COMITATO NAZIONALE PER L'ENERGIA NUCLEARE
Laboratori Nazionali di Frascati

LNF-74/7(R)
11 Febbraio 1974

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COMPARATIVE STUDY OF HADRON FRAGMENTATION WITH THE SPS. -

ABSTRACT. -

We propose a comparative study of inelastic hadron production at the SPS, by means of a single multiparticle spectrometer. While only a preliminary description of the detectors is contained in this document, the general phylosophy of the measurement and the procedure with which we plan to collect and to handle the information are discussed in detail.

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1. - INTRODUCTION. -

The recent ISR results on inclusive and semi-inclusive distributions in proton-proton inelastic interactions at high energy have offered a new, powerfull approach to the study of the dinamics of proton-proton collisions. In the single particle rapidity distribution a central region and two scaling "fragmentation cones", centered around the primary protons, have been shown to present different properties. In particular, the different scaling features of these regions lead us naturally to expect that the features of the fragmentation cones will provide informations on the parent particle structure, while the study of the production in the central region can enlight the behaviour of very hot hadronic matter.

The inclusive studies have evidentiated very important dynamical phenomena, as the large cross section for diffractive excitation of the primary particles$^{(1)}$ and the existence of important short range two-body correlations$^{(2)}$. However, it is by now quite clear that the inclusive distributions alone are not sufficient to provide unambiguous explanations of these new phenomena. A powerful tool for disentangling the different production mechanisms is the study of seminclusive channels, such as single or two--particle spectra inside events of given topology. For instance the signature for diffractive events is made much clearer if we require the quasi-elastic particle in the forward (backward) direction, to be separated by a large rapidity gap from the remaining particles. Also the dynamical meaning of two-body correlations is much clearer if the correlation function is studied inside samples of events of fixed multiplicity$^{(3)}$.

We would like to further this line of research at the SPS by means of a comparative study of the main features of hadronic production in the projectile fragmentation cone and in the pionization region as induced by different projectiles interacting with protons and nuclei. The experiment should cover the energy range between about 100 GeV/c and the maximum energy that will be available for SPS secondary beams.

The planned detector is a simple multiparticle spectrometer, characterized by a nearby 4π coverage and by the simultaneous detection of charged particles and photons. It is designed to provide momentum resolution sufficient to reveal the features of the inelastic events in the seminclusive approach mentioned above. The direction, the sign of the charge and the momentum of all charged particles produced in the projecticle fragmentation cone and in a part of the pionization region are measured by means of a forward spectrometer. A vertex detector, consisting of a magnet and of a set of chambers, provides informations on emission angle and momentum of charged particles produced in the target fragmentation region and in the remaining part of the pionization region. Photons emitted in a forward cone of half-aperture $\sim 30^{o}$ around the beam direction are detected and their energy and direction are measured with adeguate resolution.

No particle identification is planned in this experiment. We are convinced that the detailed knowledge of the nature of the detected particles is not essential for the proposed study of multibody production and that, on the other hand, this lack of information is largely compensated by the simplicity of the detector allowed by the absence of large Cerenkov counters.

A completely inclusive trigger, will be used to collect an unbiased sample of events for the study of multiparticle production, induced by different projectiles on hydrogen and on complex nuclei, e. g. properties of the diffractive component and correlations. More and more exclusive triggers can be built with the proposed set-up and can be used as their interest will arise. At present we foresee a selective study of the diffractive hadron excitation and of the elastic component at large momentum transfers.

2. - FORWARD SPECTROMETER. -

The general layout of the experiment, which includes both the forward spectrometer and the vertex detector, is shown in Fig. 1. The forward spectrometer has been designed bearing in mind several simplicity criteria, i. e. modular detector, use of standard equipments, symmetry for negative and positive particles, quick off-line analysis of multibody events. It consists of five standard PS beam transport magnets in which all charged particles emitted in a narrow cone around the forward direction ($\sim \pm 7^{o}$ vertical aperture) are analysed. These particles correspond in a rapidity plot to secondaries emitted in part of the pionization region and in all the forward fragmentation cone. The target is positioned inside the gap of an additional magnet, in which particles associated with the target fragmentation and with the remaining part of the pionization region are momentum--analysed. For particles in the forward cone, the vertex magnet acts as a simple, uniform field magnet in complete analogy with the other elements of the spectrometer. The detailed structure of the vertex detector is described in the next section.

All magnets and chambers are aligned along the direction of the undeflected beam in order to have equal acceptances and resolutions for positive and negative particles. Magnets 1 and 2 have a field of about 9 KGauss, a 30 cm gap and a length of 1 m. Magnets 3, 4 and 5 have a field of about 18 KGauss, a gap of 20 cm and a lenght of 2 m. In the region of space between two subsequent magnets (about 3 m), two sets of chambers measure the particle trajectories. The use of narrow gap magnets allows relatively small size detectors and a simple analytical parametrization of the fields. It is clear, from an inspection of Fig. 1, that most particles will at some point hit the yoke of a magnet and therefore will not be detected in the subsequent chambers. According to the present plans, in the off-line analysis, the trajectory of each particle will be reconstructed by making use only of the last pair of crossed chambers. Assuming that for each chamber we will be able to solve the ambiguities in reconstructing the intersection points (see below), the identification of hits associated to the same particle in the two chambers is obtained by requesting that each trajectory in the vertical plane is a straight line passing through the target. The same information on the dip angle of each particle is used to skip the corresponding hits in the preceeding chambers, when analyzing the tracks which end in these chambers. The momentum and the production angle of the particles is then calculated by means of the coordinates in the two last chambers, of the crossed magnetic field and of the interaction point in the target, as measured in the vertex detector.

The time needed to reconstruct the full event in the off-line analysis will be, in this way, greatly reduced, with respect to more common procedures in which each particle is traced back through all chambers and magnets.

