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A TRACK CHAMBER WITH CONTROLLED HEAT CENTRES AS A VERTEX DETECTOR FOR VERY HIGH ENERGY PHYSICS EXPERIMENTS

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The discovery of charmed particles in high energy experiments has led to development of a new direction in charged particle track detection physics. It has turned out that the first discovered particles (charmed particles) have the lifetime of the order of 10^{-12}-10^{-13} s[1], so even at the relativistic energies, one needs methods for observation of paths from 10 μm to 1000 μm. There is a similar situation in the case with beauty particles[2].

For example, if the momentum of the secondary particle is about 30 GeV/c, the paths $L = \frac{p}{m} \tau c$ of different particles will be as long as shown in Table 1.

Table 1

Particle	τ,sec	L, mm	cτ, μm	σ, μb
$D^{\pm}$	$9 \cdot 10^{-13}$	4.3	270	6 /3/
D^0	$4 \cdot 10^{-14}$	1.93	120	10 /3/
F/Λ_c	$2 \cdot 10^{-13}$	0.9	60	-
B	$1 \cdot 10^{-12}$	1.8	300	-

As far as the values of the total cross sections for production of pair of short-lived particles and antiparticles are concerned, the calculations of H.Gordon et al.[4] within the standard model $SU_c(3)xSU(2)xU(1)$ yield:

$$p + \bar{p} \rightarrow c\bar{c} + x, \qquad \sigma = 500\ \mu b$$

$$p + \bar{p} \rightarrow b\bar{b} + x, \qquad \sigma = 3\ \mu b$$

at the momentum about 30 TeV/c and the transverse momentum $M_t \sim 20$ GeV/c.

For example, the total cross section for production of charmed particles (the reaction shown in the first line) has been recently measured in Ref.[5] at the proton momenta 360 and

200 GeV/c in experiment NA 27. The corresponding values of the cross sections were $(24.6^{+12.0}_{-8.3})$ μb and $(3.9^{+2.5}_{-1.9})$ μb. Thus the range of possible cross sections at the UNK energies is in the microbarn region.

Other possible processes of interest to be studied with the help of new vertex detector are the processes like $p + p \to$ $\to$ jet + x. Estimations made by G.Kane et al.[6] for the cross section of this reaction at 20 TeV/c yield $\sigma(m_{jet} \sim 100 \text{ GeV}) \sim$ $\sim 10^{-5}$ mb.

A possible experiment for the new detector can be the study of oscillations $B - \bar{B}_0$. In this case the path of b-quarks will be from 17 mm to 25 cm[7]. The important problem is the search for CP violation in the $B - \bar{B}$ system. We need to record 10^8 events (present level is 10^5).

Nuclear emulsions are among the main components used in this experiments. Their resolution is much higher (~ 1 μm) than the one required for the experiments with charmed and beauty particles. But they are not a controlled detector, therefore they cannot be used in spectrometer experiments with large particle fluxes. Nevertheless, they allow many important observations now, e.g. the observation of production of $B - \bar{B}_0$ pairs at the pion beam energy about 350 GeV/c (Fig.1) (R is ~ 4.43 mm for $\bar{B}_0$, and ~ 437 μm for B^-).

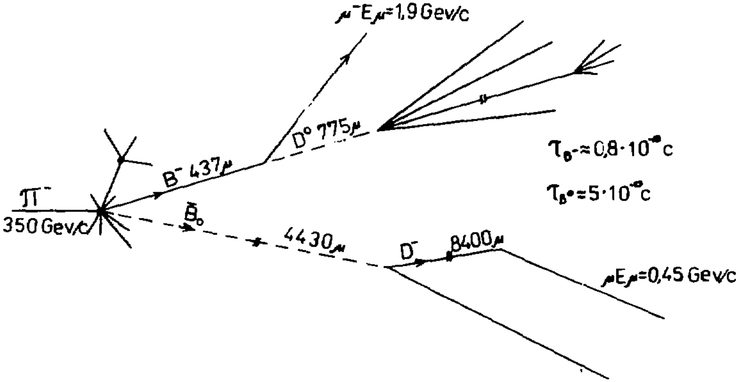

Fig.1. A typical production and decay mode observed for a pair of particles $(B^-, B_0) \pm X$.

