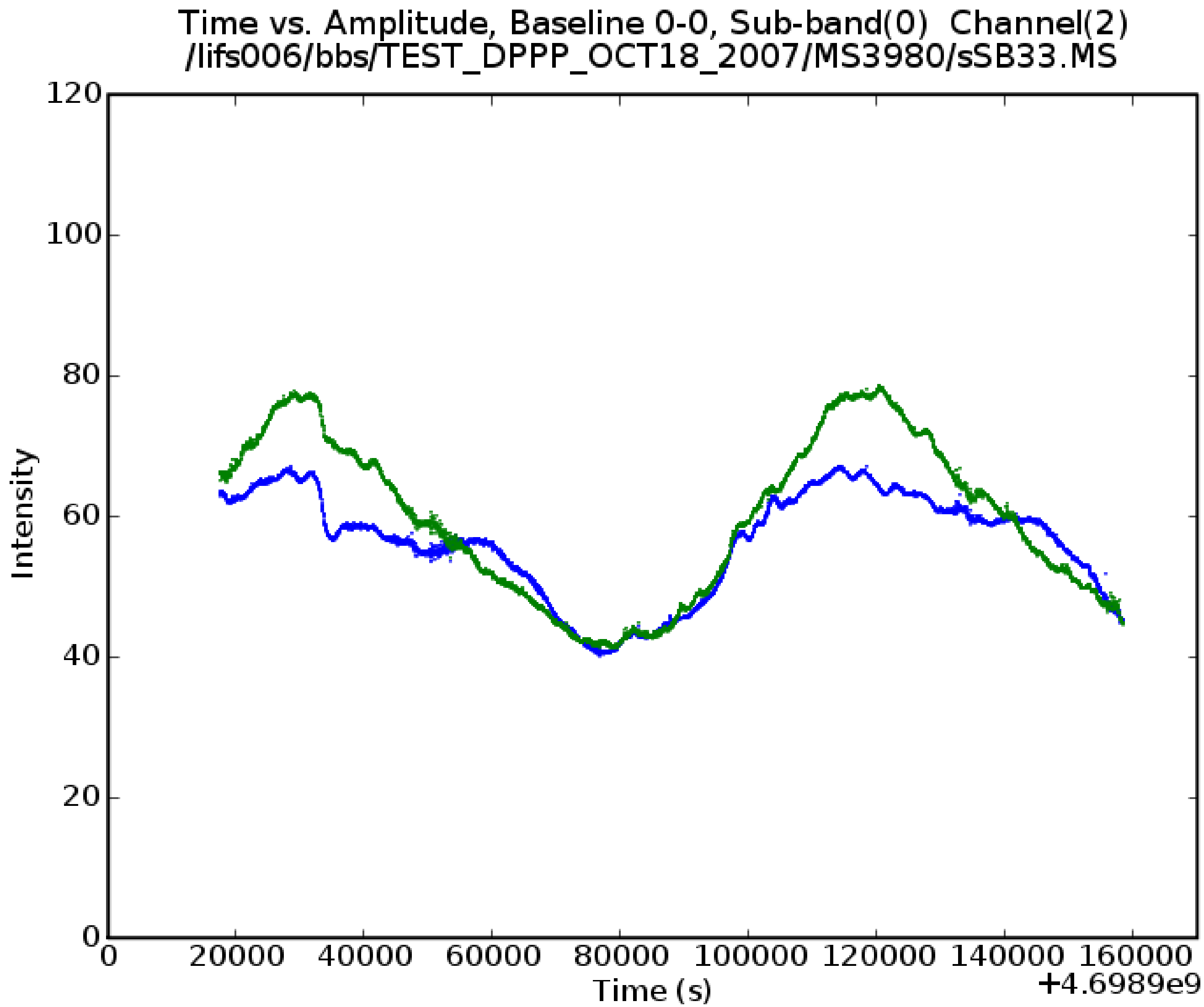
Data agree with those gone through Pandey's DP³ and plotted with Casey and Joe's pyDAL

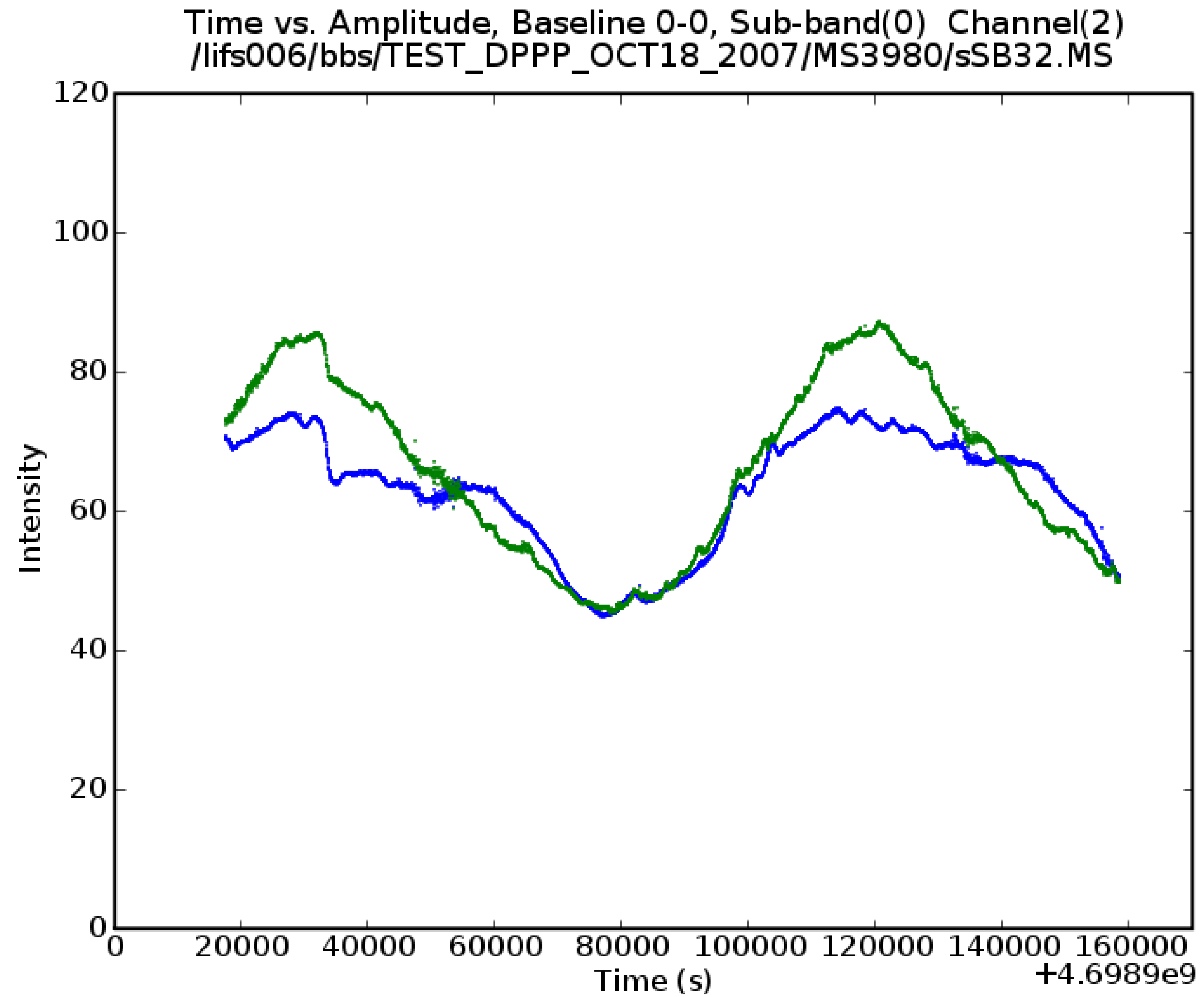


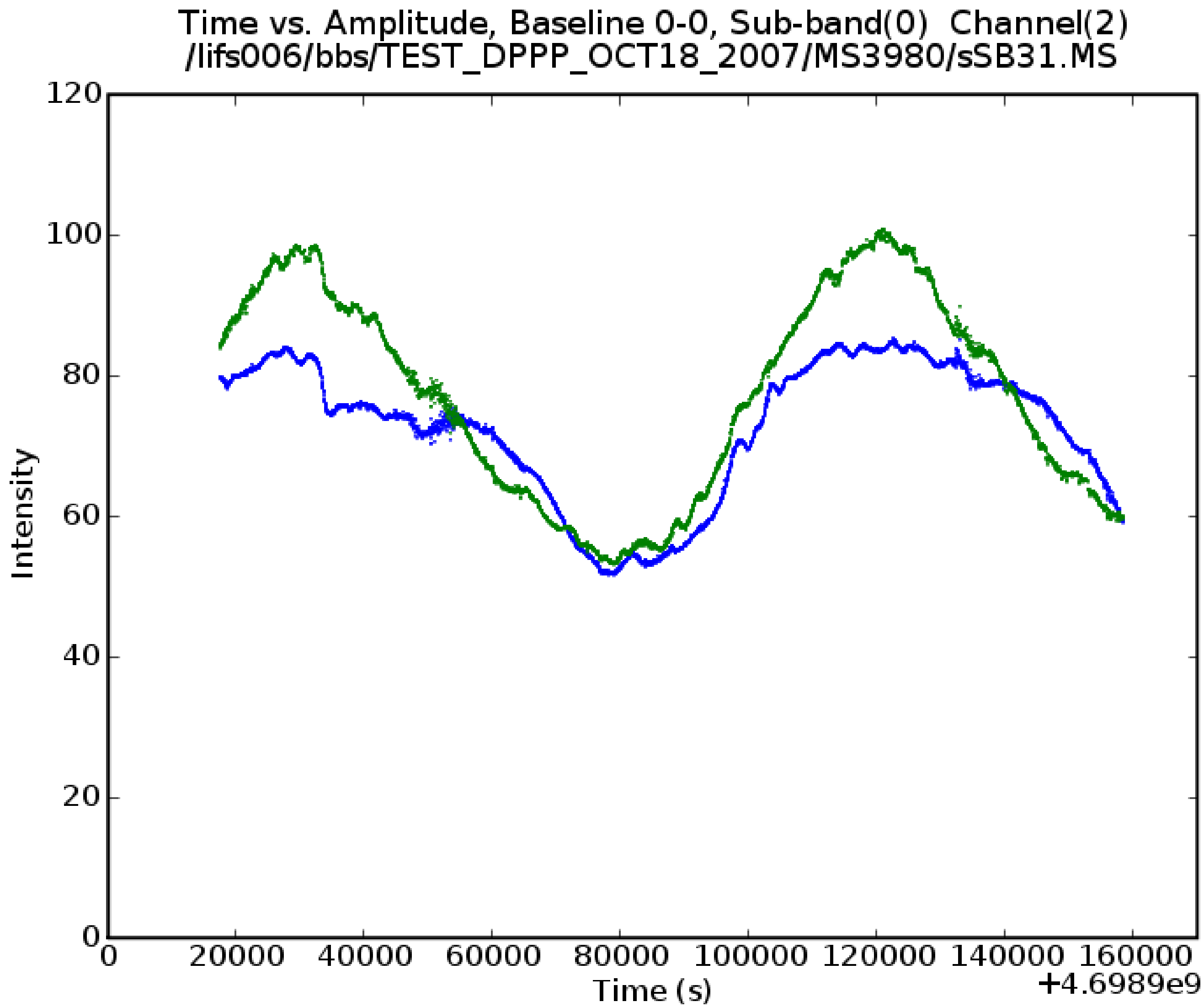

Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB35.MS
Intensity
Time (s)
+4.6989e9
0
20
40
60
80
100
120
0
20000
40000
60000
80000
100000
120000
140000
160000

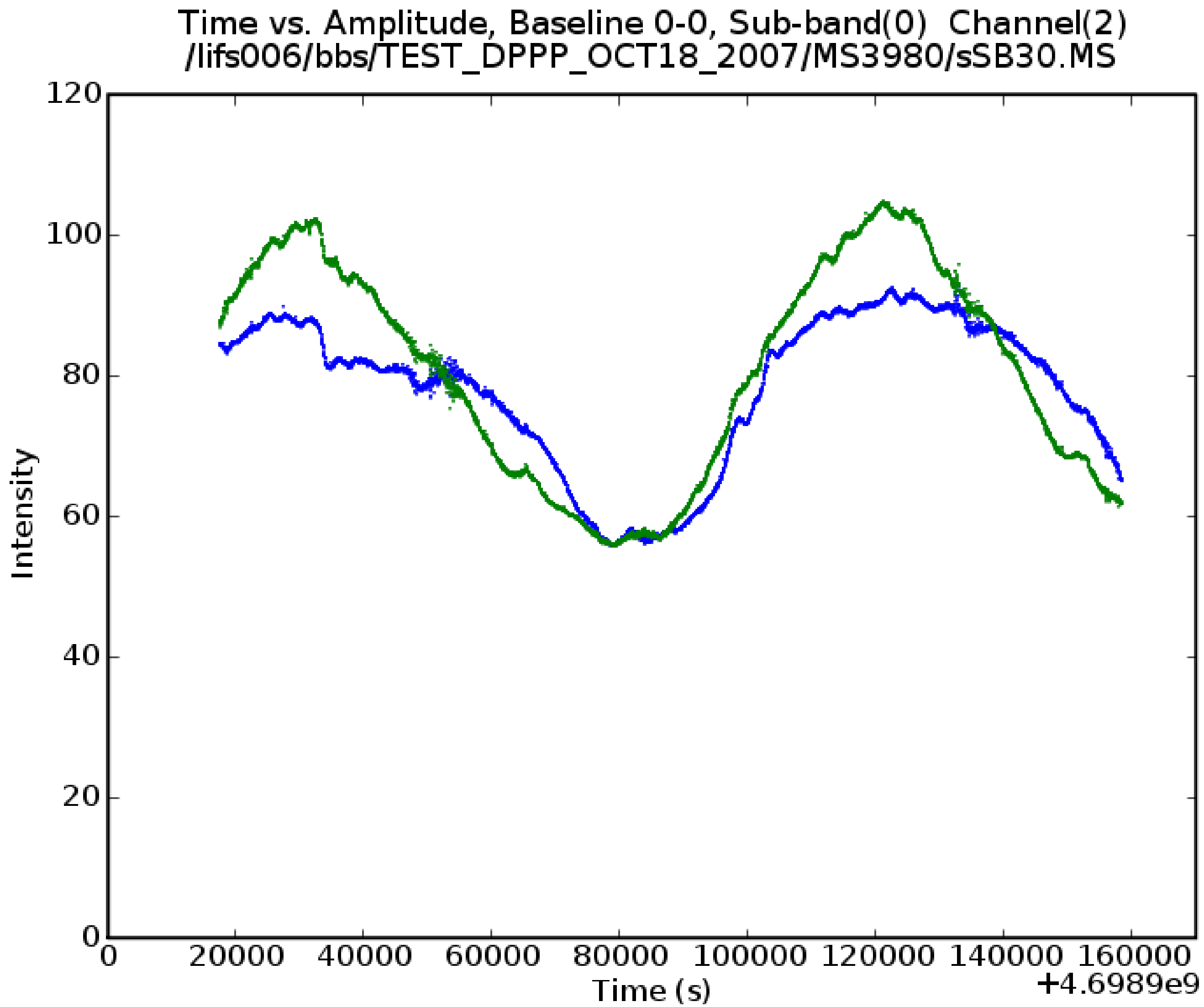


Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB34.MS
Intensity
Time (s)
+4.6989e9
0
20
40
60
80
100
120
0
20000
40000
60000
80000
100000
120000
140000
160000

