

ECLAIRs and GRM data processing pipelines for the Core Program

Frédéric Piron
(on behalf of many people)

Nanning, 10/16/2019

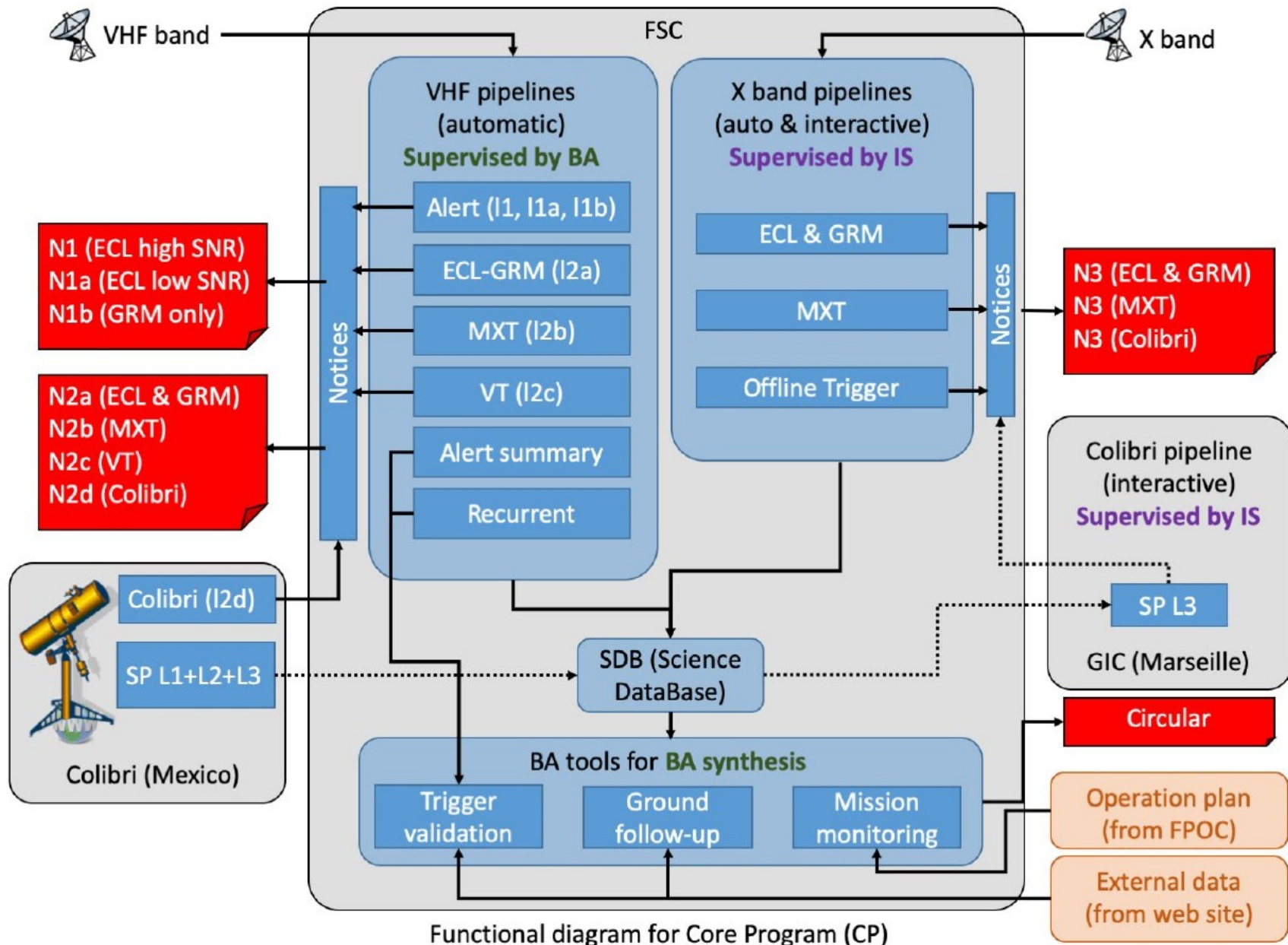
Outline

- **Overview of the VHF pipelines for ECLAIRs and GRM at FSC**
 - Excerpts from the Core Program Software Description Document
 - High-energy scientific products
- **The VHF ECLGRM pipeline at FSC**
 - Scientific products and related tasks
 - Activation conditions
 - Developers & plans for the FSC DC-1
- **The X-band ECLAIRs and GRM pipelines at FSC and CSC**
 - Scientific products and related tasks
 - Activation conditions
 - Developers
- **Organization of the software development**
 - Gitlab
 - Redmine