At present large hybrid detectors, like the systems described in Refs.[8,9], are sometimes used with bubble chambers of higher resolution (up to 10 μm) as vertex detectors.

The holographic reading of the bubble chamber information was first proposed in Refs.[10,11]. The bubble in the chamber is detected at early stages of its development, it being illuminated by the coherent laser light. The holographic readout removes Rayleigh limitations for resolution and depth of focus. The bubble chamber is an ideal target suited for various experiments, but it cannot be a controlled detector as well. This reduces its capabilities when there are large particle fluxes.

Another possible method of construction of an effective vertex detector is to use a streamer chamber. The effectiveness of the detector can be characterized by the factor $np\ell$, where n is the particle flux going through it, p is the effective pressure, ℓ is the length of the detector ($np\ell$ is $\sim 7\cdot 10^6$ for an H_2 bubble chamber 10 cm long at the flux of 10^3 s^{-1} and $p_{ef.} = 700$ atm, and $5\cdot 10^8$ for a streamer chamber at the flux of $\sim 10^6$ and the pressure of 50 atm, (more than 100 times better).

The most effective system has included a streamer chamber with the H.V. supply impulse only 0.6 ns long[12]. As the resonance line construction requires, the chamber in D.Sandweiss's team was of small size, it measured only 5x2x0.5 cm^3. A conventional lens with a very high resolution and a depth of focus of 0.5 cm was used to take pictures. Image intensifiers and a film of very high sensitivity (10000 units ASA) were also used. This set-up was successfully employed for detection of production of new particles at the accelerator in Batavia. A resolution of 50 μm was achieved at the pressure of the order of 40 atm.

A more effective vertex detector can be made on the basis of a new-type track detector - a chamber with controlled heat centres. It was proposed in Dubna and Gatchina in 1972[13]. Unlike the case of the bubble chamber, here the heat centre is not produced in the condensed medium but in the gas, where the energy is released by a streamer during thermalization of electrons. A laser illuminates the heated gas bubble and produces a hologram of the track, or directly an image of the track.

The work of this chamber was analysed in detail in several papers[14]. It was shown that the new principle can be easily realized if the chamber works in the self-shunting mode[15] i.e. without making the impulse too short, but with special admixtures used.

It was established in those experiments that tracks can be obtained in hydrogen (deuterium), helium, a methane-helium mixture at the pressure up to 5 atm in the first two cases and up to 10 atm in the latter case. The diameter of the gas bubble image was much less than the diameter of the streamer (by a factor of 5-10). Though their image is a phase object, it has quite a high degree of contrast, and its picture can be taken both with the bright-field and dark-field illumination using a low-sensitivity film (micrat-300).

An interesting feature of the chamber with controlled centres is that tracks are easier obtained in hydrogen than in helium, because the latter has a smaller refractive index. Helium requires a stronger electric field than hydrogen.

It was shown in Refs.[16,17] how one can obtain the 3-dimensional track information by the double schlieren method, illuminating the chamber by a laser with a spherical mirror behind the chamber. In this case it is easy to obtain both bright-field and dark-field tracks, stopping the laser light by the Foucault knife.

Taking pictures by the latter method, one can process the information in the scanning and measuring equipment available; the CCD technique can also be used.

The recent CERN experiments[18] have shown that the principle of operation of the chamber with controlled heat centres can be realized with formation of a high-voltage pulse ($\tau \sim$ $\sim$ 20 ns). While in the self-shunting mode the bubble diameter

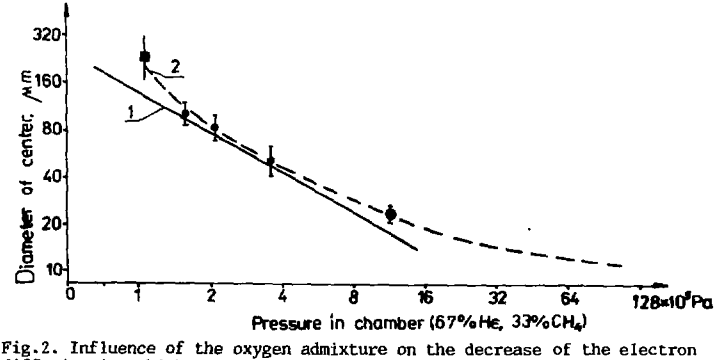

Fig.2. Influence of the oxygen admixture on the decrease of the electron diffusion in a high pressure streamer chamber (30 atm). Top: the path of the passing particle in the He + Ne mixture. Bottom: diffusion suppressed by admixing oxygen (0.2 atm) and CO_2.

was about 100 μm, at 13 atm with pulse formation it can be (25 ± 4) μm in diameter (Fig.2).