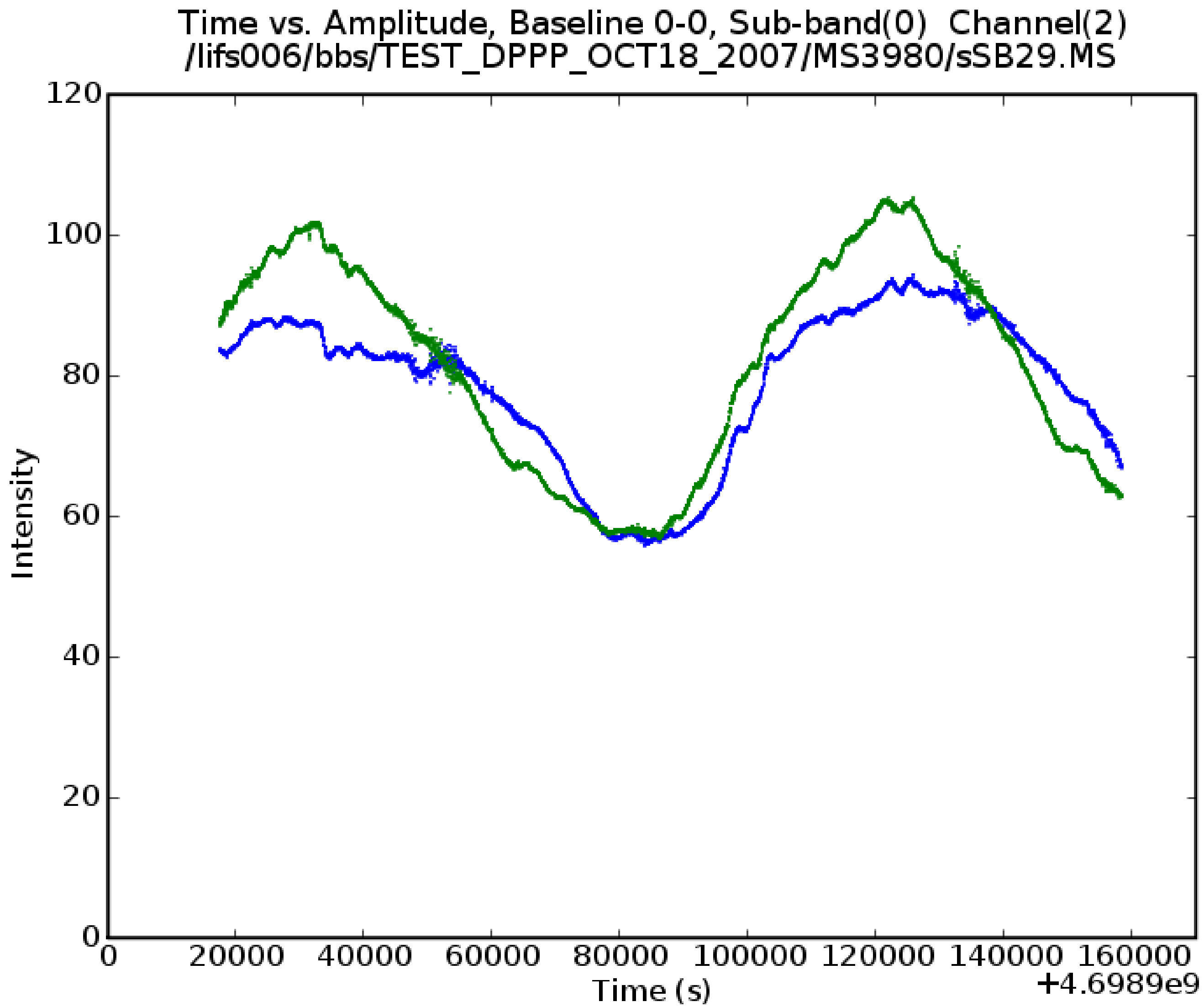

Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB33.MS
Intensity
Time (s)
+4.6989e9
0
20
40
60
80
100
120
0
20000
40000
60000
80000
100000
120000
140000
160000

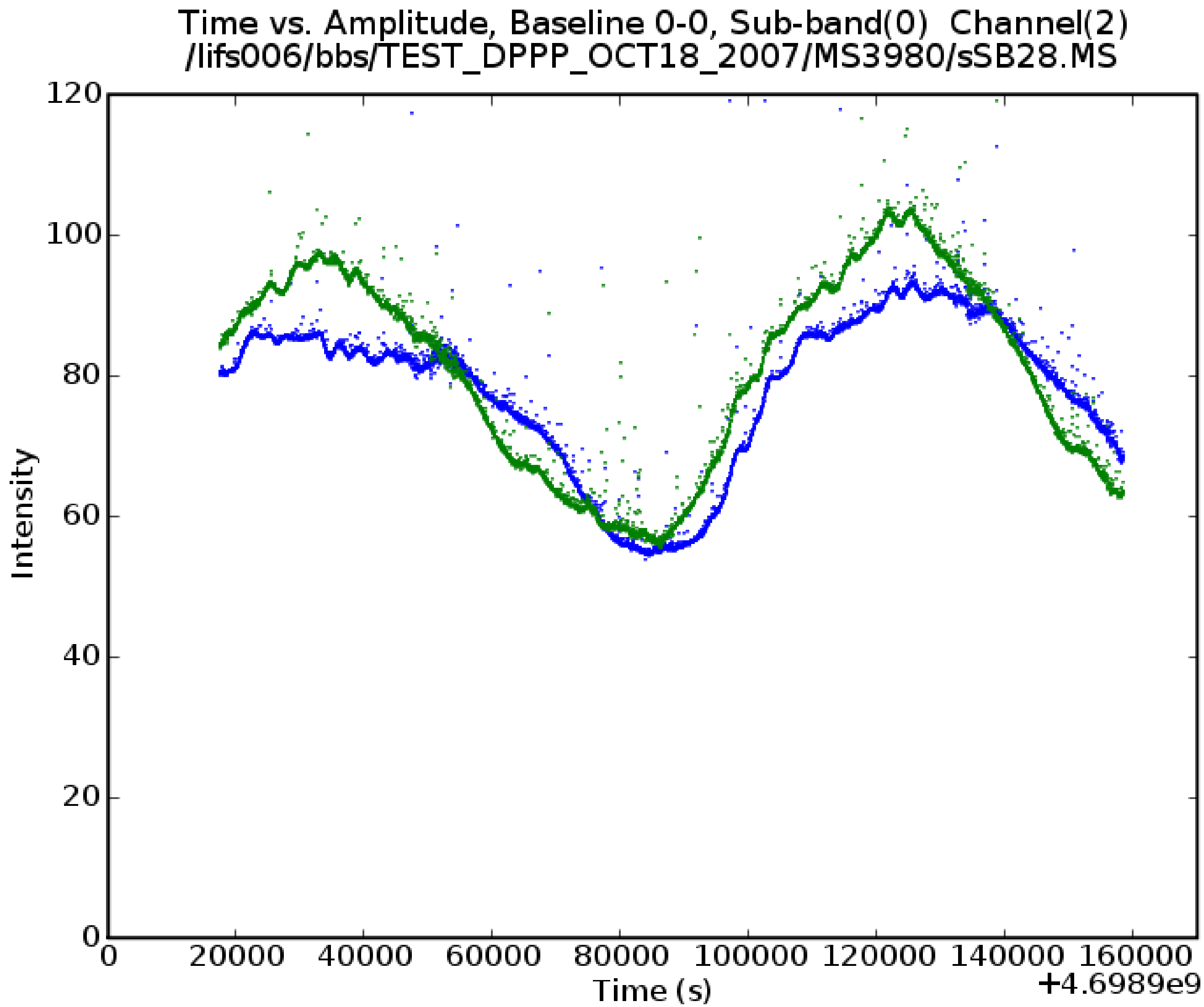

Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB32.MS
Intensity
0
20
40
60
80
100
120
0
20000
40000
60000
80000
100000
120000
140000
160000
Time (s)
+4.6989e9


Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB31.MS
Intensity
Time (s)
+4.6989e9
0
20
40
60
80
100
120
0
20000
40000
60000
80000
100000
120000
140000
160000

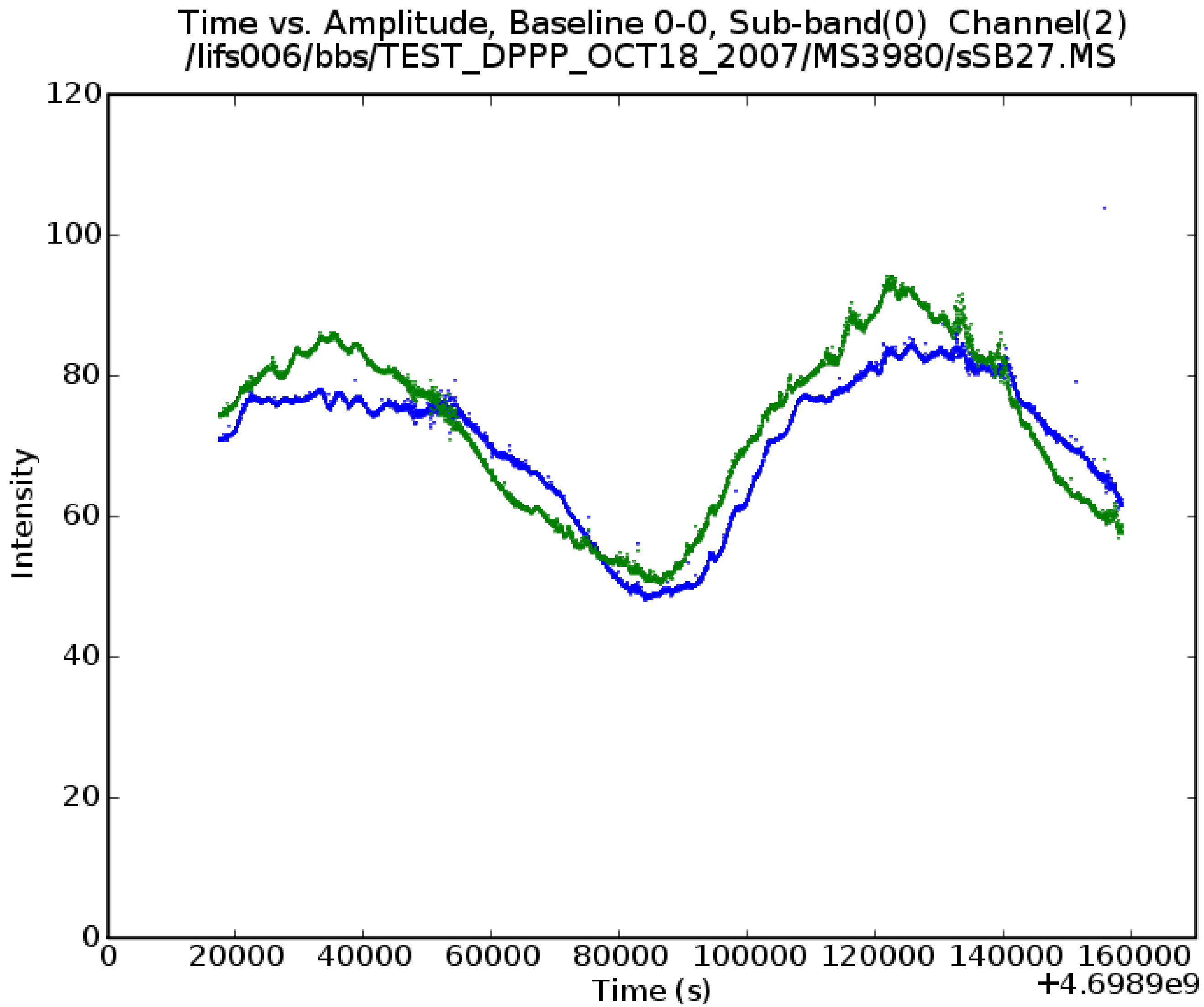


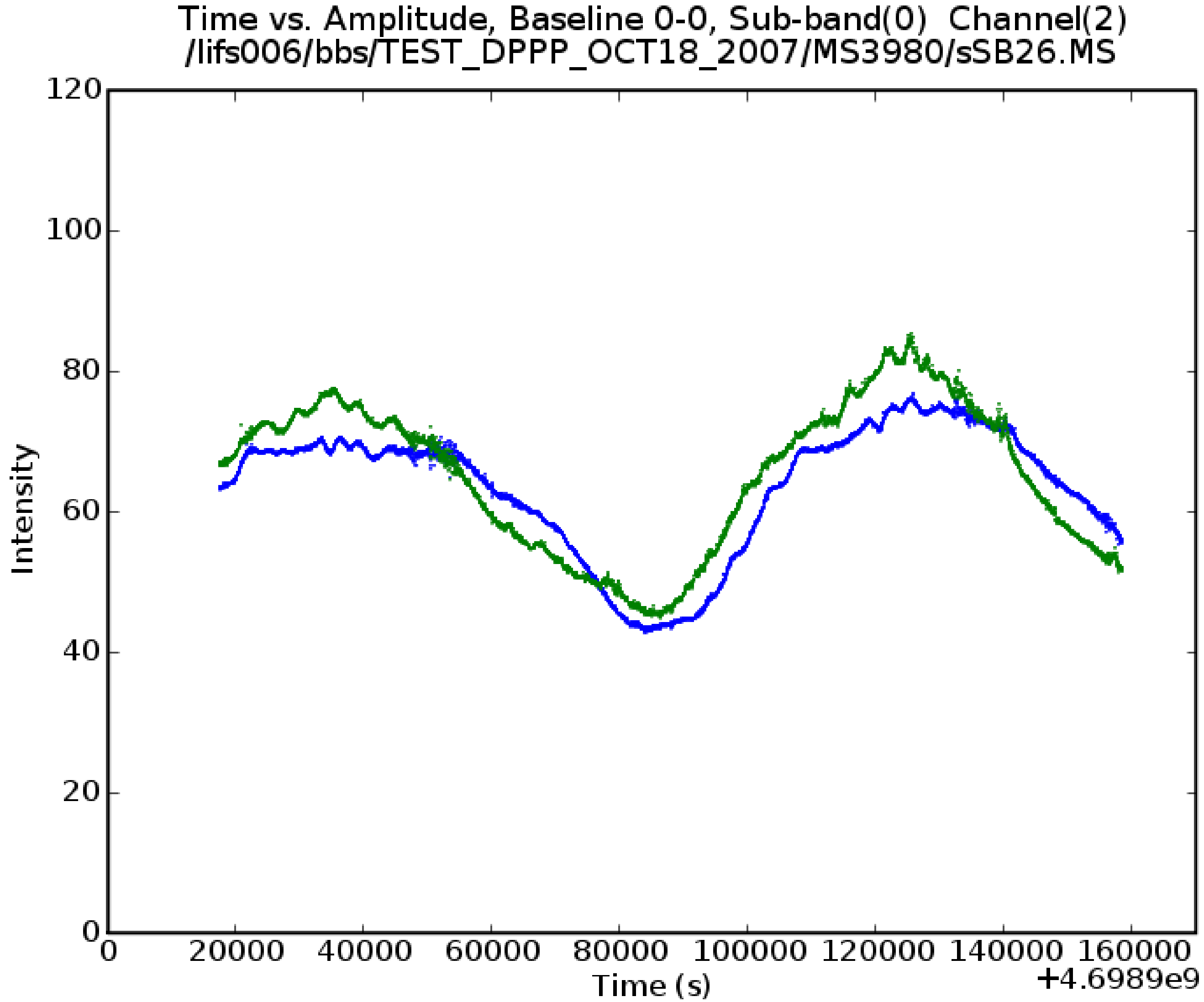
Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB30.MS
Intensity
Time (s)
+4.6989e9
0
20
40
60
80
100
120
0
20000
40000
60000
80000
100000
120000
140000
160000

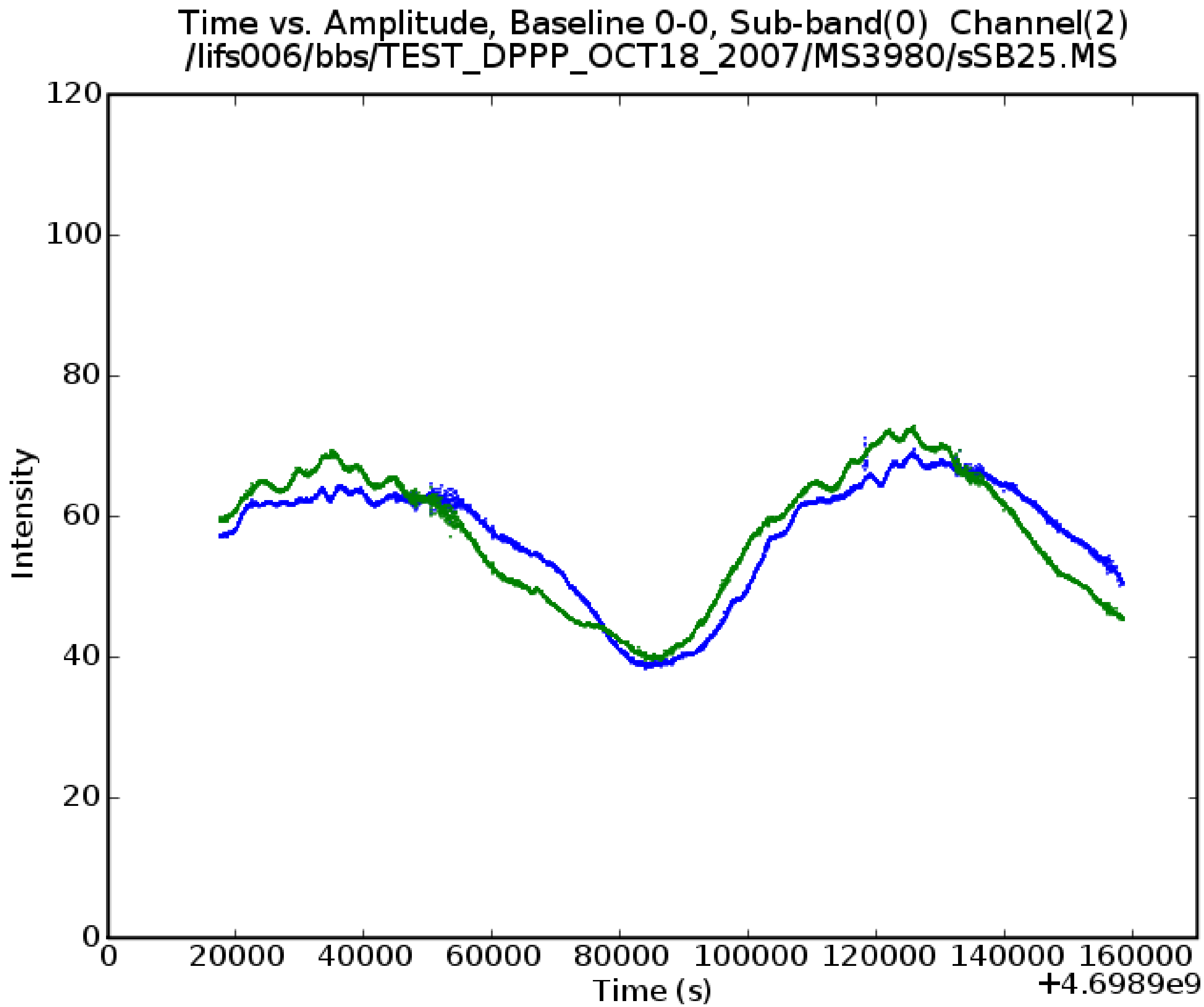

Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB29.MS
Intensity
Time (s)
+4.6989e9
0
20
40
60
80
100
120
0
20000
40000
60000
80000
100000
120000
140000
160000



