



SUMMARY TALK

ERIC VÁZQUEZ JÁUREGUI

INSTITUTO DE FISICA, UNAM, MEXICO

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A stylized, artistic poster for the VIEWS24 workshop. The background is a dark blue space with stars and a bright orange and red cube structure. A small figure of a person is standing on a platform in the foreground. The text 'VIEWS24 VIENNA WORKSHOP ON SIMULATIONS 2024' is written in a stylized font on the right side. Below the main title, the dates '22-27 April 2024 • Vienna, Austria' are displayed. At the bottom, there is information about the local organizing committee, abstract submission and registration deadlines, and logos for HEPHY and ÖAW.

Local organizing committee: Valentyna Mokina • Holger Kluck
▪ Samir Banik • Jens Burkhardt • Brigitte De Monte
<https://indico.cern.ch/e/VIEWS24>

Abstract submission deadline: 29 February 2024

Registration deadline: 1 April 2024

HEPHY INSTITUTE OF HIGH ENERGY PHYSICS

ÖAW AUSTRIAN ACADEMY OF SCIENCES

Background image: Jens Burkhardt
Poster design: Holger Kluck



Thank you very much to the organizing committee!

Thank you for bringing us together to discuss
simulations!





39 talks in 2 full days (15 minutes/talk)

A total of 585 minutes





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A total of 585 minutes

What was the most used word in this workshop?



GEANT4 + G4:

$$40 + 129 + 197 = 366$$

$$5 + 140 + 92 = 237$$

Most used in a talk: 41 times (51 times for G4)

Once every ~ 1.6 minutes (GEANT, GEANT4)



Background(s):

$$132 + 108 + 126 = 366$$

Most used in a single talk: 39 times

Once every ~ 1.6 minute






Simulation(s):

