

CS1 Data Analysis - stability

10th January, 2007

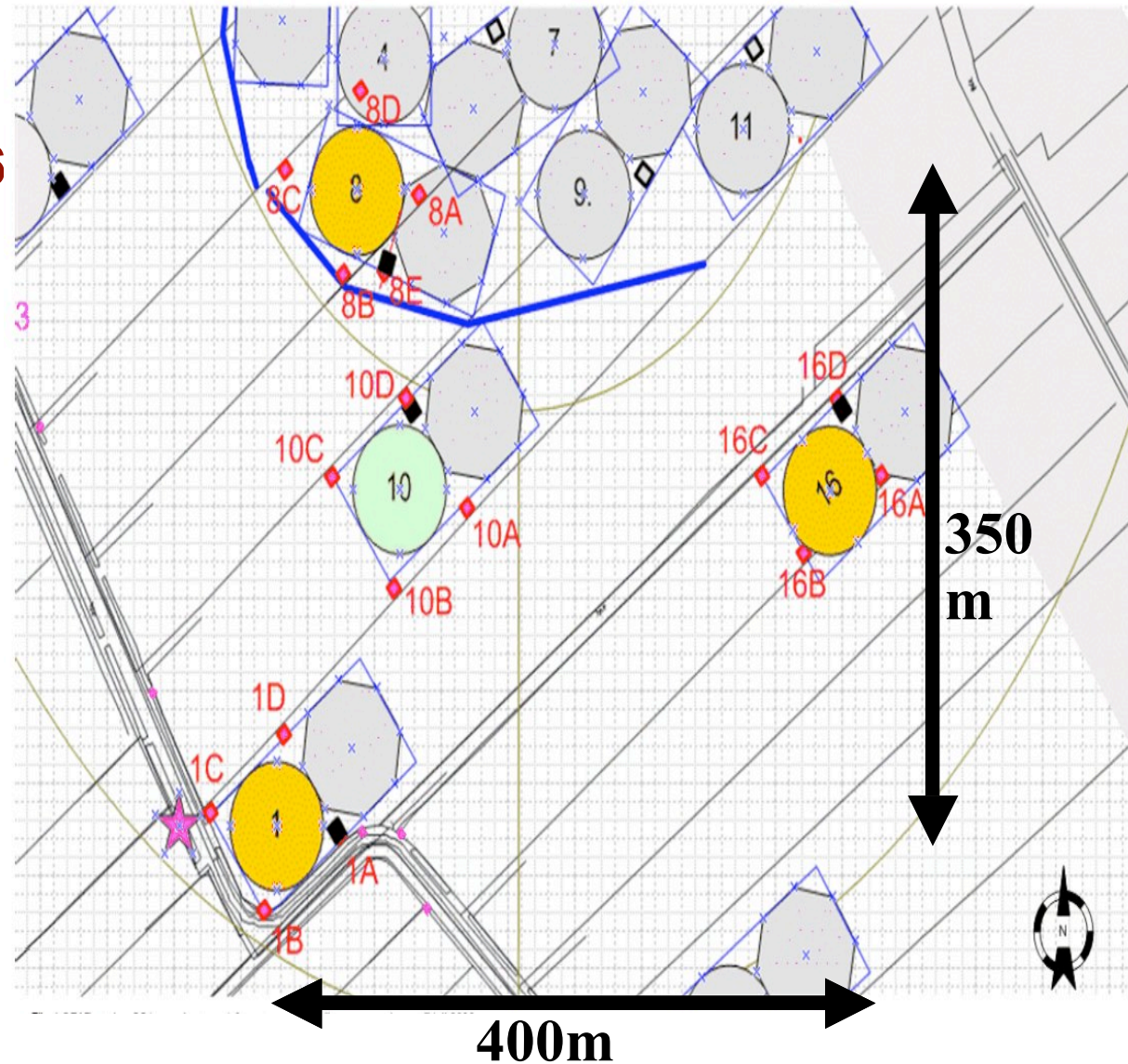
Inspected by:
Pandey, Gianni, Ger deBruyn

Outline

- **MSets Observed/Inspected**
- **Auto Correlations**
- **General comments**
- **Stability Issues**
- **More to do/Conclusions**

CS1 - Configuration

- 96 dipoles
- 24 Micro stations
- 4 Stations 1,8,10,16
- Presently Obsvsn:
16 Microstns
- *Stn 1 – 4 microstns*
- *Stn 8 – 4 microstns*
- *Stn 10 – 4 microstns*
- *Stn 16 – 4 microstns*



Measurements Sets Inspected

L2006_0583.MS to L2007_00712.MS
(Dec 15, 2006) to (Jan 7, 2007)

- 16 micro stations in total(4 micro stations each STN 1, 8, 10, 16).
- 1 dipole on in each micro station
- Frequency 60MHz
- Sub band 156.25 Khz, 256 channels => 0.6 Khz resolution
- Various issues like time stamping problems & fringe stopping (analysis/conclusions not so useful).

- Analysis from L2007_00693.MS, L2007_00698.MS, L2007_00712.MS (Time stamping fine, Header is also fine).
- **Analysis -> aims to check if basic things are working fine.**
Mainly focus on using Auto correlations to check functionality and stability Issues.

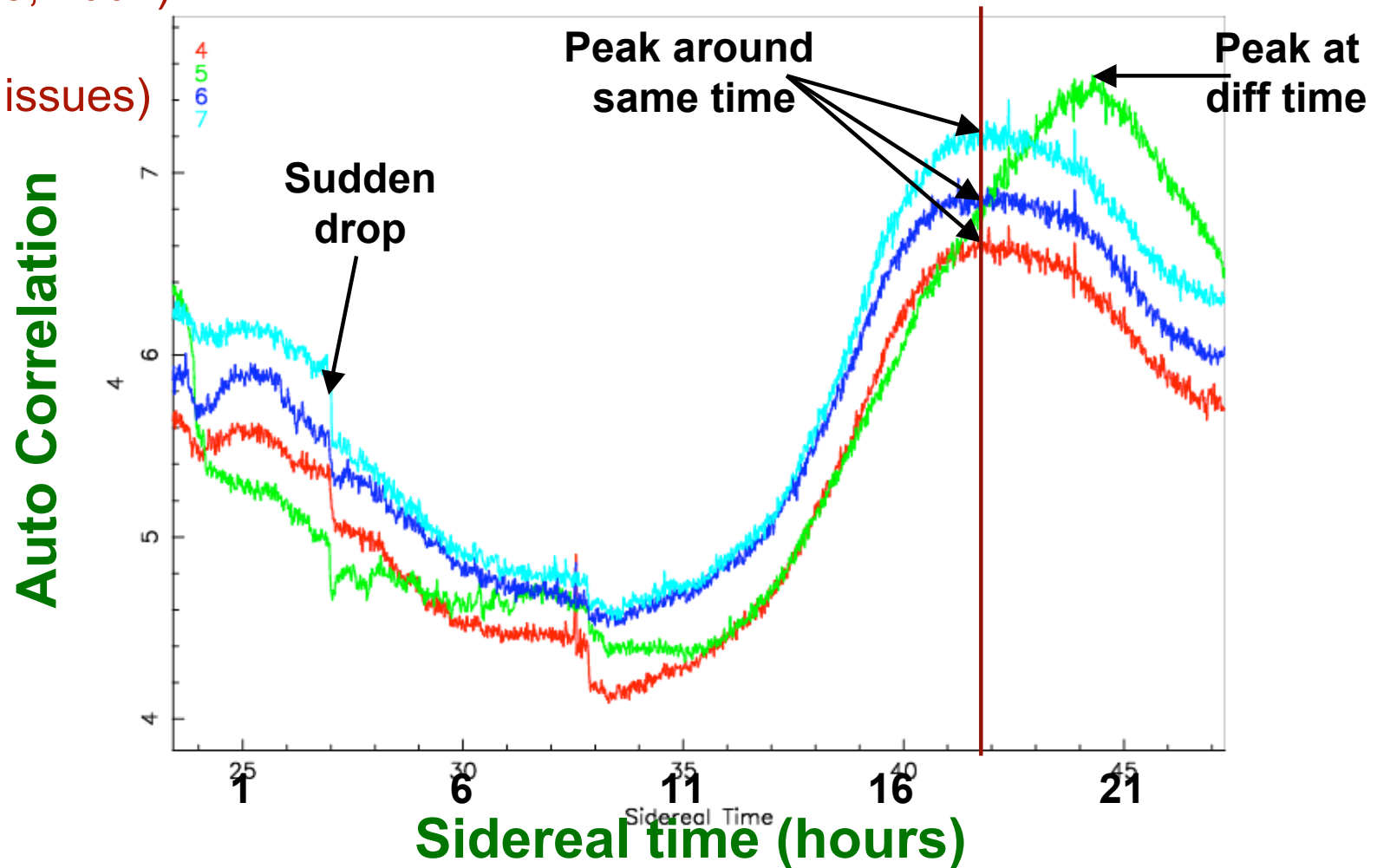
MS693 - Channel 128 CS1

(Jan 05, 2007)

1.8G

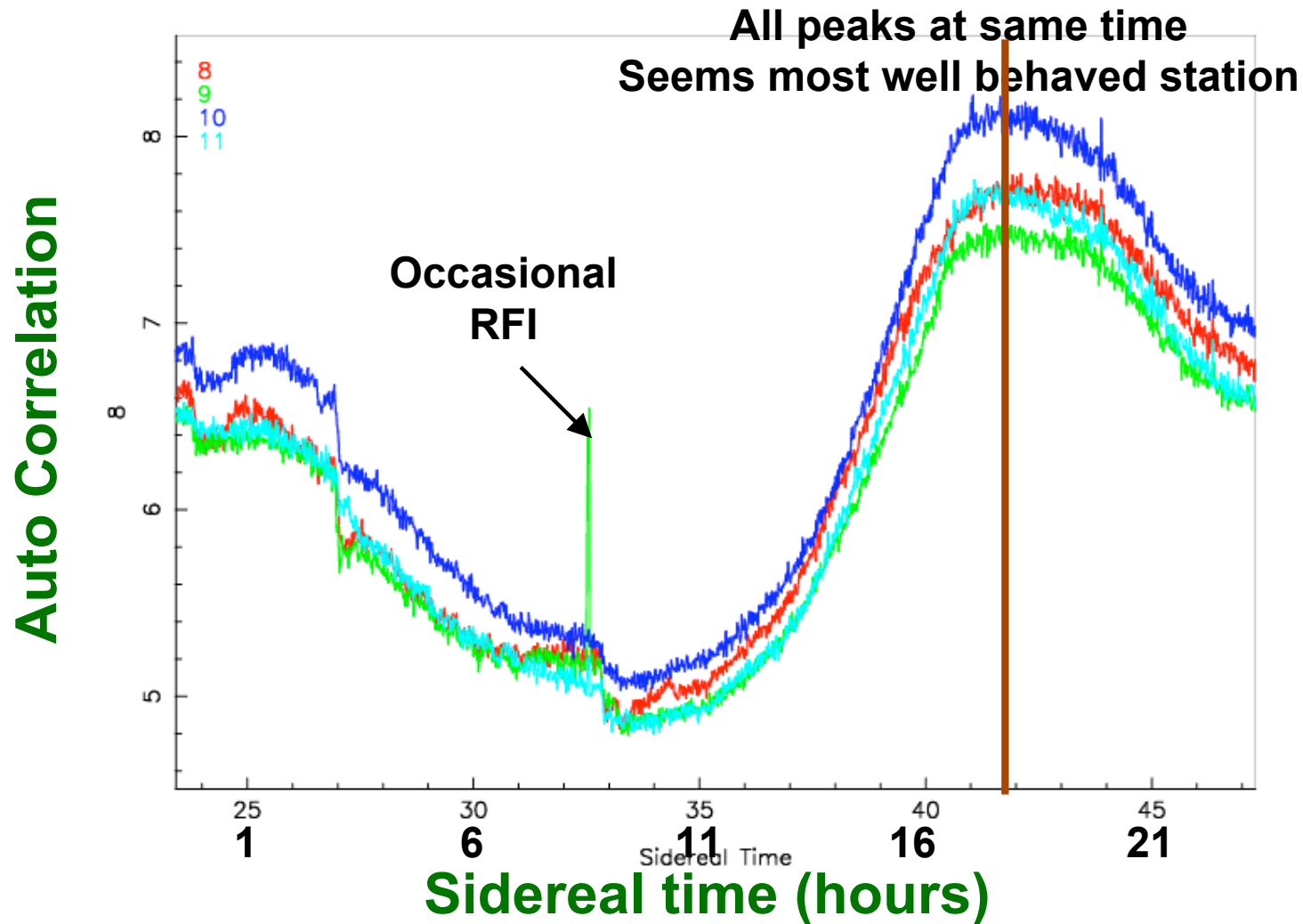
(mem issues)

Auto Correlation (Single Channel 128) L2007_00693.MS All micro stations in CS1



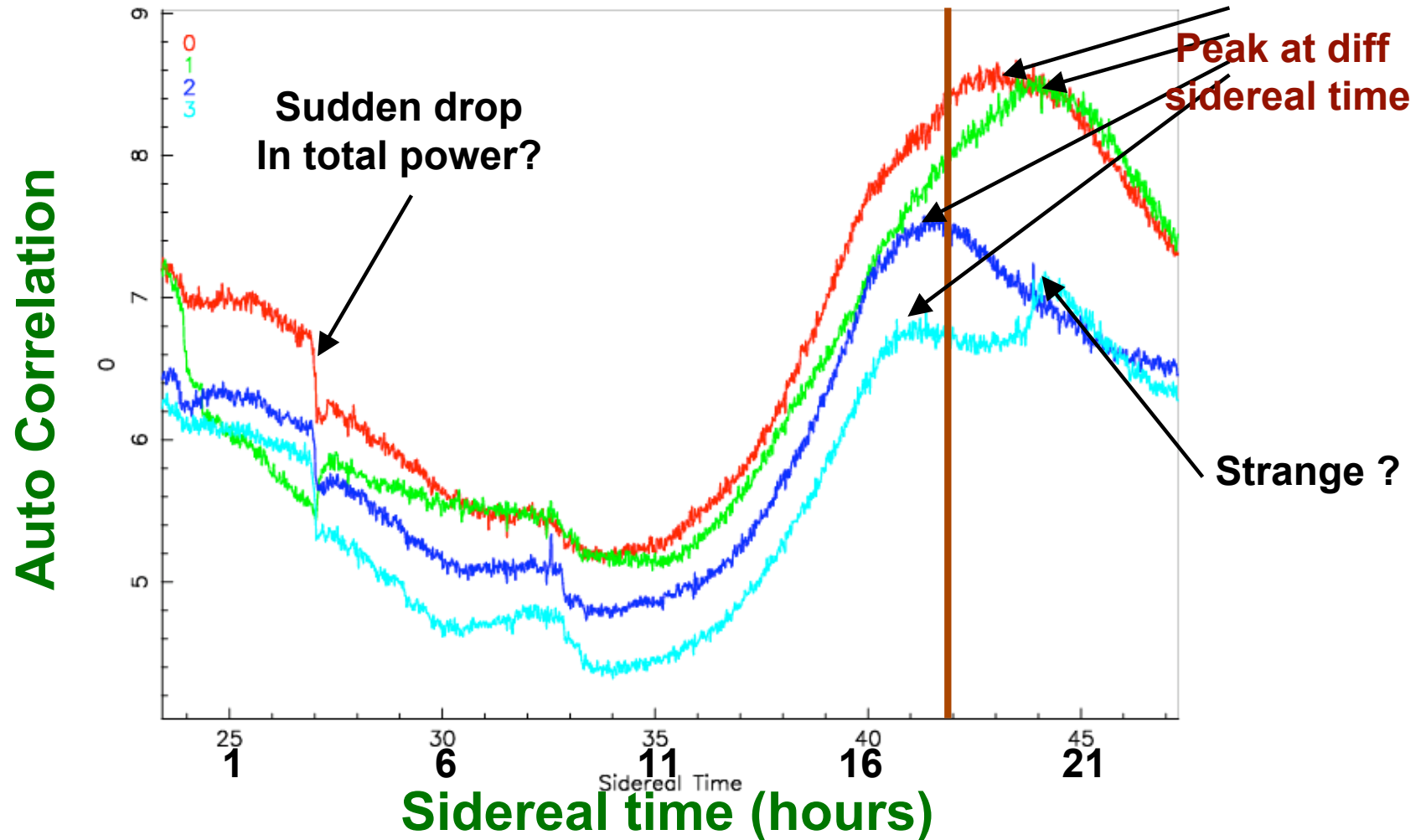
MS693 - Channel 128 CS8

Auto Correlation (Single Channel 128) L2007_00693.MS All micro stations in CS8



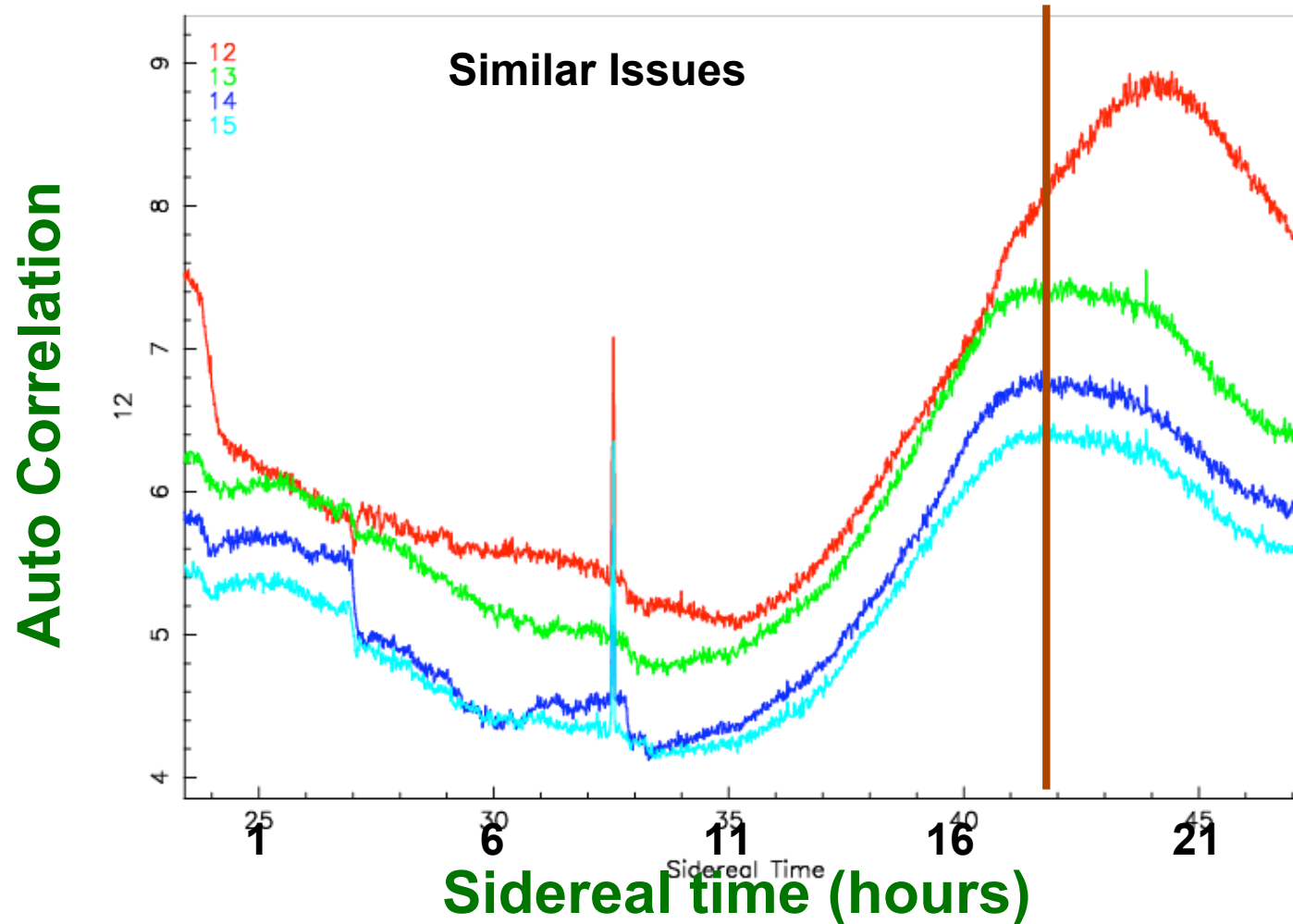
MS693 - Channel 128 CS10

Auto Correlation (Single Channel 128) L2007_00693.MS All micro stations in CS10



MS693 - Channel 128 CS16

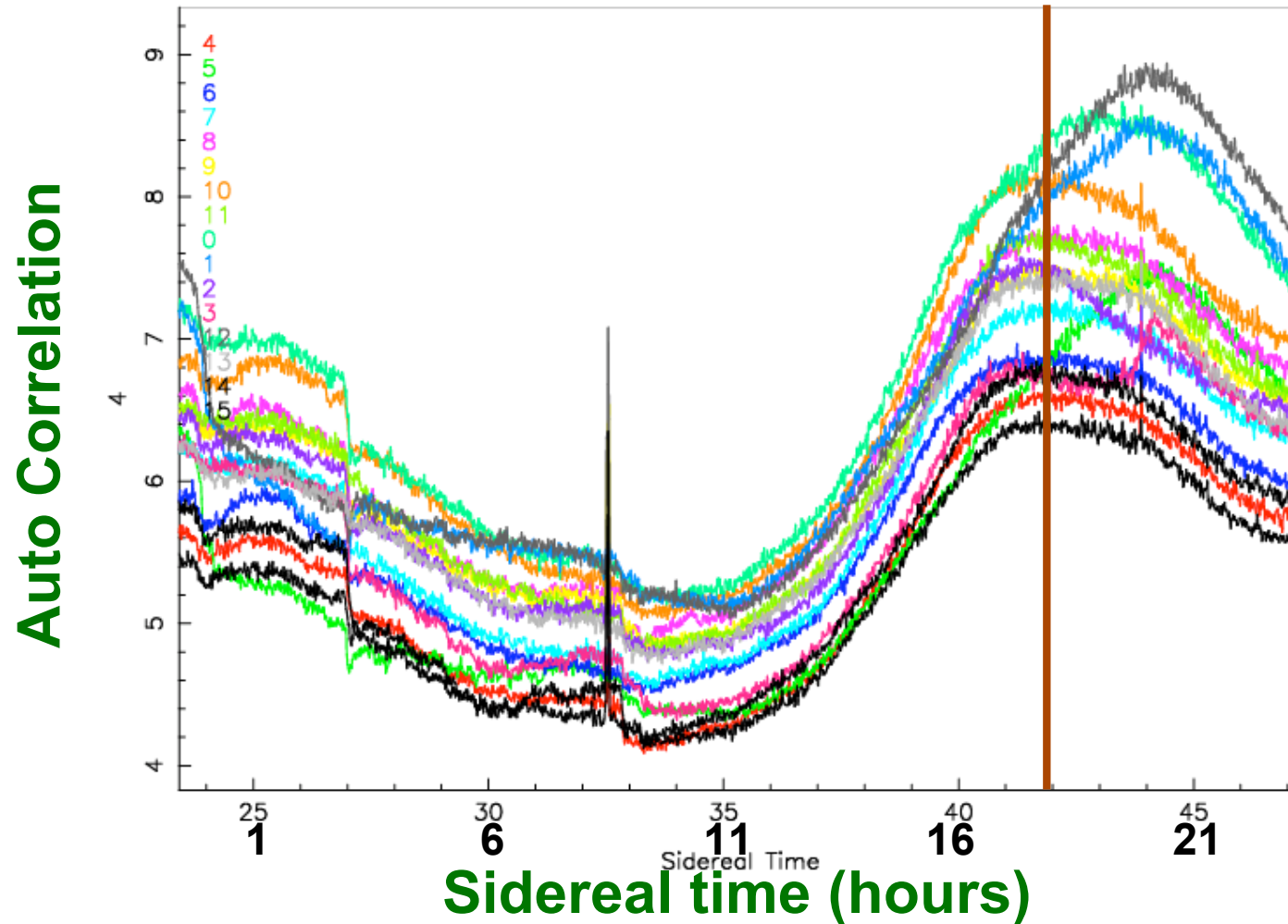
Auto Correlation (Single Channel 128) L2007_00693.MS All micro stations in CS16



- All channels show data consistent with each other

MS693 - Channel 128 , all microstations

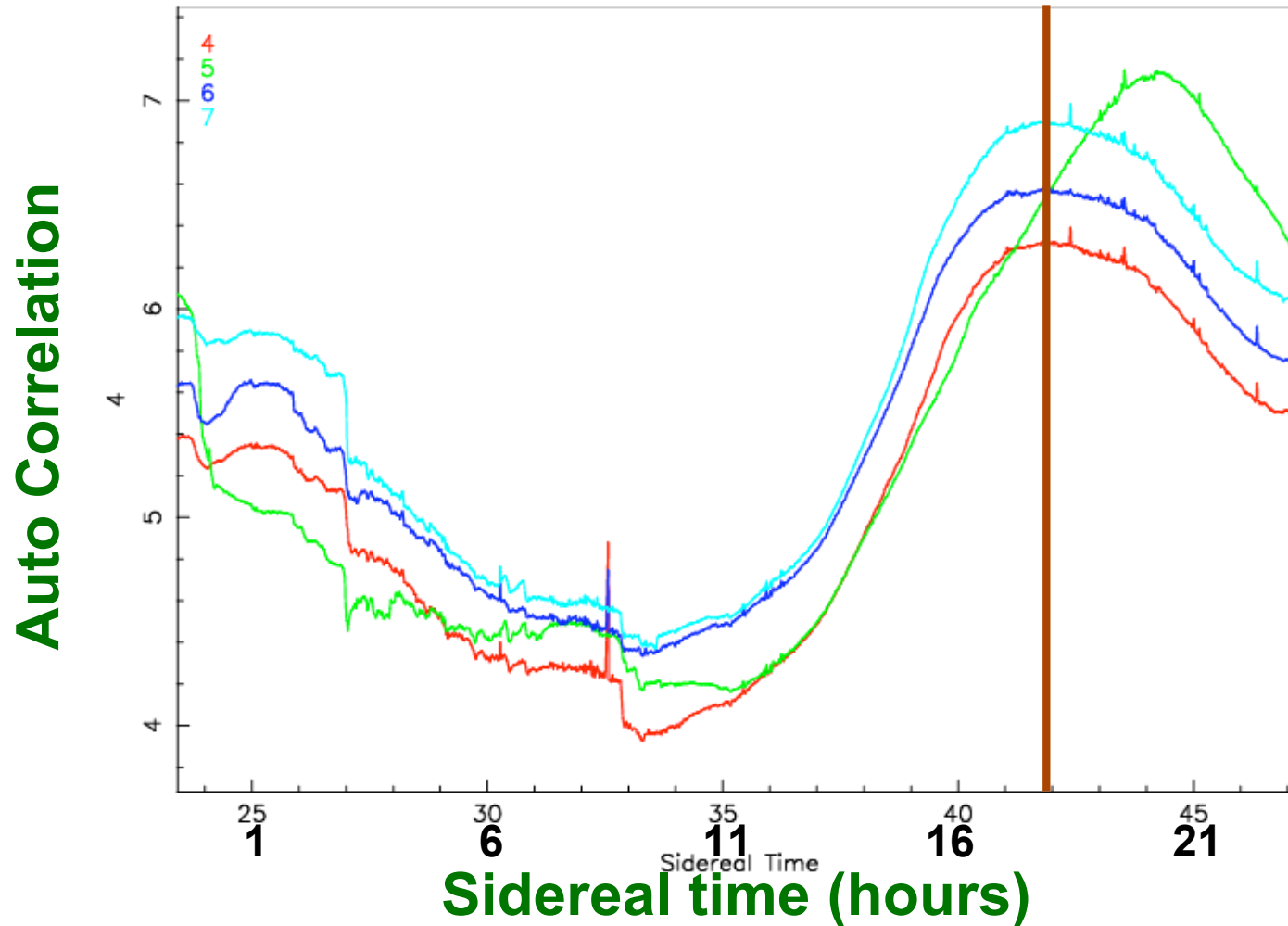
Auto Correlation (Single Channel 128) L2007_00693.MS All micro stations



- All channels show data consistent with each other

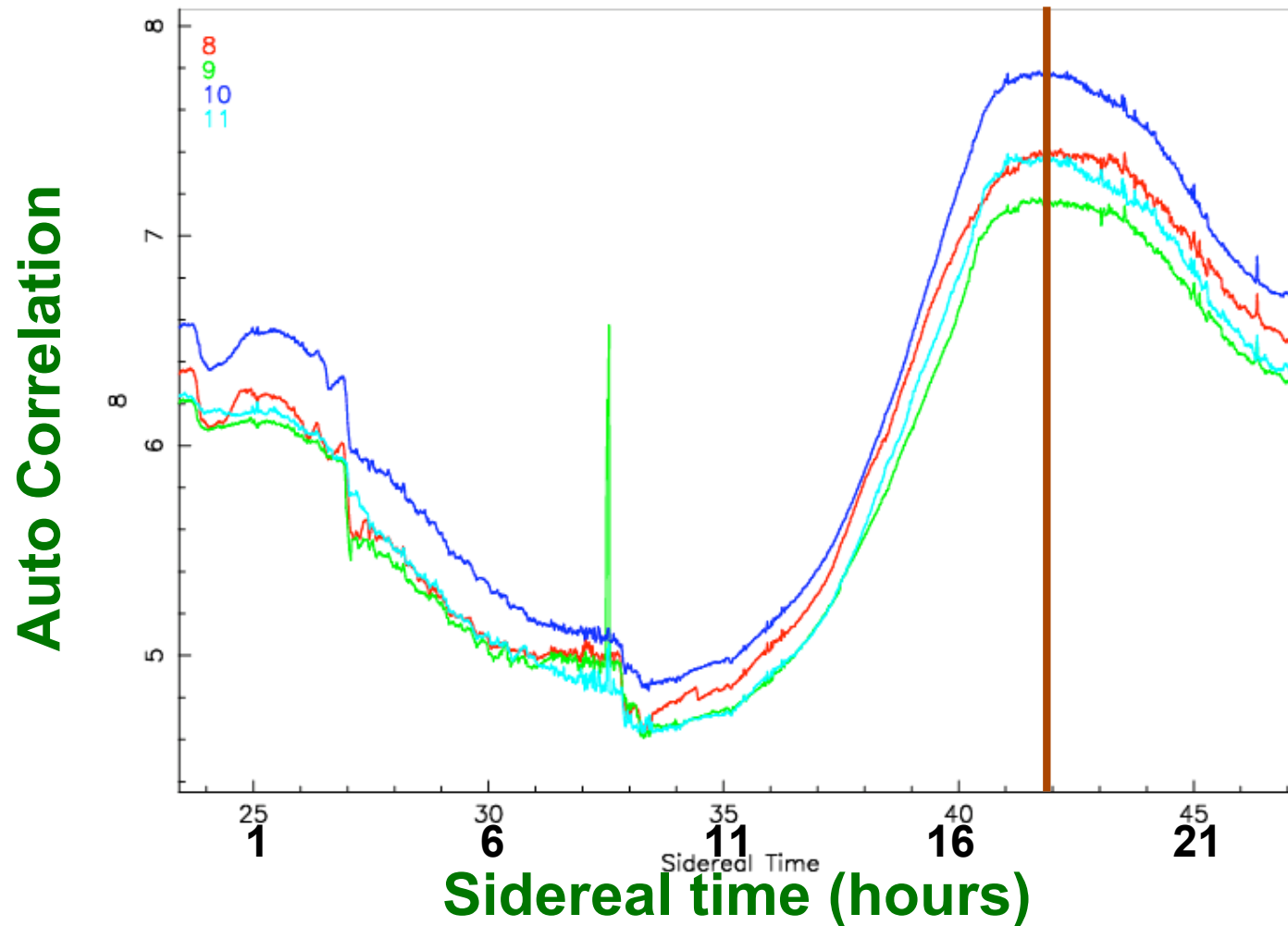
MS693 - Avg (Ch 6:250) CS1

Auto Correlation (ALL Channels averaged 6:250) L2007_00693.MS All micro stations in CS1



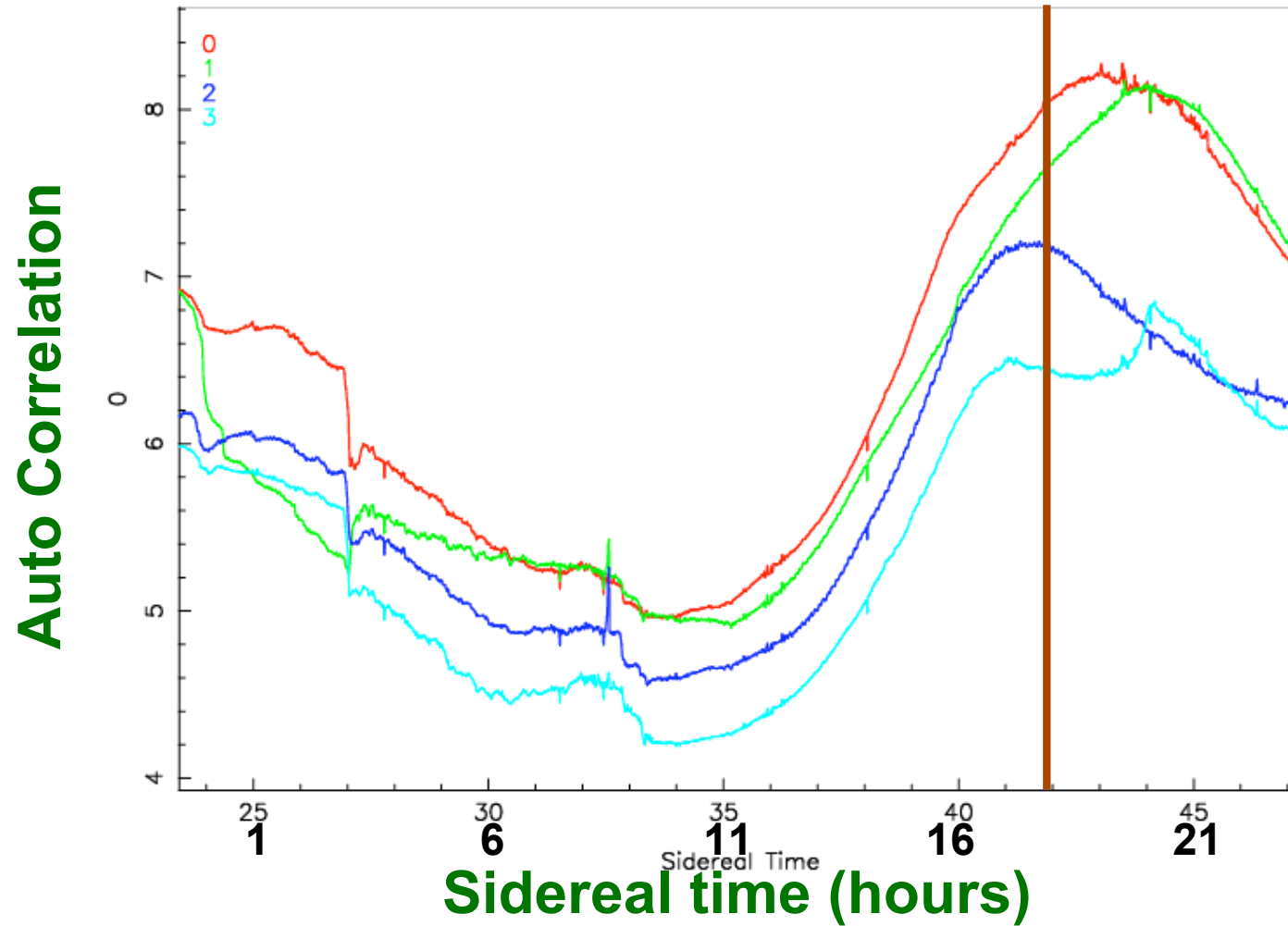
MS693 - Avg (Ch 6:250) CS8

Auto Correlation (ALL Channels averaged 6:250) L2007_00693.MS All micro stations in CS8



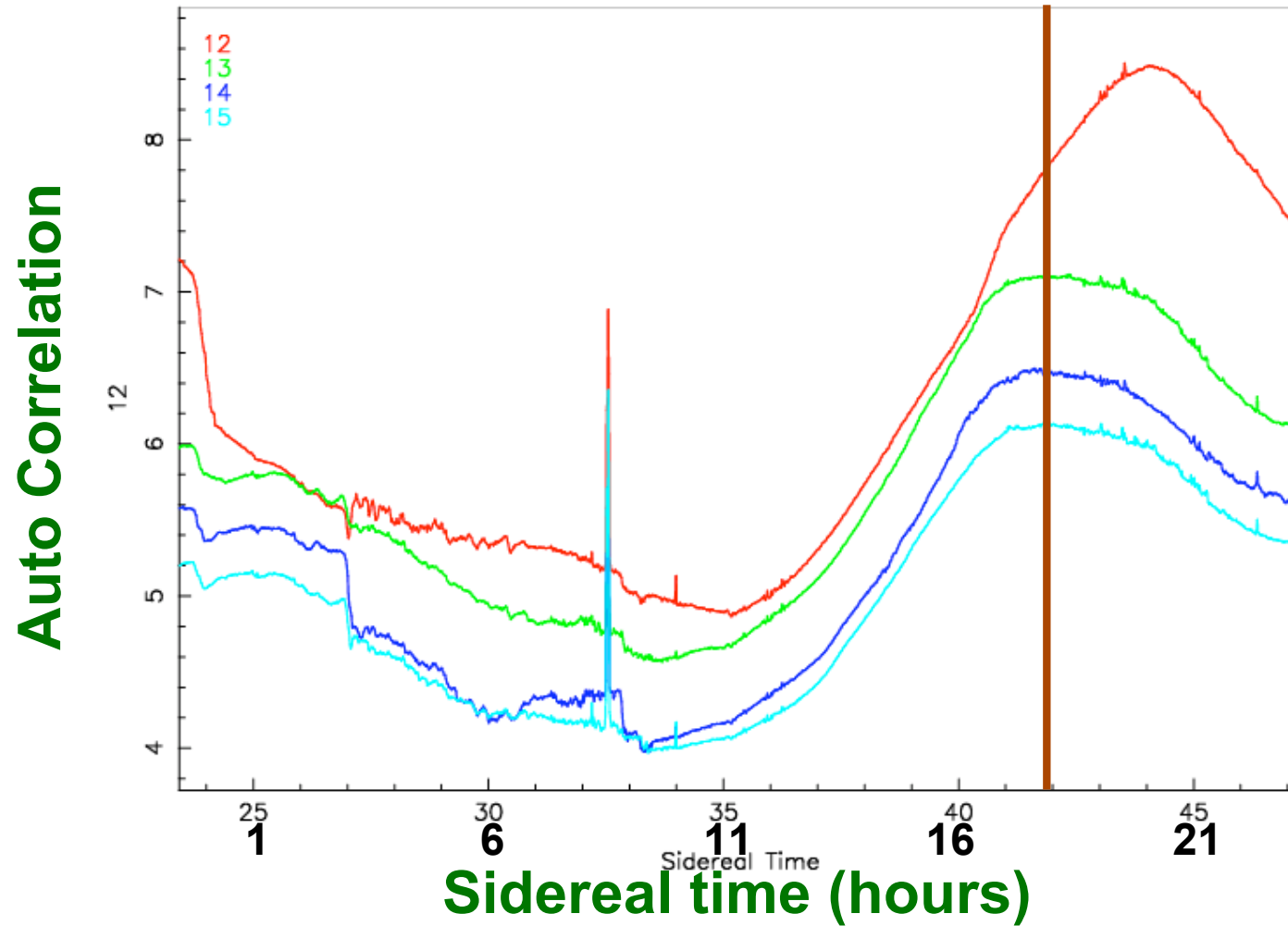
MS693 - Avg (Ch 6:250) CS10

Auto Correlation (ALL Channels averaged 6:250) L2007_00693.MS All micro stations in CS10



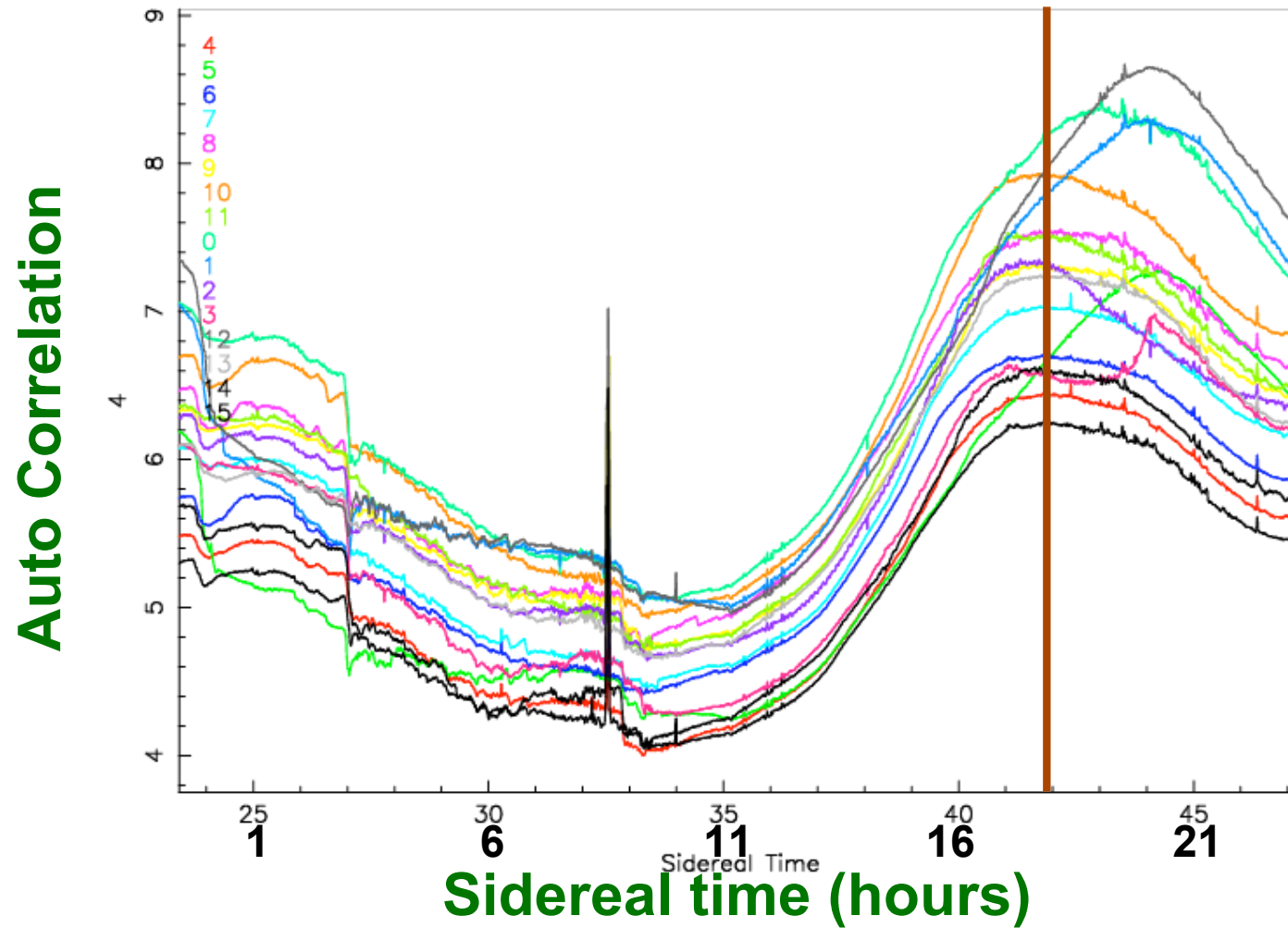
MS693 - Avg (Ch 6:250) CS16

Auto Correlation (ALL Channels averaged 6:250) L2007_00693.MS All micro stations in CS16



