EXPERIMENTAL AREAS: SUMMARY OF ACTIVITIES

B.G. Pope, Princeton University
A.J. Stevens, BNL *

INTRODUCTION

NOTICE
This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Department of Energy, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

Participants in the Experimental Areas Group were conscious of a novel aspect of their work this year. The official start of the ISABELLE project, the formation of an in-house Experimental Areas Division, and a construction schedule already under way all encouraged the belief that this summer's activity had a special relevance and immediacy. It was realized that many of the recommendations of this working group would be embodied in the ISABELLE design. Consequently, much care was taken both in examining the suggestions of the previous Summer Studies and in retaining as much flexibility as possible so that areas can evolve to meet the changing demands of physics in the coming years.

Somewhat arbitrarily, participants were divided into two subgroups: a group to examine the large magnetic facilities and their impact on the design of the so-called facility halls, and a nonfacilities group that studied each of the other interaction regions. This latter group considered, in a time-ordered sequence dictated by the proposed construction schedule, topics associated with the wide-angle hall, open areas, and the small-angle hall. Although these divisions served to define the emphasis of the two subgroups, both sections also considered problems of a more general nature which are relevant, in principle, to all interaction regions. For example, the nonfacilities group discussed the needs for radiation shielding, different modes of beam dumping, requirements for interaction region vacuum chambers, etc., while the facilities group considered the effects of magnetic fields on the beams, the problem of access to central detectors, and the question of experiment mobility. We have grouped such topics under the vague heading General Considerations. We have also included, as Appendices, three BNL technical notes that relate directly to several of the topics studied and were used as source material in many of the discussion groups.

For orientation, Fig. 1 shows the location of the experimental halls as perceived at present.

We wish to thank all those who participated, whether full or part time, whether "workers" or "advisors," in what we believe was a successful and productive two weeks. An attempt to list their names has been made in Table 1.

GENERAL CONSIDERATIONS

The titles of the papers contributed to this section indicate both the wide range of topics and problems discussed and the inventiveness and ingenuity of the participants. We wish to draw attention to three specific problems associated with the utiliza-

Table 1
Participants and Advisors

Participants

S. Aronson, BNL
C. Baltay, Columbia
G. Bozoki, BNL
H. Brody, Univ. of Penn.
A. Carroll, BNL
M. Chen, MIT
I.H. Chiang, BNL
G. Danby, BNL
E. Engelmann, SUNY-SB
K. Foley, BNL
E. Fowler, Purdue
J. Herrera, BNL
H. Jöstlein, SUNY-SB
H. Kirk, BNL
P. Koehler, FNAL
R. Lanou, Brown
L.M. Lederman, Columbia
R. Louttit, BNL
M. Marx, BNL

R. McCarthy, SUNY-SB
M. Mishina, Tokyo Univ.
S. Myers, CERN
S. Ozaki, BNL
F. Paige, BNL
A. Prodell, BNL
A.L. Read, FNAL
L. Rosenson, MIT
S. Stein, SLAC
P. Steinberg, Maryland
M.J. Tannenbaum, Rockefeller
G. Tarnopolsky, ETH-Zurich
T.M. Taylor, CERN
A. Thorndike, BNL
P. Wanderer, BNL
S. White, Rockefeller
W.J. Willis, BNL
G. Yodh, Maryland

BNL Advisors

M. Barton
J. Claus
E. Courant
H. Foelsche
H. Hahn
H. Halama

P. Mohn
M. Month
E.P. Rohrer
J. Sanford
W. Walker
D.H. White

tion of experimental areas that do not appear at present to have been satisfactorily resolved.

1. There are no plans for air conditioning the experimental areas. Severe problems arising from condensation on equipment during the summer would be expected without some form of vapor barrier. Furthermore, provision must be made for dealing with the large amounts of heat that will be generated from electronics inside the halls.

2. Large amounts of shielding may be needed in the experimental halls to protect apparatus, especially during periods of beam scraping. Radiation problems become particularly acute during beam ejection, either controlled dumping or some sudden beam loss. It has been suggested that an ejection septum be positioned upstream of the wide-angle hall crossing point. Although such a location may be desirable from the point of view of the machine lattice, the reason for mentioning it here is to point out that it would certainly increase the problems of shielding in that hall. The precise details of the scheme will have to be studied care-

fully to determine whether the physics to be done in this location would be severely compromised.

