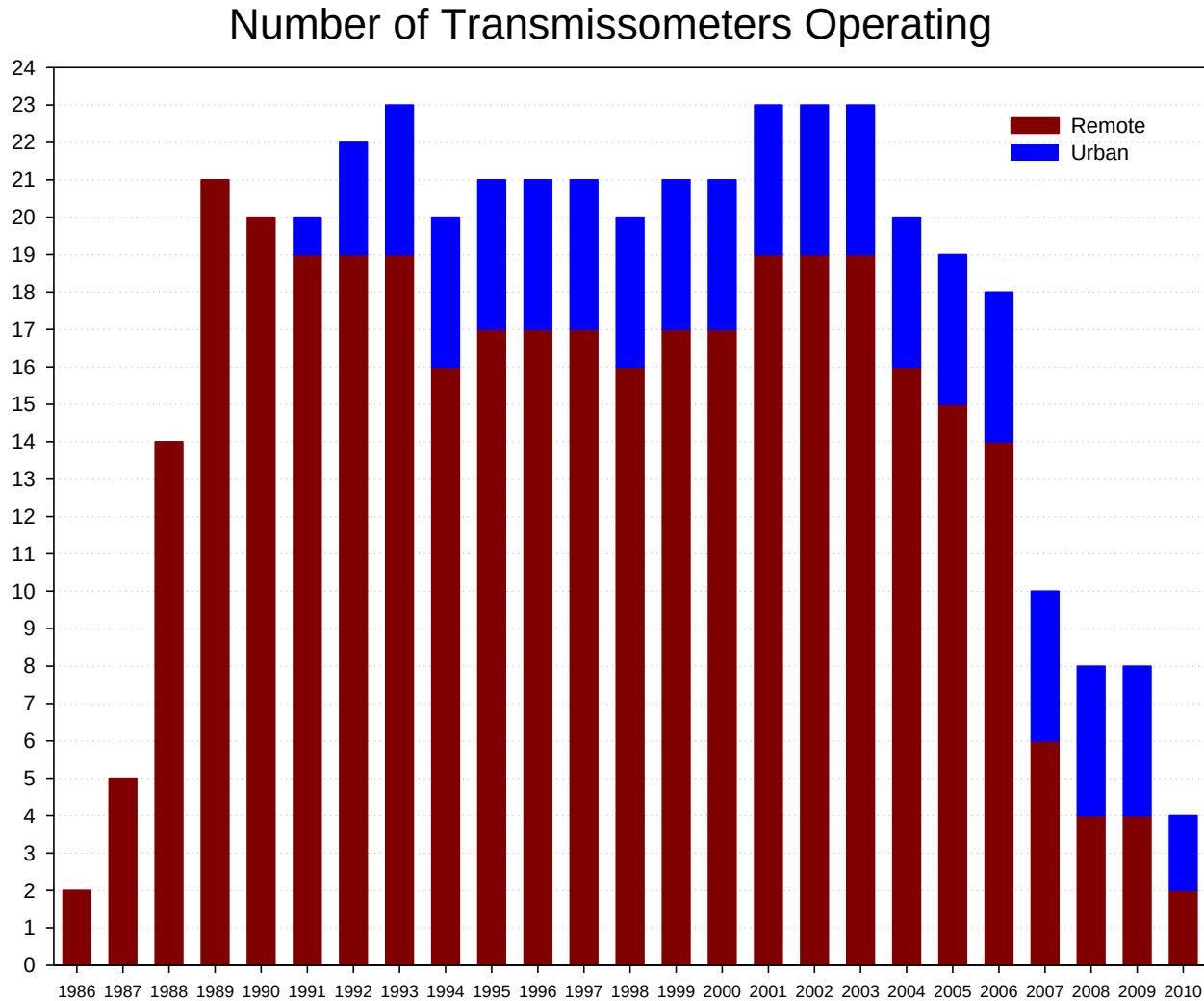


Optec LPV-4 Transmissometer

(A Comeback – Maybe?)



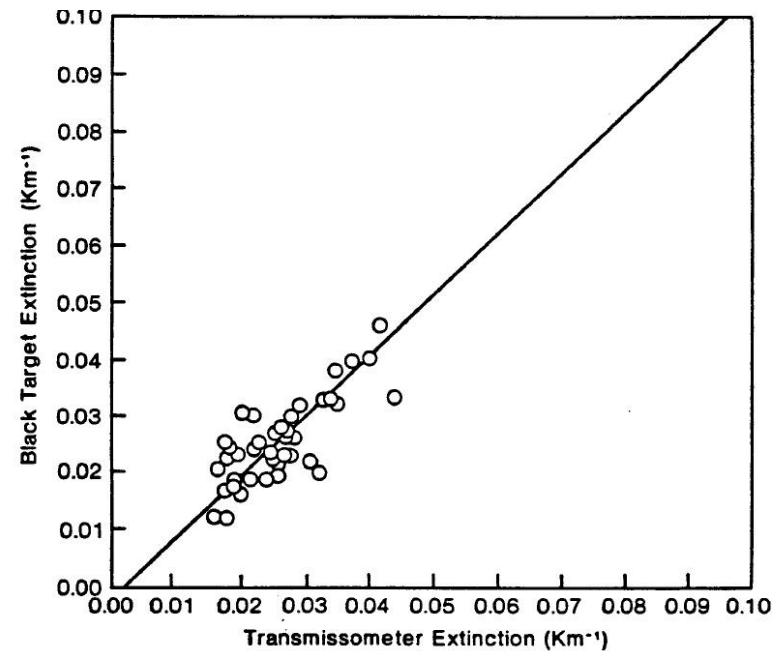
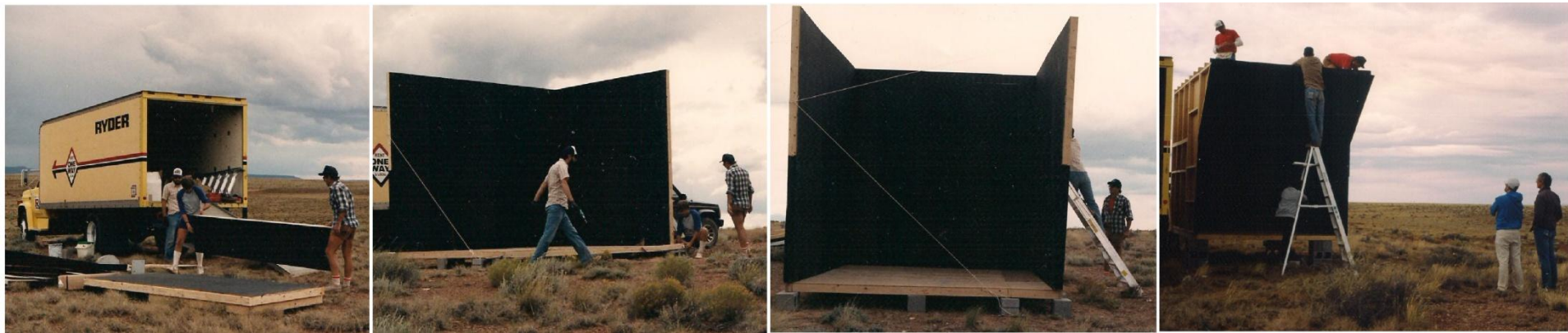
February 1985: Grand Canyon National Park

