



Fast radio burst survey with Apertif/WSRT

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Fast radio bursts (FRBs) are milliseconds-wide, highly luminous radio transient events of extra-galactic origin. To answer numerous open questions regarding their origin, host environments, population, etc., a number of dedicated FRB surveys have embarked upon around the globe. The FRB survey exploiting the new phased-array system called Apertif, installed on the Westerbork synthesis radio telescope (WSRT), is a prototypical example of such an effort. The Apertif/WSRT FRB survey employs real-time search for FRBs at 1.4 GHz in a 9 deg^2 field-of-view (FoV) using high instantaneous sensitivity of combined 10 WSRT dishes. Exploiting the interferometric capability of WSRT and state of the art instrumentation, we localize the transient events to about $1/2800$ of this large FoV. For every real-time, high significance FRB detection, full polarimetric data at reasonably high time and frequency resolutions are recorded for offline analysis. Effort are also underway to trigger real-time follow up with LOFAR telescope, which will allow for simultaneous probes of FRBs at two widely separated frequencies (150 MHz and 1.4 GHz).

The Apertif/WSRT FRB survey started in July 2019. In addition to discovering new FRBs, the survey is particularly advantageous in determining the sky position of the often poorly localized *repeating* FRBs. Using an extensive follow-up comprised of commissioning as well as survey observations, we have already characterized the polarimetric and clustering properties of the first known repeating FRB *FRB 121102*, and put tight constraints on the 1.4 GHz detection rate and clustering nature of the second repeating FRB *FRB 180814.J0422+73* [1]. With nearly 30% of the sky time available for the FRB survey, we have also discovered 10 new FRBs as of February 2020. One of these bursts, *FRB 191108*, exhibits an unusually high Faraday rotation measure of 474 rad m^{-2} , which can not be explained by either the Milky way or the intergalactic medium [2]. Following a brief review of the Apertif/WSRT survey, I will present some of the above mentioned and other early results, as well as the current status and detection rates achieved so far.

References

- [1] Oostrum, L. C., Maan, Y., van Leeuwen, J., et al. "Repeating fast radio bursts with WSRT/Apertif," *A&A (in press)*, 2020, arXiv e-prints, arXiv:1912.12217
- [2] Connor, L., van Leeuwen, J., Oostrum, L. C., et al. "A bright, high rotation-measure FRB that skewers the M33 halo," 2020, arXiv e-prints, arXiv:2002.01399