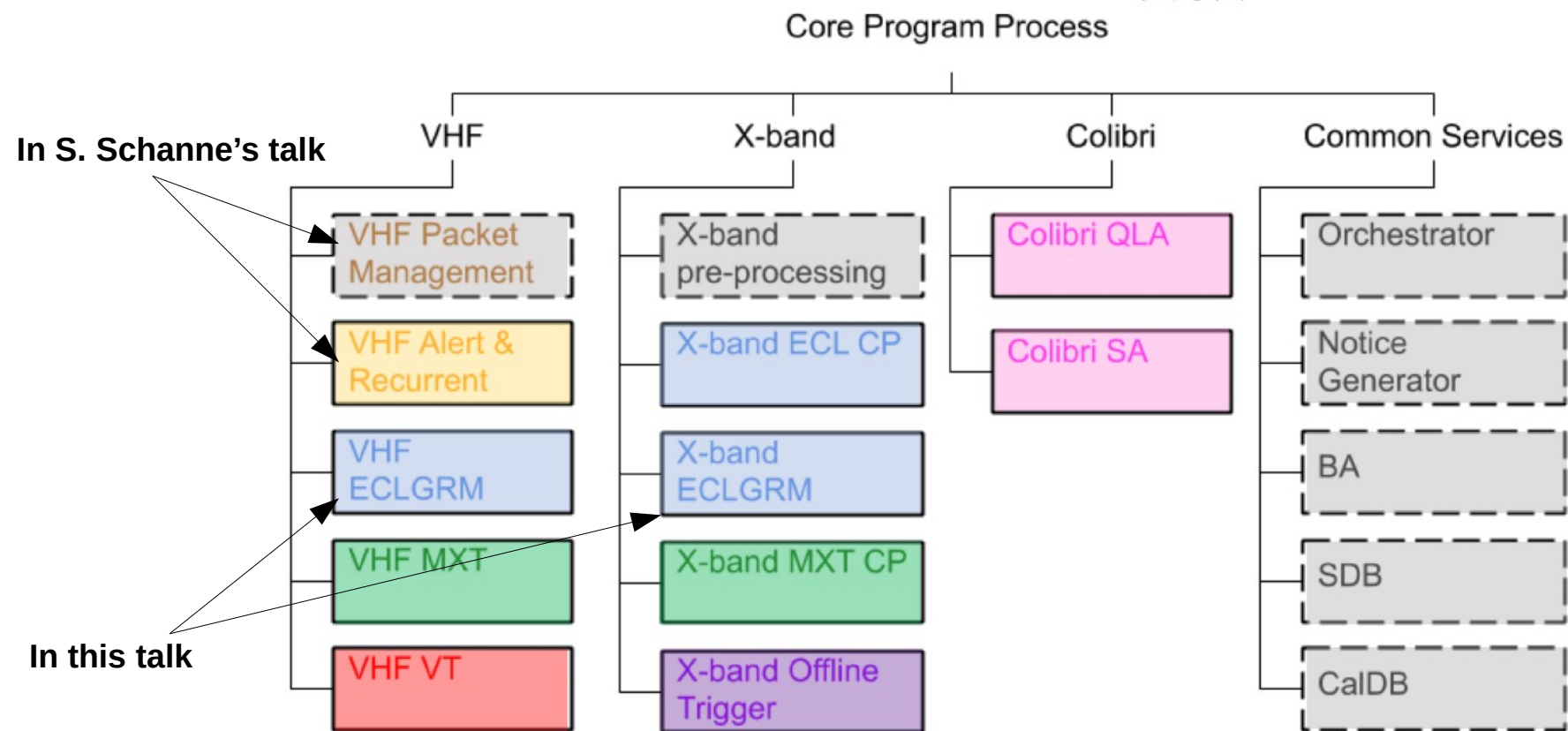
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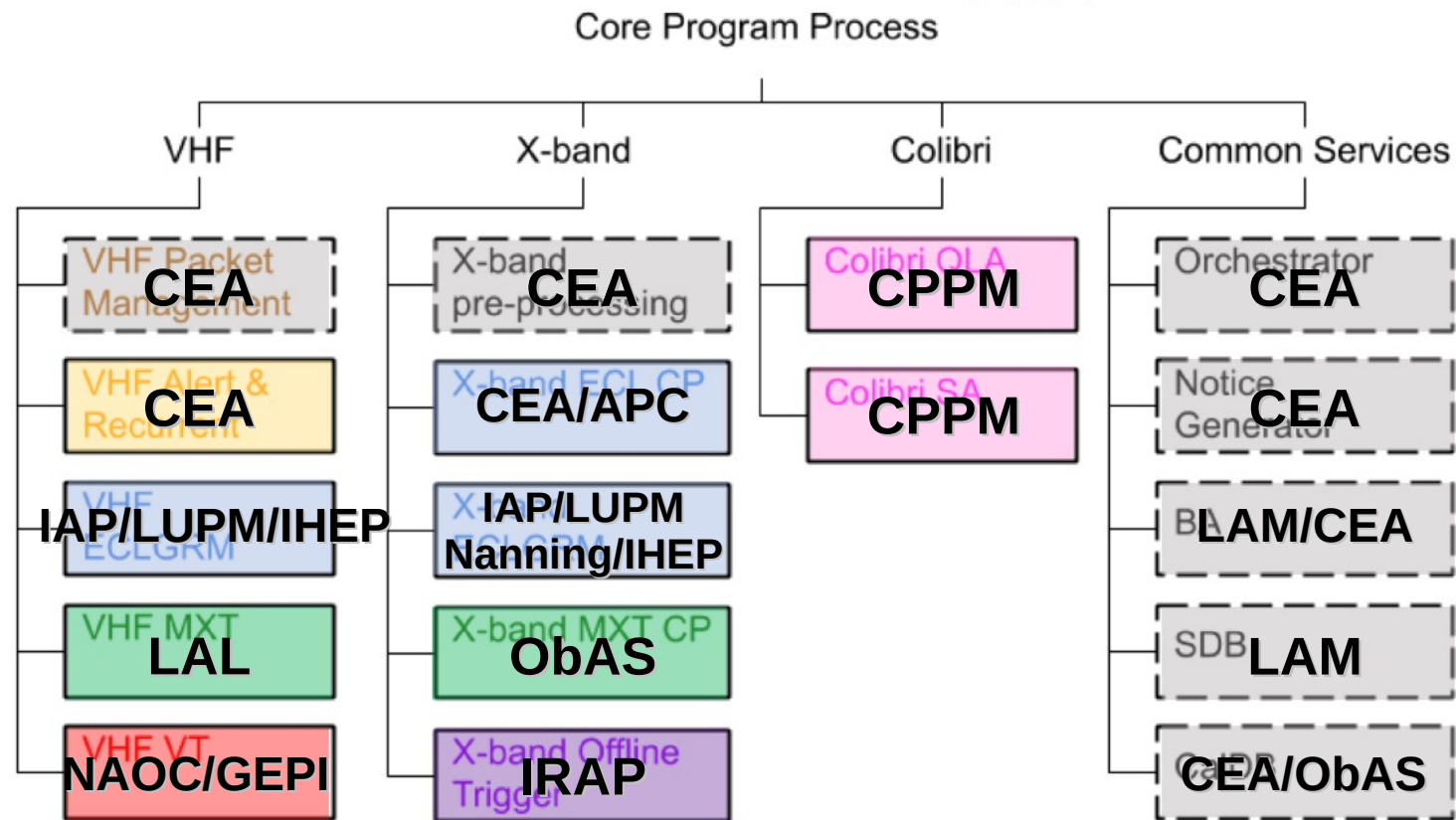
Core Program process at FSC: synthetic view



