



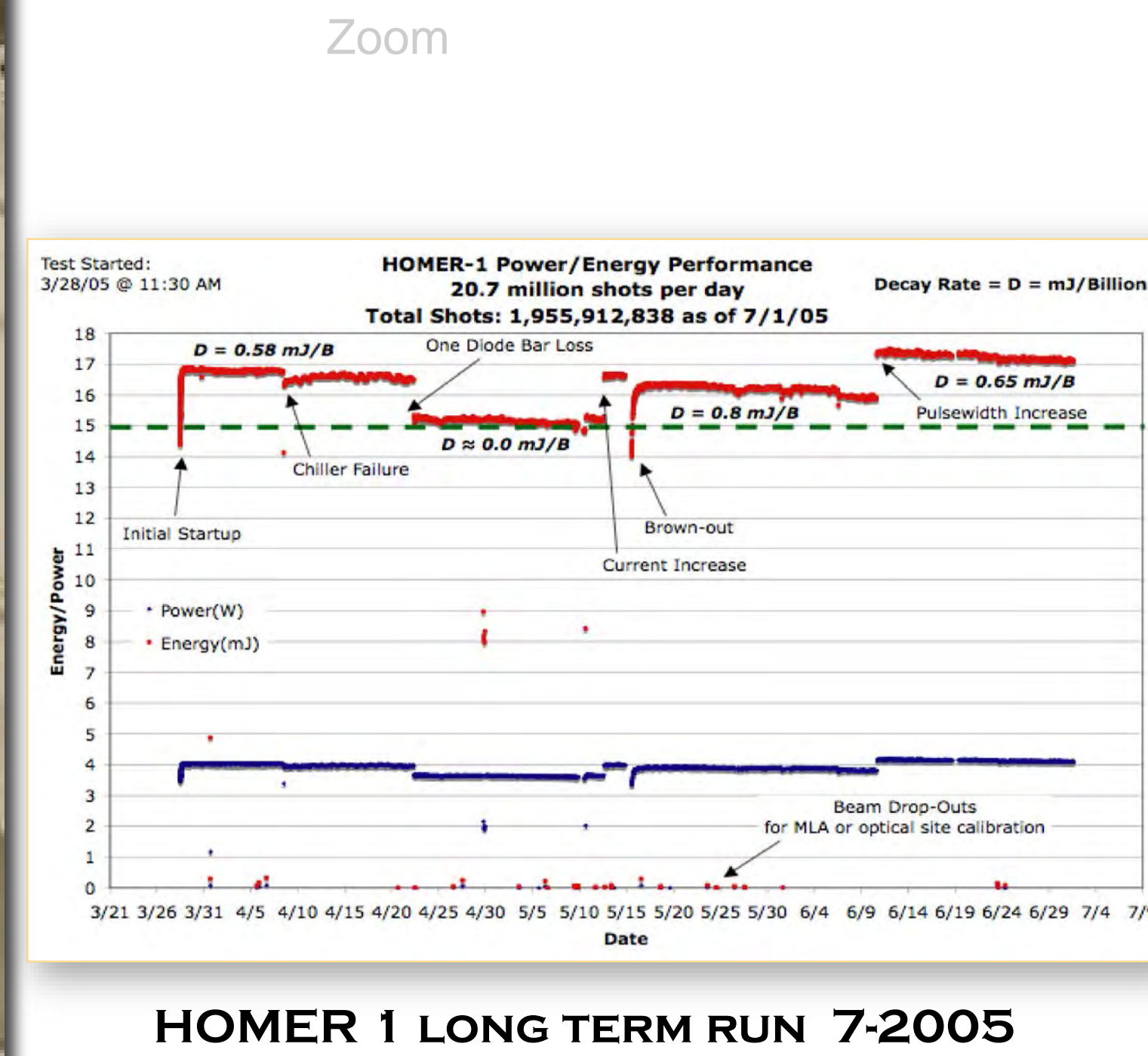
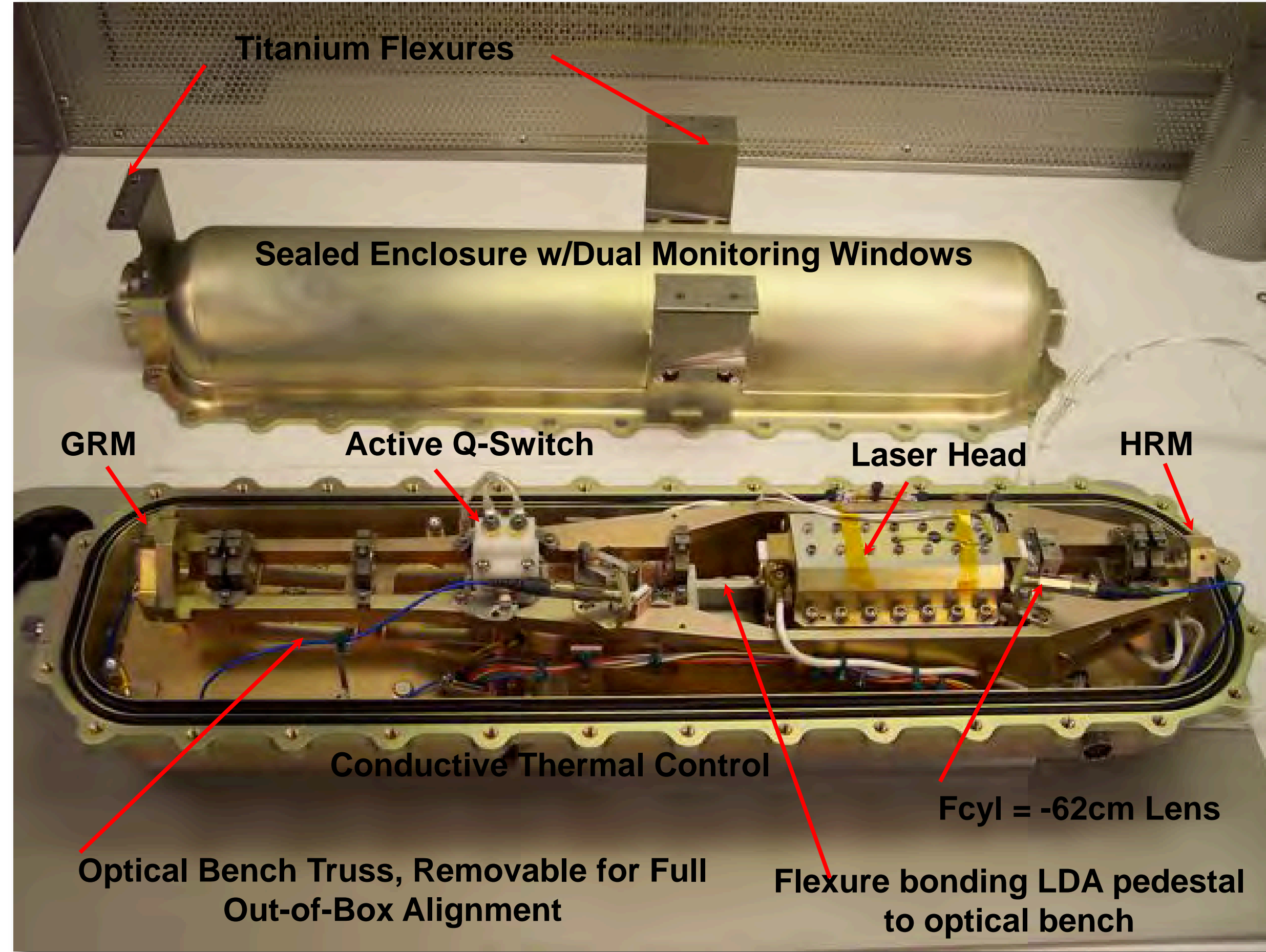
# High Output Maximum Efficiency Resonator (HOMER) Laser for NASA's Global Ecosystem Dynamics Investigation (GEDI) Lidar Mission

