MMA Level 1 Tasks

WBS (f)	Task	Start	Finish	Duration	Work
1	**Administration**	**1998-06-01**	**2001-01-01**	**135.2w**	**603.01w**

Element Scope: This task includes all the responsibilities for management of the MMA project. Management of the project engineering, business and contracting affairs, personnel, budget and schedule, the WBS, documentation, standards, reporting and archive are all included within this task. In addition it is the responsibility of this task to assure that the MMA project meets its scientific goals.

2	**Site Development**	**1998-06-01**	**2007-12-28**	**500w**	**137.8w**

Element Scope: In the initial D&D phase it is the responsibility of the Division Head for Site Development to draft an operating plan for the MMA in Chile. He will do this by establishing the operational requirements and then creating an operational model that meets those requirements. The plan will be developed in consultation with the universities and observatories presently operating facilities in Chile. The plan will be costed. In the construction phase of the project the Division Head will be responsible for construction of the civil works.

3	**Antenna**	**1998-06-01**	**2002-12-30**	**239.2w**	**712.46w**

Element Scope: This element includes all steps required for producing all antennas delivered to site on foundation provided. Setting surface to require accuracy. Making certain all antennas meet design specification. Producing antenna transporters. Will provide mechanical support for interfaces to antenna.

4	**Receivers**	**1998-06-01**	**2007-04-27**	**465w**	**2,421.29w**
5	**LO System**	**1998-06-01**	**2007-03-09**	**458w**	**1,099.44w**
6	**IF System**	**1998-11-02**	**2002-03-01**	**173.8w**	**335w**

The IF system includes 1) at the antenna, the broadband 4 - 12 GHz signal path between the receiver and the fiber optic transmitter and 2) in the Central Electronics Building (CEB), the broadband signal path between the fiber optic receiver and the digital sampler.   The interface to the receivers is after the band selection switch and final room temperature amplifiers in the receiver package.

During the D&D phase, a complete IF system design will be done and select modules and sub-modules will be prototyped. The module interfaces and Monitor/Control interfaces will be developed and tested. The goal is to prototype enough of the system so that construction of the test interferometer system can proceed rapidly when the construction phase begins, and deliver a bench prototype system before 12/00.

7	**FO System**	**1999-01-25**	**2002-03-01**	**161.8w**	**407w**

Fiber Optic System - This element includes the fiber optic transmitter / receiver pairs and all associated M/C and interconnecting FO cabling for relaying the signals of four subsystems: 1) the broadband IF, 2) the LO reference distribution, 3) the round trip phase correction, and 4) the M/C system.
During the D&D phase, the complete fiber optic system design will be done and prototype transmitter/ receiver pairs for each of the four sub-systems (IF, LO ref, round-trip phase, and M/C) will be demonstrated. The module interfaces and Monitor/Control interfaces will be developed and tested. The goal is to prototype enough of the system so that construction of the test interferometer system can proceed rapidly when the construction phase begins. The prototype system will be delivered by 12/00.

8	**Correlator**	**1998-06-01**	**2007-03-30**	**461w**	**484w**

The MMA correlator will accept multiple baseband analog signals from the IF system, digitize them, and calculate the cross-correlation functions on a pairwise basis.

9	**Computing**	**1998-10-01**	**2006-07-18**	**406.8w**	**296.5w**

These activities implement all MMA system software. This includes real-time and near-real-time software to monitor and control hardware devices, software to schedule the array, software to format the data suitably for post-processing, software to archive and restore the data, software to perform fundamental calibrations (e.g. pointing) required to operate the array, commissioning software (e.g. holography), and software to implement a near-real-time imagine pipeline.
It does not generally include post-processing software, firmware which is "inside" the device (possibly excepting the correlator), or engineering test software which is not needed during operations (i.e., operators would not run it).

10	**System Integration**	**1998-06-01**	**2003-03-28**	**252w**	**621.9w**
11	**Calibration & Imaging**	**1998-06-01**	**2001-06-01**	**157w**	**565w**

This covers aspects of characterizing the MMA site at Chajnantor, of designing and optimizing the array configurations, of correcting astronomical observations for atmospheric and instrumental effects, and of understanding the characteristics and quality of the images the MMA will produce.