

Preliminary report on data quality with a Trimble 5700 GPS receiver and an Ashtech Choke Ring Antenna

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A critical issue with the use of the Trimble 5700 GPS receiver for use as a geodetic base station system is the difficulty and added expense required to use the receiver with existing Trimble Choke Ring Antennas. This is primarily due to the output voltage of the 5700 antenna port (5.05V without and 4.97V with an antenna) is insufficient to power the Trimble Choke Ring which requires 7-28V. To use a Trimble Choke Ring antenna with the 5700 requires a special antenna power adapter (PN43216-00) that requires a separate power source and two additional cables. Cables and power source increase the cost of the system by about ~\$1200. For DC based permanent station installations this not only increases the cost but also increases the overall power draw of the system, which in effect negates its use as a low power system.

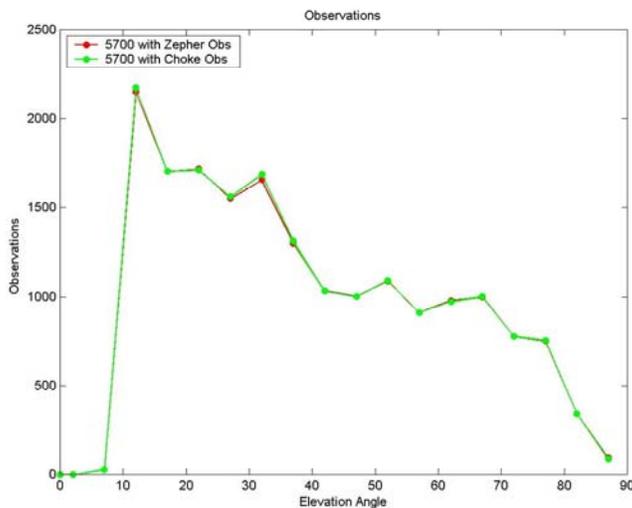


Figure 1. Elevation dependent GPS observations based on data from the Trimble 5700 with Ashtech Choke Ring antenna (green) and the Trimble 5700 with Trimble Zephyr antenna (red). There is no statistical difference between the two data sets.

a safety factor built into them. This means an antenna will probably operate slightly outside of its published range but it is probably not manufacturer recommended.

Data from the 5700 and Ashtech Choke Ring antenna were compared to data acquired from a 5700 and a Trimble Zephyr antenna (p/n 41249-00). To test the compatibility, elevation dependent SNR, observations, and multipath values were evaluated to determine if the 5700 with Ashtech antenna provided similar tracking capability to the 5700 with Zephyr antenna. Data was acquired on the same monument occupied for 24

In an attempt to put together a 5700 permanent station configuration with a Choke Ring antenna, a test was conducted with a 5700 and Ashtech Choke Ring Antenna (p/n 701945-02). Data specifications for the Ashtech antenna indicate a nominal operating range of 5-15V, which is at the voltage output limit for the 5700. It should be noted that the receiver output voltages were measured directly from the receiver. The antenna input voltages were provided from the manufactures. These values are the nominal operating values and there is

hours on successive days with the 5700 and an Ashtech Choke Ring followed by the 5700 with the Zephyr antenna.

For each data set, the number of observations, MP1/MP2 and SN1/SN2 values were extracted in 5-degree elevation bins using teqc [Estey & Meertens, 1999]. Figure 1 shows the number of observations in each bin versus elevation angle. Both data sets show a decreasing number of observations at very low and high elevation angles and there is no statistical difference between the two, indicating both receiver antenna pairs are generating the same number of observations per 24-hour period.

