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The Installation of Klaus at Mount Wilson in 1996 June

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Abstract

Roger New visited Mount Wilson from 1996 April 2 to April 14 and fixed a problem with the cell that began on 1996 January 8. Roger returned to Mount Wilson with Brek Miller on 1996 July 17 to install Klaus, the newest two-magnet spectrometer.

1 The First Trip

This report covers two trips to Mount Wilson made some time ago. I apologize for the delay in publishing this report, sometimes documentation takes a lower priority than it should. This report covers the installation of Klaus in Mount Wilson; another report, following this one, will contain more technical details of the new instrument.

The first of the two trips to Mount Wilson in 1996 was made by Roger New from April 2 to 14. At this point in time we had already planned on replacing *Mark III*, the old spectrometer from Haleakala, with *Klaus*, the newest two-magnet spectrometer. Unfortunately, a problem developed with *Mark III*. Perry Rose and Natasha Johnson tried in vain to locate the source of the bad data. As the good summer weather approached, Klaus was not yet ready for service and it was decided that Roger should visit the site.

Our problems began way back on 1996 January 8. The scattered sum was much too high while the ratio was too low. We had Perry and Natasha check the alignment, turn the oven power off and on, check all of the light guides for leaks, cover all of the holes on the backplate, and remove the transmission monitor. All with no luck. Finally, on April 2, Roger New arrived. He discovered that the cell was rotated about 20° in the oven. We still do not know how that could have happened.

2 The Second Trip

Klaus [1] was finally ready for action in July. Brek Miller and Roger New arrived on site on 1996 July 17. Roger stayed until July 30 before returning to Britain — Brek left Mount Wilson on August 4, continuing on to Carnarvon [2] and Narrabri [3] before returning to Britain.

2.1 The Optical Setup

The lens system performed pretty much as advertised in Darren's thesis [4], with an image of the front aperture on the IF and solar images on the lens before the magnet assembly and the quadrant. The beam passed through the ovens without splashing, but the front aperture images were not properly located within the cells; in the front assembly the beam diverged from an earlier focus inside the front pole piece; in the rear assembly the beam converged to a focus at the back of the pole gap. We made no attempt to change this. Moving the front assembly focus into the front cell would move the rear focus further away from the centre of that cell.

2.2 Collection Optics

In initial trials, very disappointing count rates were obtained on gain settings we expected to be useful.

Table 1: Initial Count Rates

Dark counts	260
Dark + Background	480
Dark + BG + Res. Scatt.	550

On inspection we found that apertures in the collection optics were too restrictive. Three-millimeter-diameter apertures were placed immediately against the exit face of the second lens (*i.e.*, the lens closest to the detector). We experimented with a range of apertures as close as possible to the detector. As the worst background scatter comes from the entry and exit faces of the cell we tried a range of rectangular apertures narrower in the dimension along the beam. Eventually we optimized at 3×8-mm apertures for the front detectors and 5×8 mm for the rear. These gave the results shown in Table 2.

We had difficulty getting material and tools to make satisfactory rectangular apertures. We ended up using four lengths of adhesive tape on the inside face of the detector box to provide the four straight edges of each aperture. ***The next time work is planned on the instrument, these should be replaced with something more solid.*** One possibility would be to make up new lids for each of the detector boxes with a frame on the inside into which different apertures can be slid.

Table 2: Detector Count Rates

Front	Dark counts	300
	Dark + Background	12,000
	Dark + BG + Res. Scatt.	85,000
Rear	Dark counts	300
	Dark + Background	8,000
	Dark + BG + Res. Scatt.	85,000

2.3 Burr Brown Op-Amp

We discovered that the Burr Brown OPA 2111 op-amp in one of the detectors had failed. We tried, but were unable to locate a replacement locally. Eventually I called Burr Brown directly. The person that I spoke to on the telephone was quite willing to send one to me; she asked, "Would you like to pay for this or do you want it as a free sample?" I have since learned that Burr Brown allows its customers $120 worth of free samples each year.

2.4 Marlow Industries Peltier Heat Pump

We also found that one of the Peltier-effect heat pumps had burned out. A replacement was purchased from Fry's electronics, but it was inferior quality and could not supply the necessary cooling. I contacted Marlow Industries directly and was able to order a replacement MI-1013 Peltier for $63.50 plus an additional $18.50 for overnight delivery to the mountain.

2.5 Internet Connection

During this trip, our computer (Birmingham 19) was connected to the Internet and we have been retrieving the data across the network ever since. Our computer's name is *bison.mtwilson.edu*, its IP address is 192.153.157.33, and its Ethernet address is `00:00:7B:10:17:32`.

2.6 Hard Disk

The hard disk in our computer in began to show the first signs of trouble while we were on site. We decided to replace it, though we could not find a hard disk as small as the original, so we had to settle for a 540-Mb one costing $139.

2.7 Settings

Some of the other adjustable parameters were optimized and left at the values shown in Table 3.

Table 3: Settings

Front Oven:	Top	110°C	Bottom	90°C
Rear Oven:	Top	105°C	Bottom	85°C
Interference filter: 33°C				
Input mirror micrometer settings:			RA 7.15	DEC 5.63

References

[1] BREK A. MILLER. All you (n)ever wanted to know about Klaus. *BISON Technical Report Series,* Number 107, High-Resolution Optical-Spectroscopy Group, Birmingham, United Kingdom, May 1999.

[2] BREK A. MILLER. A one-week visit to Carnarvon: 1996 August 7–15. *BISON Technical Report Series,* Number 53, High-Resolution Optical-Spectroscopy Group, Birmingham, United Kingdom, February 1997.

[3] BREK A. MILLER. Installation of a large-reservoir water-cooling system at Narrabri in 1996 August. *BISON Technical Report Series,* Number 54, High-Resolution Optical-Spectroscopy Group, Birmingham, United Kingdom, March 1997.

[4] DARREN J. LEWIS. *A Dual-Optical Resonance-Scattering-Spectrometer and the Probing of the Solar Atmosphere.* PhD thesis, University of Birmingham, 1996.