

High energy theory in Belgium RECFA meeting 2025

**Michel H.G. Tytgat, Université Libre de Bruxelles
on behalf of Belgian TH-PH groups**

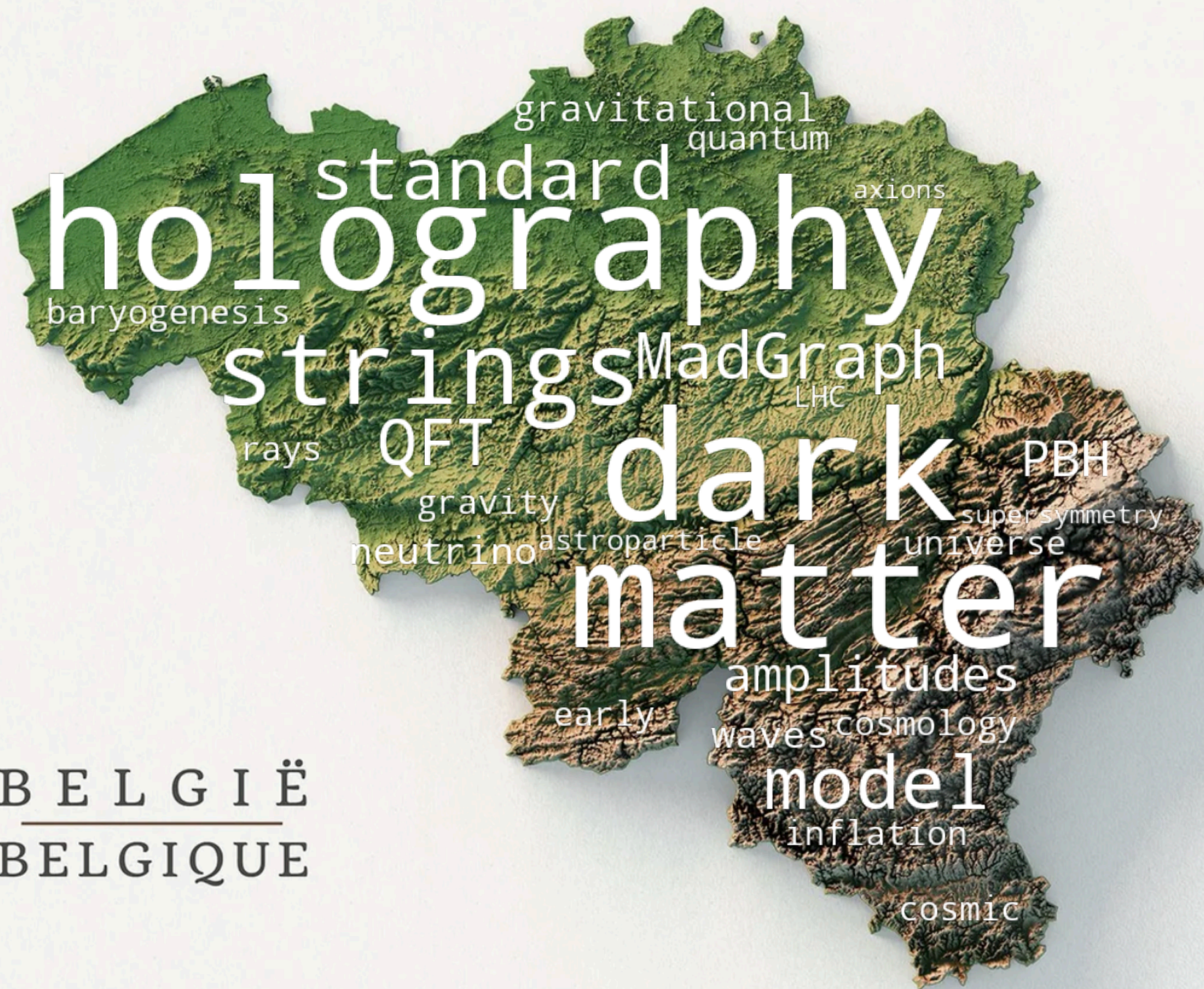
September 12th 2025 - Hotel Plaza, Brussels

High energy theory in Belgium RECFA meeting 2025

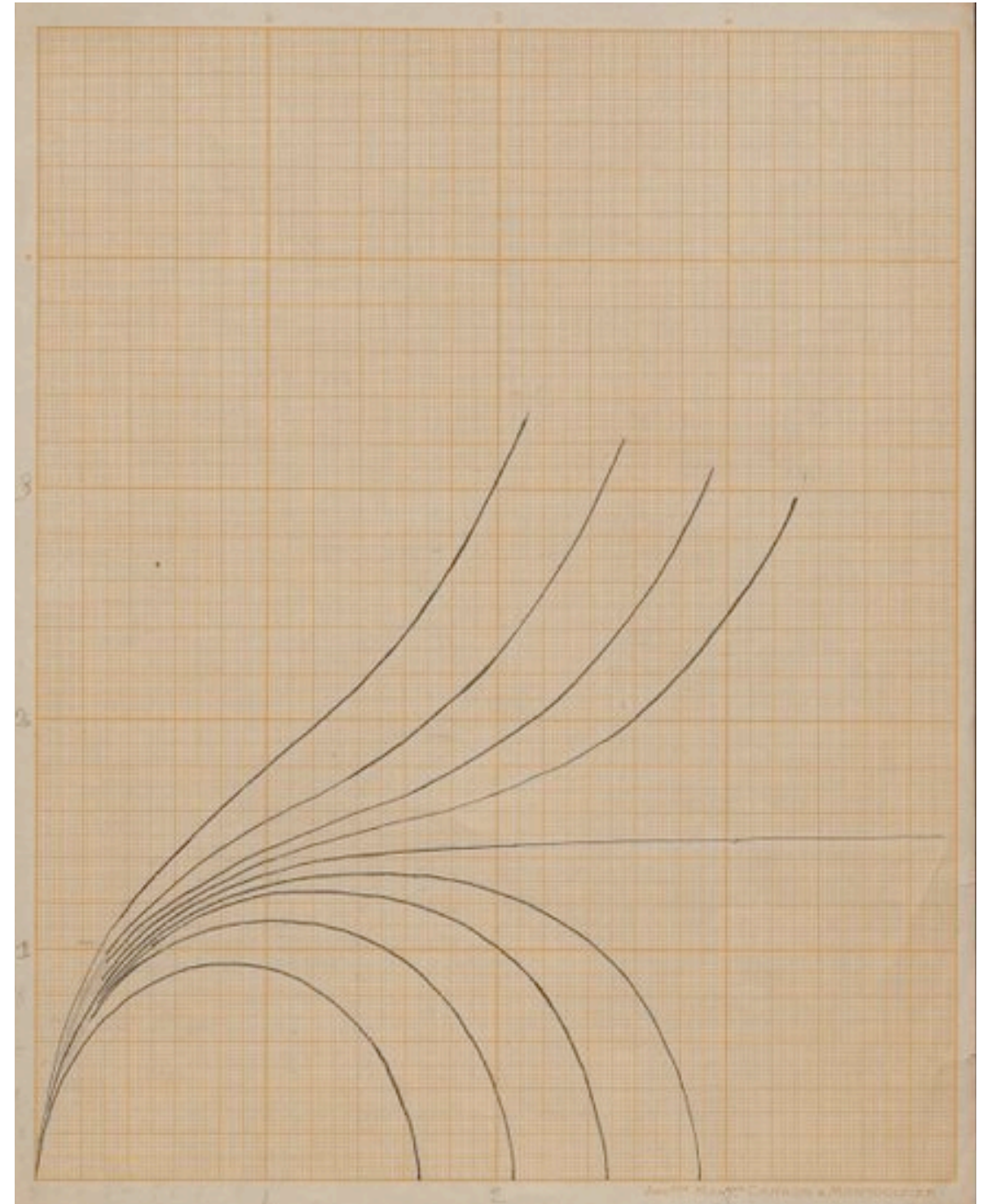
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BELGIË
BELGIQUE



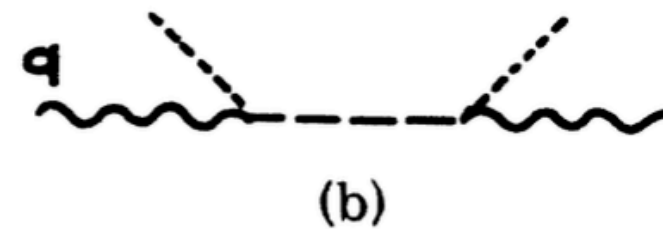
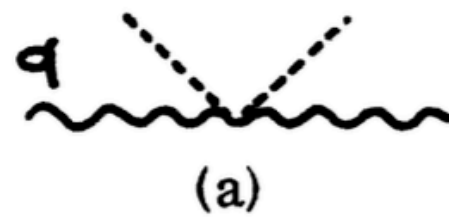


FIG. 1. Broken-symmetry diagram leading to a mass for the gauge field. Short-dashed line, $\langle \varphi_1 \rangle$; long-dashed line, φ_2 propagator; wavy line, A_μ propagator. (a) $\rightarrow (2\pi)^4 i e^2 g_{\mu\nu} \langle \varphi_1 \rangle^2$, (b) $\rightarrow -(2\pi)^4 i e^2 (q_\mu q_\nu / q^2) \times \langle \varphi_1 \rangle^2$.



