Atacama
Large
Millimeter
Array

Leak Test Results
For Band 7 300K Plate
Measured by the NRAO

FEND-40.02.07.00-009-B-TDR

Version: B

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Name(s) and Signature(s)	**Organization**	**Date**
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Change Record

Version	Date	Affected Section(s)	Change Request #	Reason/Initiation/Remarks
A	2005-10-12	All	N/A	JEE: Initial
B	2005-10-13	Fig's 4 and 5	N/A	JEE: Figs now use same scales, and corrected path to data.

Table of Contents

1 DESCRIPTION 3
2 REFERENCES 3
3 TEST PROCEDURE 3
4 DEVICE TESTED 3
5 TEST RESULTS 3

List of Figures

Figure 1: Helium Leak Test Setup, Front View 5
Figure 2: Helium Leak Test Setup, Side View 6
Figure 3: Helium hose entering bag 7
Figure 4: Helium Leak Rate for Band 7 300K Plate 8
Figure 5: Helium Leak Rate for *Band 6* 300K Plate SN003 8

1 Description

The helium leak rate was measured for a Band 7 300K plate using the procedures described in [RD01]. Although ALMA mandates that leak tests should be specified as equivalent air leak rates, conversion factors from helium to air for the Band 7 waveguide windows are unknown and consequently all leak rates reported here are simply the measured helium leak rate.

2 References

Ref.	*Document title*	*Document ID*
[RD01]	Leak Test Procedure for Waveguide Windows	FEND-40.02.06.00-073-A-PRO

3 Test Procedure

The vacuum side of the 300K plate was bolted to a test fixture designed by Neil Horner to measure leakage of entire Band 6 cold cartridge assemblies at the 300K plate interface (see photos, Figure 1 and Figure 2). An antistatic bag was placed over the atmospheric side of the 300K plate, filled and slightly pressurized (~1 kg/cm^2) by helium gas. The helium flows into the bag with a flexible hose and the bag is sealed with duct tape (see Figure 3).

4 Device Tested

There is no serial number on the Band 7 300K plate, but the following parts were serialized (at least with indelible ink):

- Plug-In Dual 51-pin MDM connector is number 4
- LO Waveguide flanges are marked numbers 13 and 14
- Two of the four SMA bulkhead IF feedthroughs were marked with numbers 1 and 8.

5 Test Results

The helium leak rate measured for the Band 7 300K plate, graphed as a function of time in Figure 4, is 8.5×10^{-6} mbar.l/sec. Recalibration of the leak detector immediately after the 5-hour measurement eliminates as error sources both sensor drift and apparatus contamination.

For reference, the helium leak rate of Band 6 300K plate for Cartridge SN003 is plotted in Figure 5 and is, within measurement uncertainty, the same as that measured for the Band 7 plate.

Baseline leakage rates, defined as the measured leak rate prior to introducing helium, are 3×10^{-9} mbar.l/sec for the Band 7 plate and 7×10^{-10} mbar.l/sec for the Band 6 plate. This low-level difference has an insignificant effect on the measured leak rates in the range of 10^{-6} mbar.l/sec.

It is interesting to note the difference in time required for the Band 7 and Band 6 plates to reach a constant leak rate. The Band 7 300K plate took only 3 minutes to reach the final leak rate while the Band 6 plate required 1 hour 15 minutes to reach its steady-state leak rate.

