3.3 UV BOX

Updated version of Reference 3.3-1

Reference 3.3-1 - "UV Light Flood System", David I. Brown

The radiometry of the NAC UV filters was calibrated using the UV light flood system. The system consisted of a standalone 450 W xenon arc lamp which was positioned vertically and placed about 1.5 meters away from a diffusely reflecting screen (made of Kodak 6080 paint which reflects diffusely down to 200 nanometers). It's height was centered on the screen. The arc was a few millimeters in length, and so closely approximated a point source. The illuminated screen completely filled the field of view of the NAC, some distance away. The output from the lamp could be monitored in real time with a UV radiometer mounted into the side of the flood system (UV box).

Figure 3.3-1 shows the lamp, the UV flood system housing, with the UV radiometer, and the purge system in place. Figure 3.3-2 shows the system with its side removed, revealing the lamp, baffle aperture, and screen. The region immediately surrounding the lamp was carefully baffled to reduce unwanted reflections which affect the flatness of the illumination field. Careful observation of the screen under illumination showed no stray reflections of any kind. One fortunate thing about the UV in this case - just as few materials transmit it well, few reflect the UV either. The baffling did its designed job, and the field flatness was virtually that of a point source at 1.5 meters over the diameter of the field of view of the NAC.

Prior to use, the system was cleaned with acetone, alcohol, and a "black light". During use, the box was purged with very clean dry nitrogen received directly from the LN2 boil off from the vacuum/LN2 facility in Bldg 144. The nitrogen gas purity and water content was tested prior to use and found very clean and dry. The fused silica window to the box was never touched after its manufacture, and the fused silica vacuum vessel window was observed to be uncontaminated prior to testing.

The UV flood system was designed to fit on the vacuum vessel alignment table as shown in Figure 3.3-3. Since its screen was not large, the screen and exit window had to be aligned to the NAC camera's optical axis. This was done with an alignment telescope and used the alignment mirror mounted to the back of the UV box to facilitate this.

Radiometric calibration of the UV Box was performed throughout the light transfer calibration testing of the NAC UV filters. This radiometric data was used to determine the radiometric conversion factors (Table 3.3-1) , converting radiometric measurements from units of picoamps (pA) to units of $W/m^2/nm/sr$. At wavelengths that were not measured during the radiometric calibration of the UV Box, the calculated conversion factors are shown. As a sanity check, a comparison between the measured and calculated conversion factors was performed and showed absolute deltas ranging from 0.2% to 4.6%.

Filter (central λ)	UV Box Radiometric Conversion Factors ($W/m^2/nm/sr/pA$)	Source
220	0.01052	calculated
240	0.01013	calculated
260	0.00909	measured (-4.1% delta)
280	0.01287	measured (-3.0% delta
300	0.00995	measured (4.6% delta)
320	0.00520	measured (-0.2% delta)
340	0.00426	measured (2.6% delta)
360	0.00548	measured (-0.9% delta)
380	0.00295	calculated
400	0.00263	calculated

