

**OAK RIDGE NATIONAL LABORATORY**

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**ORNL****FOREIGN TRIP REPORT**

ORNL/FTR-3491

**Date:** December 4, 1989  
**Subject:** Report of Foreign Travel of Glenn R. Young, Research Staff  
Member, Physics Division  
**To:** Alvin W. Trivelpiece  
**From:** Glenn R. Young

**PURPOSE**

Install trigger for WA80 experiment calibration runs in December 1989.

**SITES VISITED**

11/8-20/1989	CERN, Geneva, Switzerland	H.-A. Gustafsson H. H. Gutbrod
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**ABSTRACT**

The traveler spent two weeks at CERN working with H.-A. Gustafsson of Lund University on a reinstallation of the trigger for the WA80 experiment calibration runs in December 1989. Conversations about the experimental setup for the August 1990 heavy-ion run at CERN were had with other members of WA80 who were present. Finally, a meeting was held with Dr. Richard Sumner of Princeton/L3 about the readout boards for the L3 BGO photon calorimeter.

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## REPORT OF FOREIGN TRAVEL

CERN, Geneva, Switzerland  
November 8–20, 1989

The traveler spent two weeks at CERN collaborating with H.-A. Gustafsson on the reinstallation of the trigger for the ongoing WA80 experiment. The present electronics shack had been cleared temporarily in order to install new water-cooled racks for the WA80 readout electronics. The new racks were present upon the traveler's arrival at CERN, so the trigger needed for the December 1989 calibration runs could be installed. It was decided from the outset that the installation of the upgraded trigger would be deferred until early in 1990, since it requires use of equipment all of which had not arrived at CERN, nor which, in fact, had even been procured or constructed.

Three days were spent reviewing the trigger layout used in the 1987 and 1988 runs and discussing the various decisions taken in its construction. Fully detailed layouts were prepared, including a number of ancillary circuits required to synchronize to the SPS and lasers. Provisions were made for the new  $^{241}\text{Am}$ -stabilized PIN diode monitors for the laser systems and for the upgraded laser system for the midrapidity calorimeters, which is being prepared by A. Oskarsson of Lund. The next week was spent installing the trigger electronics, debugging them, changing the programs for loading programmable trigger units, and preparing a thorough documentation. This latter step was needed, since most of the original trigger-crew of WA80 are involved in other matters presently, meaning new persons have to be able to tune up and debug the trigger electronics.

Ongoing discussions were held during the week concerning the layout of the WA80 experiment for the summer 1990 run with  $E/A = 200\text{-GeV } ^{32}\text{S}$  ions. A new component will be 2500 elements of lead glass supplied by the Kurchatov group. That group and several members of Ole Hansen's group from BNL will be responsible for preparing this device, which will nearly triple the geometrical coverage of the present SAPHIR lead-glass array in WA80. This will markedly improve the acceptance of the experiment, in particular, for  $\pi^0$  and  $\eta$  mesons at low values of  $p_T/\text{mass}$ . This should allow a considerable improvement on the systematic and statistical errors associated with our search in WA80 for direct photon emission at low  $p_T$  in relativistic heavy-ion collisions. A second new component to be added will be an array of BGO elements, prepared by ORNL, Münster, and Lund. These offer an energy resolution 6 times better than lead glass, which should pay dividends of similar size in our ability to reconstruct  $\pi^0$  and  $\eta$  mesons at very low  $p_T$ .

It is agreed that the 1990 and 1991 runs of WA80 will concentrate on photon detection. It is agreed that sufficient data concerning multiplicity distributions, energy flow distributions, and target fragment distributions *per se* have been obtained, so that concentration on the more difficult goal of direct photon detection is in order. The experiment will, thus, be rearranged considerably to meet this goal. The Plastic Ball will be removed; the lead glass and BGO arrays will be moved to midrapidity; the multiplicity arrays will be redeployed as charged particle vetoes

for the photon detectors; and the Midrapidity Calorimeter will be moved to cover rapidities from midrapidity forward (and all azimuthal angles). The Zero-Degree Calorimeter (ZDC) will be retained for fast triggering and event classification. The ZDC is known to have suffered radiation damage over the past 4 years since its assembly at ORNL, due to the constant bombardment of the scintillator plates with beta and gamma radiation from the depleted-uranium plates in it. New scintillator plates for the ZDC will probably be required to correct this problem.

Discussions were also held concerning future plans for runs at CERN with lead beams in the period 4 to 5 years hence. Due to the very uncertain status of the lead-beam injector project at CERN and the unsettled discussions presently underway between NA35 and WA80, not much could be concluded from these discussions.

Finally, a visit was made to Richard Sumner of Princeton and the L3 experiment, who happened to be at CERN when the traveler was there. He designed and constructed the so-called "level-1 readout boards" for the L3 12000-element BGO photon calorimeter. These boards contain shaping amplifiers, a clever microprocessor-controlled ADC with 21-bit range and 12-bit resolution, and other needed electronics to interface to the preamplifiers used to read out the photodiodes viewing the L3 BGO crystals. This system is capable of providing the needed dynamic range and resolution to match the L3 BGO detector's capability of giving 1% resolution over a dynamic range of 200. Because we will employ a similar system for our BGO, we discussed the L3 solution extensively with Dr. Sumner. Copies of schematics were obtained, together with a promise to provide further information concerning the microprocessor code and board layout. This part of the trip was particularly fruitful and probably saved ORNL 10 to 12 man-months of electronic engineering work.

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Destination(s) and Dates for  
Which Trip Report Being Submitted: Geneva, Switzerland; 11/8-20/1989

Name of Traveler: Glenn R. Young

Joint Trip Report                      Yes

   X      No

If so, name of other traveler(s): \_\_\_\_\_

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