

# **The Use of NeurOptimal® With a Young Adult With an Acute TBI - A Case Study**

Joan-Marie Lartin, PhD, RN

Brian Drake

Jessica Bonner

Alan Bachers, PhD

# Background

- Approximately 22 sessions in '07-'08 (16 yo)
- April 5, 2012-M/C accident
- **Glasgow Coma Scale = 3 (3-15)**
- **Medical Dx = Grade II Diffuse Axonal Injury**
- **Severe Traumatic Brain Injury**
- **Unresponsive at scene, intracranial hemorrhage; seizure activity reported**
- **Prognosis - Uncertain**
- **Pain and seizure meds**



At the time of Brian's admission, my main concern was his neurological status. It was easy to be distracted by his ortho injuries, but I've seen far too many motorcycle crashes and the head trauma that goes along with them. I can remember thinking, "Thank God, he was wearing a helmet!" I forget now if he had a head bleed, but I think I remember Neurosurgeons I remember the pressures being low and thinking He has a chance to recover from this." I knew the ortho injuries could be fixed, but it was the extent of the head injury that was unknown

Shane Brost, RN, CCRN, Brian's Critical Care Nurse for the first two days

# Acute Phase

- SICU-Multiple fractures-legs, arms, hands, dislocations, pneumonia, other infections, non responsive, respirator, cranial pressure monitor, surgeries for fractures
- Unresponsive for days, some “surfacing”
- April 7, OK to begin NO, April 9<sup>th</sup> first session
- Day 8, Linda Tevis’ personal system arrived
- Pre and post baselines show training effect



“We didn’t know, for the first two days, whether Brian would make it.”

Shane Brosch, RN, Critical Care Specialist





# NuerOptimal Plan

## per A. Bachers and P. Friesen

- Dr. Alison Wilson - OK'd NF 4/7/12
- Two sessions per day, introduce Zen 3 gradually, watch for activation, per A. Bachers
- Typical pattern-5-6 sessions over Thurs-Sun; Linda's system arrived 4/13
- Jess started training Brian ASAP and depending on her class schedule, trained him during the week 1-4 times total ~ 6 times per week



WVU Healthcare

Date: Sunday, April 8, 2012  
Room: m1 #20  
Phone:

People caring for me:

Nurse:

Kristen

Doctor:

SICU/Trauma

Clinical Associate:

Cathy

Other Care Providers:

Dr. Wilson ok w/  
Neurofeedback therapy  
+ vit D from family

My goals / plan:

Neurostatus  
Wean vent  
pain control

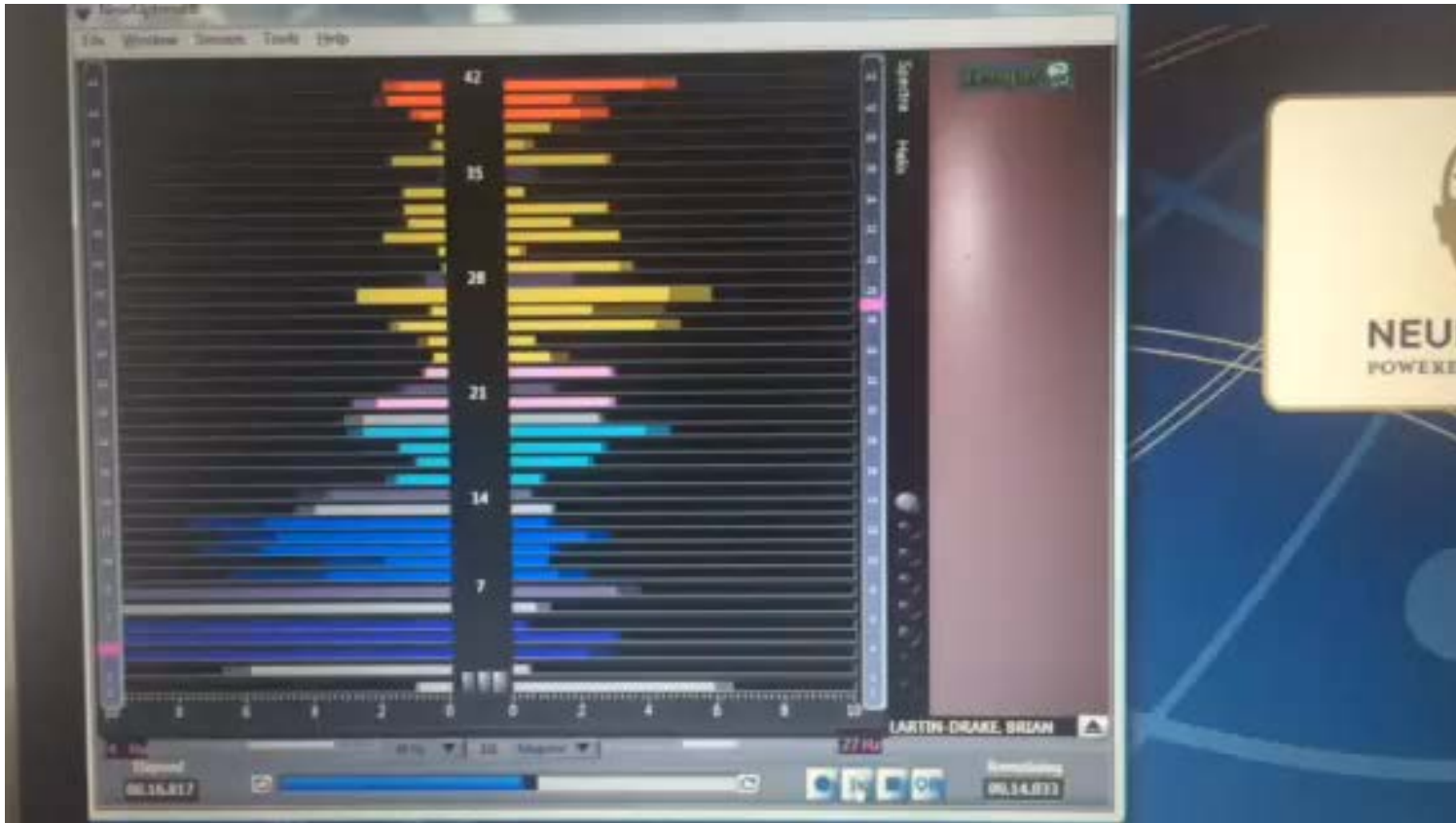
Turn 9?

Your comfort is our priority.  
Please alert us if you are in pain.



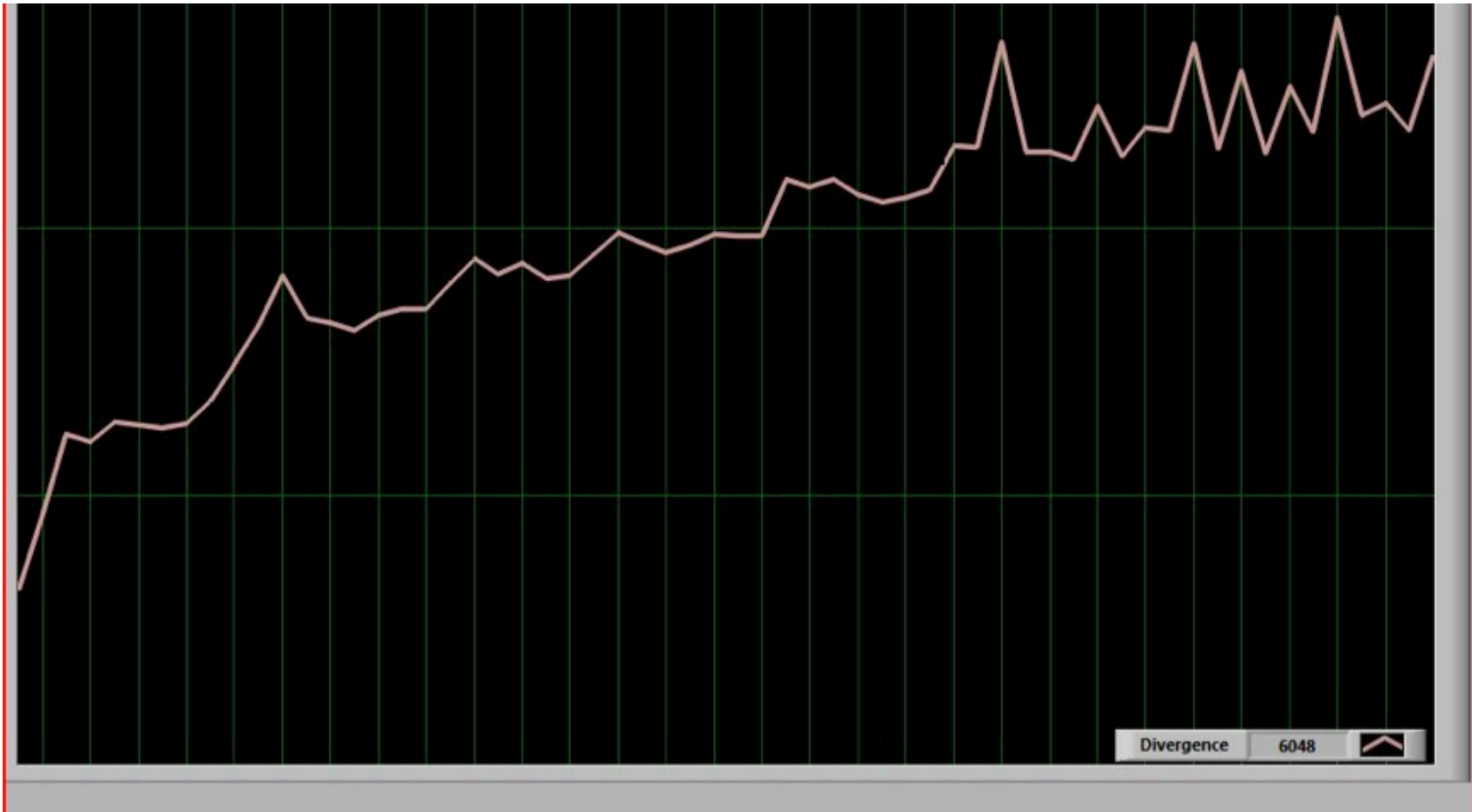
# Neurooptimal pre and post baselines

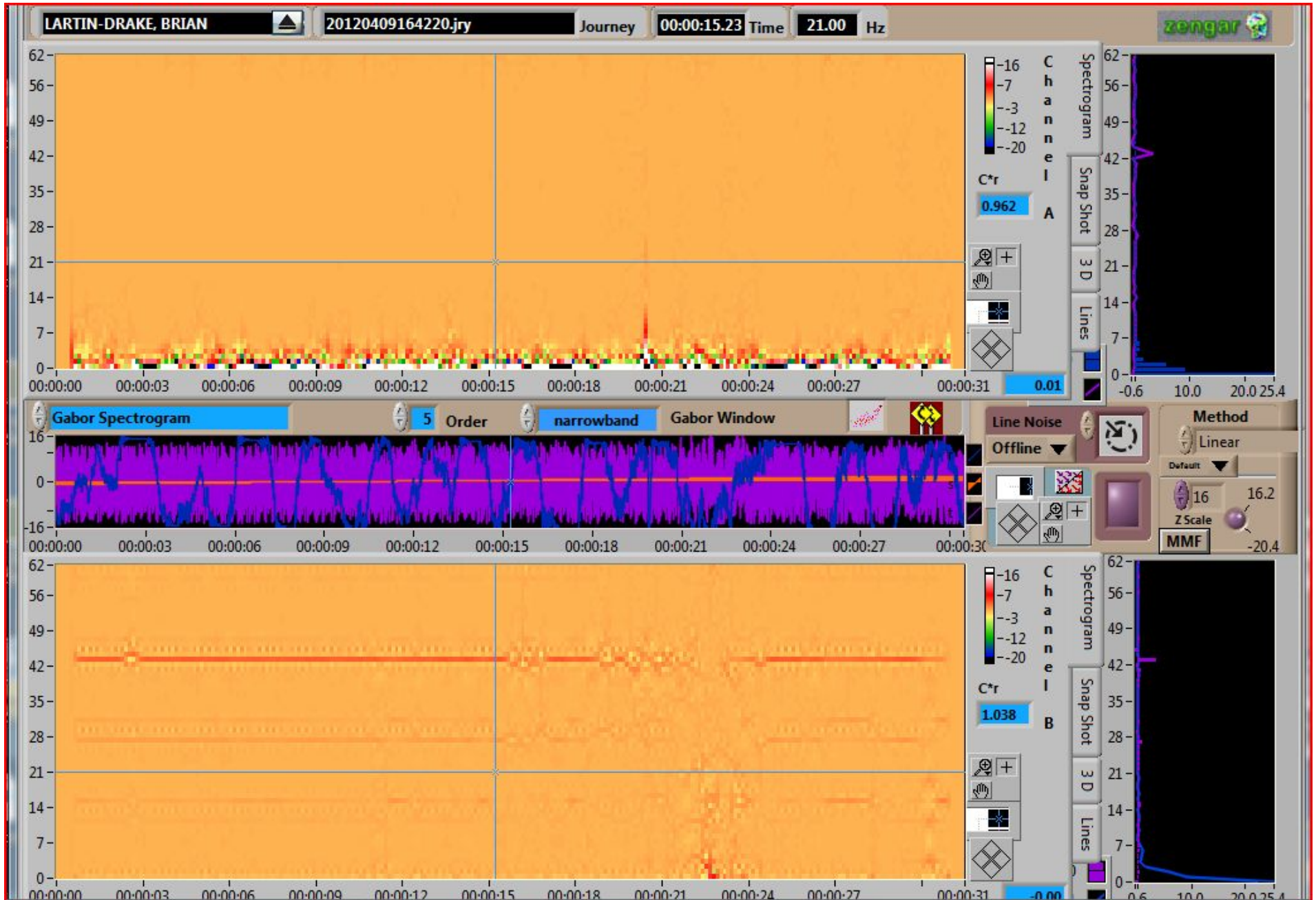
- 1-2 sessions a day
- Personal and professional systems
- Sometimes the “post” was also a “pre”
- Response pattern often but not always delayed
- Brian heavily medicated; lots of line noise
- Next series-prebaseline, journey, postbaseline
- (actual baseline video snippets, spectrographs, CCACs)



