

ALMA Band 6v2 Receiver Upgrade

We report on our proposal to develop an upgrade for the existing 211-275 GHz ALMA Band 6 receiver, referred to as “Band 6v2”, which complies with the strategies defined in the ALMA Development Roadmap to 2030 and with the recommendations of the ALMA Front-end & Digitizer Requirements Upgrade Working Group. The goal is to deliver an improved production-level receiver based on (i) a new Cold Cartridge Assembly (CCA) with increased sensitivity over an expanded IF band and a modestly expanded RF band, and (ii) a new low-noise Warm Cartridge Assembly (WCA) which contains a new lower AM sideband noise Local Oscillator source with a baseband YIG oscillator operating at twice the frequency of the current one. The new Band 6v2 receiver will be backward-compatible with the current Band 6 and will be able to be plugged into the ALMA FE (Front-End) cryostat as a replacement for the existing units.

We will describe the current ALMA Band 6 receiver, our plan to address its shortcomings, and the expected performance of the ALMA Band 6v2 receiver. The Band 6 receiver upgrade will result in several benefits including a reduction in integration time by a factor of ~1.5 to as much as 3 in the worst parts of the current IF (assuming a typical sky temperature), an increase in the IF bandwidth from the present 5.5 GHz per sideband per polarization to at least 12 GHz (4-16 GHz) and potentially to 16 GHz (4-20 GHz), and an increase in RF coverage by 8 GHz, to 209-281 GHz from the present 211-275 GHz.

The project will focus on exploring several different receiver configurations for the ALMA Band 6v2 sideband separating (2SB) SIS receiver, with improvements to all the major receiver components, including optics, OMT, mixers, IF section and local oscillator. The presentation will provide a brief overview of all of the above mentioned aspects of the project.

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Session Classification: Receivers (SIS)

Track Classification: ALMA-FED 2021 Contributions: Invited Talks