



**Atacama  
Large  
Millimeter /  
submillimeter  
Array**

**Upgrade plan to add PIC and 1-PPS distributor to  
64-stn correlator**

CORL-05.11.00.01-0001-A-PLA

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# 1 Introduction

## 1.1 Purpose

This plan details all relevant aspects associated to the following upgrade/retrofit activity:  
Upgrade plan to add PIC and 1-PPS distributor to 64-stn correlator.

## 1.2 Scope

This plan covers the installation and testing of PIC (phasing interface cards) and 1-PPS distributor to the 64-station correlator as part of the implementation of the ALMA Phasing Project.

## 1.3 Applicable documents

The following documents are part of this document to the extent specified herein. If not explicitly stated otherwise, the latest issue of the document is valid.

Appl.	Document Title	ALMA Doc. Number
[AD01]	ALMA Product Assurance Requirements	<a href="#">ALMA-80.11.00.00-001-D-GEN</a>
[AD02]	ALMA Safety Manual	<a href="#">ALMA-10.08.00.00-011-C-MAN</a>

## 1.4 Acronyms

The more complete list of acronyms and abbreviations used within this document are given below. For a complete set of acronyms and abbreviations, please go to the [ALMA AIV web page](#).

## 1.5 Glossary

### 1.5.1 Upgrade

Modification of the hardware or firmware part of ALMA equipment in response to design improvements, corrective maintenance needs, or enhanced features.

### 1.5.2 Retrofit

Replacement of obsolete hardware or firmware of ALMA equipment in order to bring it to production level.

### 1.5.3 Completion

Modification of existing hardware, firmware and/or configuration in order to complete the functionality of ALMA equipment.



## **2 Description of Activity**

### **2.1 Rationale for upgrade/retrofit/completion**

As part of the ALMA development projects, The VLBI capability will be added. The ALMA BL correlator has already the needed hooks for providing the antennas' analog sum. It is also needed to add extra hardware: in this particular case is needed to add two types of cards: PIC(Phasing Interface Card) and One PPS distributor

### **2.2 Summary of Procedure**

This change will be done in the following way:

- 1) Technical time will be requested.
- 2) At least 5 antennas will be requested
- 3) One photonic reference will be also needed.

Before start the change a DelayCal (Telescope Delay Calibration, data from an unresolved source will be collected, so the phase should be constant along the spectra) will be executed.

Correlator will turn off.

One PIC card will be added

One 1PPS distributor card will be added

Turn on the BL correlator

Check the multi-drop bus

Check the CAN bus

Check if the new cards are being reset by the QC\

Check if PIC card is able to turn on/off the attached ROACH2 card

Run the suite of test which are part of the correlator weekly test.

Pay attention to any cable or timing issue

Once the suite of tests is done, run again the same delayCal which was executed at the beginning of this change.

Check the produced ASDM, look for: spectra artifacts, phase changes (slopes for example)

Finally check the variance of the phase (should be similar to the variance of the phase collected before start this test)

### **2.3 Affected hardware or firmware**

The affected hardware will be the Q1 of the BL correlator

The current interaction with Software will not be affected, since this hardware does not change the current CAN protocols used for controlling the correlator.



## **2.4 Revision history**

The firmware version of the new hardware is available in CVS

## **2.5 Configuration Control**

A new entry for BL correlator will be requested to the CMMS administrator for keeping a control of what is currently deployed.

## **2.6 Post-Modification Unit Level Verification**

Temperature levels will be checked using the embedded temperature sensor and a thermal camera.  
CAN bus connectivity will be exercised using the CorrCANmgr object  
Finally an end to end test will be performed (delayCAL), see **2.2**

## **2.7 Sub-/System Verification**

See section **2.2**

## **2.8 Design Re-Verification**

The results of the correlator weekly test will be reported.  
The uid of both delayCal (before/after the change) will be also reported  
Since this change will be performed only in Quadrant 1, I will be set the LO2 to same frequency and the compare the results produced by the different quadrants (or BBPs)

## **2.9 PA Inspections**

PA should inspect that the new hardware properly fits into the already deployed system.

## **2.10 Roll-Out**

If the already stated test indicates problems, the new cards will be removed. If not then the new cards will be left in place and performance monitored during normal operations.

The roll-out to the remaining 3 quadrants will be performed at a later time.

## **2.11 Tentative Schedule**

Thursday 24<sup>th</sup> April 2014, 09:00-13:00 CLT

## **2.12 Required Resources**

At least 5 functional antennas.  
One photonic reference  
BL correlator.  
One correlator technician  
One Telescope Operator  
One correlator Engineer

## **2.13 Impact on Warranty**

NA



### **3 Safety**

#### **3.1 Job Hazard Analysis**

Since the affected hardware is ESD sensitive the usage of wrist strap is mandatory

#### **3.2 General Safety Considerations**

The people who must perform the hardware change should use Oxygen tank.



## 4 Workflow Chart

