## e-ASTROGAM

#### Schedule

1

- Apr 2016: Release of ESA Call for M5 mission
- Jun 2016: Letter of Intend submitted
- Oct 2016: Proposal submitted
- Feb 2017: Endorsement from national agencies
- Jun 2017: Selection on technical and programmatic feasibility criteria (13 missions down-selected)
- Oct 20<sup>th</sup> 2017: 11 written questions from ESA's M5 Science Assessment Review Panel (SARP-M5)
- Oct 30<sup>th</sup> 2017: Answer to the questions from SARP-M5
- Nov 3<sup>rd</sup> 2017: Publication of the 1<sup>st</sup> draft of the White Book: Science with e-ASTROGAM (<u>arXiv:1711.01265</u>)
- Nov 7<sup>th</sup> 2017: Interview at ESTEC (ADA, LH, VT) by SARP-M5 and SSC-M5
  - Submission of the Science White Book to the Journal of High Energy Astrophysics (Elsevier)
- Dec 2017 => May 2018:

Apr 4<sup>th</sup> 2018:

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- May 2018(?) => Nov 2018(?):
- Jun 2018(?) => Dec 2018(?): P
- May 2020(?) => Nov 2020(?):

- Selection of maximum 3 missions for study
- Phase 0 completed
- Phase A kick-off
  - Mission selection (launch in <del>2029 -</del> 2030 2031)

## e-ASTROGAM

# White Book

#### Science with e-ASTROGAM

A space mission for MeV-GeV gamma-ray astrophysics



#### 251 authors from institutions in 29 countries

- 1. Introduction
- 2. The extreme extragalactic universe (AGN, GRBs, link to new messengers (GW, neutrinos, UHECRs); 15 papers)
- **3. Cosmic-ray interactions** (CR origin, Fermi bubbles, CR impact on the ISM; 7 papers)
- 4. Fundamental physics (DM searches, Axion, primordial black holes, baryon asymmetry; 15 papers)
- 5. Explosive nucleosynthesis and chemical evolution of the Galaxy (SNe, novae, diffuse radioactivities, 511 keV; 5 papers)
- 6. Physics of compact objects (pulsars, magnetars, PWNe, X- and gamma-ray binaries; 9 papers)
- **7. Solar and Earth Science** (TGFs, solar flares, Moon; 5 papers)
- 8. Miscellanea (5 papers)

## e-ASTROGAM Core science motivation

**1. Processes at the heart of the extreme Universe** (AGNs, GRBs, microquasars): prospects for the astronomy of the 2030s.

Multi-wavelength, multi-messenger coverage of the sky (with CTA, SKA, Einstein Telescope, LISA, neutrino detectors...)

Special focus on transient phenomena

- 2. Origin and impact of high-energy particles on galaxy evolution, from cosmic rays to antimatter
- 3. Nucleosynthesis and chemical enrichment of our Galaxy

#### Gravitational waves - ET, CE, LISA...







## e-ASTROGAM

#### Collaboration



- More than 400 scientific collaborators from institutions in 29 countries
- Instrument paper: Exp. Astronomy 2017, 44, 25 <u>https://arxiv.org/abs/1611.02232</u>
- Science White Book (251 authors; 213 pages), see https://arxiv.org/abs/1711.01265

## ASTROGAM

#### Next...

- Discussions with ESA's Science Assessment Review Panel were very positive<sup>5</sup>
- Probability to go to phase A of about 50% We should be ready!
- Tasks for AHEAD W9 SWG:
  - Specify the **instrument design**: DSSD strip pitch (240  $\mu$ m in e-ASTROGAM vs. 500  $\mu$ m in AMEGO), Calorimeter (CZT, CsI...), ACD segmentation etc.
  - Improve the **background model**, e.g. influence of SAA (see Paolo's talk)
  - Add science simulations (synthetic maps and spectra)