Core Program process at FSC: pipelines & services



Core Program process at FSC: responsibilities





- ## In this talk

Scientific products based on ECLAIRs and GRM data

- About 40 high-energy SP described in the [IAP SP database](#)
 - For each SP: inputs, generation method, outputs, notices...
 - Ask L. Domisse (domisse@iap.fr) and F. Daigne (daigne@iap.fr) for a login

Q Search

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ASP

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SVOM Core Program Scientific Products

Tool

Science dependencies

Sorted I/O

Map

Selection

Full

Card

New

Export

CSV

JSON

Help

Admin

Instruments

Acronym

Group

Name

WP

Recherche

Go

Reset

Incomplete

Alert

Section included

Contributor

Last modified

Version

State

Description

Development

Acronym	Name	Group	Description	Author	Development	Version
TT_ECL	Trigger time – ECLAIRs VHF Alert (T_0)	Products generated in near-real time from VHF data or automatic link from ground	The Trigger Time (T_0) is the time in UTC when Eclairs has produced the first alert of a new VHF alert sequence	S. Schanne	CEA	2019-03-04
QCL_ECL	Quick confidence level – ECLAIRs VHF Alert	Products generated in near-real time from VHF data or automatic link from ground	The quick confidence level of an ECLAIRs burst detection based on the significance of the source in the onboard image (SNRI)	A. Claret, F. Daigne, S. Schanne, T.Sadibekova	CEA	2019-09-24
QPO_ECL	Quick position – ECLAIRs	Products generated in near-real time from VHF data or automatic link from ground	Quick position using ECLAIRs data, computed onboard	F. Daigne, S. Schanne	CEA	2019-02-26
TT_GRM	Detection time – GRM	Products generated in near-real time from VHF data or automatic link from ground	Trigger time (s) in standard frame - GRM	J. Sun & SHI HaoLi	IHEP	2019-07-17
QCL_GRM	Quick confidence level – GRM	Products generated in near-real time from VHF data or automatic link from ground	Confidence level of the GRM detection, computed onboard	J. Sun, SHI HaoLi	IHEP	2019-07-17
QPO_GRM	Quick source position – GRM	Products generated in near-real time from VHF data or automatic link from ground	Crude position using GRM data, computed onboard	J. Sun & SHI HaoLi	IHEP	2019-07-17
OBLC_ECL	On-board count light curves – ECLAIRs	Products generated in near-real time from VHF data or automatic link from ground	ECLAIRs crude light curves in counts in 5 energy channels ($i = 0, 4$).	F. Piron, S. Schanne	CEA	2019-04-25
OBLC_GRM	On-board count light curves – GRM	Products generated in near-real time from VHF data or automatic link from ground	GRM crude light curves in counts in 2 energy channels ($i = 0, 1$) for each of the 3 GRDs ($j = 0, 2$).	F. Piron, S. Schanne, SUN Jianchao, SHI HaoLi	CEA/IHEP	2019-07-17
QLC_ECL	Quick light curves – ECLAIRs	Products generated in near-real time from VHF data or automatic link from ground	ECLAIRs quick light curves in 5 energy channels ($i = 0, 4$).	F. Piron	LUPM	2019-03-13
QLC_GRM	Quick light curves – GRM	Products generated in near-real time from VHF data or automatic link from ground	GRM quick light curves in 2 energy channels ($i = 0, 1$) from the 3 GRDs ($j = 0, 2$).	F. Piron	LUPM/IHEP	2019-02-26
QPF_ECL	Quick peak flux – ECLAIRs	Products generated in near-real time from VHF data or automatic link from ground	ECLAIRs quick peak flux in 5 energy channels ($i = 0, 4$).	F. Piron	LUPM	2019-03-04
QPF_GRM	Quick peak flux – GRM	Products generated in near-real time from VHF data or automatic link from ground	GRM quick peak flux in 2 energy channels ($i = 0, 1$).	F. Piron	LUPM/IHEP	2019-02-26
QT90_ECL	Quick duration – ECLAIRs	Products generated in near-real time from VHF data or automatic link from ground	Quick estimate of the duration in ECLAIRs.	F. Piron, F. Daigne	IAP	2019-03-04
QT90_GRM	Quick duration – GRM	Products generated in near-real time from VHF data or automatic link from ground	Quick estimate of the duration in the GRM.	F. Piron, F. Daigne	IAP/IHEP	2019-02-26
QHR_ECL	Quick hardness ratios – ECLAIRs	Products generated in near-real time from VHF data or automatic link from ground	ECLAIRs quick hardness ratios.	F. Piron	IAP	2019-03-04
QHR_GRM	Quick hardness ratios – GRM	Products generated in near-real time from VHF data or automatic link from ground	GRM quick hardness ratios.	F. Piron	IAP/IHEP	2019-02-26
QHR_ECLGRM	Quick hardness ratios – ECLAIRs and GRM	Products generated in near-real time from VHF data or automatic link from ground	ECLAIRs and GRM quick hardness ratios.	F. Piron	IAP/IHEP	2019-02-26
QSP_GRM	Quick spectral parameters – GRM	Products generated in near-real time from VHF data or automatic link from ground	Quick spectral parameters of the GRM rough spectrum	J. Sun	IHEP	2019-03-05
