KU INSTRUMENTATION DESIGN LABORATORY
The University of Kansas

Array Calibration Unit Status

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[Old Slide, no name]

Timescale & Goals

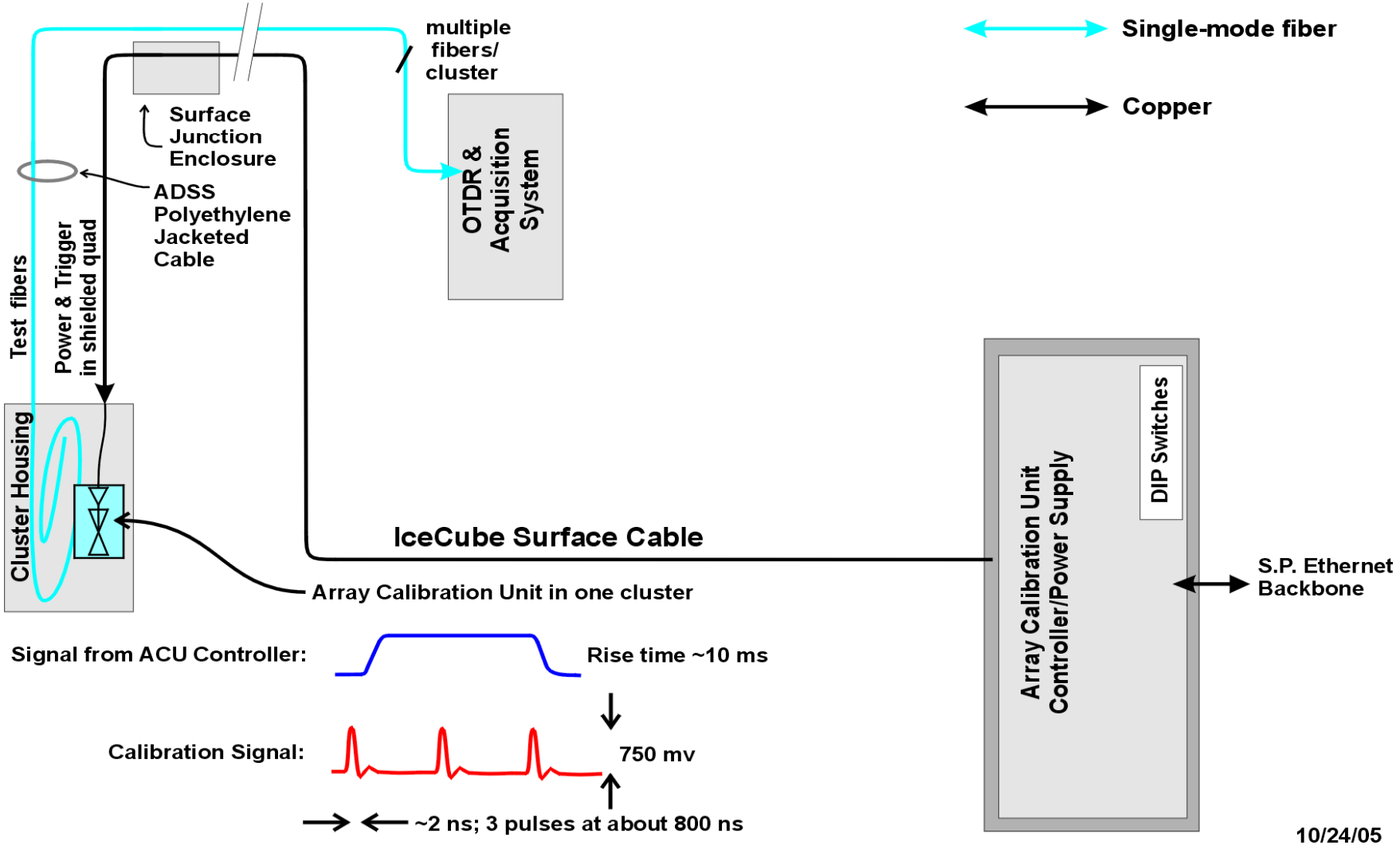
05-06: 1. Demonstrate survivability of OF, 2. check timing resolution of Rx, 3. establish procedures for wet-hole deployment, 4. 1st steps in slow control software

06-07: Implementation of full system, incl. L0/L1/L2 trigger hardware in 3 full Rx “clusters”

07-10: Buy as many modules as we can afford, populate as many IceCube holes as possible. Substantial improvement in ice/environmental characterization (if not effective volume)

