Testing the Susceptibility of Synchrophasors to GPS Spoofing

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Test Objectives

- Determine the susceptibility of GPS satellite clocks to spoofing that could undermine the accuracy of PMUs
- Tests carried out at the PNNL Electricity Infrastructure Operations Center (EIOC) December 2011 with Northrop Grumman and University of Texas-Austin
- Three different satellite clocks were utilized in the testing

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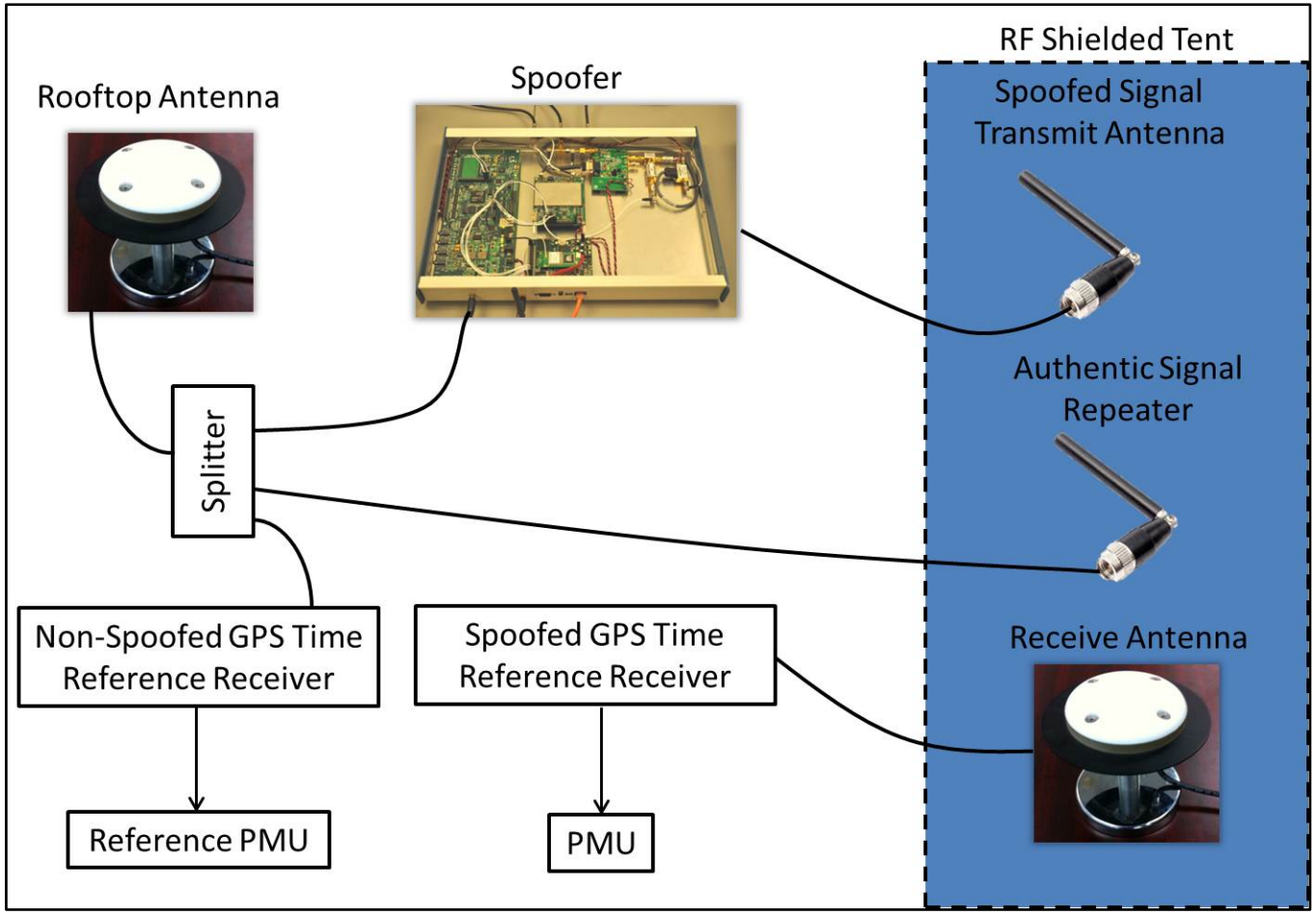
Schematic of the Test Setup