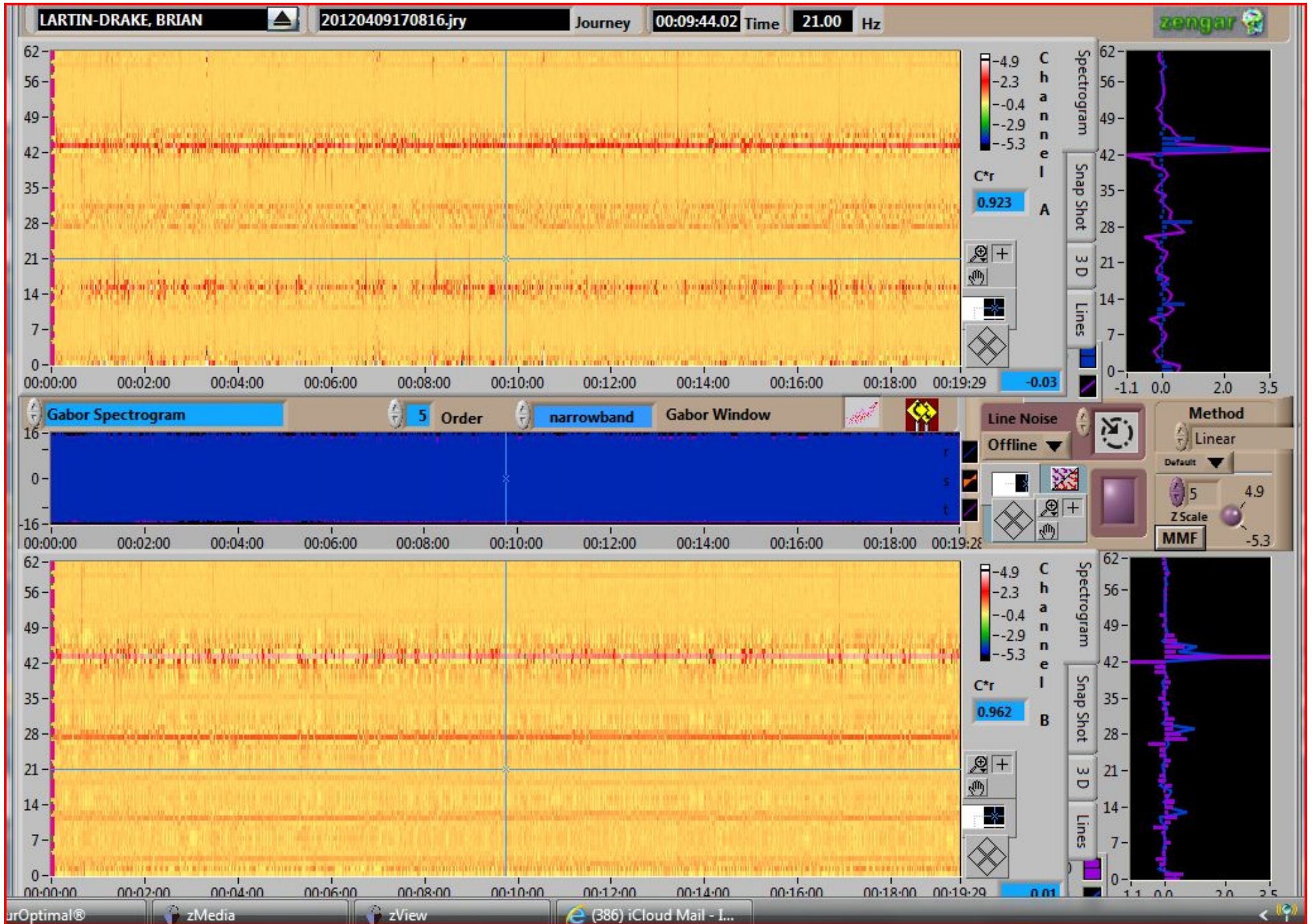
Prebaseline 4/09/12

# Prebaseline 4/9/12





4/09/12 prebaseline spectrograph

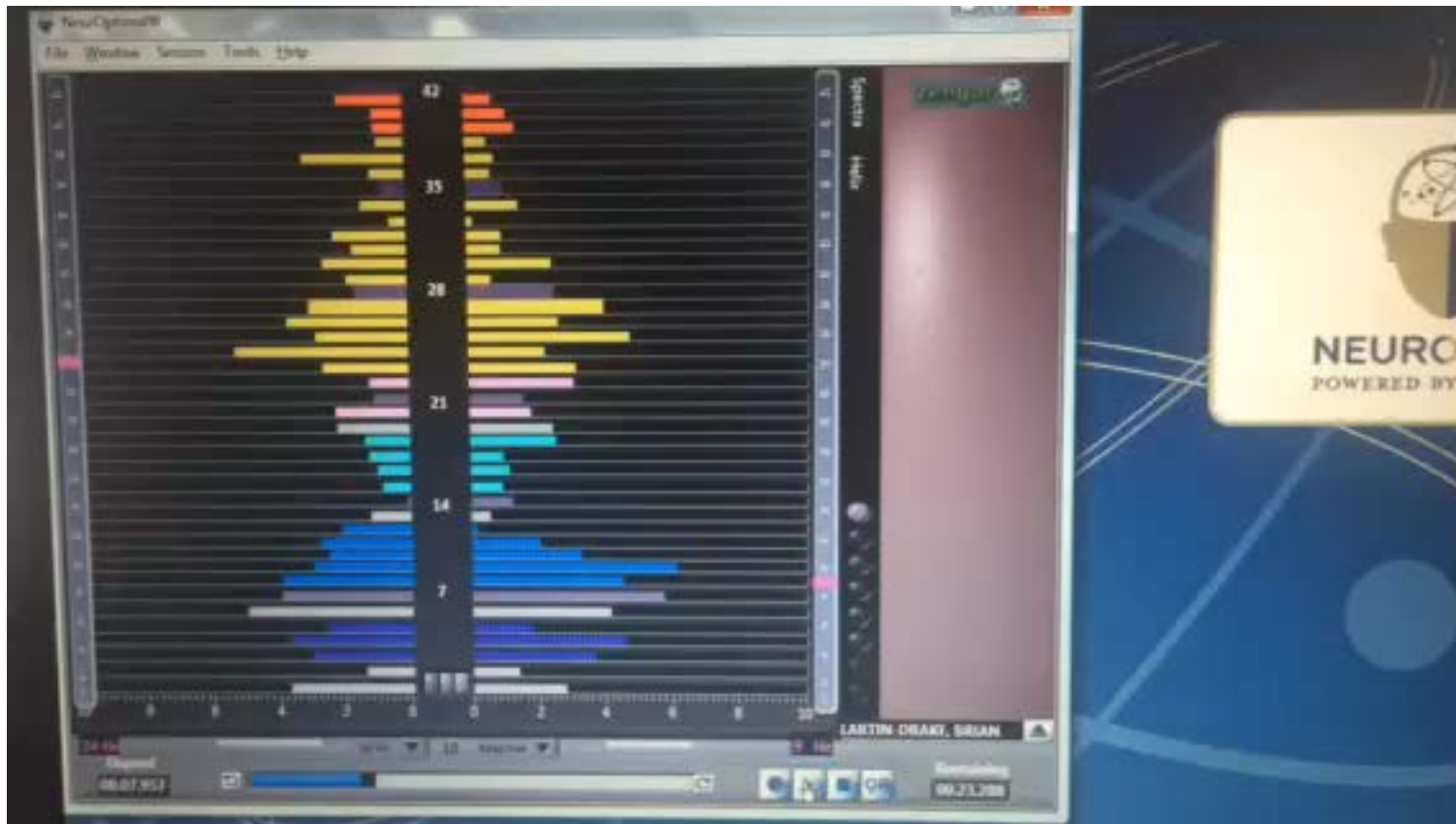


4/09/12 journey

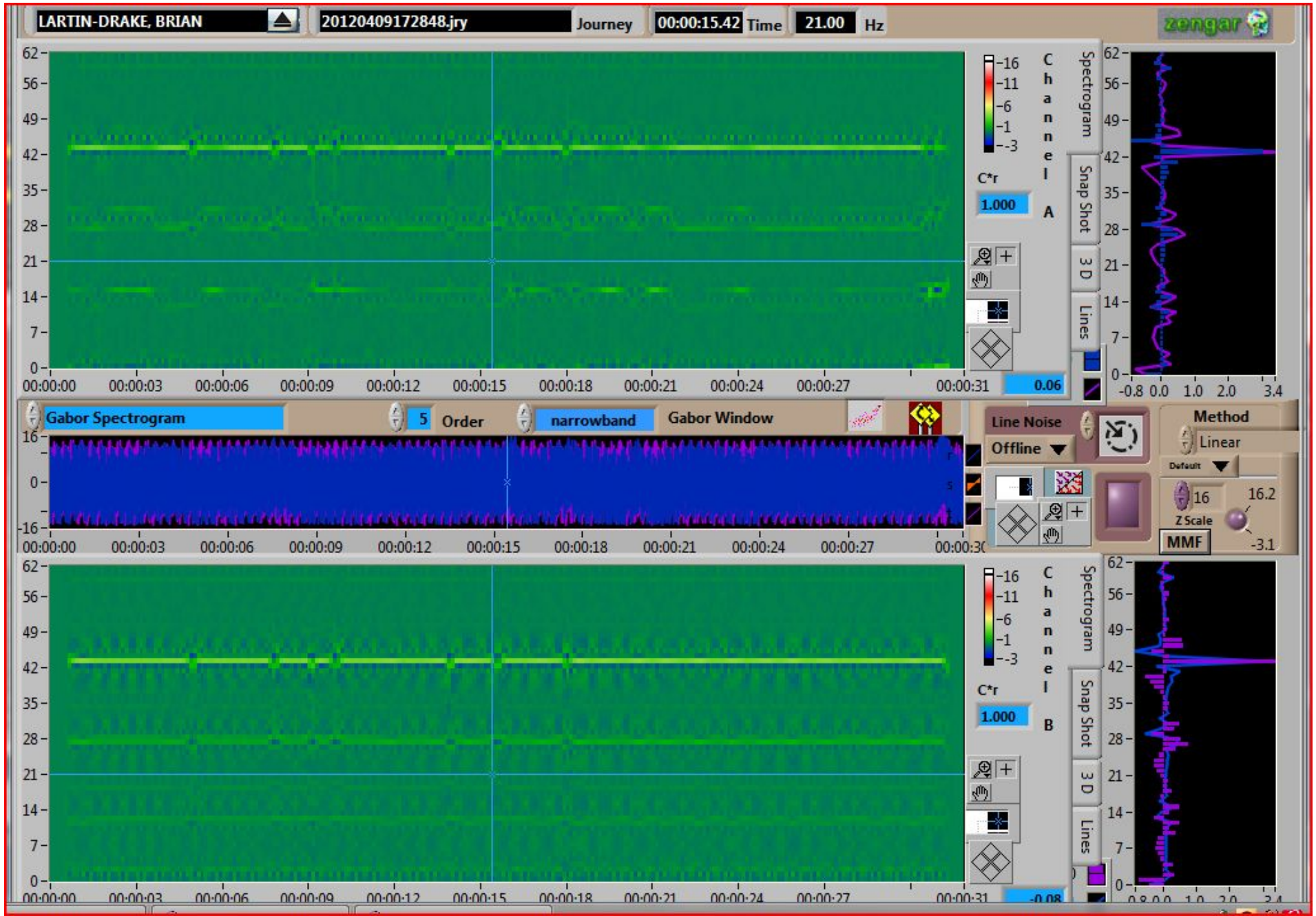




4/09/12 journey

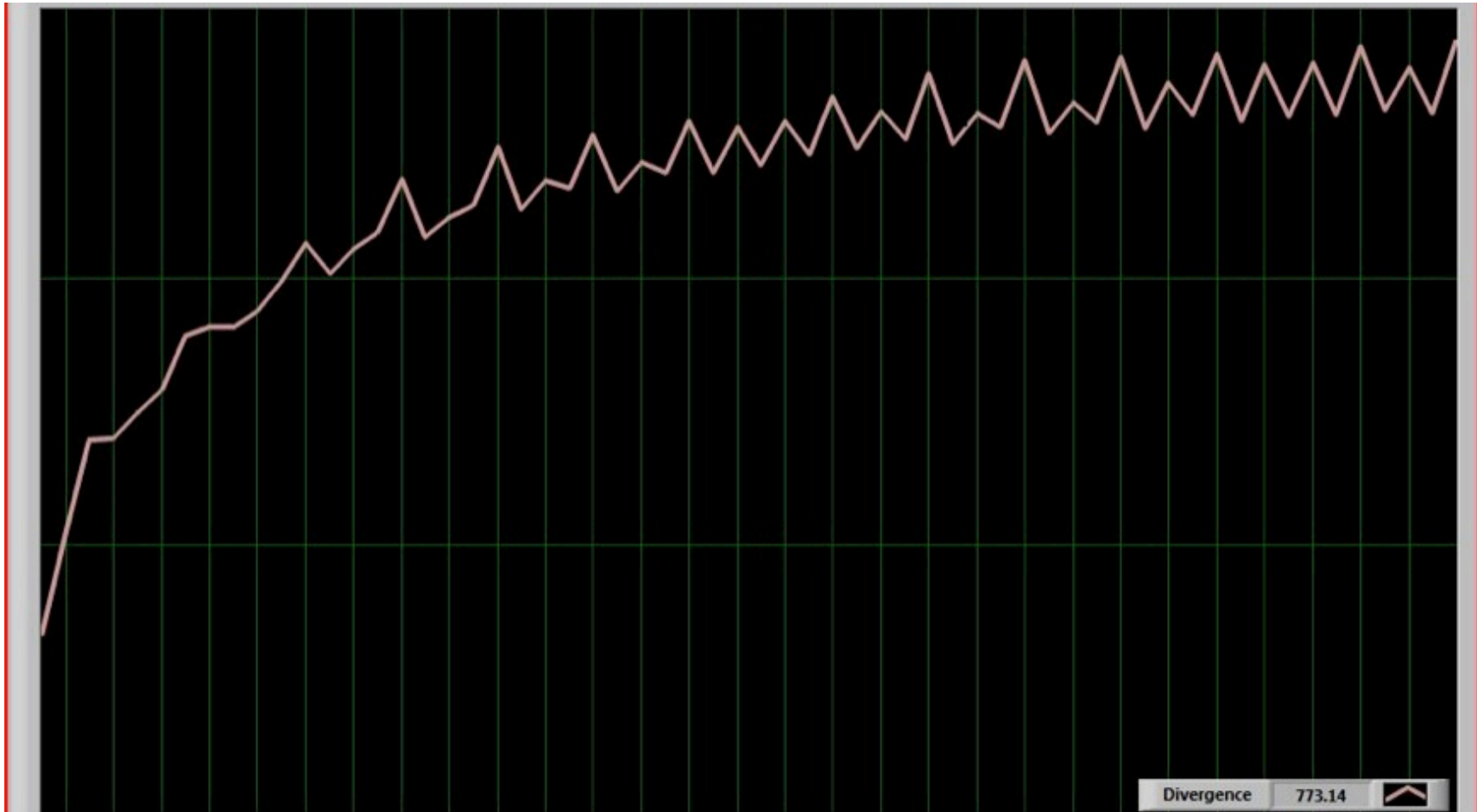


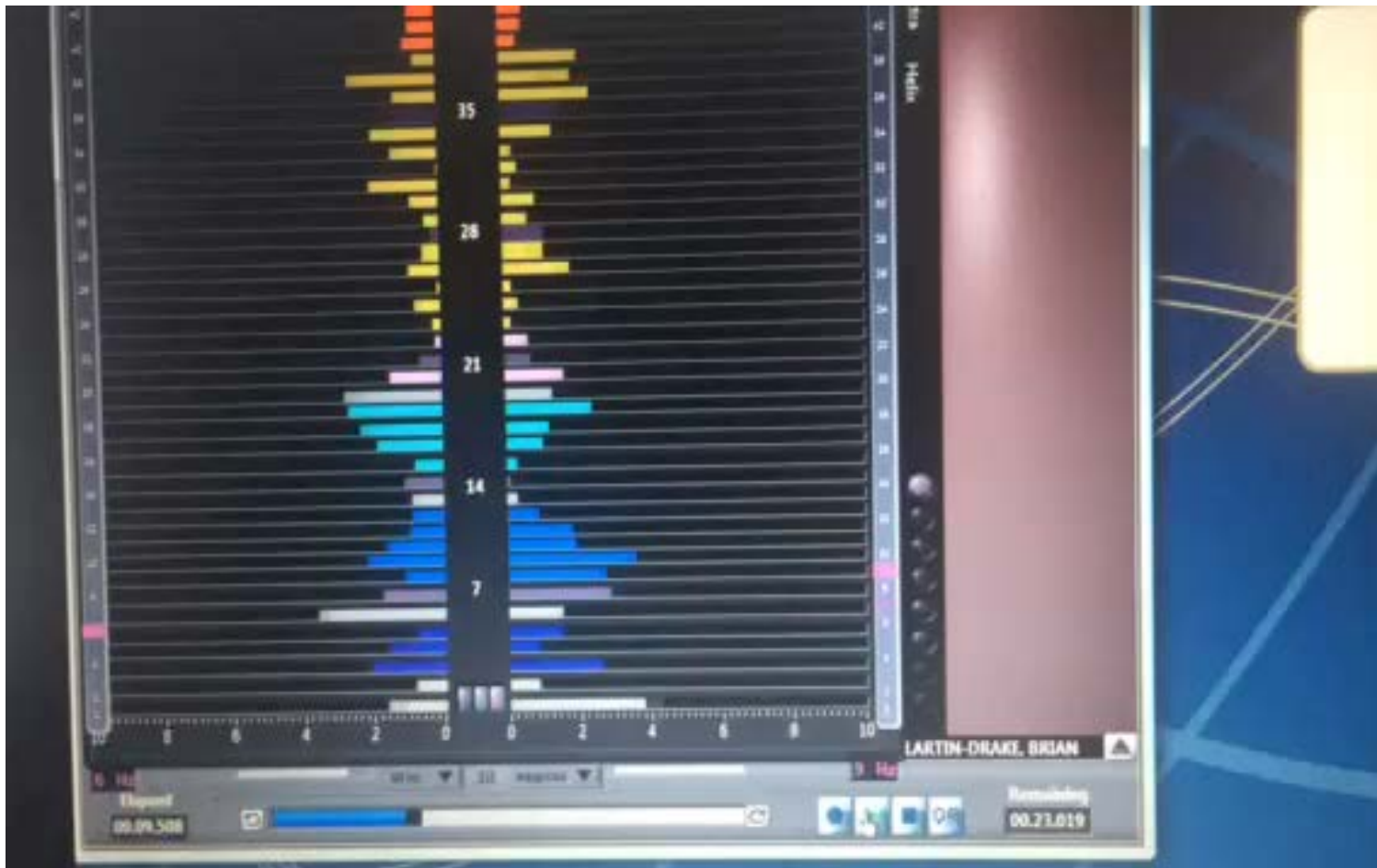
Postbaseline 4/09/12



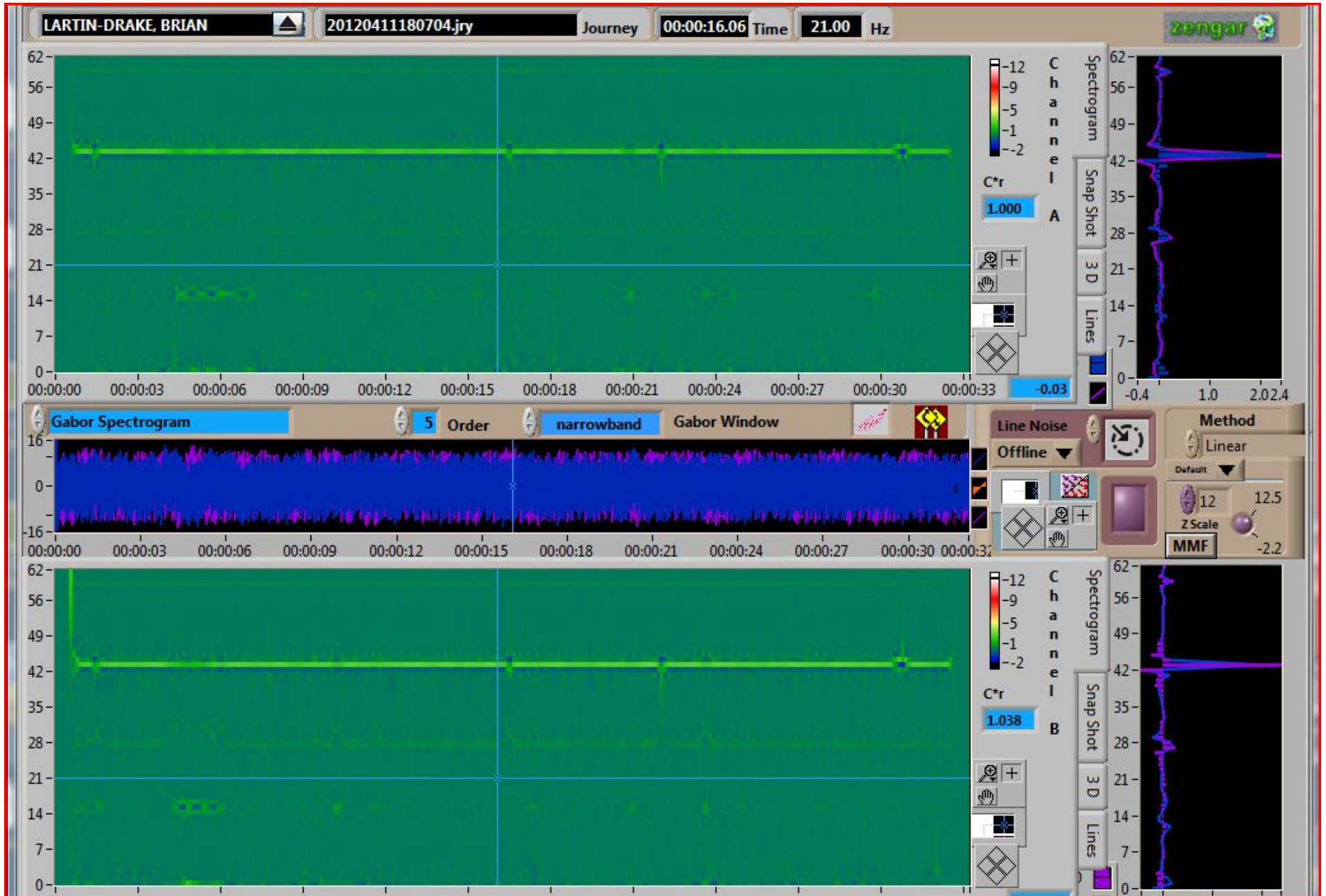
postbaseline

# Postbaseline 4/9/12



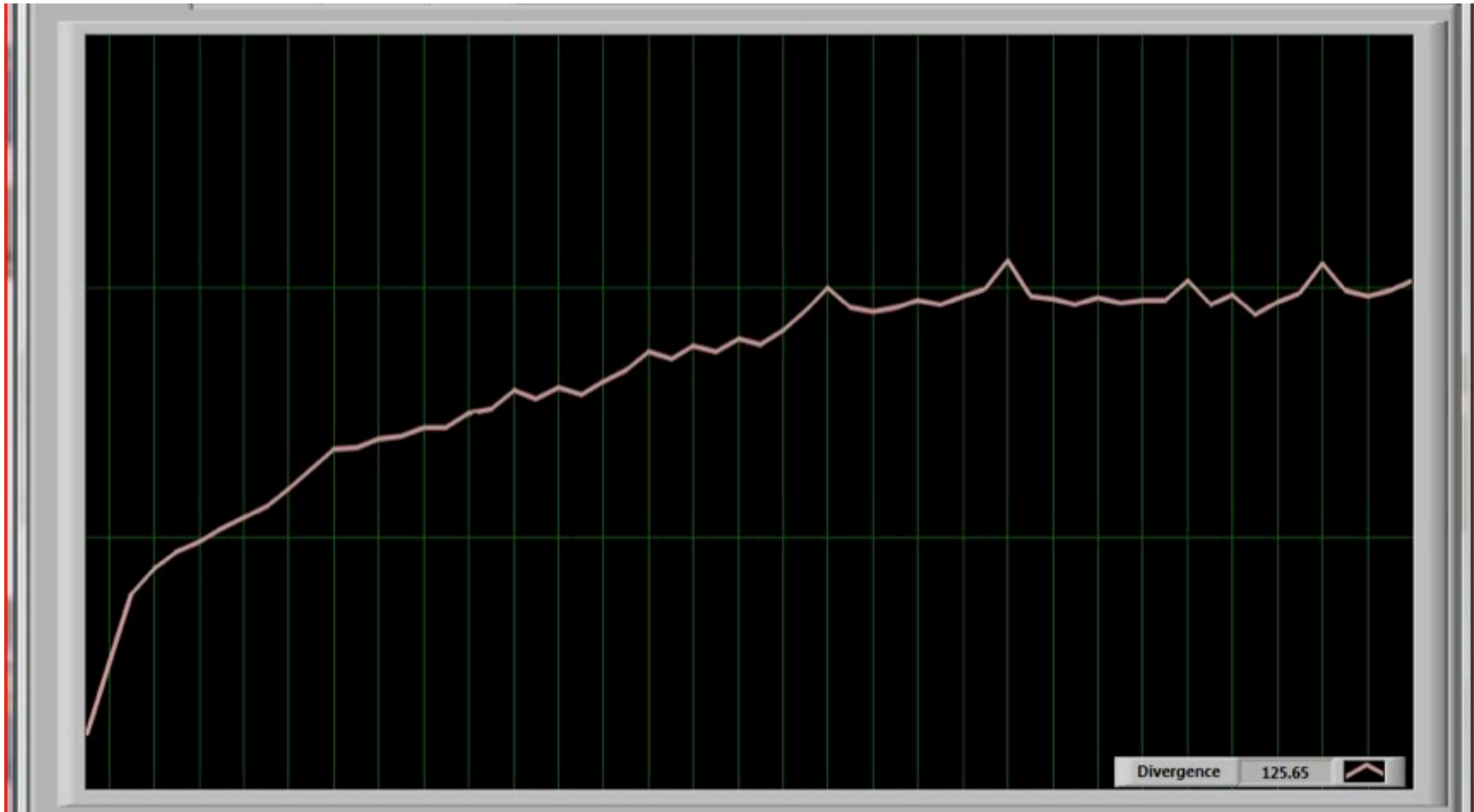


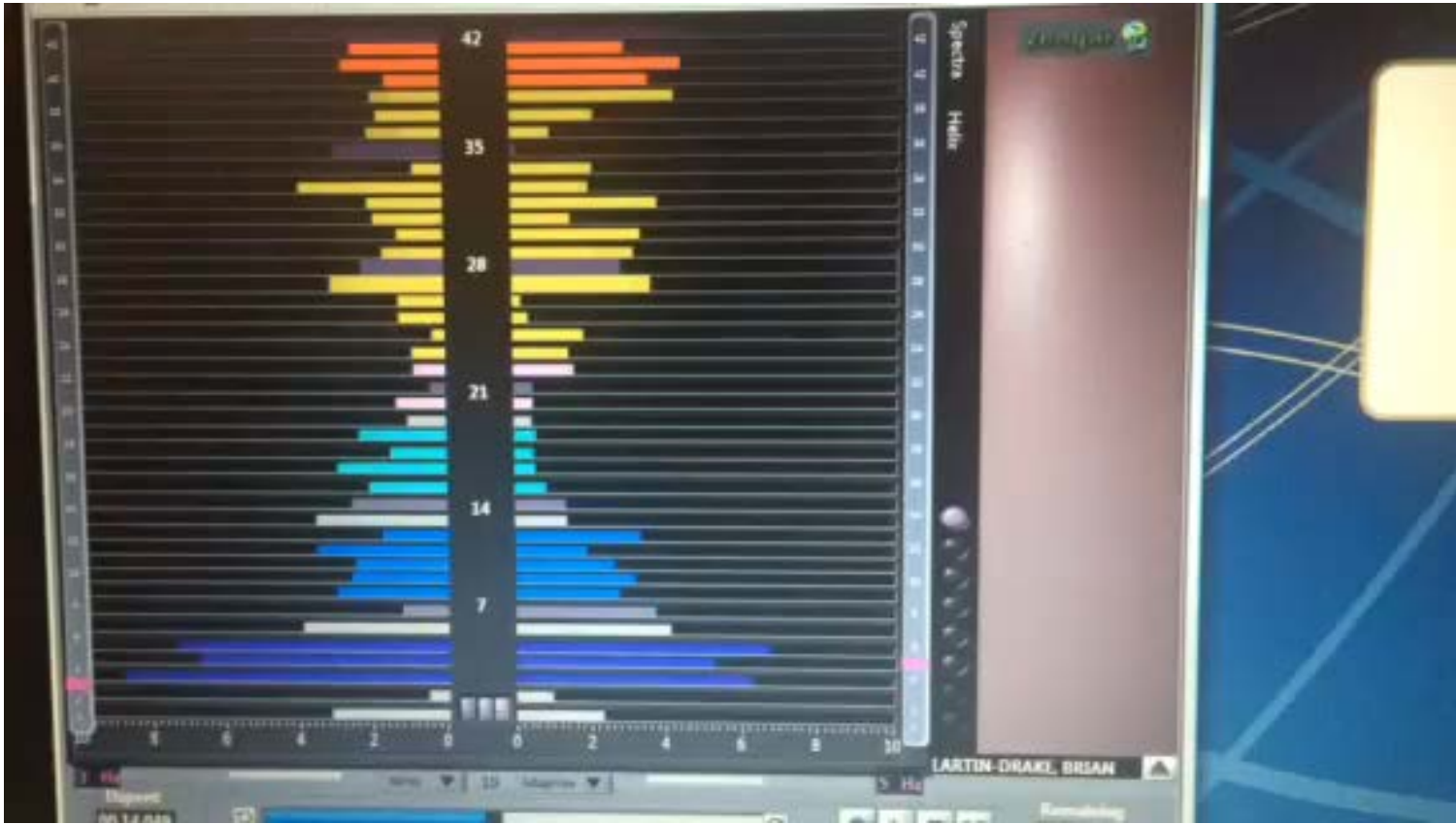
Pre-baseline 4/11/12



prebaseline

# Prebaseline 4/11/12





Post-baseline 4/11/12



LARTIN-DRAKE, BRIAN

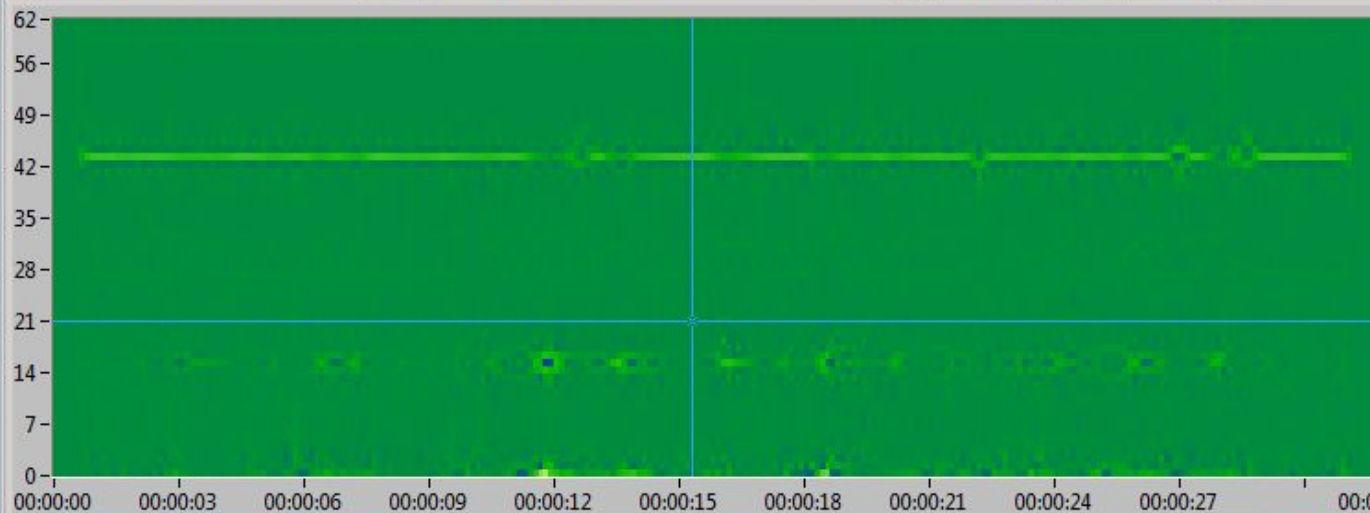
20120411184658.jry

Journey

00:00:15.31 Time

21.00 Hz

zengar

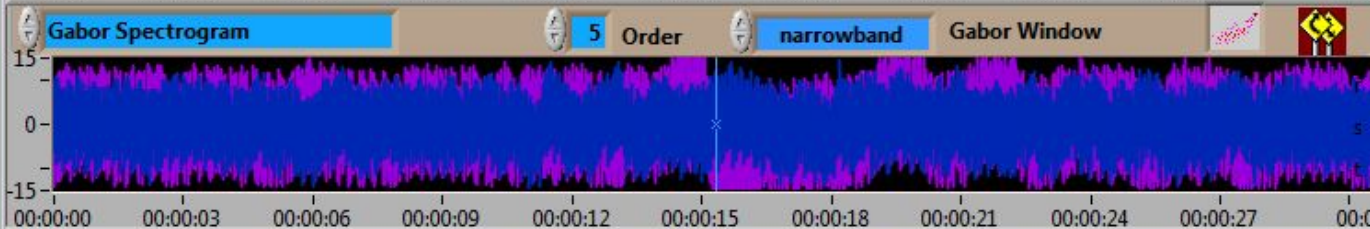
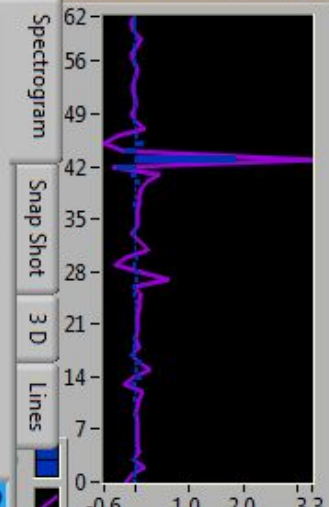


Channel A

C\*r 1.000