Since the diffusion diameter of the streamer decreases with increasing pressure, it is reasonable to hope that the gas bubble diameter will continue decreasing as the pressure increases. So it is quite possible to make a high resolution detector with the above principle of operation. Below we consider a possible version of the vertex detector with the new principle of operation, designed for very high energy experiments.

OPERATION MECHANISM OF THE CHAMBER WITH CONTROLLED HEAT CENTRES

A heat centre appears in the gas with the help of a streamer produced on the primary electron/19/. The temperature of electrons is estimated/20/ to be $T_e \approx 10^4$ K^0 (~ 1 eV) at their density $N_e = 10^{16}$ cm^{-3}. During thermalization of the electrons the gas is almost adiabatically and locally heated to the temperature T_m, the pressure in the gas increasing as:

$$p_1/p = (1 + x)\frac{T_e}{T},$$

where T is the initial temperature and $x = 5\cdot 10^{-4}$ is the degree of ionization.At thermalization $T_e = T_m$ we obtain:

$$p_1/p = (1 + x)\frac{T_m}{T}$$

thus $p_1/p=33$ for the adopted parameters.Mach value 5 corresponds to this value.So in the heat centre not only the gas is heated but also a shockwave occurs, it is well seen in the pictures taken with a longer laser pulse delay. The optical nonuniformity, which is well seen in the heat centre illuminated by the laser, normally develops within 100-200 ns.

The relationship for n - 1 allows calculation of the plasma reflection far from atomic absorption lines:

$$n - 1 = (A + \frac{B}{\lambda^2})N_a - 4.5\cdot 10^{-14}\lambda^2 N_e,$$

where N_a and N_e are the atomic and electron concentrations. The contribution of the electron component to the refraction in the streamer is ~ $5\cdot 10^{-5}$ for the electron concentration $N_e \sim 10^{17}$ cm^{-3} and for $\lambda = 600$ nm. This contribution is negligible as compared with the molecular contribution. Thus the shadowgram is obtained only from molecules.

Using the first part of this expression and the proper constants for different gases we obtain the results for λ=600 nm shown in Table 2.

Table 2

Gas	He	H_2	Ne	Ar	CH_4	70%He+30%CH_4
$(n-1)\cdot 10^4$	0.350	1.380	0.670	2.83	4.390	1.562

Hence it follows that the most difficult task is to ensure detection of tracks in helium, and not in hydrogen as is the case in usual streamer chamber.

The change in the refractive index can be expressed throug the change in the gas density in the streamer:

$$\Delta n = (\frac{\rho_1}{\rho} - 1)\ (n - 1).$$

If one takes into account that for the shockwave the value $M \geq 3$ is observed, then ρ_1/ρ will be ≥ 3. So for the mixture 90%He + 10%CH_4 $(n - 1) = 1.6\cdot 10^{-4}$. Considering that the change in the phase shift angle is $\Delta\phi = \frac{2\pi}{\lambda}\Delta n \ell$, we obtain the shift of ~ 10^0 at 5 atm for this mixture. For pure helium the value will be much less, while for H_2 we obtain $\Delta\phi \sim 40^0$. This allows shadowgrams with a satisfactory degree of contrast.

As our experiments showed, one can obtain tracks in practically pure helium (impurities are CH_4 ~ 0.1% and H_2O ~ 0.1%) if the field of higher voltage is applied to the chamber.

As the pressure increases, the streamer diameter decreases with the diffusion coefficient as $1/\sqrt{p}$, the diameter of the photographically detected optical non-uniformity also decreasing.

