

Abstract for AIPC/ANZCOP/COMMAD/WSOF

Doppler perturbations of satellite observations by VHF ST radar

Jordan Jonker^a, Manuel Cervera ^{a,b}, Trevor Harris ^a, David Holdsworth ^{a,b}, Andrew MacKinnon ^a,
David Neudegg ^{a,b}, Iain Reid ^{a,c}

^a*Department of Physics, The University of Adelaide, Adelaide, SA 5000, Australia*

^b*Defence Science and Technology Group, Edinburgh, SA 5111, Australia*

^c*ATRAD Pty Ltd, Thebarton, SA 5031, Australia*

The University of Adelaide operates the Buckland Park Stratosphere Troposphere (BPST) radar at its field site at Buckland Park, approximately 40 km north of Adelaide. Since 2017, the University has been operating the 55 MHz VHF radar system to track orbiting space objects to inform Australia's Space Situational Awareness (SSA) capability development [1,2]. The BPST radar has been observing unexpected perturbations in the measurements of a satellite's radial velocity (or Doppler). The purpose of this research is to identify why these perturbations are occurring. To do this, a Fourier analysis has been applied to the data, followed by an algorithm designed to identify the data sets where they occur, the number of perturbations and the times at which the perturbations are occurring. The results will be compared to ionospheric physics theory to explain why the observed perturbations are occurring and link the timing of the perturbations with recorded ionospheric disturbances.

- [1] D. Holdsworth, A. Spargo, I. Reid, C. Adami 2019, *Low Earth Orbit Object Observations Using the Buckland Park VHF Radar*, Radio Science, vol. 55(2), pp.e2019RS006873
- [2] E. Heading, S. Nguyen, D. Holdsworth, D. Field, I. Reid, *Analysis of RF Signatures for Space Domain Awareness using VHF radar*, 2022 IEEE Radar Conference, 21-25 March 2022, New York City, USA