>2010: Full X-RICE

RICE-II 2005-2006
Wet-Hole Plan



10/24/05

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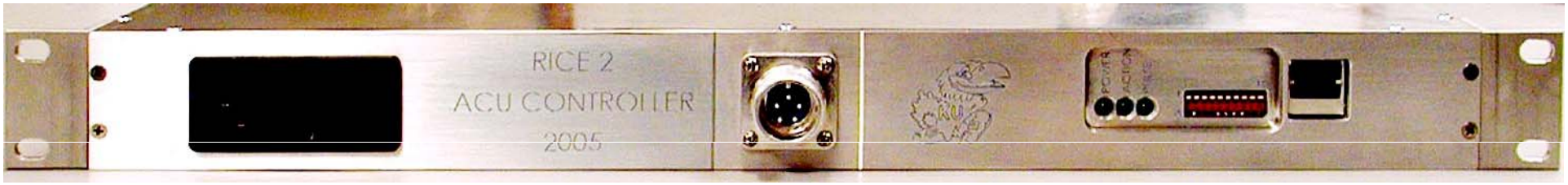
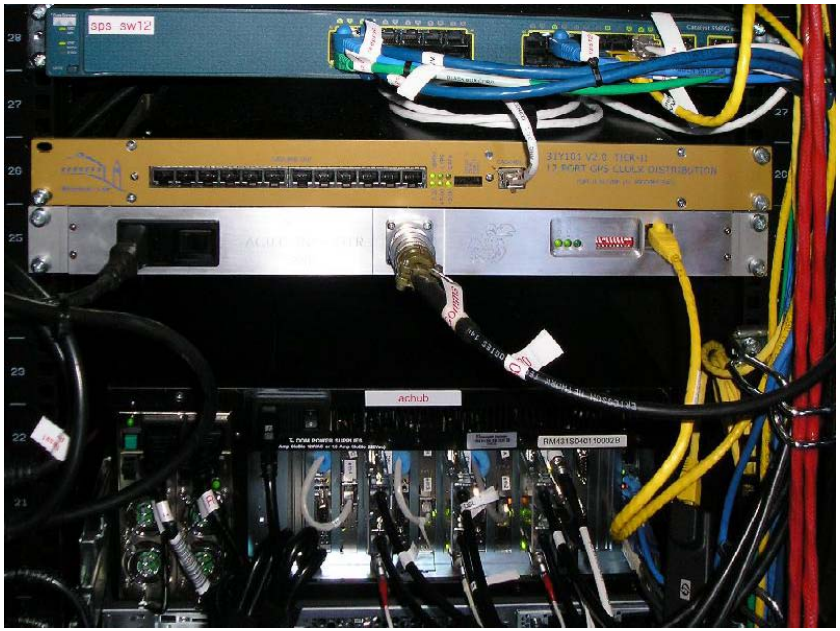
2005-6 ACU Controller