Generation Y : new TH staff since 2017



Andrea Campoleoni

UMONS 2018



Céline Degrand

UCL 218



Sebastien Clesse

ULB 2020



Evgeny Skvortsov
European Research Council
Established by the European Commission

UMONS 2020



Maxime Fays

ULg 2020



Gauthier Durieux

UCL 2022 (2023)



Thomas Mertens
European Research Council
Established by the European Commission

UGent 2022



Michel Heller
European Research Council
Established by the European Commission

UGent 2022



Ben Page
European Research Council
Established by the European Commission

UGent 2023



Laura Donnay
European Research Council
Established by the European Commission

UMONS 2025



Dionysios Anninos
European Research Council
Established by the European Commission

Partime KUL

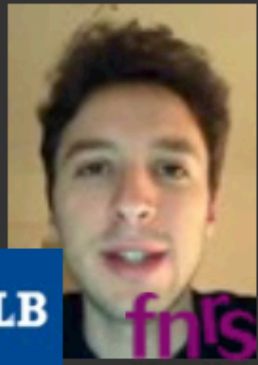
also King's College

New Generation

New Staff hired after 2010

THEORY

A. Collinucci



G. Compere



S. Detournay



T. Hertog



T. VanRiet



N. Bobev



C. Duhr

PHENO

A. Mariotti



L. Lopez Honorez



M. Drewes



C. Arina

Generation Y : new TH staff since 2017

hep-th
fnrs
LA LIBERTÉ DE CHERCHER



Andrea Campoleoni

UMONS 2018

hep-ph



Céline Degrand

UCL 218

astro-ph/hep-ph



Sebastien Clesse

ULB 2020

hep-th



Evgeny Skvortsov

UMONS 2020

astro-ph/gr-qc



Maxime Fays

ULg 2020

hep-ph/th



Gauthier Durieux

UCL 2022 (2023)