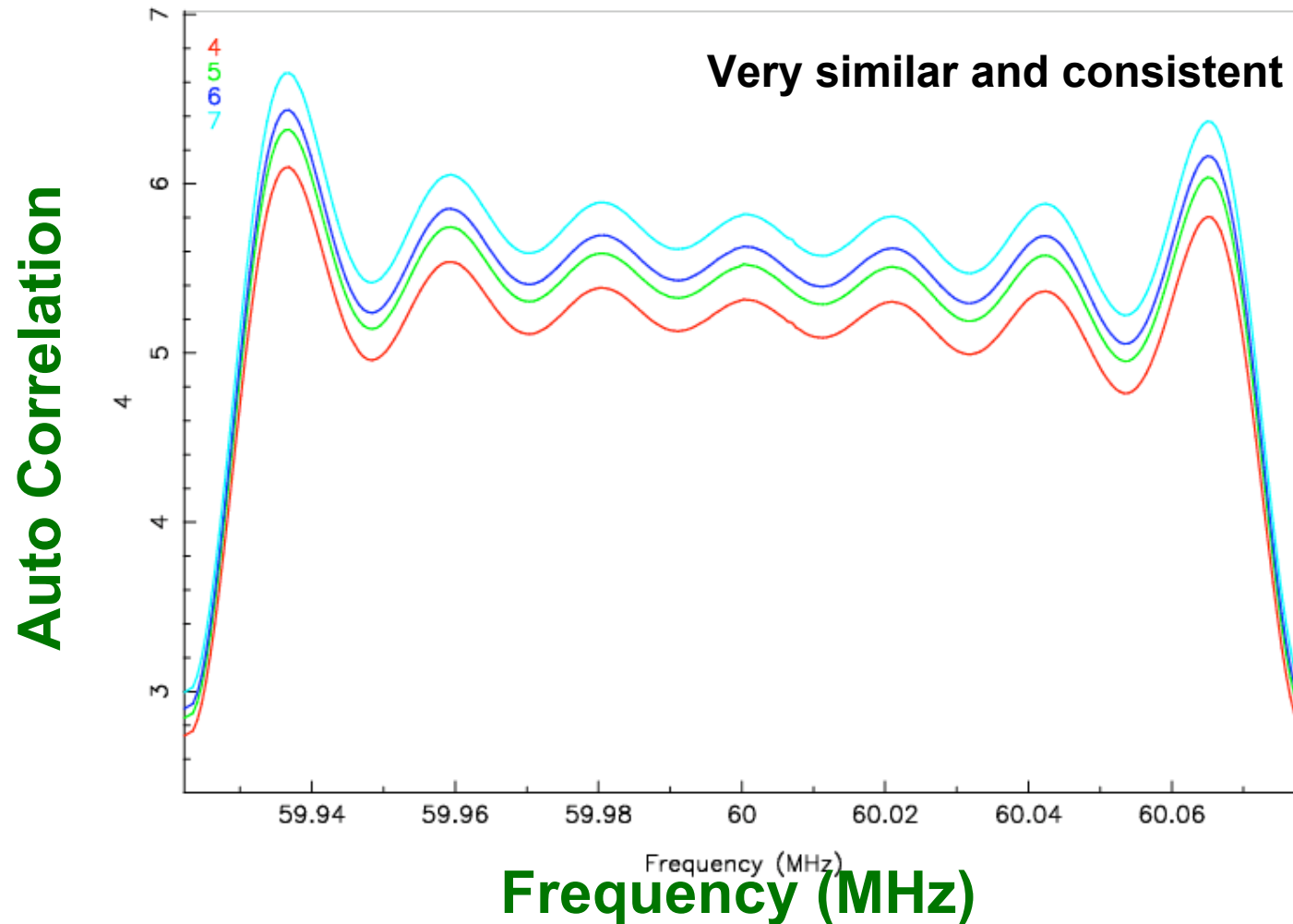
MS693 - Avg (Ch 6:250) all microstns

Auto Correlation (ALL Channels averaged 6:250) L2007_00693.MS All micro stations



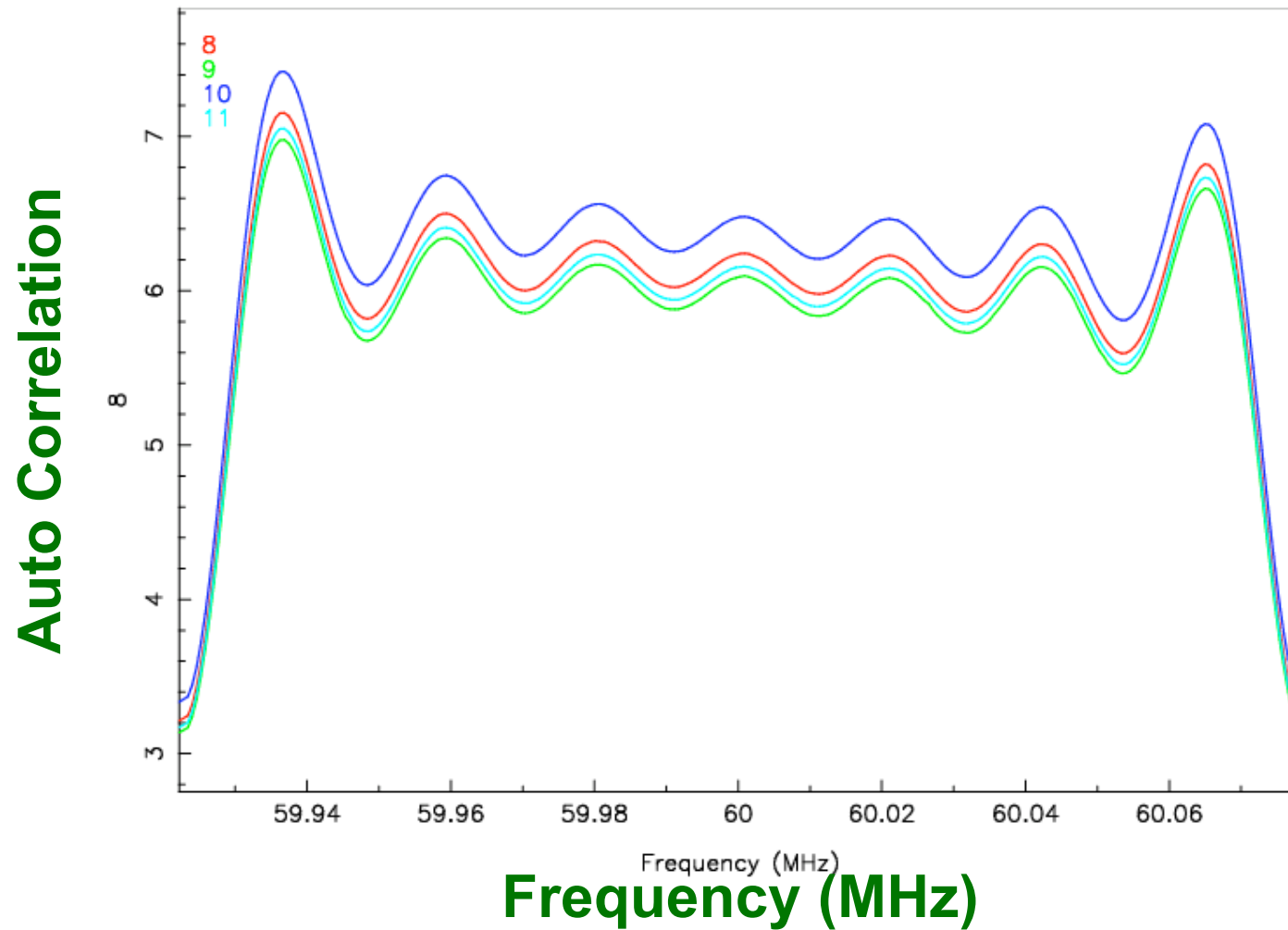
MS693: Bandpass (time averaged) CS1

Auto Correlation (ALL Time averaged) L2007_00693.MS All micro stations in CS1



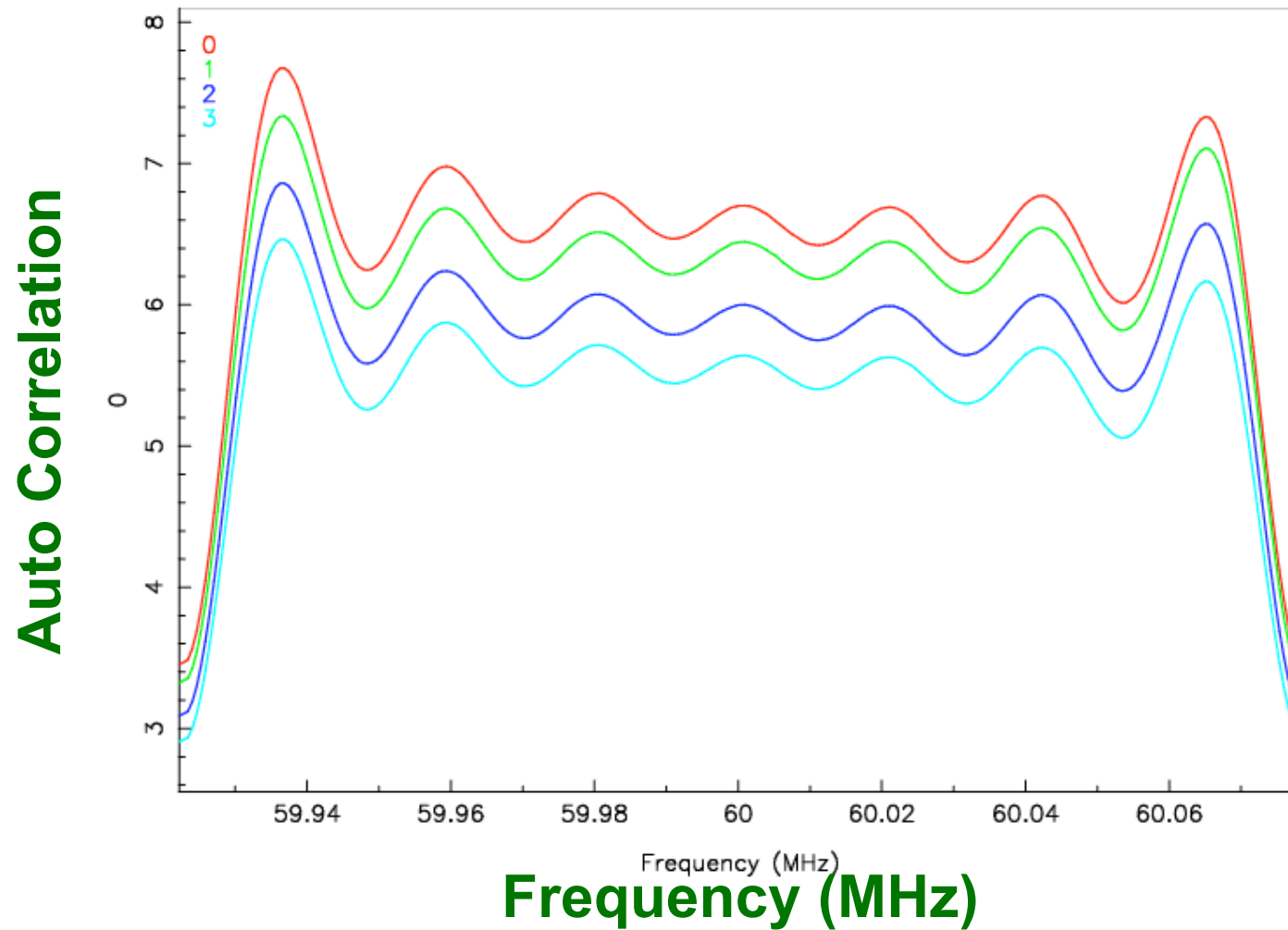
MS693: Bandpass (time averaged) CS8

Auto Correlation (ALL Time averaged) L2007_00693.MS All micro stations in CS8



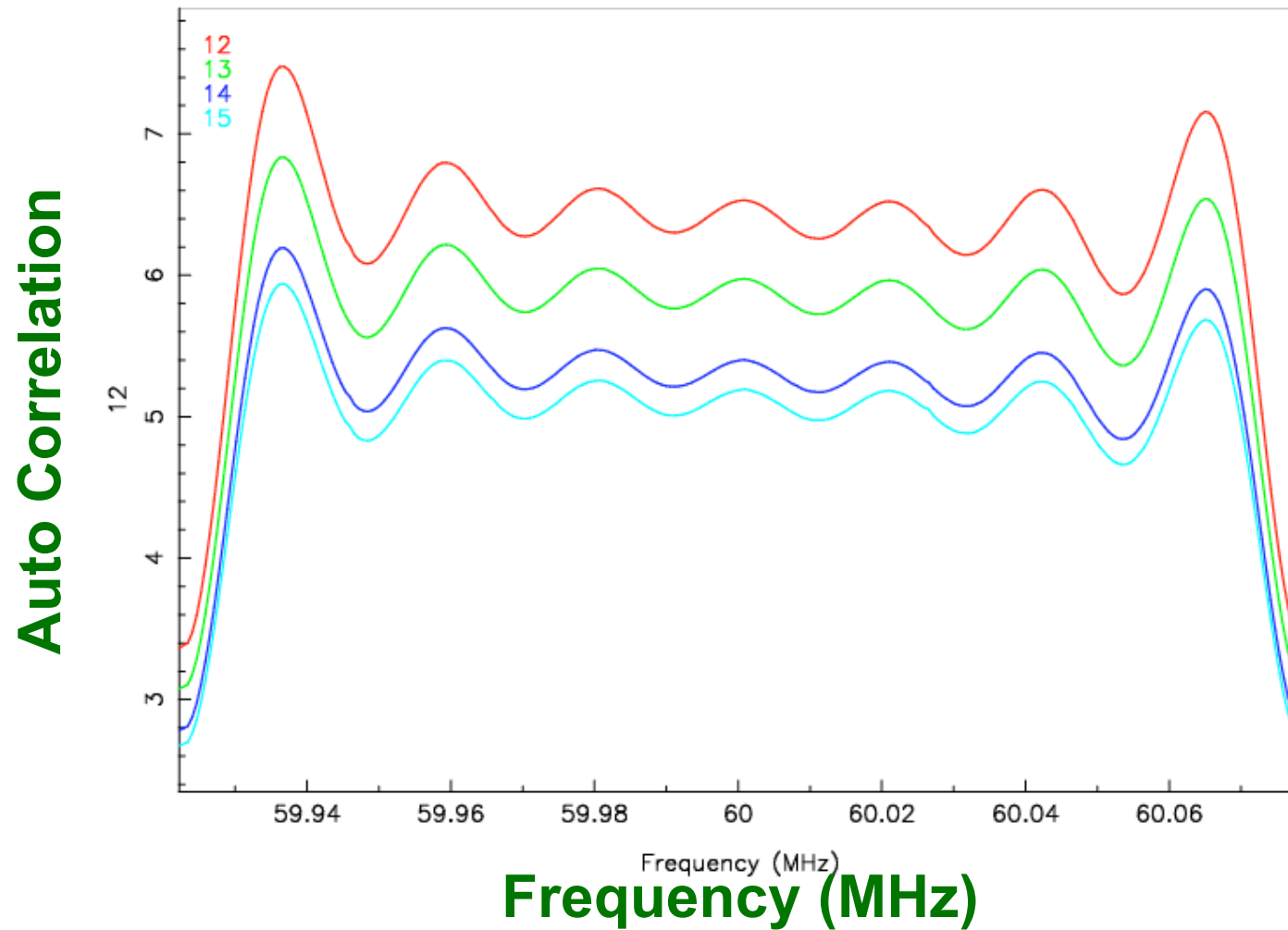
MS693: Bandpass (time averaged) CS10

Auto Correlation (ALL Time averaged) L2007_00693.MS All micro stations in CS10



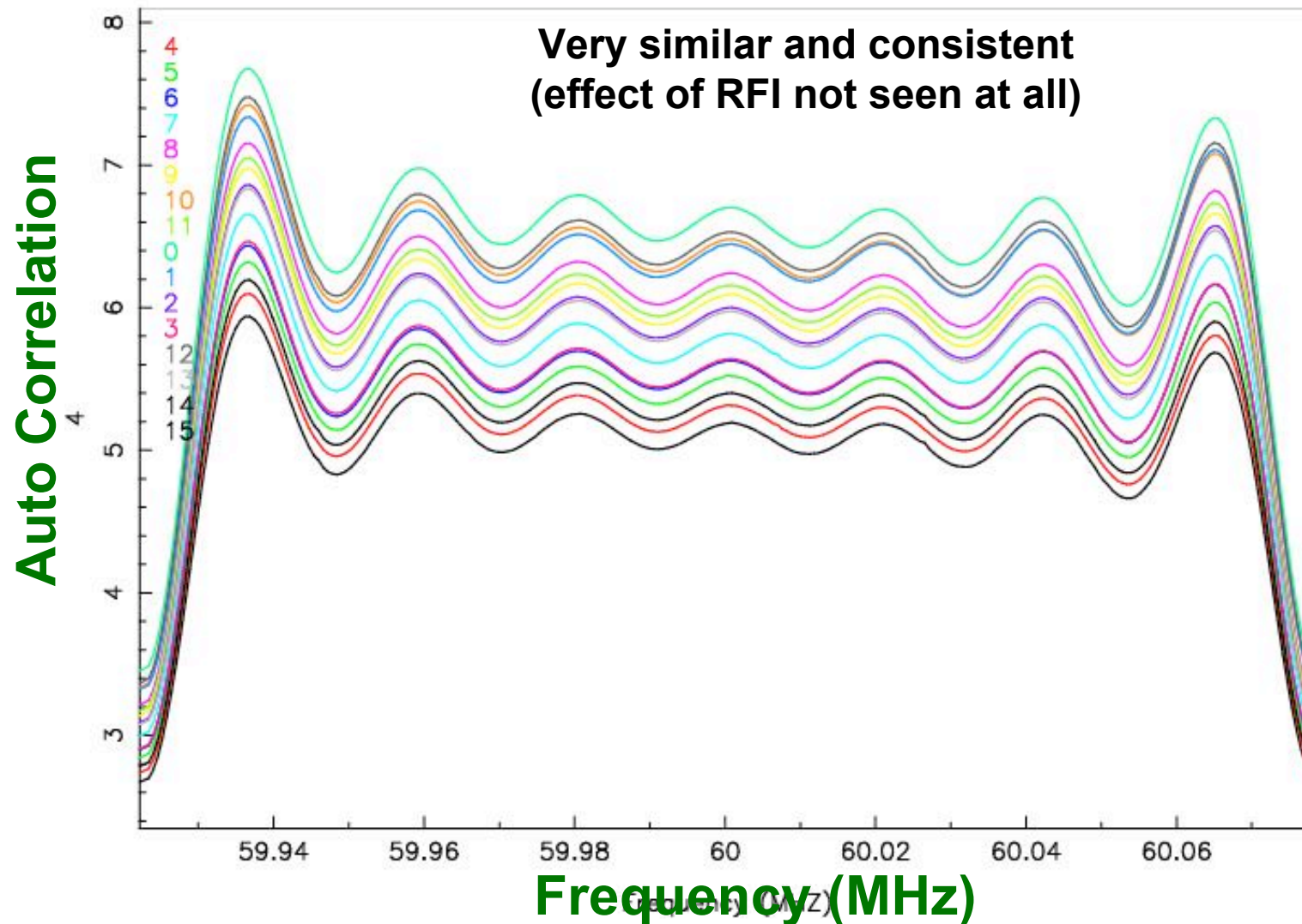
MS693: Bandpass (time averaged) CS16

Auto Correlation (ALL Time averaged) L2007_00693.MS All micro stations in CS16



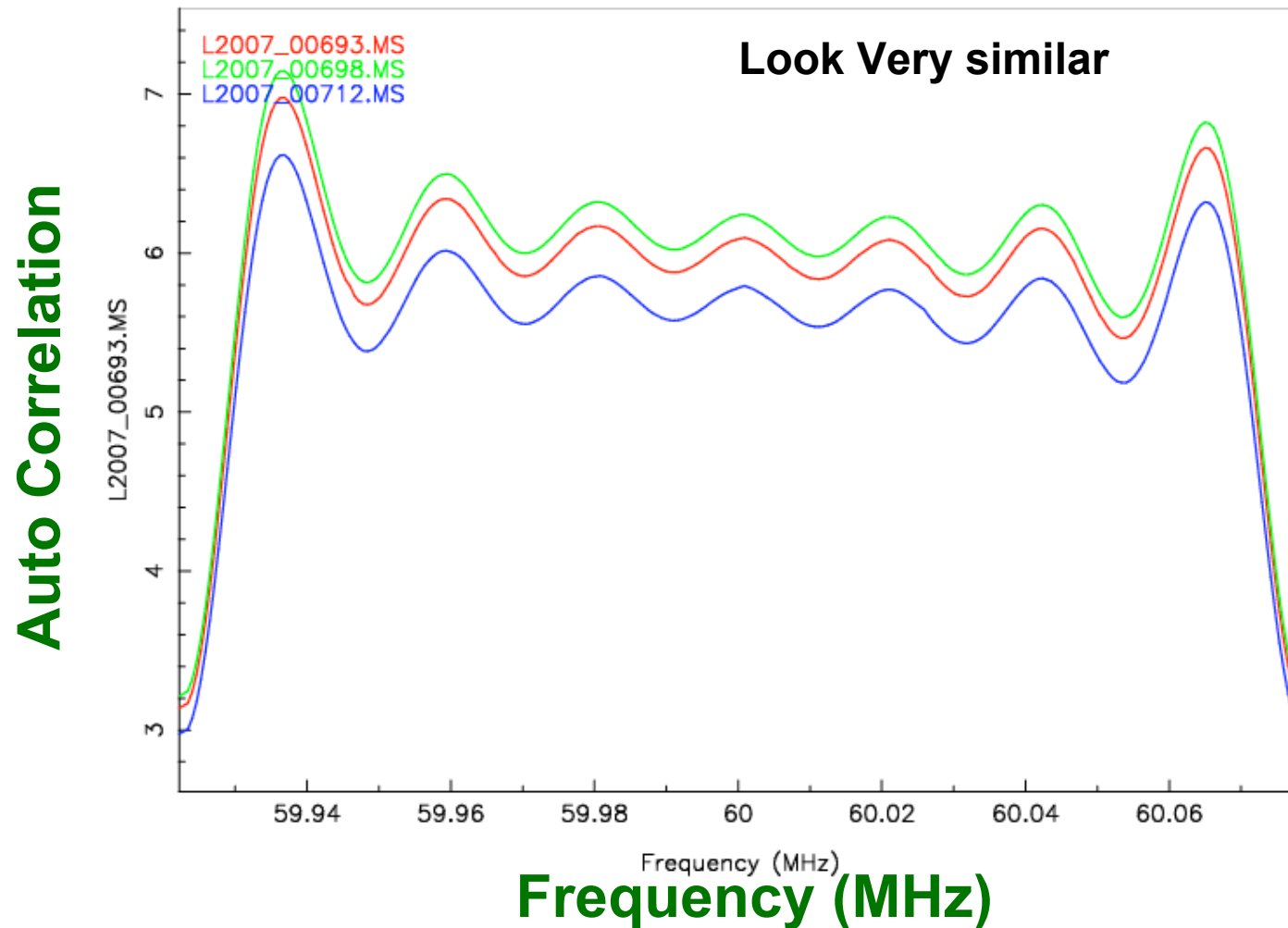
MS693: Bandpass (time averaged) all microstn

Auto Correlation (ALL Time averaged) L2007_00693.MS All micro stations



MS712/698/MS693 Bandpass(diff days): MStn9

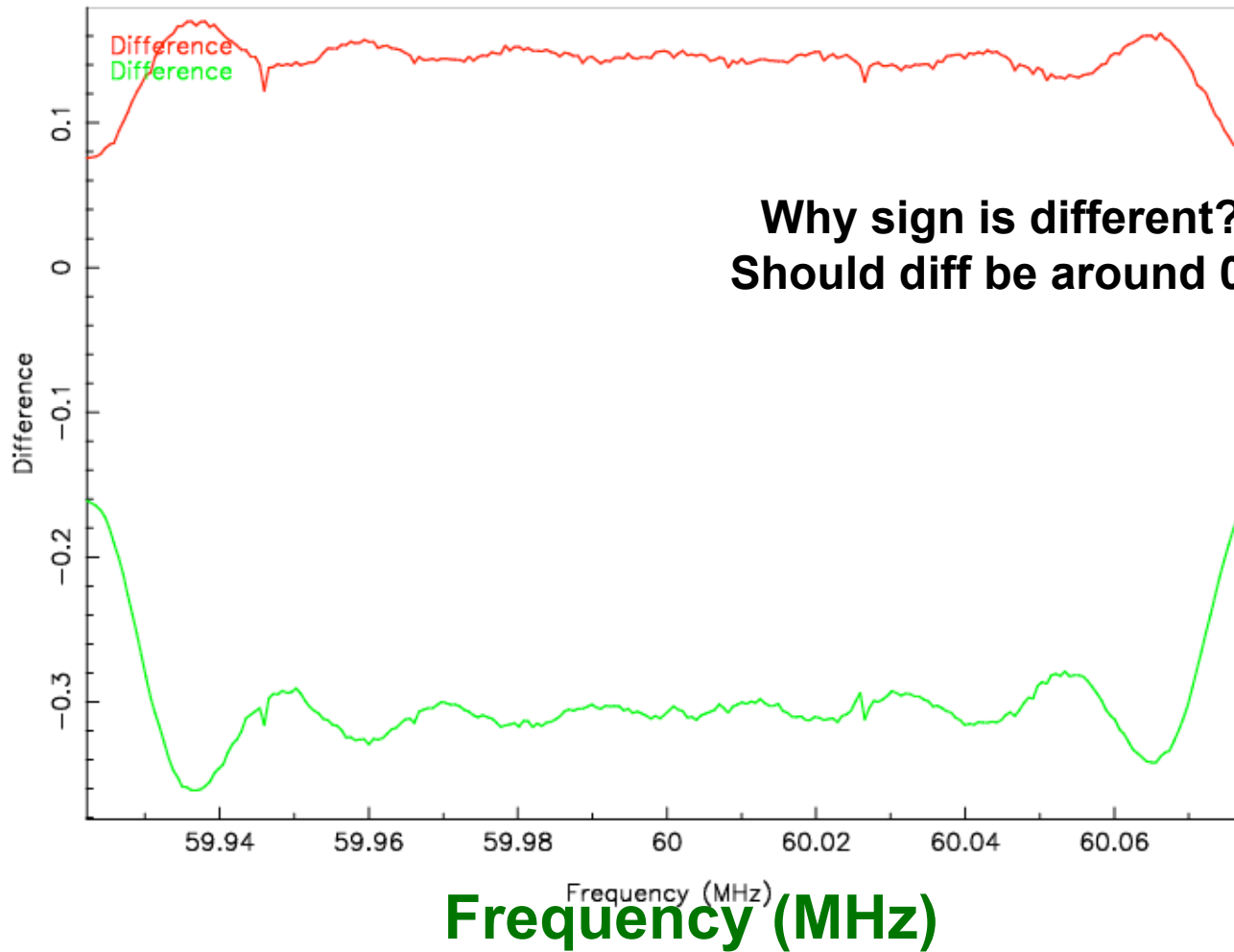
plot1_Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 9



MS712/698/MS693 Bandpass diff: Mstn9

plot2_Difference Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 9

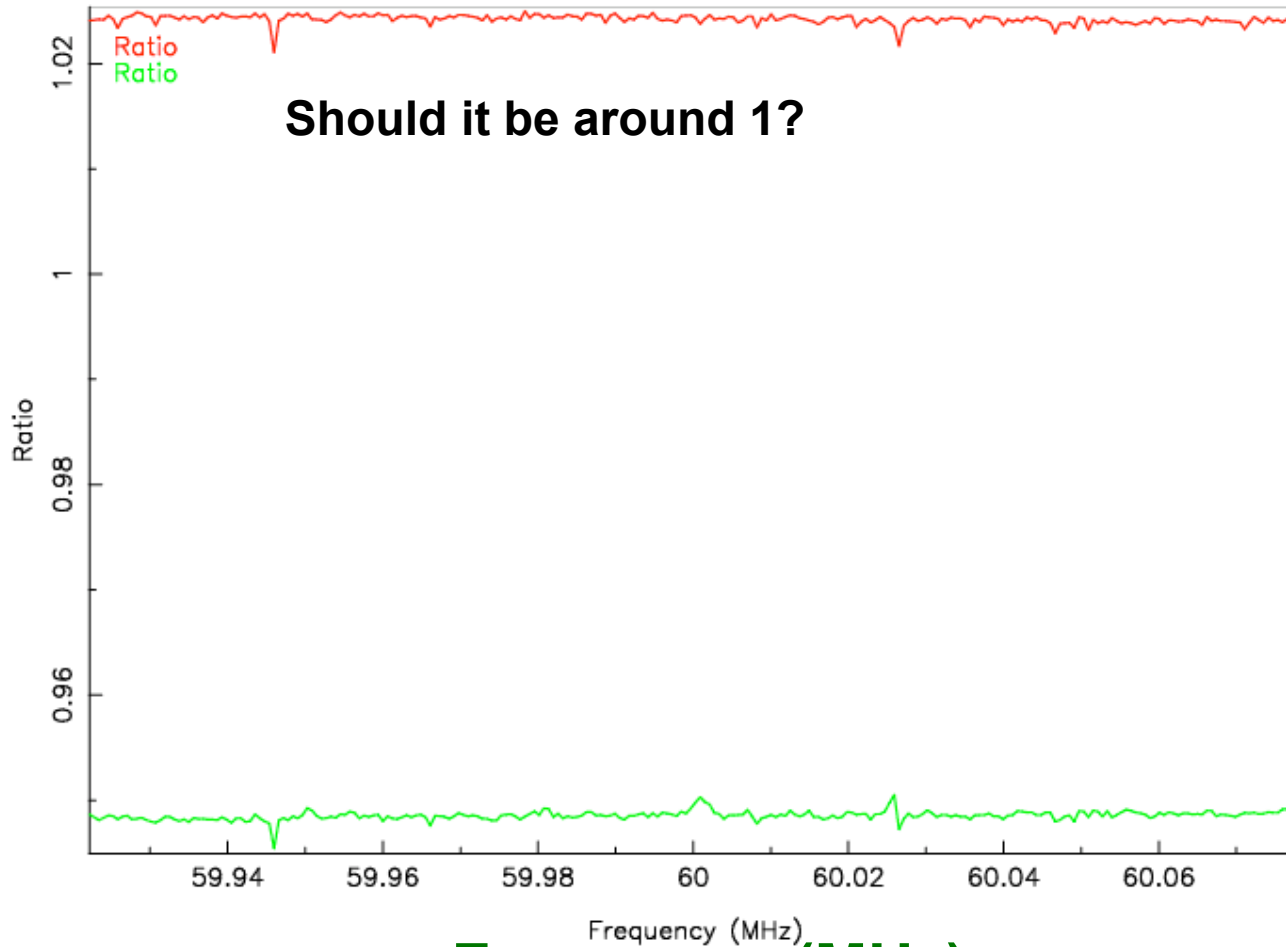
Auto Correlation (difference)



MS712/698/MS693 Bandpass ratio: mstn9

plot3_Ratio Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 9

Auto Correlation (ratio)

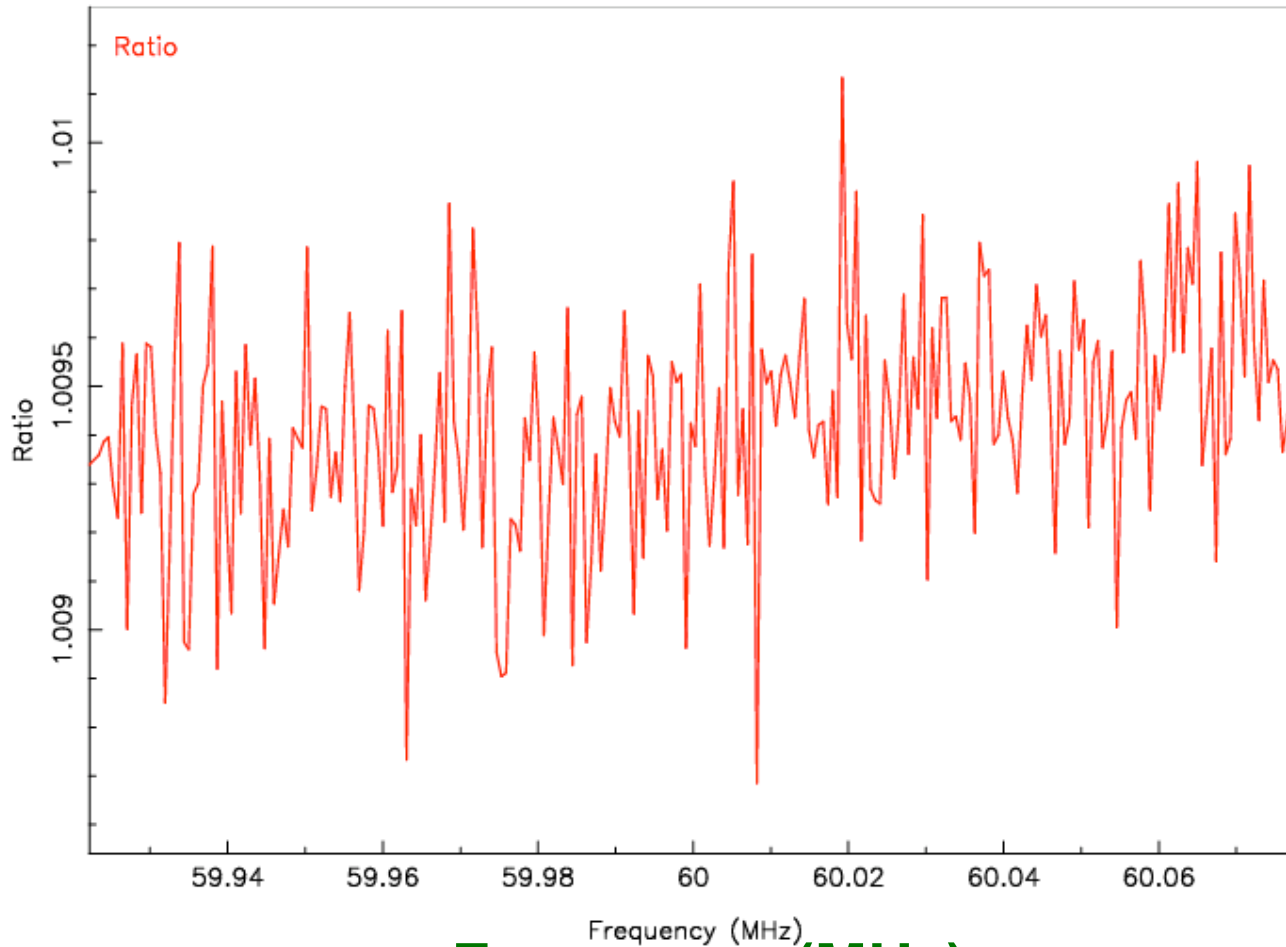


Frequency (MHz)

Bandpass stability -R- MStn 0 - MS698/MS693

plot3_Ratio Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 0

Auto Correlation (ratio)

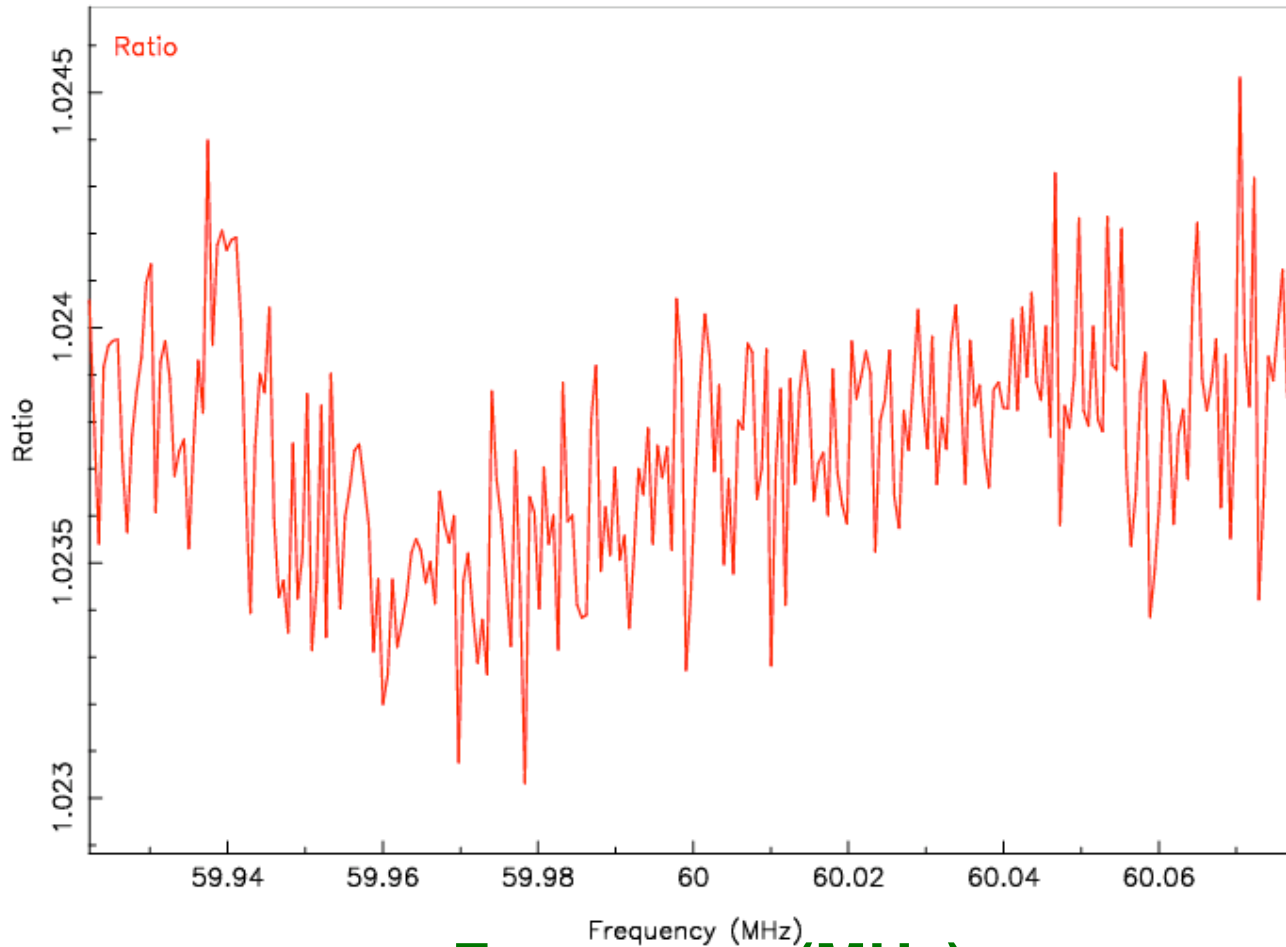


Frequency (MHz)

Bandpass stability - R MStn 1 - MS698/MS693

plot3_Ratio Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 1

Auto Correlation (ratio)

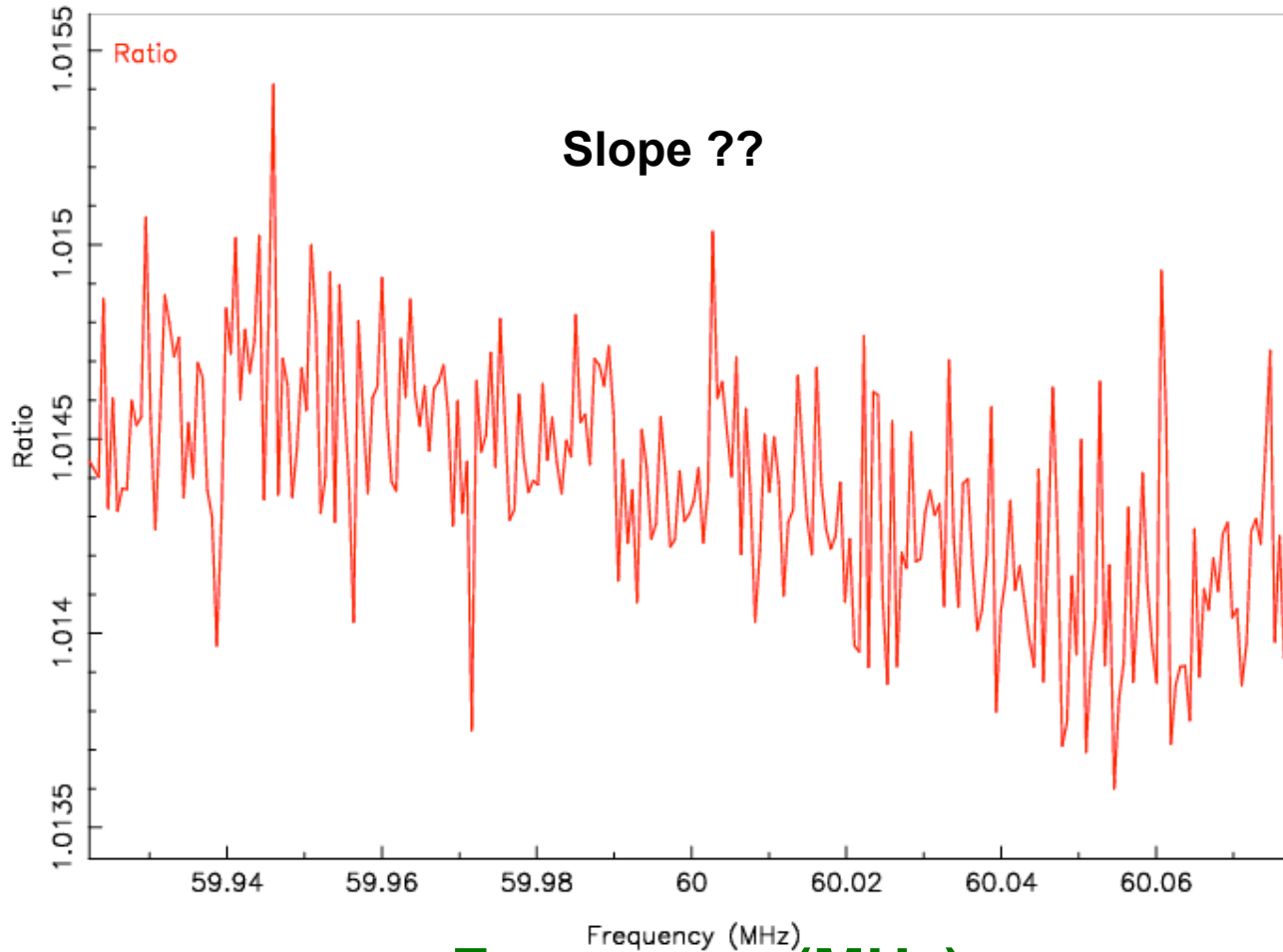


Frequency (MHz)