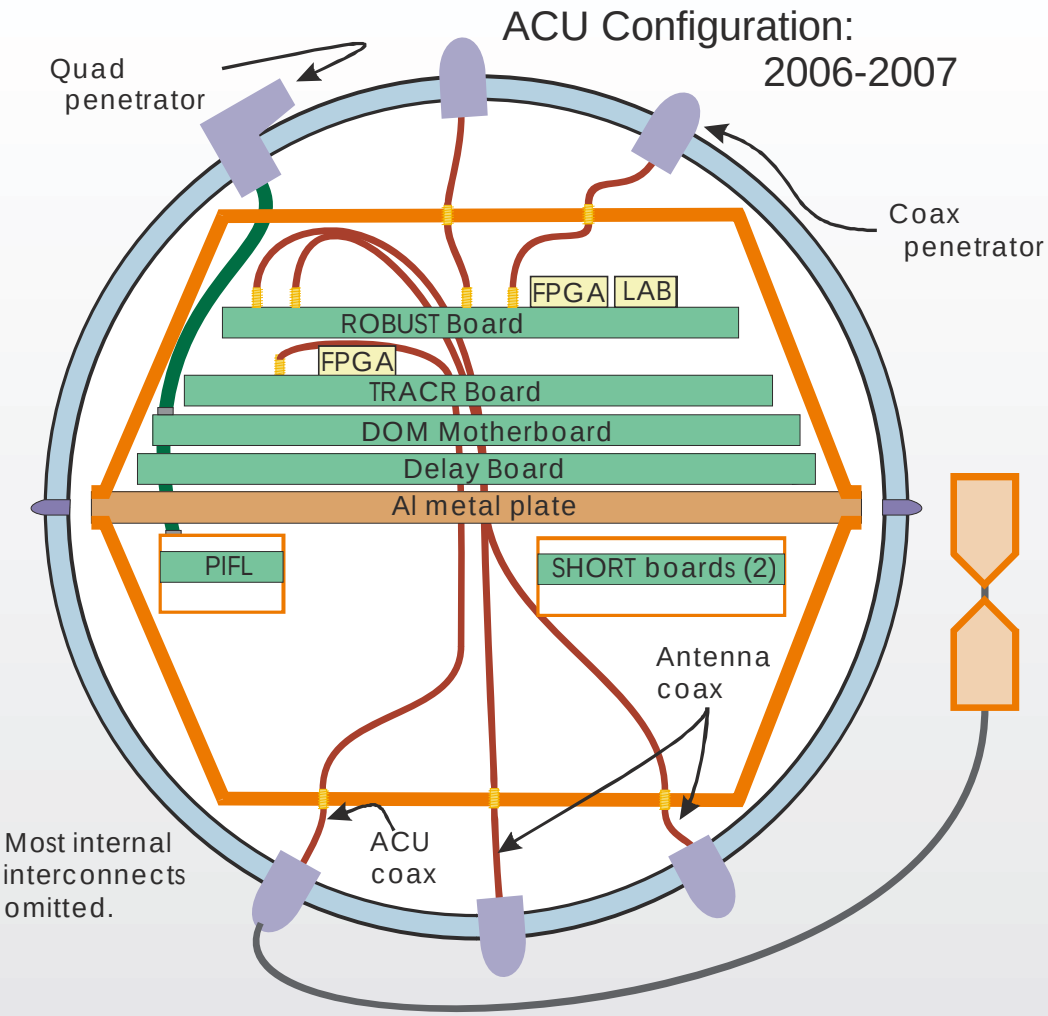


In ICL, 1/2007

Hoped to detect the triplet; now know it was much too weak.

Removed from rack last season.

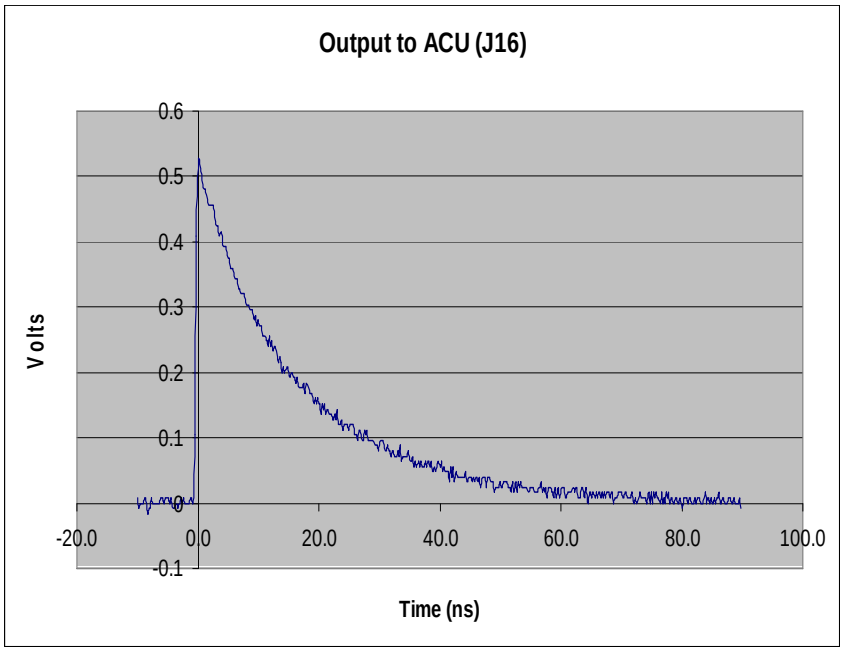
2006-2007:
ACU direct drive from DRM



LVPECL driver:

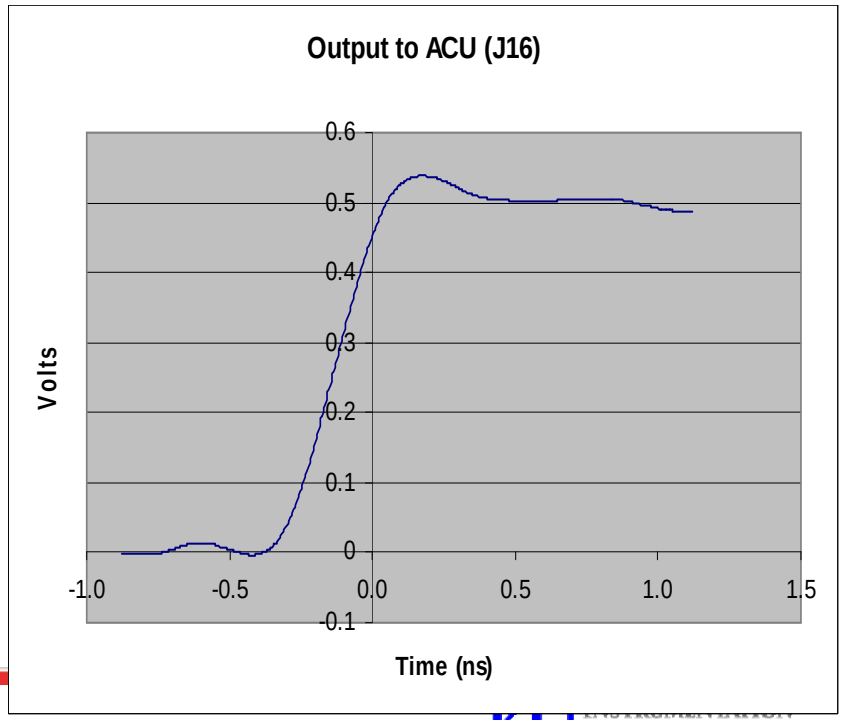
Fast edge but small pulse (about 0.5V)

Waveform at TRACR Output



Rep. rate: typically 40MHz with 50% duty cycle. The rep rate allowed high probability of untriggered capture.