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THE HOMER CAVITY IS A POSITIVE BRANCH UNSTABLE RESONATOR (PBUR), EMPLOYING A GRADED REFLECTIVITY MIRROR (GRM) WITH A GAUSSIAN REFLECTIVITY PROFILE. THIS PRODUCES HIGH BEAM QUALITY (TEM00) AND PRODUCES HIGH PULSE ENERGIES TYPICAL OF MASTER OSCILLATOR/POWER AMPLIFIER (MOPA) DESIGNS, BUT WITH HIGHER EFFICIENCY, LESS OPTICS, LESS VOLUME/MASS, EXCELLENT POINTING.

## LAB RESULTS:

Parameter	HOMER Output
Energy	17 - 9 mJ
Pulse Width	10 +/- 1 ns
Rep Rate	250 -100 Hz
LDA Duty Cycle	~2%
LDA Current	50 A
LDA Derating	50%
TRL 6 Mass	5 kg
Total QS Shots HOMER Design	15+ Billion
Optical Efficiency	17%
Elect Efficiency	> 7%

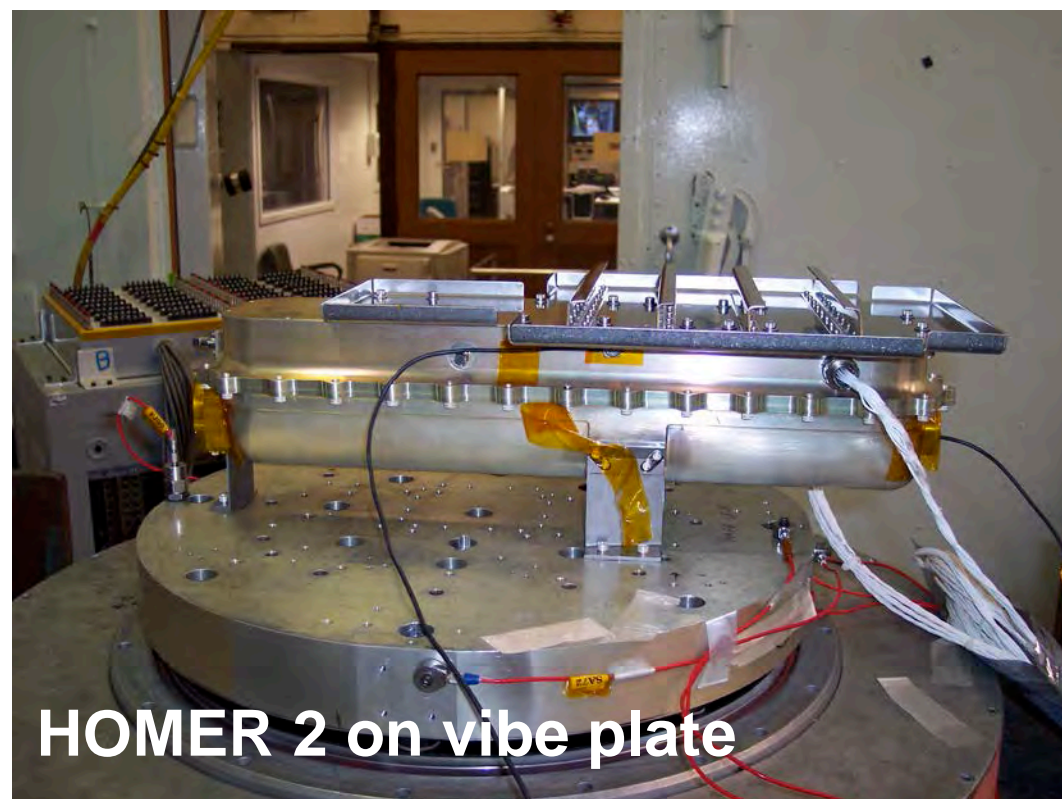


HOMER 1 LONG TERM RUN 7-2005

## ENVIRONMENTAL TESTING: HOMER-2 LIFETEST (15+ Billion to Date):

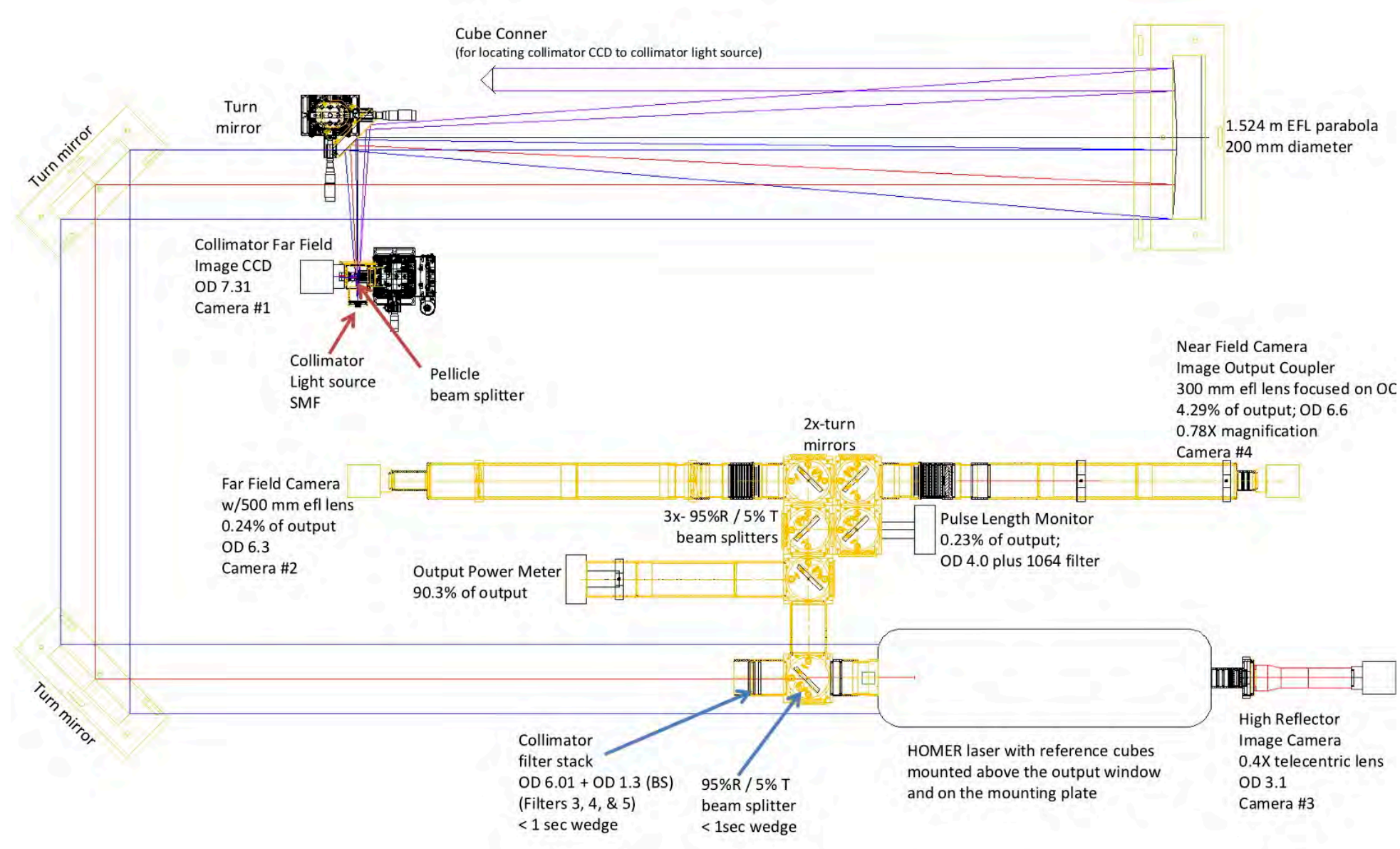
### VIBRATION TESTING:

THE GENERAL ENVIRONMENTAL VERIFICATION STANDARD (GEVS) QUALIFICATION VIBRATION SPECIFICATION WAS APPLIED. PURPOSE OF THIS TEST WAS TO QUALIFY THE HOMER DESIGN THROUGH TRL-6 VIBRATION TESTING. SINCE NO LAUNCH VEHICLE WAS SELECTED @ THAT TIME, THE

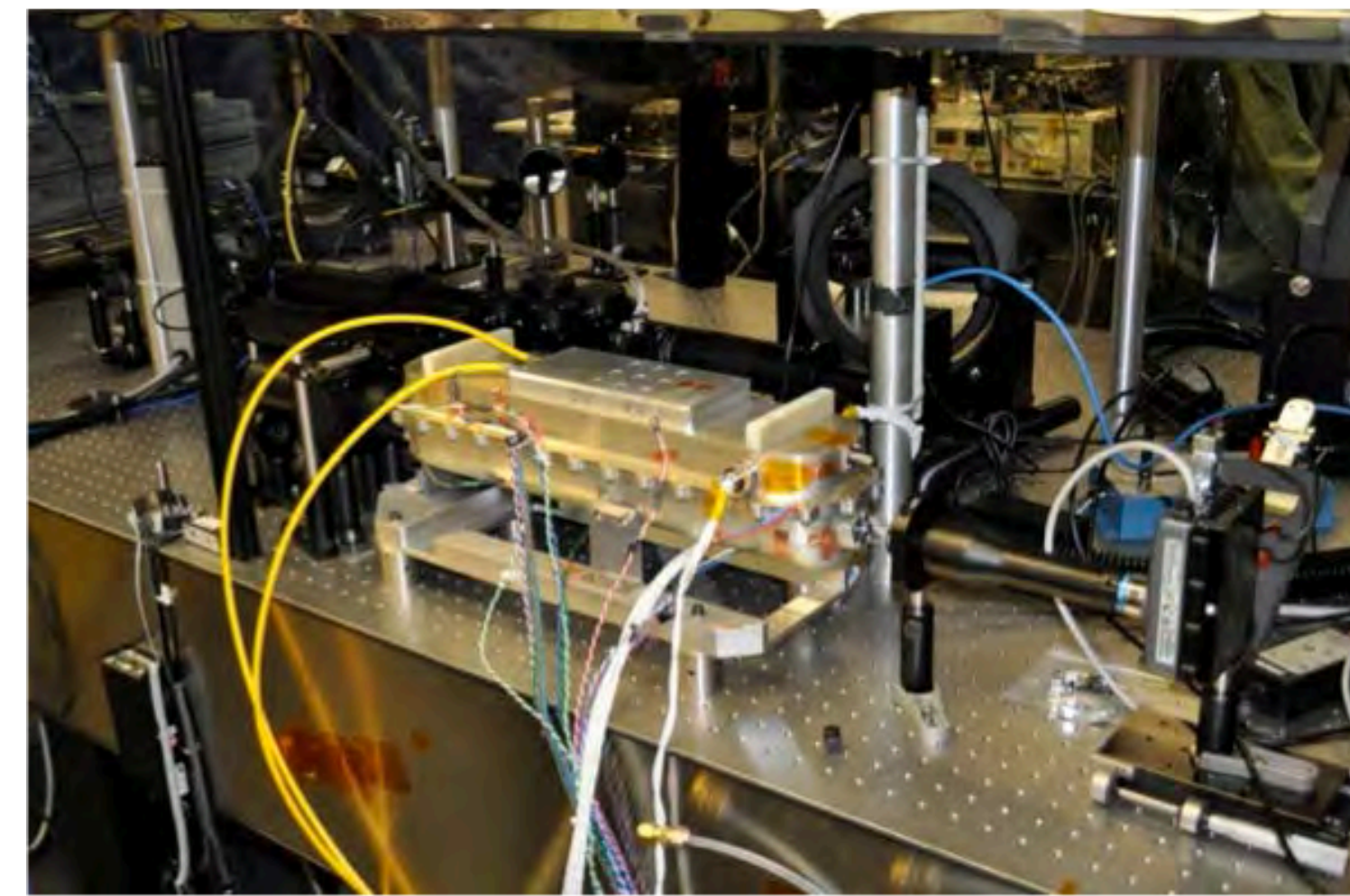
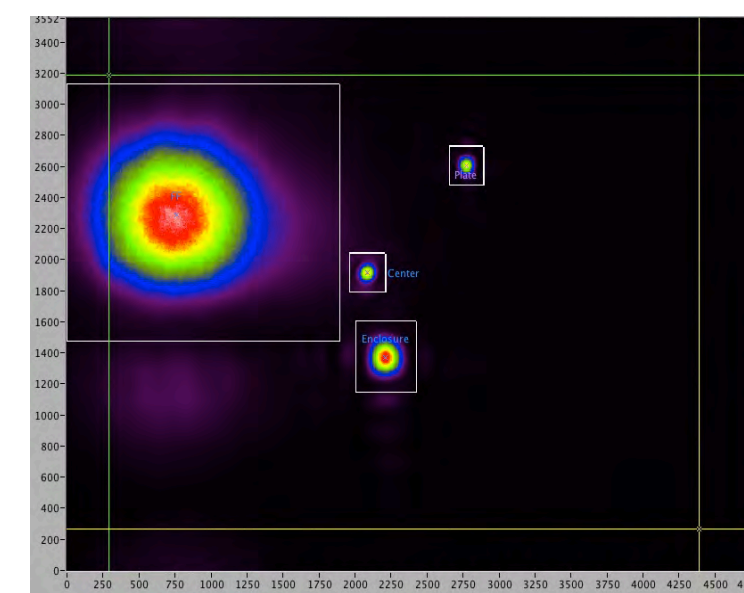


