elliptical tracks

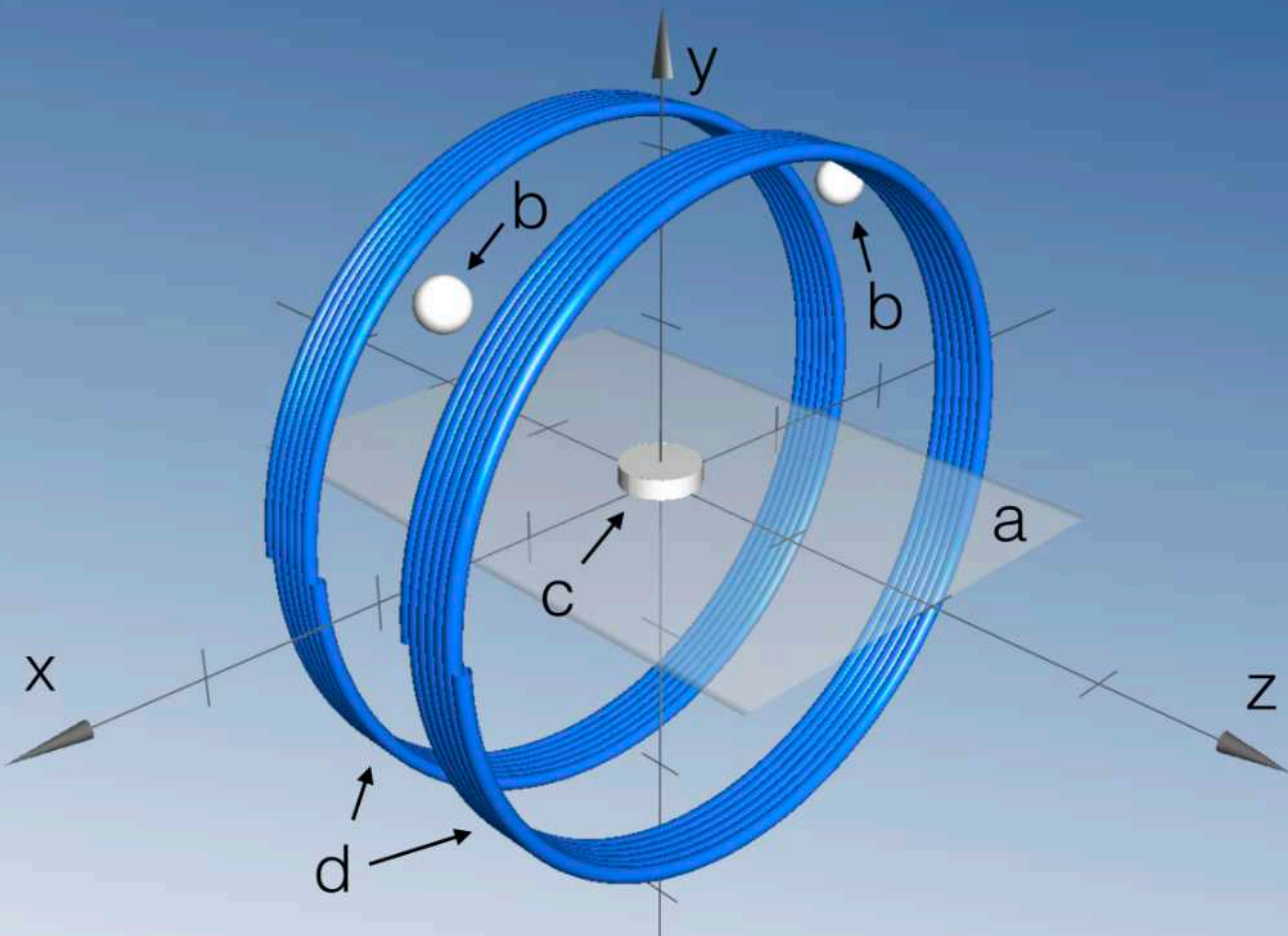
evidence for superluminal electrons?

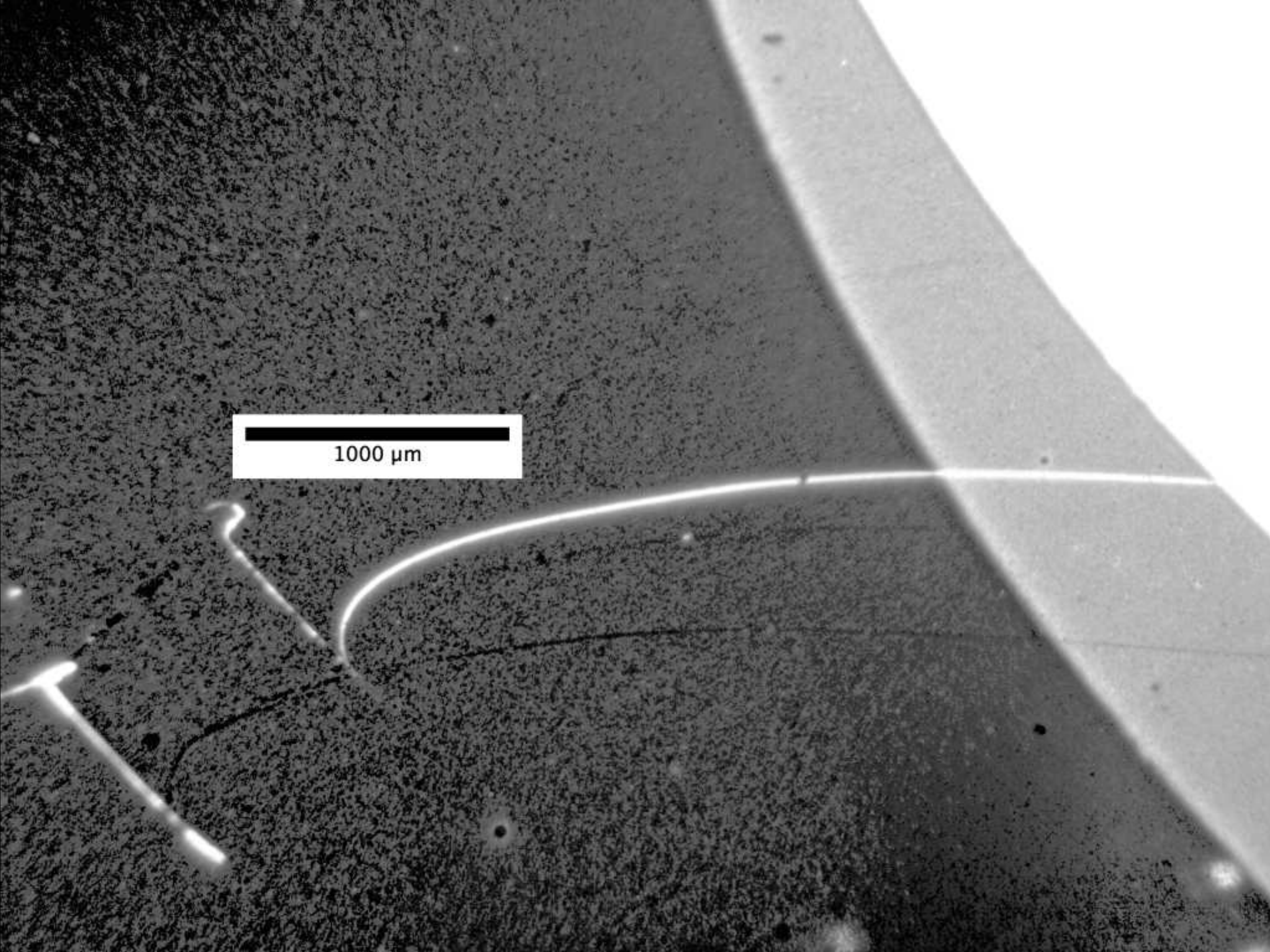
- quantized elliptical tracks
- sizes expected of bound monopoles
- yet requiring $v > c$

