Description of electron configuration using a gravity model

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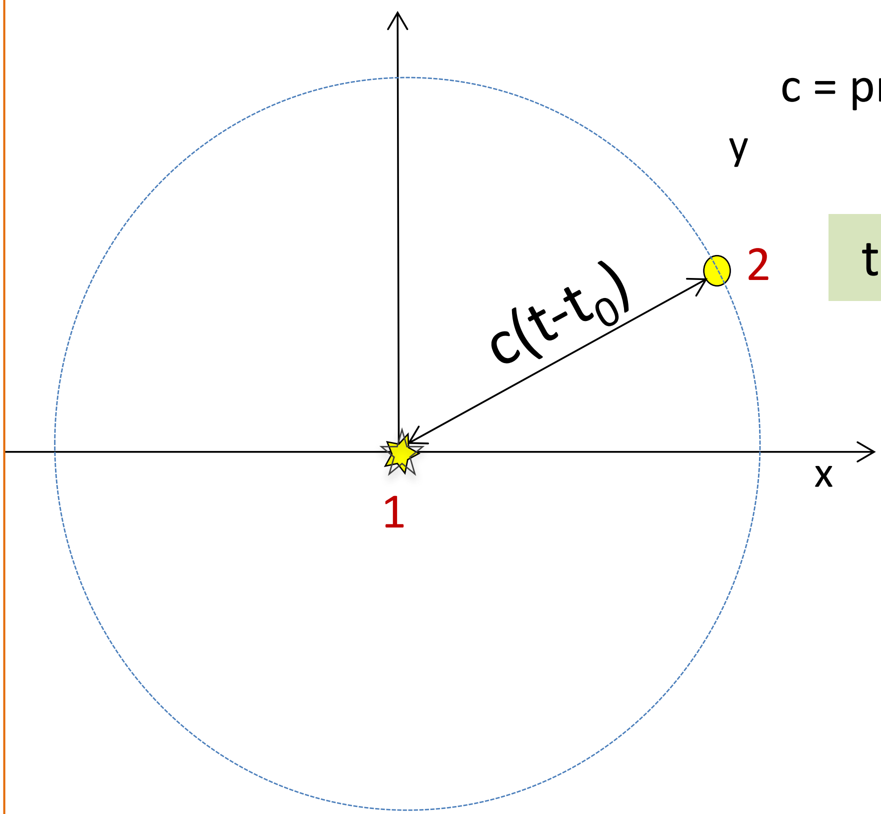
Content

- Reinterpretation of *inverse-square law* (transposing *D* → *R*)
- Newtonian dynamics
- Orbital tracking and velocity
- Typical configurations
- Solar system
- Proposal for Bohr radius stationary structure

Basic assertions

Scalar potential

$$\varphi \sim \frac{1}{c(t-t_0)}$$



c = propagation signal speed between 1 - 2

t_0= *source switch-on* time

t = detection time

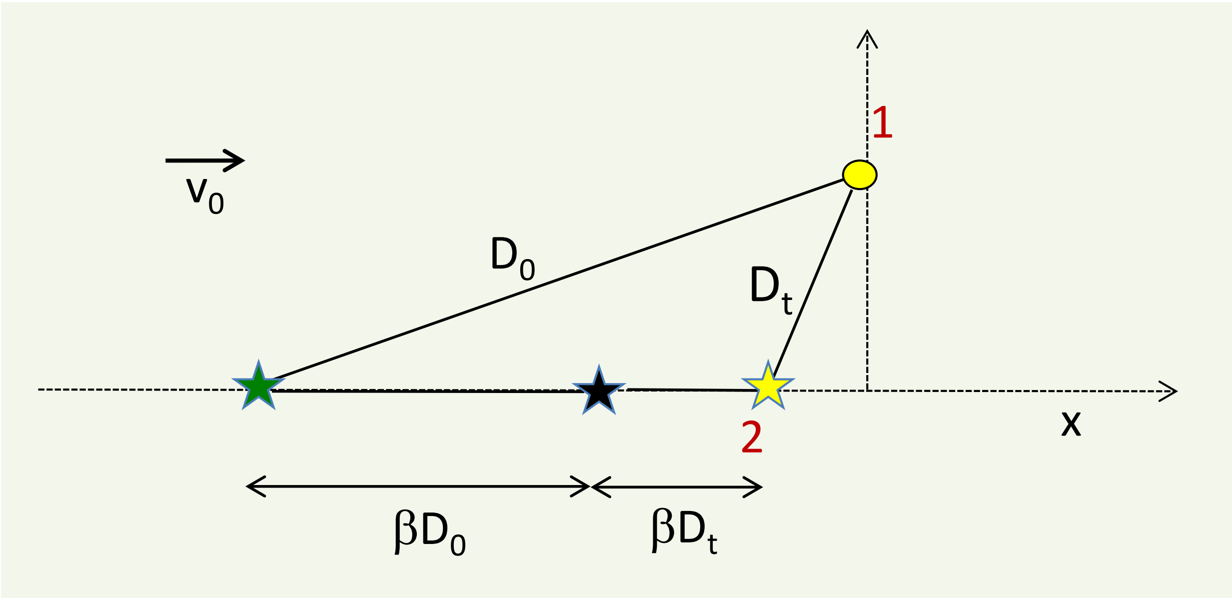
Static case
$v1=v2 \rightarrow v_0=0$

$$D = \sqrt{x^2+y^2} = c(t-t_0)$$

φ ~ 1/D

(Coulomb's law holds)

Emitting moving source



$v_1=[v_x,v_y]_1$=relative velocity of 1

$v_2=[v_x,v_y]_2$=relative velocity of 2

$v_0=v_1-v_2$ relative velocity between 1 - 2

$$\begin{aligned} R &= 2\frac{\sqrt{x^2+y^2}-\beta x}{1-\beta^2} \\ &= 2\gamma^2(D_t-\beta x) \end{aligned}$$

$$R = D_t + D_0 = c(t-t_0)$$

$\beta \quad = v_0/c$

$\gamma^2 \quad = 1/(1-\beta^2)$

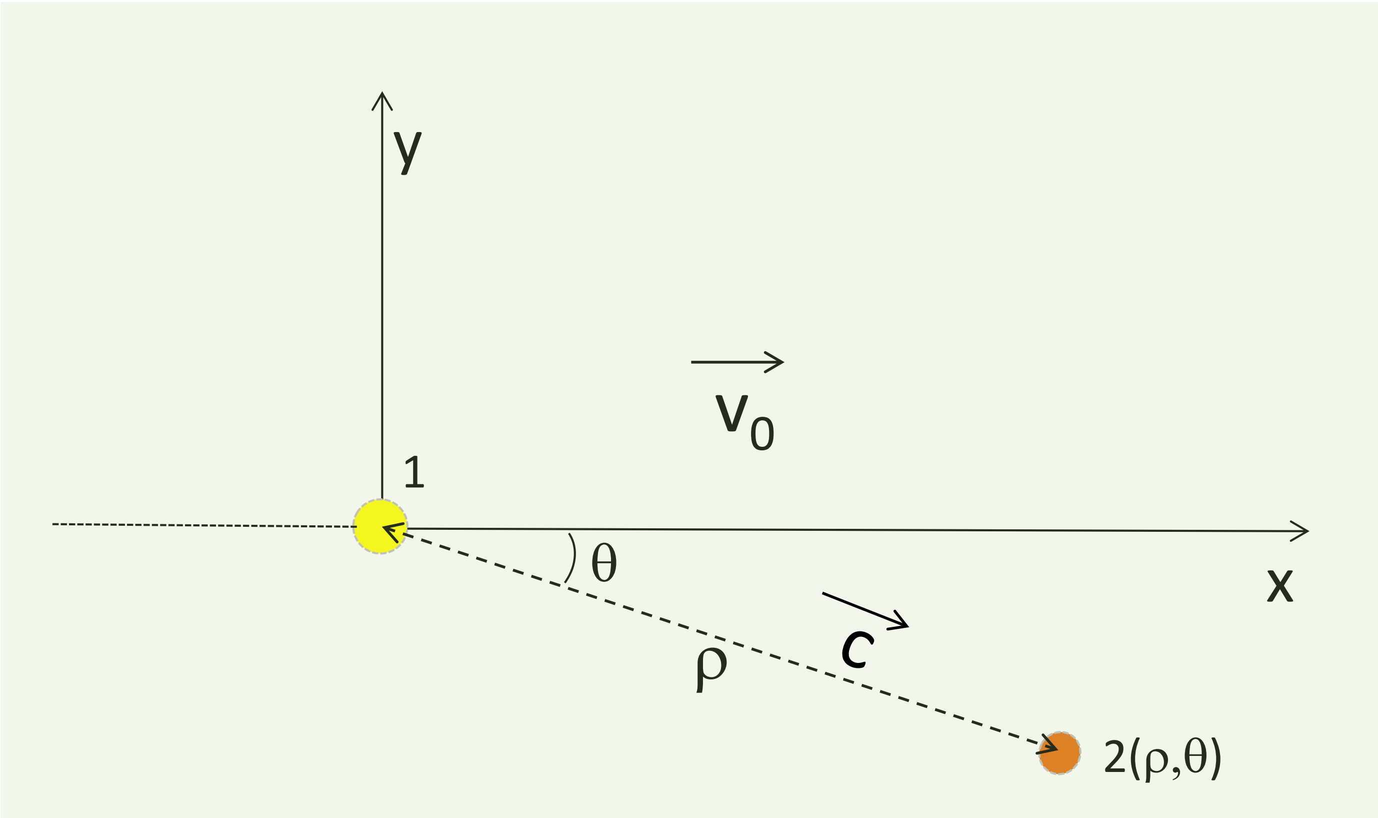
$$D = \sqrt{x^2+y^2} \cancel{=} c(t-t_0)$$

$$\boxed{\varphi \sim \frac{1}{c(t-t_0)}}$$

Always true

arxiv.org 1609.06208

R and space-time parameters



$$R = c(t-t_0) = f(t,t_0) =$$

$$= f(\beta,\rho,\theta) = 2\,\gamma^2\,\rho\,(\,1 - \beta\, cos\theta\,)$$

$\beta \quad = v_0/c$

$\gamma^2 \quad = 1/(1-\beta^2)$

$\theta = \theta\ (\mathbf{c}, \mathbf{v_0})$

$$\rho^2 = x^2 + y^2 = f(t,..)$$
$$\theta = f(t,..)$$
$$\beta = f(t,...)$$
$$R = 2\,\gamma^2\,\rho\,(\,1 - \beta\,cos\theta\,)$$

How many configurations?