Initial Test of LPV-0



September-October 1985: Meteor Crater, AZ

Extensive Test of LPV-1



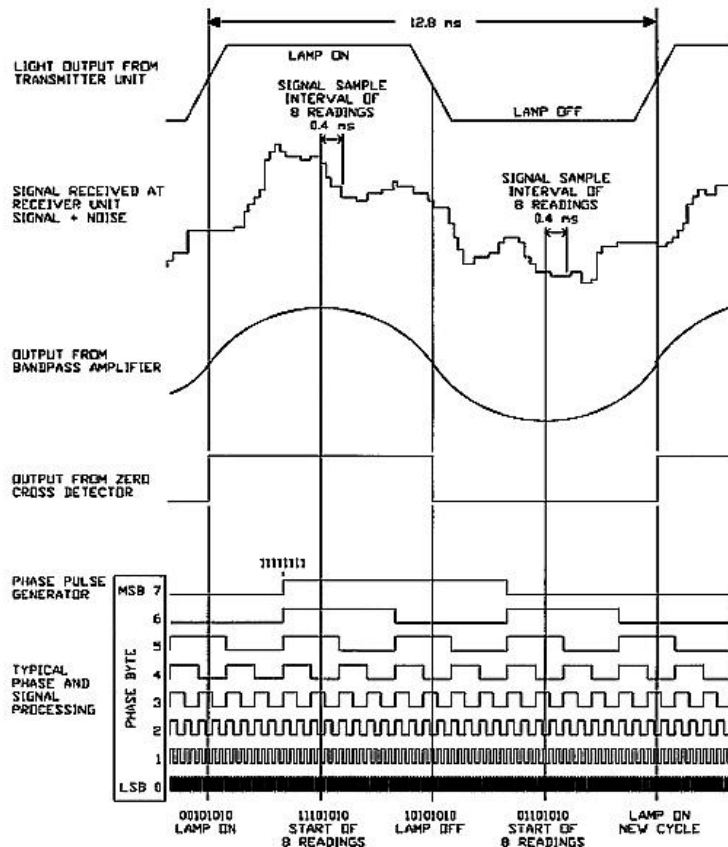
Scatterplot of black target and transmissometer atmospheric extinction. The slope of the perpendicular regression line is equal to 1.07 ± 0.074 and the intercept is equal to -0.003 ± 0.003 .

WHITEX 12/86 – 3/87: First Use of LPV-2 at Grand Canyon, Canyonlands and Petrified Forest National Parks



