BECQUEREL PROJECT
Проект БЕККЕРЕЛЬ

Beryllium (Boron) Clustering Quest in Relativistic Multifragmentation

http://becquerel.jinr.ru

PERIPHERAL DISSOCIATION OF RELATIVISTIC ^{9}C NUCLEI IN NUCLEAR TRACK EMULSION

D. Krivenkov
JINR, Dubna

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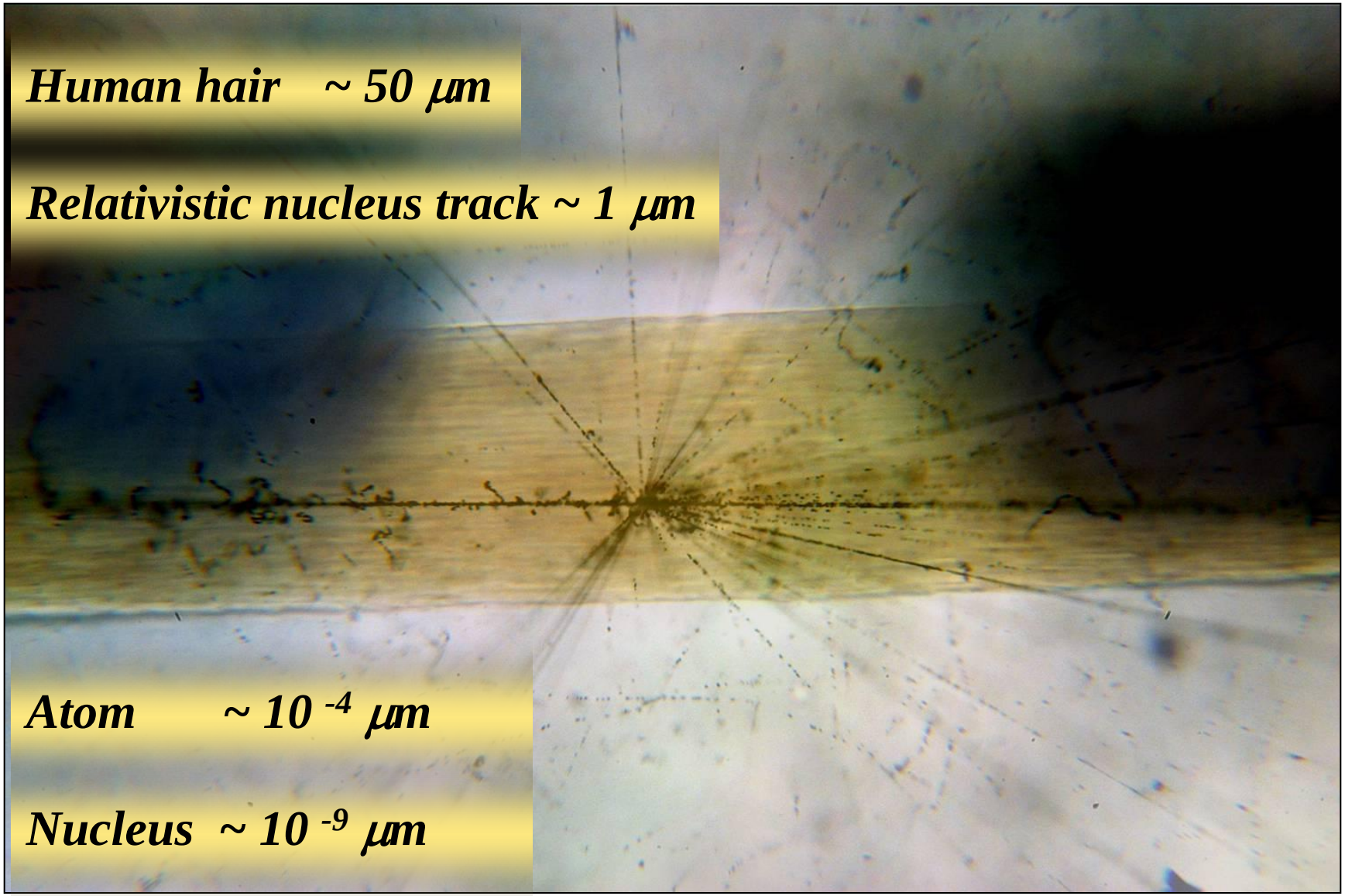
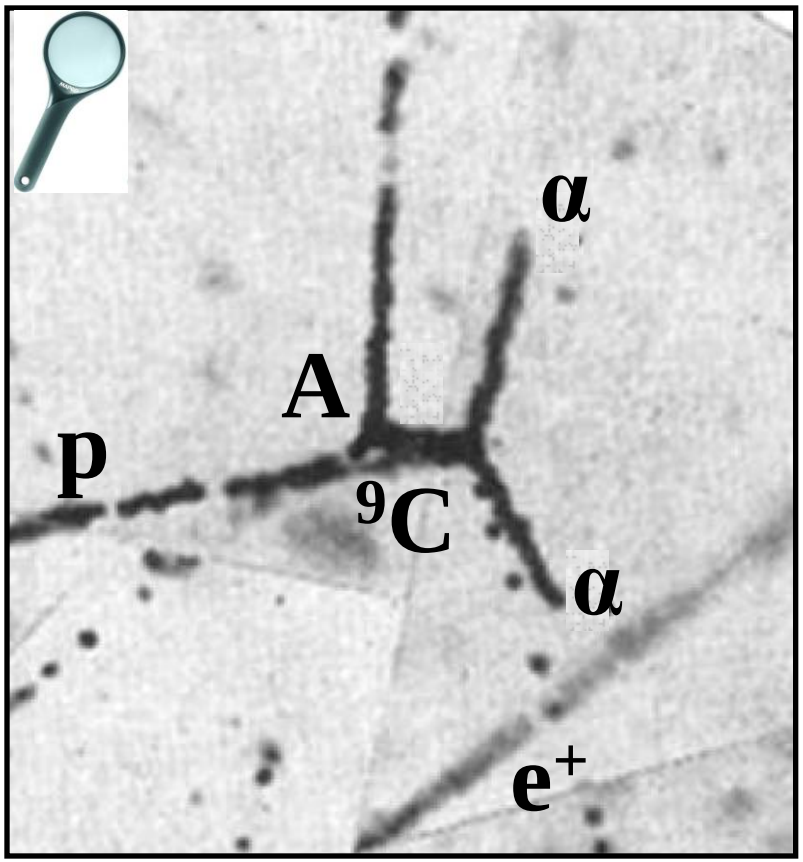
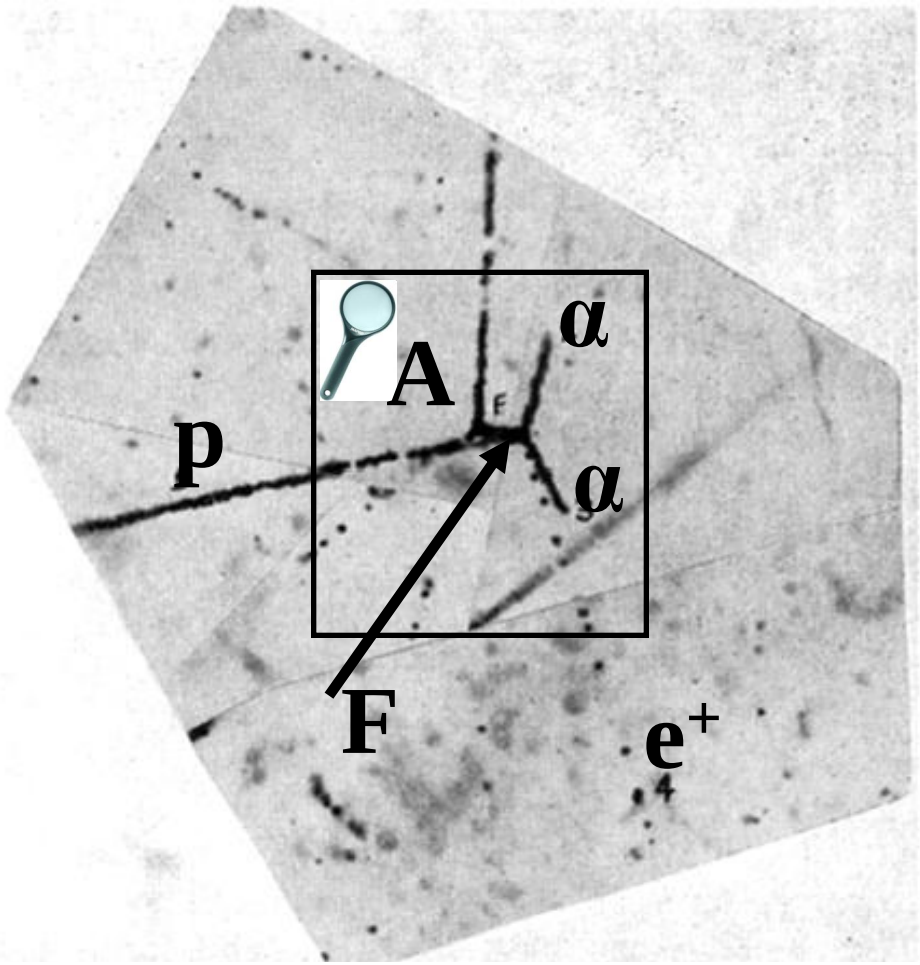
Relative Scales