METHOD OF SUPPRESSION OF PRIMARY DIFFUSION OF ELECTRONS

M.Tombak, who had greatly contributed to the development of the detector of this new type, proposed an original method for suppression of primary electrons/21/. Applied to the new detector, this method converts it into a track detector with the maximum high resolution for the incident particle momentum. The main idea is to introduce an admixture with high electron affinity, e.g. SF_6 or CCl_4, in the chamber. This admixture captures electrons resulted from the particle passing through the chamber gas; a heavy molecule is produced, it does not practically diffuse, since its mobility is 10^2-10^3 lower than that of the electron. Now, if the chamber is illuminated by a powerful laser pulse befor applying a high-voltage pulse to it, electrons will be stripped off and streamers will be produced on them, the position of the streamers in space practically coinciding with the coordinates of the track for axes X and Y.

Estimations of the energy needed for the stripping-off in a 10x10x5 cm^3 chamber filled with helium yield $E > 1.5$ J for the stricking time $\tau_a = 2\cdot10^{-8}$ s, admixture concentration $K = 1.4\cdot10^{-5}$, photoejection cross section $\sigma_{ft} = 10^{-17}$ cm^2 (the estimations are for the ruby laser, type OGM-20).

The track diffusion is expected to be only 35 μm.

At typical values of the high-voltage pulse delay in a usual streamer chamber we obtain the diffusive shift ~ 0.3 mm for helium at $D_{He} = 312$ cm^2/s and ~ 0.7 mm for neon at $D_{Ne} = 3000$ cm^2/s (the relation $d = \sqrt{2Dt}$ is used). Thus the effect must be quite noticeable.

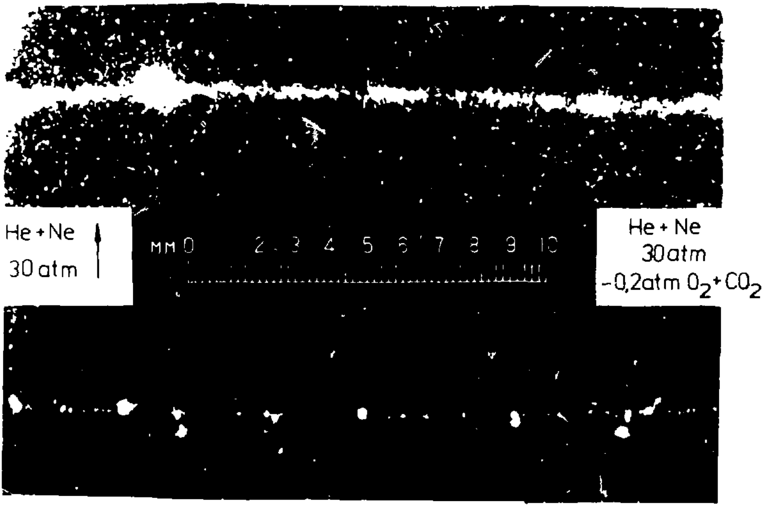

Fig.3. Heat centre diameter as a function of the pressure in the chamber.

Recently the practical realization of this proposal in the group of J.Sandweiss (USA) has been reported. Fig.3 shows two photos taken in a usual high-pressure streamer chamber (filled with He + Ne at 30 atm) and in the chamber with the admixture of O_2 (0.2 atm) and CO_2. As seen, the result is striking indeed. The statistical spread of the streamers is about 18 μm, the mean diameter of the streamer is 45 μm. The latter quantity is determined by the resolution of the image intensifier. The authors hope to obtain the 10 μm resolution at 60 atm.

The capture on O_2 results in the molecule O_4^-. An excimer laser (351 nm) was used for illumination, the trigger delay was 3 μs, the delay between the high-voltage and laser pulses was 30 ns. A happy find of the authors was the admixture of CO_2 which controls the memory time from 1 to 1000 μs. The use of this admixture in a very pure chamber shows that it is quite difficult to choose an admixture. There is no yet a theoretical paper which would explain why complex negative ions $[O_4^- + CO_2]$[23] considerably decrease the time of the memory, but the sensitivity and primary ionization remains the same.

PRACTICAL REQUIREMENTS TO THE CHAMBER

Following the geometry of the decay of charmed, and beauty particles and accepting $\sigma = 1$ μb (1 event per 20 min) one can choose a chamber with dimensions 100x50x15 mm^3. For new accelerators[17] the values of the decay-lengths and the number of events are presented in Table 3. The mean value of the secondary particle flux from the accelerator can be ~ 10^7 1/s. Then at the mean memory of 1 μs ten particles will pass through the chamber. This is tolerable, for the track diameter will be as large as 10 μm (the beam diameter being 3 mm[7], the mean distance between the tracks will be about 300 μm).

