

VLBI2010 Proof-of-Concept Demonstration

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Broadband Delay Team

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Proof of Concept Demonstration

- Westford (Massachusetts):
 - 18m prime focus antenna
 - S/X receiver must be removed to install Dewar
- MV-3 (near Washington D.C.)
 - 5m Cassegrain antenna
 - Subreflector not matched to primary surface
- Signal chains are identical at both antennas
- All operations have been conducted from Haystack (except MV-3 antenna pointing)



Proof of Concept System

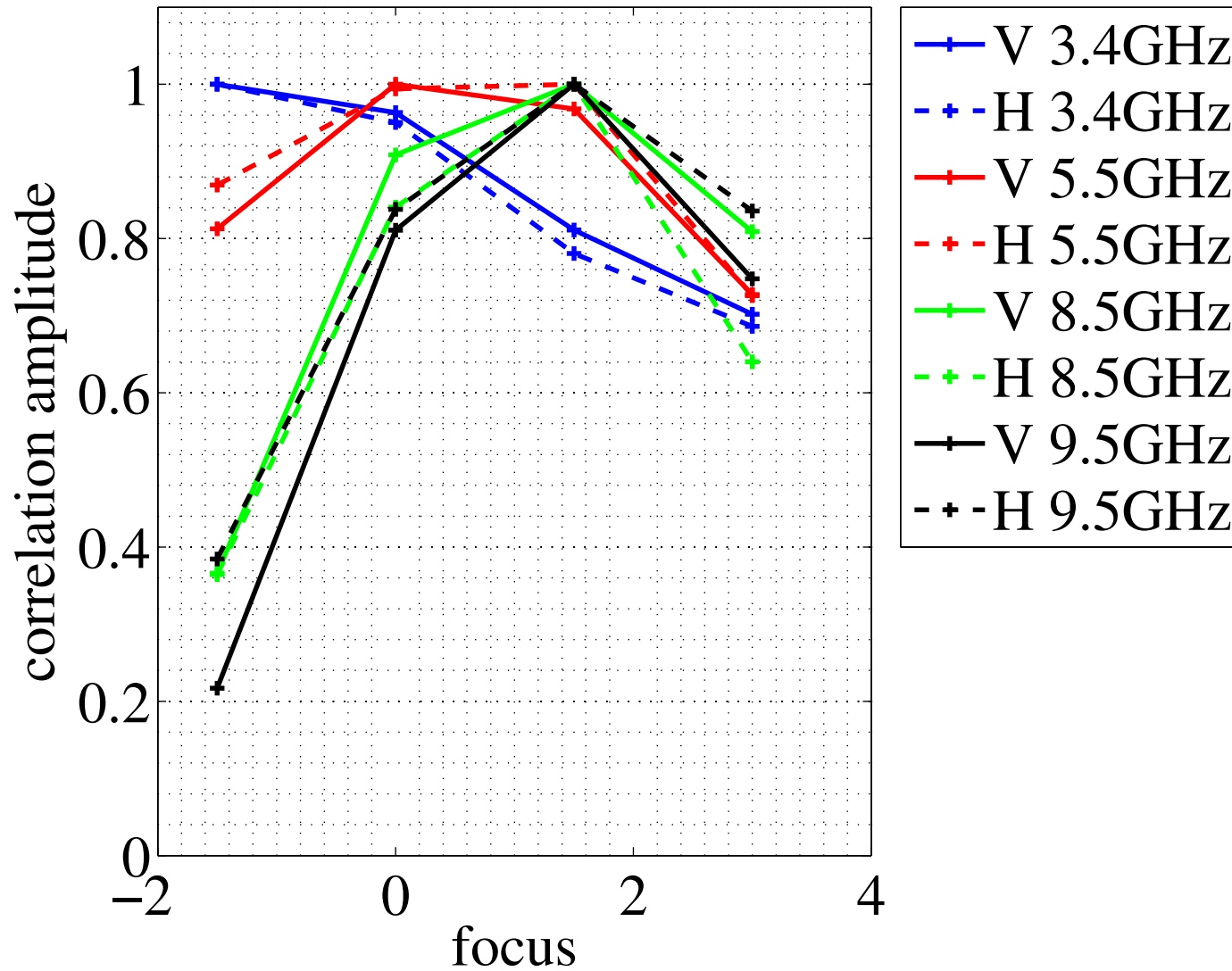
- Problems/challenges encountered
 - RFI from TV at 500 MHz saturated LNAs
 - High-pass filter: > 3.1 GHz (cooled)
 - Protection diodes on LNA leads
 - Controlling four signal chains at two sites
 - Scripts developed for setting frequencies, levels
 - Phase cal processing in correlator
 - 5 MHz spacing and 32 MHz channel bandwidth
 - “Only software”; fixed



