

CLTP 6 REPORT

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Outline

- Introduction
- CanSat Assembly
- Ground Tests
- Launch
- Conclussions

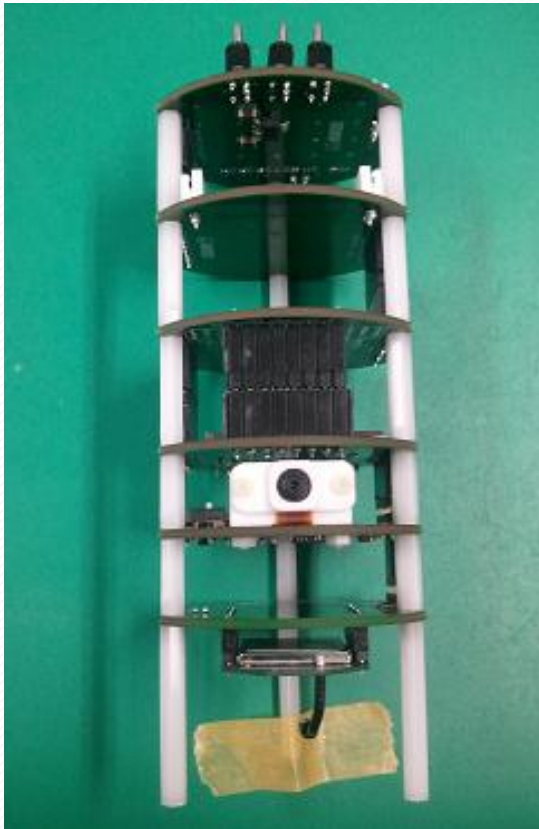
Introduction

- Aim of the training program
- i-CanSat V.6 components and tools are distributed.
- CanSat main unit contains six boards: GPS, power, user, OBC, camera, Xbee
- Additional sensors include gyro, accelerometer, pressure, and temperature

CanSat Assembly



CanSat Assembly



mass=151 g

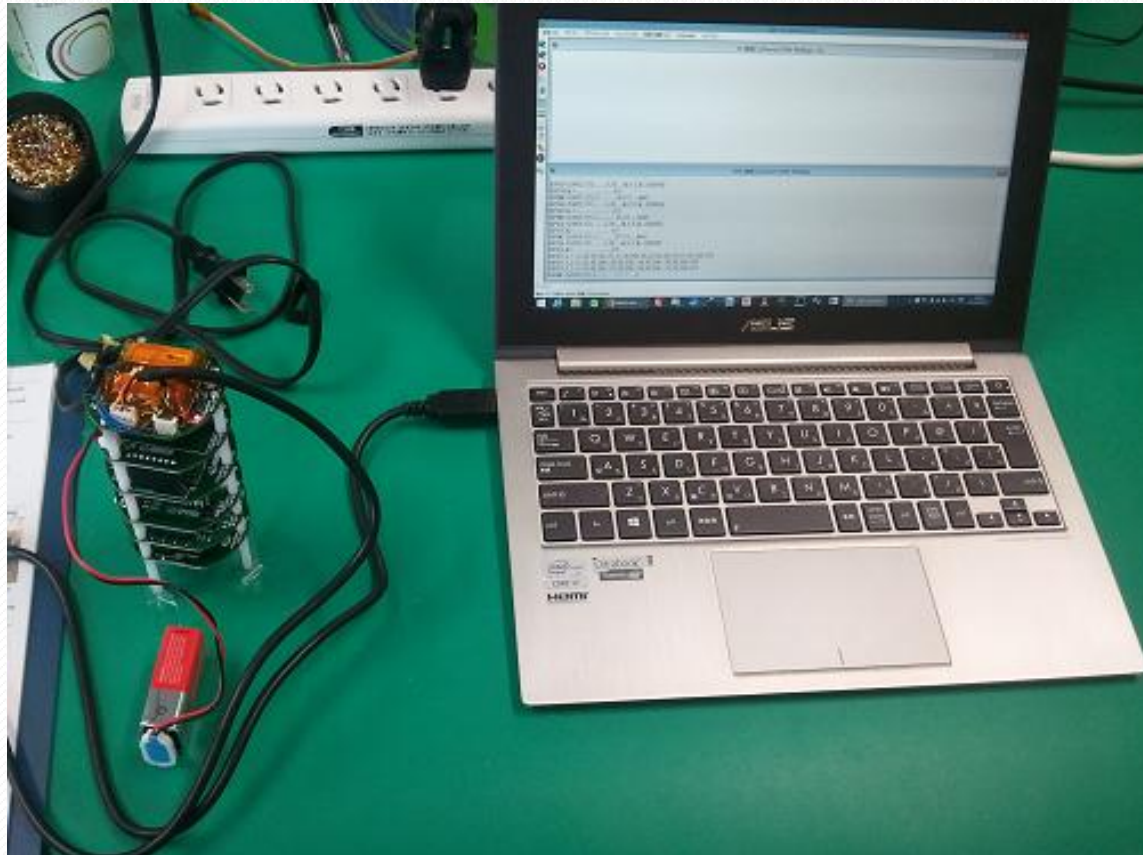
soykasap@aku.edu.tr



mass=176 g

Ground Test: Functional Test

Check GPS and camera



Ground Test: Functional Test

GPS reading

\$GPGGA,074117.000,4304.5461,N,14120.3586,E,1,06,1.5,20.0,M,33.1,M,,0000*62

<http://www.gps-coordinates.net/>

DMS (degrees, minutes, secondes)*

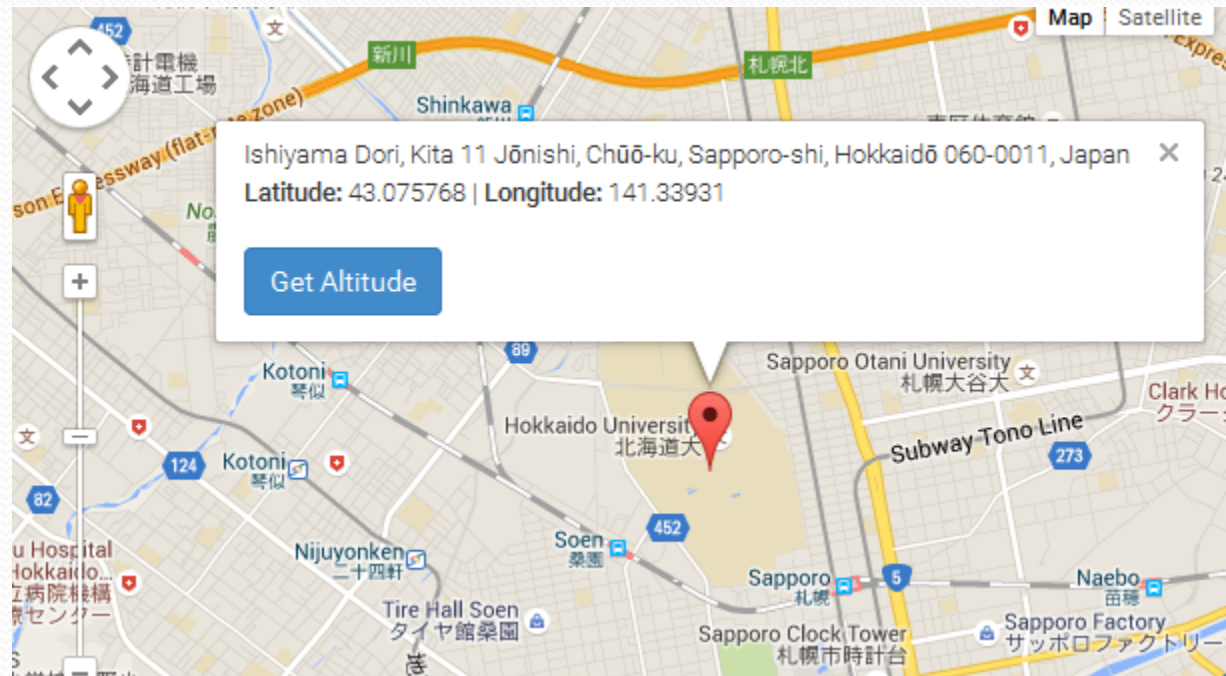
Latitude

N S 43 ° 04 ' 32.766 "

