

WAAS Technical Memorandum
William J. Hughes Technical Center
Pomona, New Jersey
03/26/2020

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DR #144: Cold Bay WRS PRN
11 L2 Signal Tracking Anomaly
Due To High Power



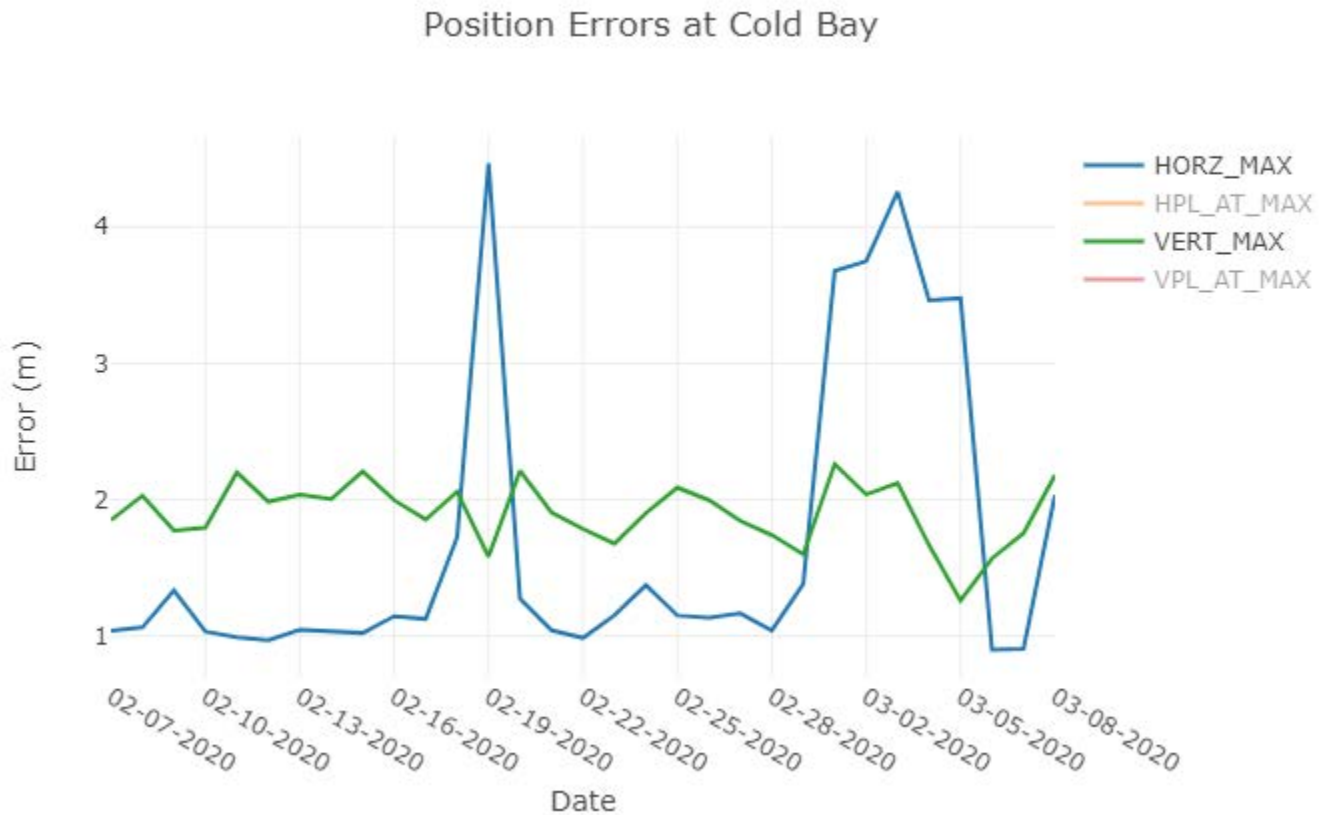
**Federal Aviation
Administration**

CDB PRN11

- **Since February 19, 2020, we have seen a higher horizontal error at all 3 CDB WRE's 6 times (3.4 – 4.4m)**
- **The high horizontal position error corresponds to high range errors observed on PRN11 (~30–50 minutes)**
 - Elevation 8–10 degrees
- **Occurs around the same time (offset for GPS constellation) for each event ~22:00 GMT**



