Analysis of Dry Run Data

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Outline

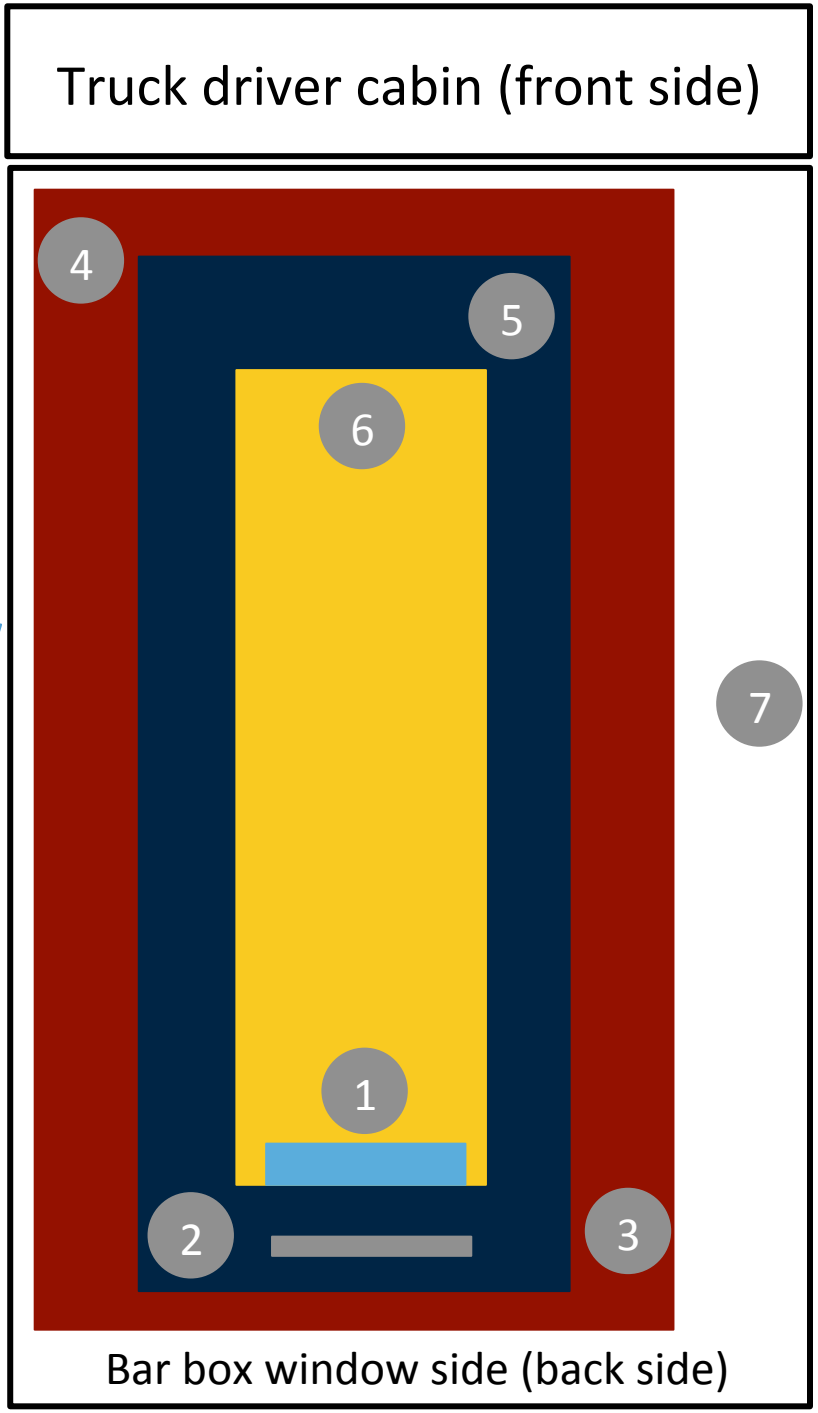
- Schematics
- Accelerometer
  - Overview
  - Shocks
  - During loading
- Thermocouple
- Conclusion

TOP VIEW*

Red: outer crate
Blue: inner crate
Maize: (mock) bar box
: accelerometer
: thermocouple
: bar box window

Accelerometer naming:
1: box_back
2: inner_back
3: outer_back
4: outer_front
5: inner_front
6: box_front
7: floor

*: Not to scale

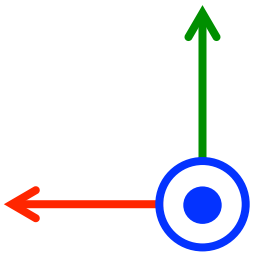


Data rates

Accelerometers: all at **256 Hz** except one (outer_front) at 128 Hz

Thermocouple: **1 Hz**

Acceleration directions:



UD: Up (positive)-Down
LR: Left (positive)- Right
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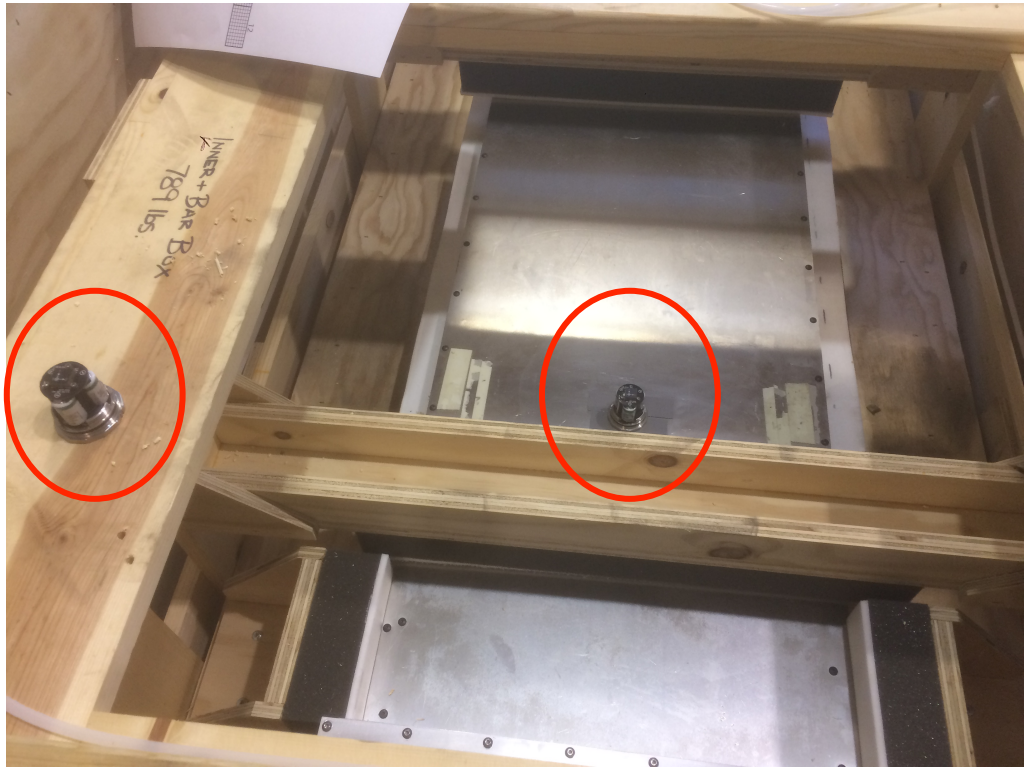
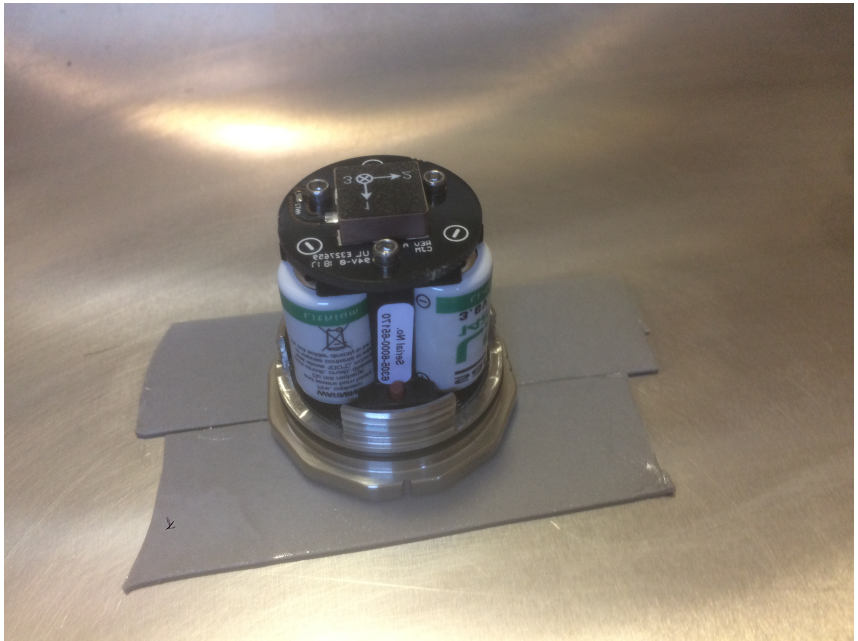
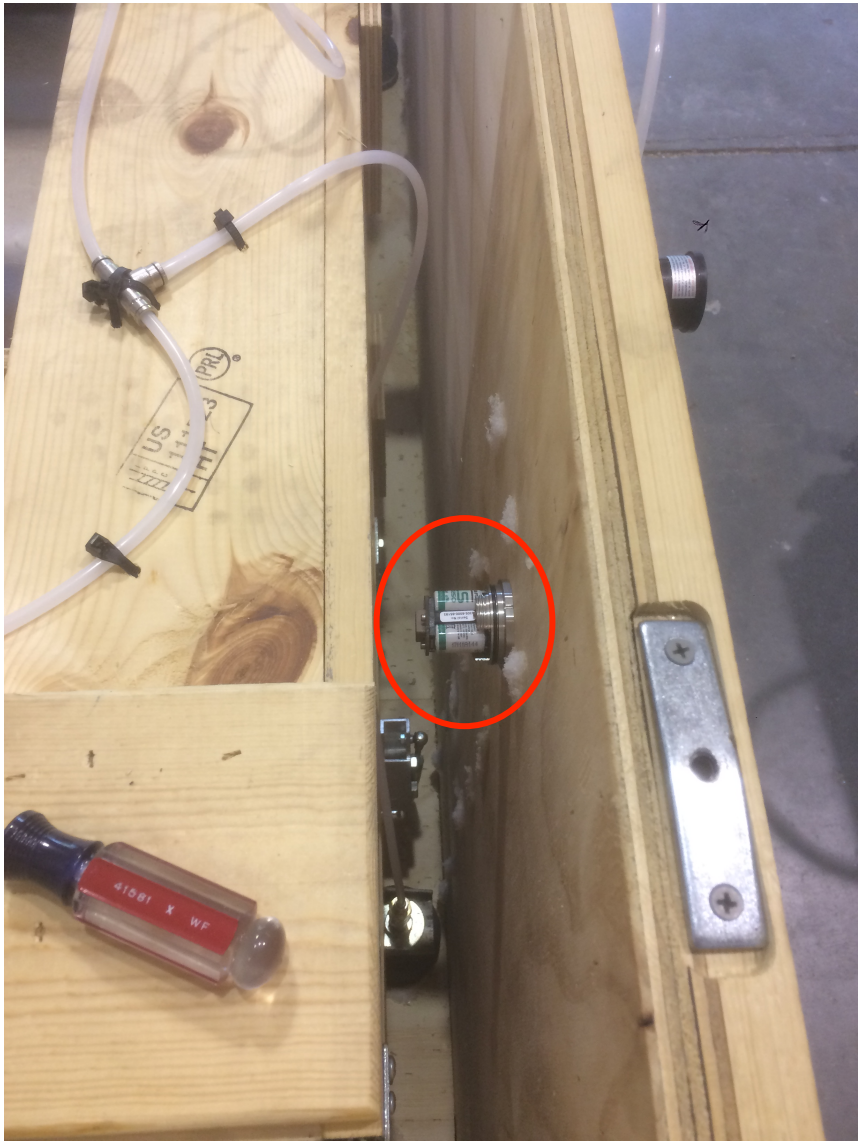
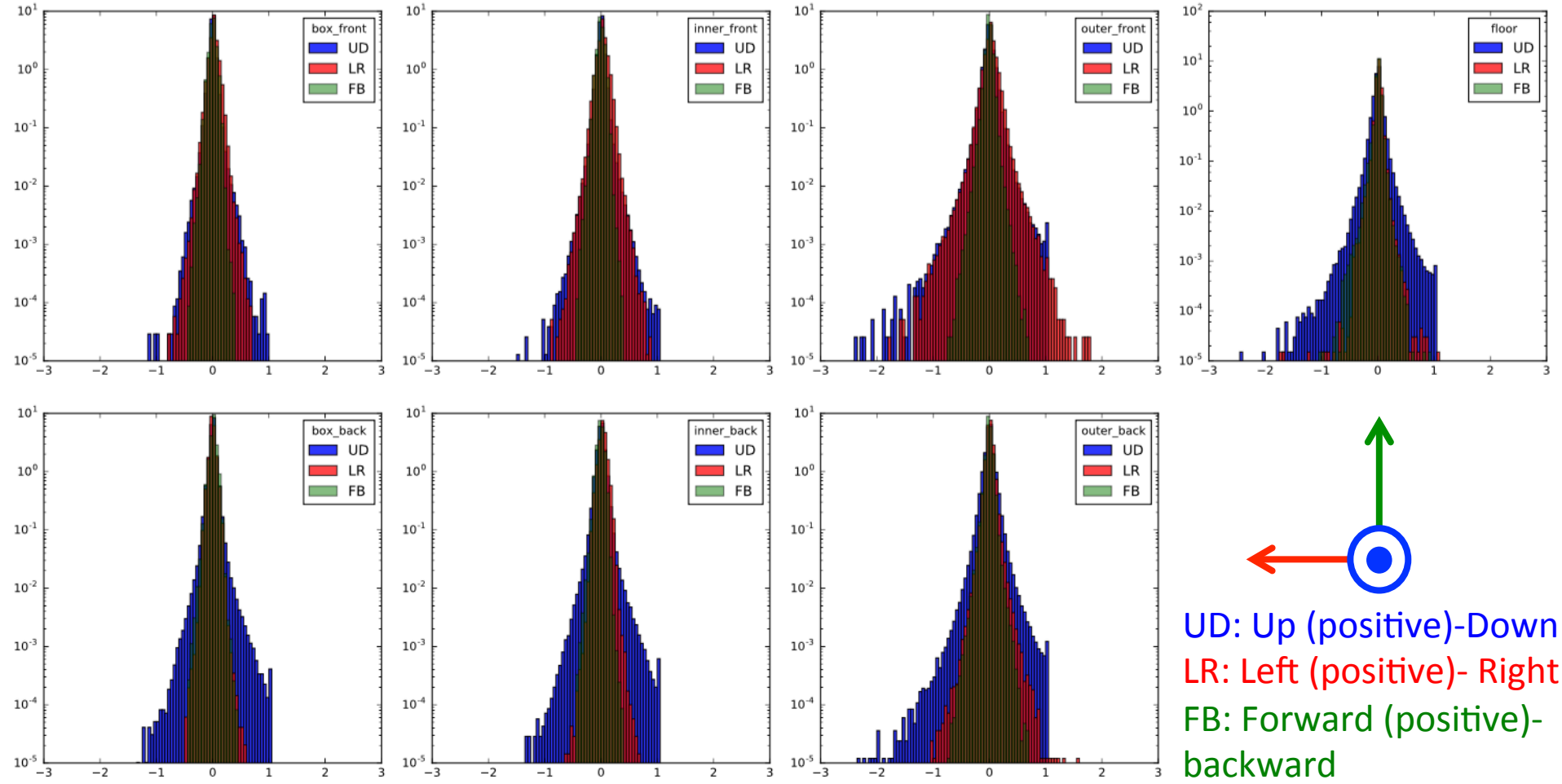

INNER + BAR BOX
789 lbs.