Longitude

E W 141 ° 20 ' 21.516 "

Get Address



Ground Test: Functional Test

Camera images: camera works well



Ground Test: Parachute Test

Carried out to check the parachute and signals during dropping from third floor, no problem appears.



Ground Test: Vibration test



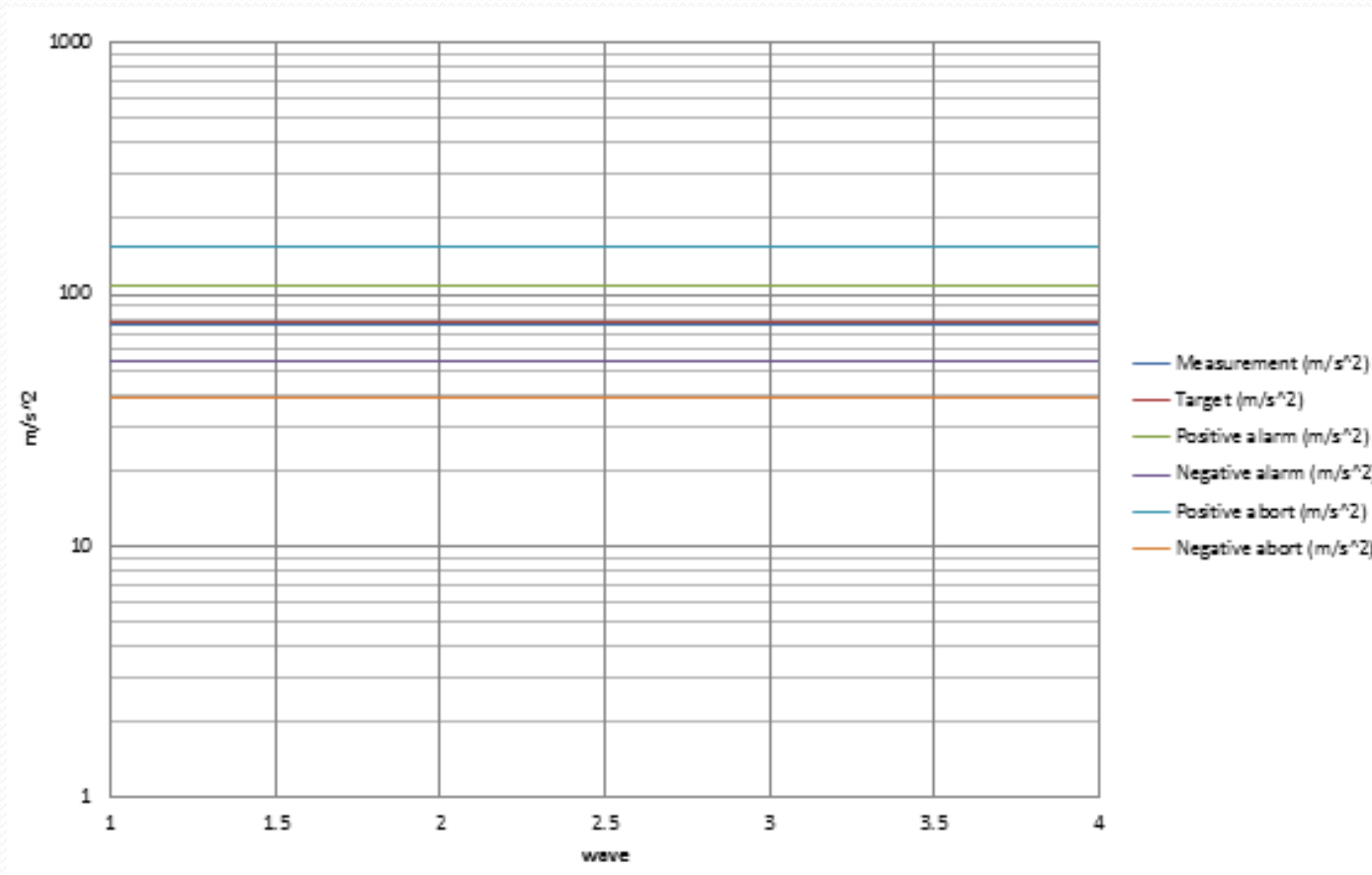
Sine, random and shock tests are carried out along longitudinal direction in a sequence: no problem