$0 \leq$ Time-varying laws ≤ 3

How many configurations exist?

Which of them are observable?

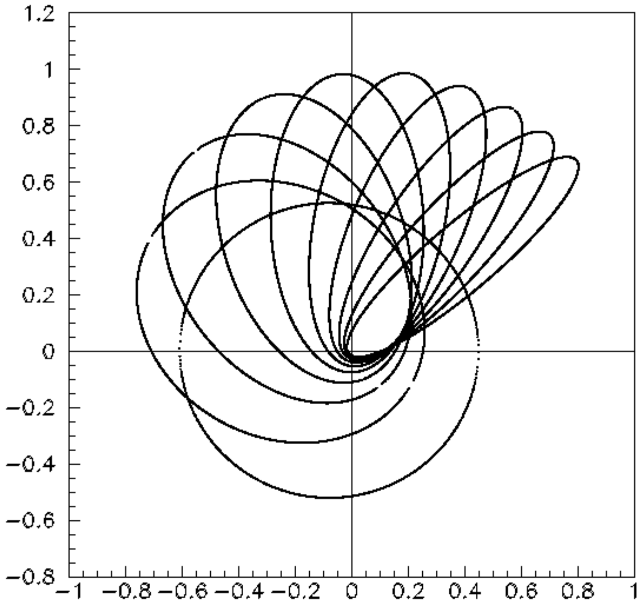
They can evolve in a different way.

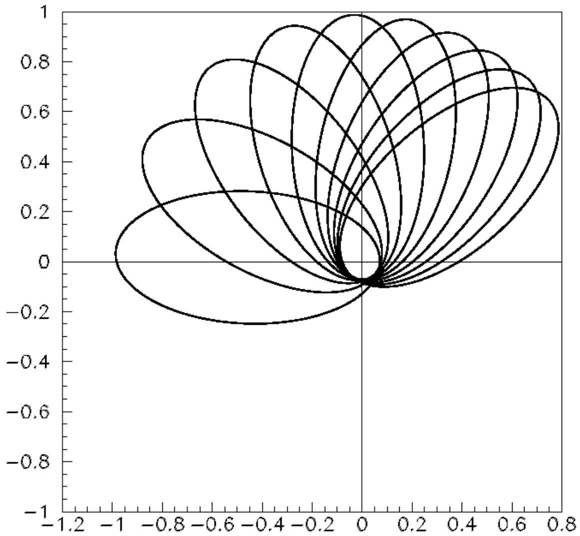
The ability to measure system parameters is proportional to the evolutionary time

