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PC38 Test System for the Front-end Electronics of the SLD Calorimeter, M. Turcotte, Physics Department, University of Victoria, D. Morris and B. Evans, TRIUMF, Vancouver, B.C., and R.J. Sobie, Physics Department, University of British Columbia, Vancouver, B.C.

The SLD is a large detector to be used at the Stanford Linear Collider facility to study e^+e^- annihilations at $\sqrt{s}$ = 100 GeV. Electromagnetic and hadronic showers initiated by particles associated with the decay of Z^0 will be detected by a finely segmented lead/liquid-argon calorimeter. Each of the 40,000 calorimeter towers is connected to front-end electronics which amplifies and shapes the signal as well as serializing the analog output. On-board self-calibration ensures that the channel-to channel calibration is approximately 0.25%. Forty-eight channels are grouped together into a single board. A stand-alone VME based driver system using a custom-made controller and commercial modules was built to test the functionality of these boards. All functions are exercised and quality control is automatically performed by code running on a PC-AT computer. Details of the system as well as results are presented.

PC39 Thin Plastic Scintillator Detector Used as a Time Zero Detector or Flux Monitor. A. GALINDO-URIBARRI AND T.E. DRAKE, University of Toronto with G.C. BALL, J.S. FORSTER, D. HORN, E. HAGBERG and C. PRUNEAU, Chalk River Nuclear Laboratories. - A time zero detector and beam flux monitor to be used with intermediate energy heavy ions has been developed. It is based on a self-supporting thin film of plastic scintillator placed at one focus of a high-quality ellipsoidal mirror. The light emitted is concentrated on the photocathode of a photomultiplier tube situated at the other focus. This detector system has excellent energy resolution, timing characteristics and very low threshold of detection (subnanosecond resolution was obtained with protons that deposit 50 keV on the film). The performance with respect to light output, time resolution and detection efficiency was studied for various transiting ions. We compare its performance with detectors based on secondary electron emission.

PC40 Ion Beam Emission of X-Rays(IBEX). X.-L. Zhao, M-J. Nadeau, M.A. Garwan, L.R. Kilius, and A.E. Litherland, Isotrace Laboratory, University of Toronto, Toronto, Canada – The characteristic K and L X-rays from excited heavy ion beam can, in principle, be used for ion identification. This could be useful for isobar identification in accelerator mass spectrometry [1]. It should also prove to be useful for ion counting, as it will bridge the gap between the detection of pA ion currents and individual ions. With a small Si(Li) detector we have observed the well resolved L X-rays from iodine and niobium ions by passing the ions through a thin aluminized foil or a 100 $\mu g/cm^2$ carbon foil. As for the first identification of ions in this mode, the mass-189 peak from a copper sample was confirmed to be $^{63}Cu_3^-$ ions by the observation of copper K X-rays. The X-rays fron sulphur and chlorine beams were readily separated. Further experiments will be carried out to optimized the efficiency, which is only $\sim 10^{-6}$ for iodine at present.

1. A.E. Litherland, Phil. Trans. R. Soc. Lond. **A323** 5-21 (1987)

PC41 A Future for Positron Polarimetry. D. Paul and K. Lee, University of Toronto – Polarimeters of the Gerber (or University of Michigan) type have now brought into reality longitudinal polarization measurements on-line having a precision about 0.4 %, and which could do better than this in long runs. However, the present polarimeters in Princeton and Louvain have serious limitations which are instrumental and are partly due to the use of MgO powder as the medium for positronium formation. We shall report on the quasi ideal polarimeter, that is, the best that is theoretically possible using the positronium formation method as the basis for polarimetry; and we shall describe the closest approximation to the ideal that might be realised experimentally. We conclude that a factor of about six improvement in statistical error might be achieved for a given number of particles entering the polarimeter.

9:30
EE1 Experimental Search for the Cerenkov Line Emission From Relativistic Electrons in Dense Gases. Y.H. YEO, J.S.C. MCKEE, G.R. SMITH, U. of Manitoba - It has recently been suggested that the existence of a new line radiation mechanism, namely Cerenkov line emission, may have potential significance for high energy astrophysics. In particular, the observed characteristics of emission lines from quasars such as anomalous intensity ratios, asymmetric profiles, large line widths and unexpected large red shifts, may be explainable in terms of such a mechanism. The effect was first predicted by J.H. You and F.H. Cheng in 1980 and Cerenkov line-like emissions from O_2, Br_2 and Na vapor may have been observed using a ^{90}Sr β-ray source ($E_{max} \sim 2.2MeV$) by Xu et al. at the University of Science and Technology of China. A recent paper, however, underlines the need for detailed additional study of this effect which, it is suggested, is as yet unconfirmed. It is our intention to remedy the situation by means of an experiment to be carried out shortly at SAL. Both theory and experiment will be described.

