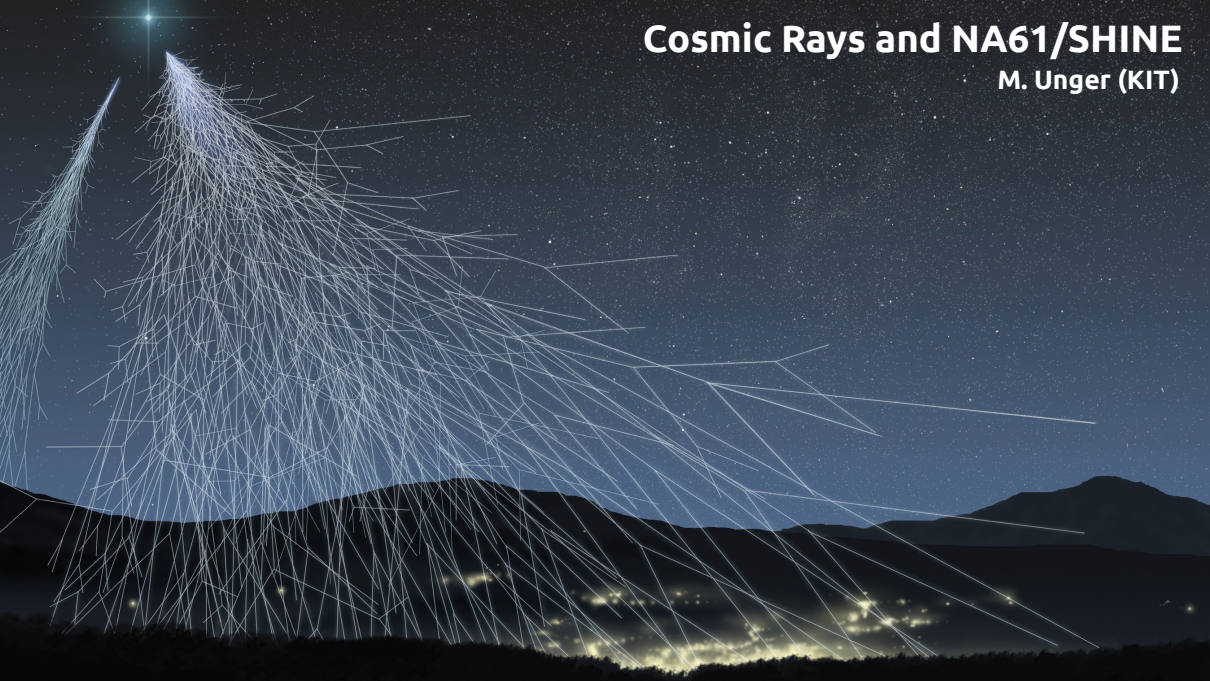


Cosmic Rays and NA61/SHINE

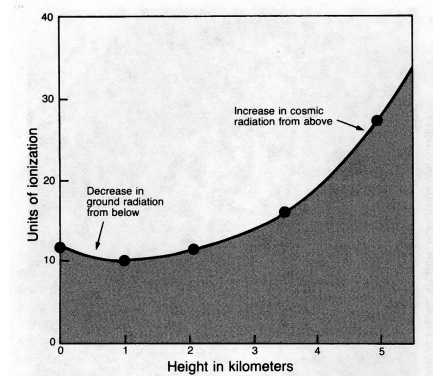
M. Unger (KIT)



Cosmic Rays – A 100-Year-Old Mystery



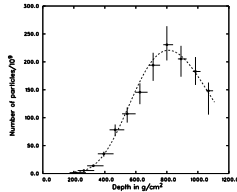
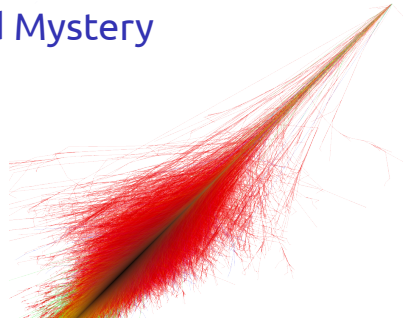
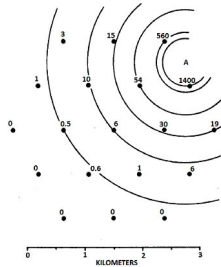
Victor Hess balloon flights 1912 (Nobel prize 1936)



Readings on ionization chamber Victor Hess carried aloft in the Böhmen. Above four kilometers the ionization rose rapidly indicating "that rays of very great penetrating power are entering our atmosphere from above". These cosmic rays contain the only modern samples of matter from outside our solar system which can be investigated directly.