PO_ECL	Source position – ECLAIRs	Products in physical units generated from complete data	Position of the source in ECLAIRs.	A. Gros, A.Goldwurm, F. Piron	CEA	2019-02-26
PO_GRM	Source position – GRM	Products in physical units generated from complete data	Position of the source in GRM.	SUN Jianchao & SHI HaoLi	IHEP	2019-07-17
T90_ECL	Duration – ECLAIRs	More elaborate products generated from SVOM data only	Duration of the prompt gamma-ray emission in ECLAIRs.	F. Piron, F. Daigne	IAP/LUPM	2019-02-26
T90_GRM	Duration – GRM	More elaborate products generated from SVOM data only	Duration of the prompt gamma-ray emission in the GRM from the 3 GRDs ($j = 0, 2$).	F. Piron, F. Daigne	IHEP/IAP/LUPM	2019-02-26
SP_ECL	Spectra in physical units – ECLAIRs	Products in physical units generated from complete data	Spectra ($\text{ph/cm}^2/\text{s/keV}$ as a function of energy in keV) in different time intervals using ECLAIRs data.	F. Piron, F. Daigne	LUPM	2019-02-26
SP_GRM	Spectra in physical units – GRM	Products in physical units generated from complete data	Spectra ($\text{ph/cm}^2/\text{s/keV}$ as a function of energy in keV) in different time intervals using the data from the 3 GRDs ($j = 0, 2$).	F. Piron, F. Daigne	IHEP/LUPM	2019-02-26
SP_ECLGRM	Spectra in physical units – ECLAIRs and GRM	Products in physical units generated from complete data	Spectra ($\text{ph/cm}^2/\text{s/keV}$ as a function of energy in keV) in different time intervals using ECLAIRs and GRM data.	F. Piron, F. Daigne	LUPM/IHEP	2019-02-26
LC_ECL	Light curves in physical units – ECLAIRs	Products in physical units generated from complete data	Light curves (photon fluxes ($\text{ph/cm}^2/\text{s}$) and energy fluxes ($\text{erg/cm}^2/\text{s}$) in different energy channels using ECLAIRs data.	F. Piron, F. Daigne	LUPM	2019-02-26
LC_GRM	Light curves in physical units – GRM	Products in physical units generated from complete data	Light curves (photon fluxes ($\text{ph/cm}^2/\text{s}$) and energy fluxes ($\text{erg/cm}^2/\text{s}$) in different energy channels using GRM data.	F. Piron, F. Daigne	IHEP/LUPM	2019-02-26
PF_ECL	Peak fluxes – ECLAIRs	More elaborate products generated from SVOM data only	Peak photon flux ($\text{ph/cm}^2/\text{s}$) and peak energy flux ($\text{erg/cm}^2/\text{s}$) in different energy channels using ECLAIRs data.	F. Piron, F. Daigne	LUPM	2019-02-26
PF_GRM	Peak fluxes – GRM	More elaborate products generated from SVOM data only	Peak photon flux ($\text{ph/cm}^2/\text{s}$) and peak energy flux ($\text{erg/cm}^2/\text{s}$) in different energy channels using GRM data.	F. Piron, F. Daigne	IHEP/LUPM	2019-02-26
FLUENCE_ECL	Fluences – ECLAIRs	More elaborate products generated from SVOM data only	Photon fluences (ph/cm^2) and energy fluences (erg/cm^2) in different energy channels and time intervals using ECLAIRs data.	F. Piron, F. Daigne	LUPM	2019-02-26
FLUENCE_GRM	Fluences – GRM	More elaborate products generated from SVOM data only	Photon fluences (ph/cm^2) and energy fluences (erg/cm^2) in different energy channels and time intervals using GRM data.	F. Piron, F. Daigne	IHEP/LUPM	2019-02-26
FLUENCE_ECLGRM	Fluences – ECLAIRs and GRM	More elaborate products generated from SVOM data only	Photon fluences (ph/cm^2) and energy fluences (erg/cm^2) in different energy channels and time intervals using ECLAIRs and GRM data.	F. Piron, F. Daigne	LUPM/IHEP	2019-02-26
HR_ECL	Hardness ratios – ECLAIRs	More elaborate products generated from SVOM data only	Hardness ratios between different energy channels in different time intervals using ECLAIRs data.	F. Piron, F. Daigne	IAP	2019-02-26
HR_GRM	Hardness ratios – GRM	More elaborate products generated from SVOM data only	Hardness ratios between different energy channels in different time intervals using GRM data.	F. Piron, F. Daigne	IHEP/IAP	2019-02-26
HR_ECLGRM	Hardness ratios – ECLAIRs and GRM	More elaborate products generated from SVOM data only	Hardness ratios between different energy channels in different time intervals using ECLAIRs and GRM data.	F. Piron, F. Daigne	IAP/IHEP	2019-02-26
LAG_ECL	Time lags between light curves – ECLAIRs	More elaborate products generated from SVOM data only	Time lags between light curves in different energy channels in ECLAIRs.	F. Piron, F. Daigne	IAP	2019-02-26
LAG_GRM	Time lags between light curves – GRM	More elaborate products generated from SVOM data only	Time lags between light curves in different energy channels in the GRM.	F. Piron, F. Daigne	IHEP/IAP	2019-02-26
LAG_ECLGRM	Time lags between light curves – ECLAIRs and GRM	More elaborate products generated from SVOM data only	Time lags between light curves in different energy channels in ECLAIRs and GRM.	F. Piron, F. Daigne	IAP/IHEP	2019-02-26

