Paper ID: 75593
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30th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Interactive Presentations - 30th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (IP)

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FAST RADIO BURST DETECTION VIA SMALLSAT CONSTELLATION

Abstract

This presentation focuses on the potential to develop and operate a constellation of smallsats capable of monitoring Fast Radio Bursts (FRBs). FRBs are brief transients that come through the sky approximately once per minute. They have a very short lifetime, lasting approximately one millisecond, but this fleeting lifespan is accounted for by their sheer abundance. FRBs have no known exact physical origin, but they may originate from neutron stars with extreme gravitational fields, also known as magnetars. In recent years, data collection on these FRBs has aided the field significantly, as well as data from neighboring fields, such as gamma ray bursts and radio pulsars.

One specific FRB holds the interest of many astrophysicists because of its interesting pattern. FRB 121102 shows a repeating burst pattern, something previously undiscovered in the field of Fast Radio Bursts. Thanks to the Very Large Array (VLA), FRB 121102 has been localized to 100 MAS (milli-arcseconds). FRB 121102 is thought to have originated in a dwarf galaxy approximately three billion light years away from earth. The FRB seems to show a cycle, suggesting that it may be originating from a celestial object with an orbital period, such as a neutron star, massive star, or black hole.

The field is still developing and progressing, although unable to completely solve the overwhelming problem of insufficient data from the lack of area covered. Investigators cannot possibly detect every single FRB that comes through the sky every minute, but we can minimize the percentage of undetected FRBs. Efforts to resolve this issue would normally be difficult and tedious, as it would require establishing vast antenna arrays nearly worldwide. The proposed constellation of smallsats may provide a appropriate data collection system would make an immense impact in the field of astronomy.