3. No design currently exists for a "standard vacuum pipe" at the intersection regions. Such a pipe should be thin enough ($\sim 1\%$ of a radiation length?) to permit experiments without excessive multiple scattering or photon conversion. We urge strongly that design studies for such a pipe be initiated as soon as practicable.

NONFACILITY REGIONS

Discussion in the nonfacilities subgroup began with consideration of the wide-angle hall. Many of the topics under General Considerations, above, first arose in connection with this (6 o'clock) area.

The subgroup was guided by a report by Aronson et al.¹ which describes a recent study of a high $p_{\perp}$ experiment that might be appropriate for this area. Two features of this model experiment, the vertical bending that determines the floor height and the particle identification scheme, were reviewed and are discussed in contributions below.

A revised design for the wide-angle hall has been made as discussed in detail below. The most important features of this new design are that a large (but cheap!) staging area has been added, which should greatly facilitate experiment assembly and repair, and that the beam enclosure be partially composed of movable shielding blocks.

The open-areas subcommittee reviewed the scope of open areas as outlined in the Title I report.² Specifically, the subcommittee (1) made recommendations for the initial phase of construction, (2) examined various "nook-and-cranny" experiments which might be located in these areas during the initial operation of ISABELLE, and (3) discussed possible longer-term scenarios for future development of these areas.

The subcommittee made recommendations consonant with making these areas as open as possible in the sense of preserving future options. They recommended a hardstand dimension of ± 40 m in the beam direction, with the future possibility in mind of having a crossing point to Q1 distance > 30 m and reserving areas that may well be appropriate for intermediate-angle physics. A recommended difference in beam height-to-floor elevations ($\sim 14'$ at 4 o'clock and $\sim 7'$ at 12 o'clock) allows the possibility of "large" initial experiments at 4 o'clock while retaining convenience for "small" experiments at 12 o'clock.

The small-angle subcommittee was guided by (1) a recent report⁴ detailing the design of a possible single-particle production experiment at x_F which would reside in a stub adjacent to the small-angle hall, (2) the Title I report,² which does not include such a stub, and (3) a previous review of several experiments that might be appropriate for the hall proper.

The subcommittee strongly agreed with the concept of including the stub in the initial construction and pointed out that the end of such a stub would provide an excellent location for testing detectors at 400 GeV. The subcommittee further suggested a simpler design for the hall-stub combination and reviewed the adequacy of this design for a variety of experiments previously suggested for this area.

LARGE MAGNETIC FACILITIES

Discussion in this section centered on comparison of the three configurations of magnetic field: a solenoid, a dipole, and a toroid. Elements of the discussion were the particular physics for which each type of magnet was best suited, the effect of the magnetic field on the beams, the optimum size and strength of the field (here, the idealized "physics" view was tempered by more realistic technical discussions of cost and feasibility), and the problems of access to and mobility of the detector. Since the physical characteristics of large magnetic facilities are expected to dominate the configuration of experimental halls, discussions at this stage were centered on general aspects rather than specifics. In this, the subgroup was guided by several talks on existing or proposed large facilities.⁵⁻⁷ Some illustrative advantages of each configuration are shown below.

Solenoid	(1) good azimuthal acceptance (2) good transverse momentum measurement (3) small magnetic field on the beams
Dipole	(1) good rapidity acceptance (2) good energy measurement (3) easy (relative to solenoid) access
Toroid	(1) magnetic field perpendicular to particle trajectory (2) no field acts on the beams (3) no iron return yoke

The contributions below elaborate on these various characteristics and draw broad conclusions as to their requirements for the experimental areas.

REFERENCES

1. S. Aronson et al., Appendix EA-I in this volume.
2. ISABELLE Conventional Facilities Design, Final Report, Title I (March 1, 1978).
3. A.M. Thorndike, Appendix AE-II in this volume.
4. S. Aronson et al., Appendix EA-III in this volume.
5. W.J. Willis, Review of Axial Field Magnet, CERN ISR Experiment R807.
6. M.J. Tannenbaum, Review of CCOR Solenoid, CERN ISR Experiment R108.
7. B. Sadoulet, Review of pp Dipole Facility, CERN SPS Experiment UA1.