9:45
EE2 The Effect of the Planck's Radiation Field on Elastic Scattering of Electrons, H. Zaleski, Department of Physics, University of Alberta - The process of scattering of electrons by a static potential results in energy loss due to bremsstrahlung radiation. In the presence of an external radiation field stimulated bremsstrahlung processes have to be included. A method for calculation of the scattering cross section in the presence of a Planck's field is presented. Calculations for a model case show that the resultant cross section has a Lorentzian shape with a finite value at $\delta E = 0$.

10:00
EE3 Relativistic Effects in Atomic Cesium and Francium: Numerical Results. R.A. MOORE and T.C. SCOTT, (GWP²) Waterloo Campus, U. of Waterloo - Effective one-particle Dirac equations are obtained for the valence and excited states of Cesium and Francium atoms using previous procedures[1] developed for the alkali-atom sequence. Exchange effects are included by a partial Hartee-Fock calculation and correlation effects by core polarization. Numerical solutions are obtained using a perturbation scheme[2] developed earlier for the Dirac equation and numerical methods[3] found to be applicable to the hydrogen atom case. The results are expressed as power series in the fine structure constant. Numerical values will be presented for eigenvalues, spin-orbit splittings, hyperfine splittings and electric-dipole oscillator strengths. Convergence, is generally good in all cases.

[1] Moore R.A., Reid J.D., Hyde W.T. and Liu C.F., J. Phys.B (At.Mol.Phys.)14, 9 (1981)
[2] Moore R.A., Can.J. Phys. 59, 1240,1247,1251 (1975)
[3] Moore R.A. and Scott T.C., Can. J. Phys. 64, 297 (1986)

10:15
EE4 Negative Ions For Some Group IIa Elements. M.A. Garwan, L.R. Kilius, A.E. Litherland, M-J. Nadeau, J.C. Rucklidge, and X-L. Zhao. IsoTrace Laboratory, University of Toronto, Toronto, Canada.- Negative ions of the alkaline elements were not expected to be stable until the recent theoretical prediction that isolated Ca^- should have a binding energy of 45 milli-electron volts. This was followed by the experimental confirmation by a group at the University of Tennessee. More recent calculations by Vosko and co-workers at the University of Toronto provided strong theoretical grounds for the Sr^-, Ba^-, and Ra^- to be stable. These studies motivated the experimental search at the IsoTrace Laboratory for those and other stable negative ions. Using the new IsoTrace heavy ion analysis system, evidence is presented for the existence of Sr^- and Ba^- created by cesium ion sputtering of pure elements. Accelerator mass spectrometric techniques were used to resolve the newly observed elemental negative ions from the interfering molecular species. The details of these measurements and their implications for the detection of other negative ions will be presented.

10:30
EE5 Laser spectroscopy of the $GO_u^- \leftarrow AO_g^-$ transition in the $(Hg^{202})_2$ excimer.* J. SUPRONOWICZ, W. KEDZIERSKI, J.B. ATKINSON, and L. KRAUSE, Dept. of Physics. U. of Windsor. and OLLRC.--The $GO_u^- \leftarrow AO_g^-$ excitation spectrum of monoisotopic $(Hg^{202})_2$ molecules was investigated using pump and probe methods of laser spectroscopy. A more complex structure was recorded than with natural mercury[1], which is ascribed to transitions between rotational levels. An analysis of the spectrum yielded accurate values of the vibrational frequency and anharmonicity for the GO_u^- state. A partial resolution of the rotational components in the spectrum was also carried out, leading to a value for $B_v' - B_v''$, the difference of the upper- and lower-state rotational constants.

[1] J. Supronowicz, R.J. Niefer, J.B. Atkinson, and L. Krause, J. Phys. B 19, L717 (1986).

