SEARCHING FOR COMPLEX ORGANIC MATERIAL IN THE INTERSTELLAR MEDIUM USING CENTIMETER WAVE SPECTRAL LINE SURVEYS. A. J. Remijan[1], B. A. McGuire[2], J. F. Corby[3] and A. J. Burkhardt[4], [1]National Radio Astronomy Observatory/Joint ALMA Observatory (aremijan@nrao.edu), [2]National Radio Astronomy Observatory/California Institute of Technology (bmcguire@caltech.edu), [3]University of Virginia Department of Astronomy (jfc2113@gmail.com), [4]University of Virginia Department of Astronomy (amb3au@virginia.edu)

Introduction: Investigating our pre-biotic molecular origins has been a long standing effort in astrobiology research. Specifically, since the middle part of the 20th century, several experiments were designed to mimic the presumed environmental conditions of the early Earth (e.g. the famous Miller –Urey experiment in 1953). It is now known that these early experiments did not adequately reproduce the initial atmospheric conditions of the early Earth – the atmosphere was in fact high oxidizing, not reducing, which inhibits the formation of large, complex organic molecules. Yet, evidence clearly indicates the appearance of life very quickly after the end of the heavy bombardment period. The supposition based on this evidence suggests that the pre-biotic origins of life took place in extraterrestrial environments and was then seeded to early Earth. The question remains as to what is the limit of molecular complexity in the astronomical environments where newly formed planetary systems are found.

Broadband spectral line surveys now hold the key to uncovering the full molecular complexity in astronomical environments. This capability is now fully realized with the advent of wide bandwidth receivers on single dish telescopes such as the 100-m Green Bank Telescope (GBT) and the IRAM 30-m Telescope and in the case of telescope arrays like the Very Large Array (VLA), the Australian Telescope Compact Array (ATCA) and the Atacama Large Millimeter/submillimeter Array (ALMA), correlators capable of a petaflop calculations to combine signals from 1000s of telescope baselines. The centimeter regime specifically has proved remarkably fruitful in the identification of new molecular material. Centimeter wave observations are sensitive to the low energy, high line strength transitions of large complex molecules and coupled with unique excitation conditions, provide a means to detect some of the lowest abundance species in the interstellar medium. This presentation will highlight the new discoveries of complex molecules from centimeter wave broadband spectral line surveys and discuss how these surveys can be used in understanding the physical, chemical and kinematic nature of the astronomical environments where this molecular material is present.