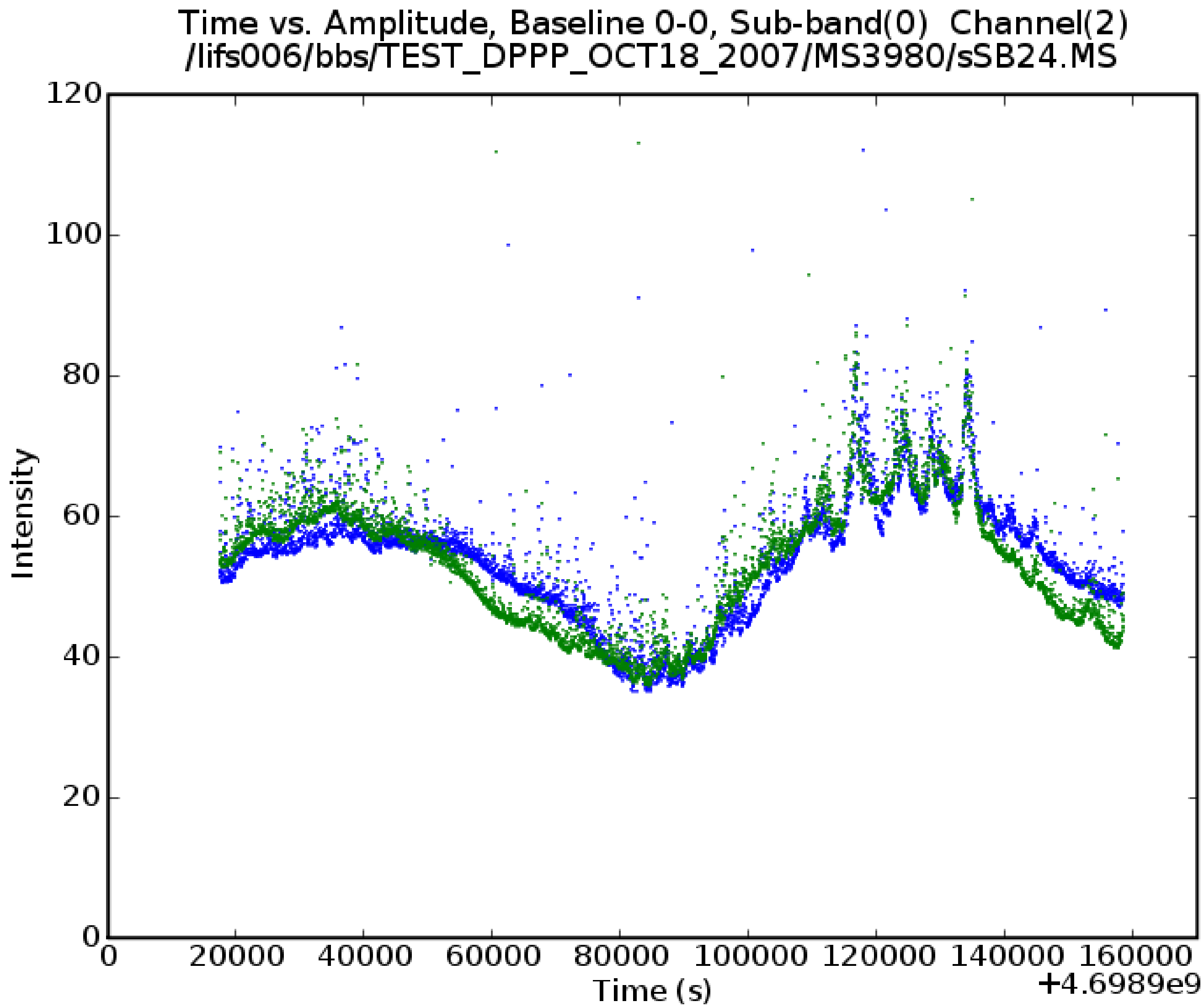
Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB28.MS
Intensity
Time (s)
+4.6989e9
0
20
40
60
80
100
120
0
20000
40000
60000
80000
100000
120000
140000
160000

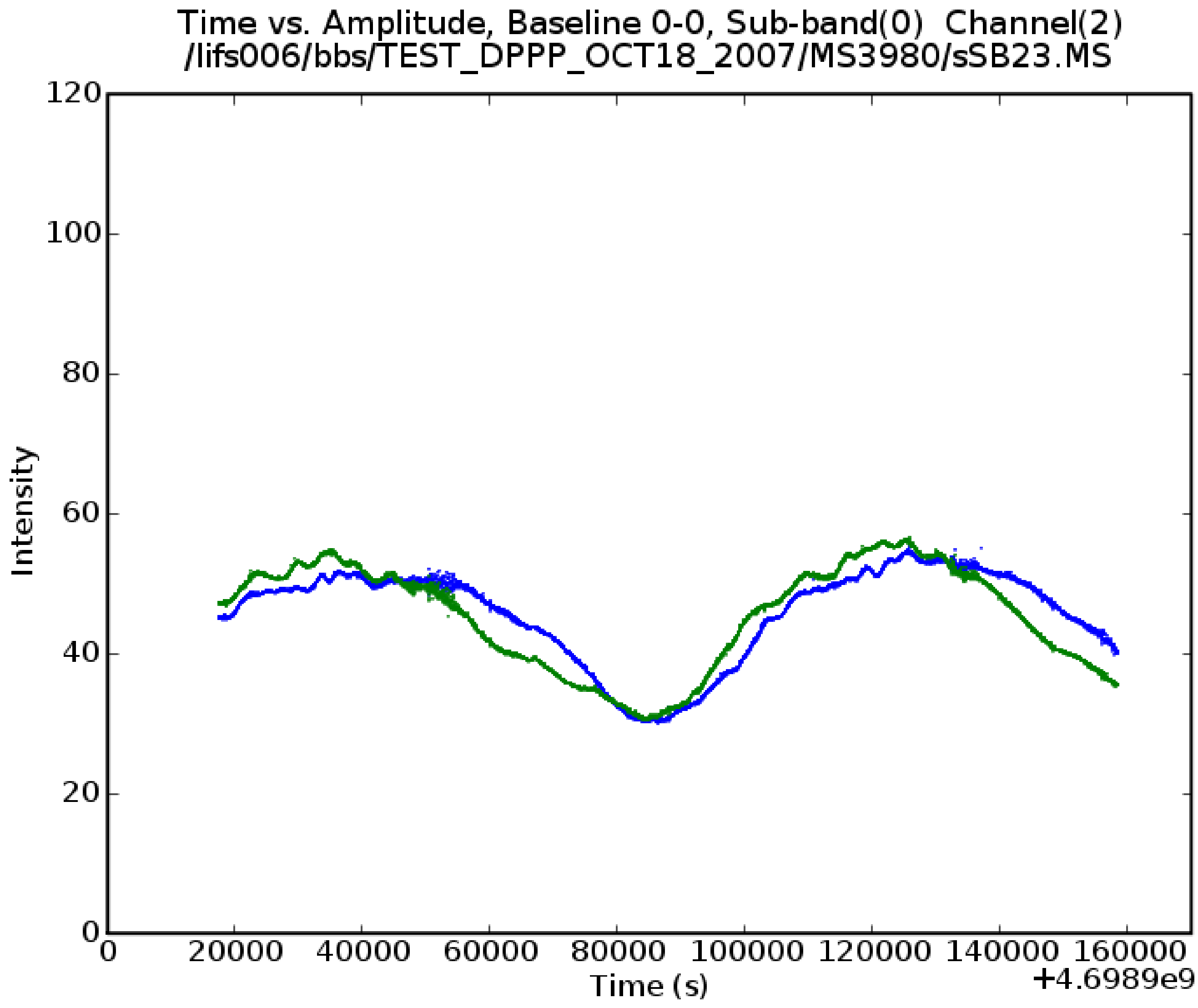

Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB27.MS
Intensity
Time (s)
+4.6989e9
0
20
40
60
80
100
120
0
20000
40000
60000
80000
100000
120000
140000
160000

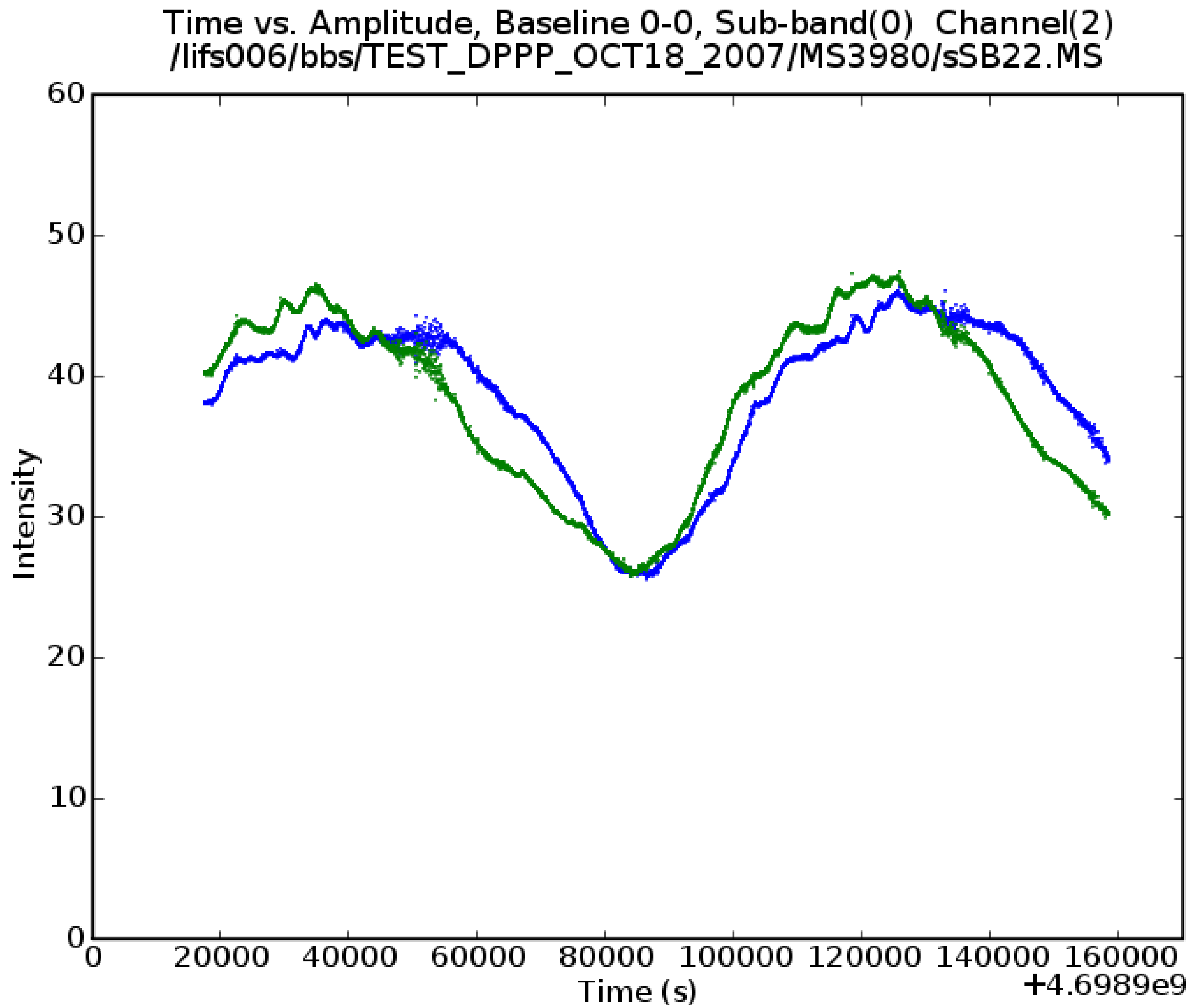

Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB26.MS
Intensity
Time (s)
+4.6989e9
0
20
40
60
80
100
120
0
20000
40000
60000
80000
100000
120000
140000
160000

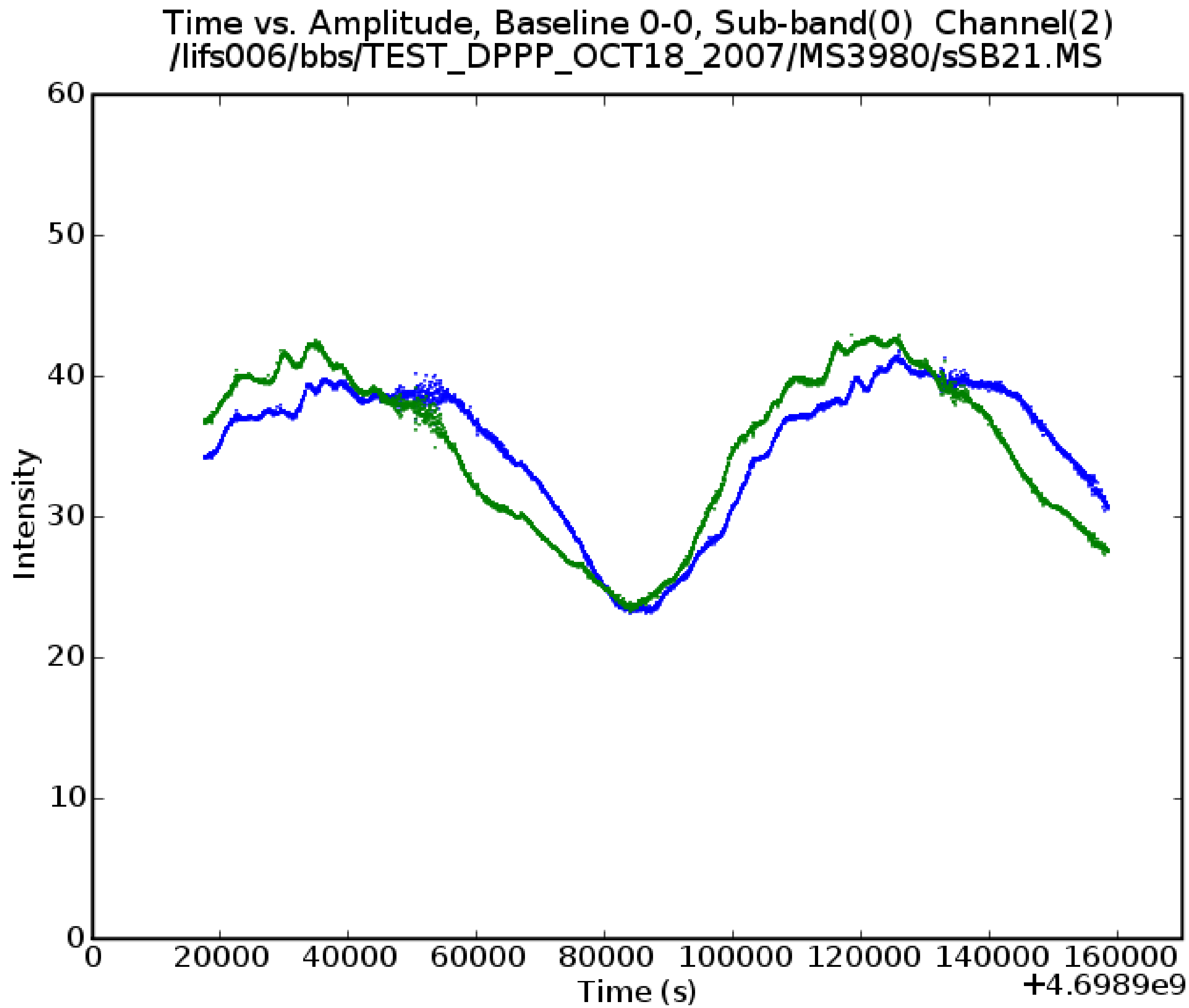


Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB25.MS
Intensity
Time (s)
+4.6989e9
0
20
40
60
80
100
120
0
20000
40000
60000
80000
100000
120000
140000
160000