- ICCF 11: Urutskoev, Ivoilov, Lochak, Strange radiation

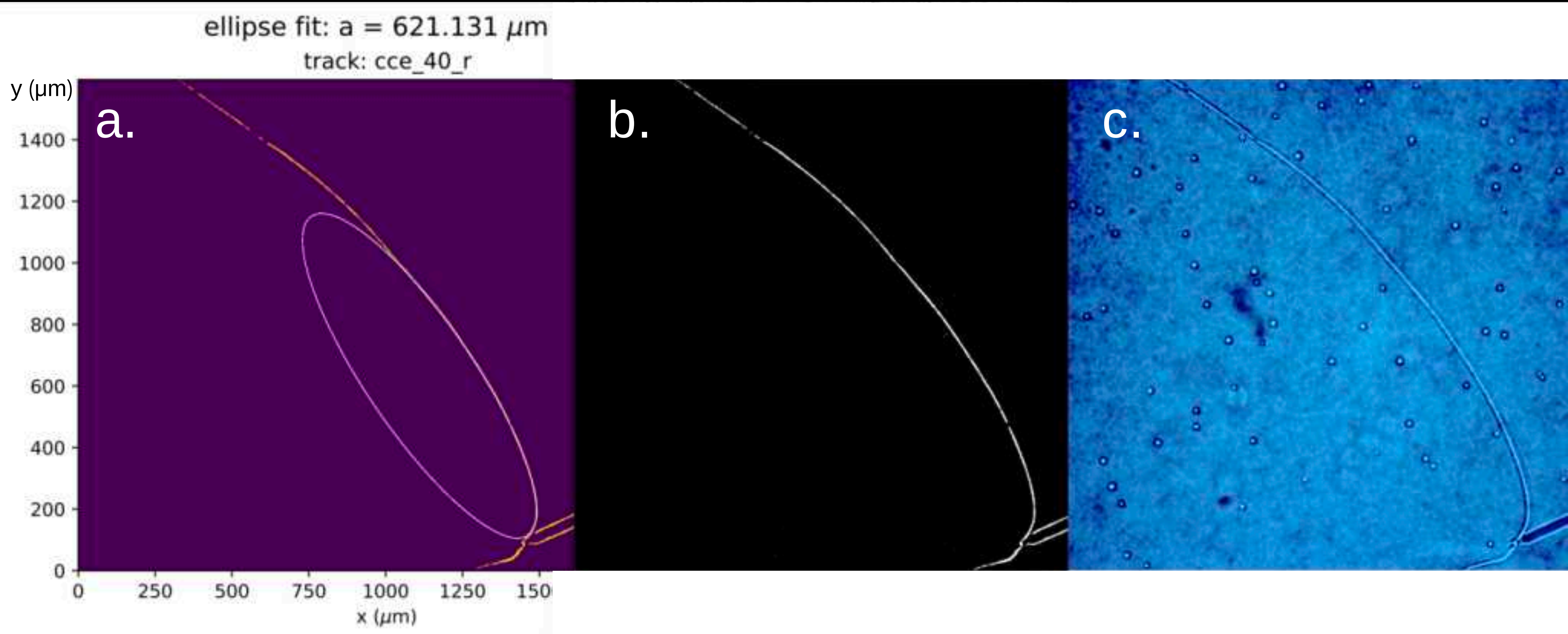
- ICCF 18: replication of tracks with simplified technique

- Do these particles respond to electric or magnetic fields?


