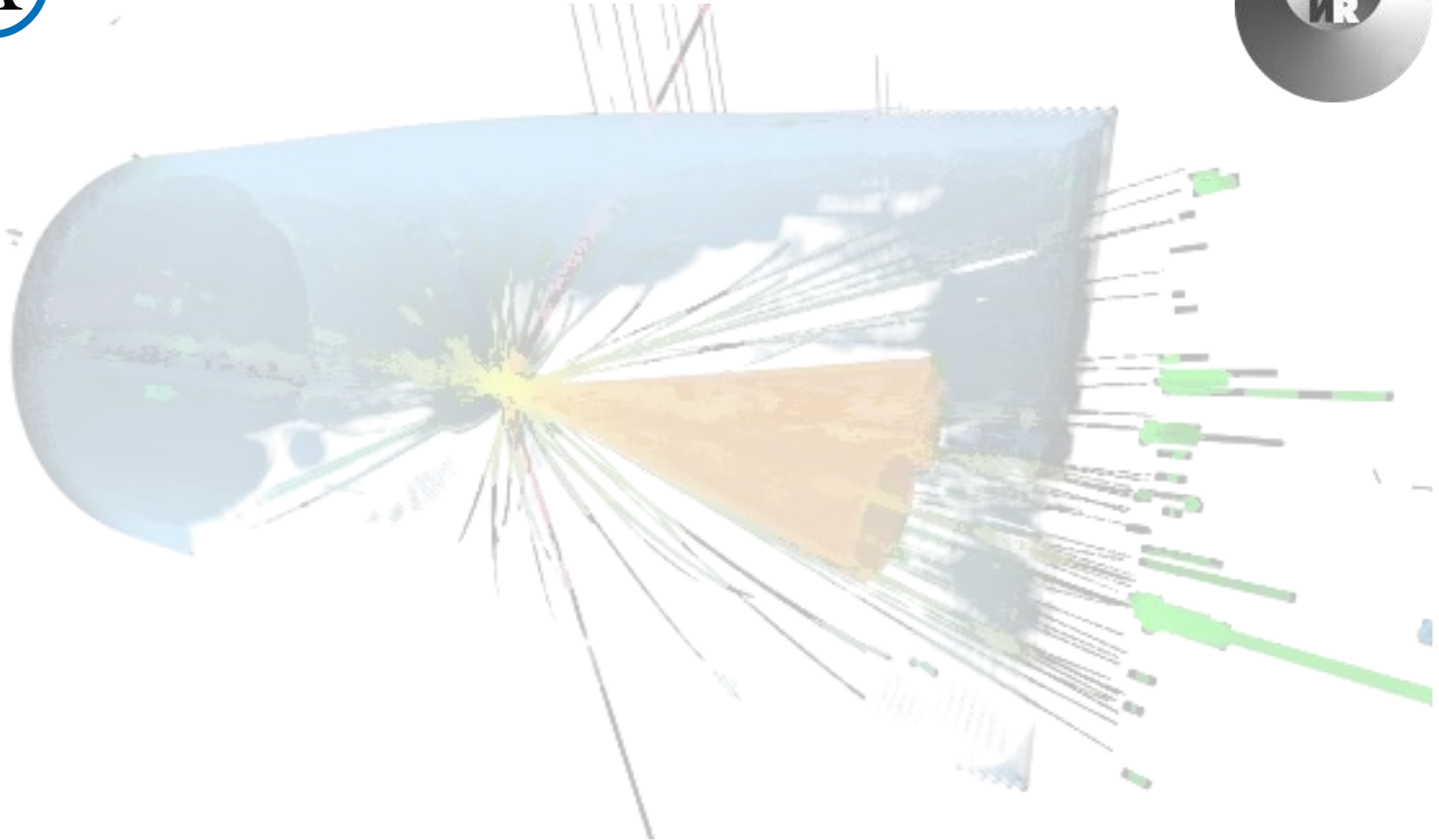




PARTICLES OF NEW PHYSICS AT NICA

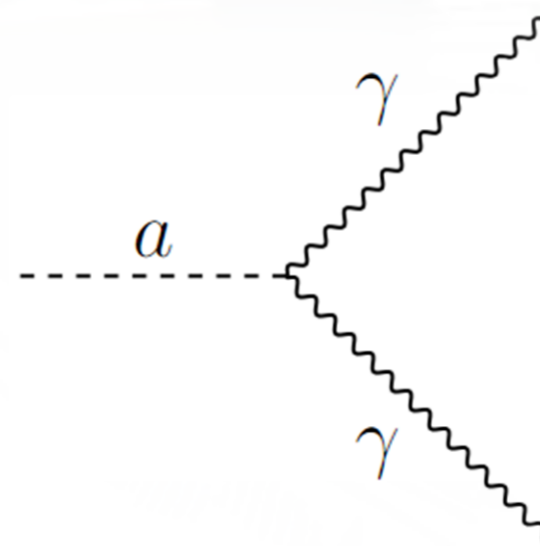
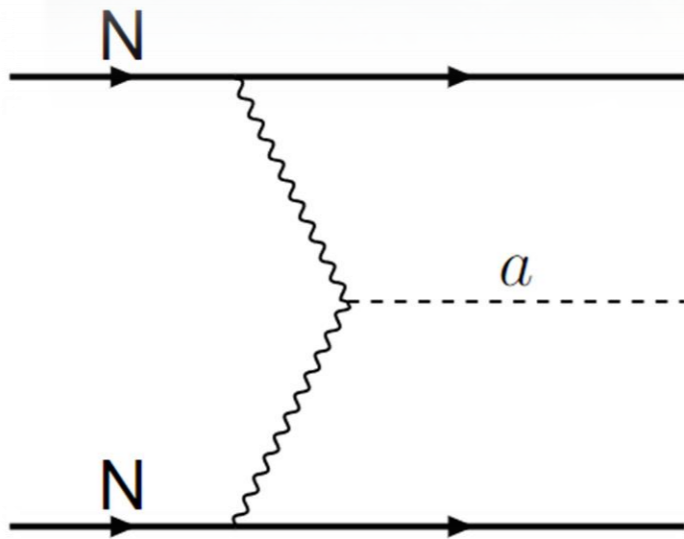