The interaction load is less dangerous. The pressure in the chamber being p = 100 atm, we will have 0.162/μs collisions of 400 GeV/c pions.

It will be interesting, of course, to deal with rare events. For example, there will be only two cases of 26-prong events for 10^5 frames,2.5 cases of 10-prong events for 10^3 frames. Thus, the primary beam intensity being 10^7 s^{-1}, the tolerable triggering rate can be selected by adjusting the required first level trigger to multiplicity.

Table 3

Particles	L-decay length, mm		
	UNK ($\sqrt{s}$ = 75 GeV)	LHC (CERN) ($\sqrt{s}$ = 122 GeV)	SSC (USA) ($\sqrt{s}$ = 192 GeV)
D_s^0	1.4	2.2	3.5
B_d^0	2.3	3.6	5.89
B_s^0			
$\tau^{\pm}(F/\Lambda_c)$	1.0	1.7	2.7
$D^{\pm}$	9.0	14.6	23.1
$\frac{\sigma_{b\bar{b}}}{\sigma_{tot}}$	10^{-5}	-	10^{-4}
$N_{b\bar{b}}$/year	10^7	-	10^{11}
This detector/ year	$0.24\cdot10^7$	-	$0.24\cdot10^8$

As is shown in Ref.[10,19], track element images 10 μm in diameter are quite possible. Since one can expect up to ~ 600 electrons per cm from a relativistic particle passed through neon at 100 atm, the mean distance between streamers will be about 17 μm, i.e. the track will be quite continuous.

If one uses the data on the streamer diameter as a function of the high-voltage pulse duration[10,19], one finds out that it is hardly reasonable to use pulses shorter than 20 ns. This conclusion is quite justified if one takes into account the fact that special admixtures allow much better localization of the discharge[15,25].

The expected value of the high-voltage pulse for a chamber at 100 atm can be obtained from Fig.4 by extrapolating the ratio $\frac{E^3\tau}{p^2} = (1.7 \pm 0.2)\cdot10^5$ for the He + 75%Ne mixture[22].

It turns out to be about 500 kV/cm, and the pulse amplitude must be about 750 kV for a 15 mm gap.

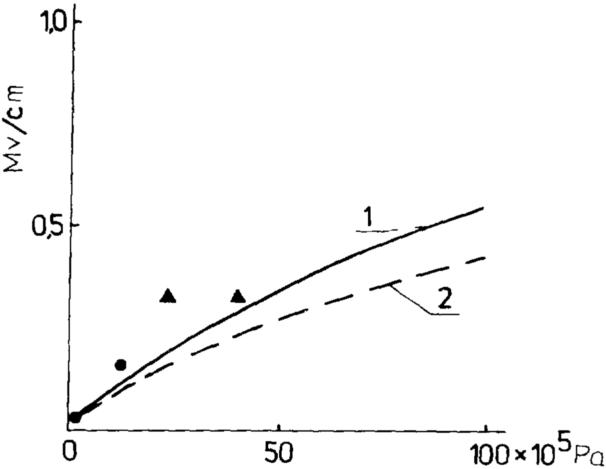

Fig.4. Dependence of the working strength of the electric field in the streamer chamber at higher pressures for the He + Ne mixture. The solid curve is from the ratio $\frac{E^3\tau}{p^2} = (1.7 \pm 0.2)\cdot 10^5$ for the pulse duration $\tau_p \sim 10$ ns, the dashed curve is for the pulse duration $\tau_p \sim 20$ ns. ▲ - experimental points from Ref. /12/ for $\tau_p \sim 0.6$ ns, (the second point is obtained with CO_2 added). ● - point from Ref. /18/, $\tau_p \sim 20$ ns.

POSSIBLE CHAMBER DESIGN VERSIONS

We shall consider two versions of the chamber with the oil insulation ensuring the most compact design. One version is with the photographic readout, the other is with the on-line readout using a CCD device.

