A prototype of MUSER-I Correlator upgrade

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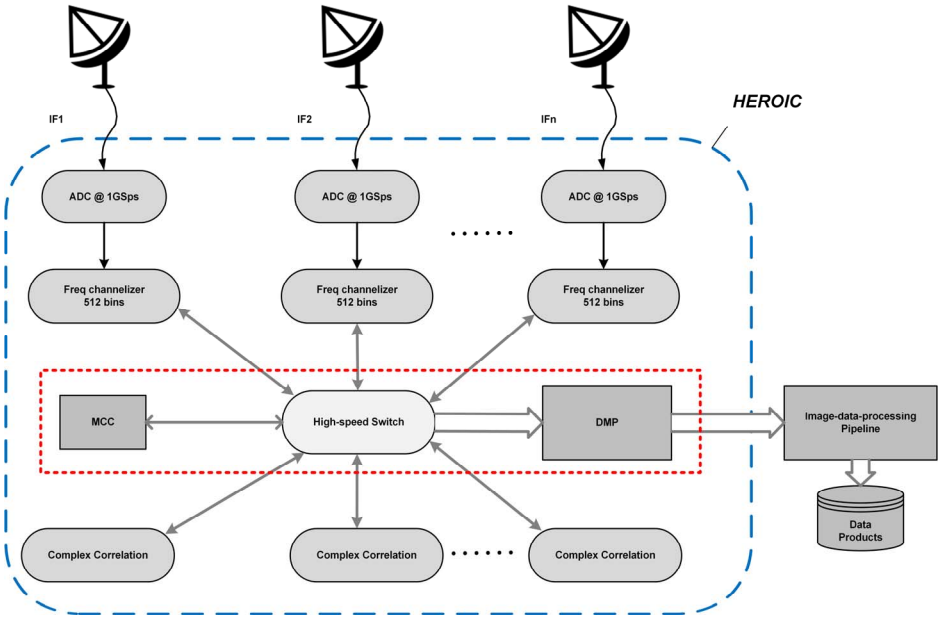
Mingantu Spectral Radioheliograph heliograph (MUSER),located on Mingantu Observing Station(MOS) in Inner-Mongolia of China, is composed of MUSER-I and MUSER-H. MUSER-I consists of 40 4.5m dish antennas, observing from 0.4 GHz to 2 GHz. While MUSER-H consists of 60 2.5m dish antennas and works at higher frequencies from 2 GHz to 15 GHz. All 100 antennas of MUSER-I and MUSER-H are arranged along three spiral arms. The max antenna-pair baseline is ~3km.

The existing MUSER-I correlator has been working for nearly 8 years since 2010 at MOS. Even though the routine solar radio observing is seldom missed and some meaningful images have been acquired in recent years, the correlator's performance, especially MUSER-I correlator, is degrading due to long-period running (~8 years) and harsh lab environment. Besides, there are some other reasons that we determine to upgrade the MUSER-I correlator. We need a more flexible, reconfigurable and extensible correlator frame structure; Lower cost and better performance digital computing components (FPGA & SOC) are available (compared with 8 years ago); We prefer acquiring both imaging spectroscopy and power spectrum with higher frequency resolution; It is necessary to further increase Correlation quantification (2-bit to > 4-bit) to improve correlation efficiency [2]; Finally we can deal with RFI detection effectively and excision accordingly through finer spectral spectrum.

To fulfill our specification, one eight-channel prototype of MUSER-I correlator upgrade, termed as HEROIC, is about to be designed and developed. The deployed signal processing hardware will be SNAP2, proposed by CASPER and developed by Institute of Automation Chinese Academy of Sciences.



1. Yihua Yan, Wei Wang, Fei Liu, Lihong Geng, Zhijun Chen, Jian Zhang, "Radio imaging-spectroscopy observations of the Sun in decimetric and centimetric wavelengths," *Solar and Astrophysical Dynamos and Magnetic Activity, Proceedings of the International Astronomical Union, IAU Symposium,* Volume 294, 2012, pp. 489-494, doi:10.1017/S1743921313003001
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