Recent Results

- Westford focus setting measurement
- Test sessions
 - Six hours with four bands identical frequencies
 - Five hours with bands contiguous -
 - Five hours on 4C39.25 polarization test

Westford focus measurement





Polarization session

- Frequency coverage
 - 512 MHz bands
 - 3.5 GHz, 5.5 GHz, 7.5 GHz, and 8.0 GHz
- Source 4C39.25
 - Passes south of Westford and north of MV-3
 - Differential parallactic angle: $+6^\circ$ to $+279^\circ$
- Signal chains identical at both antennas
- All operations conducted from Haystack (except MV-3 antenna pointing)



Results

- Expected SNR ~250

- BW = 256 MHz

- Integration time = 570s

- Correlated flux density = 10Jy

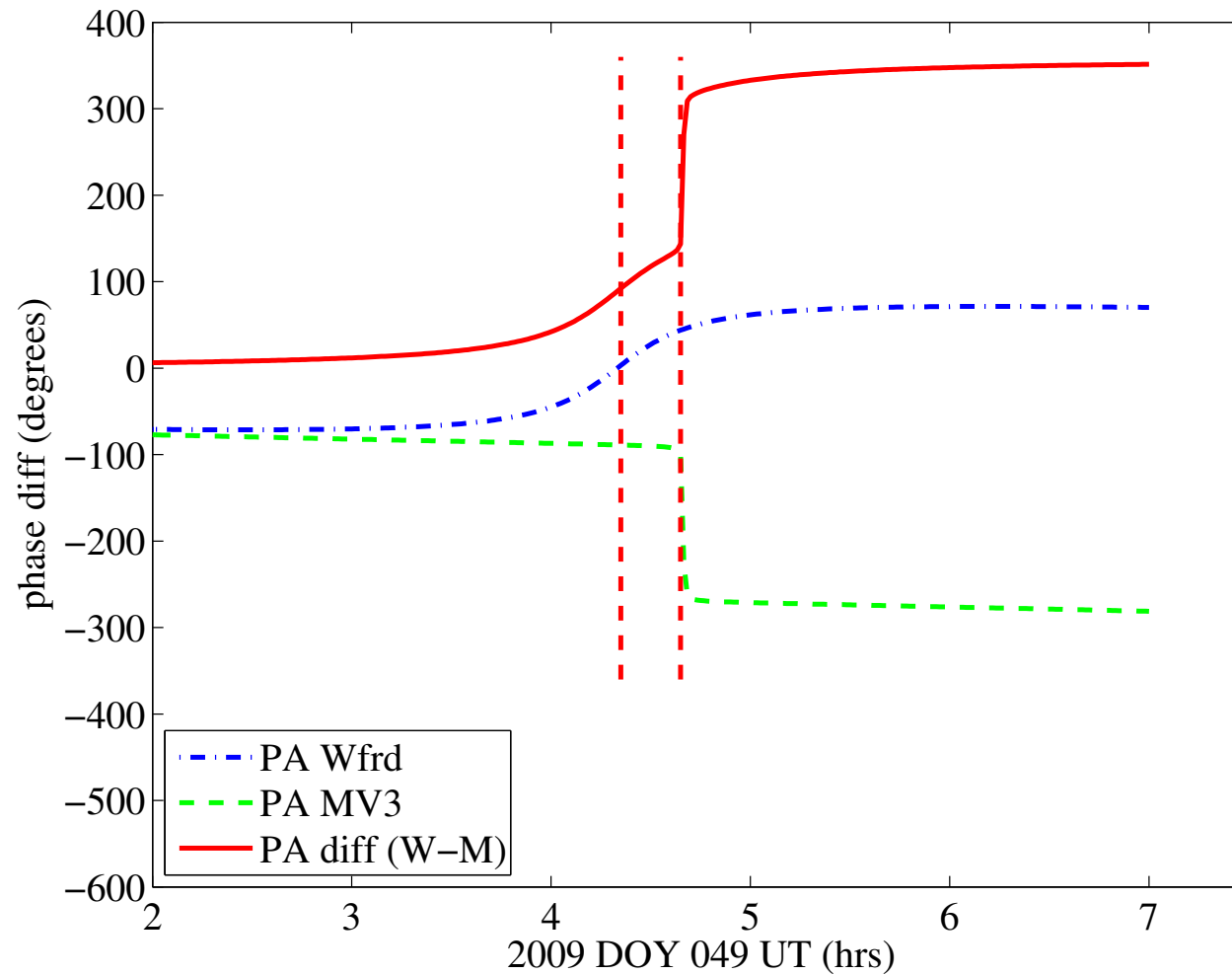
- SEFDs = 3000Jy/100,000JY

- Observed SNR (max)

