Atacama
Large
Millimeter
Array

Latest beam scans of bands 3 and 6 using the NSI scanner after alignment

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Prepared By:		
Name(s) and Signature(s)	**Organization**	**Date**
G.A.Ediss	NRAO	2007-11-05
Approved By:		
Name and Signature	**Organization**	**Date**
Released By:		
Name and Signature	**Organization**	**Date**

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Change Record

Version	Date	Affected Section(s)	Change Request #	Reason/Initiation/Remarks
A	2007-11-05	ALL	Draft A	Initial version

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1.0 Introduction

This document reports on the latest measurements of band 3 and 6 beam pointing following the alignment of the NSI scanner to the FESS/cryostat, and tightening of the loose mounting screws [RD1].

1.1 Reference Documents

The following documents contain additional information and are referenced in this document. The latest version should be used.

Reference	*Document Title*	*Date*	*Document ID*
[RD1]	Alignment of NSI scanner to FESS/cryostat	2007-11-02	FEND-40.09.07.00-071-A-REP
[RD2]	Front end sub-system for the 12 m antenna array technical specifications		ALMA-40.00.00.00-001-A16-SPE

2.0 Measurements

After the FARO optical interferometer was used to align the NSI beam scanner to the FESS/cryostat system, and all the NSI scanner screws which were found to be loose were tightened, beam scans of bands 3 and 6 were made. Figure 1 and figure 2 show the beam center of the band 3 receiver, with the warm optics installed and aligned, measured for tilt table angles of zero and 90 degrees. Figure 3 and figure 4 give the beam center for the band 6 receiver.

As can be seen there is very good reproducibility of the beam pointing angle, even after changing the elevation tilt angle. There is a slight movement in absolute pointing with tilt angle but there are no longer any changes of beam pointing with time.

The band 3 measurements had a low signal to noise (SNR) ratio of 30 dB due to the unlocked YIG oscillator frequency changes, whereas the band 6 measurements had a SNR of 80 dB. This was attained by replacing the YIG oscillator with a synthesizer. The band 3 measurements will be repeated using the same system. This may explain the very slight, long term drift in the elevation beam pointing seen in figures 1 and 2.

These measurements were made with the 45 degree tilt angle planarity corrections measured before the NSI scanner was aligned. Presently new planarity data is being taken to check if there were any changes due to the alignment procedure for the x and y axes.

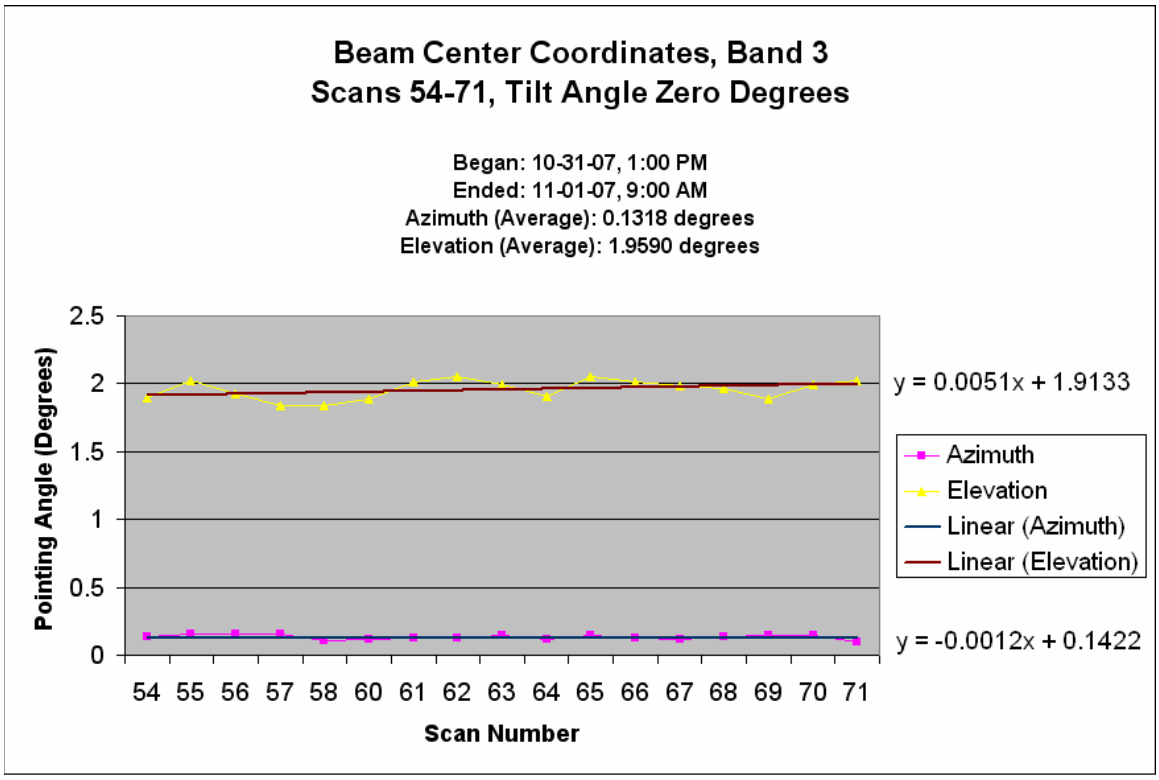
Table 1 gives the measured and required beam pointing angles in degrees for the two bands.

