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# Mission Extension 2012

## Preparations

Items for consideration

## Mission extension 2012

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- 18 November 2010: ESA's Science Programme Committee unanimously approved an extension of INTEGRAL operations until 31 December 2012. SPC also approved an extension until 31 December 2014, subject to a mid-term review in 2012.
- *Assume* same format of the process as in 2010 (TBC, SRE/O)
- In 2010 (Fall) the following was sent from D/SRE to Advisory Structure:
  - Document "Mission extension request for INTEGRAL" + 2 appendices
  - 7 pages (figures and references were contained in the 2 appendices)
    - Introduction (0.5 page) -
    - Science case (5 pages)
    - S/c, payload and g/s status (1 page)
    - Other items (0.5 page)
      - MEOR recommendations
      - National funding status
      - Financial request (ESA costs)
      - IUG recommendation on mission extension
- The new request will include a re-confirmation of the 'earmarked' budget for 2013 and 2014 (see 2010 request), and a new request (new money) for 2015 and 2016. So, science case needs to cover 2013-2016 window.
- Note, the IUG is **not** submitting the request...

## Science case (2010)– essential elements

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- Science case uses about 80% of the request (i.e. 5 out of 7 pages)
- Should address two aspects, A & B:
  - A: "Impact to date" (25%) :**
    - ✧ Summary of selected key results (since launch), most recent ones first
  - B: "Expected return" (75%) :**
    - ✧ Provide clear account where future measurements will be most productive beyond  $\sqrt{(\text{time})}$  improvements
    - ✧ What will be learned from extension ?
    - ✧ Avoid focus of incremental science
    - ✧ If possible, tackle 'criticism' ("small community", "less broad nature of science")
    - ✧ INTEGRAL and other space-/ground-based missions

## Mission Extension 2012 – lessons learned from 2010 ?

AWG recommendation, October 2010 (~ same/slightly better than AWG recommendation from October 2008)

- INTEGRAL continues to provide unique possibilities for studying the high-energy sky, in particular thanks to its imaging, spectral and polarimetric capabilities in the 20 keV to a few MeV range.
- No mission is planned in the near future to substitute INTEGRAL at energies above a few hundred keV. An extension of the INTEGRAL operations would enable new and interesting science.
- ✧ However, while producing science of high quality, the community making use of INTEGRAL is *smaller* than for other missions (e.g., XMM-Newton or HST) and *the resulting science is of a somewhat less broad nature.*
- The AWG was impressed by the *innovativeness* of the INTEGRAL community as shown by recent results.
- The extension to the end of 2014 will benefit from the low particle background expected around solar maximum and the AWG recommends the extension of the mission.



## The INTEGRAL request 2012 – some initial thoughts

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- Update science case – “Godfather” model again ? 3 main chapters: Nucleosynthesis/gamma-ray line emission, Galactic & Extragal. Astronomy
- Include brief section/paragraph with comparison “promised 2010 vs achieved 2010-2012” ?
- INTEGRAL’s role in >2012 (e.g. T. Maccarone [“Concluding Remarks”](#), Chia Laguna 2011)
  - Value of long uninterrupted observations
  - “new” obs/analysis modes: polarimetry, diffuse emission studies /w IBIS (!)
  - Upcoming era of h.e. missions: without RXTE (de-commissioned 5 Jan 2012) and with NuStar and Astro-H (2012, 2013)
    - less “deep pointings on individual sources” ?
    - highlight science that can either only be done, or much better be done, with INTEGRAL.
  - INTEGRAL vs MAXI, Swift, Fermi-GBM as wide-field survey missions:
    - better sensitivity and angular resolution. Important in source-rich regions (e.g. GC): confusion limit !
    - detect faint transients with pointed INTEGRAL observations rather than with all-sky instruments. Example: detection of two ms-pulsars in faint, crowded regions with INTEGRAL.
  - new ‘synergy’ with e.g. LOFAR: Monitoring hard X-ray transient @ Radio + Hard X-ray energies
- Impact of Finref on ESA costs ? How will this be handled ?

## Proposed activities and 2012 milestones (assume 2010 schedule)

2012	Activity
Feb/March	IUG to review 2010 science case and send comments to all. Discuss/define requirements to establish legacy
April/May	Write new section comparison "promised 2010 vs achieved 2010-2012"
May/June	Update science case (INTEGRAL's role in 2012+) & tech. part
May/June	Update appendix A & B (figures, references etc)
June	IUG: Review draft extension request – all 7 pages - incl science case <u>and</u> updated technical report, costs (indications) etc. Have working meeting in June.
July/August	Finalise science case and finalise technical report incl. costs
Aug/Sep	CW: Prepare presentation for AWG to summarize/highlight written science case, to clarify issues, answer questions ...
Sep	SRE/O to submit request for Director's approval, and send to advisory structure
16/17 Oct	AWG meeting (☹ !)
24 Oct	SSAC meeting
Nov	SPC decision