FRAGILE

Accelerometer - Overview



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Acceleration (i.e. deviation from nominal) [G]

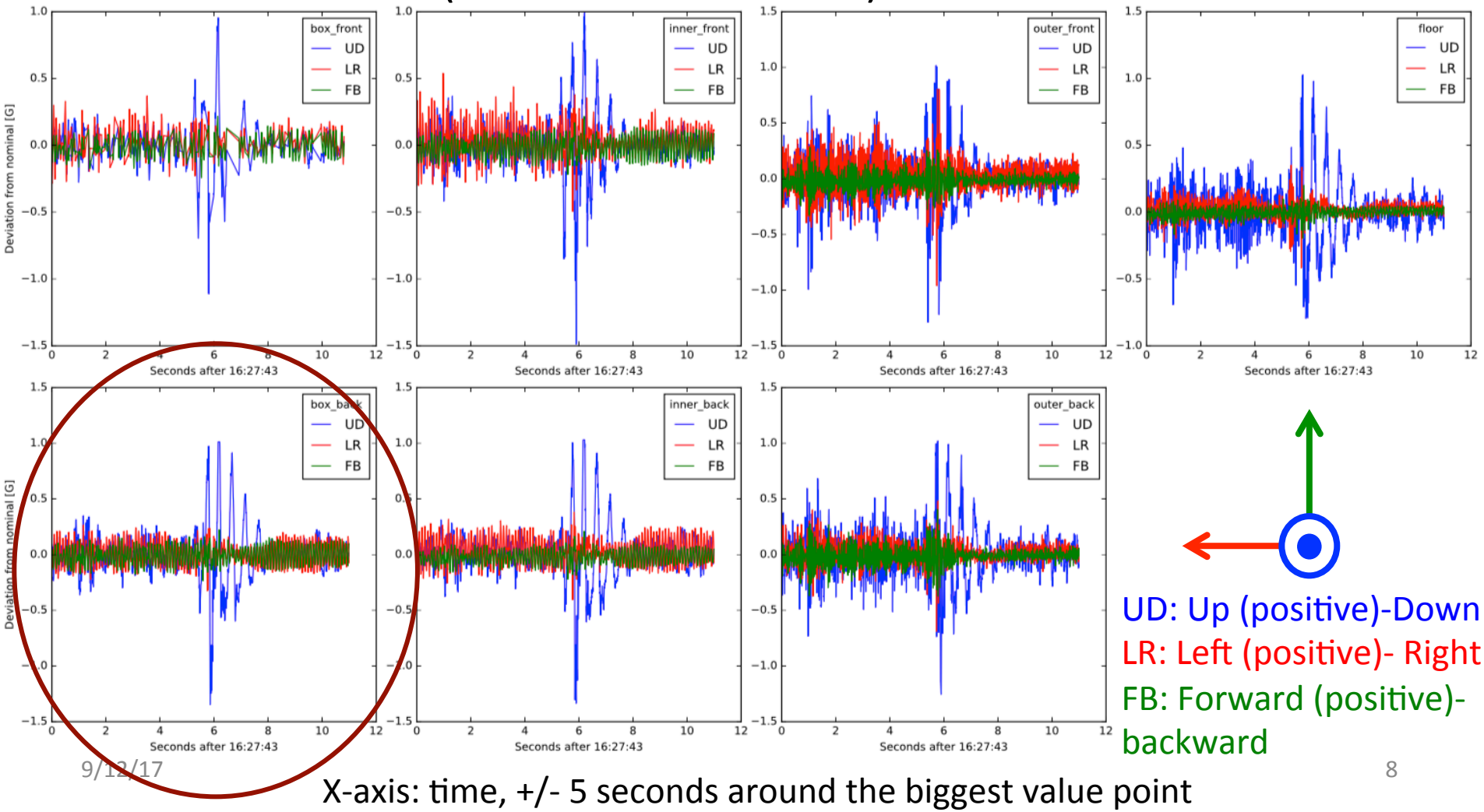
Accelerometer - Overview

Notes:

- Cut-off at 1G: LORD accelerometers claim to have +/- 8G range, but probably the current setting default is at +/- 2G. Need to check and change to full +/- 8G range
- Crates show noticeable shock-absorption in general
- Front side seems to experience less shocks than back side

Accelerometer - Shocks

Largest shock experienced by the “box_back” accelerometer in **UD** direction at 16:27:48 (one of John’s videos)



UD: Up (positive)-Down
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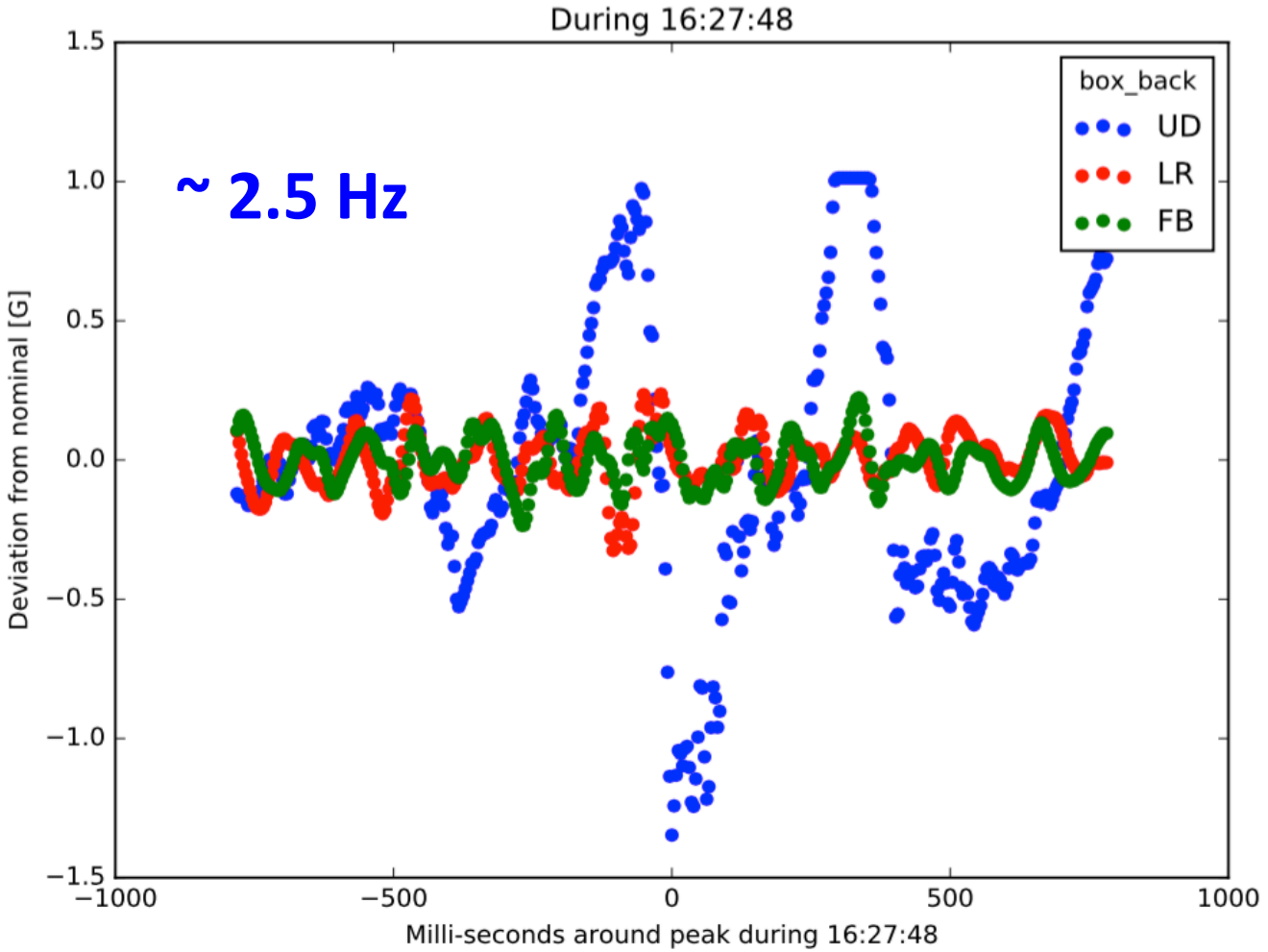
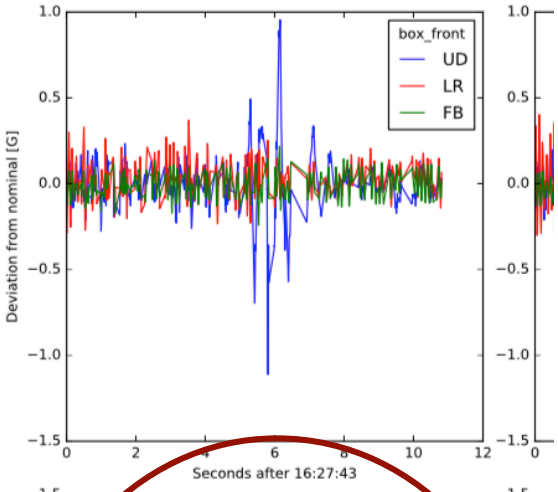
FB: Forward (positive)-backward