$$b_{\text{ext}} = (1/r) \ln(r^2 I_r / I_o)$$

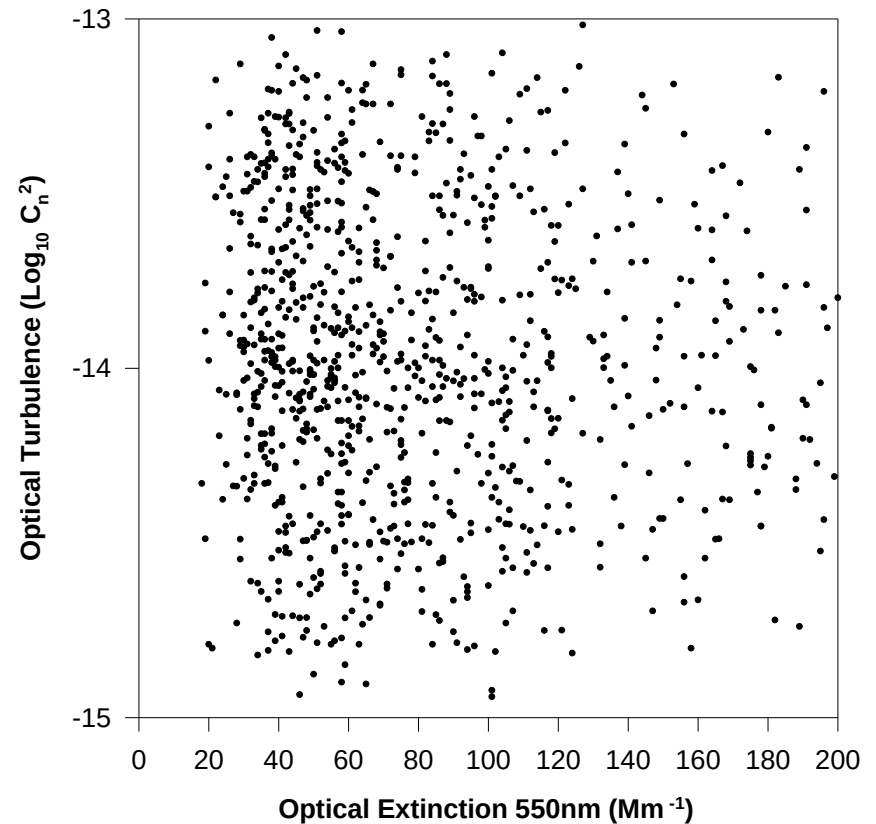
Receiver Processing



Turbulence

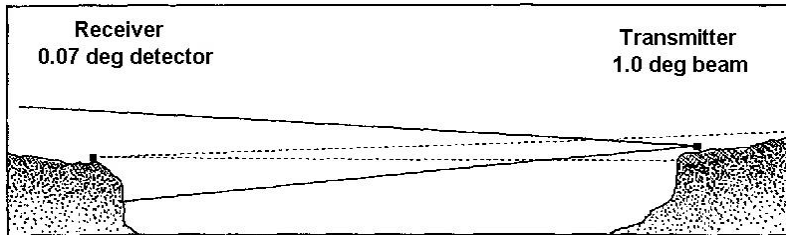
Extinction vs. Optical Turbulence

Denver 11/87 - 1/88



$$b_{\text{ext}} = (1/r) \ln(r^2 I_r / I_o)$$

Siting

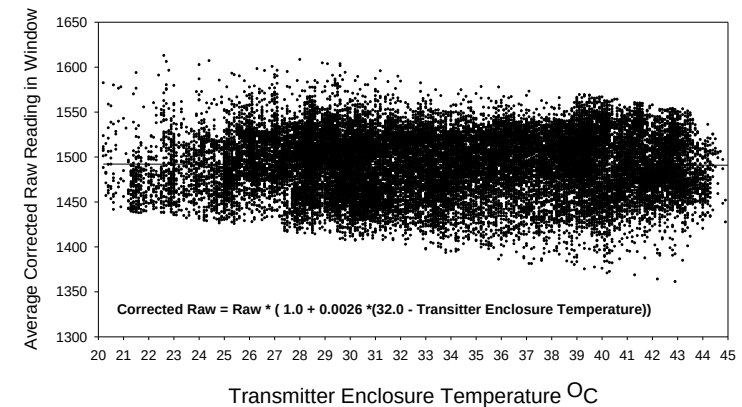
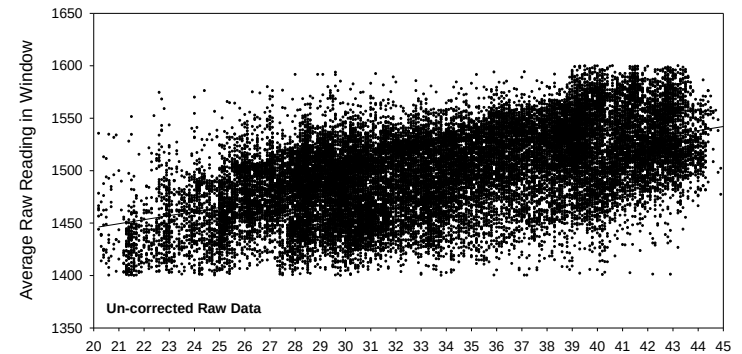


Lamp Brightening

Original data indicated that lamp increased brightness at a rate of 2% per 500hrs !!!

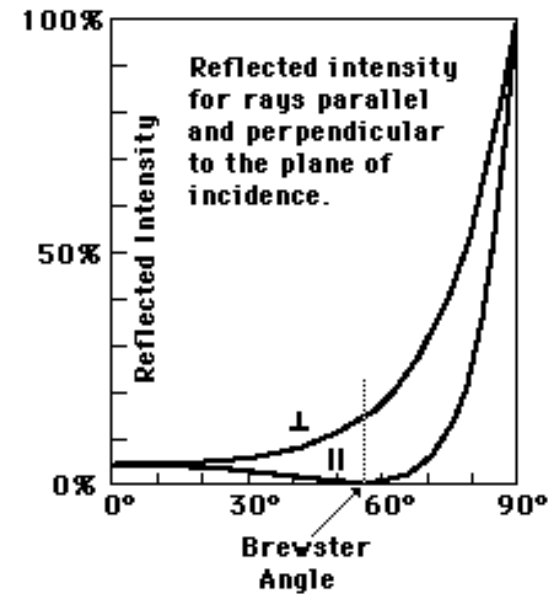
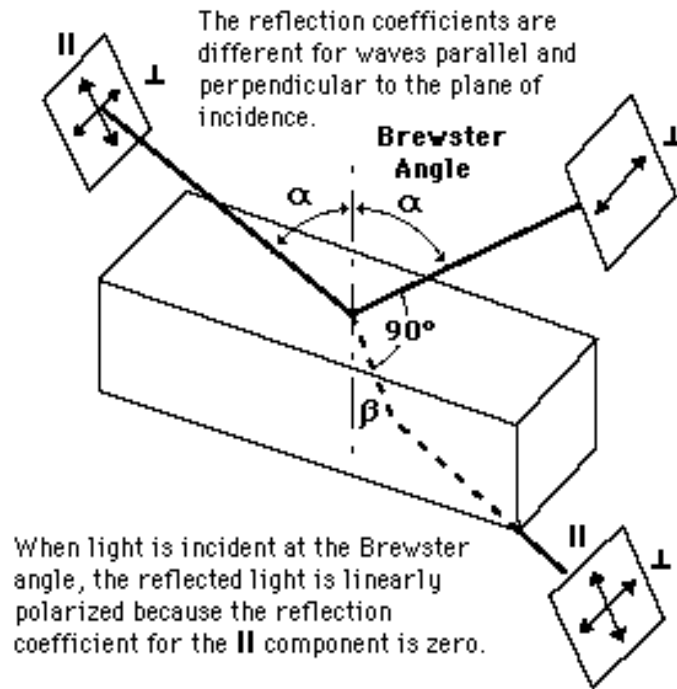
Temperature

