



# Atacama Large Millimeter Array

## Interface Control Document

*Between:*

AOS Facilities

*And:*

Ancillary Calibration Devices

ALMA-20.01.04.00-90.05.13.00-A-ICD

Version: A

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2008-08-26

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## ALMA Project

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## Change Record

Version	Date	Affected Section(s)	Change Request #	Reason/Initiation/Remarks
A	2003-11-30	all		First draft
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## 1 Description

### 1.1 Purpose

To monitor observing conditions and provide information for observatory operations, the ancillary calibration devices described in *Specification of Ancillary Calibration Devices* (SCID-90.05.13.00-001-A-SPE) will be installed at the AOS. These devices include meteorological instruments and other site characterization equipment. This ICD defines the interfaces between this equipment and the facilities at the AOS.

### 1.2 Scope

This ICD specifies the electrical and mechanical interfaces between the ancillary calibration devices and the AOS facilities. These facilities include:

- central equipment shelter,
- external mounting area,
- meteorological towers,
- electrical power,
- heating or cooling, and
- communications.

### 1.3 Responsibilities

The Science IPT is responsible for the specification, purchase, and installation of the ancillary calibration devices and associated equipment.

The Site IPT is responsible for providing facilities at the AOS with adequate space, electrical power, cooling, lighting, and mechanical support for the ancillary calibration devices. Communications cabling is to be provided by the appropriate ALMA IPT.

Responsibilities for individual items are noted in the text.

## 2 Related Documents and Drawings

### 2.1 References

- ALMA-20.01.00.00-001-C-SPE, Oxygen Enrichment in AOS Buildings
- ALMA-80.05.02.00-001-B-SPE, ALMA Environmental Specifications
- Federal Standard 209D, Cleanroom and Work Station Requirements, Controlled Environments (1988) (obsolete)



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- ISO 14644-1, Cleanrooms and associated controlled environments--Part 1: Classification of air cleanliness
- ALMA-80.05.00.00-004-D-STD, Standard for Plugs, Socket-outlets, and Couplers.
- SCID-90.03.00.00-101-A-SPE, ALMA Weather Instrumentation Specification
- SCID-90.05.13.00-001-A-SPE, Specification of Ancillary Calibration Devices
- ALMA Project Book, Chapter 14 SITE CHARACTERIZATION AND MONITORING

### 3 Facilities

The ancillary calibration devices will be installed either in, on, or adjacent to a central equipment shelter or on meteorological towers. No ancillary calibration devices will be installed in or on the AOS Technical Building.

#### 3.1 Central Equipment Shelter

Near the center of the array, an enclosed shelter shall be provided for the equipment and for maintenance. This shelter shall meet the following requirements:

Location on ALMA construction grid	7453223 N 627690 E (m)
Orientation	Long dimension EW parallel to prevailing wind
Interior size	4.3 m × 11.5 m <sup>1</sup>
Interior height	2.2 m
Door opening	1.5 m (wide) × 2.0 m (high)
Door location	East end, with vehicle access
Floor load	300 kg m <sup>-2</sup>
Interior temperature	20 ± 5 °C
Interior humidity	30 – 50 %
Equipment heat load	0.5 kW
Design occupancy	4 people
Air quality	Filtered, oxygen enrichment desirable
Electric power	See below
Communications	See below
External mounting area	3 m × 5 m reinforced concrete slab, on <i>north</i> side, 300 kg m <sup>-2</sup>
Cable feed through	From interior to external area.
Parking	3 vehicles

<sup>1</sup> may be constructed from a pair of joined steel shipping containers



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In addition to weather monitoring instruments, of which there are several, this central station will host a number of instruments unique to it. These unique instruments include:

1. Atmospheric temperature profiler
2. Infrared (10  $\mu\text{m}$  all-sky camera)
3. 11.2 GHz Phase monitoring interferometer (300m E-W baseline)
4. Tipping radiometer (225 GHz or 183GHz)
5. Broadband Emission Monitor (*e. g.* Fourier Transform Spectrometer)
6. Ozone Monitor

Of these, versions of numbers three and four are currently deployed at the site characterization containers. Numbers five and six are desirable but are not in the current budget. The central shelter may be constructed from a pair of joined steel shipping containers. Any clear area necessary for buried interferometer cables, etc., *must be defined*.