Equipotential lines R= const

γ=1.01÷4.45

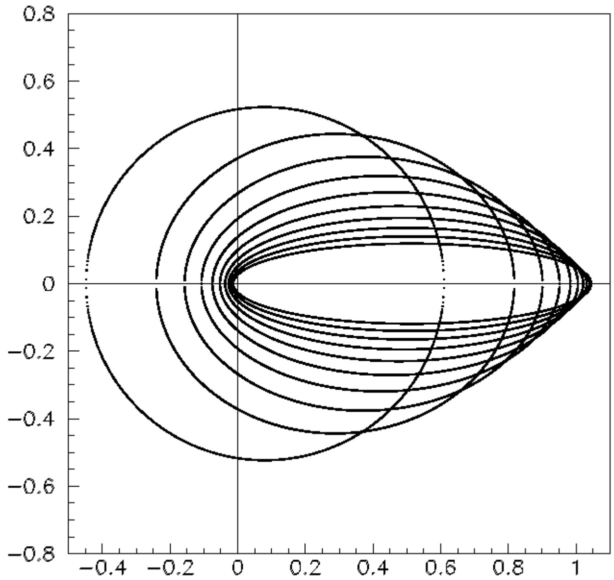
R=k=0.53x2





γ=const = 3

R=k=0.53x2

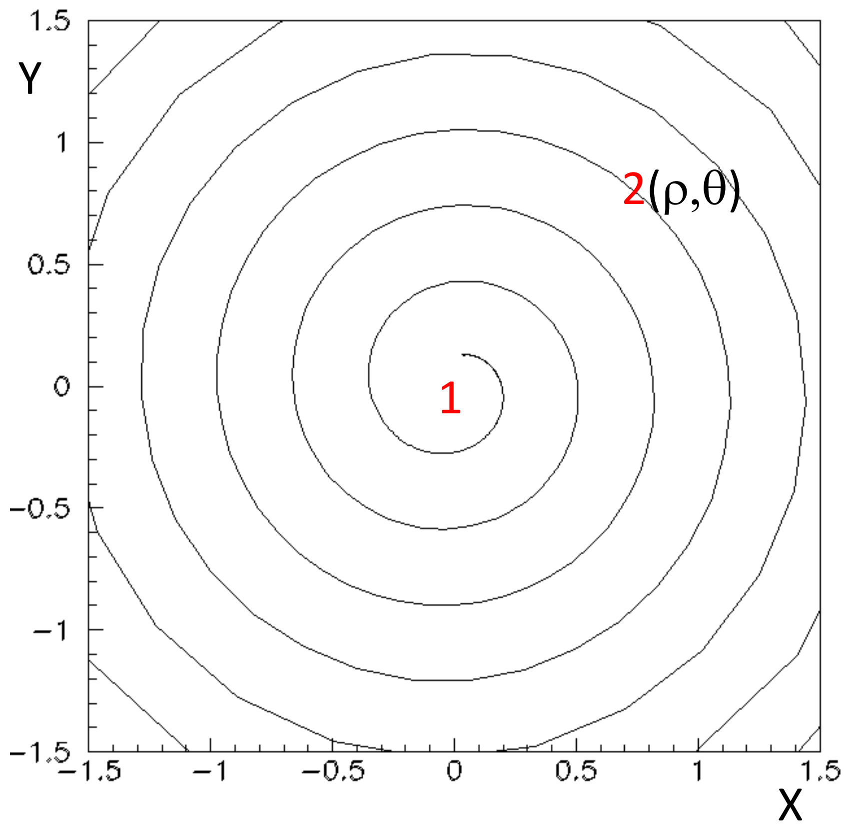


γ = const= 1.01÷4.45

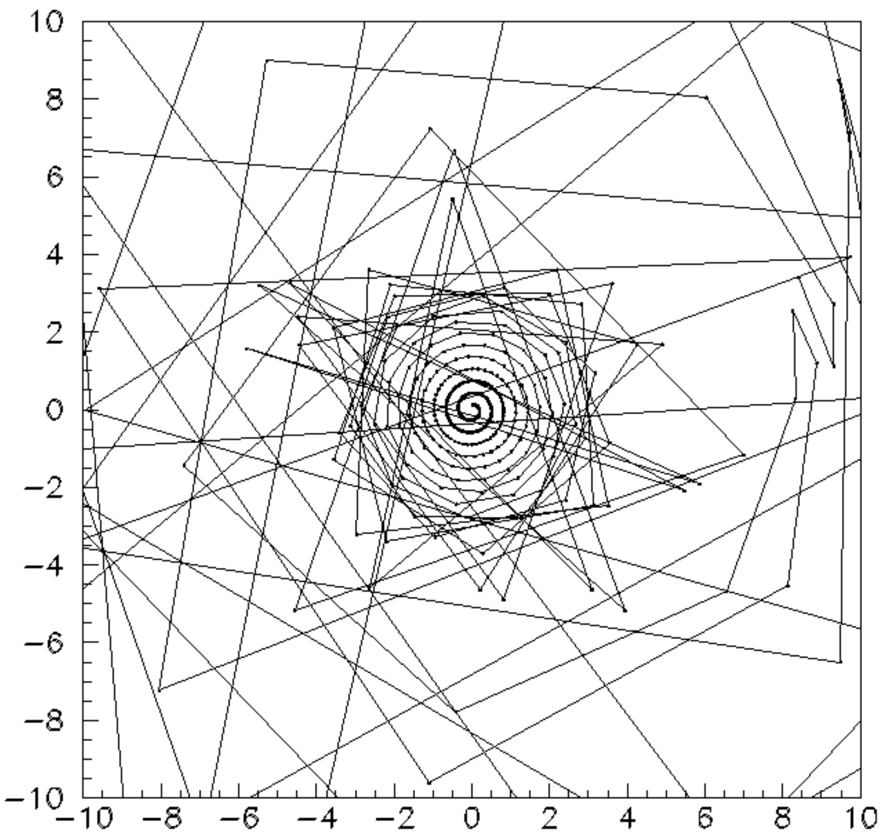
R= 0.53x2

γ = const= 1.5

R= k t



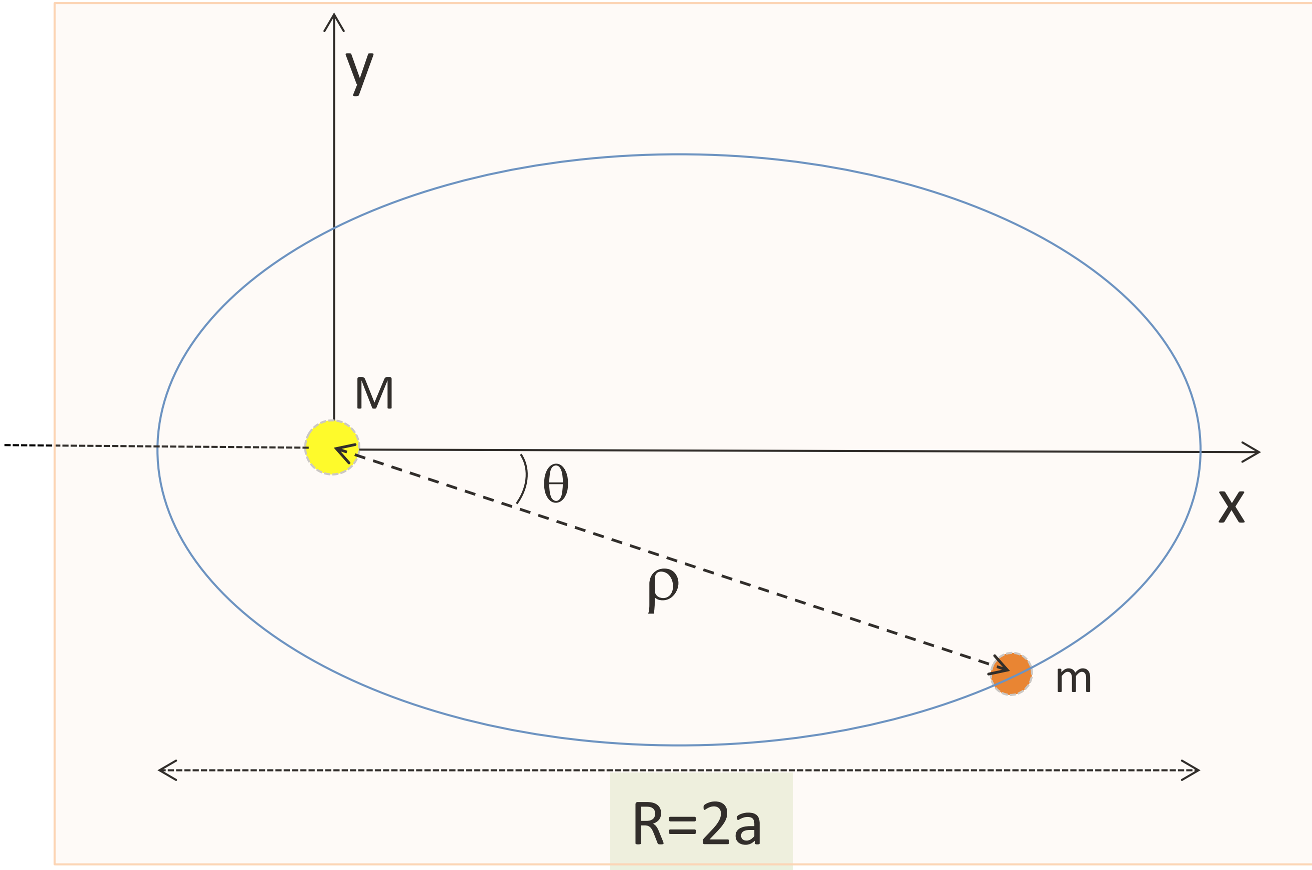
500 steps



600 steps

Stationary configuration

φ=constant ➔ R(β,ρ,θ) =constant



$$\rho(\theta) = \frac{a(1-\varepsilon^2)}{1-\varepsilon \cos\theta}$$

$\varepsilon = \beta$

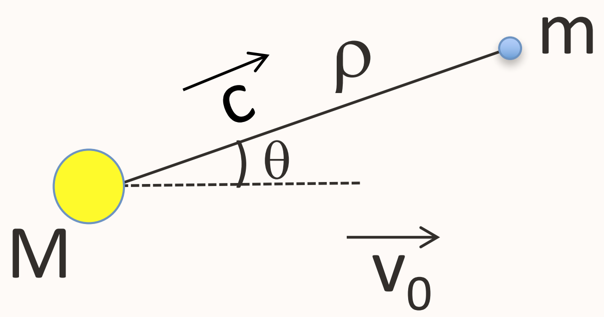
R = 2a

(ρ,θ) ellipsis polar coordinates

Gravitational potential

Transposing ρ→R

- *M* (in the center mass) >> *m*
- $v_0 = v_M - v_m$ @ t_0
- *c* = light speed (velocity of field propagation)
- $t-t_0$ = propagation time interval
- $\cos\theta = \dfrac{\mathbf{c}\cdot\mathbf{v}_0}{|\mathbf{c}||\mathbf{v}_0|}$



$$c(t-t_0) \neq \rho$$

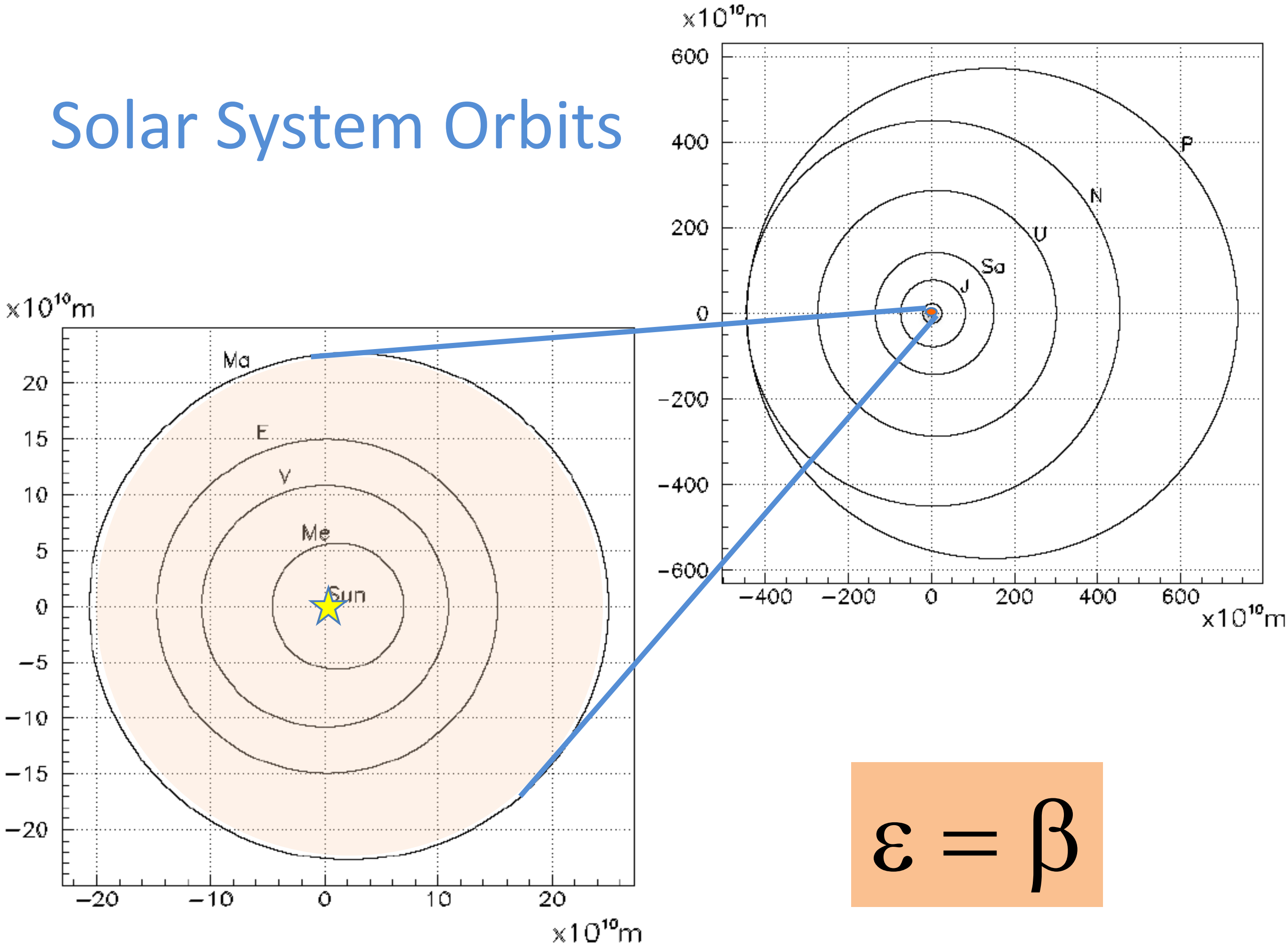
$$\cancel{\varphi \propto \frac{1}{\rho}}$$