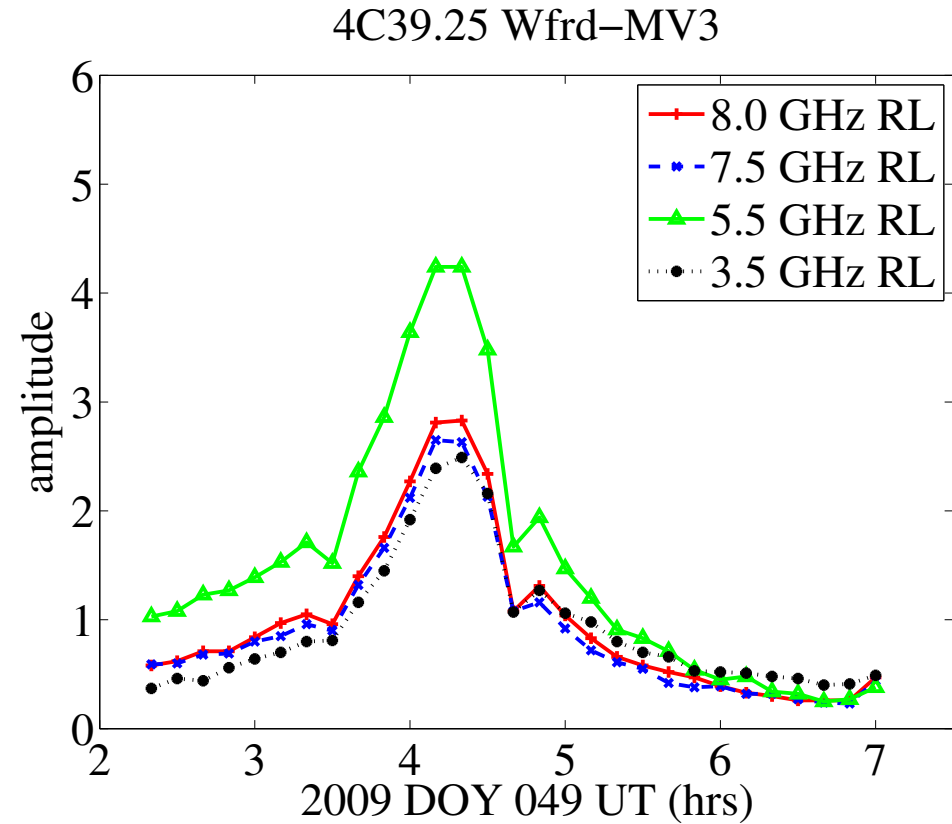
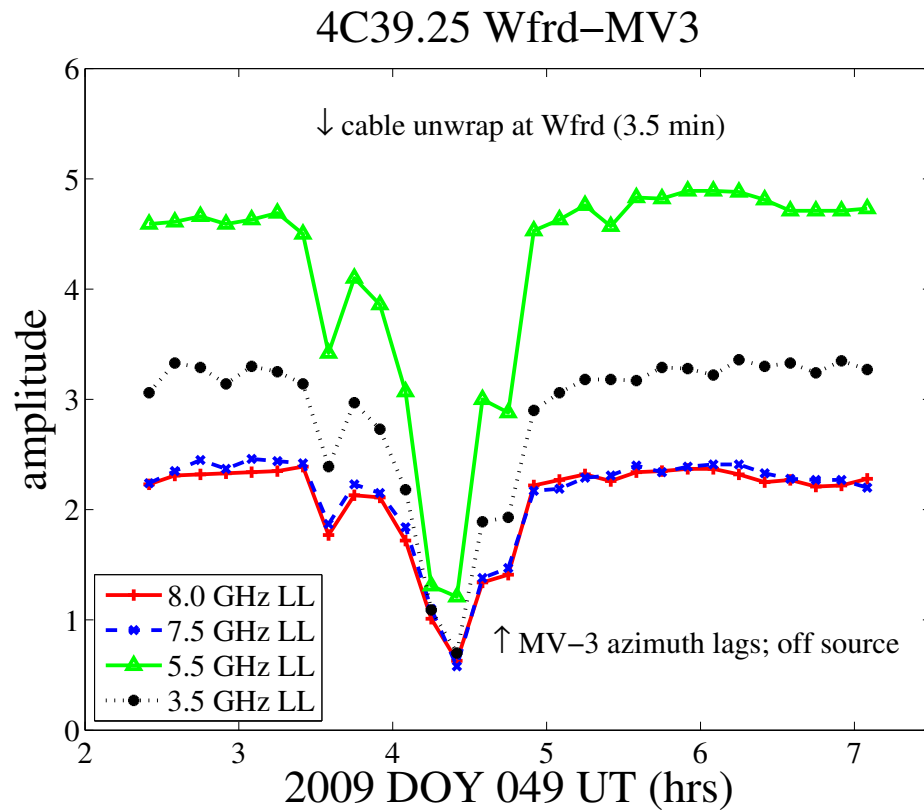
2009-040 freq (GHz)	3.5	5.5	7.5	8.0
	140	200	120	120