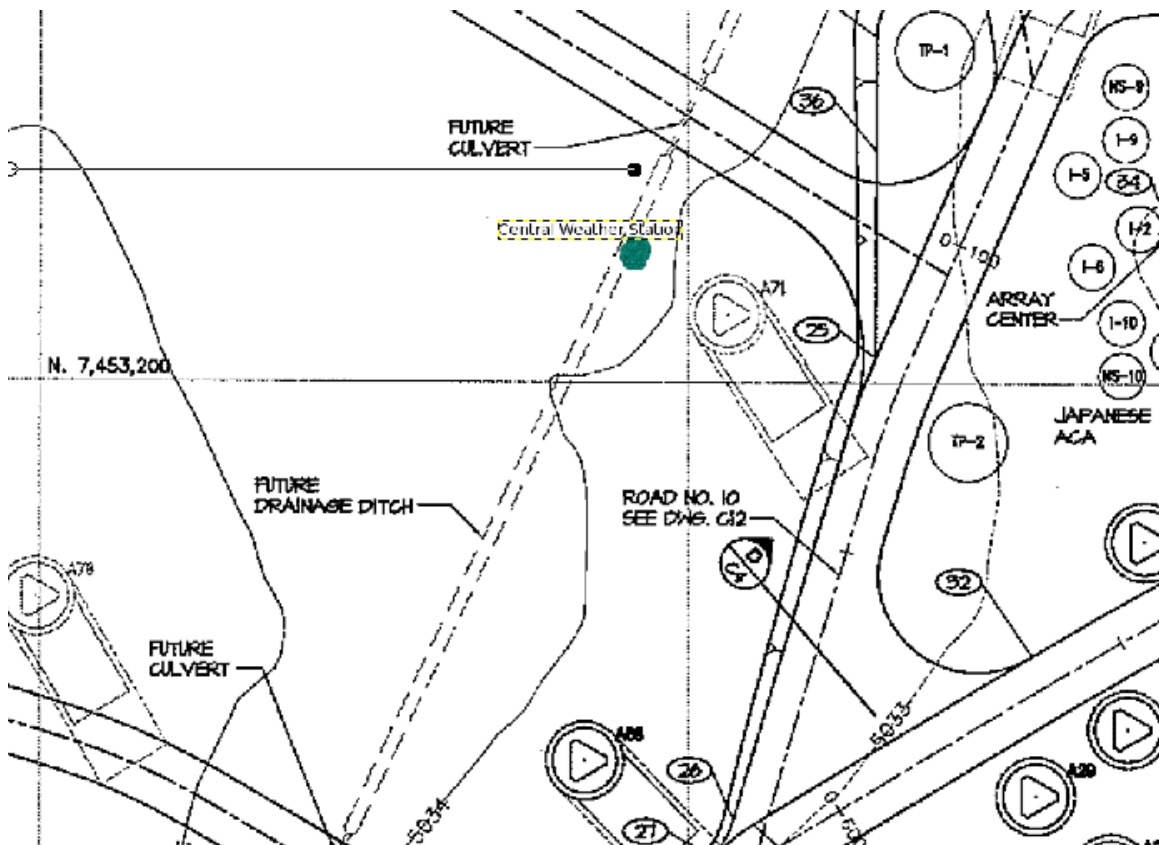



Figure 1 Location of central weather station (green). Proposed western end of 11.2 GHz phase monitoring interferometer (300m east-west baseline, too large for this figure) is shown by small black mark just north.

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### 3.1.1 Electrical Power

All ancillary calibration devices shall operate from 230 VAC, 50 Hz single phase power and the equipment connected to the shelter shall consume not more than 0.560 kVA. Although the equipment power factors are not yet known, they will exceed 0.9 (TBC). Inrush currents will be less than 120% (TBC) of the steady state currents. Although no circuit may be overloaded, there are no restrictions on how the equipment loads are distributed among circuits nor on the phases of the different circuits.

Sufficient single phase power outlets shall be supplied to allow also use of normal laboratory test and maintenance equipment and laptop computers.

#### 3.1.1.1 Electrical Connectors

The plugs and outlets shall conform to *Standard for Plugs, Socket-outlets, and Couplers*, ALMA-80.05.00.00-004-D-STD. (*Need specific connector models?*).

#### 3.1.1.2 UPS

No uninterruptible power supply (UPS) shall be provided in the equipment shelter by the Site IPT; a UPS will be included with instruments delivered by the Science IPT.

### 3.1.2 Communications

The central equipment shelter shall be connected to the AOS communications network by a fiber optic Ethernet link. This link shall have the same characteristics as the links between the AOS technical building and the antenna stations. *The Computing IPT will determine if a router is necessary.*

#### 3.1.2.1 Telephones

Two Voice over IP (VoIP) telephones shall be provided in the central equipment shelter *by the Computing IPT.*

### 3.2 Meteorological towers

At least seven towers for eight sets of meteorological equipment (one set will be a spare) are required, one near the center of the array and others each near the end of each arm of the extended configuration. We recommend a total of at least seven towers for optimum coverage. These towers shall meet the following requirements:



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Locations on ALMA construction grid (at least six of these locations to be chosen; one will be near the central building)

- 1: 7453657.0 N 620125.0 E (m) (W1)
- 2: 7455040.0 N 623451.0 E (m) (W5)
- 3: 7457210.2 N 625901.9 E (m) (W8)
- 4: 7452986.0 N 626124.0 E (m) (A130)
- 5: 7447310.0 N 634062.0 E (m) (S9)
- 6: 7451111.2 N 632668.2 E (m) (S7)
- 7: 7450388.2 N 629490.2 E (m) (S1)
- 8: 7462869.2 N 633309.9 E (m) (P13)
- 9: 7458399.5 N 631556.8 E (m) (P10)
- 10: 7454297.0 N 628978.0 E (m) (A129)

Maximum equipment mounting height 15 m

Capacity at maximum height 20 kg

Electric power 230 VAC, 50 Hz, single phase, 0.05kW equipment load, in weather proof, lockable junction box at tower base

Communications

Optical fiber Ethernet with one VoIP telephone, in weatherproof, lockable junction box at tower base

The towers will *not* be suitable to support personnel. Equipment installation or maintenance shall be done with a cherry picker.

### 3.3 Electronic Interface

Any required RFI shielding of any and all instruments shall be the responsibility of the Science IPT.

## 4 Software/Control Function Interface


There is no software or control interface between the ancillary calibration devices and the facilities.

## 5 Safety Interface

### 5.1 Earthquake protection

The equipment shelter and meteorological towers shall be anchored sufficiently to withstand seismic accelerations. The equipment shelter floor shall provide adequate



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support for the equipment racks. The rack anchors shall be strong enough to withstand seismic accelerations. (*Need anchor point loads, etc.?*)

## 5.2 Fire protection

A fire alarm system shall be provided in the equipment shelter by the Site IPT. This alarm system shall be connected to the fire alarm system for the AOS TB. *No fire suppression system shall be provided (TBD).*

In the event of fire or other emergency, the electrical power supply will be disconnected and forced air flow in the equipment shelter