hep-th



Thomas Mertens

UGent 2022

hep-th



Michel Heller

UGent 2022

hep-ph/th



Ben Page

UGent 2023

hep-th



Laura Donnay

UMONS 2025

hep-th



Dionysios Anninos

Partime KUL

also King's College

	2017	2025
staff	35	33
PhD	~ 50	71
post-docs	~45	42



ps: nucl-th not included

Interest and expertise

Many thanks to M. Tytgat for inspiration

Pheno

Symmetry
Breaking,
SM & BSM,
Unification



String, SUSY
Holography,
Higher spins
Amplitudes

Symmetries

Dark matter,
neutrinos,
Cosmology,
early Universe



Gravity,
Cosmology,
Inflation

Dark sector

High energy
cosmic rays

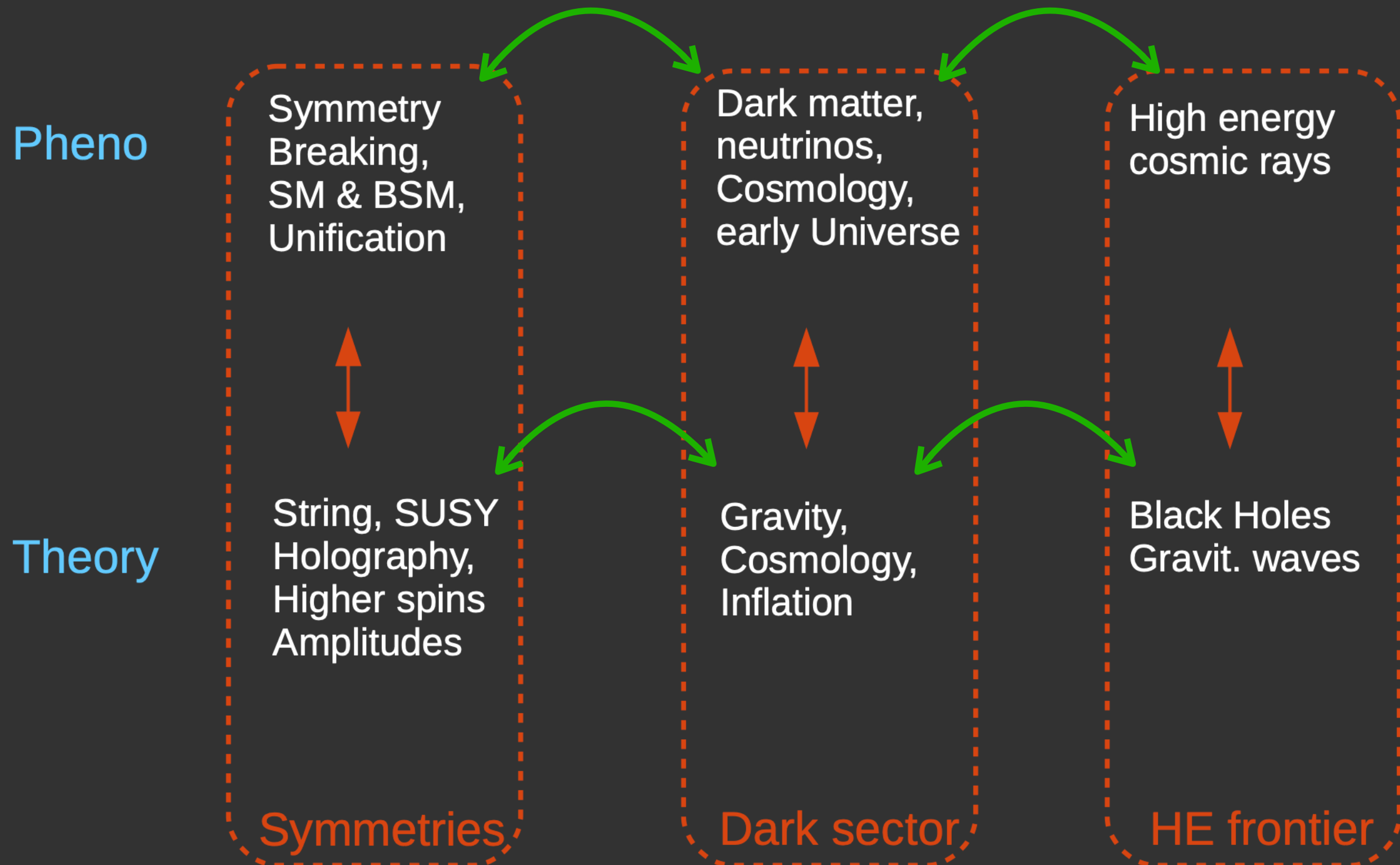


Black Holes
Gravit. waves

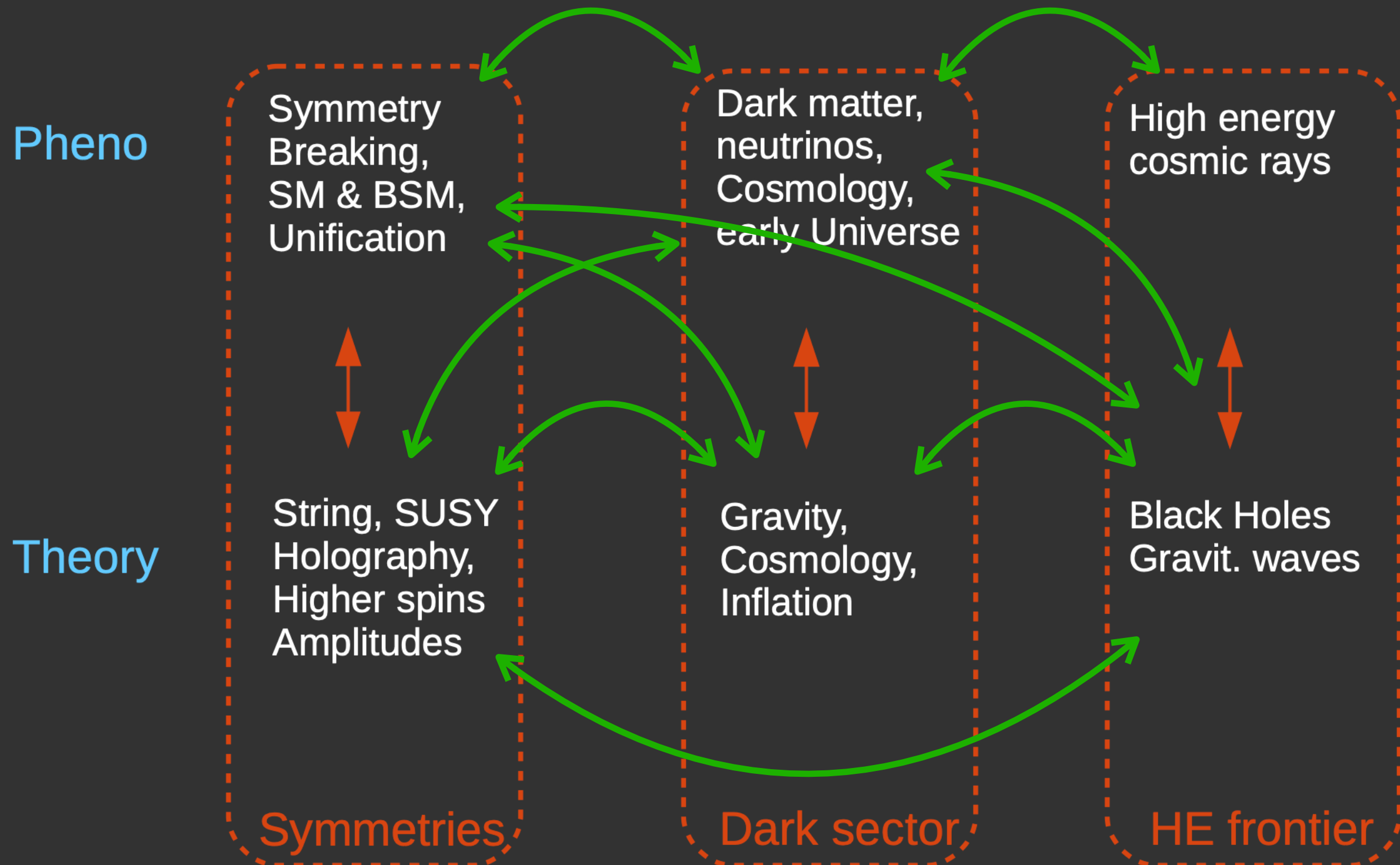
HE frontier

Theory

Interest and expertise



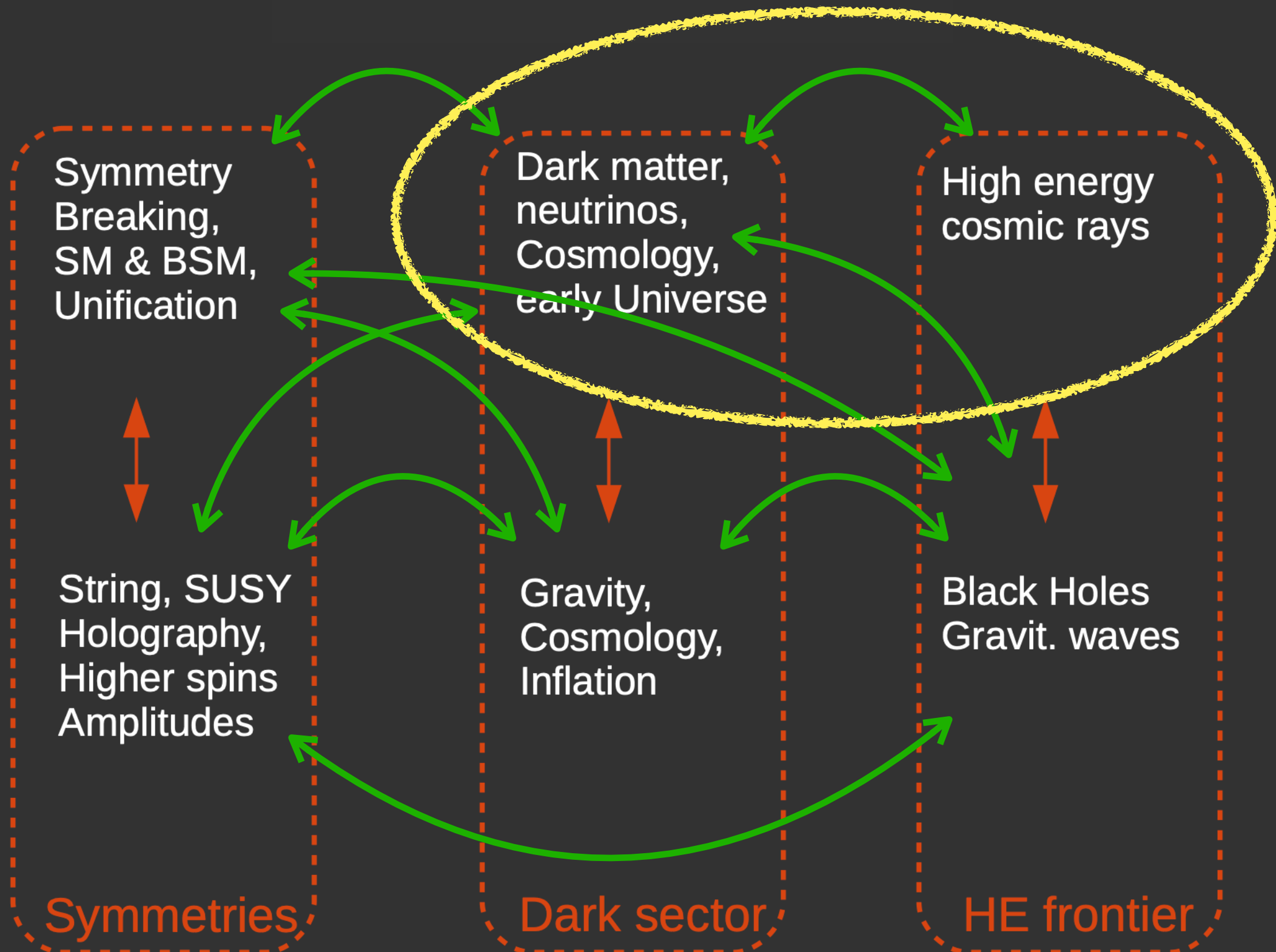
Interest and expertise



Interest and expertise

Pheno

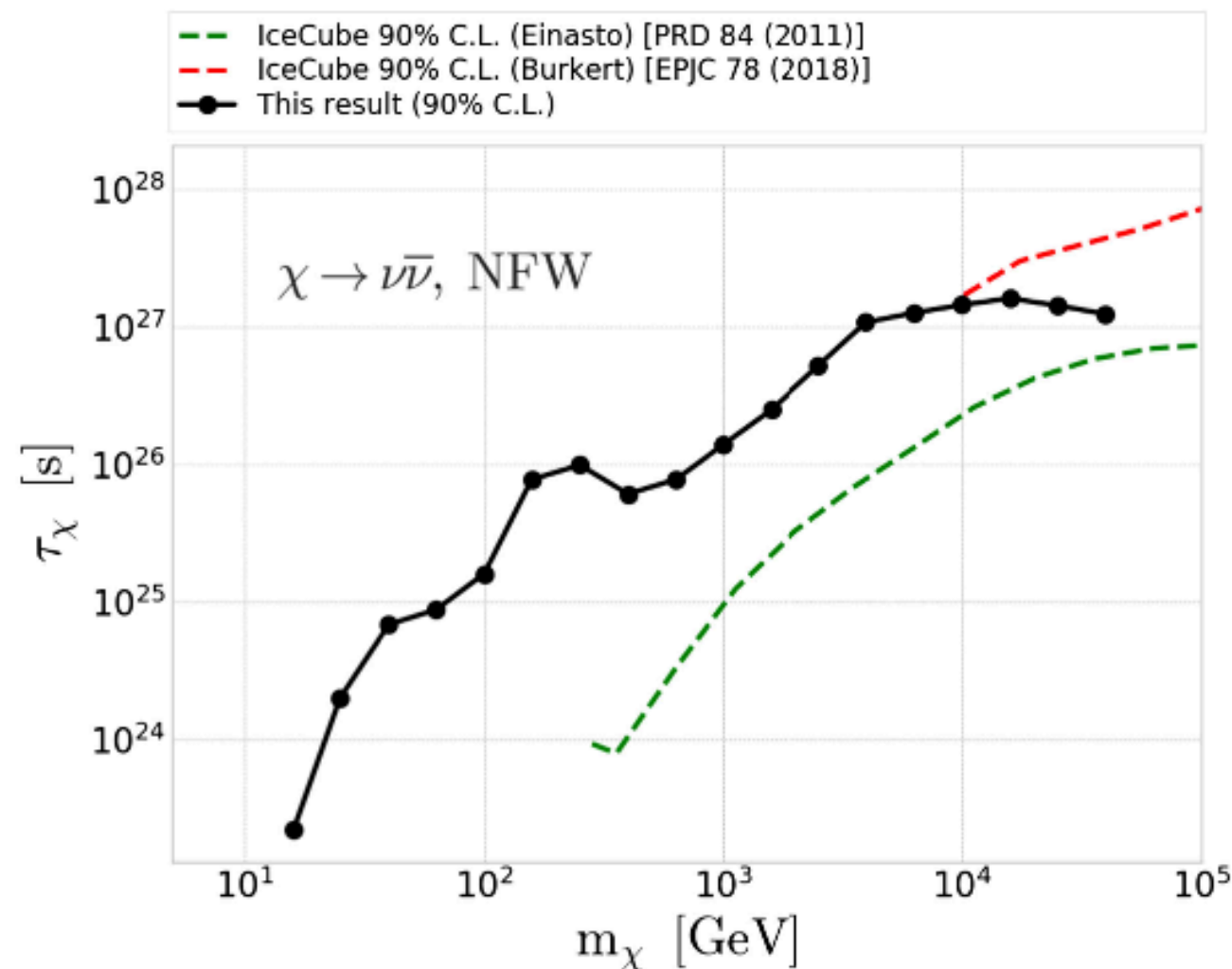
Theory



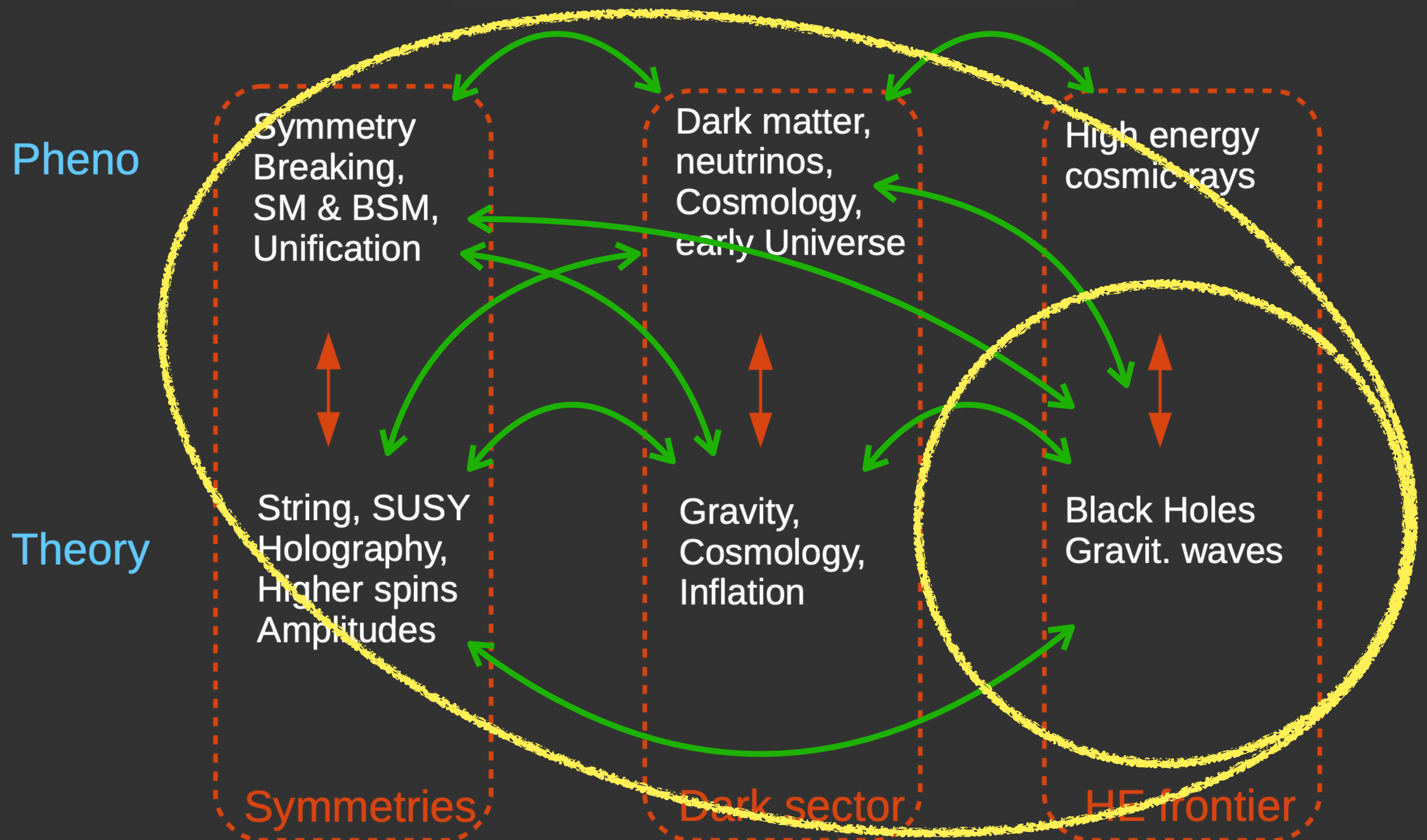
Search for neutrino lines from dark matter annihilation and decay with IceCube