Ten Minute Moving Average
Raw Readings vs. Transmitter Enclosure Temperature
August 1-20, 2010

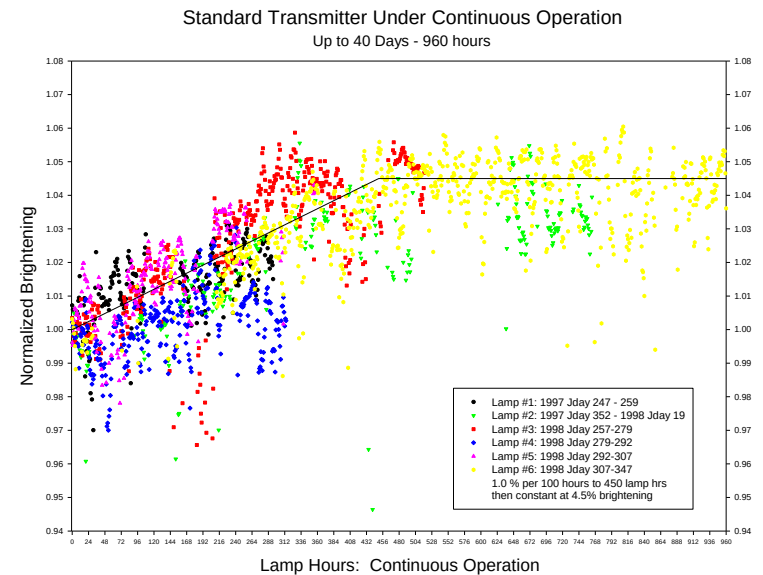
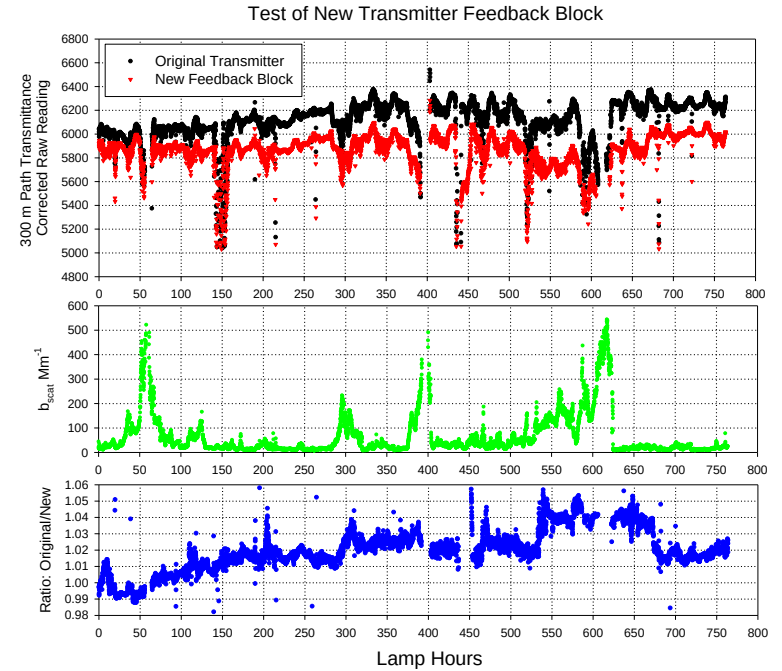
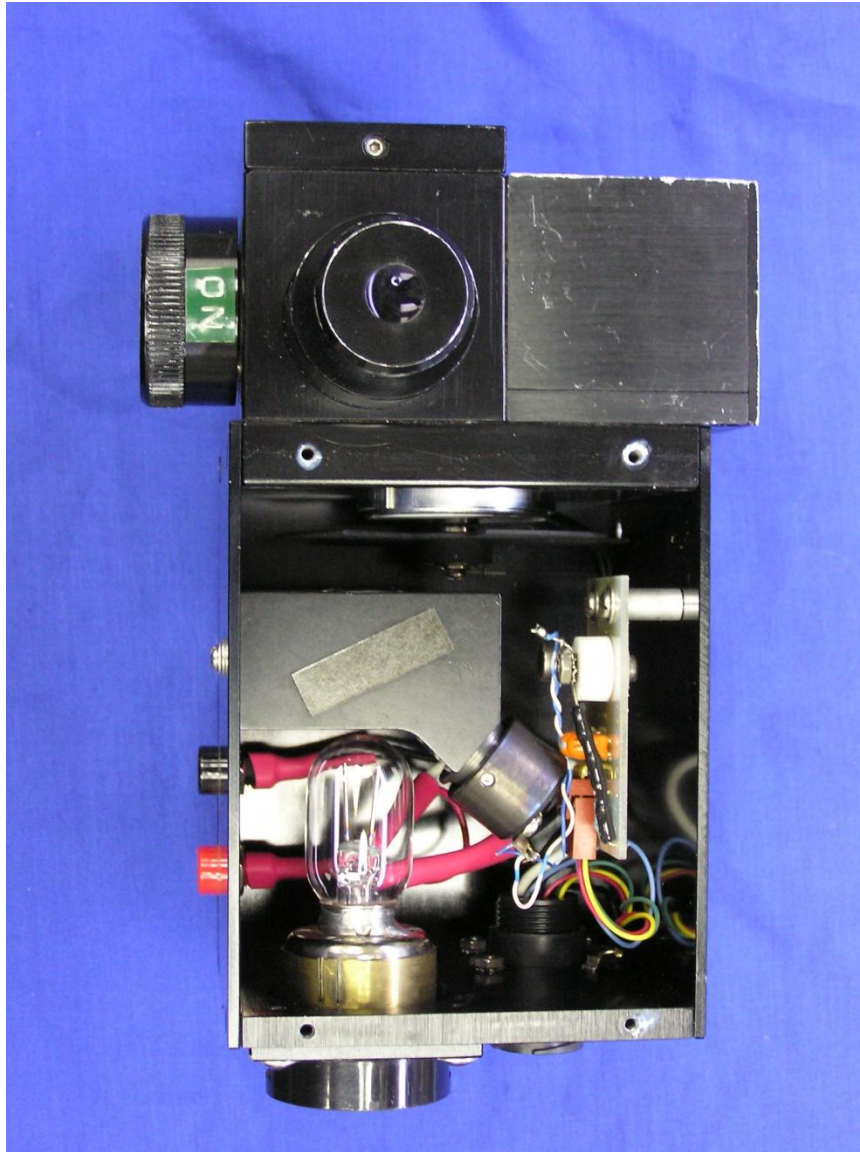