y
b
b
a
c
x
z
d


1000 µm

track cce a = 621.1 ±7.3 μm n = 5.0

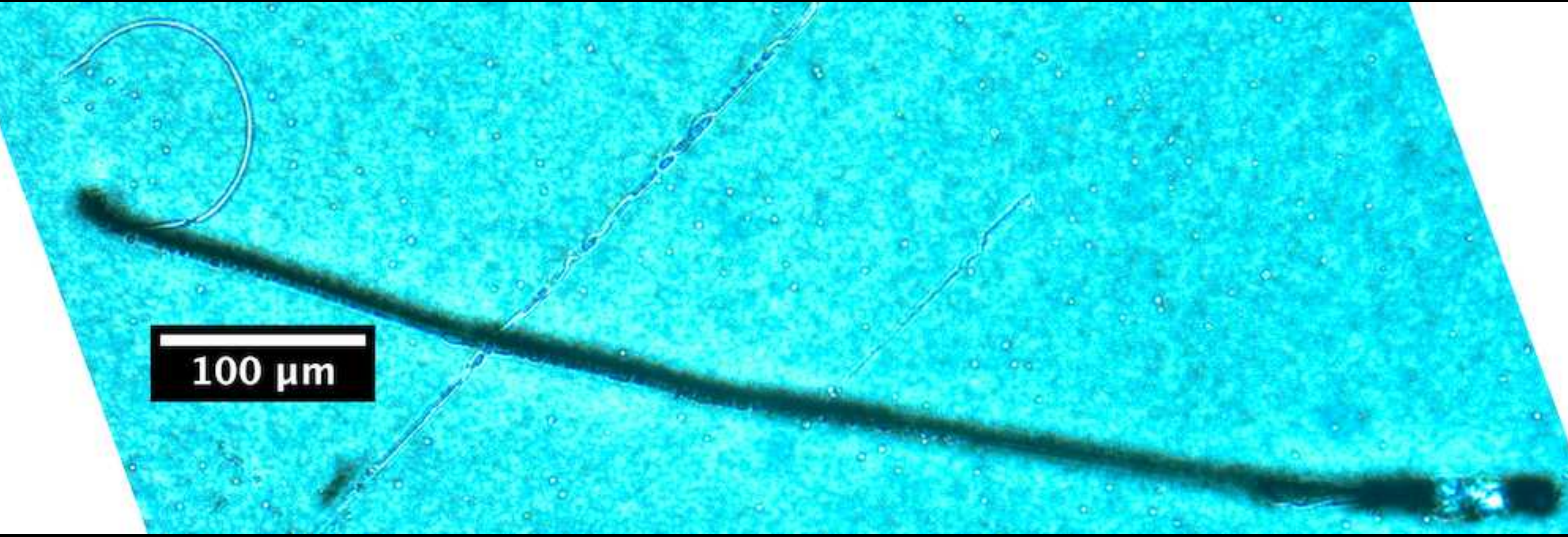


a.) Ellipse fitted to track

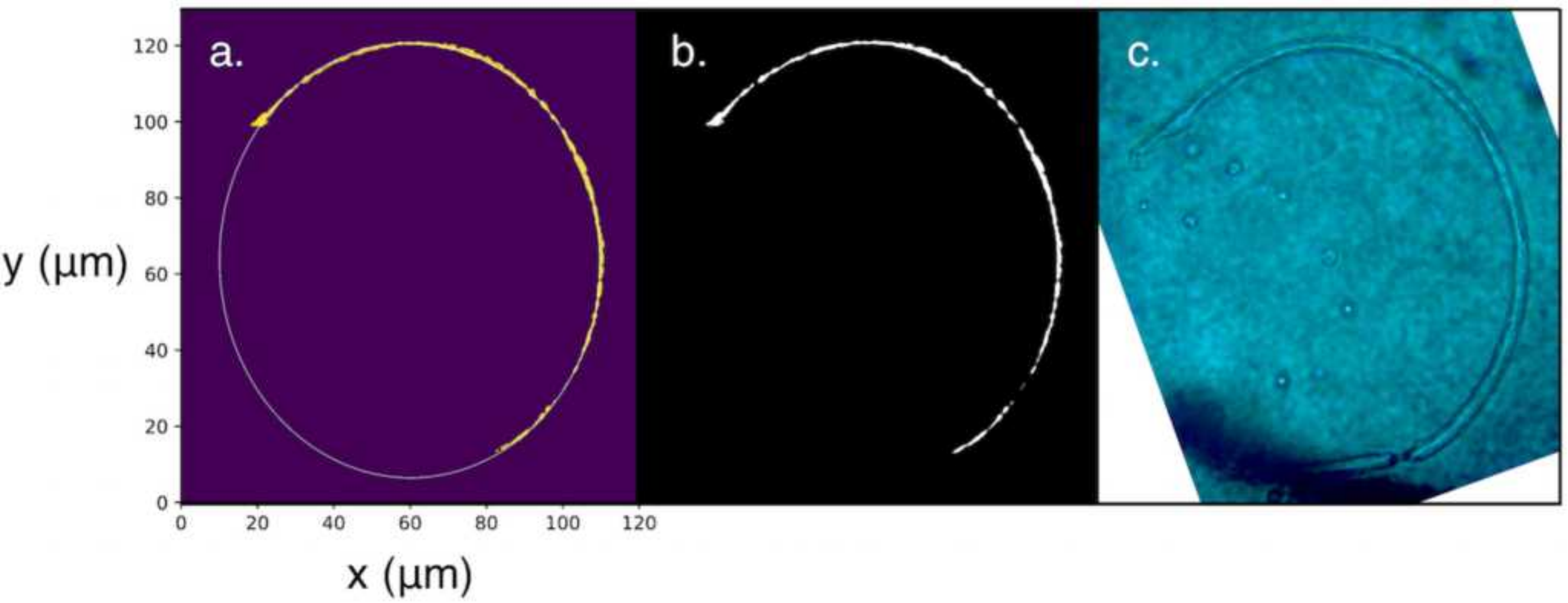
b.) After processing and background eradication.

c.) Photo using Leitz PL 40x objective.