CDB Maximum Horizontal Error



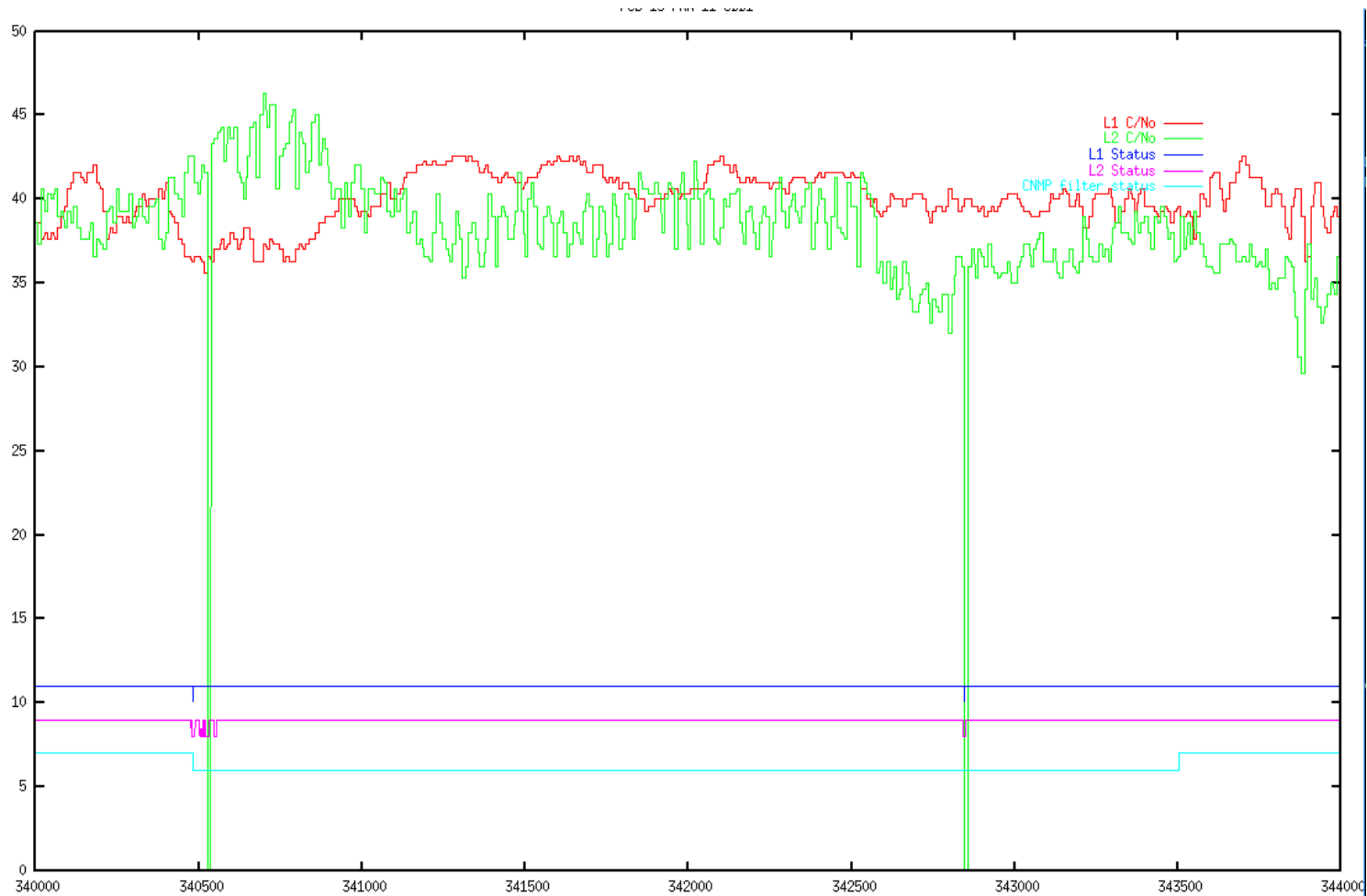
CDB PRN 11

- **CDB WREs lose track of PRN11 L2 signal at time of events**
 - Often lose track multiple times