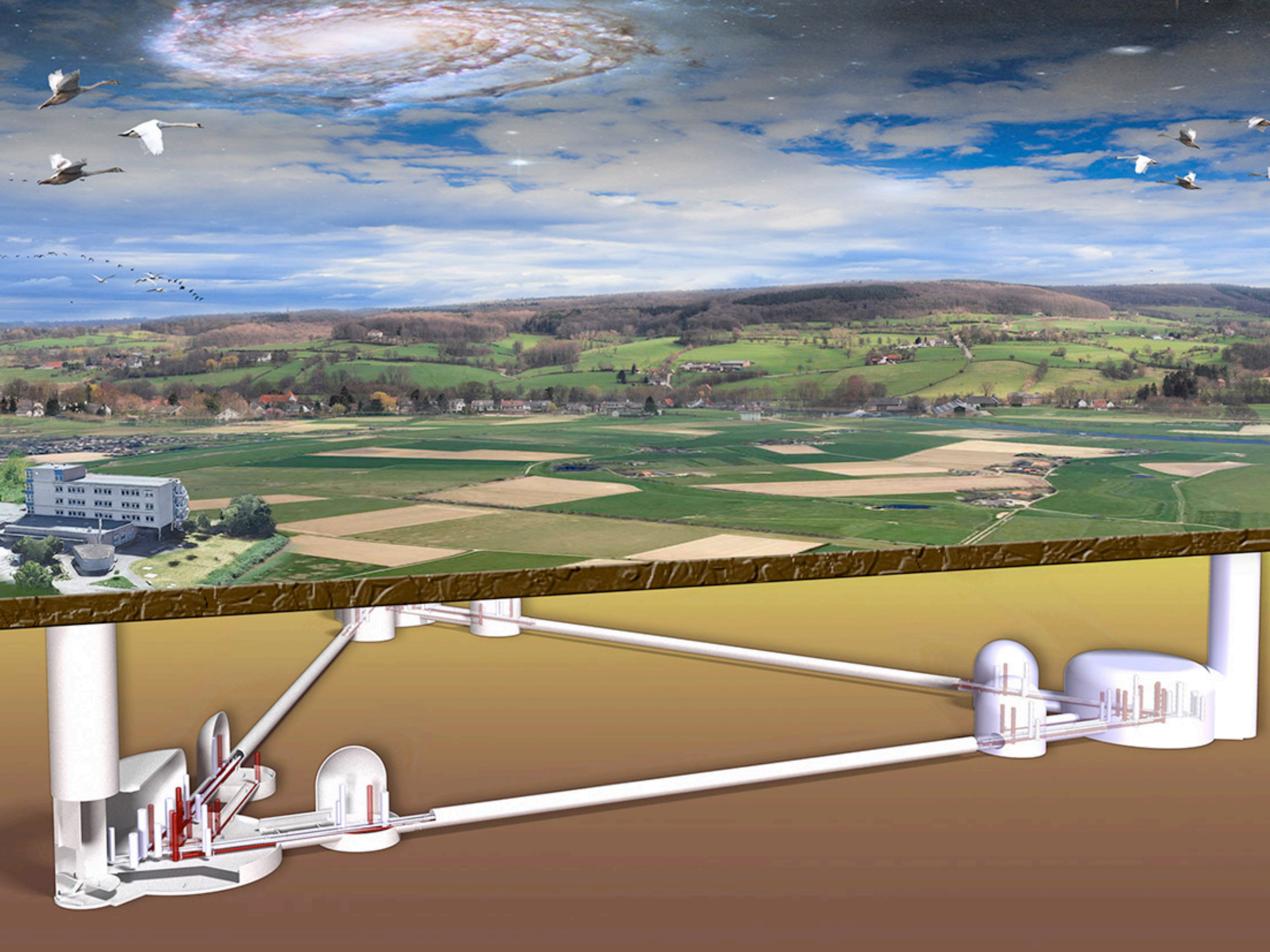
R. Abbasi¹⁷, M. Ackermann⁶⁴, J. Adams¹⁸, S. K. Agarwalla^{41,*}, J. A. Aguilar¹², M. Ahlers²², J. M. Alameddine²³

¹ S. Griswold^{ID}, ²⁷ C. Gunther,[†] ¹ F. Halzen^{ID}, ⁴¹ T. Hambye,¹² H.
³ A. Haungs^{ID}, ³¹ K. Helbing^{ID}, ⁶³ I.



Interest and expertise





Spin-aligned inspiral waveforms from self-force and post-Newtonian theory

Geoffrey Compère,¹ Loïc Honet,¹ Josh Mathews²,³ Gabriel Piovano,¹ Adam Pound³, Maarten van de Meent^{4,5}, Niels Warburton⁶, and Barry Wardell⁶

¹Université Libre de Bruxelles, BLU-ULB Brussels Laboratory of the Universe, C.P. 231, B-1050 Bruxelles, Belgium

²Department of Physics, National University of Singapore, 21 Lower Kent Ridge Rd, Singapore 119077

³School of Mathematical Sciences and STAG Research Centre,

University of Southampton, Southampton, United Kingdom, SO17 1BJ

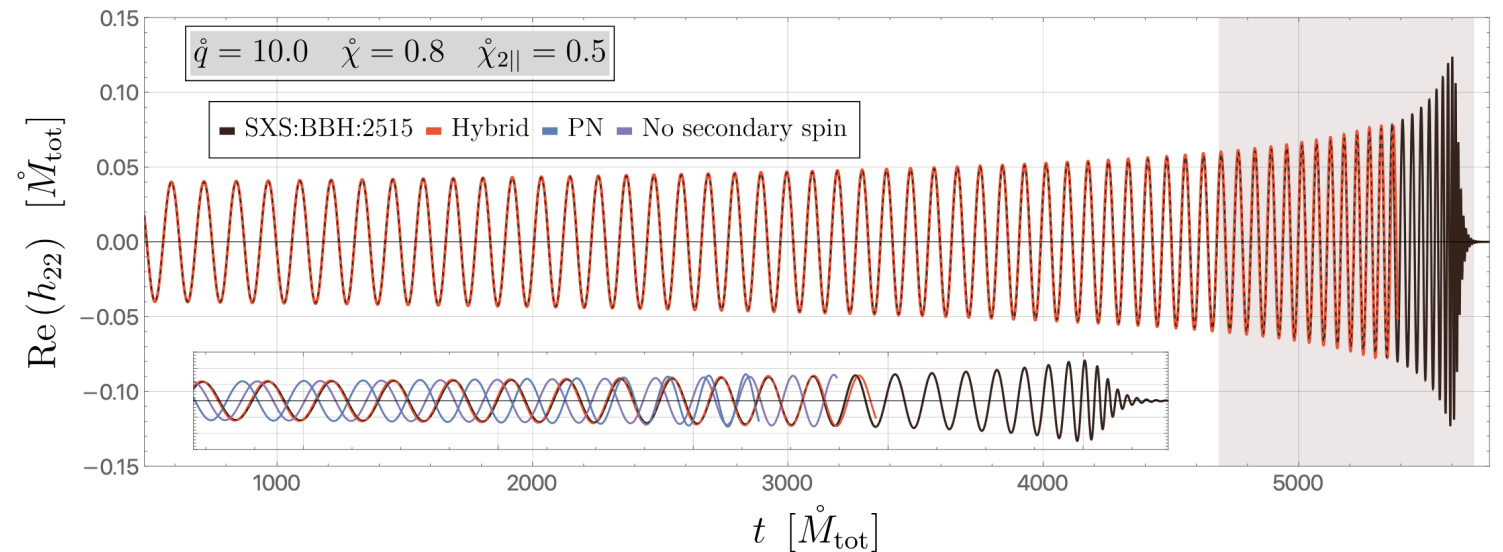
⁴Center of Gravity, Niels Bohr Institute, Blegdamsvej 17, 2100 Copenhagen, Denmark

⁵Max Planck Institute for Gravitational Physics (Albert Einstein Institute), Am Mühlenberg 1, Potsdam 14476, Germany

⁶School of Mathematics & Statistics, University College Dublin, Belfield, Dublin 4, Ireland, D04 V1W8