10:45
EE6 Laser-induced fluorescence from high-lying states of the HgZn excimer.* E. HEGAZI, J. SUPRONOWICZ, J.B. ATKINSON, and L. KRAUSE, Dept. of Physics. U. of Windsor. and O.L.L.R.C.--Pump and probe methods of laser spectroscopy with time resolution were used to excite fluorescence from high-lying spin-orbit states of the HgZn excimer. Several new fluorescence and excitation spectra due to bound-bound transitions were recorded, and analyses of their vibrational structures yielded the respective vibrational frequencies as well as the relative $v = 0$ energies which are compared with the values derived from the PE diagram.

11:00
EE7 Induced Infrared Spectra of Double Transitions of H_2 and D_2*. C T. W. HSIEH and S. PADDI REDDY, Memorial U. of Newfoundland - Collision-induced infrared absorption spectra of the double transitions of H_2 ($v = 0 \to 1$) and D_2 ($v = 0 \to 1$) were observed for the first time in the spectral region 7000 - 8000 cm^{-1}. The spectra were recorded with a 2 m absorption cell for total gas densities up to 550 amagat with partial gas density ratio of 1:1 of H_2 and D_2 at 77 K. The observed spectra are interpreted in terms of the following transitions:
$Q_1(1,0)$ of H_2 + $Q_1(2,1,0)$ of D_2,
$Q_1(1,0)$ of H_2 + $S_1(0)$ of D_2,
$Q_1(1,0)$ of H_2 + $S_1(1)$ of D_2,
$S_1(0)$ of H_2 + $Q_1(2,1,0)$ of D_2, and
$S_1(1)$ of H_2 + $Q_1(2,1,0)$ of D_2.
Further experiments at 201 K are in progress. Profile analysis of the absorption profiles is also in progress. The results of this work including the absorption coefficients, line-shape parameters etc. will be presented.

MONDAY, JUNE 26, 1989
ROOM: MacN 105
Chairman: E.D. Earle

13:30
BD1 π^+p Integrated Cross Sections at Low Energies.
E. FRIEDMAN, A. GOLDRING, Hebrew U., Jerusalem, Israel,
G.J. WAGNER U. Tübingen, Germany, A. ALTMAN, Soreq
Nuclear Res. Centre, Yavne, Israel, R.R. JOHNSON,
O. MEIRAV, M. HANNA, U. British Columbia,
B.K. JENNINGS, TRIUMF — Recent measurements of the π-N
differential cross sections at energies below 100 MeV
disagree with the existing phase shift analyses. In
the present experiment, the integral of the π^+p
scattering angular distribution was measured directly
over an angular range of 20 - 180° (lab.) at 7 pion
energies between 51.5 and 125.9 MeV. Overall
uncertainties of less than 5% were achieved by using
the transmission method for a pair of C and CH_2 targets
and by avoiding any Coulomb corrections or
extrapolations to zero solid angle. Our results are in
very good agreement with the integrated values
predicted by the existing phase shift sets.

13:45
BD2   Three-Proton Coincidences Following Pion
Absorption in ^{4}He. P. WEBER, J. MCALISTER,
R. OLSZEWSKI, A. FELTHAM, R.R. JOHNSON, M. PAVAN,
C. PONTING, M. SEVIOR, V. SOSSI, D VETTERLI, U. British
Columbia, D. OTTEWELL, G. SHEFFER, G.R. SMITH, TRIUMF,
G.J. LOLOS, Z. PAPANDREOU, D. HUMPHREY, U. Regina,
R. TACIK, U. Karlsruhe — Three proton coincidences
following $T_{\pi+}$=165 MeV absorption in ^{4}He have been
measured in a kinematically complete manner
kinematically complete in four detectors for various
counter configurations. Energy spectra and angular
correlations of the detected protons as well as the
spectator momentum distribution of the undetected
neutron are compared with detailed Monte Carlo
calculations modelling three-body and four-body phase
space. The results provide strong evidence that most
of the three proton coincidences result from three
nucleon absorption. An estimate will be given for the
integrated three nucleon absorption cross section σ^{3N}
based on the phase space calculations. The result will
be compared to the total absorption cross section in
^{4}He which allows conclusions about the relative
importance of absorption processes involving more than
two nucleons.

