à SVOM GRB Science Meeting

IAP - 6 & 7 May 2024 - Organized by F. Daigne & S. Antier

Link to the tool/skills excel repo at https://docs.google.com/spreadsheets/d/18-7IGJCpBCWFErPvaFNGVjALv2auxN1gKtvtbsrUm6A/edit?usp=sharing

Part 1 - Scientific exploitation of SVOM GRBs

Objectives : We propose to consider the case of a bright GRB detected by all instruments of SVOM and to discuss the tools and skills necessary to analyze and discuss this GRB in the context of a publication

1- PROMPT **HIGH-ENERGY** EMISSION (AND TRANSITION TO THE AFTERGLOW ?) [ECLAIRS AND GRM, WITH POSSIBLY OTHER INSTRUMENTS].

F. Piron, M. G. Bernardini

Presentation: https://docs.google.com/presentation/d/1rS6kCPLwDV0SR11-NQtzSAzEMDcFtF387KeGBd_IC9M/edit#slide=id.g15692eca3aa_0_2

Standard analysis of the prompt HE emission of a GRB:

- Lightcurves in different energy channels
- Background model: several possible models, phenomenological or physical, evolution expected during the mission
- Duration (T90): standard method (more sophisticated methods possible but not implemented)
- Hardness Ratios (HR)
    - energy bands for HRs is not frozen yet; will try to enlarge the high-energy band to ensure a minimal SNR and avoid large HR errors, without loosing discriminating power b/w short and long GRBs
- Spectral analysis: several possible components: non-thermal (keV-MeV), quasi-thermal, additional non-thermal component at high-energy, etc. ; additional features are possible: high-energy cutoff, X-ray excess, etc. line ? (the BOAT)
- Forward-folding spectral analysis ; maximum likelihood estimator - many common phenomenological models (PWRL, COMP, BAND, SBPL, …) or physical models (BB, ISSM, etc.)
- Selection of time intervals - Count spectra - Detector response - Fit spectral model: standard tool = (py)XSPEC (choice of statistics: cstat, pgstat, chi2)

- Comparison of spectral models - likelihood ratio test; for instance very different Epeak energies between Band & ISSM
- Derived quantities (flux, fluence, + redshift: Liso, Eiso)

Comparison to other GRBs
- T90 vs HR (short/hard/…)
- Amati-like or Yonetoku-like correlations (Ep-Eiso, Ep-Liso): beware of the selection effects (Heussaff+2013)
- Classification: complementary obs can be crucial

Refined analysis:
- evolution of lightcurve with energy channel: time lags, pulse width(E)
- minimum variability timescale

Joint-analysis with multiple instruments
- variability studies: GRM+ECLAIRs+GWAC+MXT
- broadband SED analysis: GRM+ECLAIRs+MXT+GFTs

Stéphane: The case of faint bursts: standard method limited, other methods e.g. for ECLAIRs (photon list is available unlike Swift/BAT)

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2 - LATE PROMPT/AFTERGLOW IN **X-RAYS** [MXT WITH POSSIBLY OTHER INSTRUMENTS

D. Götz

- MXT Data Analysis: classical X-ray analysis (but peculiar PSF)
- image: two regions, one with the burst, one to estimate the background
- Localization: several methods
- Light curve: bayesian blocks
- Spectrum: PWRL + N(H) abs (typically)

Specific: late prompt emission
- improving the spectral modeling of the prompt: low-energy photon index, cf. BAT+XRT analysis by Brera's group (note: **importance of a early and fast slew**)
    - Synchrotron parameters vm and vc can be measured by measuring the LE spectral shape (additional break wrt. simple Band/cutoffpl model)
- comparison with GWAC/GFTs data if available can improve the global picture
- importance of cross-calibrating between instruments (e.g Hete-II with Konus was a good example), DG mentioned it is a priority between GRM+ECLAIRs+MXT especially for prompt GRB. SV mentioned the topic related to inter-calibrations between different X-ray instruments should be addressed in a general way (than SVOM other instruments and EP).
- Synergy with Einstein Probe - B. Cordier: discussion SVOM-Einstein Probe in progress (to be reviewed next year and maybe with a modification of the pointing law of SVOM) - improve the overlap of both FOVs?
- Einstein Probe: in addition to the wide FOV instrument (1 sr), two narrow-fov instruments (FXT) = ~6 times more sensitive than MXT, follow-up of the afterglow

