much beyond the standard model

Frascati 15.2.2017

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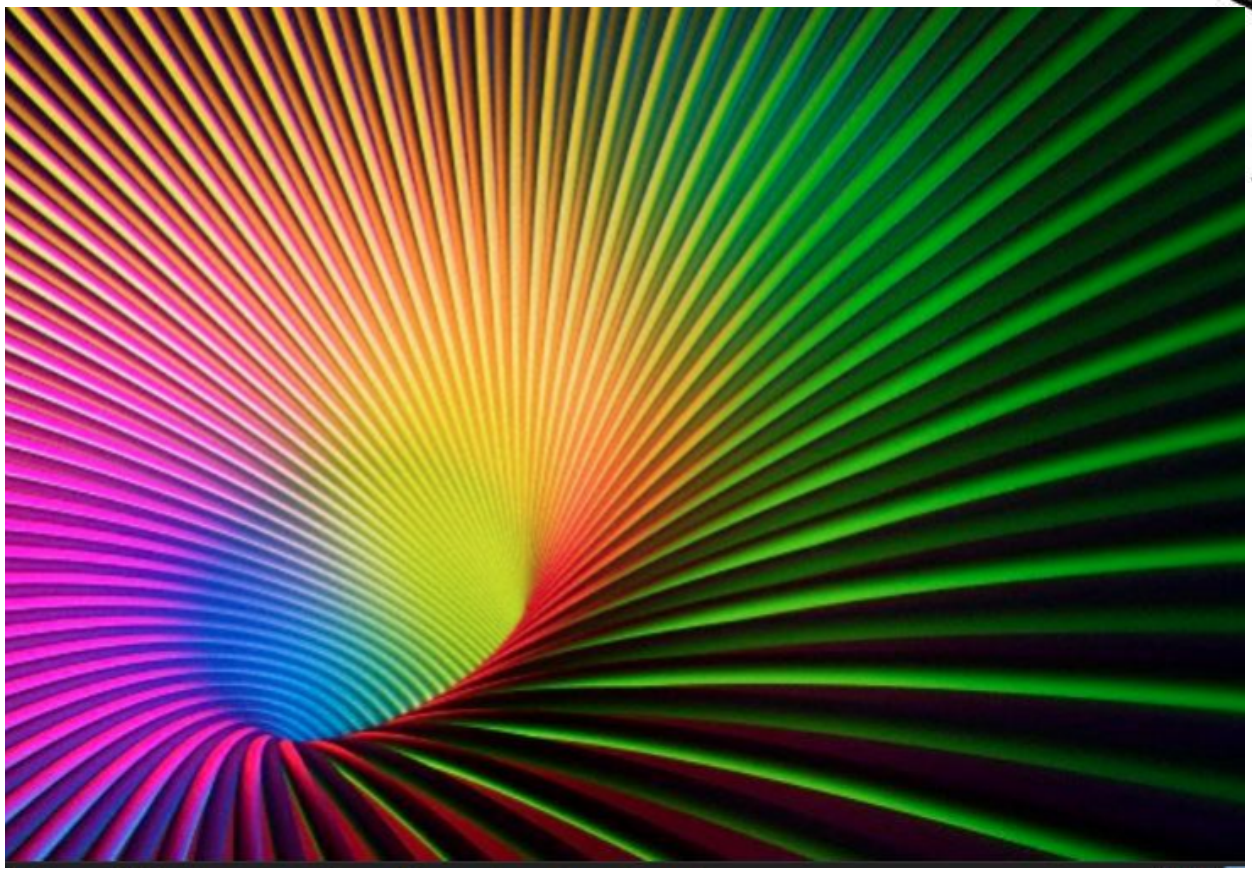
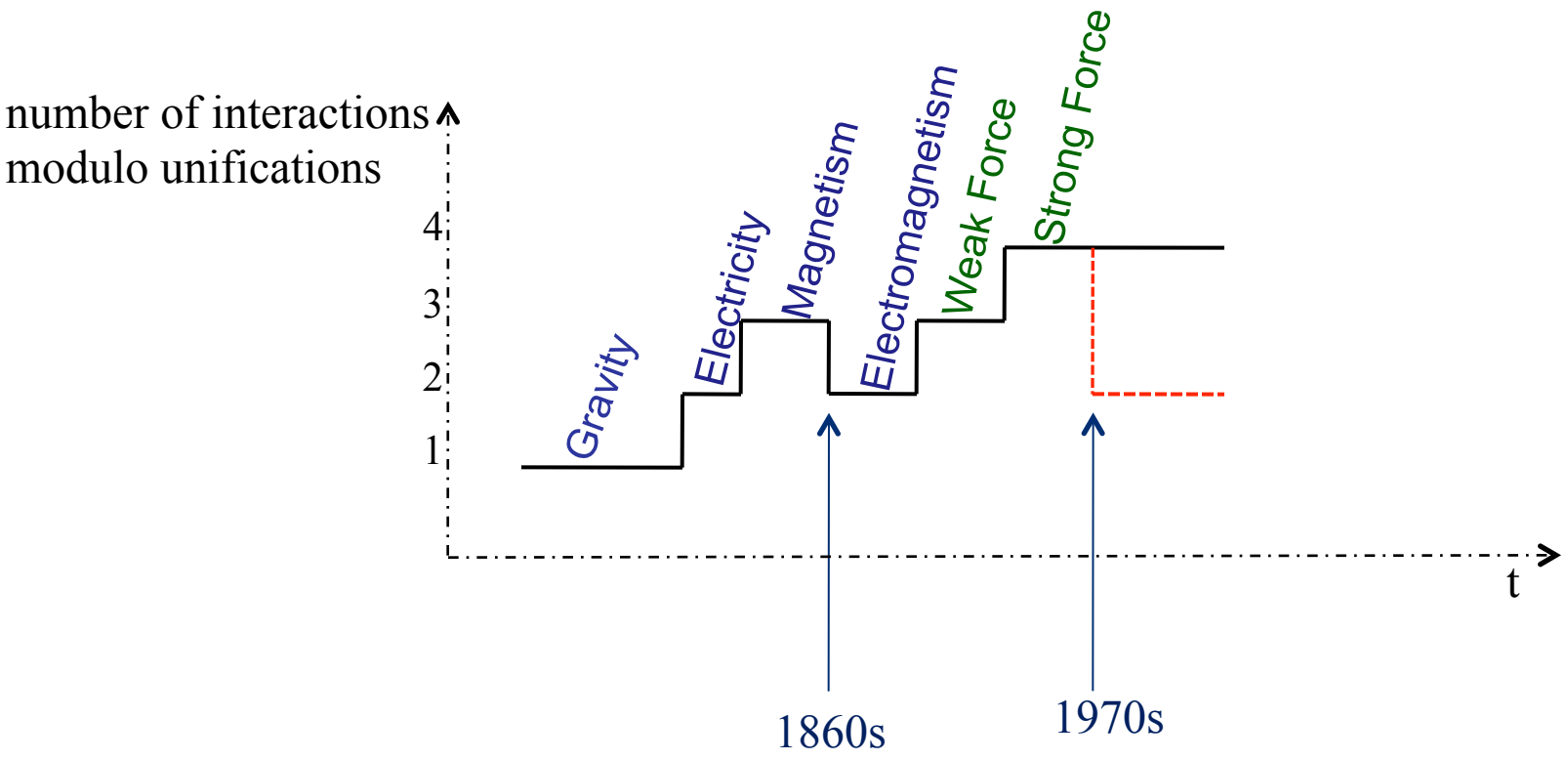