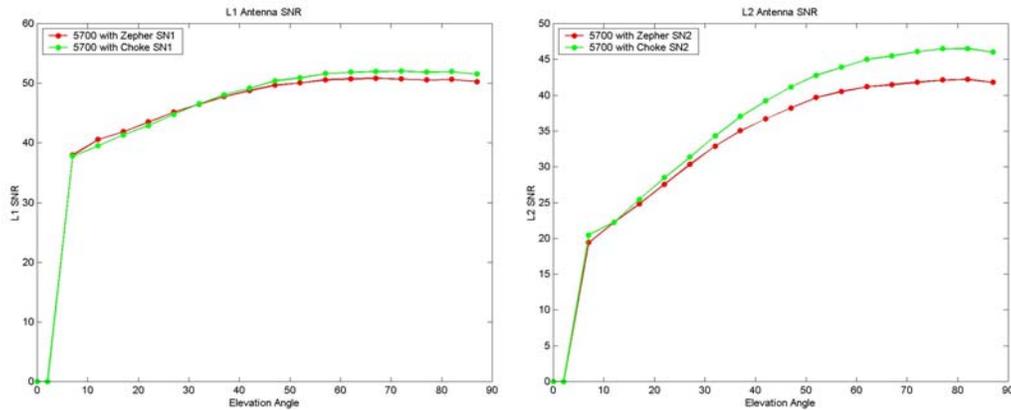


Figure 2. L1 SNR (left) and L2 SNR (right) for Trimble 5700 with Ashtech Choke Ring antenna (green) and the Trimble 5700 with Trimble Zephyr antenna (red). There is no statistical difference between the two data sets for L1 but there is a statistically significant improvement in L2 SNR when using the Trimble 5700 and the Ashtech Choke Ring antenna.

Figure 2 shows L1 and L2 SNR values for both receiver antenna pairs. In this case for L2 SNR, the Trimble 5700 antenna with Ashtech Choke ring antenna performs better than the same receiver with a Zephyr antenna. Figure 3 shows L1 and L2 MP values for both receiver and antenna pairs. The reduced level of both MP1 and MP2 indicate that the 5700 appears to perform better with respect to elevation dependent multipath when using the Ashtech Choke ring antenna versus the Trimble Zephyr antenna.

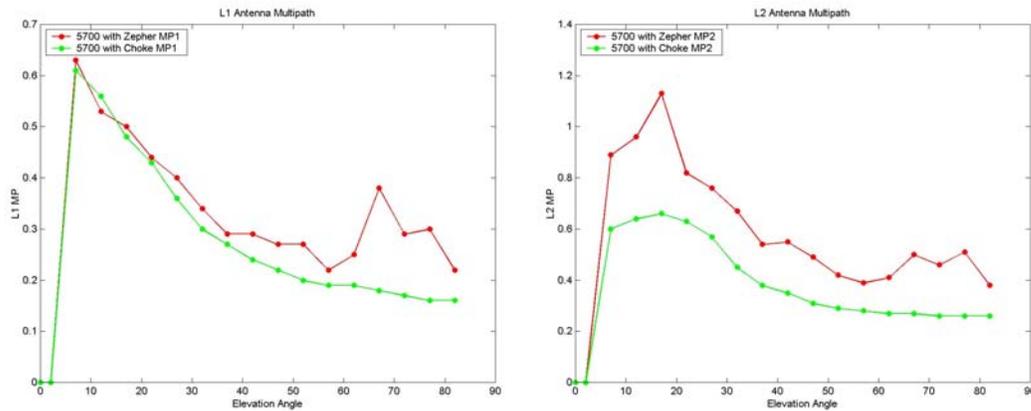


Figure 3. L1 MP (left) and L2 MP (right) for Trimble 5700 with Ashtech Choke Ring antenna (green) and the Trimble 5700 with Trimble Zephyr antenna (red). For both L1 and L2 there is a statistically significant improvement in both L1 and L2 MP values when using the Trimble 5700 and the Ashtech Choke Ring antenna.

In conclusion, this is a limited test utilizing only one day of data for each configuration and testing was done with an antenna at the lower end of acceptable input voltage and a receiver at the upper end of acceptable output voltage. Based on this limited test, the Trimble 5700 is compatible with the Ashtech Choke Ring antenna (701945-02), and in some cases (L2 SNR, MP1 and MP2) it performs better than a 5700 with a Zephyr antenna.

References

Estey, L., & Meertens, C.M. (1999). TEQC: The multi-purpose toolkit for GPS/GLONASS data. *GPS Solutions*, 3, 42-49.