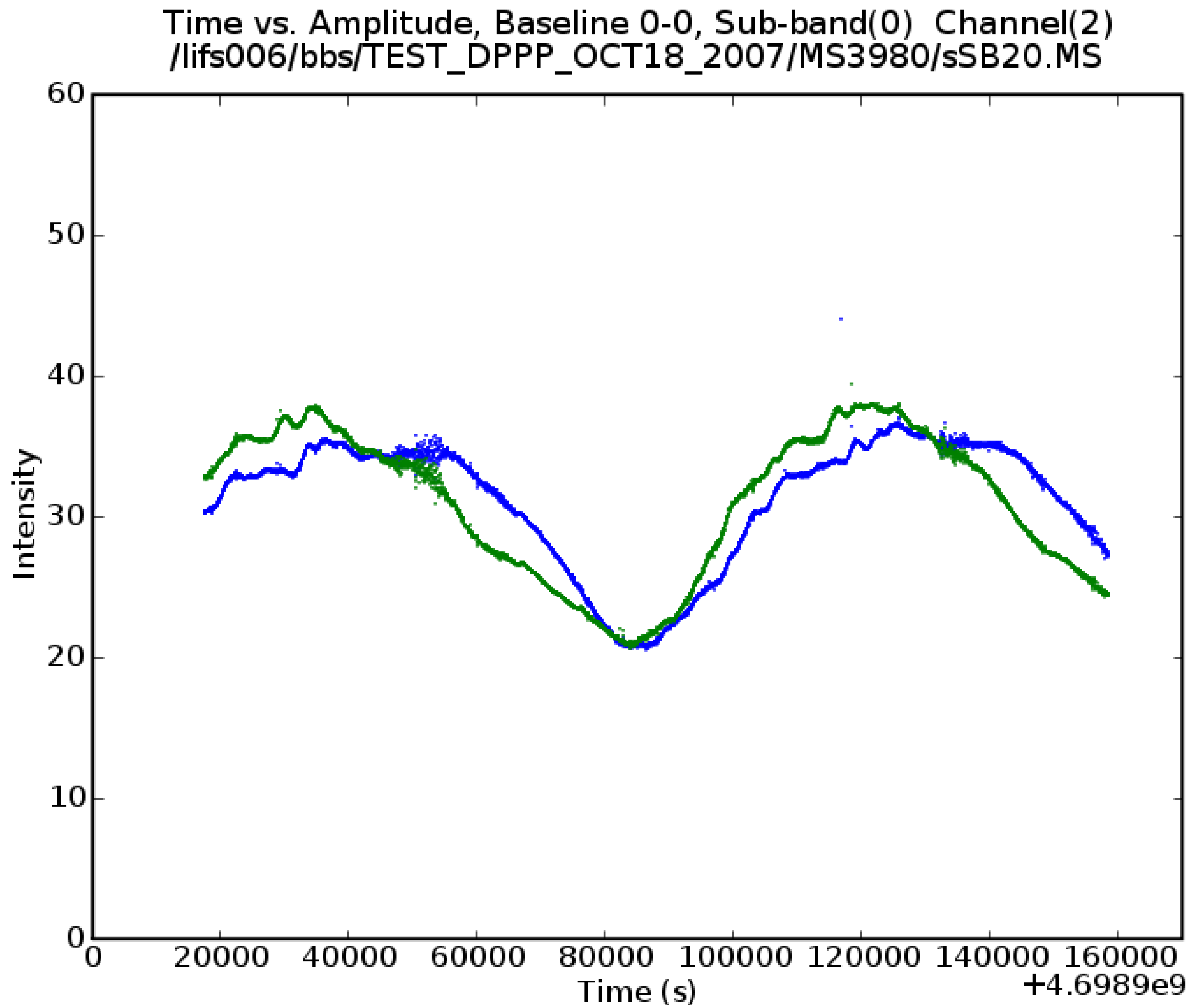

Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB24.MS
Intensity
Time (s)
+4.6989e9
0
20
40
60
80
100
120
0
20000
40000
60000
80000
100000
120000
140000
160000


Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB23.MS
Intensity
Time (s)
+4.6989e9
0
20
40
60
80
100
120
0
20000
40000
60000
80000
100000
120000
140000
160000

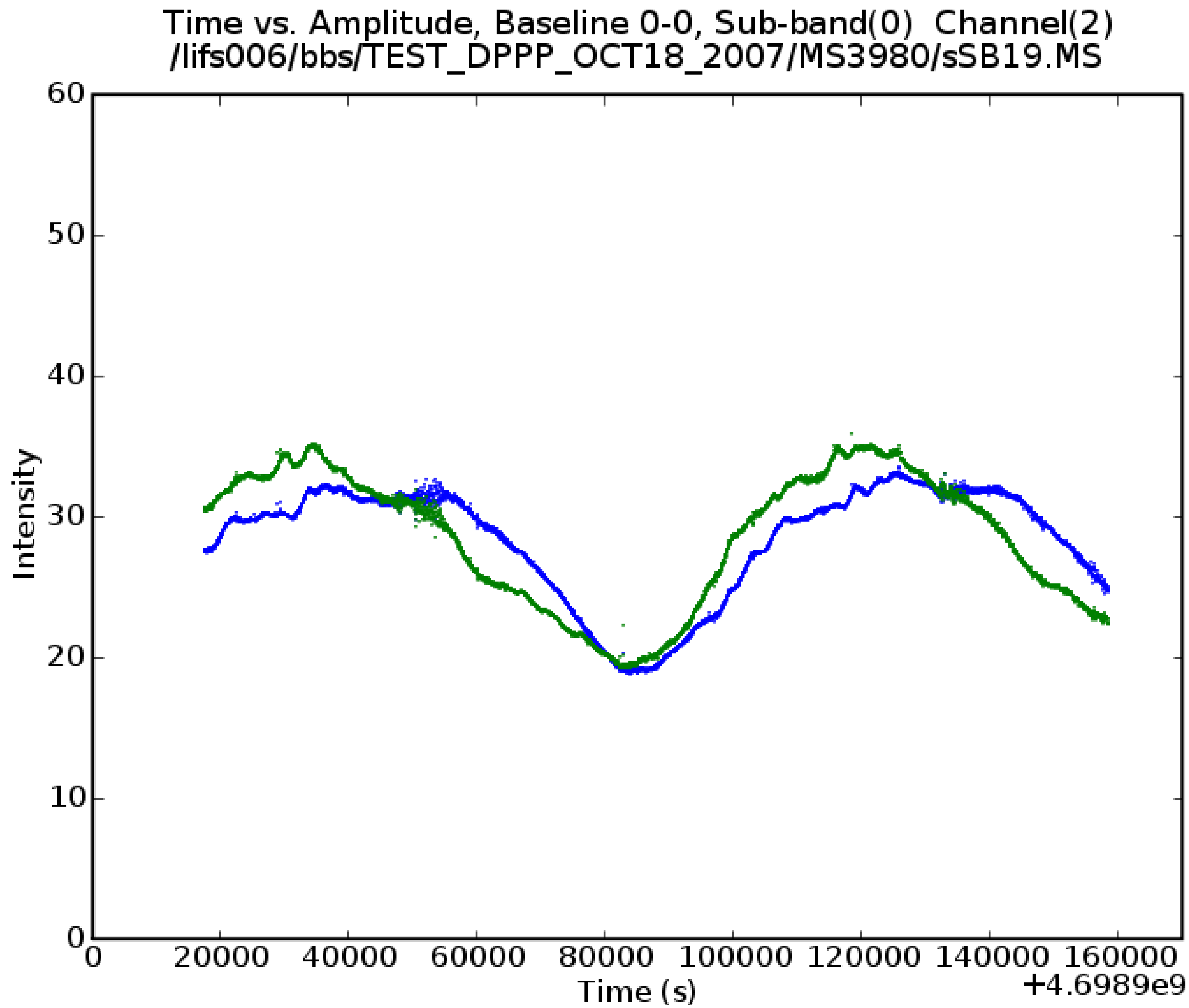

Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB22.MS
Intensity
0
10
20
30
40
50
60
0
20000
40000
60000
80000
100000
120000
140000
160000
Time (s)
+4.6989e9

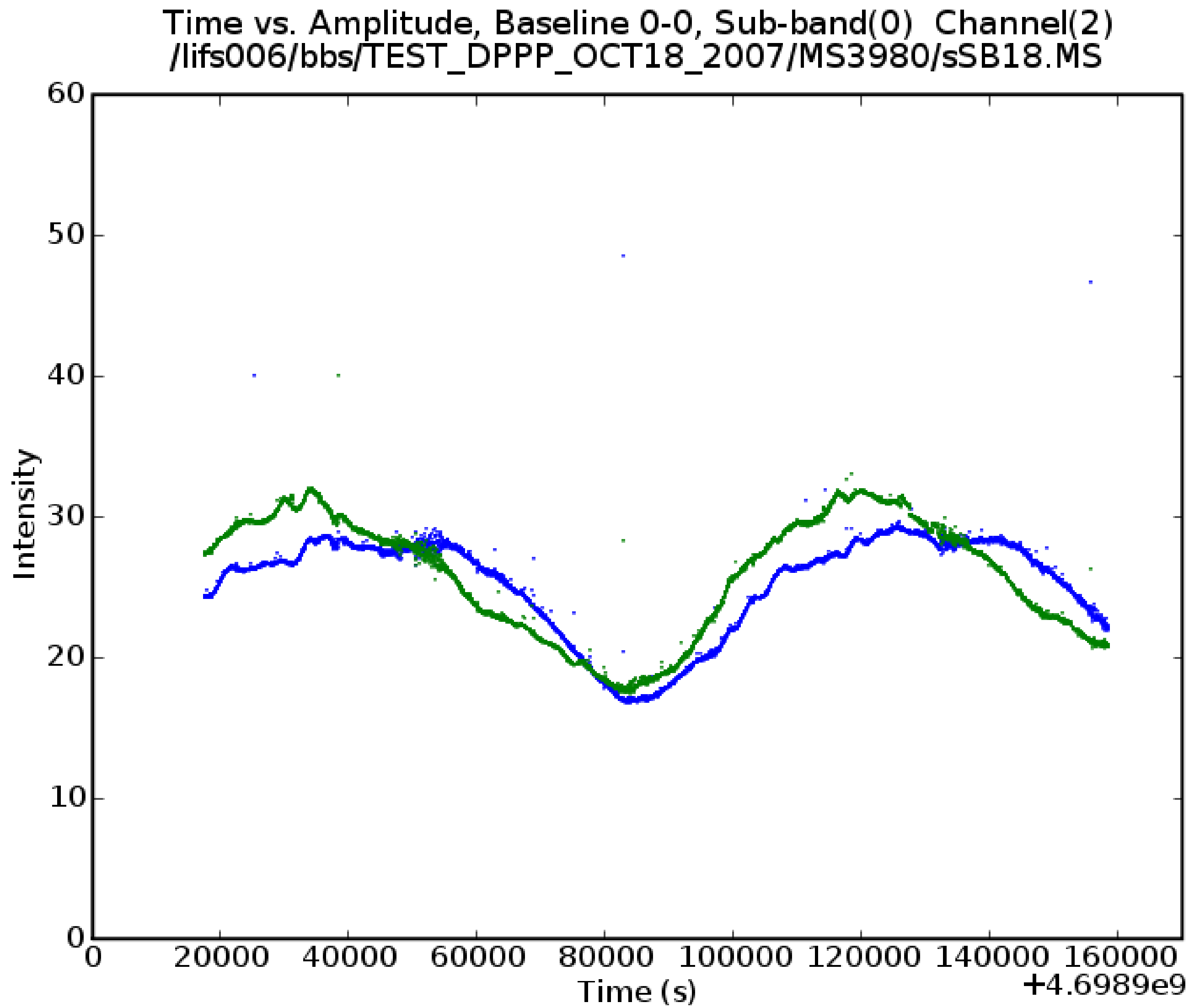


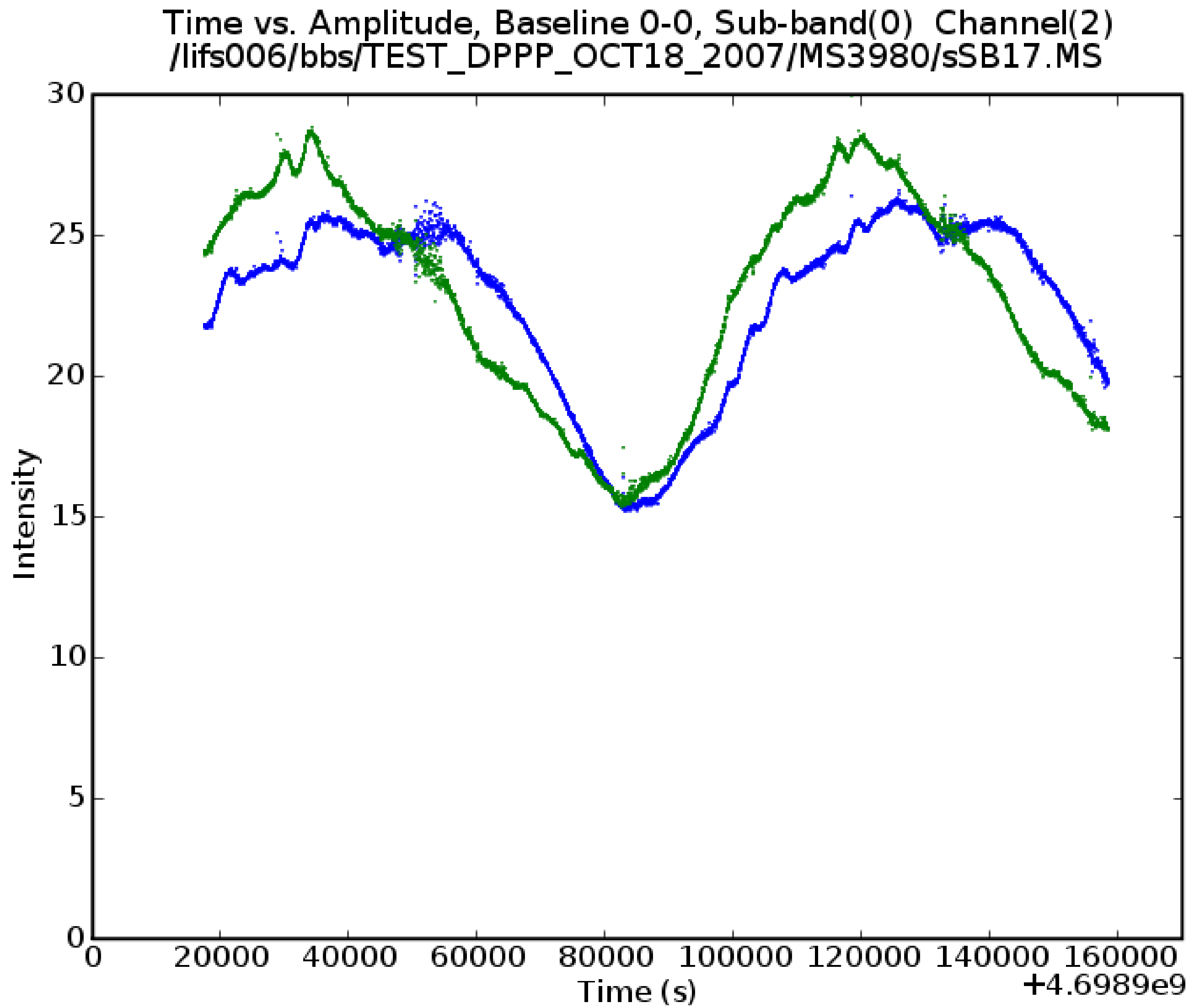
Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB21.MS
Intensity
Time (s)
+4.6989e9
0
10
20
30
40
50
60
0
20000
40000
60000
80000
100000
120000
140000
160000



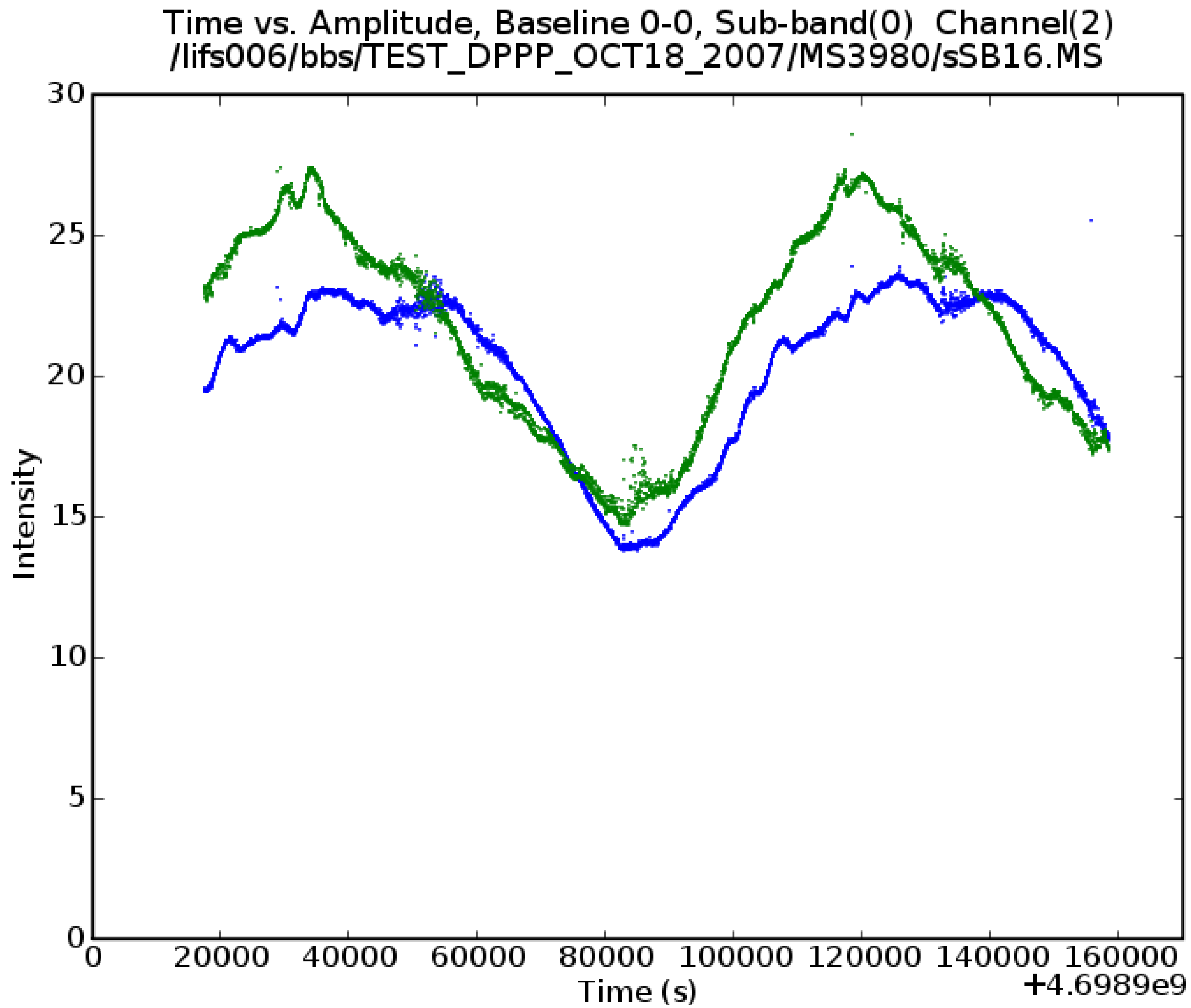
Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB20.MS
Intensity
Time (s)
+4.6989e9
0
10
20
30
40
50
60
0
20000
40000
60000
80000
100000
120000
140000
160000