Bandpass stability - R MStn 2 - MS698/MS693

plot3_Ratio Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 2

Auto Correlation (ratio)

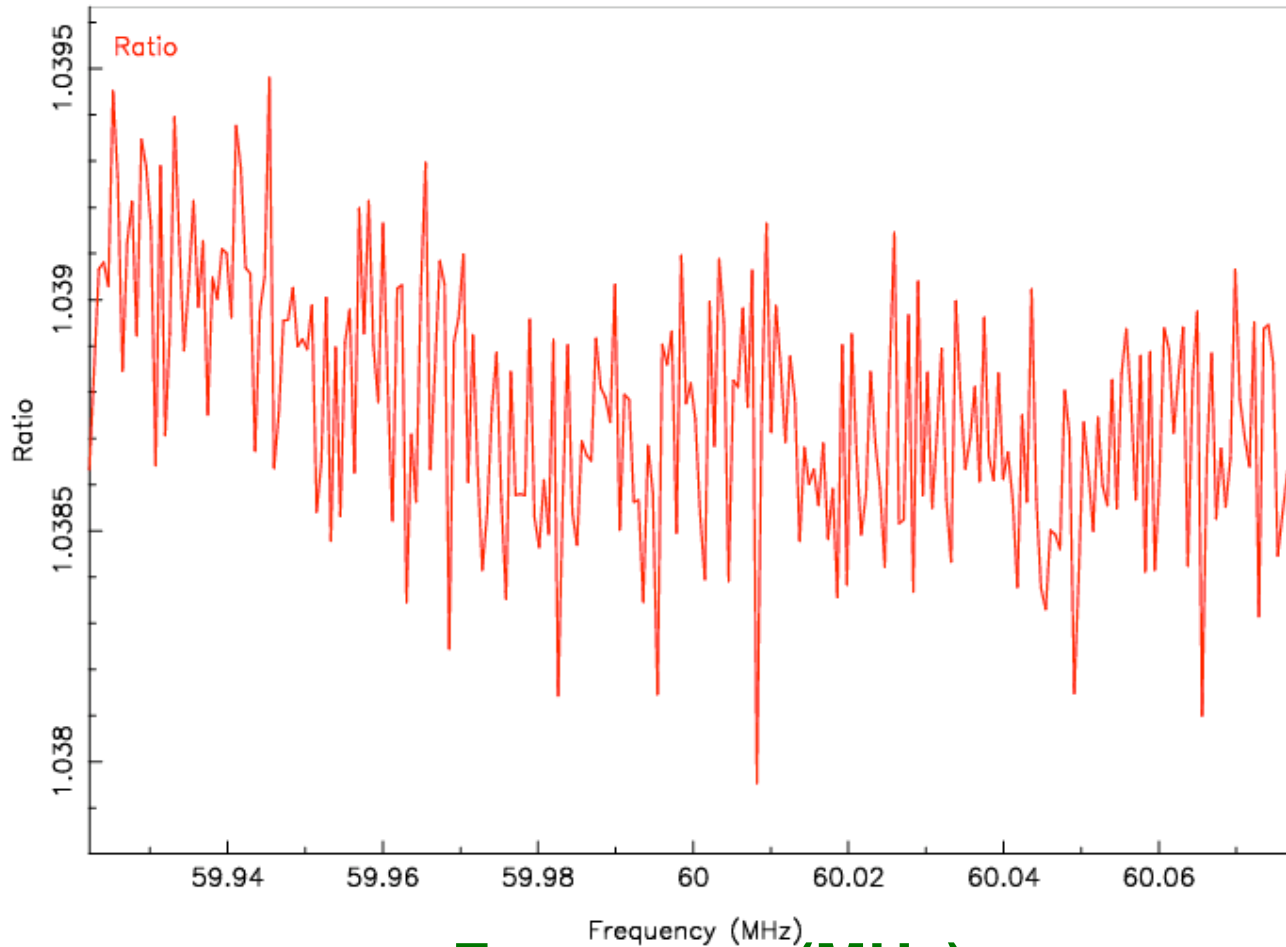


Frequency (MHz)

Bandpass stability - R MStn 3 - MS698/MS693

plot3_Ratio Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 3

Auto Correlation (ratio)

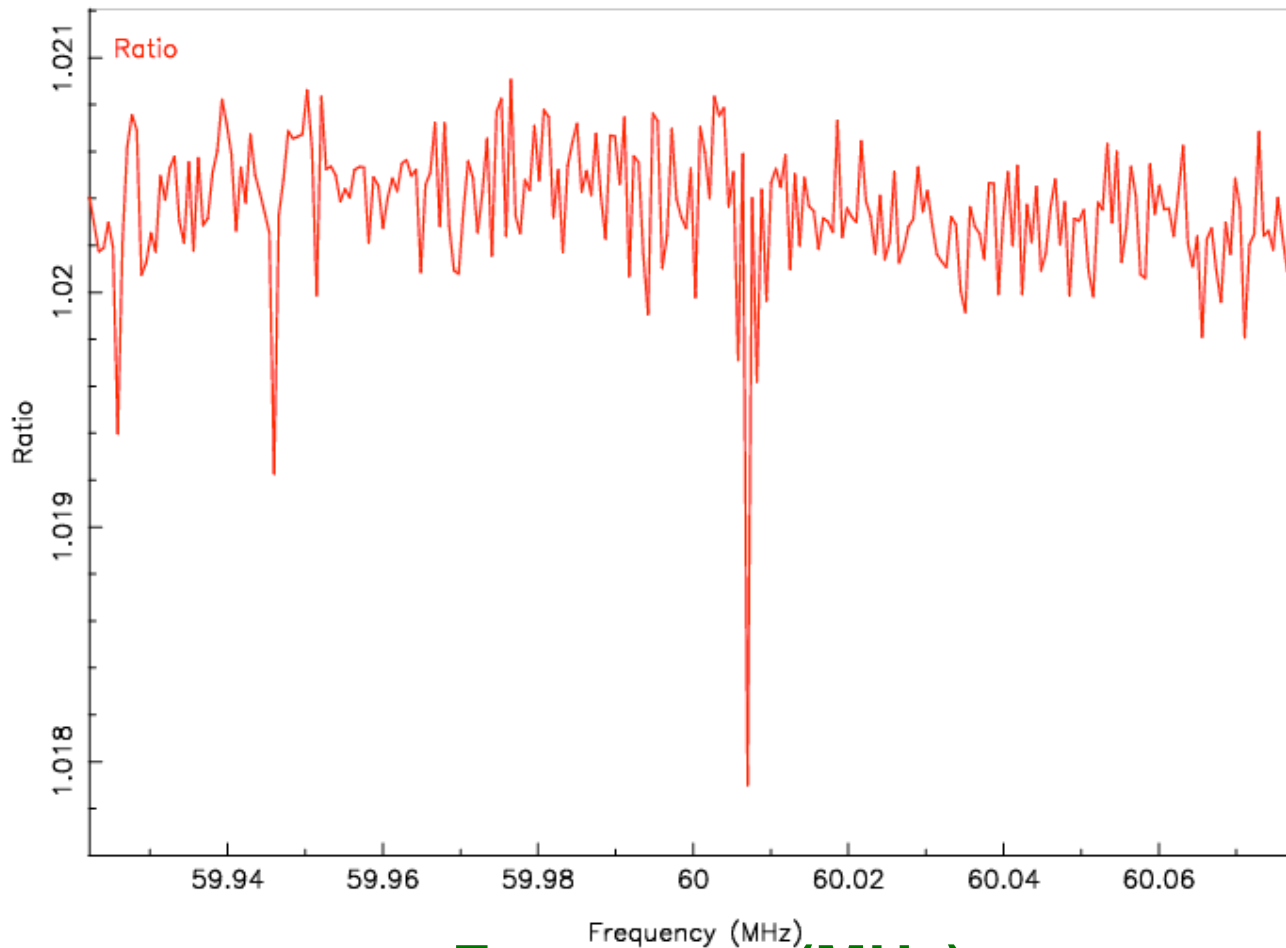


Frequency (MHz)

Bandpass stability - R MStn 4 - MS698/MS693

plot3_Ratio Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 4

Auto Correlation (ratio)

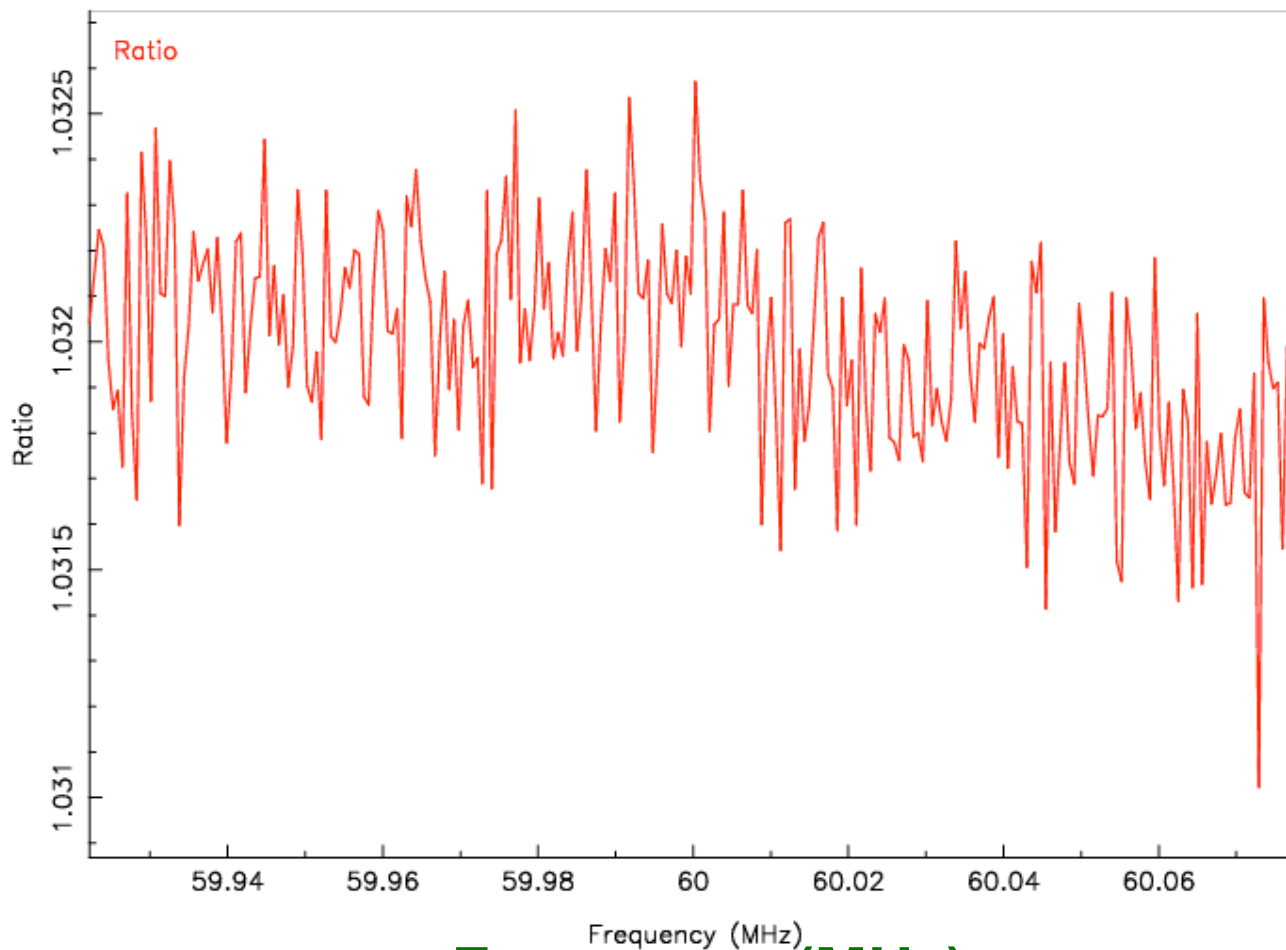


Frequency (MHz)

Bandpass stability - R MStn 5 - MS698/MS693

plot3_Ratio Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 5

Auto Correlation (ratio)

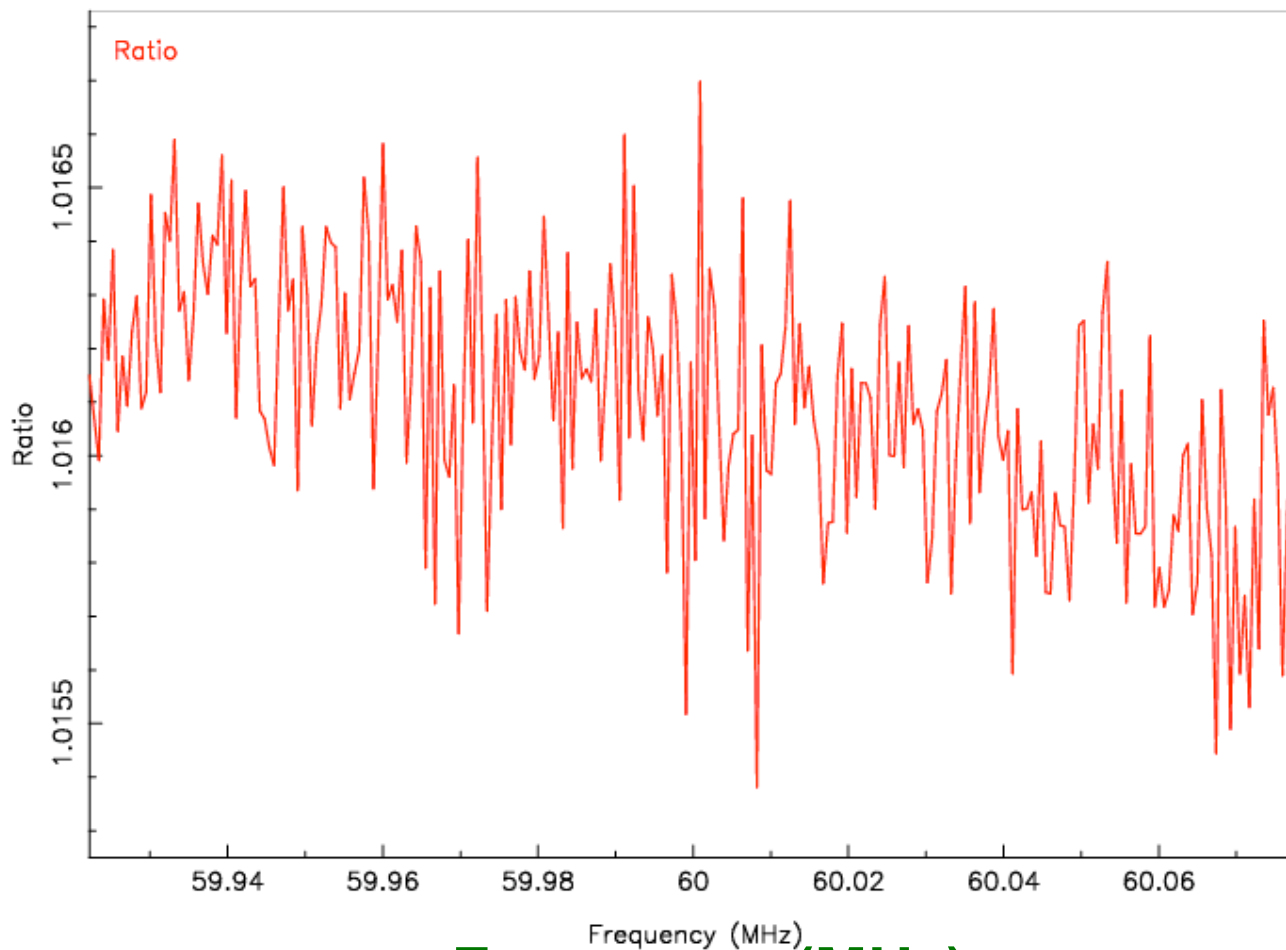


Frequency (MHz)

Bandpass stability - R MStn 6 - MS698/MS693

plot3_Ratio Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 6

Auto Correlation (ratio)

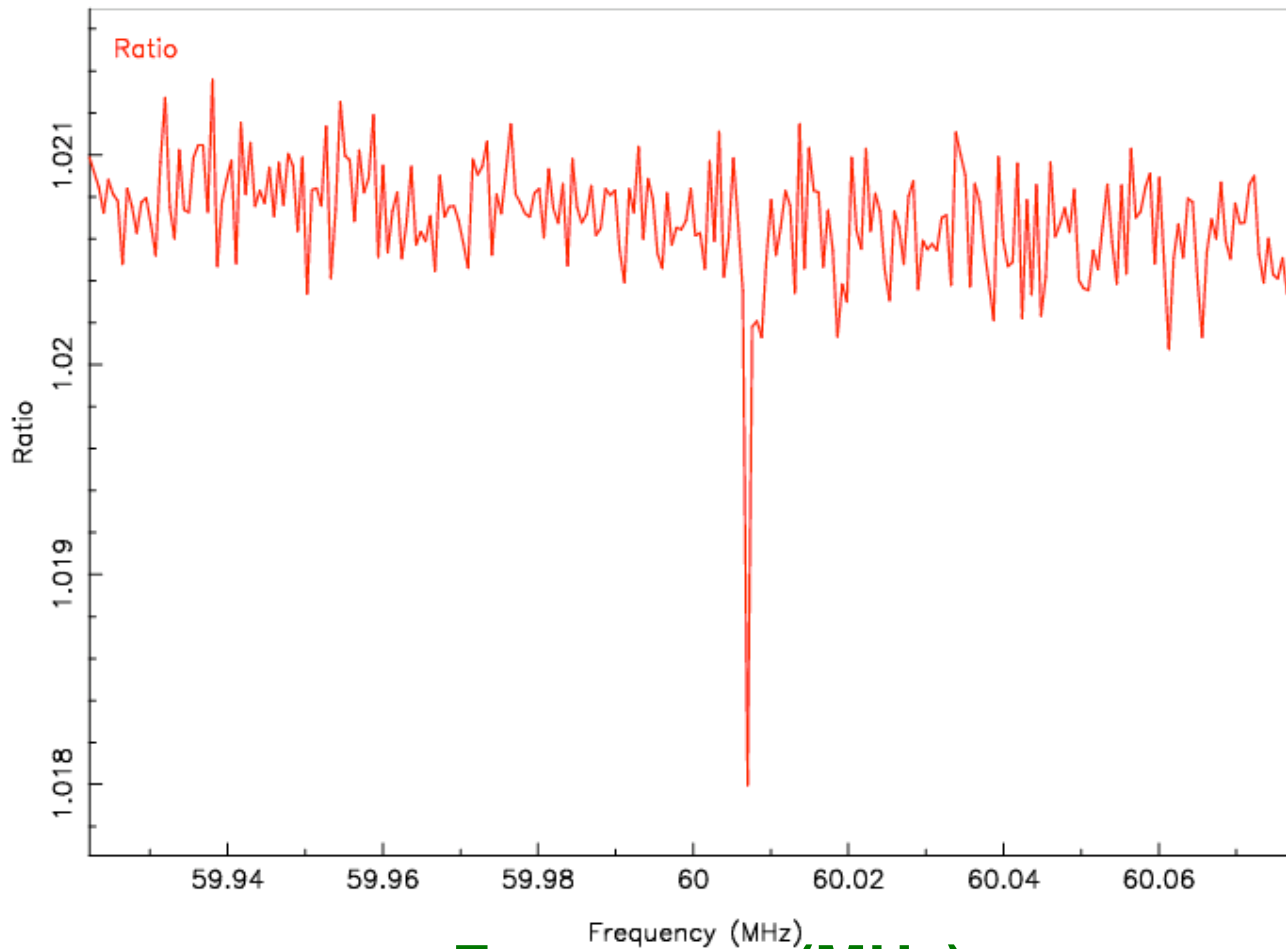


Frequency (MHz)

Bandpass stability - R MStn 7 - MS698/MS693

plot3_Ratio Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 7

Auto Correlation (ratio)

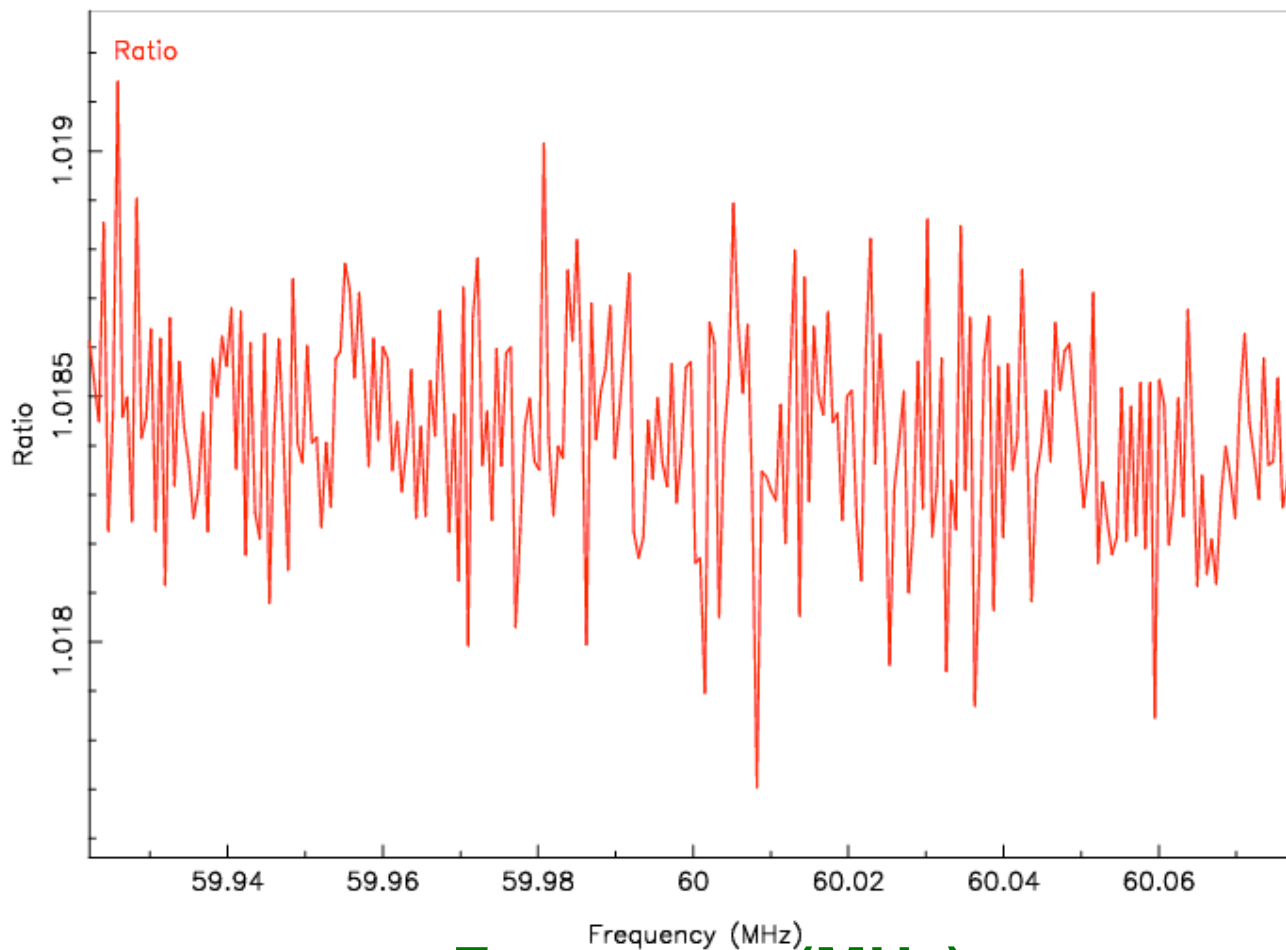


Frequency (MHz)

Bandpass stability - R MStn 8 - MS698/MS693

plot3_Ratio Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 8

Auto Correlation (ratio)

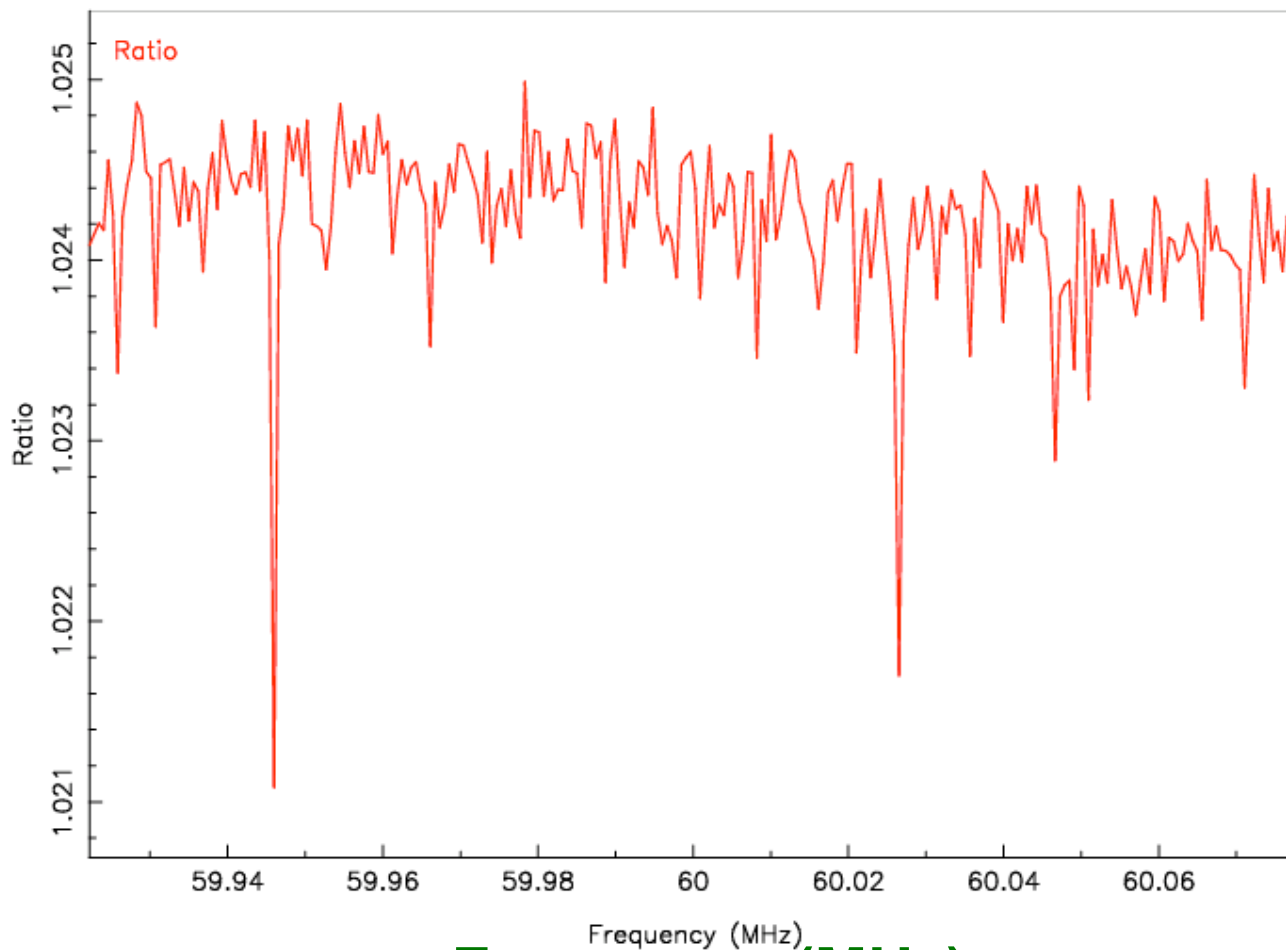


Frequency (MHz)

Bandpass stability - R MStn 9 - MS698/MS693

plot3_Ratio Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 9

Auto Correlation (ratio)

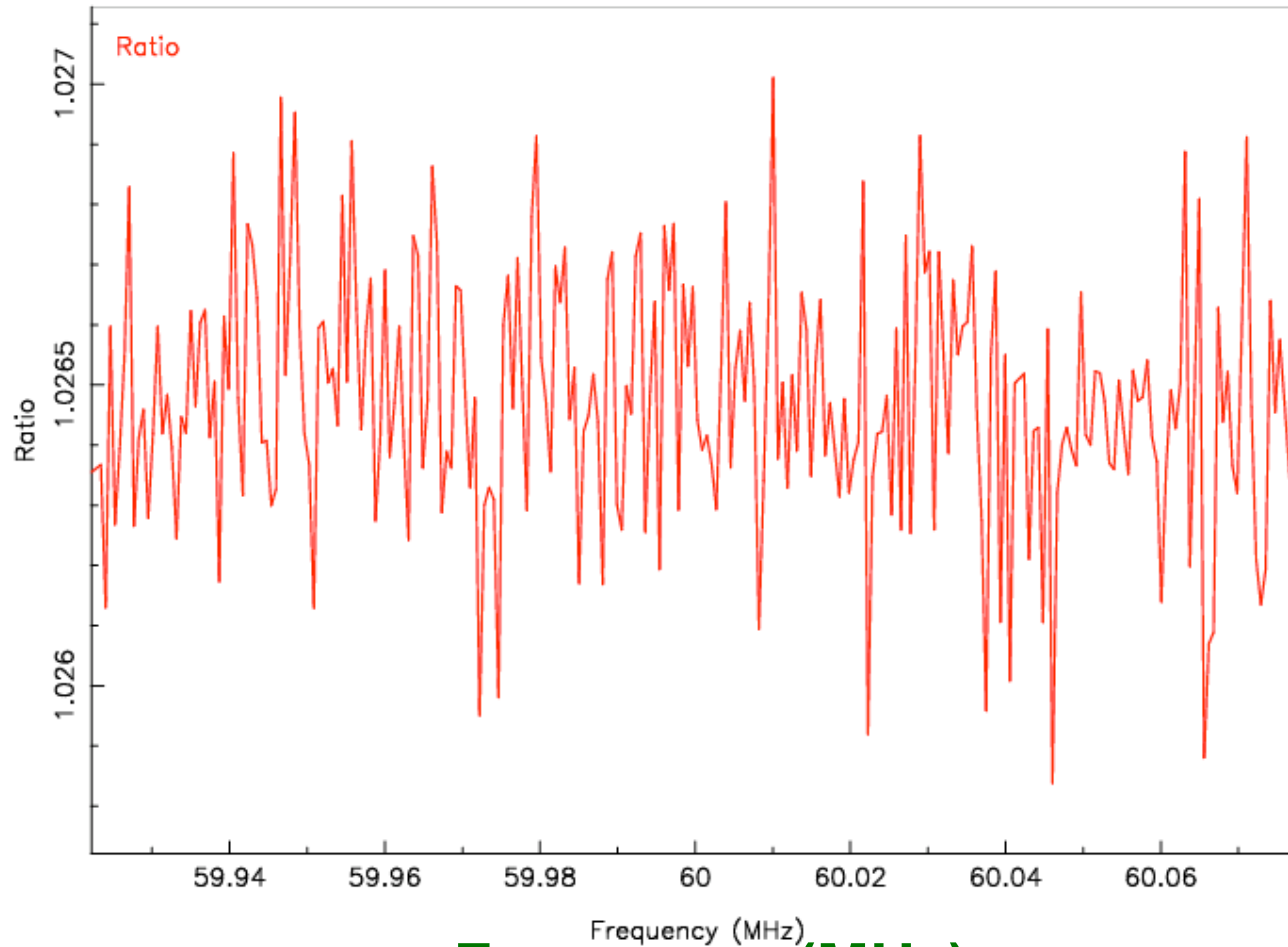


Frequency (MHz)

Bandpass stability - R MStn 10 - MS698/MS693

plot3_Ratio Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 10

Auto Correlation (ratio)

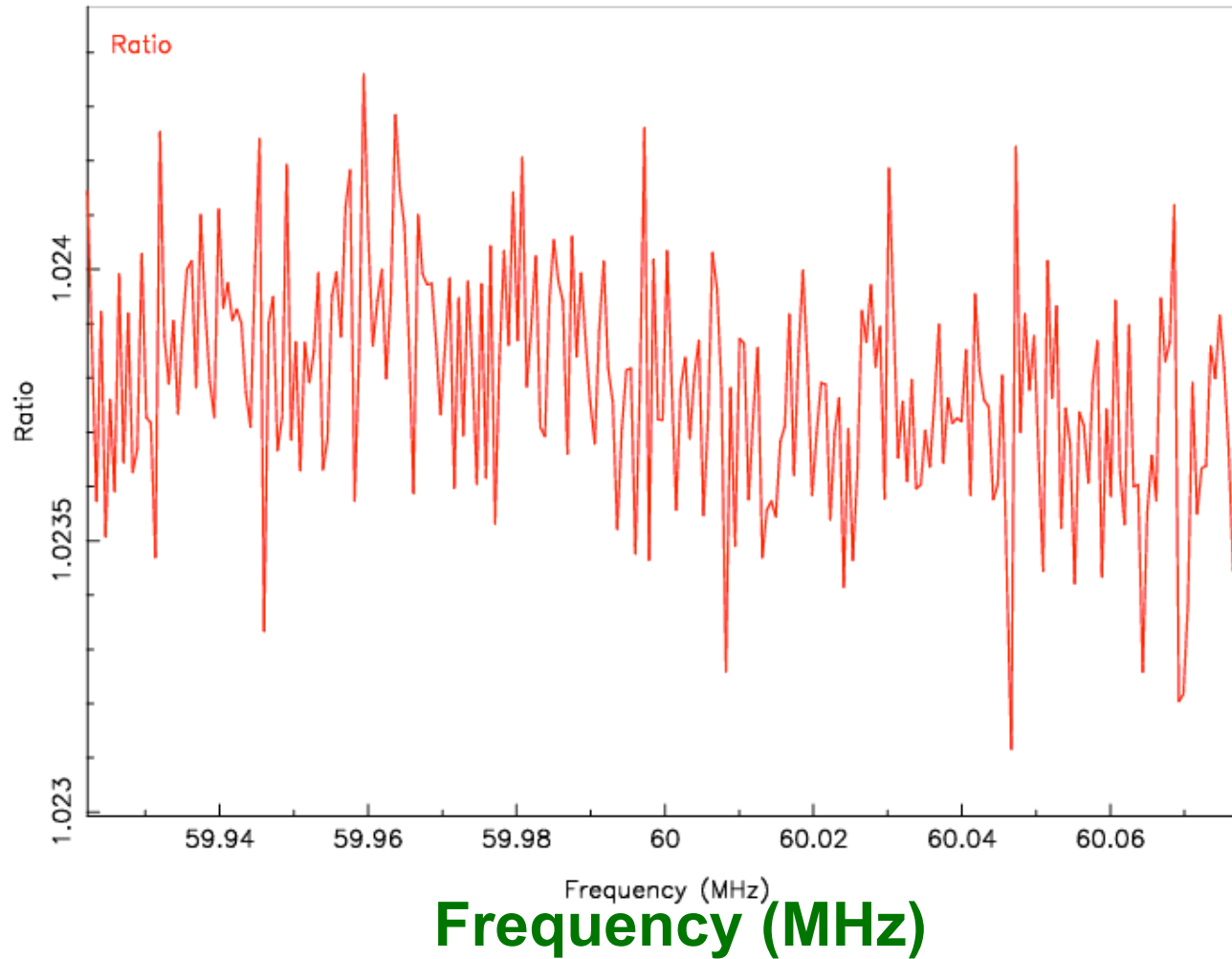


Frequency (MHz)

Bandpass stability - R MStn 11 MS698/MS693

plot3_Ratio Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 11

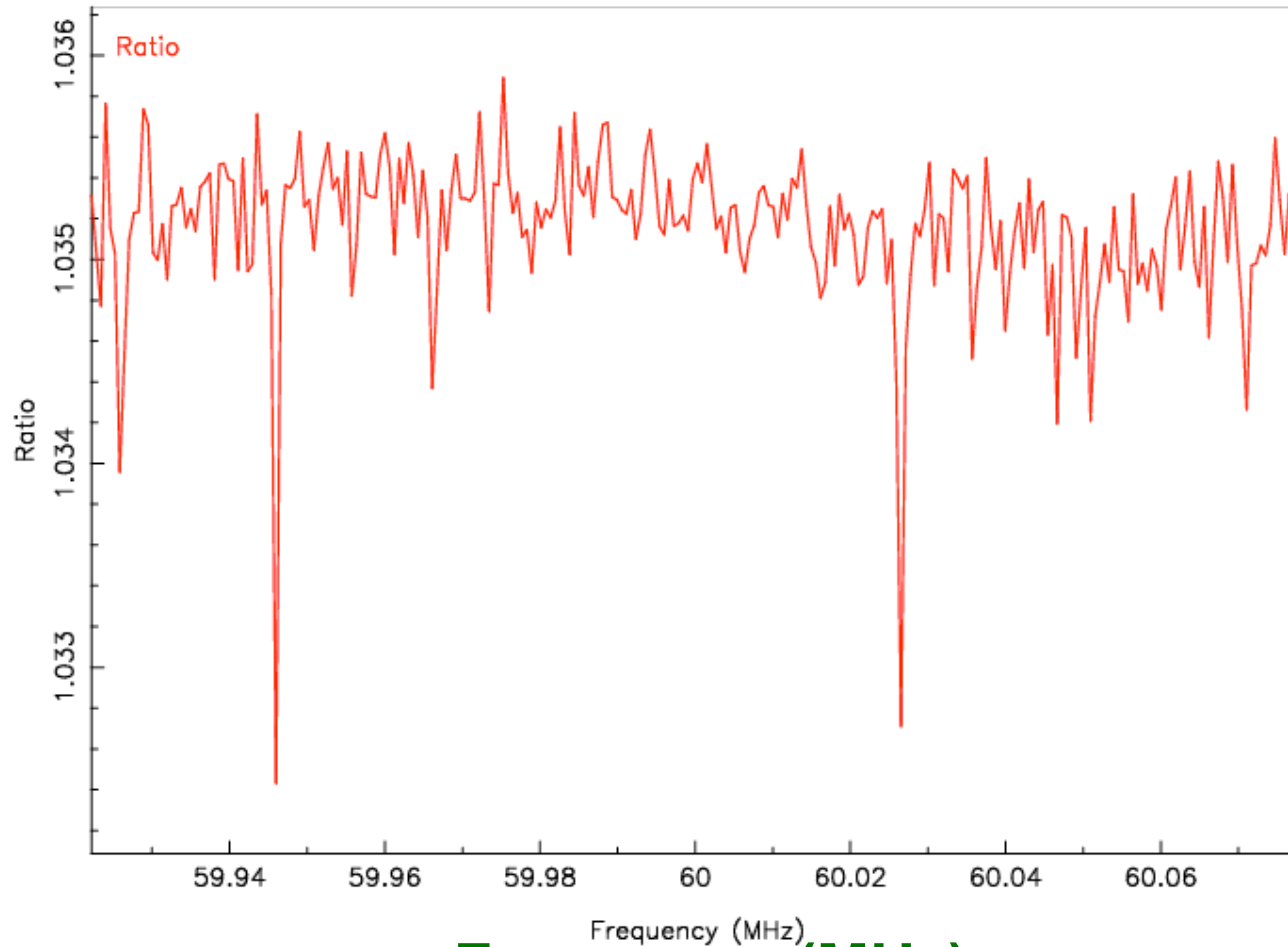
Auto Correlation (ratio)



Bandpass stability - R MStn 12 MS698/MS693

plot3_Ratio Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 12

Auto Correlation (ratio)