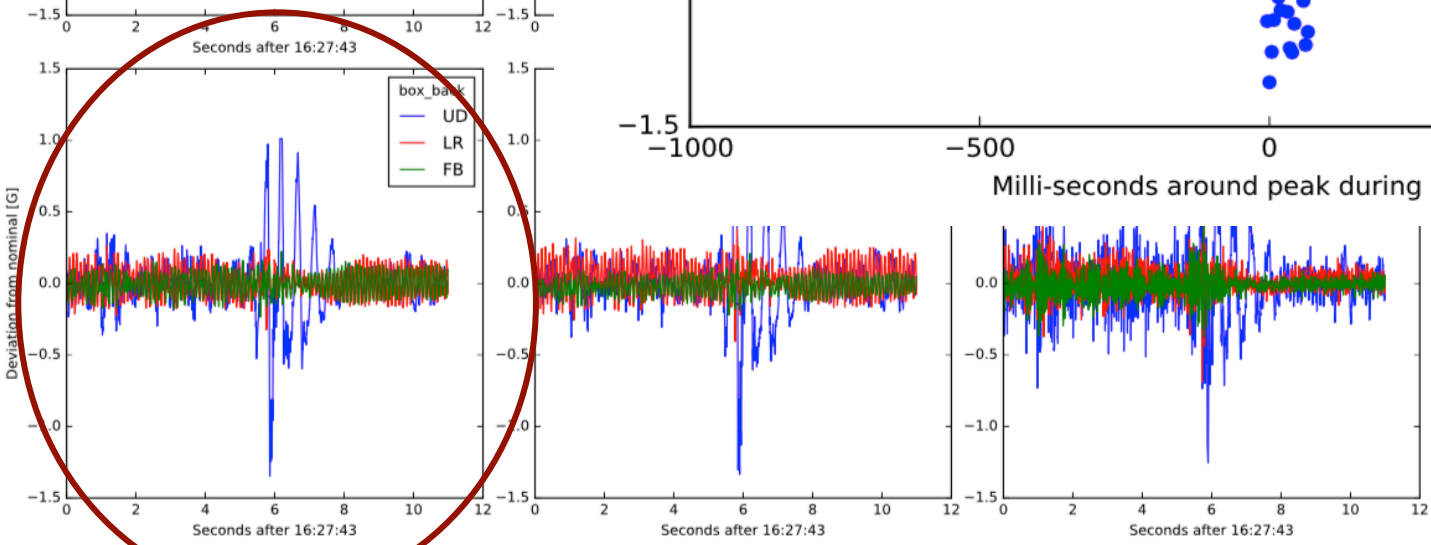
X-axis: time, +/- 5 seconds around the biggest value point

Acc

Largest shock experie
direction at 16:27:48







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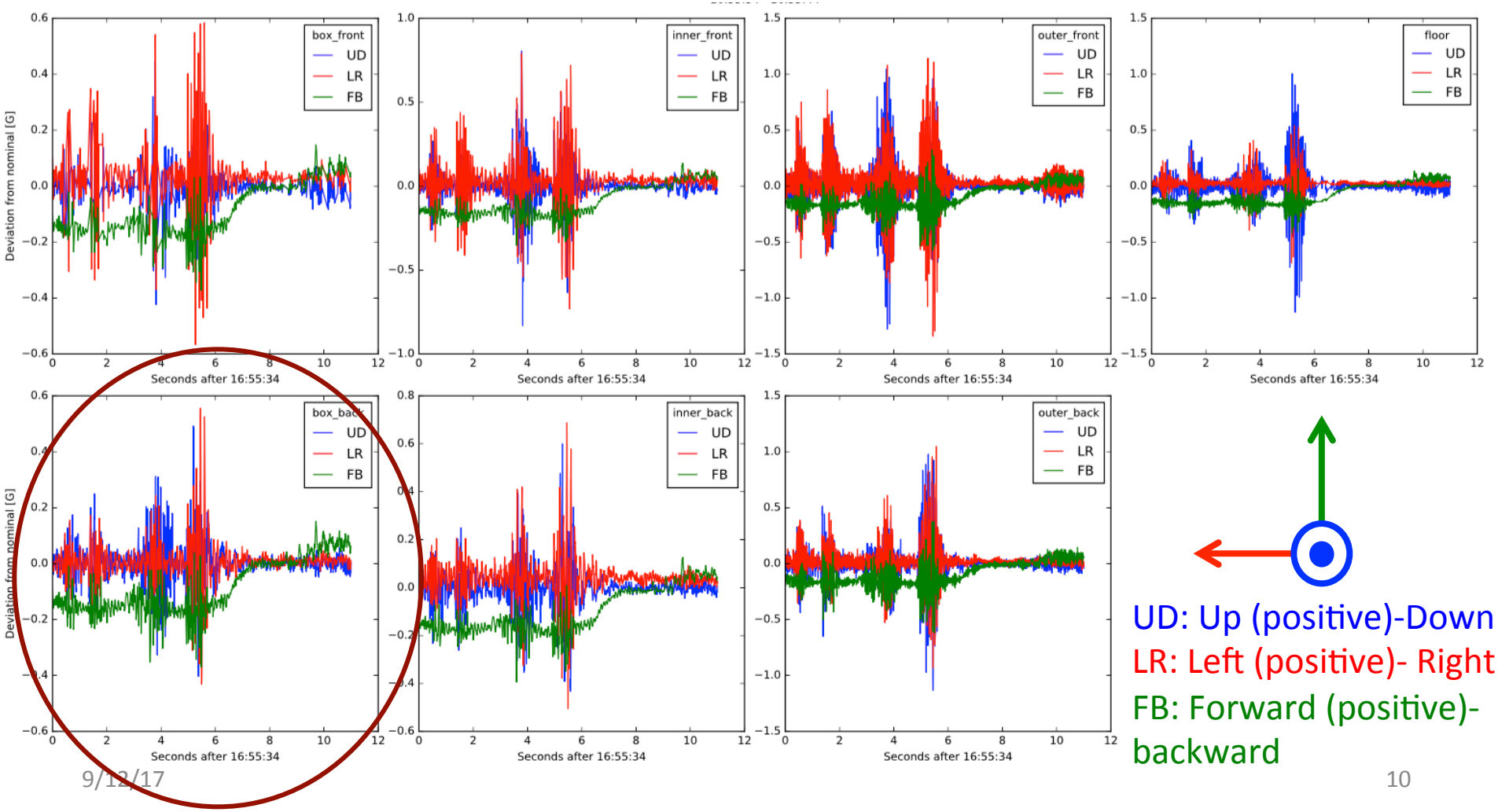
X-axis: time, +/- 5 seconds around the biggest value point