Observed in local cluster



2007- Plan

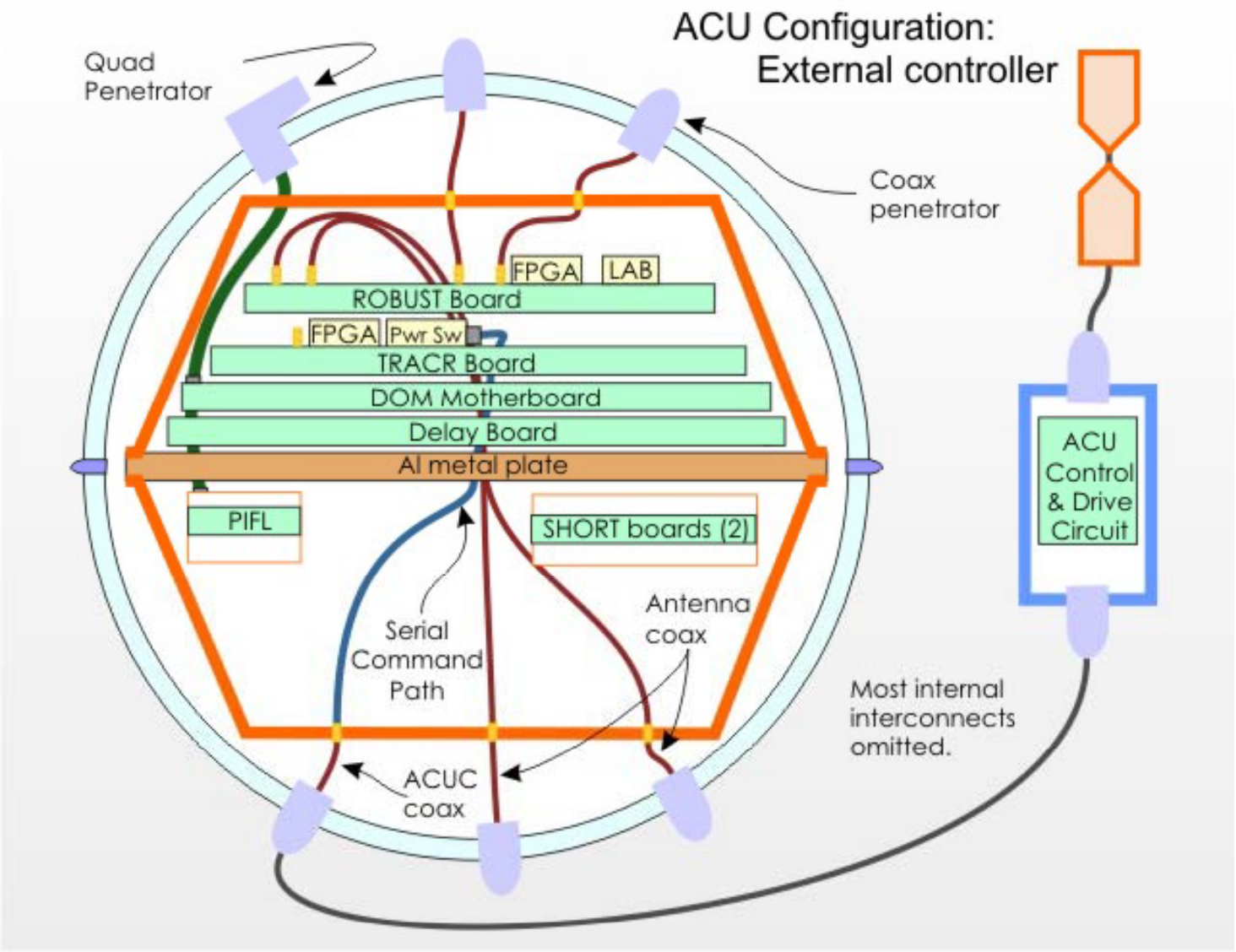
Wish-List Goals based on what we thought we might deliver that might be useful:

- Pulses
  - frequency content to a GHz to trigger all 4 bands.
  - Rep Rate MHz or more (for untriggered capture)
  - Pulse amplitude about 5V (originally); later, a higher amplitude requested.
- CW (sine wave) output from about 300 MHz to GHz
  - For calibration.
  - For clear observation in the FT