Vibration & Shock Tests

11

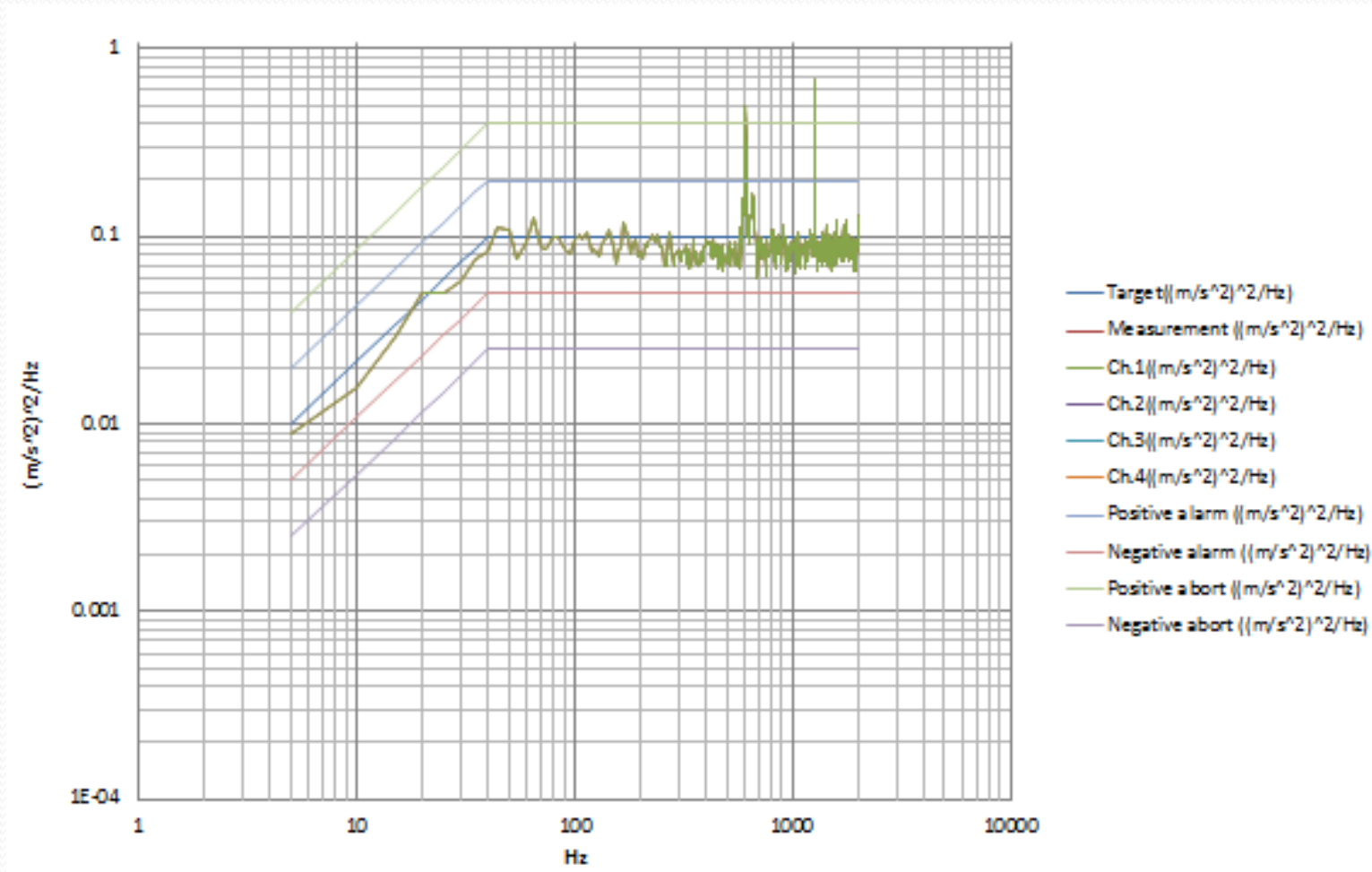
Type	Direction	Frequency	Acceleration	Duration
Sine Wave Vibration	Rocket Launch	10 Hz	7.88 G _{0-P}	0.4 s
Random Vibration	Rocket Launch	5 to 2000 Hz	1.42 G _{rms}	7 s
Shock	Rocket Launch	-	8.00 G	2 times

Ground Test: Vibration test



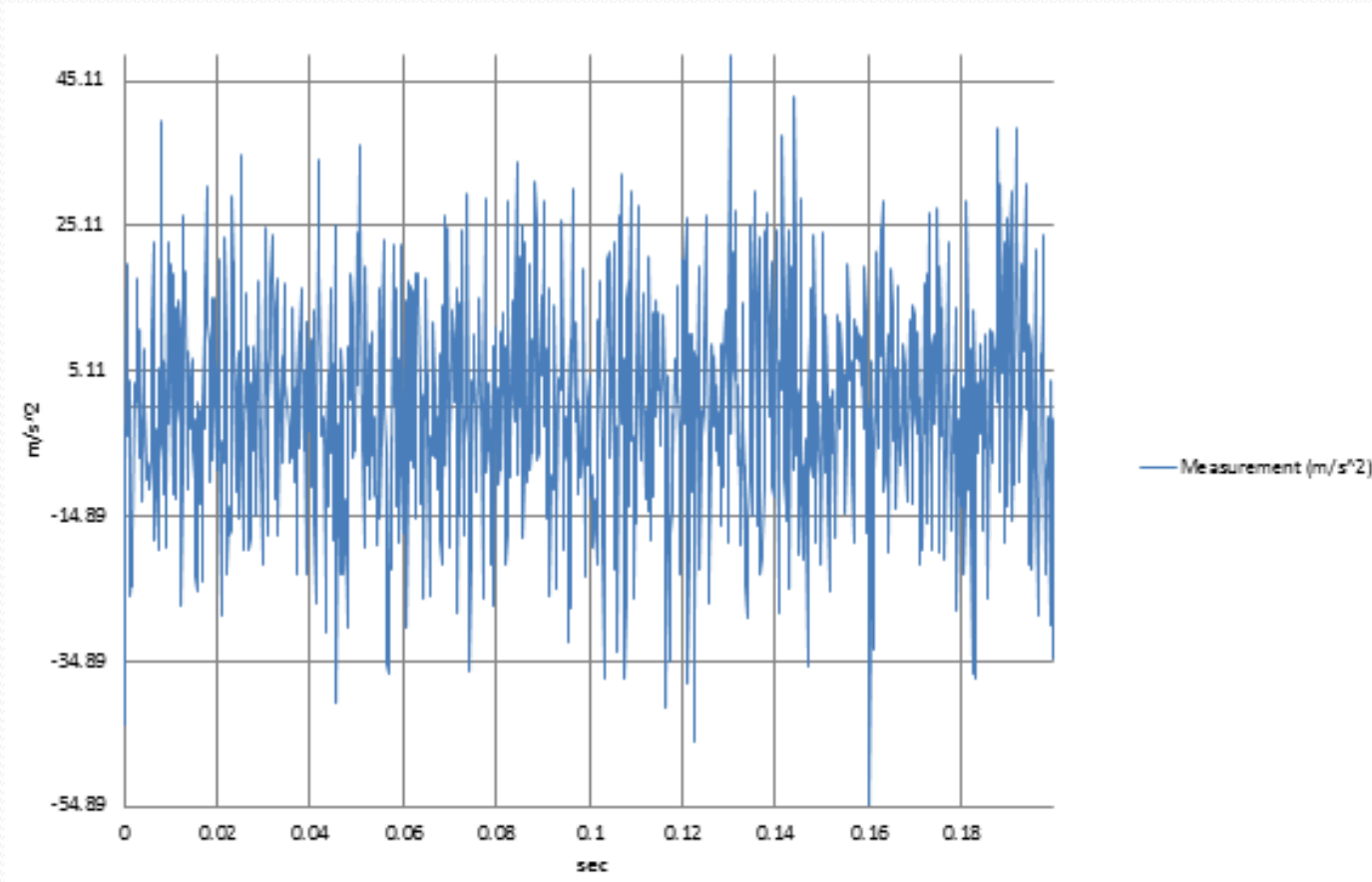
Sine vibration target setting value 77.22 Hz, Measured 77.5 Hz