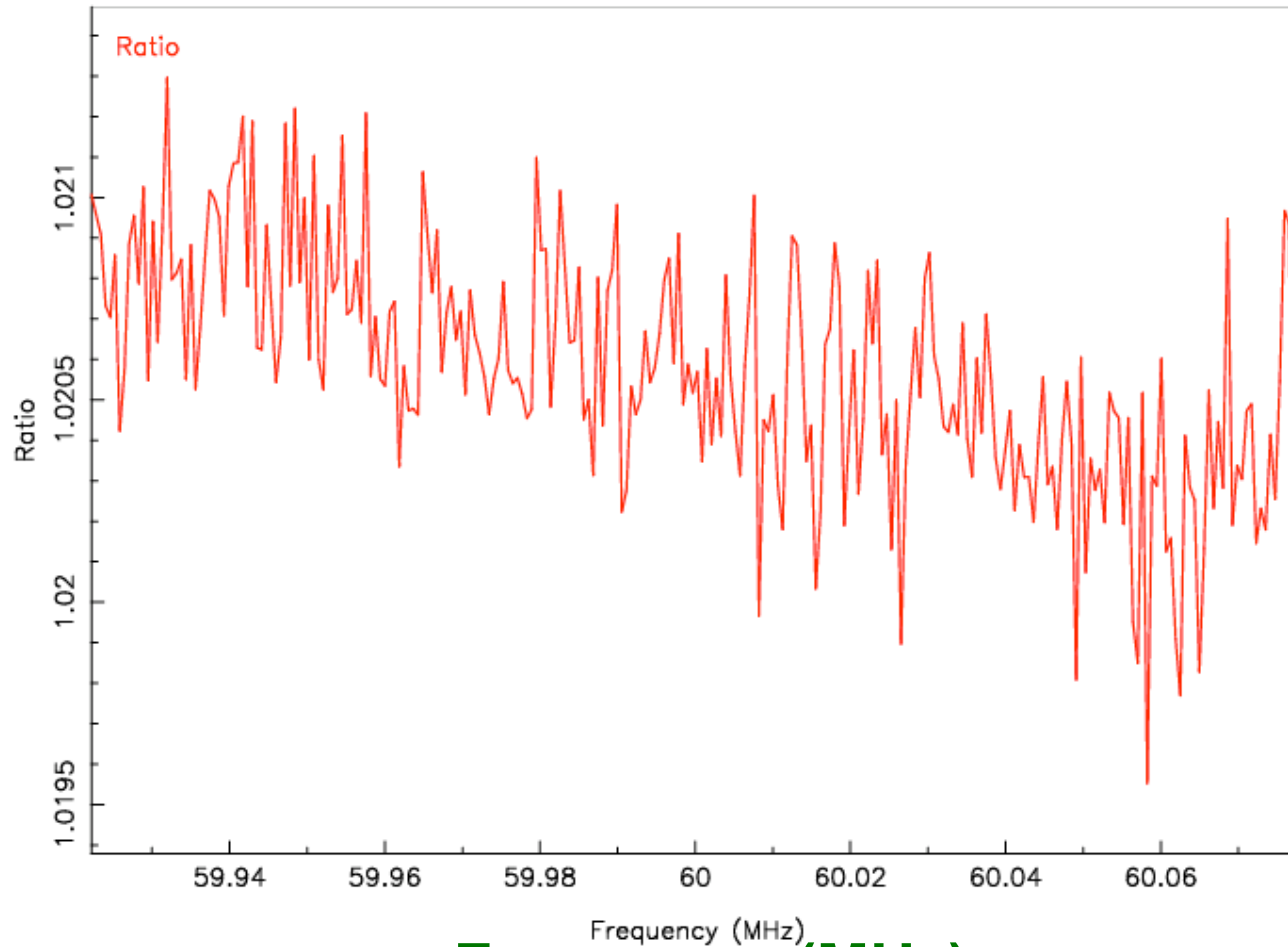


Frequency (MHz)

Bandpass stability - R MStn 13- MS698/MS693

plot3_Ratio Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 13

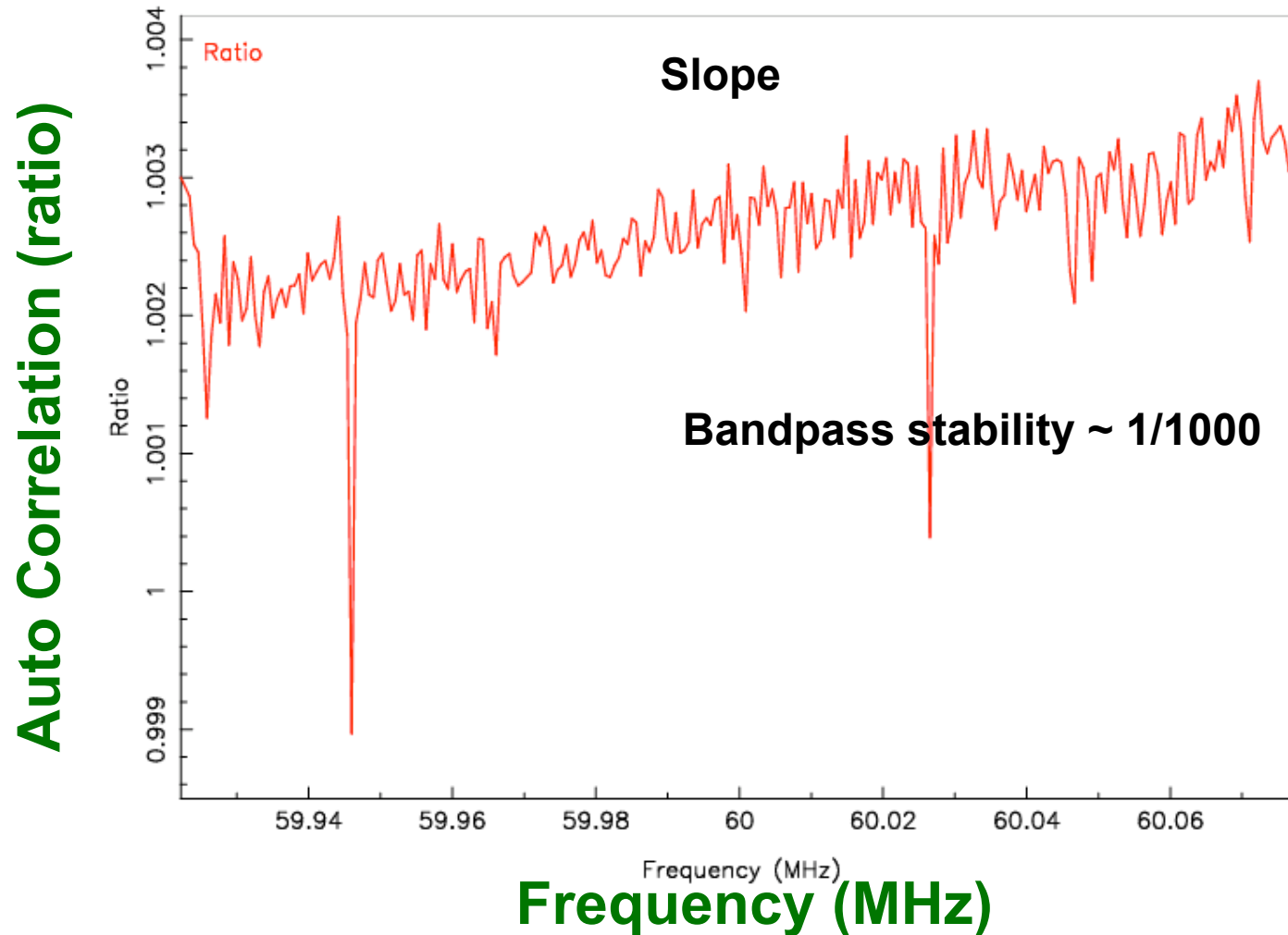
Auto Correlation (ratio)



Frequency (MHz)

Bandpass stability - R MStn 14 MS698/MS693

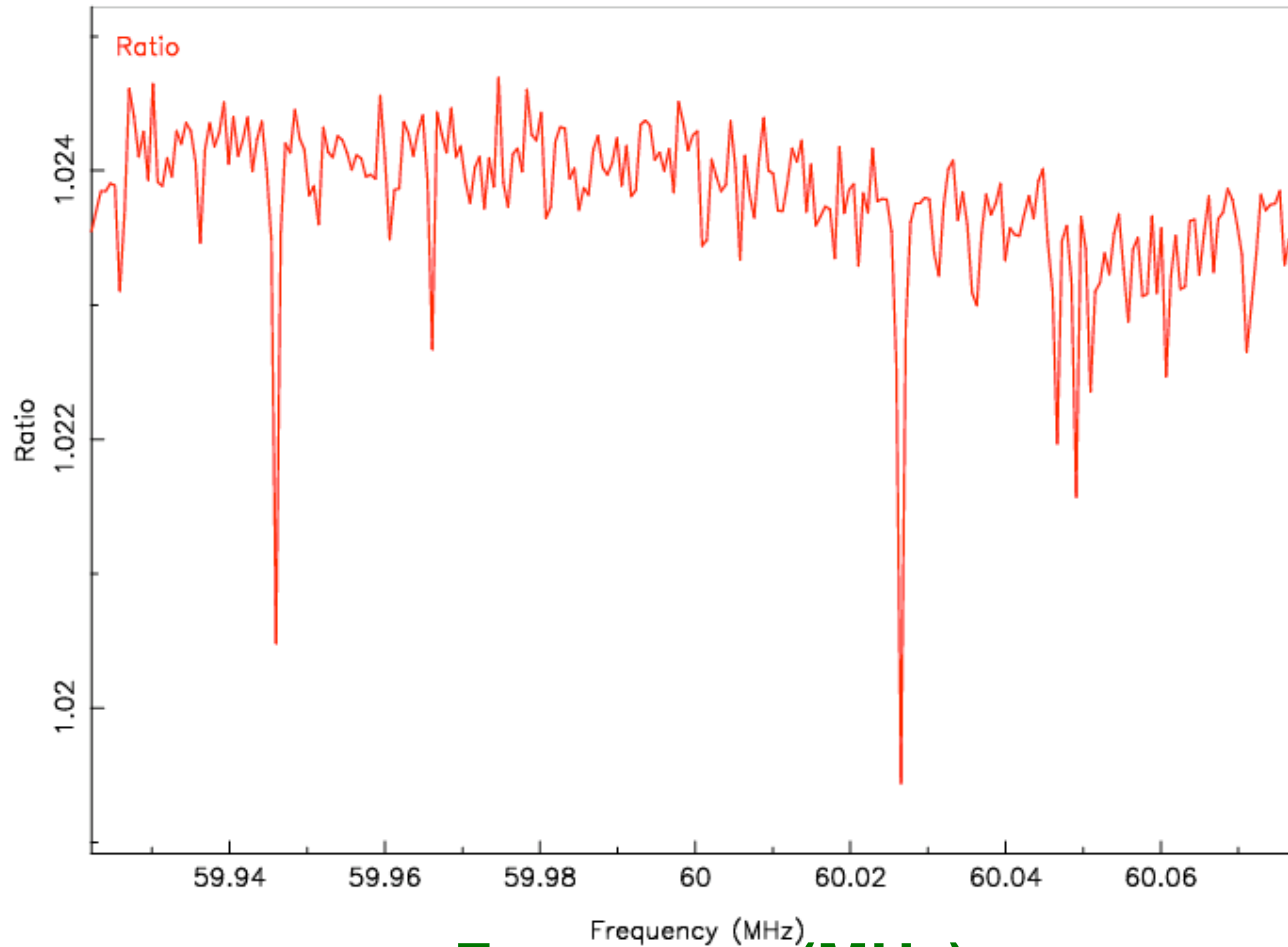
plot3_Ratio Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 14



Bandpass stability - R MStn 15 MS698/MS693

plot3_Ratio Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 15

Auto Correlation (ratio)

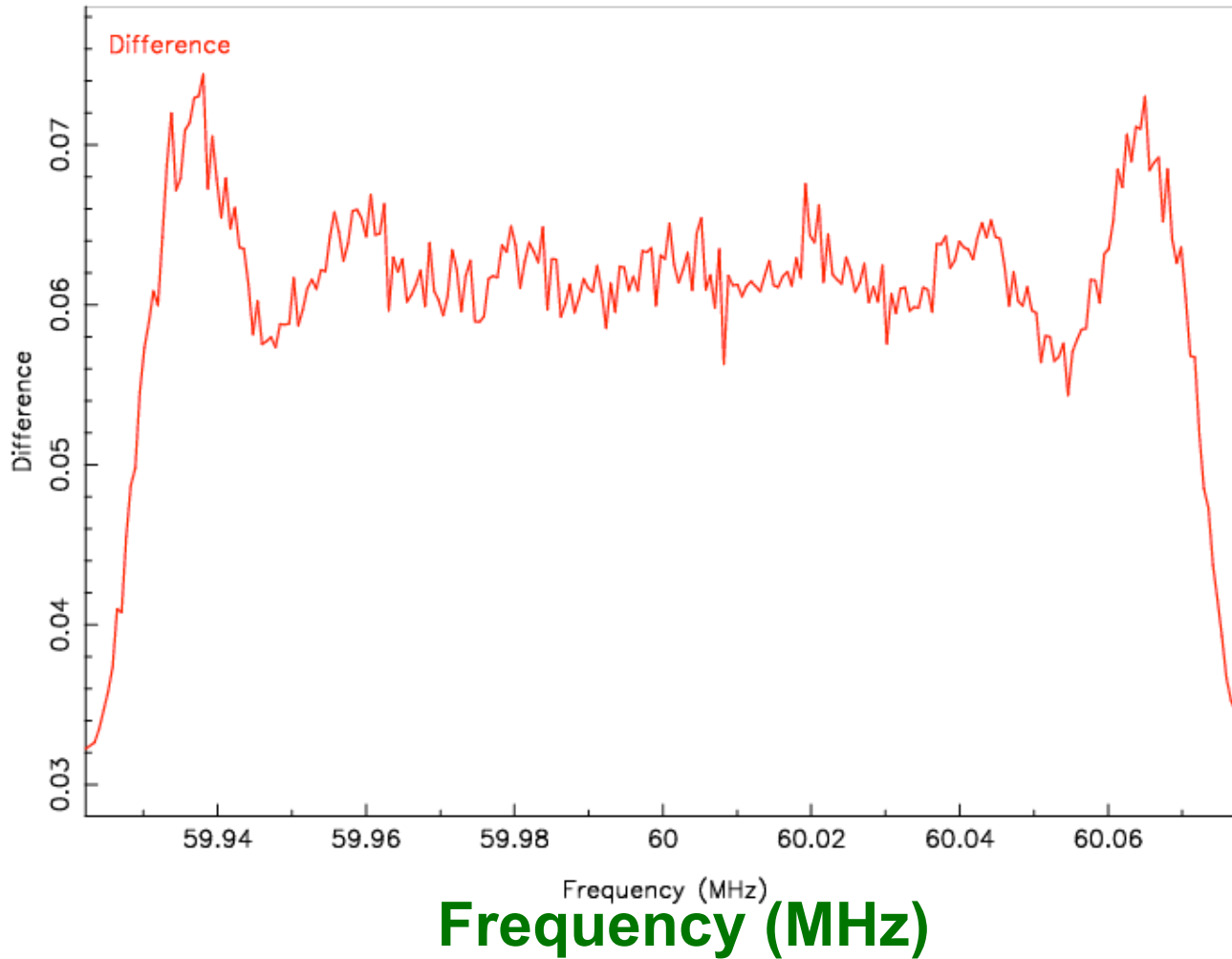


Frequency (MHz)

Bandpass stability - D MStn 0 - MS698/MS693

plot2_Difference Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 0

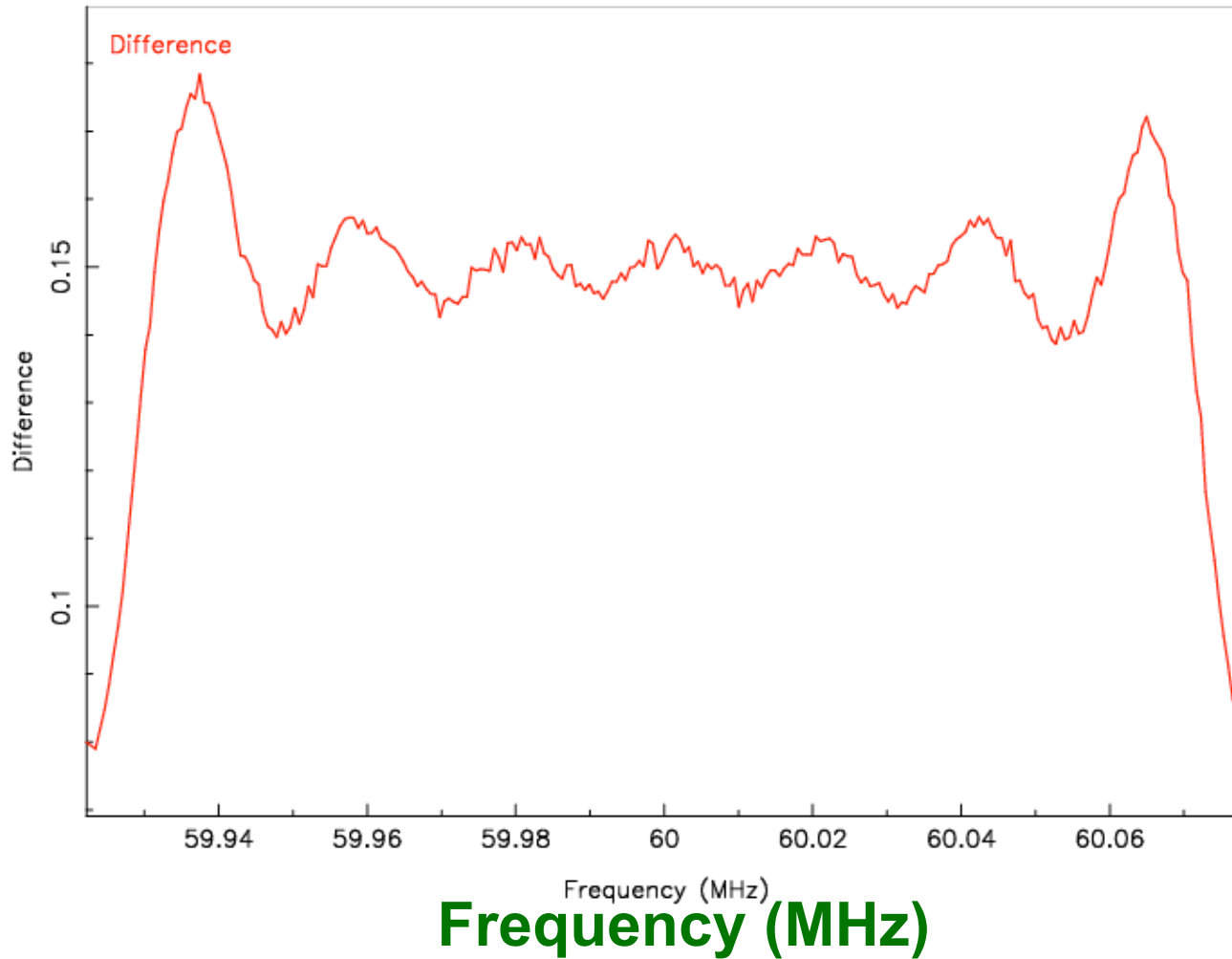
Auto Correlation (difference)



Bandpass stability - D MStn 1 - MS698/MS693

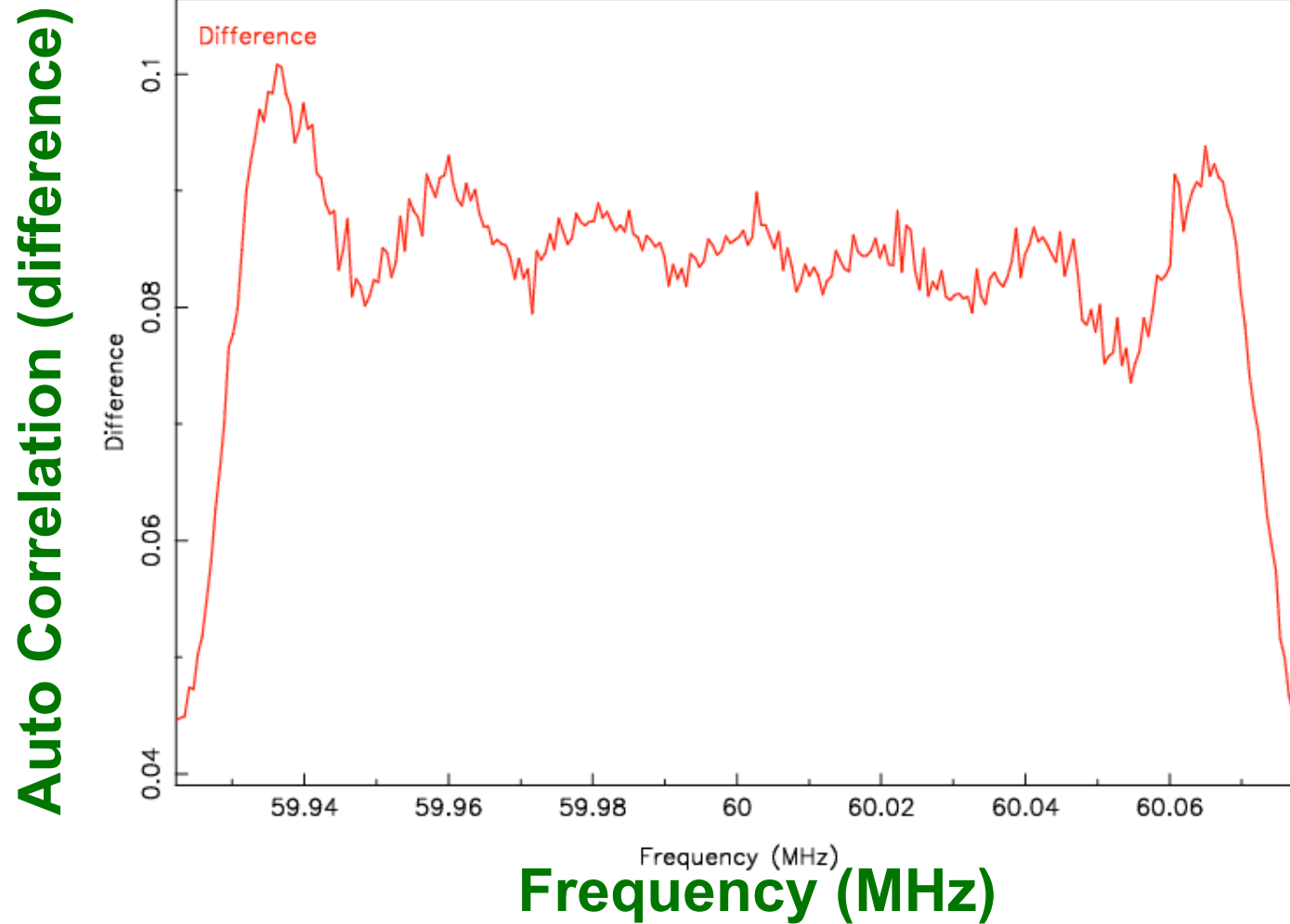
plot2_Difference Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 1

Auto Correlation (difference)



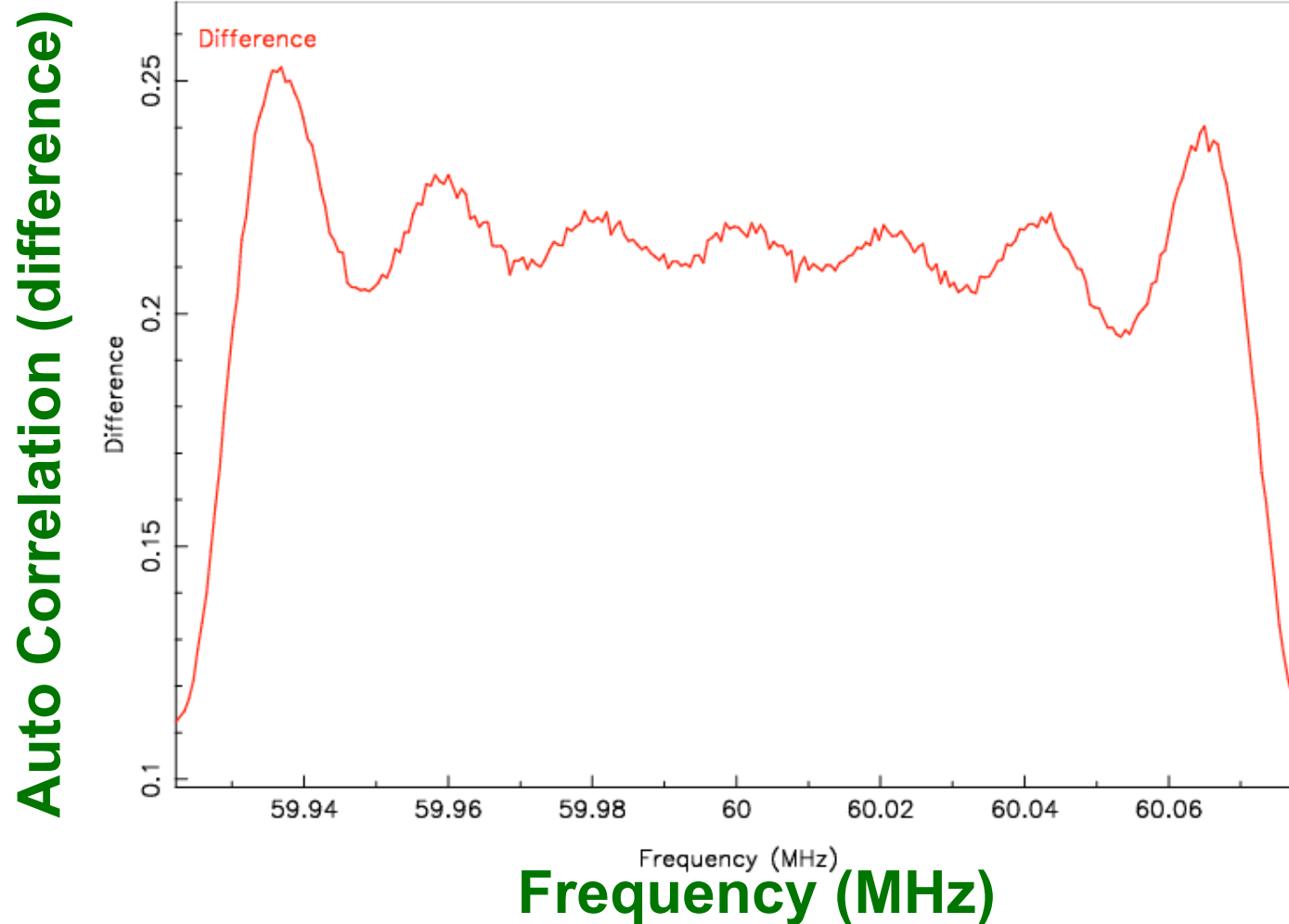
Bandpass stability - D MStn 2 - MS698/MS693

plot2_Difference Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 2



Bandpass stability - D MStn 3 - MS698/MS693

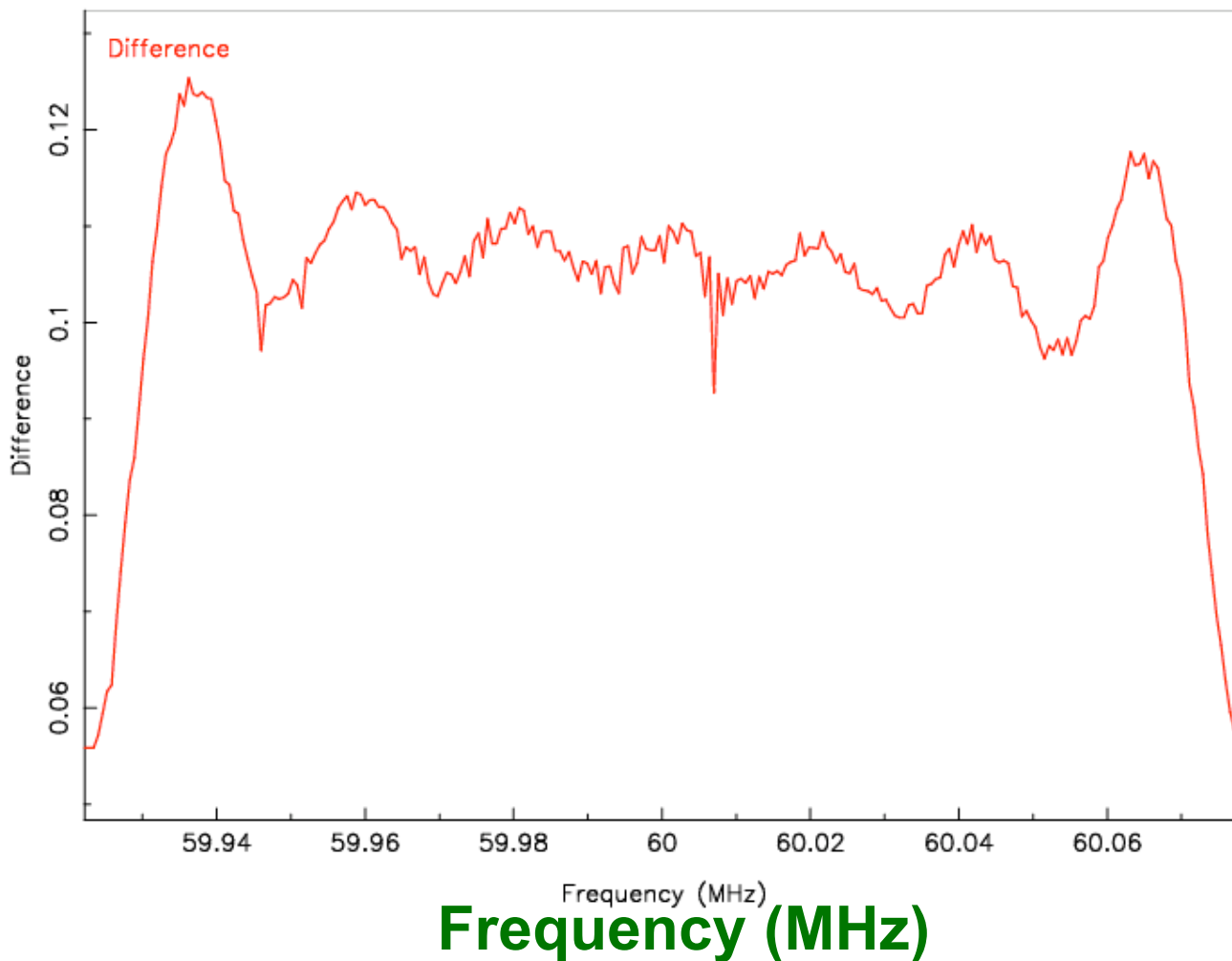
plot2_Difference Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 3



Bandpass stability - D MStn 4 - MS698/MS693

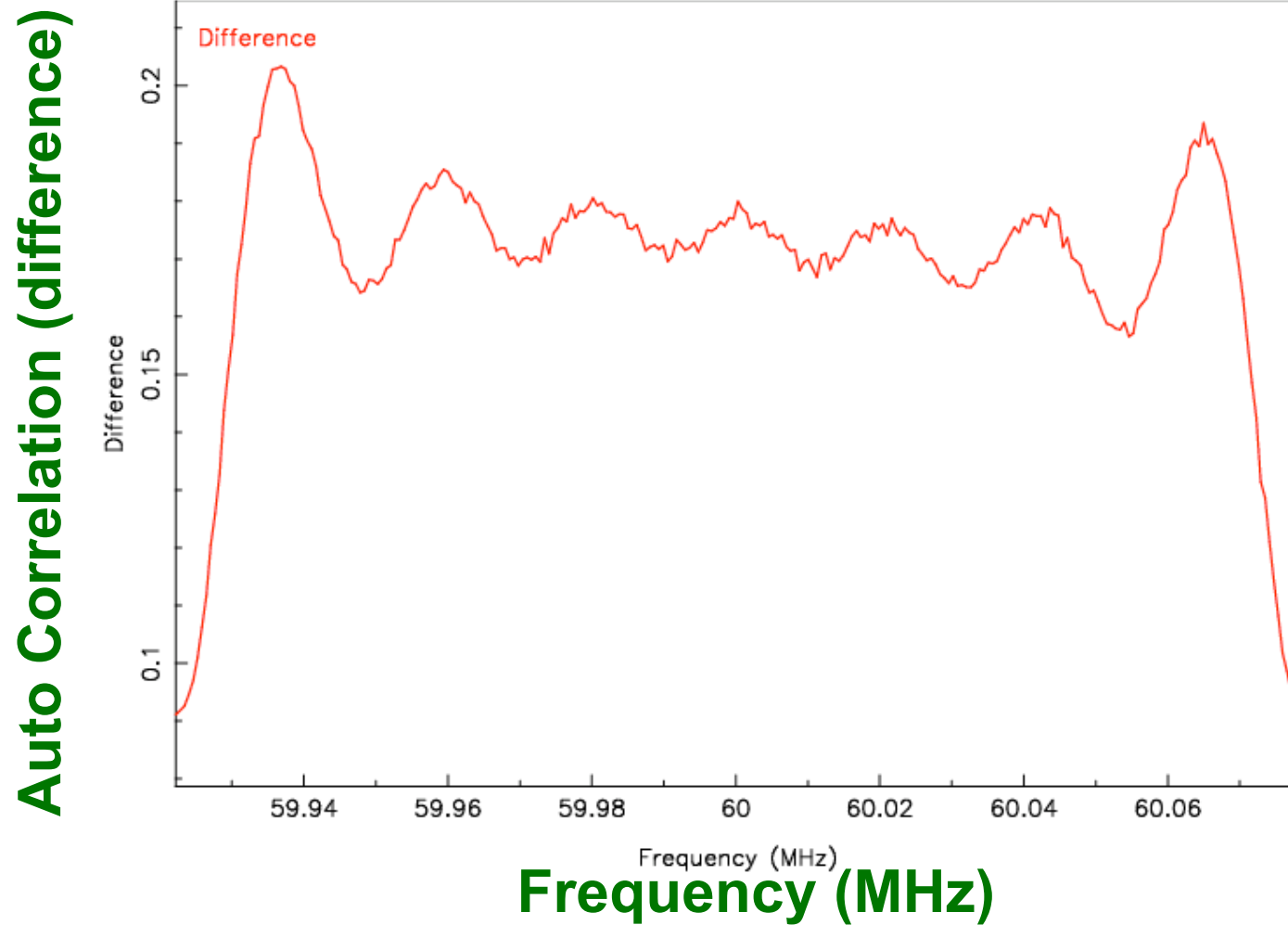
plot2_Difference Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 4

Auto Correlation (difference)



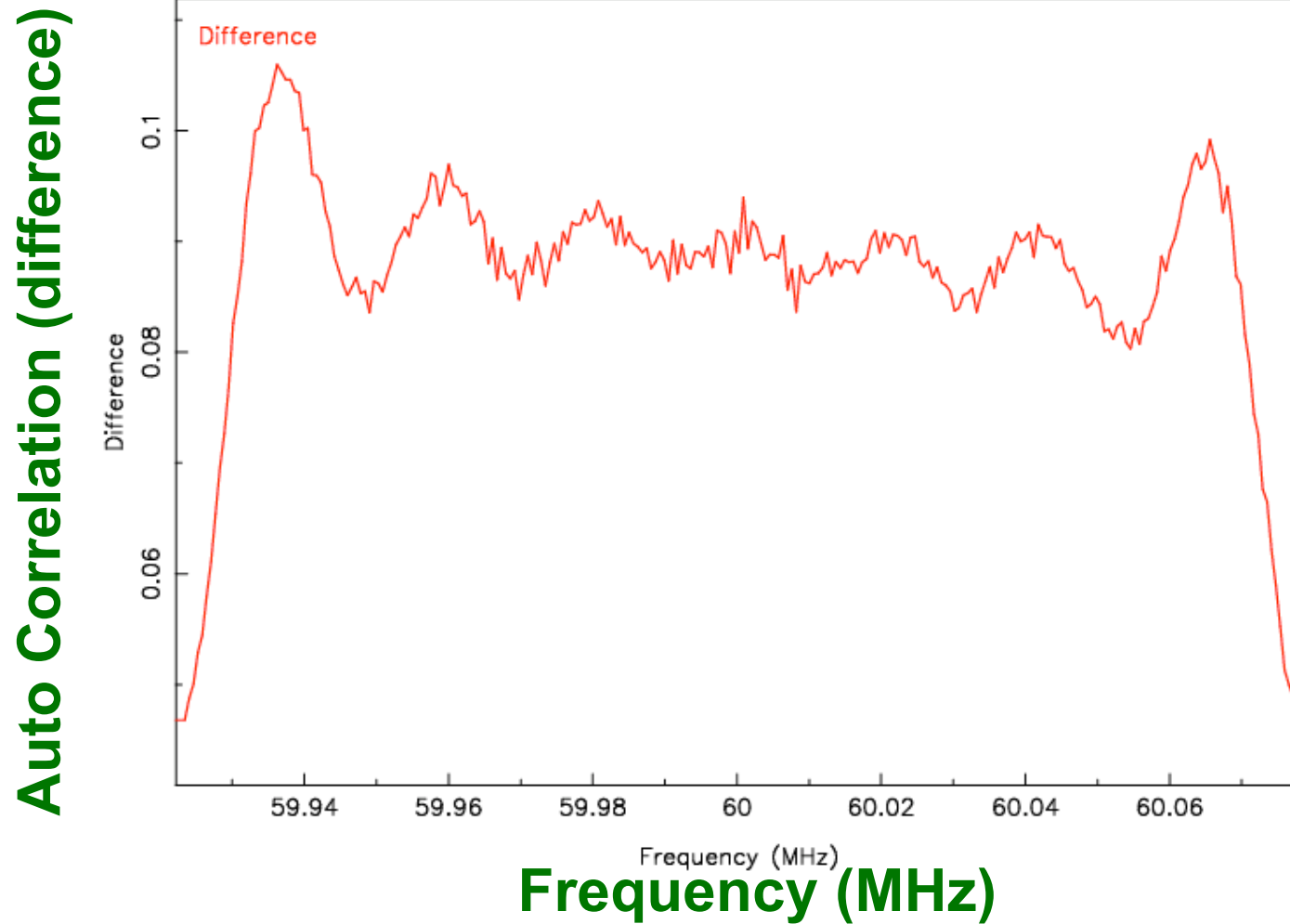
Bandpass stability - D MStn 5 - MS698/MS693

plot2_Difference Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 5



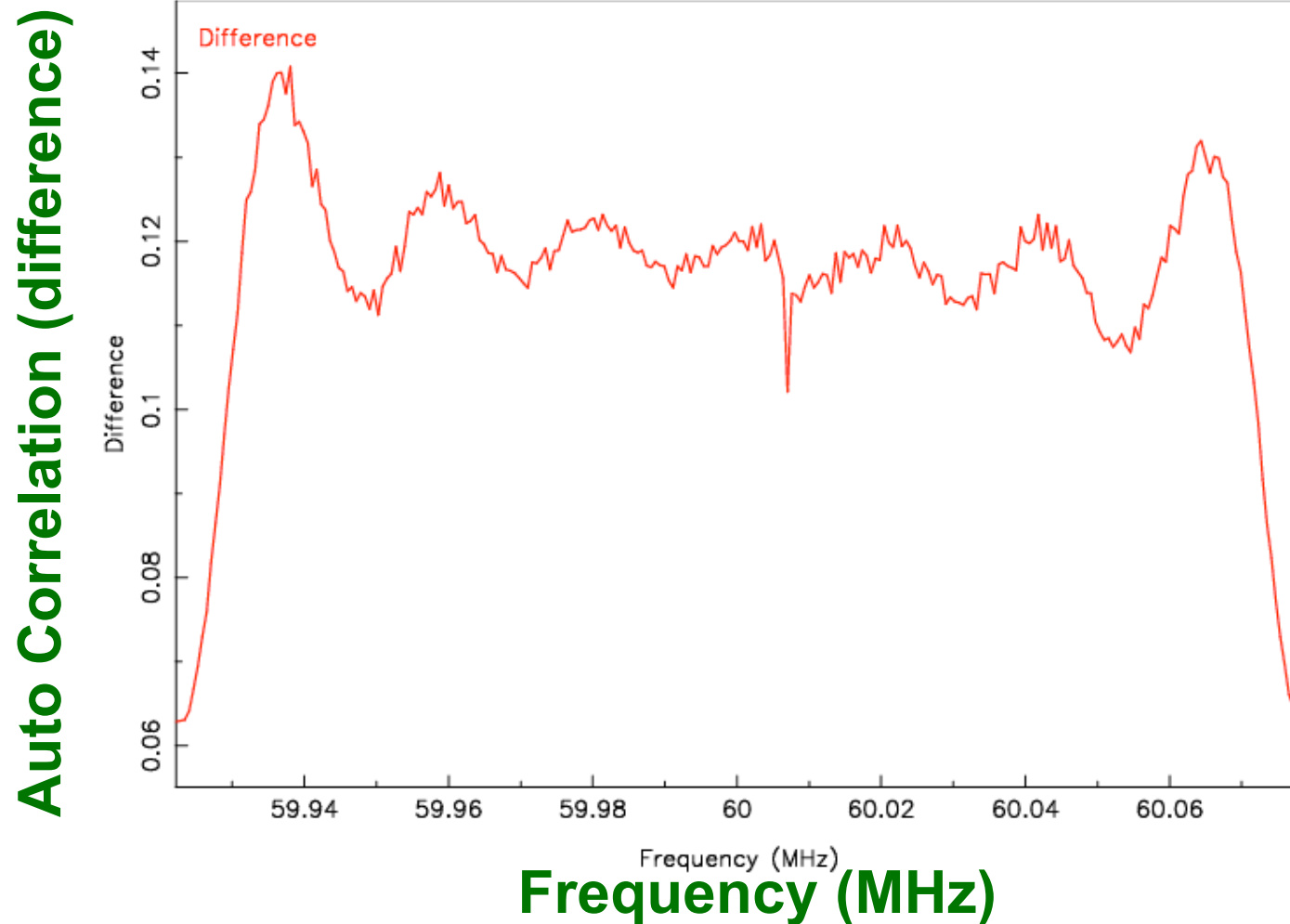
Bandpass stability - D MStn 6 - MS698/MS693