track lee2



track lee2   a = 56.9 ±13.0 μm   n = 2.75

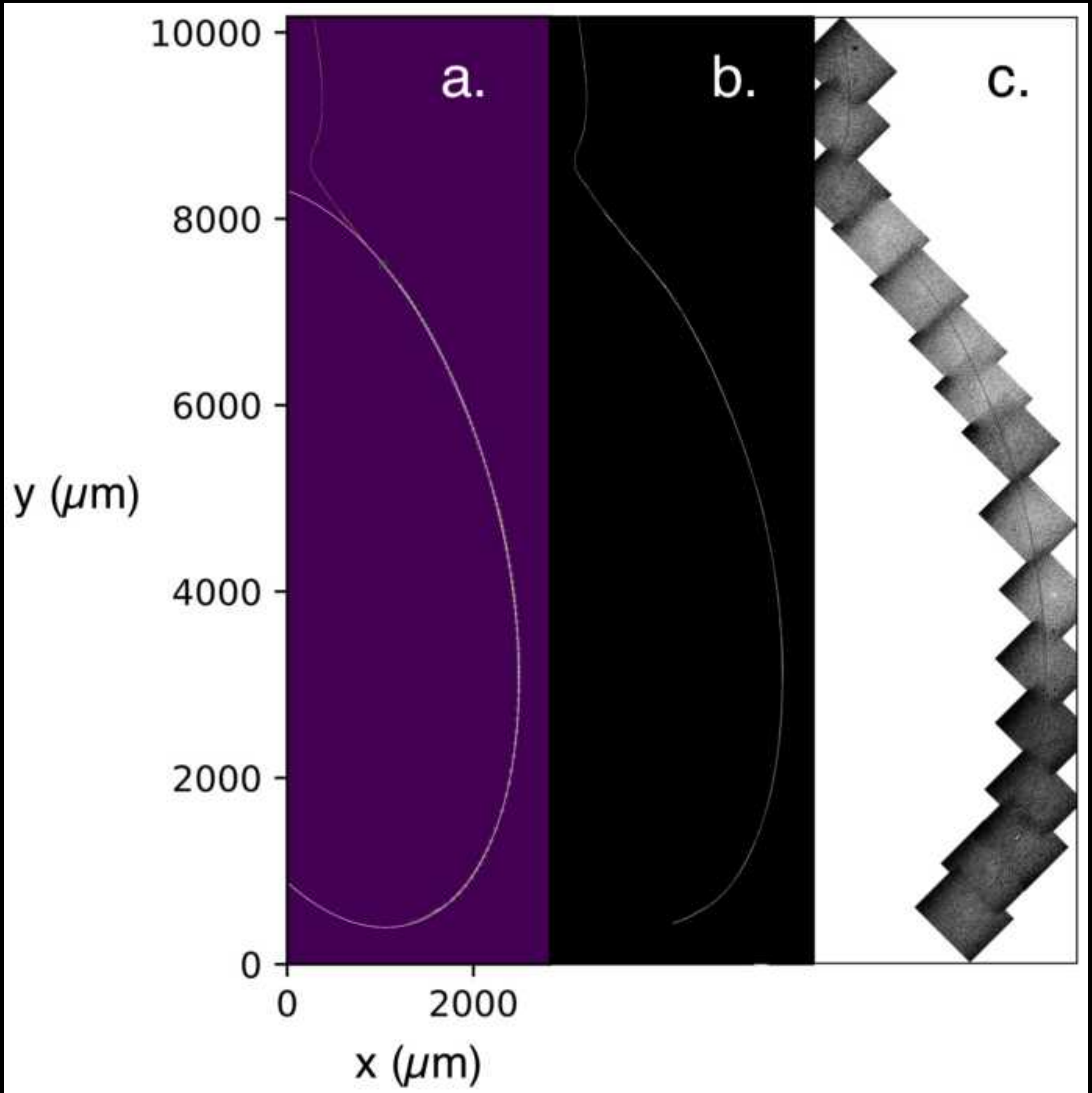


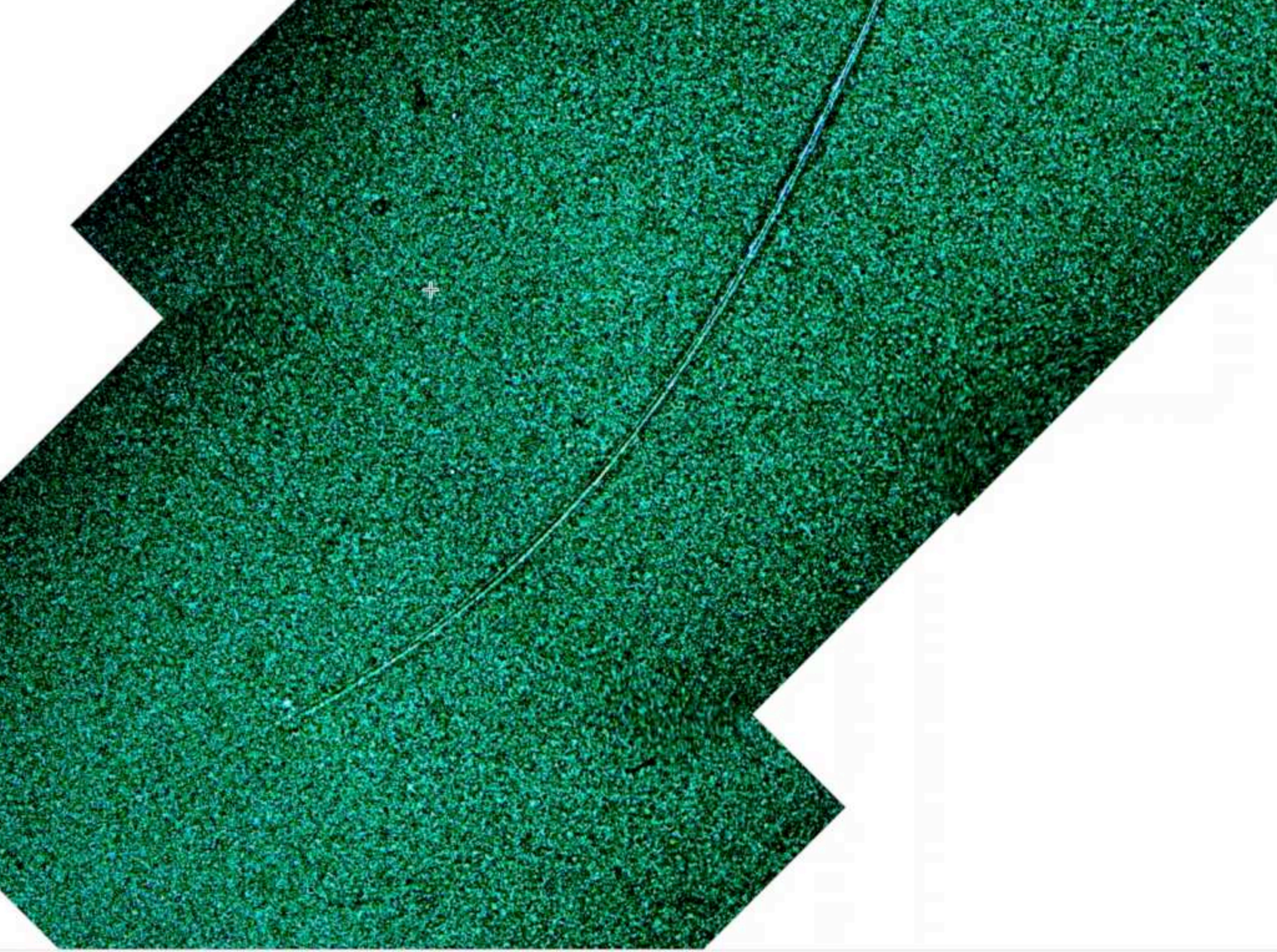
a.) Ellipse fitted to track

b.) After processing and background eradication.

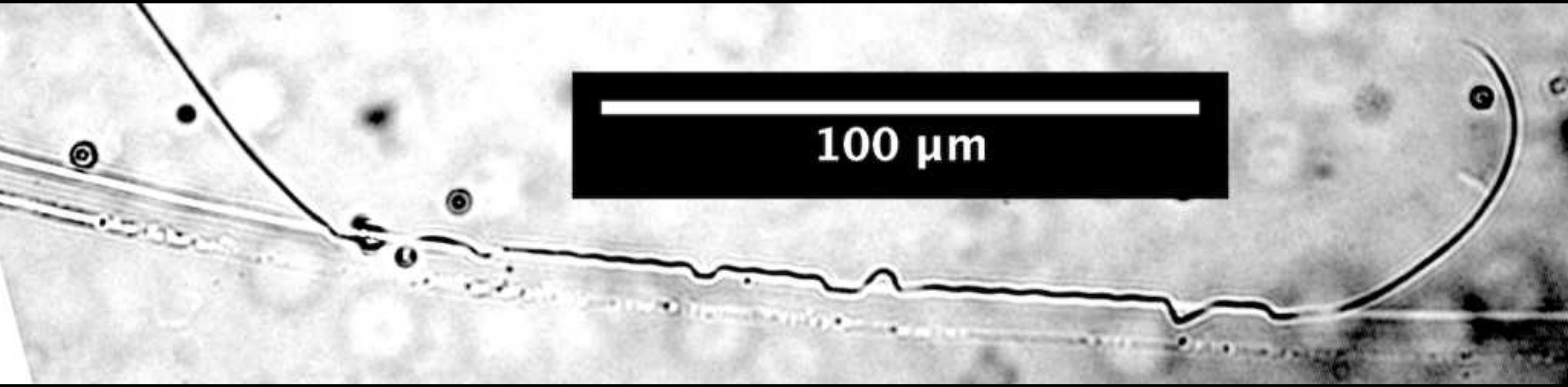
c.) Photo using Leitz PL 100x objective.

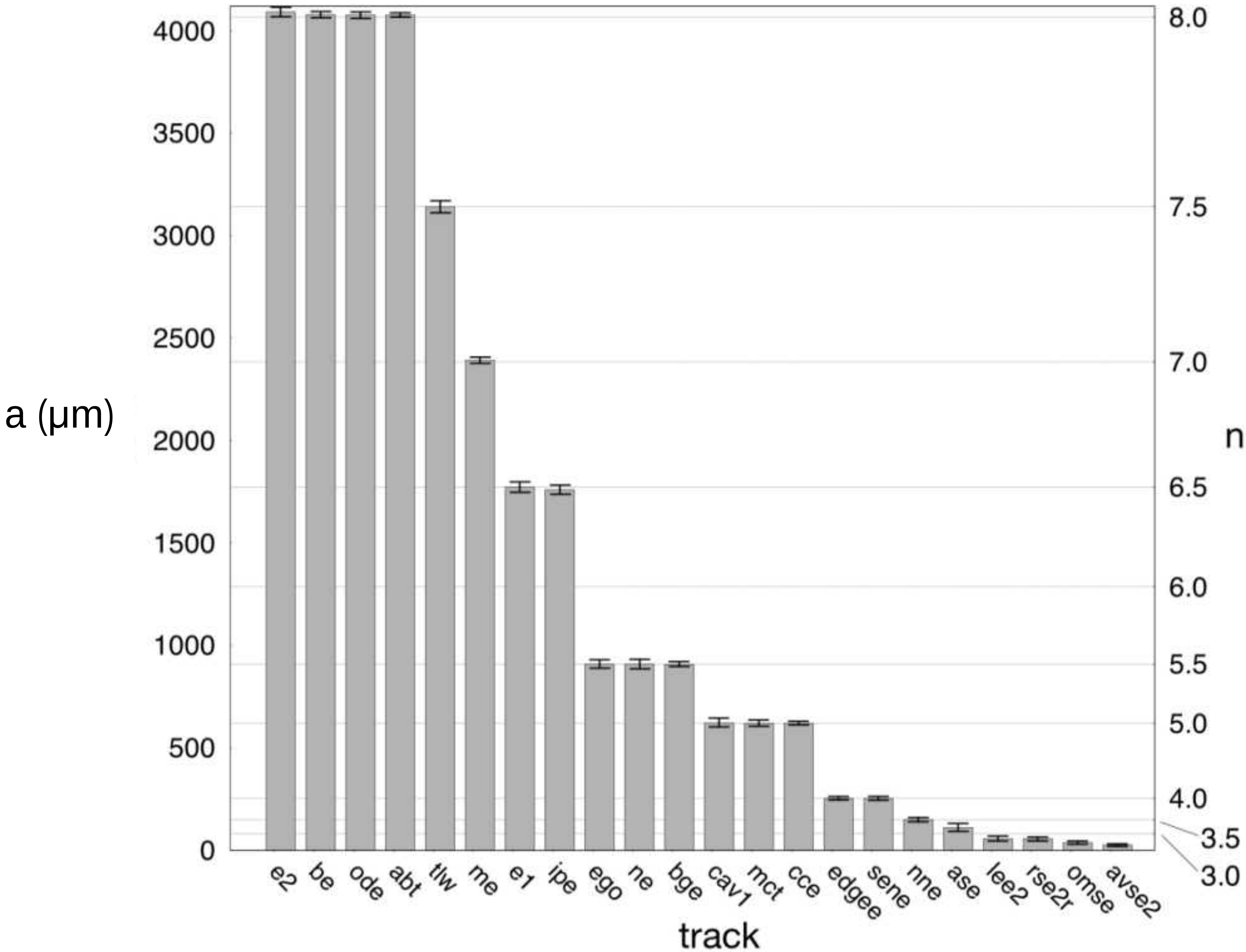
track be a = 4078.6 ±14.6 μm n = 8





track rse2 a = 56.7 ±9.5 μm n = 2.75





a (μm)
4000
3500
3000
2500
2000
1500
1000
500
0
n
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.0
3.5
3.0
e2
be
ode
abt
tlw
me
e1
ipe
ego
ne
bge
cav1
mct
cce
edgee
sene
nne
ase
lee2
rse2r
omse
avse2
track