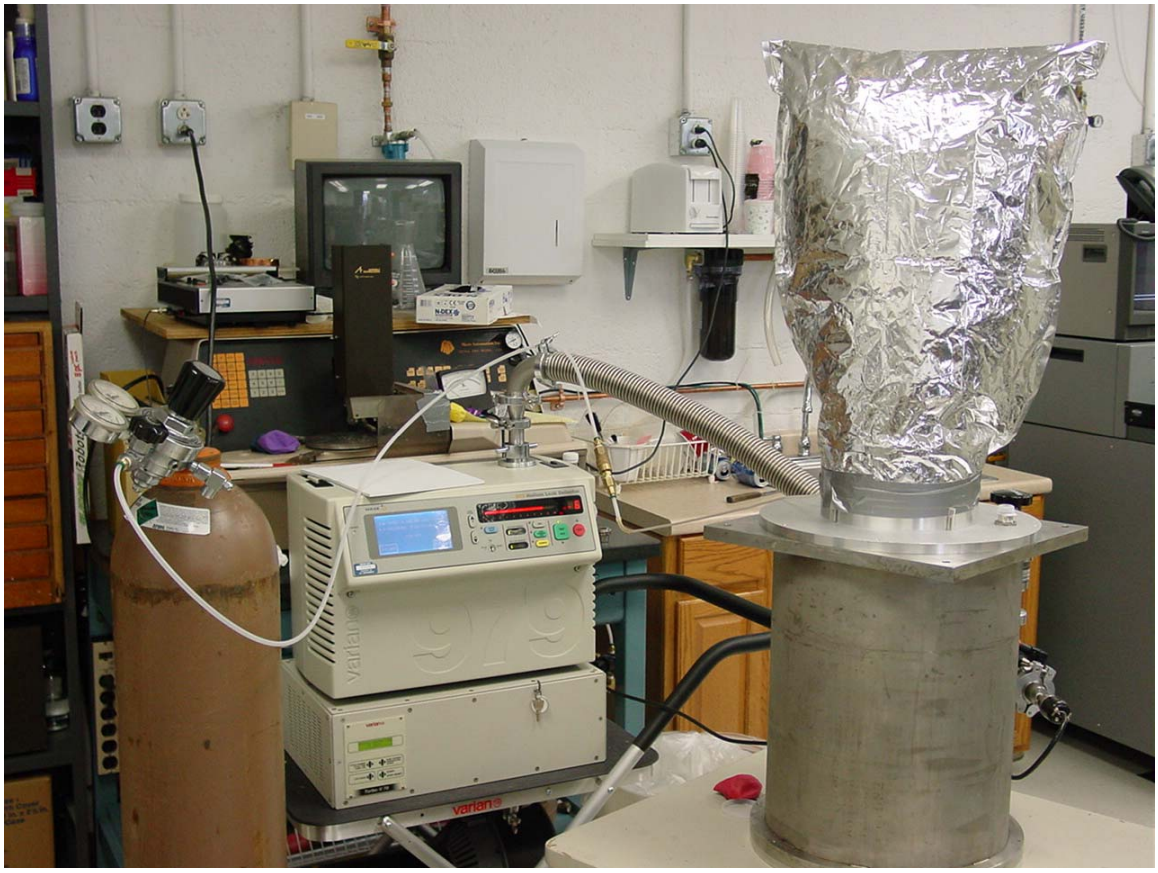

Figure 1: Helium Leak Test Setup, Front View

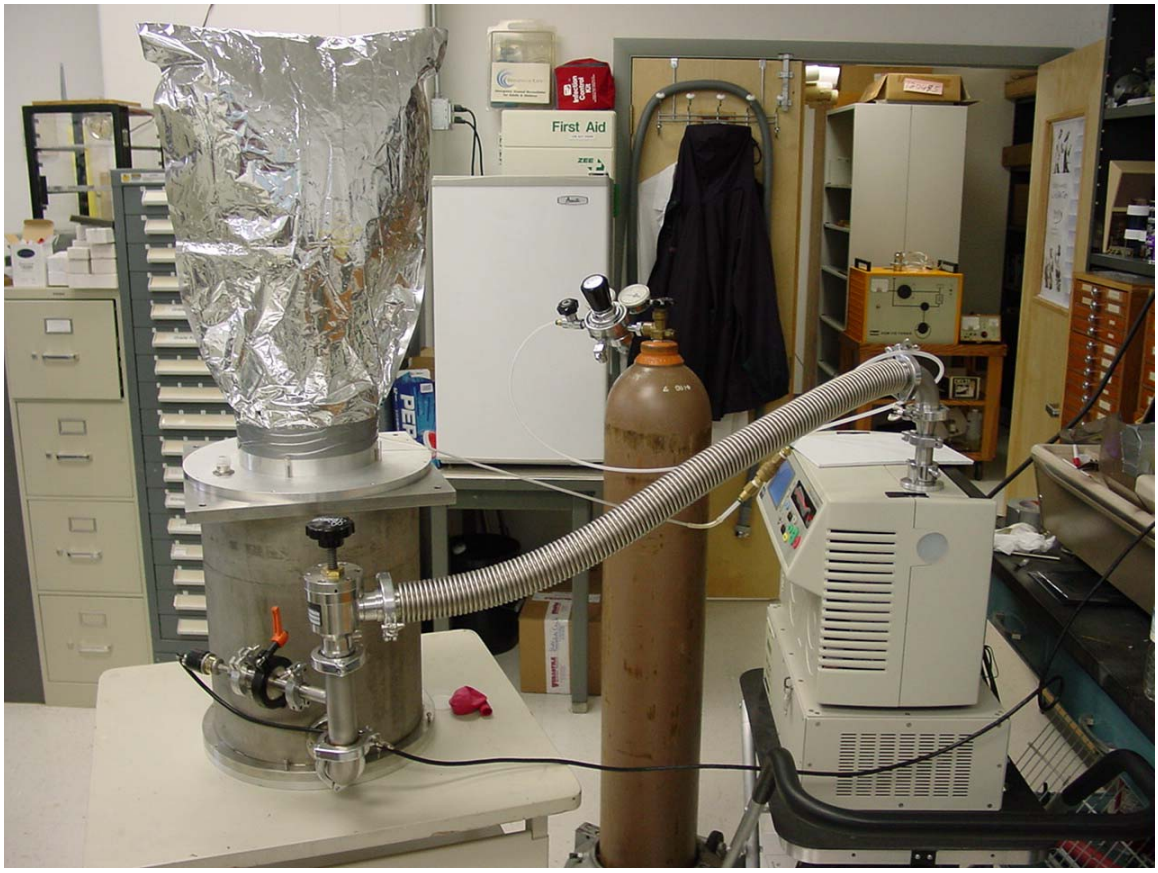

