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A continuously-operating standalone radio cosmic ray detection system at the OVRO-LWA

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The new cosmic ray detection system at the Owens Valley Radio Observatory Long Wavelength array expands on methods introduced in a previous demonstration to use radio signals alone to trigger data capture, reject radio frequency interference, and reconstruct the air shower properties: energy, arrival direction, and Xmax. The Owens Valley Radio Observatory- Long Wavelength Array (OVRO-LWA) in Eastern California is currently completing an expansion to 352 dual-polarization antennas and new signal processing infrastructure. The upgraded array will operate a full-duty-cycle cosmic ray detector simultaneously with a variety of radio astronomy observations. In order to detect cosmic rays in the presence of radio frequency interference, initial event classification and RFI rejection is performed on Field Programmable Gate Array boards which each process a sampled voltage timeseries from both polarizations of a subarray of thirty-two antennas. Each board uses dedicated RFI veto antennas outside the air shower radio footprint to reject RFI events. I will present the trigger design, RFI flagging strategy, and a progress update from early commissioning. When fully commissioned, the OVRO-LWA will offer a new estimate of cosmic ray composition at the upper energy limit of Galactic accelerators by observing thousands of cosmic rays per year at energies 10ˆ17–10ˆ18 eV and reconstructing air showers with a typical Xmax precision better than 20g/cmˆ2 per air shower.

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