breakthrough

- No observed curvature effects due to applied electric or magnetic fields
- Decay events
- the ellipses must be bound states caused by an inverse square ($1/r^2$) central force
- → Elliptical tracks are $137^2 n^2$ bigger than Bohr-Sommerfeld hydrogen

$$137^2 n^2 = \frac{n^2}{\alpha^2}, \quad g = 2g_D$$

larger than Bohr-Sommerfeld hydrogen

$$g = \frac{ec}{\alpha}$$

Schwinger quantization condition $g = 2g_D$

using analogy with the electron, the coupling constant for the magnetic monopole is

$$\alpha_m = \alpha^{-1} = k_m \frac{g^2}{\hbar c}$$

Semi-major axes of the fitted ellipses, a_m, differ from the semi-major axes, a_e, of corresponding Bohr-Sommerfeld ellipses for hydrogen by $\simeq 137^2 n^2$.

Using $g = 2g_D$,

$$a_m = a_e \frac{n^2}{\alpha^2}$$

For n = 1,

$$\frac{a_{0m}}{a_{0e}} = \frac{1}{\alpha^2}$$

Substituting the Bohr radius, $a_{0e} = \hbar/m_e c\alpha$, and the monopole Bohr radius, $a_{0m} = \hbar\alpha/m_m c$ ($\alpha_m = 1/\alpha$), monopole mass:

$$m_m = m_e \alpha^4$$

$$= 1.45 \times 10^{-3} \text{eV}/c^2$$

interesting aside…

$$1.45 \times 10^{-3}\ \mathrm{eV/c^2}$$

$$\sim 1.33 \times 10^{-3}\ \mathrm{eV/c^2}$$

$$= 2 \times (1.3 \times 10^{-9} m_e)$$

John Wallace's exceedingly small effective mass

Bohr radius

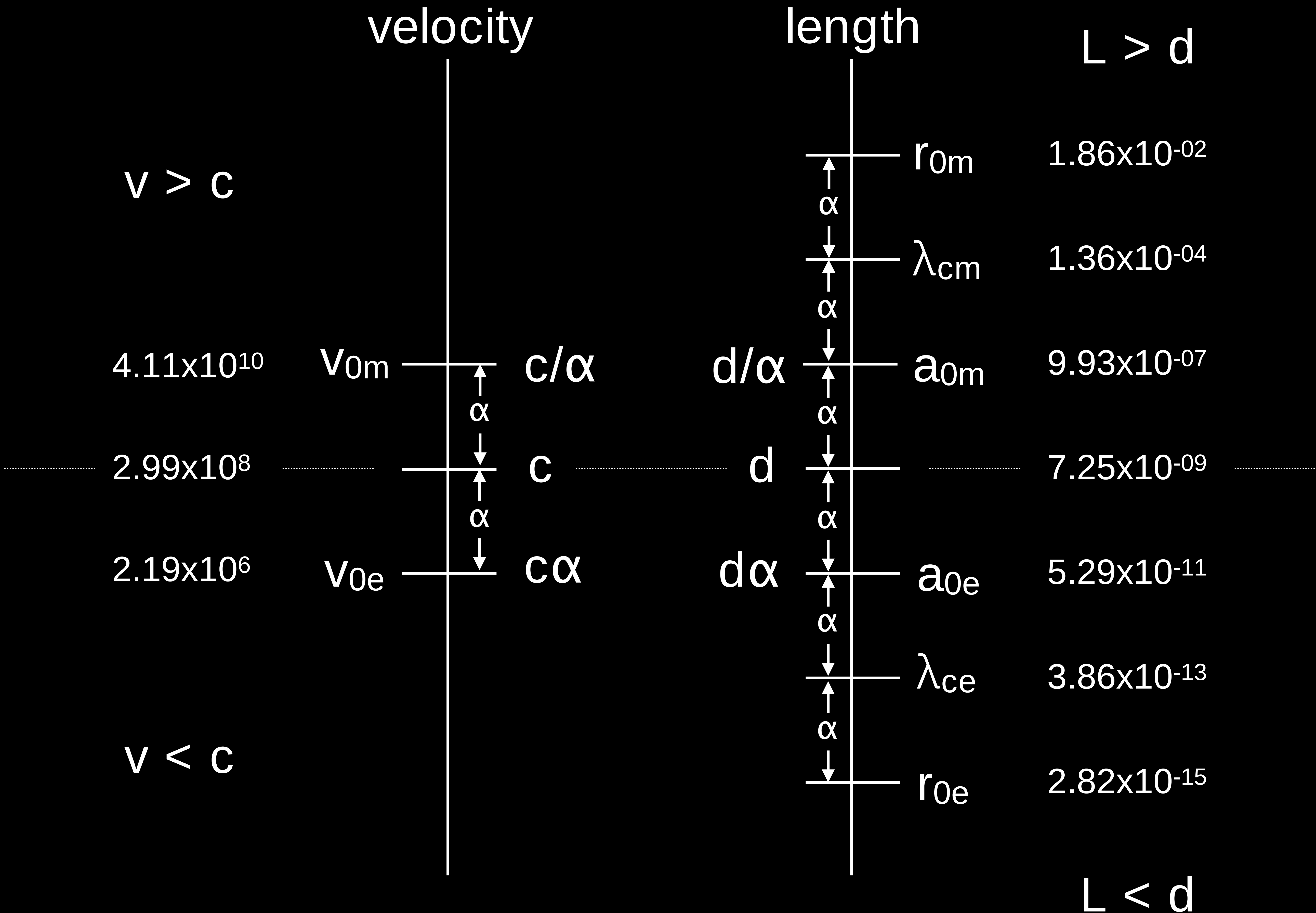
gso velocity

$$a_{0e} = \frac{\hbar}{m_e c\alpha}$$

$$v_{0e} = k_e \frac{e^2}{\hbar} = c\alpha < c$$

$$a_{0m} = \frac{\hbar\alpha}{m_m c}$$

$$v_{0m} = k_m \frac{g^2}{\hbar} = \frac{c}{\alpha} > c \;\; !$$

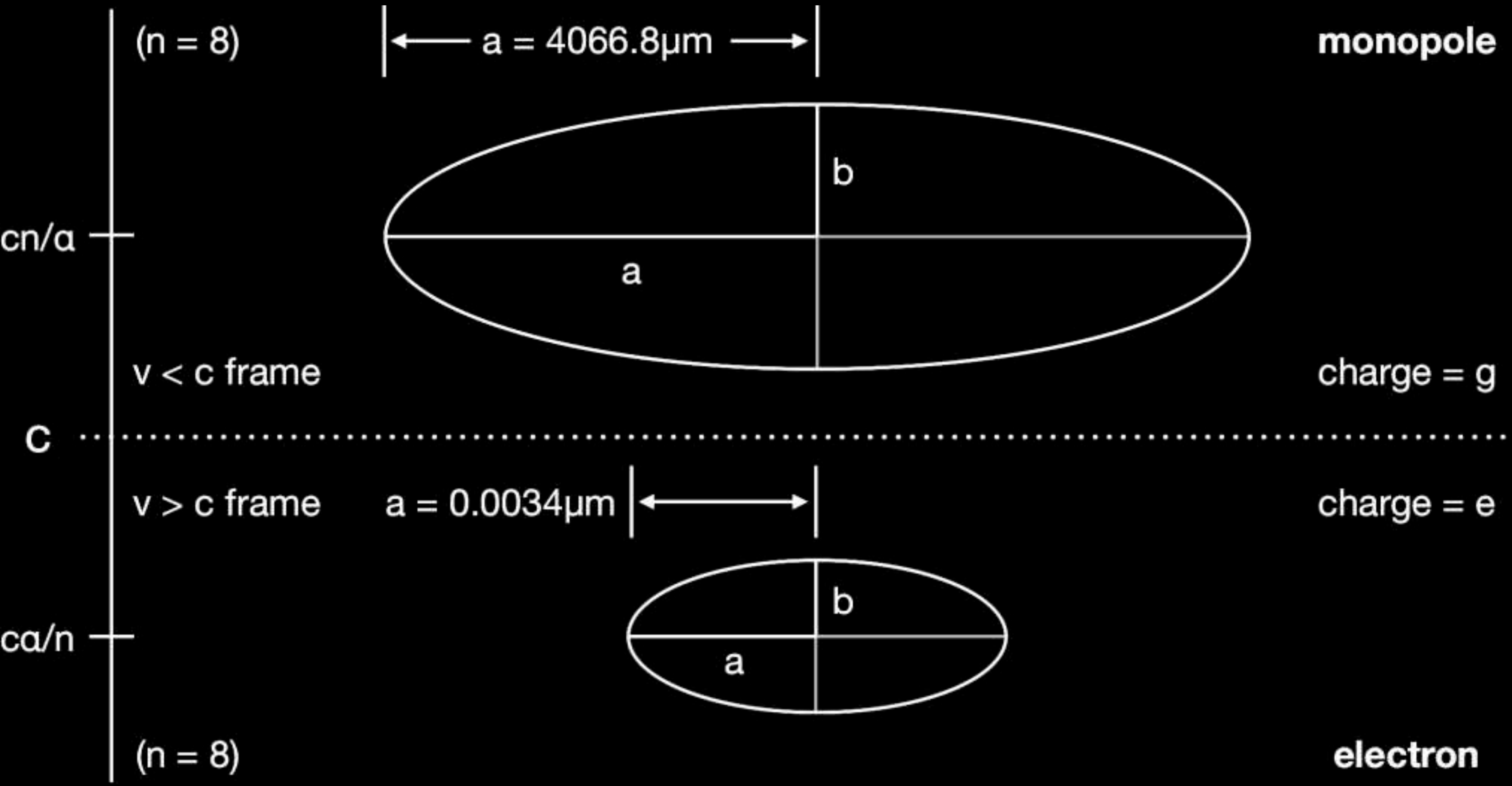

velocity
length
L > d
v > c
r0m
1.86x10-02
α
λcm
1.36x10-04
4.11x1010
v0m
c/α
d/α
a0m
9.93x10-07
2.99x108
c
d
7.25x10-09
2.19x106
v0e
cα
dα
a0e
5.29x10-11
λce
3.86x10-13
v < c
r0e
2.82x10-15
L < d

there is a relativistic scale transformation between $v > c$ and $v < c$ frames

$$\left(\frac{n^2}{\alpha^2}\right)^2 \left(\frac{x^2}{a_m^{(n)2}} + \frac{y^2}{b_m^{(n)2}}\right) = 1,$$

here contracting the monopole ellipse into the electron ellipse

the Coulomb flip



the superluminal electron, equivalent to a magnetic charge, together with the subluminal electron, creates the condition for charge quantization

next

- replicate quantized elliptical tracks
- thick nuclear track emulsions

- repeatable experiment
- consistent with the idea of magnetic charge
- best evidence yet for magnetic charge?
- funding for 1 physicist

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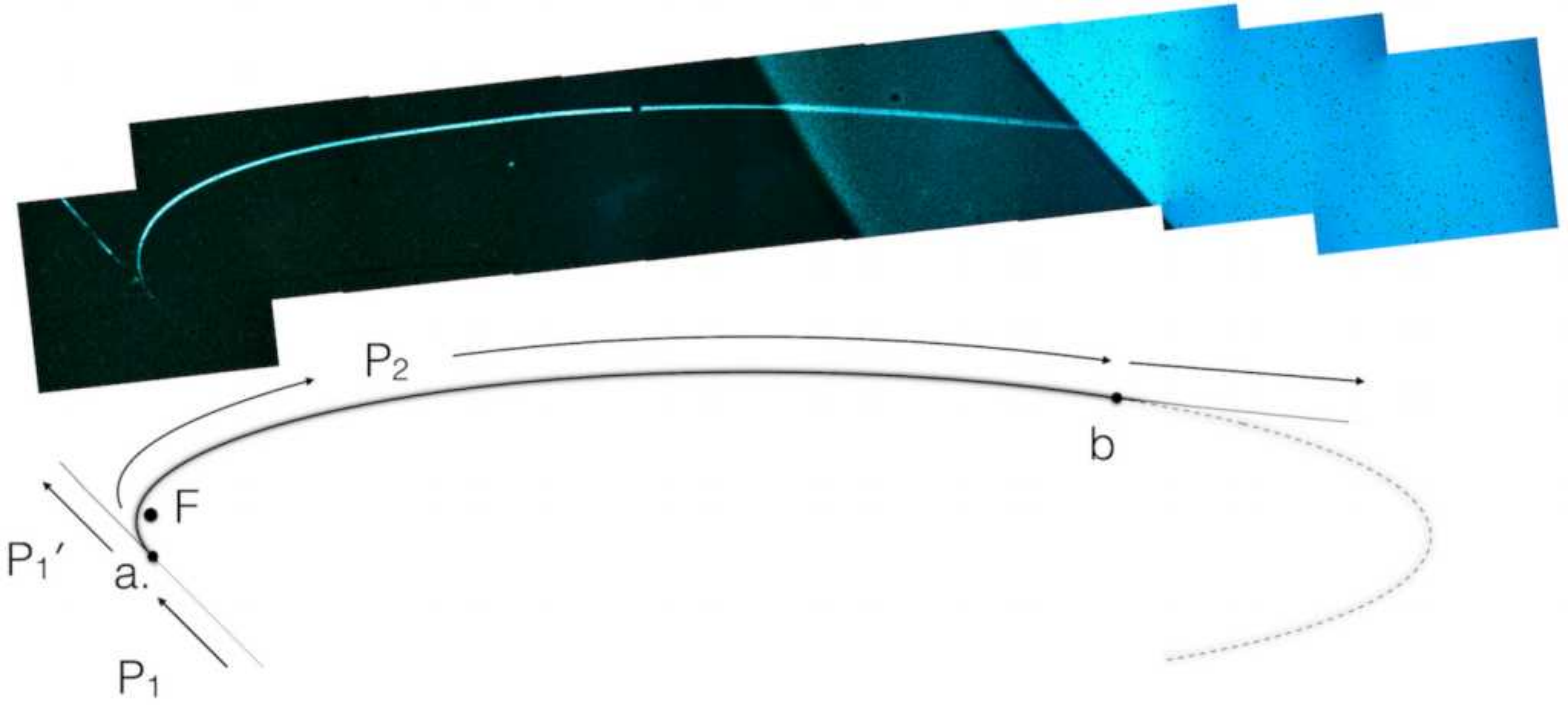
Q: How can you be sure that the applied magnetic fields are not responsible for the tracks?

A: The magnetic source creating the central force for the ellipse has to be a spherically symmetric point source. The applied magnetic fields were not spherically symmetric point sources.