0.00

+  
-  
3 D  
Lines

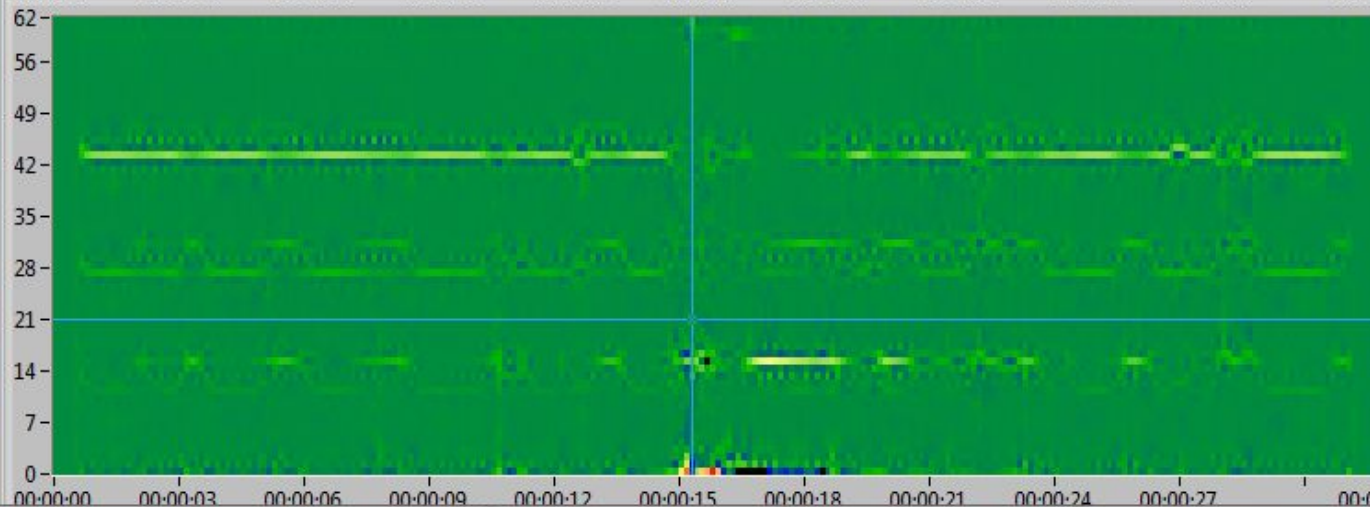


Line Noise Offline

Method Linear

Z Scale 15 14.5

MMF -3.1

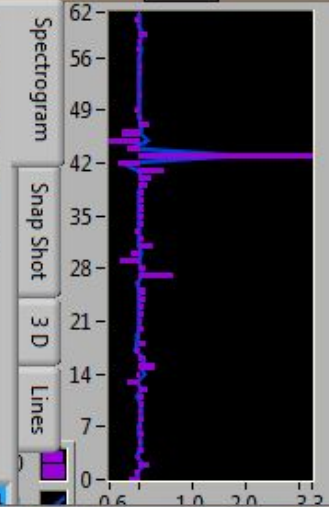


Channel B

C\*r 1.000

0.04

+  
-  
3 D  
Lines





4/11/12 post baseline

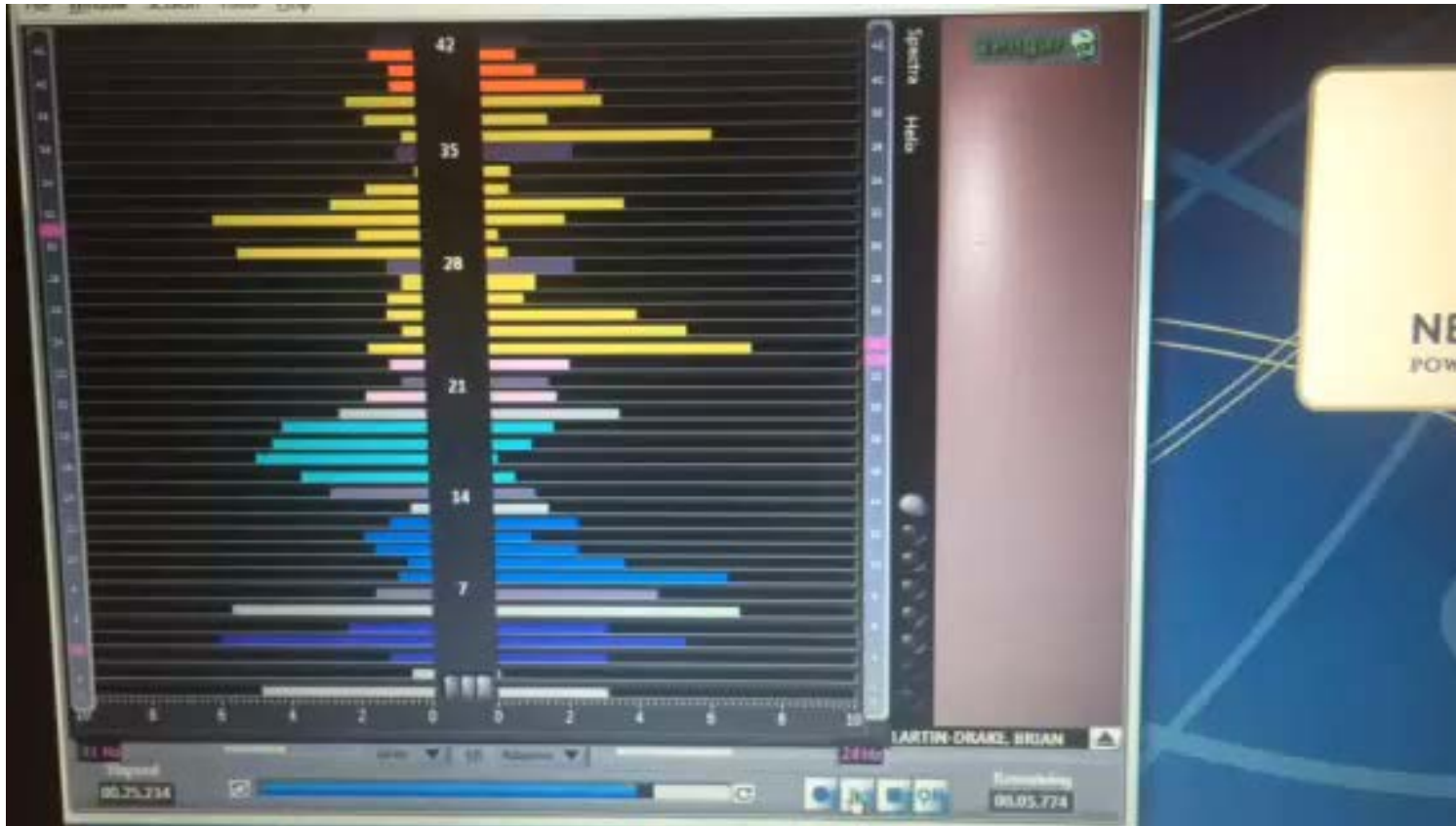
# Clinical progress

- Can follow some commands
- No seizures as of 4/10, Dilantin ends ~ 4/18
- 4/11/12 still on ventilator

# The Step down unit, 1<sup>st</sup> time OOB

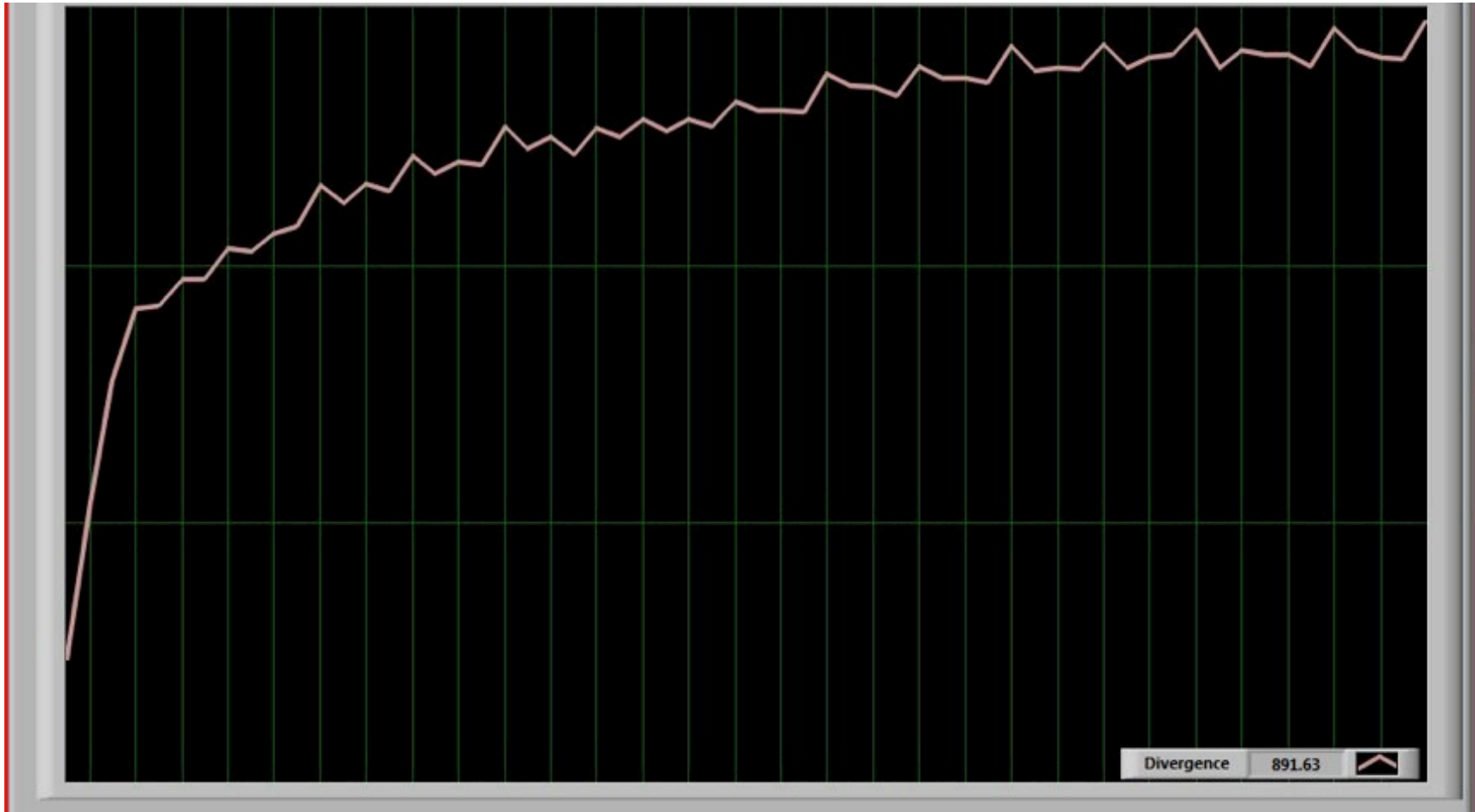


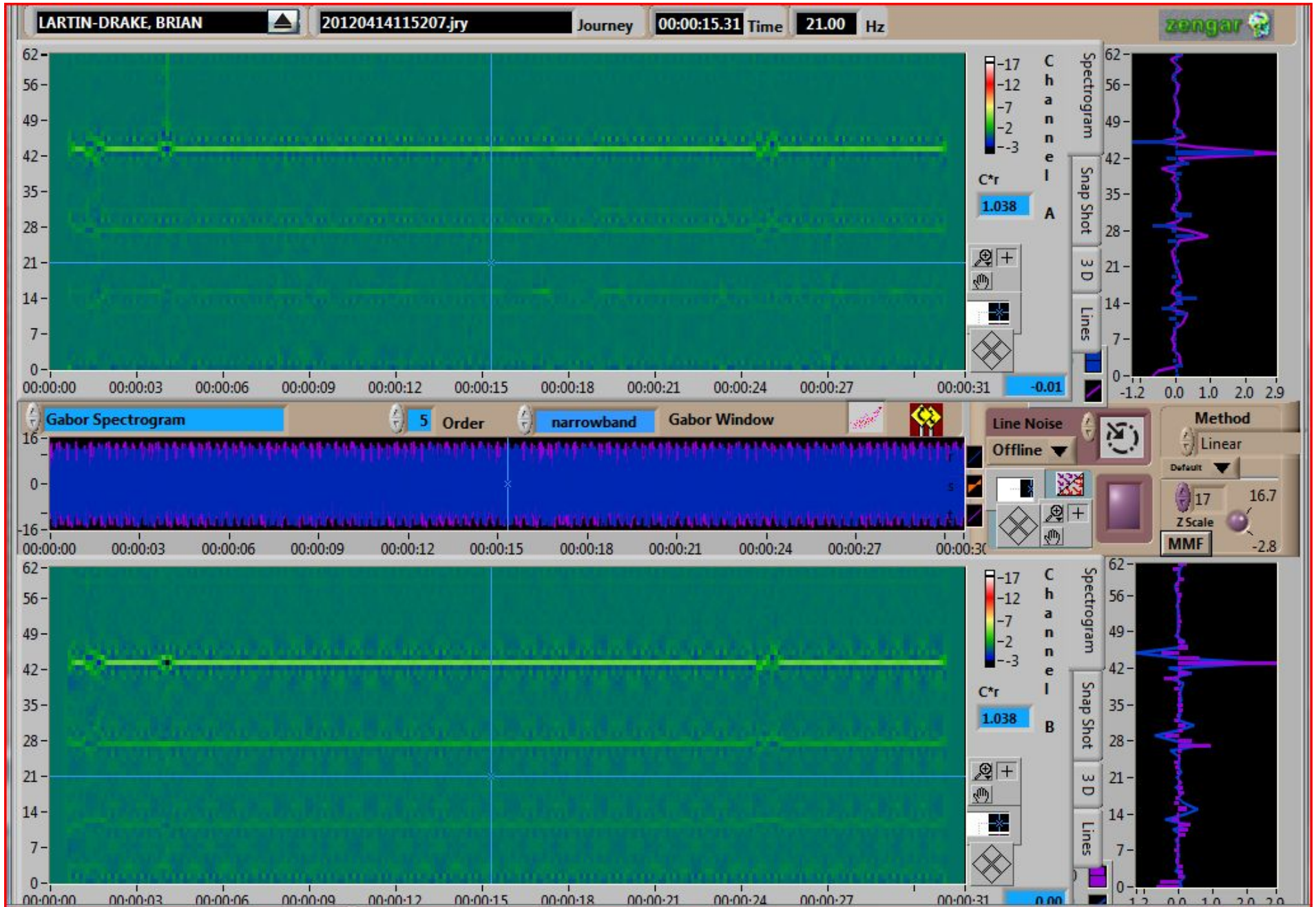
- 4/14/12-two sessions:
- Pre-baseline 1 at noon: video, spectrograph CCAC
- Post-baseline 1 (12:40)video, spectrograph CCAC
- Pre-baseline 1 (4:30): video, spectrograph, CCAC
- 2<sup>nd</sup> journey: video, spectrograph, CCAC
- Post-baseline 1 at 5:15: video, spectrograph, CCAC