Ground Test: Vibration test



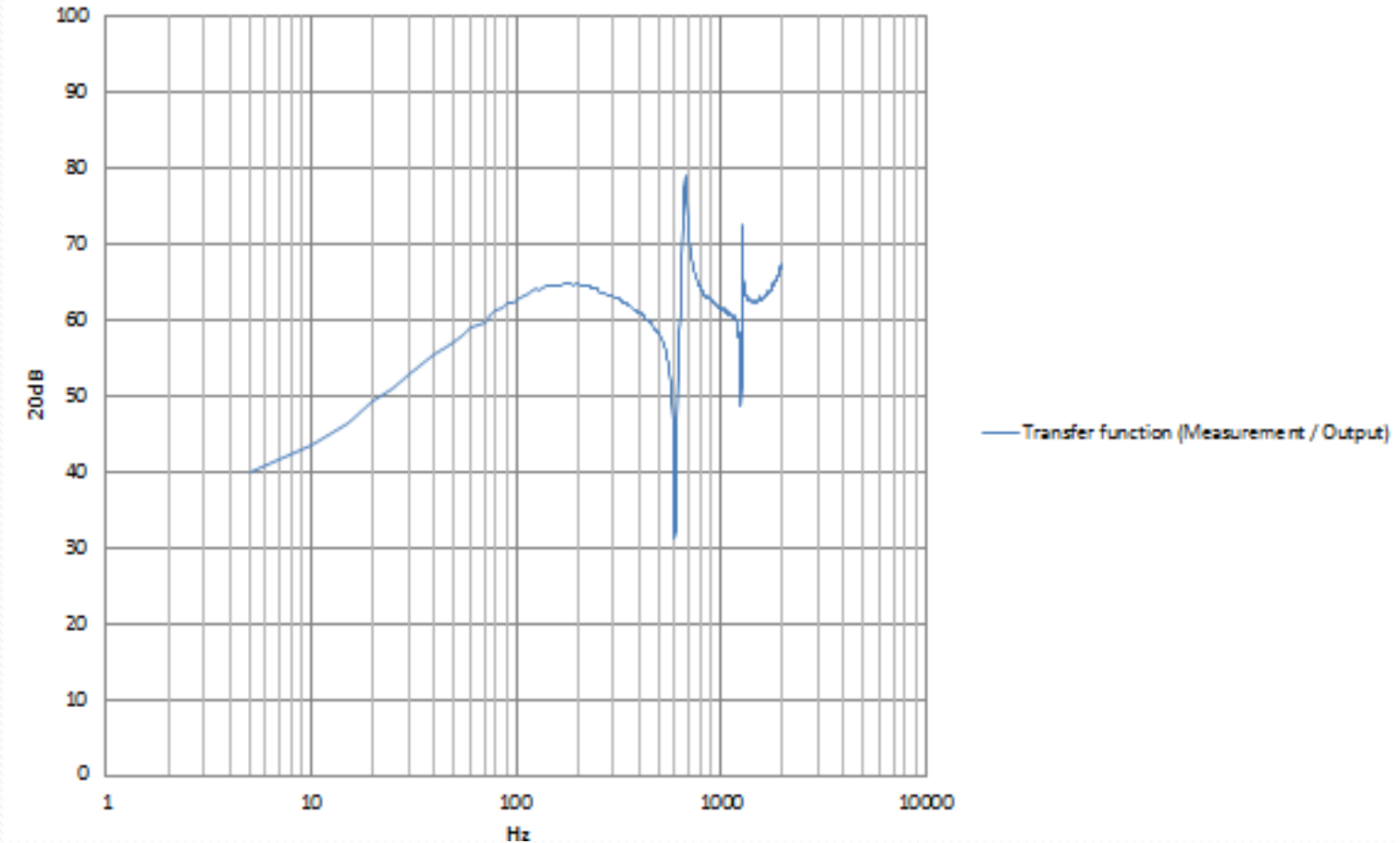
Random vibration: PSD graph

Ground Test: Vibration test



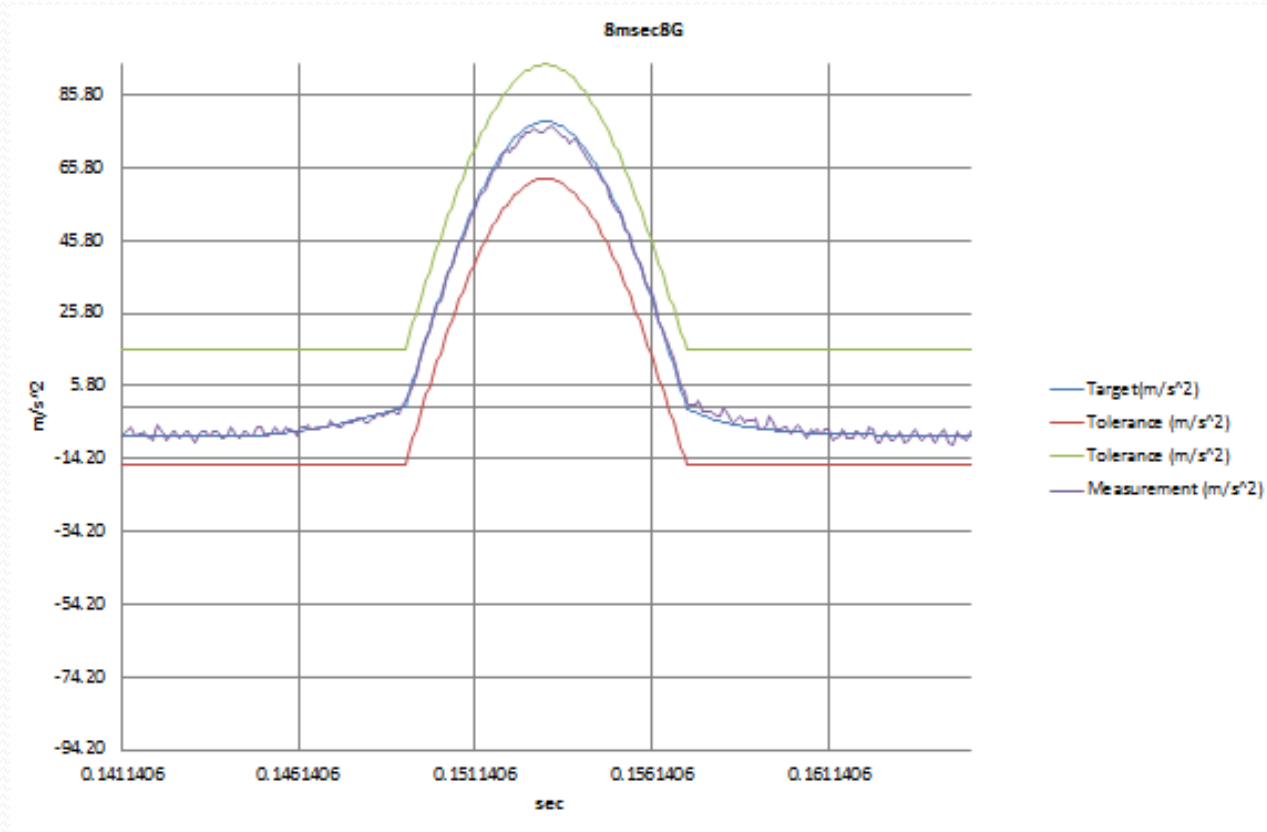
Random vibration: frequency vs. time

Ground Test: Vibration test