Parallactic Angle Differences

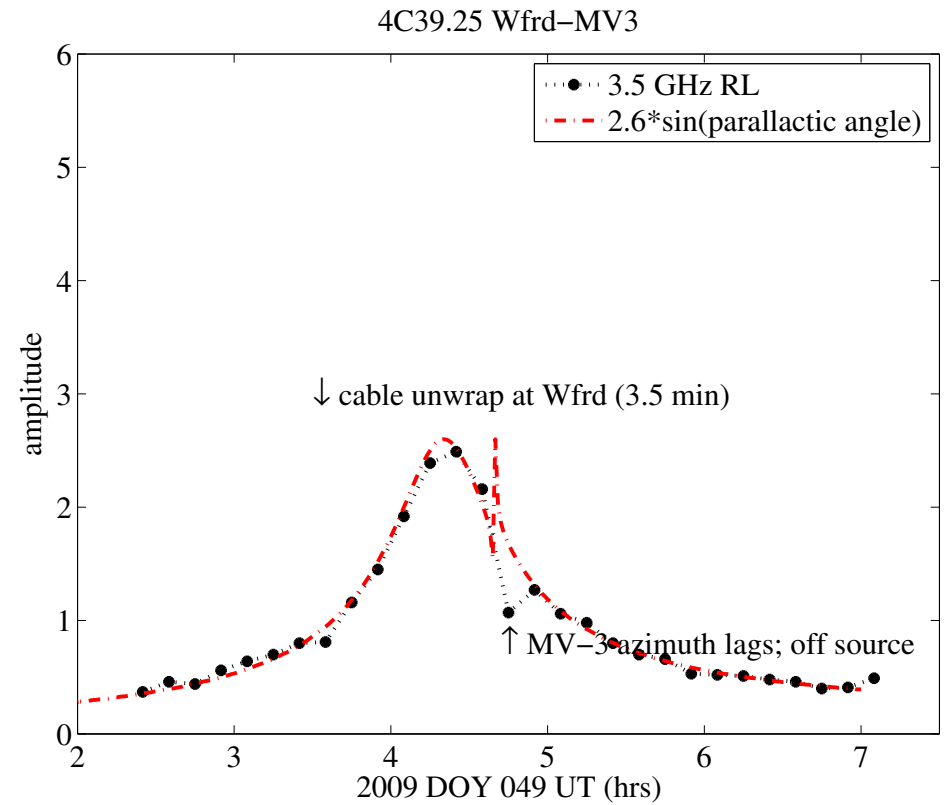
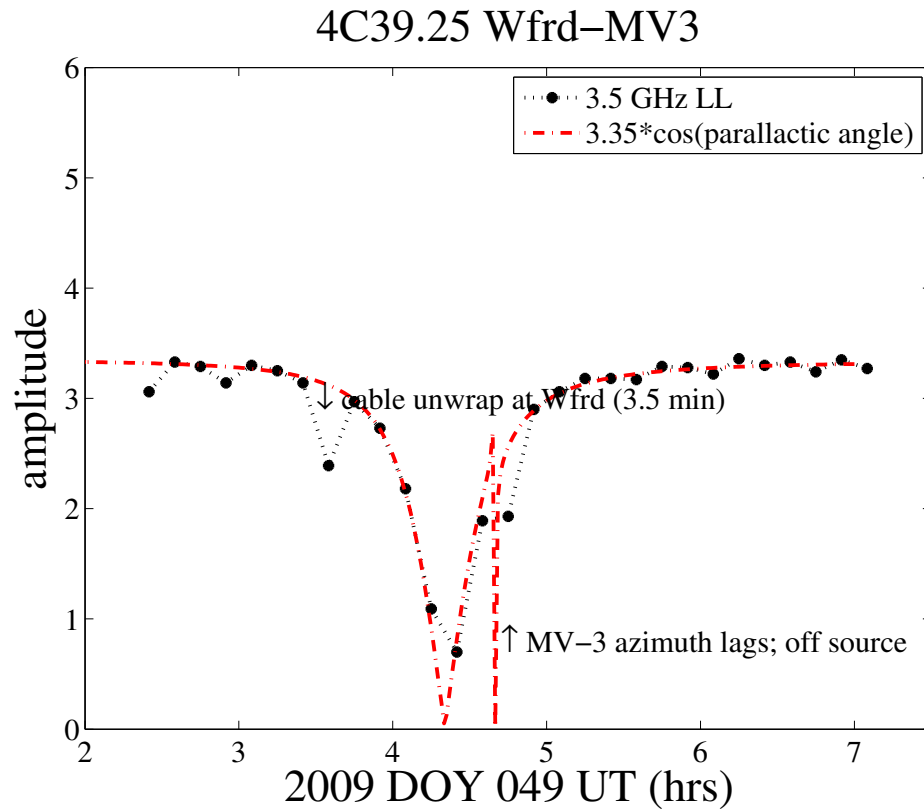
4C39.25 Wfrd-MV3