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VHF data analysis tasks

- **OTLOC-[ECL, GRM] – Onboard Trigger and LOCalization**
 - [Output SP](#): trigger time (T0), trigger confidence level, quick position
- **RSP-GRM – ReSPonse generation**
 - Compute the DRM of each GRD for the current GRB-Earth-detector geometrical configuration (accounting for the scattering of the GRB signal in the spacecraft and the Earth's atmosphere)
 - [Outputs](#): DRM of each GRD for the current GRB
- **QSPEC-GRM – Quick SPECTrum**
 - For each GRD: use the total / bkg count spectra (generated onboard) and DRM (from RSP-GRM task)
 - Spectral fits with XSPEC (PGstat) using simple spectral models (PL, COMP, Band)
 - [Output SP](#): crude time-integrated spectrum, parameters and covariance matrix
- **QTEMP-[ECL, GRM] – Quick TEMPoral analysis**
 - Background modeling and subtraction (temporal fit)
 - Analysis of bkg-subtracted count light curves (+ selection of the useful GRDs)
 - [Output SP](#): source count light curves, peak flux, duration (T_{90})
- **QHR-[ECL, GRM, ECLGRM] – Quick Hardness Ratios**
 - Use the results of the previous tasks
 - [Output SP](#): time-integrated hardness ratios
- **CLASS – CLASSification of the triggered event from previous tasks (ECL and/or GRM)**
 - [Output SP](#): nature of the event (GRB, other?)

