WAAS Technical Report
William J. Hughes Technical Center
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DR#107 WAAS GEO PRN135 (CRW) Oscillator Failure

GPS Week/Day: Week 1665 Day 2 (12/06/2011) to Week 1669 Day 5 (01/06/2012)

Discussion:

Beginning on December 29, 2011 until January 6, 2012, WAAS GEO PRN135 (CRW) experienced daily missed WAAS User Messages (WUMs) that correlate with bursts of noise on L1 & L5 carrier phase. Similar occurrence was observed on December 6, 2011.

Additionally, there were CCC monitor trips on December 30th of 2011, and January 2nd, 4th and 6th of 2012, followed by SV alerts on PRN135. The UDRE (User Differential Ranging Error) of CRW stayed elevated at a value of 15m after SV alerts.

Since CRW serves as a critical satellite to achieve good constellation geometry in Alaska, UDREi increase from 10 (UDRE = 7.5m) to 11 (UDRE = 15m) causes a reduction in Alaska LPV200 coverage area, as shown in Figure 3, from expected 90% to approximately 78% at 99%availability.

Figure 1 shows plots of Coverage vs. Time in Alaska on 12/27/11 when CRW UDRE=7.5m (UDREi=10) and no missed WUMs occurred.

Figure 1: Coverage vs. Time on December 27, 2011

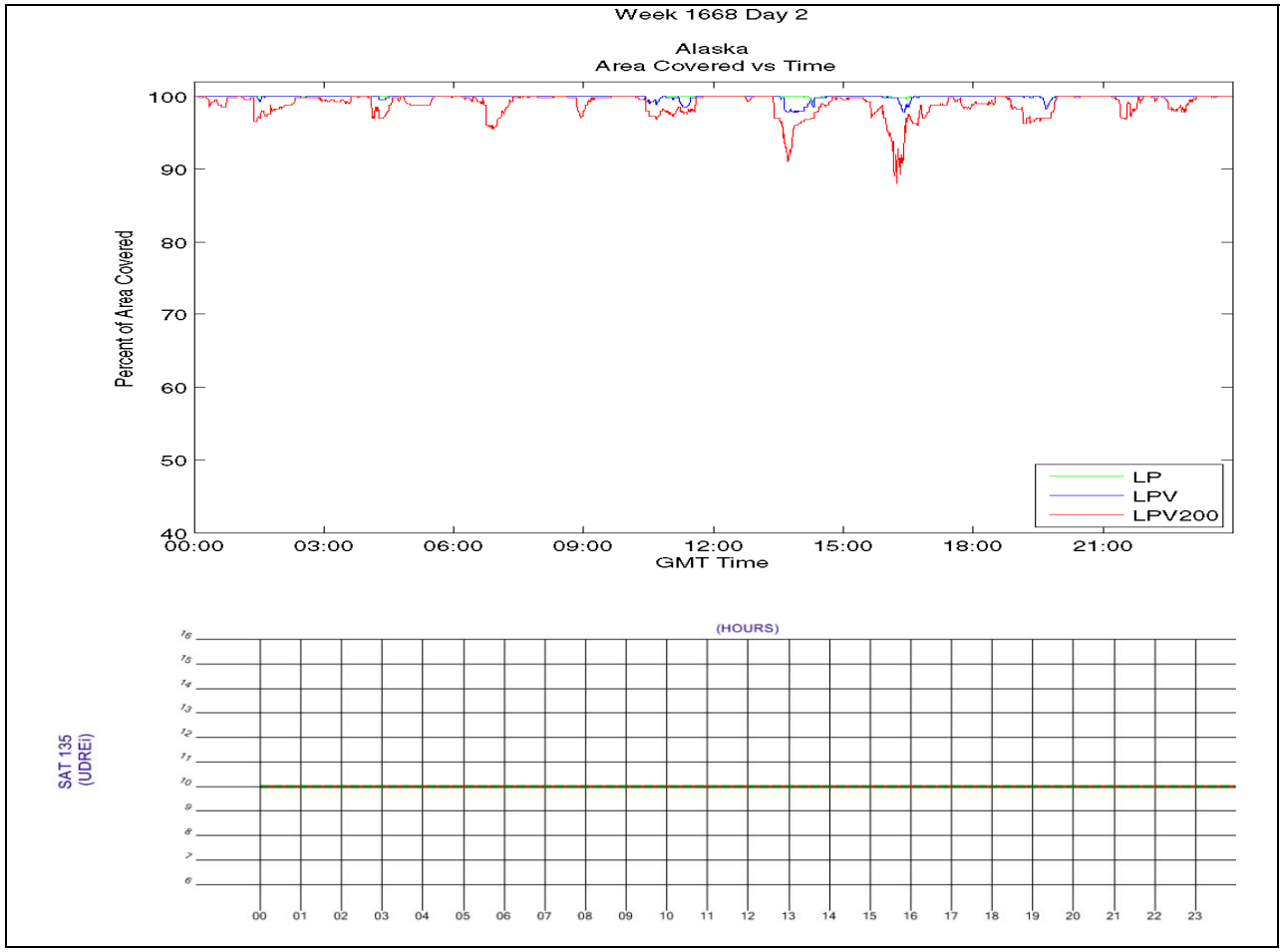


Figure 2 shows the sensitivity of LPV200 Coverage in Alaska to increase in CRW UDRE to 15m (UDREi=11) at approximately 13:30 and 15:30 GMT on 12/30/2011.