plot2_Difference Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 6



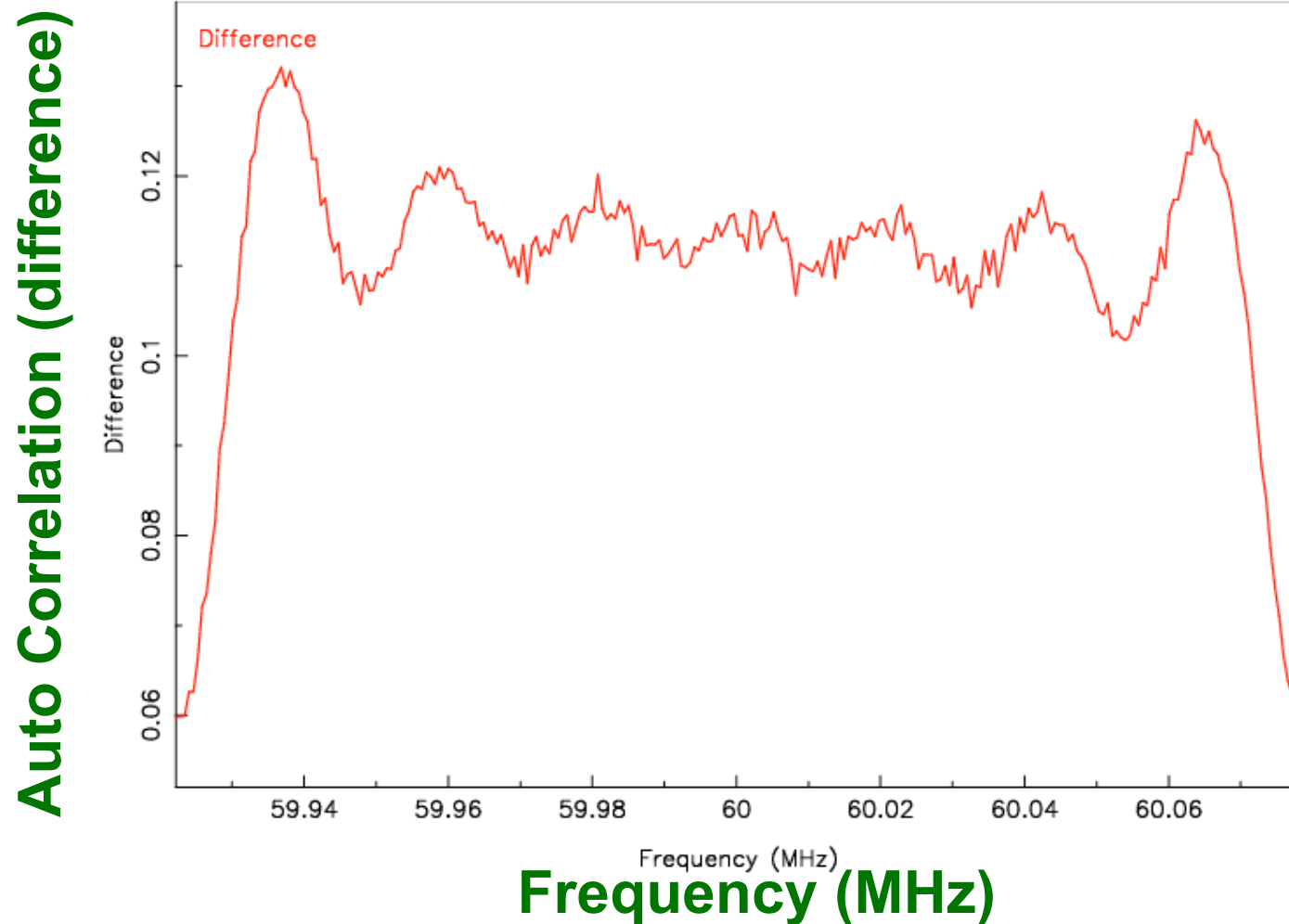
Bandpass stability - D MStn 7 - MS698/MS693

plot2_Difference Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 7



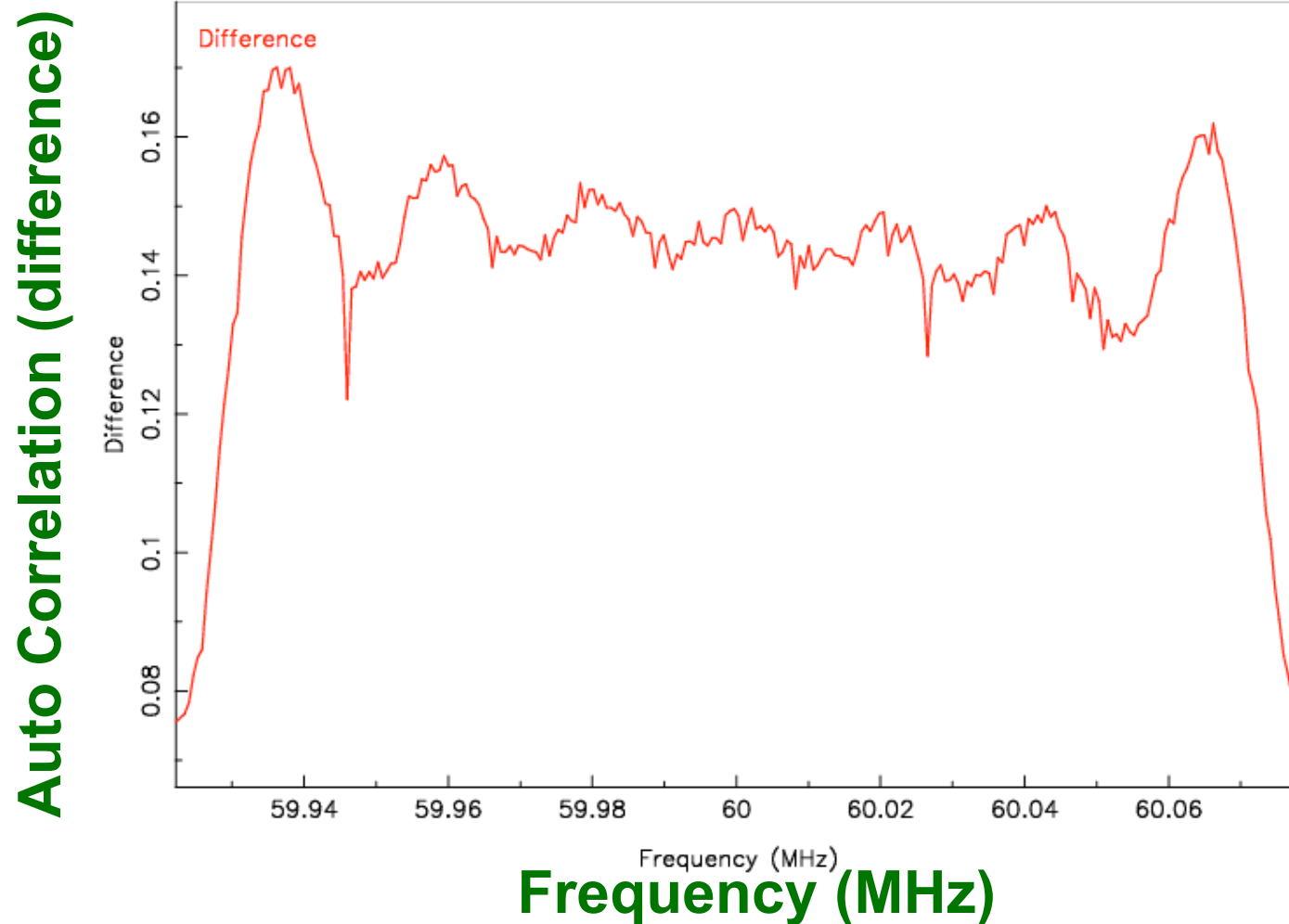
Bandpass stability - D MStn 8 - MS698/MS693

plot2_Difference Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 8



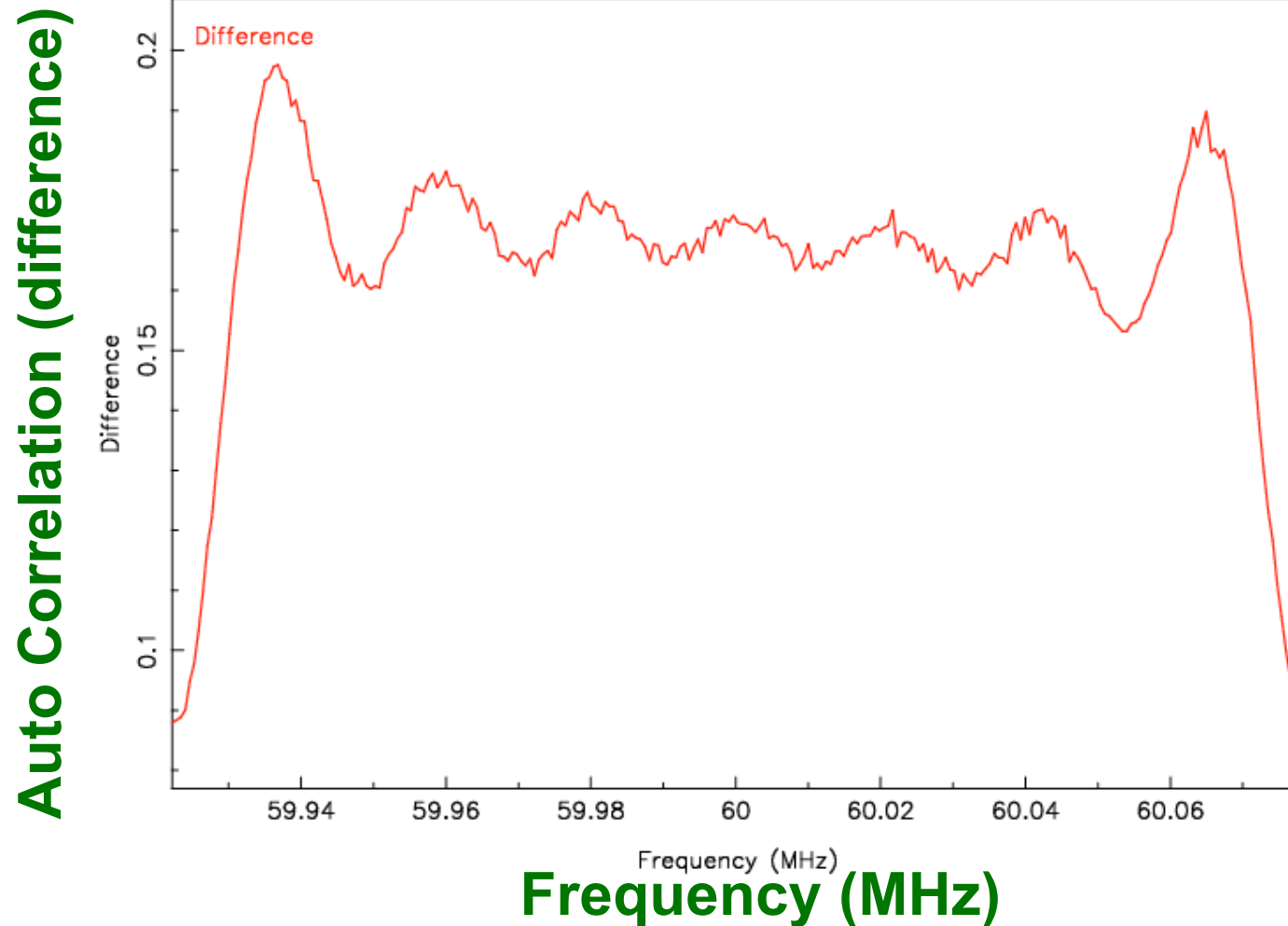
Bandpass stability - D MStn 9 - MS698/MS693

plot2_Difference Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 9



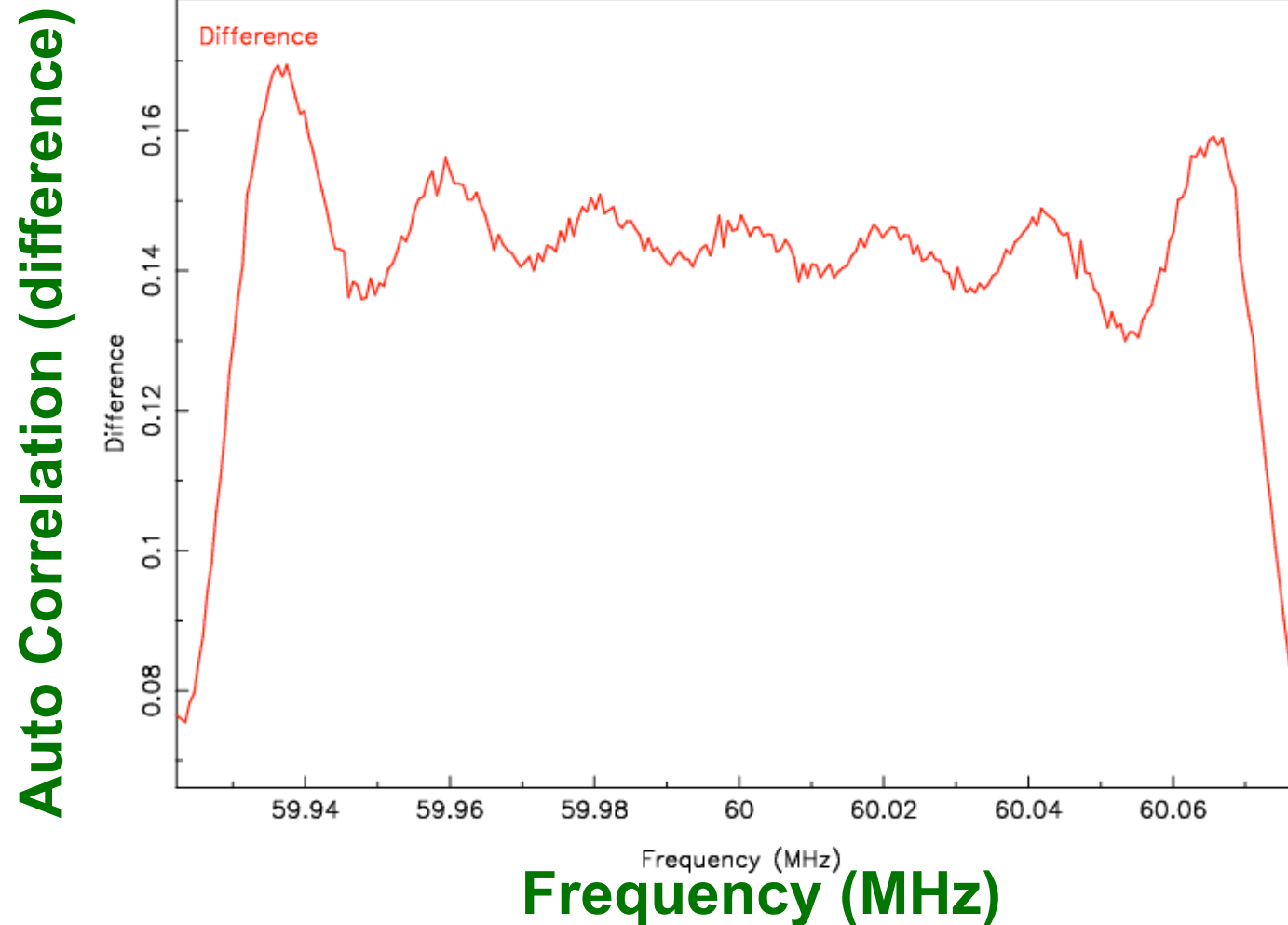
Bandpass stability - D MStn 10 MS698/MS693

plot2_Difference Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 10



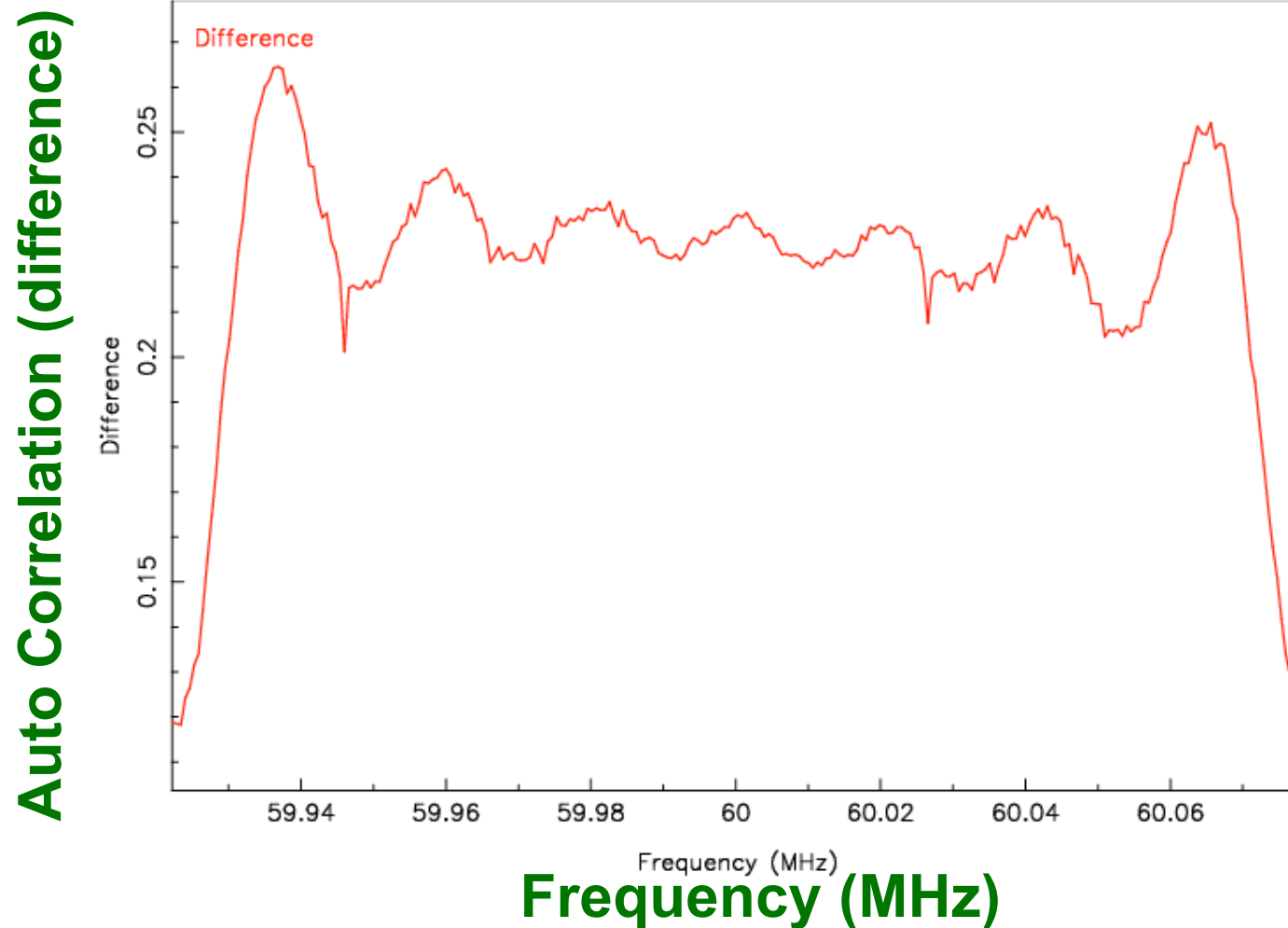
Bandpass stability - D MStn 11 MS698/MS693

plot2_Difference Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 11



Bandpass stability - D MStn 12- MS698/MS693

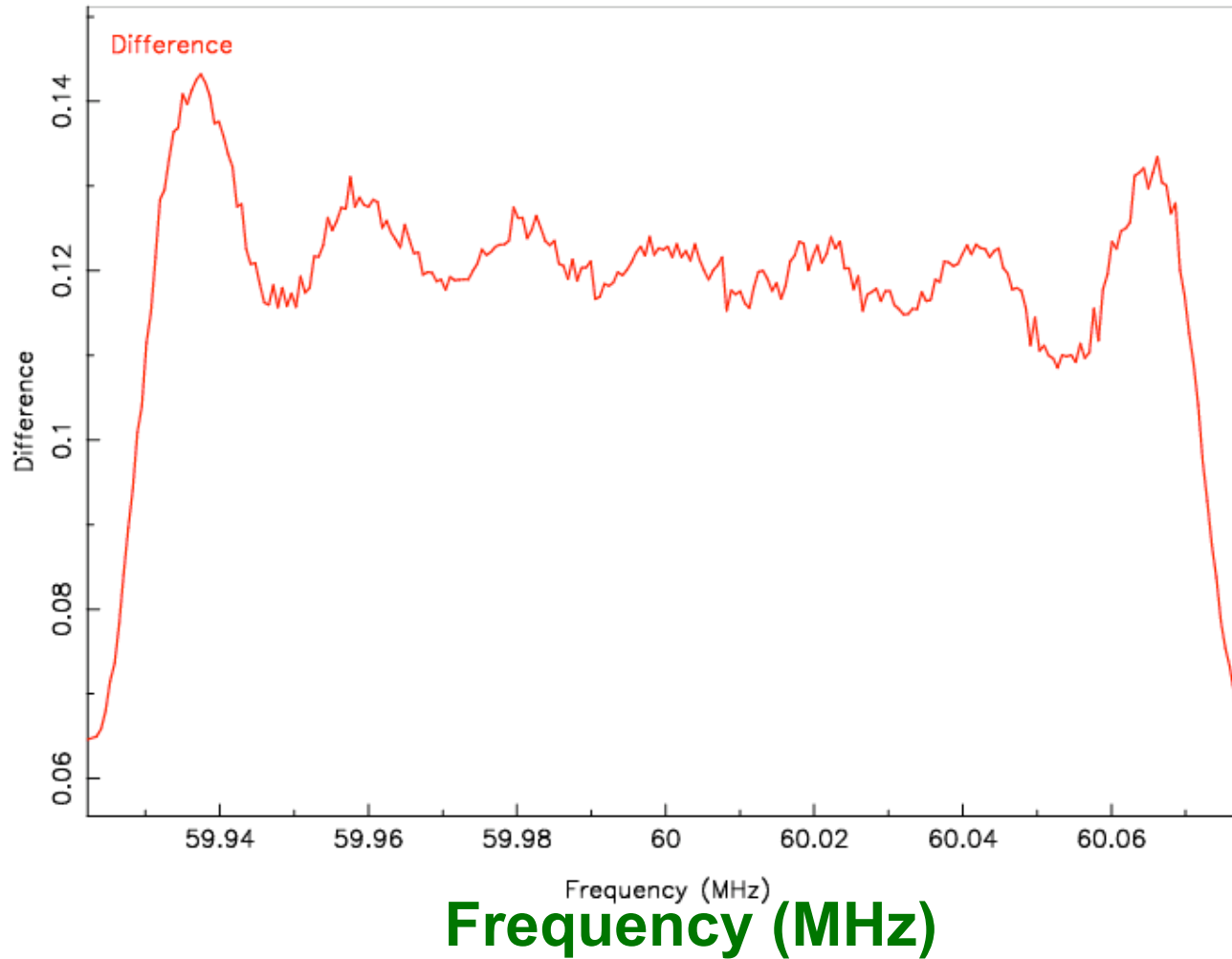
plot2_Difference Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 12



Bandpass stability - D MStn 13- MS698/MS693

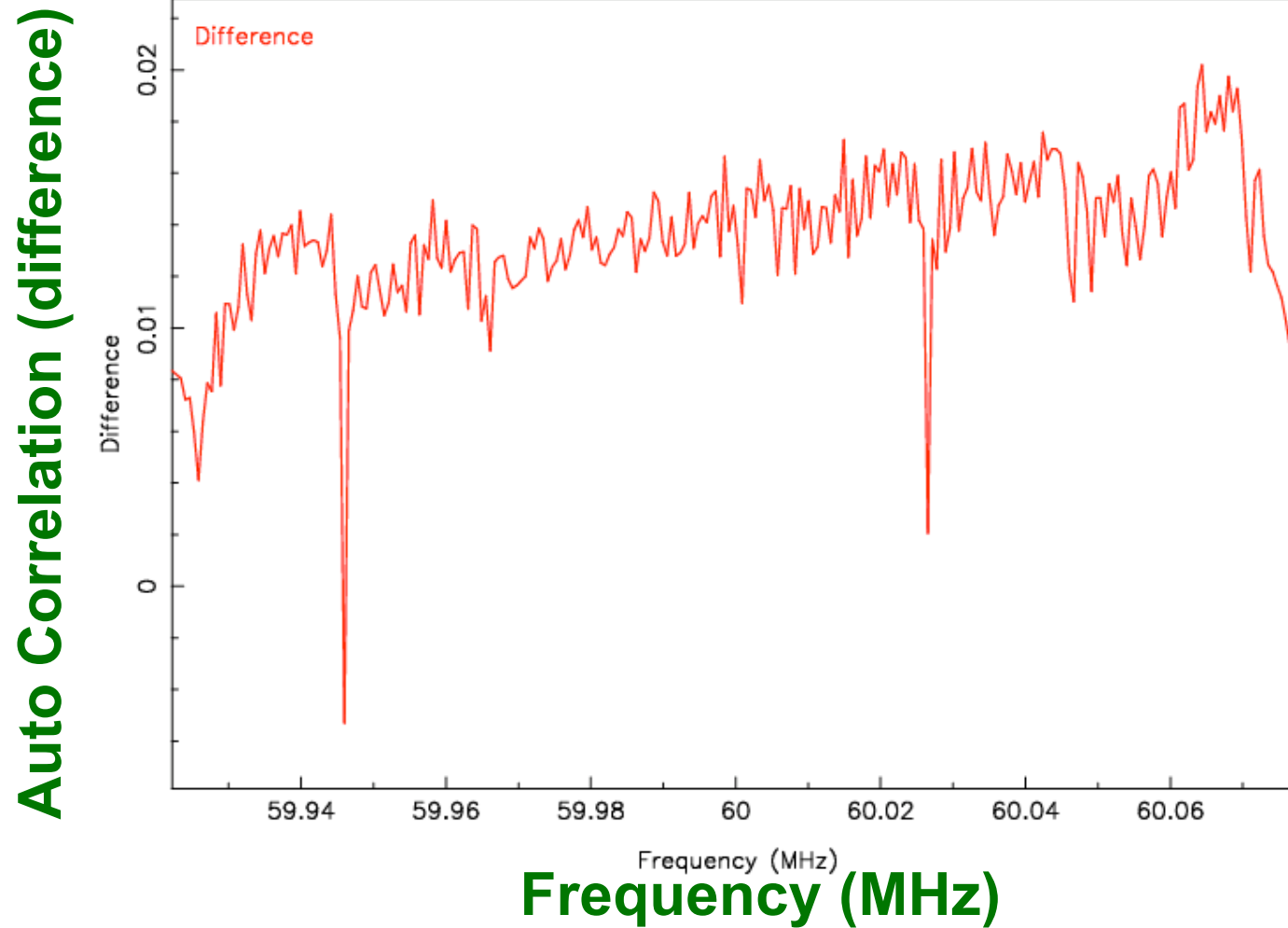
plot2_Difference Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 13

Auto Correlation (difference)



Bandpass stability - D MStn 14 - MS698/MS693

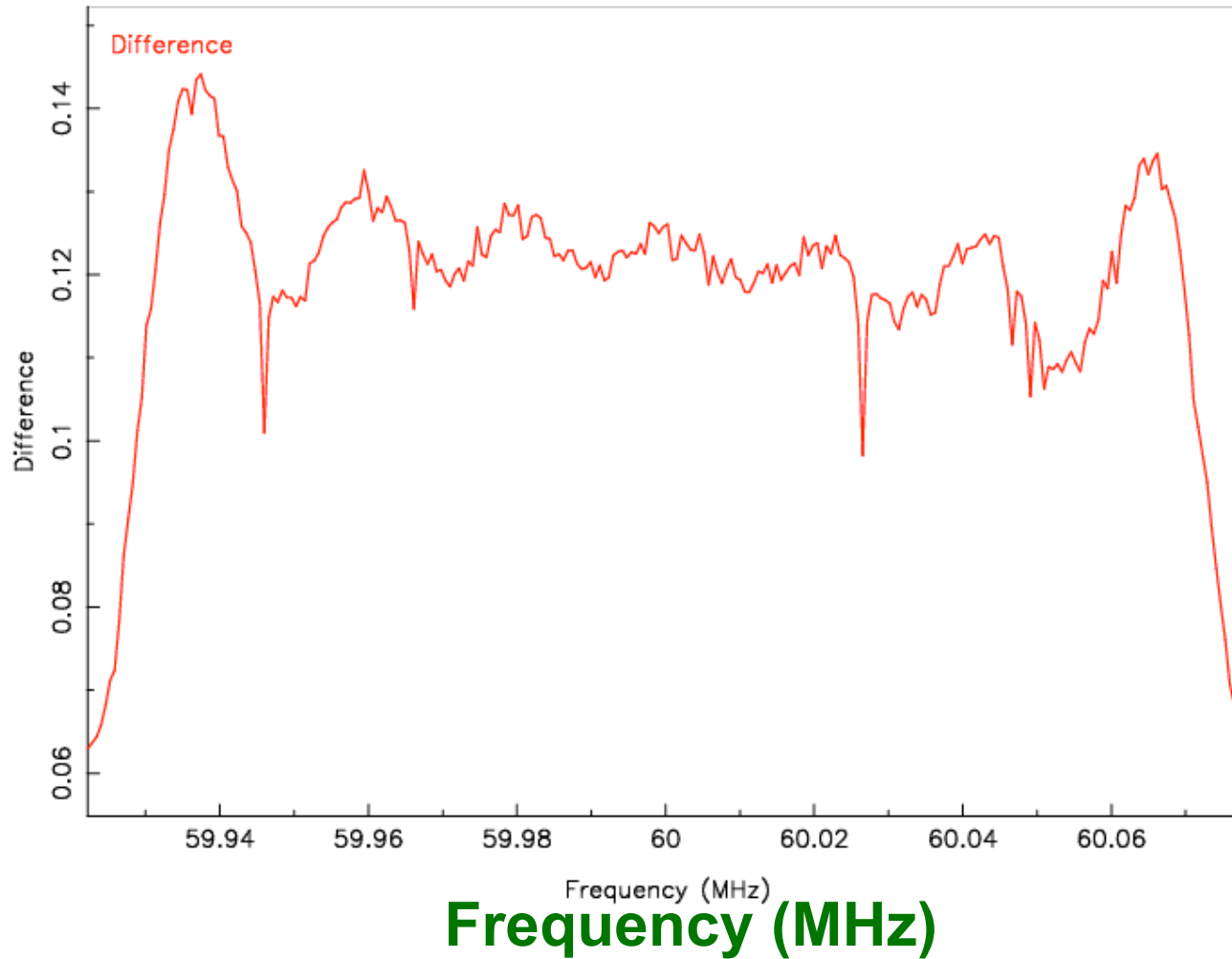
plot2_Difference Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 14



Bandpass stability - D MStn 15 MS698/MS693

plot2_Difference Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 15

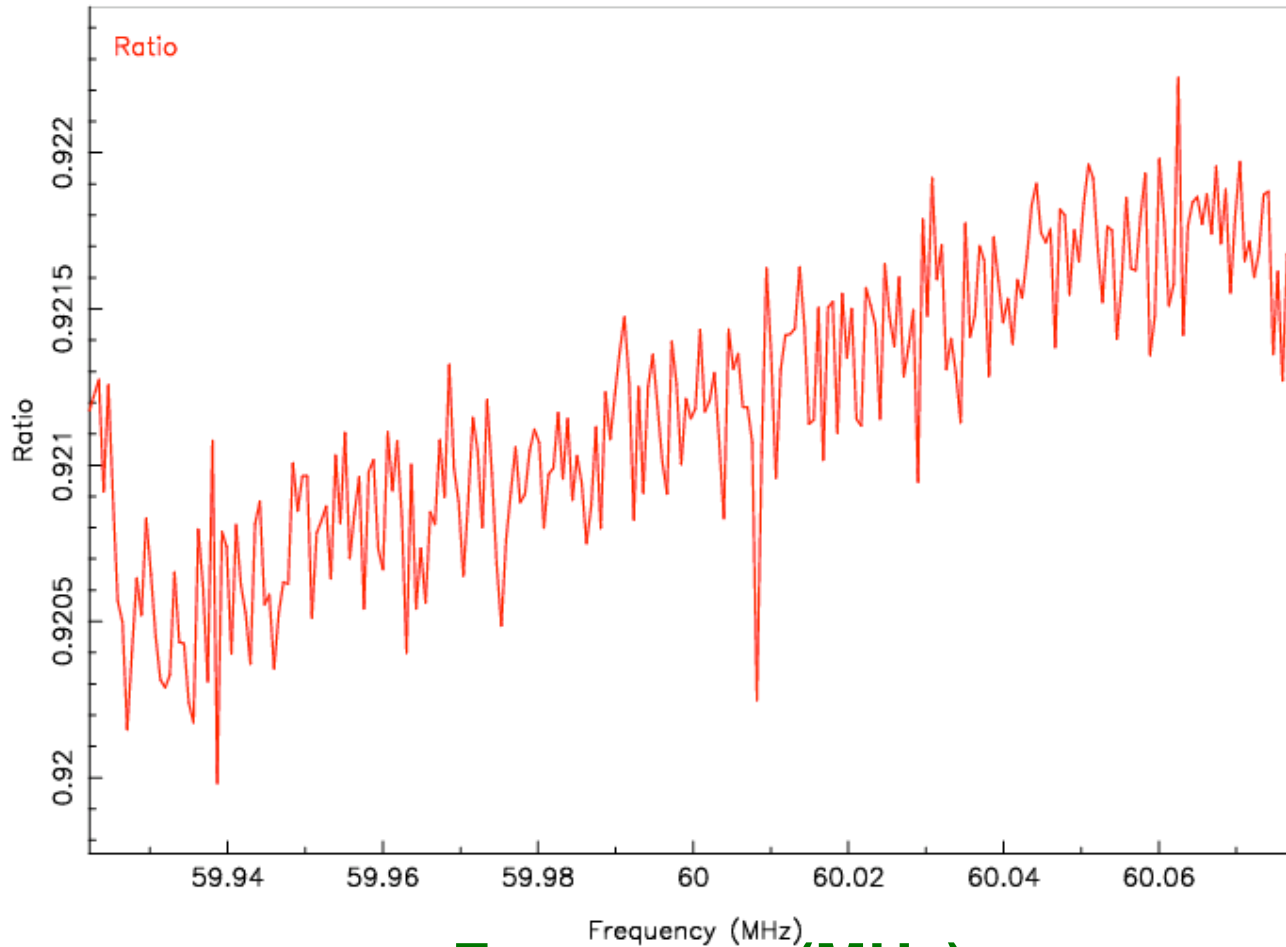
Auto Correlation (difference)



Bandpass stability - R MStn 0 - MS712/MS693

plot5_Ratio Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 0

Auto Correlation (ratio)

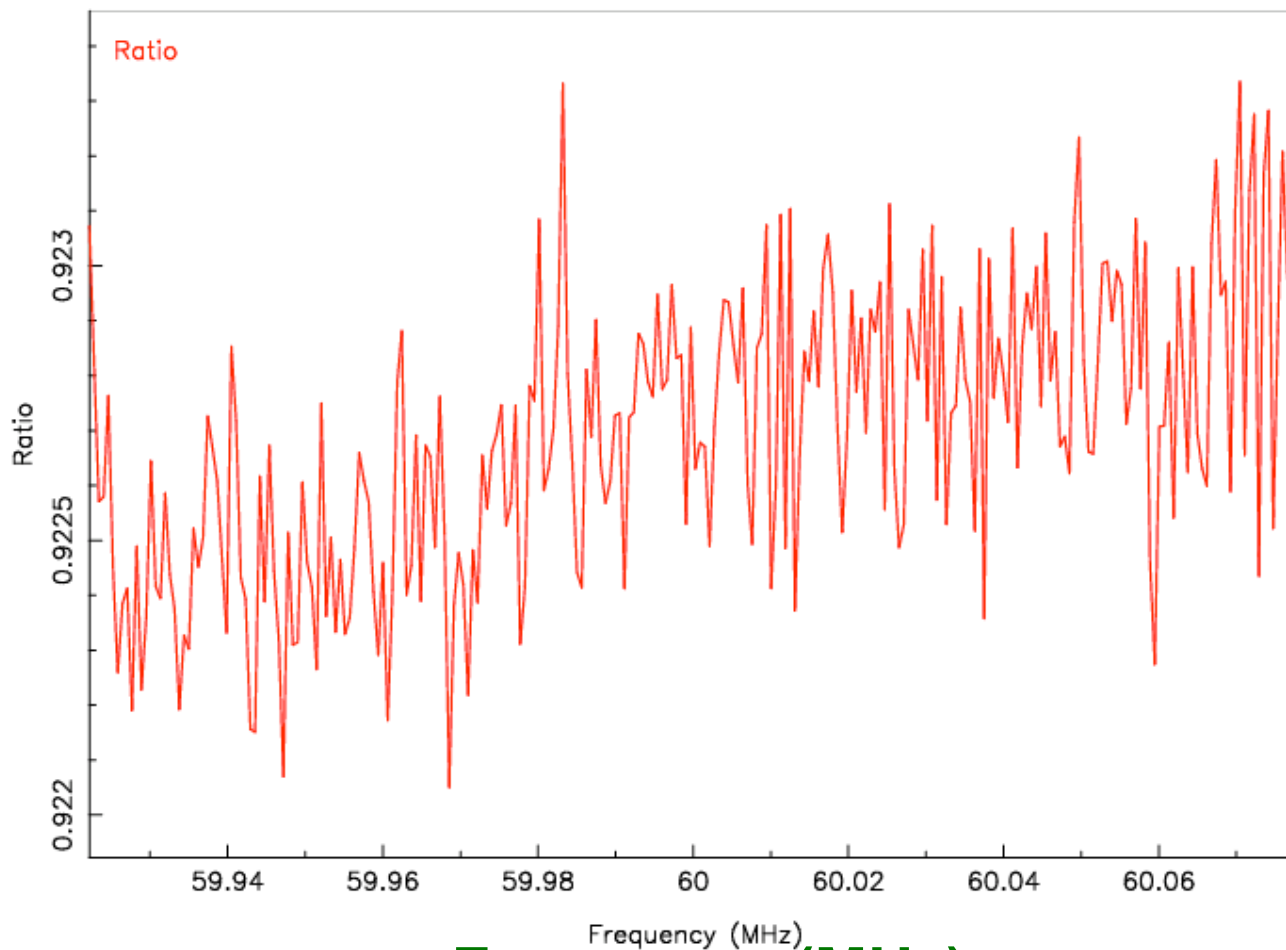


Frequency (MHz)

Bandpass stability - R MStn 1 - MS712/MS693

plot5_Ratio Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 1

Auto Correlation (ratio)

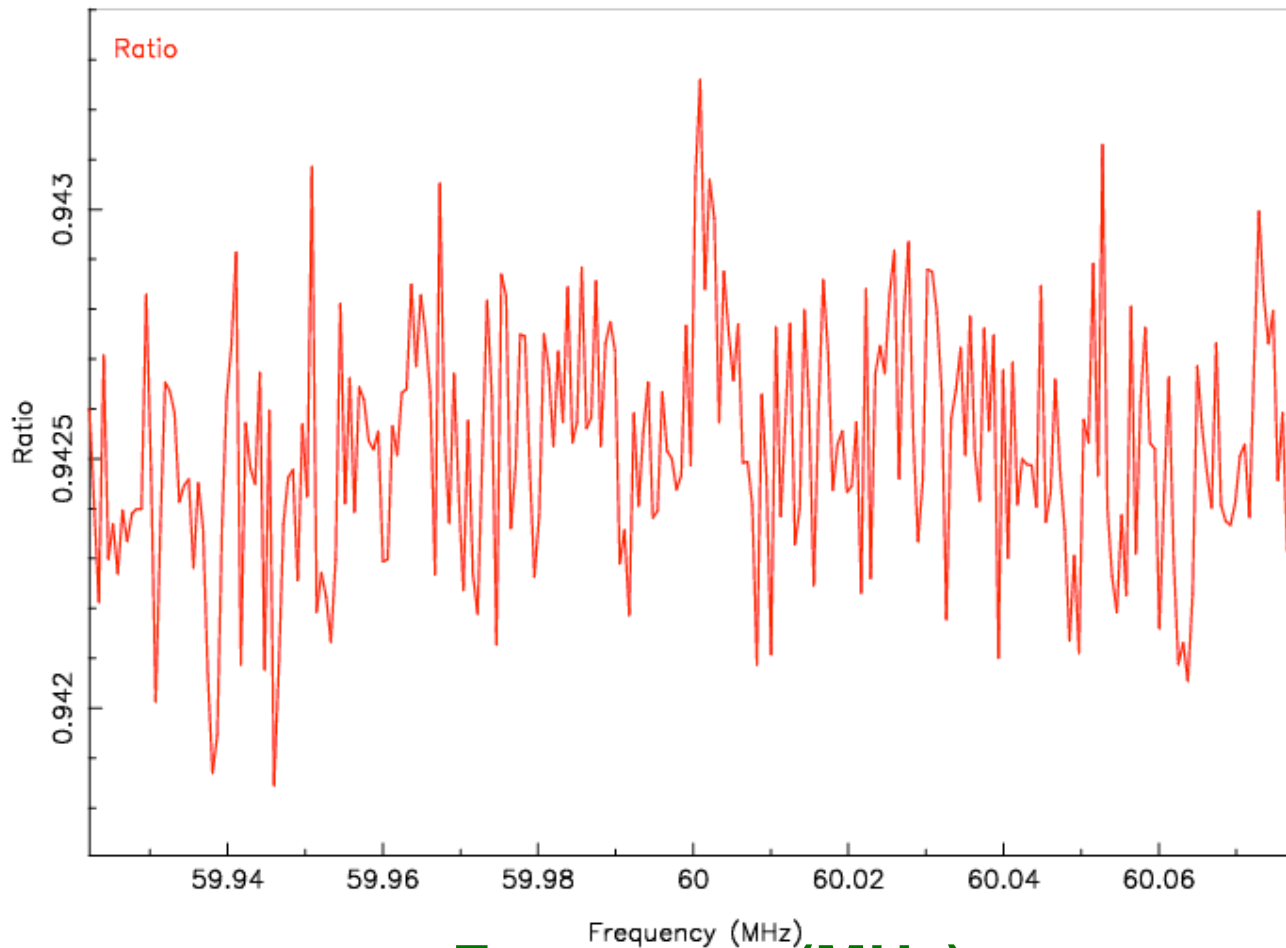


Frequency (MHz)

Bandpass stability - R MStn 2 - MS712/MS693

plot5_Ratio Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 2

Auto Correlation (ratio)