possible with EP. BC mentioned SVOM owns 5% of EP time that can be used as ToO.
- Paul O'Brien: Einstein Probe has already an agreement to follow Swift GRBs ; calibration ?
- P. Maggi: tool for the identification of several segments in the X-ray lightcurve (with independent spectral analysis for each segment)
- F. Piron: Flares? for the tool developed by Obs. Stras, PM said that flares will be appeared as residuals, as there is only possibly power law fitting
- FD: Late prompt: early steep decay? Spectral evolution with several SVOM instruments? Interesting to test models (high latitude emission)

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3 - PROMPT/AFTERGLOW IN THE **VISIBLE/NEAR-INFRARED** [VT, GWAC, GFTS, WITH POSSIBLY OTHER INSTRUMENT

J. Palmerio

- Quality of the modeling is based on taking good data at the best time. In this sense, the data acquisition for late time is essential. First points are automatic, but then we need a plan = follow-up strategy (cadence, color, nIR data ?) . The importance of coordinating multi-lambda obs (e.g. X-visible) is based on the physics and properties of the source we are following-up. Usually, it is done based on experts that provided estimation of the flux.
- importance of spectroscopy (redshift and more) - different strategy for weak/bright afterglow as high / low resolution mode. Acquisition is also important (as Fibre/slit)
- data reduction for photometry as stacking images, astrometry, constant flux subtraction, upper limit, cross-matched between reference catalog, deepness of the catalog to photometric and AB mag or mJ (to compare with other wavelengths)
- data reduction for spectroscopy
- SVOM tools: need somewhere to show which SVOM telescopes have observed?
  need somewhere to retrieve follow-up SVOM data? and the analysis results ?
  - wiki page per burst + database to store data
  reduced data are stored in SDB for SVOM instruments (including GFTs)
  for SVOM partners: MoU, storage in SDB
  To discuss with SDB - raw data / calibration / … ?
  Damien Dornic: Or we should ask the instrument team (for SVOM instruments)
  If VT raw data & calib needed on Fr side, ensure they are included in the CSC/FSC transfer protocol (Léa Jouvin leading the weekly meetings)
- question of upper-limits, detection limit. Rapid modeling would be great to adjust very late time observations (with limiting time)
- follow-up strategy: who? (late observations: BA still in charge) - Discussion also within the follow-up group
- Discussion on scientific products will be discussed on mattermost, but summarized in the wiki with images, for each GRB + access to data used for the analyses
- F. Piron: orphan afterglow candidates? ECL/GRM upper limits from offline trigger pipeline (and tools), what about visible follow-up? Susanna: a priori no SVOM ToO because VT sensitivity limited, rather to be observed by SVOM ground FUP telescopes

4 - CORRECTING FOR **THE ABSORPTION** IN THE CONTEXT OF A MULTI-WAVELENGTH DATA SET

N. Rakotondrainibe, V. Buat

There is extinction in the line of sight for the GRB, in the host galaxy and in the milky way.
Analysis along the l.o.s. of the afterglow can be done at different timescales of the afterglow.
The addition of X-ray data largely improves the measurement.
At later time, the global attenuation of the host (with photometry) and of its HII regions (with spectroscopy) is retrieved when the afterglow is not detected anymore.
The goal is not only to correct GRB data from various extinctions, but also to study the environment of the host galaxy, its dust content through the extinction curve (GRB los) and the dust/stars interaction when the global attenuation is also measured.

