An update on the GRIFEX Mission

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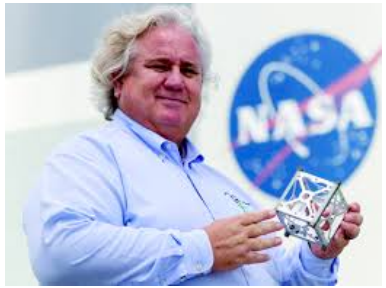
MXL – Michigan Exploration Laboratory
http://exploration.engin.umich.edu/

David Rider, Charles Norton
JPL – The Jet Propulsion Laboratory

Jet Propulsion Laboratory
California Institute of Technology

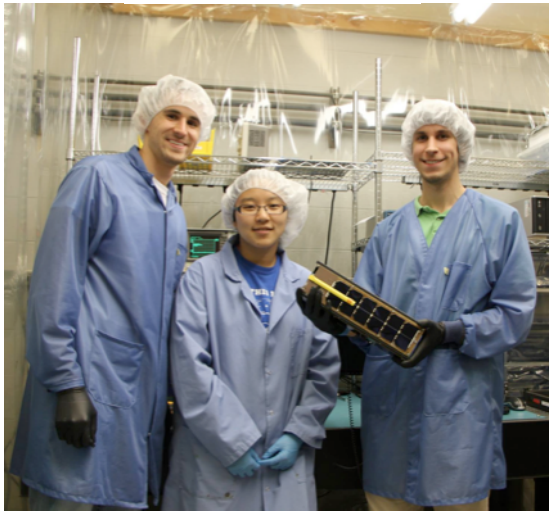
Core Team – Enablers, scientists, students.

NASA ESTO Earth Science Technology Office



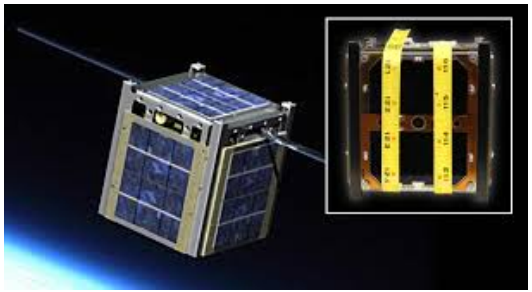
JPL Jet Propulsion Laboratory California Institute of Technology

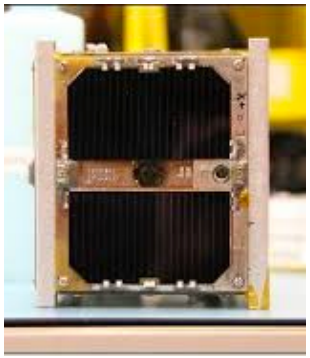
MXL Michigan eXploration Laboratory



Mission – tech demos for advanced imaging capabilities.

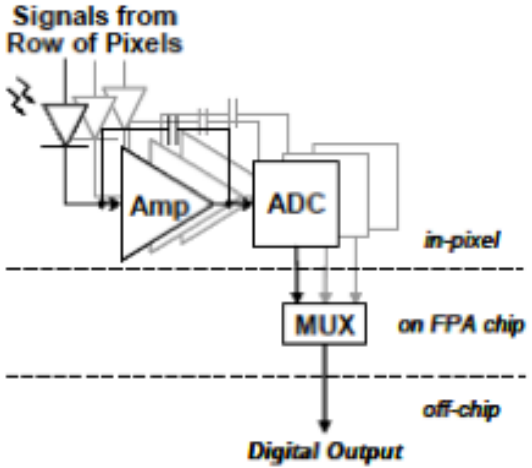
MCubed – High speed processing with rad hard FPGA.



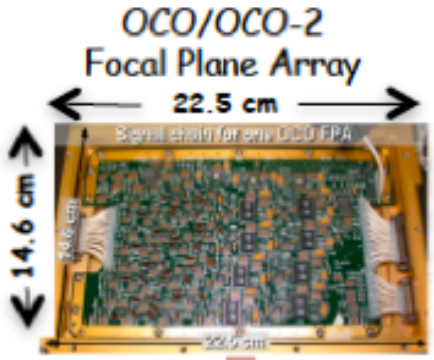


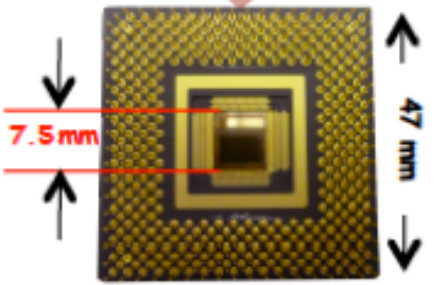
GRIFEX– High speed imaging frame rate.

Validation of a ROIC (Read Out Integrated Circuit) Does it work in space?