ACU Control Location

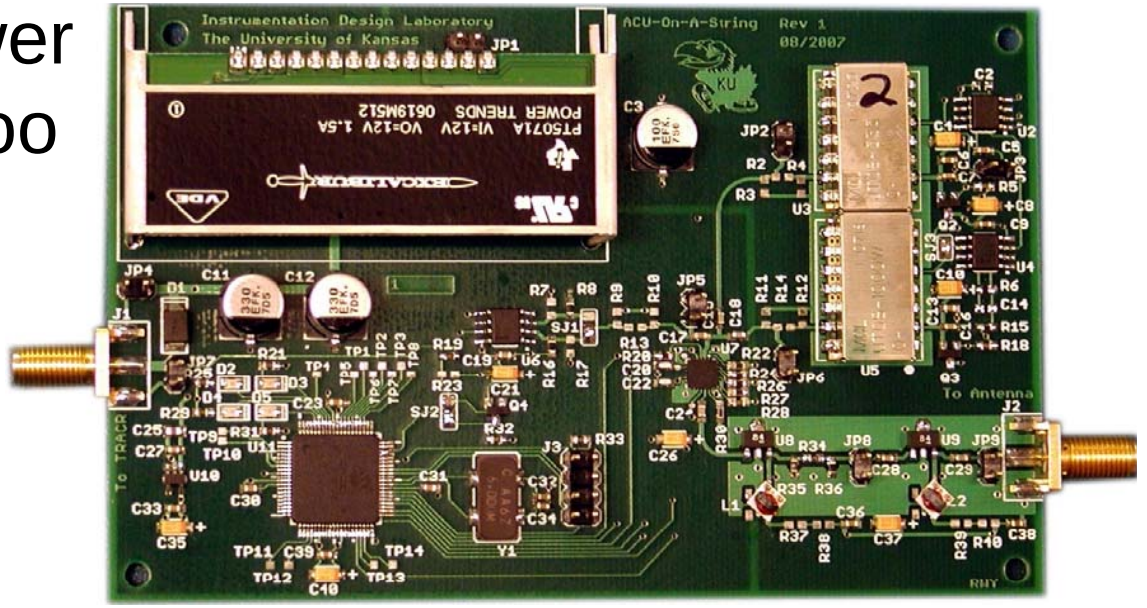
ACU comms and power must be on a single coax from the DRM.

Comms by modulating the +12V output.



Controller (in PV) with CW

- Programmable pulse frequency, but original amplitude target was found inadequate.
- CW: a pair of VCOs covered most of 200-800 MHz range.
- Higher CW power would require too large of a power amp for the DRM.