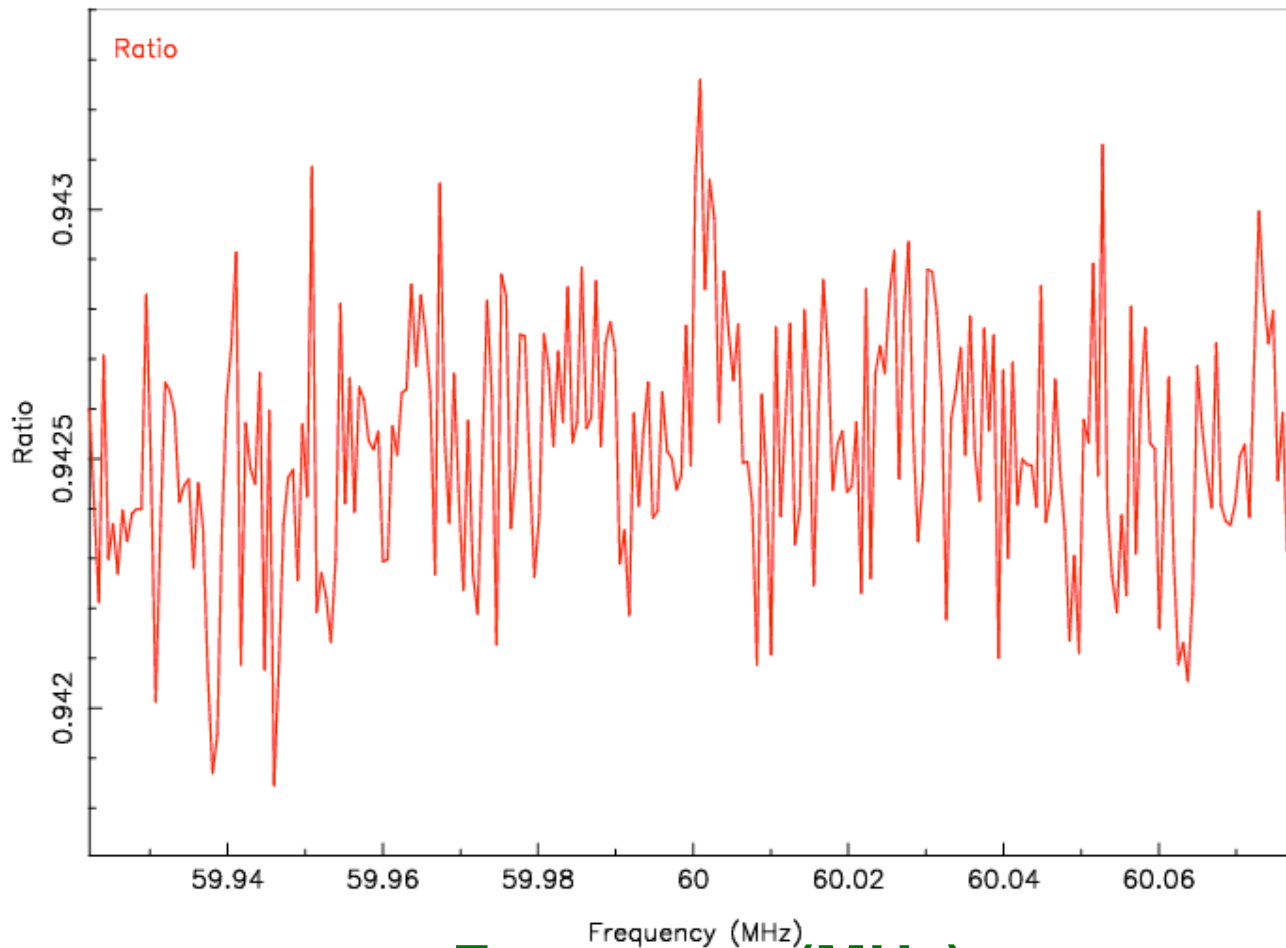


Frequency (MHz)

Bandpass stability - R MStn 2 - MS712/MS693

plot5_Ratio Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 2

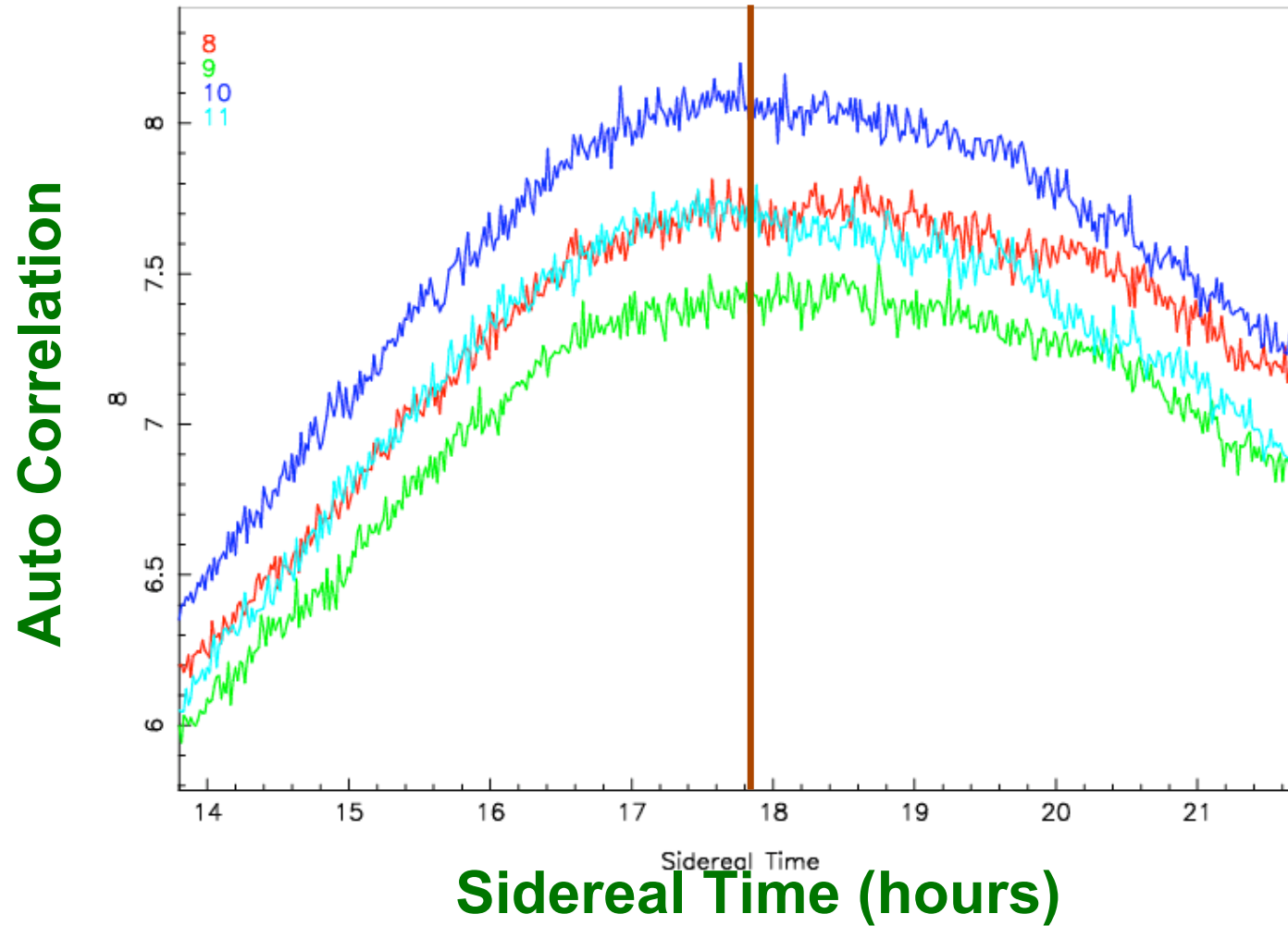
Auto Correlation (ratio)



Frequency (MHz)

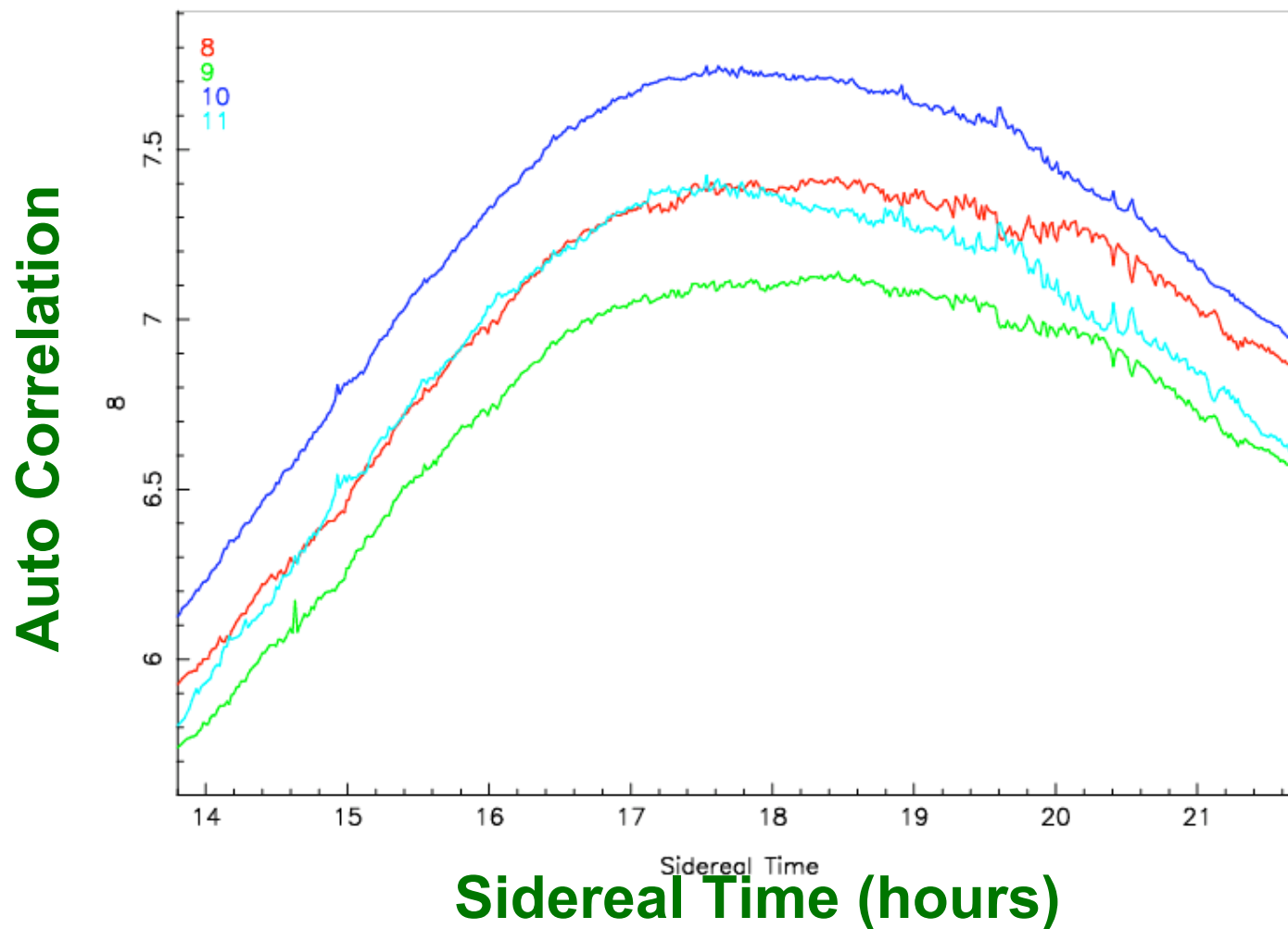
Auto correlation as time MS658

Auto Correlation (Single Channel 128) L2006_00658.MS All micro stations in CS8



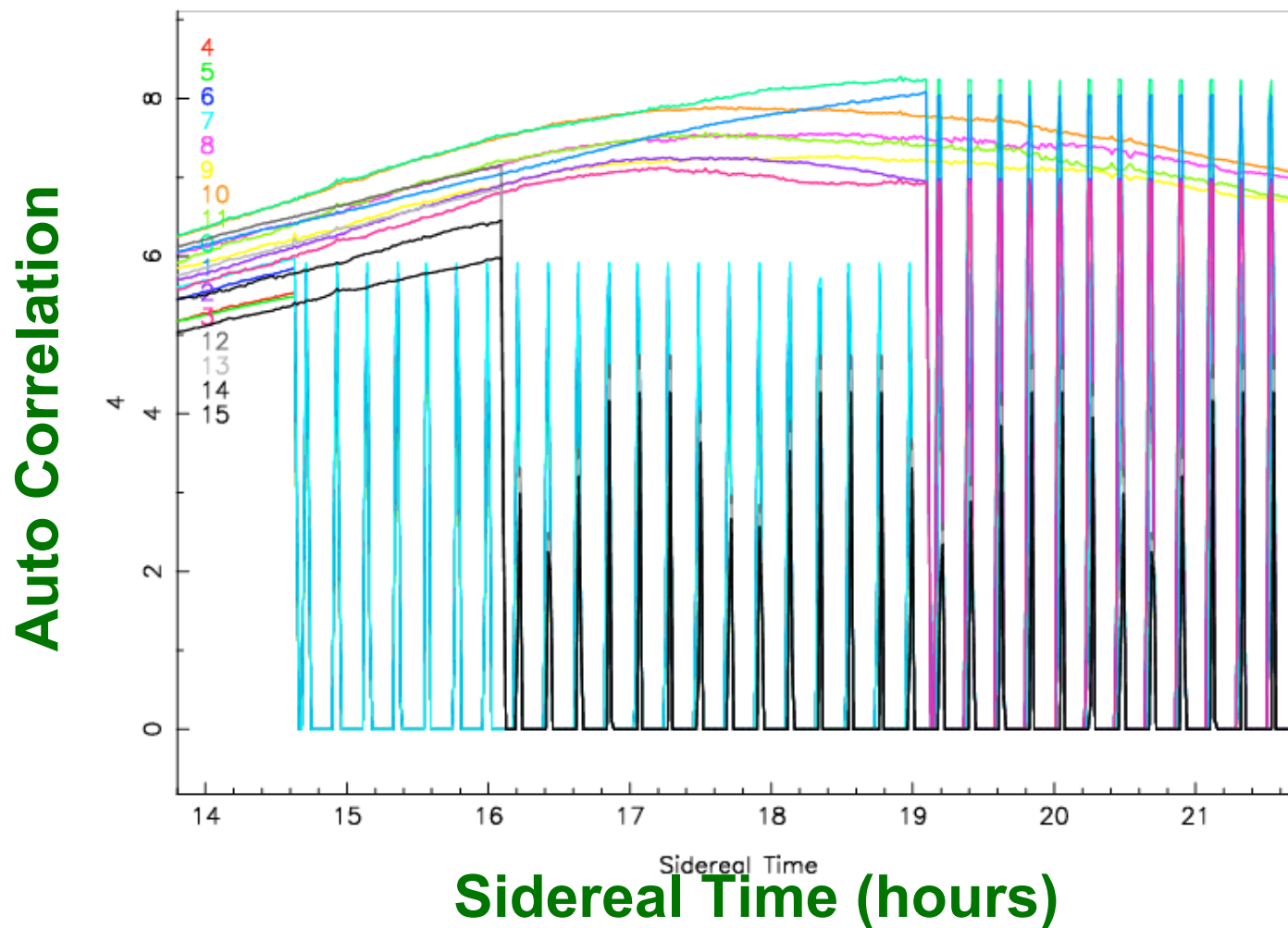
Auto correlation as time

Auto Correlation (ALL Channels averaged 6:250) L2006_00658.MS All micro stations in CS8



Auto correlation as time

Auto Correlation (ALL Channels averaged 6:250) L2006_00658.MS All micro stations



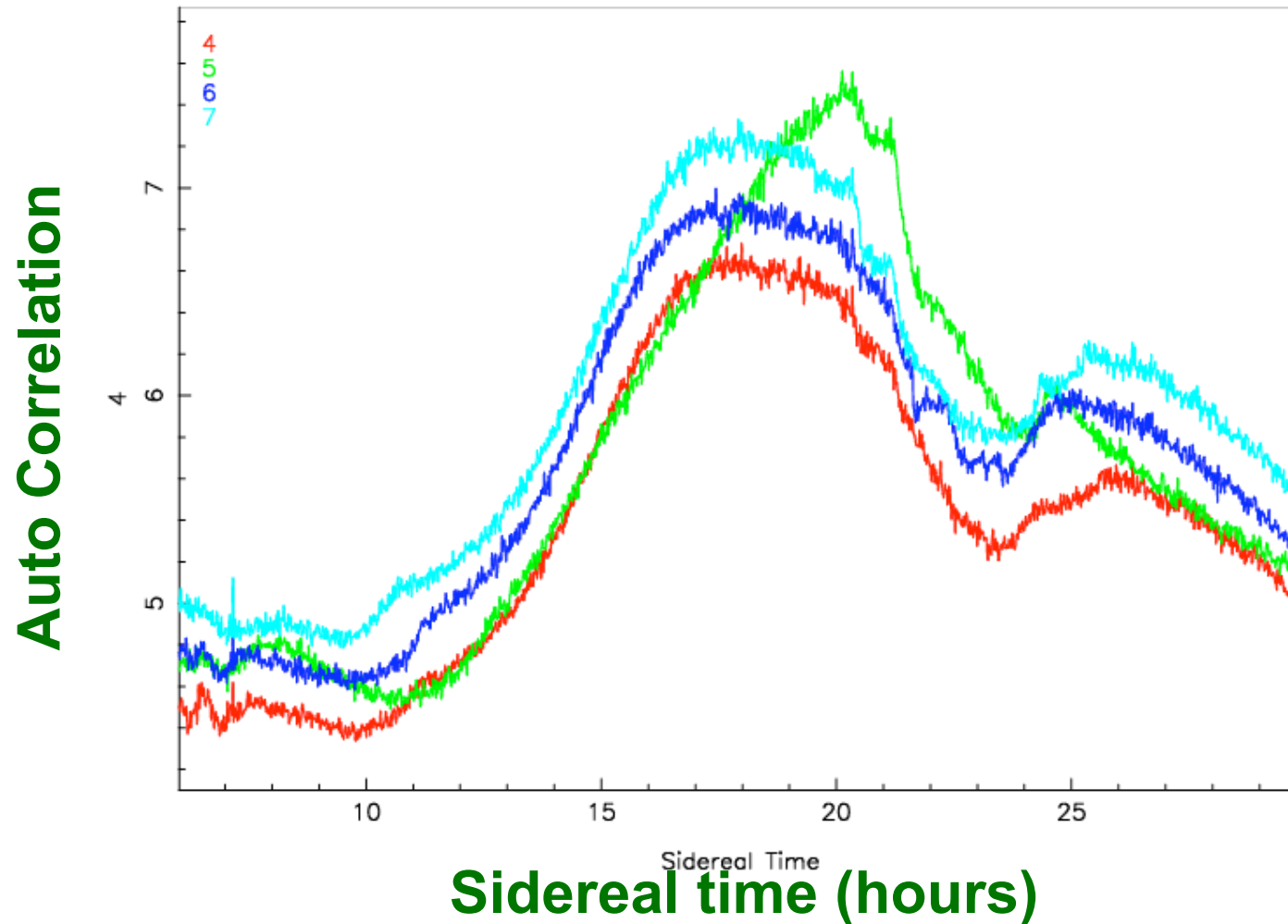
Conclusions/To do

- More detailed look up on each auto correlation plots
- Cross correlations, Imaging.
- Calibration - BBS/Meq Tree.
- Analysis based on median filtering both time wise and frequency wise on a few data sets
- On average bad data flagged due to RFI (>4 sigma) $\sim 0.5\%$

- Compare AIPS++ automatic flagger and existing flagger for LOFAR on real data.
- Depending upon how much RFI is remaining, more RFI mitigation algorithms need to be investigated??
- False RFI detection??

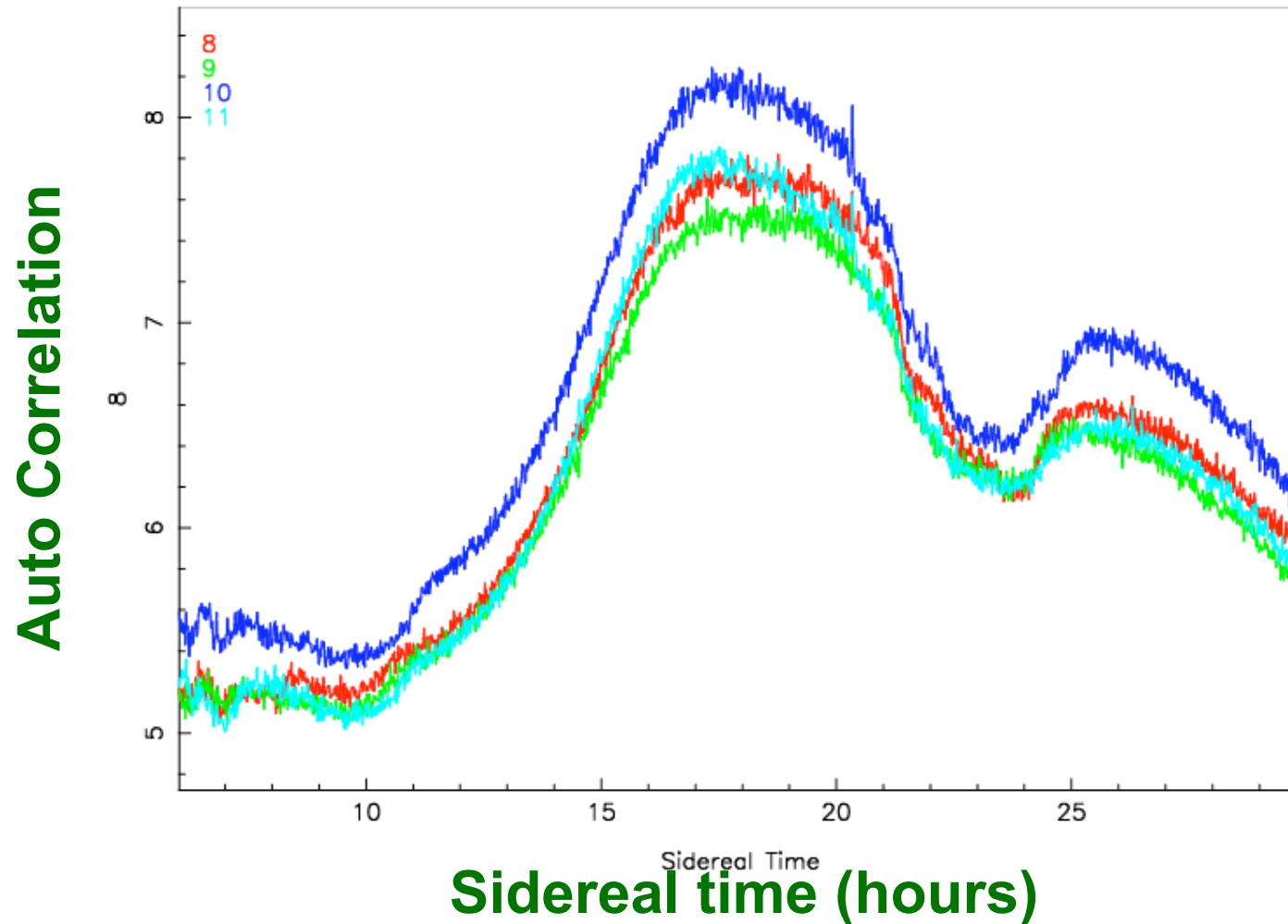
MS698Auto Correlation (XX) Channel 128 CS1

Auto Correlation (Single Channel 128) L2007_00698.MS All micro stations in CS1



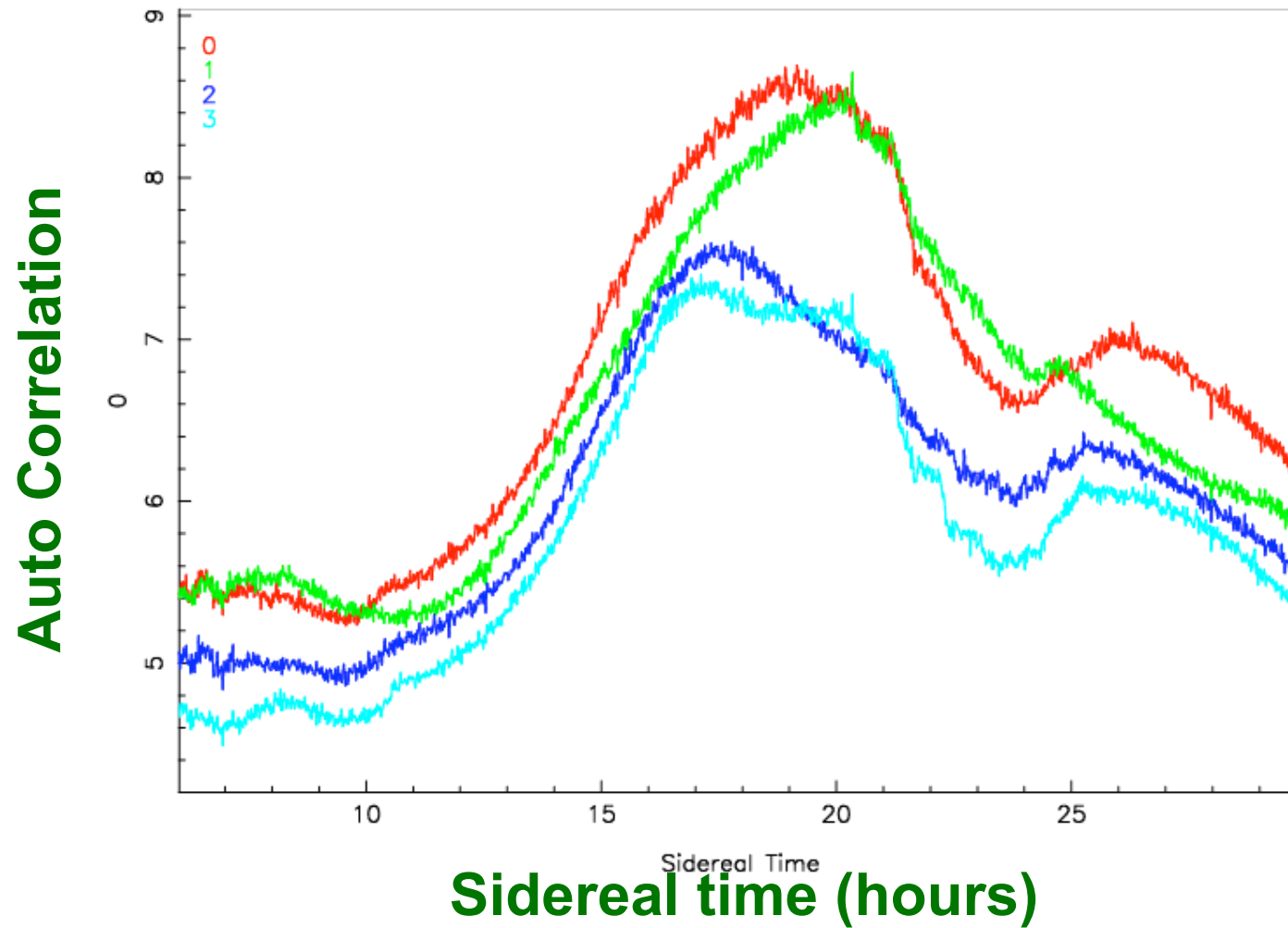
MS698Auto Correlation (XX) Channel 128 CS8

Auto Correlation (Single Channel 128) L2007_00698.MS All micro stations in CS8



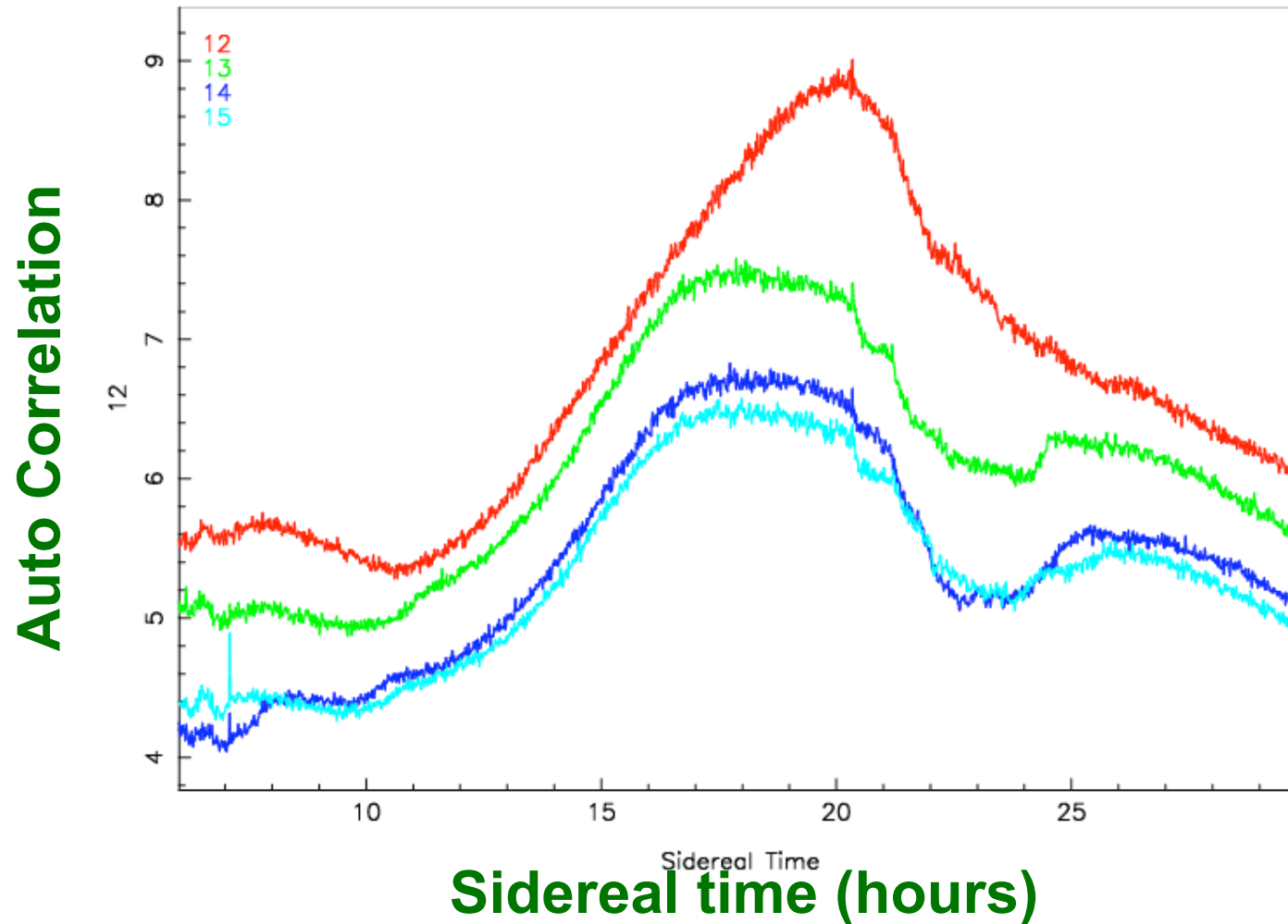
MS698Auto Correlation (XX) Channel 128 CS10

Auto Correlation (Single Channel 128) L2007_00698.MS All micro stations in CS10



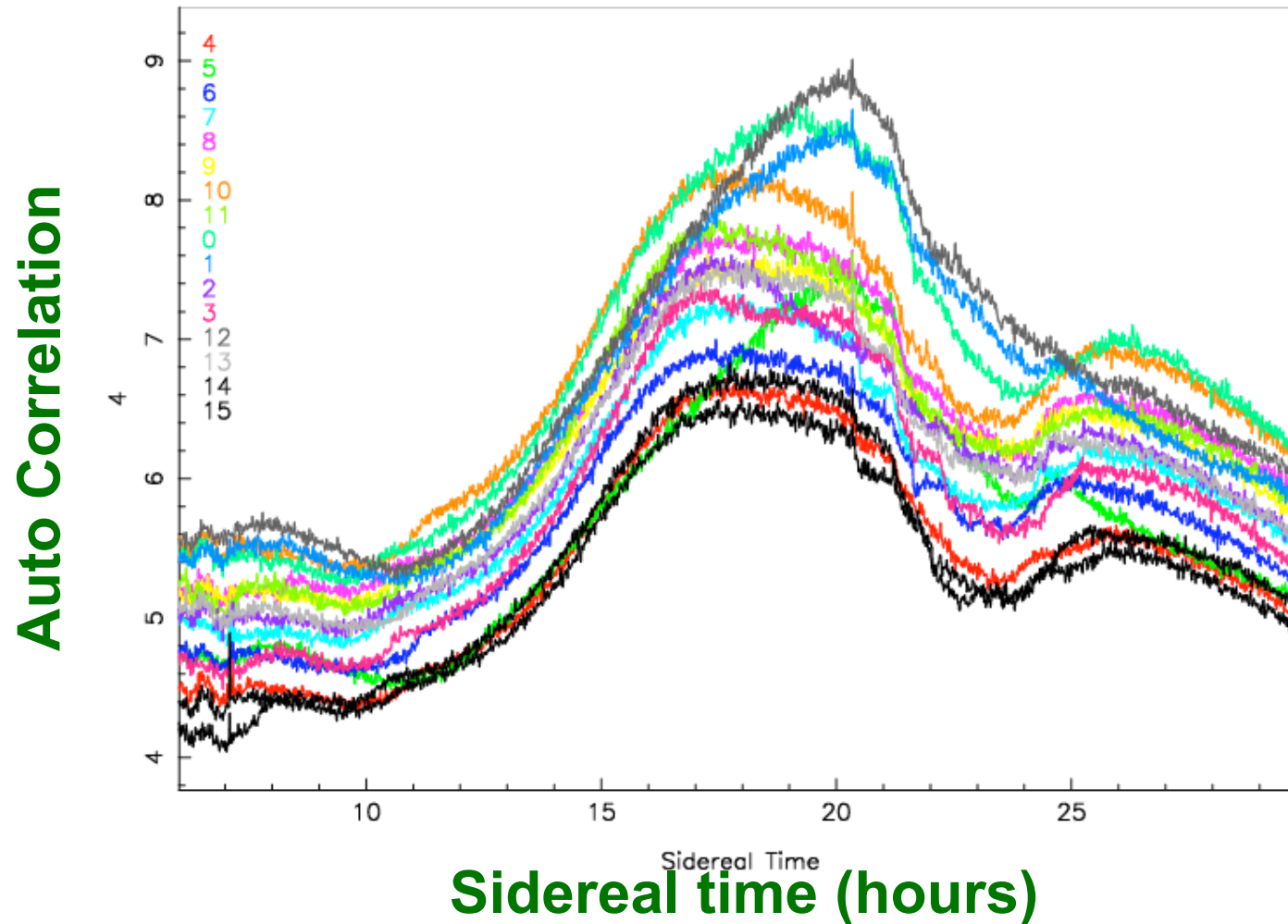
MS698Auto Correlation (XX) Channel 128 CS16

Auto Correlation (Single Channel 128) L2007_00698.MS All micro stations in CS16



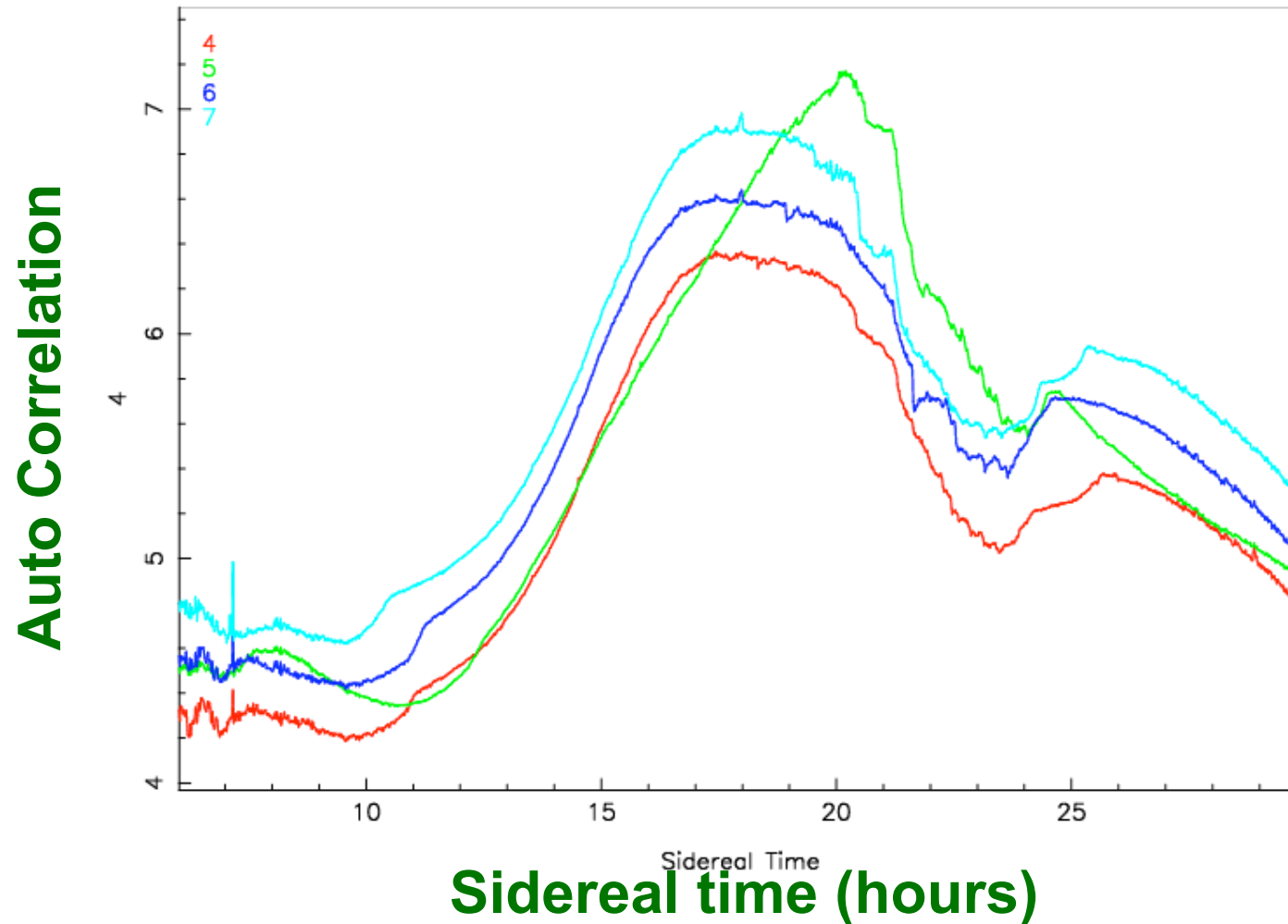
MS698Auto Correlation (XX) Channel 128 all microstations

Auto Correlation (Single Channel 128) L2007_00698.MS All micro stations



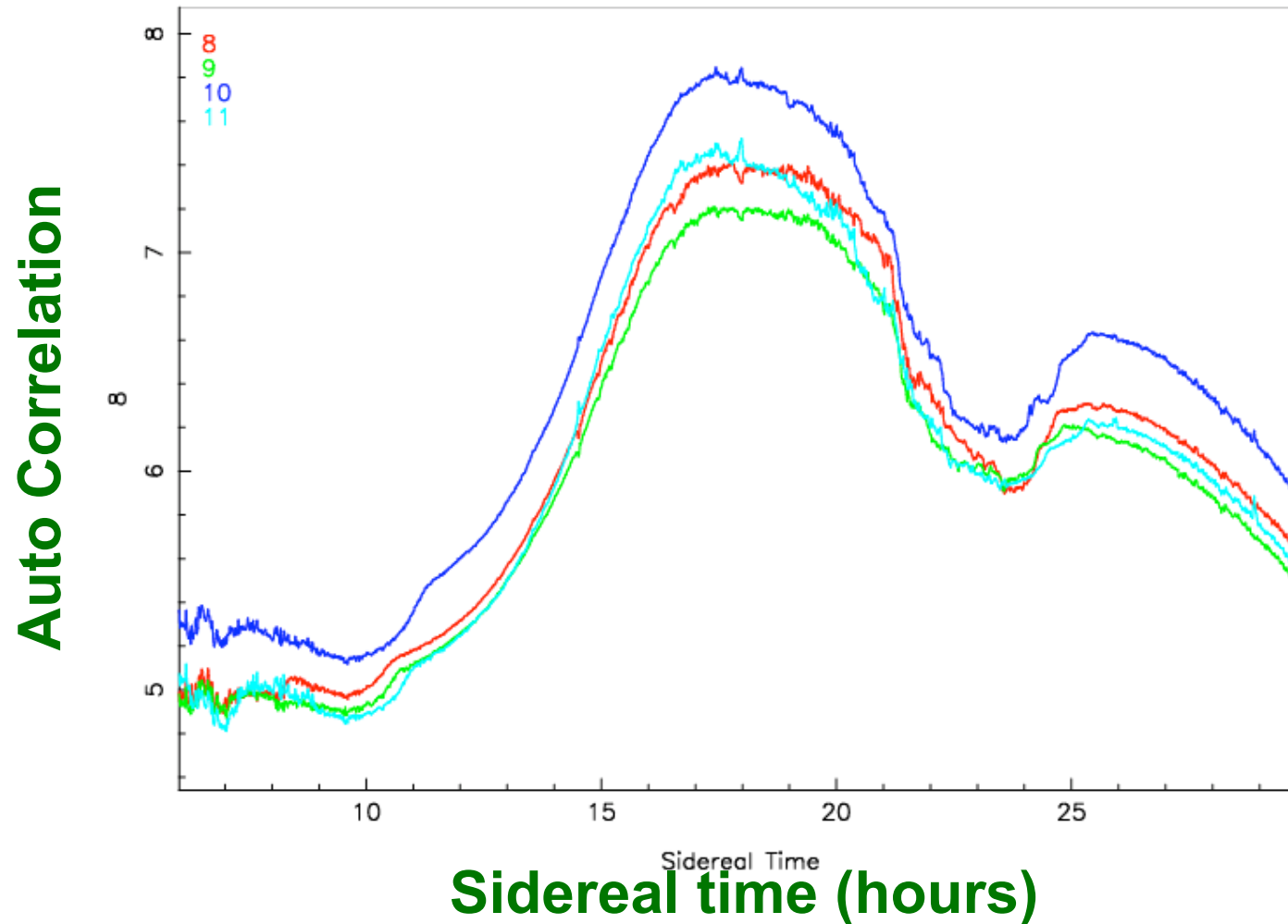
Auto Correlation (XX) avg Ch 6:250 CS1

Auto Correlation (ALL Channels averaged 6:250) L2007_00698.MS All micro stations in CS1