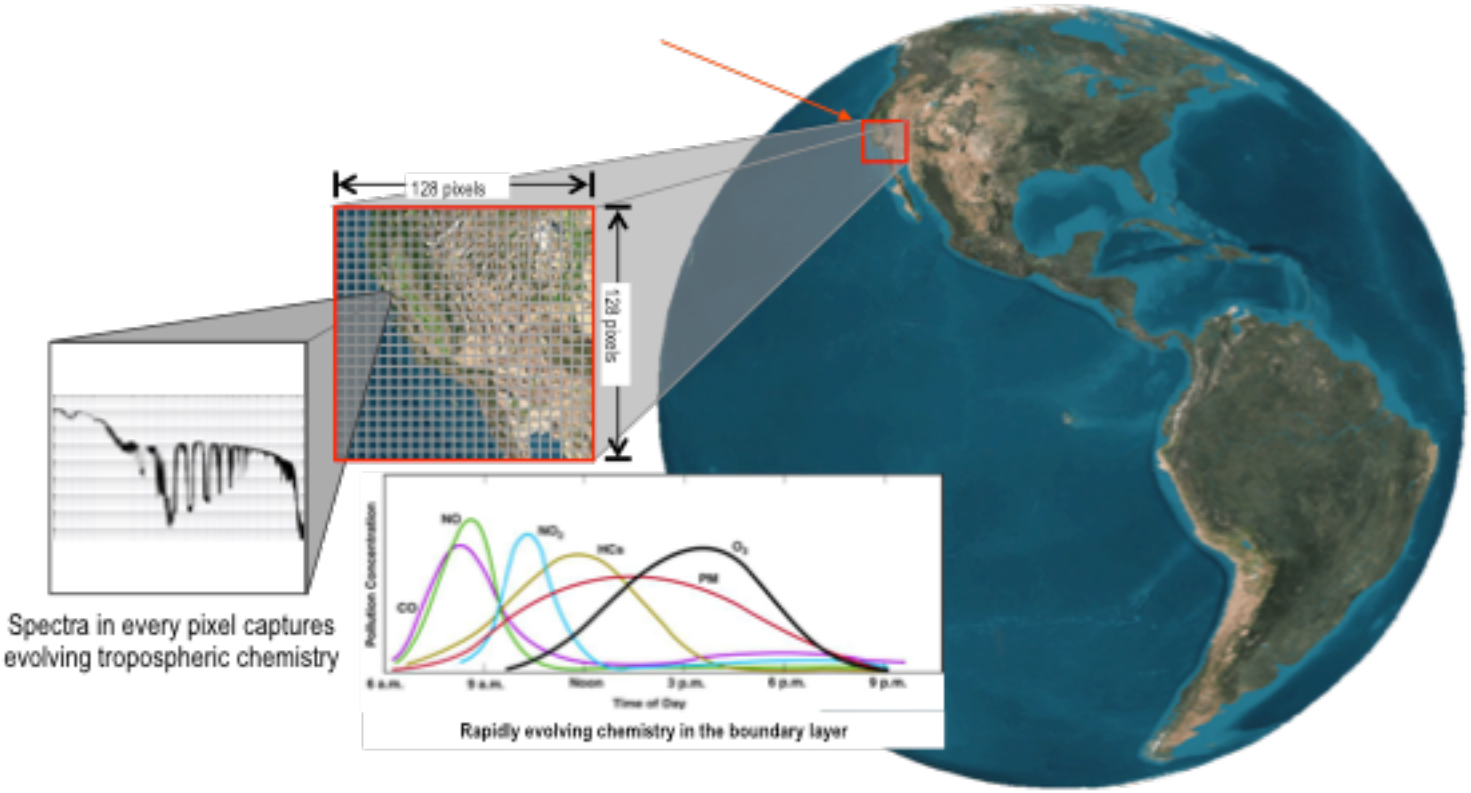
In-pixel ADC ROIC concept with unprecedented throughput (4.2 Gbits/s)





In-pixel digitization ROIC developed by this task

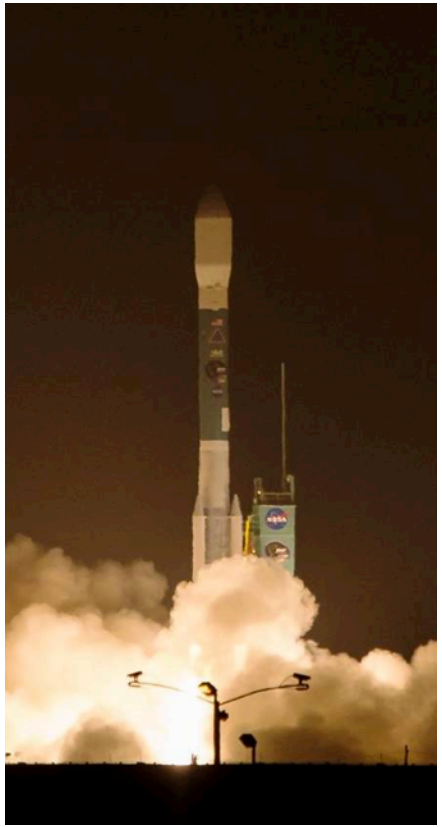
Why? Advanced imaging technology enabling atmospheric chemistry and pollution transport science from GEO.



