The FP6 Proposal: ALMA Enhancement

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Purpose

- To allow measurement of spectral lines of water vapor at 183 GHz (H$_2$O) and 203 GHz (H$_2^{18}$O) in the early science period of ALMA when the ESA Cornerstone satellite Herschel is in operation.

- The best angular resolution of Herschel is 13”, while ALMA can obtain 1” images.

- Herschel can measure many water lines in star forming regions, comets, megamasers.
183 GHz line

Atmospheric transmission at Chajnantor, pwv = 0.5 mm

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Participants

• ESO (Administration, management)
• Mullard Radio Astronomy Observatory, Cambridge Univ., UK (atmospheric correction)
• IRAM, Grenoble, France (OTF mapping)
• Chalmers University/Onsala Space Observatory (Receiver prototype and construction)
• Astronomy Dept., University of Chile (Receiver tests in Chile)
ALMA Enhancements (1)

1. Construct and install **eight Superconducting receivers** for the frequency range 163-211 GHz ("Band 5") that will be used on ALMA starting with early science operations, to study star-forming regions in our galaxy in the water vapor lines in the 1.8 mm wavelength band, to combine the resulting ALMA data with that from the ESA/NASA satellite Herschel. A part of this project will include receiver tests in Chile. **OK**

2. Develop sophisticated atmospheric models and develop and install software based on them to **automatically and precisely correct the phase** on astronomical sources, generating images with high sensitivity and fidelity, and in principle extending ALMA’s operating range to periods of less stable weather conditions. **OK**

3. Develop and install a suite of sophisticated software tools for **wide-field imaging** with ALMA, so that the many targets with structures larger than ALMA’s primary beam size can be studied in detail. **OK**

4. Further develop the **On-the-Fly interferometric mosaic observing technique** and necessary reduction software. This technique produces 1) a gain in on-target integration time, since the instrument is continuously acquiring data; and 2) higher quality images from homogeneous data that is all acquired under the same observing conditions. **OK**

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