4/14/12 1<sup>st</sup> prebaseline at noon

# Prebaseline 2 4/12/12



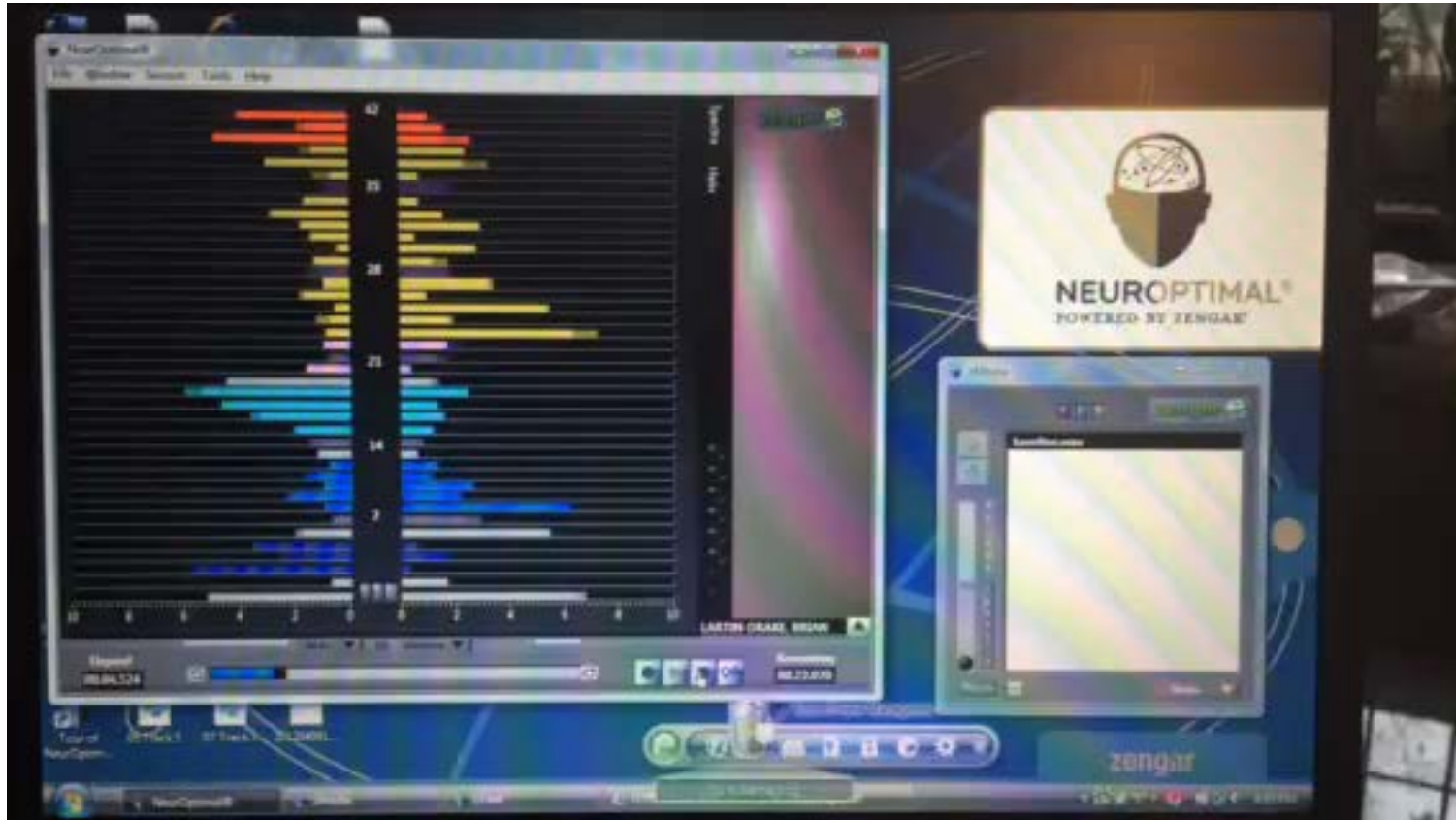


4/14/12 1<sup>st</sup> prebaseline

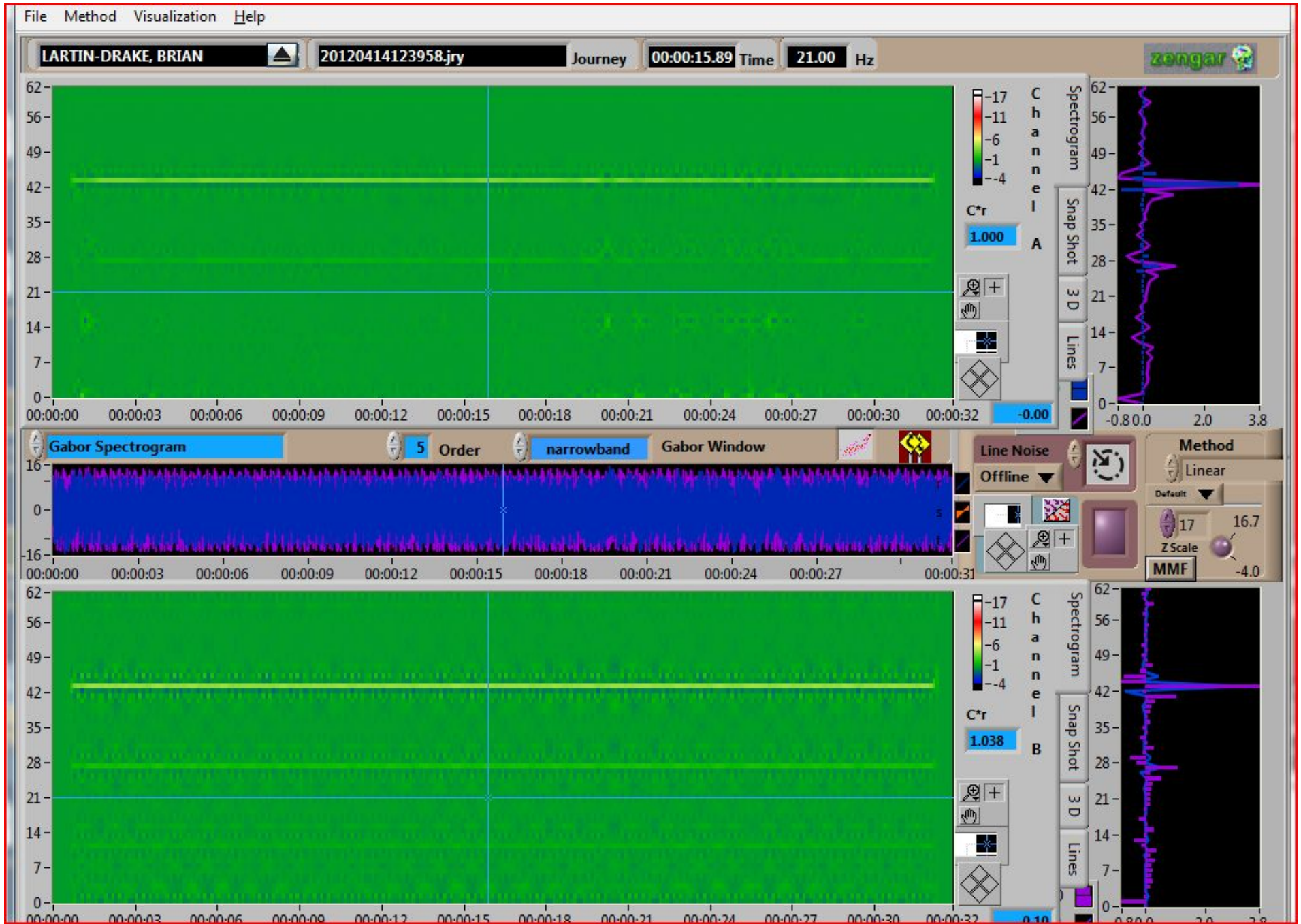


# Prebaseline 4/14/12 (1<sup>st</sup>)



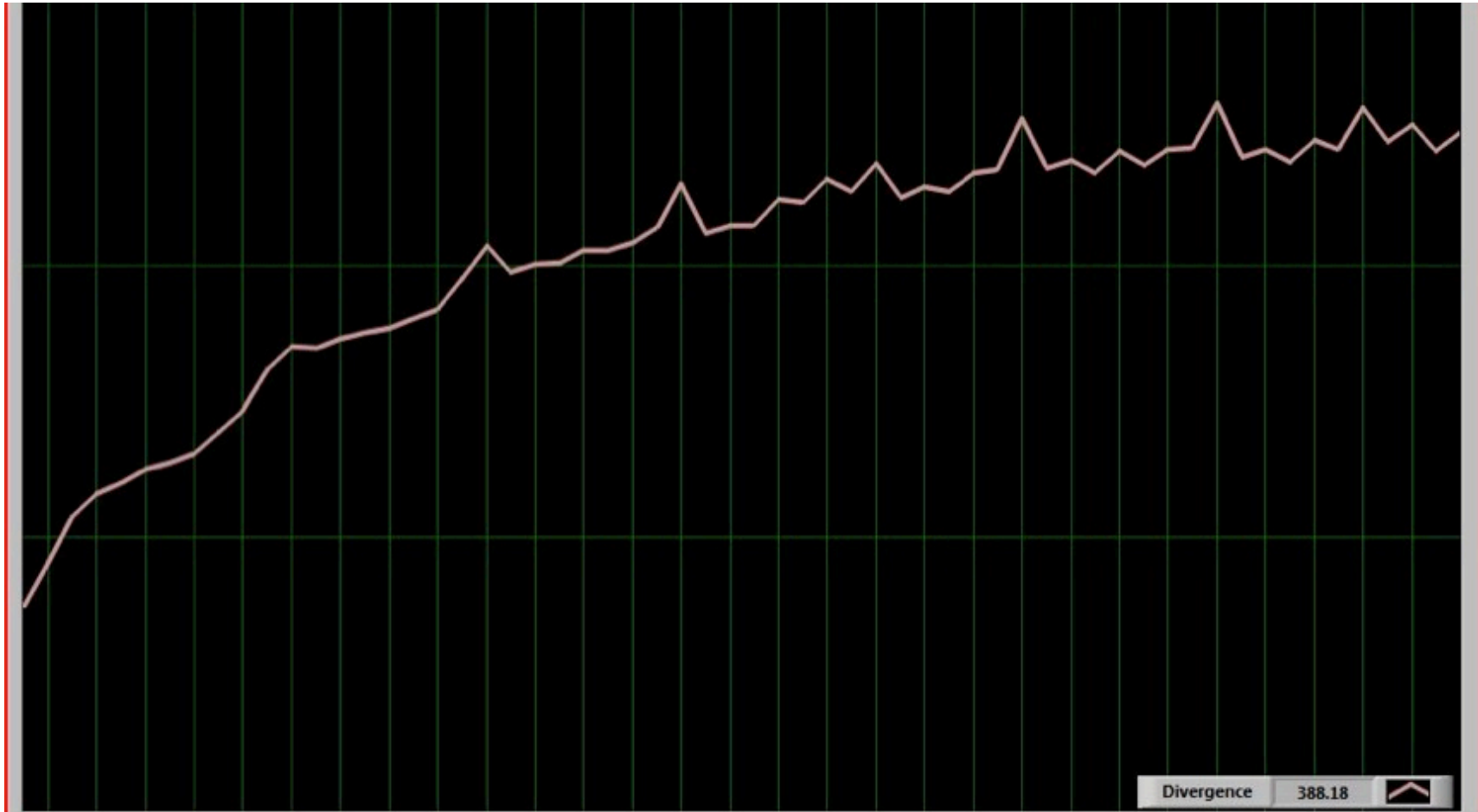


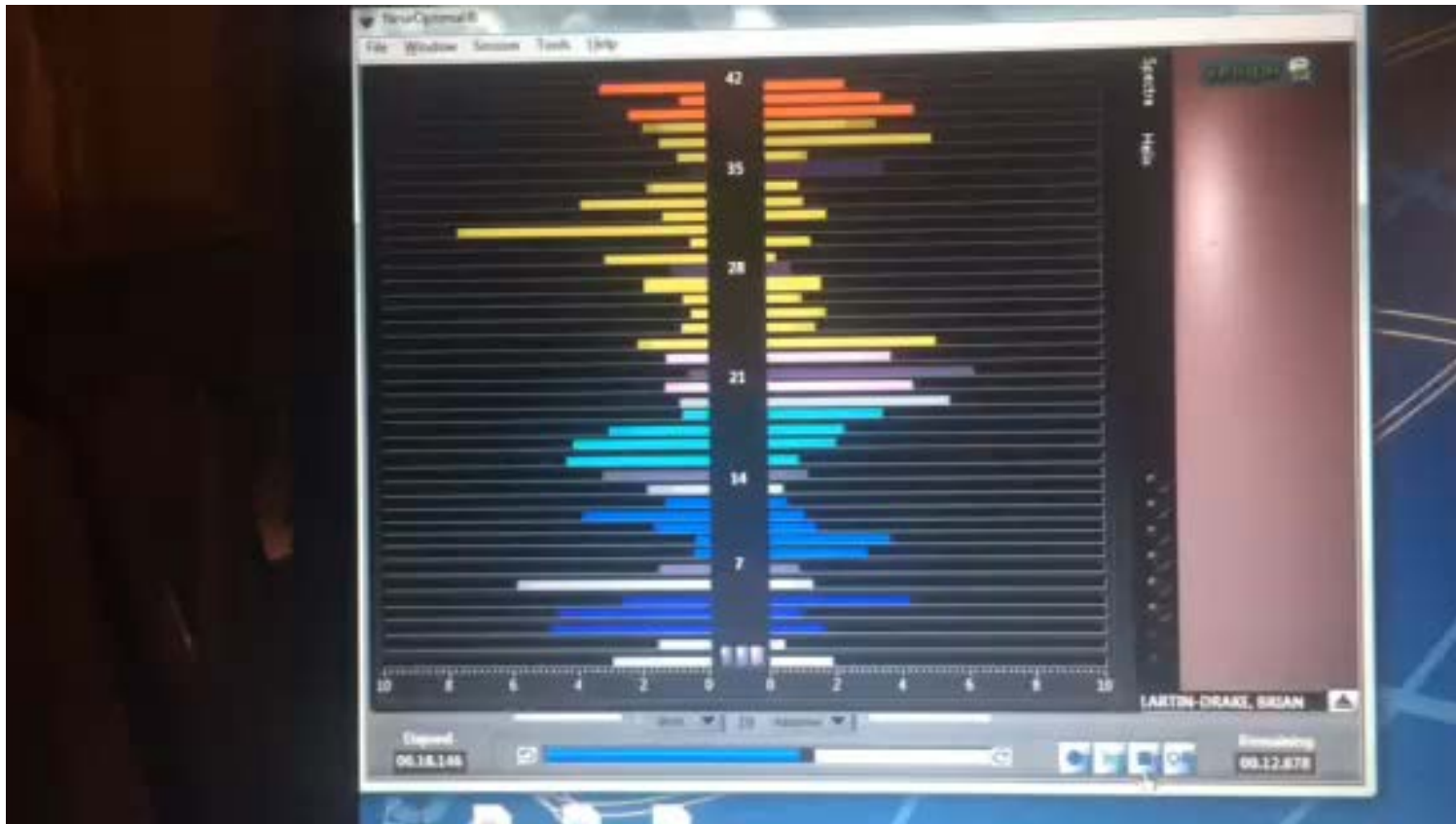
1<sup>st</sup> post-baseline 4/14/12 12:40 pm



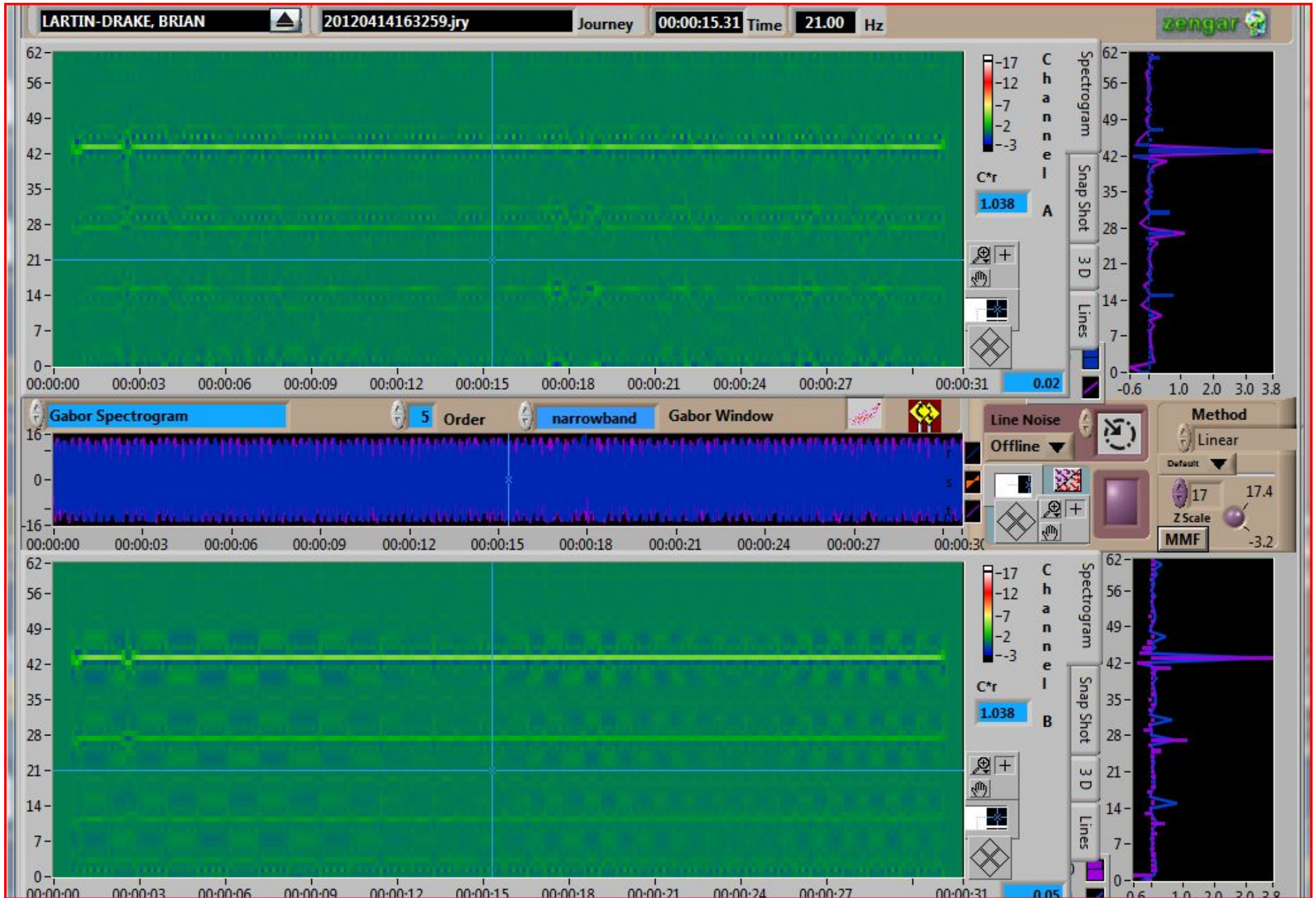
1<sup>st</sup> post-baseline 4/14/12

# Postbaseline 4/14/12 (1<sup>st</sup>)





4/14/12 2<sup>nd</sup> prebaseline zMirror (also post)



4/14/12 2<sup>nd</sup> prebaseline spectrogram-also a post of the day's first session

