NASA-CR-195114

Final Report on NAG5-675: A Sounding Rocket program in Extreme and Far Ultraviolet Interferometry

With the support of this program, we have developed a self-compensating, all reflection interferometric (SCARI) spectrometer that can provide high resolution measurements of spectral features at any wavelength. The original work was conducted in collaboration with the University of Wisconsin group. Afterwards, each group has concentrated on a different design; while the Wisconsin group has adopted a design that uses transmitting optical components, we have chosen to stay with the all-reflection version.

Since, our task was rather new, we had to develop several mechanical components that aid the instrument's performance at the short wavelength range. Examples of such include an optical bench and modular removable precision mechanisms for alignment. Upon alignment and lock down of the interferometer with the latter, the device is remove to minimize weight.

Since the instrument uses a very novel design, we developed a ray-trace code to simulate its performance. To our knowledge no commercially available ray-trace program has the capability to simulate physical optics and hence cannot simulate interference. Our raytrace code was developed specifically to simulate the SCARI version of the interferometer and was very helpful during analyzing laboratory test and calibration activities.

With the support of this grant, we have been successful in obtaining interference pattern at the shortest wavelength - the Hydrogen Lyman α (1216Å). When the original scope of the sounding rocket program was revised from three year to two year, we used these funds to develop a laboratory instrument. We now have been supported to fly this instrument aboard a Black Brant sounding rocket to study the very local interstellar medium.

List of Publications and Talks in Scientific Meetings

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B. Bush, D. M. Cotton, and S. Chakrabarti, "Instrument Design and Test Results of the New All-Reflection Spatial Heterodyne Spectrometer," *Proc. SPIE*, 1549, 376, 1991.

Cotton, D. M., B. Bach, B. Bush, and S. Chakrabarti, "A V-groove Diffraction Grating for use in a FUV Spatial Heterodyne Interferometer," *Proc. SPIE*, 1549, 313, 1991.

Tom, J., D. M. Cotton, B. Bush, R. Chung, and S. Chakrabarti, "Modular Removeable Precision Mechanism for a FUV Spatial Heterodyne Interferometer," *Proc. SPIE*, 1549, 308, 1991.

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Vickers, J. S., B. Bush, D. M. Cotton, and S. Chakrabarti, "Laboratory Evaluation of an EUV interferometer: Line Profile Measurements at Hydrogen Lyman-α," *EOS Trans. AGU*, 72, 362, 1991.

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Spectroscopy of Astrophysical and Laboratory Plasmas, Cambridge University Press 1993.

Chakrabarti, S., D. M. Cotton, J. S. Vickers, and B. C. Bush, "A Self Compensating All Reflection Interferometer (SCARI)," *Appl. Opt.*, in press, 1993.