

# Interface Control Document

*From:*

Site (AOS Technical Building)

*To:*

ACA Correlator

ALMA-20.01.02.00-62.00.00.00-A-ICD

(X)

(Y)

where X<Y

Version: A

Status: Draft A

2004-05-21

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Xxx	Xxx	yyyy-mm-dd
<b>Released By:</b>		
<b>Name and Signature</b>	<b>Organization</b>	<b>Date</b>
Xxx	Xxx	yyyy-mm-dd

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### Change Record

Version	Date	Affected Section(s)	Change Request #	Reason/Initiation/Remarks
A	2004-05-31	all	Draft A	First Draft

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## **1 Description**

### **1.1 Purpose**

This document defines the interface between the ACA correlator and the AOS technical building.

### **1.2 Scope**

This ICD covers the electrical and mechanical interface requirements of the ACA correlator with AOS technical building. Also, we will be doing the common requirements with those of enhanced Baseline Correlator (eBLC) (see RD 02) and Backend Central Equipments (see RD 03) as possible.

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## 2 Related Documents and Drawings

### 2.1 References

No	Document Title	Date	Reference
RD 01	AOS Technical Building Architectural Program	2004-xx-xx	SITE-20.01.02.00-001-D-PLA
RD 02	ICD From: Site (AOS Technical Building); To: Baseline Correlator	2004-xx-xx	ALMA-20.01.02.00-60.00.00.00-A-ICD
RD 03	ICD From Site (AOS Technical Building); To Backend (Central Equipment)	2004-xx-xx	ALMA-20.01.02.00-50.00.00.00-A-ICD
RD 04	Standard for Pulgs, Socked-outlets, and Couplers,	2004-xx-xx	ALMA-80.05.00.00-004-D-STD
RD 05	ALMA system Electrical Design Requirements	2004-xx-xx	ALMA-80.05.00.00-005-B-SPE.
RD 06	Site and Fiber Optic Cable System	2004-xx-xx	ALMA-20.00.00.00-50.02.04.09-A-ICD
RD 07	Oxygen Enrichment in AOS Buildings	2004-xx-xx	ALAM-20.01.00.00-001-C-SPE

### 2.2 Abbreviations and Acronyms

RD	Reference Document
NAOJ	National Astronomical Observatory of Japan
ACA	Atacama Compact Array
ESO	European Southern Observatory
NRAO	National Radio Astronomy Observatory
JAO	Joint ALMA Office
ALMA	Atacama Large Millimeter Array
ALMA-B	ALMA Bilateral
ALMA-J	ALMA Japan
SE&I	System Engineering and Integration
eBLC	enhanced Baseline Correlator
IPT	Integration Product Team
BE	Back-End
DTS	Data Transmission System
FOR	Fiber Optical Receiver