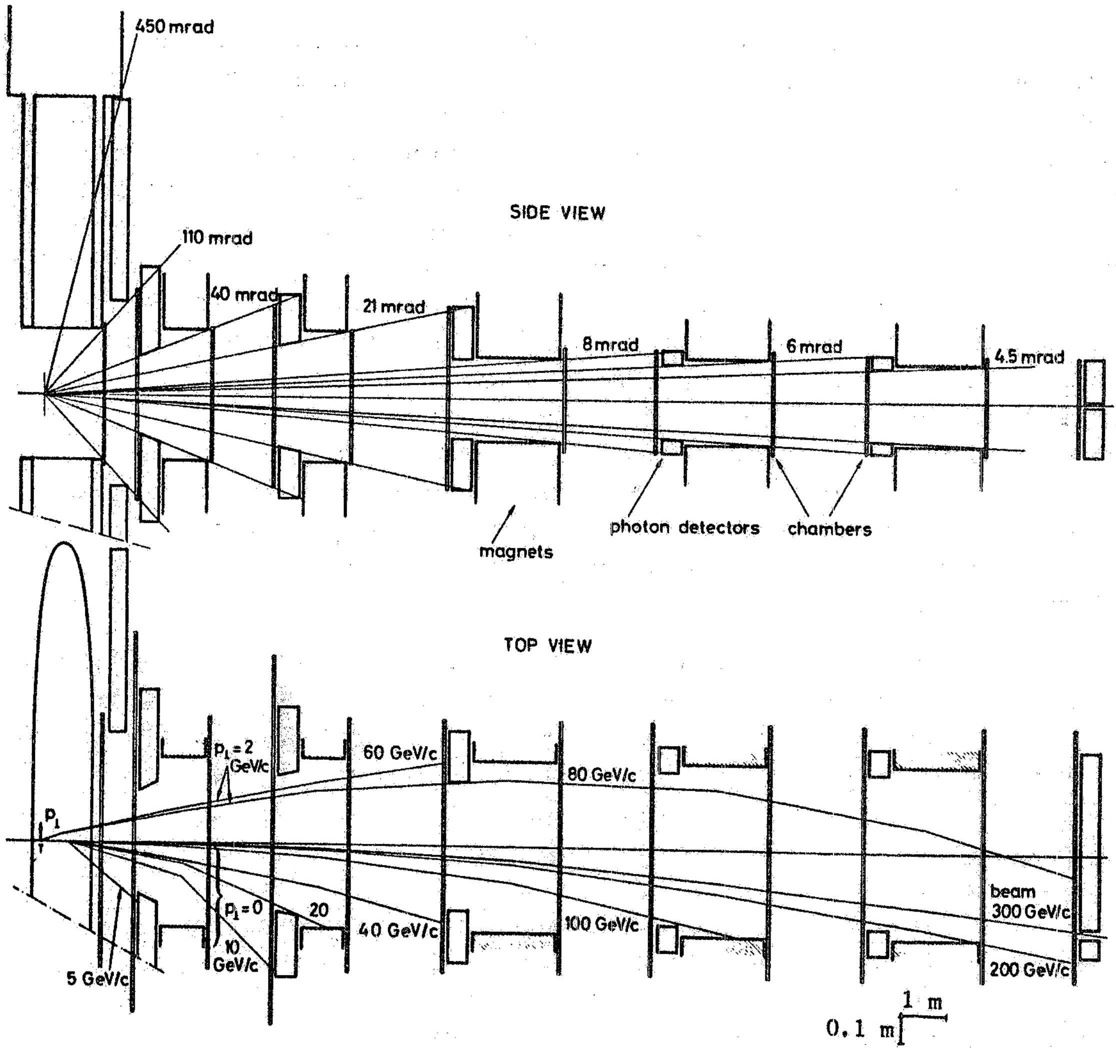

FIG. 1 - General layout of the experiment.

By making use of the above procedure, we are allowed to make the chambers insensitive in a region of a few cm^2 around the beam line (see Fig. 2) in order to obtain an important reduction of the background in the chambers. Finally, this method provides a rather uniform sharing of measured tracks among the various sets of chambers, reducing their average number to not more than ~ 3 tracks. Table 1 gives the dimensions of the chambers and shows the average multiplicities measured in the subsequent pairs of chambers, as calculated by means of a Montecarlo program

TABLE 1

CHAMBER	WIDTH (cm)	HEIGHT (cm)	N_1	N_2
1	60	40	4.4	2.6
2	130	60	4.4	2.6
3	60	40	2.9	1.6
4	90	50	2.9	1.6
5	60	40	1.6	0.9
6	60	40	1.6	0.9
7	60	25	0.8	0.4
8	60	25	0.8	0.4
9	60	25	0.4	0.25
10	60	25	0.4	0.25
11	60	25	0.2	0.2
12	60	25	0.2	0.2

N_1 = Number of tracks in the sensitive region of the chambers.
N_2 = Number of tracks to be measured in the chambers.

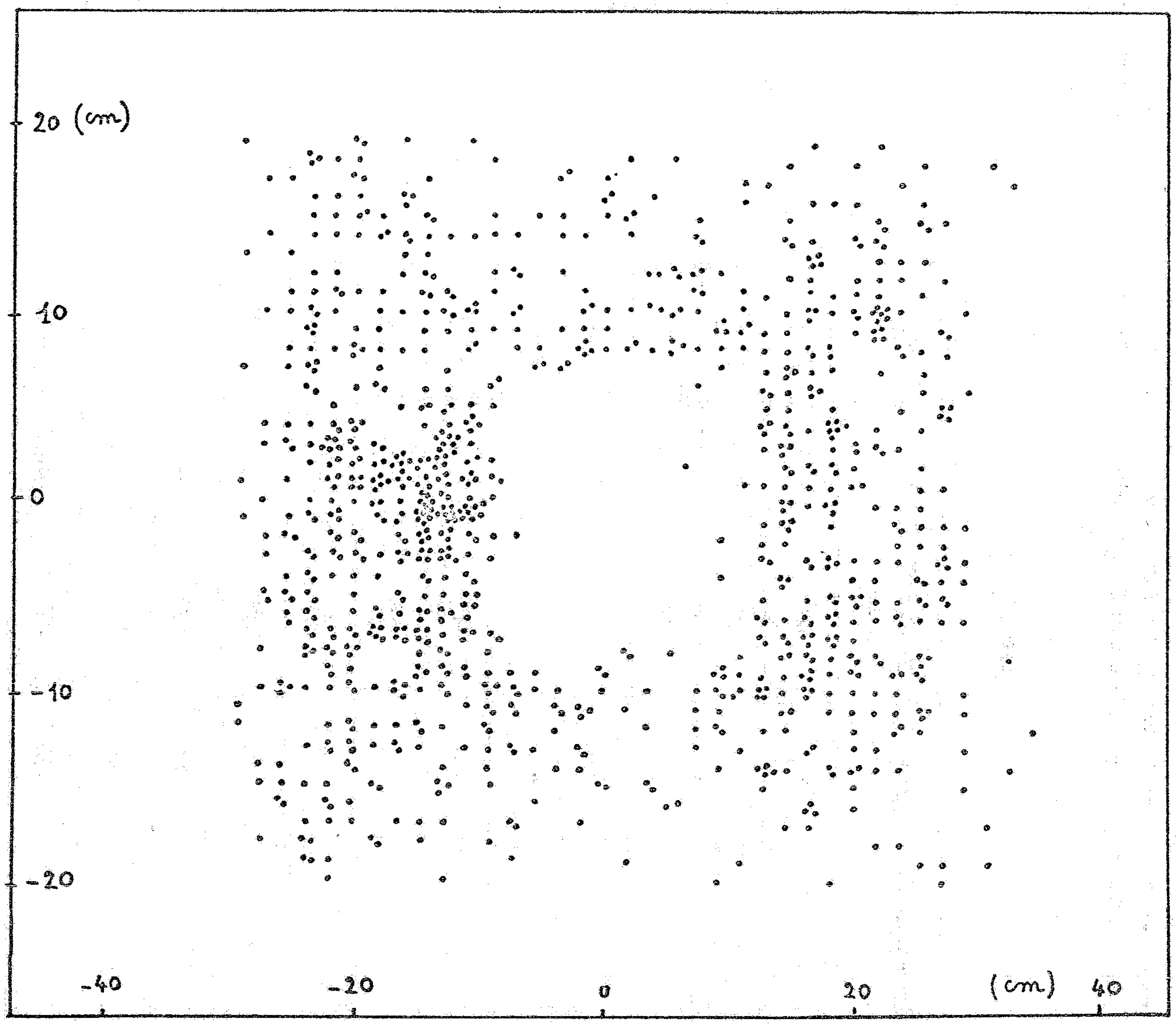

FIG. 2 - Example of the distribution of tracks in the chambers, where particles are analysed only in the last two chambers, as explained in the text. This constraint creates the empty region in the centre.

me(x).