β-Decay of a ^{9}C Nucleus

A photograph of an event interpreted as the beta decay of ^{9}C. The ^{9}C nucleus (track F) was produced in star (A) and disintegrated into a proton, two alpha particles, and a positron.



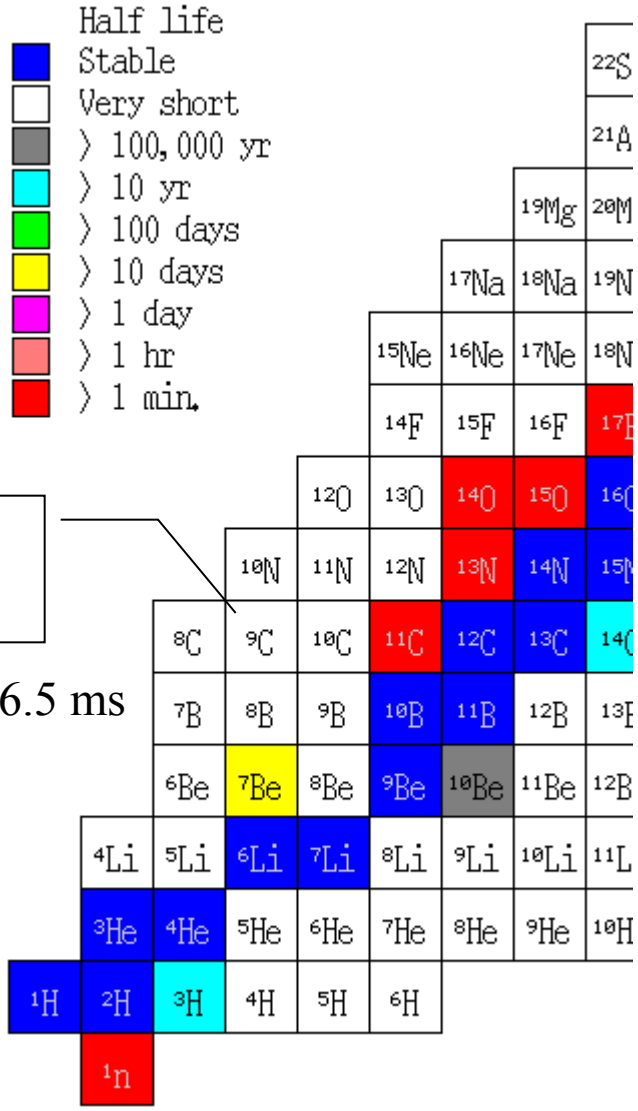


M. S. Swami, J. Schneps, and W. F. Fry

Department of Physics, University of Wisconsin, Madison, Wisconsin

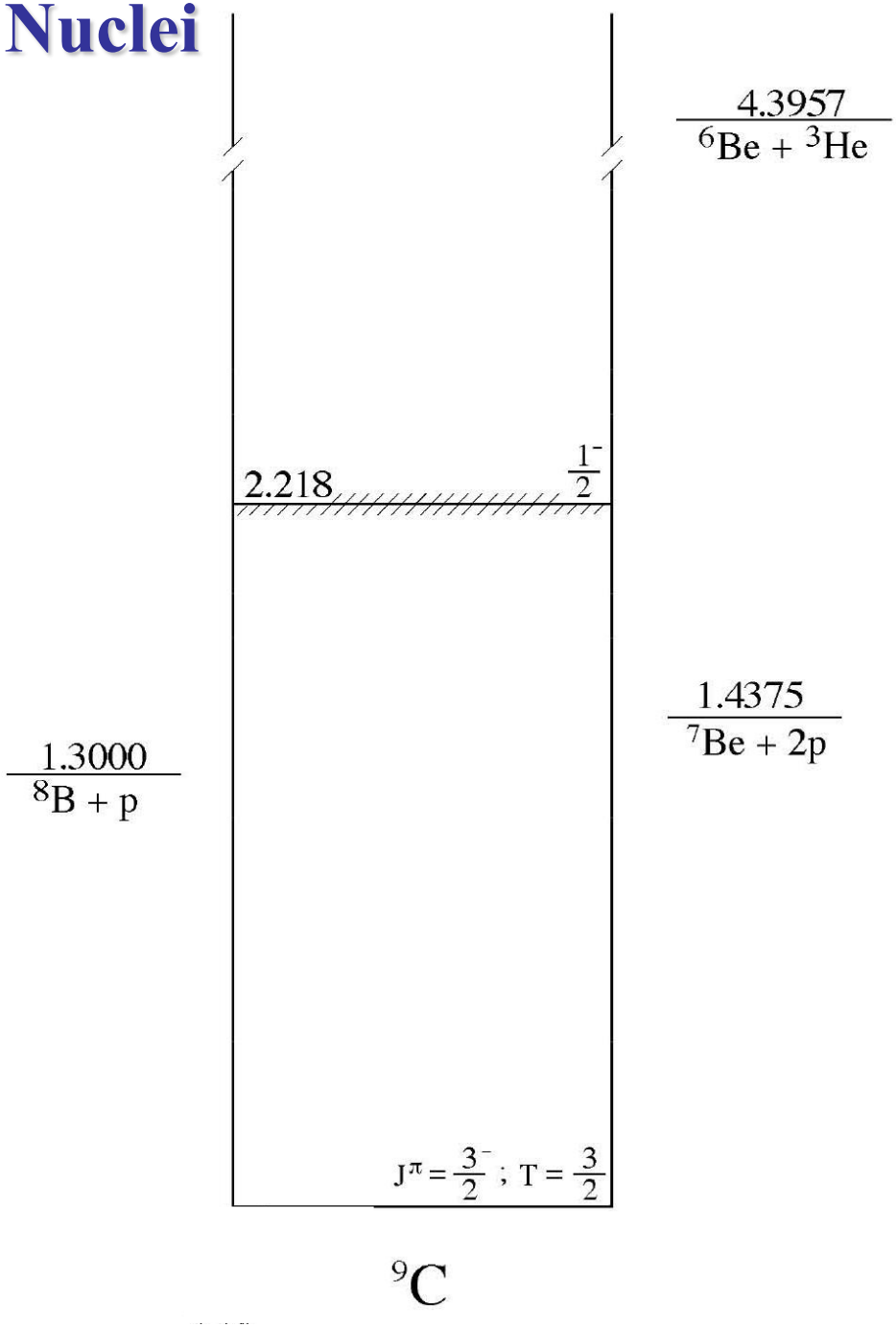
(Received June 29, 1956)