(Dated: September 4, 2025)

to be released soon



Echoes of Kerr-like wormholes

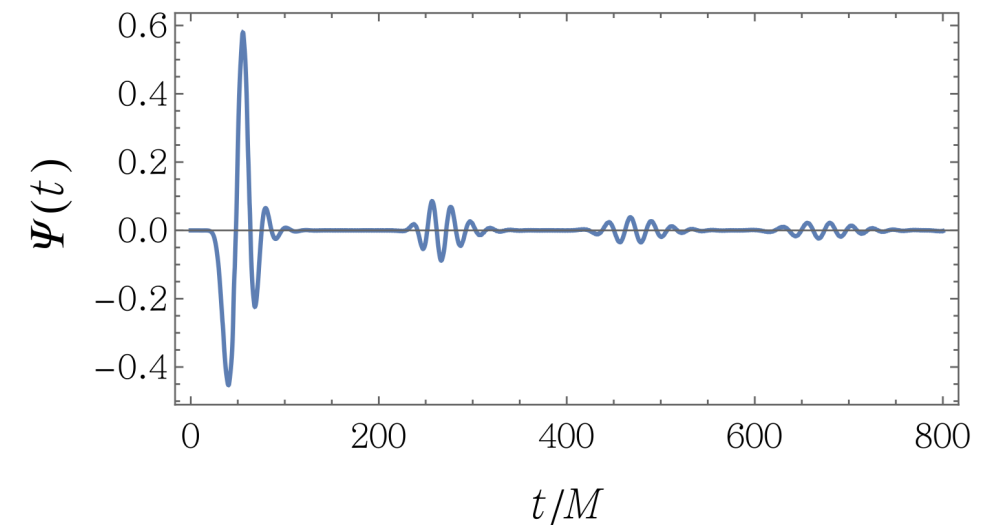
A. Cano,^{1,2,3,†} Frederik Goelen,^{1,‡} Thomas Hertog,^{1,§} and Bert Vercnocke^{1,||}

¹Theoretical Physics, KU Leuven, Celestijnenlaan 200D, B-3001 Leuven, Belgium

²Instituto de Física Teórica UAM/CSIC, C/ Nicolás Cabrera,

13-15, C.U. Cantoblanco, 28049 Madrid, Spain

³Institute for Theoretical Physics, Waterloo, Ontario N2L 2Y5, Canada



Observational evidence for primordial black holes: A positivist perspective

B.J. Carr^a, S. Clesse^b, J. García-Bellido^c, M.R.S. Hawkins^d, F. Kühnel^{e,*}

^a School of Physics and Astronomy, Queen Mary University of London, United Kingdom

^b Service de Physique Théorique, University of Brussels (ULB), Belgium

^c Instituto de Física Teórica UAM/CSIC, Universidad Autónoma de Madrid, Spain

^d Department of Physics and Astronomy, University of Edinburgh, United Kingdom

^e Max Planck Institute for Physics, Germany

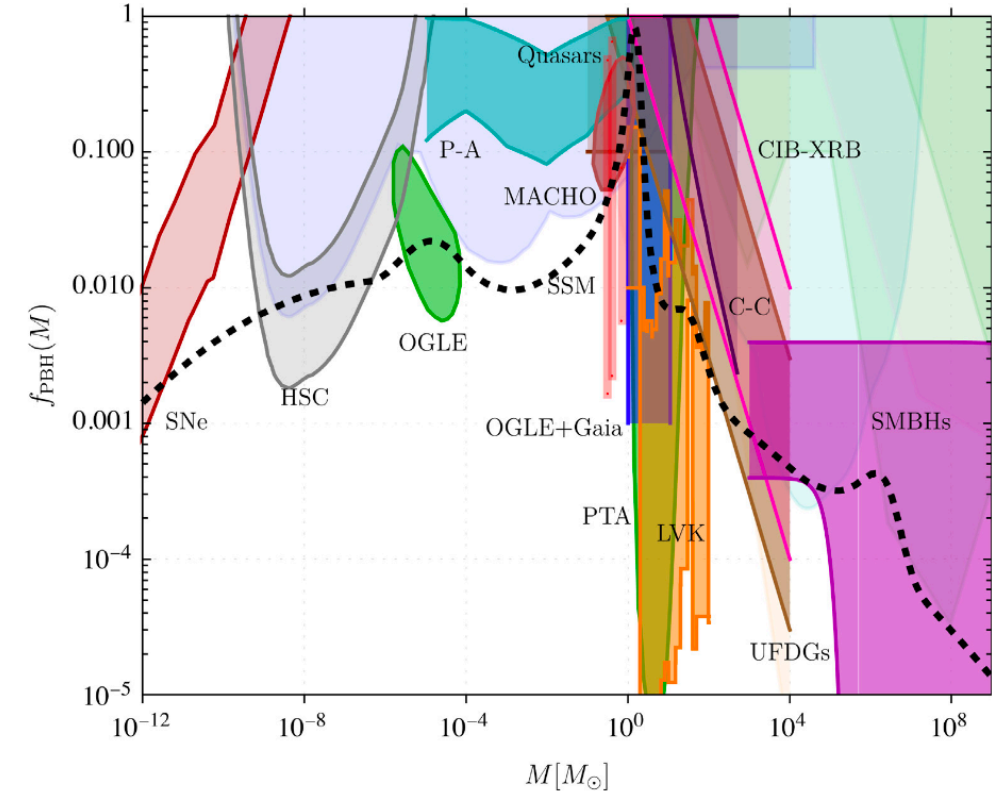


Fig. 39. PBH mass function with peaks induced by the thermal history of the Universe (thick, dashed curve; cf. Ref. [38]). This replicates the positive features of Fig. 1 but also includes various monochromatic constraints on $f_{\text{PBH}}(M)$ (light-shaded regions), taken from Ref. [444].

Axionic domain walls at Pulsar Timing Arrays: QCD bias and particle friction

Simone Blasi,^a Alberto Mariotti,^a Aäron Rase^a and Alexander Sevrin^{b,c}

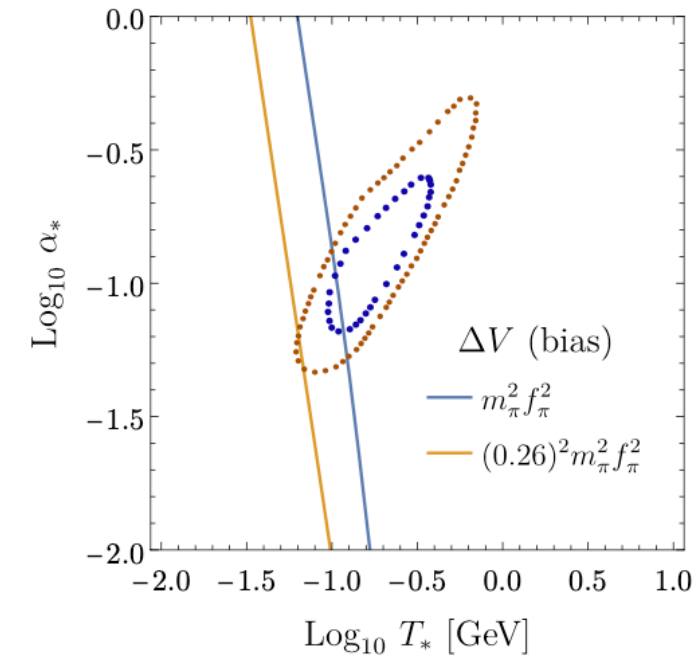
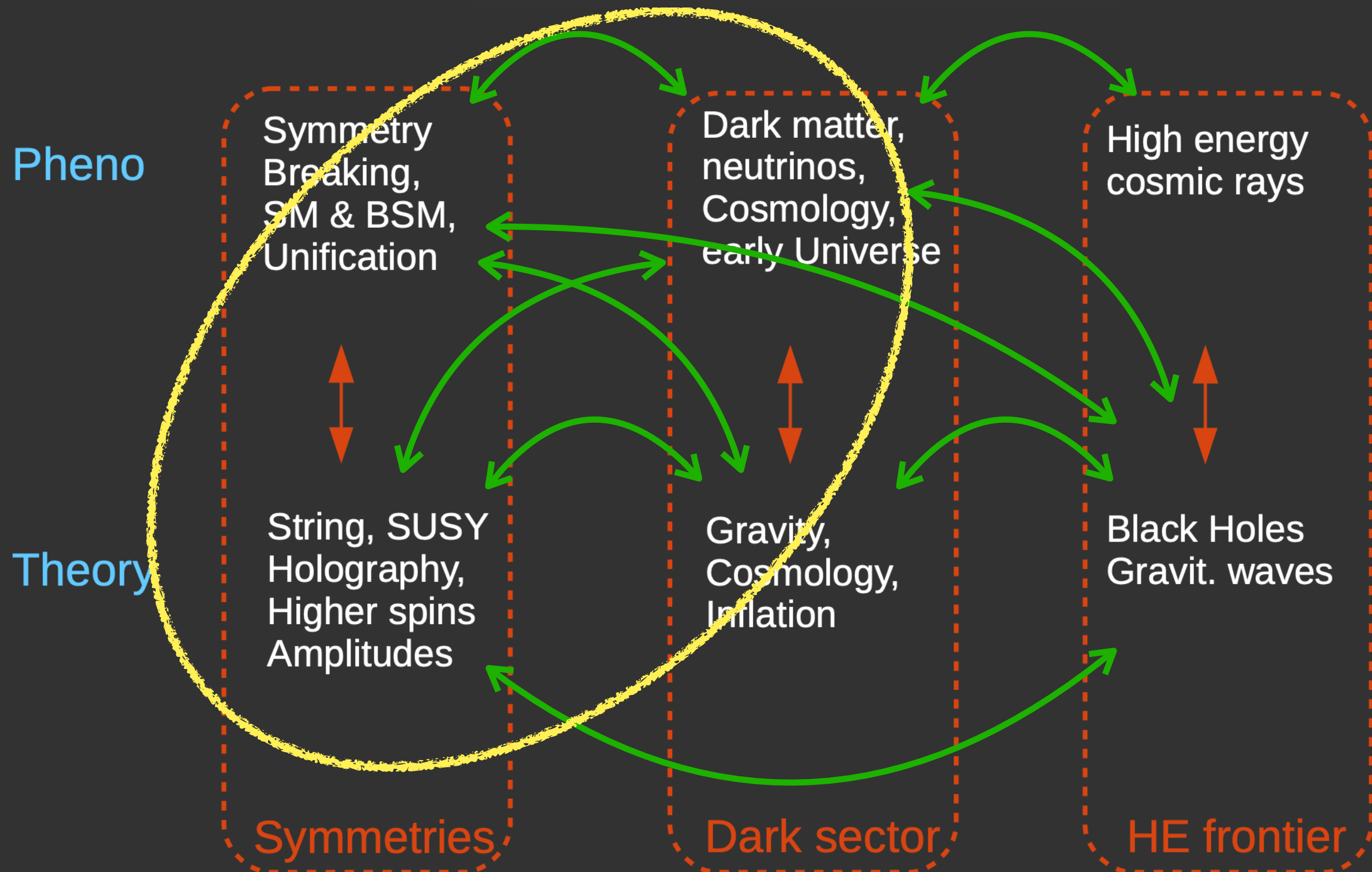


Figure 1. One and two sigma contours for the DW interpretation of the signal as provided by the [1] collaboration (blue and yellow dots). The prediction of a DW network with QCD induced bias ($\Delta V \sim \epsilon^2 m_\pi^2 f_\pi^2$) are displayed as lines with varying DW tension.