$$R = c(t-t_0)$$

$$\varphi(v_0,\rho,\theta) \propto \frac{1}{c(t-t_0)} = \frac{1}{R}$$

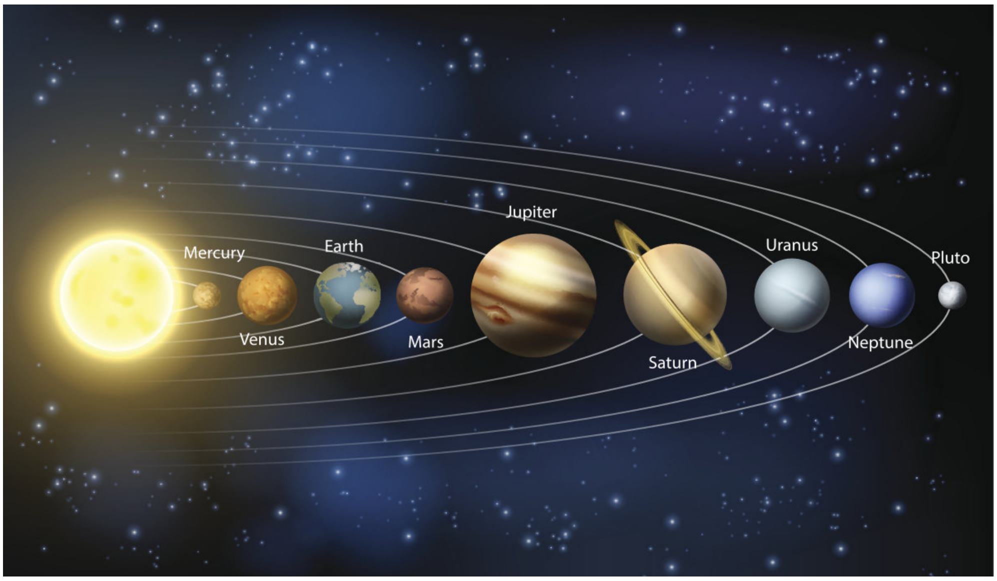
$$R = 2\,\gamma^2\,\rho\,(\,1-\beta\cos\theta\,)$$

Solar System Orbits



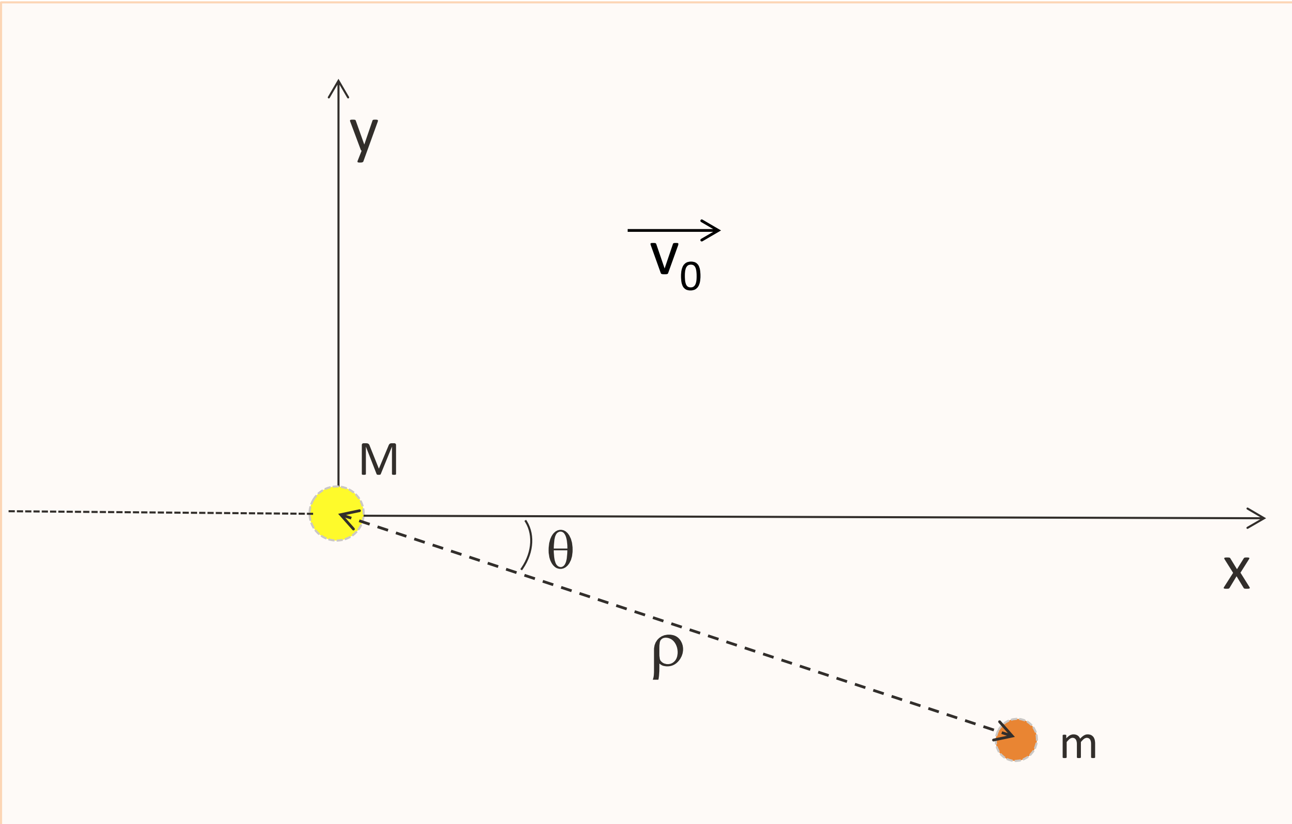
$$\varepsilon = \beta$$

Mercury	.2056
Venus	.0068
Earth	.0167
Mars	.0934
Jupiter	.0484
Saturn	.0539
Uranus	.0472
Neptune	.0086
Pluto	.2489



The initial relative momentum remains embedded in the orbit geometry as eccentricity

Orbital speed



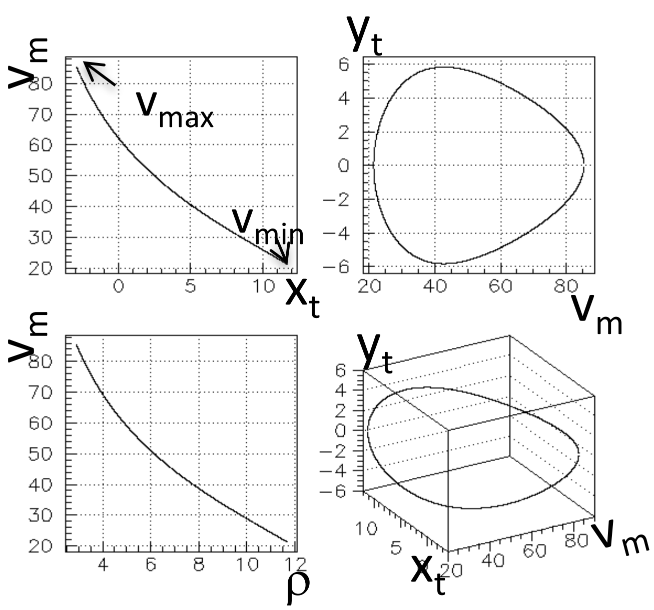
$$v_m = f(\beta, R, \theta) = \gamma\sqrt{\frac{2GM}{R}\left[1+\beta^2-2\beta\cos\theta\right]}$$

$$R = f(\beta, \rho, \theta) = 2\gamma^2\rho(1-\beta\cos\theta)$$

Orbital speed

$$v_m = f(\beta, R, \theta) = \gamma\sqrt{\frac{2GM}{R}\left[1+\beta^2-2\beta\cos\theta\right]}$$

$$v_{min,max} = \gamma\,(1 \pm \beta)\,\sqrt{2GM/R}$$

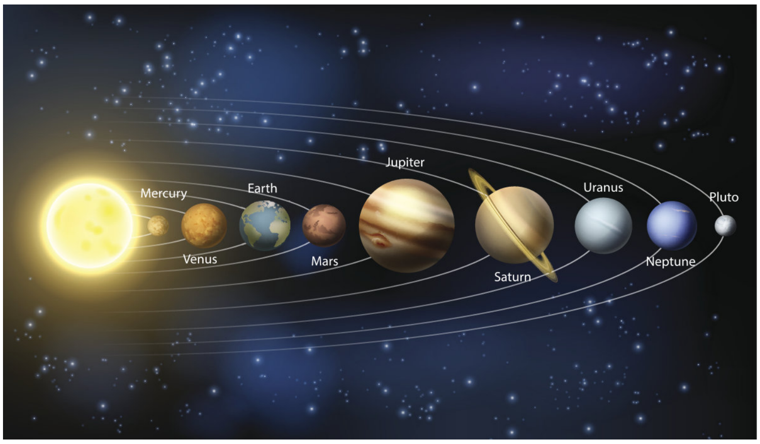


Integrating on time period T

$$\bar{v}_T = \frac{1}{N(T)}\sum_{\rho(t)}\sqrt{\frac{2GM}{R}(1-2\beta x/\rho(t)+\beta^2)}$$

