Planning for the ALMA Front Ends: E-AEC Response

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Planning for the ALMA Front Ends to this point has been done in the "cooperative" spirit that characterizes the entire ALMA project Design and Development phase. Satisfactory progress has been made in many areas, particularly in those areas where tasks were concentrated at a single institute (e.g. the cryogenic system, the frequency band cartridges, the optics design, WVR) whereas progress has been limited in areas at the interface between tasks (e.g. FE system instrumentation, calibration, integration). This limitation has been recognized by the FE DH/TLs and has led to the appeal for the establishment of a FE subsystem engineering group to tie the FE effort together. Unfortunately, this appeal has not been acted upon because it is not presently feasible for the "cooperative project" to manipulate or modify the task structure underway at many institutes, particularly those that are working with their own resources to provide "in kind" contributions. Too often the institutes define what can be done, how it is to be done, and what effort will be allocated to the task. This is simply the nature of the ALMA D&D effort where there is no unified project but instead we work in an environment of coordinated but independent efforts among the partners.

At this point all of us recognize:

- Significant progress has been made in the design of the FE subassembly, cryogenics system, optical system, and cartridge layout;
- Significant progress has been made in many aspects of the mixer design for the baseline (4 frequency bands) FE system;
- Limited progress has been made in other critical technical areas (e.g. the first LO system);
- Limited progress has been made in critical sub-system areas (FE control electronics, calibration system, integration planning, specification of the <u>project</u> requirements);
- The consequence of the highly uneven progress on the FE tasks made to date makes it impossible to establish a credible schedule for the FE delivery to Chile.

The construction phase of ALMA will change all this. Most importantly, ALMA will have its own resources and will be in a position to establish specifications and work packages, and the <u>Project</u> will have the funds to sponsor those work packages. Institutes participating in the ALMA work packages will use the funds to secure personnel and services of the scale the institutes' regard as appropriate to the task. We recognize that in many cases this will require a negotiation between "The Project" and those institutes wishing to be involved. [*This negotiation is a significant management challenge that we have not yet faced!]*

In August the E-AEC began the process of defining the entire ALMA construction project in terms of “work packages”. This was done by combining like WBS tasks derived from the bi-lateral project tasking augmented to reflect the participation of a third partner and further augmented by the tasks required for all the “enhancements” made possible by the additional resources that the third partner makes available to the Project. There are approximately 75 such work packages that include all the FE subsystem level tasks at the interface such as FE integration and calibration. Although no effort is yet allocated to the work packages, it will be once the construction project begins. Indeed, the E-AEC is discussing a plan for that allocation now.