Interactions in the spectrometer or decays of produced particles will modify the apparent momentum and production angle of a fraction of the detected particles, and produce some spurious tracks. Though this will not be an important problem in a first approximation study of the events, there are several experimental ways to study these effects. For instance, the constraint that the projection of the trajectories in the vertical plane cross the beam axis in the target can be used to isolate these spurious tracks. Montecarlo calculations have shown that, for the first two pairs of chambers, assuming a precision of $\pm$ 0,5 mm in the measurement of the coordinates, we can identify practically all cases of interactions and all cases of K^o decays.

In addition, in a more refined analysis of samples of data, we intend to measure the momentum of each particle by making use of the last four (instead of two) chambers. Our Montecarlo calculations have shown that this extra constraint would reduce the background from secondary interactions to negligible values. This check is particularly effective and simple for the forth, fifth and sixth pairs of chambers (large momenta), where the flux of particles is minimum and the precision of the momentum measurements in two subsequent sets of chambers are comparable.

The data-taking conditions outlined above can be preserved at all beam momenta simply by scaling down the currents of the magnets of the forward spectrometer according to the reduction of the beam momentum. The scaling property of the production in the projectile fragmentation cone(4) guarantees that the general pattern of the events will appear the same, as far as the projection in the horizontal plane is concerned in this kinematical region. In addition, in this way, the beam will follow an energy-independent trajectory through the spectrometer, will cross the chambers in the same (unsensitive) regions and will be available unaffected to possible subsequent users. It is interesting to notice that the scaling of the magnet currents according to the beam momentum is probably a good choice also from the point of view of the physics of inclusive and semi-inclusive reactions, since it provides a constant resolution in rapidity and a constant relative precision in the momentum measurement for different beam energies.

In order to solve the ambiguities arising when several tracks cross the same chamber, each chamber should consist of various crossed planes of wires, if conventional (MWPC or drift) chambers were used. During 1974, a large effort will be devoted to the development of position-sensitive drift chambers, in which the two coordinates are simultaneously read-out on the

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(x) - This is the same Montecarlo program presently used by the Pisa-Stony Brook collaboration working at ISR to correct the row data on multiplicity distributions.

same wire (even if with different resolutions)(5). Two orthogonal planes per chamber would then be sufficient to identify unambiguously the position in space of the detected particles and to achieve the same resolution in the two coordinates. This solution would further simplify the off-line analysis and reduce the time required by the pattern recognition. The planned blind region around the beam position will facilitate the operation of the drift chambers, in particular of the first ones, for which the average multiplicity is maximum. The construction of several chamber prototypes are in progress. We expect to be able to make a final choice by the end of 1974. The dimensions of the chambers, which are likely to remain the same in the final spectrometer design, are given in Table 1. In the scheme outlined above and assuming a spacing of 4 cm between two sense wires, the overall amount of digitized read-out channels would amount to ~ 600 elements. Since all chambers are small, it will be relatively easy to study their performances and to calibrate them in a beam.

The calculations of the performances of the spectrometer have been performed assuming a spatial resolution in the chambers of ± 0.5 mm. We have found that this resolution is fully adeguate for the experimental program that we have in mind. We will try, however, to achieve in practice an even better resolution (perhaps ± 0.3 mm).

The rapidity and momentum resolutions provided by the forward spectrometer are plotted, for maximum magnet currents, as a function of y and p in Fig. 3 and 4. The error in the reconstructed point of interaction in the target has been assumed to be ± 5 mm along the beam direction and ± 1 mm in the transverse direction. Different curves have been drawn for different values of the azimuthal angle. Indeed, particles of the same charge, produced with different values of φ, at fixed y and $p_\perp$, cross a different number of magnets, due to the combined effect of the production angle and of the bending in the magnetic field. The rapidity resolution is on average $\Delta y \leq 0.05$ and only in a few cases is larger than 0.1. This resolution is clearly sufficient to study phenomena as two-particle correlations, which are characterized by a length of the order of 1 rapidity unit.

Table 2 shows the resolution in the transverse momentum ($\Delta p_\perp / p_\perp$) for two values of the rapidity (in the central plateau region) and for three values of the azimuthal angle. The average resolution ranges from 1 to 10% and is best in the range in which the production is concentrated ($p_\perp \sim 500$ MeV/c).

2. - VERTEX DETECTOR. -

The vertex detector consists of an array of chambers positioned inside a magnet surrounding the target. As observed above, it acts on high momentum particles as one of the other magnets of the spectrometer. Its structure is dictated by the request of detecting all charged particles

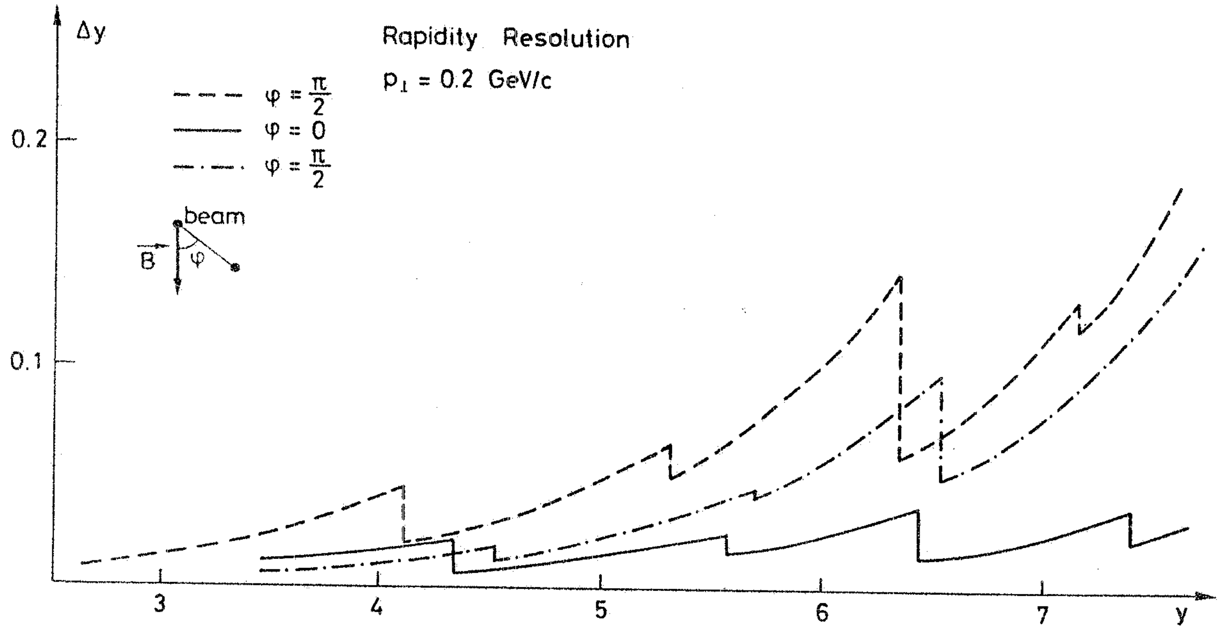

FIG. 3 - Rapidity resolution for three different values of the azimuthal angle, at fixed $p_\perp$.