Accelerometer - Shocks

Largest shock experienced by the “box_back” accelerometer in **LR** direction at 16:55:39



UD: Up (positive)-Down

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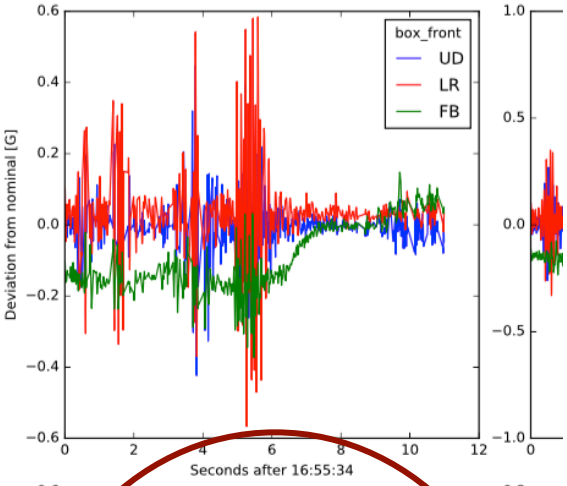
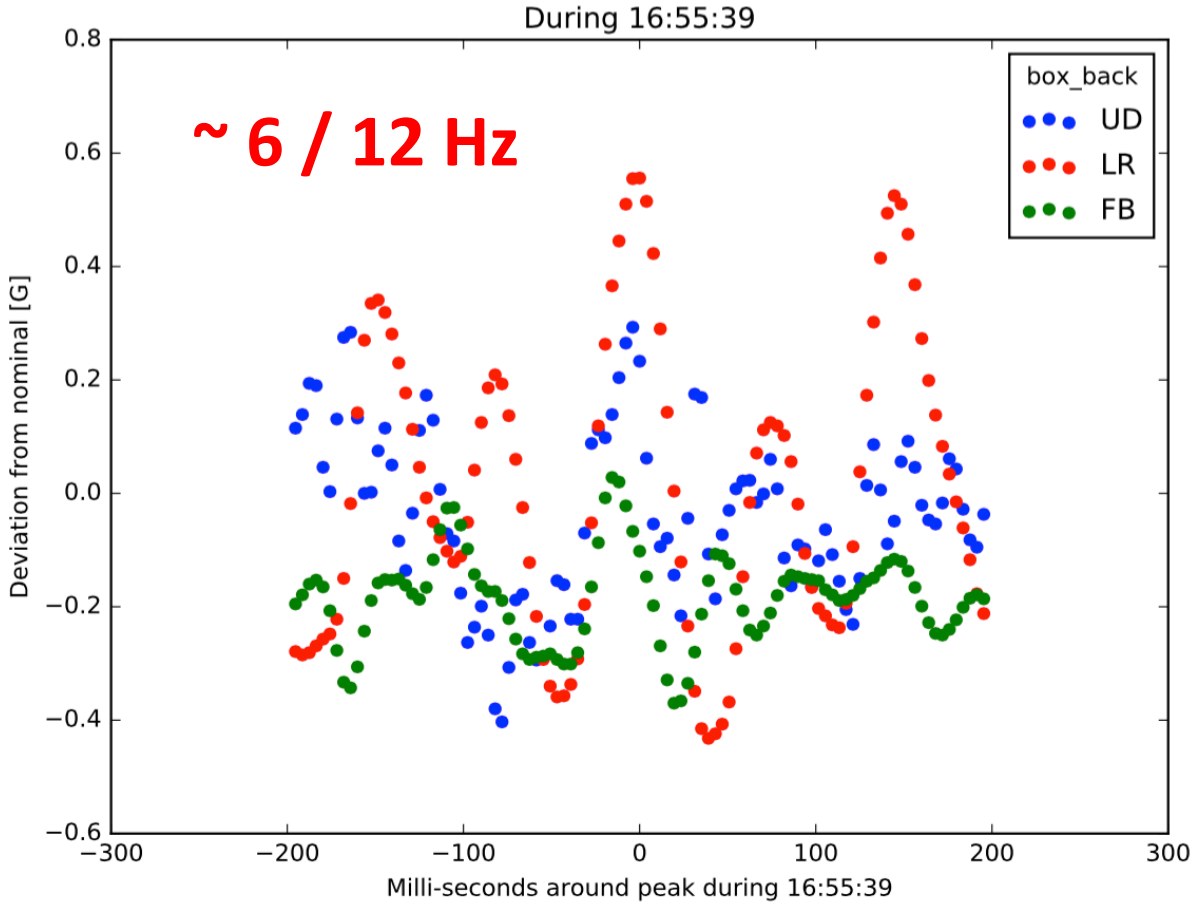
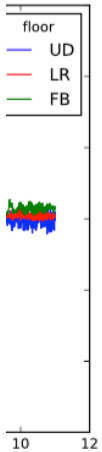
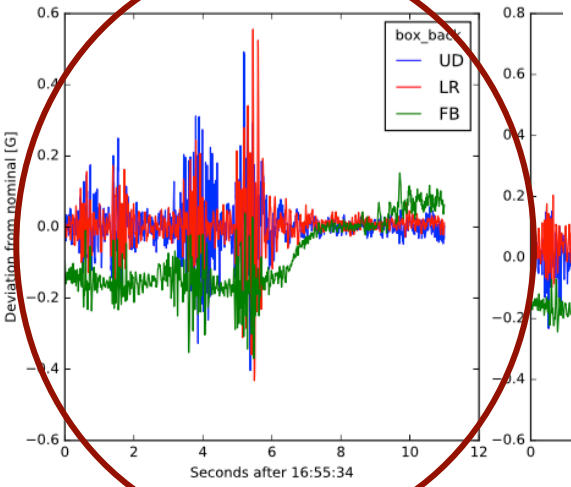
Acc

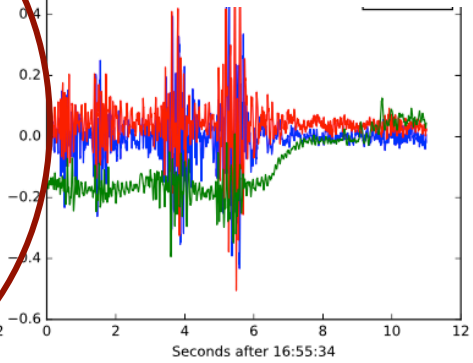
Largest shock experie
direction at 16:55:39