Interest and expertise



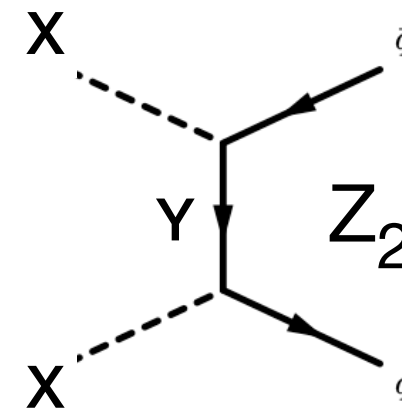
t -channel dark matter models – a whitepaper

Chiara Arina^{★,1} Benjamin Fuks^{★a,2} Luca Panizzi^{★,3,4} Michael J. Baker^{†,5} Alan S. Cornell^{†,6} Jan Heisig^{†,7}

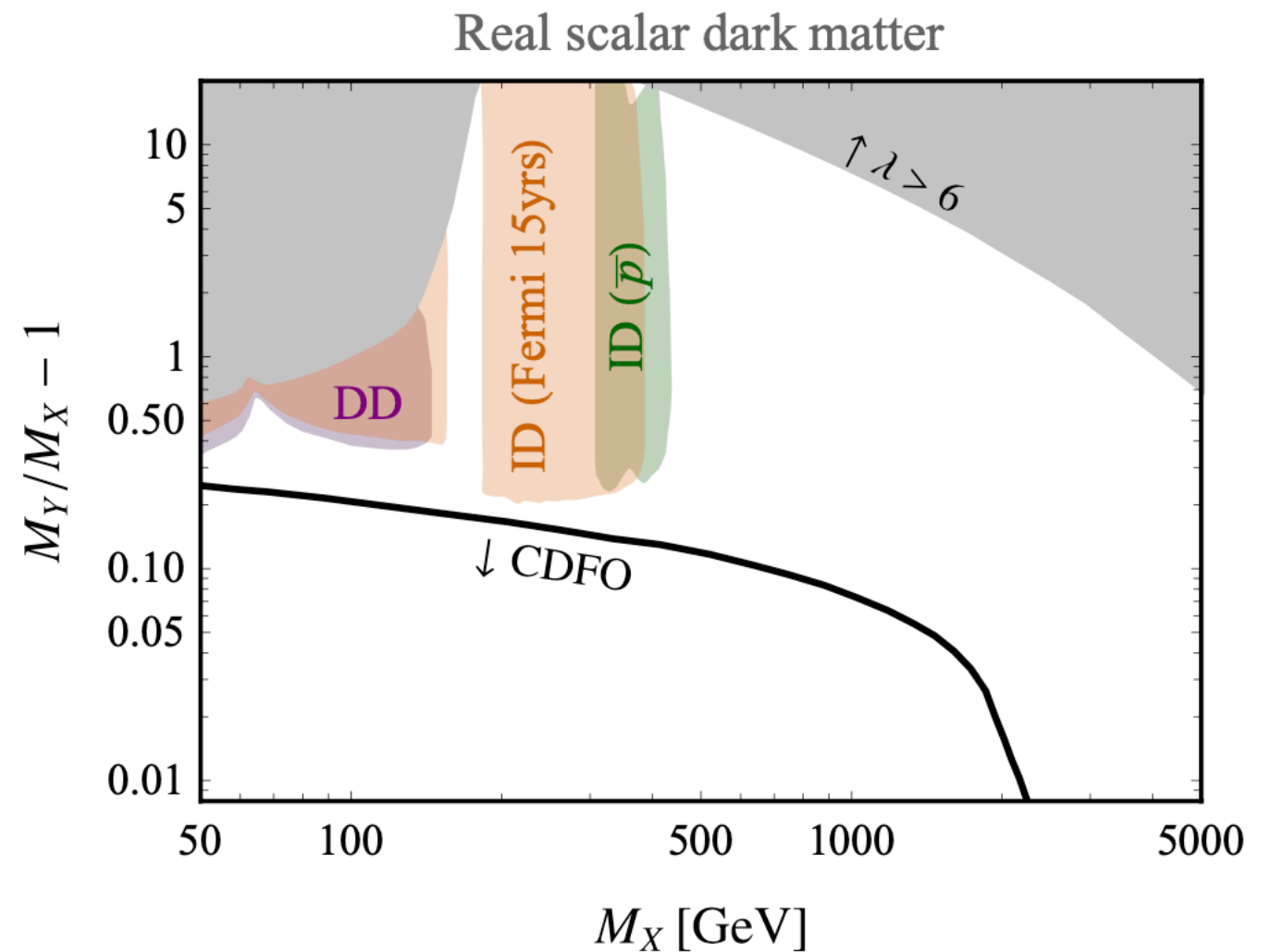
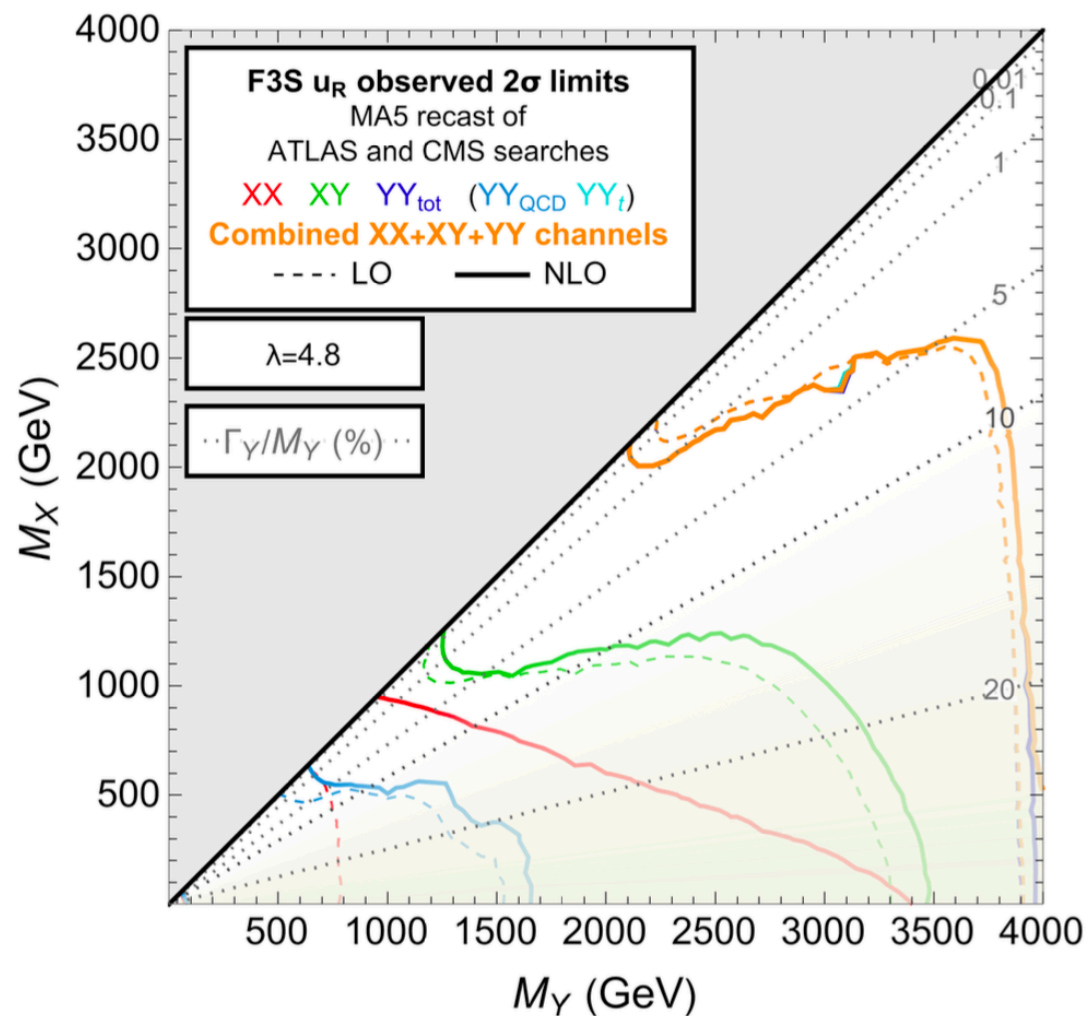
Laura Lopez-Honorez^{48,49} Alberto Mariotti^{50,49}



DM
 Z_2 odd

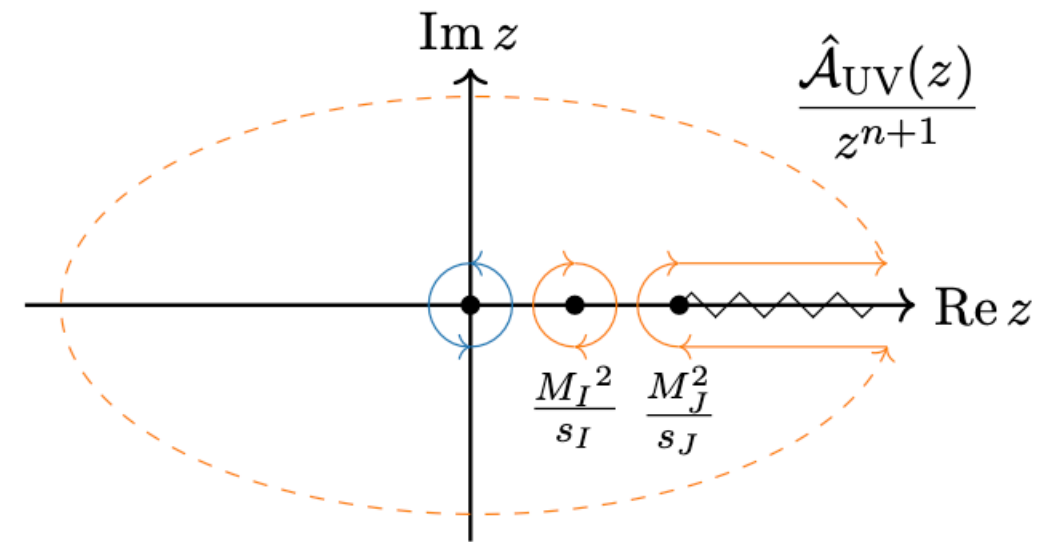


Z_2 odd, color, charge,...