$$t \in [0, T]$$

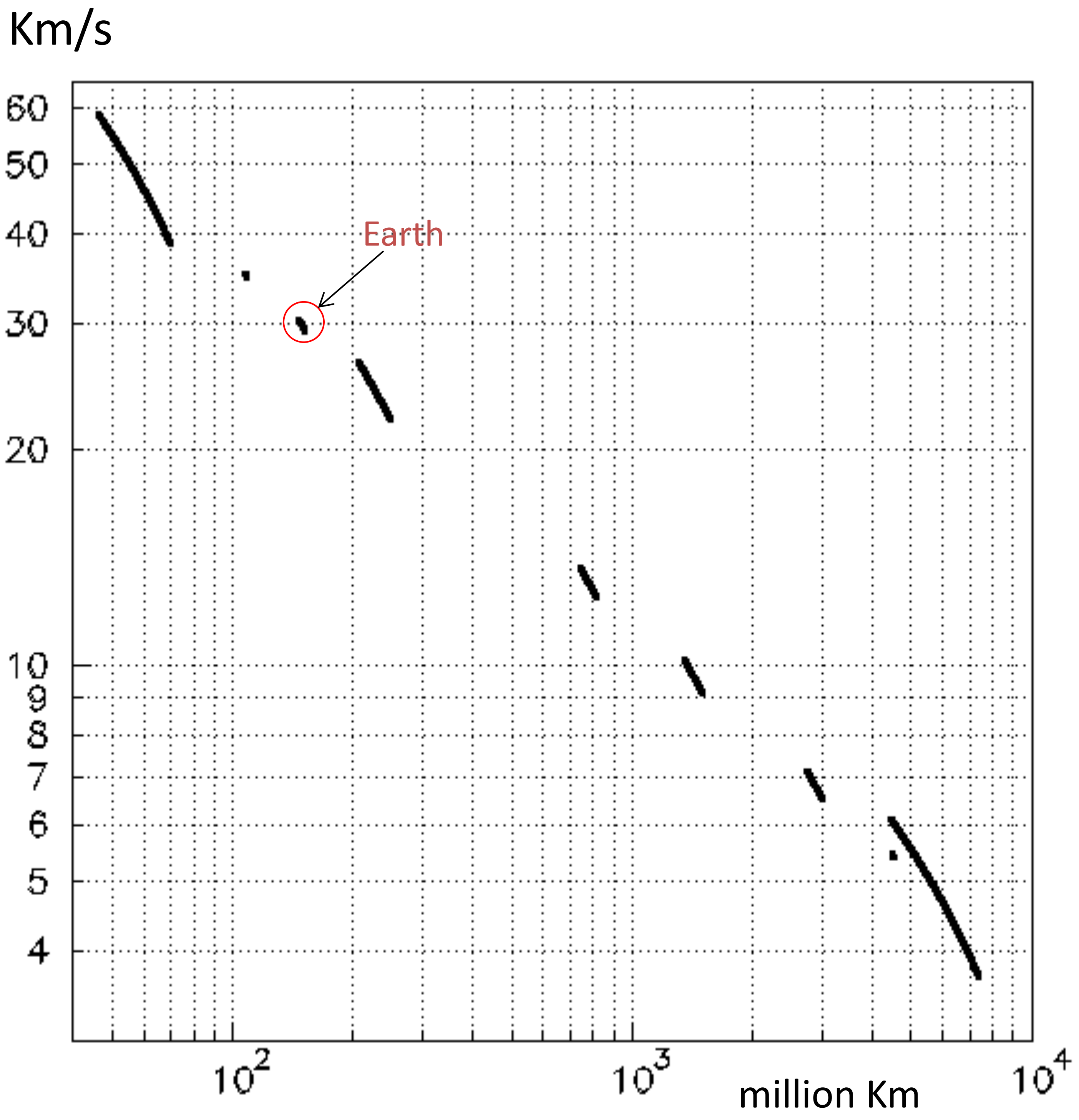
Orbit speeds



	v_{min} (Km/s)	$\bar{v}_p$ (Km/s)	v_{max} (Km/s)	$\Delta v/v_{mea}$ %	ϵ
Mercury	38.858	48.215	58.975	1.8	0.2056
Venus	34.784	35.020	35.258	0.0009	0.00678
Earth	29.291	29.786	30.286	0.0013	0.0167
Mars	21.972	24.164	26.497	0.14	0.0934
Jupiter	12.440	13.063	13.705	0.056	0.0484
Saturn	9.138	9.649	10.179	0.23	0.0539
Uranus	6.485	6.802	7.128	0.5	0.0473
Neptune	5.385	5.432	5.478	0.85	0.00859
Pluto	3.676	4.790	6.112	2.6	0.2488

Solar System

Orbital speed vs distance from Sun to the planets

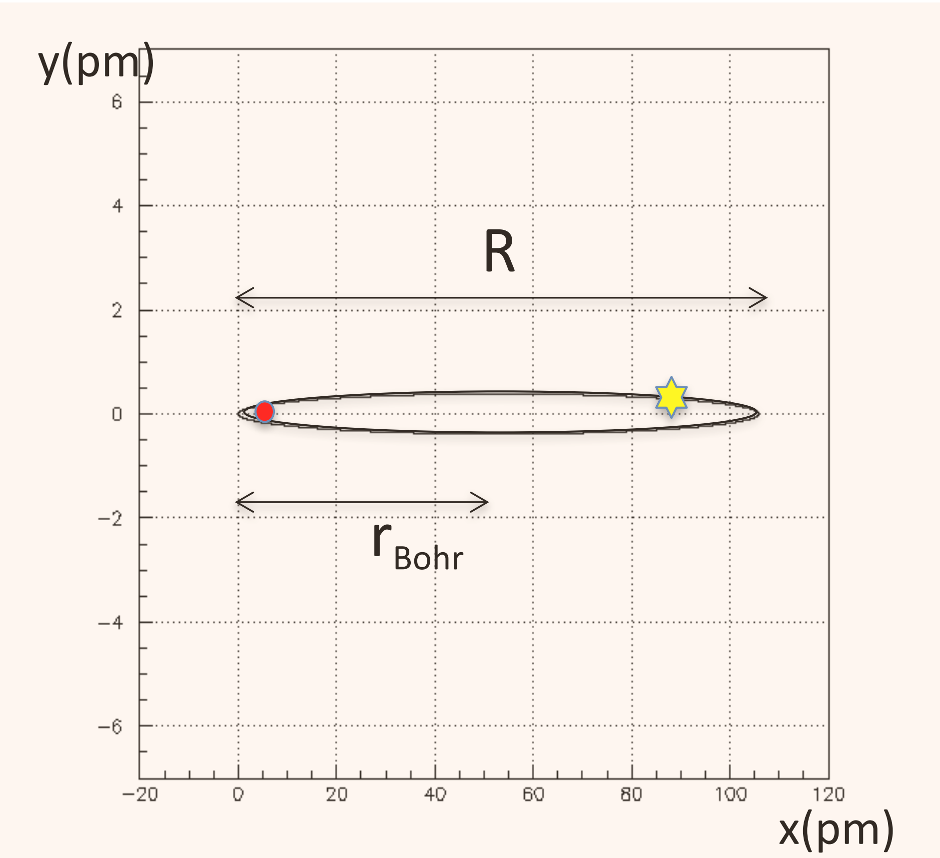


Considering atomic dimensions (a simple exercise)

Assign R= 2 x Bohr radius

γ=const = 137

R=k=0.53x2x10^{-12} m



Nucleon is the red bullet, the center mass.

The equipotential orbit is extremely elliptical !

Note: y-scale is 100 times x-scale.