HOMER 2 on vibrate plate

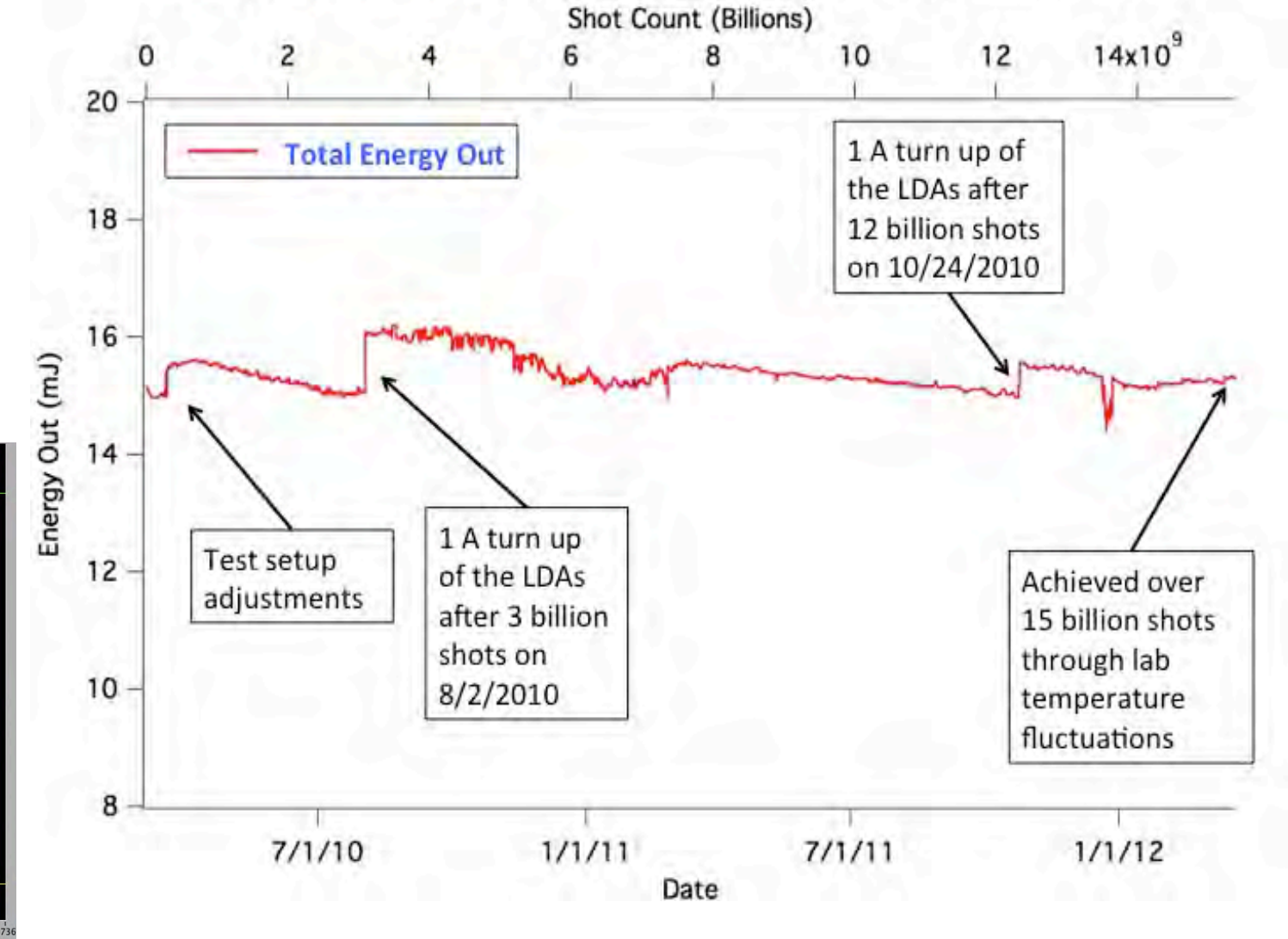
OPTICAL LAYOUT OF THE HOMER-2 LIFETEST. A 1064NM FIBER COUPLED LASER DIODE IS REFLECTED OFF REFERENCE CUBES MOUNTED ON THE ENCLOSURE AND THE BASE PLATE. THESE DETERMINE ANY MOVEMENT OF LASER CAVITY VS. THE OUTSIDE ENVIRONMENT.