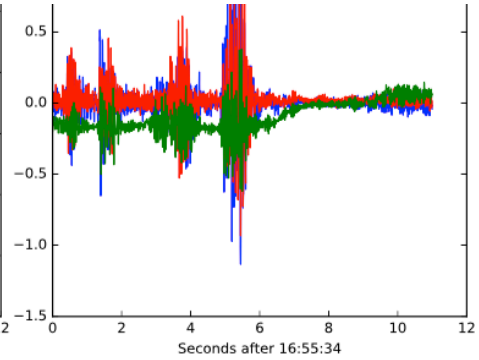


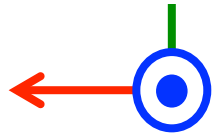












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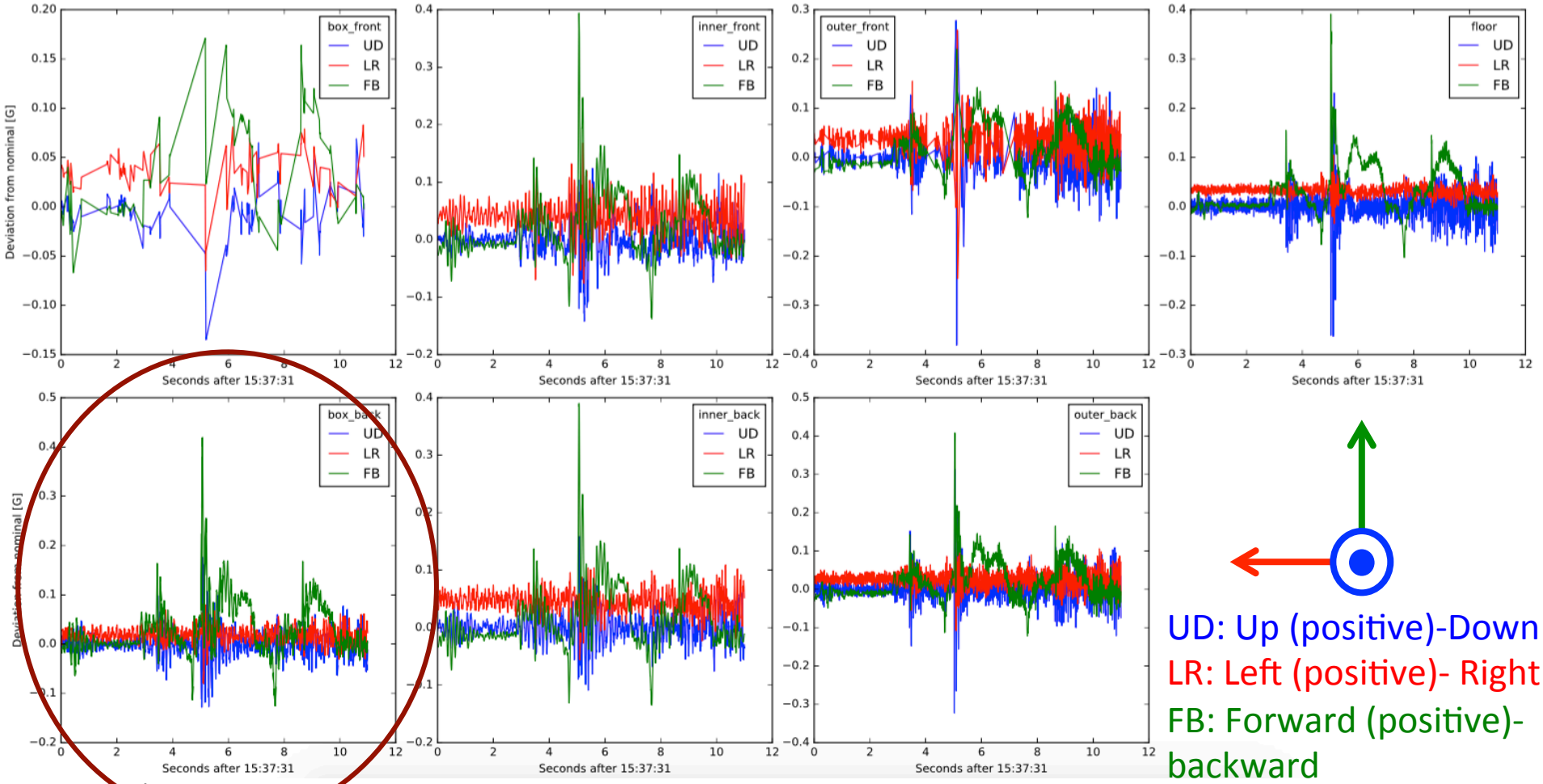
FB: Forward (positive)-backward

Accelerometer - Shocks

Largest shock experienced by the “box_back” accelerometer in **FB** direction at 15:37:36