D. Kalashnikov, D. Gorbunov
INR RAS, MIPT

PARTICLES OF NEW PHYSICS AT NICA

Axion

$$\mathcal{L} = \frac{1}{4} g_{a\gamma\gamma} a F^{\mu\nu} \tilde{F}_{\mu\nu}$$



PARTICLES OF NEW PHYSICS AT NICA

Axion

$$Au^{79+}: E_{NN} = 10 \text{ GeV}, L = 0.01 \text{ pb}^{-1}$$

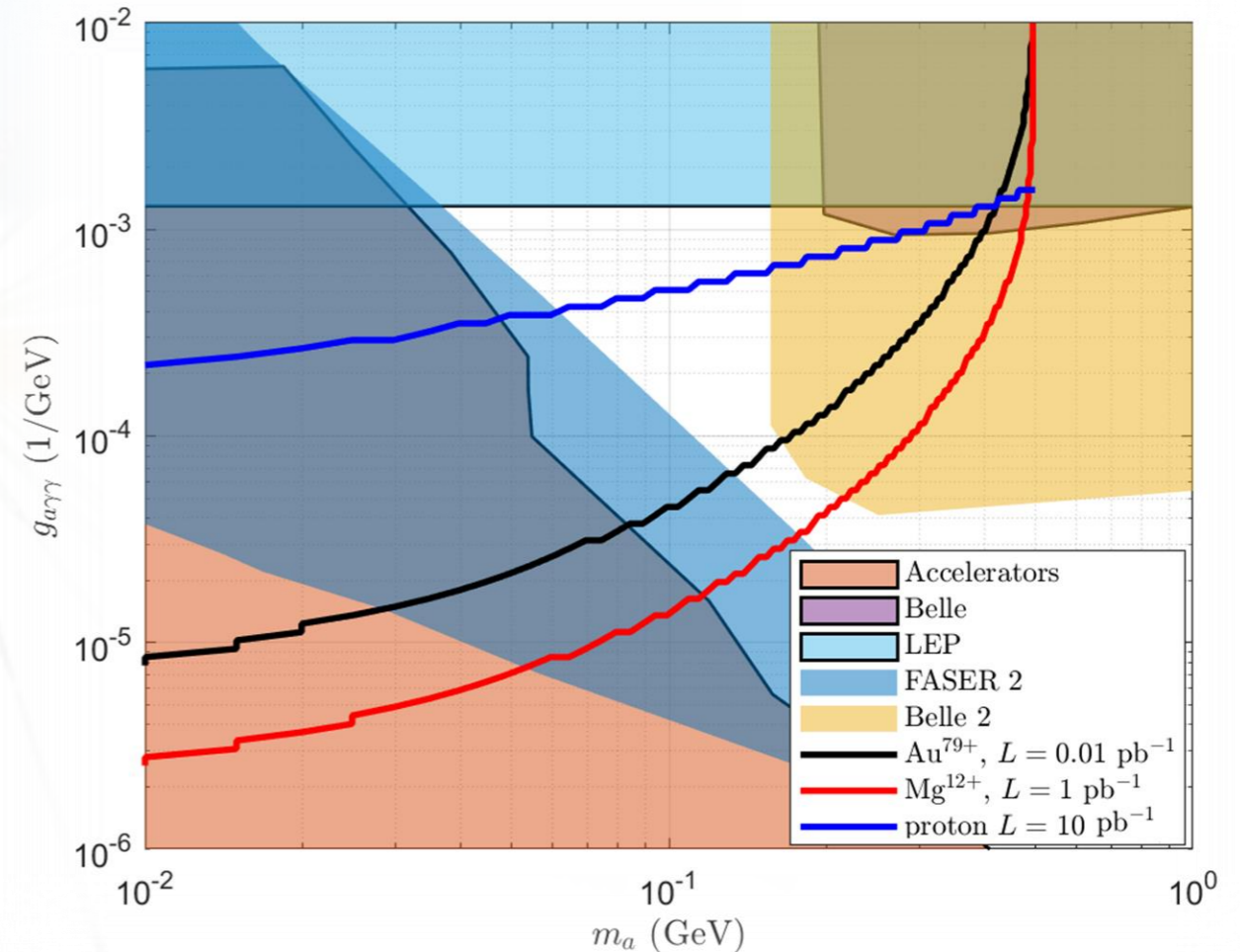
$$Mg^{12+}: E_{NN} = 10 \text{ GeV}, L = 1 \text{ pb}^{-1}$$

$$H^+: E_{NN} = 10 \text{ GeV}, L = 10 \text{ pb}^{-1}$$

[3] Технический проект объекта «Комплекс NICA» (2018)