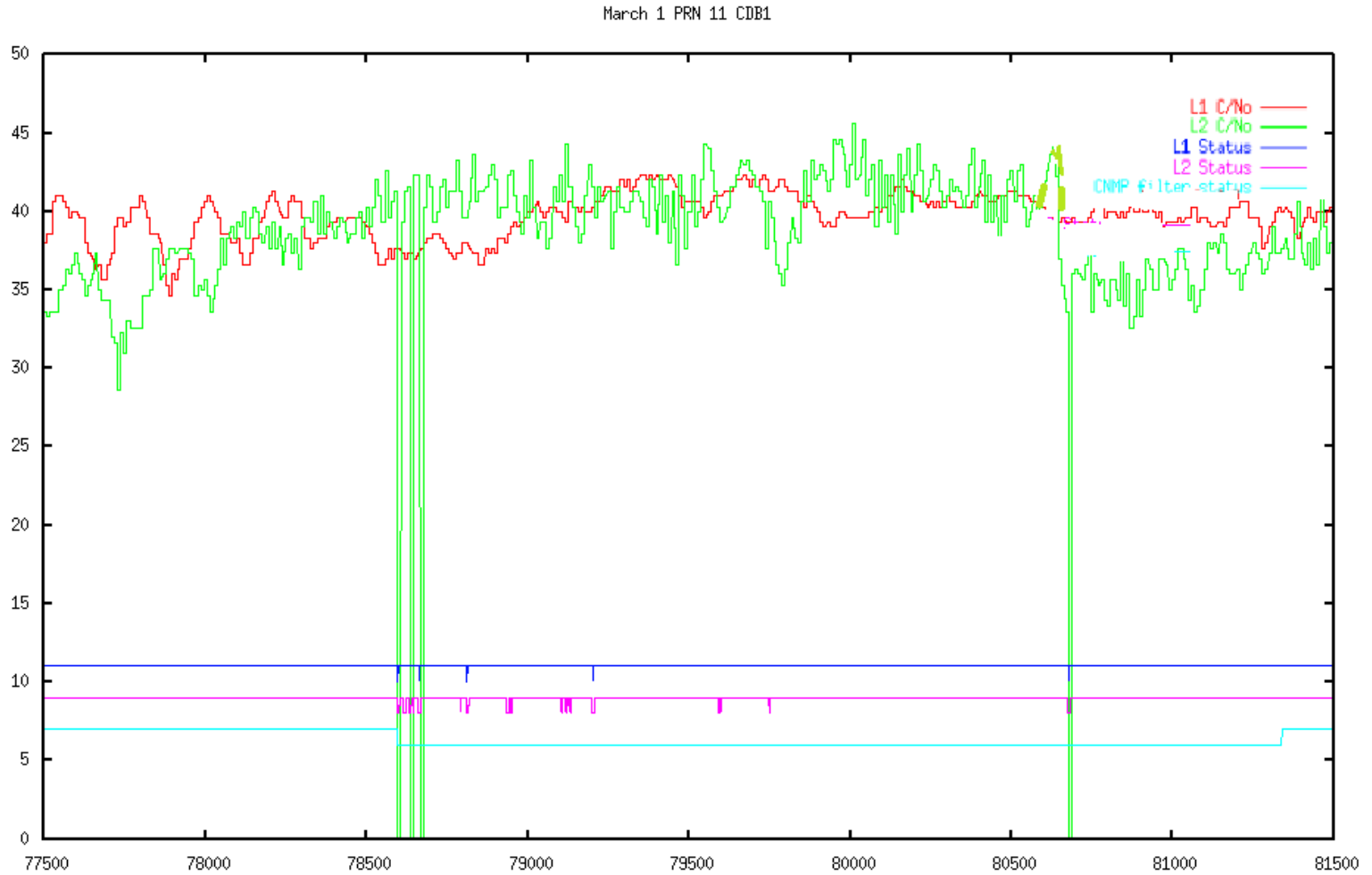
- **See slides 5 (February 19) and 6 (March 1)**