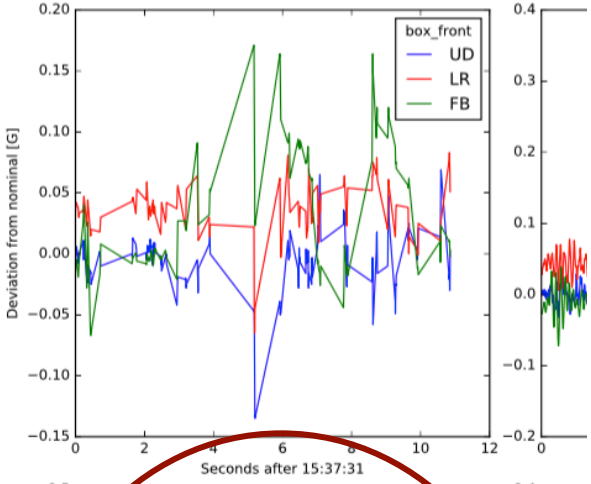
UD: Up (positive)-Down

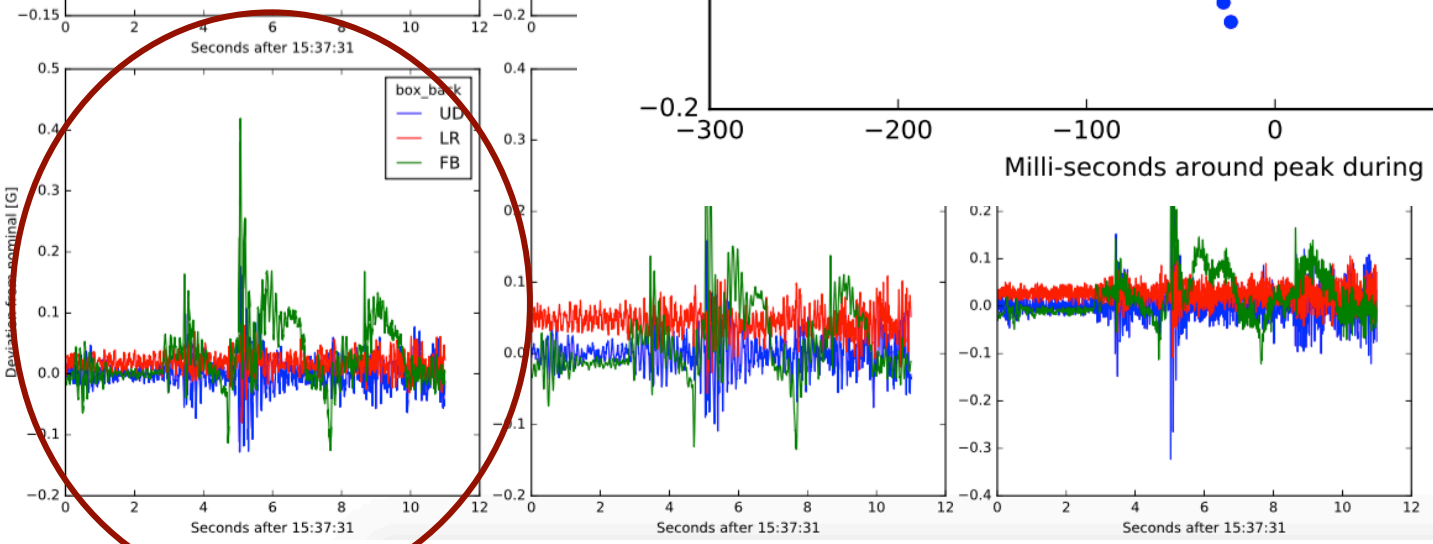
LR: Left (positive)- Right

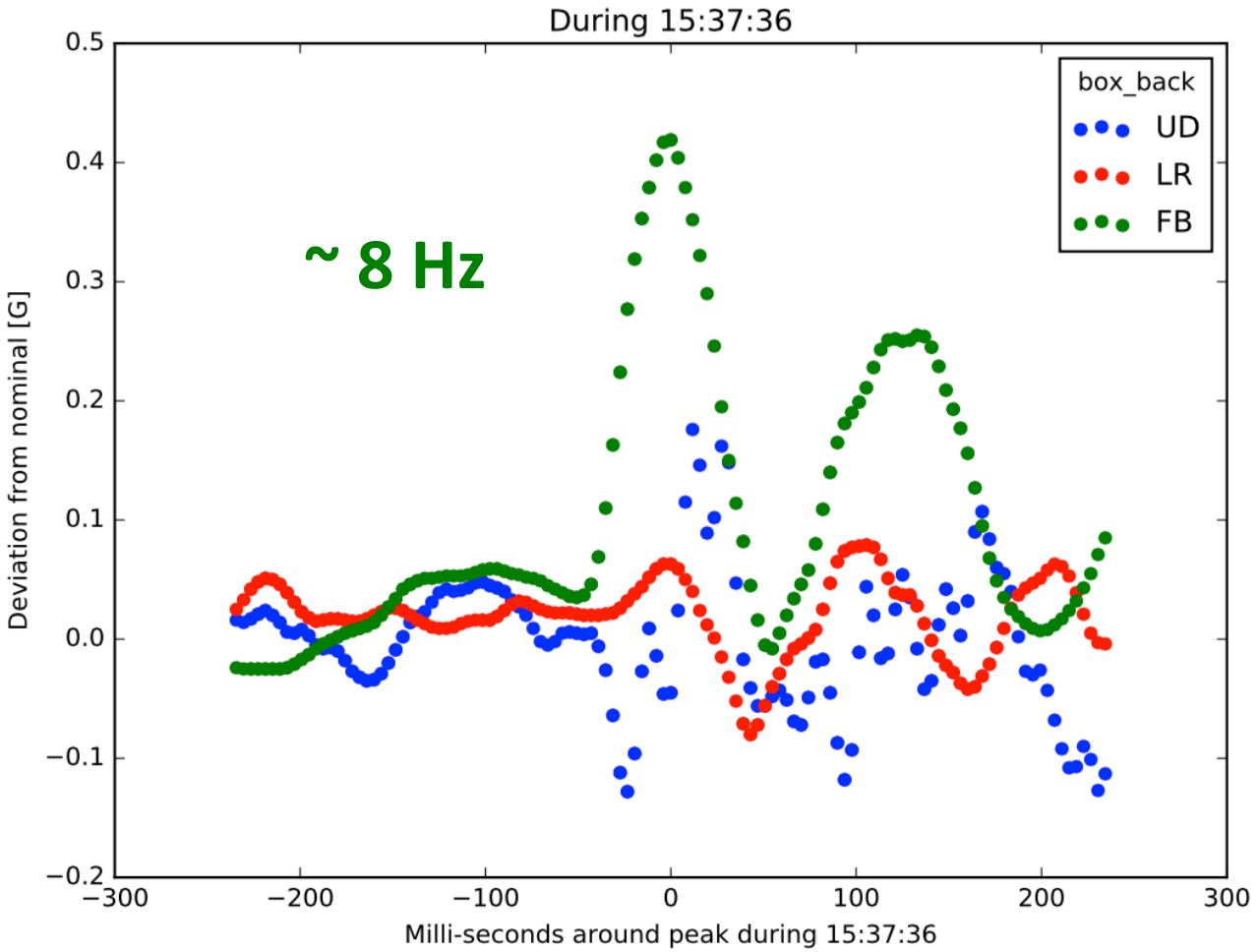
FB: Forward (positive)-backward

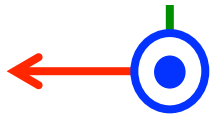
Acce

Largest shock experier
direction at 15:37:36









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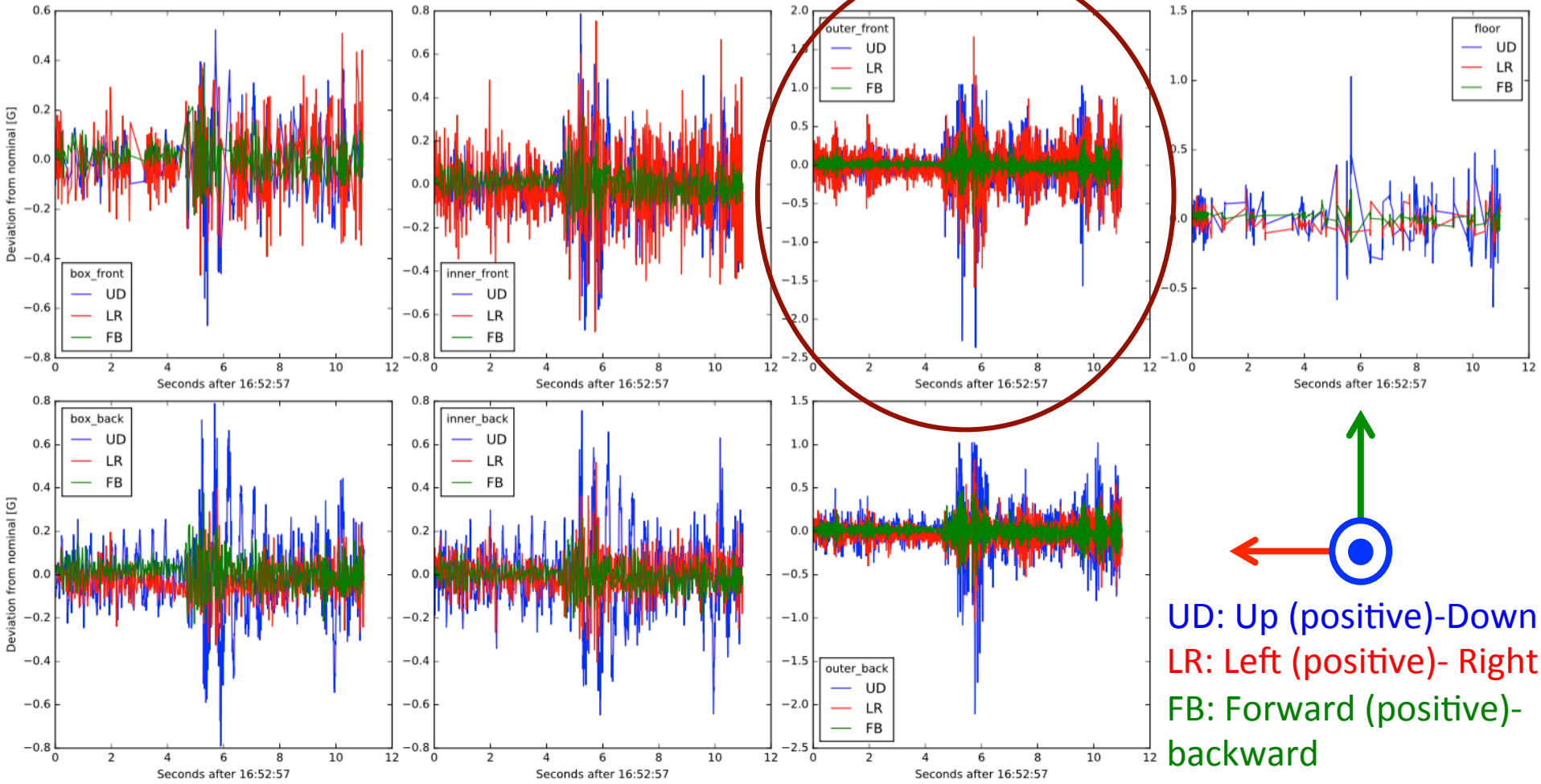
The other shock that John showed