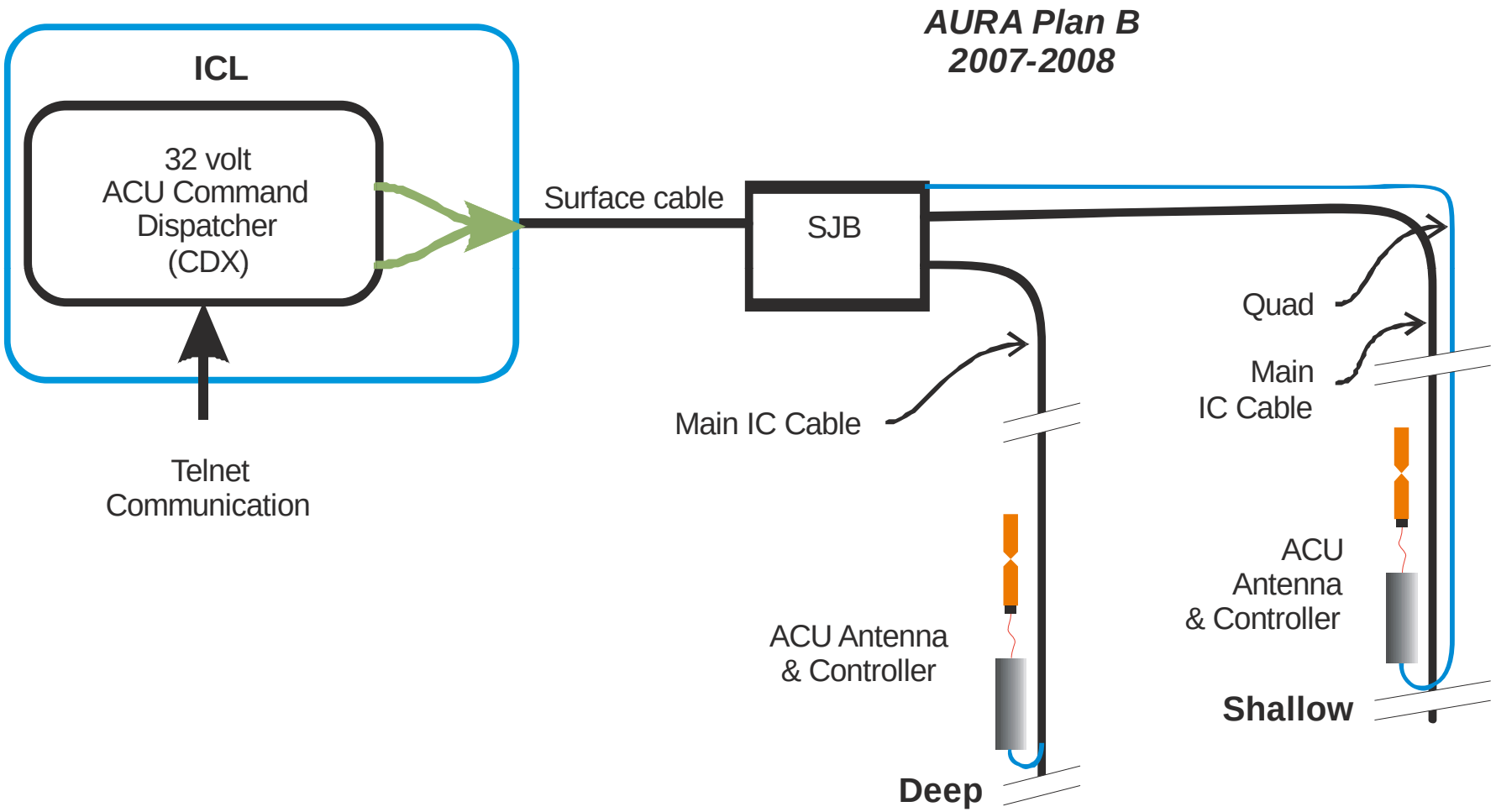


Pulser circuit

- Avtec unit
- +15V, 200 ma
- 50 ohm output
- Small enough for pressure vessel.

Cutback in number of clusters but desire to keep the number of ACUs led to:

Plan B (not implemented in 2007-08)



CDX Hardware

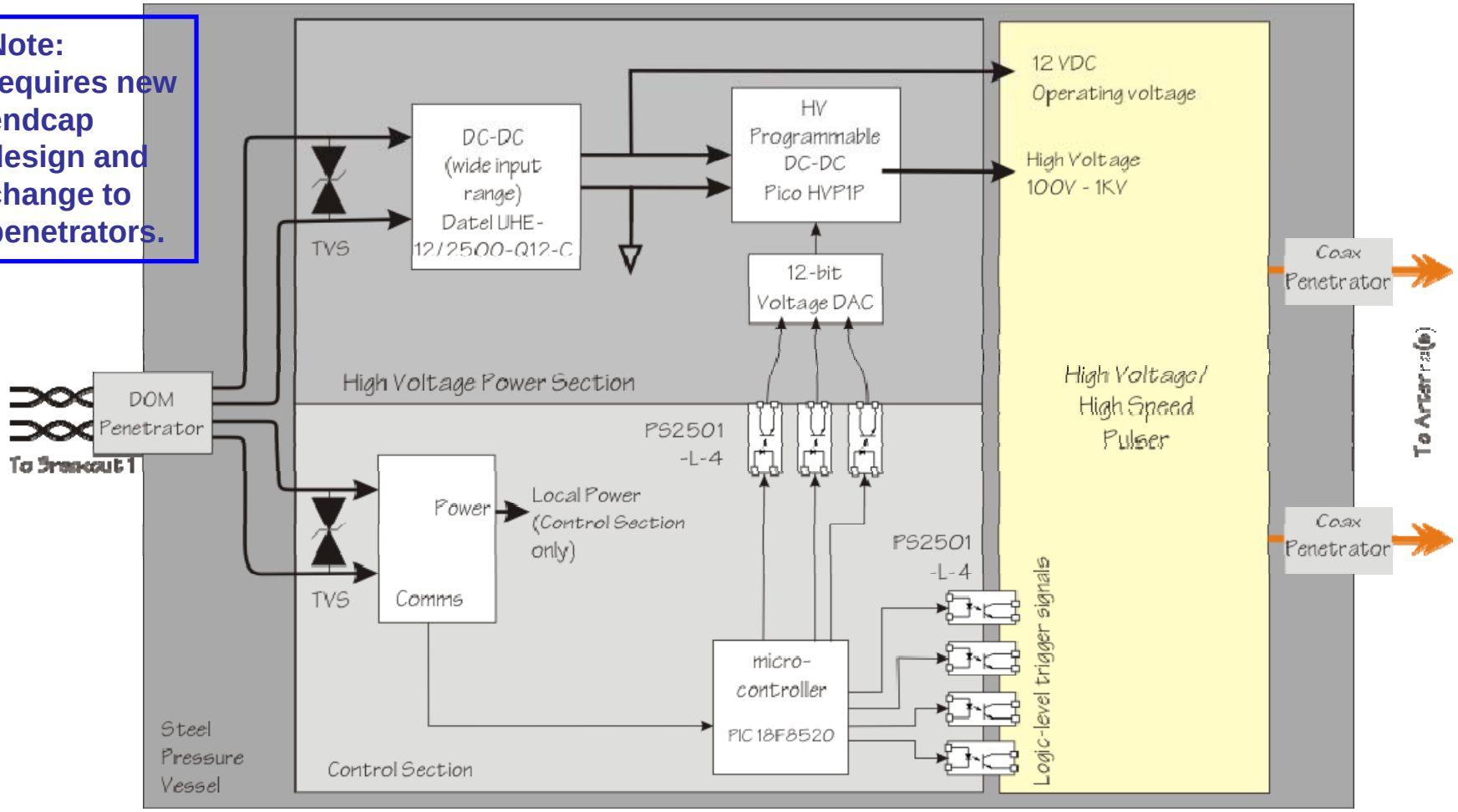
- 1U, half depth.
- Provides power and comms TO ACU. (No return comms.)
- Provides for control from the North *via* Telnet.
- Functionally ready for 2007-2008. [Deployed in 2009-2010, using 1 circuit.]

