

IPPOG – Beyond Flat Earth Model

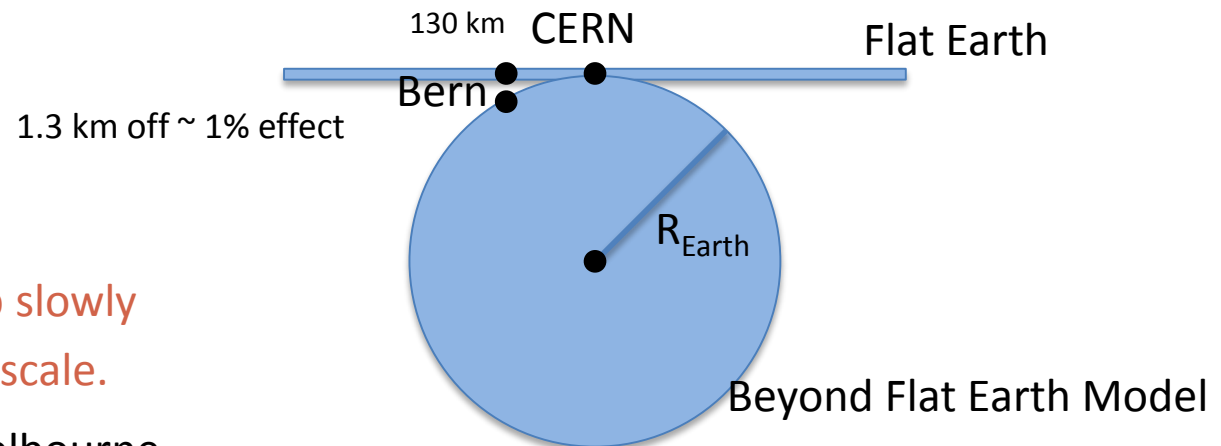
Why Scales Matter

- ❑ A flat earth is not completely wrong
 - ❑ Imaging the world as being flat yields a reasonably good approximation of our local environment
 - ❑ No need to know the **earth radius** to build a house or a bridge across a river or a valley



Measuring the Standard Model at unprobed energy scales

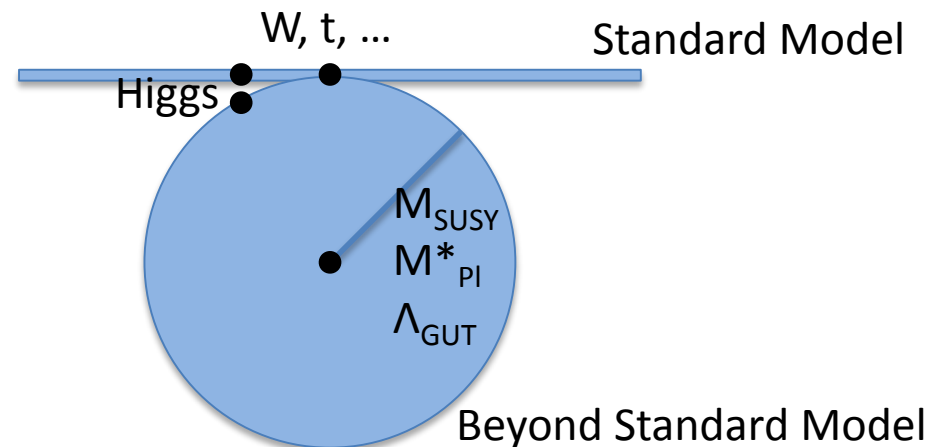
- ❑ Even a **good and axiomatically well motivated mathematical model** i.e. Flat Earth – or, if you want, the Standard Model, is only as good as it has been tested by experiment.
- ❑ **Predicting the coordinates of Bern** in absolute space, given direction and distance, of Bern from CERN and assuming a Flat Earth **is straight forward to do**.
Traveling to Bern and **carefully measuring via triangulation the true coordinates** of Bern **takes an effort** and will lead to a sizeable discrepancy between theoretical prediction and measurement.



- ❑ Discrepancy will build up slowly with increasing distance scale.
- ❑ i.e. take New York, or Melbourne rather than Bern.

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- ❑ **Scales matter** – even when a model is axiomatically well defined
- ❑ **Expanding the scale** at which a model is probed will either further strengthen the validity of the model or will tell when the model collapses and a new model will need to be found.
- ❑ It is exactly the deviation from the predicted value that tells how a better model can be constructed.
- ❑ Old models embed in the new and better model describing the world and keep their validity within a limited but now well understood scope.
- ❑ As an example, take Newtonian mechanics which is truly embedded in Einstein's General Relativity.
- ❑ **Abandon Popper** – a pure falsification paradigm leads to nowhere !

Measuring the Standard Model at unprobed energy scales

Why does it matter ?

- ❑ Again the Flat Earth Analogy helps:
- ❑ Knowing the earth is round doesn't help building a better house – your architect doesn't rely on knowing R_{earth} when drawing your new house.
- ❑ Reaching out to India via going West, however, is adding new concrete possibilities.
 - ❑ You may detect further unknown territory while on your way.
- ❑ We may be in a position **to understand Dark Matter** or even **Dark Energy** once we know how to expand out of the Standard Model.