Cause of Lamp Brightening

Polarization of Source, Feedback Block and Brewster Angle



LPV-2b ~ 1997-98



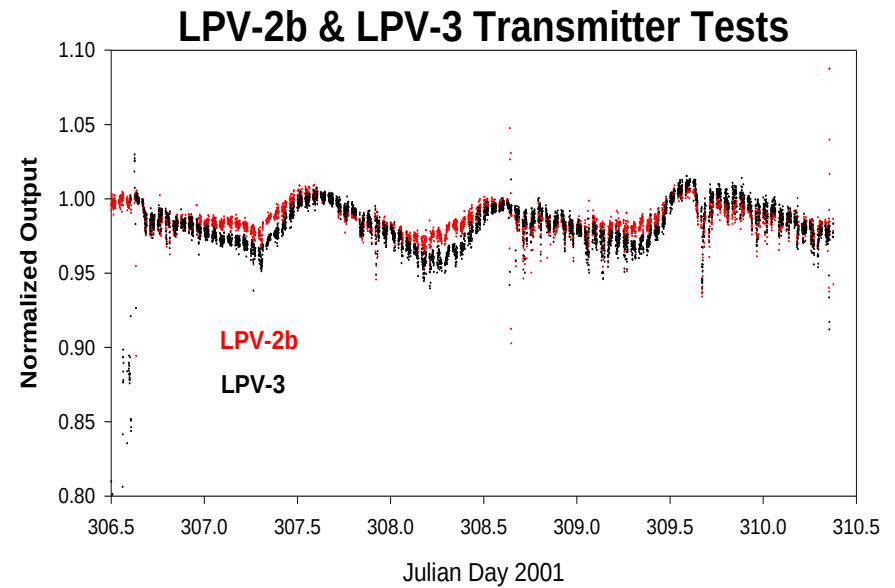
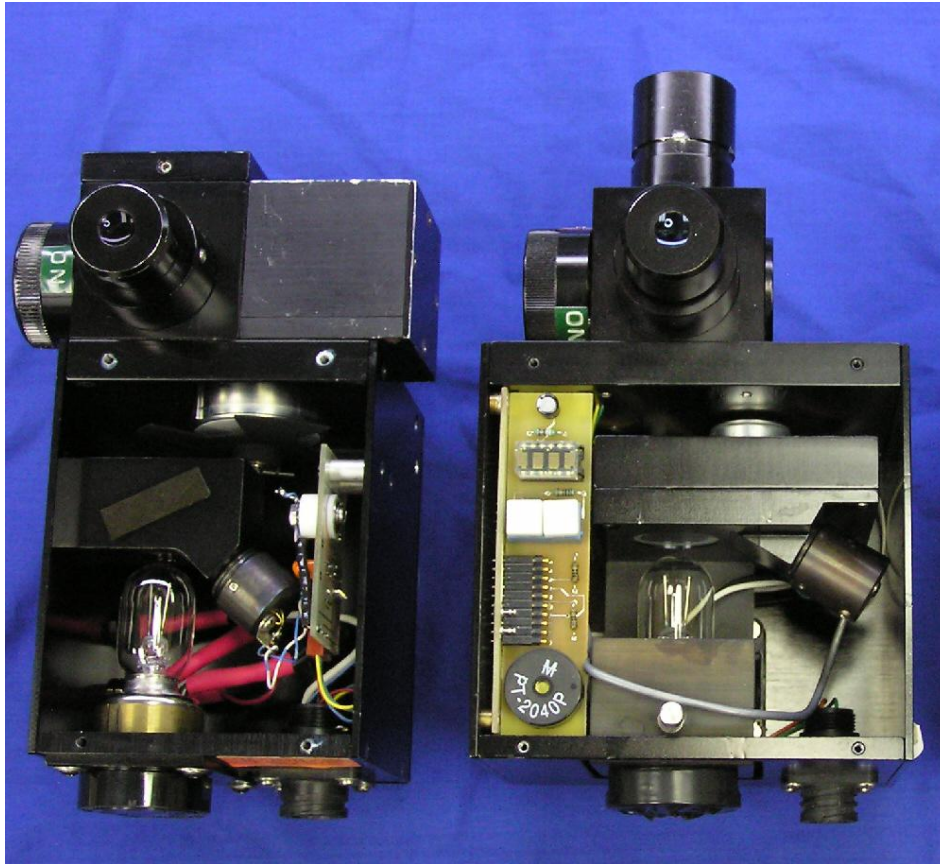
Interestingly This Is A Problem That Occurs In Other Radiation Measurements

- The polarization of the radiation of the lamp is due to the polarization of the radiation from the tungsten filament, observed at an angle (apart from the error in setting up the lamp), and the polarization of the radiation from the window of the bulb, which is usually directed at an angle of from 2° to 15° .