Polarization test



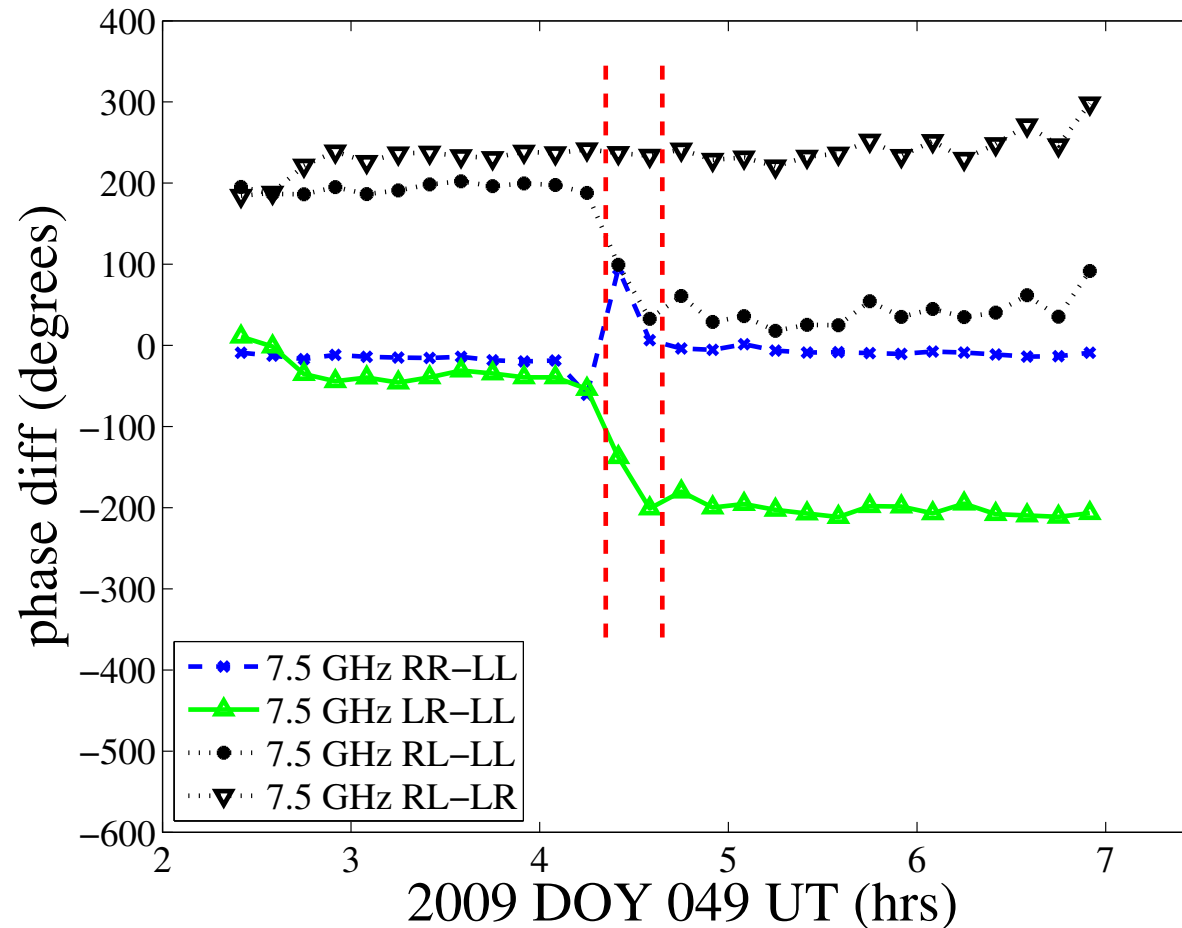
Polarization test



Polarization Phase Differences