CDB February 19 L1 and L2 C/No



CDB March 1 L1 and L2 C/No

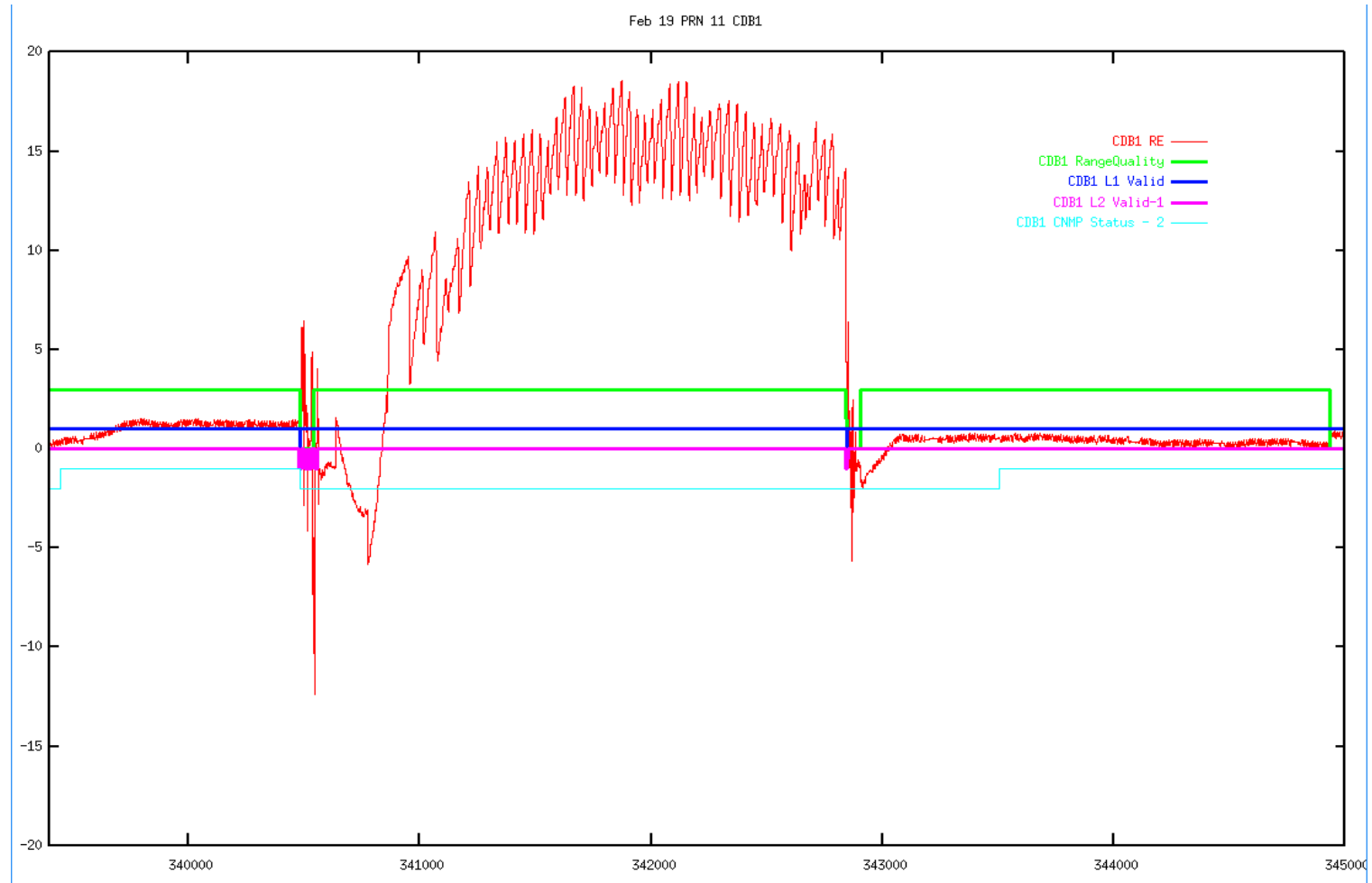


CDB PRN11

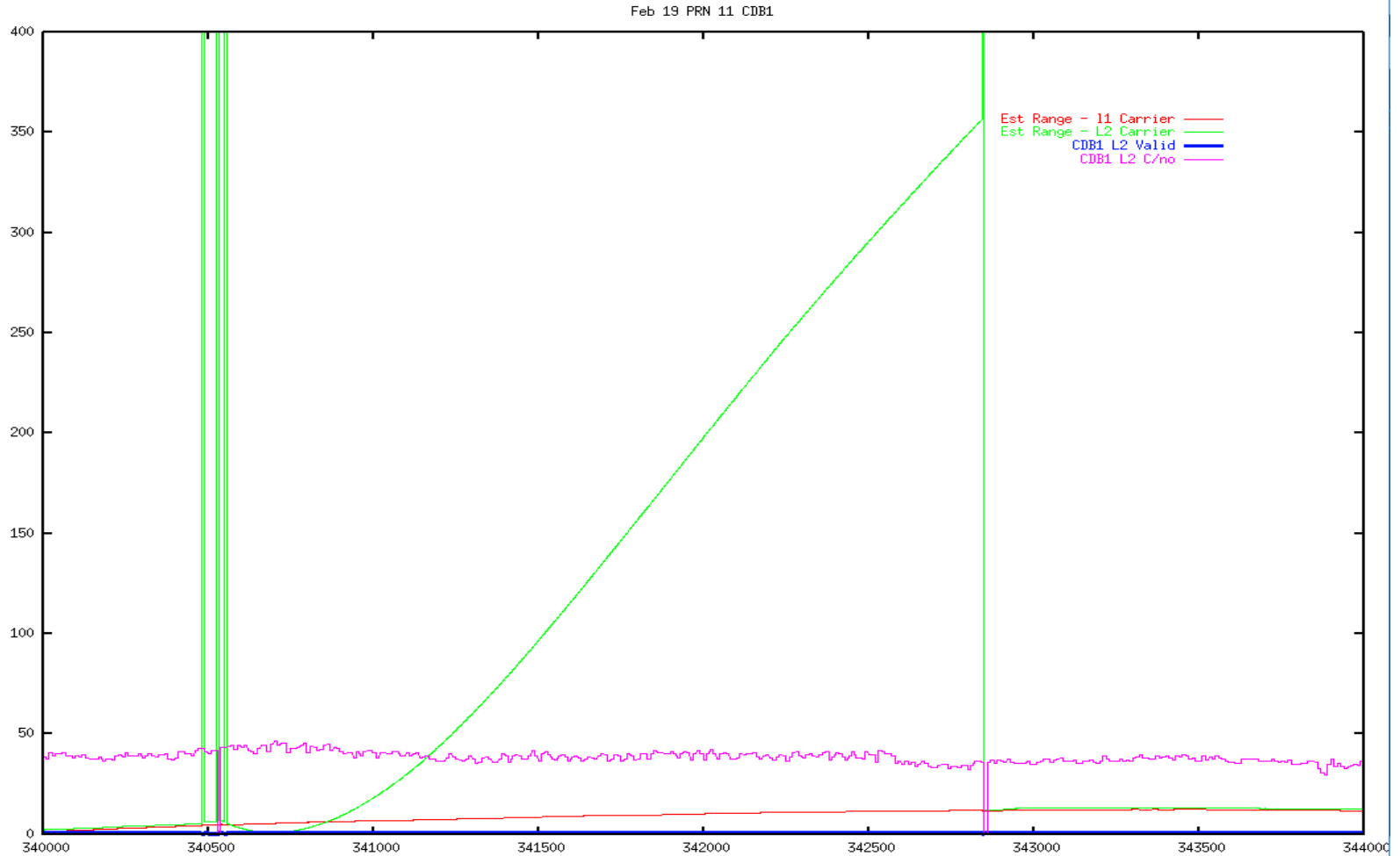
- **WJHTC has observed higher range errors on PRN11 at CDB during times it seems to reacquire L2, and the L2 carrier measurement is unexpected compared to expected true range calculation**
- **Slide 8 shows observed range errors on Feb 19**
- **Slides 9 and 10 show Estimated True range – L1/L2 Carrier**
- **Range errors remain high and return to normal after CDB loses track of L2 signal and reacquires**