TEM00 HOMER Beam Quality: THIS CCD IMAGE SIMULTANEOUSLY DISPLAYS ALL REFERENCE BEAMS AND THE HOMER-2 FAR FIELD BEAM. THE FAR FIELD (LARGEST BEAM) MEASURES APPROXIMATELY 0.9 mR x 1.0 mR DIVERGENCE.

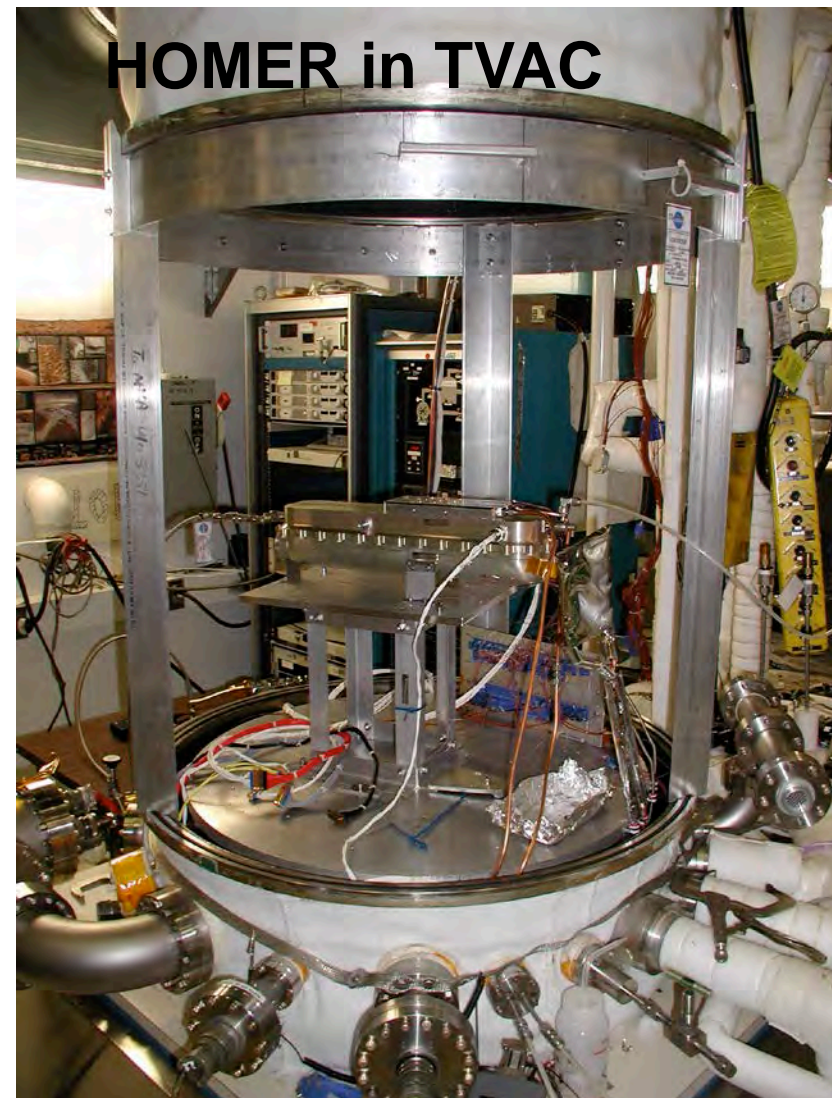


HOMER-2 LIFETEST: TOTAL SHOTS ~15.4 BILLION



### TVAC TESTING:

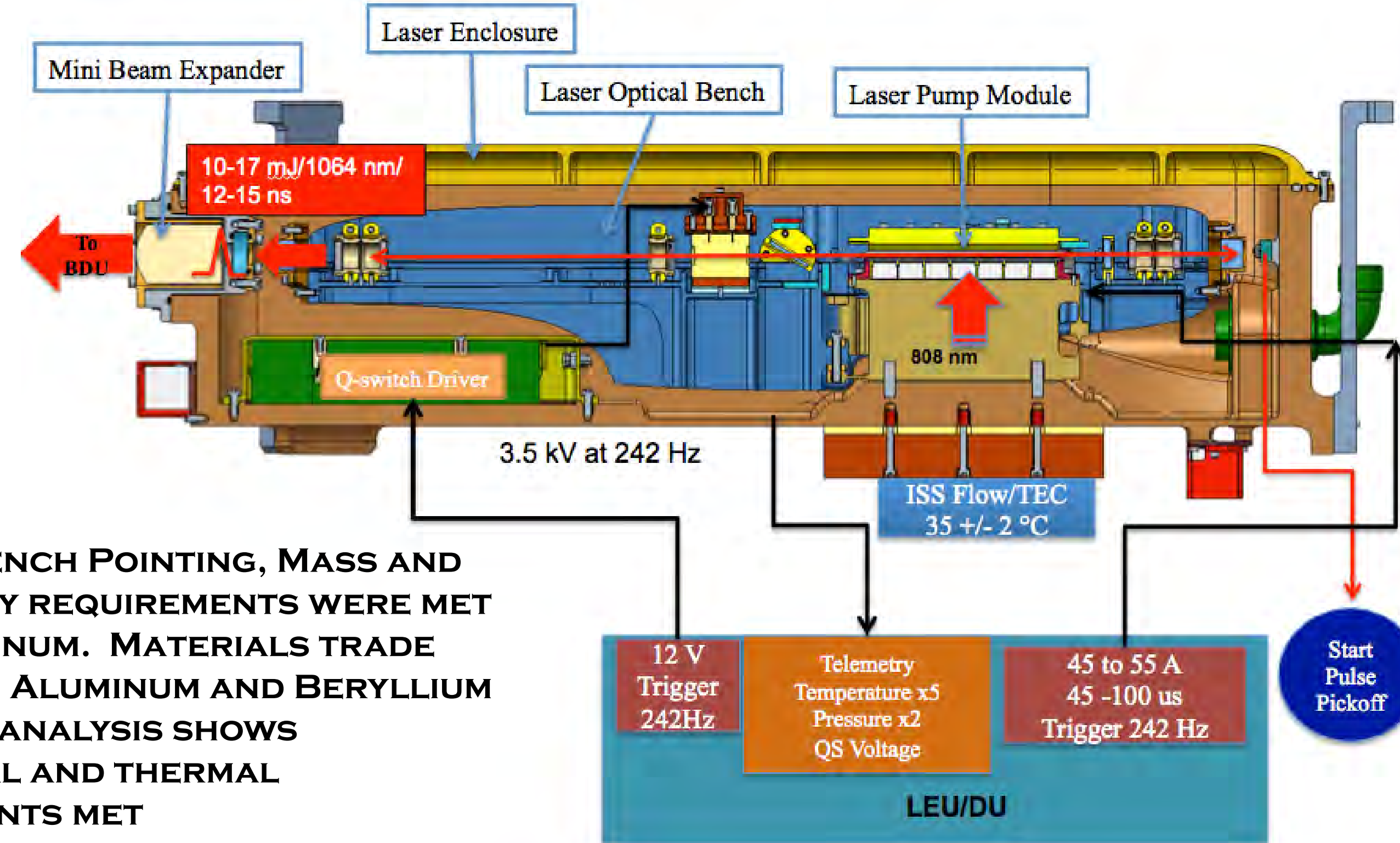
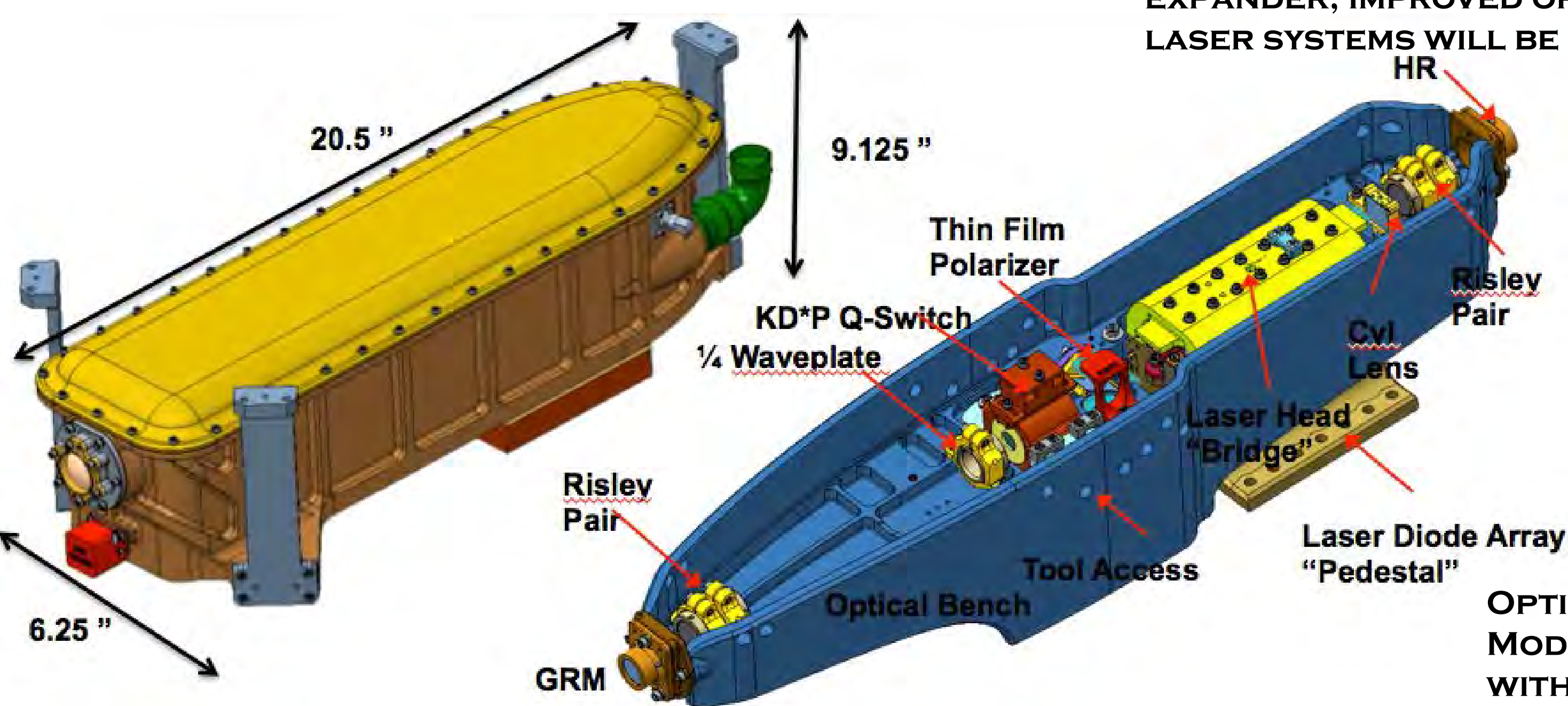
HOMER WAS DESIGNED FOR A 0 C TO 40 C SURVIVAL TEMPERATURE RANGE. THEREFORE USING GEVS COMPONENT QUALIFICATION STANDARDS HOMER WAS TEMPERATURE CYCLED TO -10 C FOR 4 HOURS AND THEN TO 50 C FOR 4 HOURS AT TOTAL OF 8 TIMES. HOMER'S PERFORMANCE WAS CHECKED AT REGULAR INTERVALS TO ASSURE PROPER LASER OUTPUT QUALITY.



HOMER in TVAC

## FINAL HOMER DESIGN:

NOW THAT HOMER IS THE GEDI LASER, IT IS BEING MECHANICALLY UPGRADED; INCORPORATING A BEAM EXPANDER, IMPROVED OPTICAL BENCH, AND A FLIGHT-LIKE LASER ELECTRONICS BOX. THE ETU AND FLIGHT LASER SYSTEMS WILL BE BUILT IN-HOUSE AND WILL GO THROUGH ENVIRONMENTAL TESTING.



OPTICAL BENCH POINTING, MASS AND MODULARITY REQUIREMENTS WERE MET WITH ALUMINUM. MATERIALS TRADE STUDY WITH ALUMINUM AND BERYLLIUM COMPLETE: ANALYSIS SHOWS MECHANICAL AND THERMAL REQUIREMENTS MET WITH MARGIN.

INCORPORATING ALL OPTO-MECHANICAL LESSONS LEARNED FROM HOMER-2, LOLA, MLA, CALIPSO, GLAS, & ESA'S ALADIN.