Figure 2: Helium Leak Test Setup, Side View

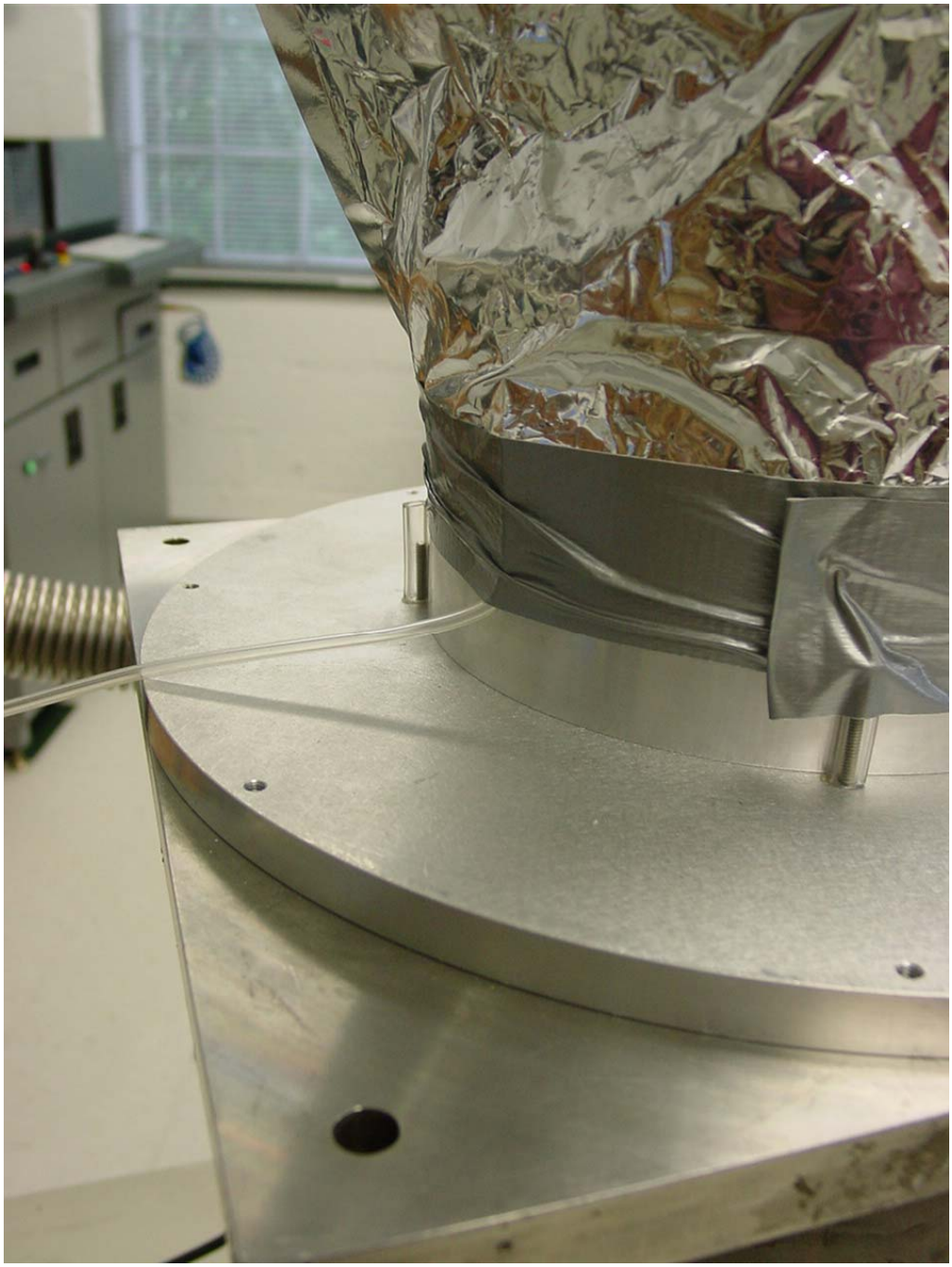

Figure 3: Helium hose entering bag

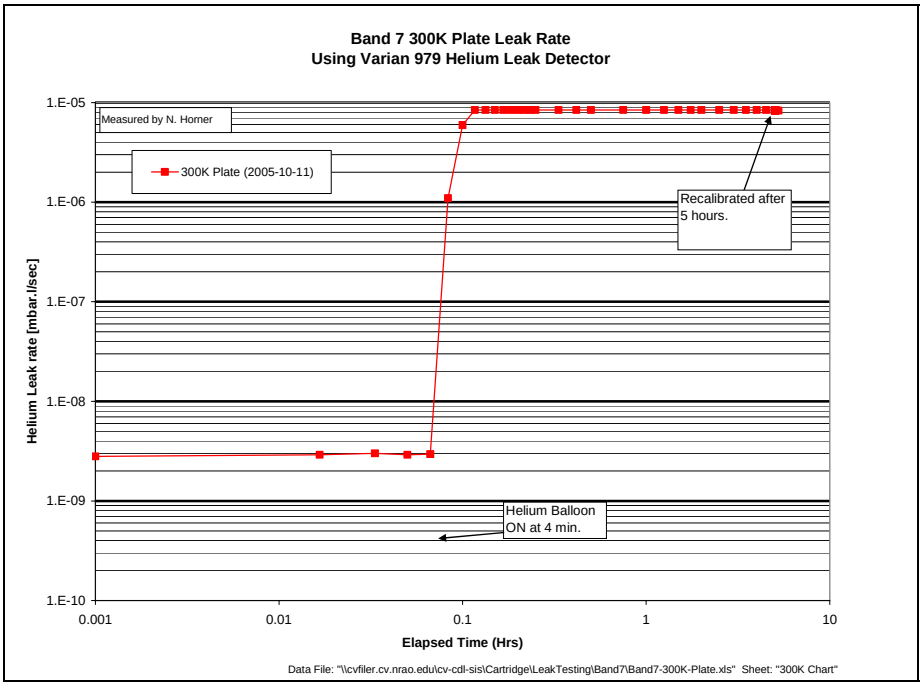