CDB/PRN11 Range Error February 19

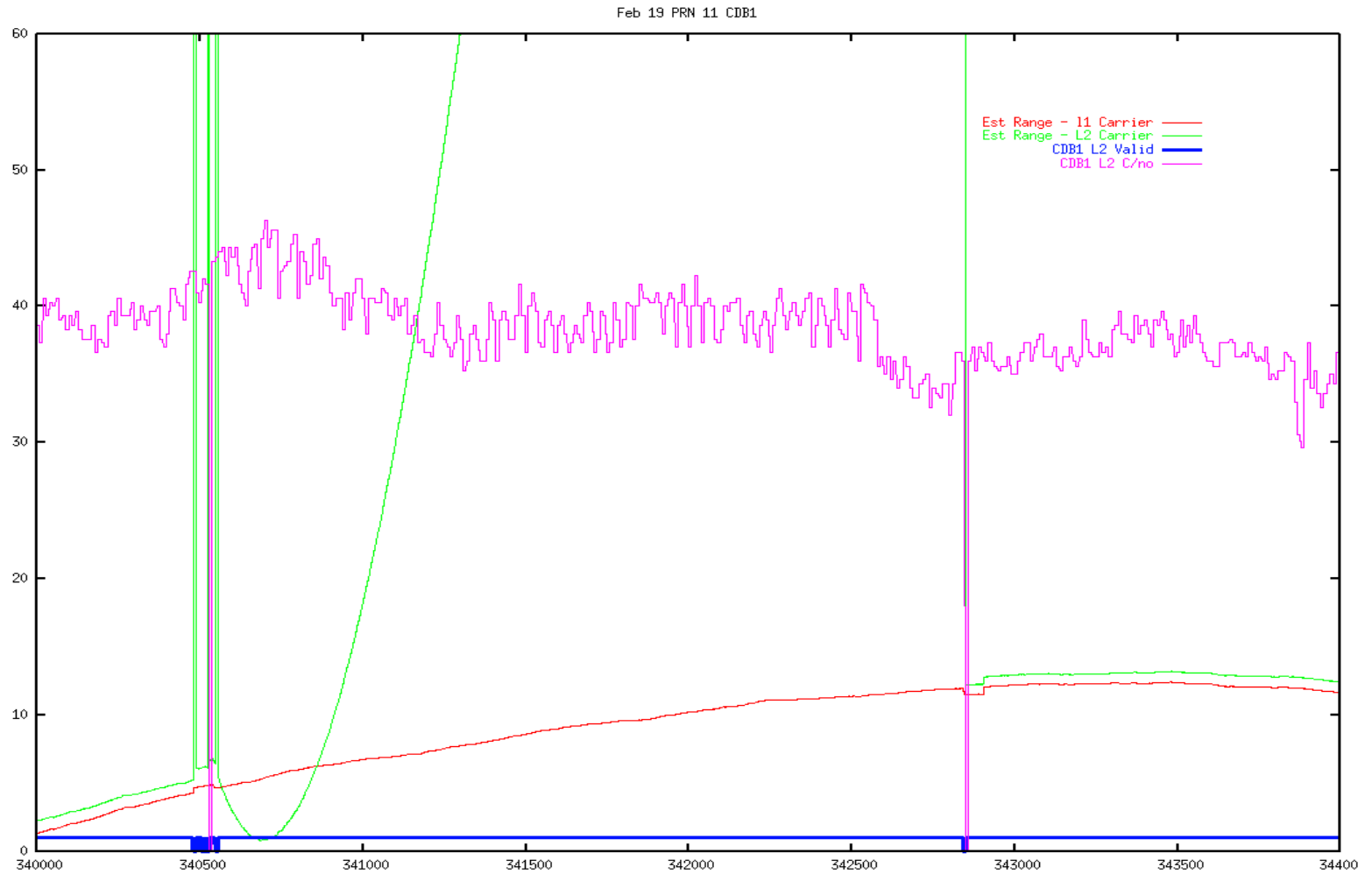


CDB/PRN11 Expected Range February 19



CDB/PRN11 Expected Range February 19

- Zoomed in view



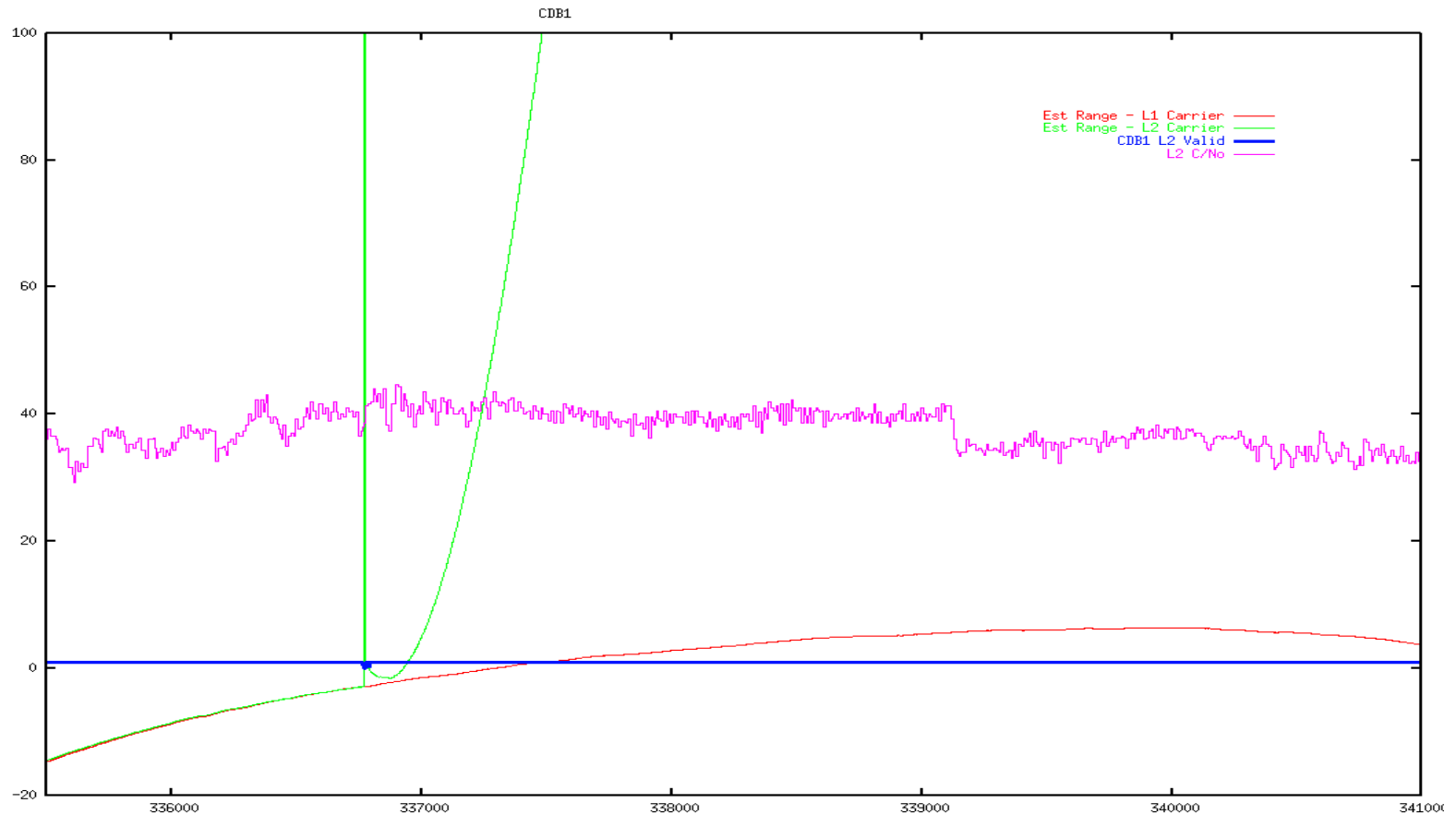
CDB PRN11

- **Other days with high horizontal errors follow similar profile and course of events on all 3 WREs**
 - 1 or 2 of the events only affected 2 WREs
- **Observed some events that L2 was reacquired with L2 carrier measurement differing from estimated true range and then never loss track of L2 again. Estimated True Range – L2 Carrier and range error grew exceedingly until it could no longer view satellite**
 - See Slides 12 and 13
- **Days that CDB does not have high horizontal errors it still loses track of L2 multiple times, but L2 carrier measurement does not differ greatly from estimated range**