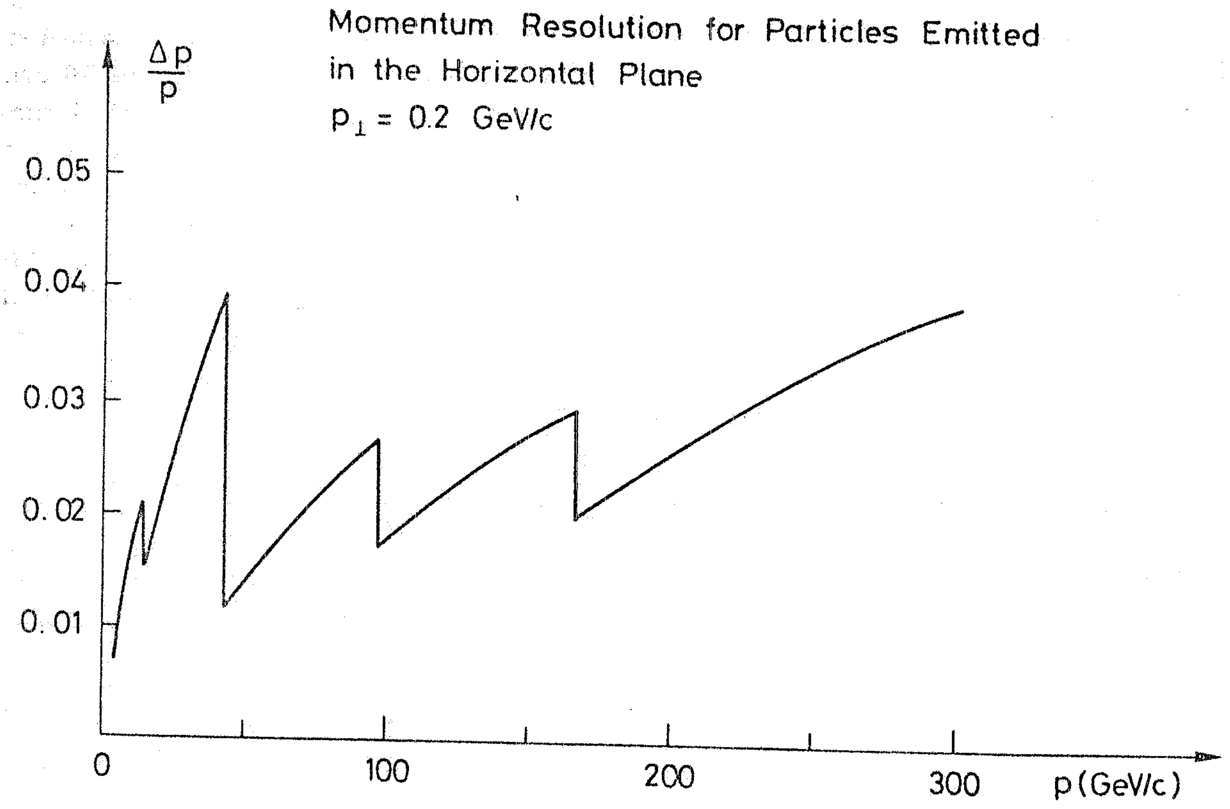

FIG. 4 - Momentum resolution $\Delta p/p$ at fixed $p_\perp$. This resolution depends only weakly on the azimuthal angle.

TABLE 2

$P_\perp$ (GeV/c)	y = 3.2			y = 4.2		
	$\varphi = \frac{\pi}{2}$	$\varphi = 0$	$\varphi = -\frac{\pi}{2}$	$\varphi = \frac{\pi}{2}$	$\varphi = 0$	$\varphi = -\frac{\pi}{2}$
0.1	3.6	1.2	8.4	5.4	3.2	13.0
0.2	1.4	1.6	6.4	2.7	1.3	11.2
0.5	0.7	3.2	7.1	1.0	2.6	5.8
1.0	1.1	6.2	10.7	0.5	5.2	8.2
2.0	11.0	12.3	12.1	0.5	10.3	13.3

produced at large angles in the laboratory frame. The scheme of the magnet is shown in Fig. 5. A vertical solenoid, 140 cm in internal diameter, 140 cm in height, is splitted into two parts, separated by a gap of 30 cm. The magnetic flux is closed by two return yokes, as in a standard H magnet. The main feature of this magnet is to provide a large volume of magnetic field, constant to a few percent. This can be seen in Fig. 6, where the value of the field is plotted versus the radial coordinate at different heights. This characteristics will be extremely useful in handling the data in the off-line analysis. Indeed, the maximum systematic deviations on the sagitta and on the angular deviation, as compared to the case of an uniform field, are 2% and 1%, respectively. These errors can be corrected for, by means of simple factors depending only on the vertical coordinate measured in the last chamber inside the magnet.

The maximum design field is about 15 KGauss. In order to reduce the dimensions and the thickness of the coils it would be convenient to make the magnet superconductive. The radial thickness of the dewar would be in this case 25 cm, corresponding to two radiation lengths of equivalent alluminium.

In analogy to all other magnets of the spectrometer, the current in the vertex detector magnet will be scaled according to the beam energy.