FIGURE 2: Coverage vs. Time on December 30, 2011

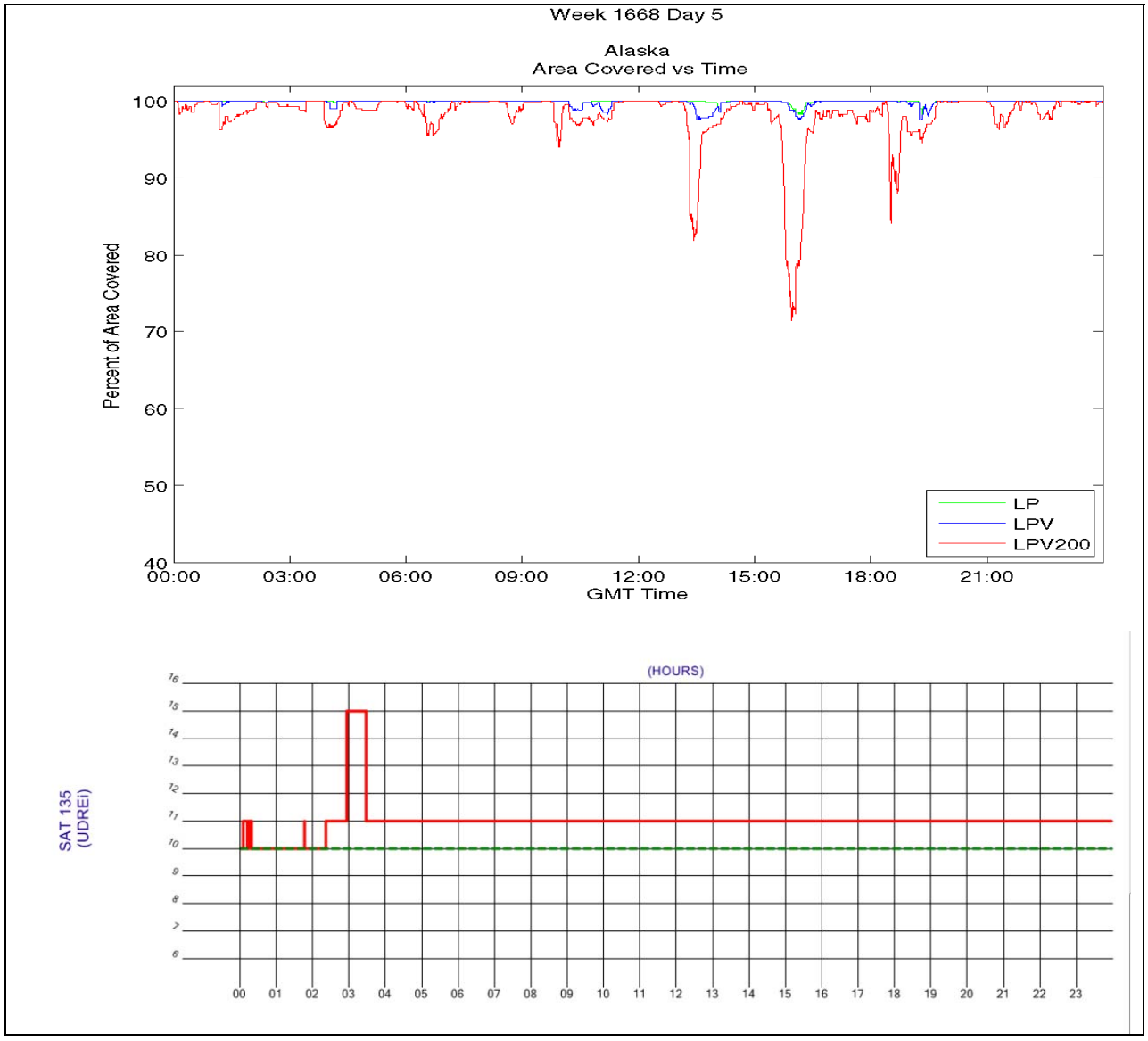
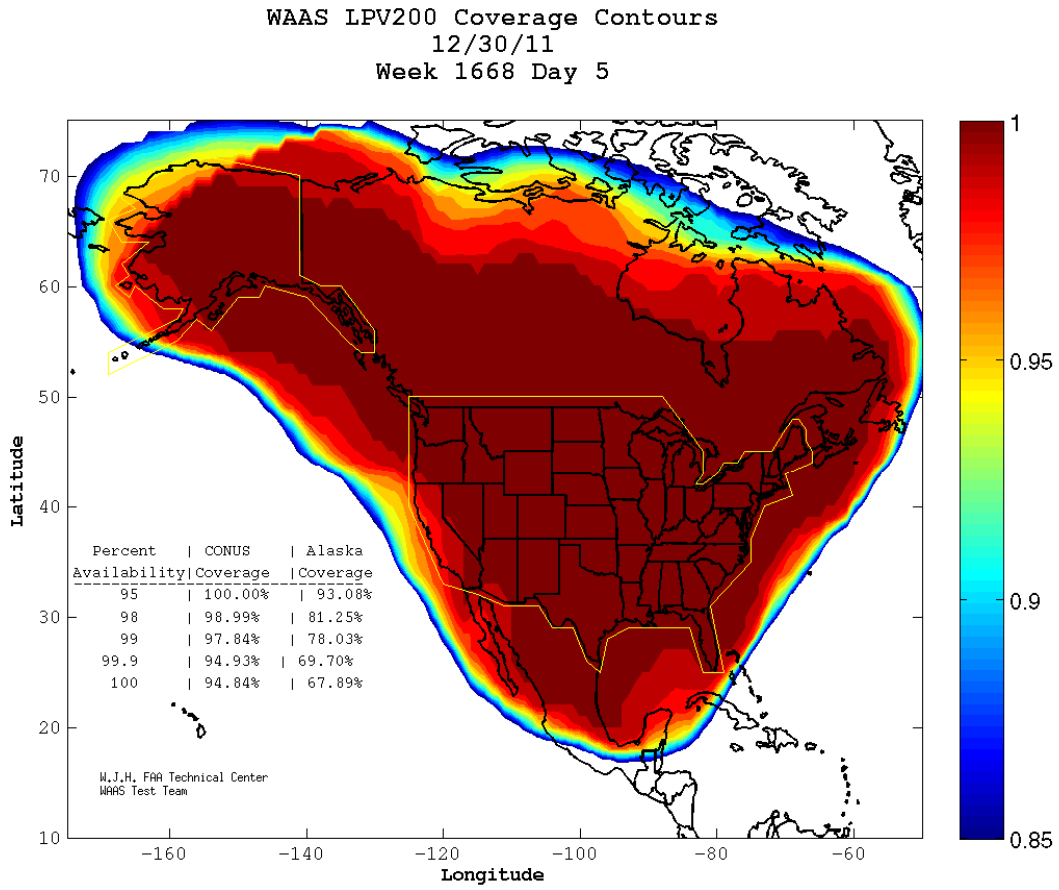


FIGURE3: WAAS LPV200 Coverage on December 30, 2011



Conclusion:
Hardware failure of Universal Stable Oscillator (USO) on CRW caused the phase spikes on the downlink data signal, missed WUMs, and CCC monitor trips, which bumped the GEO's UDRE. Alaska LPV200 coverage is sensitive to changes in the UDRE from the CRW. The maintenance performed to switch to backup USO corrected the issue on January 6th, 2012.