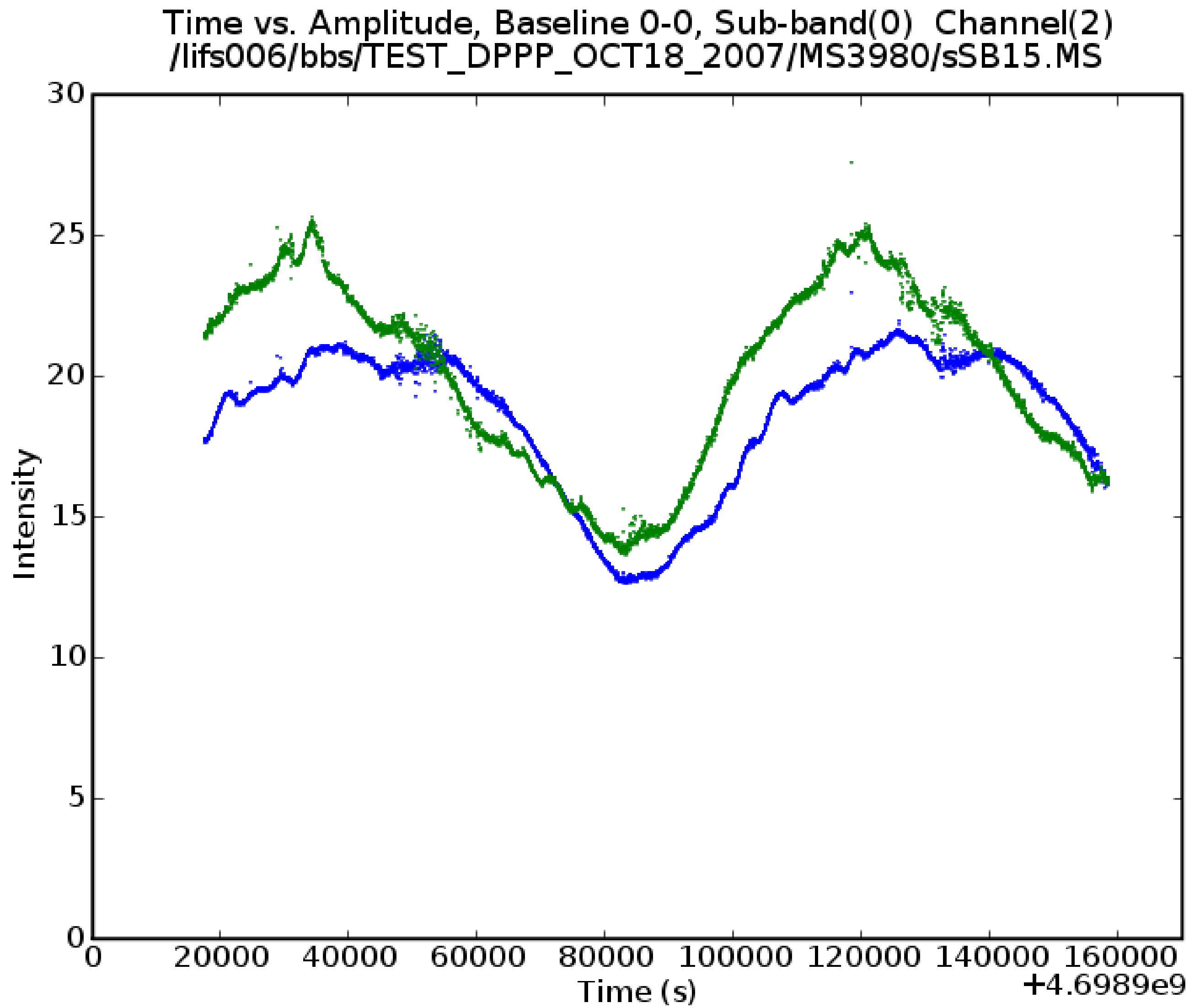

Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB19.MS
Intensity
Time (s)
+4.6989e9
0
10
20
30
40
50
60
20000
40000
60000
80000
100000
120000
140000
160000


Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB18.MS
Intensity
Time (s)
+4.6989e9
0
10
20
30
40
50
60
0
20000
40000
60000
80000
100000
120000
140000
160000

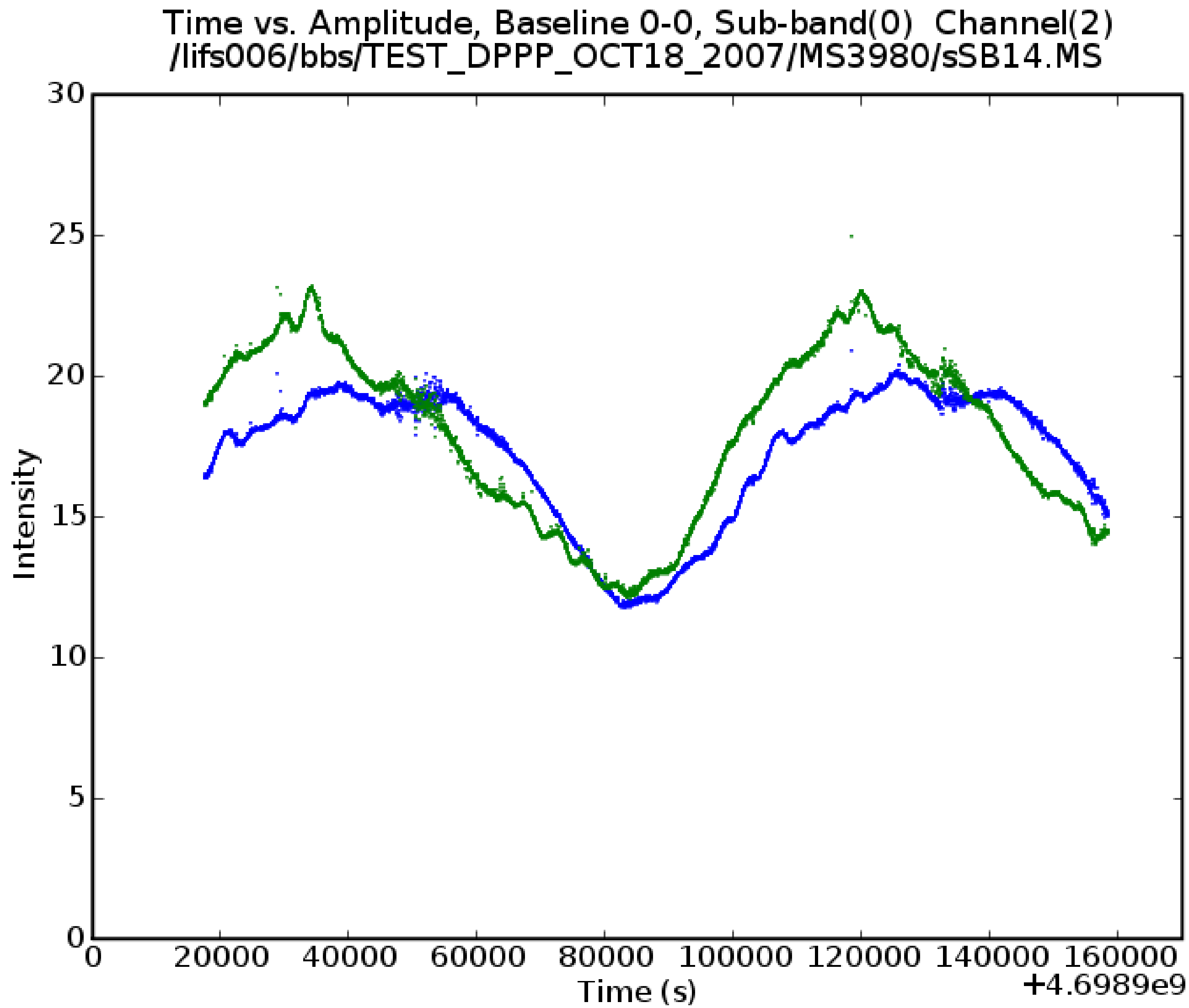


Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB17.MS
Intensity
Time (s)
+4.6989e9
0
5
10
15
20
25
30
0
20000
40000
60000
80000
100000
120000
140000
160000

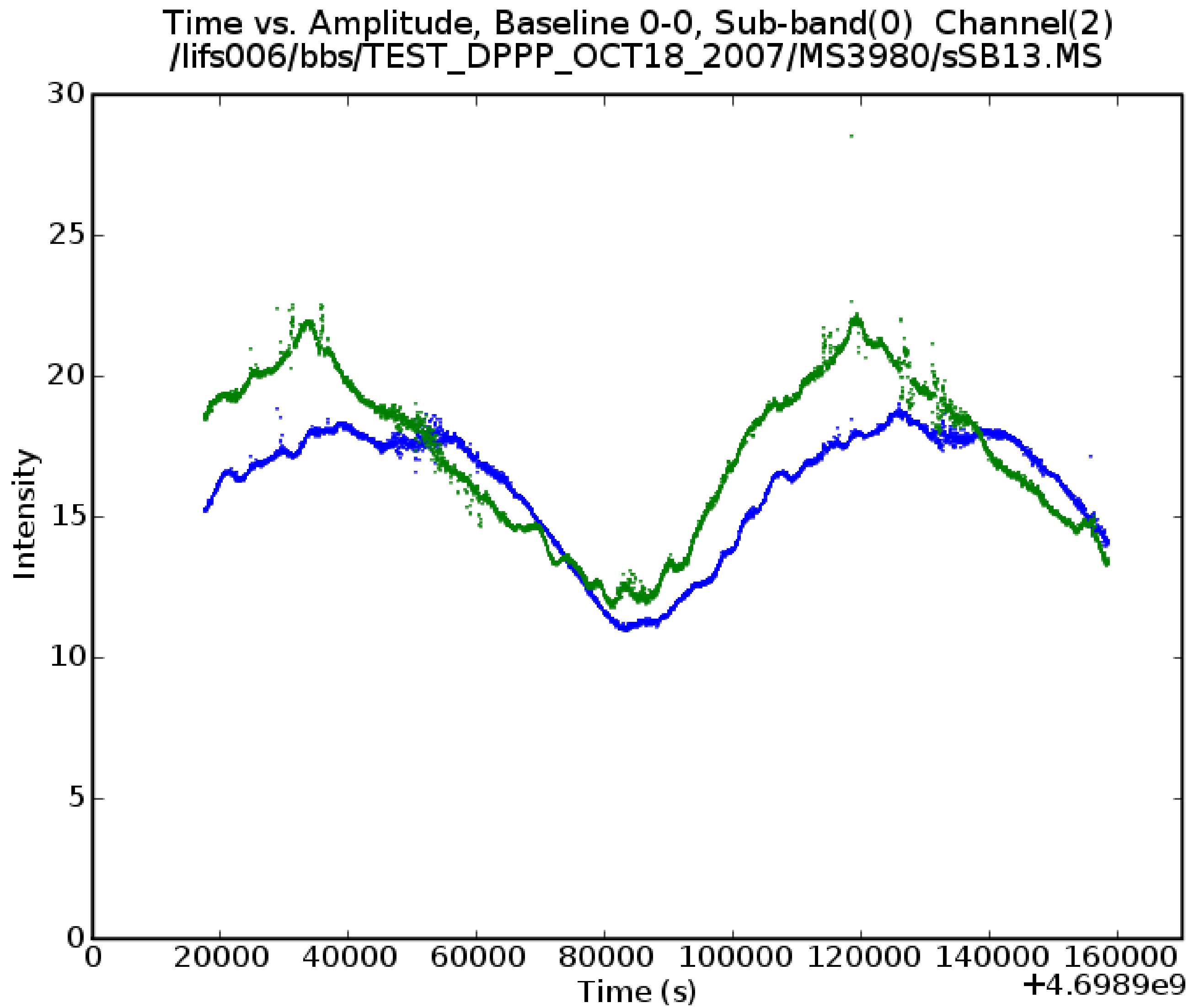

Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB16.MS
Intensity
Time (s)
+4.6989e9
0
5
10
15
20
25
30
0
20000
40000
60000
80000
100000
120000
140000
160000