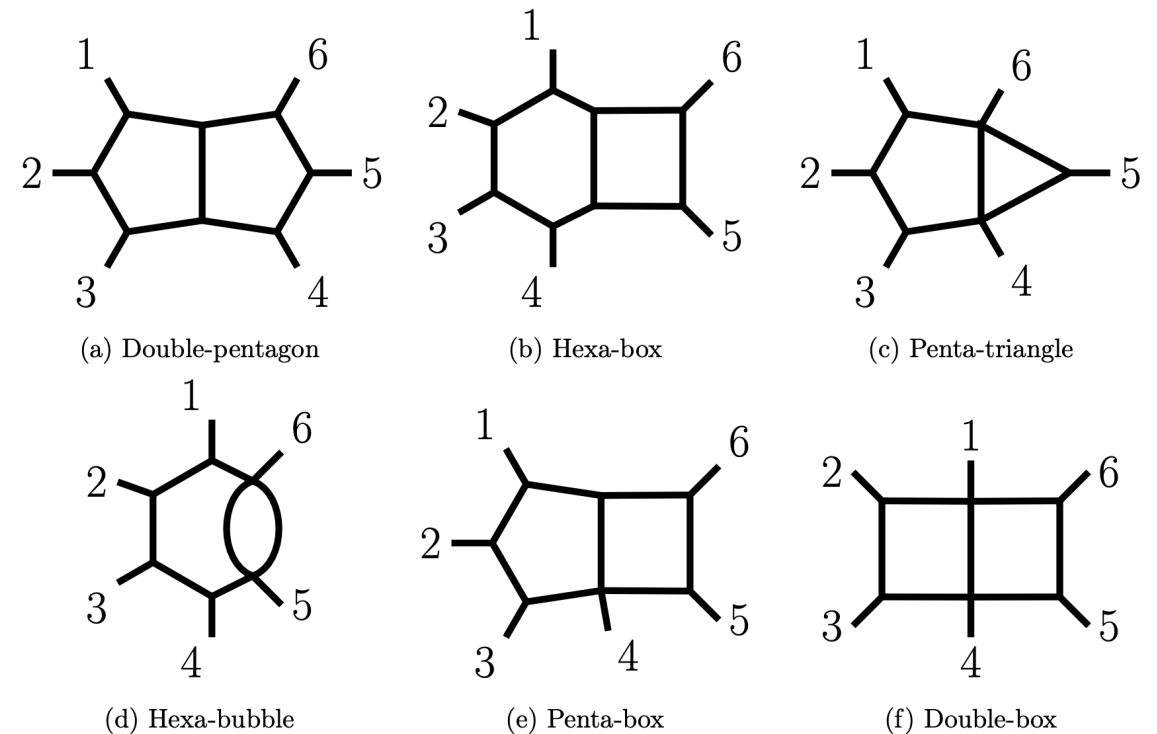
EFT matching from analyticity and unitarity

Stefano De Angelis^{1*} and Gauthier Durieux^{2†}



Planar Six-Point Feynman Integrals for Four-Dimensional Gauge Theories

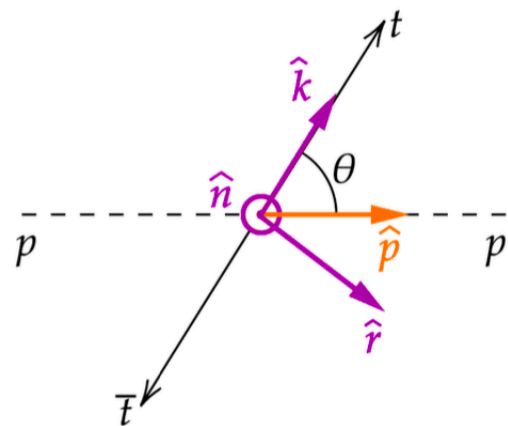
Samuel Abreu,^{1,2} Pier Francesco Monni,¹ Ben Page,³ Johann Usovitsch^{1,4}



Quantum detection of new physics in top-quark pair production at the LHC



Fabio Maltoni,^{a,b,c} Claudio Severi,^d Simone Tentori^c and Eleni Vryonidou^d



$$\rho = \frac{1}{4}(\mathbf{1} \otimes \mathbf{1} + \mathcal{B}_1 \cdot \boldsymbol{\sigma} \otimes \mathbf{1} + \mathcal{B}_2 \cdot \mathbf{1} \otimes \boldsymbol{\sigma} + \mathcal{C} \cdot \boldsymbol{\sigma} \otimes \boldsymbol{\sigma})$$

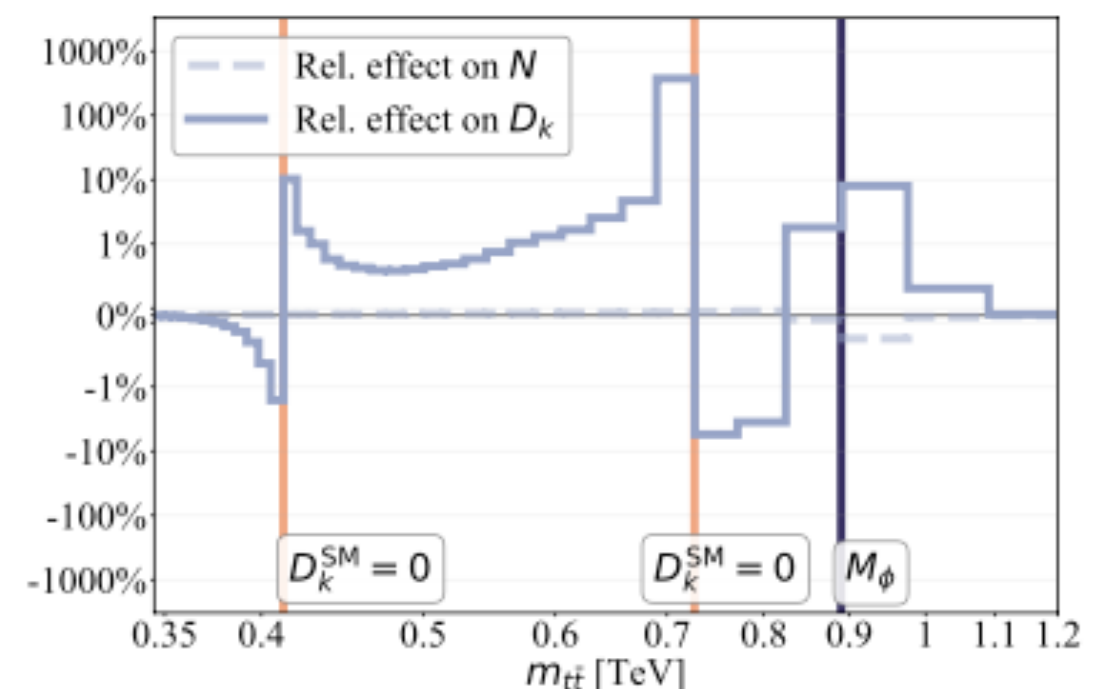
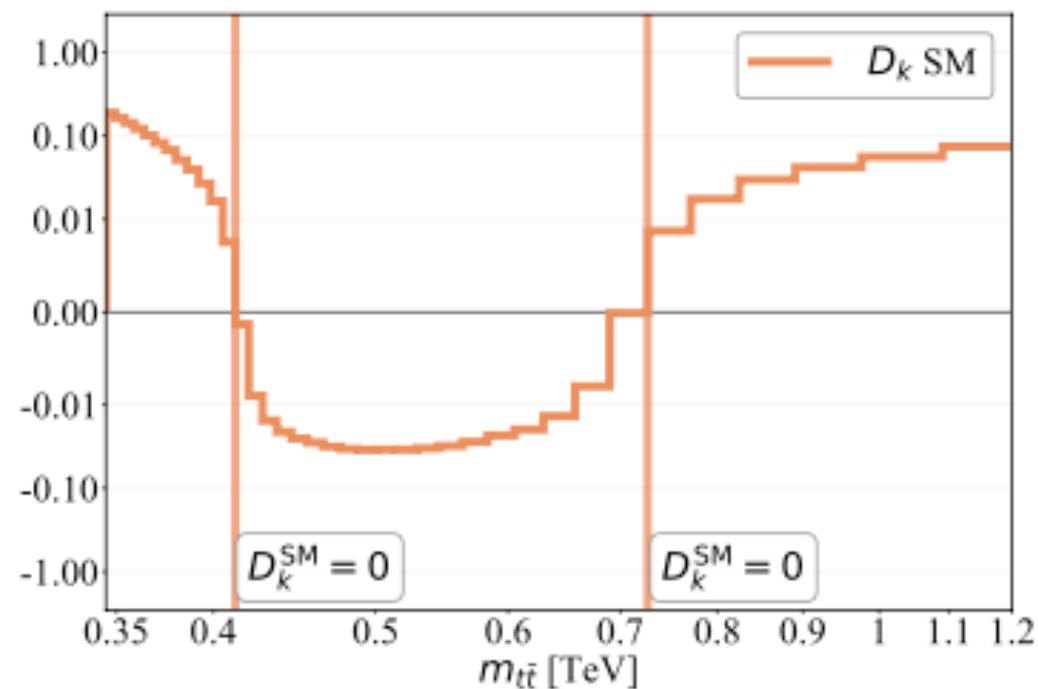
$$\begin{aligned} -C_{kk} - C_{rr} - C_{nn} &\equiv -3D^{(1)} \\ -C_{kk} + C_{rr} + C_{nn} &\equiv -3D^{(k)} \end{aligned} \quad > 1 \text{ if entangled}$$