[4] 5th Edition of the NICA White Paper (2011)

$$N_a \propto LZ^2$$



PARTICLES OF NEW PHYSICS AT NICA

Axion

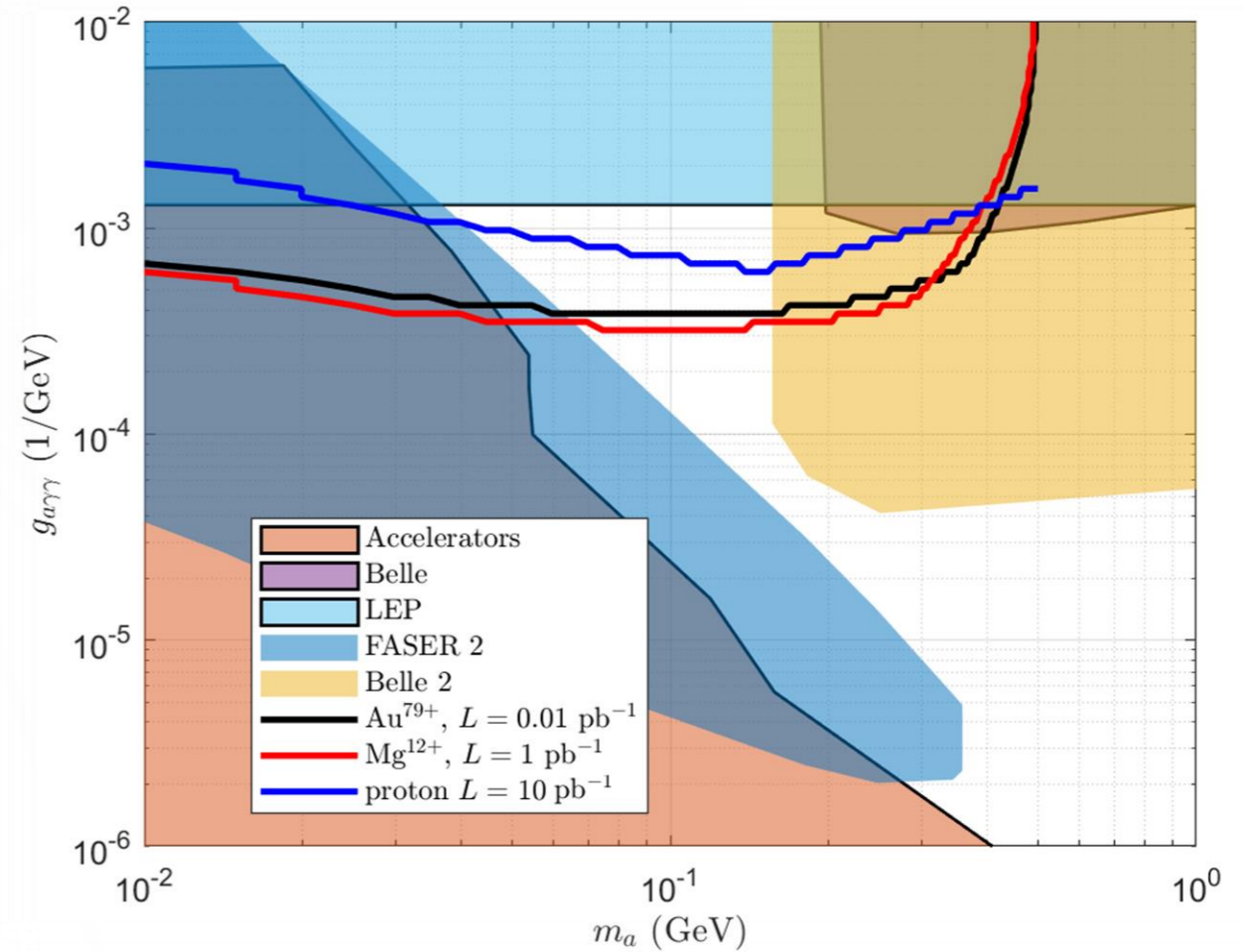
$$Au^{79+}: E_{NN} = 10 \text{ GeV}, L = 0.01 \text{ pb}^{-1}$$

$$Mg^{12+}: E_{NN} = 10 \text{ GeV}, L = 1 \text{ pb}^{-1}$$

$$H^+: E_{NN} = 10 \text{ GeV}, L = 10 \text{ pb}^{-1}$$

$$BG: \sigma = fit(m_{\gamma\gamma})$$

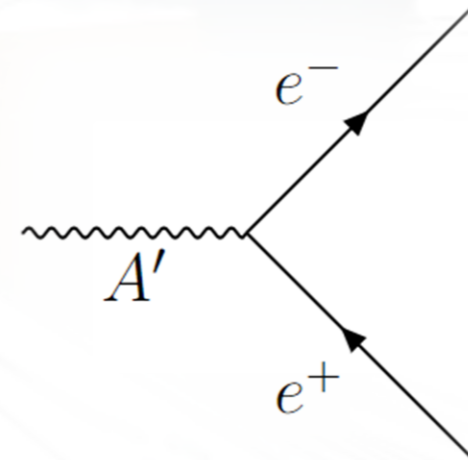
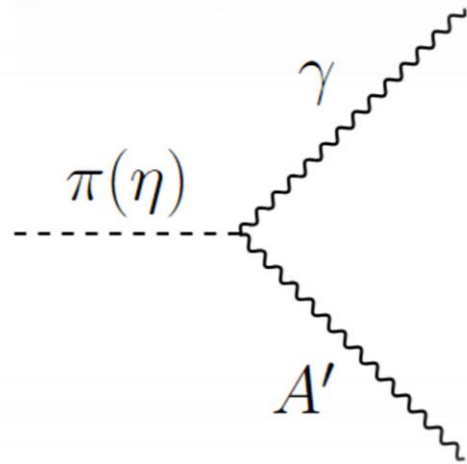
[5] Talk at Epiphany2019 by M. Klusek-Gaweda