Ultrahigh-Energy Cosmic Rays – A 50-Year-Old Mystery

John Linsley, first UHECR $E > 10^{20}$ eV, PRL 10 (1963) 146



$$E = 3 \times 10^{20} \text{ eV}$$

using LHC magnets for 10^{20} eV particles:



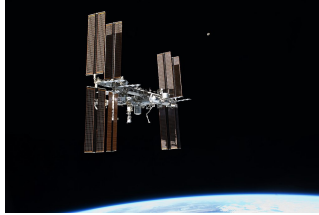
Fly's Eye Collab., ApJ 441 (1995) 144

Ongoing Research

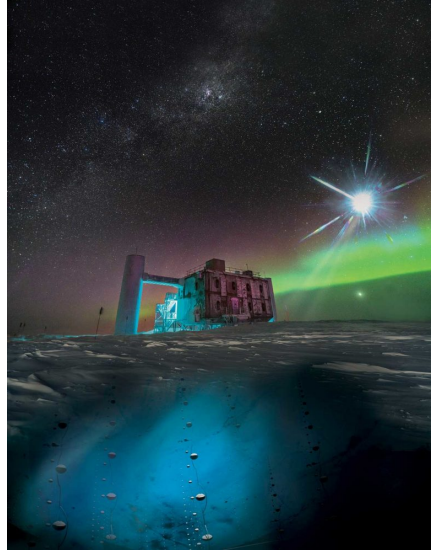
J. Cham&D. Whiteson "We have no idea"