$$130 + 313 + 204 = 647$$

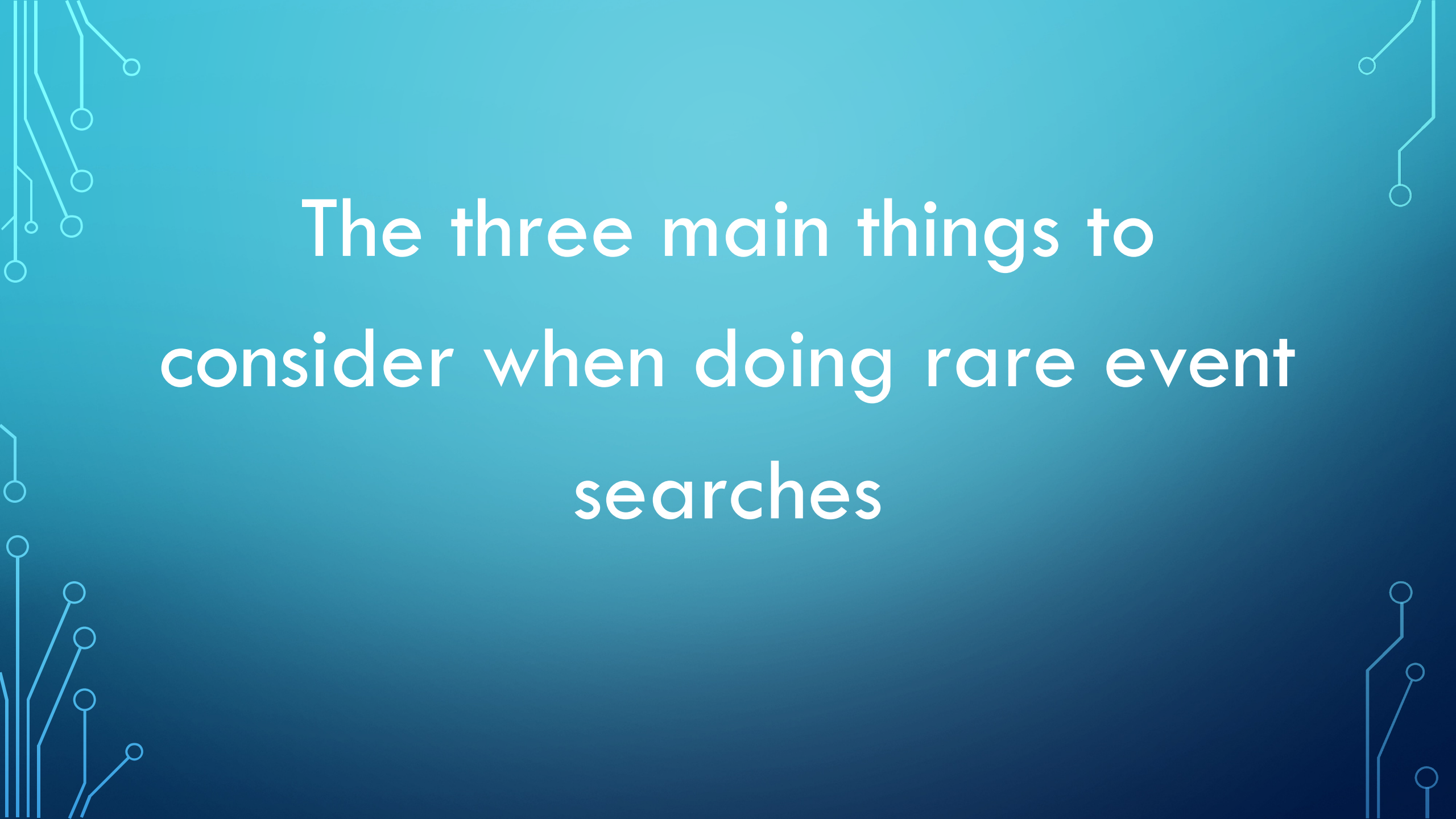
Most used in a single talk: 59 times

Every 54 seconds!



The background is a dark blue gradient. In the four corners, there are white line-art patterns resembling circuit boards or neural networks, with lines connecting to small circles.

GEANT4 simulation of backgrounds

The background is a dark teal gradient. In the corners, there are decorative white line-art elements resembling circuit traces or neural network connections, with small circles at the end of the lines.

The three main things to
consider when doing rare event
searches