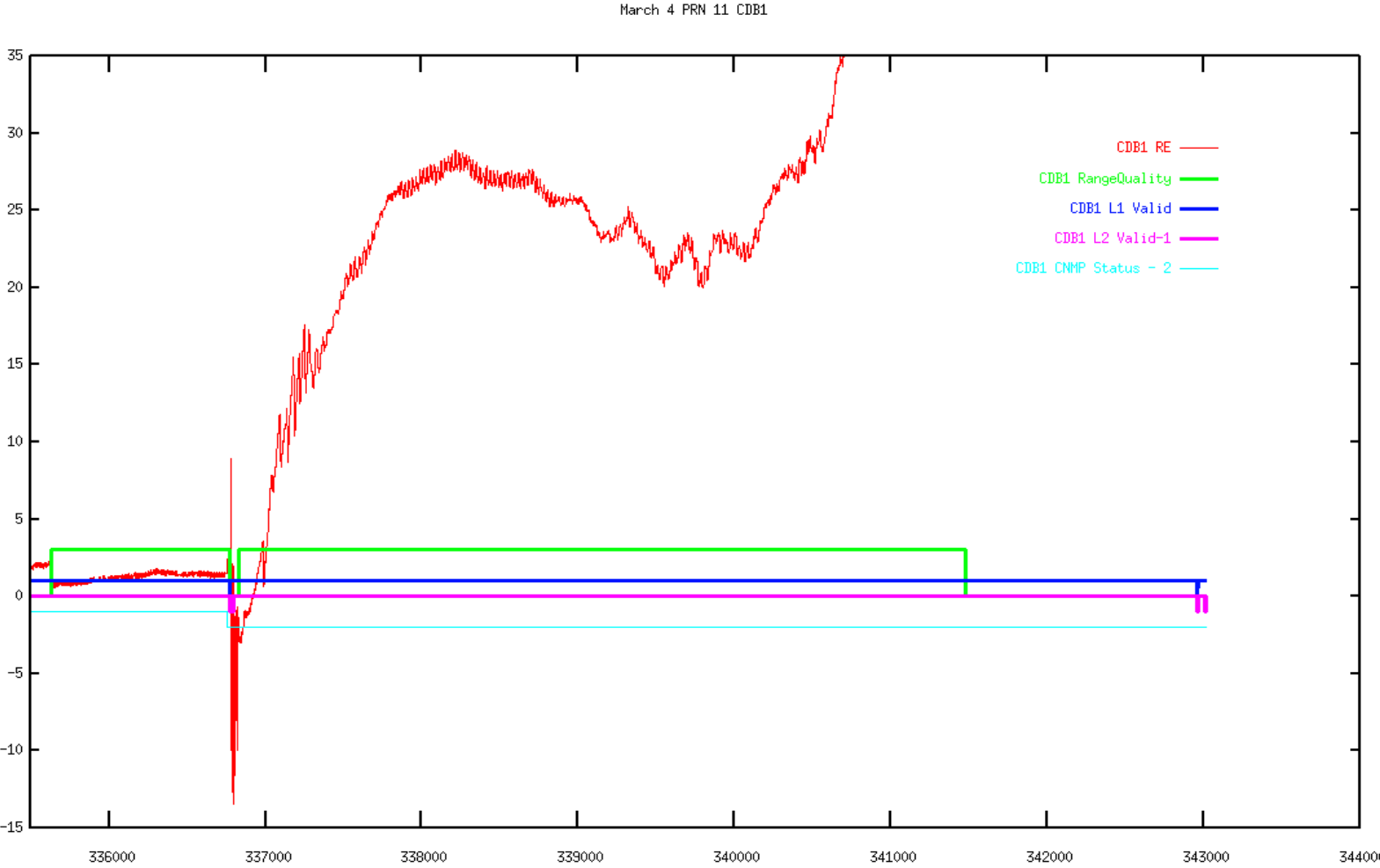


CDB/PRN11 Expected Range March 4

- CDB1 Estimated True Range – L2 carrier (green trace) grows to ~1500 m while PRN11 > 5 degrees



CDB/PRN11 Observed Range Error March 4



Conclusion

- **CDB WRS L2 signal tracking problem at all WREs for PRN11 between 8–10 degrees elevation**
- **PRN11 L2 signal tracking problems occur during times of high power of PRN15 L2**
 - Zeta reported PRN11 and PRN15 L2 dopplers near identical
- **Events can last up to 50 minutes**
- **L2 carrier on reacquisition has looked anomalous on at least 6 days**

