



Memorandum

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From: John Effland

Date: 2007-02-13

Revisions: 2007-02-12 jee Initial
2007-02-13 jee Minor editorial changes

Subject: Action Plan to Investigate Sidelobes in Band 6 Cartridges

1. Introduction

Recent nearfield measurements at the FEIC confirm that high sidelobes are present in near-field beam patterns of the Band 6 cartridge and they transform in the farfield to a pair of sidelobes only about 12 dB below beam peak. The Front End IPT has stated that they will no longer accept cartridges with these sidelobe levels, so this memo serves as the preliminary action plan to solve this serious problem. Table 1 lists tasks and assignments, and a preliminary schedule will follow shortly.

A mountain of beam pattern data has already been measured at the NTC for Band 6 cartridges^{1,2,3} (a later memo will summarize results to date), but the source of the sidelobes remains unknown. In August 2005, IRAM measured a Band 6 Cartridge warm using their Schottky mixers, and found no sidelobes⁴. Early drafts of an appendix to the ALMA optics report attempted to suggest that, based on their warm optics measurements, IRAM's design meets specifications, but revisions to that draft⁵ refute that assertion. Recent measurements with the Cartridge Test System attempted to show that replacing IRAM's vacuum windows and IR filters would eliminate the sidelobes, but the sidelobes remained⁶.

We will now attempt to duplicate IRAM's results by measuring a Band 6 Cartridge installed in the NAOJ test cryostat with the cartridge at room temperature. To simplify the optical system, the OMT will be replaced with an

¹ "Band 6 Beam Pattern Measurements, Cartridge B6-001 Update #12 Measurements through 2005-05-21,"
<http://edm.alma.cl/forums/alma/dispatch.cgi/iptfedocs/showFolder/101230>

² "Beam Pattern Measurements of Band 6 Cartridge using Gunn Oscillator as Source,"
<http://edm.alma.cl/forums/alma/dispatch.cgi/iptfedocs/docProfile/101731>

³ "Comparison of Calculated and Measured Data for Mirrors used in ALMA Band 6 Cartridges,"
<http://edm.alma.cl/forums/alma/dispatch.cgi/iptfedocs/showFolder/101258>

⁴ "ALMA Band 6 antenna measurements at IRAM, 2005-08-26 (Preliminary Report),"
<http://edm.alma.cl/forums/alma/dispatch.cgi/iptfedocs/showFolder/101595>

⁵ "Band 6 Pattern Comparison, Summary Appendix for Optics Report,"
<http://edm.alma.cl/forums/alma/dispatch.cgi/iptfedocs/docProfile/102836>

⁶ "Comparison of Band 6 Sidelobes with IRAM and Gore-Tex IR Filters and with a Tilted and Un-tilted Vacuum Window,"
<http://edm.alma.cl/forums/alma/dispatch.cgi/iptfedocs/showFolder/103002>

existing Band 6 corrugated horn and adapter that accepts a single Schottky mixer that operates from 211-275 GHz. IR filters and the vacuum window will be removed from the test cryostat for the initial warm tests.

Band 6 acceptance testing is now suspended until the source of the sidelobes is eliminated.

Table 1: Band 6 Sidelobe Investigation – Tasks and Assignments

Task	Notes	Personnel Assignment
Develop a schedule for solving beam pattern problems		Effland
Document existing problem	<ul style="list-style-type: none"> Get beam patterns from the FEIC and tabulate sidelobe levels vs. frequency for the existing near-field data. Present patterns of warm cartridge measured by IRAM Summarize amplitude-only sidelobes vs. frequency measured by the cartridge test system 	Effland
Organize and hold meeting to discuss status, assignments, and brainstorm solutions	John Webber requested that Geoff and Sri attend	Effland
Ask Geoff to analyze optics: tilt mirrors, <i>etc.</i> in attempt to find problem	As recommended by John.	Effland
How far out of spec are current beam patterns?	What is beam efficiency at subreflector?	Ediss
Ask FEIC to measure patterns of Cartridge B6-004	FEIC has scheduled warm-up beginning Fri, 23 Feb so this is an opportune time to replace Cartridge B6-001 with B6-004. RAL will work with cryostat for some time afterwards so results will not be available until early March.	Schmitt -- Installation
Contact IRAM and VDI about borrowing Schottky mixers and possibly LO sources for warm tests	Confirm: <ul style="list-style-type: none"> Mixer LO requirements IF band Flange, mounting, and other mechanical interfaces (request mechanical drawings) Tony Kerr recommends obtaining a balanced mixer to eliminate the need for an LO coupler	IRAM – Effland VDi - Saini
Prepare brackets <i>etc.</i> for installation in a Band 6 cartridge of horn and single-pol adapter		Horner
Ready Cartridge Test System for warm measurements	Remove vacuum window and IR filters. Make sure software is ready	Schmitt – Hardware Lacasse -- Software
Measure beam patterns warm	First with no windows and IR filters, then reintroduce each component and remeasure beam patterns.	Schmitt