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5 - ADDITIONAL DATA **OUTSIDE** OF SVOM : THE CASE OF A **"STANDARD" FOLLOW-UP** (E.G. RADIO TO X-RAYS)

D. Turpin

SVOM limitation in terms of wavelength data for the afterglow physics (UV, IR, radio, smm), need to collaborate ?
Lack of timely data within the first 24h/48h
Archival data can be useful in optical surveys (ZTF, LSST, ATLAS)
UV/X-ray follow-up of SVOM sources (EP, Insight-HXMT, Swift/RT, UVOT, XMM-Newton)

Challenges:

- How to collect the follow-up data ? How do we retrieve them ? Do we plan to have a standard format ?
- How to communicate with a (partner) telescope team ? How to trust their results ?
- How to have access to optical surveys ? Who can have access to these live streams ?

SV said: We need to use the precise vocabulary because it is not the same need and process (there are official partners with formal agreement, volunteering partners)
Strategy is not the same based on previous experience in other collaborations than SVOM that have specific criteria and process and ground telescopes.
Important key is to encourage associate partners to take efficient data.
Agreements with SVOM will drive data sharing.
We need to be careful to work on a case by case basis (otherwise not manageable).

For X-ray flux conversion, the heasarc has the tool PIMMS which has a command-line interface, any instrument can be added if we use the MXT response curve.

FP mentioned that several contact persons have been identified for the associate partners (see JSOG meeting on March 20, 2024). MAGIC will be an associate partner (MoU ongoing, Fred & Grazia on the SVOM side for GRBs + Alexis for GP). Then, MoU planned with CTA-LST (Susanna & Fabian) and HESS Fabian)

Contributions and authorship will be discussed on one case basis, when there is no agreement.

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6 - ADDITIONAL DATA **OUTSIDE** OF SVOM: EXCEPTIONAL WITH **VHE, GW, NEUTRINO COUNTERPART**

D. Dornic, F. Piron, N. Leroy

SVOM GRB + GW

Different scenarios: BNS or NSBH with GRB (with Kilonova or not)

- tools for significance of association between GW and GRB: RAVEN method (prompt emission only), Links with Fink: review what is already available, especially in Fink
- workflow to analyze kilonova light curves : some python tools available
- subthreshold analysis in ECLAIRs/GRM data : different searches already under development in IJCLab and IRAP for ECLAIRs. should have a search developed for GRM or ECLAIRs+GRM
- Targeted searches for weak GWs associated with SVOM-detected GRBs (PyGRB)

Derive flux upper limit of GRB
👍 (with IRAP tool ?) in case of a joint GRB+GW coverage
Could also have luminosity upper limit of GRB
For GCN circulars, an estimate of LVK coverage could be important to state

Also the case of orphan afterglow and the GW with a large error box, and so, uncertainties with the T0 of the GRB

Tool developed by SS and ND for ECLAIRs sub-threshold targets, see reference document here for a summary
https://docs.google.com/document/d/1Rkj7L6EFF83CjJiWp0DsBrD0uKa1WG7T0VMx0bay9_0/edit

GW O5 start of Virgo will depend on instrumentation to reach the O5 sensitivity
New organization in Virgo post O4 but not have a direct impact on collaboration with SVOM.

HE + VHE

We need advanced modeling tools for SVOM MWL fitting with Fermi + MAGIC + HESS + VERITAS + HAWC + LHAASO + CTA). Xspec is limited (events are binned in energy and space), need to use the 3ML (more powerful for some specific analysis where combining the native likelihood of the respective data sets helps constrain the model, e.g. a faint spectral cutoff in the LAT).
https://threeml.readthedocs.io/en/stable/md_docs/slow_execute/joint_BAT_gbm_demo.html#example-joint-fit-between-gbm-and-swift-bat
Also keep an eye on gammapy MWL analysis functionalities

Neutrinos

3 ways to do GRB-nu analysis (IC, KM3NeT)