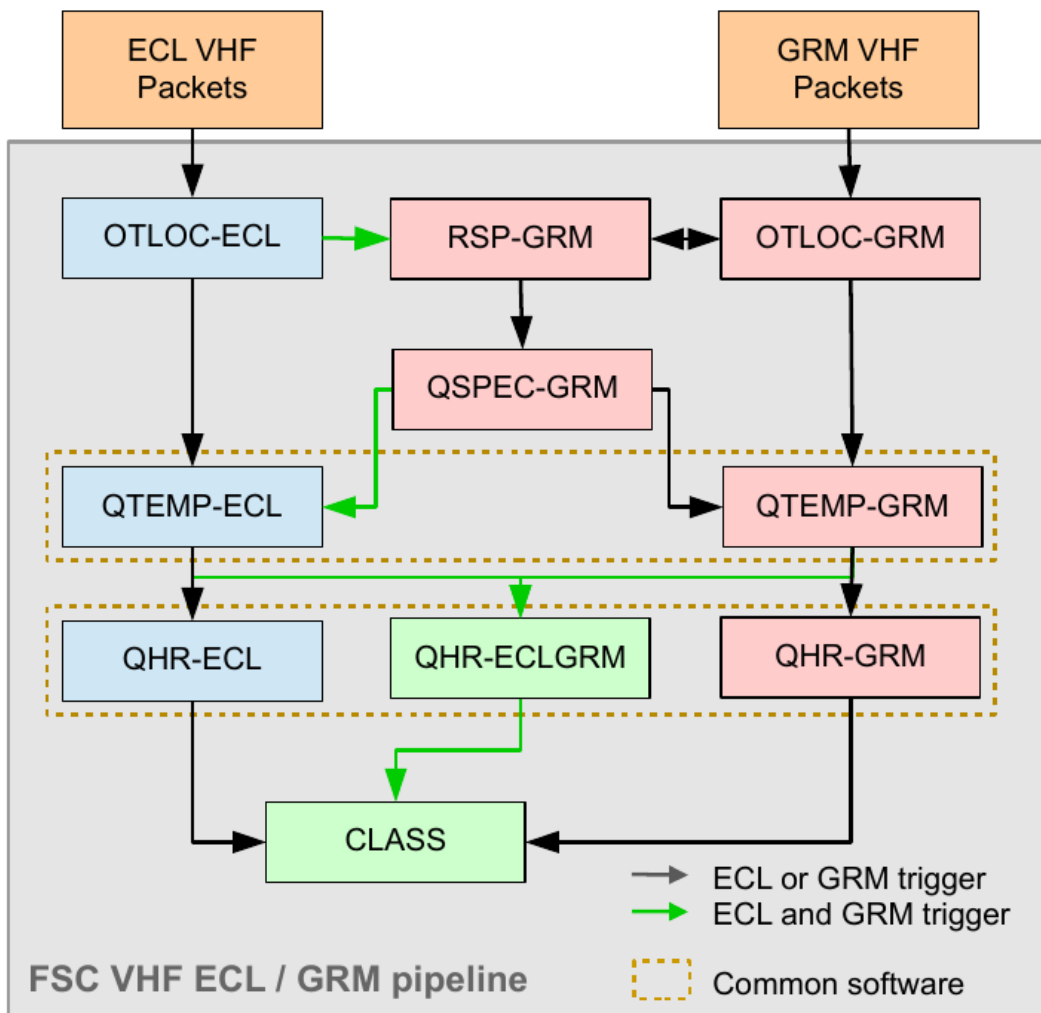
VHF data analysis tasks and scientific products

	TASK		SCIENTIFIC PRODUCTS <i>(and other products)</i>		COMMON SOFTWARE ?
VHF DATA ANALYSIS	OTLOC	ECL	TT_ECL	Trigger time - ECLAIRs (T0)	NO
			QCL_ECL	Quick confidence level - ECLAIRs	
			QPO_ECL	Quick position - ECLAIRs	
		GRM	TT_GRM	Detection time - GRM	
			QCL_GRM	Quick confidence level - GRM	
			QPO_GRM	Quick source position - GRM	
	RSP	GRM	GRM Detector Response Matrices including Earth/SC scattering effects		NO
	QSPEC	GRM	QSP_GRM	Quick spectral parameters - GRM	NO
	QTEMP	ECL	OBLC_ECL	On-board count light curves - ECLAIRs	YES
			QLC_ECL	Quick light curves - ECLAIRs	
			QPF_ECL	Quick peak flux - ECLAIRs	
			QT90_ECL	Quick duration - ECLAIRs	
		GRM	OBLC_GRM	On-board count light curves - GRM	
			QLC_GRM	Quick light curves - GRM	
			QPF_GRM	Quick peak flux - GRM	
			QT90_GRM	Quick duration - GRM	
	QHR	ECL	QHR_ECL	Quick hardness ratios - ECLAIRs	YES
		GRM	QHR_GRM	Quick hardness ratios - GRM	
		ECLGRM	QHR_ECLGRM	Quick hardness ratios - ECLAIRs and GRM	
	CLASS	ECL GRM	CRCLASS	Crude classification	YES