Client **LARTIN-DRAKE, BRIAN**

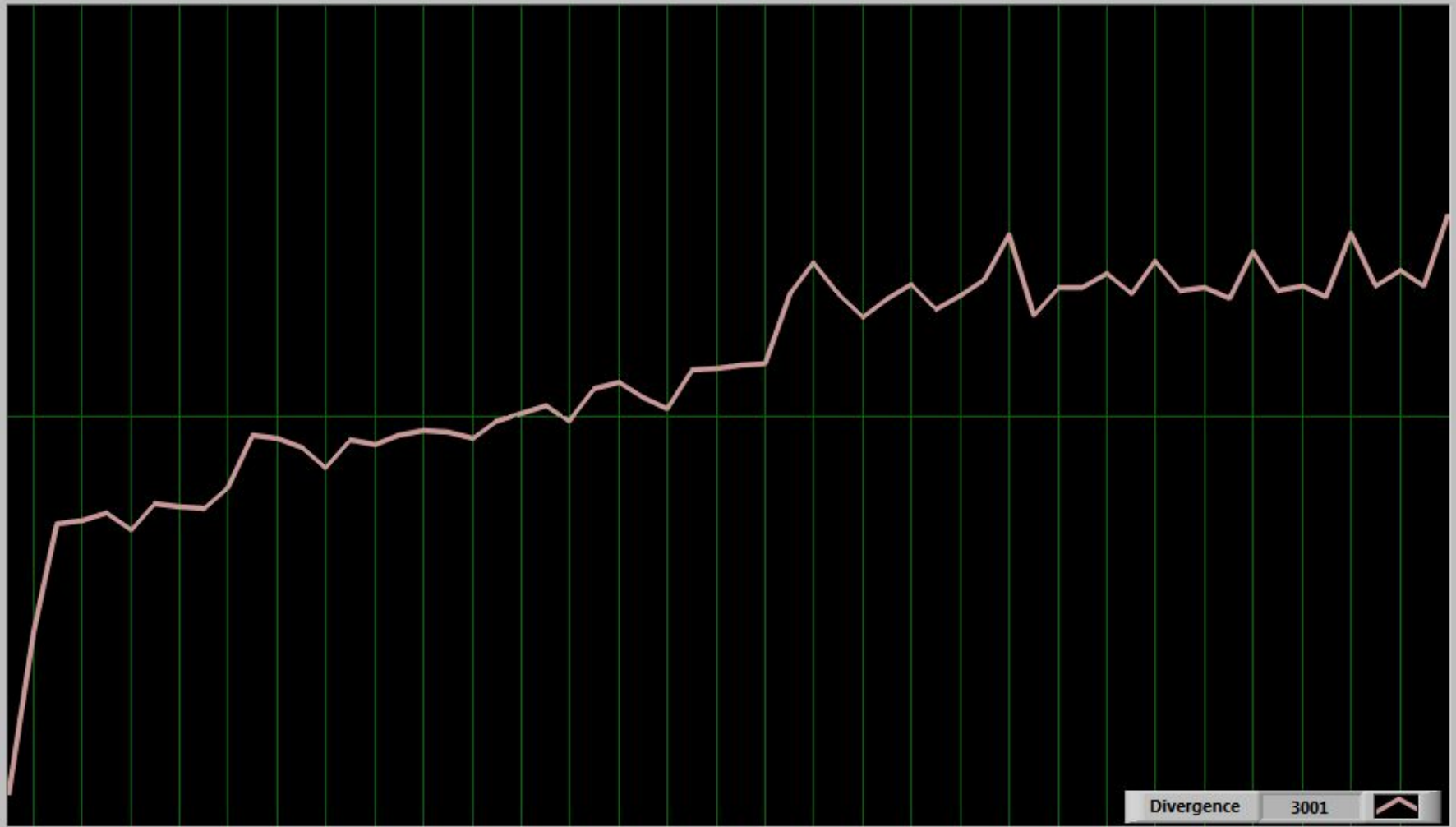
Journey **20120412191057.jry**

Date **Sunday, December 15, 2013**

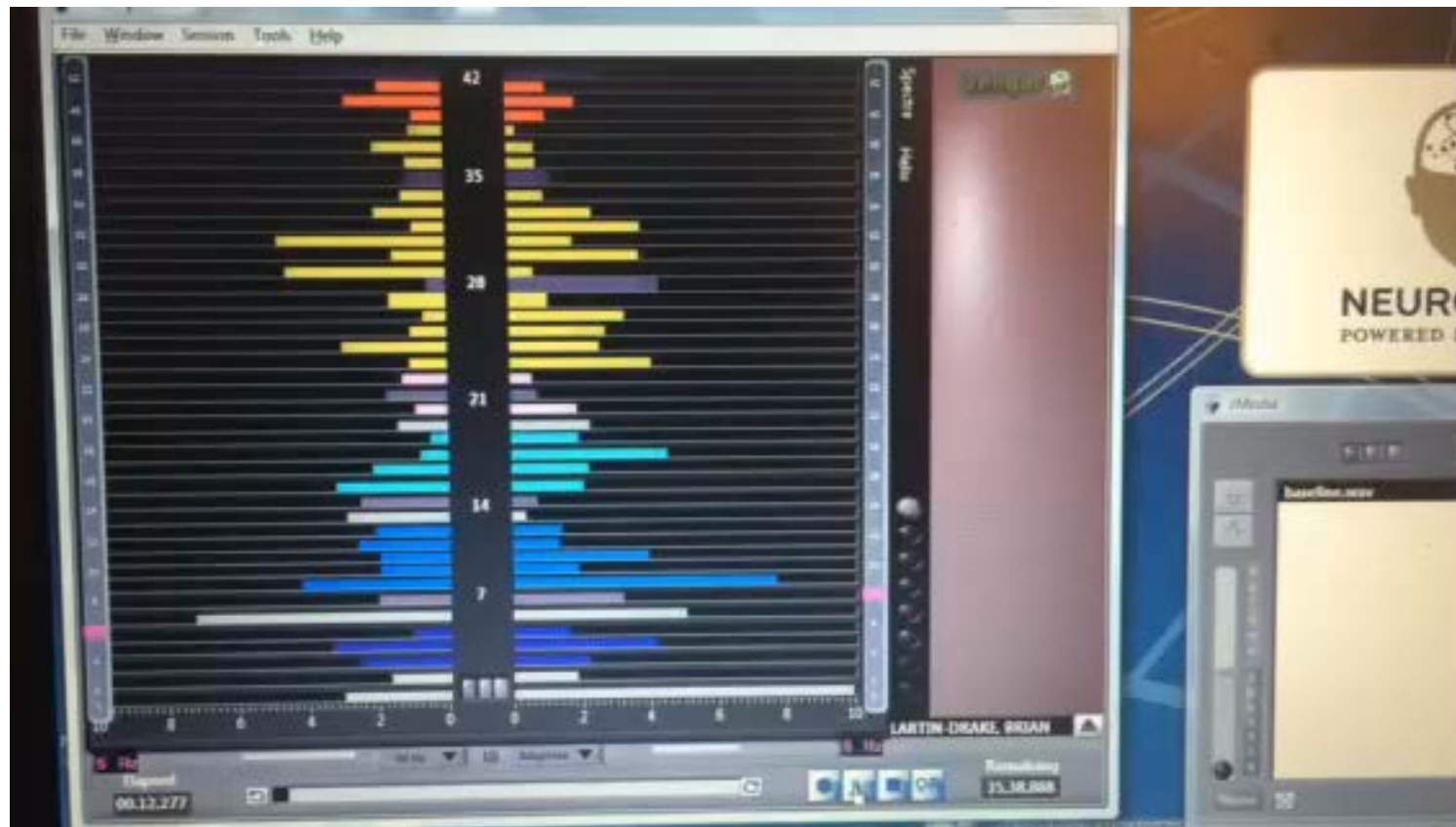


**zengar**

Cross Corr of ACs   **Best Linear Fit**   Coherence   Transfer

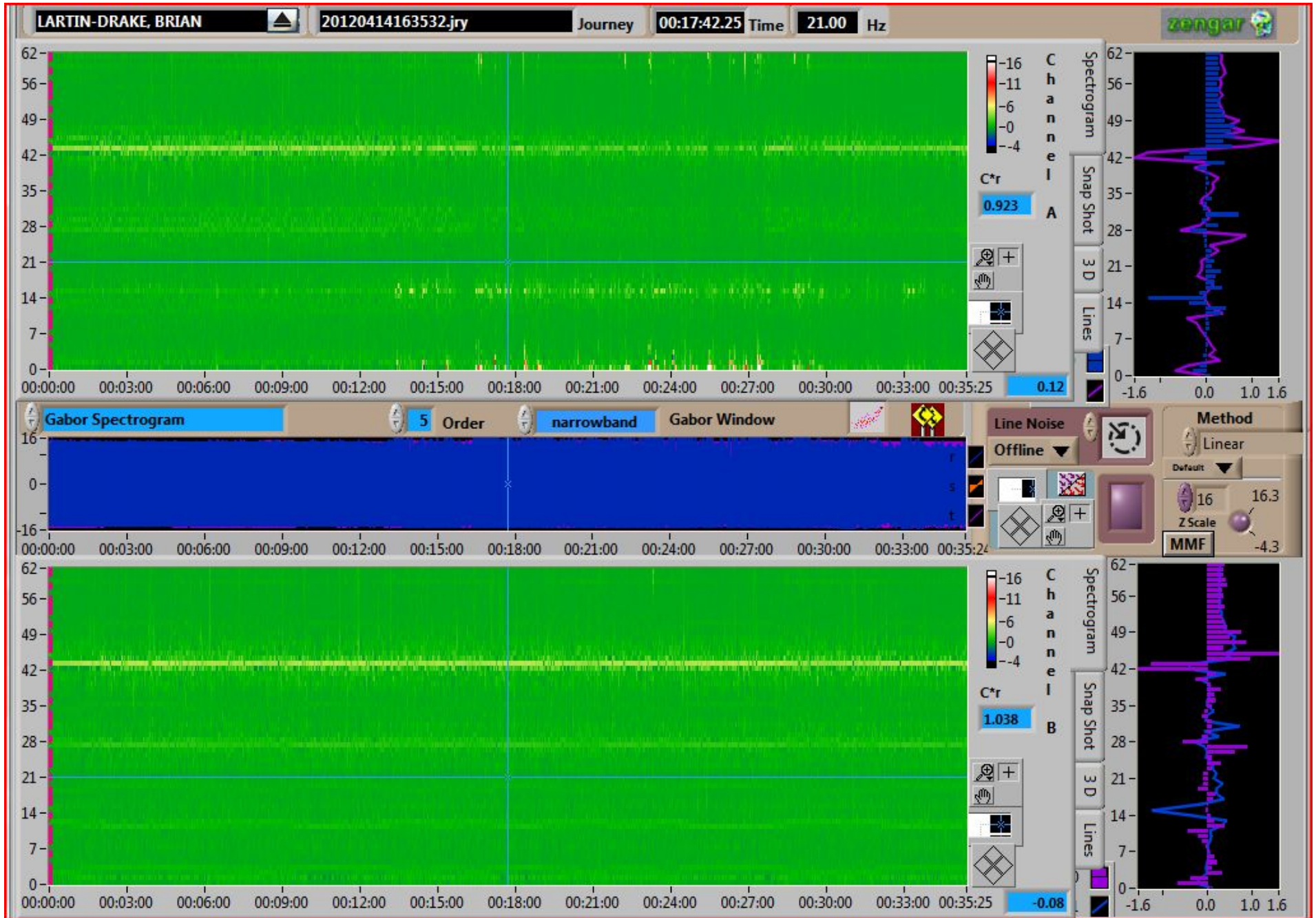


Divergence   3001



2<sup>nd</sup> journey 4/14/12, 4:35 pm

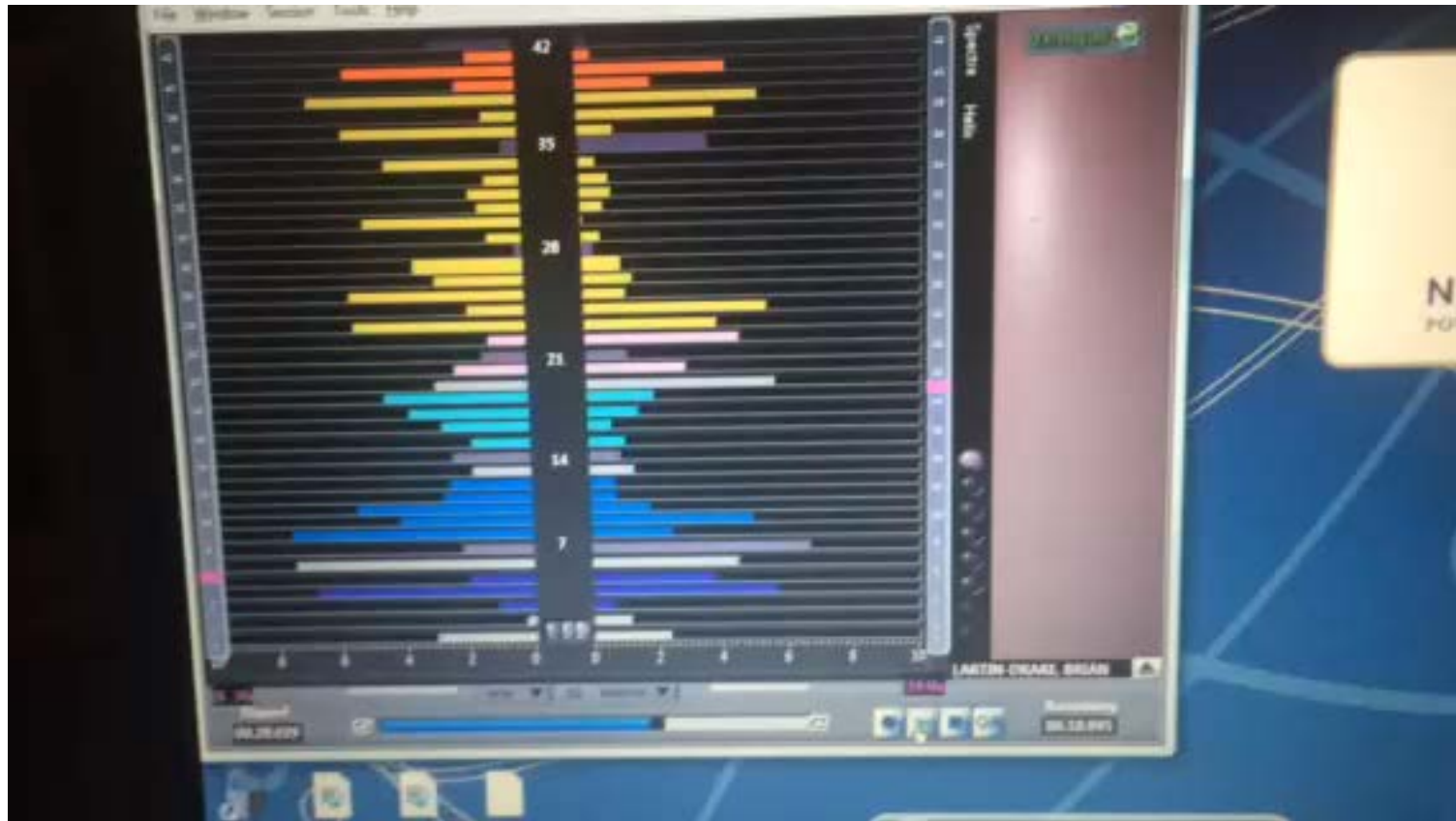




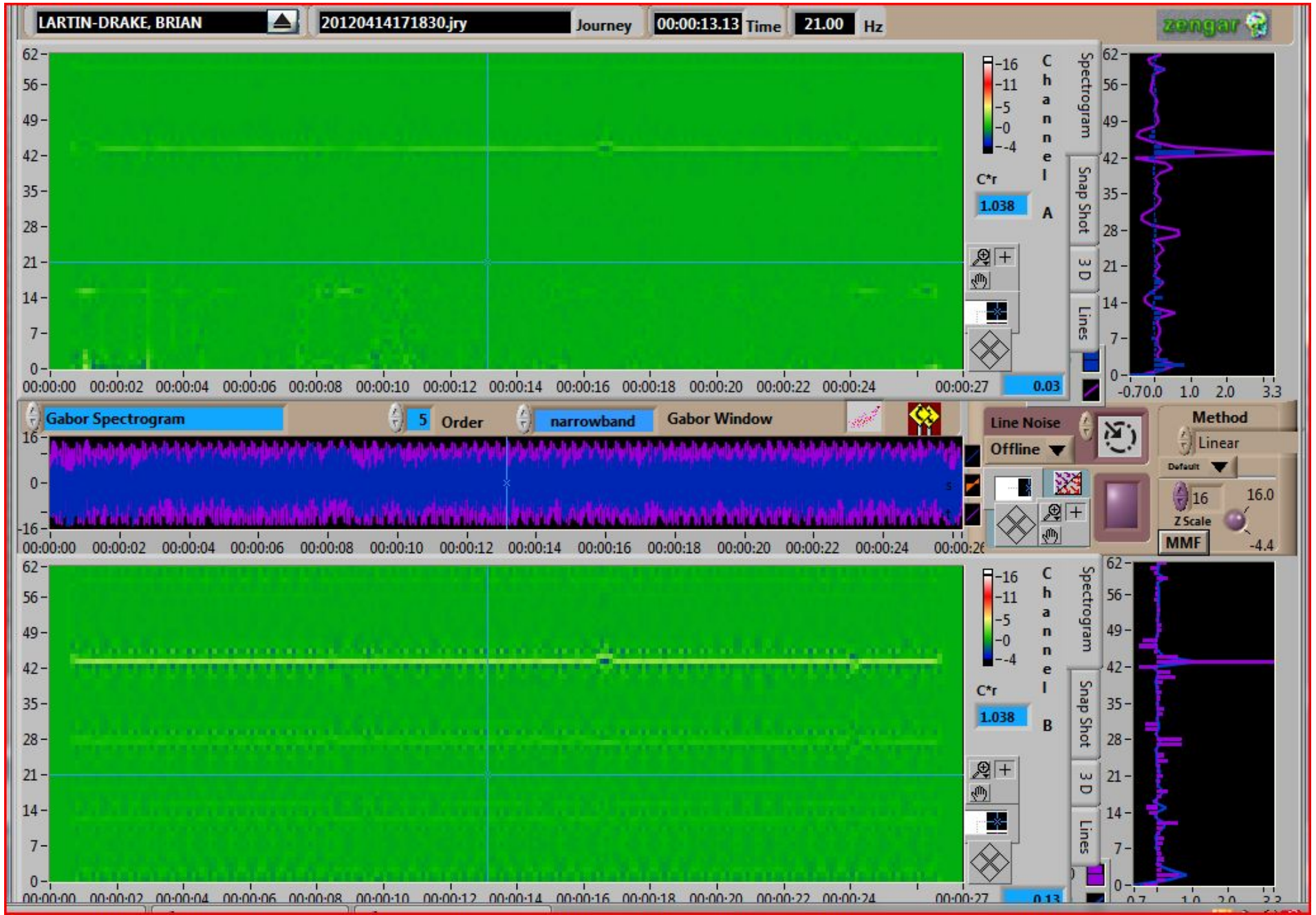
2<sup>nd</sup> journey spectrograph



2<sup>nd</sup> journey CCAC 4/14/12

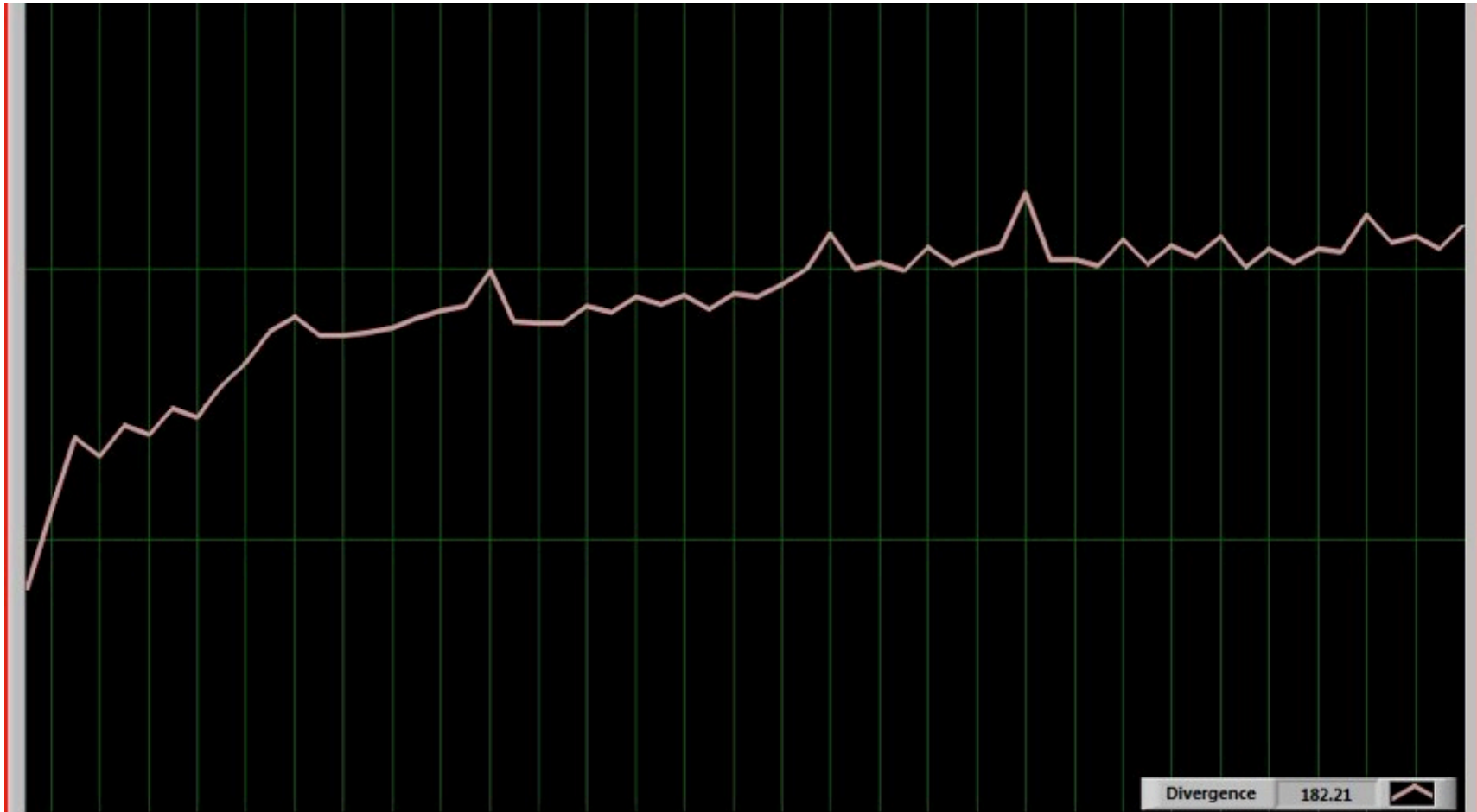


4/14/12 2<sup>nd</sup> postbaseline at 4:30 pm



4/14/12 2<sup>nd</sup> postbaseline

# Postbaseline 4/14/12 (2)





# Clinical progress

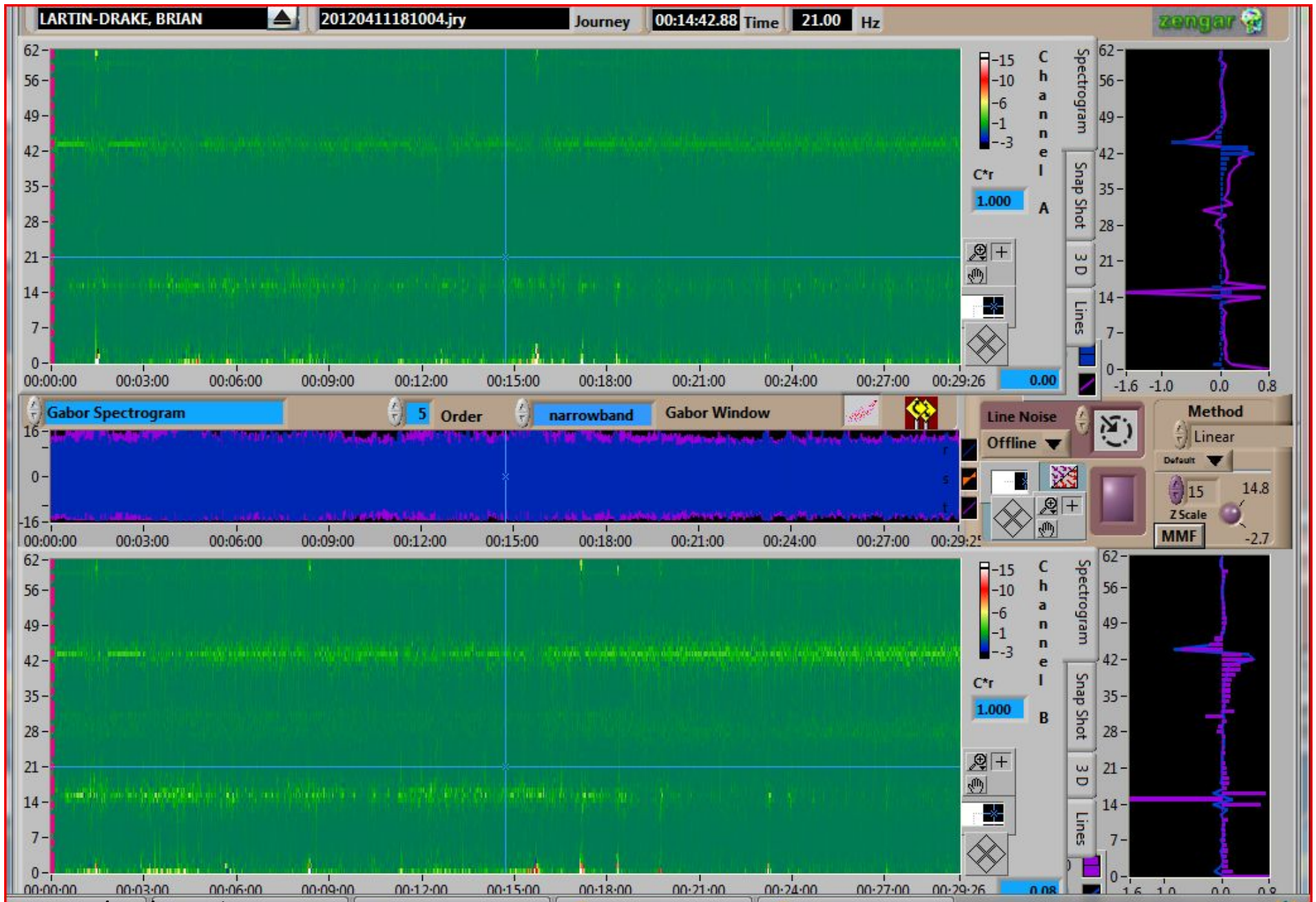
- 8 sessions by 4/16/12; swallowing, sherbert, less restless; seemed to be tracking
- By 4/18, 4 more, improved motor control, nudging Jess with his foot and squeezed her hand, wiggled feet upon request
- Hand surgery 4/19, hugely disruptive
- 4/23, Asked by speech therapist to identify an object; Brian said “pear” and said “Andrei” when his friend entered the room
- He’s coming back!

# Clinical progress

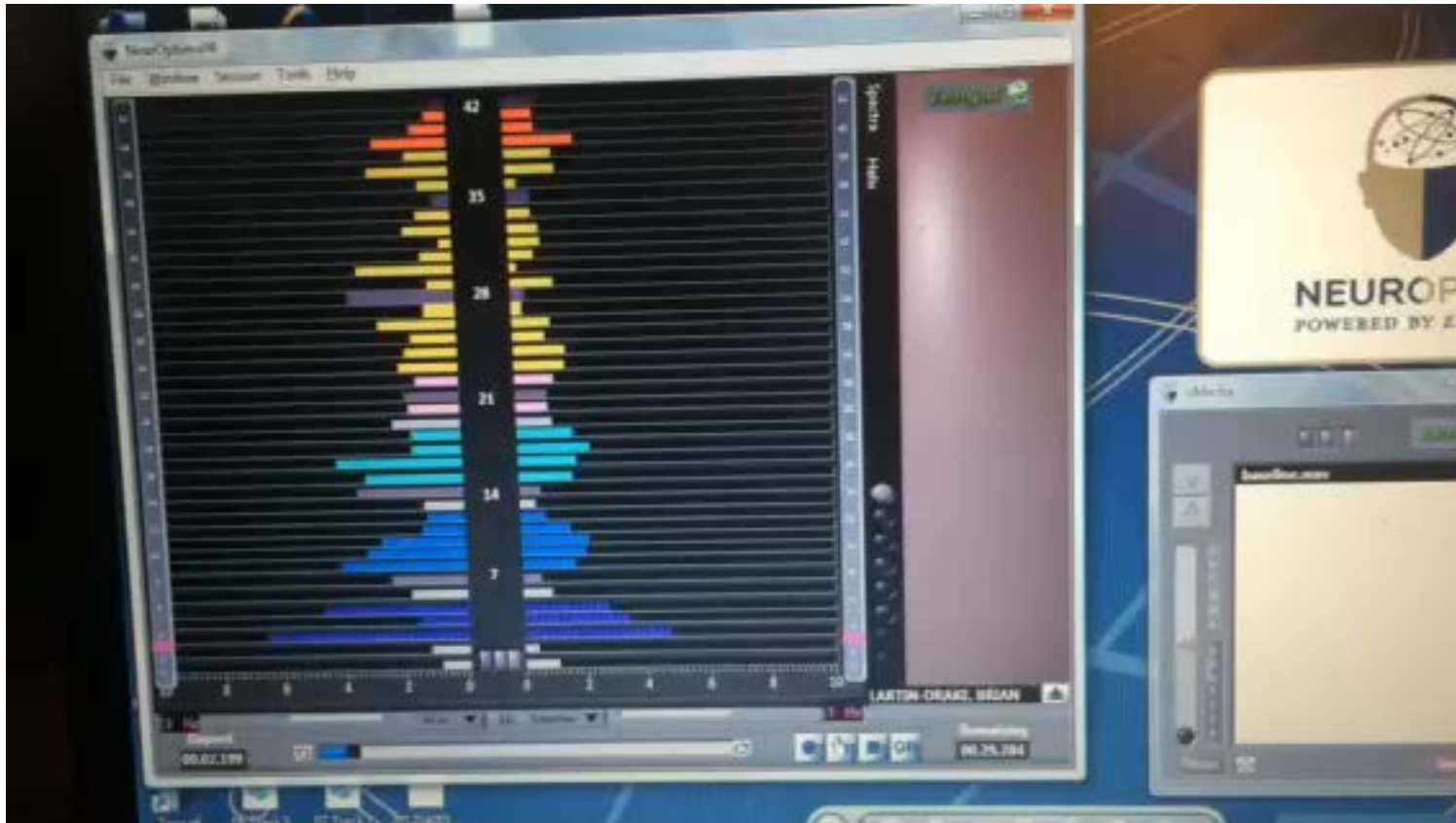
- 15 sessions in 18 days, 5 over 3 day period
- 4/23-Isolated, context ,words-"hi"
- Expressing full range of emotions, aware of impact of accident
- Sitting in chair w assistance
- 4/25-to rehab w/ no tubes
- 5/1-more present
- Speech intelligibility variable (What's all that shit doing on the floor?")