- Automatic real-time followup of GRB triggers with online analysis by KM3NeT

- Neutrino alert sending to ToO SVOM after detection in prompt early optical follow-up, not already detected by ECLAIRs
- Offline analysis of the GRB catalogs (stacking, time-dependent point-source likelihood)

⇒ What we need? Direction, time, flux, duration, class
⇒ We have all the tools to estimate the significance of the association
⇒ We have tools to perform model fitting (NeuCosma, AM3, FIRESONG…)

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7 - **MODELLING**

F. Daigne, J. Guilet, S. Vergani

Gamma-ray burst host galaxy studies:
Spectroscopy in the south in the future with SVOM for SoXs (in addition to VLT within Stargate)
Some example of research :
What are the sources that reionized the universe ?
Nucleosynthesis in distant galaxies ? How stars enrich galaxies ?
Study of the properties of the neutral gas in high-resdshift galaxies
Chemical enrichment of galaxies
To infer information on progenitors through host galaxy studies (e.g. new population of transients, …).

SGRB hosts to infer information on binary neutron star mergers and stellar evolutionary paths.

Single event paper if especially interesting and sample papers

Comment from JL: Need very large telescopes and connection with James Web for these studies.
What are the criteria to follow up SV mentioned “visible and not in the galactic plan”. James Web time is very very high pressure (especially for very rapid follow-up).

Central engine :
Difficulty to constrain directly the central engine from the EM emission because of the difference of spatial scales and the need to assume emission model (model dependence).
The modelling of prompt and afterglow can constrain jet properties (Lorentz factor, magnetization, time variability) that can be compared to central engine predictions. The total energy can also be useful to disentangle the magnetar-driven or BH accretion central engines.
CEA group performs 3D simulations of the magnetar central engine in stellar explosions : protoneutron star dynamo to predict the magnetic field of a magnetar central engine (R Raynaud, J Guilet, A Reboul-Salze), magnetar-driven jetted SN explosion (M Bugli, J Guilet).
M Bugli has proposed an ERC project (audition at the end of the month) to bridge the gap between these jet SN explosions and the photosphere to predict the EM emission.
Associated KN or SN can disentangle whether the GRB comes from a compact object merger or stellar explosion progenitors (which can be more complex than the standard

long/short dichotomy). SN modelling especially in case of superluminous SN can give parameters of a millisecond magnetar central engine. X-ray plateau modelling also. This can then be compared to theoretical prediction of B field vs rotation from 3D simulations of protoneutron star dynamos.
Modelling of a magnetar-driven X-ray counterpart of off-axis BNS merger detected in GW and followed up : PhD thesis of C Plasse (CEA).
FD : do the simulations that bridge the gap between central engine and photosphere include a treatment of radiation and are they able to describe a radiation mediated shock ? -> No they cannot describe this physics at the moment.
MD : can all superluminous supernovae be linked to a GRB ? SV : no because the host galaxy properties are different.

Prompt and afterglow modeling :
Diagnostics based on non-thermal/thermal components, Lorentz factor of the ejecta. Also early afterglow is very important and redshift of courset. Evidence of shock breakout ?
Some example with GRB090926A to verify the standar scenario for prompt emission (as international shocks). Another example is that Non-thermal/thermal ratio can provide insights about the properties of the eject (GRB 090902B / GRB100724B). A third example is catching the peak precises the blast wave Lorentz factor constraints.
However these diagnostics are model dependant
Prompt emission Internal shocks with expertise from IAP and reconnection from Chinese side (this part should be precised)
Additional components with SSC to be consider
Afterglow Standard model (synchrotron radiation from shock-accelerated electrons at the forward chock), (to be continued….)
Be careful of posteriors results from modeling fitting as it may not be physical (and need to be discussed)
2 timescales of publications: a very detailed analysis will be on a second publication.
FD mentioned we have the capacity to modelize the prompt and afterglow at once. The difficulty from the Phrase transition from the prompt to the afterglow is that consequences of prompt emission reflect only one component of the afterglow
DG : emission duration of X-rays is not well known and have an impact on the modeling.
J-L Atteia: How we will organize the work for a bright GRB ? FD answered said first we need to do spectral analysis and to see at first place what we can do (like spectral evolution etc).
FD is aware that with SVOM we won't exclude some model truly compared to others, but we can make progress along the years. First publication is more "asking questions" (or we can assume something on the lorentz factor) and then refined modeling that can take several years on a specific scenario.