PARTICLES OF NEW PHYSICS AT NICA

Dark Photon

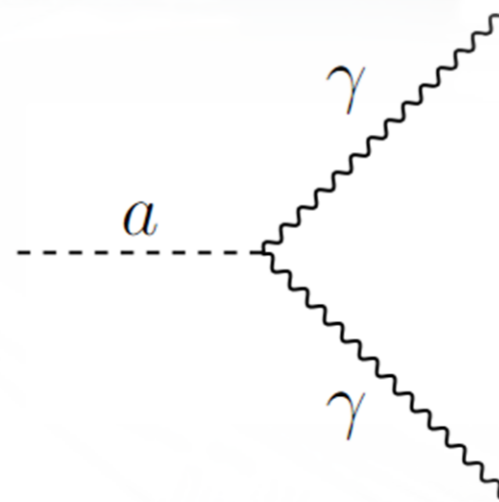
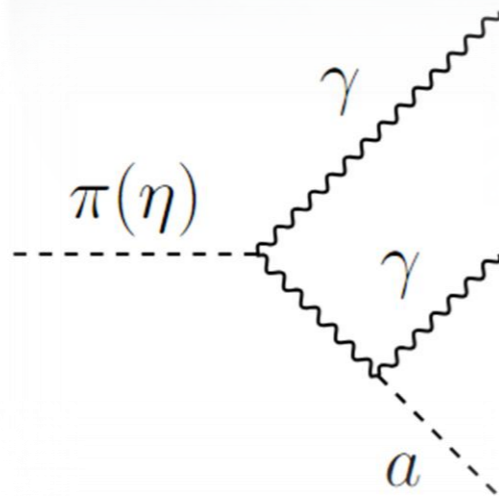
$$\mathcal{L} = \epsilon e A'_\mu \bar{e} \gamma^\mu e$$