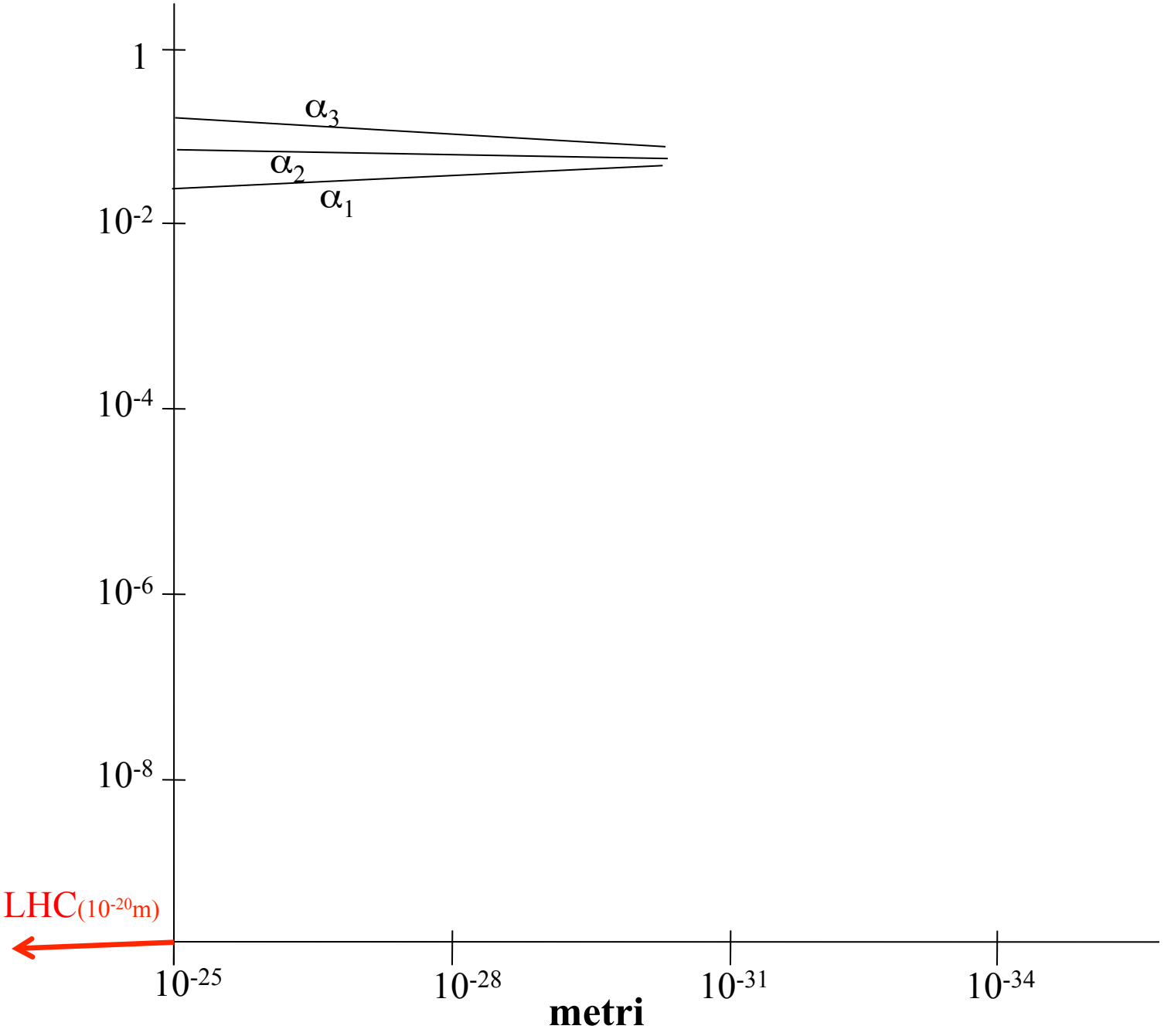
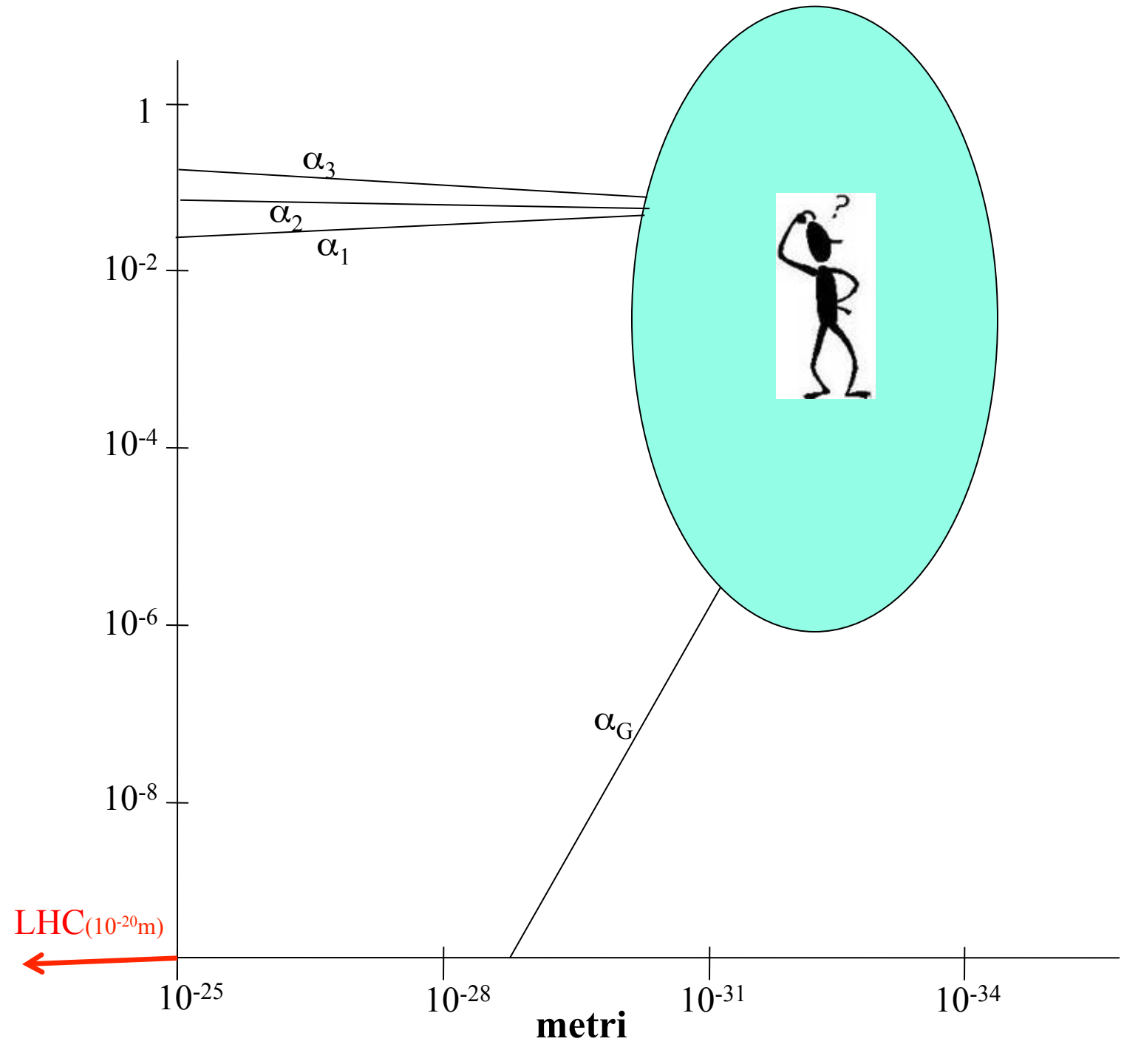
Sapienza University of Rome