Part 2 - Science GRB studies

1 - COMMENTS RELATED TO DOCUMENTATION / PROCESS (**SSMP, JWSG, OPERATIONAL & SCIENTIFIC GROUPS ("GRB STUDIES")**)

Acton: will try discussion with chinese side for the discussion

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2 - COMMENTS RELATED TO **SCIENTIFIC PRIORITIES**

APC: Scientific activities mainly focused on the GP. Participation in the CP through Burst Advocates activities and ToO (GRB revisit) + Multi-messenger : GRB-neutrino.

CPPM: 3 main priorities linked to the optical properties of the GRB afterglow + follow-up of MM triggers + GRB - neutrino association. In details, scientific topics:
- Optical properties of GRB afterglows (follow-up, COLIBRI, GRANDMA, Fink@VRO…)
- CR/neutrino production in GRBs
- **Very near** GRBs
- **Absorbed/choked GRBs, X-ray rich GRBs** & orphan afterglows
- Search for optical counterparts of GW alerts
- Host galaxies of VHE GRB

Activities linked to SVOM BA, COLIBRI IS activities and image analysis pipeline for COLIBRI

CEA:

- GRB prompt & afterglow emission modeling: checking against ms magnetar driven models (especially short GRBs, i.e. mergers)
- X-ray rich GRBs particularly in association with EP
- Ultra-long GRBs
- GRB XUVOIR afterglow late time emission (late rebrightening, jet break, late chromatic features)
- SNe/KNe GRB association
- Population comparison between classical and low-luminosity and soft GRB (connection with EP mission)
- Dust extinction model (with LAM)
- Follow-up of GW alerts: search for X-ray counterparts (prediction & modeling) for BNS.
- Magnetars (GF & regular bursts)
- Optical follow-up of SVOM bursts (OHP, GRANDMA, KNC)
- GRB orphan afterglow, kilonovae with Fink and GVOM
- Outside GRB topic : instrumental background study for low altitude orbits (with IRAP for ECLAIRs and with LUPM for GRM, including albedo neutrons for MXT)

IAP:

Interests related to the modeling of GRBs (several scenarios)

- Physics of the prompt/afterglow emission: model/interpretation
  -Interest in testing the models with bright GRBs
  Special interest for GRBs with prompt complementary data (optical,X-rays,HE/VHE).
  -Interest in understanding the prompt emission of the weak/soft events: identifying tail of the classical GRB population (same mechanism)
  - transition prompt to AG emission at different wavelength

- physics of the AG emission (Clement Pellouin's code+...)
-Interest in modelling the early afterglow:
-interest for the prompt-afterglow connection (orphan, efficiency of the prompt, transition, …)

Prompt: collab with Fred Piron' group at LUPM
Afterglow: collab with Susanna Vergani's group at GEPI

- Population models
  -Interest in extanding long GRB pop. models to soft events
  -Interest in building a pop. model of long GRB based on a physical model (e.g. internal shocks)
  -Interest in building a pop. model of short GRBs (merger scenario)

Interests related to the use of GRBs to probe the distant Universe
long term collaboration with Susanna Vergani
-Gas along the line-of-sight
-ISM in the host, intervening systems, IGM
-Different phases

Potential other expertises: other IAP members have expressed an interest for SVOM GRB Science (may lead to an implication at a moderate level, will depend on the available results)
-Irina Dvorkin: GW, stellar evolution in binaries
-Kumiko Kotera & Rafael Alves Batista: neutrinos, cosmic rays, VHE emission
-Damien Leborgne: host galaxies (+ expertise at IAP on spectral modelling of galaxies)
-Luc Dessart: modeling of supernovalightcurves
-Note: Martin Lemoine is now at APC: particle acceleration in GRBs

Michel Dennefled is more involved in the GP science but will participate to BA activities.