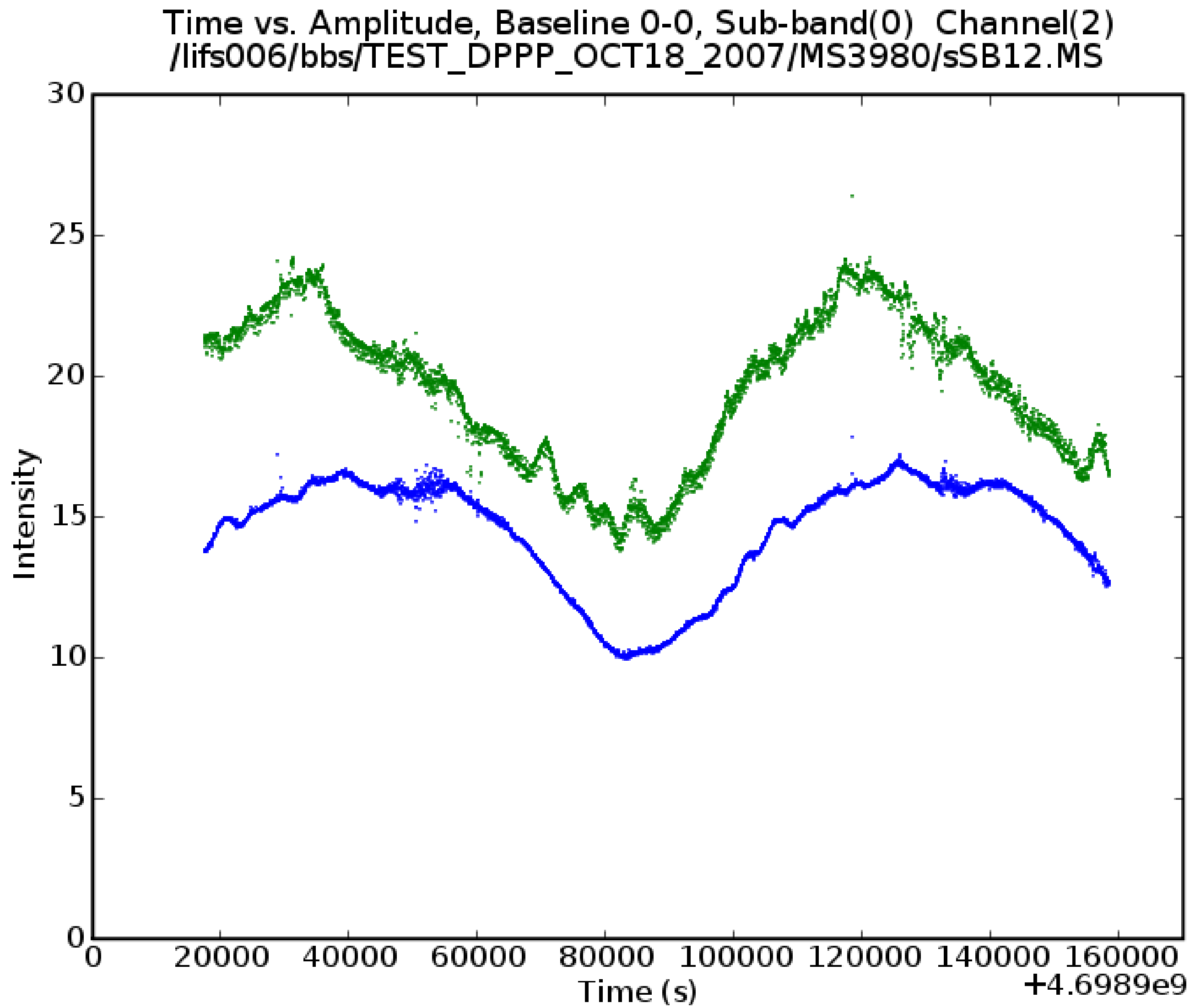


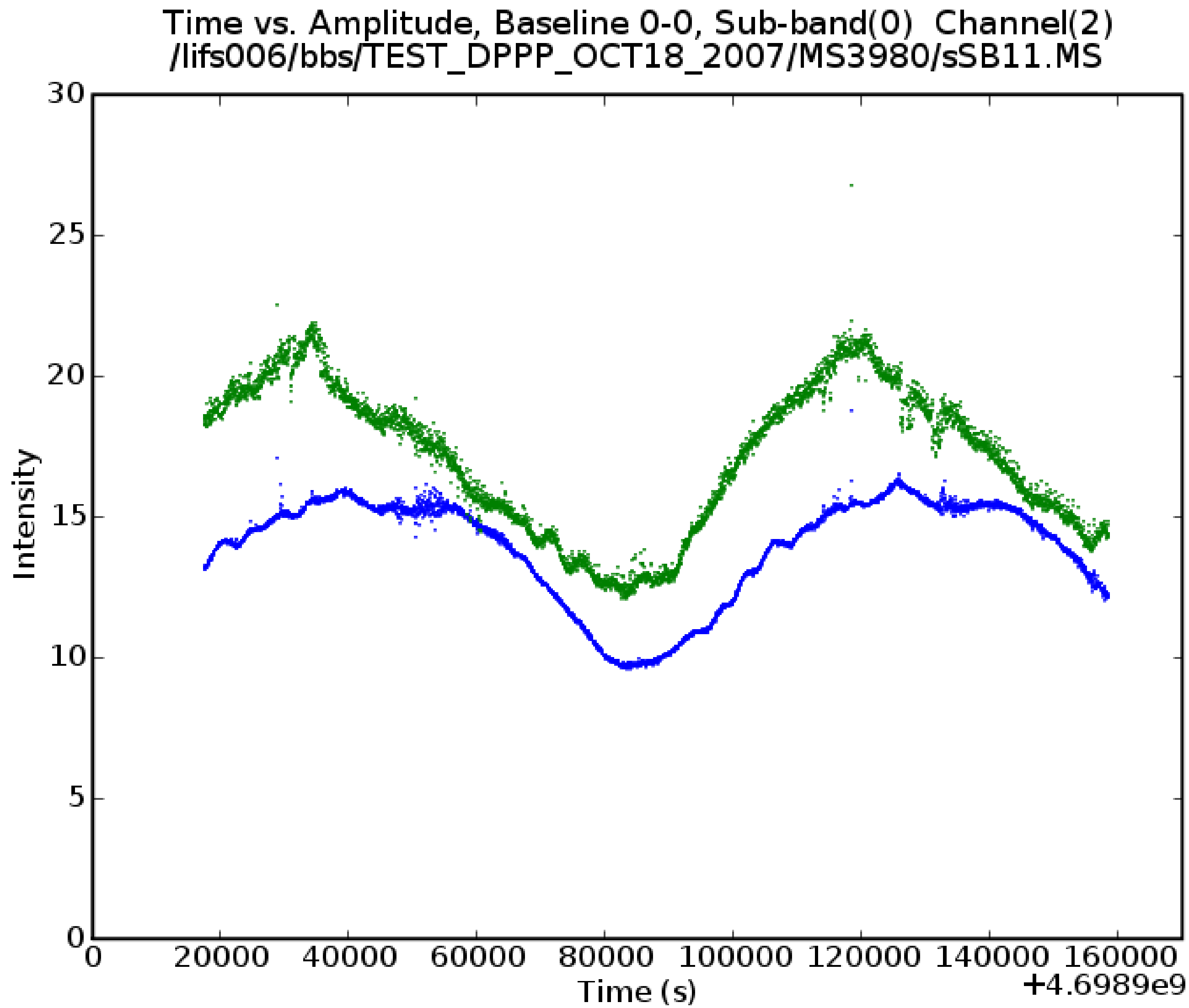
Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB15.MS
Intensity
Time (s)
+4.6989e9
0
5
10
15
20
25
30
0
20000
40000
60000
80000
100000
120000
140000
160000

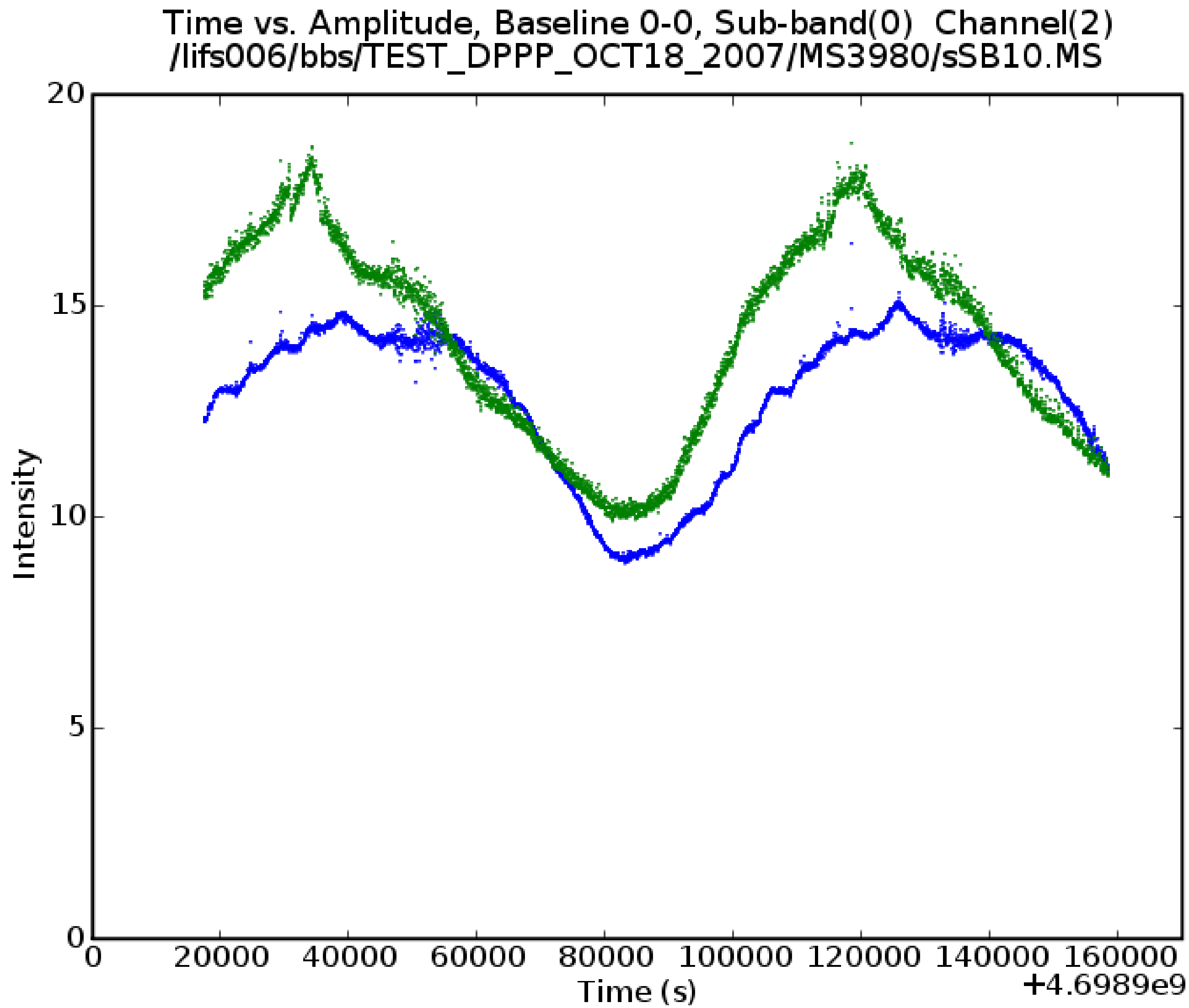


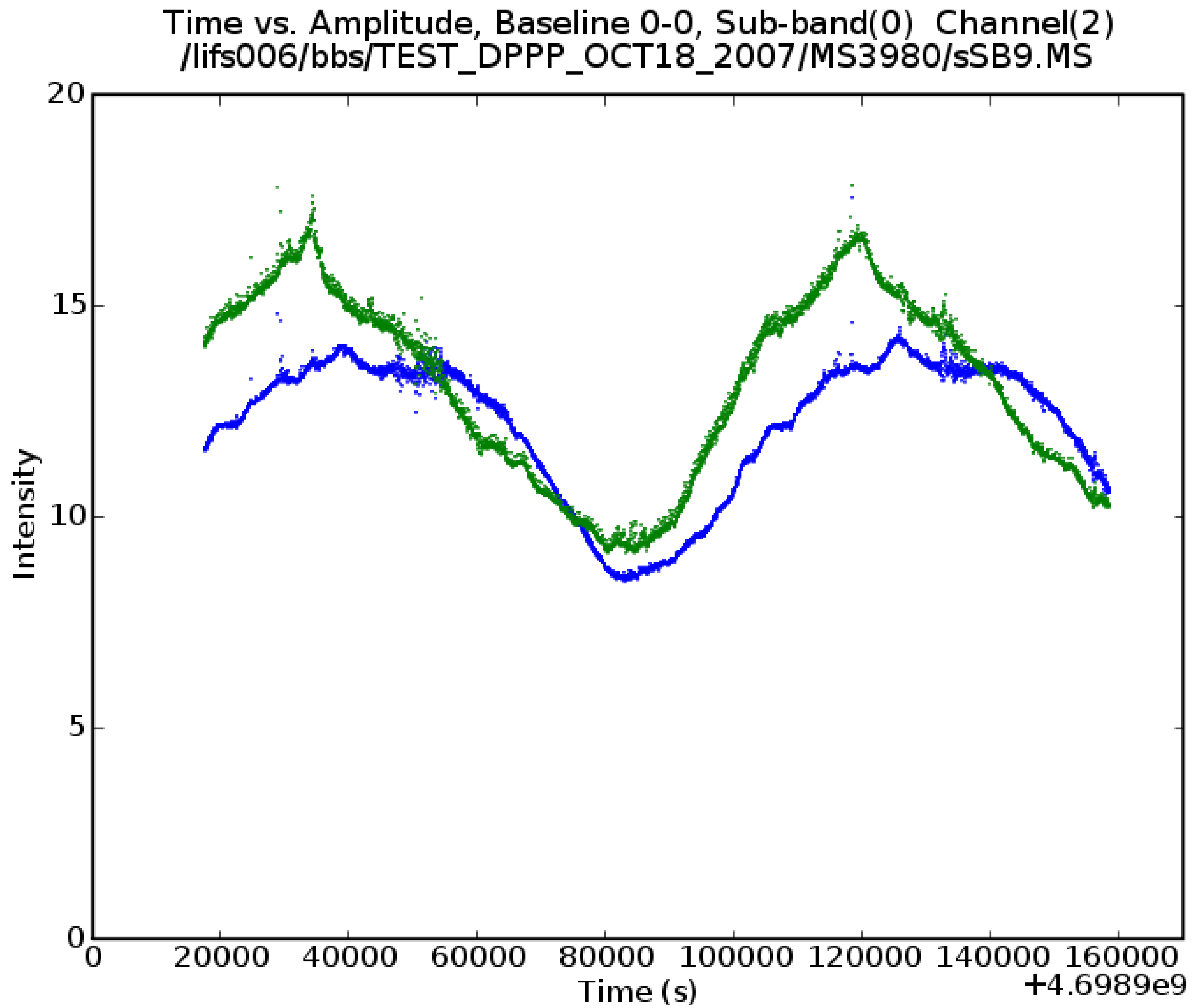
Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB14.MS
Intensity
Time (s)
+4.6989e9
0
5
10
15
20
25
30
0
20000
40000
60000
80000
100000
120000
140000
160000

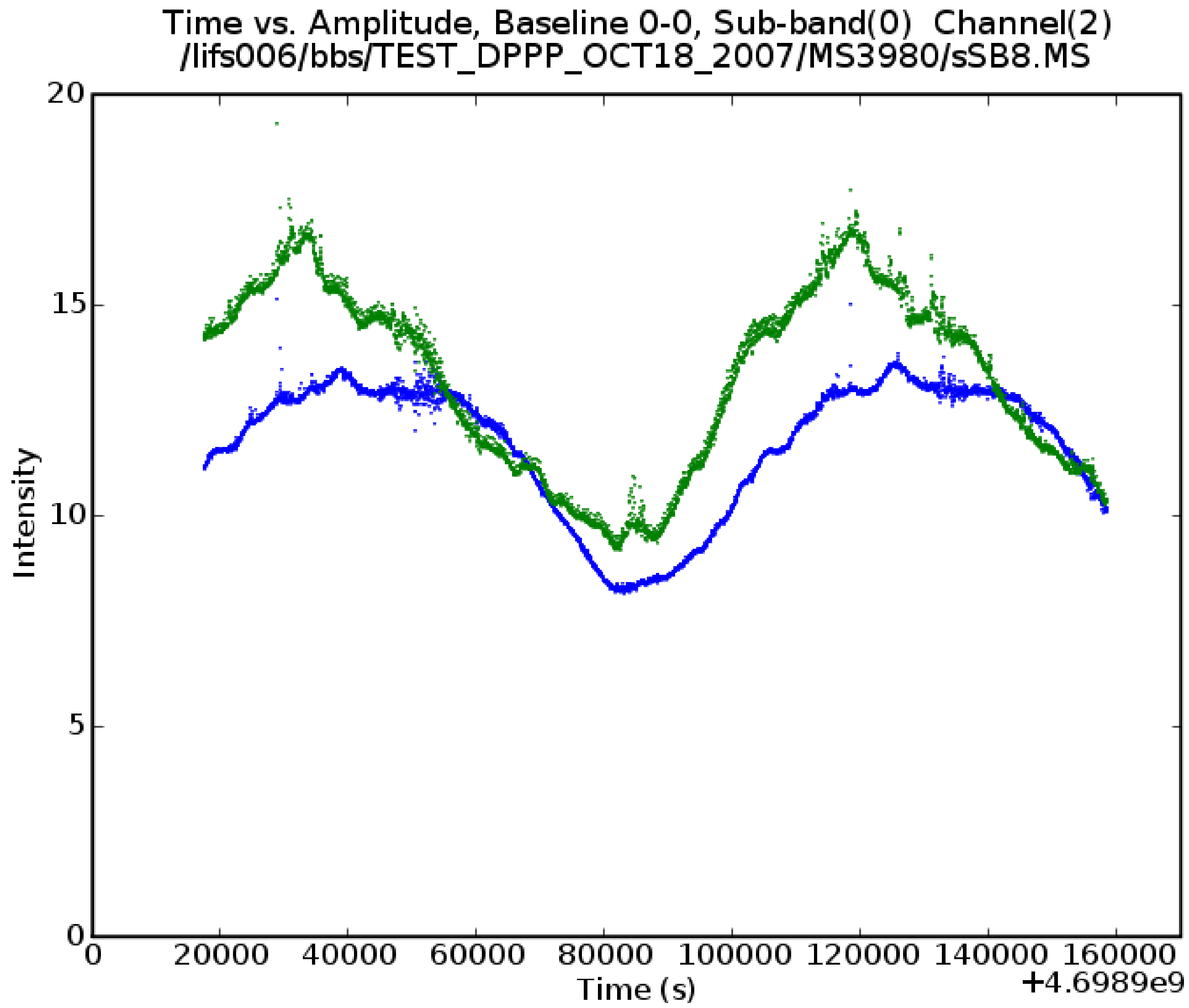

Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB13.MS
Intensity
Time (s)
+4.6989e9
0
5
10
15
20
25
30
0
20000
40000
60000
80000
100000
120000
140000
160000


Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB12.MS
Intensity
Time (s)
+4.6989e9
0
5
10
15
20
25
30
0
20000
40000
60000
80000
100000
120000
140000
160000

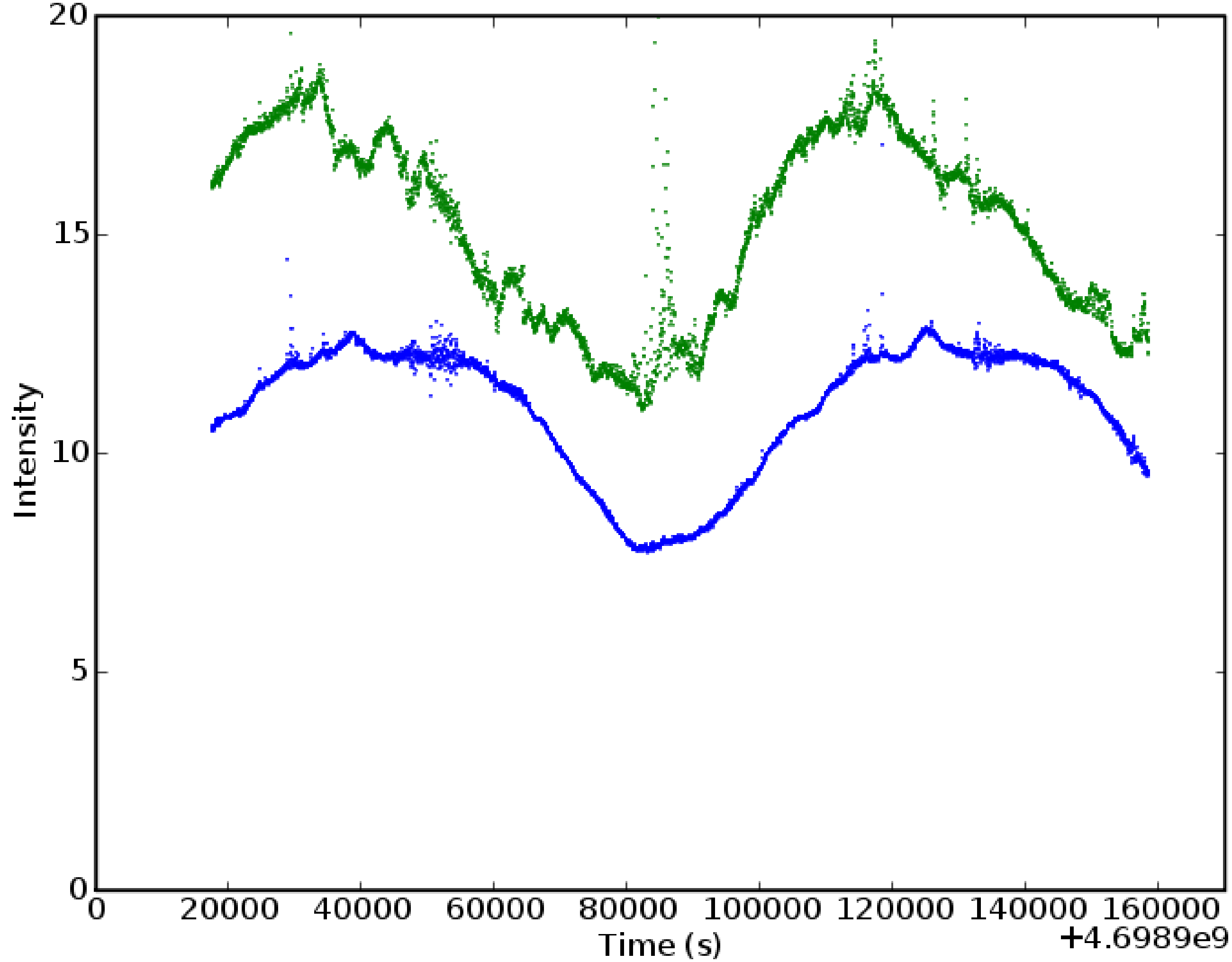

Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB11.MS
Intensity
Time (s)
+4.6989e9
0
5
10
15
20
25
30
0
20000
40000
60000
80000
100000
120000
140000
160000