Q: Under quantum mechanics, how can these tracks even occur? Any sharply defined track, including all those routinely observed in bubble chambers or in photographic films, is produced by a sufficiently small, fast moving wave packet. And the latter is generally formed only by a superposition of many stationary states, even though each such state alone is spatially extended. This is universally true in relativistic and non-relativistic domain. One cannot in principle attribute a *single* definite quantum number *n* to a semi-classical track observed.

A: This apparent contradiction points to new physics. The classical tracks occur and are quantized making them semi-classical in the spirit of Bohr-Sommerfeld.

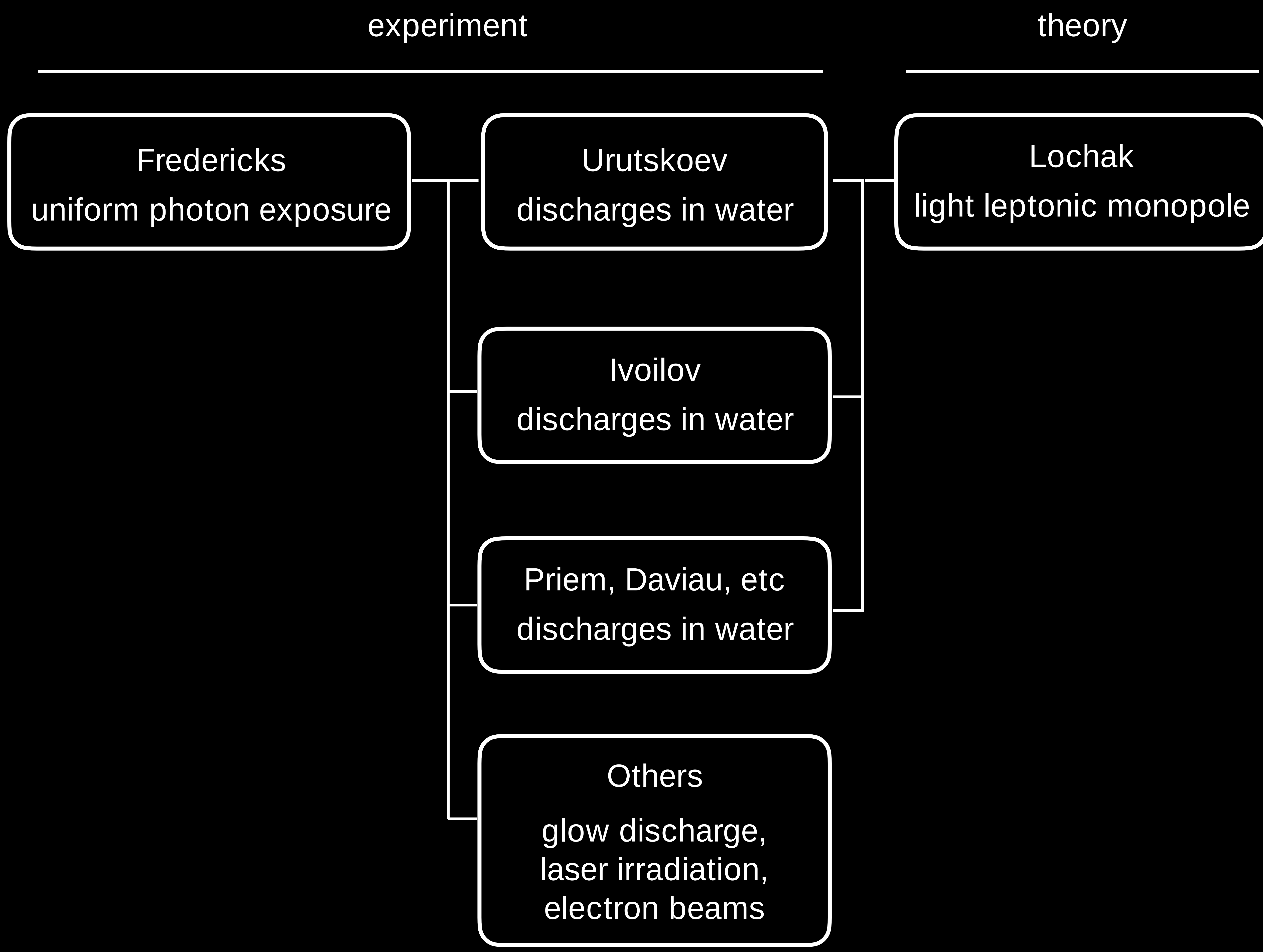
Capture into and escape from an elliptical orbit



1.) initial particle, P1, trajectory.

2.) at point a. particle decays into P1′, continuing on initial trajectory and P2, which is captured into an elliptical orbit.

3.) at point b. particle escapes from the elliptical orbit.


experiment
theory
Fredericks
uniform photon exposure
Urutskoev
discharges in water
Lochak
light leptonic monopole
Ivoilov
discharges in water
Priem, Daviau, etc
discharges in water
Others
glow discharge,
laser irradiation,
electron beams