number of interactions
modulo unifications
4
3
2
1
Gravity
Electricity
Magnetism
Electromagnetism
Weak Force
Strong Force
t
1860s
1970s

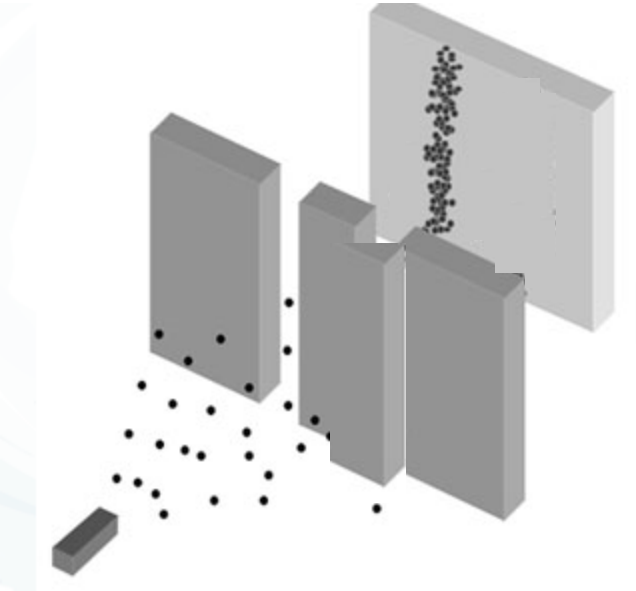

1
α_3
α_2
α_1
10^{-2}
10^{-4}
10^{-6}
10^{-8}
LHC(10^{-20}m)
10^{-25}
10^{-28}
10^{-31}
10^{-34}
metri

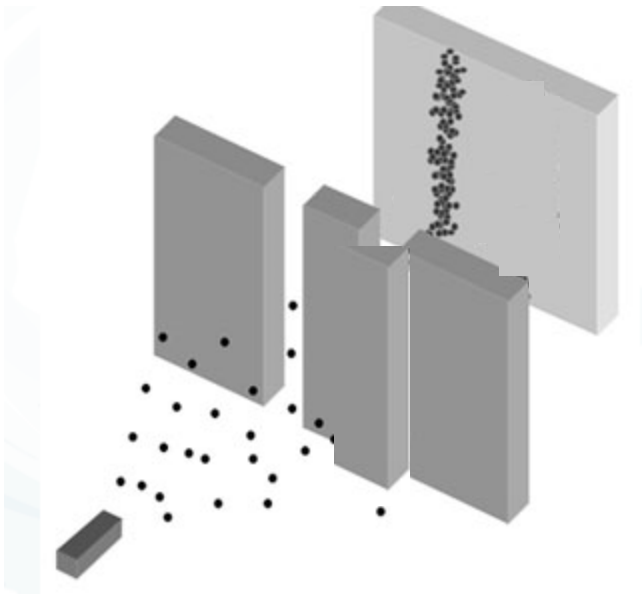

1
α_3
α_2
α_1
10^{-2}
10^{-4}
10^{-6}
10^{-8}
α_G
LHC(10^{-20}m)
10^{-25}
10^{-28}
10^{-31}
10^{-34}
metri