A possible arrangement of the detectors in the magnet is sketched in Fig. 7. In the forward part, a set of multiwire chambers (MWPC) detects particles produced in a cone of ~ 60° half-aperture angle. We plane to achieve in all chambers a resolution of ± 1 mm or better. We are envisaging the

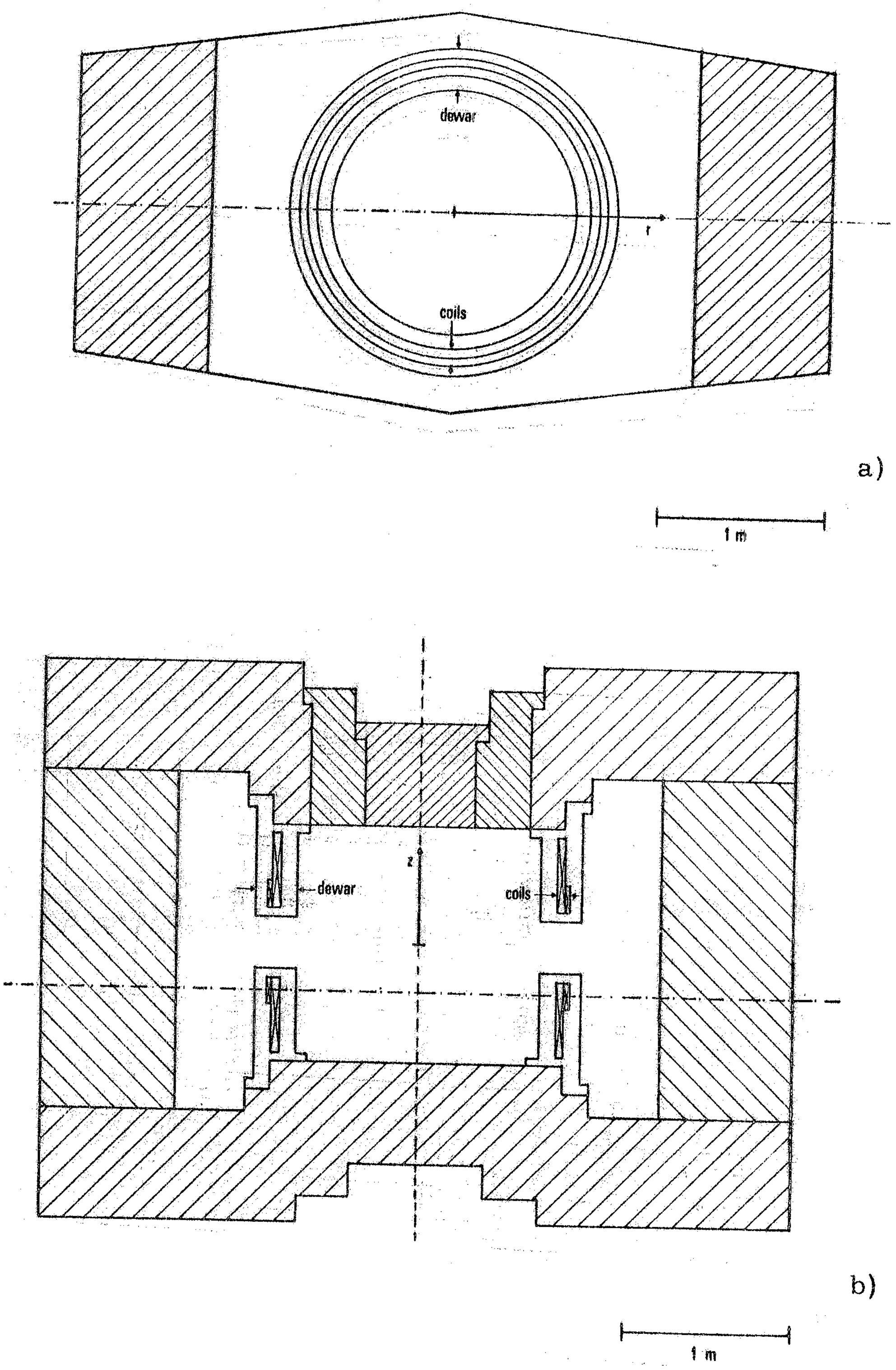

FIG. 5 - Scheme of the magnet of the vertex detector. The upper part is movable in order to allow installation and repair of the detectors.

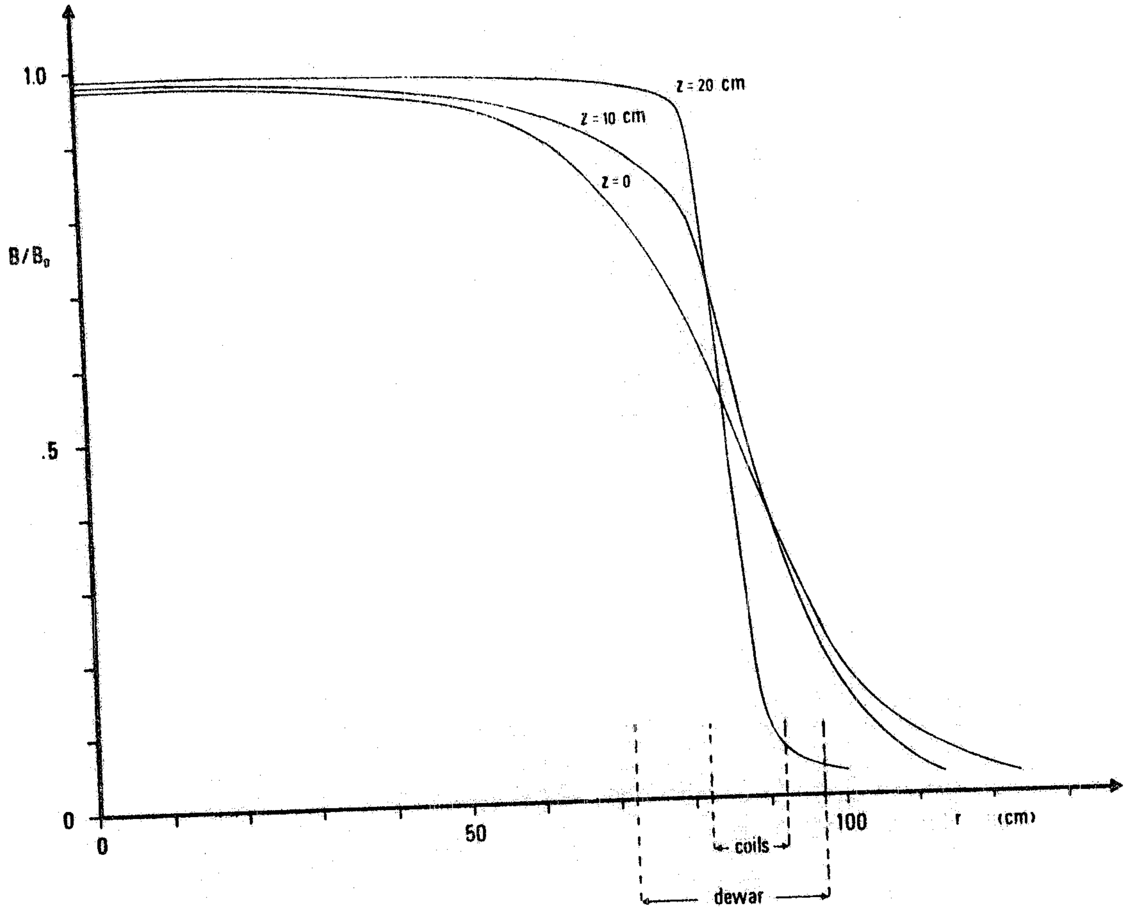

FIG. 6 - Dependence of the field of the vertex detector magnet on the radial coordinate at three different heights with respect to the median plane.

