The FP6 Proposal: ALMA Enhancement

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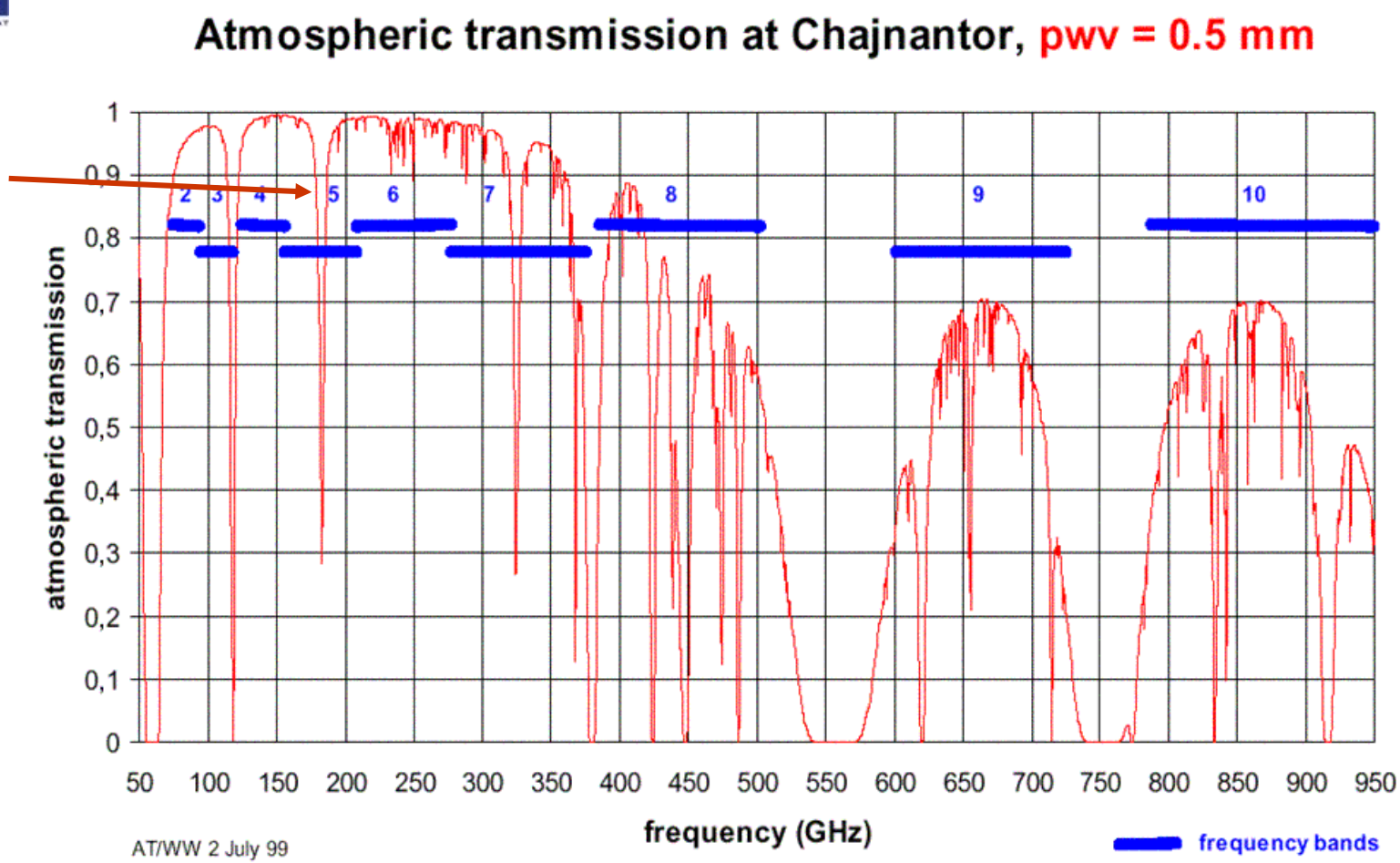
Purpose

- To allow measurement of spectral lines of water vapor at 183 GHz (H_2O) 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
atmospheric transmission
1
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
2
3
4
5
6
7
8
9
10
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
frequency (GHz)
AT/WW 2 July 99
frequency bands

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***