GRIFEX is a 3U, university-class CubeSat.

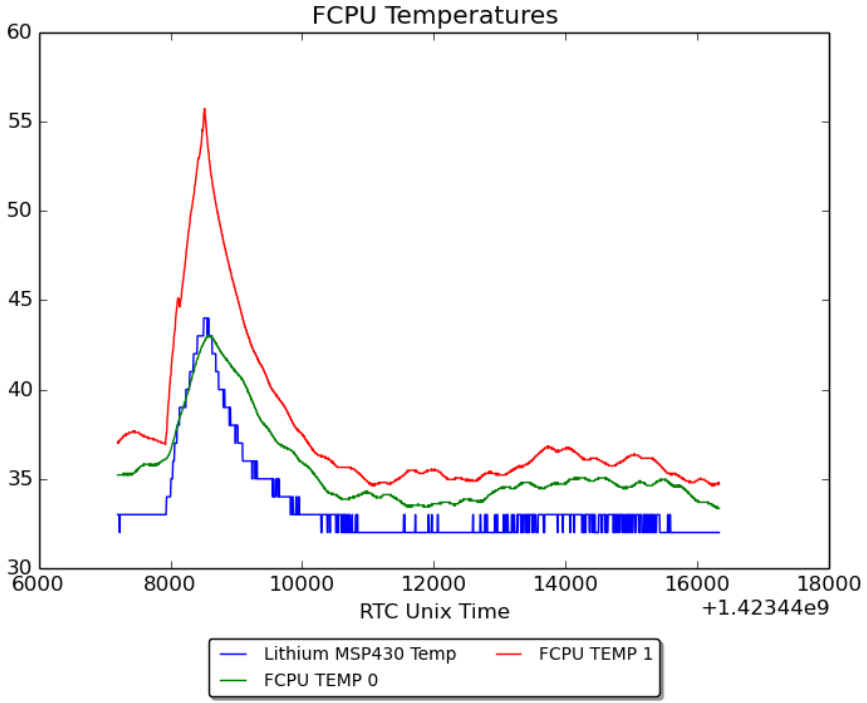
- 1U camera payload.
- Flight Computer
  - StampG920
  - External Watchdog monitoring system
- Magnetic control
  - Passive magnets
  - Experimental 3 axis torque rod system.
- UHF half duplex communication
  - Lithium-1, monopole, AX.25

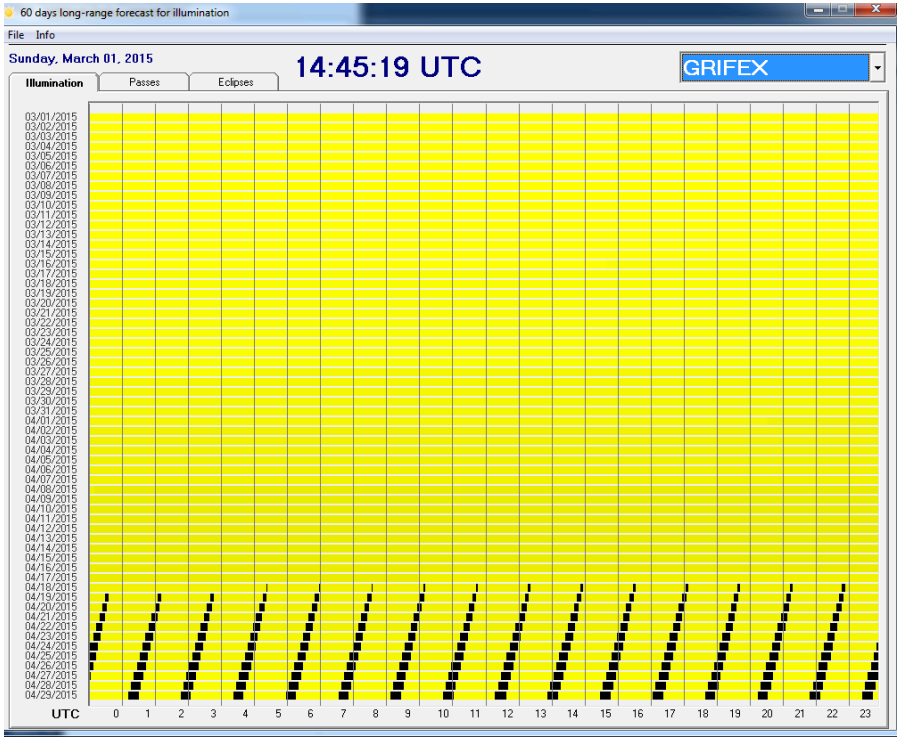
31 January 2015 – Launch was a go!