UD: Up (positive)-Down

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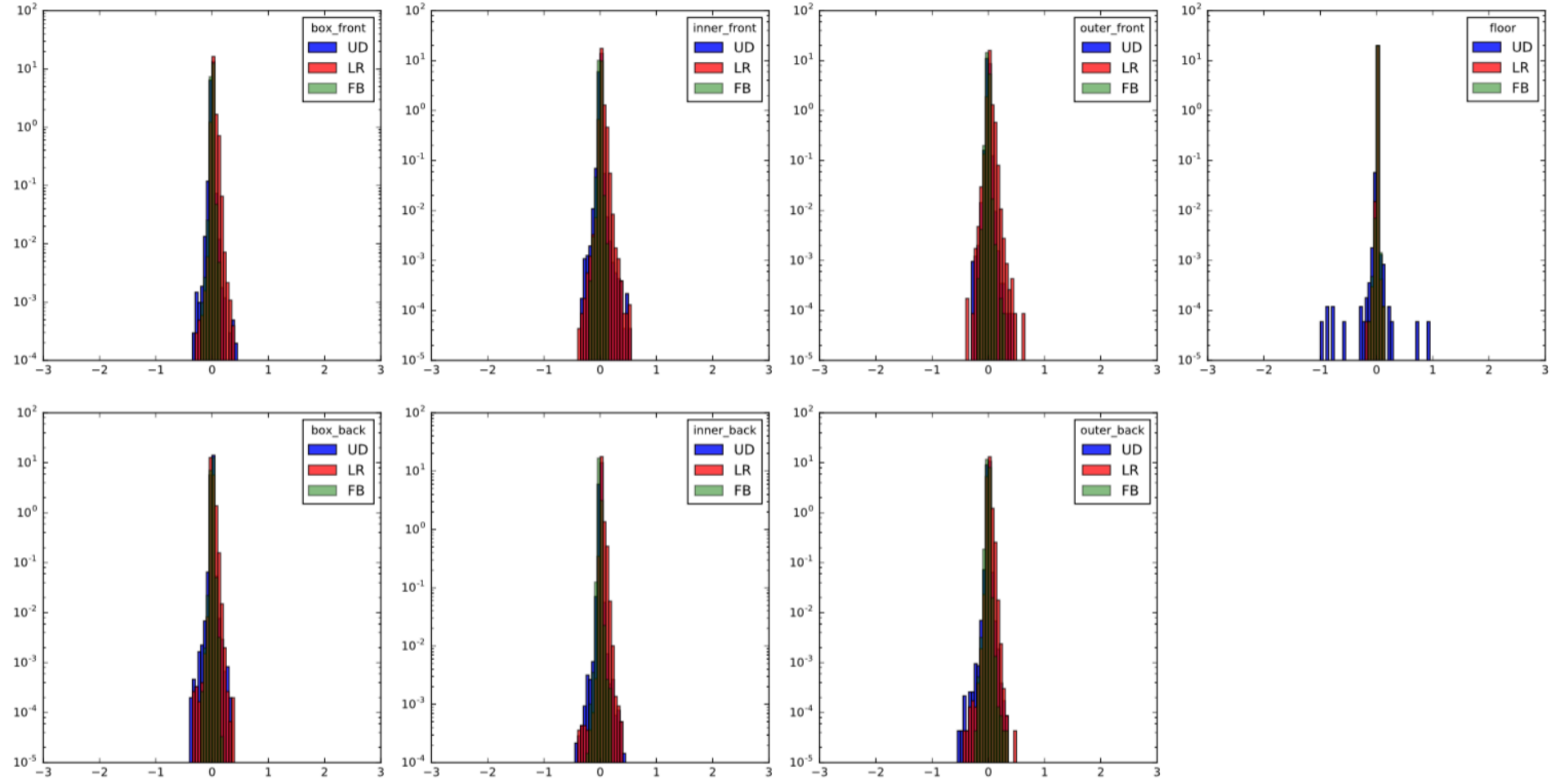
FB: Forward (positive)-backward

Shock at 16:53:02. This is also the largest shock experienced by the “outer_front” accelerometer in the **UD** direction.

Accelerometer - shocks

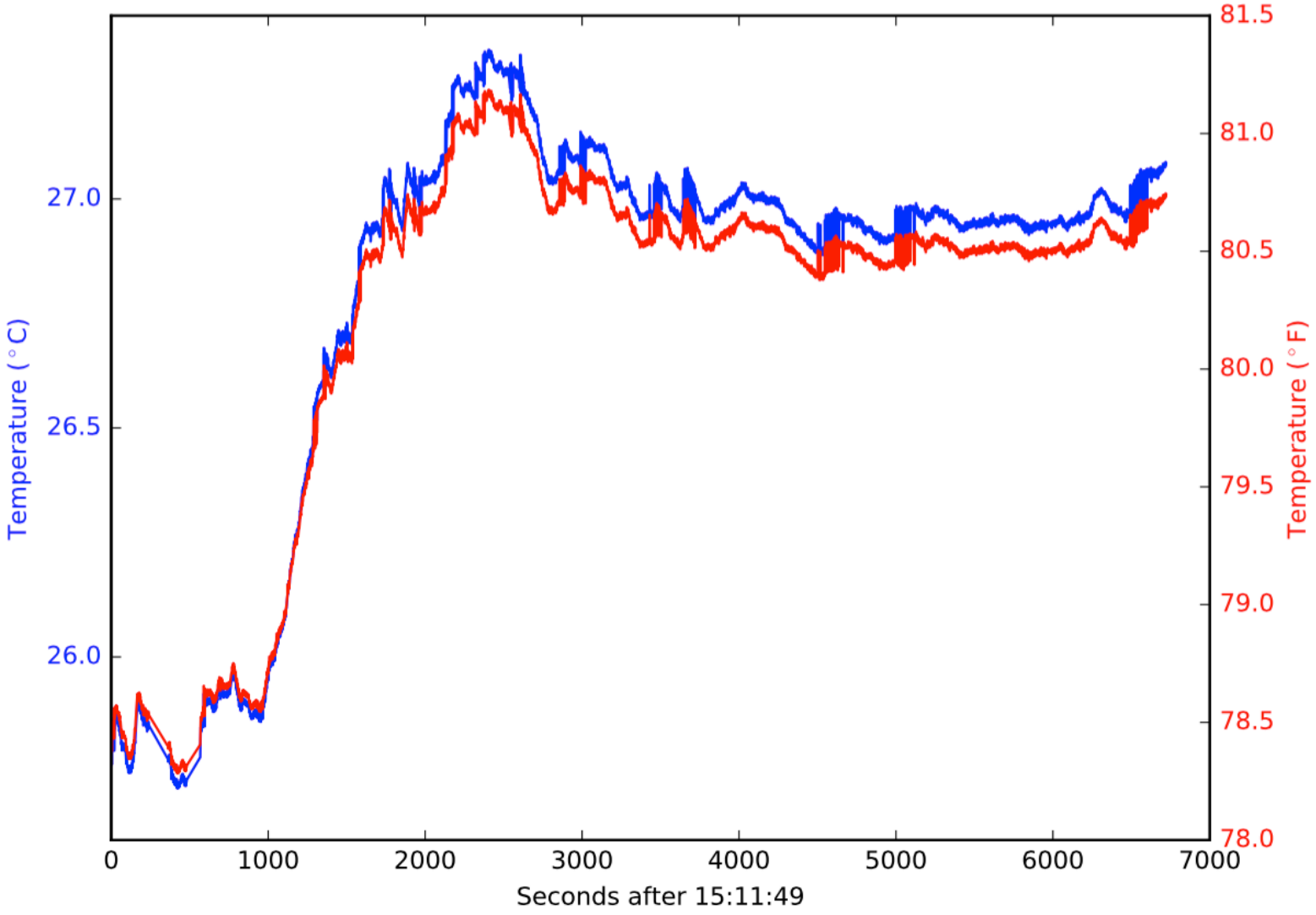
- For this run, largest shocks on the bar box is ~1.5G in UD, ~0.6G in LR and ~0.5G in FB
- No O(10G) shocks observed compared to previous road test (lower sample rate? better shock-absorption?)
- Able to correlate camera output with accelerometer data, and vice versa.
- But not able to correlate these with road conditions
- More plots of the same idea shown in the "shock_details" document

Accelerometer – during loading



No big shocks experienced

Thermocouple data



Conclusions

Essentially, the system worked as expected. Some issues need to be addressed:

- Pressure sensor electronics
- Accelerometer range +/-2G ---> +/- 8G
- Understand and address the loss of data packets issue