14:00
BD3   Manganese-55 and Solar Neutrino Detection using AMS.
M-J. Nadeau, M.A. Garwan, L.R. Kilius, A.E. Litherland and
X-L. Zhao, Isotrace Laboratory, University of Toronto, Toronto,
Canada — The complete separation of isobars by negative ion
formation using Accelerator Mass Spectrometry (AMS) has rev-
olutionarized the detection of some rare long lived radioactive
isotopes. As part of a study of negative ion stability, we have
recently shown that Mn , in contradiction to some recent calcu-
lations, does not produce detectable negative ions. We propose
here to use ^{55}Mn→^{55}Fe (half-life = 2a) as a neutrino detector.
The use of other elements will be discussed.

14:15
BD4   Positron Polarization from the Decay of ^{25}Al relative
to ^{26}Al^m, and from ^{26}Al^m relative to ^{30}P. M. Skalsey and A.
Rich, University of Michigan, K. Lee, D.W. Holdsworth and D.
Paul, University of Toronto — An experimental comparison has
been made for two pairs of isotopes using a polarimeter of the
Gerber type, on-line at the Princeton Cyclotron. No difference
in longitudinal polarization was found in a preliminary anal-
ysis of the ^{25}Al/^{26}Al^m data, at a level of precision of 0.48%,
at which results are consistent with the standard electroweak
interaction model. The data analysis will be further reported,
both for the ^{25}Al/^{26}Al^m comparison, and for the ^{26}Al^m/^{30}P
comparison.

14:30
BD5   Polarization Transfer in Inelastic Proton Scattering from ^{16}O
B. LARSON[§], O. HÄUSSER[§,†], D. FREKERS[†], R. JEPPESEN[¶]
R. ABEGG[†], W. ALFORD[‡] A. CELLER[‡], R. HELMER[†] K. HICKS[§],
R. HENDERSON[†,§§] K.P. JACKSON[†]. J. MILDENBERGER[§] C. OLMER[††]
C. MILLER[†], B. POINTON[§], R. SCHUBANK[‡‡], M. VETTERLI[§,†]. S.
YEN[†]
We have measured cross sections, analyzing powers, and the spin observables
P, D_{ss} and $D_{sl'}$ for the reaction ^{16}O(p, p') at 350 MeV populating three 4−
states. These 'stretched' states, at excitation energies of 17.79 MeV, 19.80
MeV (both mainly $T = 0$) and 18.98 MeV (mainly $T = 1$), have very well
known nuclear structure and are used as a nuclear filter to examine the tensor
and spin-orbit components of the effective nucleon-nucleus interaction at 350
MeV. The data set provides, as a byproduct, accurate information on the q-
dependence of complete spin observables for 'background' continuum states at
$\omega = 17 - 22$ MeV which are of high current interest for models of quasielastic
scattering. To complete the experiment, measurement of the spin observables
D_{nn}, D_{ls}, and $D_{ll'}$ are planned.
§ Simon Fraser U. †TRIUMF ‡ U. of Western Ontario ¶ LAMPF ††
IUCF ‡‡ U. of Saskatchewan §§ U. of Melbourne $ Ohio U.

14:45
BD6   Spin-Orbital Interference in ^{20}Ne
B. POINTON[§], O. HÄUSSER[§,†], R. HENDERSON[†,‡], A. CELLER[¶,§],
R. HELMER[¶], K. HICKS[†], K.P. JACKSON[†], R. JEPPESEN[†,§], S. YEN[†],
B. LARSON[§], J. MILDENBERGER[§], A. TRUDEL[†,§], M. VETTERLI[§,†]
—The Gamow–Teller strength distribution in ^{20}Ne has been determined from
the ^{20}Ne(n, p)^{20}F cross–sections at five angles from 0° to 15°. A multipole
decomposition was done to extract the L=0, L=1, and L=2 contributions to
the cross–sections. The $B(GT)$ is directly proportional to the cross–section of
the L=0 contribution extrapolated to q=0. The comparison of the resulting
$B(GT)$ with the $B(M1)$ found by photon and electron scattering shows the
importance of the spin–orbital interference. The $B(M1)$ is enhanced by a fac-
tor of four in the 11.2 MeV, 1+ state in ^{20}Ne. The results are also contrasted
with recent (p,p') measurements and indicate a large difference in measured
strength for the 13.5 MeV, 1+ state in ^{20}Ne. The $B(GT)$ is compared with
that predicted by recent large basis shell model calculations using the free
nucleon operator. The difference between the measured and calculated val-
ues of the total $B(GT)$ may give direct evidence for meson exchange currents
in nuclei once the systematics of the spin–orbital interference is determined
across the full (sd) shell. Such a program is being undertaken at TRIUMF.

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