Development of Software-Defined Multi-Channel Receiver System for the Equatorial Atmosphere Radar (EAR)

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Equatorial Atmosphere Radar (EAR) was established in June 2001 by the collaboration between Research Institute for Sustainable Humanosphere (RISH), Kyoto University and Indonesian National Institute of Aeronautics and Space (LAPAN). EAR is a VHF Doppler radar operated at 47 MHz with an active phased-array antenna system and located at the equator at Kototabang, West Sumatra, Indonesia (0.20^{o} S, 100.32^{o}E, 865 m above sea level). Established with a single receiving channel until currently, here we present the development of multi-channel receiver system for the EAR using the combination of Universal Software Radio Peripheral X300 (USRP X300) series and GNU Radio. Two USRP X300 devices corresponding to four receiving channels are synchronized using 10 MHz reference clock and 1 pulse per second (PPS) signal. Received signals are collected by the existing EAR antennas and fed to the USRPs for digital conversion and then stored in Hard Disk Drive (HDD). Signals post-processing are carried out to obtain the Doppler spectra and the measurement of wind speed and direction.

Keywords: VHF radar, Multi-channel receiver, USRP, GNU Radio