AMS on ISS

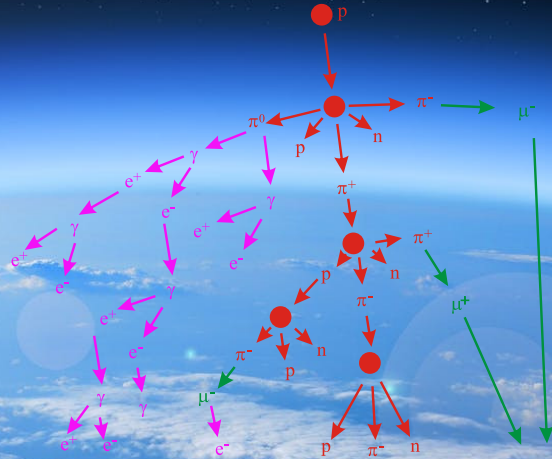


Pierre Auger Observatory, Argentina



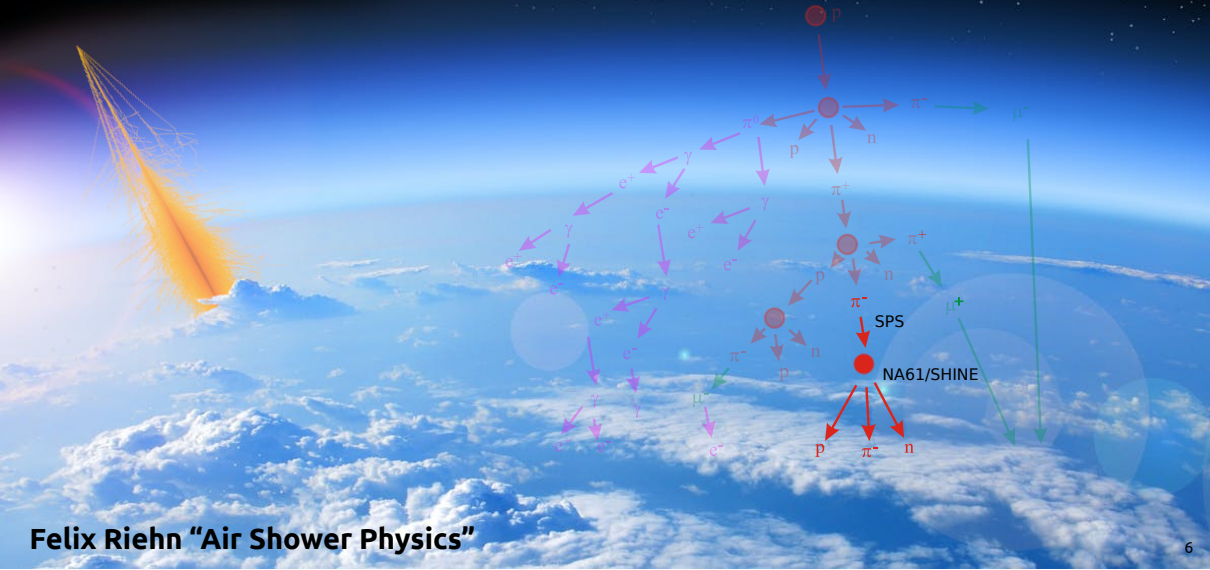
IceCube, Antarctica

NA61/SHINE Cosmic Ray Topic #1: Interactions in Air Showers



Felix Riehn "Air Shower Physics"

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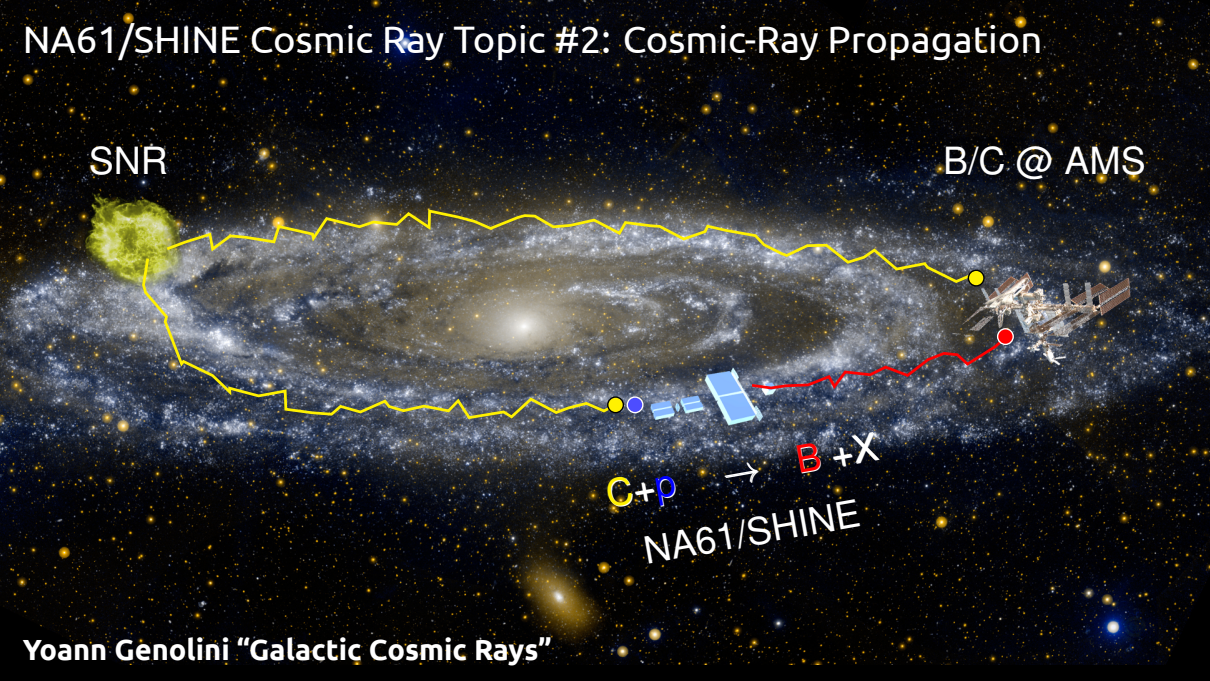
NA61/SHINE Cosmic Ray Topic #2: Cosmic-Ray Propagation

SNR

B/C @ AMS

$C + p \rightarrow B + X$
NA61/SHINE

Yoann Genolini "Galactic Cosmic Rays"



NA61/SHINE Cosmic Ray Topic #2: Anti-Nuclei

SNR

$$\chi + \bar{\chi} \rightarrow \bar{p}/\bar{\text{He}} + X?$$

$$p + p \rightarrow \bar{p}/\bar{\text{He}} + X$$

NA61/SHINE

Jonas Tjemsland "Cosmic-Ray Antinuclei"