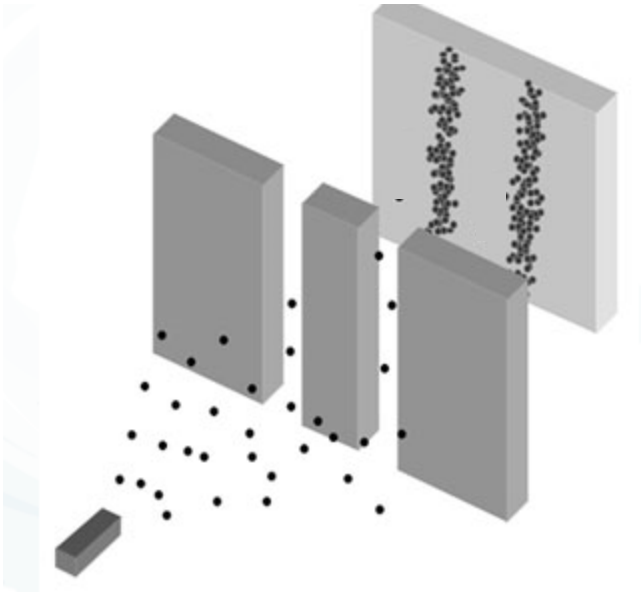
relative simultaneity for distant events

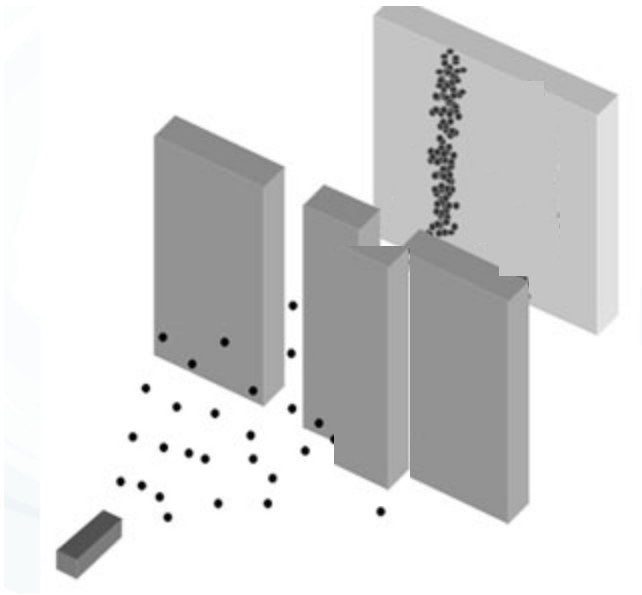
but still absolute simultaneity for coincident events

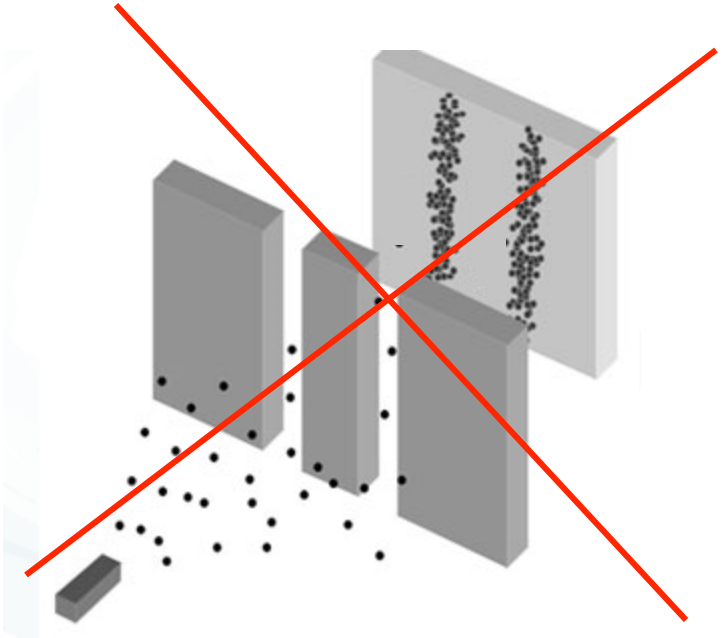
Missleading inferences from quantum mechanics