Table 1 required and measured beam pointing angles in degrees				
Tilt 0 degrees	Band 3		Band 6	
	Required	Measured	Required	Measured
Elevation	+1.81	+1.96	-1.69	-1.41
Azimuth	+0.32	+0.13	+1.69	+1.86
Tilt 90 degrees	Band 3		Band 6	
	Required	Measured	Required	Measured
Elevation	+1.81	+1.96	-1.69	-1.35
Azimuth	+0.32	+0.12	+1.69	+1.91

Note that the difference in the measured to required angles is less than the 6 milli radians permitted, and the change with tilt angle is also within the allowance given in the front end specifications [RD2].

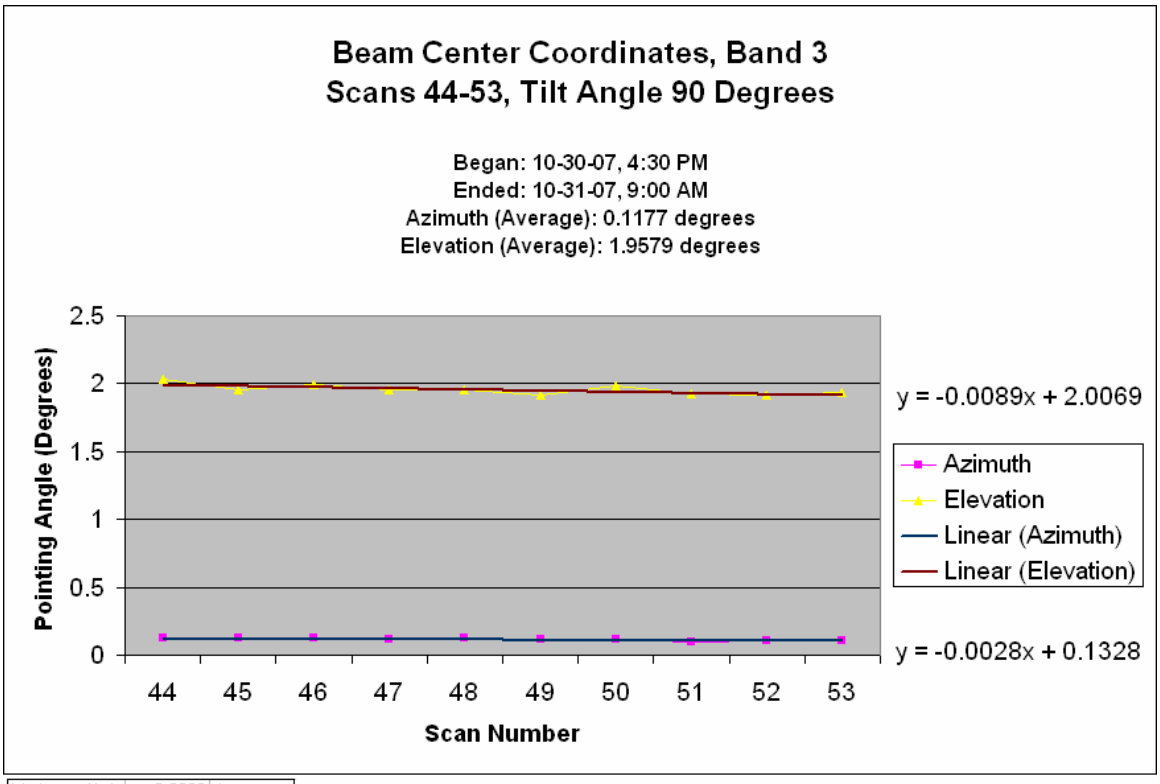
3.0 Conclusions

The beam pointing repeatability changes reported previously were caused by the test system and not by any movement of the cartridges internal to the cryostat.



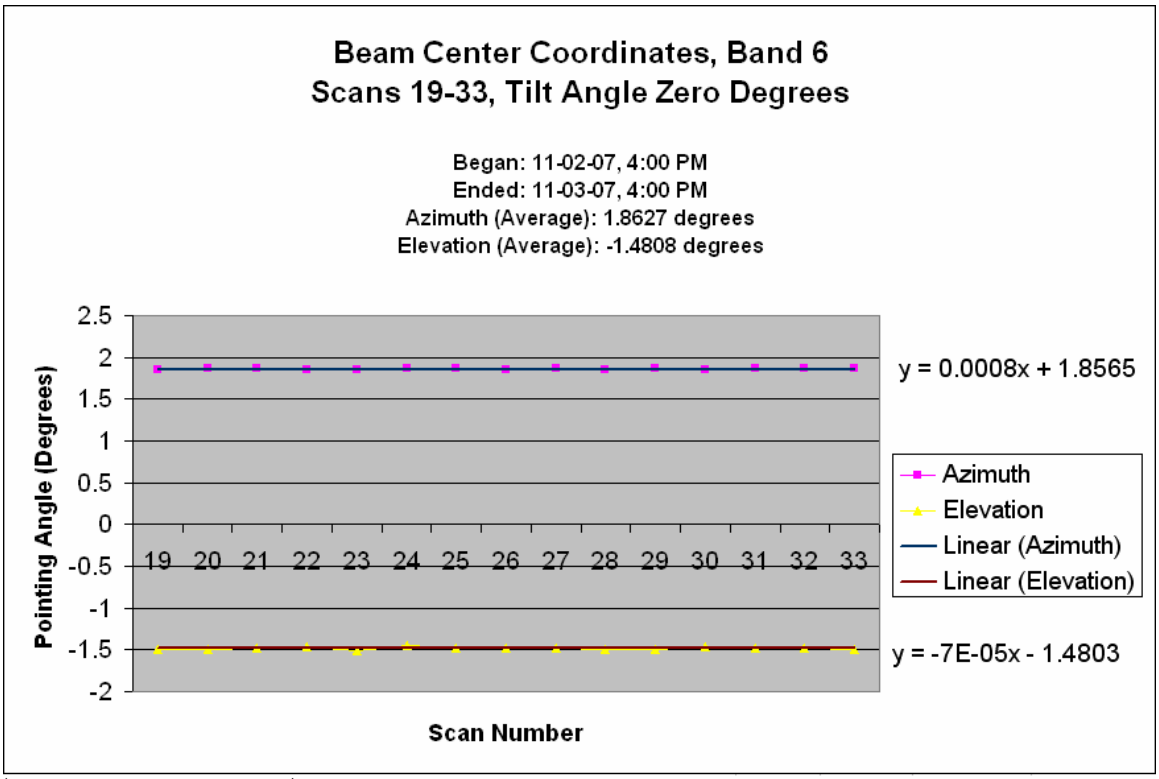
Variance (Az):	0.0590	deg
Variance (El):	0.2182	deg
Std Dev (EL):	0.0718	deg

Figure 1 Band 3 beam pointing angles (azimuth and elevation) tilt angle 0 degrees.