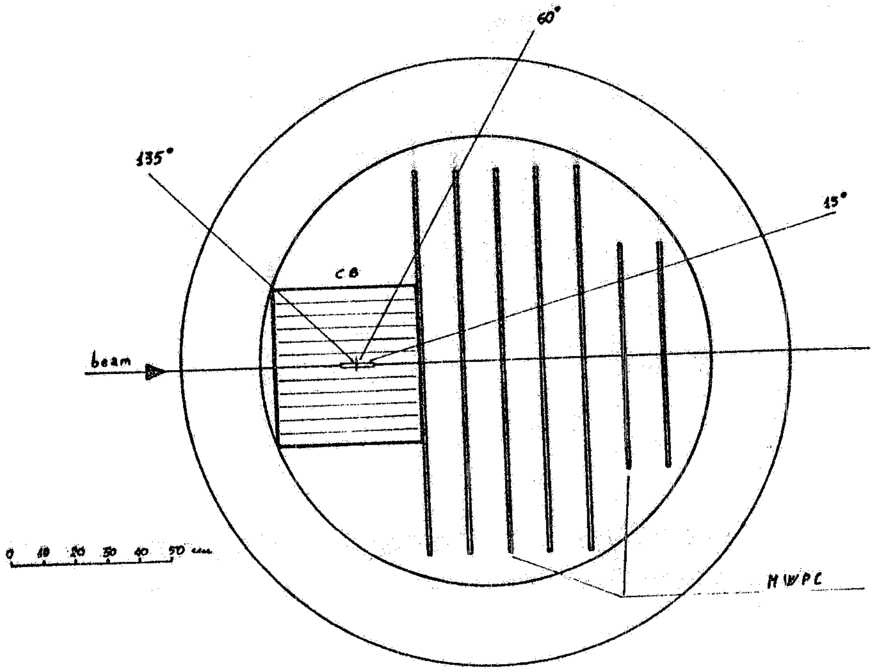

FIG. 7 - Possible structure of the detectors inside the vertex magnet. The MWPC have a rectangular shape, while CB is a set of cylindrical chambers, coaxial with the beam.

possibility of using, also in this case, position sensitive chambers. The momentum resolution for particles of momentum less than 2.5 GeV/c, detected in these chambers (more than 95% of the total measured in the vertex detector) will range between 1 and 3% at the maximum value of the field. The momentum resolution for particles associated to the target fragmentation becomes worse at lower incident energies because of the corresponding reduction of the magnetic field. Nevertheless the resulting y resolution [illegible] still satisfactory, being always $\Delta y \leq 0.08$ at 100 GeV/c incident momentum.

Tracing back each trajectory the interaction point can be identified with a precision of ± 2 mm. When more particles are simultaneously detected, the quoted resolution will improve.

A chamber box CB surrounding the target is used to count the particles produced at very large angles and to help in identifying the vertex of the event. Particle momenta are also roughly measured ($\Delta p/p \sim 10\%$). The detailed structure of this box has not yet been designed. We are presently considering a set of small cylindrical chambers, coaxial with the beam. These chambers should consist of wires parallel to the beam, allowing to measure azimuthal angles with a resolution of ± 1°. Informations on the longitudinal coordinate would be obtained by reading out the pulses induced on the high tension electrodes suitably splitted into helicoidal stripes(6). The combined information from these chambers should provide measurement of the momentum of all low momentum particles ($P < 500$ MeV/c) with a precision with ~± 10% at the maximum field.

The set-up described above implies a read-out system for ~10.000 MWPC wires.

4. - PHOTON DETECTOR. -

In inelastic hadronic interactions the average number of photons from π^0 decay is roughly equal to the number of charged particles produced. It is therefore important to detect these photons and to measure there energy in order to gain a complete picture of the events. In a charge exchange experiment at Serpukhov(7), scintillation counter hodoscopes sandwiched with converters are being succesfully used to measure high energy photons. The use of this reliable techniques is certainly at present the most straightforward approach to our detector and, with this in mind, we have prepared the project that follows. However, what we are describing is not necessarily the final version of the detector.

Montecarlo calculations have shown that more than 95% of the produced photons fall, on average, inside a cone of 30° aperture angle around the beam axis. Energy-wise only 1% (or less) is lost. This solid angle is covered by means of a system of several gamma ray detectors positioned behind each magnet of the spectrometer (see Fig. 1). As shown in Fig. 8, each detector has a rectangular shape with a hole corresponding to the aperture of the following magnet.

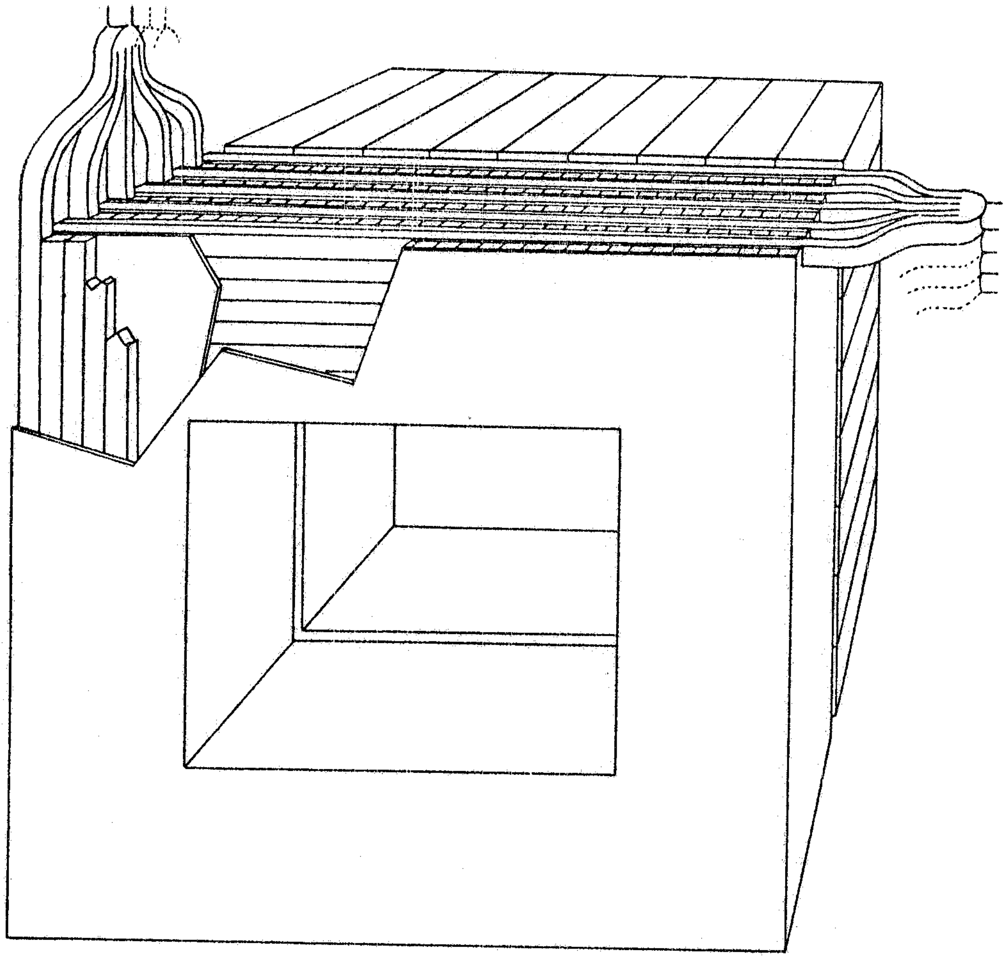

FIG. 8 - Sketch of one of the photon detectors in the forward spectrometer.