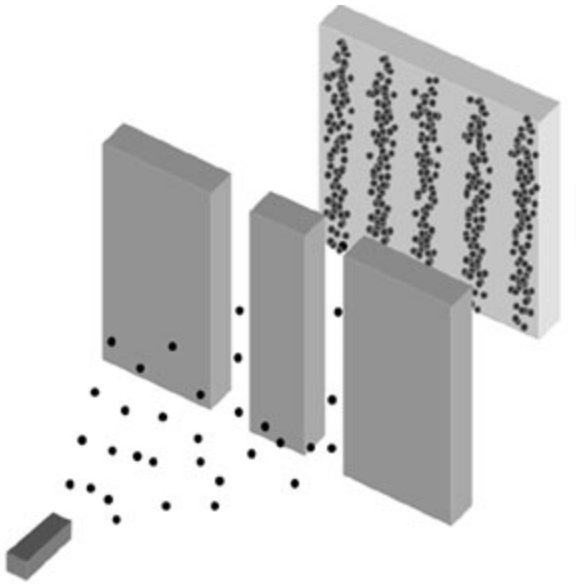


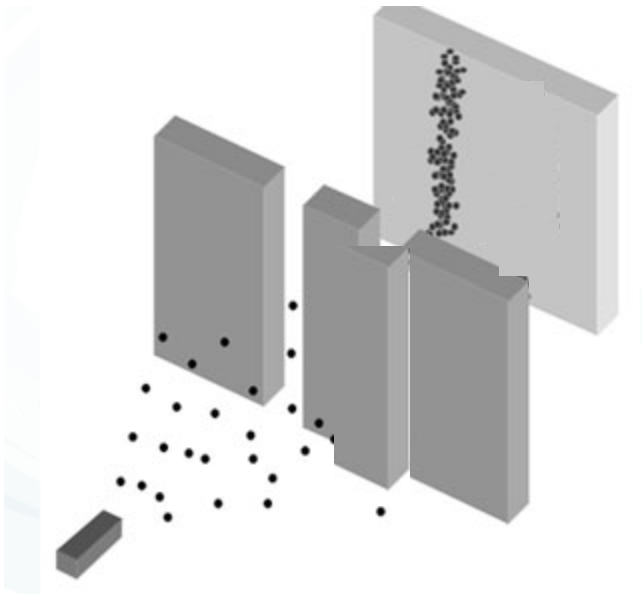


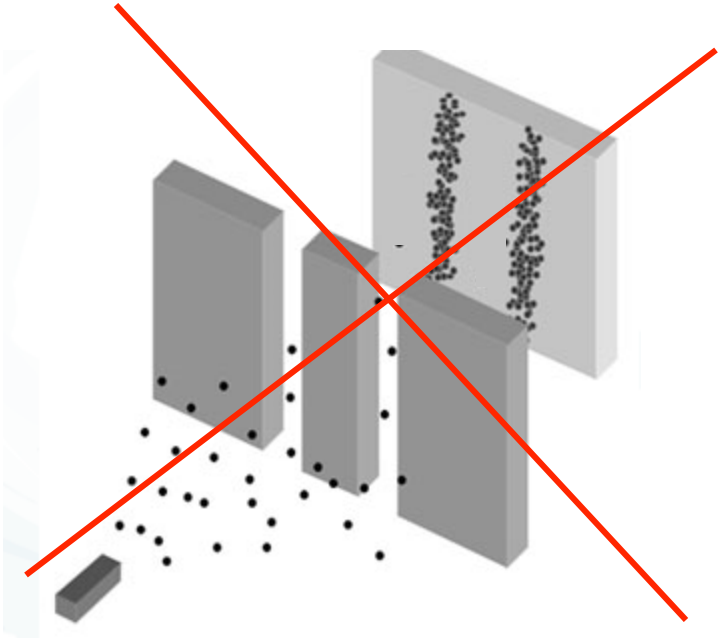


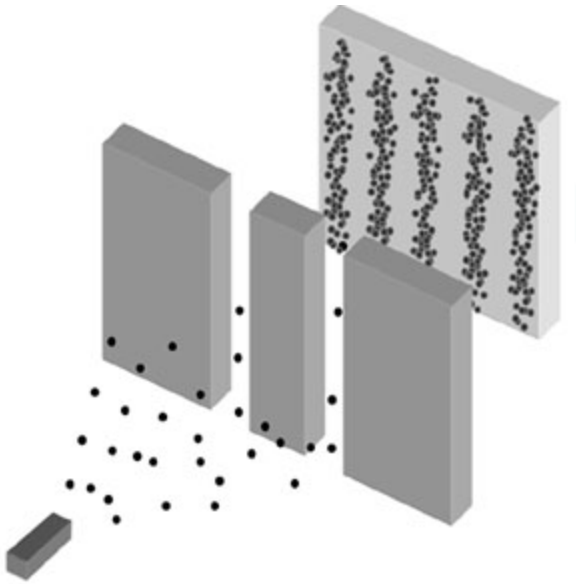










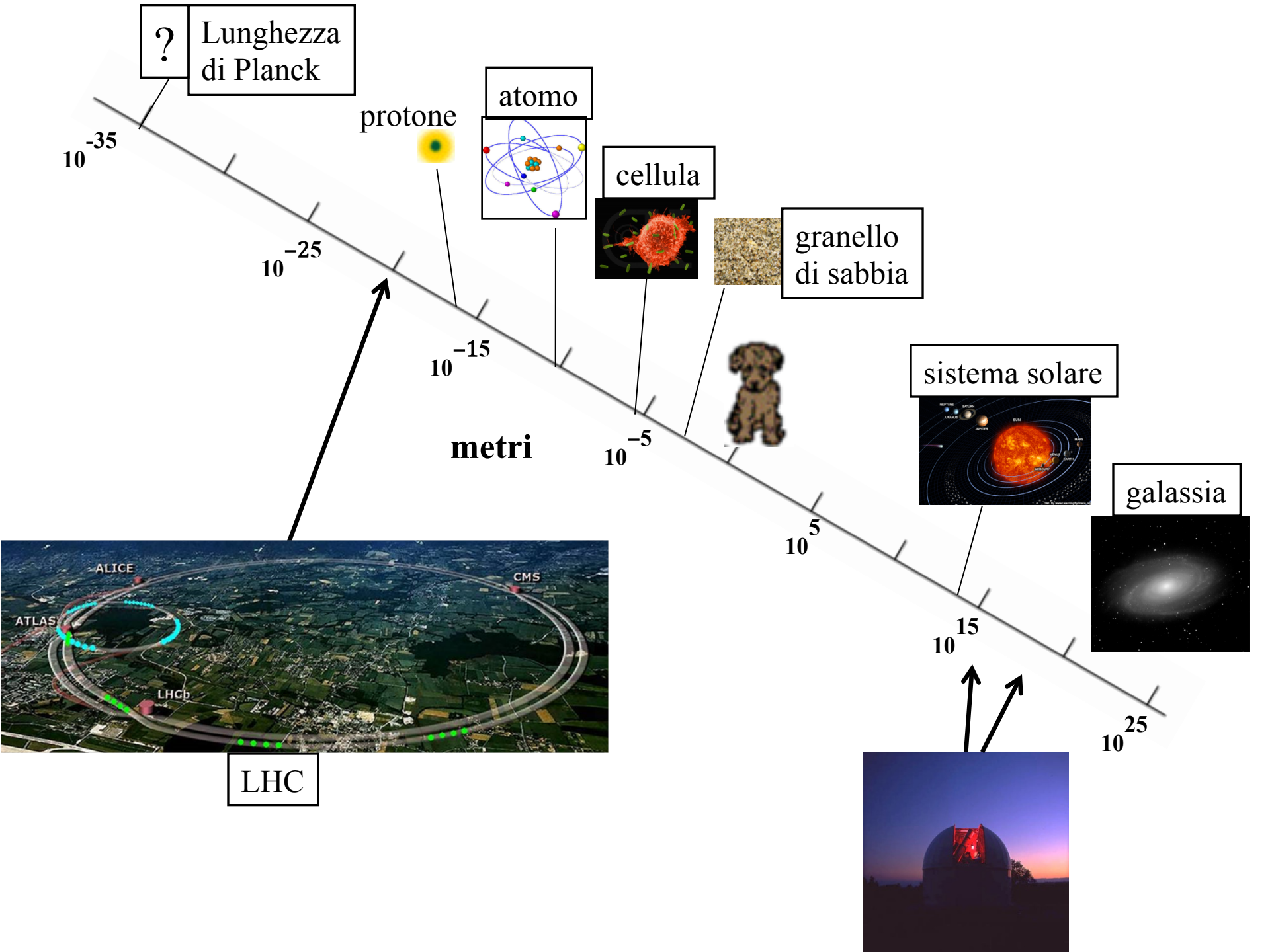


notion of spacetime point maybe be just an approximative notion

$E_{QG} \sim E_{Planck} = 1.2 \cdot 10^{19} GeV = \left(\frac{\hbar c^5}{G} \right)^{\frac{1}{2}}$ i.e. 10^{-35}meters ("Planck length")