The image features a dark blue gradient background with white circuit-like lines in the corners. These lines consist of straight paths that branch out and terminate in small circles, resembling a stylized PCB or network diagram. The lines are positioned in the top-left, top-right, bottom-left, and bottom-right corners, framing the central text.

Backgrounds, backgrounds, and
backgrounds

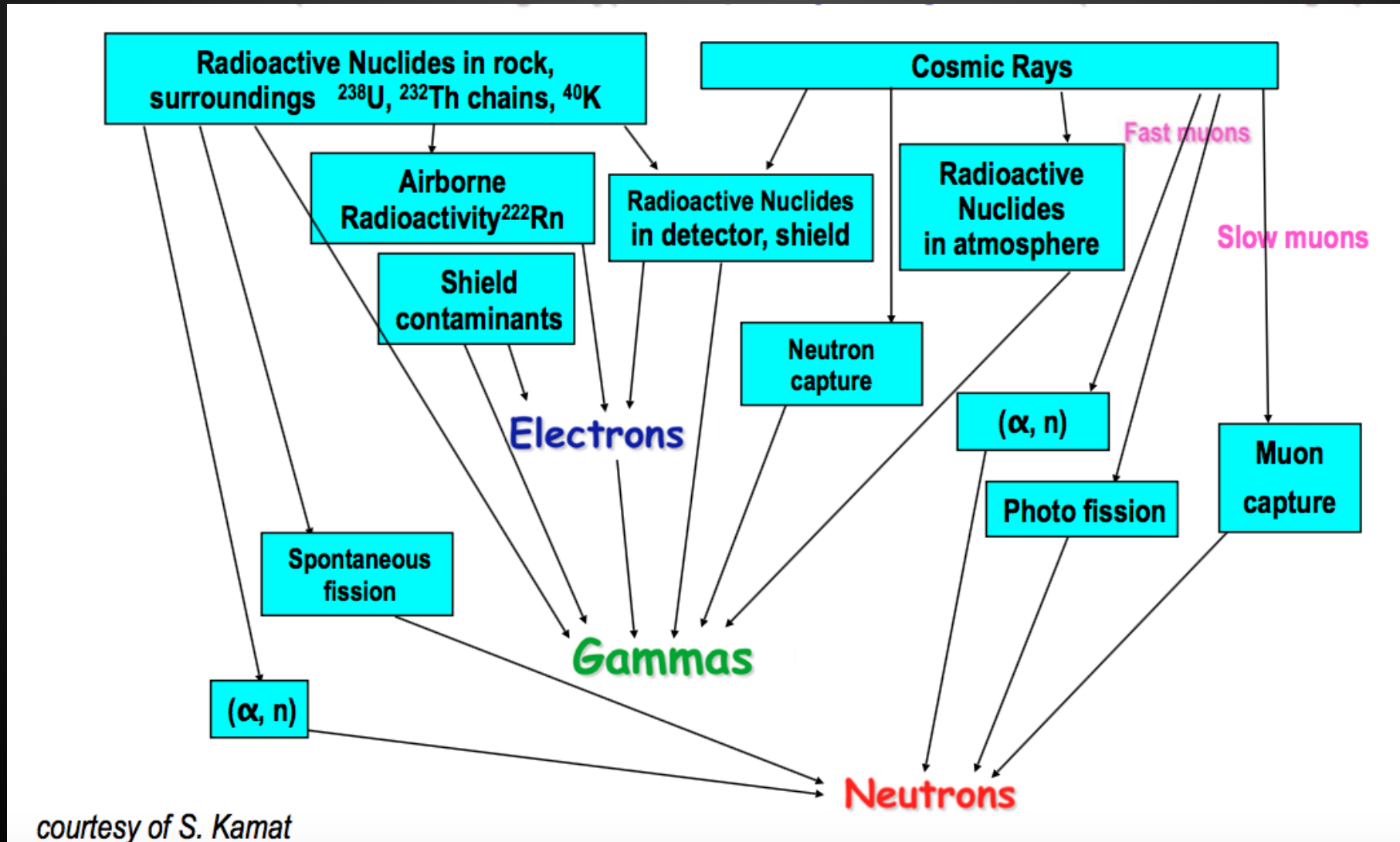
The image features a dark blue gradient background with white, stylized circuit board traces in the corners. These traces consist of straight lines and right-angle turns, ending in small white circles that represent components or connection points. The traces are located in the top-left, top-right, bottom-left, and bottom-right corners, framing the central text.