BILL INGALLS / NASA

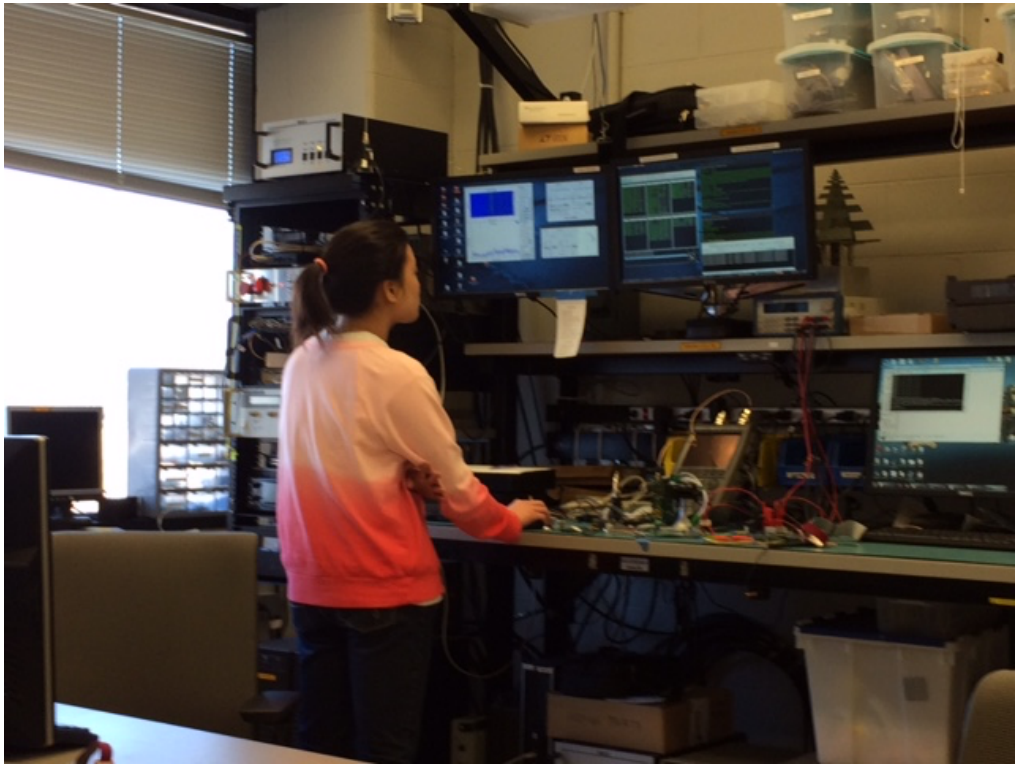
Sun synchronous, terminator orbit --- plenty of power, but it is hot!





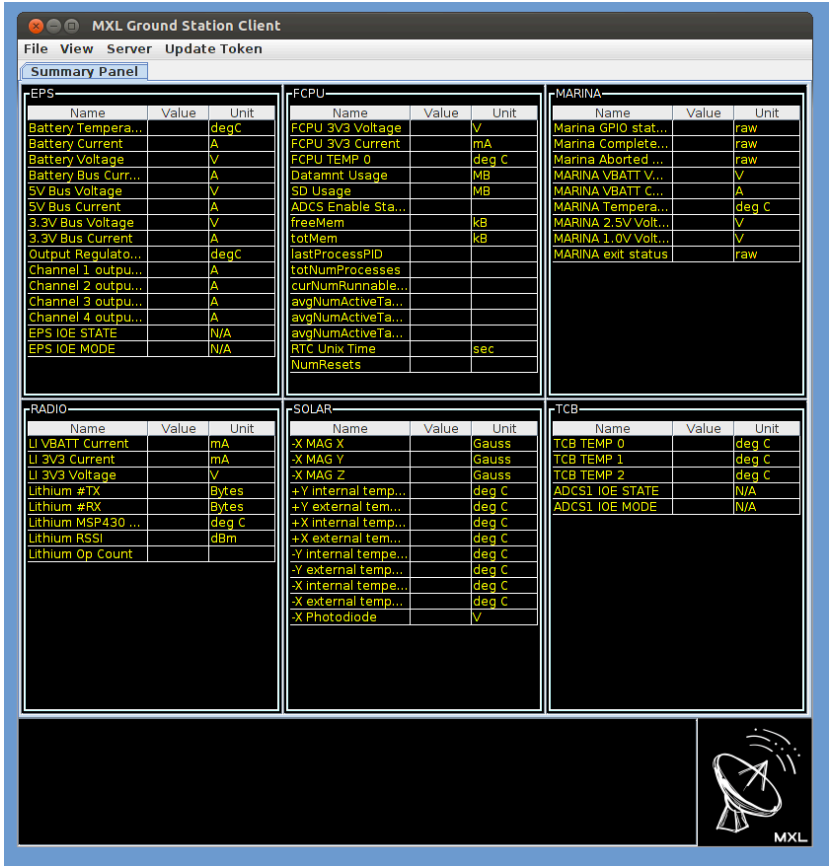
Eclipse tool from DK3WN.