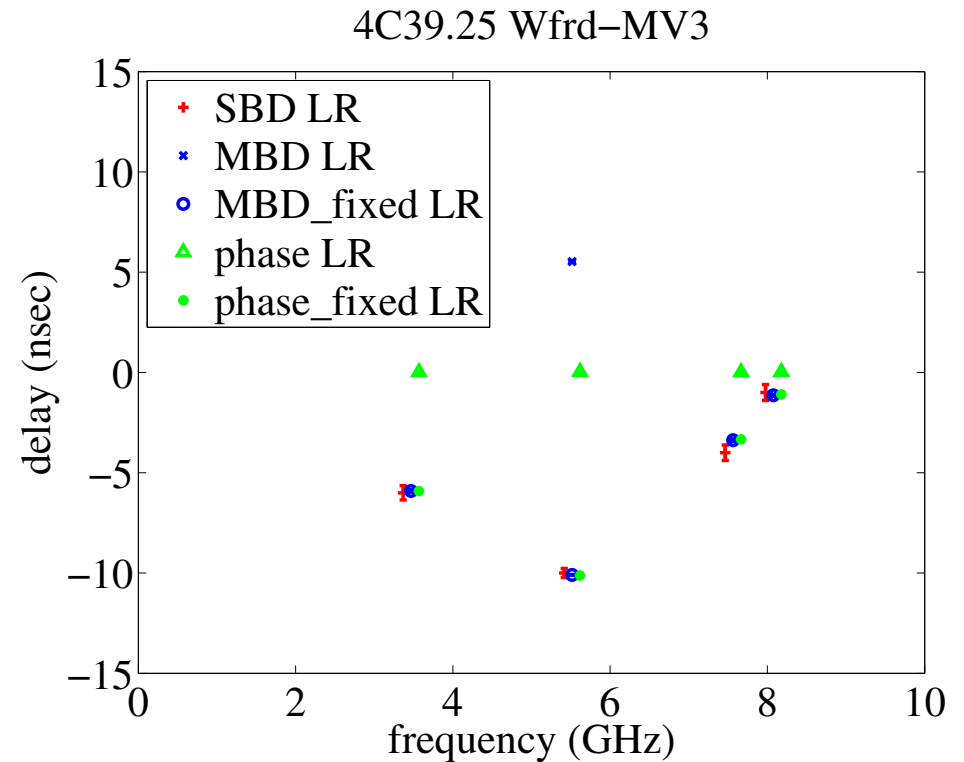
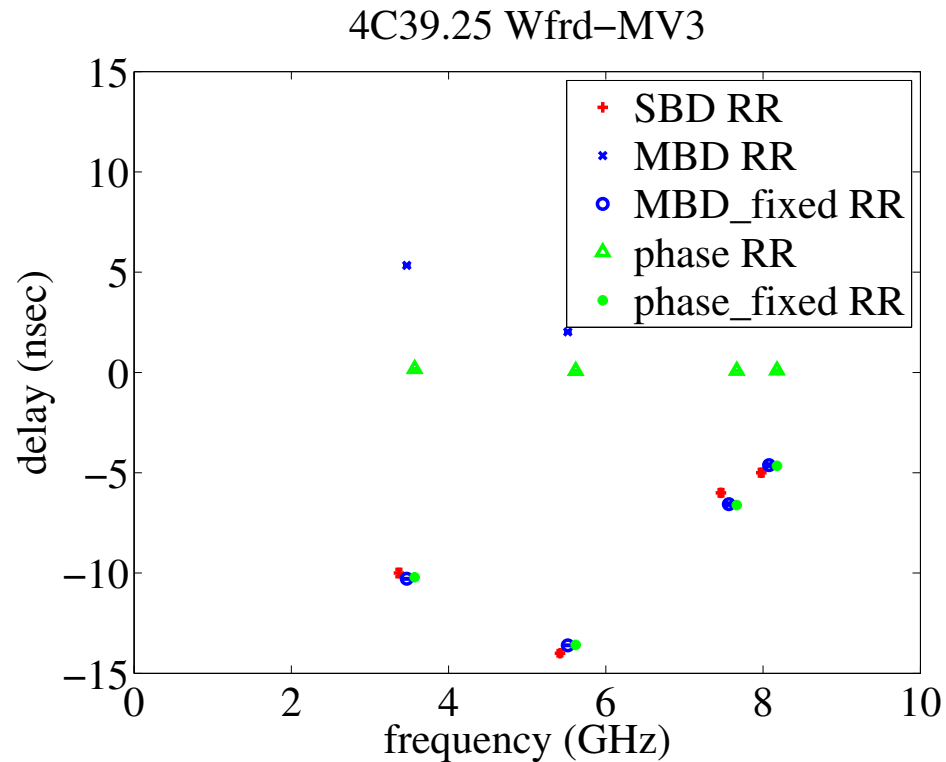
(no phase cal applied)