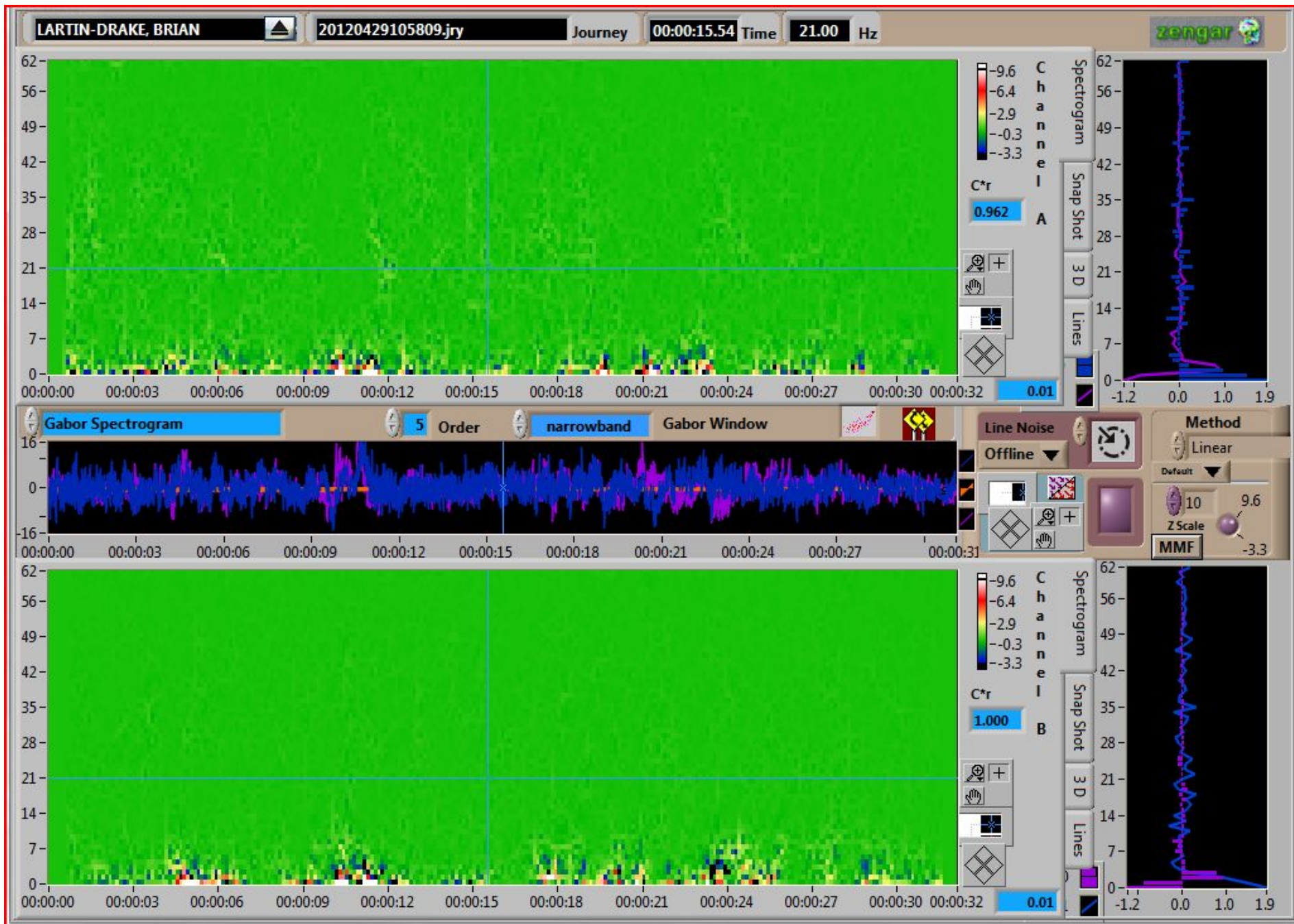




4/29/12 1<sup>st</sup> prebaseline



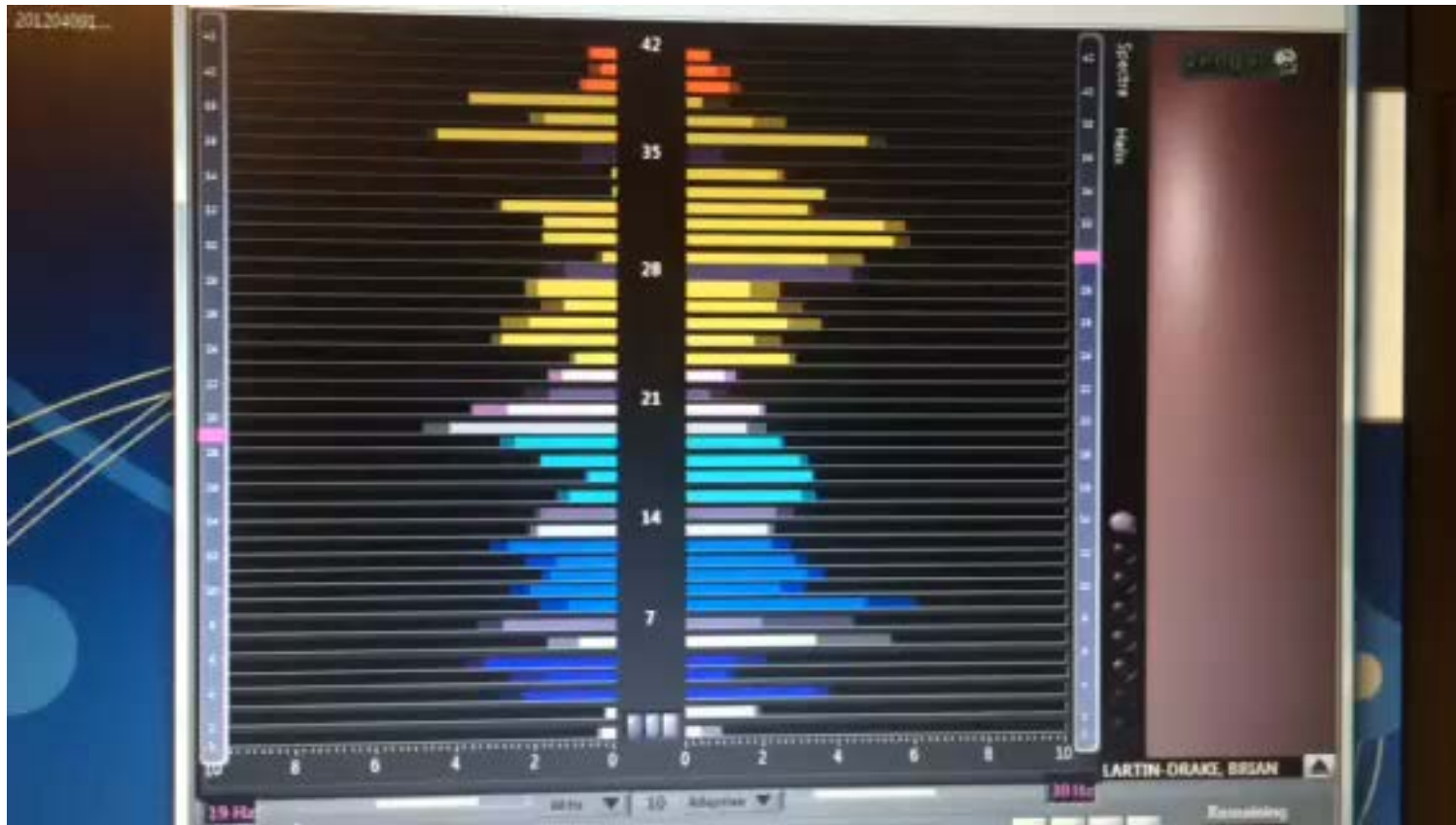
4/29/12 1<sup>st</sup> base-line



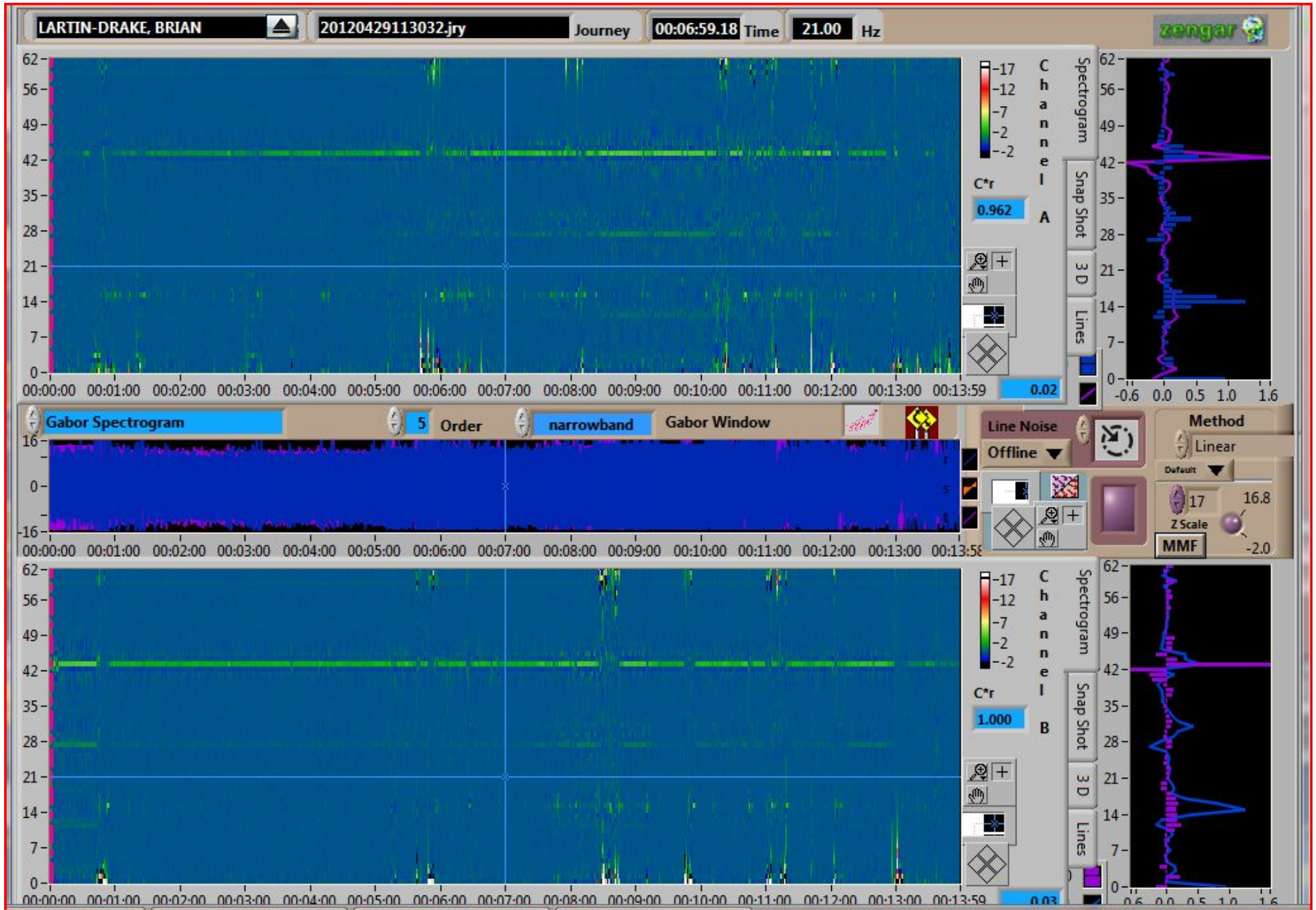
4/29/12 1<sup>st</sup> pre-baseline



4/29/12 1<sup>st</sup> prebaseline ccac



4/29/12 1<sup>st</sup> journey



4/29/12 1<sup>st</sup> journey spectrogram



4/29/12 1<sup>st</sup> journey ccac



# May 2012

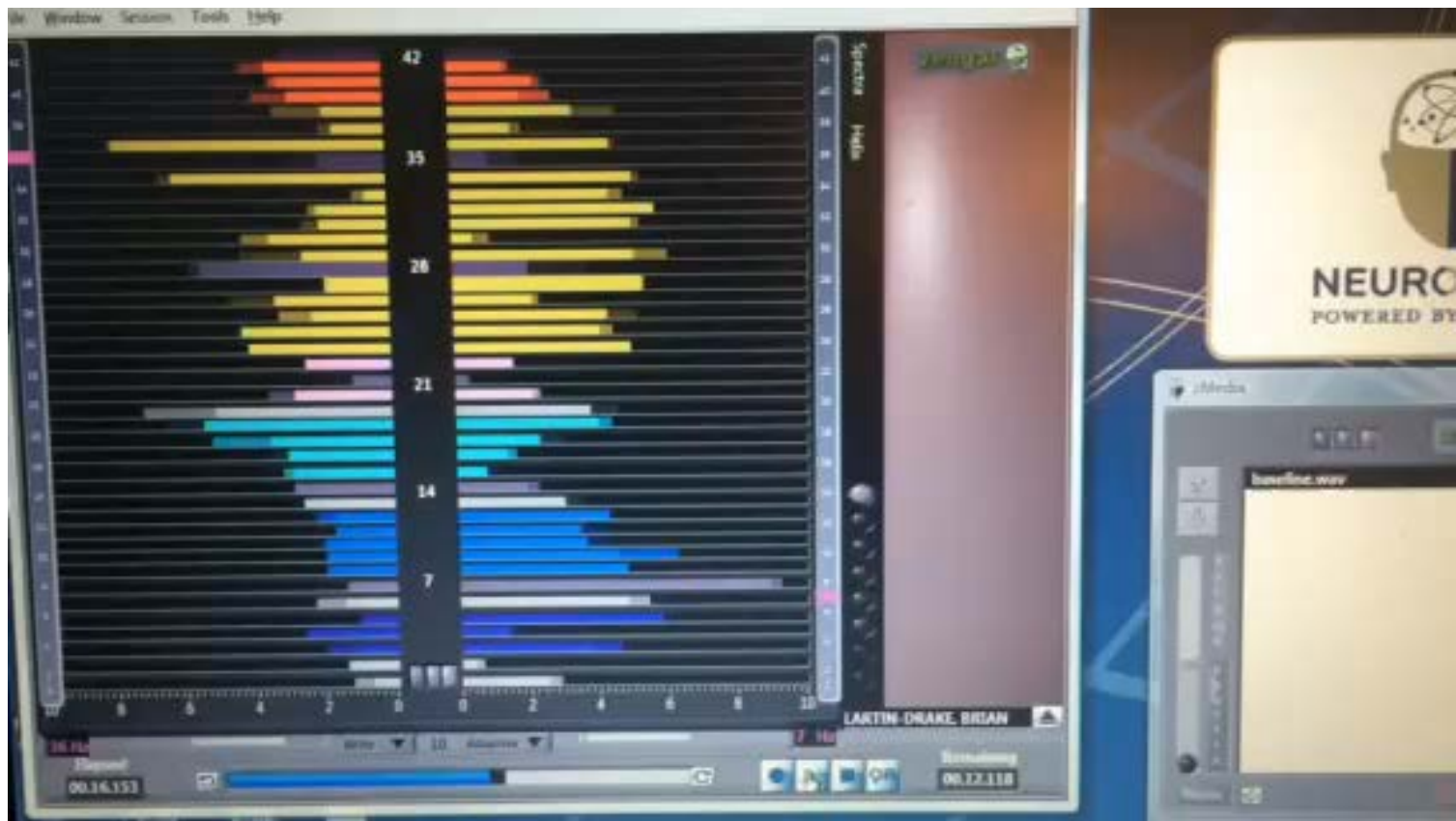
- 5/2-eating everything in sight, own clothes, standing and able to walk w support in PT
- “How are you?”
- Walking entire hall w/ assistance
- Staff are “pleasantly surprised” by the amount and speed of his progress



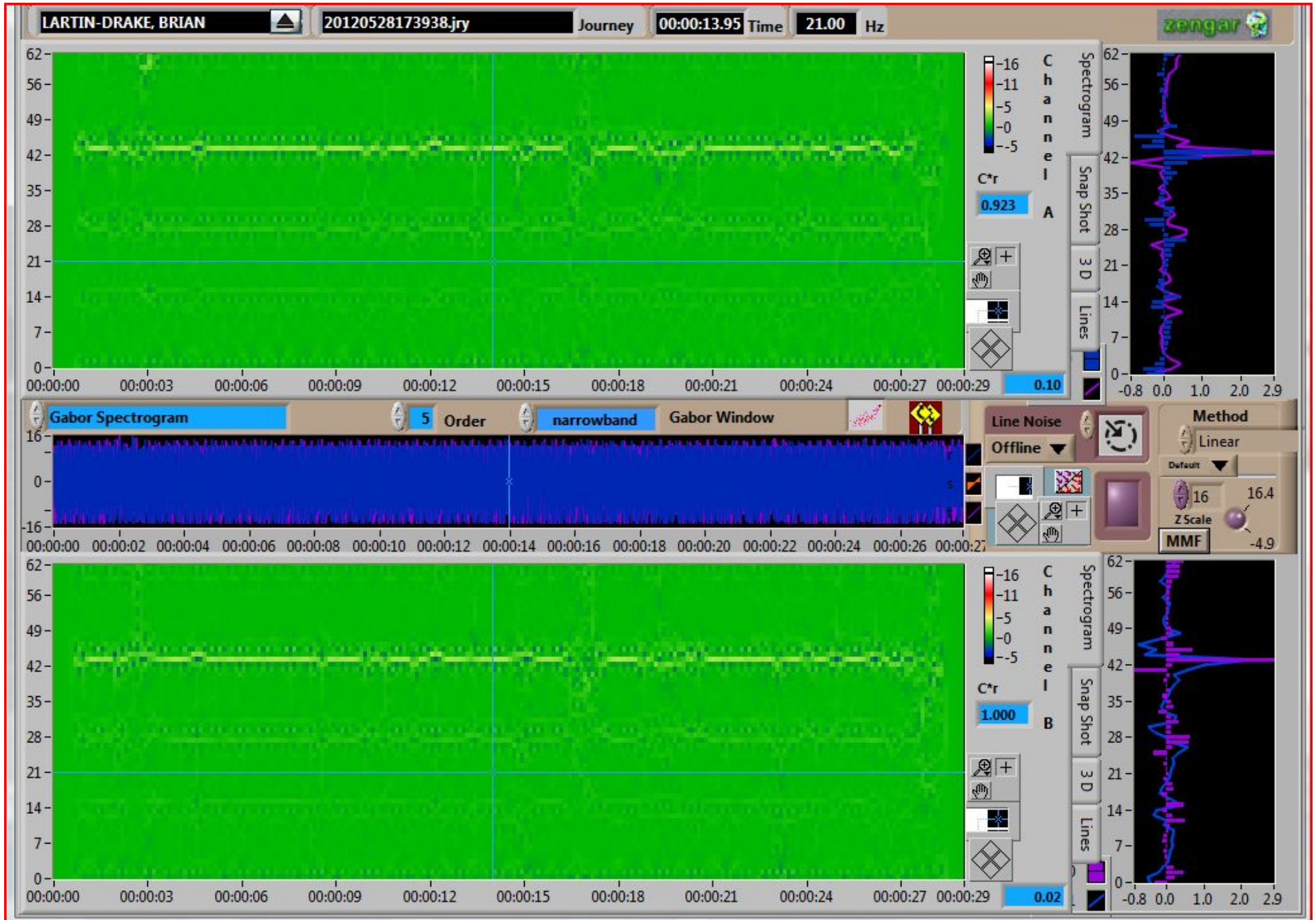








5/28/12 pre-baseline 7 weeks out

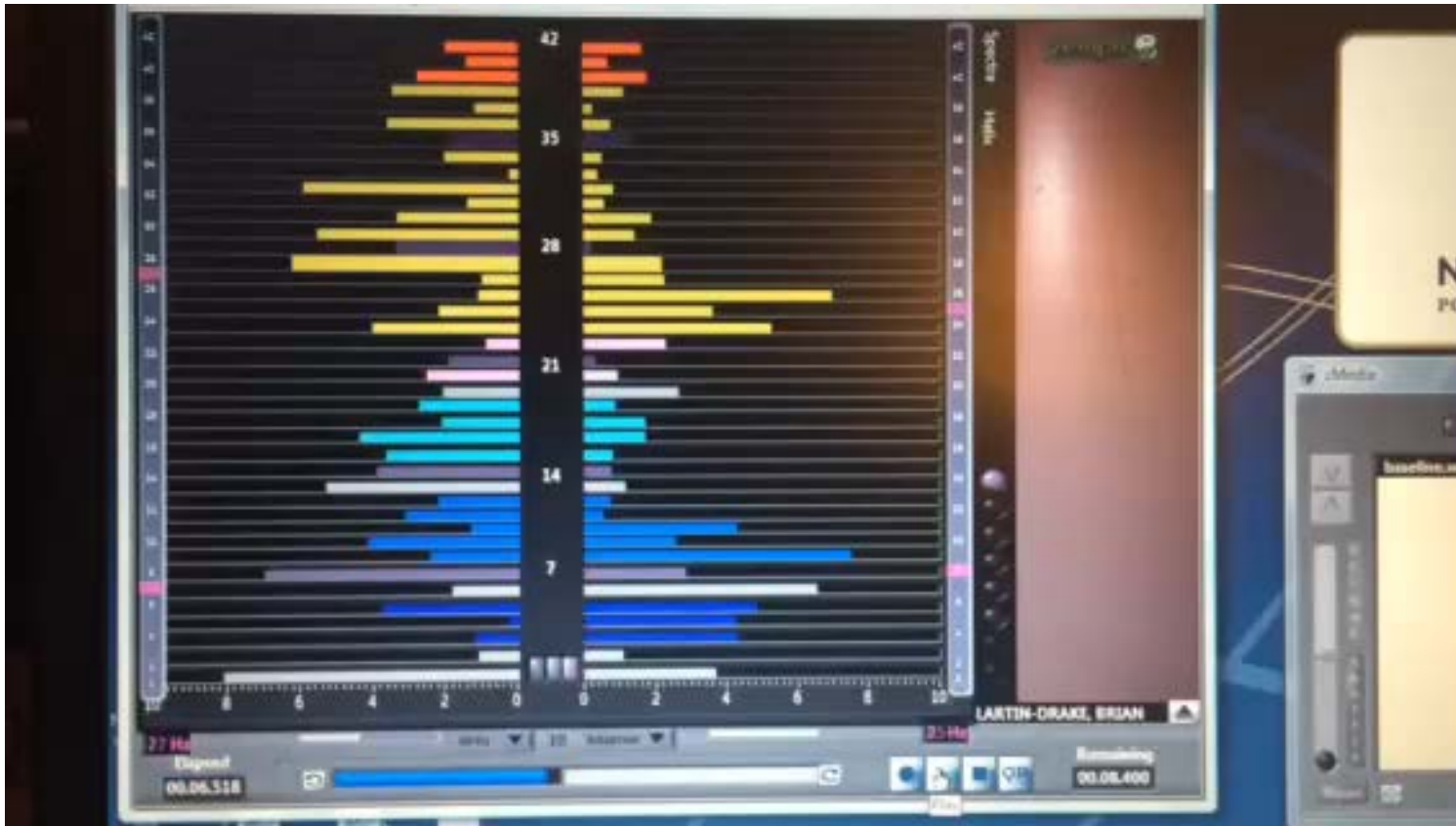


5/28/12 pre-baseline spectrograph

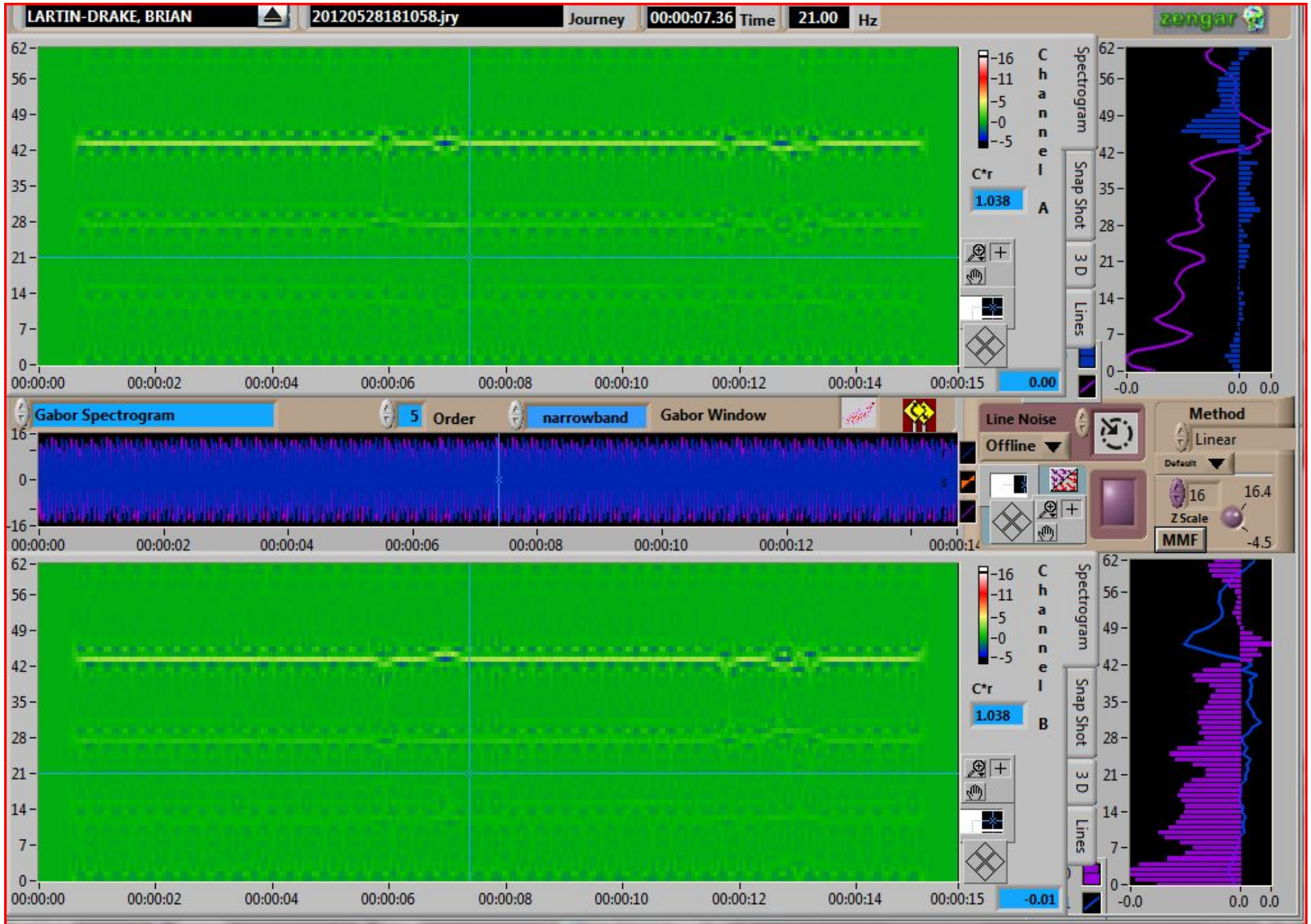


5/28/12 pre-baseline CCAC





5/28/12 post-baseline



