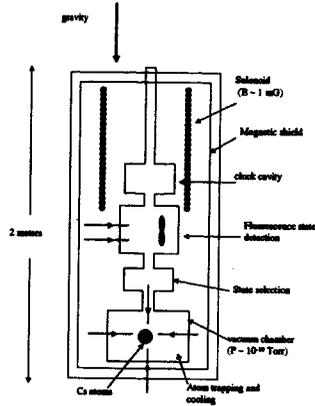


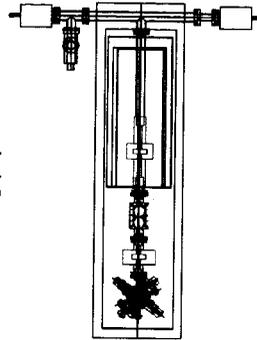
PARCS Test and Development Laboratory

Purpose:

- To test instrument configurations and validate novel implementations.
- To evaluate performance of components, subassemblies, and fabrication techniques.
- To act as a vehicle for rapid prototyping of flight-like designs.



Atomic Fountain Clock



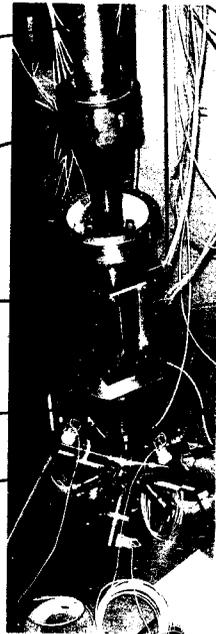
Optical Test Bench



Optical detection region

State selection microwave cavity

Atom collection region



Magnetic shields for fountain conform to same constraints as for flight



Vibration testing of diode lasers, zoom, optical isolators
All components survived to the levels required for a shuttle launch

Meltdown!

Titanium-copper explosion bonded flanges:
alloy becomes liquid and stays liquid at -900 deg. C

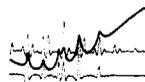


Rapid electronic prototyping



External Cavity Laser on opt. table

Computer-Controlled Laser Locking



- "Simple" algorithm:
- Search for Doppler features
 - Center on correct Doppler line
 - Search for saturated absorption features
 - Coast line

- Adaptive algorithm:
- Accommodates changing FET gain
 - Works with variations in relative peak heights
 - Works even when some lines not visible
 - Automatic implementation for coarse and refinement
 - Filters for error signal or saturated absorption



Frequency Distribution



Frequency reference distributed from Frequency Standards Lab via optical fiber

Reliable External Cavity Diode Laser for Flight

- New Power, Inc. External Cavity Diode Laser (ECDEL)
 - Modifications to existing New Power platform
 - Suitable to Cs transitions in air and vacuum
 - Excellent performance comparable to commercial Ytterbium laser used extensively on the ground.
 - Development began several years ago for optical pump, thermal performance.
 - Prototype delivered in late March 2005.
 - Vibration (shock) survived and settling (disturbance) and thermal cycle runs in test.