Why?

Why?

- We haven't seen dark matter
- We don't know if neutrinoless double beta decay really exists
- Only one experiment has measured CEvNS

Cosmic rays and natural radioactivity



courtesy of S. Kamat

In this workshop we had ROI's at the MeV, keV, and eV scales

- Low-mass DM, CEvNS: sub-keV
- Double beta decay: few MeV
- WIMP DM: a few keV
- Others: low energy anti-protons,...

In this workshop: lots of experience with GEANT4 and simulations, many challenges, many solutions

- In general, ensemble of base GEANT4 physics lists, tuned:
 - Custom physics lists: low-energy EM, hadronic HP,...
 - Modular physics list: shielding

Either in pure form or with frameworks using them (many available to the community): GEMC, SAGE, RAT, SNIPER, REST, G4DS, Geant4.jl

Even tools for importing/exporting CAD, GDML



But with input from different, many areas: software
and data-driven

Encompassing nuclear, atomic, solid-state physics, and
more



Cosmic rays: muons, neutrons,..., muon-induced,..

- In-situ measurement, but not all particles in the cascades (surface or underground)
- External generators: CRY, MUSUN, MUTE, PARMA, custom
- Systematical uncertainties play a significant role: cross-sections, material composition,...

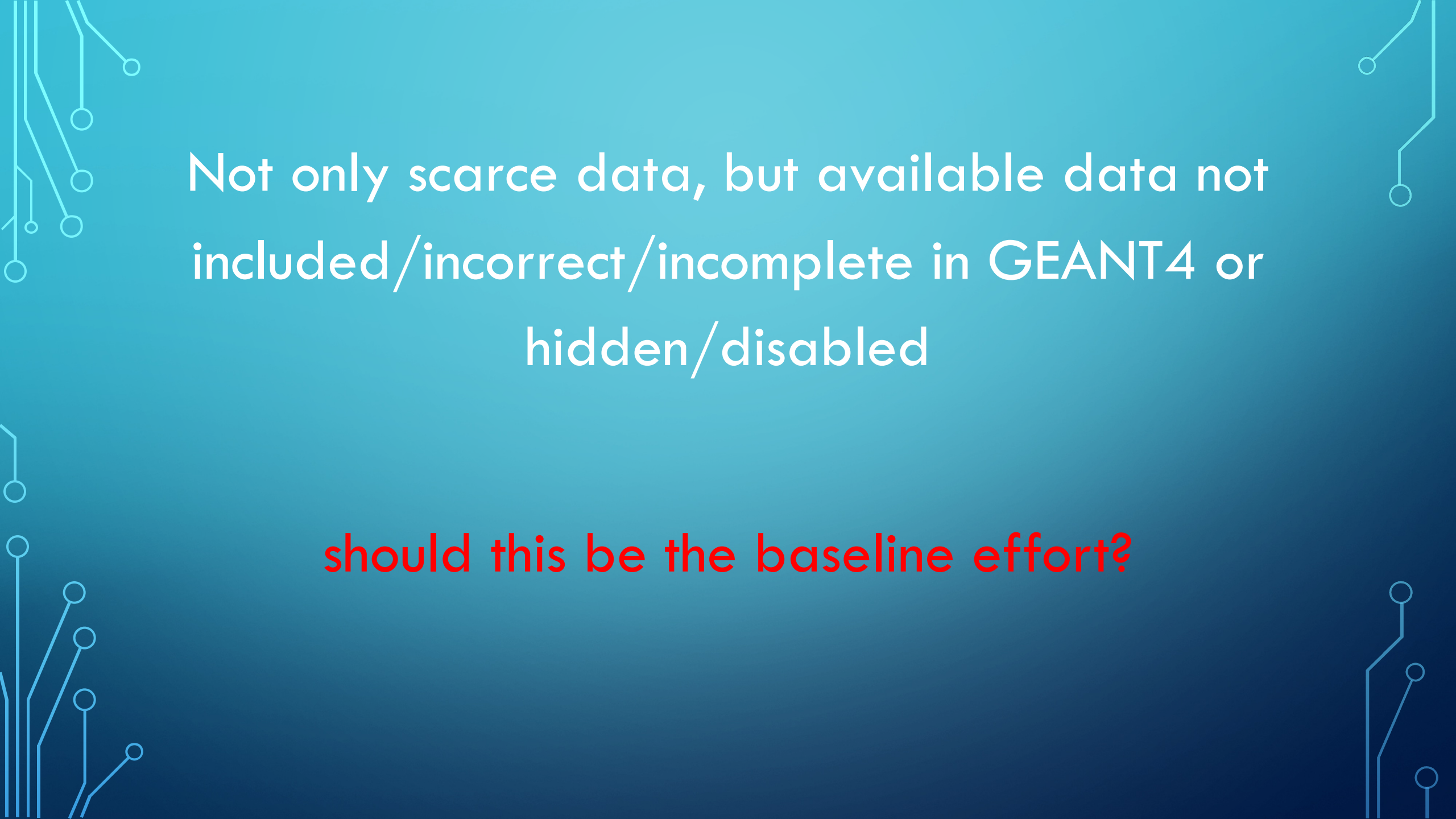
Gammas, electrons, neutrons, and others: radioactive decays, captures, fission, (α,n) , (γ,n)

- Gammas: RadioactiveDecay, Decay0, DICEBOX, Marina, FIFRELIN, FIFRADINA, Grabmayr,...
- Neutrons: SOURCES, NEuCBOT, SaG4n,...
- Systematical uncertainties also play a significant role

Optics

- To GEANT or not to GEANT

Chroma, MaGe, others

The background is a dark blue gradient. In the corners, there are decorative white circuit-like patterns consisting of lines and small circles, resembling a network or data flow diagram.

Not only scarce data, but available data not included/incorrect/incomplete in GEANT4 or hidden/disabled

should this be the baseline effort?



In addition, material intrinsic properties also
lacking experimental data or there are
discrepancies

**NR and ER response: ionization efficiencies,
quenching factors...**





Calibrations



Once these two are “understood”

Unidentified backgrounds, excess showing up in many
rare event searches



They will probably continue to pop-up as thresholds and
backgrounds lower even more

The background is a blue gradient with white circuit-like lines in the corners. The lines consist of straight segments connected by small circles, resembling a network or data flow diagram.

Alternative codes?

MCNPX, FLUKA, TOUCANS

Do they cover all the experimental efforts?

The image features a blue gradient background with white circuit-like lines in the corners. These lines consist of straight paths that branch out and terminate in small circles, resembling a network or data flow diagram.

Let's keep the momentum!

The background is a gradient of blue, darker at the bottom. In the corners, there are decorative white line-art elements resembling circuit traces or neural network connections, with small circles at the end of the lines.

Let's keep the momentum!

Whitepaper and central database

The background is a dark blue gradient. In the corners, there are decorative white line-art elements resembling circuit traces or data paths, with small circles at the end of the lines.

Let's keep the momentum!

Whitepaper and central database

More VIEWS workshops!