Structure Peculiarities of ^{9}C Nuclei

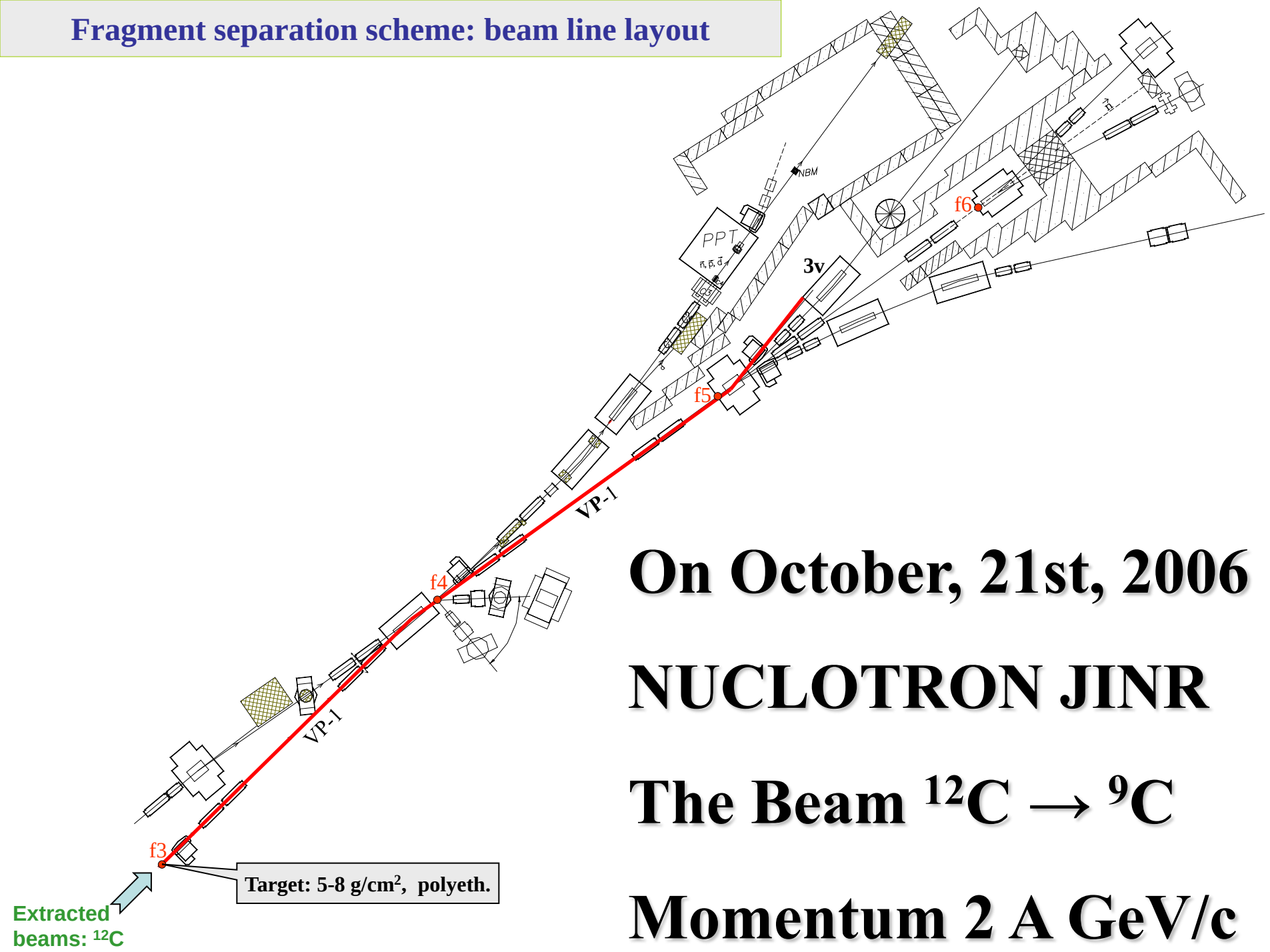


^{9}C

Half life – 126.5 ms



Fragment separation scheme: beam line layout



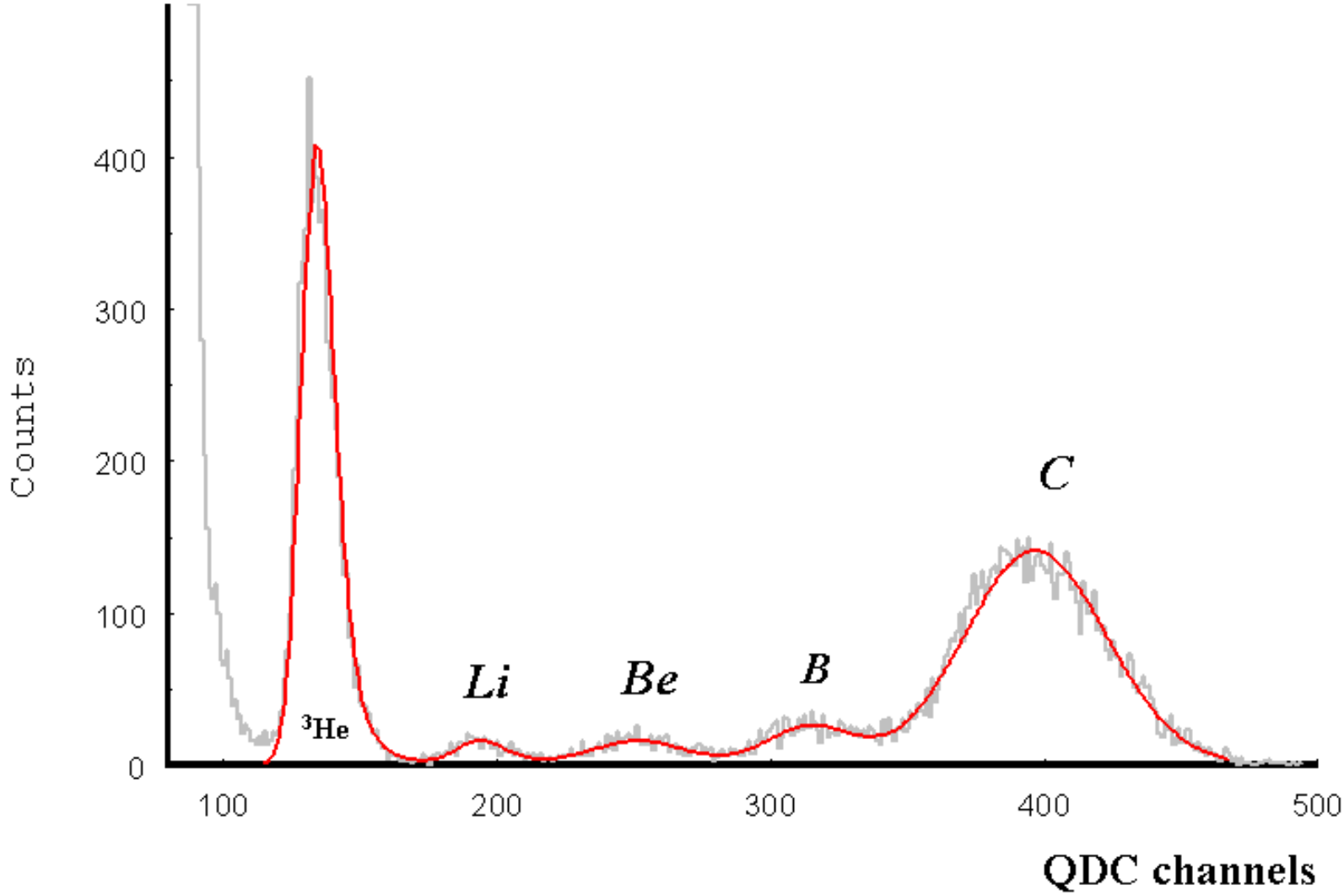
On October, 21st, 2006

NUCLOTRON JINR

The Beam $^{12}C \rightarrow {}^{9}C$

Momentum 2 A GeV/c

Amplitude Spectrum from a Scintillation Monitor of the Secondary Beam