Operations are nominal, working to maximize data downloaded.



- 10 payload runs total
- 4 contacts at MXL per day
- 1 commanding pass.
  - Ping watchdog
  - Upload command sets
- Downloads over any station listening (historically)
  - EVERY telem point
  - Payload data
- Payload assessment in progress.

Publically available decode client for telemetry.



- Java-based client for local decode.
- Packets sent to MXL server and logged.
- Protocols available if anyone is interested.

Amatuerfunk community continues to be a valuable partner.

Mike Rupprecht
@dk3wn

Follow

New post: GRIFEX dk3wn.info/p/?p=56804
05:45 UTC

Kasei Toshio, JA1GDE, Japan

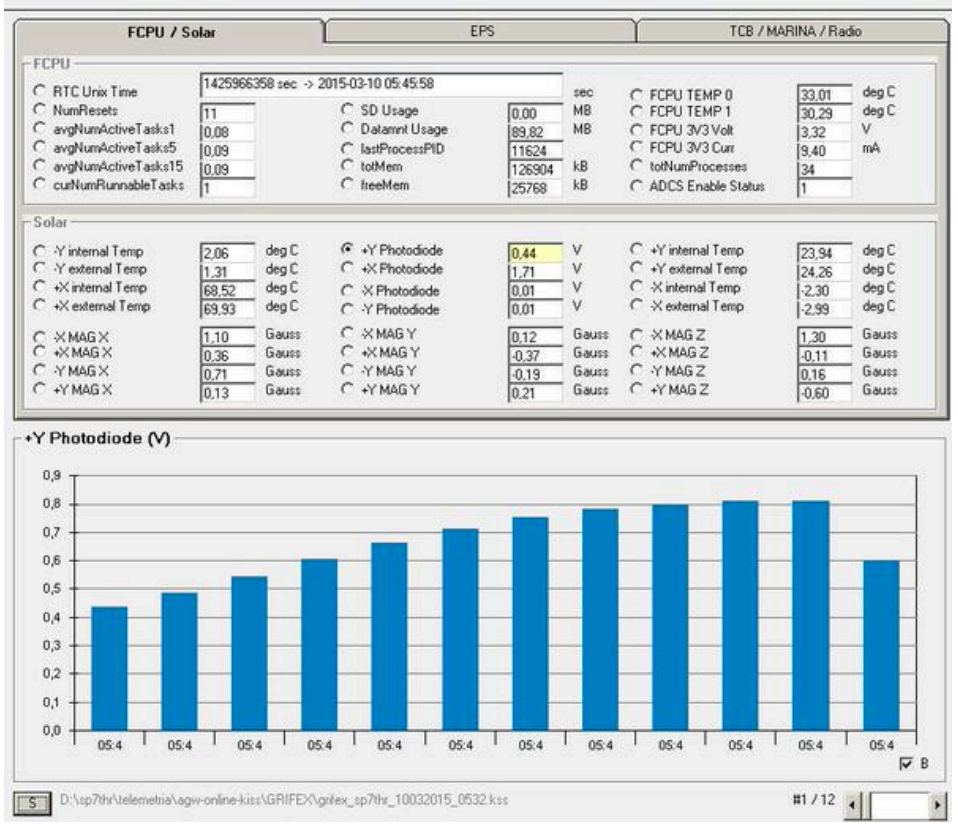
Mark Hammond, N8MH, North Carolina, USA

Colin Hurst, VK5HI, Australia

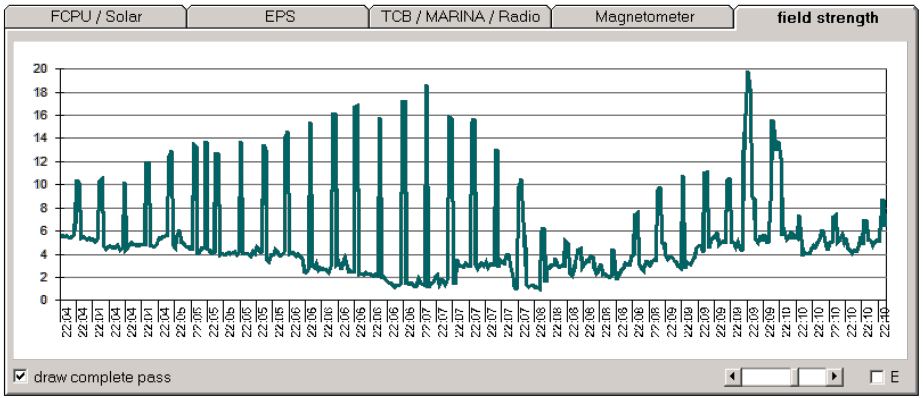
Henk Hamoen, PA3GUO, Netherlands

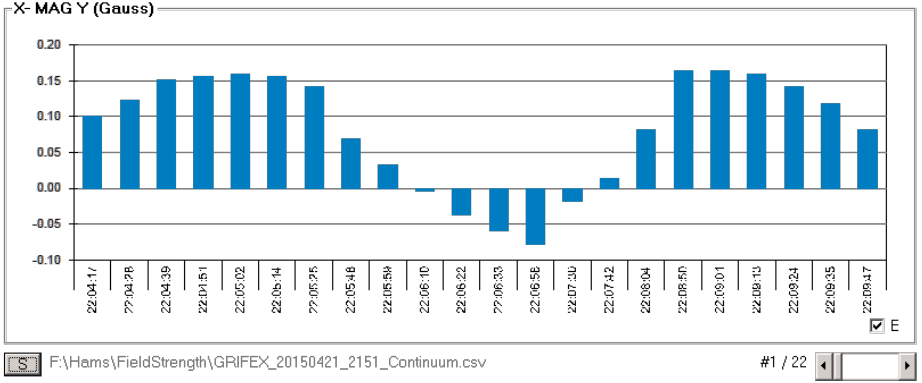
Tetsurou Satou, JA0CAW, Japan

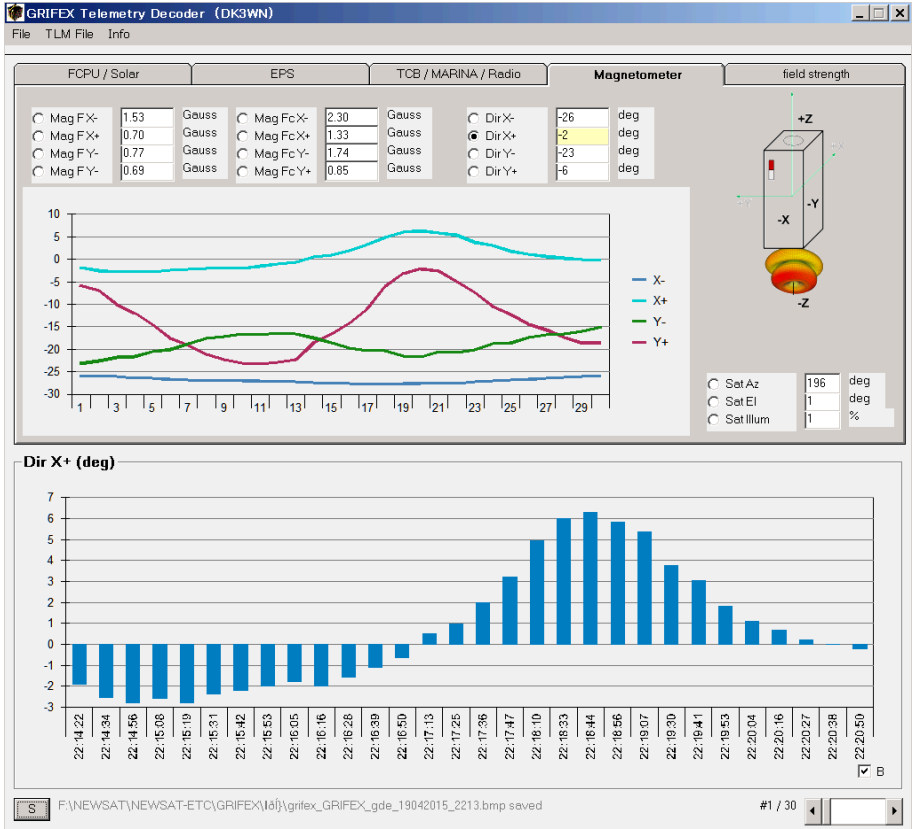
Jan van Gils - PE0SAT



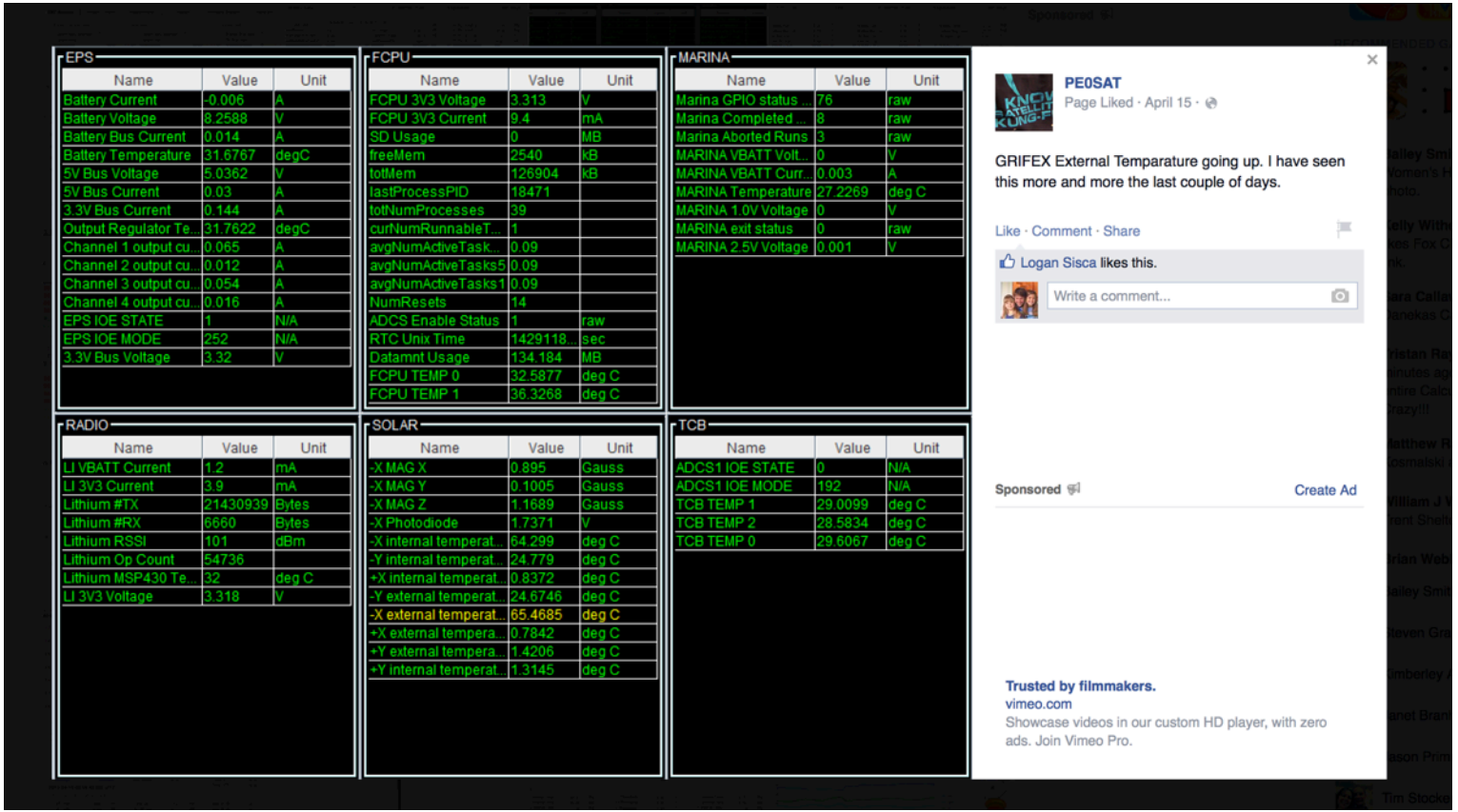