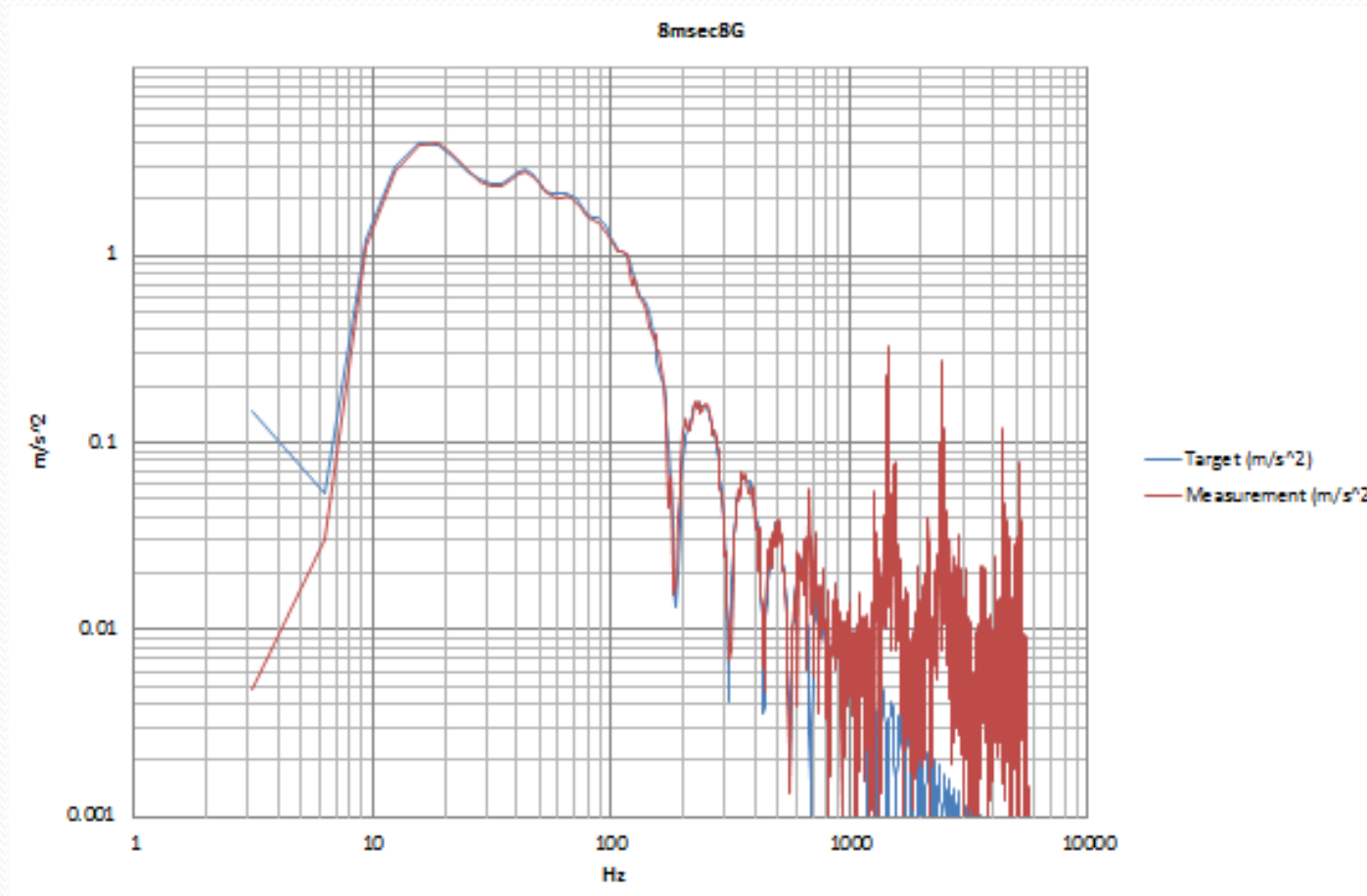
Random vibration: transfer function, first peak 700 Hz above requirement of 100 Hz

Ground Test: Vibration test



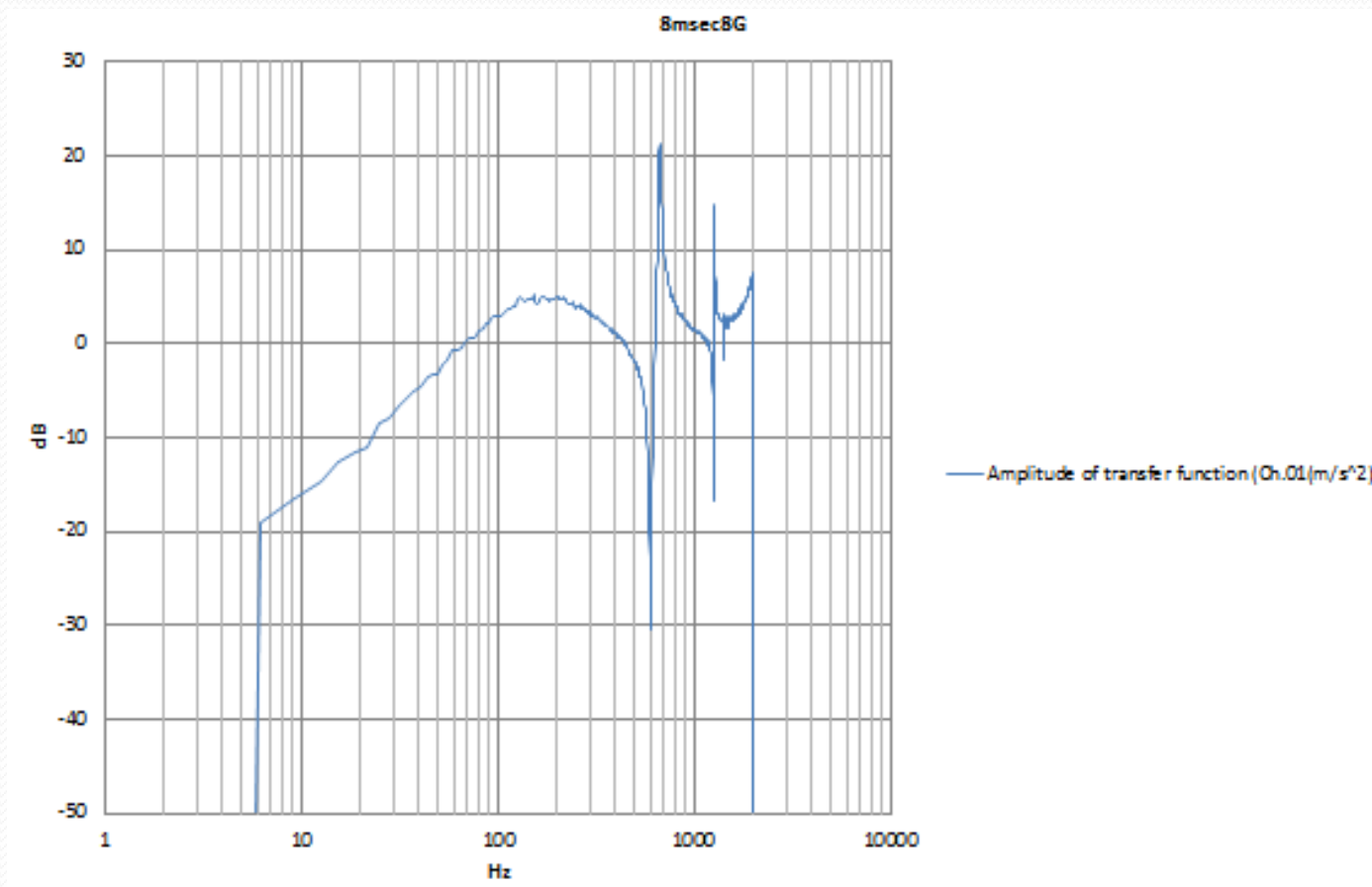
Shock test 1 (8ms, 8G), history of acceleration