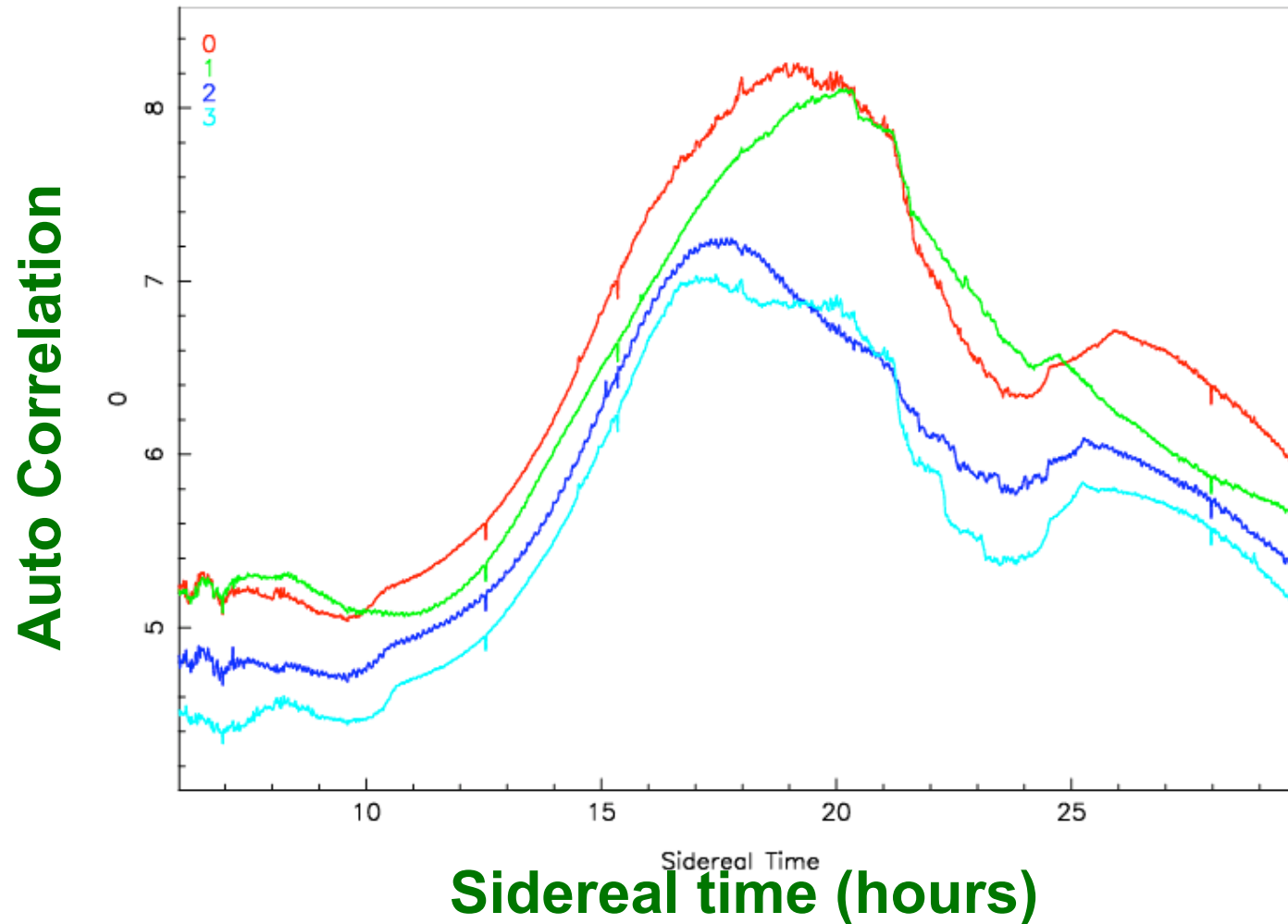
Auto Correlation (XX) avg Ch 6:250 CS8

Auto Correlation (ALL Channels averaged 6:250) L2007_00698.MS All micro stations in CS8



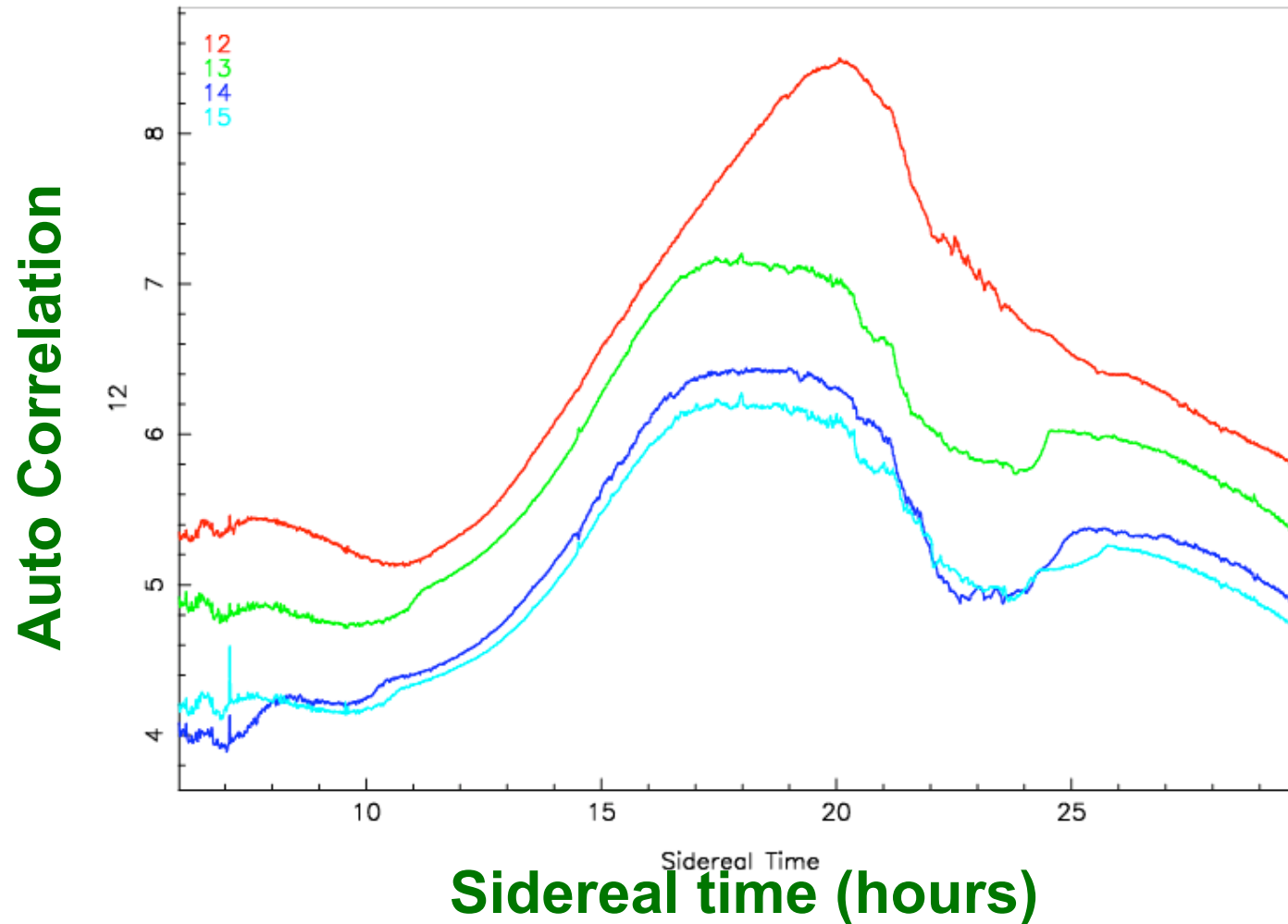
Auto Correlation (XX) avg Ch 6:250 CS10

Auto Correlation (ALL Channels averaged 6:250) L2007_00698.MS All micro stations in CS10



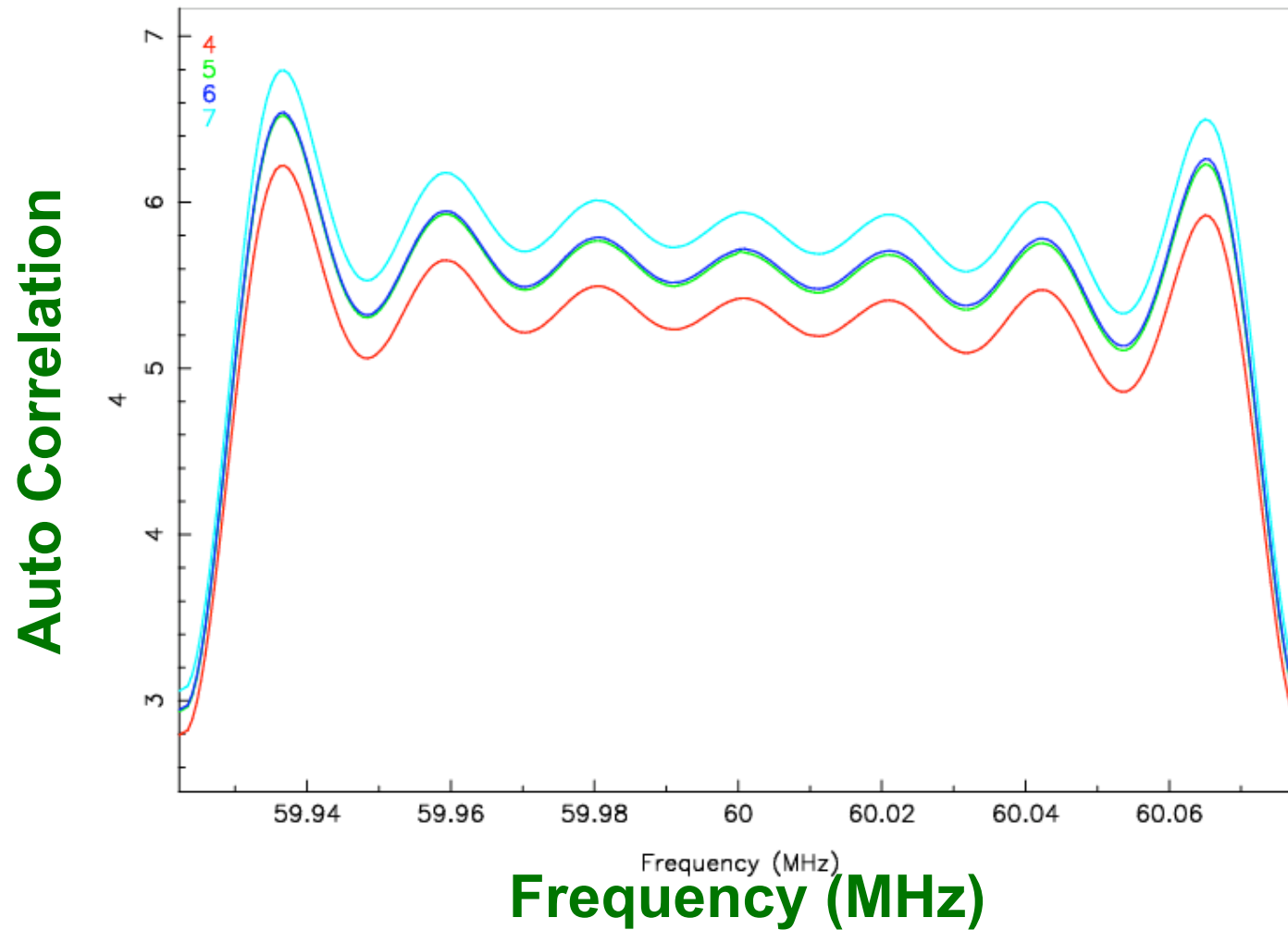
Auto Correlation (XX) avg Ch 6:250 CS16

Auto Correlation (ALL Channels averaged 6:250) L2007_00698.MS All micro stations in CS16



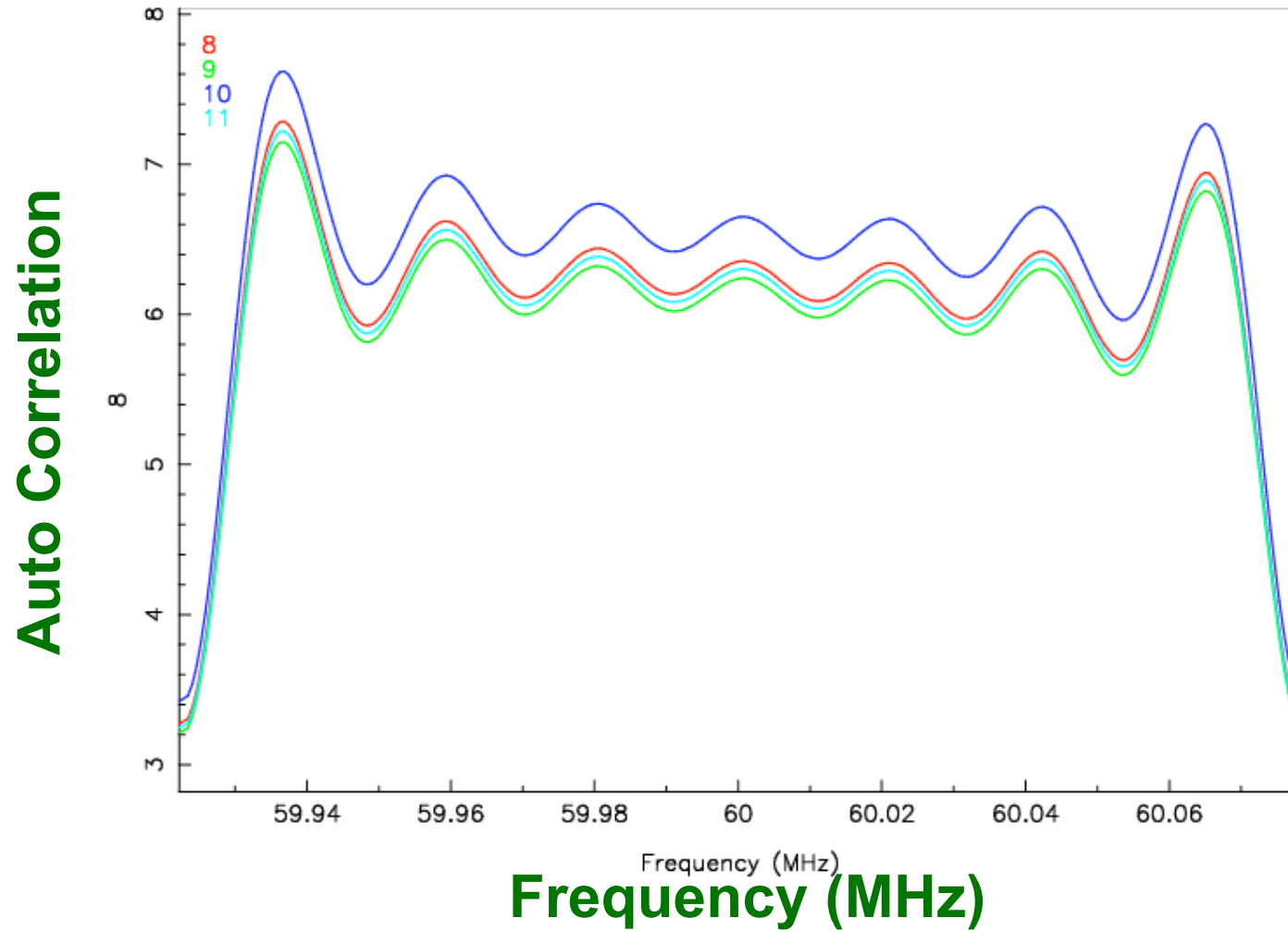
Auto Correlation (XX) (avg time) CS1

Auto Correlation (ALL Time averaged) L2007_00698.MS All micro stations in CS1



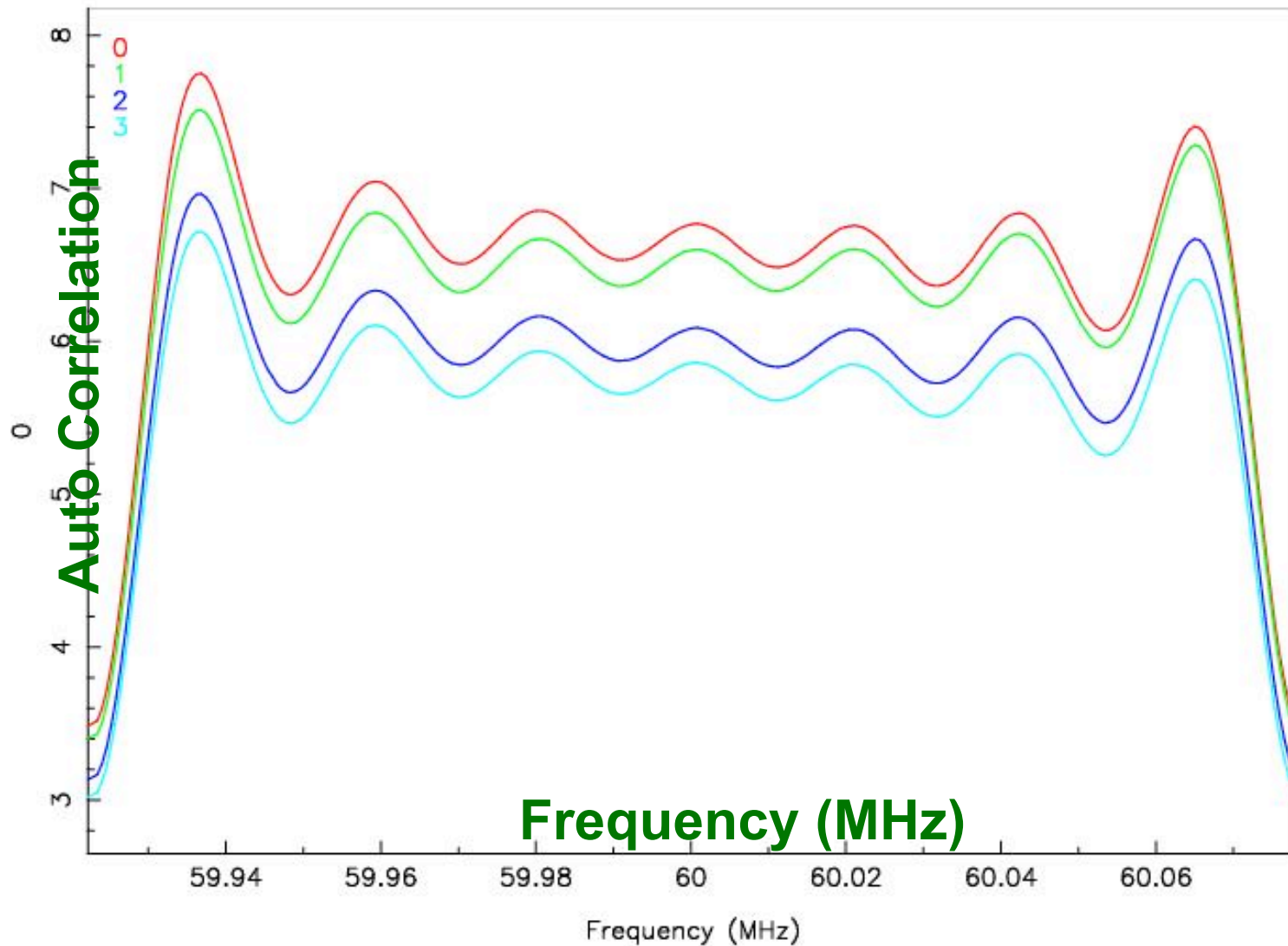
Auto Correlation (XX) (avg time) CS8

Auto Correlation (ALL Time averaged) L2007_00698.MS All micro stations in CS8



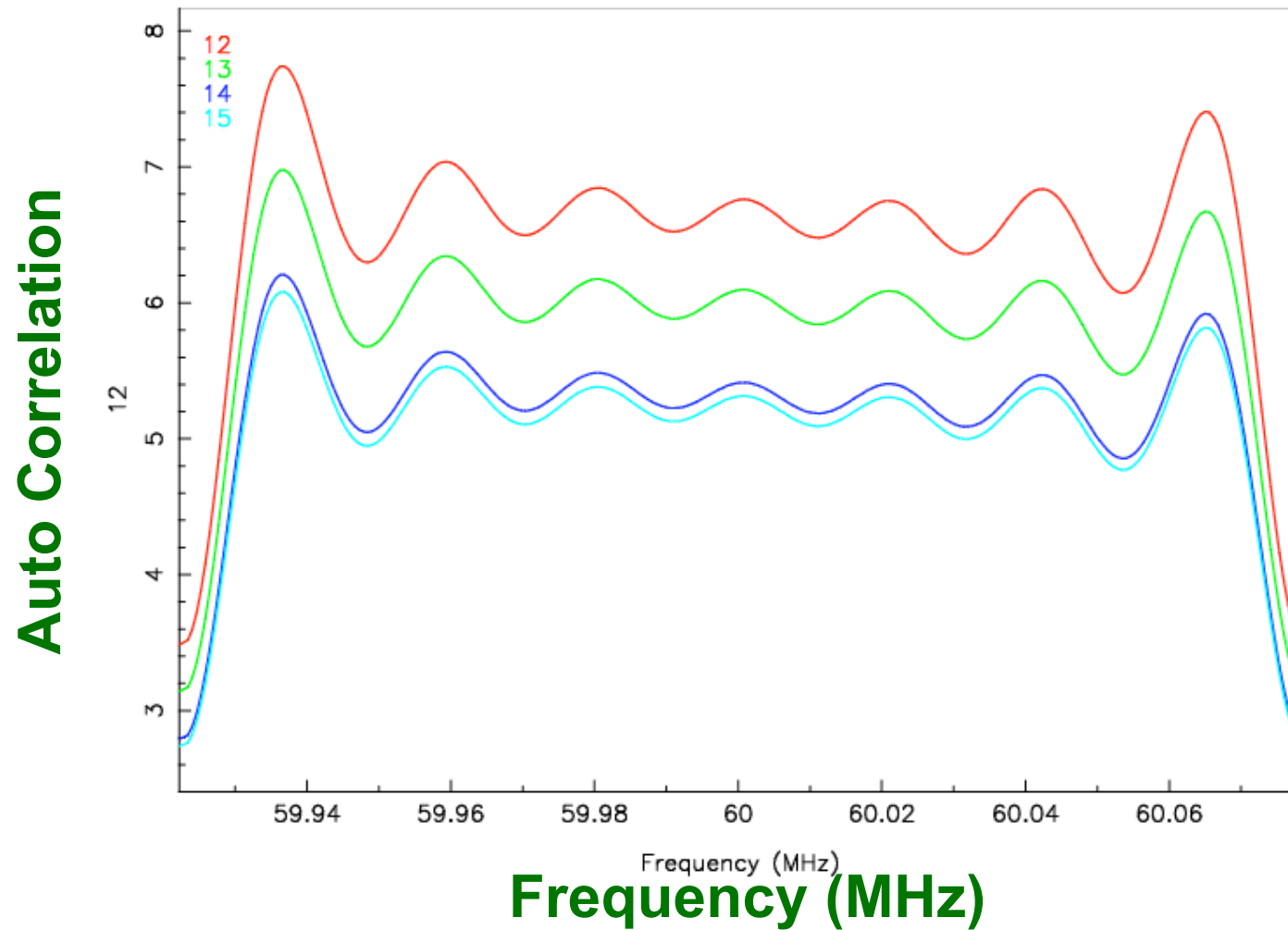
Auto Correlation (XX) (avg time) CS10

Auto Correlation (ALL Time averaged) L2007_00698.MS All micro stations in CS10



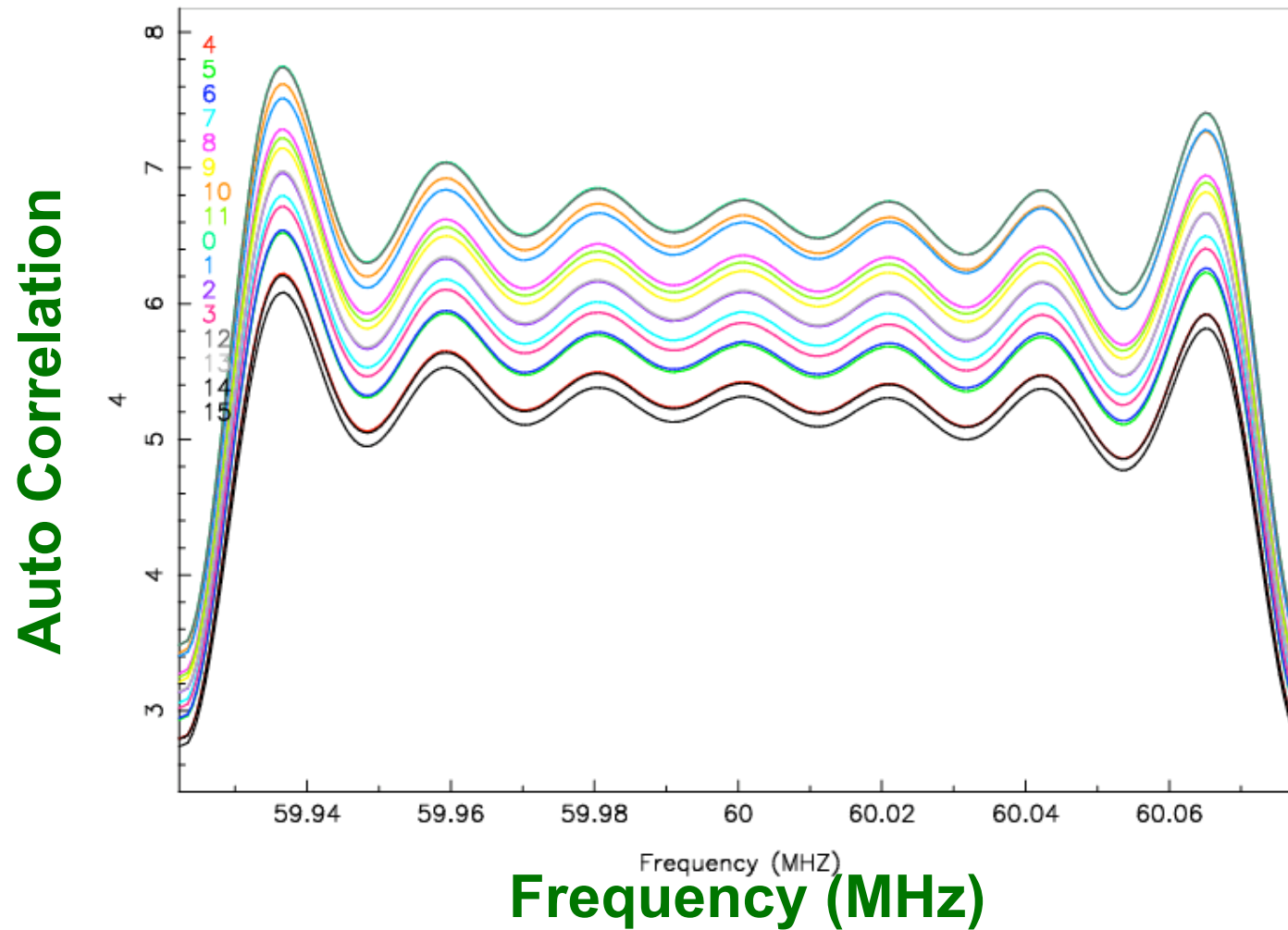
Auto Correlation (XX) (avg time) CS16

Auto Correlation (ALL Time averaged) L2007_00698.MS All micro stations in CS16



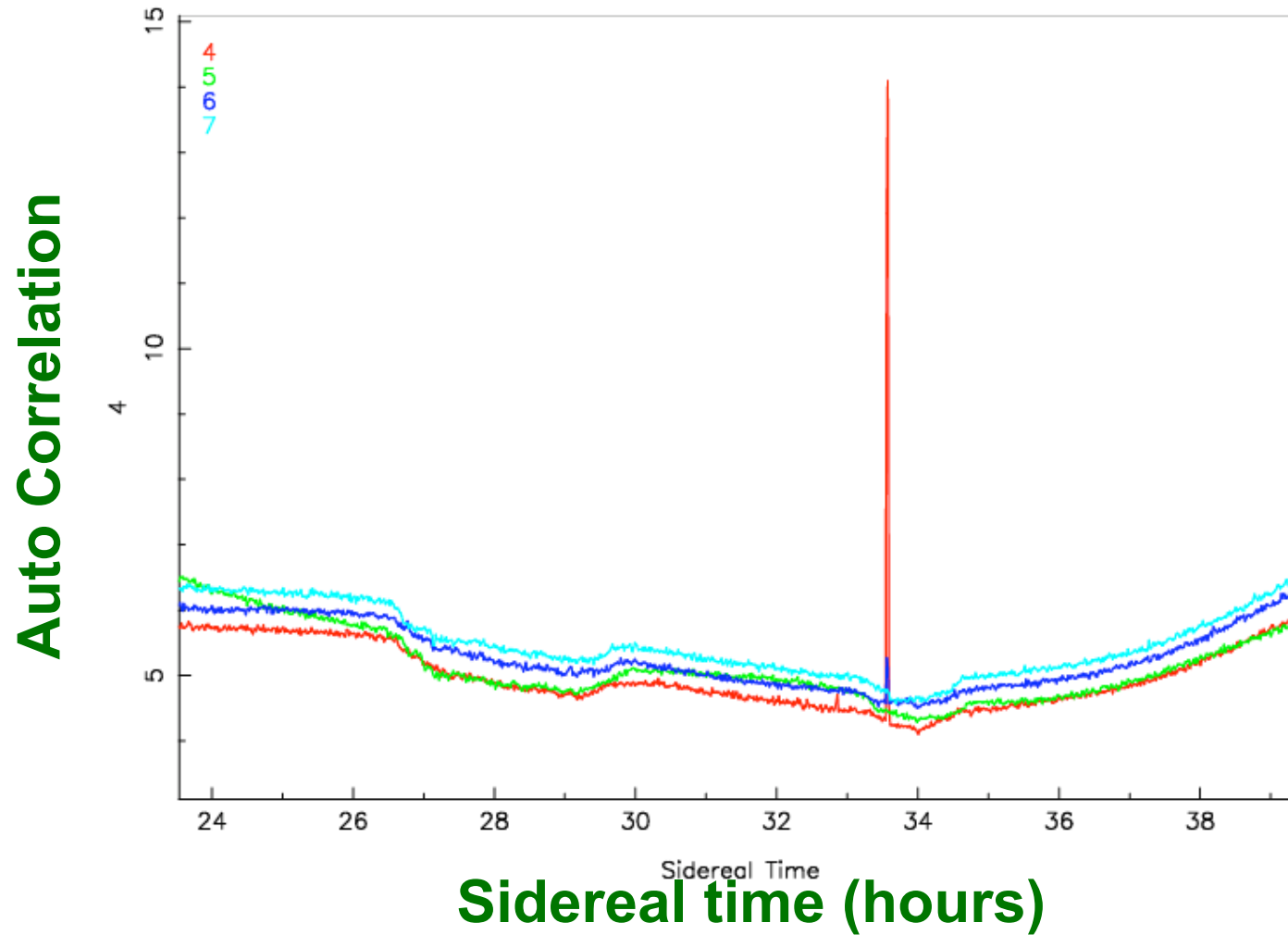
Auto Correlation (XX) (avg time) all mstns

Auto Correlation (ALL Time averaged) L2007_00698.MS All micro stations



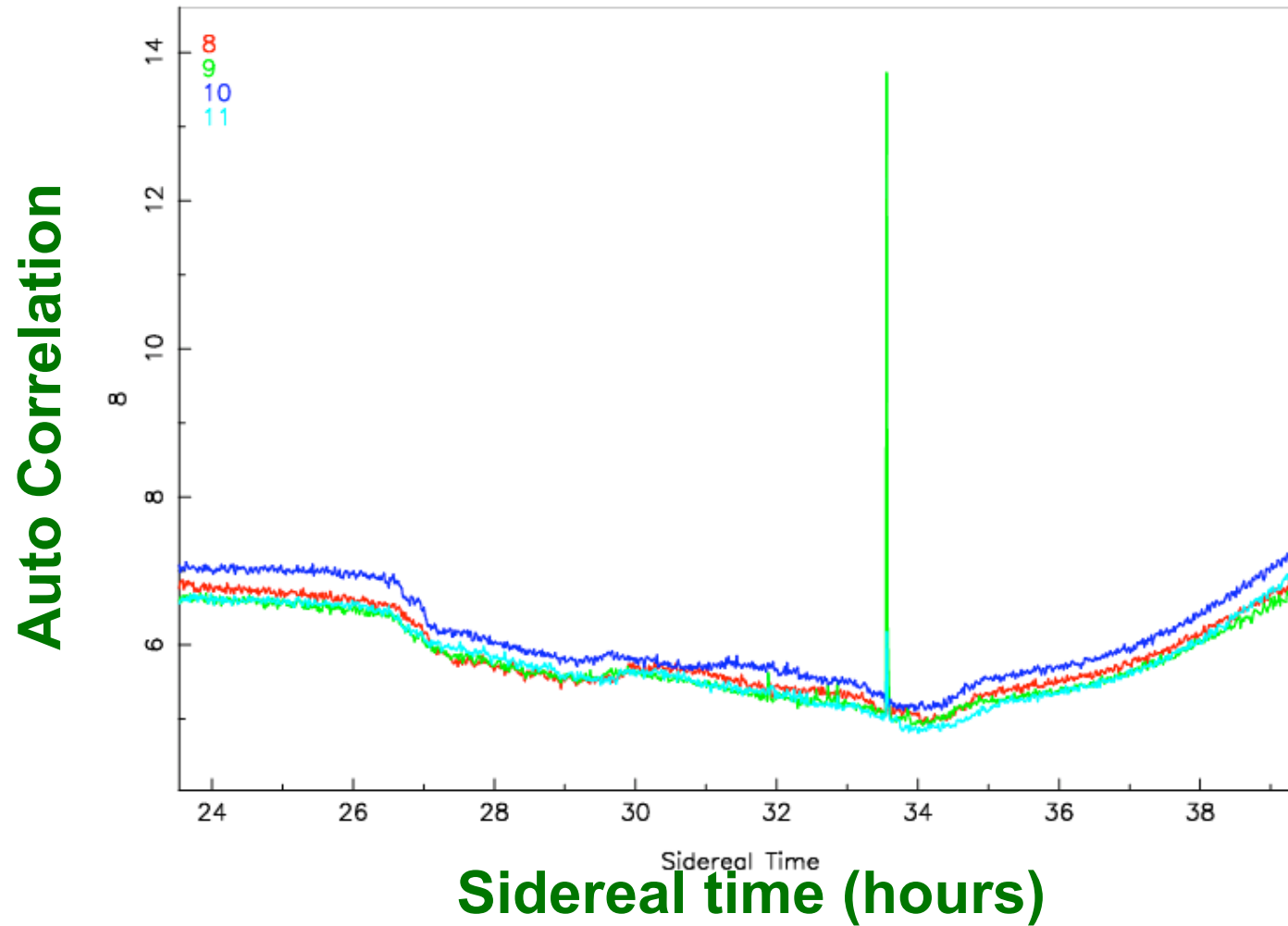
MS712Auto Correlation (XX) Channel 128 CS1

Auto Correlation (Single Channel 128) L2007_00712.MS All micro stations in CS1



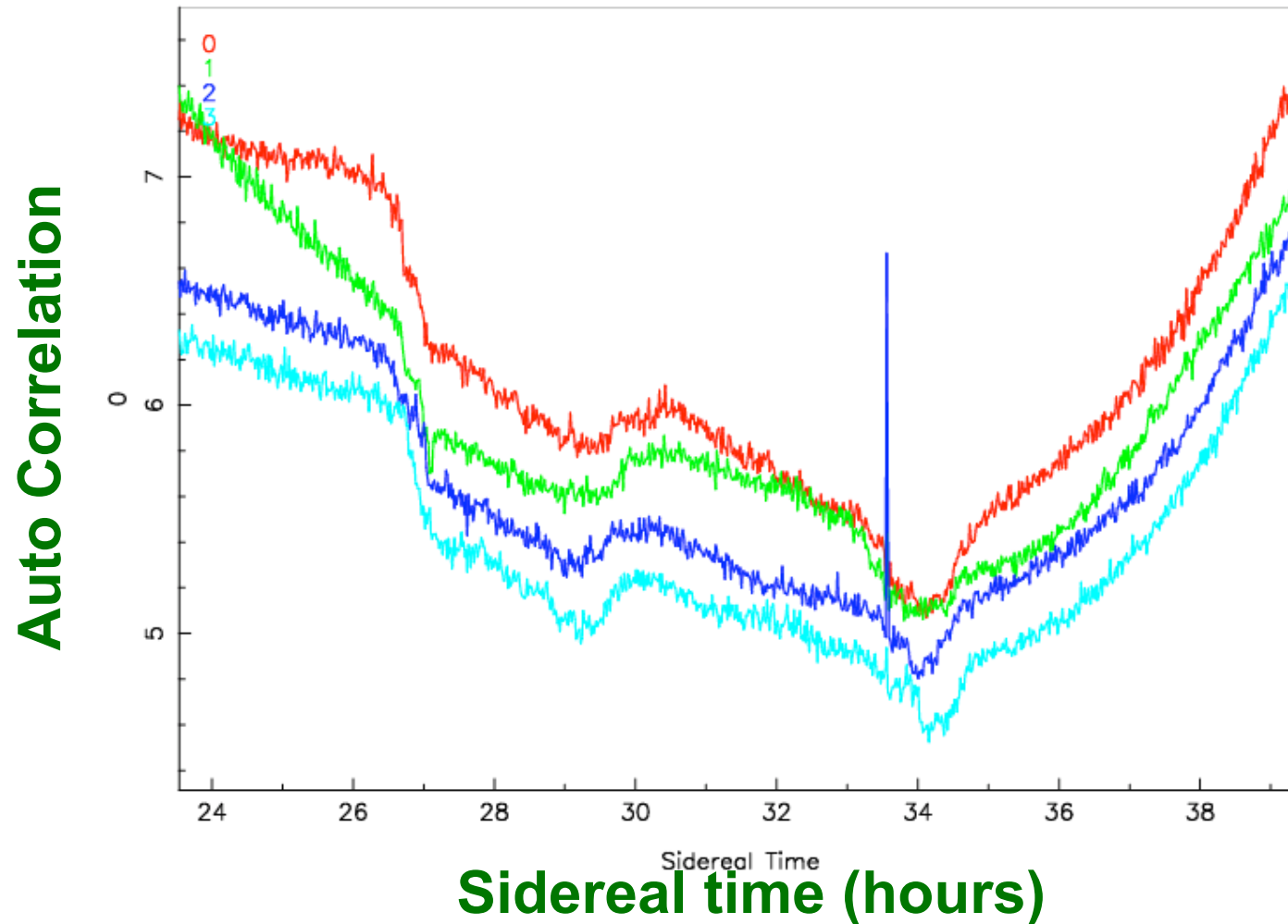
MS712Auto Correlation (XX) Channel 128 CS8

Auto Correlation (Single Channel 128) L2007_00712.MS All micro stations in CS8



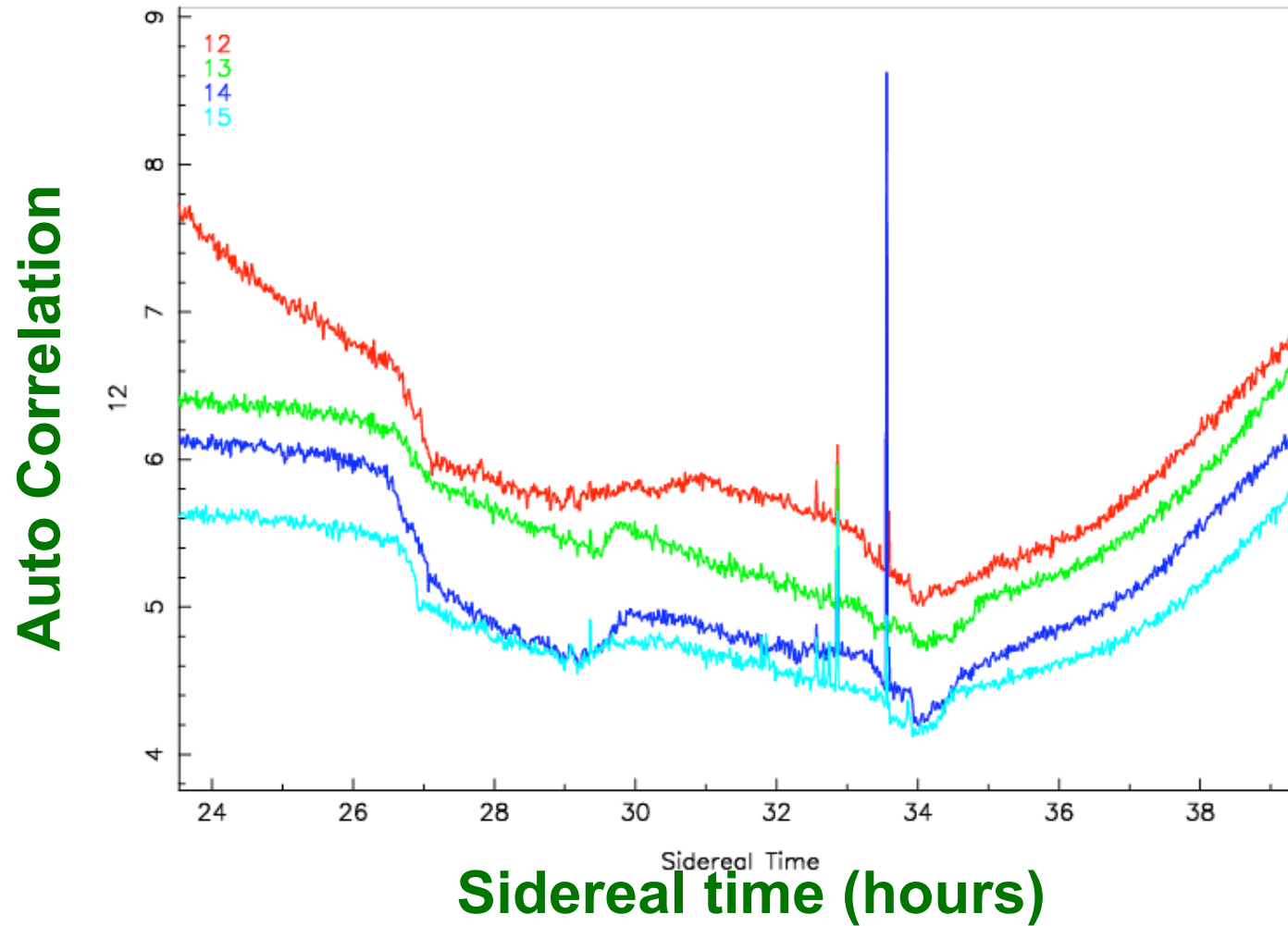
MS712Auto Correlation (XX) Channel 128 CS10