IJCLAB:

- Multimessenger science w/ GW-GRB
  - GW follow-up and statistical association of EM emission
    - past involvement w/ 170817 and GW observing runs
  - ECLAIR/GRM subthreshold analyses
    - need to initiate more collaboration with IRAP and GRM teams
  - GW follow-up of SVOM GRBs and joint subthreshold searches
- GRB temporal and spectral analysis of prompt emission
- GRB X-ray and optical afterglow – detection, analysis, modeling; links with Fink
- Analysis of SNe and KNe lightcurves (have python codes) in connection with OCA

IRAP:

Team : J-L Atteia (SVOM), O. Godet (SVOM), L. Bouchet (SVOM), S. Guillot (SVOM, NICER), N. Webb (SVOM, XMM, NuSTAR), D. Barret (SVOM, XMM, NuSTAR), J. Malzac (theory/modeling), A. Klotz (SVOM, TAROT, T0.6m à la Réunion, T1m au Pic du Midi,

GRANDMA), T. Contini (SVOM, instrument VLT, notamment MUSE), J.-P. Dezalay (SVOM), Postdoc chinoise (GRB host galaxies), M. Coriat (SVOM, XMM, Meerkat, SKA), Doctorant (off-line trigger, soft or underluminous GRBs)

Science Topics:

- GRB phenomenology: Dark GRBs, Soft GRBs (XRF, X-ray rich GRBs), Short GRBs with extended tails, Ultra-long GRBs
- Non-GRB transients (e.g. jetted TDEs, galactic SGRs and SGR giant flares in Virgo, galactic and nearby transients) in connection with external triggers and/or through SVOM direct or off-line triggers.
- High-z GRBs and GRB Formation History
- GRB Physics: Prompt emission, transition prompt/afterglow phase – lifetime/nature of central engine (X-ray flares, plateau, etc.), precursors – shock breakouts
- Sub-threshold GRBs : connection with non-electromagnetic transients (neutrinos, GW)
- GRB populations : joint statistical analysis with GRM (+MXT once available), GRBs among other stellar mass BH populations
- GRB host galaxy properties
- Early optical/NIR afterglow (TAROT + Colibrí)
- ECL instrumental/selection effects: Study how instrumental biases could affect GRB detection depending on GRB properties/populations
- Outside GRB topics: TGFs (if any), ECLAIRs background structure and evolution including cosmic X-ray Background, developing off-line trigger capabilities for MXT data, building GRB and serendipitous non GRB source catalogs + source classification tools,

Operational Topics:

- ECL instrument follow-up & calibration (EIC)
- Quality flag for ECL data
- BA
- …

LAM: team: C. Adami, S. Basa, S. Blondin, S. Boissier, V. Buat, D. Burgarella, A. de Ugarte Postigo, N. Rakotondraibe

- Host science :
  - Physics of the host : host vs general population of galaxies, dust content (los of afterglow versus whole galaxy), environment
  - very high z hosts, impact on formation, evolution of galaxies
  - Hosts at all redshifts: Evolution of environments and progenitors with redshift
- Multi-wavelength afterglow follow-up:
  - Observations with OHP, COLIBRI, NOEMA, VLT, GTC, CAHA
- GRB progenitor populations: in particular supernovae/kilonovae
  - Observation of radioactive components
  - Modeling and simulation
  - Understanding the variety of progenitors
- Compilation of multi-observatory observational data: GRBSpec+GRBPhot = GRBBase (if funds become available)