[In 1:1 ratio, the trajectory appears like a string]

Orbital energy

$$v_m = f(\beta, R, \theta) = \gamma \sqrt{\frac{2GM}{R} \left[1 + \beta^2 - 2\beta \cos\theta\right]}$$

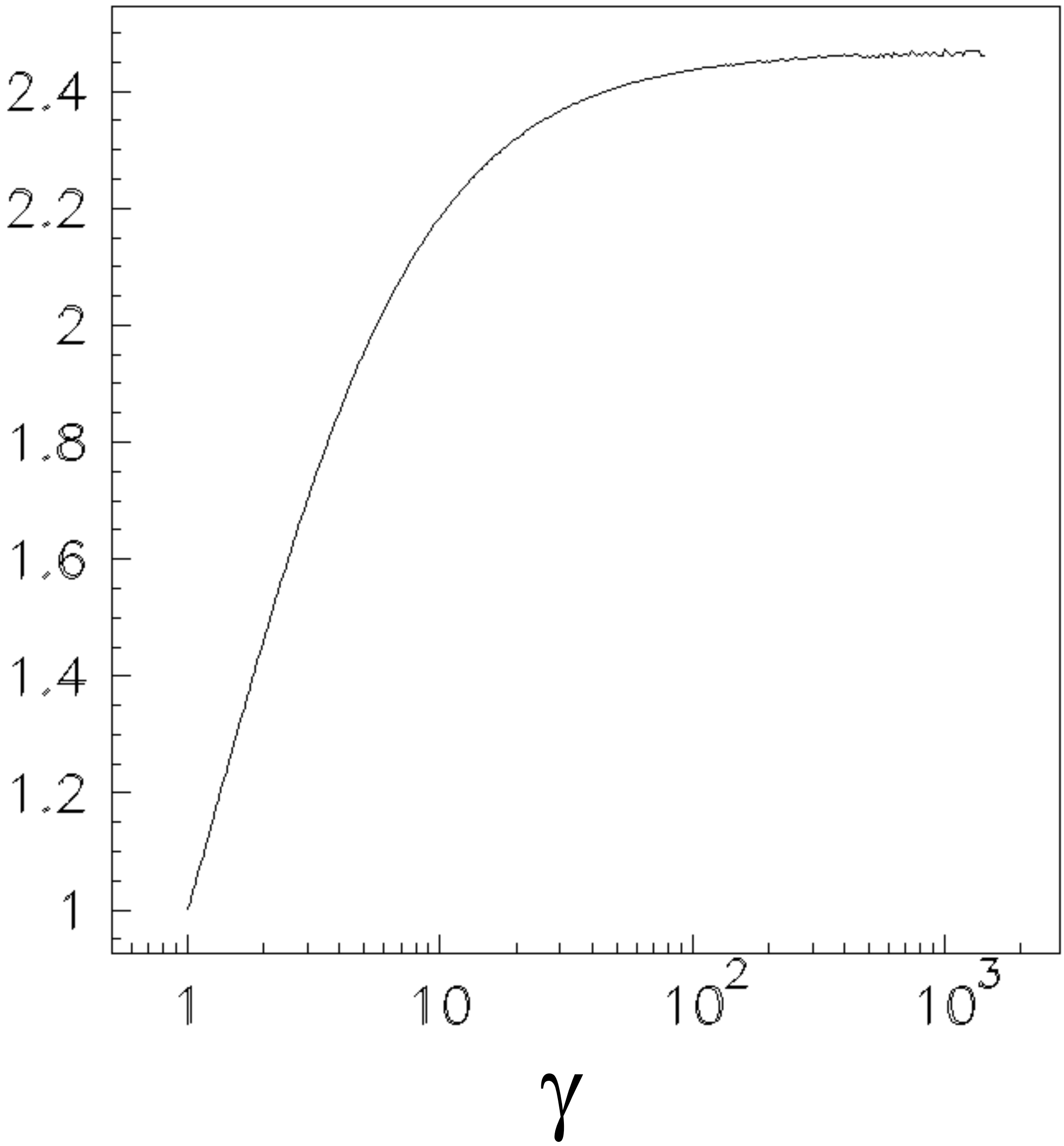
Assign m= orbiting mass
M=mass in the center mass

$$E_{orb} \equiv \frac{1}{2} m v_m^2 = \frac{GMm}{R} \gamma^2 \mathcal{S}^2$$

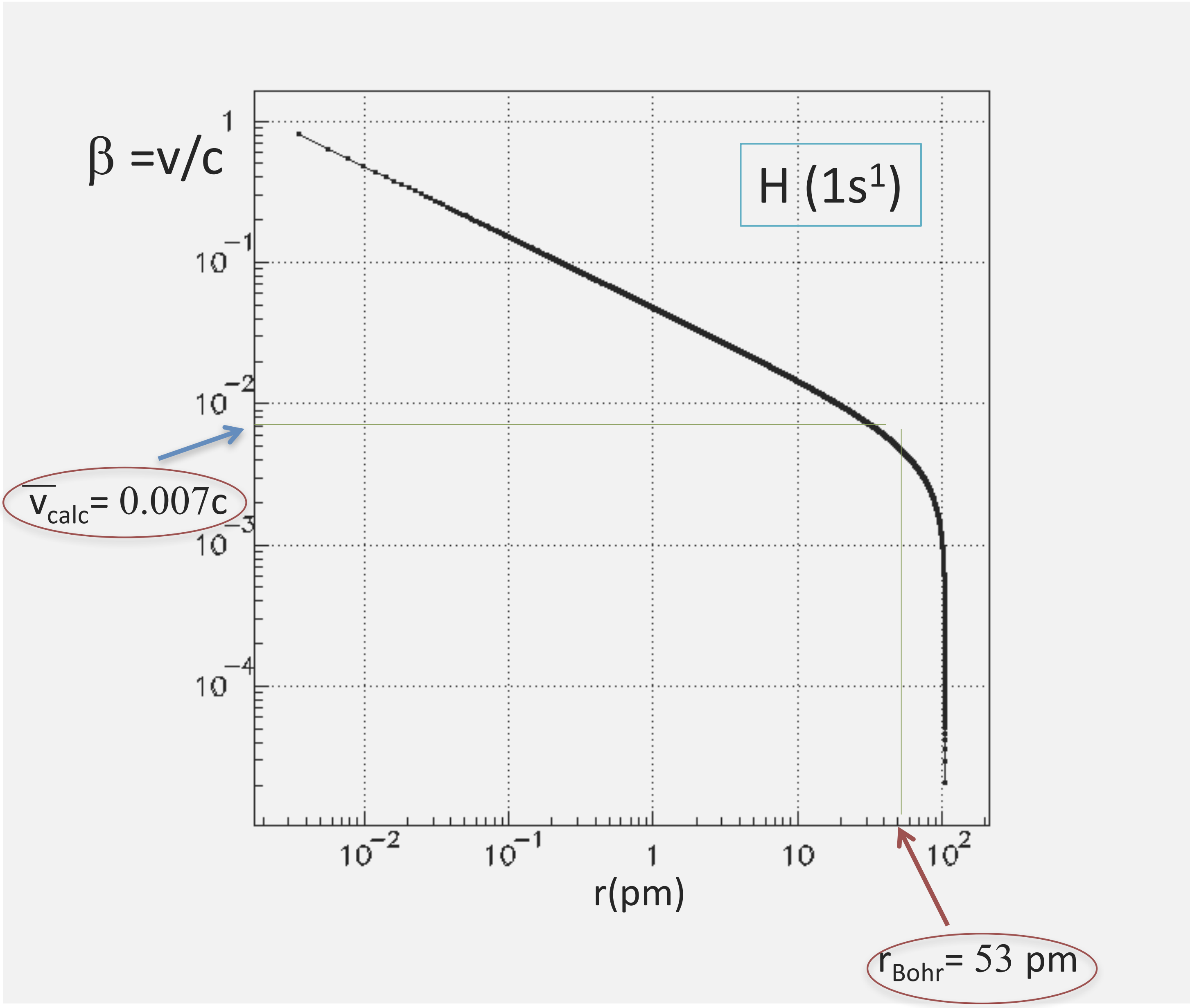
$$\mathcal{S} \equiv \frac{1}{N} \sum_{N\rho} (1 + \beta^2 - 2\beta x/\rho)^{1/2}$$

