Final Report
DOE Grant DE-FG02-91ER-40609

Jack Sandweiss

March 19, 2003

Our grant, DE-FG02-91ER-40562, supported our research at Yale in high energy nuclear physics. This is a continuing research program and continues to be supported under grant DE-FG02-91ER-40609. The reason for this change was to coordinate the support of all nuclear physics at Yale under a single grant with the different programs as distinct tasks. There was no discontinuity in our support and none in the operation of the research program.

This report then summarizes the work which was done before the change in grant.

There were two principal activities carried out under this grant. The first, was our research program to search for strange quark matter produced in high energy heavy ion collisions using the Au beam (at 11.5 GeV per nucleon) at the Alternating Gradient Accelerator (AGS) at Brookhaven National Laboratory (BNL). This search began with our group joining Experiment 814 at the AGS. After several years we had carried out the search at the limits that were reachable with E-814. We then designed and proposed a dedicated experiment (E-864), which could carry out the search at much higher sensitivity and also perform a number of measurements that were important more generally for high energy heavy ion physics.

The experiment was approved by the BNL program committee and supported by the Department of Energy. It was constructed and operated in a successful manner. No strangelets were discovered but the best limits yet achieved on their production were determined. In addition very considerable data were obtained on the coalescence yields of a range of nuclear species from Deuterium to Berylium. These measurements, which spaned a yield range of 10 orders of magnitude, gave strong support to the statistical thermodynamic picture of high energy heavy ion reactions. The experiment also measured a number of other processes important for the field and a total of 16 Ph.D. theses were written based on E-864 data.

It is also interesting to note that some of the equipment designed and produced for E-864 (the hadronic calorimeter modules) are currently being used in the PHENIX experiment at the Relativistic Heavy Ion Collider (RHIC) at BNL.

Following our work in E-864, our group joined the STAR collaboration at RHIC and have been active in that program. We began the analysis of hadronic resonant states produced in RHIC collisions and that has become a major element in the RHIC physics program. It is interesting to note that it is being led by physicists who received their Ph.D. at Yale and elsewhere on the E-864 experiment.

The conversion to the new grant number happened shortly after the beginning of our RHIC research began. The program is continuing, in many interesting directions, under the new grant.

I do not provide here a detailed list of the research results obtained and the many papers published because they are all contained in the yearly reports which were submitted to the DOE. The present report is intended to convey a broad brush overview of the work carried out with the support provided by the grant. Obviously, further detail can be supplied if desired.

Form Approved
OMB No. 1902-0121

PATENT CERTIFICATION

Yale University
Awardee

☐ Interim Certification

DE-FG02-90ER40562
DOE Prime and/or Subcontract Nos.

☒ Final Certification

Awardee hereby certifies unless indicated to the contrary, that:

1. All procedures for identifying and disclosing subject inventions as required by the patent clause of the contract have been followed throughout the reporting period.

2. There were no subcontracts or purchase orders involving research, development, and demonstration except as follows: (a separate certification must be provided to DOE for each subcontract or purchase order awarded.)

3. No inventions or discoveries were made or conceived in the course of or under this contract other than the following (Certification includes ☒, does not include ☐ all subcontracts):

TITLE	INVENTOR	DATE REPORTED	DOE "S" NO.*
NONE			

4. The completion date of this contract is as follows:

5. The following period is covered by this certification:

April 1, 1990 (Month Day Year) to April 30, 2001 (Month Day Year)

Yale University
Contractor

Signature

Physics Department
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Address

Professor
Title

New Haven, CT 06520-8121

March 19, 2003
Date of Certification

* Also include Subcontract No. if available.

NOTE: A positive certification for this Item 3 does not negate the requirement for furnishing to DOE a fully executed Patent Certification from each subawardee identified in Item 2.