Planck length is where quantum mechanics and gravity meet

$$\lambda_{compton} \sim \lambda_{schwartzschild}$$


?
Lunghezza di Planck
protone
atomo
cellula
granello di sabbia
sistema solare
galassia
10^{-35}
10^{-25}
10^{-15}
10^{-5}
10^{5}
10^{15}
10^{25}
metri
ALICE
CMS
ATLAS
LHCb
LHC

10 orders of magnitude over a century…

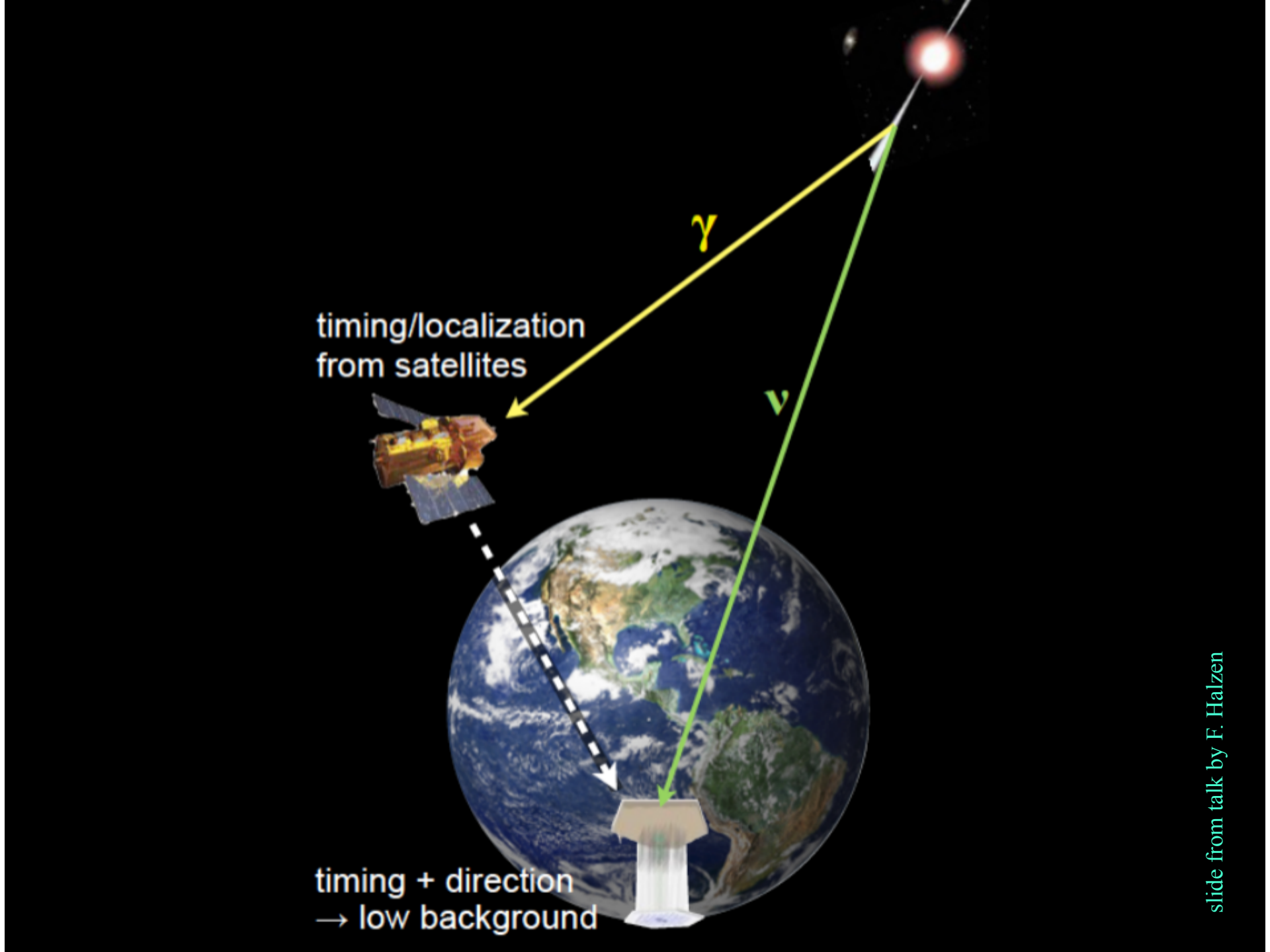
what can we do?

not the “theory of everything”…

let’s try to use the Brownian-motion paradigm

if the notion of spacetime point is “fuzzy” then trajectory of particles should be fuzzy

iiny fuzziness effects could cumulate over large propagation times



slide from talk by F. Halzen

QG researchers think Nature is hiding from us…
but she might not be hiding so well…