4C39.25 Wfrd-MV3



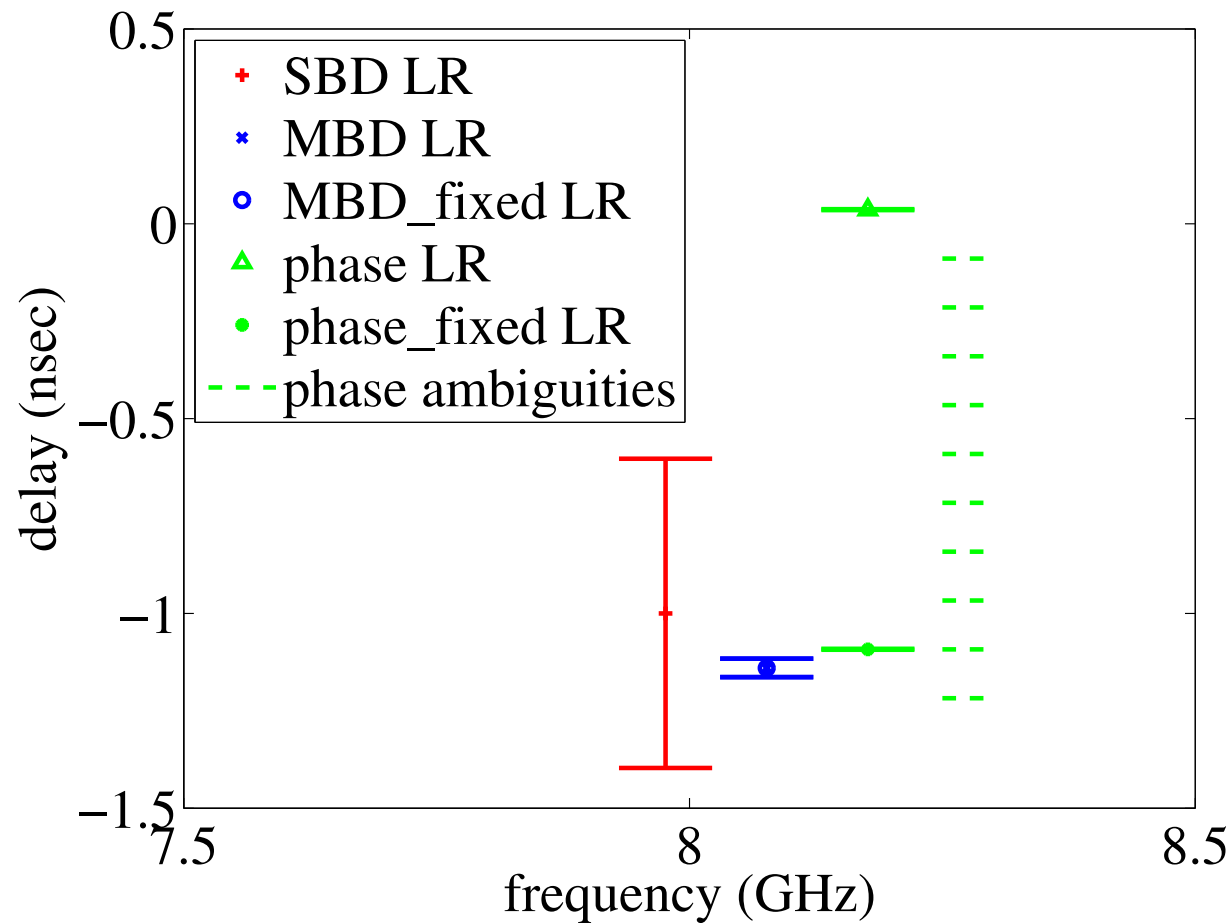
Phase diff plot; table of RMS phase diff RR-LL etc

Polarization test (no phase cal applied)