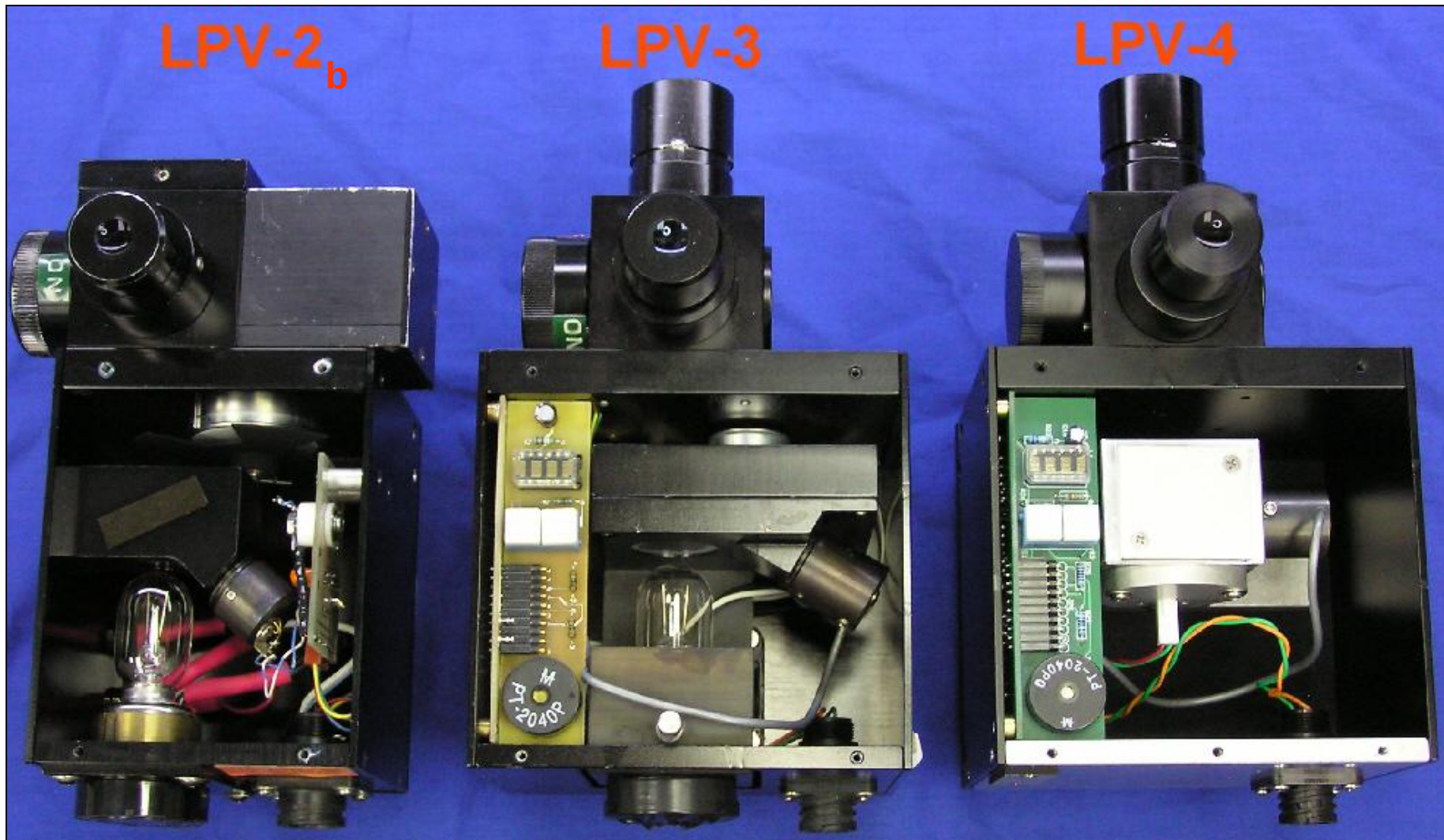
in:

Measurement Techniques, Vol. 47, No. 9, 2004 “THE INFLUENCE OF THE POLARIZATION OF THE RADIATION ON THE ACCURACY OF THE TRANSMISSION OF THE DIMENSIONS OF THE UNIT OF TEMPERATURE IN RADIATION THERMOMETRY”, M. S. Matveev, A. Yu. Makarenko, and V. G. Tsorin