Ground Test: Vibration test



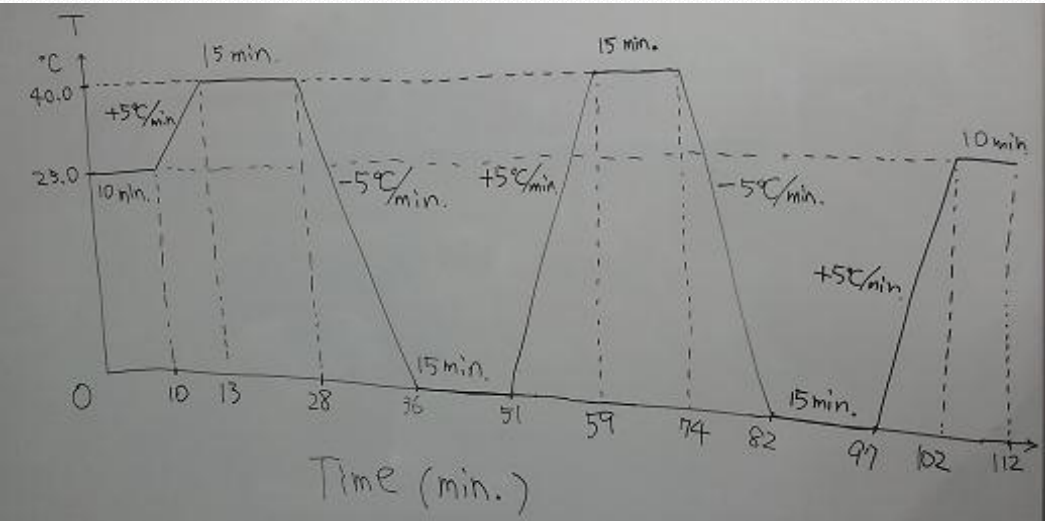
Shock test 1 (8ms, 8G), FFT

Ground Test: Vibration test



Shock test 1 (8ms, 8G), Transfer function, first peak 700 Hz
above requirement of 100 Hz

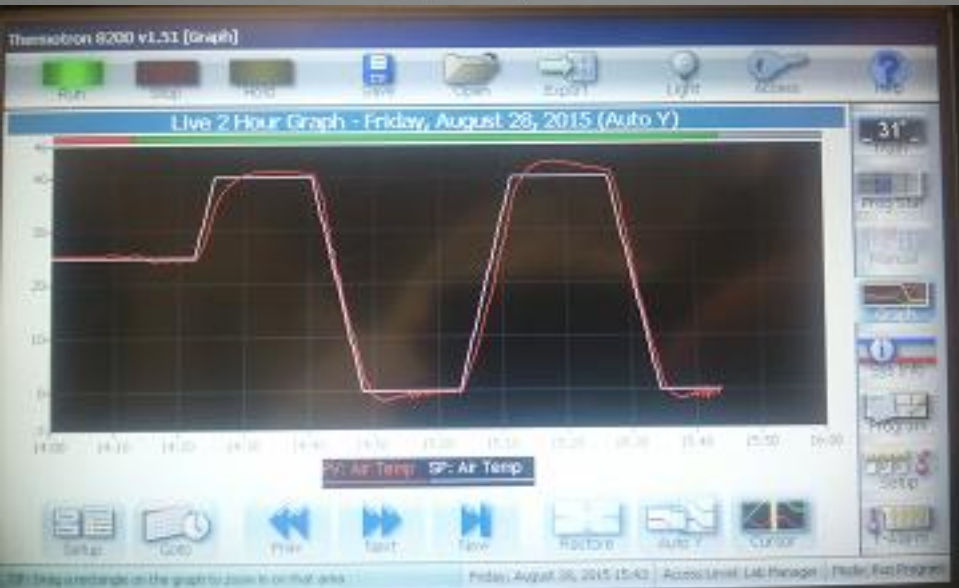
Ground Test: Thermal



Thermal cycle: 0-40 °C,
112 min,

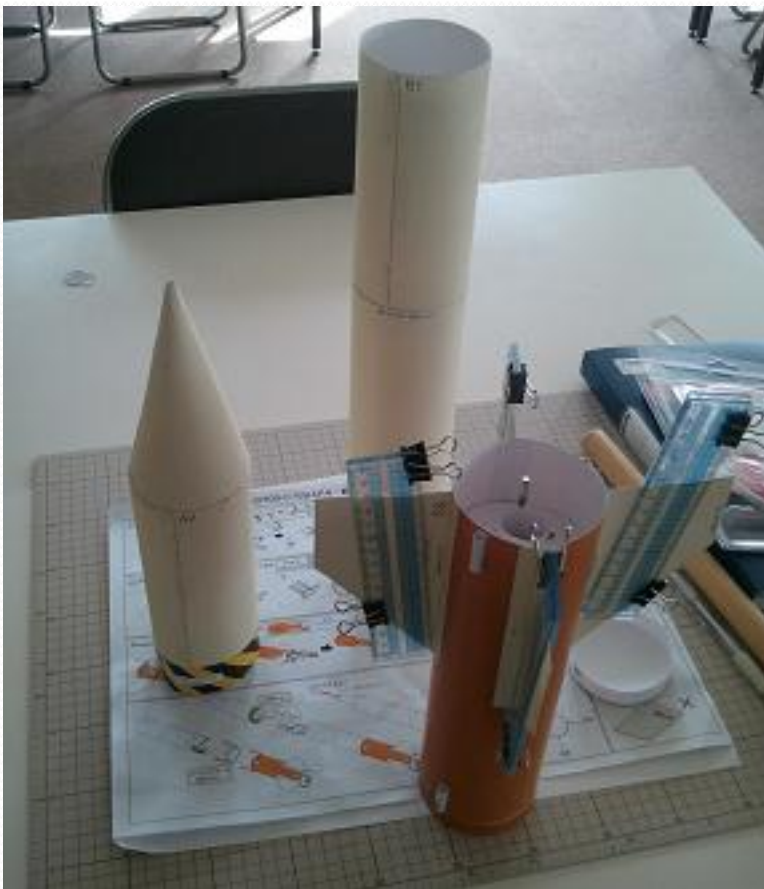
Stops transmitting GPS
after 1 hour due to
battery life

No problem after testing



Launch

Paper rocket making and preparing for launch at Akabira, Uematso Electric



Launch 1&2



Successful launch, but ?

Launch 1&2

- Successful launch and separation of first stage,
 - Launch 1, second stage separation is failed and the CanSat crashed to the ground, resulting a damage in camera and X-bee transmitter.
 - After failure the reasons are investigated for failure: First launch is failed due to strings of parachute stuck in the second stage of rocket
 - Launch 2 a) Attach the strings of parachute via grommet holes on the plastic container so that the CanSat is separated in the second stage b) Put the CanSat upside down in the rocket
 - Launch 2 failed after the first due to the forward movement of the CanSat in the second stage. But this time it was soft landing. It was decided some improvements in the rocket are needed for separation in the second stage

Launch 3

- Successful launch and separation of first stage and second stage finally. All the sensors work well before and after launch, during flight and after landing.