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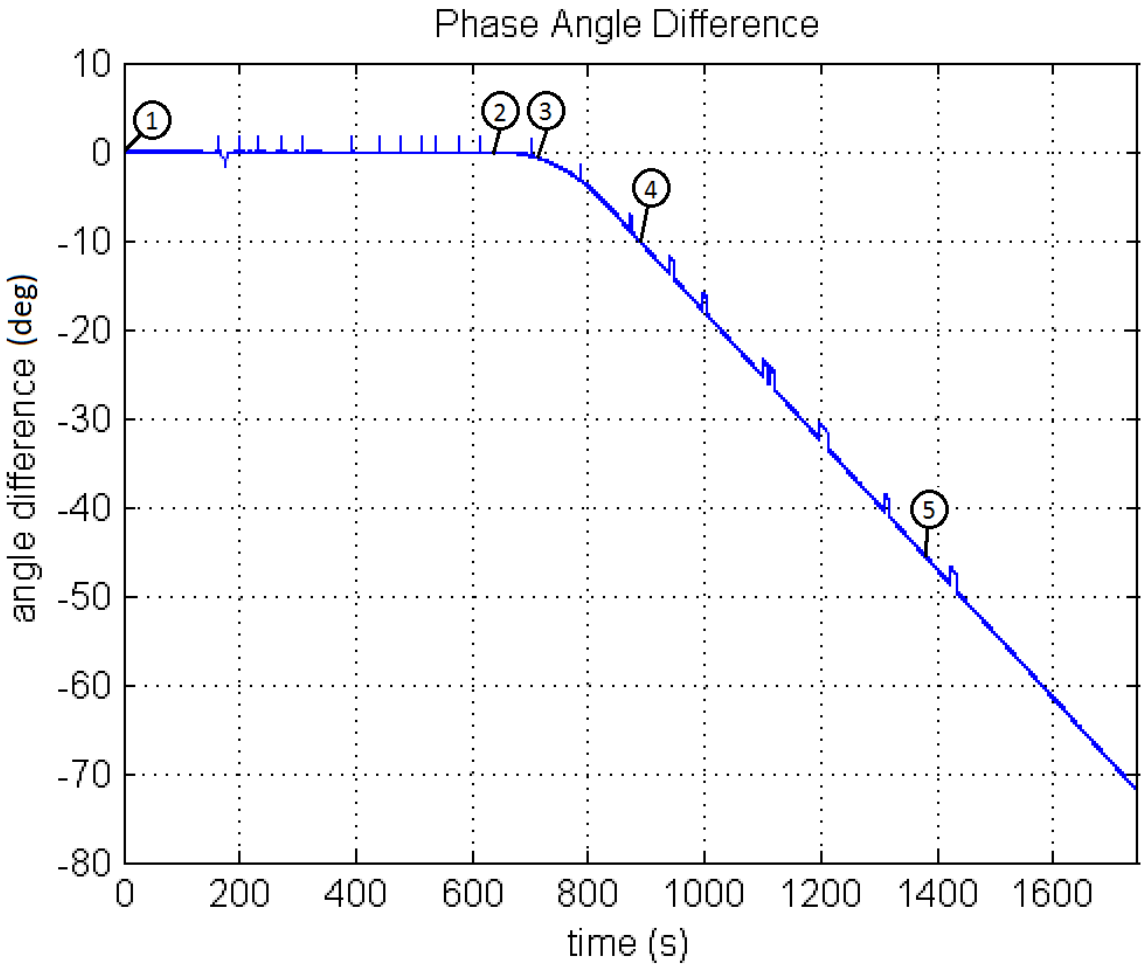
Spoofing the Synchropahsor



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Conclusions

- All three satellite clocks were susceptible to GPS spoofing
  - Some differences in the rate of change that could be implemented (defeating the internal error checking algorithms)
  - Some differences in how the clocks responded when the spoofing signal was turned off
- Need to find alternative methods for ensuring critical applications cannot be undermined

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