Status Report on NRAO RDBE: PFB & DDC
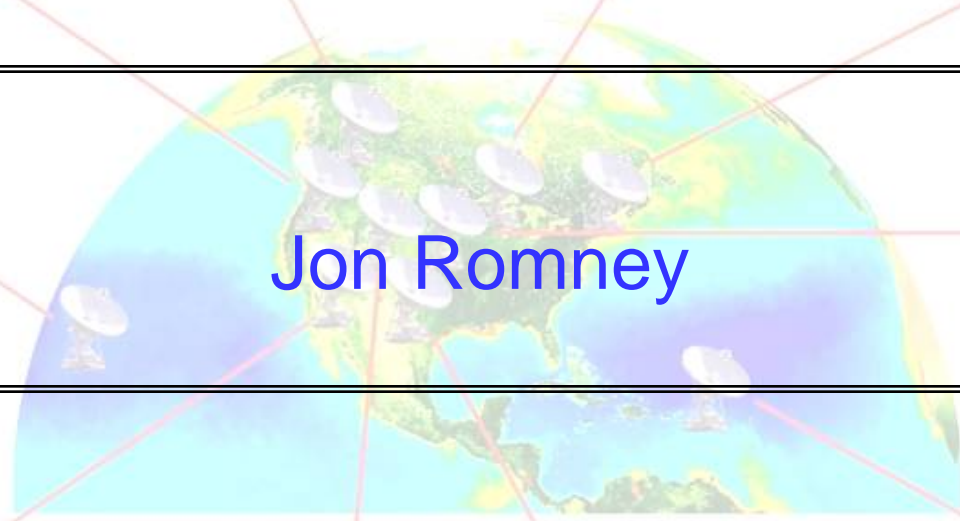
Jon Romney

EVN TOG Meeting

2013 April 10
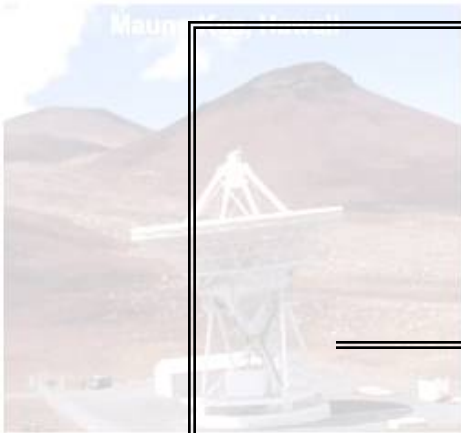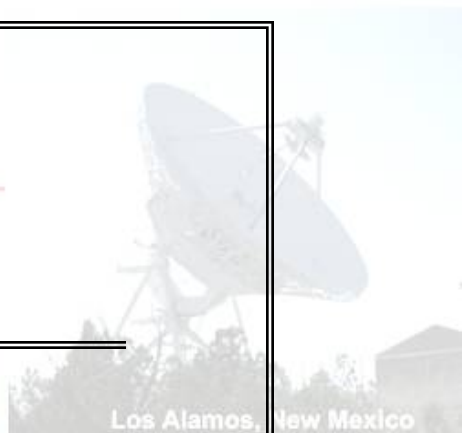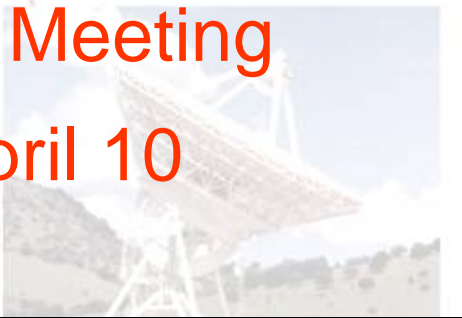
RDBE / PFB

Scientifically Operational

Current workhorse for VLBA 2-Gbps projects.

188 of 208 2-Gbps observations (845 total) in last 12 months.

Limited functionality:

Second Nyquist zone (all channels LSB).

16x 32-MHz channels; requantized at 2 bits.

Selectable between polarizations, and on 32-MHz grid along frequency axis.
Common cases: contiguous channels, 8 dual-polar pairs; 16 single-polar.

Fixed 2048-Mbps output in Mark 5B emulation format.

Currently running Haystack version 1.4, with one known minor bug:

180° phase flip in every fourth channel.

Little negative feedback from PIs.

Some known deficiencies in amplitude calibration, not yet remedied.

RDBE / DDC

In Limited Operational Use

Currently supports only 4 channels.

Individually selectable input IF (polarization) & sideband.

Bandwidths 128 / 64 / ∘∘∘ / 1 MHz (same for all 4 channels).

Tunable in 15.625-kHz quanta (testing incomplete).

250-kHz common quantum with 10-kHz on legacy systems.

Data rate proportional to bandwidth.

Output in 2-bit Mark 5B emulation format.

Ideal match to current phased-VLA capabilities (subsequent slide).

Only 128-/64-MHz BW offered (as shared risk) in 2013A CfP.

Transition from legacy schedules currently in planning.

RDBE / DDC 8-Channel System

Under Development

Second RDBE & XCube software-based network switch.

Installed at VLBA stations + GBT.

VDIF formatter replaces Mark 5B emulator.

FPGA code in hand; testing just beginning.

Dual-RDBE tests pending.

Must be Ready for Semester 2013B!

HSA Issues

Phased VLA — "Y27"

First scientific observation 2013/2/2, beginning of semester 2013A.
Some successes, many problems.
EVLA's Widar correlator supports functions equivalent to VLBA's RDBE.
Data recorded on Mark 5C, in VDIF format.
4 channels, as 2 dual-polar pairs.
Y27 phasing and observing must use same bandwidth.

VLBA+Y27 observations use matching DDC configurations on VLBA.
All DDC bandwidths available, but < 16 MHz only as shared risk.

Correlation (from 2013B CfP):
"HSA proposals can request the phased VLA in conjunction with the VLBA and other HSA telescopes, and must be correlated at the DiFX correlator in Socorro."

Green Bank Telescope

GBT has same equipment used at VLBA stations.
Can observe compatibly with any VLBA mode (Legacy / PFB / DDC).
Also encountered many problems in early 2013A observations.

HSA / Global Issues

Effelsberg & Arecibo...

… have acquired VLBA RDBE units and Mark 5C recorders.

… have [had] to adapt station control systems to operate new instrumentation.

VLBA uses extended version of EVLA control system; generally not suitable for other stations.

Bonn colleagues have worked to adapt Field System (?); fairly successful in HSA PFB runs, but not in DDC observations beginning in Feb 2013.

Arecibo had initial success with manual operation in early RDBE-PFB/Mark5C commissioning; no recent information.

Full solution probably still has to await Field System support.

Global Network

Compatible operation of RDBE and DBBC demonstrated at VLBI Technology Workshop at Haystack last October.

Matching channels and bandwidths somewhat challenging.

Recent tests and discussions indicate "hybrid mode" with mixed configurations is possible (up to 1 Gbps), and can be correlated at JIVE.

Thank you