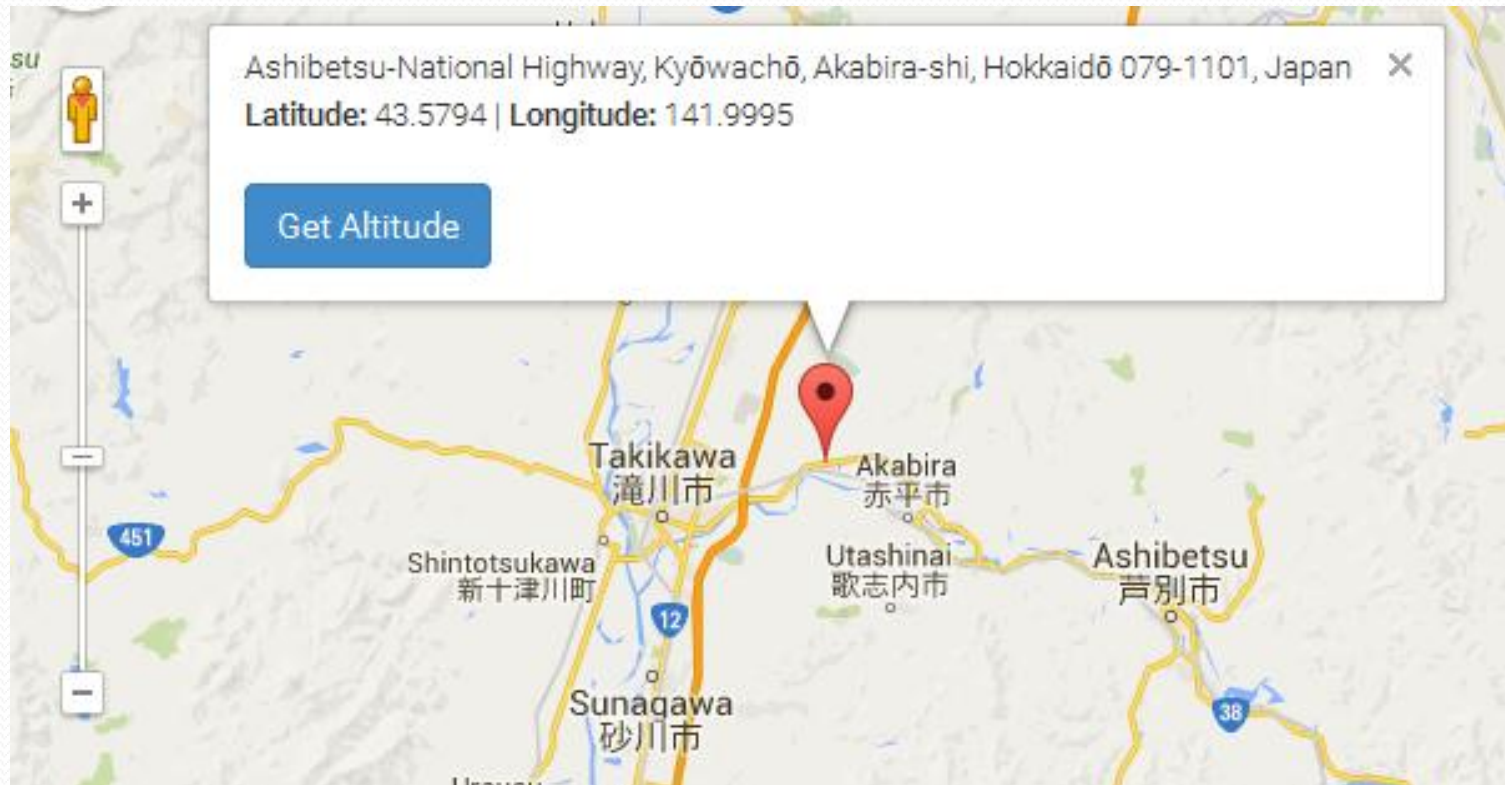


Launch 3



Launch 3

- GPS data



DMS (degrees, minutes, seconds)*

Latitude

N S 43 ° 34 ' 45.84 "

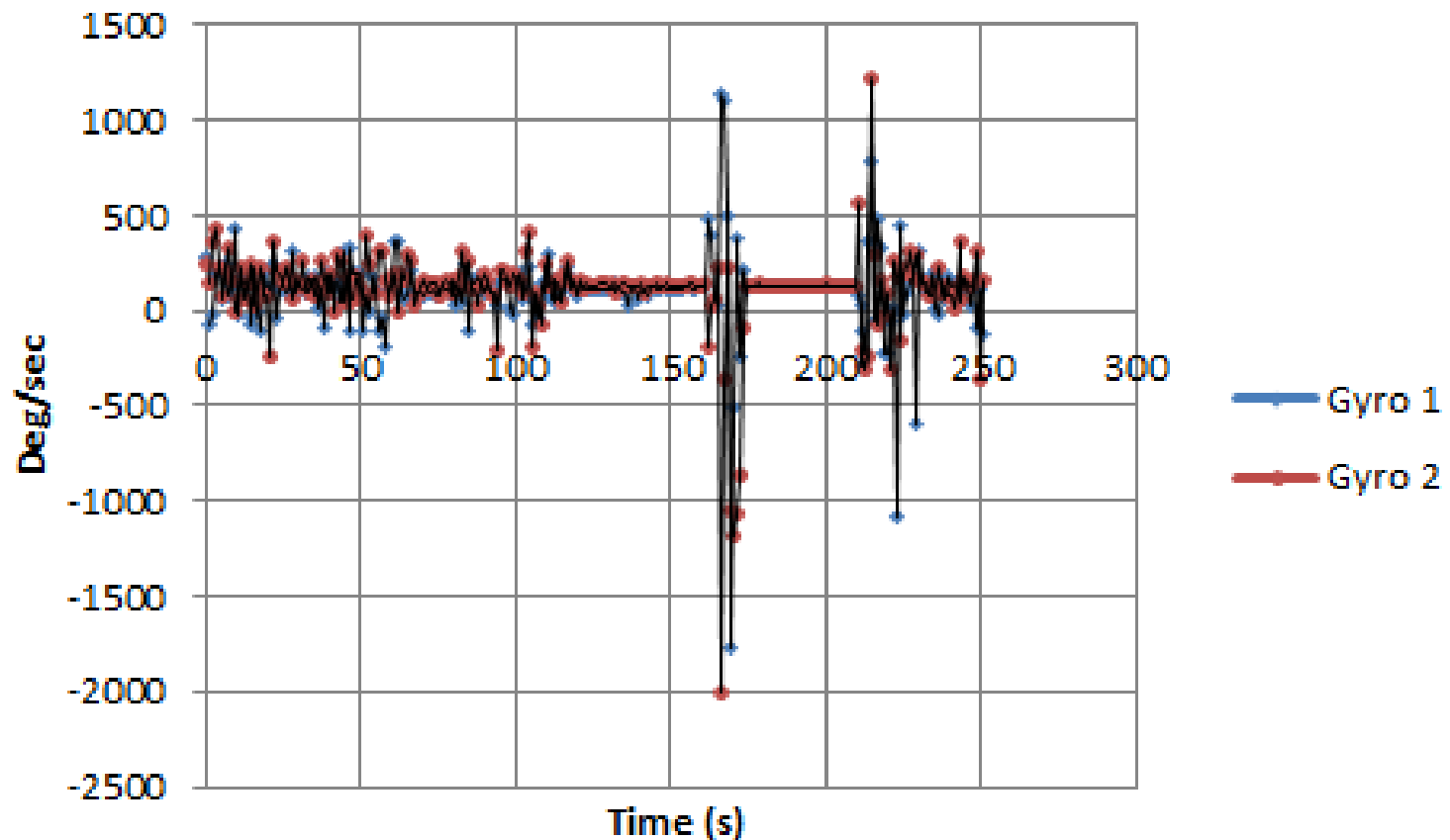
Longitude

E W 141 ° 59 ' 58.2 "