Auto Correlation (Single Channel 128) L2007_00712.MS All micro stations in CS10

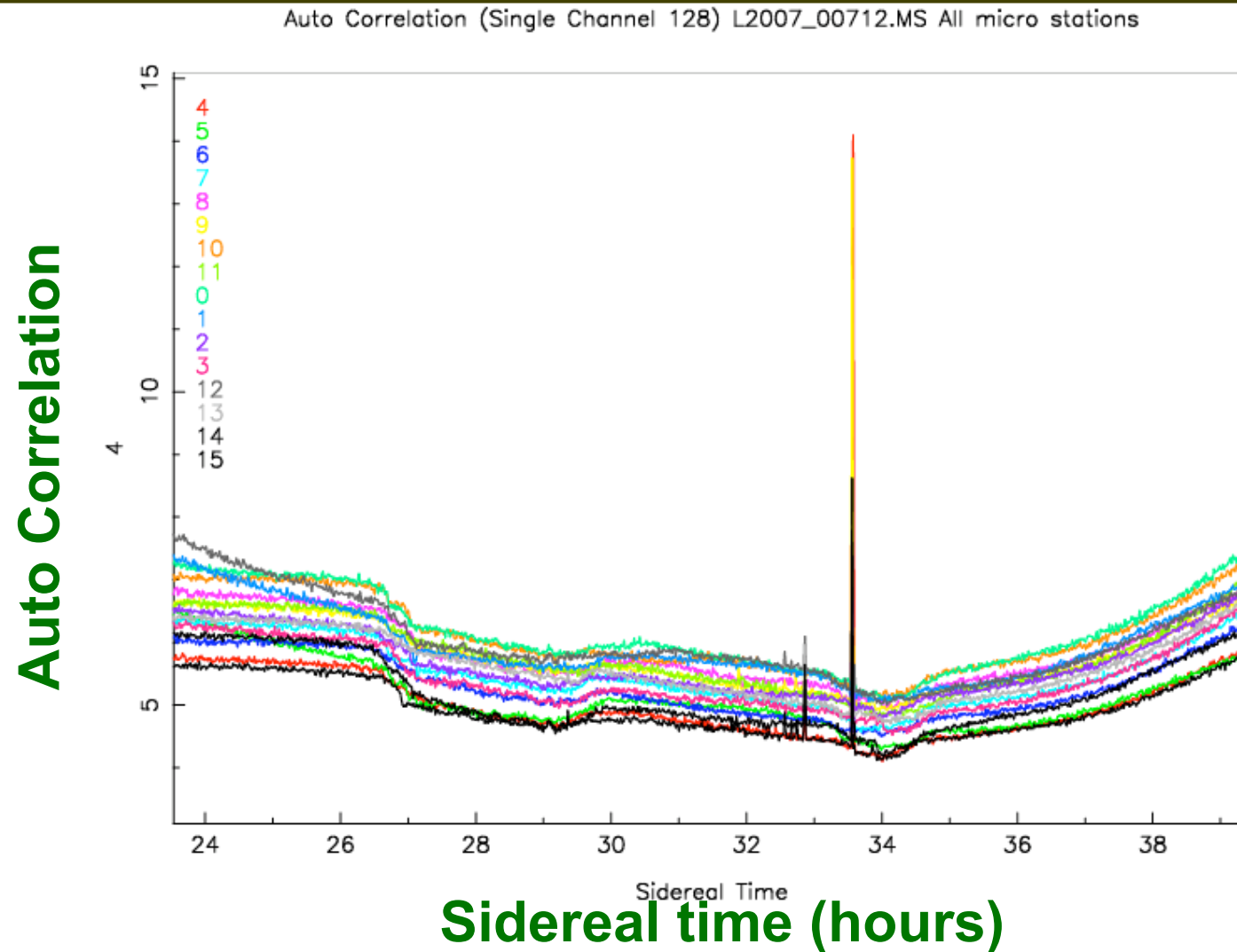


MS712Auto Correlation (XX) Channel 128 CS16

Auto Correlation (Single Channel 128) L2007_00712.MS All micro stations in CS16

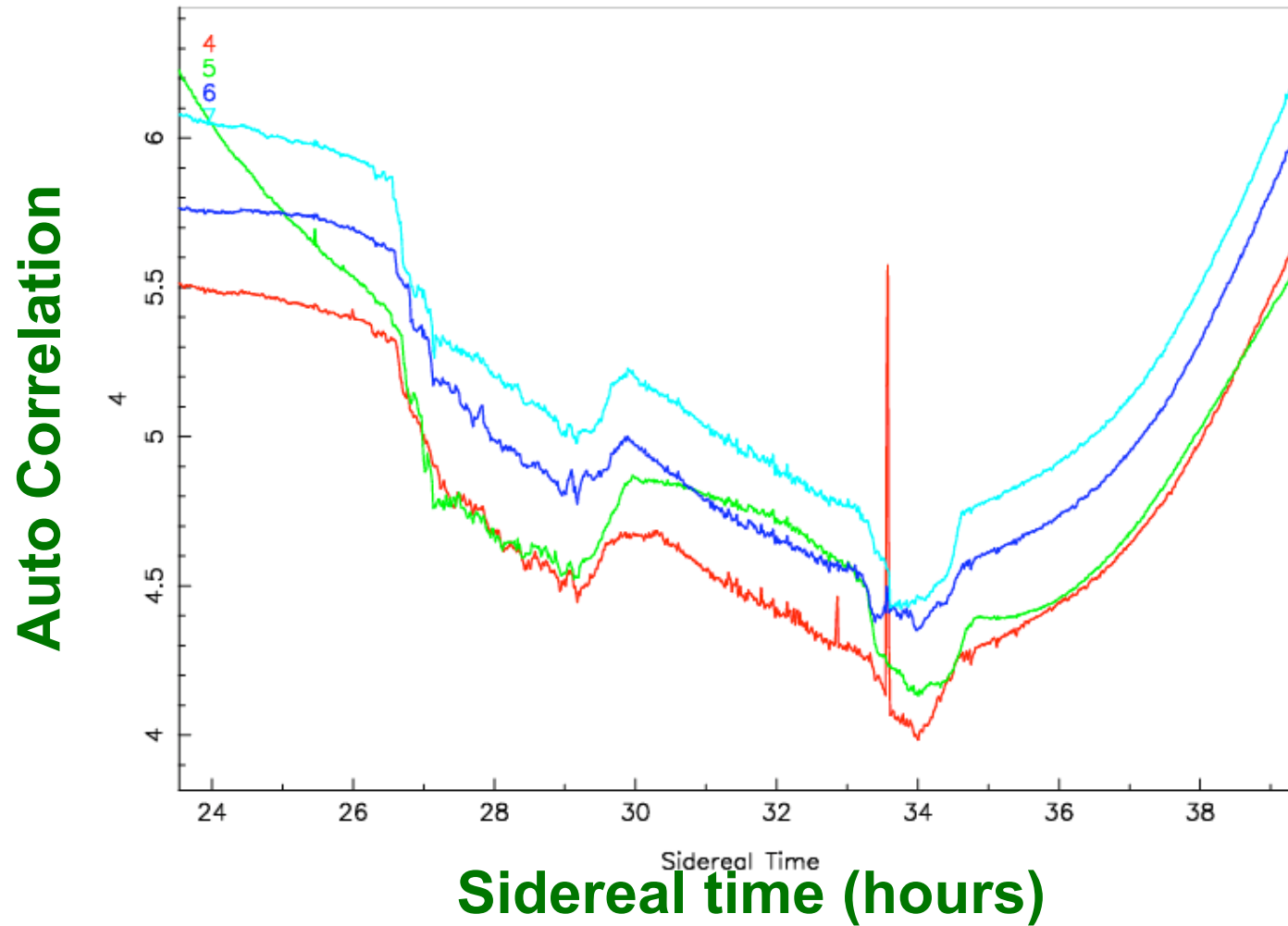


MS712Auto Correlation (XX) Channel 128 all microstations



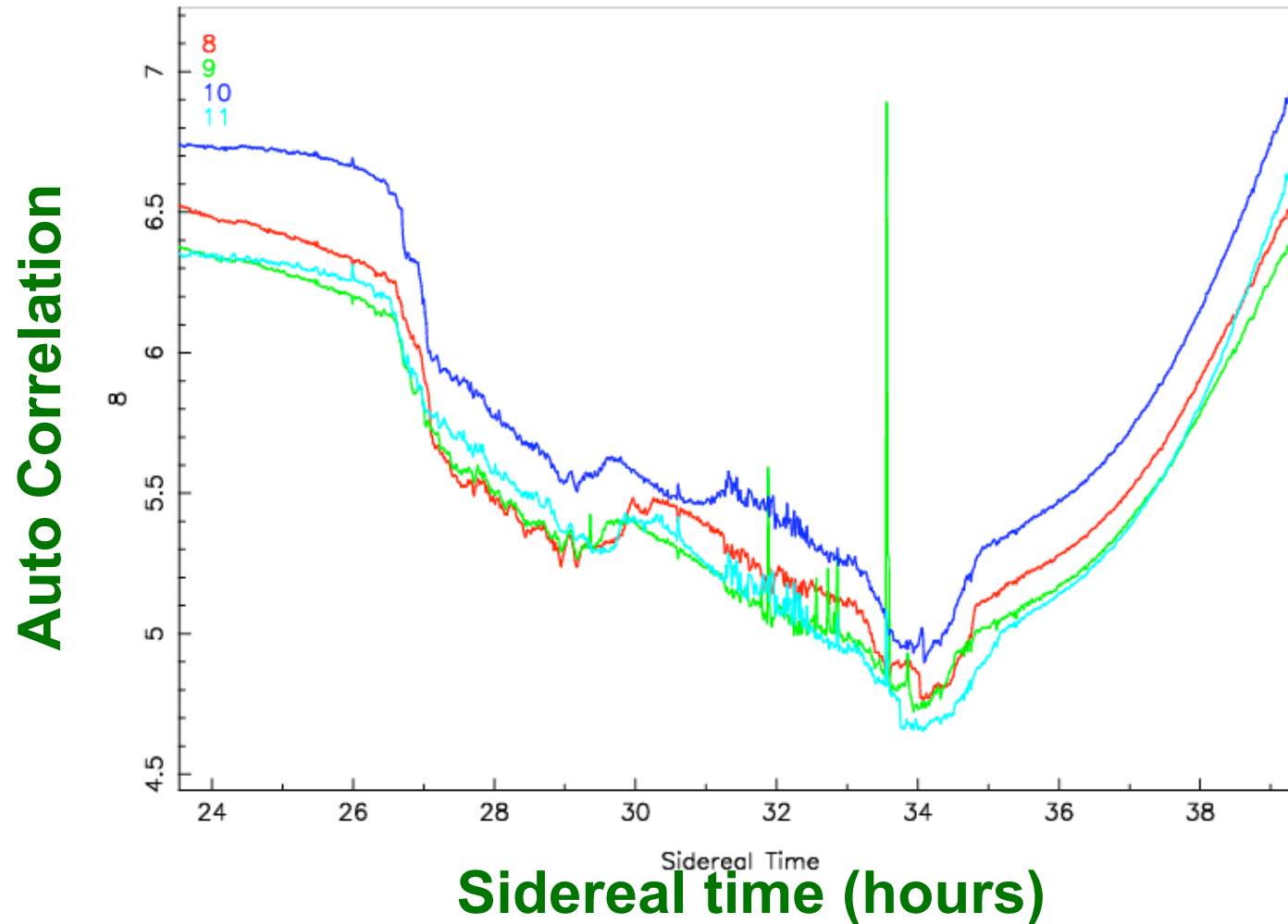
Auto Correlation (XX) avg Ch 6:250 CS1

Auto Correlation (ALL Channels averaged 6:250) L2007_00712.MS All micro stations in CS1



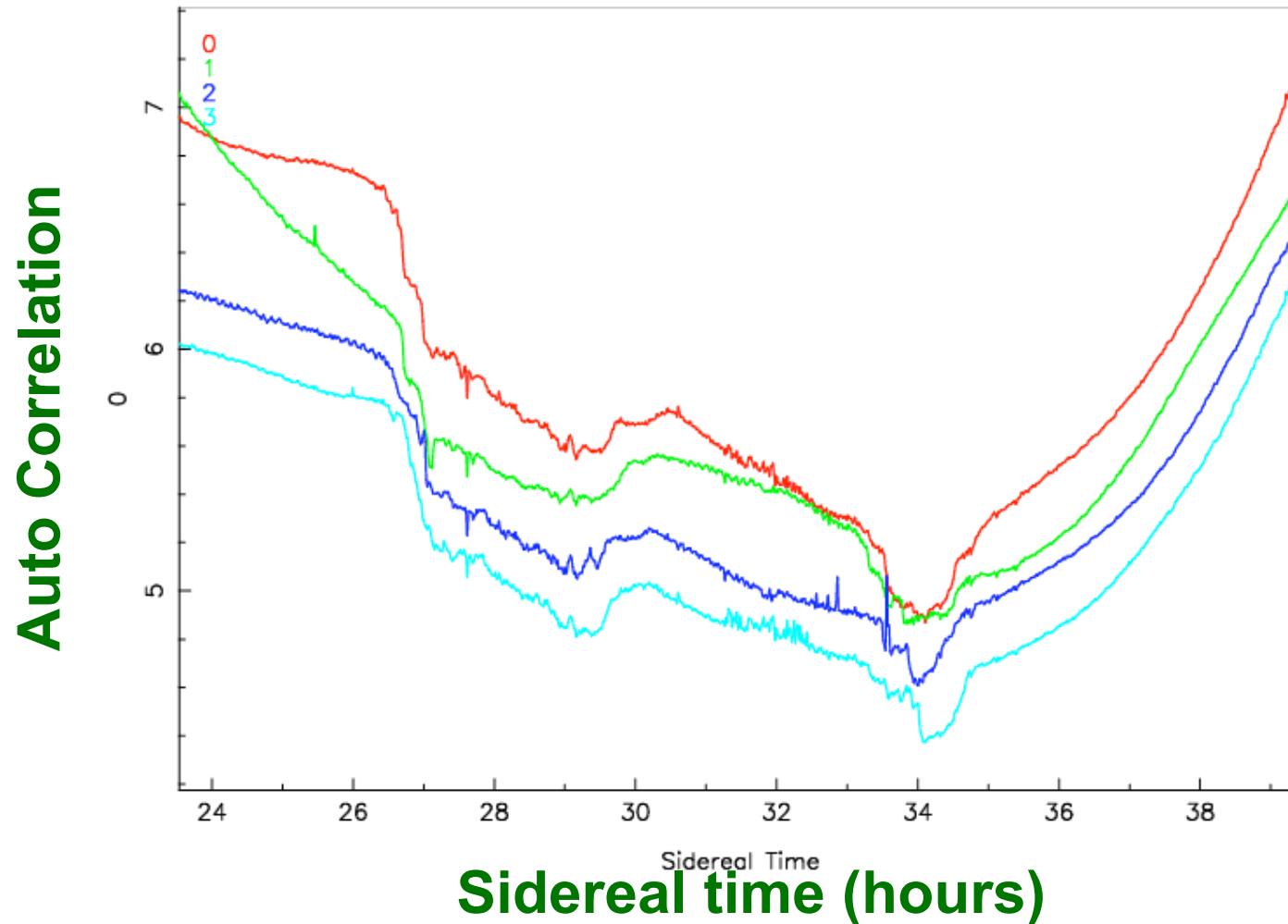
Auto Correlation (XX) avg Ch 6:250 CS8

Auto Correlation (ALL Channels averaged 6:250) L2007_00712.MS All micro stations in CS8



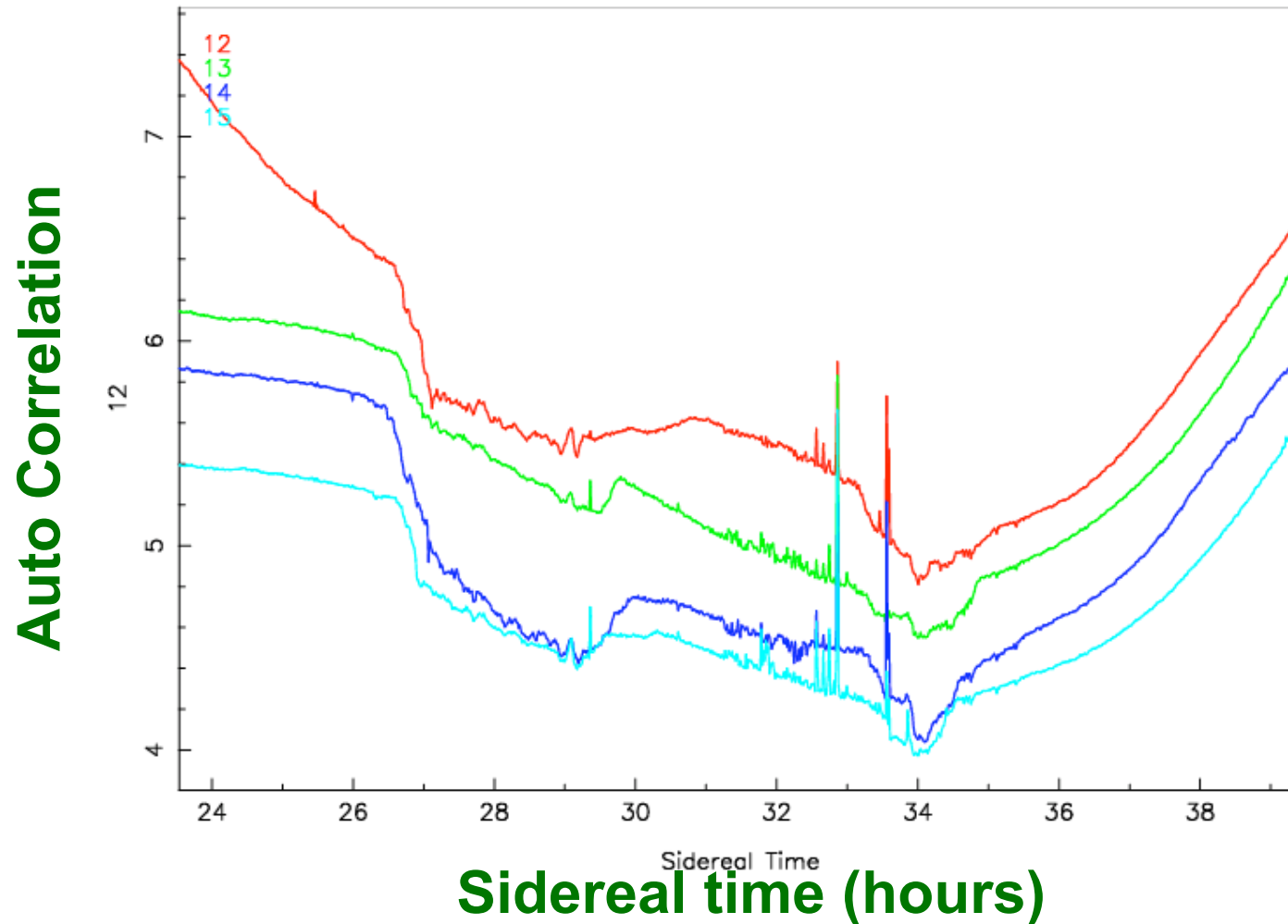
Auto Correlation (XX) avg Ch 6:250 CS10

Auto Correlation (ALL Channels averaged 6:250) L2007_00712.MS All micro stations in CS10



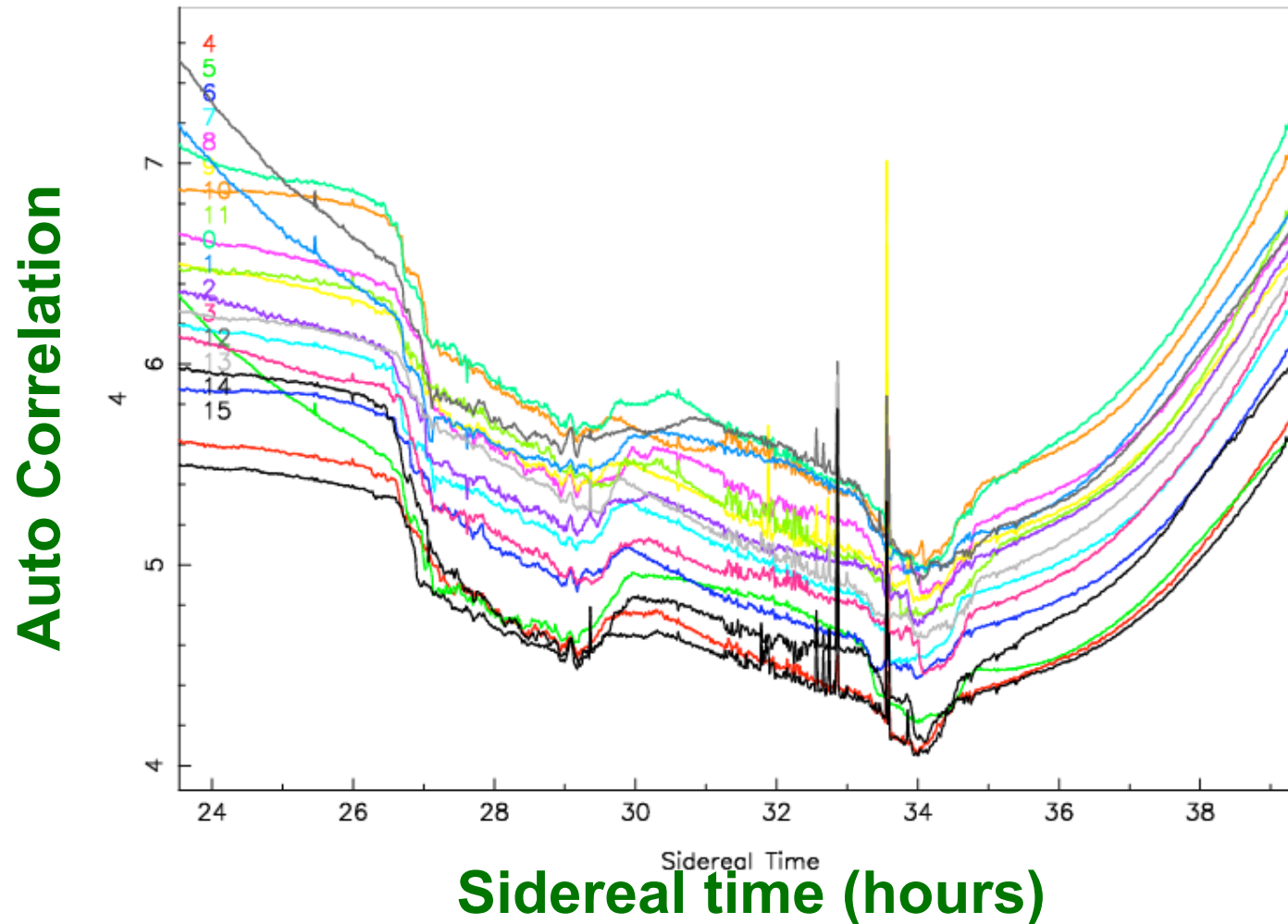
Auto Correlation (XX) avg Ch 6:250 CS16

Auto Correlation (ALL Channels averaged 6:250) L2007_00712.MS All micro stations in CS16



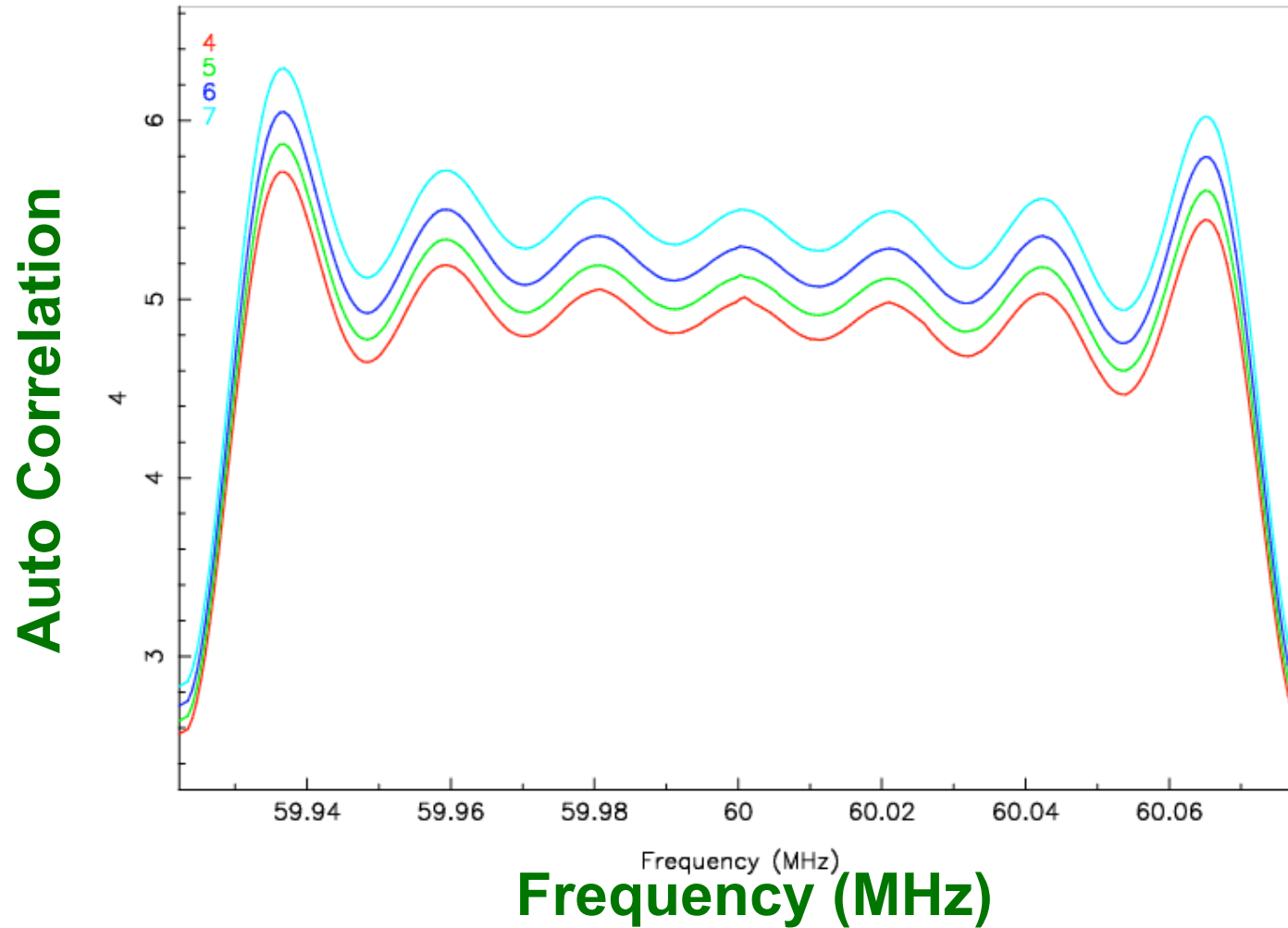
Auto Correlation (XX) avg Ch 6:250all microstn

Auto Correlation (ALL Channels averaged 6:250) L2007_00712.MS All micro stations



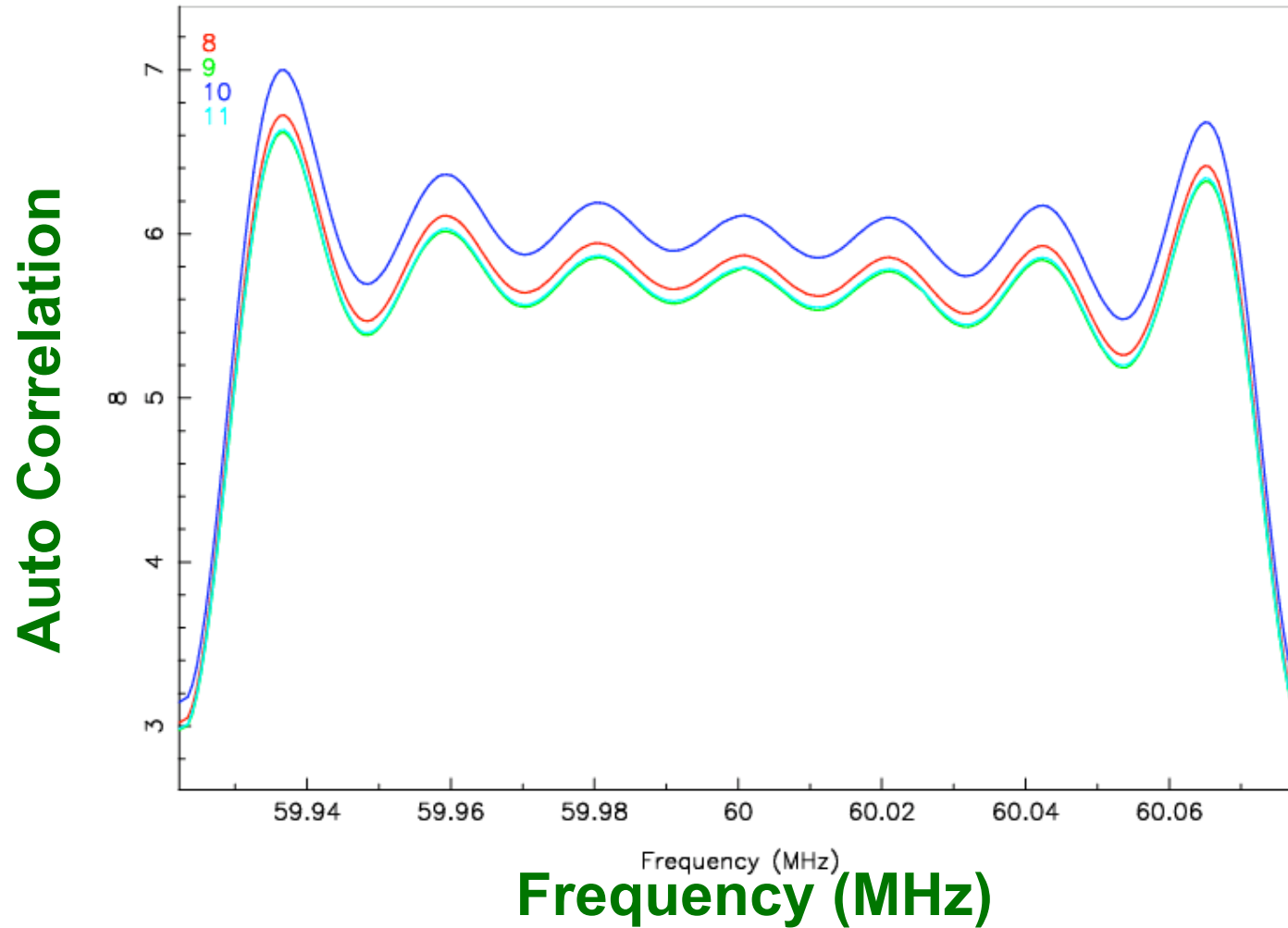
Auto Correlation (XX) (avg time) CS1

Auto Correlation (ALL Time averaged) L2007_00712.MS All micro stations in CS1



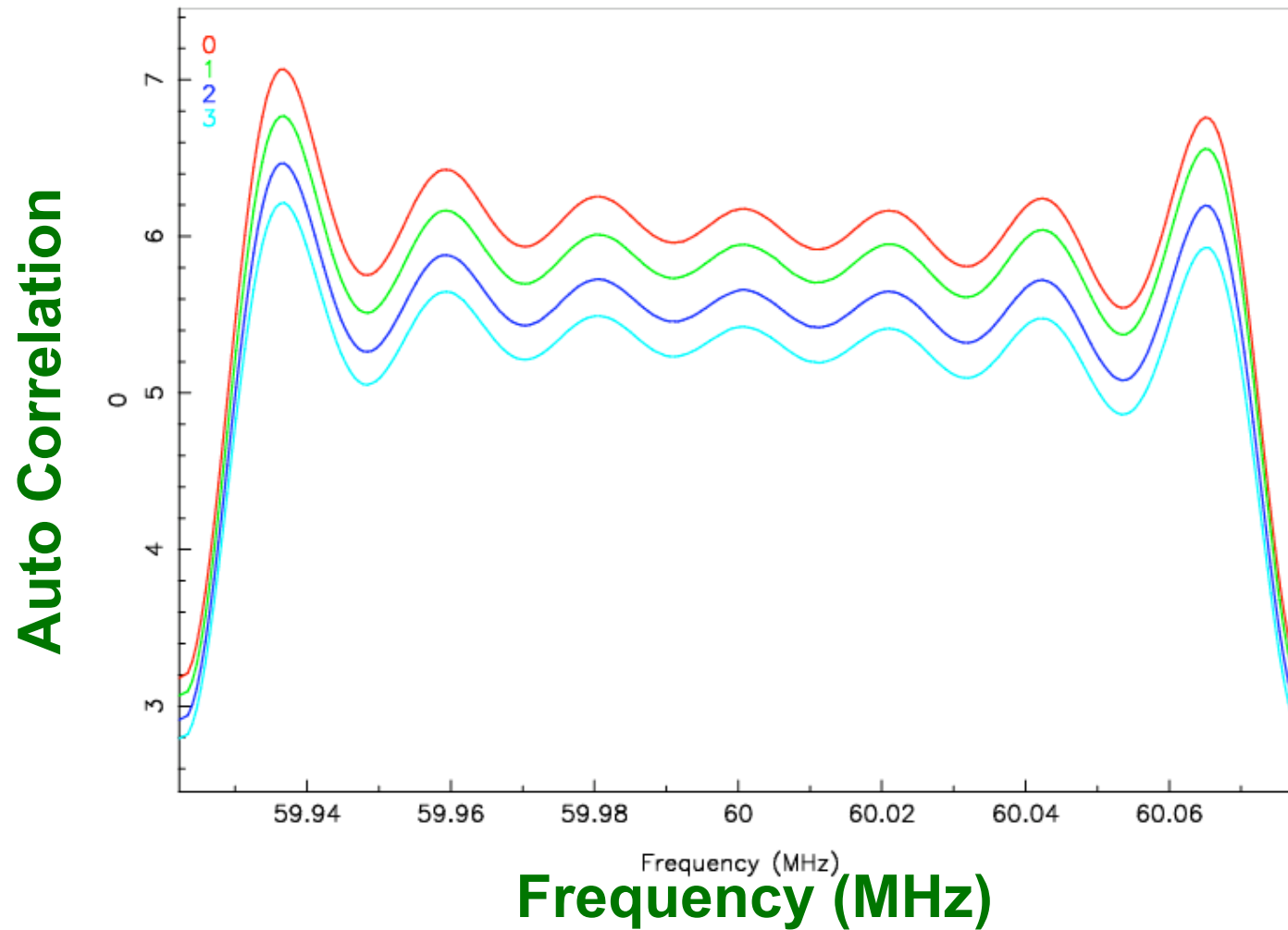
Auto Correlation (XX) (avg time) CS8

Auto Correlation (ALL Time averaged) L2007_00712.MS All micro stations in CS8



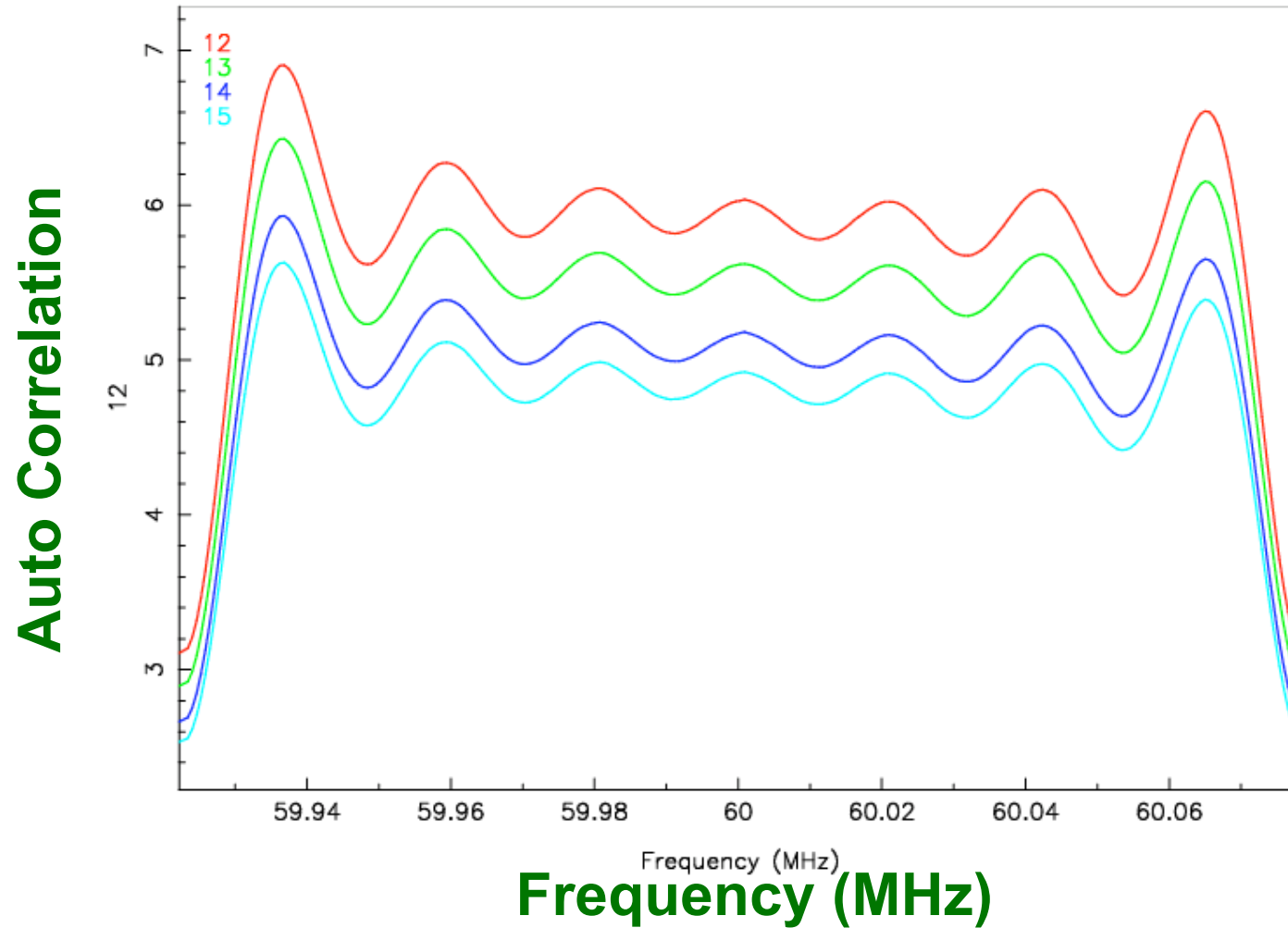
Auto Correlation (XX) (avg time) CS10

Auto Correlation (ALL Time averaged) L2007_00712.MS All micro stations in CS10



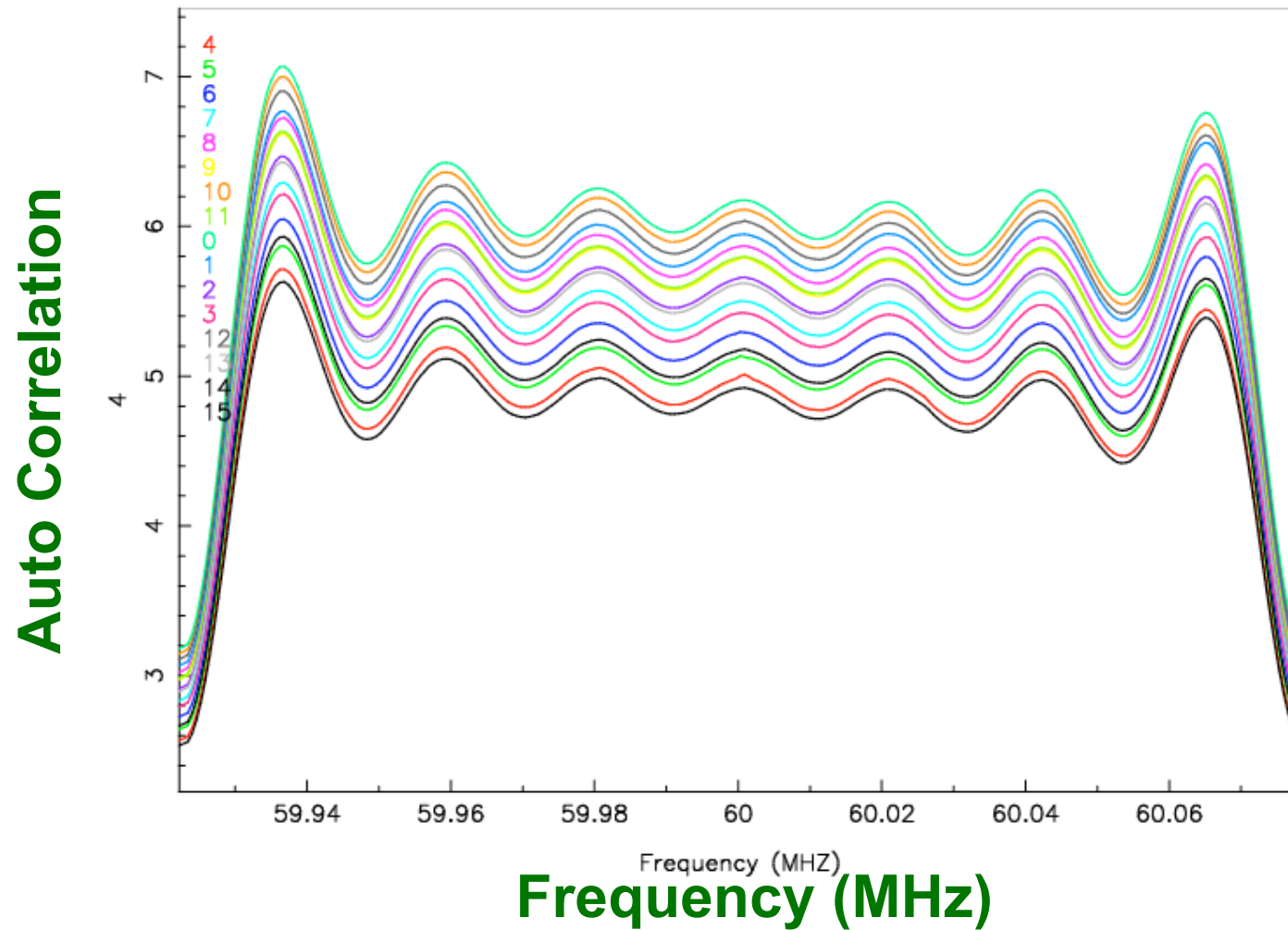
Auto Correlation (XX) (avg time) CS16

Auto Correlation (ALL Time averaged) L2007_00712.MS All micro stations in CS16



Auto Correlation (XX) (avg time) all mstns

Auto Correlation (ALL Time averaged) L2007_00712.MS All micro stations



Bandpass(time averaged) on diff days: MStn1

plot1_Auto Correlation (Channels averaged 1:256) MS693,698,712 micro station 0