PARTICLES OF NEW PHYSICS AT NICA

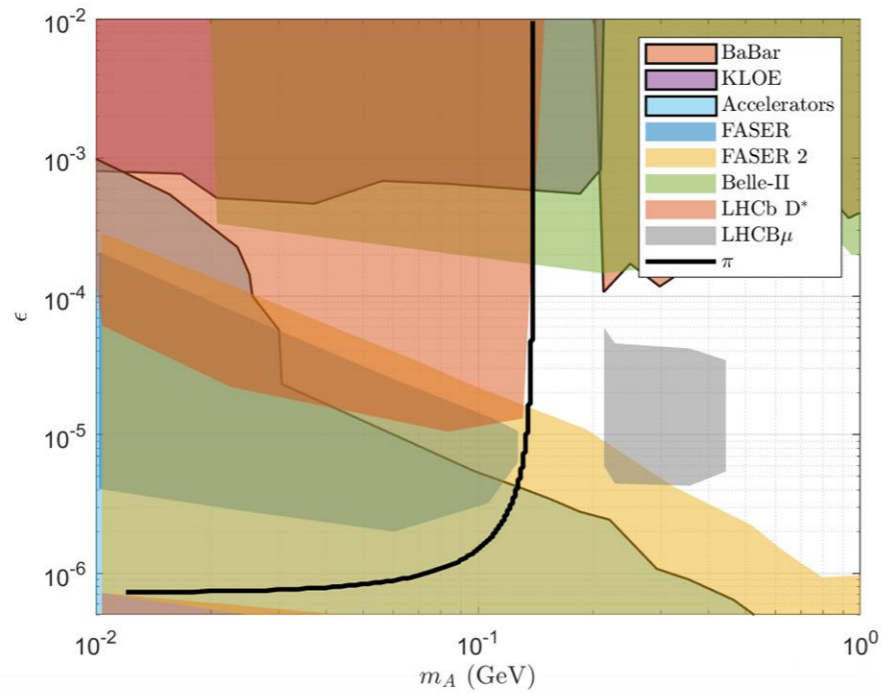
Axion

$$\mathcal{L} = \frac{1}{4} g_{a\gamma\gamma} a F^{\mu\nu} \tilde{F}_{\mu\nu}$$



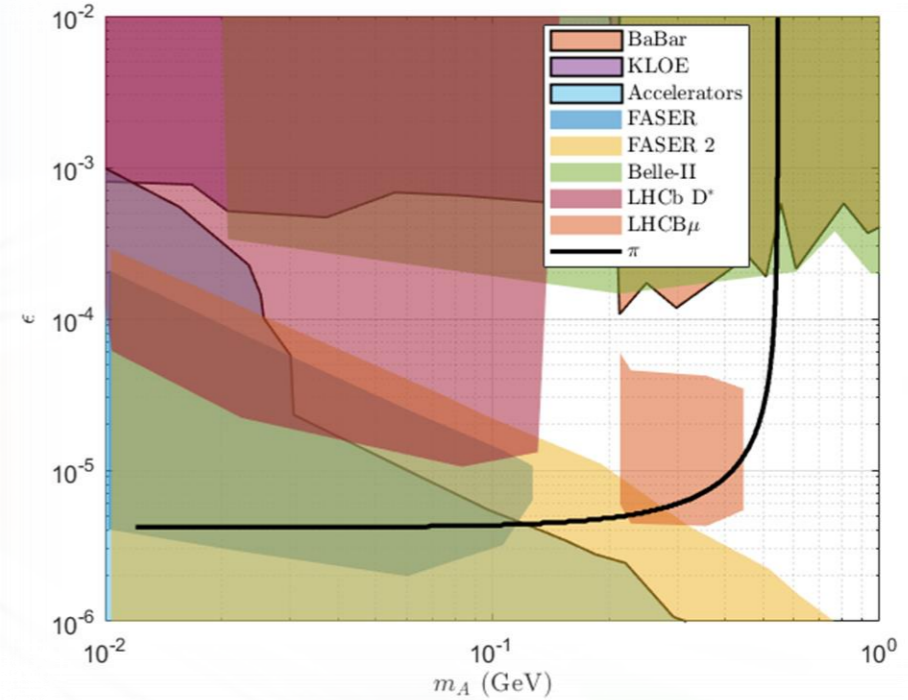
PARTICLES OF NEW PHYSICS AT NICA

Dark Photon



$$N_{\pi} = 6 \cdot 10^{12}$$

$$Br_{max} = 4 \cdot 10^{-4}$$

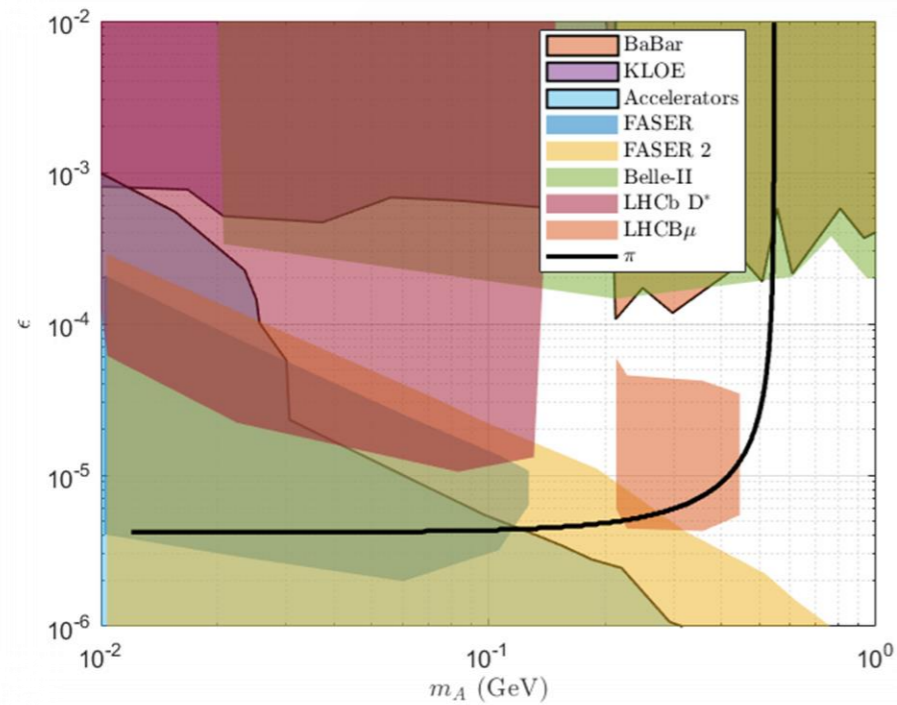


$$N_{\eta} = 1.8 \cdot 10^{11}$$

$$Br_{max} = 1.8 \cdot 10^{-3}$$

PARTICLES OF NEW PHYSICS AT NICA

Displaced Vertex



$$\Gamma_{A \rightarrow ee} = \frac{\epsilon^2 e^2 M \sqrt{1 - \frac{4m_e^2}{M^2}}}{12\pi}$$