Polarization test (no phase cal applied)

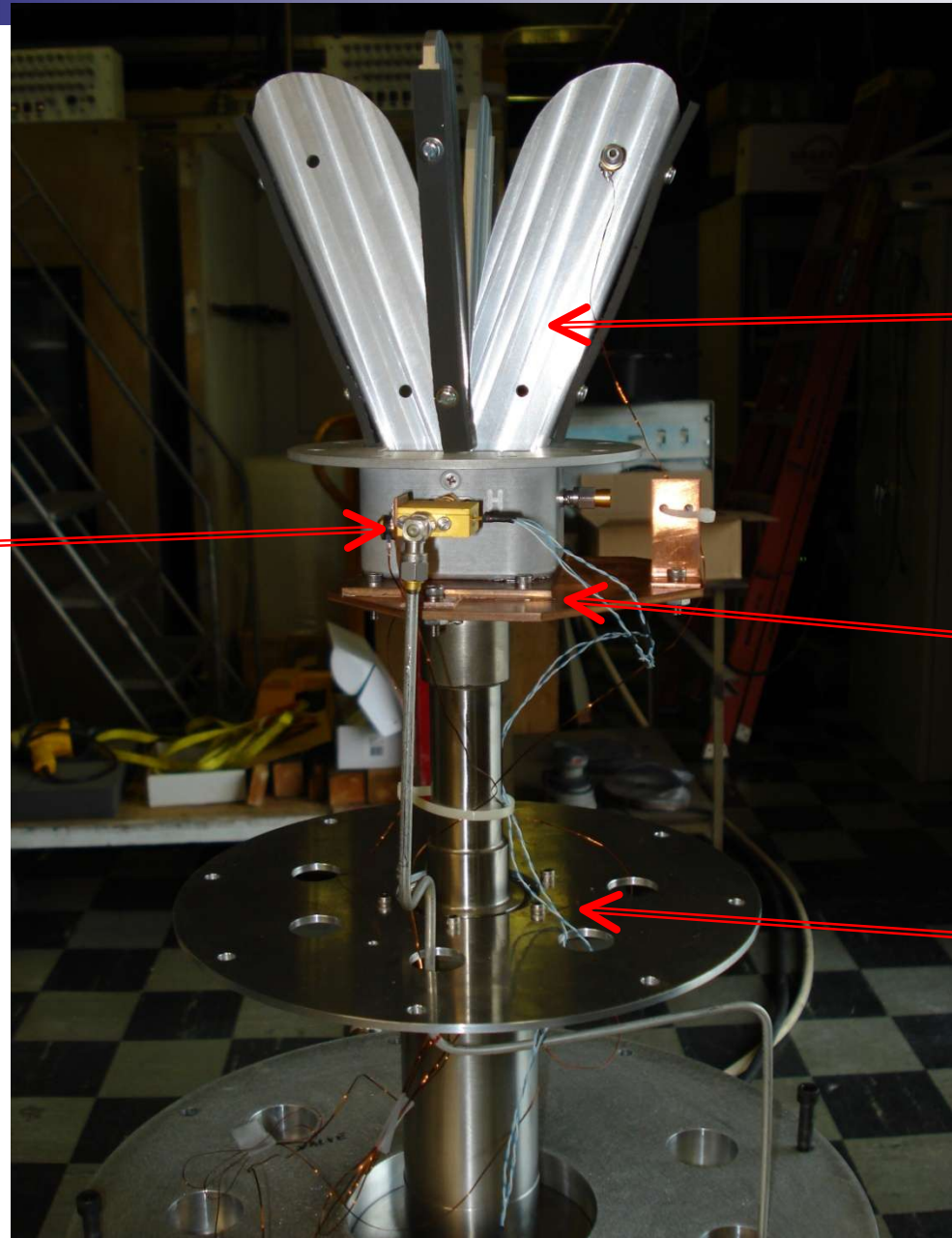
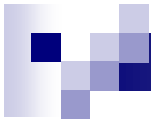
4C39.25 Wfrd-MV3





Proof of Concept System Status

	<u>Current</u>	<u>Next</u>
■ Feed	Lindgren	Eleven?
■ RF filter	>3.1 GHz	≥ 2.2 GHz
■ Phase cal	S/X pcal	“digital” pcal
■ DBE	DBE1(iBOB)	DBE2(ROACH)
■ Recorder	Mk5B+	Mk5C
■ Correlator	Mk4 (hardware)	Software (DiFX)



LNA

Lindgren feed
(linear pol'n)

Cryo
Refrigerator
20K Station

77K Station

12 m Antenna