Dimensionless energy factor

$\gamma^2 \Sigma^2$ vs γ

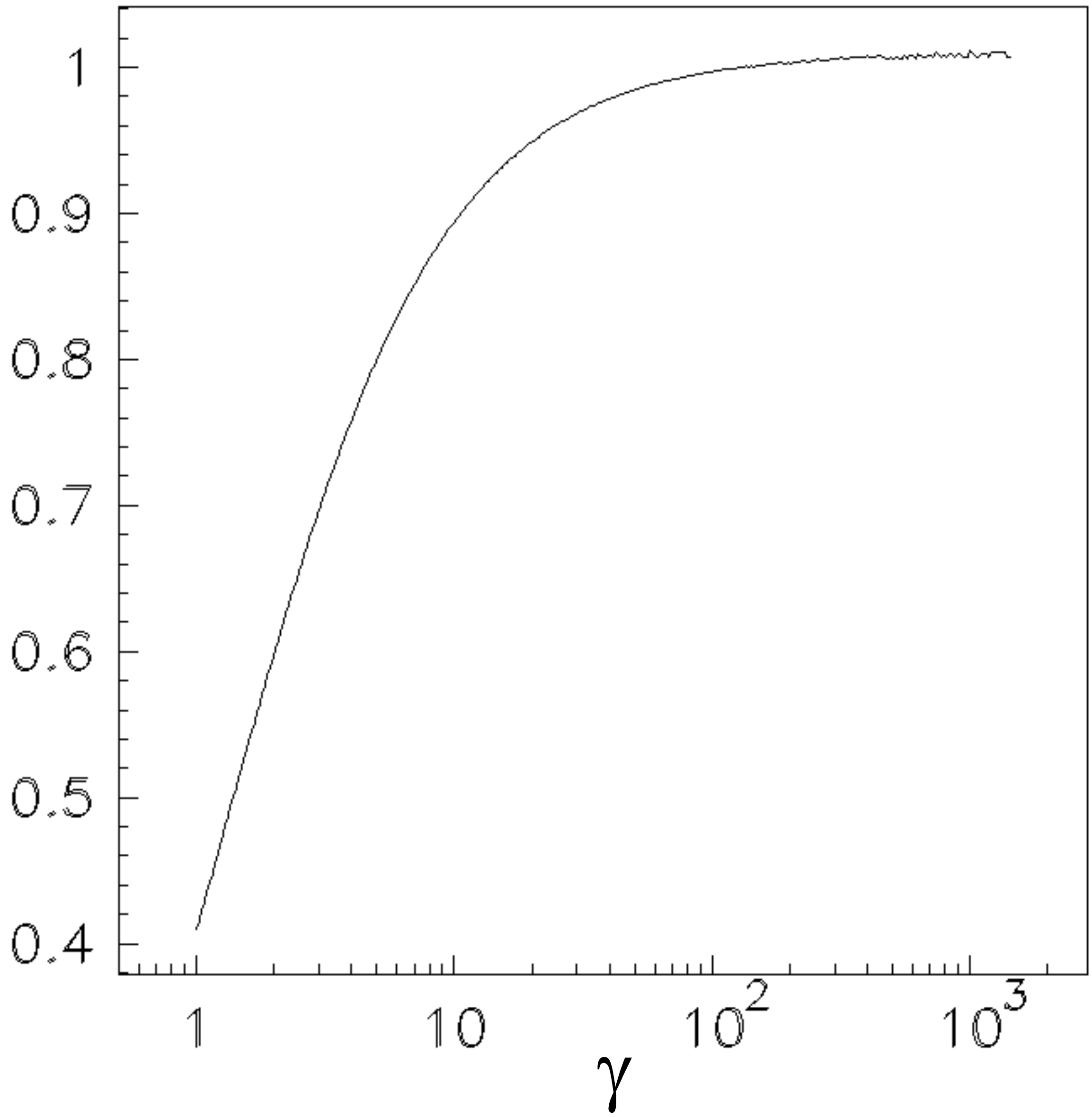


Orbital velocity



Electron energy = 1/2 $m_e v^2$ = $\boxed{13.6 \text{ eV}}$

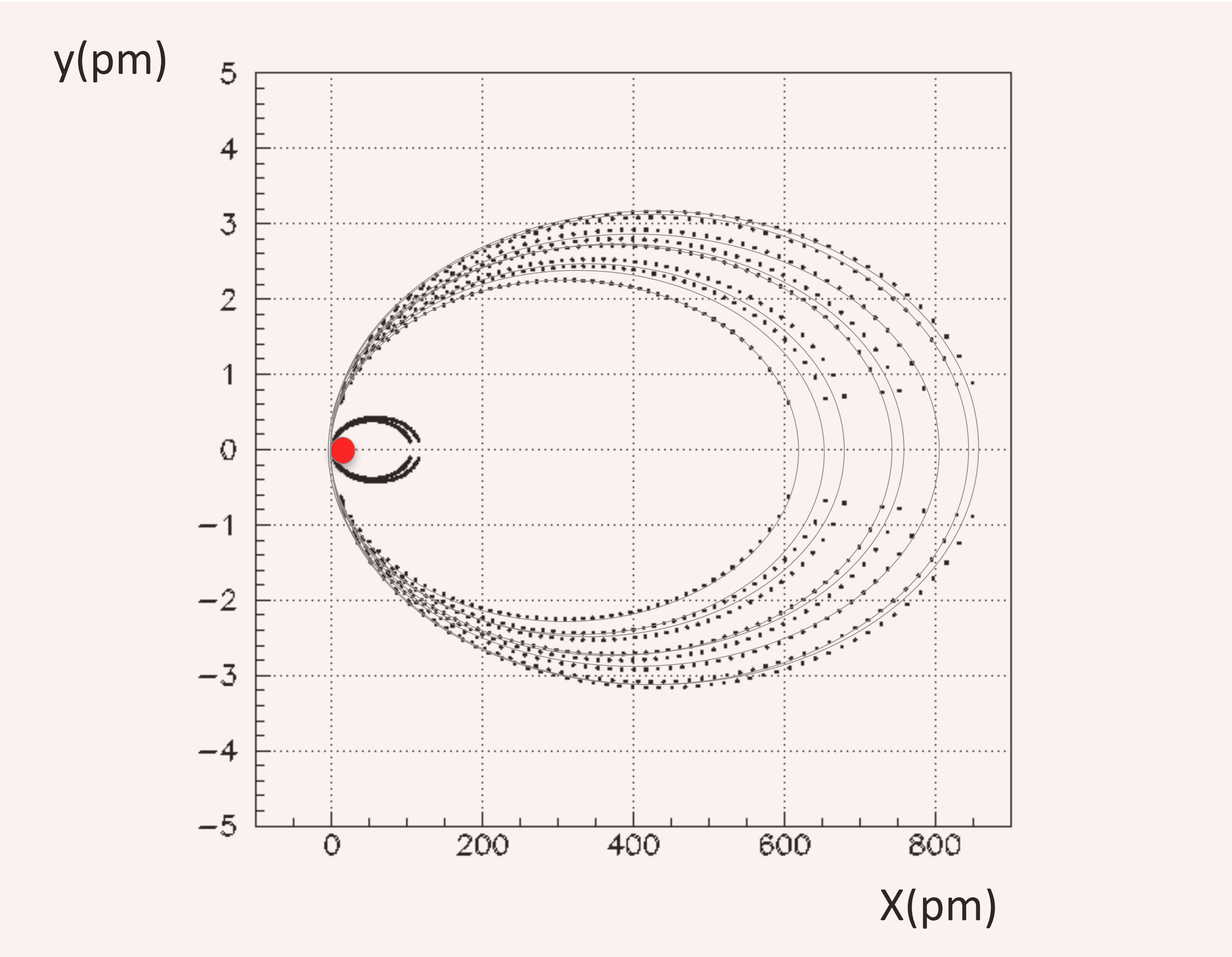
$E_{cal}(\gamma)/E_{ion}$



ρ = Bohr radius

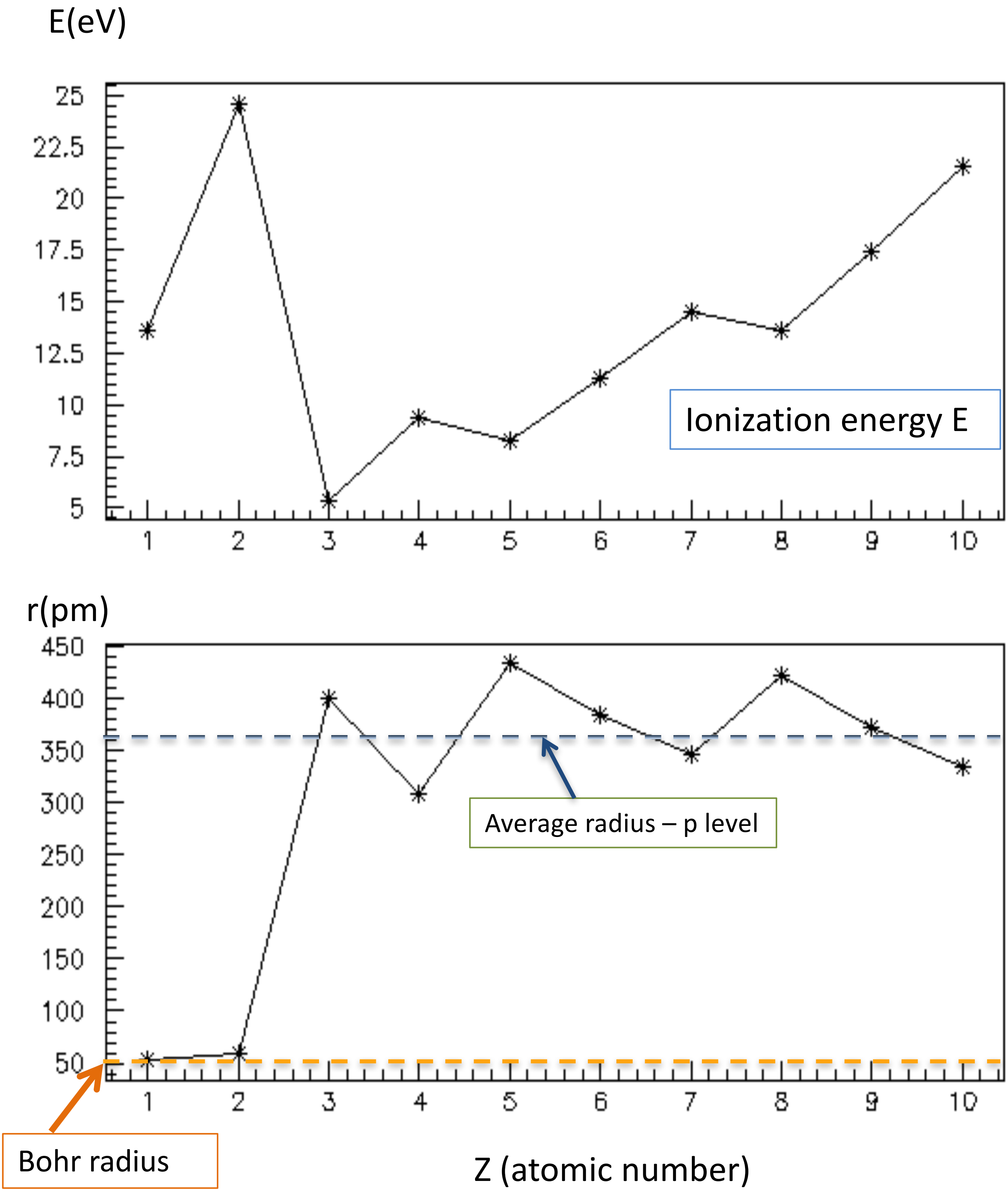
$E_{cal}(\gamma) \sim \gamma^2 \Sigma^2$