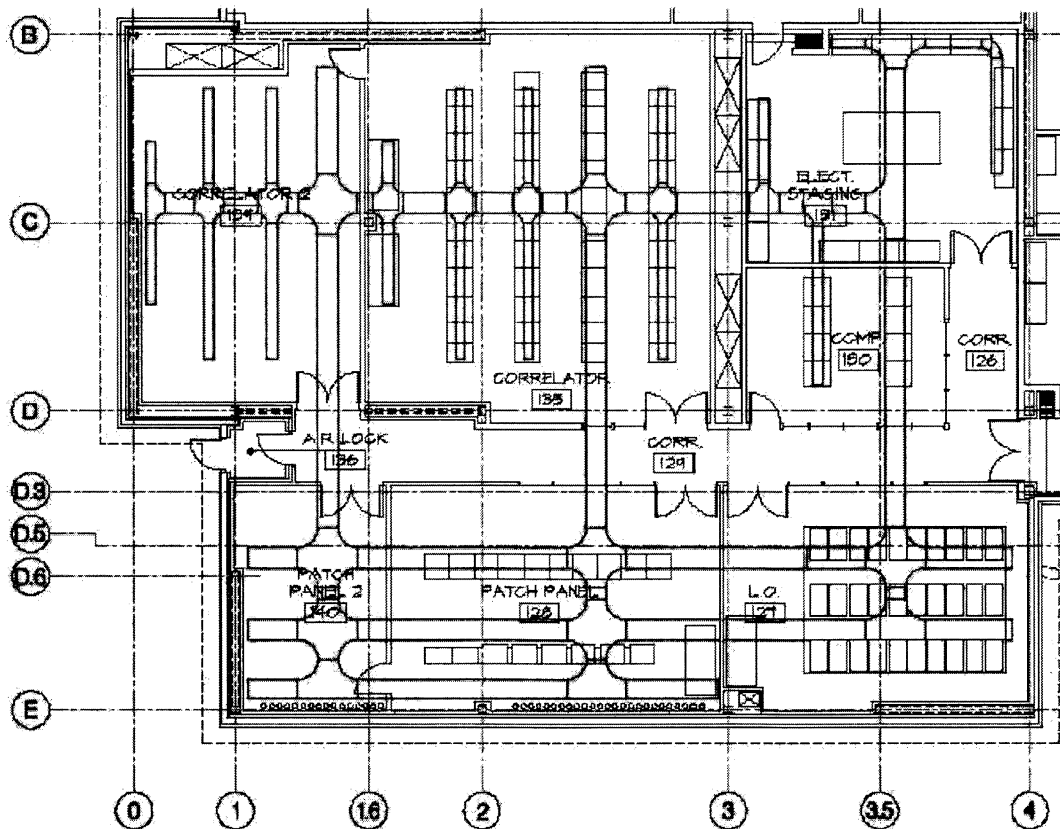
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### 3 Physical System Interfaces

#### 3.1 Mechanical Interface

##### 3.1.1 ACA Correlator Room Space

The ACA Correlator floor space will be described in RD 01, delivered by ALMA Site IPT (see the CORRELATOR 2 in figure 3-1). The minimum floor space required to house the ACA correlator is 50 m<sup>2</sup> in a 10 m ((B)-(D)) by 5 m ((0)-(1.6)) configuration. The ceiling height should be 3 m that is the same as that of eBLC. Also, the under floor of a dimension of 0.5 m will be allowed beneath the computer floor as an air plenum and for under-floor cabling.



**Figure 3-1.** The CORRELATOR 2 floor space and cable tray routing for ACA correlator in the AOS technical building.

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The ACA correlator consists of

Unit name	Qty	Size	Comments
Station Rack	4	TBD	Including DTS RX cards, F-part cards, control cards, etc
Correlation Rack	4	TBD	Including X-part cards, control cards, etc
ACA CDP Rack	1 or 2	TBD	ACA Correlator Data Processors
ACA CCC Rack	1	TBD	ACA Correlator Control Computer
Spare storage Rack	1	TBD	For spare parts storage

The other requirements of ACA correlator is the same as those of eBLC as follows:

Telephone and network connections are required. Overhead lighting should be general office quality fluorescent fixtures, with total illumination level high enough to compensate for the approximately 67 % loss of visual sensitivity relative to sea level caused by the expected enriched oxygen level.

### 3.1.2 AOS lab space requirement

Shared laboratory space as shown in the AOS building plan will be required for spares storages and simple maintenance procedures.

The air conditioning requirements for this facility of the ACA correlator will be same as those of the eBLC (see RD 02).

Telephone and network connections are required. Overhead lighting should be general office quality fluorescent fixtures.

### 3.1.3 OSF lab space requirement

Shared Laboratory space as shown in the OSF building will be required for test fixtures and general system maintenance.

The air conditioning requirements for this facility of the ACA correlator will be same as those of the eBLC (see RD 02).

Telephone and network connections are required. Overhead lighting should be general office quality fluorescent fixtures.

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### **3.2 Electrical Power Interface**

The each racks of ACA correlator operates from 230 VAC/ 400VAC, 50 Hz three phase power. Although the equipment power factors are not yet known, it will exceed 0.9 or greater. The inrush current will be <20 Amp peak for each 20-AMP circuit. The total power supply will be less than 40 kW.