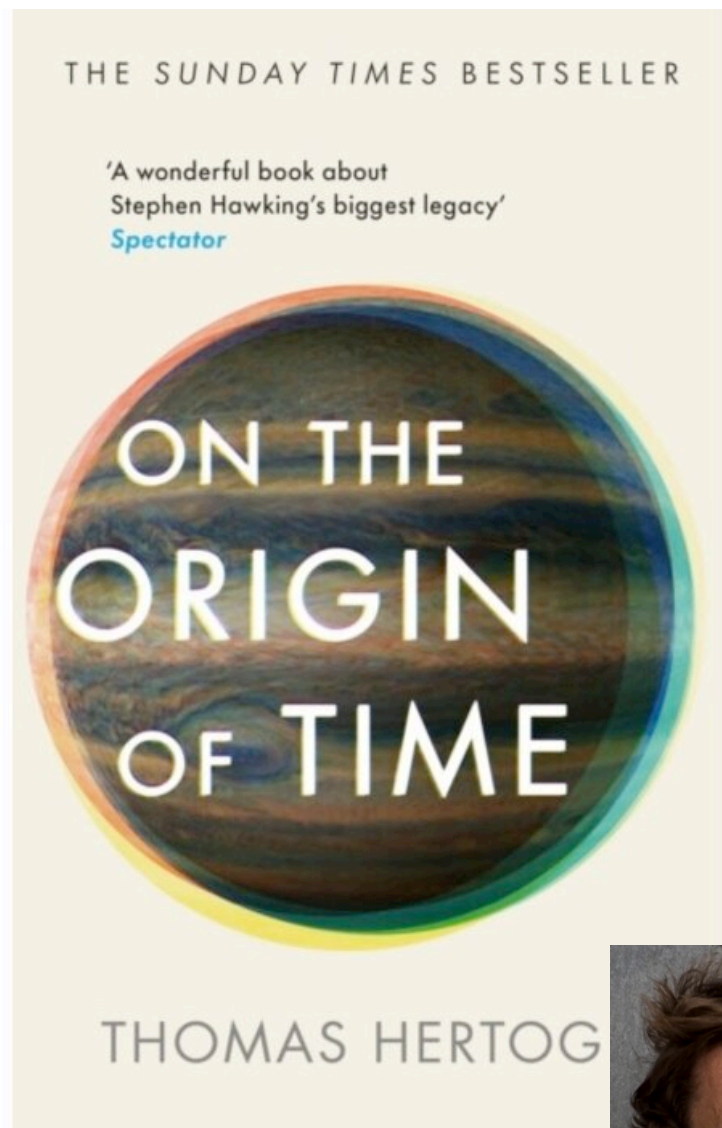
$$\mathcal{L} = \mathcal{L}_{\text{SM}} - \frac{1}{2}\phi(\partial^2 + M_\phi^2)\phi + c_y \frac{y_t}{\sqrt{2}} \phi \bar{t} (\cos \alpha + i\gamma^5 \sin \alpha) t.$$

SM

BSM

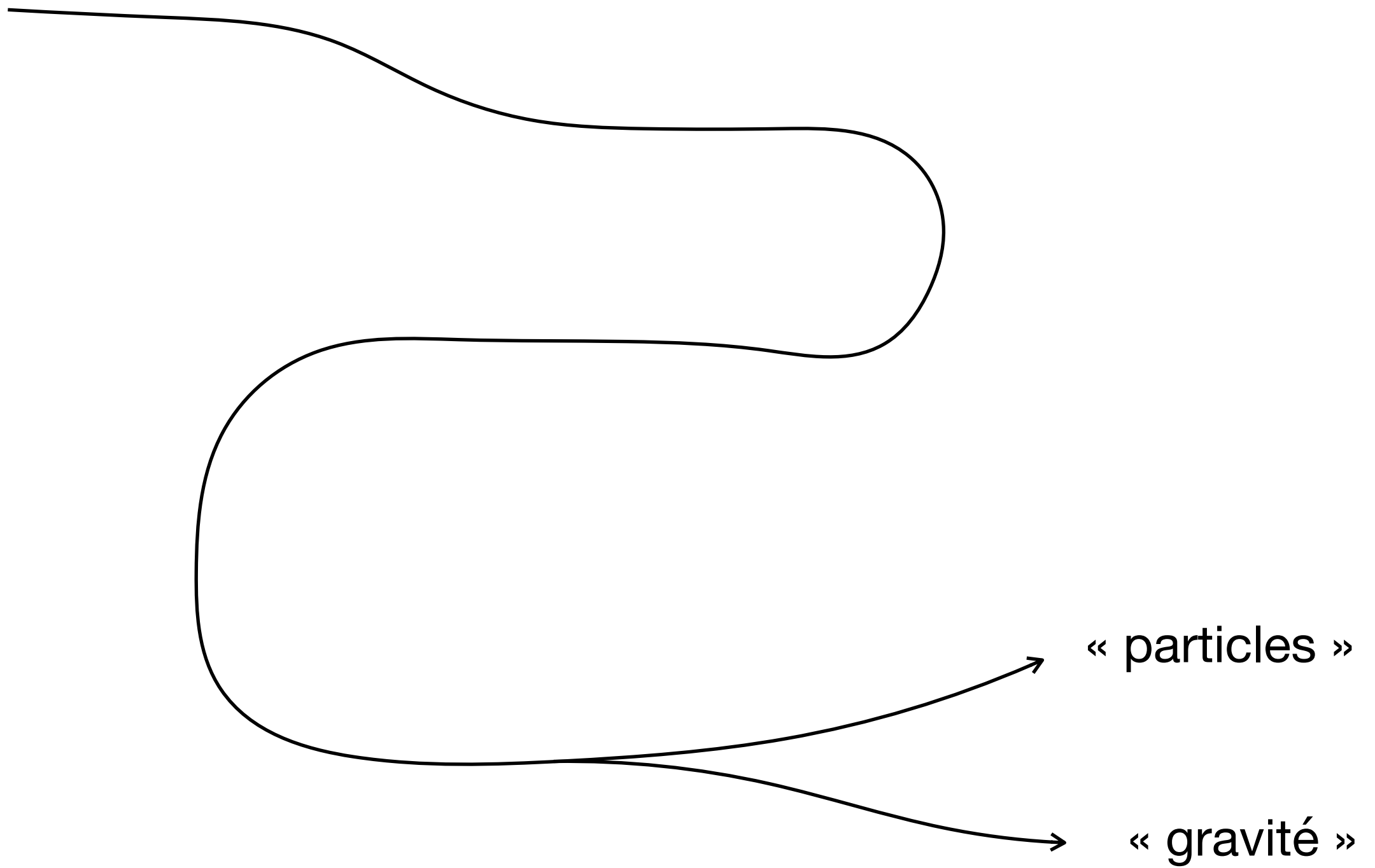


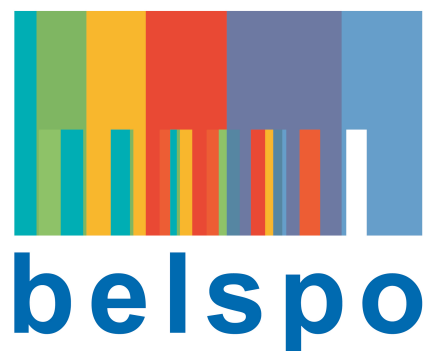
Public engagement activities



SCIENCE AND COCKTAILS



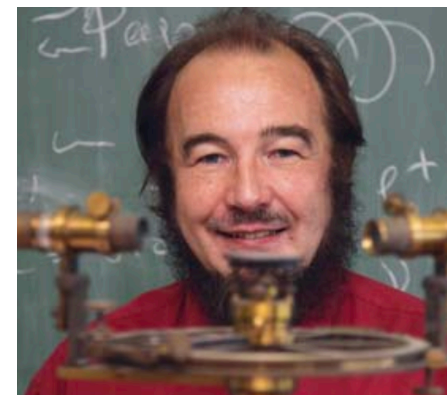




P5/27 (2002-2006)

P6/11 (2007-2011)

P7/37 (2012-2017)



- FRERE Jean-Marie, ULB
- FAVART Denis, UCL
- BERTRAND Daniel, ULB
- GERARD Jean-Marc, UCL
- HENNEAUX Marc, ULB
- SEVRIN Alexandre, VUB
- DE CLERCQ Catherine, VUB
- DE WOLF Eddi, UA
- TROOST Walter, KULeuven
- RYCKBOSCH Dirk, UGent
- CUGNON Joseph, ULg
- ABEL Steven Adam, Durham University (UK)
- AUGÉ Etienne, Université Paris-Sud (FR)
- DE GROOT Nicolo, NIKHEF (NL)
- TENCHINI Roberto, Istituto Nazionale di Fisica Nucleare (IT)



bel
(2017-2021)



« particles »

« gravité »



B



E



L

BEL Center for Theoretical Physics

ULB



KU LEUVEN



BEL Center for Theoretical Physics



Thank you for your attention

Thanks to my colleagues for their
collaboration

My apologies for not being able to
cover all of the excellent work from the
Belgian theory community.

And so apologies if your picture didn't
make it into this talk

Side remarks

In my field, many PhD graduates seem to choose not to continue with a postdoctoral position.

A common trend?

Since 2023, non-EU researchers on grants staying in Belgium for over three months need a 'single permit' for residence and work. The Belgian host institution applies via a single desk, with documents including the passport, hosting agreement, proof of funds, and a criminal record extract.

Process is simpler and faster if the researcher is employed with a salary instead of funded by a grant.