Experiment

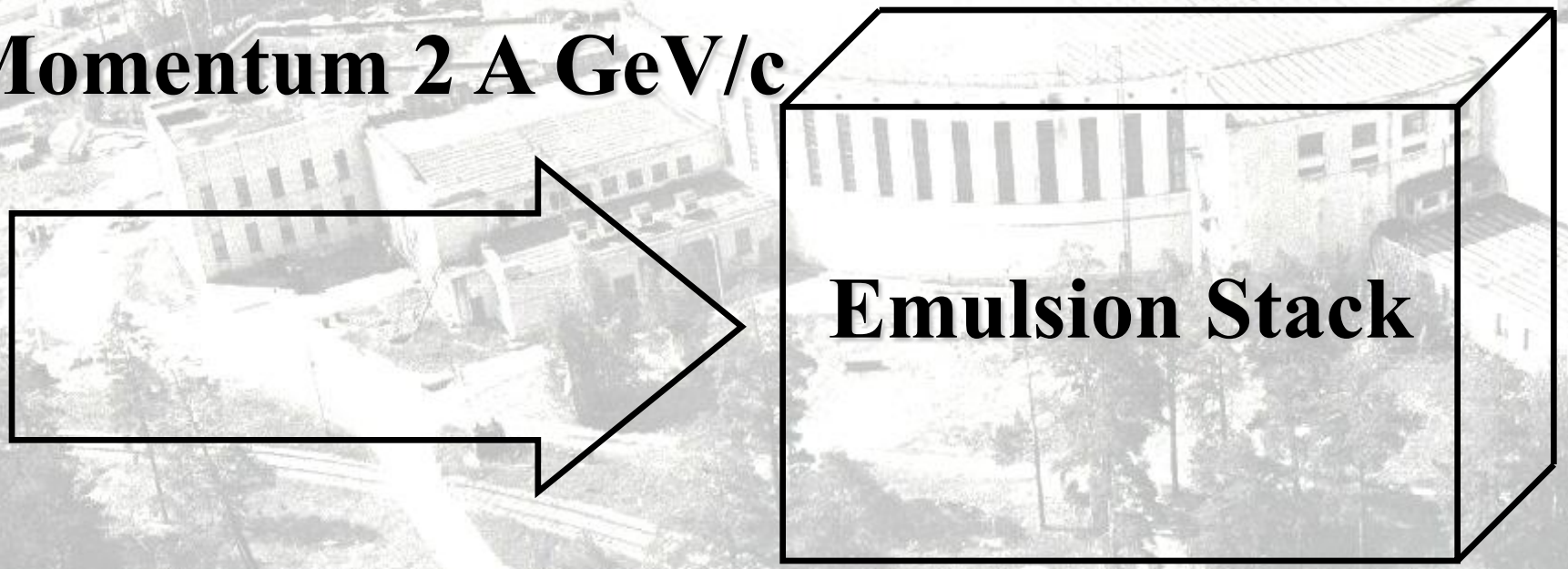
On October, 21st, 2006

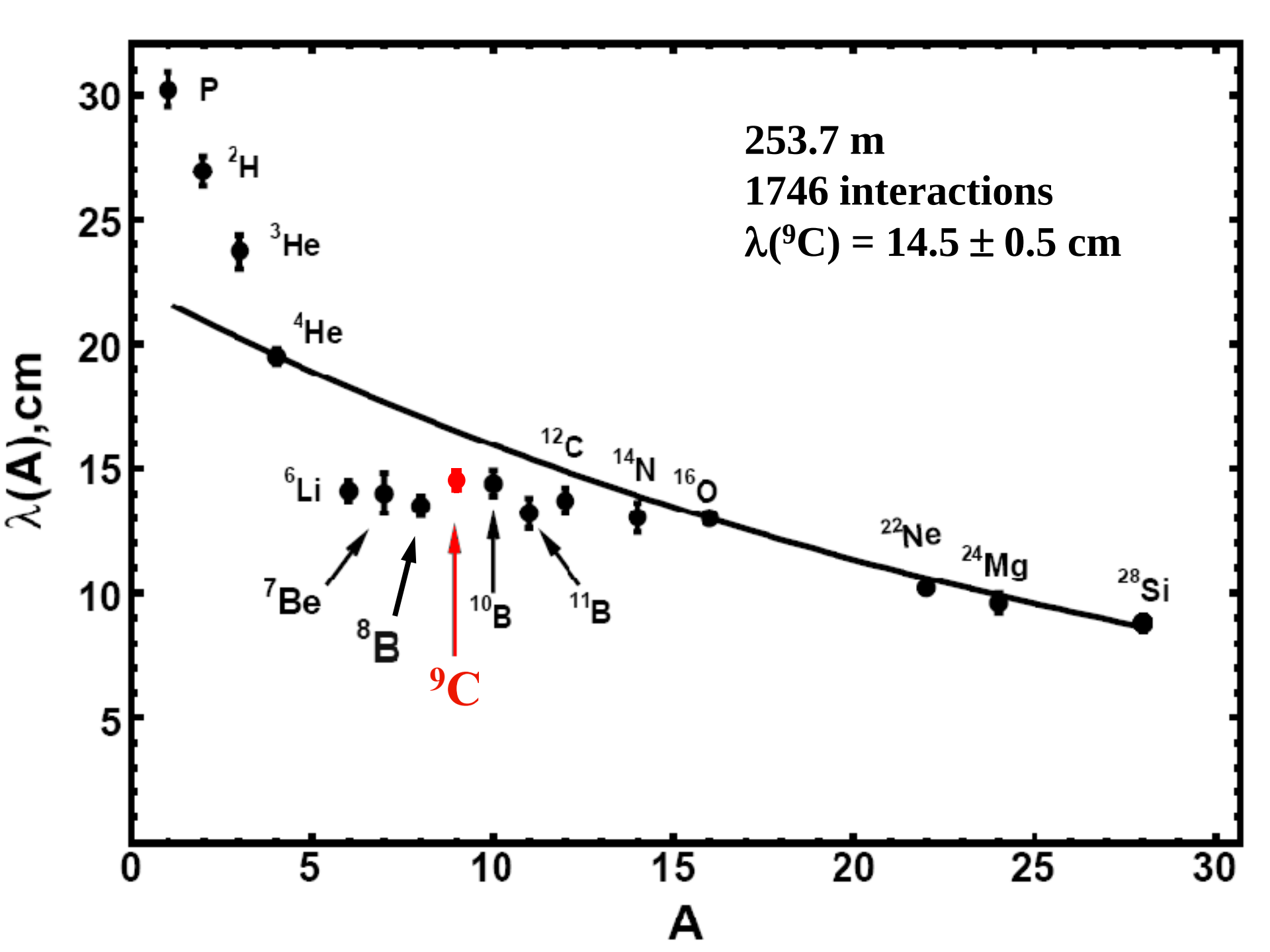
NUCLOTRON JINR

The Beam $^{12}C \rightarrow {}^{9}C$

Momentum 2 A GeV/c

19 emulsion layers
Scales of plate
20 cm × 10 cm × 550 μ




253.7 m
1746 interactions
λ(⁹C) = 14.5 ± 0.5 cm
λ(A),cm
A
P