2009-2010 Goals

- Higher voltage required – goal was 1000V.
- Double antenna output added.
- Limits:
  - RG-316 with SMA has 300V limit;
  - Penetrator? Unknown.
  - Limited time for development and testing
- Consequent pulse amplitude ~ 100V

2009-’10 Device Block Diagram

Note: requires new endcap design and change to penetrators.



Controller, integration: KU; Pulser: UMd

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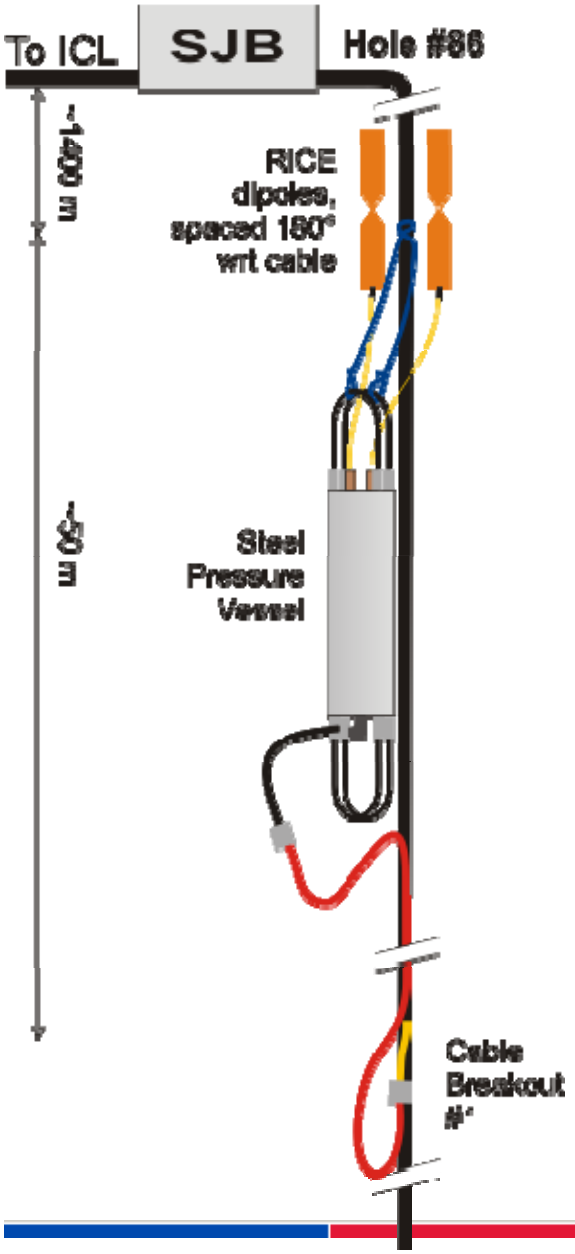


2009-2010 Deployed Configuration

The Deep ACU uses the top breakout on the IceCube cable.

The pressure vessel: same as those used with DRMs in previous AURA deployments except for the penetrator configurations.