Figure 4: Helium Leak Rate for **Band 7** 300K Plate

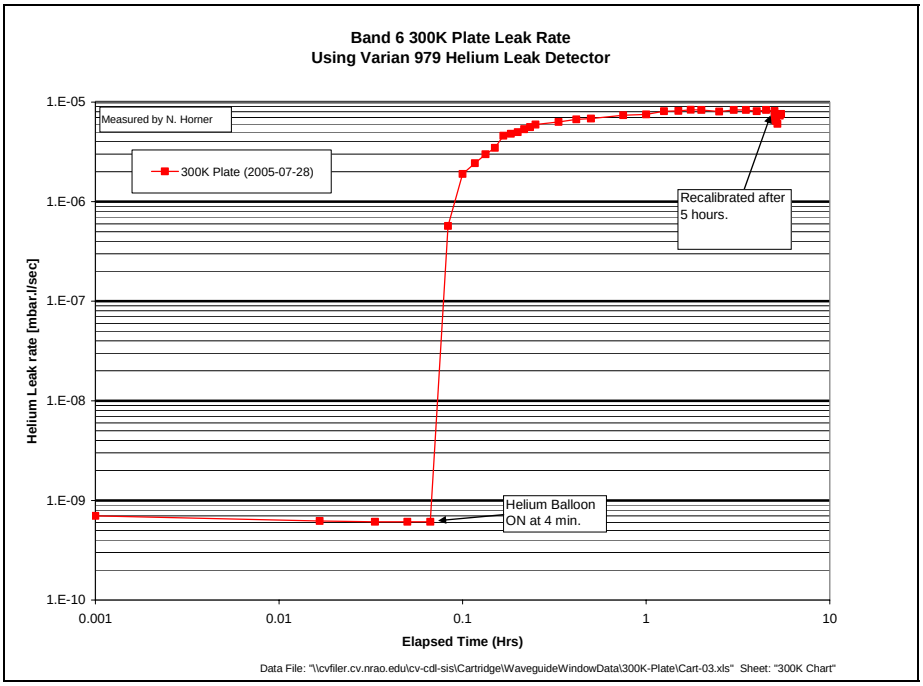

Figure 5: Helium Leak Rate for ***Band 6*** 300K Plate SN003