LUPM

- M.-G. Bernardini (SVOM, Swift, Fermi, CTA, ENGRAVE), J. Devin (H.E.S.S., CTA), C. Guépin (theory, UHE neutrinos), T. Maiolino (SVOM), A. Marcowith (theory), F. Piron (SVOM, Fermi, CTA)
    - + collaboration with IAP+ (F. Daigne, Z. Bosnjak) for modeling
- Science operations
    - FSC: BA
    - EIC: ECLAIRs / GRM Instrument Scientist (IS) shifts ~10 weeks/yr/person; in the front line in the 1st year, providing the near real-time analysis results (N3 notices, circulars)
    - EIC/GIC: ECLAIRs / GRM background modeling (with IRAP / IHEP)
    - EIC/GIC: ECLAIRs / GRM spectral cross-calibration with Crab observations
    - GeV/TeV follow-up of SVOM GRBs
- Single-GRB papers: leading role (if BA → rare, ~1 BA shift week/yr) or contribution (e.g. if on IS shift when the GRB occurred)
- GRB phenomenology: full spectro-temporal characterization at high energy with ECLAIRs / GRM
- Physics of GRB prompt emission
    - Explore the synchrotron scenario
        - ECLAIRs / GRM time-resolved spectral analysis
        - SVOM broad-band multi-instrument analysis (ECLAIRS, GRM, MXT, GWAC / GFTs), including search for cooling break at low energy with ECLAIRs and MXT if available
        - Testing physical models: ISSM, simple synchrotron model, GRB synchrotron model
    - Extension to SSC: MWL analysis up to GeV/TeV with Fermi and IACTs
    - IAP collaboration: exploration of physical model parameter space (prompt SSC, lepto-hadronic scenarios)
    - Transition to afterglow phases (and link to the origin of GeV/TeV early emission)
- Physics of GRB afterglow: spectral and temporal analysis of X-ray flares, interpretation of X-ray features (flares, plateau) within the magnetar central engine model
- More elaborated analysis chains (w.r.t. FSC pipelines): dedicated automated pipeline for GRB catalog papers, 3ML / gammapy for MWL analyses, etc
- GRB (spectral) catalog papers (ECLAIRs, ECLAIRs+GRM): incremental versions to be anticipated (and pipelines, see above)
- GRBs for cosmology (e.g. revisiting Amati/Yonetoku with SVOM sample of well-characterized GRBs with known z)
- Contribution to instrument performance studies (GRB sensitivity, GRB localization performance, etc), ECLAIRs sub-threshold targets
- Contribution to ECLAIRs targeted searches (GW counterparts, Rubin orphan afterglows)
- GRBs and New Physics: Lorentz Invariance Violation (likely driven by GeV/TeV detectors, but ECLAIRs/GRM might help to understand intrinsic time lags)

Obs. Paris:

- spectroscopic follow-up (Stargate, SOXS, …)
- GRB host galaxy studies
- very high-z GRBs and galaxies
- GRBs as tools to probe the high-z universe, galaxy evolution, chemical enrichment
- GRB ionization of its environment
- reionization
- multi-messenger studies (ENGRAVE)
- general expertise on multi-wavelength afterglow studies (+ modeling in coll. with F. Daigne)
- GRB orphan afterglows (tickets LSST) + spectroscopy
- progenitor properties of GRBs and fast / energetic transients through host galaxy studies

Obs. Côte d'Azur:

(S. Antier in addition to SVO, member of [LVK, Colibri, TAROT, GRANDMA-KNC, NMMA])

Afterglow UVOIR light curve

- Offline analysis of Colibri/DDRAGO's data associated with the SVOM GRB (together with Damien's Dornic's group) : detection, upper limit and measurement.
- Interface with GRANDMA and Kilonova-catcher (if data available) with science products as detection, upper limit and measurements
- Interface with TAROT, in collaboration with IRAP
- In connection with GRANDMA/NMMA, we can run Afterglowpy to check if the timely and colored LC is well described by a synchrotron emission with a forward shock, in collaboration with GRB group