In the forward spectrometers all, the detectors are similar and each one consists of the sequence: absorber (I R. L. Pb), horizontal hodoscope, absorber, vertical hodoscope, repeated five times. All sets of five overlapping stripes of the vertical (horizontal) hodoscopes are coupled toghether via light guides into a single photomultiplier. The alternation of vertical and horizontal hodoscopes, with equal width elements allows the same resolution on both coordinates while keeping the total number of photomultiplier and counting channels within reasonable limits. The pulse height of each phototube is digitized and recorded for the off-line analysis of the energy release. The size of the hodoscope elements is fixed by the natural width of the cascade, which has been found at Serpukhov to be almost independent of the photon energy and localized within a cylinder of 1 cm radius. With a bin-width of 1.5 cm the spatial resolution obtained for a single photon is 5 mm or better. Showers closer to each other more than 1.5 cm will not be resolved.

The detectors described above are completed by arrays of lead-glass Cerenkov counters.(∼8 radiation lengths thick). They are essential to improve the overall energy resolution (by allowing a complete absorption of the shower) and to solve the pattern ambiguities, due to several photons hitting the same detector. The thin frame structure of the detectors takes this solution cheaper with respect to the use of a third, diagonal hodoscope. This is not true for the detectors immediately following the vertex magnet and for the one positioned in front of the first magnet of the forward spectrometer. In this two cases a standard structure with three crossed hodoscopes is planned. In the angular range covered by these last detectors, the rapidity dependence upon the angle is much weaker than in the forward direction. The binning of these hodoscopes will be correspondingly larger (up to stripes ∼10 cm wide in the first detector). In this way the rapidity resolution $\Delta y \cong \Delta\theta/\theta$ will be of the order. $\Delta y = 0.03$ almost uniformely over the full angular range. This value is fully adequate for the purpose of semiinclusive measurements and analogous to the resolution obtained for charged particles. However, a direct measurement of the energy is also necessary in order to separate photons from hadrons, (which are also seen by the detector) and to study the energy released by photons in the various regions of space. The energy spectra of the photons entering the detectors, as obtained in the previously mentioned Montecarlo calculation, are shown in Fig. 9. A comparison of plots shows that the peak value of the spectra move slowly when decreasing the angle, while the high energy tail expand very quickly. On the basis of these spectra the detector thicknesses have been chosen in such a way that on average less than 5% of the shower should be lost from the back of the lead glass counter even for the highest energy photons, thus introducing an error smaller than the intrinsic counter resolution. This resolution is expected to range between 10÷15%, being mainly determined by the instabilities and non equalities of the photomultipliers. Table 3 gives the characteristics of the detectors.

5. - EXPERIMENTAL PROGRAMME. -

We give in the following a number of details on the proposed experiment on semi-inclusive properties of inelastic interactions. We also discuss two features of hadron interactions at high energy, i.e. particle production on nuclei and elastic hadron-hadron scattering at large angles, which can be well studied with the proposed apparatus and in which we are specifically interested.

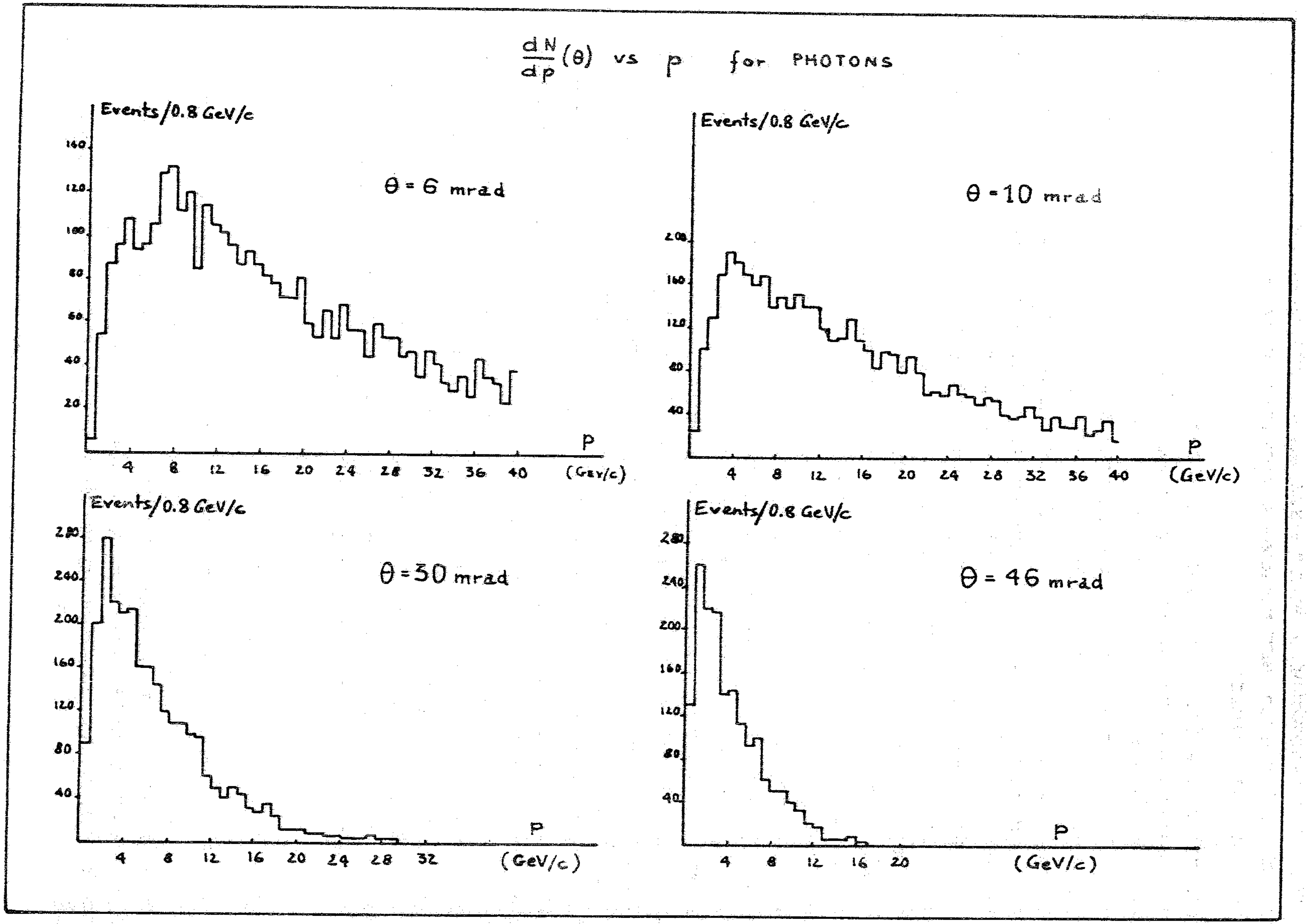

FIG. 9 - Spectra of photons inside the solid angle covered by the four forward photon detectors, as obtained by means of our Montecarlo calculations.