Holographic Readout Chamber. Fig.5 shows the side section view of the chamber, and Fig.6 shows its horizontal section view. A stainless steel vessel has two side windows closed by plexiglass or quartz glass in a self-sealing manner. One piece of glass leans on the chamber casing, the other is kept in the working position by means of a flange. Between the internal glass surfaces covered with transparent layers of tin oxide or gold there is a fluoroplastic chamber. The internal volume of the chamber together with the feeder

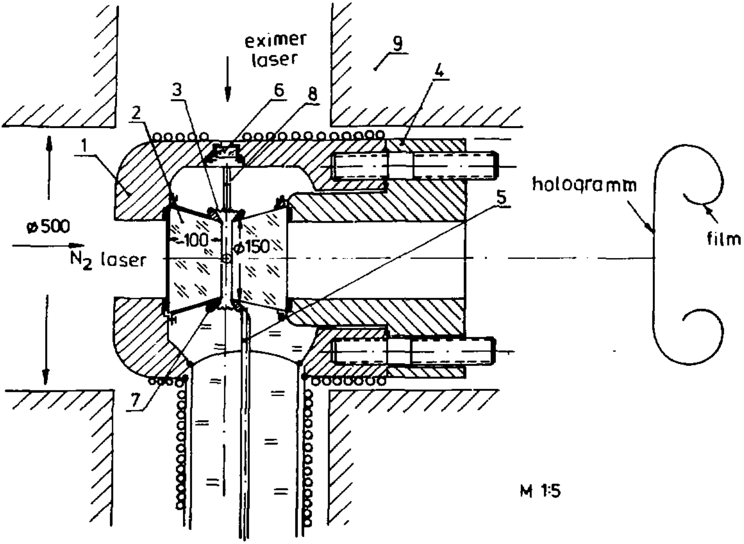

Fig.5. Sectional view of the oil-insulated chamber. 1 - chamber casing with cooling; 2 - illuminators; 3 - vacuum chamber; 4 - pressing flange; 5 - high voltage feeder; 6 - window to let the excimer laser radiation in; 7 - protective electrodes; 8 - inlet channel with H_2 at high pressure; 9 - superconducting magnet coils.

welded to the casing is filled with pure cable or capacitor oil. The total chamber capacitance with the spurious ground capacitance added is about 60 pF. The internal diameter of the chamber will be 12-15 cm. The conducting coat on the glass is in contact with the side rings shaped as the suitable profile, they hold the internal chamber. The left ring rests on a casing that connects it to the ground, and the right one is connected to the central electrode of the feeder. The working gap of the chamber is 1.5 cm. The "shaking-off" excimer laser radiation is envisaged to be introduced from above. The internal chamber is filled with the He-Ne mixture, the volume between the inlet illuminator and the chamber is filled with hydrogen at the same pressure of 60-100 atm. As in our earlier papers/15,25/, we think to introduce charge-compressing admixtures to the chamber, so we intend to replace the Blum-

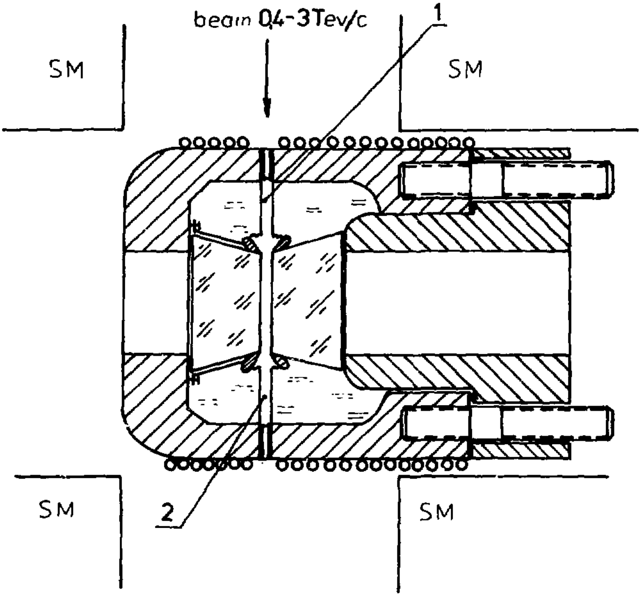

Fig.6. Horizontal sectional view of the chamber. Notation is as in Fig.5. 1 - inlet channel for a beam (hydrogen); 2 - outlet channel for a beam.

line by a simple sparkgap at high pressure for shortening a high-voltage pulse to ~ 20 ns.