Regular feedback from global amateurfunk.







Operational feedback via social media.



EPS

Name	Value	Unit
Battery Current	-0.006	A
Battery Voltage	8.2588	V
Battery Bus Current	0.014	A
Battery Temperature	31.6767	degC
5V Bus Voltage	5.0362	V
5V Bus Current	0.03	A
3.3V Bus Current	0.144	A
Output Regulator Te...	31.7622	degC
Channel 1 output cu...	0.065	A
Channel 2 output cu...	0.012	A
Channel 3 output cu...	0.054	A
Channel 4 output cu...	0.016	A
EPS IOE STATE	1	N/A
EPS IOE MODE	252	N/A
3.3V Bus Voltage	3.32	V

FCPU

Name	Value	Unit
FCPU 3V3 Voltage	3.313	V
FCPU 3V3 Current	9.4	mA
SD Usage	0	MB
freeMem	2540	kB
totMem	126904	kB
lastProcessPID	18471	
totNumProcesses	39	
curNumRunnableT...	1	
avgNumActiveTask...	0.09	
avgNumActiveTasks5	0.09	
avgNumActiveTasks1	0.09	
NumResets	14	
ADCS Enable Status	1	raw
RTC Unix Time	1429118...	sec
Datamnt Usage	134.184	MB
FCPU TEMP 0	32.5877	deg C
FCPU TEMP 1	36.3268	deg C

MARINA

Name	Value	Unit
Marina GPIO status ...	76	raw
Marina Completed ...	8	raw
Marina Aborted Runs	3	raw
MARINA VBATT Volt...	0	V