Short GRBs SVOM origin

- Depending if we get the redshift, evaluate the merger and core collapse scenario and provide probabilities of the best scenario envisioned (using NMMA framework)

GW Astronomy with SVOM GRB

- In collaboration with IJCLAB, contribute (I don't know how yet, but maybe on the GW side ?), the campaign article, or one particular GW in "sky and time" coincides with GW (and for which we may have redshift). It can be on sub-thresholds as well, but only in the GW-BNS and NSBH scenario.
- Contribution to run KN modeling if needed (with NMMA with Possis, Kasen)
- If time, running sub-threshold in ECLAIRs

Fast Transients

- Gamma-ray/X-ray prompt counterpart of fast transient (> 0.3 day) is interesting with LSST fast classification with IA (long term) + definition of T0.

Obs. Strasbourg:

- Focusing on General Programme science but link to (long) GRBs through compact object/neutron star studies (compact remnant in supernova remnant, pulsar wind nebulae/magnetars).
- Involved on the Core Programme as lead for the MXT X-band pipeline, including GRB-specific tasks (e.g. light curve fitting, spectral analysis) + BA activity

University of Leicester:

[Members of Swift, EP, GOTO, HESS, CTA, LSST, JWST, LOFAR, Stargate, ENGRAVE etc]
Experience over many years on GRB/transient topics. Interests include:

- low luminosity/low E_peak GRBs (+Swift and EP)
- high-z GRBs and host galaxies (Stargate)
- multi-messenger studies of GW events (ENGRAVE, GOTO, EP, Swift)
- multi-wavelength GRB prompt emission and afterglow studies (link various space and ground facilities)
- GRB orphan afterglows (GOTO, LSST)
- progenitors of GRBs (including magnetar engines)
- ultra-long GRBs
- related fast jet objects, particularly relativistic-jet Tidal Disruption Events
- have staff with experience in cross-calibration of X-ray instruments

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3 - General comments

Question of non-GRB transients: where to discuss the science?

Paper type 1: SVOM-onlu data (BA first author ?)
Paper type 2- most SVOM data + extrernal data or expertise or model
Paper type 3: external leadership + still unpublished SVOM data
TBD: Paper type 4: GCN circular

First paper, should be on an exceptional GRB (maybe not only SVOM lead)
Conference of joint Einstein Probe and SVOM by end of 2024
Where we will publish SVOM papers .

Urgent matter of author list of the circular and first paper

We must use the

Part 3 - Organisation of the GRB science group

1 - FEEDBACK FROM PAST EXPERIENCE

2 - GENERAL COMMENTS

What we define on part of GRB science group or not.

GRB science group named instead of “GRB population studies”
SV: Need to clarify the contours of the group
FD: I will ask the status of the publication, which difficulty their have currently
DG: I think for catalog, major articles, need a collaboration decision, otherwise, each co-I can have the responsibility of each publication
FD: question about credibility of the SVOM consortium, so we need to be careful for the first year

FP: How we collaborate together is a key discussion for today
FD: Different categories of articles, and some are related to instrumentation performances (here, the referee should be very light etc)
PB: BA will be the lead author, right ?
FD: Yes, but in complement with a senior person to help
PO'Brien: Better to write from the bottom-up style.
DT: I have the feeling that the GRB population or catalogs, etc but some single GRB, it is the BA to defend its GRB for publication
DV: Free papers at the beginning are dangerous, at least for the first year
BC: One goal is to encourage collaboration with French and China, and also among the different institutes.
FP: Collaboration is important and with inside knowledge is important. For the first year, we have one paper for each bright burst
DP: do we agree if the group would be

a) to discuss on new projects
b) to follow the progress of these projects (with regular meeting)
c) referee of someone not involved (very light)

J-L Atteia: We can't prevent someone to do it, and t does not include instrument's studies.
RH is in favor in paper commitee. Also do you want to have different instrument policies or one as a full collaboration ?
FD: start one weekly meeting at fixed time

Start of the group cannot be done without chinese colleagues