Electron shells for s and p levels



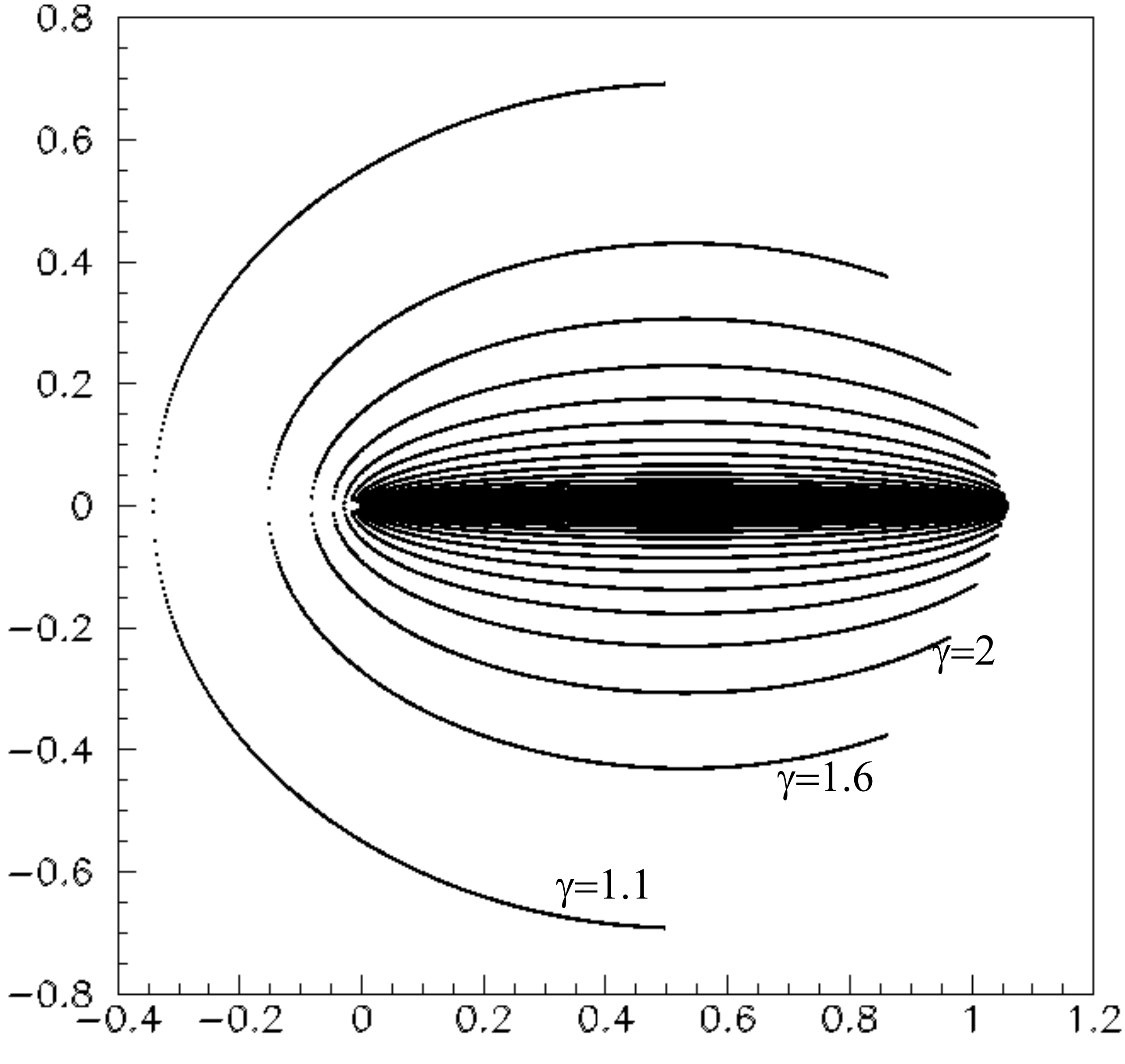
Note: y-scale is hundred times x-scale.

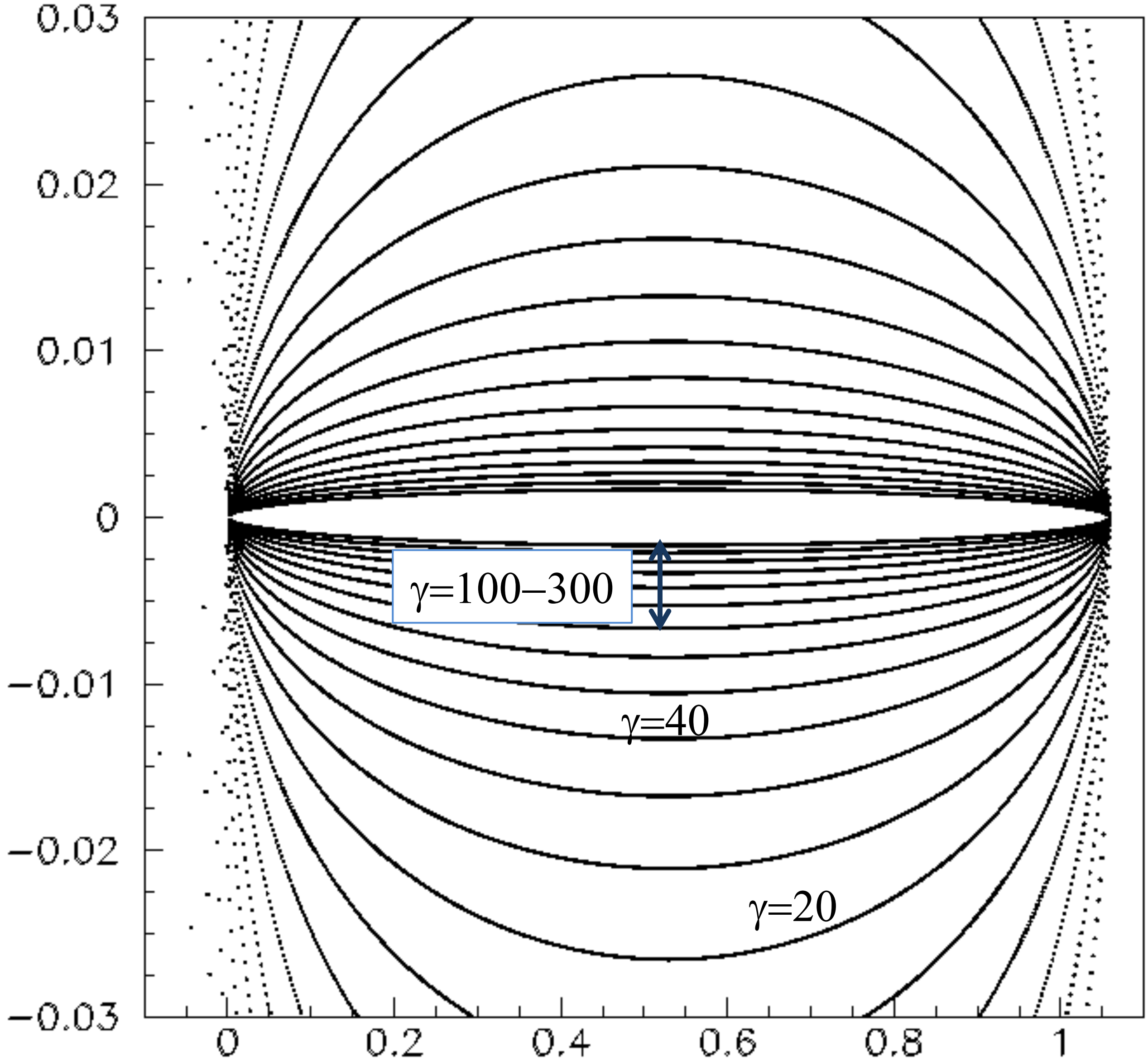
[Graphing the scale 1:1, the trajectories appear like strings!]


E(eV)
25
22.5
20
17.5
15
12.5
10
7.5
5
Ionization energy E
1
2
3
4
5
6
7
8
9
10
r(pm)
450
400
350
300
250
200
150
100
50
Average radius – p level
Bohr radius
Z (atomic number)

A (very simple) physical structure can be explained by following a simple but analytic path, not only by pre-established models or phenomenological considerations. In order to verify the validity of the formulas and to evaluate the accuracy, we need more (and more and more…) analyses and rational comparisons to the consolidated theories and of course to the experimental measures.

$$\hat{H}\Psi(\mathbf{r},t) \overset{?}{\Rightarrow} \hat{H}\Psi(R,t)$$


0.8
0.6
0.4
0.2
0
−0.2
−0.4
−0.6
−0.8
−0.4
−0.2
0
0.2
0.4
0.6
0.8
1
1.2
γ=2
γ=1.6
γ=1.1


0.03
0.02
0.01
0
−0.01
−0.02
−0.03
0
0.2
0.4
0.6
0.8
1
γ=100−300
γ=40
γ=20