ОБЪЕДИНЕННЫЙ ИНСТИТУТ ЯДЕРНЫХ ИССЛЕДОВАНИЙ
Лаборатория высоких энергий

Р А С П О Р Я Ж Е Н И Е

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г. Дубна

Для подготовки сборника "Эксперименты и проекты Лаборатории высоких энергий Объединенного института ядерных исследований "

П Р И К А З Ы В А Ю :

1. Образовать редакционный совет в следующем составе:
   - Балдин А.М. - председатель ред. совета
   - Пенев В.Н. - зам. председателя
   - Коваленко А.Д.
   - Шелаев И.А.
   - Глаголев В.В.
   - Лукстиньш Ю. - ученый секретарь
   - Плеханов Е.Б. - ученый секретарь
   - Гоголева С.В. - технический секретарь

Просмотрел и написал введение.

2. В срок до 25.06.99 всем начальникам подразделений и руководителям тем (проектов) представить ученым секретарям сборника информацию об экспериментах и проектах, в которых принимают или будут принимать участие сотрудники ЛВЭ (образец прилагается).

3. Назначить ответственными за подготовку и выпуск сборника "Эксперименты и проекты Лаборатории высоких энергий Объединенного института ядерных исследований " Лукстиньш Ю. и Плеханова Е.Б.

Директор Лаборатории
Высоких энергий ОИЯИ **А.И. Малахов**

Е.Плеханов

JINR–LHE–1010–3, JINR–LPP (WA98-Project)

•Date approved: 1992 •Date started: 1993 •Date completed: 1998

•Accelerator: CERN SPS

•Detector: WA98 setup with photon and hadron calorimeters, photon and charged particles multiplicity detectors and time-of-flight particles identification system

LARGE ACCEPTANCE HADRON AND PHOTON SPECTROMETER

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(8) University of Tennessee, Knoxville, USA
(9) CERN, Geneva, Switzerland
(10) University of Utrecht, Utrecht, Netherlands
(11) University of Geneva, Geneva, Switzerland
(12) University of Jammu, India
(13) Punjab University, Chandigarh, India
(14) University of Rajasthan, Jaipur, India
(15) VECC Calcutta, India
(16) Institute of Physics, Bhubaneswar, India
(17) Institute of Nuclear Studies, Warsaw, Poland
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The physics goal of WA98 is to investigate nuclear matter under extreme conditions i.e. quark-gluon plasma formation. WA98 emphasises on high precision, simultaneous measurement of both photons and hadrons by combining high graularity photon detection with multiplisity measurement and tracking for hadrons over a large acceptance.

The aim of the experiment is the high statistics study of photons, neutral hadrons and charged particles, and their correlations in Pb-Pb collisions to observe and correlate different of QGP formation in several classes of events.

WA98 is a dedicated heavy-ion detector designed to exploit the physics potential of nucleus-nucleus interactions at SPS. The WA98 Collaboration presently consists of about 160 physicists from 19 institutions and 10 countries. JINR responsibiities concentrated in the following WA98 detector subsistems: full responsibility on the design and construction of the Zero Degree Calorimeter (ZDC), TOF system based on scintillation counters, Charged Particles Veto Detector based on streamer tubes, and the mechanical structure of the Lead Glass Calorimeter stand. JINR physicists participate also in the data analysis.

Main results in 1992–1997

1. 35 channels radiation hard ZDC was developed, constructed and included in WA98 setup. Energy dependence of the calorimeter resolution in tne energy region 40 GeV through 32.8 TeV is equal to $(47.6 \pm 1.1)\%/\sqrt{E[GeV]} + (1.94 \pm 0.20)\%$. Measured value of the e/h ratio equals to 1.02 ± 0.01.
2. The TOF system based on scintillation counters was developed, constructed and included in WA98 setup. The TOF system consists of 480 plastic scintillators with the PMTs fixed

at both ends of scintillators. Fullsize of the TOF wall is $4 \times 2m^2$. The time resolution of the system is $\sigma = 100$ ps.

3. Two planes of plastic streamer tubes operated in proportional mode for Charged Particles Veto Detector were developed, constructed and included in WA98 setup. The efficiency of the detector is close to 100%.
4. Two Pb-beam runs and two hadron runs for a data taking took place.
5. The detector dependent data analysis of ZDC and TOF was made on the raw data to make DST's.
6. The data analysis on the energy flow measurements and inclusive particle spectra started.

The Research Programme The research programme of the experiment is as follows:

1. via hadronic signals:
   (a) to measure the nuclear stopping power by the baryon content at mid-rapidity and to study the reaction mechanism by detecting protons over a region of rapidity $-1.6 \leq y \leq 2.6$
   (b) to study the degree of thermalization and of chemical equilibrium by comparing the ratio of cross sections and the momentum distribution of well identified particles like $\pi^+, \pi^-, K^+, K^-, p, \overline{p}, d, \overline{d}$
   (c) to measure source sizes via two-pion correlations and two-kaon correlations as function of the moomentum of the pair $(p_\perp \leq 1)$GeV/c down to $\Delta Q = 2$ MeV
   (d) to determine the charged particle multiplicity and pseudorapidity density distribution and related fluctuations
2. via electromagnetic signals:
   (a) to carry out high precision measurements on the production of π^0's and η^0's with transverse momenta of 0.7 GeV/c up to 4.5 GeV/c for π^0's
   (b) to search for a photon enrichment in each event or in an event class by measuring the photon multiplicity in the forward hemisphere and comparing it with the multiplicity of the charged particles
   (c) to determine the thermal and direct photon production with an accuracy of $\sigma(\gamma/\pi^0) \leq 0.06$ and $N_\gamma/N_{ch} \leq 0.05$ for the momentum range of 0.7 to 4.5 GeV/c
3. to measure the global events characterisitcs:
   (a) the number of participants and thus impact parameter via the forward energy flow measurement and the charge measurement of the projectile spectators, as well as the energy flow in the target rapidity region
   (b) the energy density by beasuring the electromagnetic energy flow and the hadronic energy flow
   (c) the entropy density derived from the charged particle density as function of pseudorapidity and scaled with the number of participants.

Journal papers: NIM A 360 (1995) 593; JINR Rapid Communications 2[70]-95 (1995) 15; NP A 610 (1996) 200; NIM A 376 (1996) 368; JINR Rapid Communications 1[75]-96 (1996) 103; JINR Rapid Communications 5[79]-96 (1996) 15; JINR Rapid Communications 2[82]-97 (1997) 23; PL B 420 (1998) 169

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WA98 Experimental Setup
158 A GeV Pb+Pb Collisions at the CERN SPS (1996)