As is seen in Figs.5,6 the inlet and outlet of the chamber have the same hydrogen gas channels, so the chamber filling system must ensure filling and maintaining the same pressure in the internal chamber, hydrogen volumes and oil tank of the external shell of the chamber. The use of these channels will result in the fact that the event will not be observed for ~ 1/3 of all triggers, since it will occur in hydrogen filling the channel.

The shock capacitance of Marx's generator must be about 1000 pF at the output voltage about 1 MV. At the working frequency of 20 Hz the consumed power of Marx's generator will be about ~10^4 J/s, it will require 2 rectifiers of VS 50/50 type for each arm of Marx's two-pole generator. Naturally, this power can be only taken from Marx's generator with oil-immersed capacitors. The losses in Marx's generator taken into account, the total dissipated power will be as large as 20 kW. Marx's 20-section generator with the bipolar power supply is quite capable of providing a delay about 300 ns, with allowance for the trigger system delay the total delay is quite reasonable.

However, the main fast action problem is related to the fast action of the camera that provides strict optical conditions for reading-out. In JINR there is only one development/26/ designed for the frequency up to 15 Hz, transport length of 180 mm and film 35 mm wide. In CERN there is a system operating at the frequency of 20 Hz/26/.

Thus, now it is possible to work with the frequency of 20 Hz at the power, dissipated by the power supply system, as large as 20 kW. To remove this power released as heat, the chamber and Marx's generator must have a water cooling system.

The readout system can be made by the Gabor scheme, as in bubble chambers with the holographic readout/8,27/. This, of course, makes it difficult to scan and measure the information. The apparatus like HOLMES/27/ must be used. Mesooptics could certainly facilitate the scanning/28/, if one applies it directly by photography.

If one allows some decrease in the chamber resolution, one can consider a possibility of constructing a chamber with the readout based on the double schlieren method developed in Dubna/16,17/. It allows the adopted techniques of scanning and processing the films with tracks. (When taking pictures at a distance Z_1 = 250 mm by a lens 6.6 cm in diameter with f = 250 mm, the resolution will be 20 μm). But in this case one can hardly obtain a chamber with dimensions larger than 40x80 mm^3 (using 2 matrix 2048x2048 CCD).

On-line Readout Chamber. Fig.7 shows a possible design of the chamber for implementation of the double schlieren method. The design does not practically differ from the above one, except for the back wall being blank, and smaller size of the chamber, as said above.

The information is read in the following way. Behind the chamber there is a spherical long focal-length lens with a focus satisfying the Fraunhofer condition for tracks in the chamber. The spherical side of the lense is aluminized, while the face is coated with a transparent layer of tin oxide or gold and has an antireflecting coating. The chamber is illu-

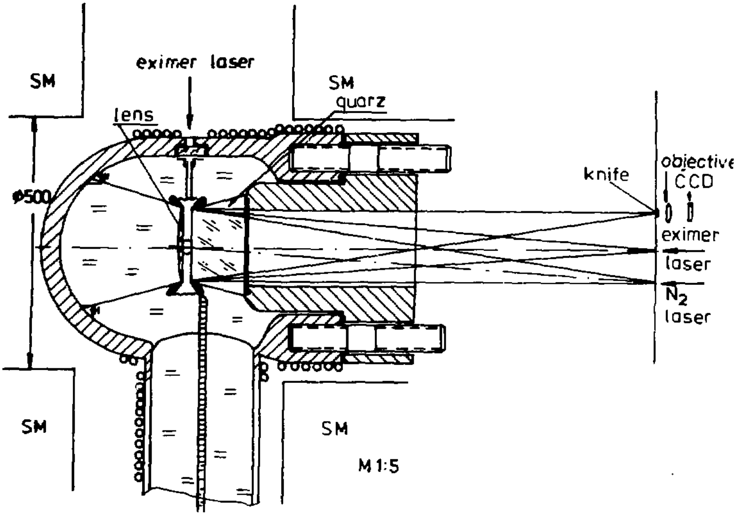

Fig.7. Design of a chamber based on the double schlieren method. Notation is as in Fig.5.

minated by a nitrogen laser whose beam is transformed in a dye R6G laser into a beam with λ = 600 nm. Styril-6 gives two time better output from CCC at λ = 850 nm. Since the cha ber's area is not large, one can, as in the case[25], confin oneself to a moderate nitrogen laser of 2 MW/pulse with the frequency as high as 20 Hz owing to cooling.