MARINA VBATT Curr...	0.003	A
MARINA Temperature	27.2269	deg C
MARINA 1.0V Voltage	0	V
MARINA exit status	0	raw
MARINA 2.5V Voltage	0.001	V

RADIO

Name	Value	Unit
LI VBATT Current	1.2	mA
LI 3V3 Current	3.9	mA
Lithium #TX	21430939	Bytes
Lithium #RX	6660	Bytes
Lithium RSSI	101	dBm
Lithium Op Count	54736	
Lithium MSP430 Te...	32	deg C
LI 3V3 Voltage	3.318	V

SOLAR

Name	Value	Unit
-X MAG X	0.895	Gauss
-X MAG Y	0.1005	Gauss
-X MAG Z	1.1689	Gauss
-X Photodiode	1.7371	V
-X internal temperat...	64.299	deg C
-Y internal temperat...	24.779	deg C
+X internal temperat...	0.8372	deg C
-Y external temperat...	24.6746	deg C
-X external temperat...	65.4685	deg C
+X external tempera...	0.7842	deg C
+Y external tempera...	1.4206	deg C
+Y internal temperat...	1.3145	deg C

TCB

Name	Value	Unit
ADCS1 IOE STATE	0	N/A
ADCS1 IOE MODE	192	N/A
TCB TEMP 1	29.0099	deg C
TCB TEMP 2	28.5834	deg C
TCB TEMP 0	29.6067	deg C

PE0SAT
Page Liked · April 15 ·

GRIFEX External Temparature going up. I have seen this more and more the last couple of days.