See the [IAP SP database](#) for details on scientific products and methods

- Many SP will be generated by the same software
 - Similar methods (*_ECL and *_GRM “mirror” SP) or joint analyses (QHR_ECLGRM and CRCLASS)
- Some tasks are specific to an instrument: no common software for OTLOC-ECL, OTLOC-GRM, RSP-GRM and QSPEC-GRM

VHF data analysis workflow, activation and notices



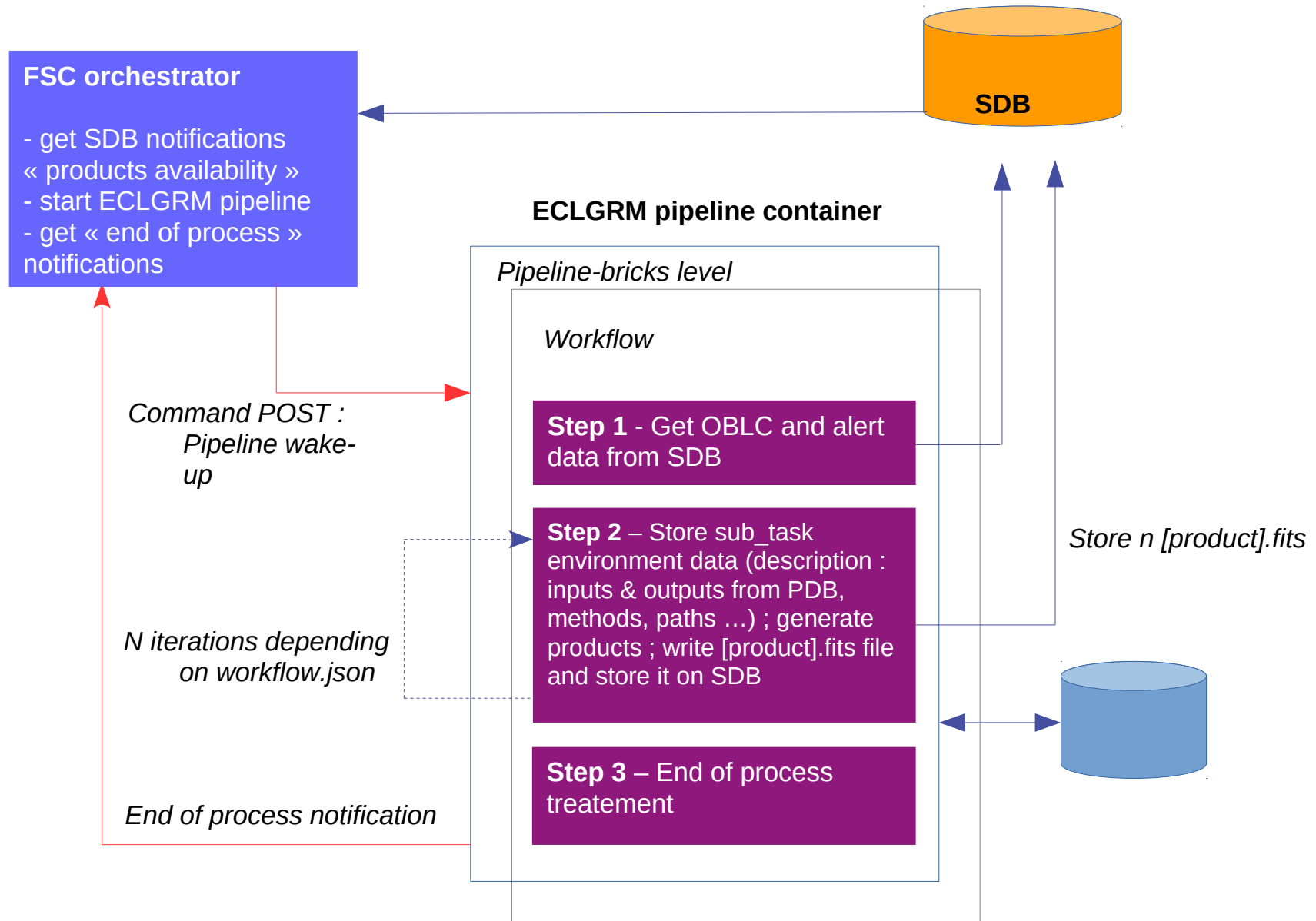
See backup slides for more details on notices (definition, distribution)

Condition	VHF pipeline to be run	Notice	Sent out by
ECL-only onboard trigger	FSC VHF ECLGRM	N1 N2a	FSC
Common onboard trigger	FSC VHF ECLGRM	N1 N2a	FSC
GRM-only onboard trigger	FSC VHF ECLGRM	N1b N2a (*)	FSC

(*) To add to the SRa (“SVOM alert distribution strategy”)

- Note:** OTLOC-ECL and OTLOC-GRM tasks are shown here for completeness, but will be performed by the VHF Alert & Recurrent pipeline (see S. Schanne’s talk)