²H
³He
⁴He
⁶Li
⁷Be
⁸B
⁹C
¹⁰B
¹¹B
¹²C
¹⁴N
¹⁶O
²²Ne
²⁴Mg
²⁸Si
0
5
10
15
20
25
30

The Beam Analysis
Using the Multiple Coulomb Scattering

$$p\beta c = \frac{Z_f K t^{3/2}}{573\overline{D}}$$

where **P** – the fragment momentum

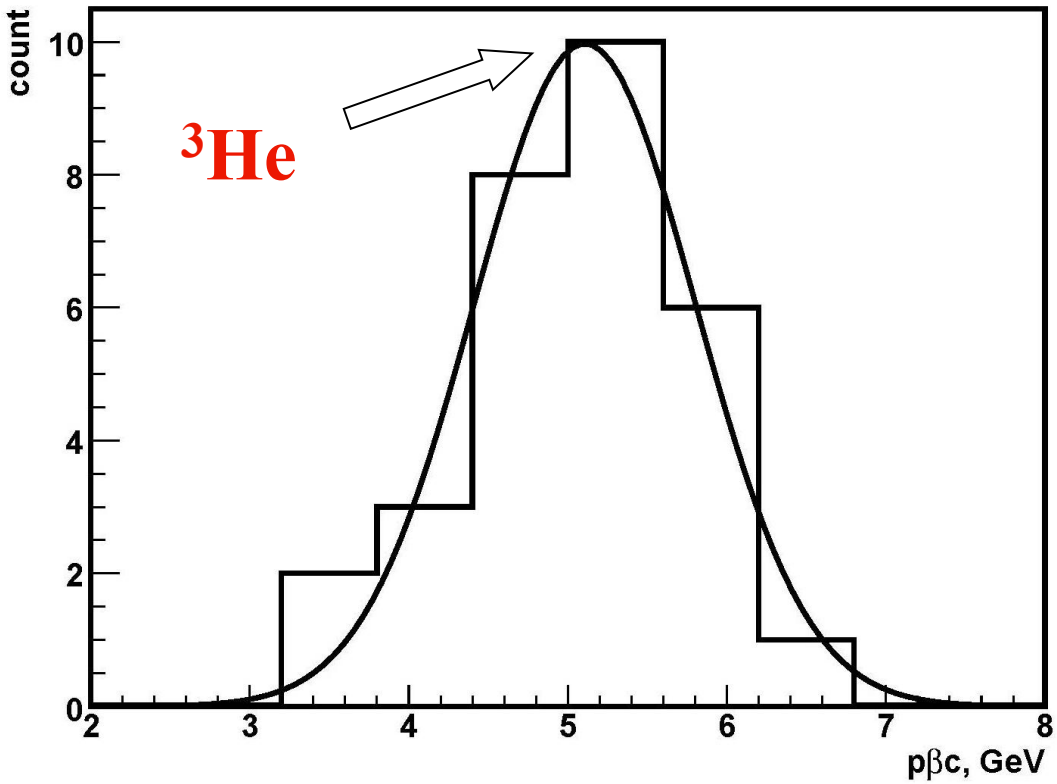
$\mathbf{Z_f}$ – the fragment charge

βc – velocity

K – "scattering const"