LPV-3 2001

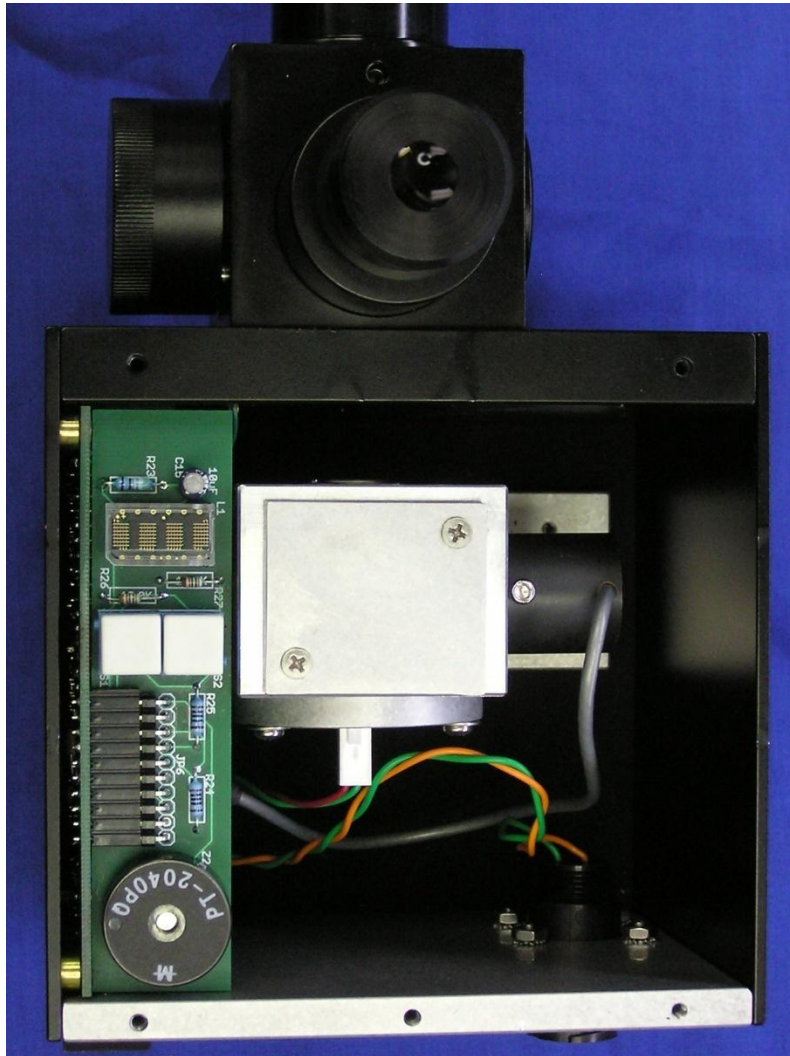


Evolution of Transmitter



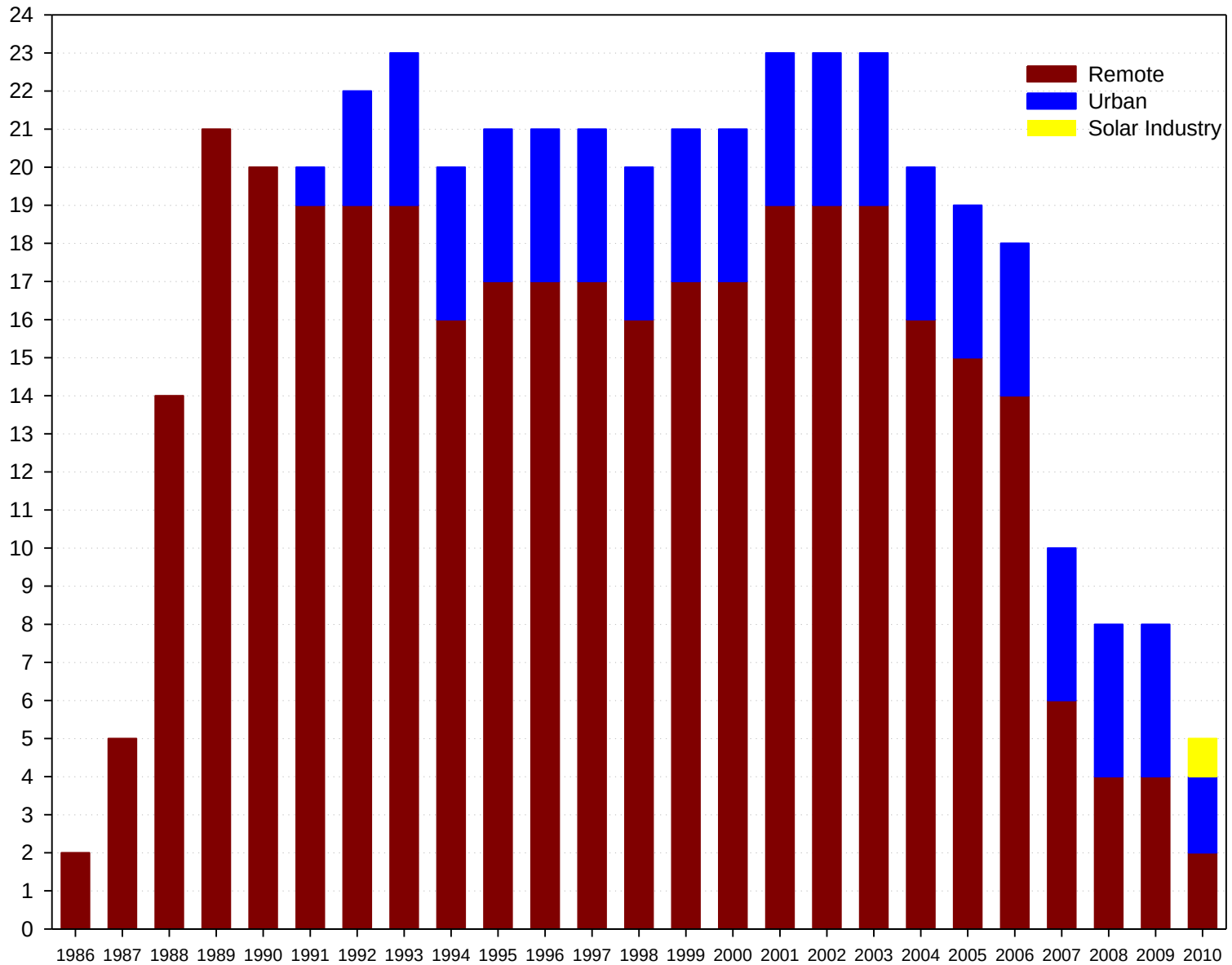
2010 LPV-4 LED

Expected Advantages Over LPV-2 & 3 Incandescent Lamp



- Long life $\sim 10,000 +$ hrs
- Lower power
- Brighter source
- No mechanical chopper
- Better stability due to un-polarized LED
- Lower temperature dependency

