Auroral spectra from a High Throughput Imaging Spectrograph (HiTIES) operated in Svalbard by the University of Southampton. The three panels show the $\text{N}_2^{+} \ \text{1neg} (1,3)$ band (top), the H-beta line (center), and the $\text{N}_2^{+} \ \text{1neg} (0,2)$ band (bottom). The wavelength region shown in the top panel also has three $\text{O}^{+} (^4\text{P} - ^4\text{D}^0)$ lines. During proton aurora events when the Doppler shifted H-beta line becomes bright, the $\text{O}^{+} (^4\text{P} - ^4\text{D}^0)$ lines also brighten up. These enhanced $\text{O}^{+}$ brightnesses are stronger than in electron aurora, indicating a relatively large cross section for proton impact on O to generate the excited state. These measurements were combined with DMSP observed precipitation and an auroral proton/hydrogen transport model to estimate the emission cross section for the $(^4\text{P} - ^4\text{D}^0)$ transition of atomic oxygen ions due to proton aurora. (Ivchenko, N., M. Galand, M. H. Rees, B. S. Lanchester and D Lummerzheim, Observation of $\text{O}^{+} (^4\text{P} - ^4\text{D}^0)$ lines in proton aurora over Svalbard, Geophys. Res. Letters 31, L10807, doi: 10.1029/2003GL019313, 2004).