t – the length of a cell

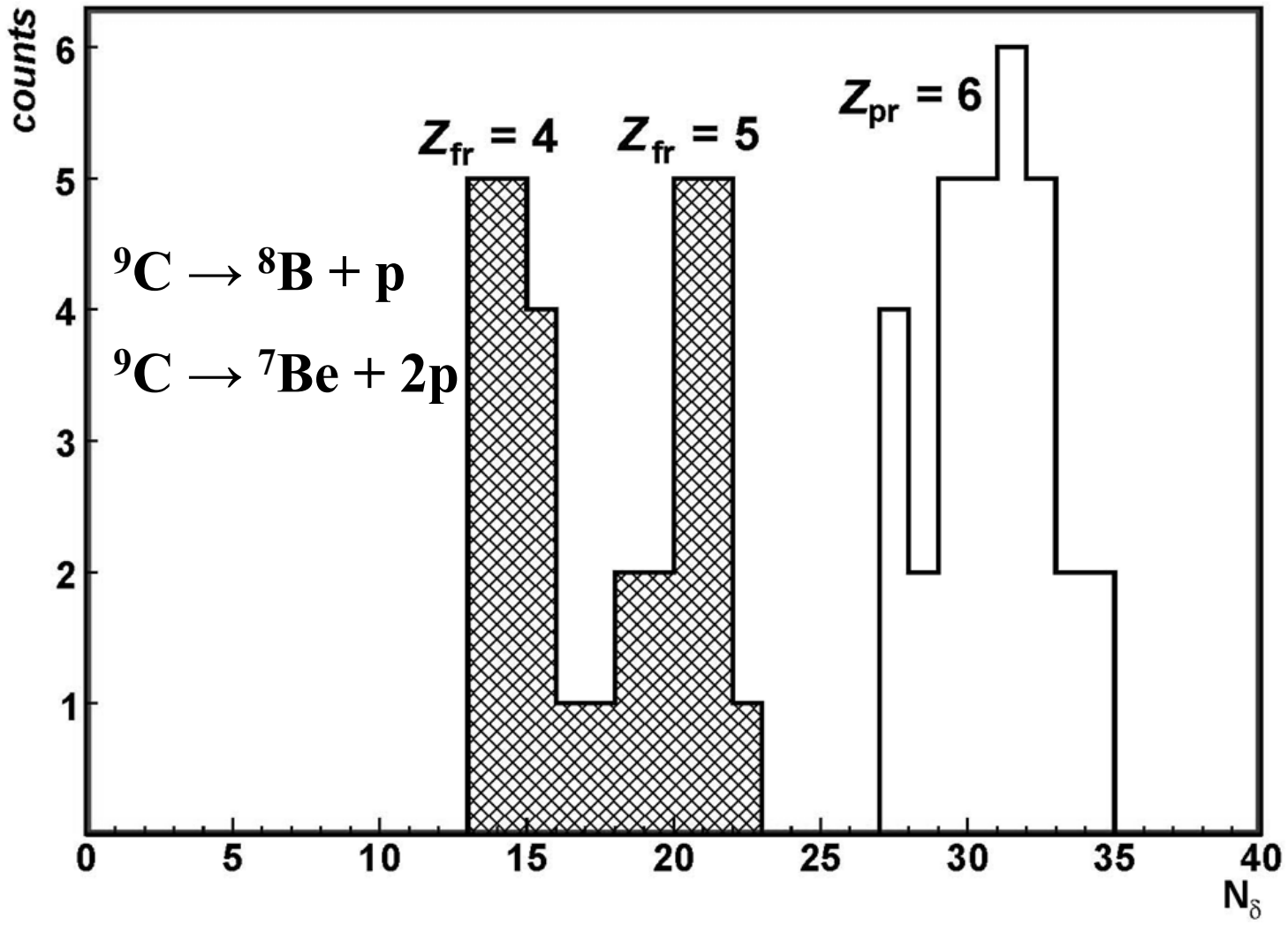
D – the mean deviation



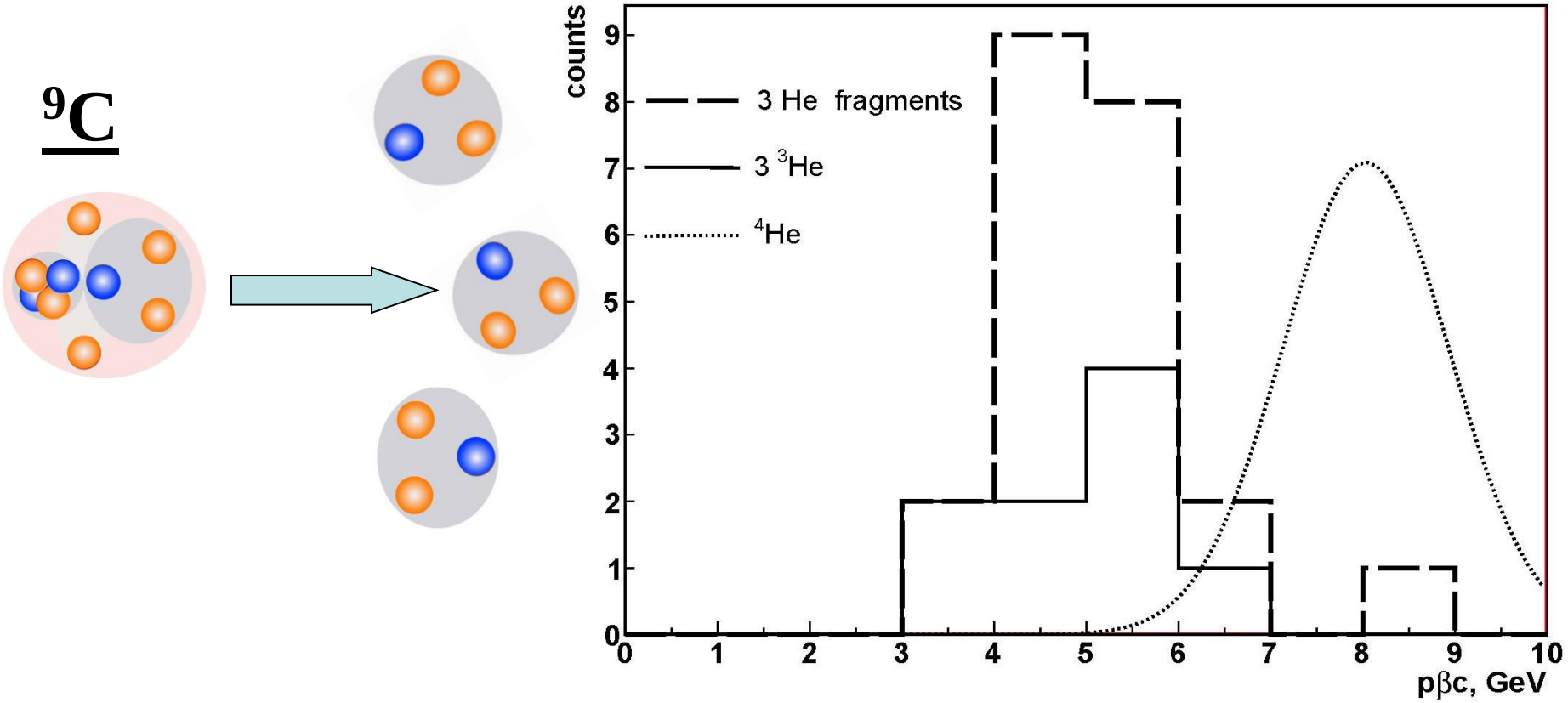
Charge Topology of ^{9}C Nuclei Interactions with Emulsion Nuclei