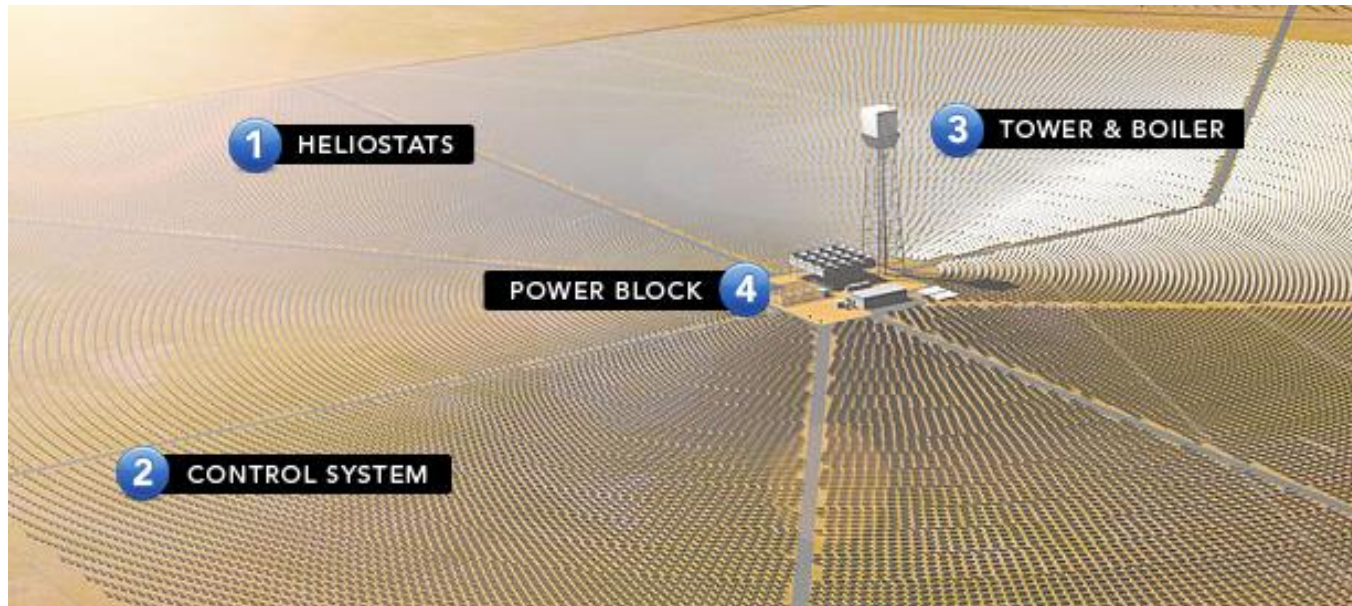
Number of Transmissometers Operating



Operating 11 MW Concentrating Solar Power (CSP) Plant Seville, Spain



CSP Basics



Nicolas Léonard Sadi Carnot
1796 – 1832

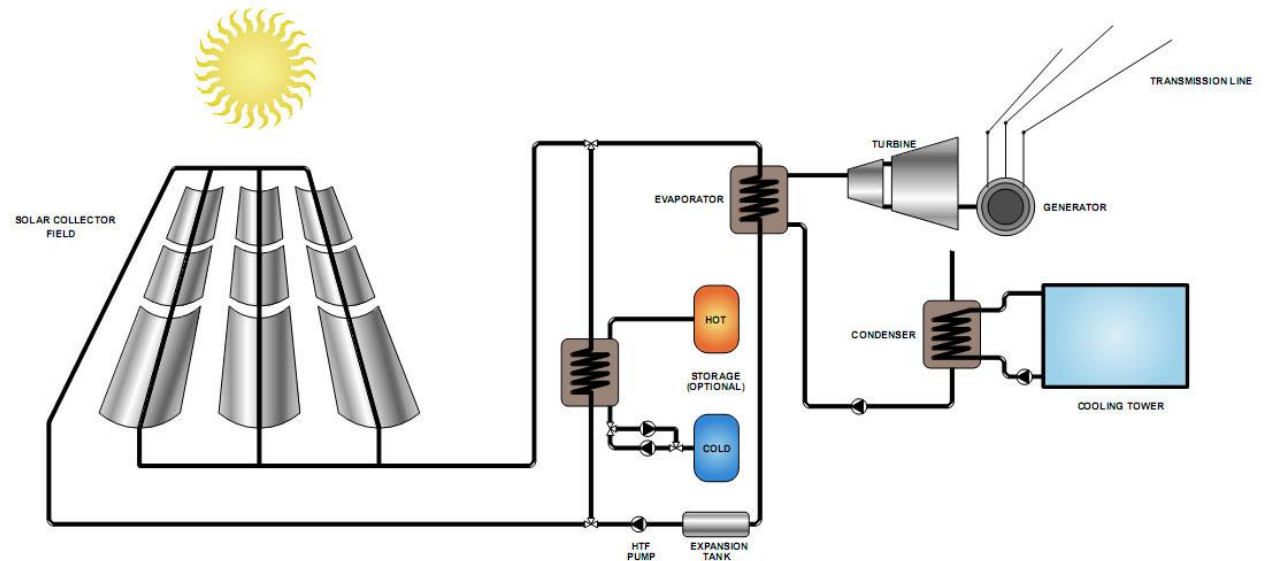


Image of dust illuminated by reflected rays



Issue: Monitor real time path transmittance



IVANPAH SOLAR ELECTRIC GENERATING SYSTEM – IVANPAH, CALIFORNIA

BrightSource is currently developing its first solar power complex in California's Mojave Desert. The Ivanpah Solar Electric Generating System (ISEGS) will be located in Ivanpah, approximately 50 miles northwest of Needles, California, and about five miles from the California-Nevada border. The 370 megawatt nominal (392 megawatt gross) complex will generate enough electricity to power more than 140,000 homes and reduce carbon dioxide (CO₂) emissions by more than 400,000 tons per year.

LPV-4 Testing

- Prototype built by Optec
- Testing at ARS began 10/10/10

LPV-4 October 10-16, 2010