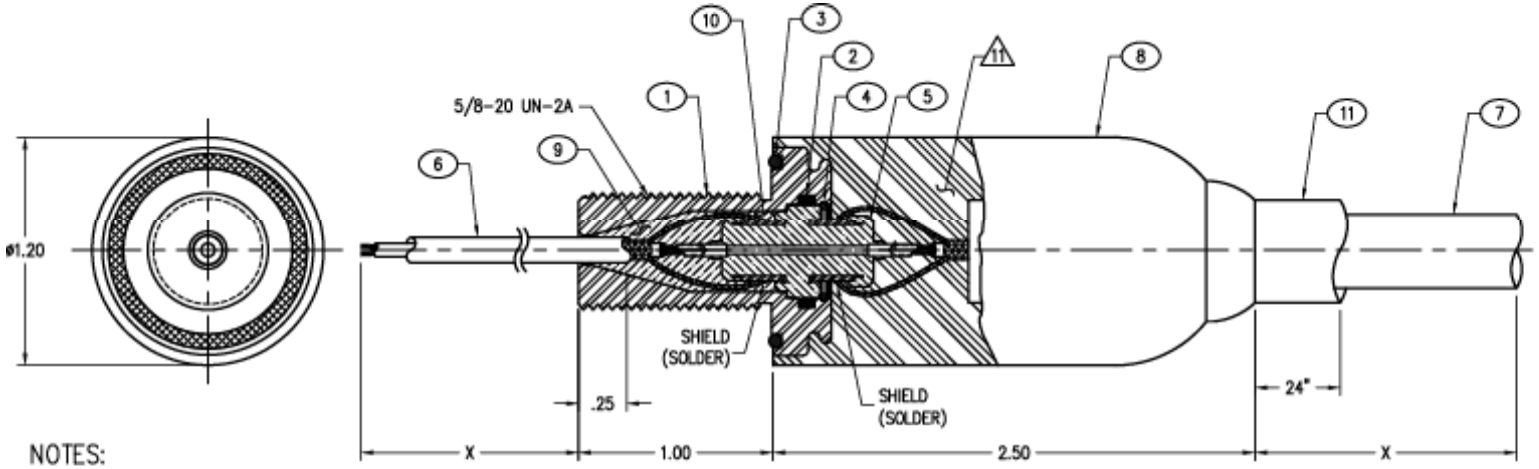
Two outputs to antennas; the antennas were taped to the cable on opposite sides using similar standoffs to those used in DRM deployments.

Field change made to place antennas at slightly different depths.

2010-2011 Plan

- Present status: **Steve**
  - Delivery of power and commands to the pressure vessel by the CDX appears reliable.
  - Control board appears reliable.
  - One antenna failed after deployment; power-draw measurements point to pulser board.
  - PV with re-designed endcaps appears adequate.
  - Deployment procedure has minimal impact.
  - Seen by deep AURA clusters (shortest distance and best angle.)
  - RG-316 (w/o connector) is spec'd at 1.6KV.
  - Penetrator HV rating unknown.

Coax Penetrator



NOTES:

1. MATERIAL: 316 SST PER MSBA-002.
2. MATERIAL: GRE PER MSBA-034.
3. MATERIAL: CA360 PER MSBA-015.
4. FINISH: GOLD PLATED PER MSBA-022.
5. MATERIAL: 302 SST PER ASTM A 484.
6. MATERIAL: NITRILE PER MSBA-028.
7. MATERIAL: FLUOROSILICONE, BLUE.
8. MATERIAL: POLYURETHANE, BLACK PER MSBA-031.
9. MATERIAL: WHITE EPOXY PER MSBA-033.
10. PRESSURE RATING: 10,000 PSI.
11. NO BUBBLES ALLOWED MOLD PEM MPS - SGP PPM.

ITEM	QTY REQD	FSCM NO.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICAT
11	AR	——	——	TAT HEAT SHRINK	——
10	AR	——	——	CONDUCTIVE EXPOXY	——
9	AR	——	——	POTTING	9
8	AR	15789	——	OVERMOLD	8
7	AR	——	RG-400	CABLE	——
6	AR	——	RG-316	COAX CABLE	——
5	1	15789	7841-270	COAX PENT INSERT	2 3 4
4	1	——	RR-50	RETAINING RING	5
3	1	——	2-020	O-RING	7
2	1	——	2-014	O-RING	6
1	1	15789	7841-238	COAX PENETRATOR SHELL	1

PARTS LIST SEACON ®

DESCRIPTION	PART NO.
REF DATA	

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ORIGINAL JOB NO.

APPROVALS	DATE
DRAWN BINH LE	23MAY06
ENGR CHAU TRAN	24MAY06
ISSUED	

DO NOT SCALE DRAWING THIRD ANGLE PROJECTION

BRANTNER & ASSOCIATES, INC.
MAIN PLANT 1240 VERNON WAY EL CAJON, CALIF. 92020

COAX STRAIGHT PENT ASSEMBLY

SIZE	FSCM NO.	DWG NO.	
C	15789	7841-114	B

SCALE 2/1 SHEET 1 OF 1

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Active Deep ACU Options

- Pulser circuit options (all compatible with pressure vessel and ACU controller) – one or more could be deployed.
  - New UMd circuit. (Rob Bard)
  - FID pulser: 0.2-1kV or 1-5kV (programmable), FWHM=1.5-2ns, 100Hz rep rate. ($15K)
  - Pulstek: 1.6kV, FWHM=3ns, 1MHz rep rate (£760)
- Higher voltage CW could be back in play (could require PV re-design.)
- More than 1.2kV requires penetrator design review.