Get Address

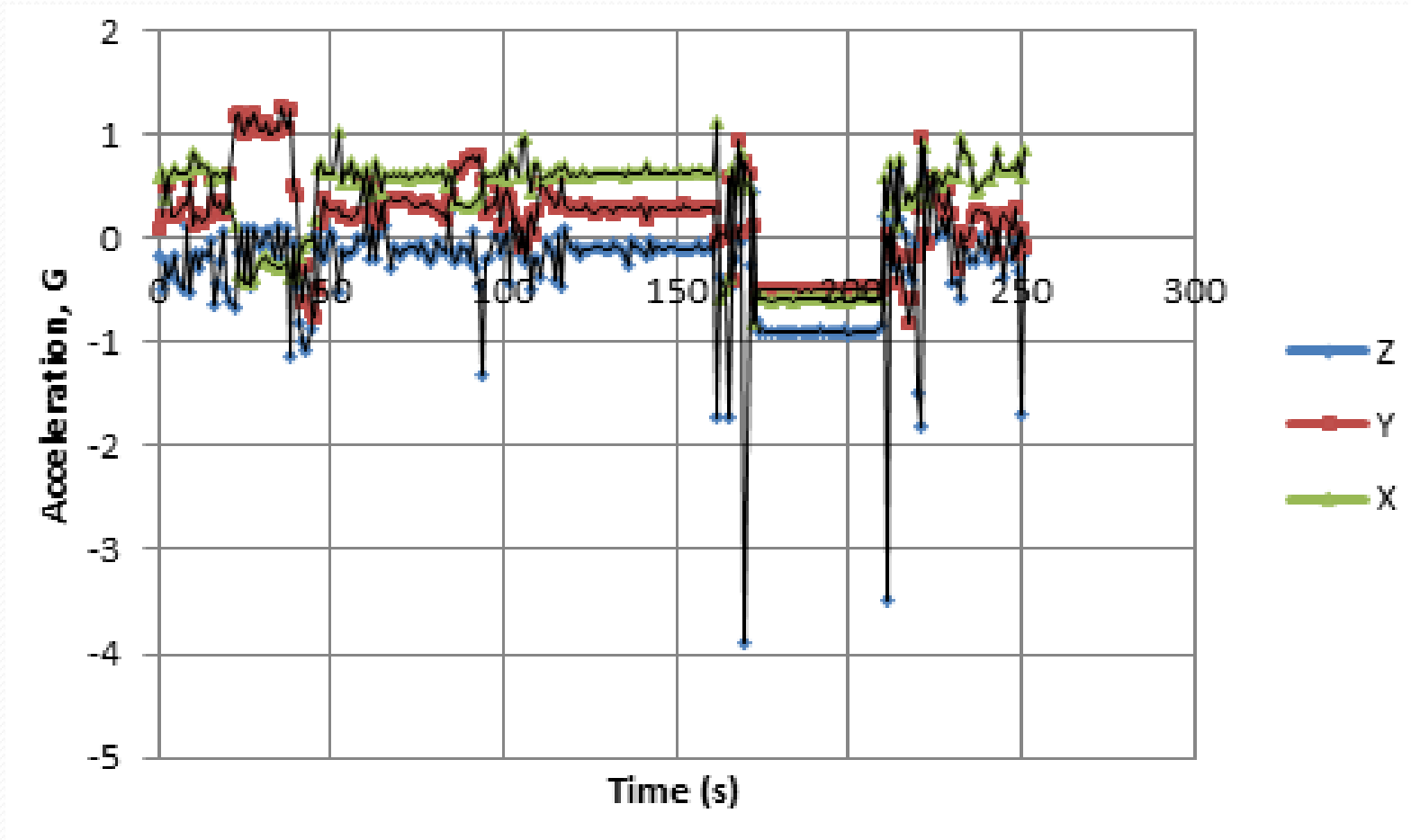
Launch 3

- Gyro readings



Launch 3

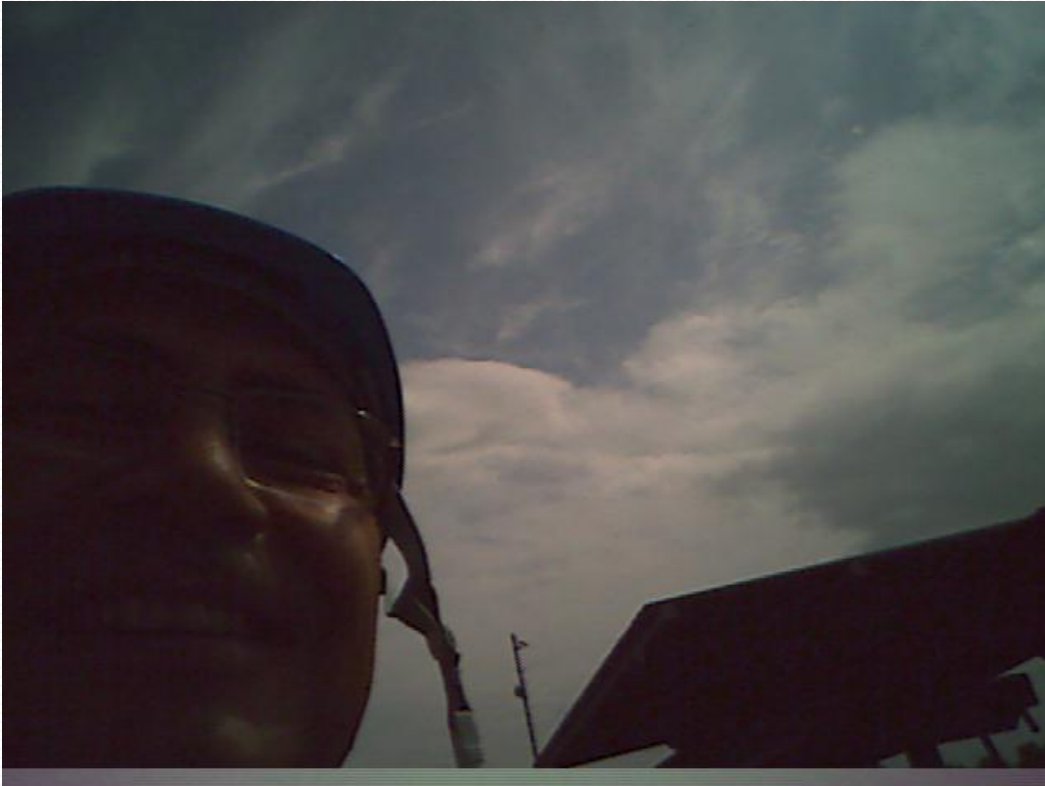
- Acceleration reading



Launch 3, CanSat photos



Launch 3, CanSat photos



Conclusions

- CanSat successfully assembled, and tested on ground for functional tests, vibration, thermal and parachute opening.
- First and second launch are failed due to strings of parachute stuck in and forward movement of the CanSat the second stage of rocket.
- Damaged parts are replaced and lesson learnt applies to the CanSat. Final launch resulted in a success.
- It was a great experience, and beyond my expectations. The CanSat Leader Training Program (CLTP) enabled me to have an experience the entire cycle of CanSat development from the design to launch as well as teaching methods utilized in space engineering.