Table 3.3-1 - UV Box Radiometric Conversion Factors

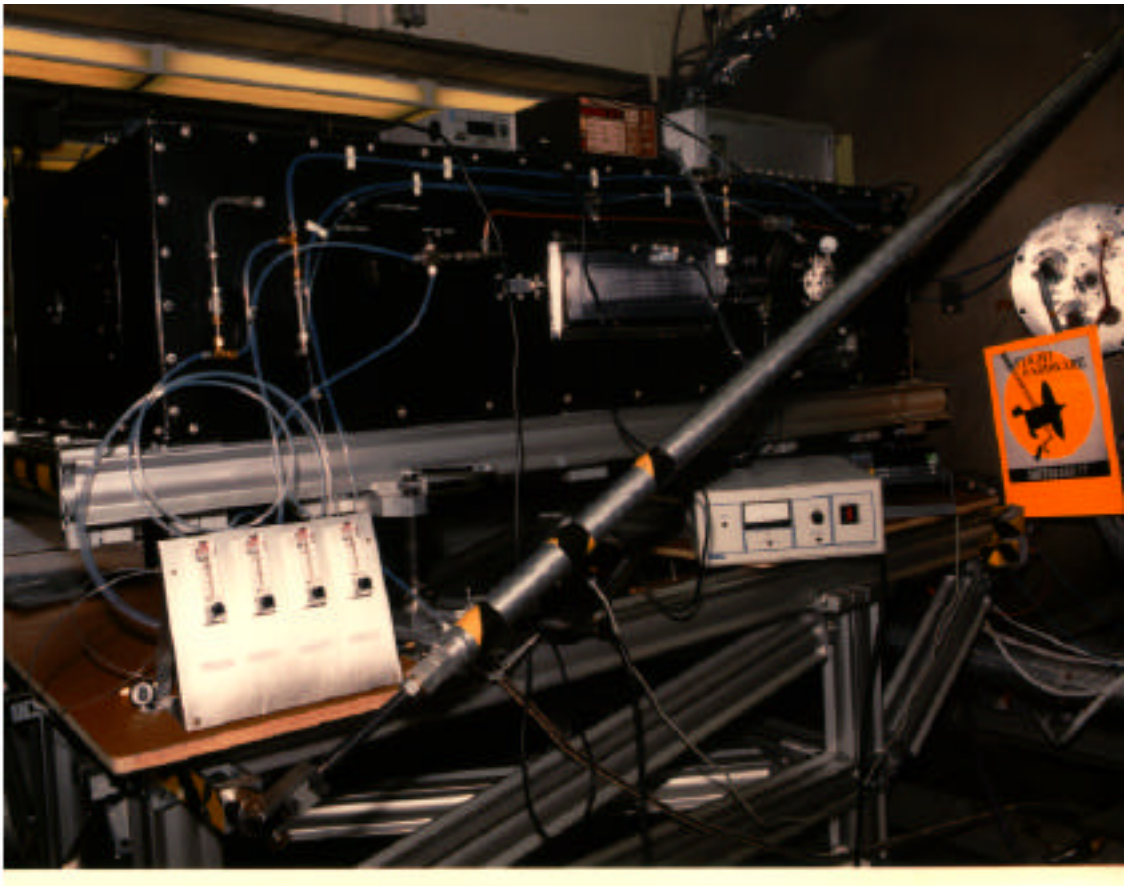

Figure 3.3-1 - UV Box (Plumbing View)

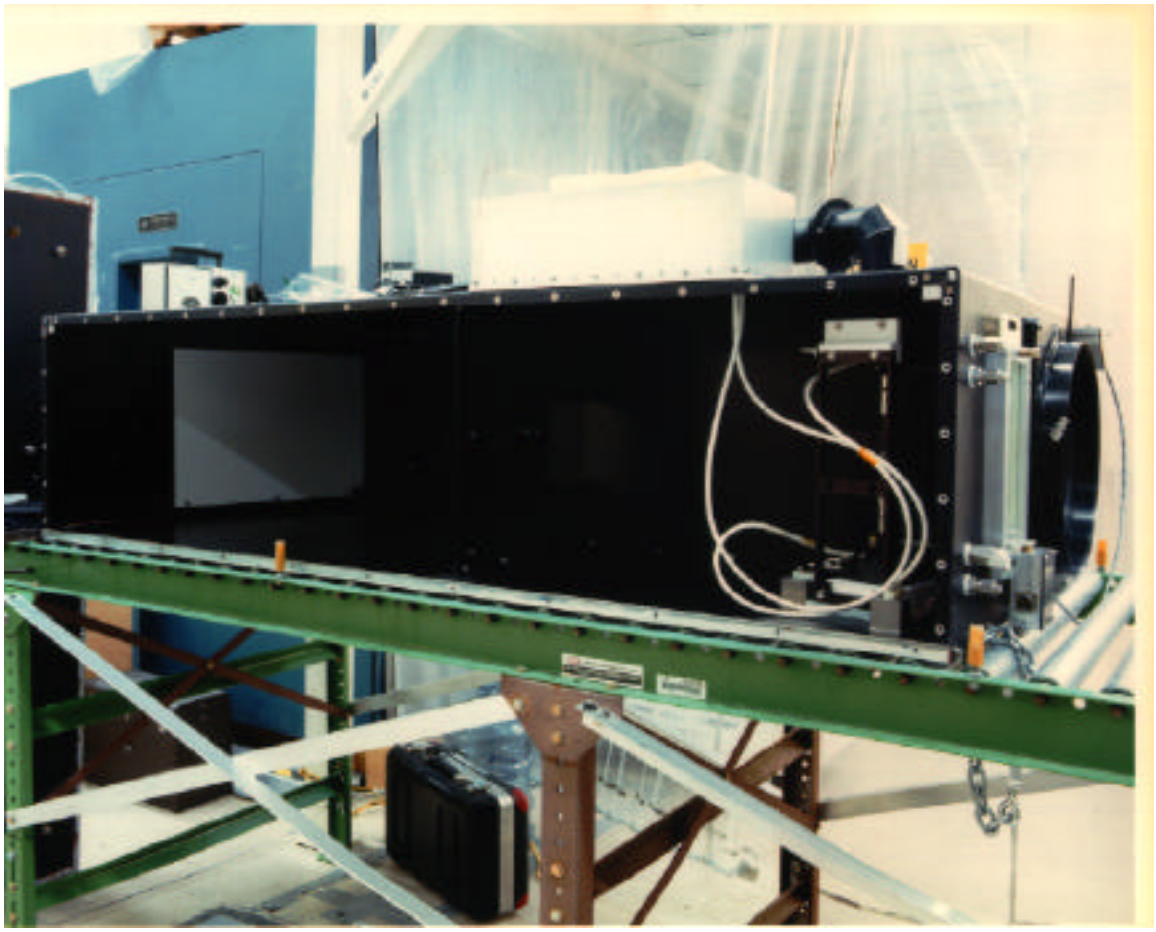

Figure 3.3-2 - UV Box (Internal View)