$\sum Z_{fr} = 6$	N_{fr}	N_{ws}	$N_{fr} + N_{ws}$
$^{8}B + p$	**51**	**15**	**66**
$^{7}Be + p + p$	**47**	**16**	**63**
$3\ ^{3}He$	**9**	**16**	**25**
He + 4 H	80	28	108
2 He + 2 H	54	22	76
6 H	6	16	25
…	…	…	…

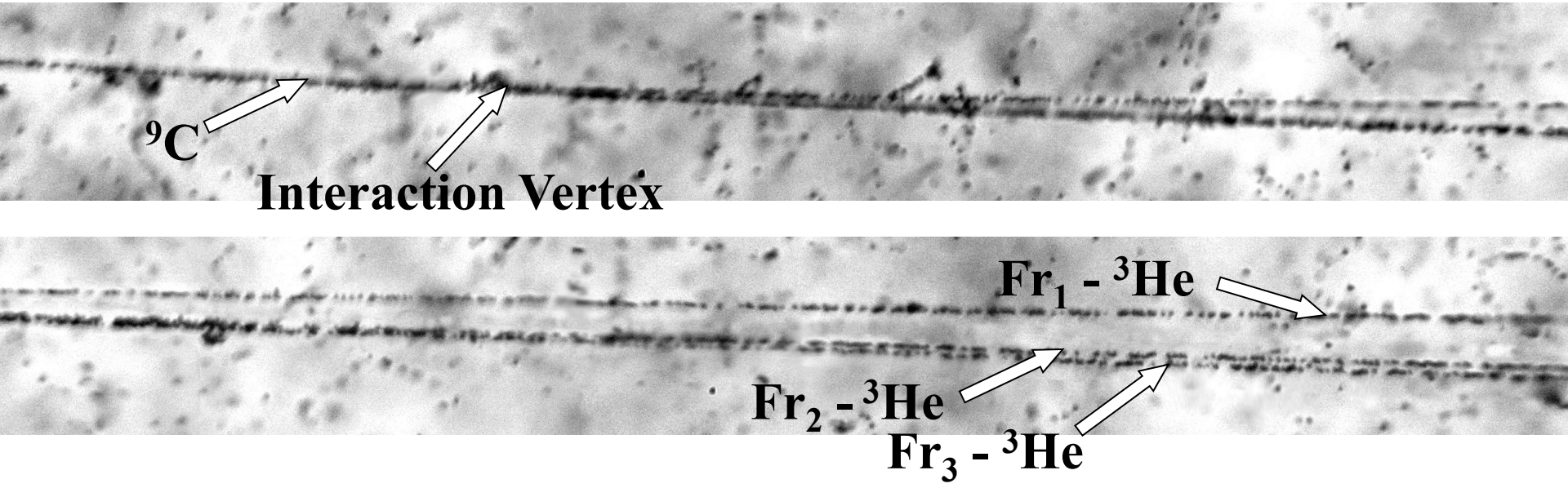
^{9}C Charge Distribution for "White" Stars



Double-charged Fragments Identification from $^{9}C_{ws} \rightarrow 3^{3}He$ Using the Multiple Coulomb Scattering Method



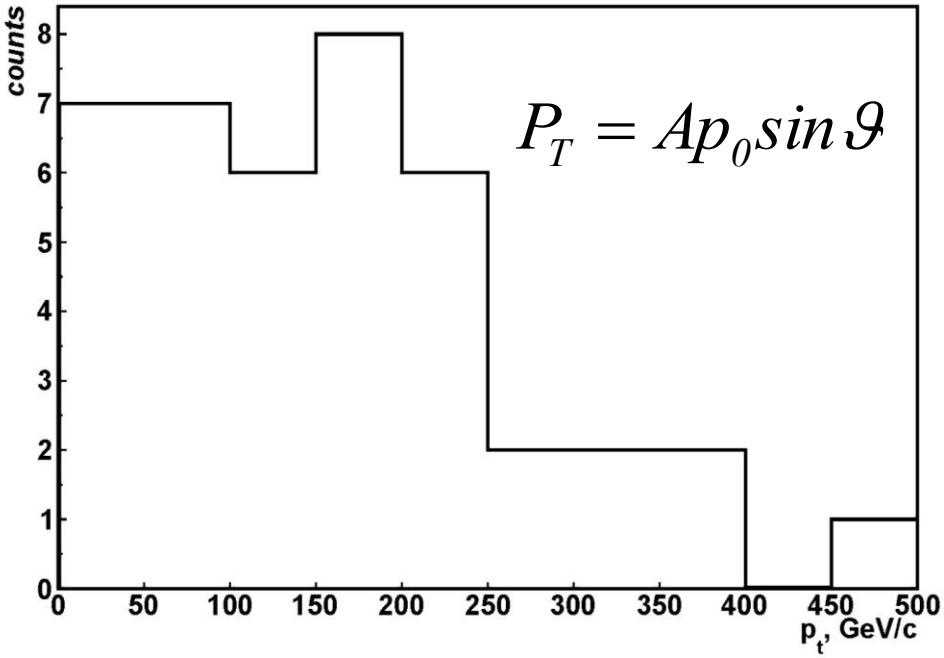
Fully Identified Event of $^{9}C \rightarrow 3\ ^{3}He$

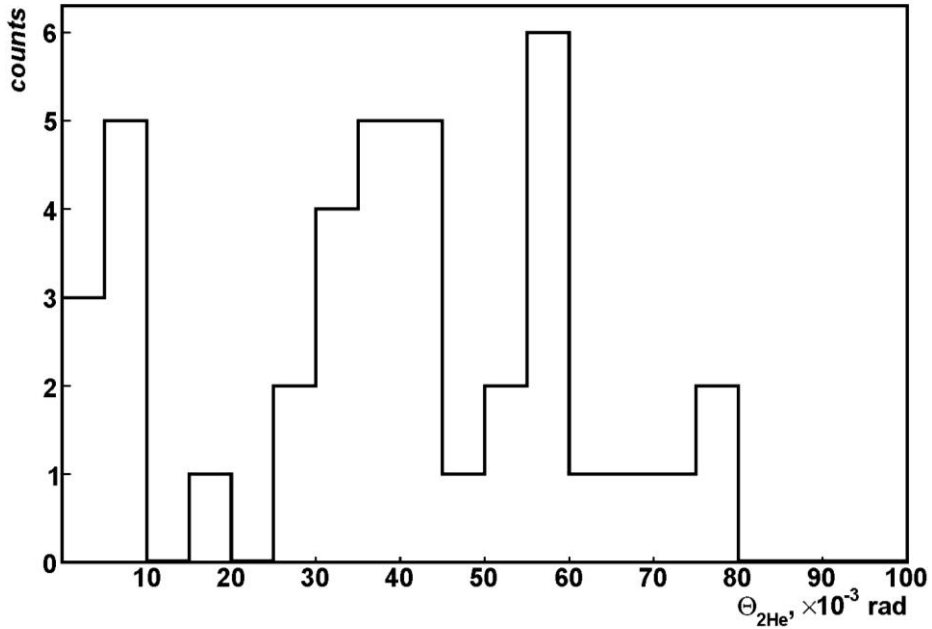


	$Openangle_{i,j}$ rad	P_t, MeV	ΣP_t, MeV	P_t^*, MeV	$\varepsilon_{i,j}^*$, rad	M_{eff}, MeV
Fr_1	0.056	466	760	216	3.038	0.046
Fr_2	0.055	154		111	3.034	8.786
Fr_3	0.004	148		106	0.211	9.017