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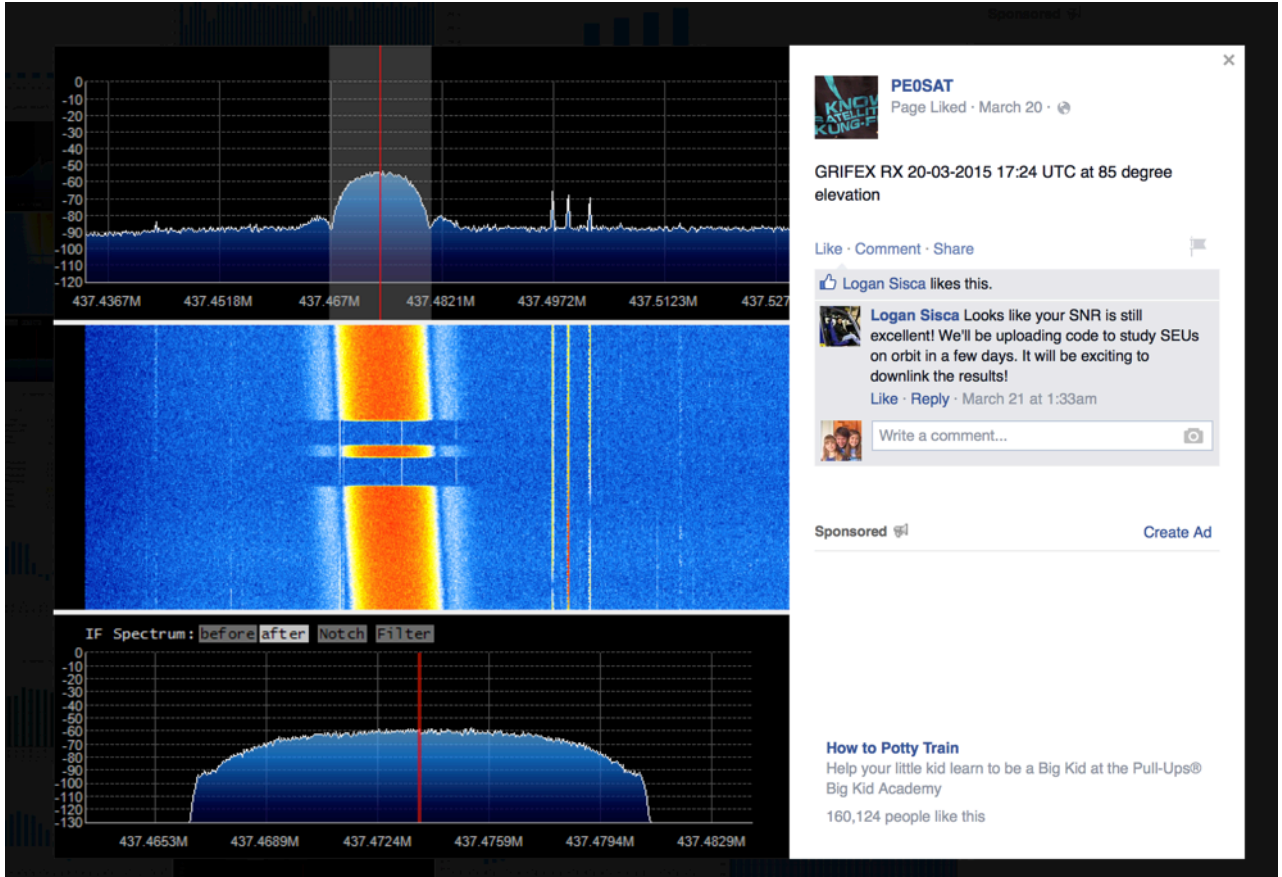

Next steps in operations…push the capability.

- Uploaded code to monitor SEUs.
- Run Lithium at higher data rates.
- Utilize magnetic control system
- Monitor anomalies:
  - SD card issues (again)
  - Quasi periodic software crashes.

Lessons reinforced and learned…

- Install all the screws.
- Have a “stowed” software configuration
  - Deployables and flight configuration post environmental testing
- Interface control documents…make them.
- Processes are needed, don’t change them on the flight build.

Recommendation – build community.

Mentors

Team

Funding

In summary, GRIFEX is operational and students providing data to scientists with help from a global team!