The Correlator Computing System, while not part of the correlator, will add an additional 3 kW power requirement for the ACA correlator room.

For the maintenance areas at the AOS and OSF, sufficient single-phase power outlets shall be supplied to allow use of normal laboratory test and maintenance equipment (oscilloscopes, soldering irons, etc.).

#### **3.2.1 Electrical Connectors**

Power outlets shall be provided under the floor near the base of each rack. This may be achieved with circuit breaker panels on the walls and conduits running under the floor to junction boxes near the rack foot prints. Each rack shall be equipped with a flexible cord that connects to a power outlet. The cord will be provided by the ALMA-B BE IPT and the power outlets by the ALMA-B Site IPT. The plugs and outlets shall conform to RD 04. The specific connector model shall be selected by the SE&I IPT.

#### **3.2.2 UPS requirements**

ACA Correlator, ACA CDP and ACA CCC shall be supplied from a UPS for power quality and to be able to ride through power emergencies up to 5 minutes. This UPS shall be furnished as part of the building the ALMA-B Site IPT. Any further UPS requirements shall be the responsibility of the ALMA-J.

#### **3.2.3 Grounding**

There shall be a copper grounding bus for the ACA correlator racks. This bus shall be installed below the raised floor near the rack footprints. The bus shall be bonded to the building ground counterpoise.

The grounding shall comply with the RD 05.

Any armor on the exterior fiber optic cables shall be bonded to ground before the cable enters the building, as described in detail in the ICD between Site and Fiber Optic Cable System (see



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RD 06). The ALMA-B Site IPT will provide the ground and bond the armor to it under the supervision of the ALMA-B BE IPT or SE&I IPT.

### **3.3 Mass/Balance**

The total weight of the correlator system plus the computer system is estimated to be a maximum loading of 500 kg/m<sup>2</sup>.

### **3.4 Air conditioning**

#### **3.4.1 Requirement for ACA Correlator Room Space**

The room to house the ALMA correlator must have a computer floor to allow for forced air cooling of the system. A minimum dimension of 0.5 m will be allowed beneath the computer floor as an air plenum and for under-floor cabling. The racks will be bolted to frames which are rigidly attached to the underlying foundation floor rather than to the computer floor. Each Racks will be bolted together to allow running cables from rack to rack without going under the floor.

#### **3.4.2 Air Quality**

The ceiling should consist of dust-free acoustic lay-in tile.

It is desirable that a clean room specification at ISO class 8 (Fed. Std. 209D class 100,000) or better be maintained.

Static control should be maintained by keeping the relative humidity between 30 % and 50 %.

When personnel are in the room, oxygen enrichment must be supplied according to RD 07.

#### **3.4.3 Thermal Interface**

Sufficient cooling air must be supplied to the correlator racks to allow for a temperature rise of no more than 10 deg C when the correlator system, including the fiber optic receiver cards and the correlator computer system, is dissipating its maximum power of 40 KW.

All racks are less than 2.05 m high. Air flow through the racks will be restricted to:

a 0.?? m by 0.7 m (TBD) chimney for all station racks

a 0.?? m by 0.7 m (TBD) chimney for all correlator racks

a 0.?? m by 0.7 m (TBD) chimney for all other racks

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Electronic components with each rack will restrict the area of air flow by an average of 50 % of the chimney cross section.

Inlet air temperature shall be nominally at 20 deg C but be adjustable to as low as 15 deg C.

The ambient temperature in the working area around the racks within the correlator room shall be in the range 20 to 25 C (normal working environment).

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#### **4 Software/Control Function Interface**

All software is internal or described in the ACA Correlator / Computing ICD.

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## **5 Safety Interface**

### **5.1 Earthquake and Fire protection**

The ACA correlator protection requirements will be same as those of the eBLC (see section 5.1 and 5.2 in RD 02, and section 5.3 in RD 03).

### **5.2 Others**

TBD