TABLE 3

Detector	Ext. dimensions (cm^2)	Central hole (cm^2)	Number of phototubes	
			Hodoscopes	Lead-glass
I	140 x 140	50 x 30	~ 200	—
II	72 x 66	24 x 18	207	—
III	72 x 60	36 x 24	128	96
IV	54 x 42	30 x 18	96	48
V	48 x 24	36 x 16	83	20
VI	48 x 24	36 x 18	84	20
VII	48 x 24	—	48	32
			Total =	1062

5.1.- Multiparticle production on hydrogen.-

We plan to start the experiment with a measurement of the inclusive particle production using a completely unbiased trigger with a proton beam hitting an hydrogen target ~10 cm long. We want, in this way, to check the performances of the apparatus by comparing the results with data obtained at ISR and NAL at similar energies. Moreover a comparison of the distributions obtained in the forward direction, Lorentz transformed to the target frame, with the data collected by the vertex detector will help in understanding possible biases of the experiment. The inclusive trigger will be provided by a set of counters positioned in front of the target, signalling an incoming proton, vetoed by an analogous set of counters in the beam at the end of the spectrometer (trigger IN-$\overline{\text{OUT}}$). Data will then be collected, using the same trigger and varying the energy and the type of the incident projectile ($\pi^{\pm}$, $K^{\pm}$, $\bar{p}$), having in mind three specific physical problems.

a) the knowledge of the structure of each single event can be used as a tool to identify the different components of the inelastic production, first of all the diffractive excitation of the projectile. The simultaneous detection of charged particles and photons should play an important role in the identification of the rapidity gap between the leading particle and the fragments of the excited mass. The particular points we want to study are the $|t|$ and M^2 distribution of the leading particle and the corresponding y,

$p_\perp$ distributions of the secondaries associated with the decay of the excited hadron. The comparison of results obtained in different reactions should provide interesting informations on the structure of different hadrons and on the mechanism of the reaction.

b) A most interesting approach to the dynamics of the non-diffractive part of the production is the study of clustering effects, in particular as seen in the two-body rapidity correlations. Recent Pisa-Stony Brook data show that this effect is best studied inside samples of events of fixed multiplicities(3). We expect it to be even more the case in the present experiment, since the simultaneous detection of charged particles and photons allows a much neater definition of the event multiplicity. In addition to rapidity correlations, $p_\perp$ and charge correlations can be studied in the proposed set-up. The informations obtained with different projectiles should allow to perform significant checks of the ideas underlying the various cluster model presently proposed(8,9).

c) It is well known that the total pp and K^+p cross-sections increase with increasing energy. A similar effect is also suggested by the K^+p cross-section data at Serpukov energies. It is possible that this behaviour is common to other reactions, with different importance, in the energy range between 100 and 350 GeV. The measurement of the energy dependence of the various components of the inelastic cross sections will certainly be very usefull to enlight the mechanism of this growth.

5.2.- Multiparticle production on nuclei.-

The interest in the physics of the interactions between elementary particles and nuclei has greatly increased in the last few years and is now an important instrument for the interpretation of the basic hadronic processes, complementary to the study of single hadron interactions.

We intend to investigate two specific problems.

a) An analysis of nuclear emulsion data collected at NAL and in experiments with cosmic rays has shown that there is a surprising similarity of the general properties of the inelastic production (multiplicity distributions, inclusive cross-sections) in hadron-nucleus and hadron-hadron interactions. The ideal has been put forward(10÷12) that the features of the intranuclear cascade products reflect basically only the early stage of the collision process, which can therefore be investigated in this way. The first step of the measurements of particle production on nuclei will therefore consist of a study of the characteristics of the forward hadronic showers, as functions of the atomic number, of the energy and of the type of the projectile.

b) If coherent interactions are singled-out by checking experimentally that the target is not excited, a very powerful signature is obtained for diffractive events. Owing to the high energy of the projectile, a smaller momentum transfer is needed to produce a given mass, thus greatly reducing the damping factor on the production of large masses due to the nucleus form factor. For the selection of the coherent interactions, we intend to use devices that are able to reject events in which the nucleus break-up. The possibilities we are analysing include the use of silicon active targets(13) and of metallic targets split into thin layers, interspaced by proportional chambers sensitive to recoil protons in inelastic events. For light elements the possibility of identifying recoil deuterons and helium nuclei is studied.

5.3.- Elastic scattering at large momentum transfer.-

The proposed set-up is well suited for studying elastic scattering cross-sections at large momentum transfers $0.5 \leq (|t| \leq 4\,(\mathrm{GeV}/c)^2$, because it provides a measurement of the momentum vectors of the forward and recoil particles with full acceptance, while acting as a powerful veto against events in which other particles (charged or neutrals) are produced in any other direction.

An estimate of the expected counting rate can be obtained by taking the values of the differential cross section of pp scattering as measured at the ISR. For a beam of 6×10^6 particles/burst, with a liquid H_2 target 20 cm long, the rate as a function of t, in a given Δt bin, taking $\Delta\varphi = 2\pi$, is shown in Table 4.

The $|t|$ resolution is determined by the accuracy on the measurement of the polar angle θ_{recoil}, which will be ~ 2 mr. This corresponds to $\delta|t|$ errors as given in Table 5.

These values of the resolution are perfectly adequate to recoil structures possibly present in the angular distributions.

TABLE 4

-t (GeV^2)	$d\sigma/dt$ (cm^2/GeV^2)	Δt (GeV^2)	Events/day
0.5	3×10^{-28}	0.001	2.2×10^4
1	10^{-30}	0.01	7×10^2
2	5×10^{-32}	0.02	7×10^1
4	10^{-33}	0.3	20
6	10^{-34}	0.5	4

TABLE 5

-t (GeV^2)	δt (GeV^2)
0.5	0.007
1	0.010
4	0.025

6.- BEAM REQUIREMENTS.-

A high-energy hadron beam in the North Area, such as the H2 beam described in the list of the SPS experimental facilities (CERN/EA/Note 73-5), would be ideal for this experiment if equipped with a DISC Čerenkov counter.

In this experiment the data acquisition rate is expected to be high. We plan, however, to run the experiment in various steps so that the time needed for the measurement will depend essentially on the final program.

During the course of the experiment, we would require from CERN the standard facilities, the DISC counter, the use of the five PS beam transport magnets (with slightly modified gap widths), the H_2-D_2 target and the power supplies for all magnets.

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