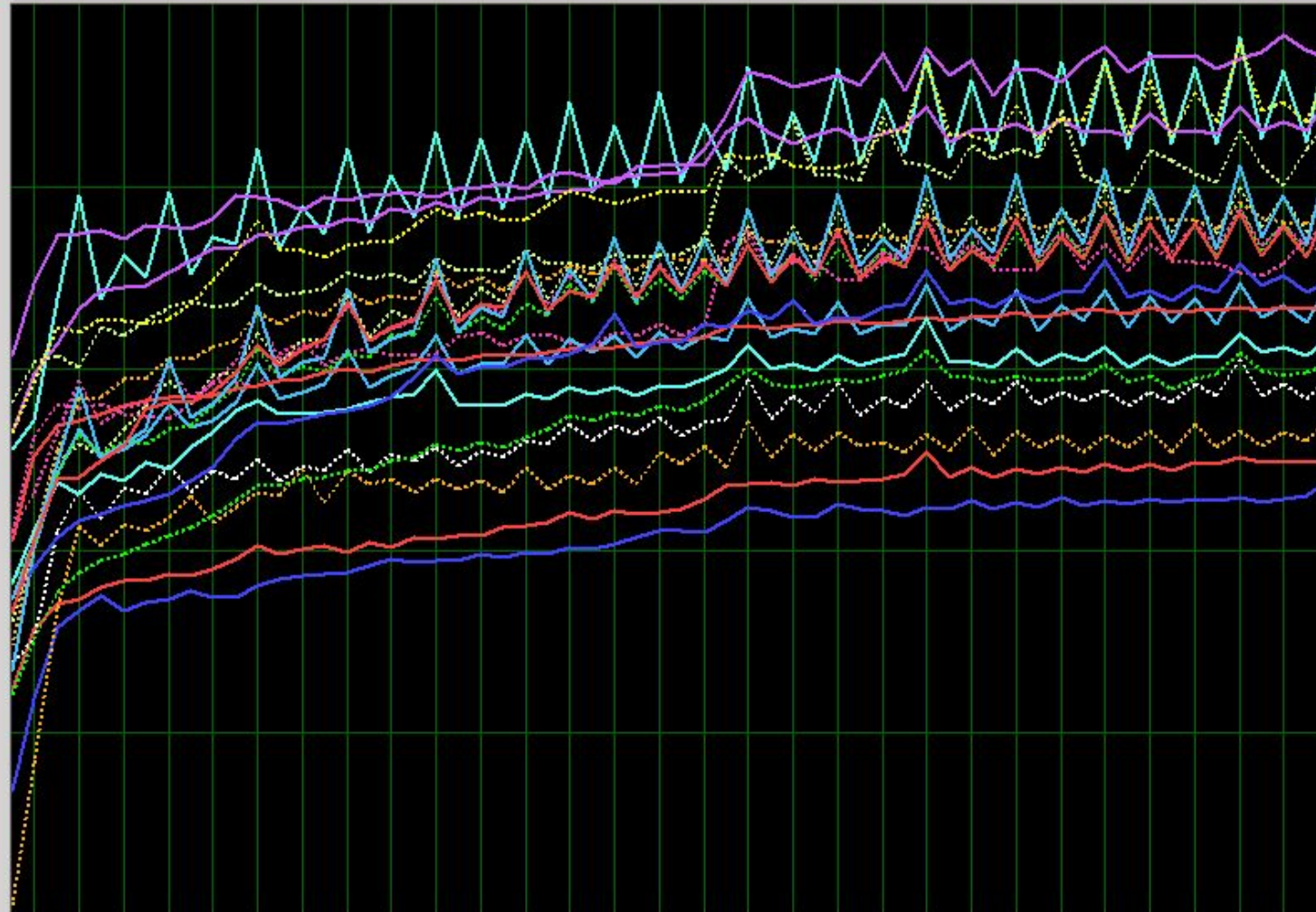
5/28/12 post-baseline spectrograph































5/28/12 post-baseline CCAC

# CCACs-Pre and post




- 4/09/12 6048
- 4/11/12 125
- 4/12/12 2566
- 4/12/12 891
- 4/14/12 744
- 4/14/12 790
- 4/21/12 1046
- 4/21/12 51
- 4/22/12 578
- 4/22/12
- 4/27/12 670
- 773 ?
- 1413
- None
- 3001 Noise
- 388 TE
- 182 TE
- 251 TE
- 293 ?
- 6785 Noise
- None
- 23



Pre	04/09/2012	6048.05	
Post	04/09/2012	773.14	
Pre	04/11/2012	125.66	
Post	04/11/2012	1413.29	
Pre	04/12/2012	2566.24	
Post	04/12/2012	3001.17	
Pre	04/12/2012	891.63	
Post	04/14/2012	388.18	
Pre	04/14/2012	744.35	
Post	04/14/2012	182.21	
Pre	04/14/2012	388.18	
Post	04/21/2012	207.83	
Pre	04/14/2012	790.88	
Post	04/21/2012	293.53	
Pre	04/21/2012	1046.03	
Post	04/22/2012	6784.56	
Pre	04/21/2012	51.79	
Post	04/27/2012	23.75	
Pre	04/22/2012	578.56	
Post	04/28/2012	6727.56	
Pre	04/22/2012	112.14	
Post	04/29/2012	32.89	