$$d \sim 10^{-3} \text{ cm}$$

$$\epsilon = 3 \cdot 10^{-5}$$

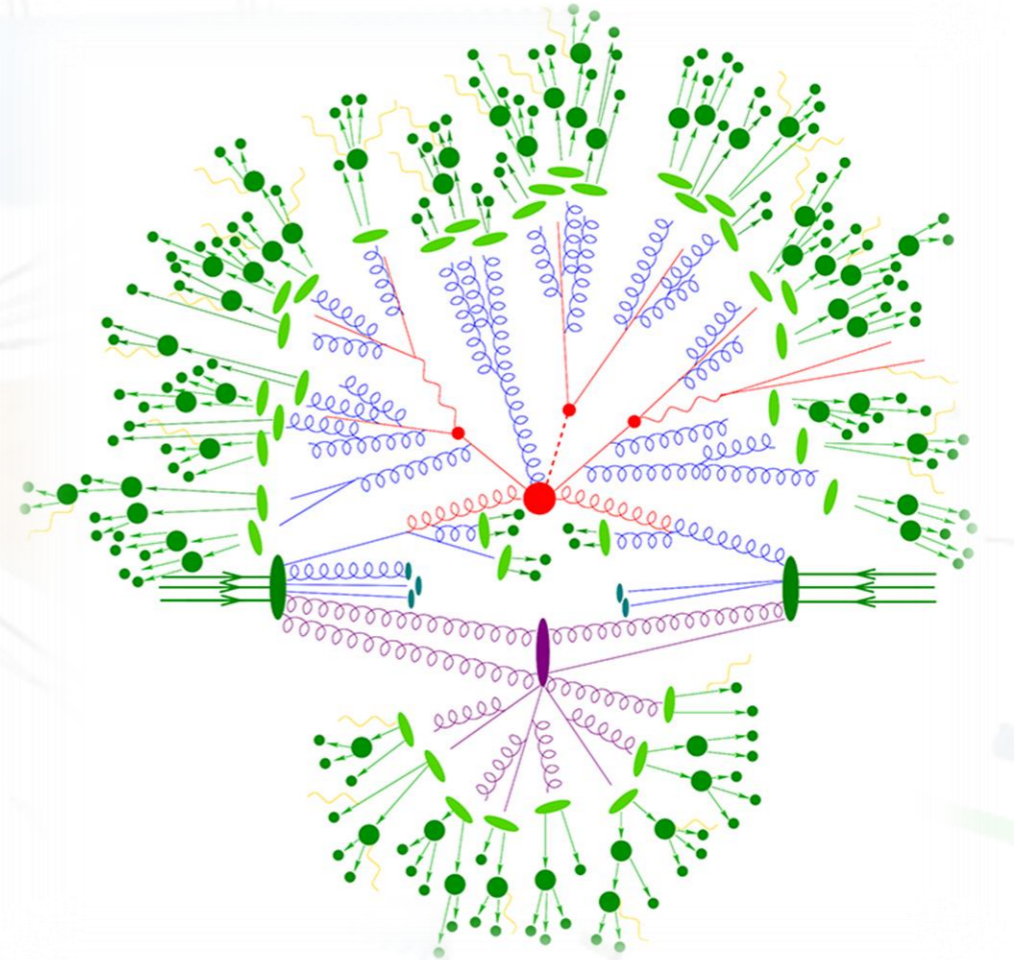
$$M = 200 \text{ MeV}$$

$$p \approx M$$

PARTICLES OF NEW PHYSICS AT NICA

Simulations

- Light meson production
- Background estimation
- Displaced vertex recognition
- Plans on ion-ion collisions

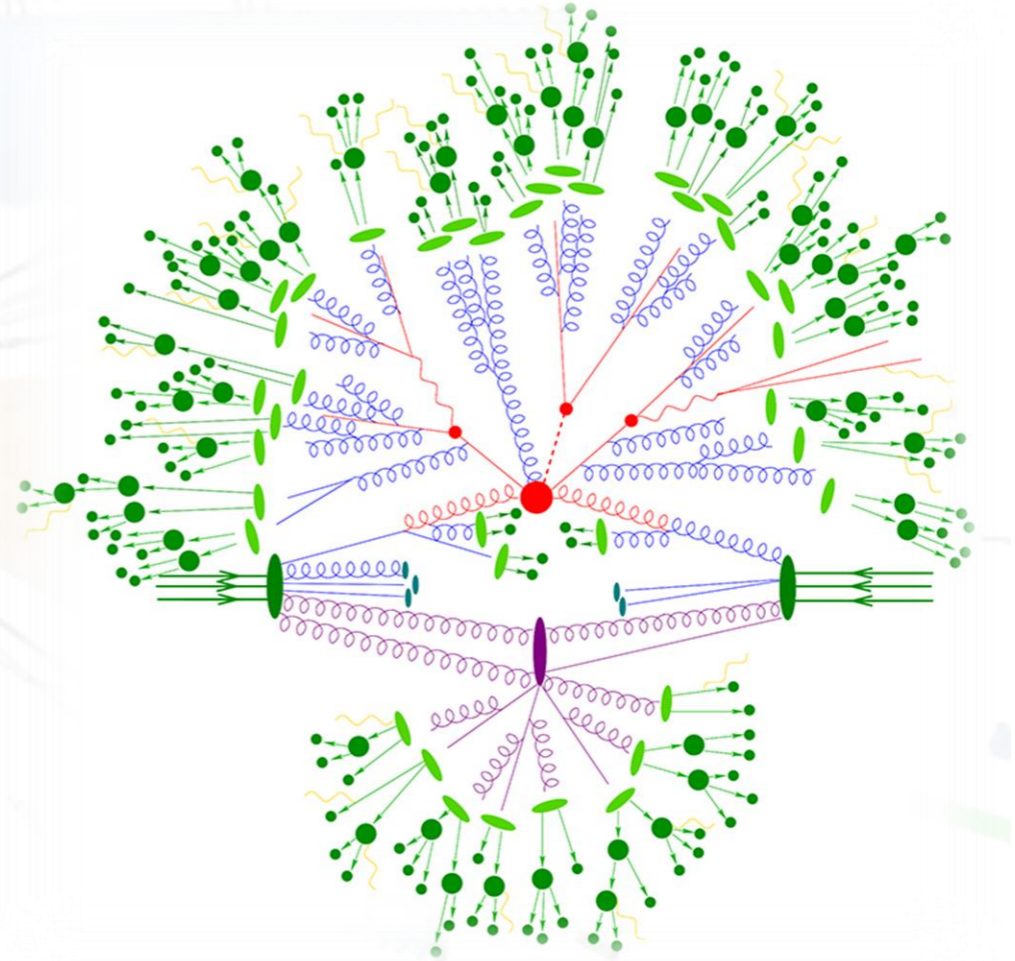


[6] Image from theory.slac.stanford.edu

PARTICLES OF NEW PHYSICS AT NICA

Simulations

- Light meson production
- Background estimation
 - Photons
 - e^-e^+ -pairs
- Displaced vertex recognition
- Plans on ion-ion collisions