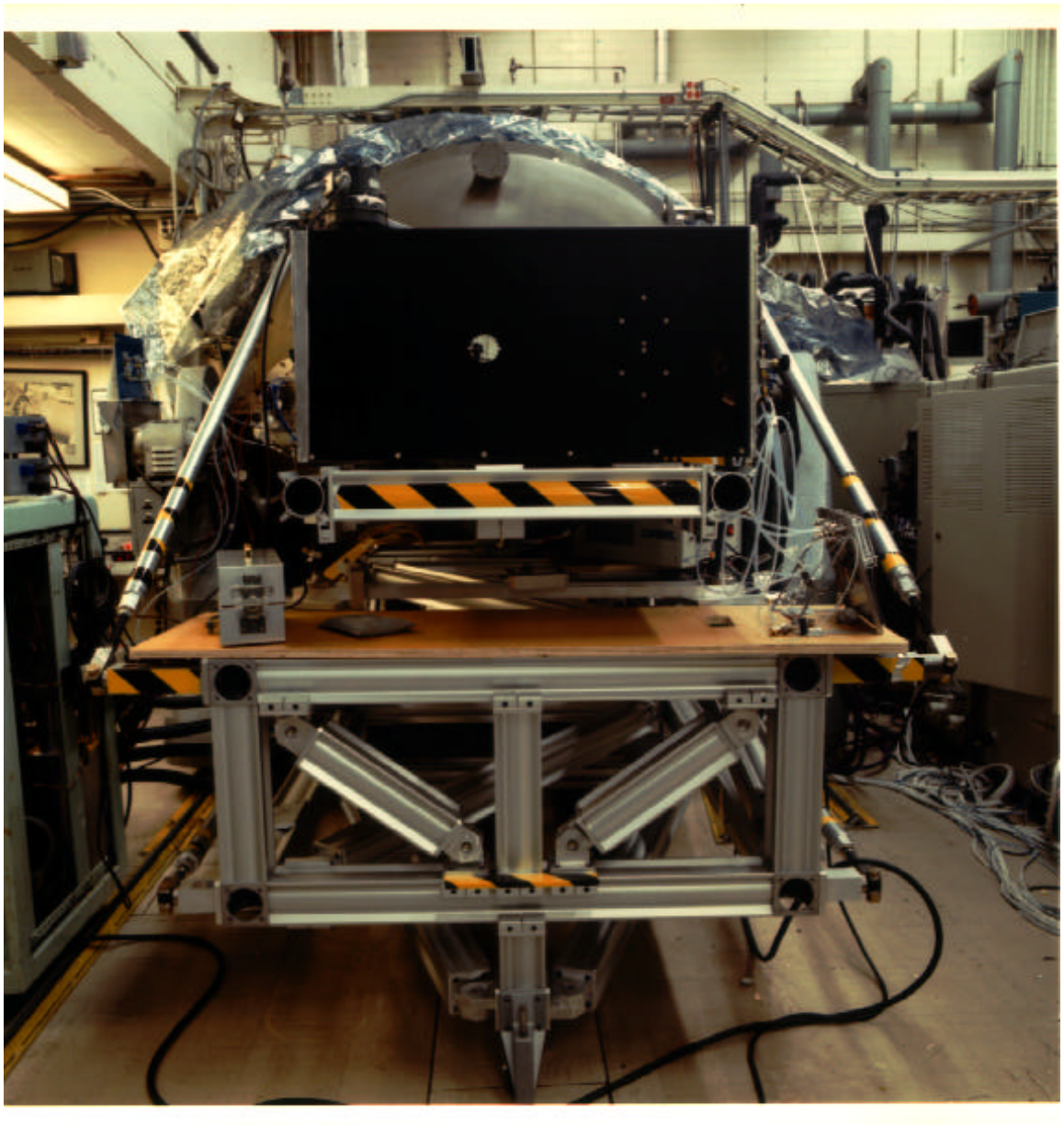

Figure 3.3-3 - UV Box (Aligned with Chamber)