**Divergence Curves** Next

    
 No Trend v

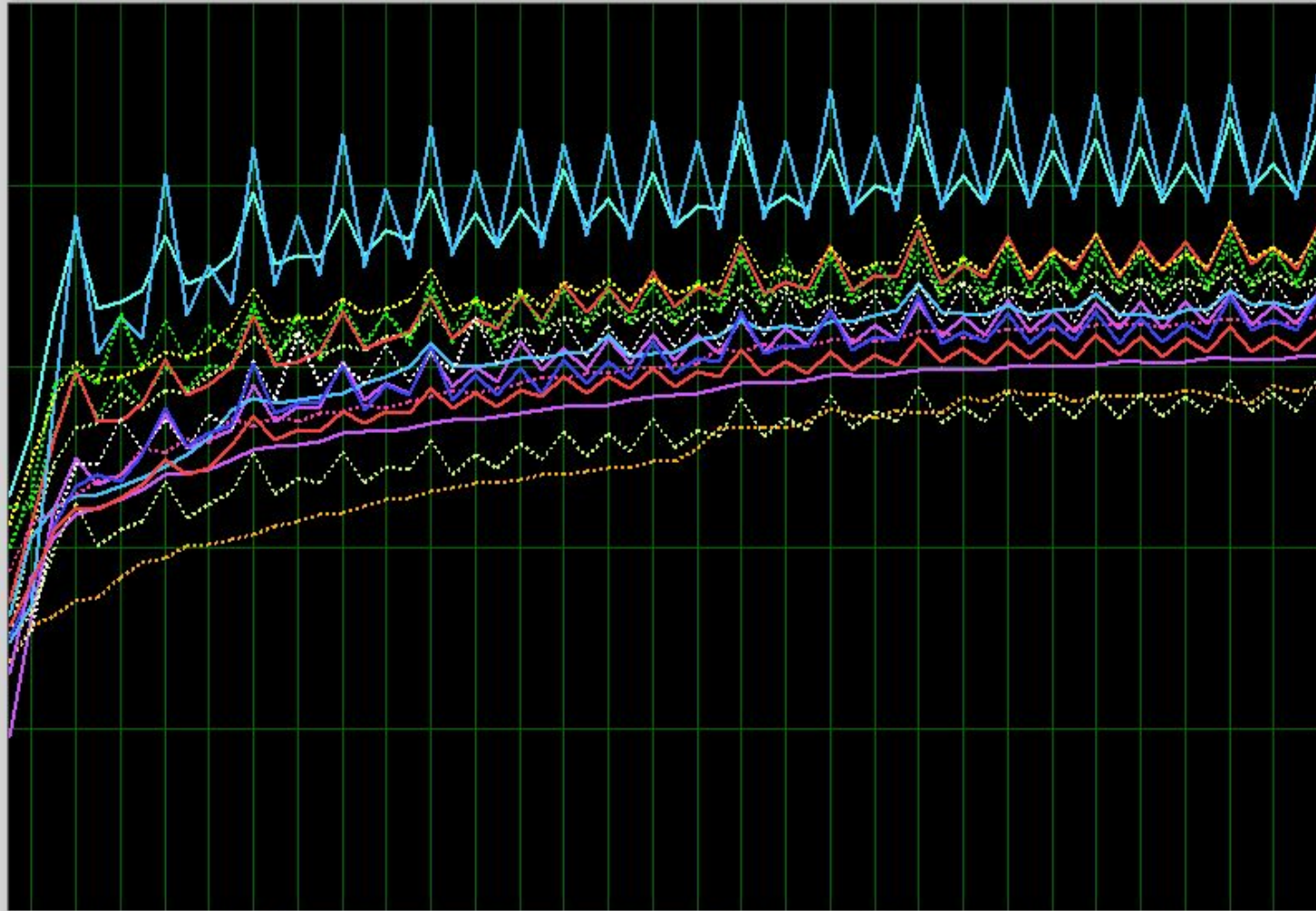
First	3	169.53
Pre 04/		



 Print







# CCACs-Pre and post

- 4/28/12 449
  - 4/28/12 82
  - 4/29/12 76
  - 4/29/12 183
  - 5/04/12 312
  - 5/05/12 545
  - 5/06/12 366
  - 5/11/12 1204
  - 5/28/12 687
  - 9/21/12 355
  - 6/23/13 633
  - 2/08/14
- 6728
  - None
  - 32
  - 160
  - 4089
  - None
  - None
  - None
  - 243
  - 281
  - 257



zengar 

Pre	04/27/2012	670.60	
Post	04/29/2012	160.89	
Pre	04/28/2012	449.55	
Post	05/04/2012	4089.28	
Pre	04/28/2012	82.88	
Post	05/06/2012	114.02	
Pre	04/29/2012	76.85	
Post	05/28/2012	243.06	
Pre	04/29/2012	183.50	
Post	06/15/2012	2382.14	
Pre	05/04/2012	312.90	
Post	06/15/2012	608.62	
Pre	05/05/2012	546.00	
Post	09/21/2012	281.05	
Pre	05/06/2012	366.58	
Post	06/23/2013	257.85	

    
Divergence   

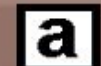
Divergence Curves

All Pairs

Prior

No Trend

First	3	69.03
Pre 04/		



Print

Jessica Bonner's observations about the  
impact of NeurOptimal on Brian's recovery



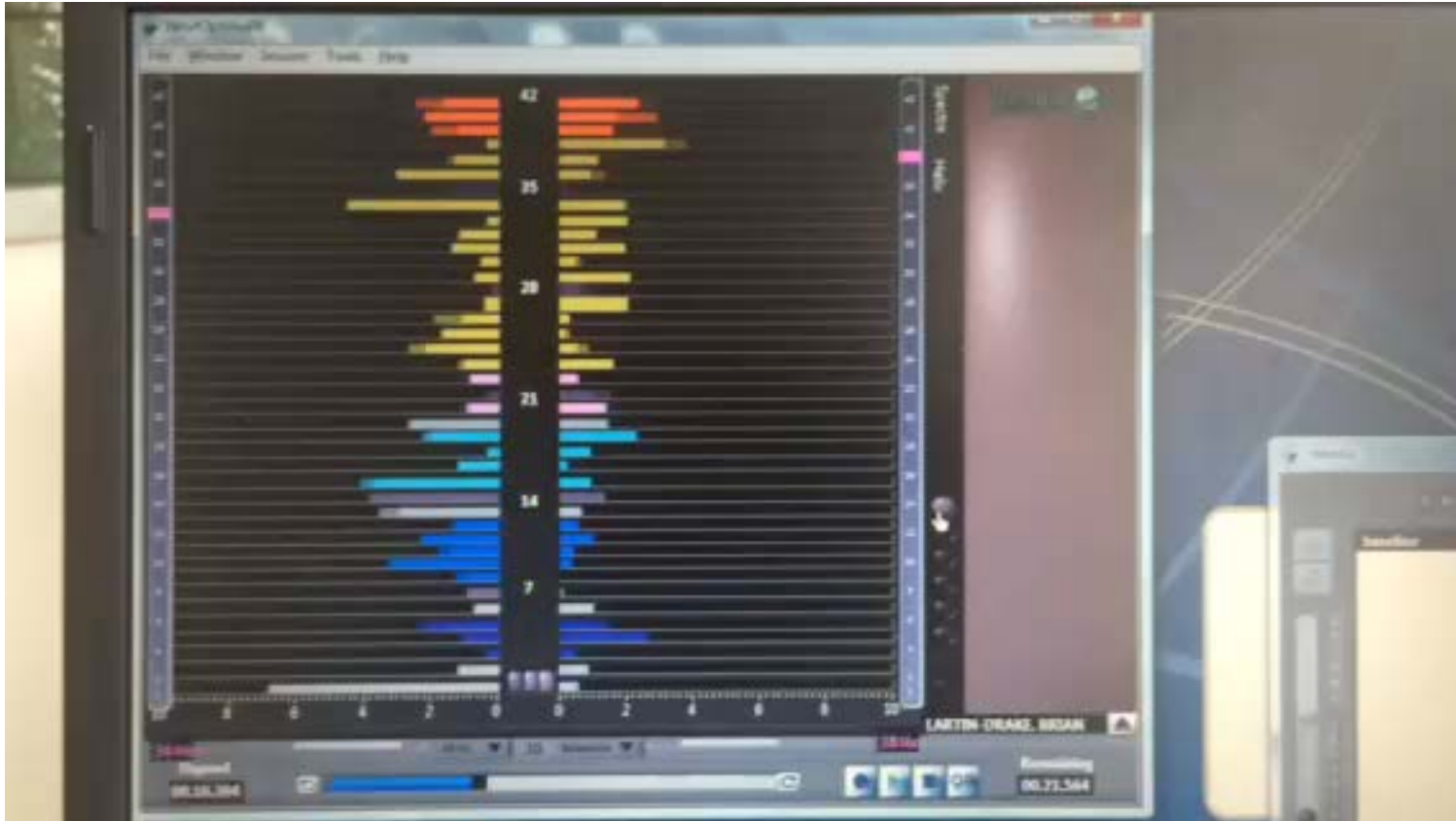
# Chart Review

- RN with 10 years experience in rehab and TBIs:
- “There is nothing other than the NF training that can explain the extent and rapidity of his progress.”
- Brian’s neurologist, 11/13:” If there were no infections, excellent nutrition and a great deal of rehab, those factors especially in combination could explain his unusual progress”

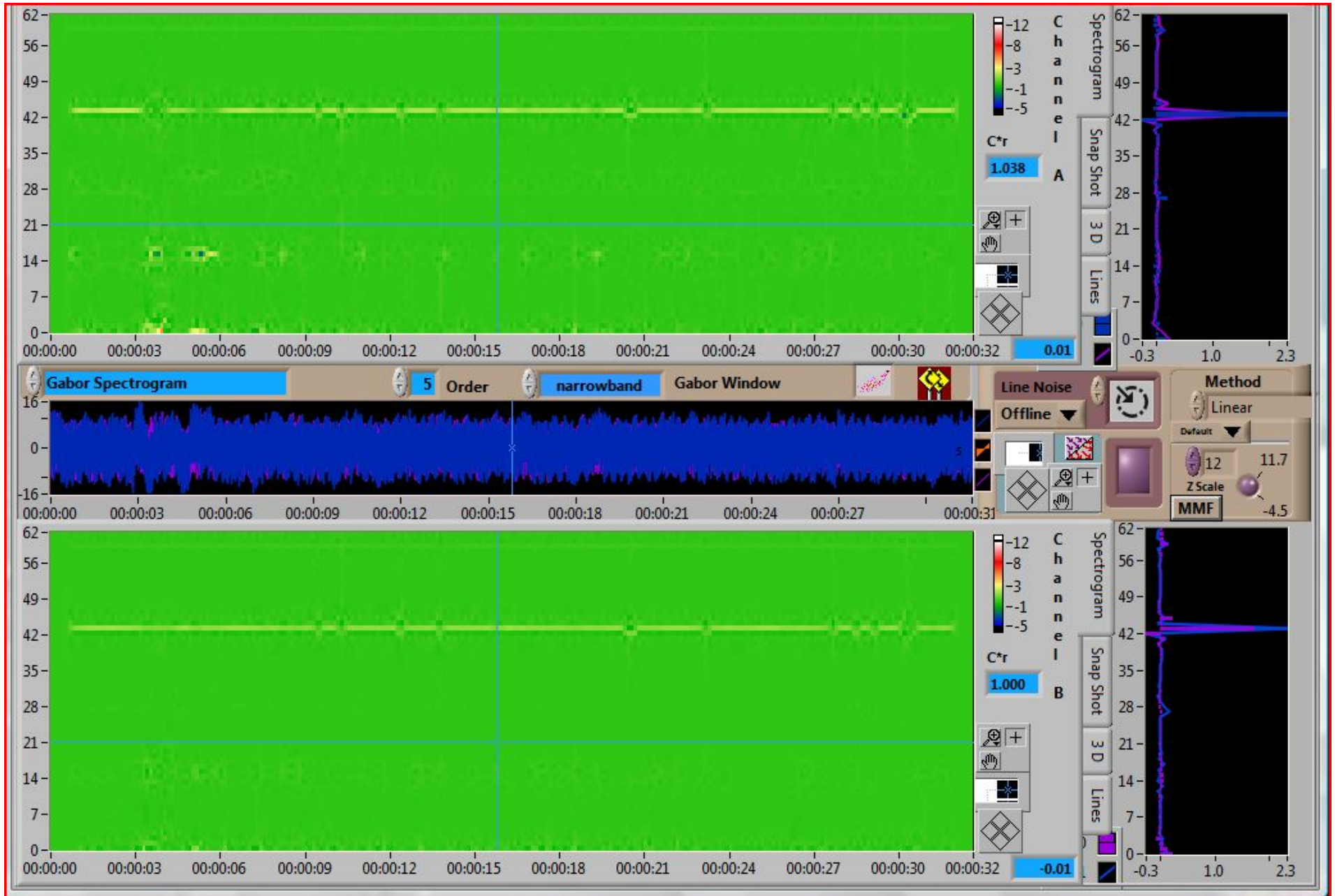
- Dr. B continued
- “While I can’t say the NF was responsible for his progress I can’t rule it out. More research should be done.”
- Constant staff comments beginning on the step down unit about how well and quickly Brian progressed-MDS, RNs, PT staff, speech staff, aides.







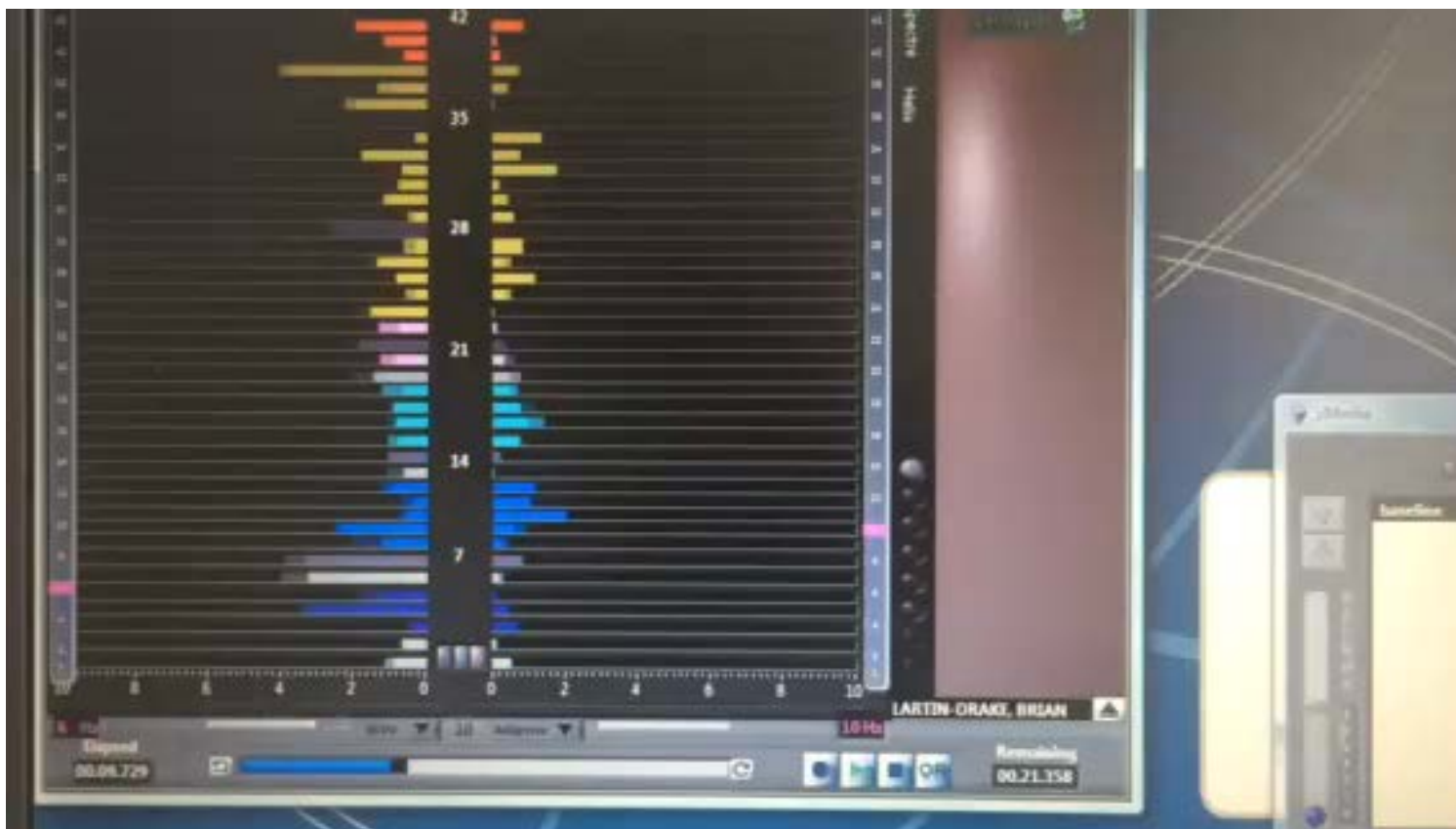
February 9, 2014, pre-baseline



February 9, 2014 pre-baseline

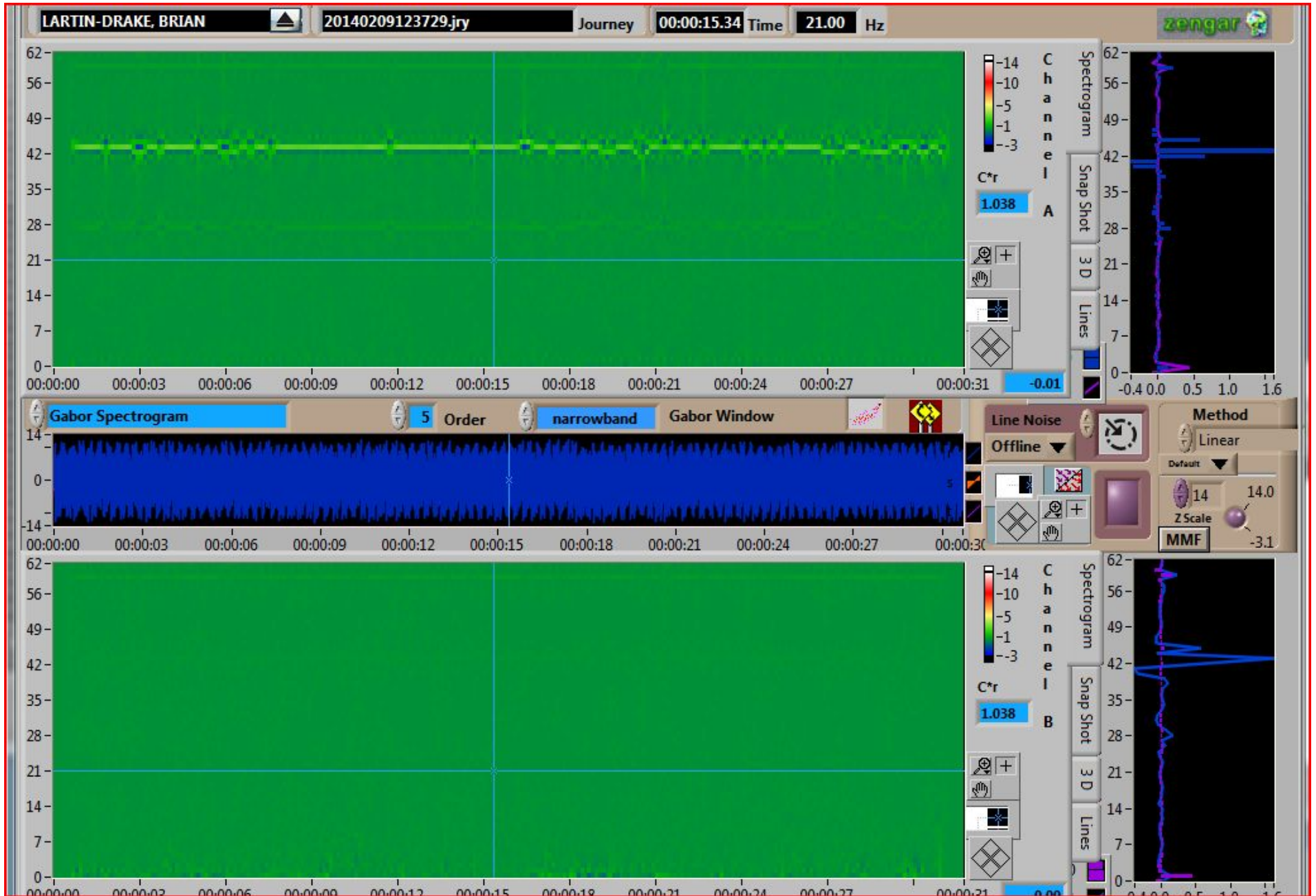


February 9, 2014, pre-baseline



February 9, 2014 post-baseline





February 9, 2014 post-baseline



February 9, 2014 post-baseline

## CURRENT STATUS

OVR NeuroPsych testing:

Beck Anxiety Inventory-10=  
Overheating, inability to relax,  
Fear of the worst happening, racing heart rate,  
uneasiness, general  
nervousness and fear of losing control”

Superior range IQ

Ability to sustain attention, concentration,  
and exert mental control has not been  
effected. Lt memory appears to most effected.

Cannabis dependency

Dythymic pattern may be effecting memory

Info retention maximized by pairing learning material  
performance and repetition

Neuropsychologist-ID specific techniques to improve memory

# Chart Review

- I have the idea that neurofeedback training is an important factor in Brian's healing. After reviewing his acute care medical records and knowing the extent of his neurological and orthopedic injuries, his recovery times are remarkable in comparison to others without NF training opportunities. Thank you for the chance to review his case.
- By the way, wanted to let you know that we just received our personal unit to start training with Dad hopefully tomorrow.
- Thanks for all you have done,
- Leah

## CONCLUSION

It is highly likely that the intensive neurofeedback training with NeuroOptimal made a substantive, positive difference in Brian's recovery from the TBI.

\* Leah Mechling, RN, TBI Rehabilitation summary of her chart review:  
was nothing other than the neurofeedback training that could explain the rapidity and substance of Brian's recovery."

- Pre and and
- Surges of progress post groupings of sessions
- Postbaselines
  
- Overall quality and speed of recovery relative to severity of injury
- (GCS of 3, DA,I, level 2)