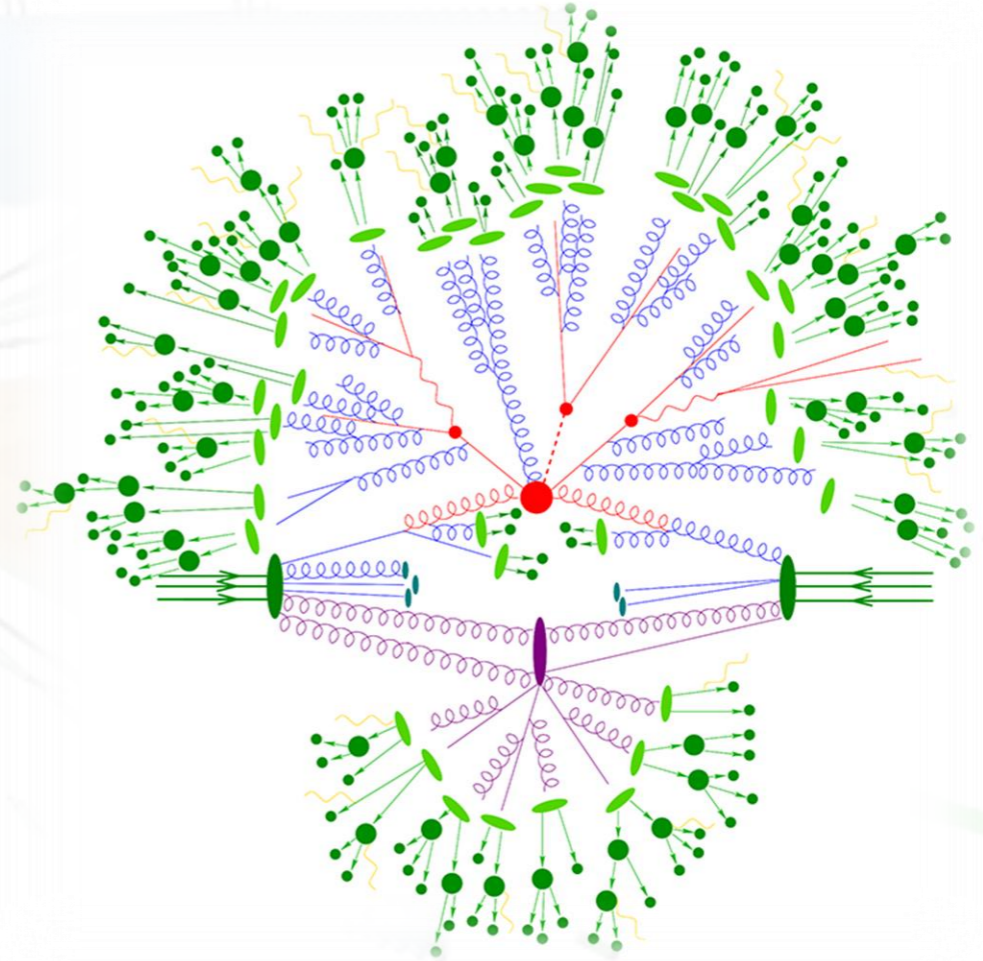


[6] Image from theory.slac.stanford.edu

PARTICLES OF NEW PHYSICS AT NICA

Simulations

- Light meson production
- Background estimation
- **Displaced vertex recognition**
- Plans on ion-ion collisions