Searching for $^{9}C \rightarrow 3\ ^{3}He$ Channel

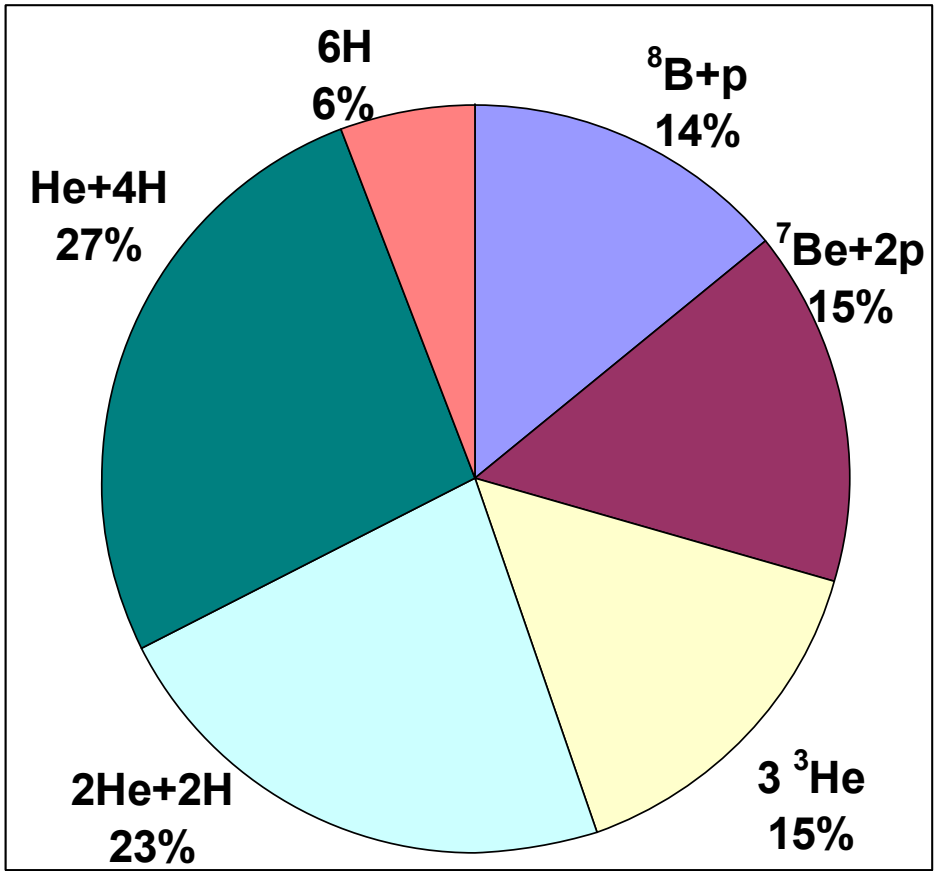
Transverse Momentum Distribution of 3 ^{3}He-system for Processes: $^{9}C \rightarrow 3\ ^{3}He$

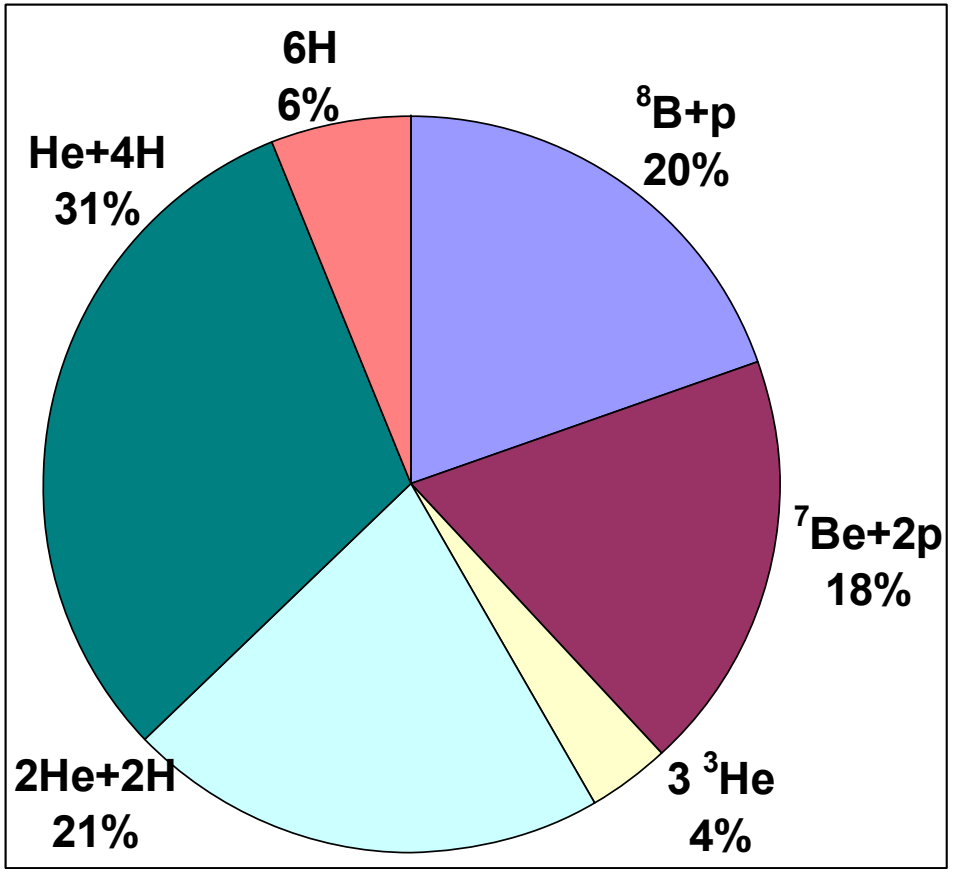




Opening angle Distribution for He-fragments in $^{9}C \rightarrow 3\ ^{3}He$ Fragmentation Channel

Fragmentation Channel Distribution for "White" Stars (Left Picture) and Events with Target Fragmentation (Right Picture) in Percent Ratio





Conclusions

- Irradiation by relativistic ^{9}C nuclei with momentum 2 A GeV/*c* of emulsion was performed and 1746 inelastic interactions were recorded.
- The mixed beam analysis showed that the primary beam is highly enriched with ^{9}C nuclei.
- Charge topology distribution of ^{9}C nuclei interactions with emulsion nuclei was obtained.
- The fragmentation channels respected to the lowest mass threshold are studied.
- Angular and momentum distributions of fragments ^{3}He allowed to demonstrate some features of rare dissociation channel $^{9}C \rightarrow 3\ ^{3}He$.

Thanks for Attention