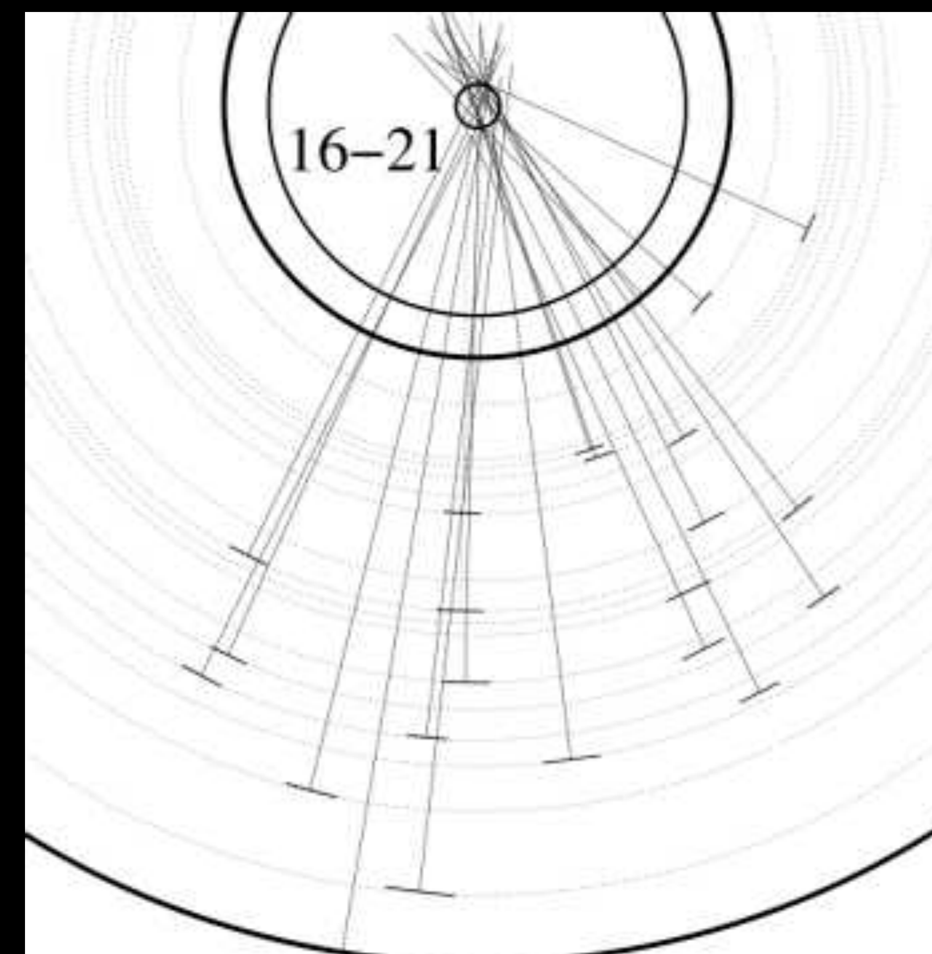
Periodicity

Penetration

Random motion

Correlation of tracks

Central force

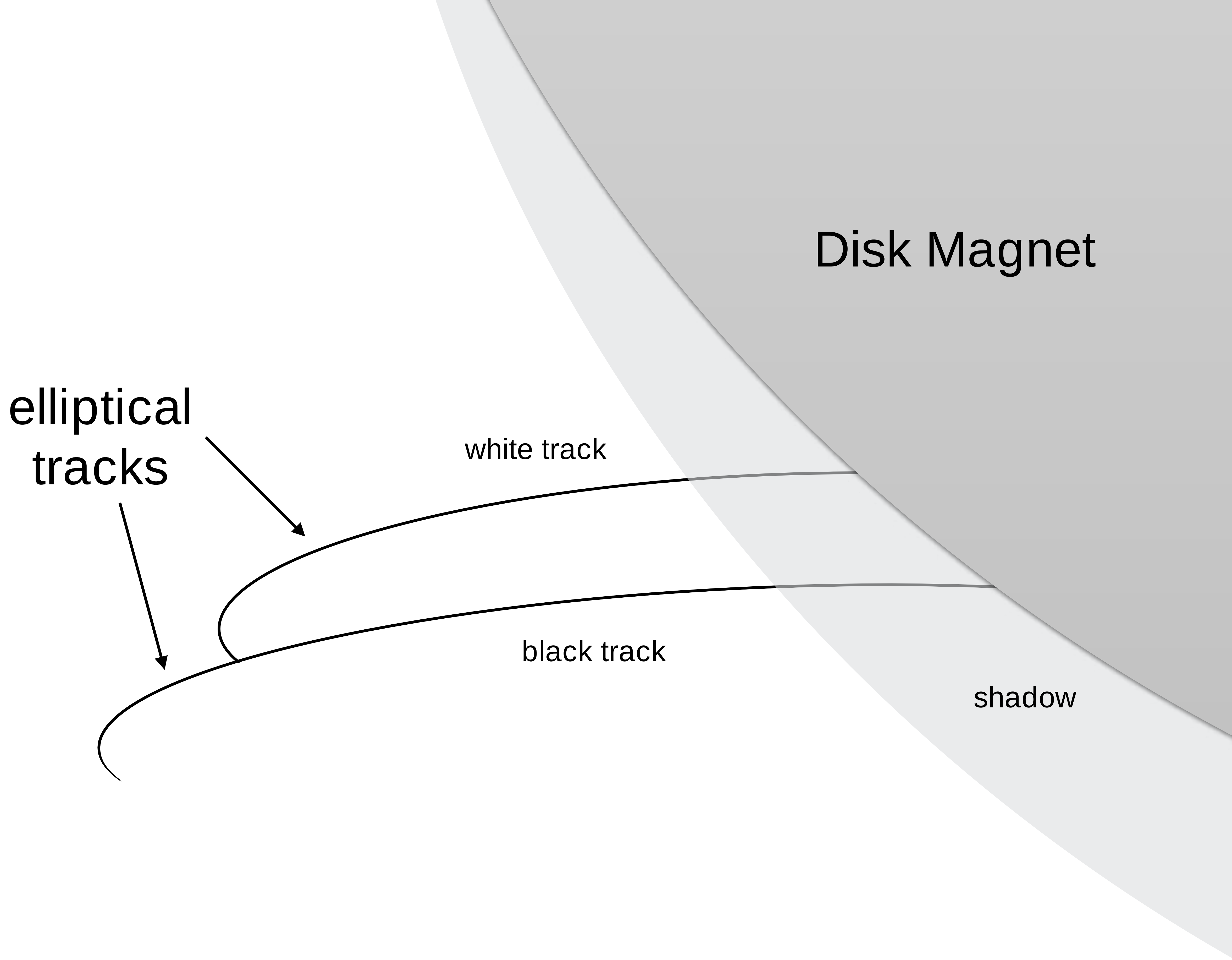


Tracks in various materials — emulsions, metals, semiconductors

Large angles of curvature

White tracks

track	$a(\mu m)$	$b(\mu m)$	n
e2	4091.7 ±22.5	2241.3 ±22.5	8.00
be	4078.6 ±14.6	1996.0 ±14.6	8.00
ode	4077.0 ±16.1	1129.4 ±16.1	8.00
abt	4076.6 ±10.3	1053.6 ±10.3	8.00
tlw	3141.0 ±30.5	1474.4 ±30.5	7.50
me	2391.6 ±16.1	549.3 ±16.1	7.00
e1	1773.2 ±24.9	1100.5 ±24.9	6.50
ipe	1760.0 ±23.1	615.3 ±23.1	6.50
ego	908.9 ±21.8	505.8 ±21.8	5.50
ne	909.0 ±25.7	367.2 ±25.7	5.50
bge	907.5 ±11.6	284.3 ±11.6	5.50
cav1	622.1 ±21.1	300.7 ±21.1	5.00
mct	619.9 ±16.2	192.7 ±16.2	5.00
cce	621.1 ± 7.3	173.8 ± 7.3	5.00
edgee	254.2 ± 7.4	104.8 ± 7.4	4.00
sene	253.6 ± 9.8	202.2 ± 9.8	4.00
nne	149.8 ±13.1	83.0 ±13.1	3.50
ase	111.1 ±20.6	72.1 ±20.6	3.25
lee2	56.9 ±13.0	49.8 ±13.0	2.75
rse2	56.7 ± 9.5	31.5 ± 9.5	2.75
omse	38.1 ± 6.2	36.0 ± 6.2	2.50
avse2	25.6 ± 6.4	15.9 ± 6.4	2.25


Disk Magnet
elliptical
tracks
white track
black track
shadow

superluminal dual of electron

$$E_m^{(n)} = -k_m \frac{g^2}{2a_m^{(n)}}$$

$$v_m^{(n)} = n\frac{c}{\alpha}$$

$$p_m^{(n)} = \frac{n\hbar}{a_m^{(n)}}$$

$$m_m^{(n)} = \frac{n^4\hbar\alpha}{a_m^{(n)}c}$$

electron

$$E_e^{(n)} = -k_e \frac{e^2}{2a_e^{(n)}}$$

$$v_e^{(n)} = c\frac{\alpha}{n}$$

$$p_e^{(n)} = \frac{n\hbar}{a_e^{(n)}}$$

$$m_e^{(n)} = \frac{n^2\hbar}{a_e^{(n)}c\alpha}$$

Observation of transformation of chemical elements during electric discharge Urutskoev, L. I.; Liksonov, V. I.; Tsinoev, V. G. (2000)

Low-energy nuclear reactions and the leptonic monopole, G. Lochak and L. Urutskoev, (2004)

Unusual structures on the material surfaces irradiated by low energy ions, B. Rodionov and I. Savvatimova, (2005)

Low Energy Generation of the “Strange” Radiation, N. G. Ivoilov (2006).

Transmutations et traces de monopôles obtenues lors de décharges électriques, D. Priem et al. (2009).

Tracks of magnetic monopoles, C. Daviau, D. Fargue, D. Priem, and G. Racineux (2013).

K. A. Fredericks. Possible detection of tachyon monopoles in photographic emulsions. *Eng. Phys.*, 6, 2013.

K. A. Fredericks. Possibility of tachyon monopoles detected in photographic emulsions. *J. Condensed Matter Nucl. Sci.*, 15:203–230, 2015.

K. A. Fredericks, Monopole mass from fundamental lengths, Phys. Essays 30, 269 (2017).