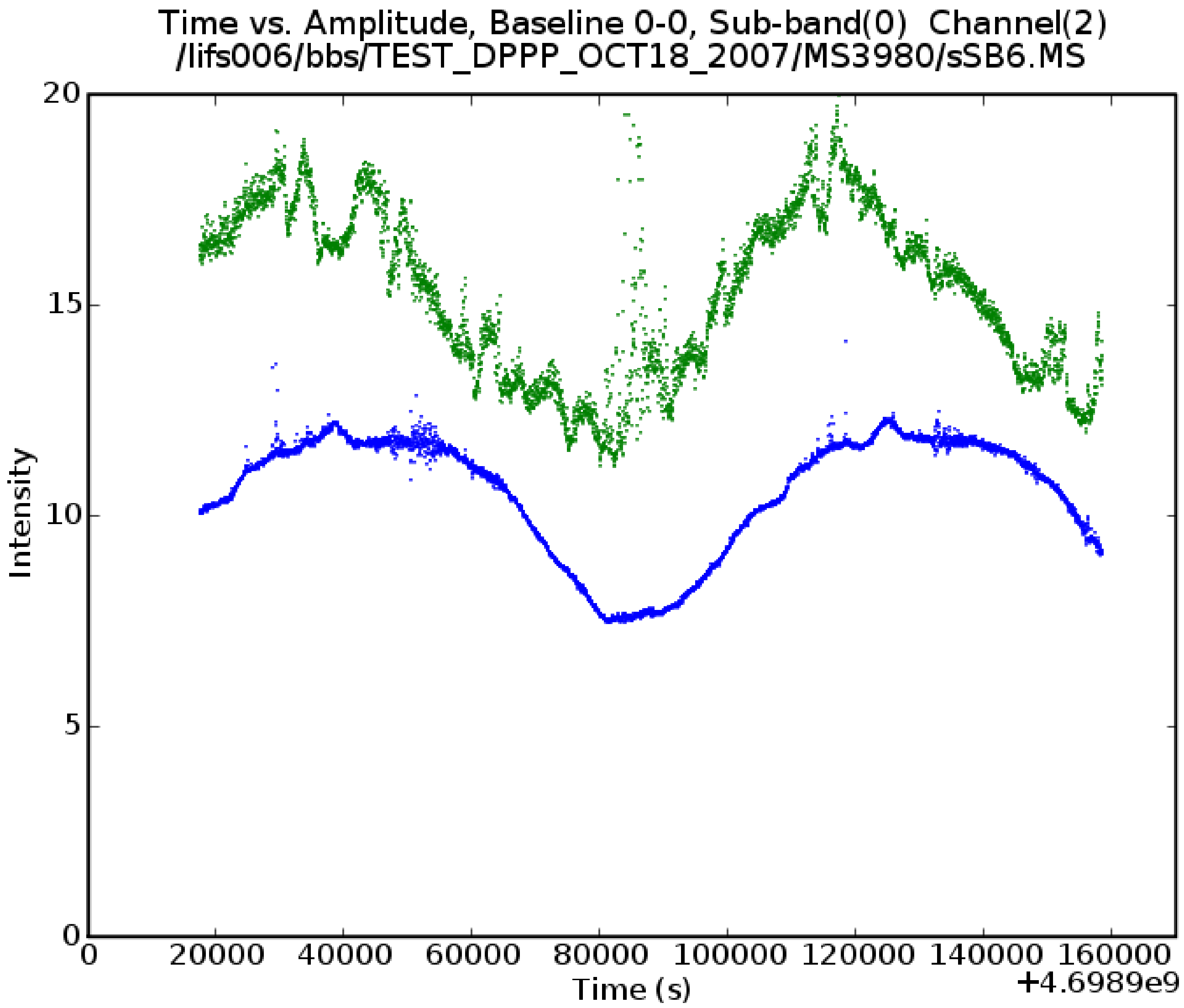

Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB10.MS
Intensity
Time (s)
+4.6989e9
0
5
10
15
20
0
20000
40000
60000
80000
100000
120000
140000
160000


Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB9.MS
Intensity
Time (s)
+4.6989e9
0
5
10
15
20
0
20000
40000
60000
80000
100000
120000
140000
160000

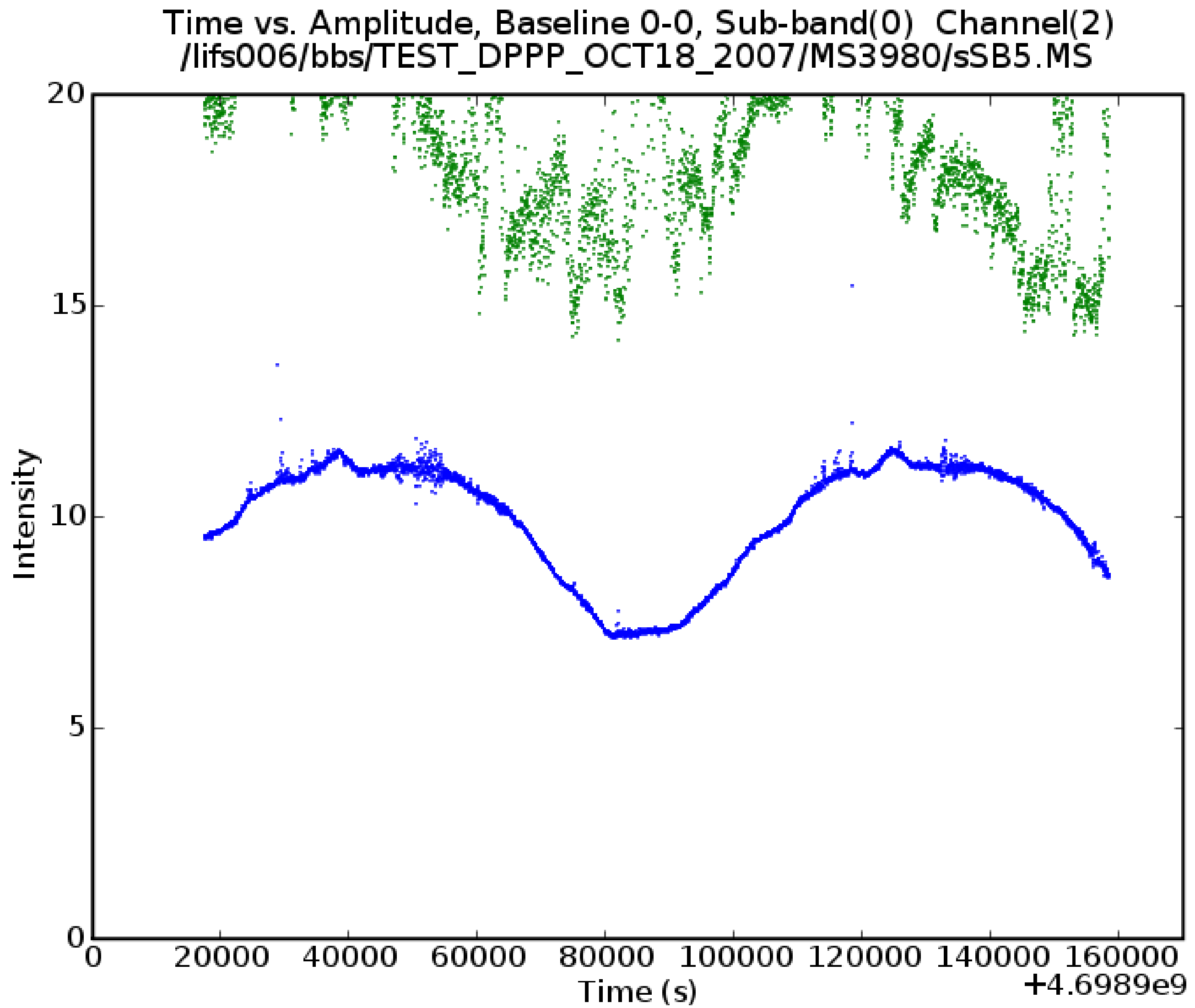

Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB8.MS
Intensity
Time (s)
+4.6989e9
0
5
10
15
20
0
20000
40000
60000
80000
100000
120000
140000
160000

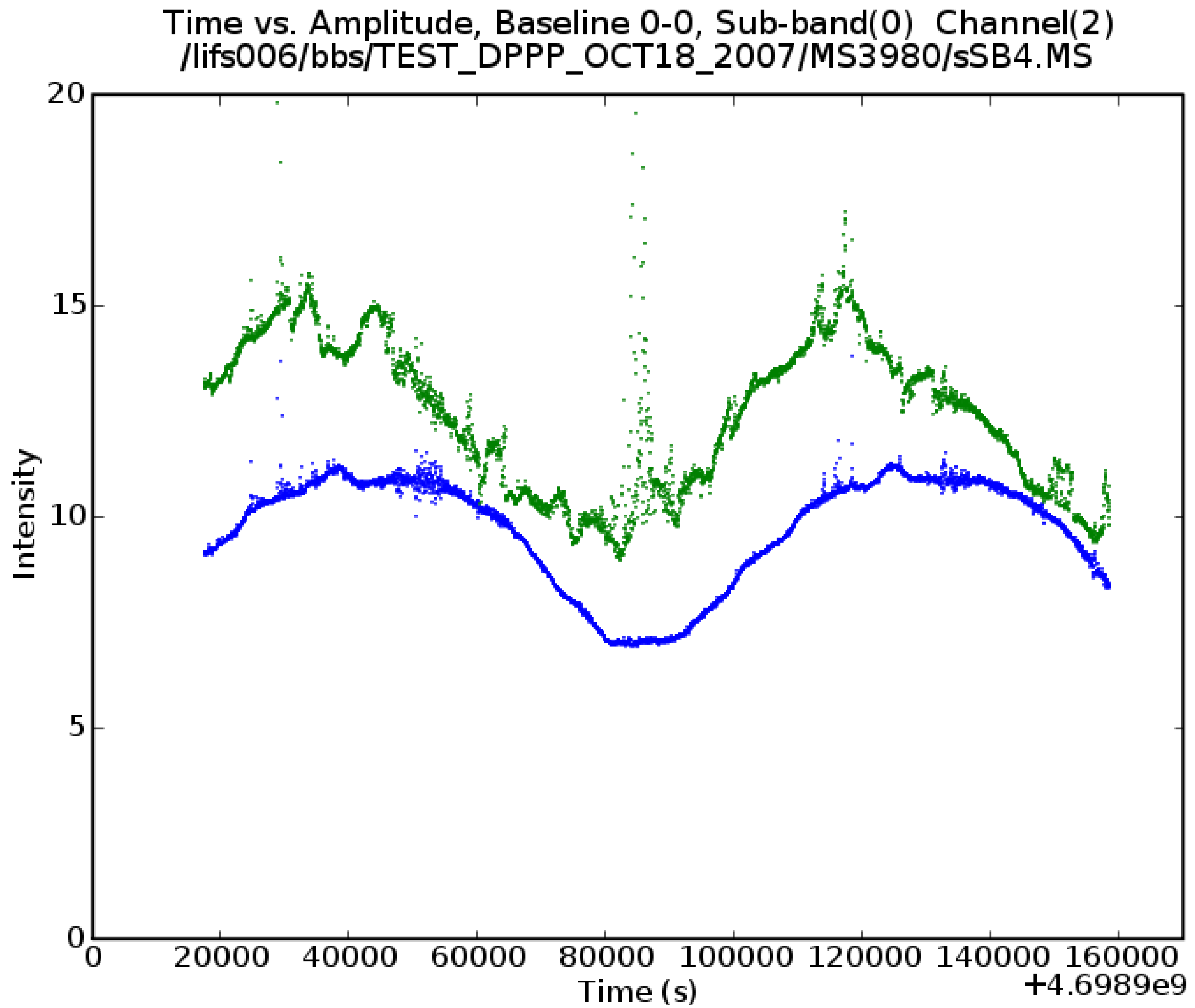
Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB7.MS