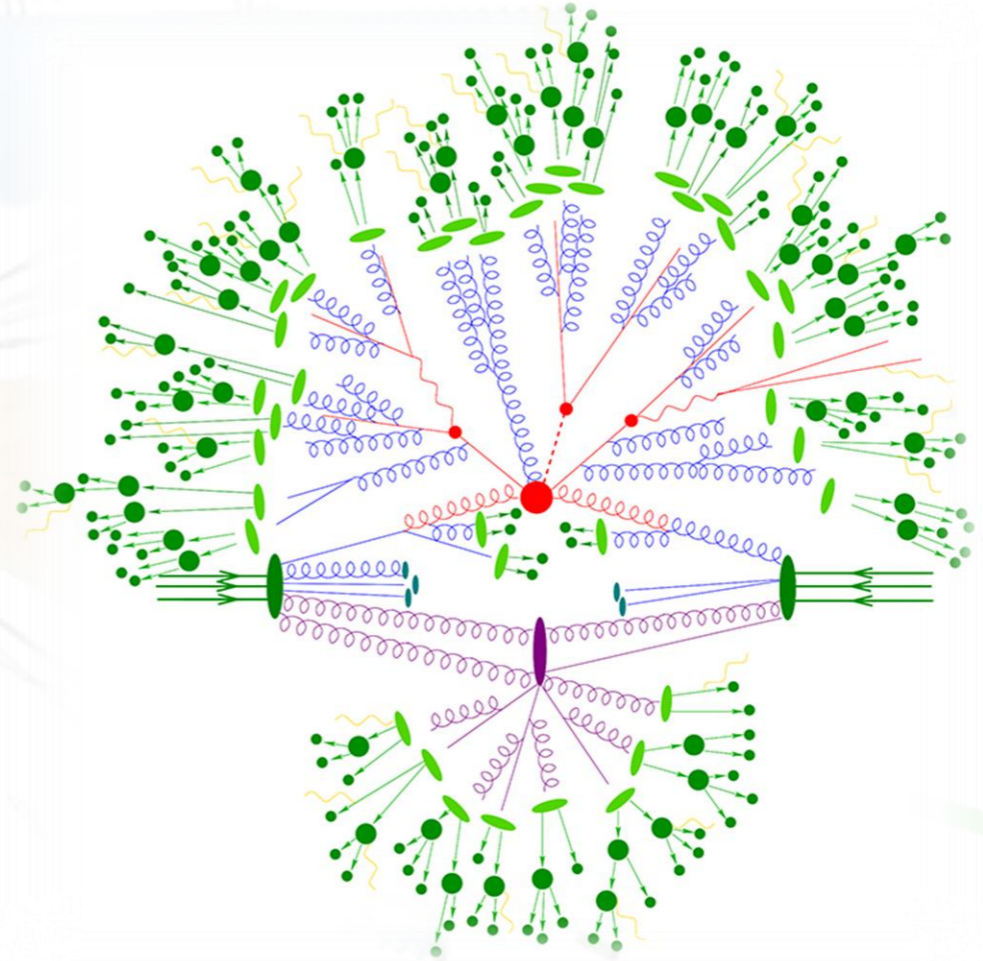


[6] Image from theory.slac.stanford.edu

PARTICLES OF NEW PHYSICS AT NICA

Simulations

- Light meson production
- Background estimation
- Displaced vertex recognition
- **Plans on ion-ion collisions**
 - Ions
 - Energy
 - Luminosity

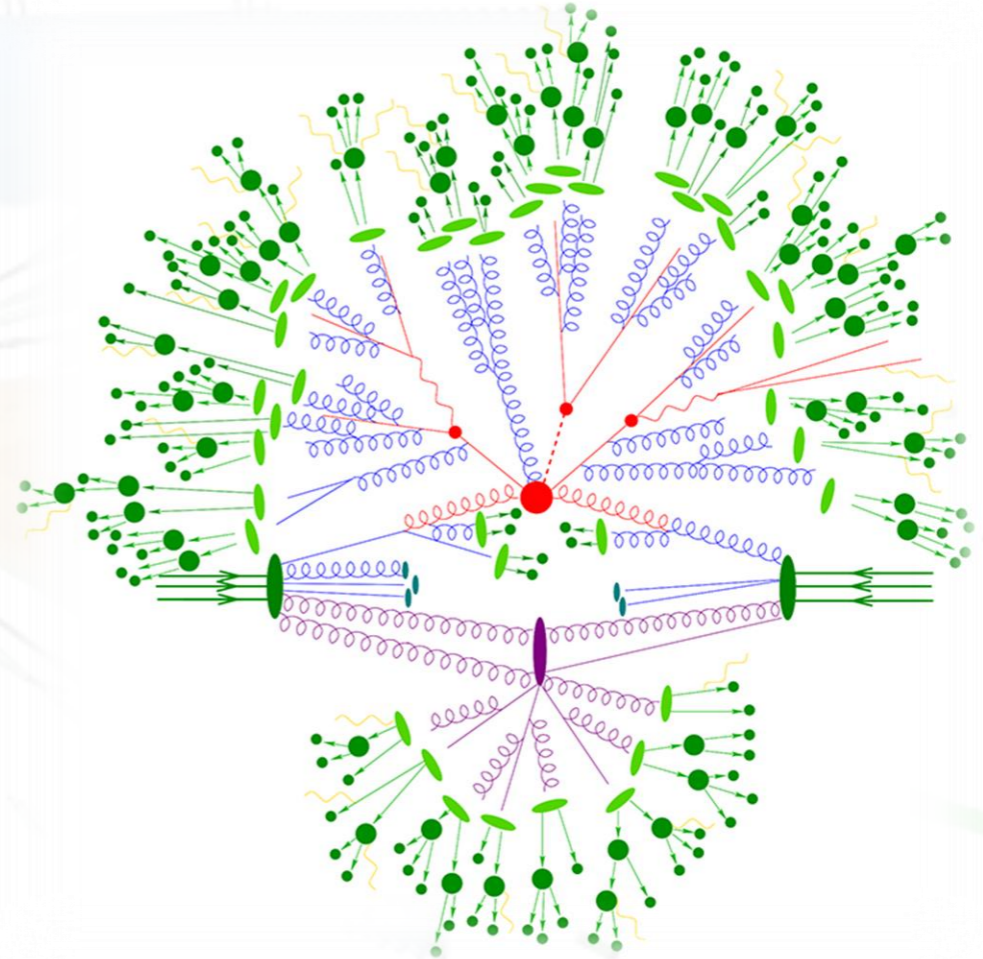


[6] Image from theory.slac.stanford.edu

PARTICLES OF NEW PHYSICS AT NICA

Simulations

- Light meson production
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 - Energy
 - Luminosity



[6] Image from theory.slac.stanford.edu



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"It's a dangerous business, Frodo, going out your door. You step onto the road, and if you don't keep your feet, there's no knowing where you might be swept off to."

— J.R.R. Tolkien, *The Lord of the Rings*

Contacts:

kalashnikov.d@phystech.edu