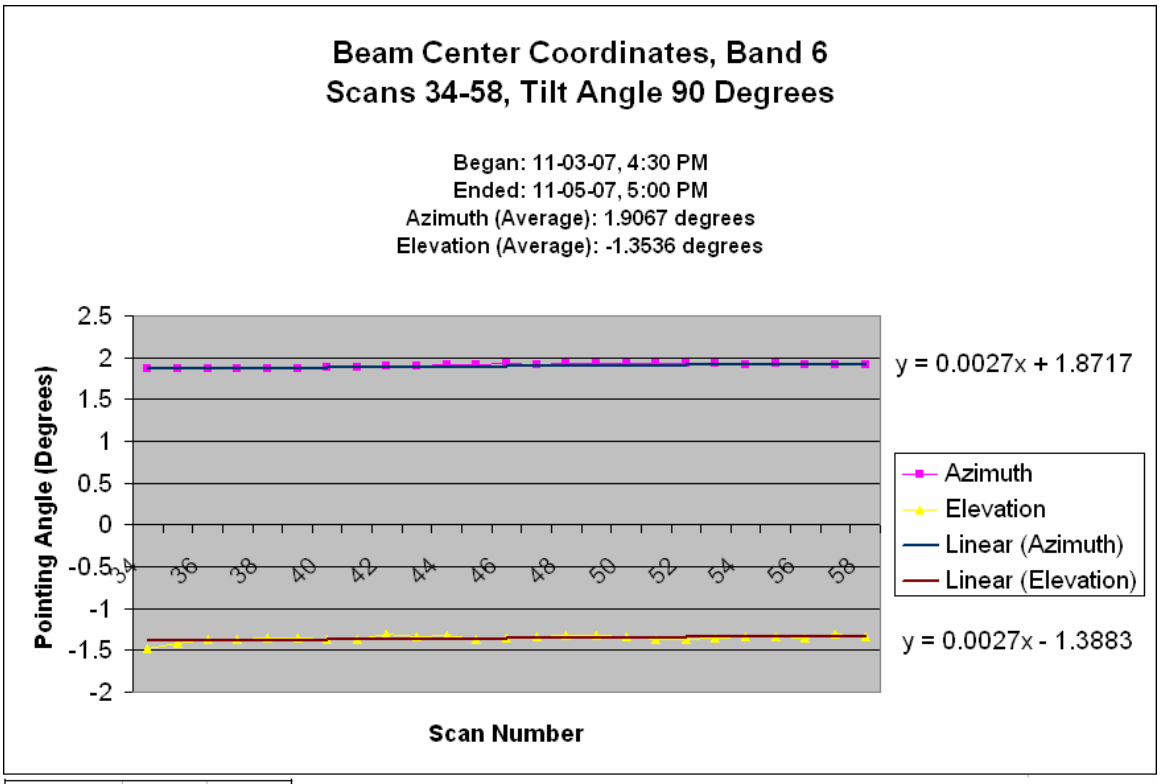
Variance (Az):	0.0332	deg
Variance (El):	0.1189	deg
Std Dev (EL):	0.0376	deg

Figure 2 Band 3 beam pointing angles (azimuth and elevation) tilt angle 90 degrees.



Variance (Az):	0.0199	deg
Variance (El):	0.0769	deg
Std Dev (EL):	0.0169	deg

Figure 3 Band 6 beam pointing angles (azimuth and elevation) Tilt angle zero.



Variance (Az):	0.0733	deg
Variance (El):	0.1723	deg
Std Dev (EL):	0.0346	deg

Figure 4 Band 6 beam pointing angles (azimuth and elevation) Tilt angle 90 degrees.