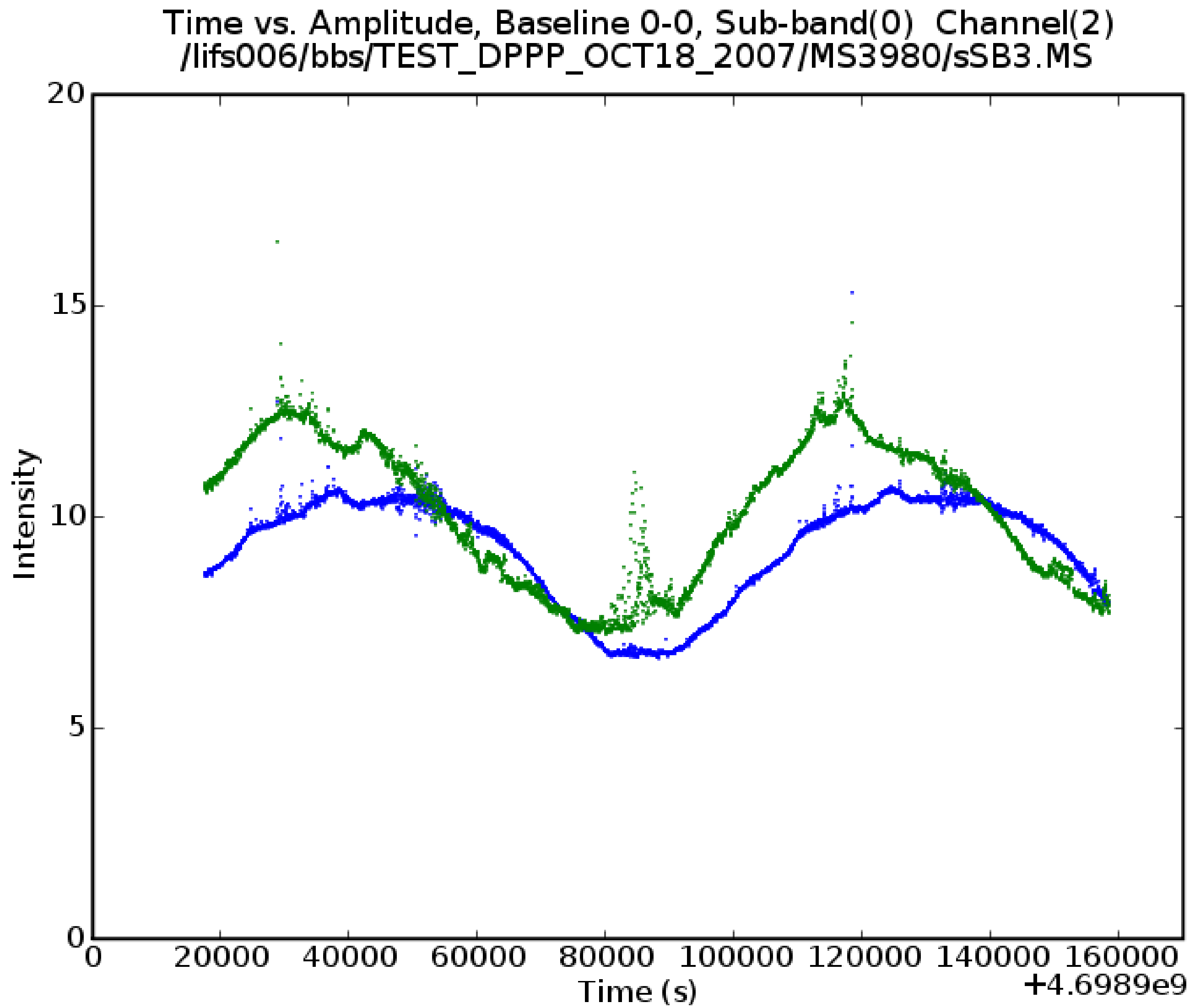




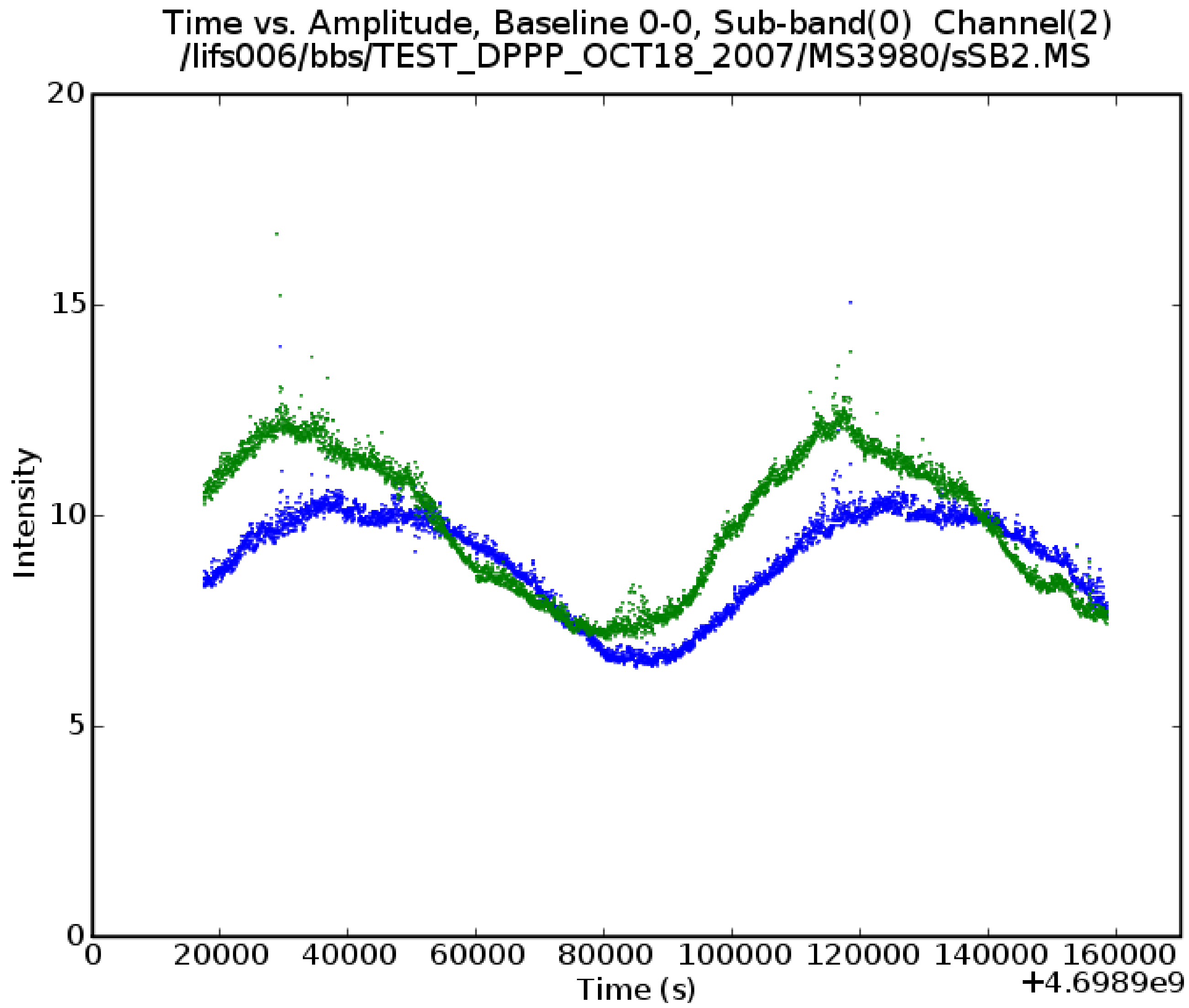
Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB6.MS
Intensity
Time (s)
+4.6989e9
0
5
10
15
20
0
20000
40000
60000
80000
100000
120000
140000
160000


Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB5.MS
Intensity
0
5
10
15
20
0
20000
40000
60000
80000
100000
120000
140000
160000
Time (s)
+4.6989e9

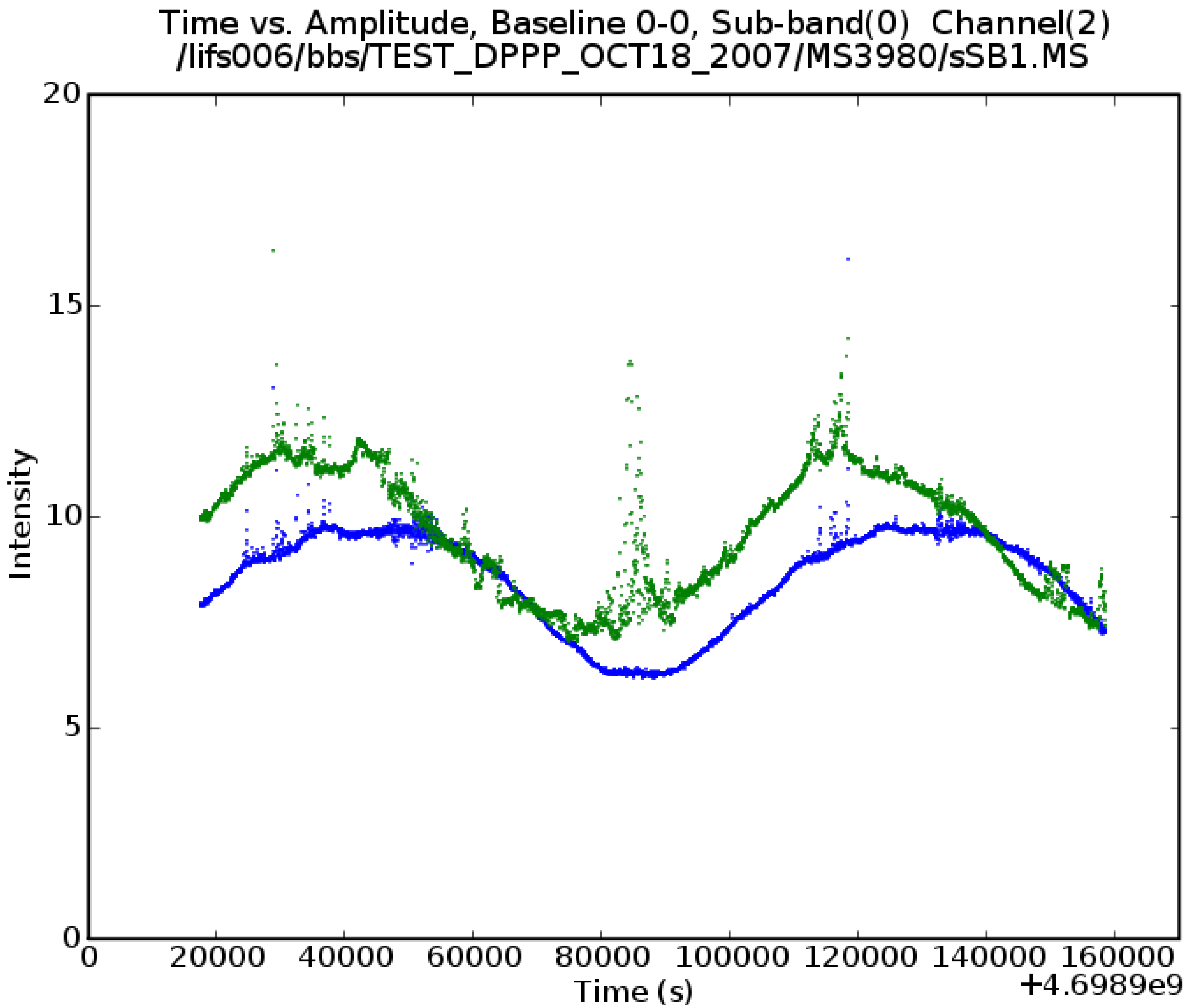

Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB4.MS
Intensity
Time (s)
+4.6989e9
0
5
10
15
20
0
20000
40000
60000
80000
100000
120000
140000
160000

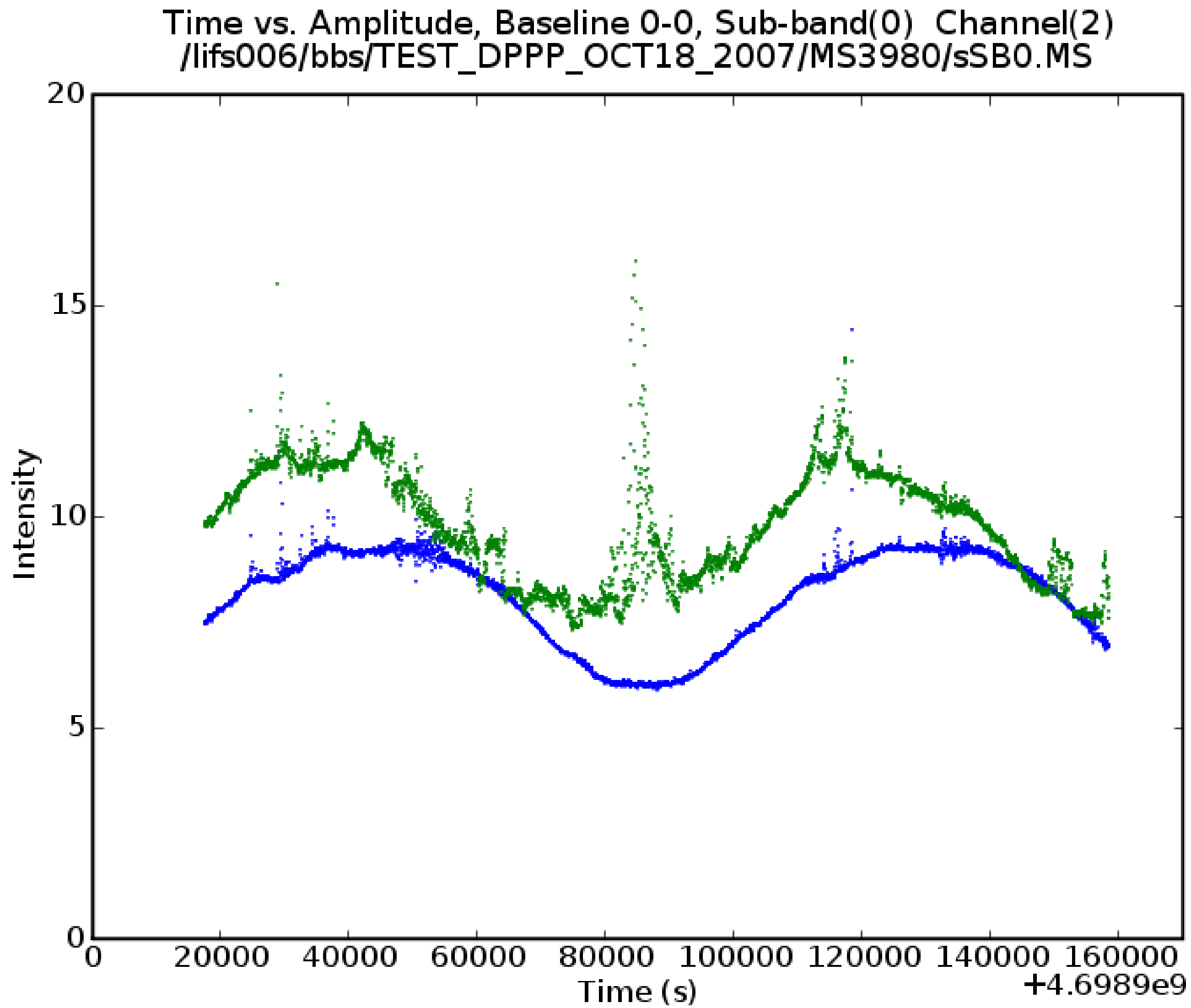


Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB3.MS
Intensity
Time (s)
+4.6989e9
0
5
10
15
20
0
20000
40000
60000
80000
100000
120000
140000
160000

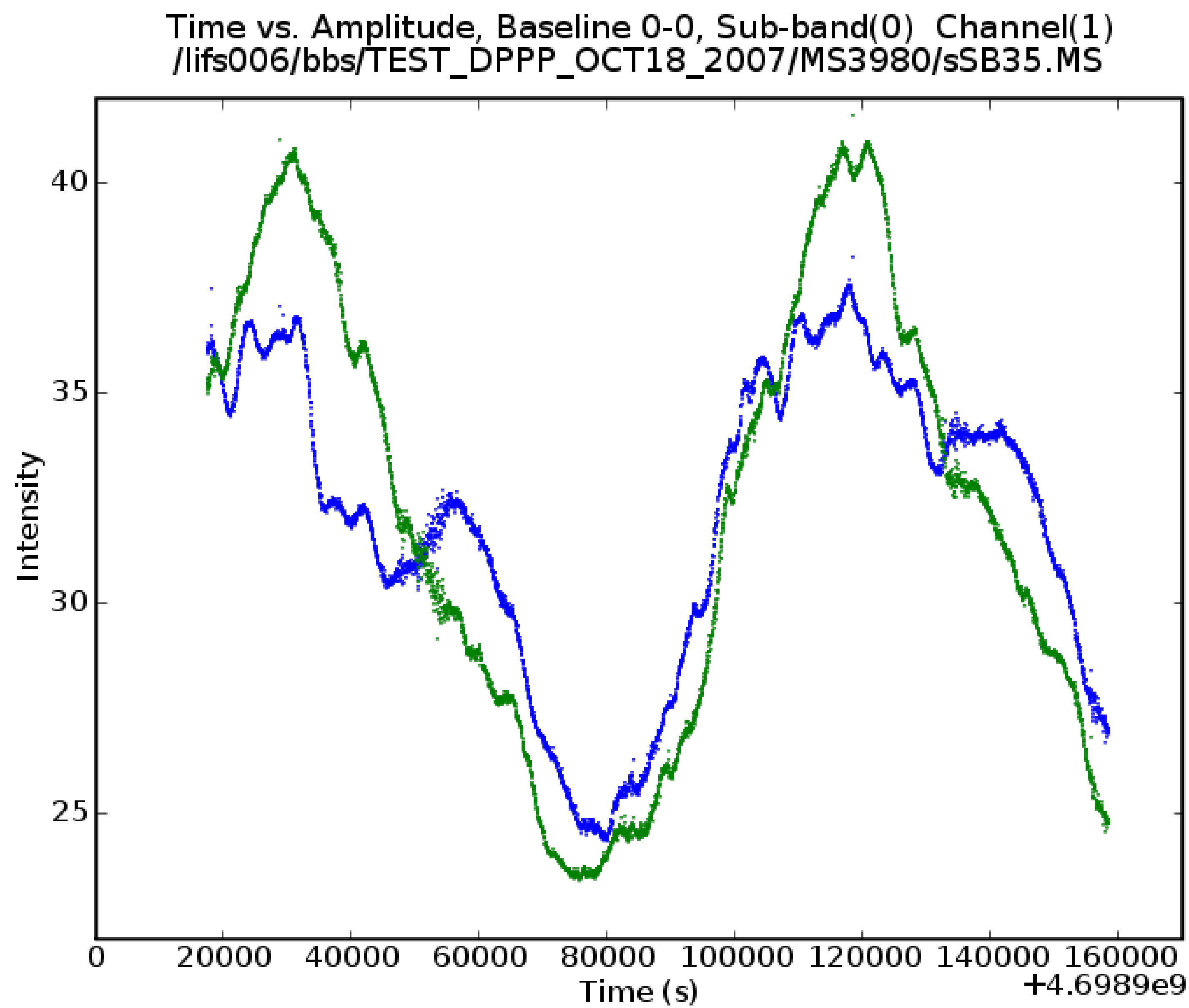


Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB2.MS
Intensity
Time (s)
+4.6989e9
0
5
10
15
20
0
20000
40000
60000
80000
100000
120000
140000
160000


Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB1.MS
Intensity
20
15
10
5
0
0
20000
40000
60000
80000
100000
120000
140000
160000
Time (s)
+4.6989e9



Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(2)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB0.MS
Intensity
Time (s)
+4.6989e9
0
5
10
15
20
20000
40000
60000
80000
100000
120000
140000
160000


Time vs. Amplitude, Baseline 0-0, Sub-band(0) Channel(1)
/lifs006/bbs/TEST_DPPP_OCT18_2007/MS3980/sSB35.MS
Intensity
40
35
30
25
0
20000
40000
60000
80000
100000
120000
140000
160000
Time (s)
+4.6989e9

Some conclusions

Can we understand temporal and frequency-dependent fluctuations in the total power of CS010 microstation 0 (=beamformed sum 48 dipoles) ?

Note that the station diameter ~ 65 meter, which at 5m wavelenghth (60 MHz) has a HPBW of ~ 1.3x5/65 radian ~ 5.7^{o} (and 'full' beam about 10^{o}). Depends on spatial taper across station.

Observed fluctuations in Total Power on timescales of about 0.5 - 1h at 60 MHz

1h corresponds to about 15^{o} cos(58^{o}) ~ 8^{o} /hour movement on sky at the declination of CasA. But beamformer tracks CasA so we should not see any fluctuations from CasA and its environment (except the slow change due to the dipole beam response).

The main variations that we should observe are those caused by the convolution of the apparent sky (mostly diffuse Galactic structures and CygA) that moves through the changing station beampattern. These should take therefore place on timescales of about 30 - 60 min as indeed observed. This can and should be simulated to be compared in detail with the observed fluctuations. Use e.g. the Japanes 45 MHz all-sky image?

Can we nevertheless already say something about 'beamformer' stability ? Yes. The TP signals should repeat from day to day ! And they do not to a level of a few% which varies from subband to subband. We still do not understand where these frequency dependent varaiations come from.

To be continued...