Illuminating the chamber the laser beam must go out of a conjugated focus shifted several centimeters off the chamber axis. To correct astigmatism, a cylindrical lens is installe in the beam[16,17]. The diverging laser beam is reflected by the spherical mirror surface of the lens and arrives at the other conjugated focus where the double Foucault knife is installed. Behind the conjugated focus with the knife we obtain the real and virtual images of the track. The real imag is produced when the reflected light beam passed directly through the heat centre, and the virtual image is caused by the light passing directly through the centre and being then reflected by the mirror.

To convert it into both projections in a form suitable fo the scanning and measurement by the existing methods, we use a high-resolution lens which allows projections of both images on the film. The images are shifted with regard to each other by a parallax determined by the photographing geometry. It is this parallax that carries the information of the Z-coordinate. The lens must have a sufficient depth of focus for the real and virtual images, as the high resolution is ~ 100 lines per mm. To design such a lens is not a very hard task, because it must work with a monochromatic light beam and with a practically paraxial bundle of rays.

This readout method allows one to put into practice the main advantage of the chamber with controlled centres over the ordinary streamer chamber. In the former the intensive light diffused on the centre is detected, in the latter the only weak radiation emitted by the streamer is detected. That is why it may be possible to use CCD for the readout system in the chamber with controlled heat centres. There is enough light and the matrix can be used even without cooling it to -10°C/29/. In our case /25/ the power affecting the film was about 0.1 $\mu J/cm^2$. This is two orders higher than the sensitivity level for KZ1200ZM2 matrix.

The main problem is that now the maximum possible size of a matrix used can be 2048x2048 elements. Thus, the frame will be covered only by two pieces (40x80 mm^2). The resolution will be 24 μm instead of 10 μm. This is the limit for which a camera must be designed to-day. The on-line readout system has, of course, great advantages, feeding information directly into a computer (VAX) and eliminating the photography process.

CONCLUSION

It should be mentioned that the above readout system based on the double schlieren method can be also employed in vertex detectors based on high resolution bubble chambers/8/. In this case the information will also be fed directly into the computer without taking holographic pictures.

We see that the chamber with the controlled heat centres allows new opportunities in creating a vertex detector for experiments in elementary particles physics.

If one succeeds in implementing the idea of oil insulation, a compact chamber design may be the result, and one may hope to place it in the superconducting magnet with the field ~ 10 T/30/. In this case the detector acquires an important capability of discriminating secondaries by their charge.

It is significant for identification of processes in the chamber. The momentum being on an average ~ 40 GeV/c (multiplicity of ~ 10), the curvature will be about ~ 94 m^{-1}, which can be detected at the resolution of 30 μm. This is essentially lower than the maximum momentum of ~ 280 GeV/c for the chamber of the given dimensions. At the pressure of 100 atm the multiple scattering will add to the curvature as much as 1/3 of the track width.

Of course there is a problem of primary beam intensities. Now the limit is at the level not higher than 10^8 particles per second.

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На основе исследований, связанных с разработкой нового трекового прибора - камеры с управляемыми центрами, предлагается вершинный детектор заряженных частиц высокого давления для экспериментов в области физики высоких энергий. Обсуждаются возможные конструкции такой камеры. Использование лазерного освещения стримерной камеры позволяет получить достаточно света для осуществления съема информации с помощью ПЗС матрицы. Рассматриваются некоторые характеристики установки. Обсуждается возможность применения нового метода подавления диффузии.

Работа выполнена в Лаборатории ядерных проблем ОИЯИ.

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Shcherbakov Yu.A. D13-89-153

A Track Chamber with Controlled Heat Centres as a Vertex Detector for Very High Energy Physics Experiments

A high-pressure vertex detector for high energy experiments is proposed on the basis of development of a new track detector of charged particles, which is a chamber with controlled heat centres. A possible design of this chamber is discussed. Laser illumination of a streamer chamber allows enough light for reading the information by means of a CCD device. Some characteristics of the set-up are considered in the paper. A possibility of using a new method for suppression of diffusion is discussed.

The investigation has been performed at the Laboratory of Nuclear Problems, JINR.

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