VHF ECLGRM pipeline architecture



- *Pipeline-bricks* for processing internal management and communication with external services
- *config.json* (pipeline configuration) & *workflow.json* (definition of processing workflow)
- eclgrm main repository on gitlab: projects for scientific analysis, container building and deployment

VHF data analysis tasks, products and developers

	TASK		SCIENTIFIC PRODUCTS <i>(and other products)</i>		RUNNING AT		DEVELOPERS		COMMON SOFTWARE ?
					FSC	CSC	F	C	
VHF DATA ANALYSIS	OTLOC	ECL	TT_ECL	Trigger time - ECLAIRs (T0)	X		CEA		NO
			QCL_ECL	Quick confidence level - ECLAIRs					
			QPO_ECL	Quick position - ECLAIRs					
		GRM	TT_GRM	Detection time - GRM	X			IHEP	
			QCL_GRM	Quick confidence level - GRM					
			QPO_GRM	Quick source position - GRM					
	RSP	GRM	GRM Detector Response Matrices including Earth/SC scattering effects		X			IHEP	NO
	QSPEC	GRM	QSP_GRM	Quick spectral parameters - GRM	X			IHEP	NO
	QTEMP	ECL	OBLC_ECL	On-board count light curves - ECLAIRs	X		CEA		YES
			QLC_ECL	Quick light curves - ECLAIRs			LUPM		
			QPF_ECL	Quick peak flux - ECLAIRs			IAP		
			QT90_ECL	Quick duration - ECLAIRs					
		GRM	OBLC_GRM	On-board count light curves - GRM	X		CEA	IHEP	
			QLC_GRM	Quick light curves - GRM			LUPM		
			QPF_GRM	Quick peak flux - GRM					
			QT90_GRM	Quick duration - GRM			IAP		
	QHR	ECL	QHR_ECL	Quick hardness ratios - ECLAIRs	X		IAP	IHEP	YES
		GRM	QHR_GRM	Quick hardness ratios - GRM	X		IAP		
		ECLGRM	QHR_ECLGRM	Quick hardness ratios - ECLAIRs and GRM	X		IAP		
	CLASS	ECL GRM	CRCLASS	Crude classification	X		IRAP	IHEP	YES

- **Goals for the DC-1 (12/2019)**
 - Develop a simplified version of the OTLOC-ECL and OTLOC-GRM tasks
 - Develop the QTEMP, QHR and CLASS tasks (ECL / GRM count LC analysis, classification)
- **Goals for the DC-2 (12/2020)**
 - Develop the RSP-GRM and QSPEC-GRM tasks
 - Finalize the tasks developed for DC-1
- **Note: software specific to GRM (OTLOC-GRM, RSP-GRM, QSPEC-GRM) will be developed by IHEP and then integrated to the FSC pipelines by CEA/IAP/LUPM**

GRM needs for DC-1

- **VHF Alert & Recurrent pipeline: 1 container (CEA with contribution from IHEP) for I1 data processing (ECLAIRS and GRM alerts)**

IHEP send to CEA the content of the GRM alert packets for the DC-1 simulated GRB

IHEP send to CEA the software to read these packets and to generate the OTLOC-GRM scientific products

- **VHF ECLGRM pipeline: 1 container (IAP/LUPM with contribution from IHEP) for I2a data processing (ECLAIRS and GRM light curves)**

IHEP contribution to the QTEMP-GRM and QHR-[GRM, ECLGRM] tasks

- **See next slides on software development organization**

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X-band data analysis tasks

- **TEMP-[ECL, GRM, ECLGRM] – TEMPoral analysis**
 - Background modeling and subtraction for ECL (imaging with GP pipeline) and/or GRM (temporal fit)
 - Analysis of bkg-subtracted count light curves (+ selection of the useful GRDs)
 - [Output SP: source count light curves, duration \(\$T_{90}\$ \), time intervals for spectral analysis](#)
- **RSP-GRM – ReSPonse generation (same software as for the VHF RSP-GRM task)**
 - Compute the DRM of each GRD for the current GRB-Earth-detector geometrical configuration (accounting for the scattering of the GRB signal in the spacecraft and the Earth's atmosphere)
 - [Outputs: DRM of each GRD for the current GRB in each time interval](#)
- **LOC-[ECL, GRM] – LOCalization**
 - For ECL (imaging with GP pipeline) and/or GRM (relative count rates in 3 GRDs, correcting for the signal scattering in Earth's atmosphere from RSP-GRM task)
 - [Output SP: source position](#)
- **SPEC-[ECL, GRM, ECLGRM] – SPECtral analysis**
 - Generate total count spectra and bkg count spectra for ECL and/or each GRD
 - Use the DRM of ECL (from CalDB) and/or of each GRD (from RSP-GRM task)
 - Spectral fits with XSPEC (PGstat) using simple spectral models (PL, COMP, Band)
 - [Output SP: time-dependent source spectra, parameters and covariance matrices](#)
- **LC-[ECL, GRM], [FLUENCE, HRL]-[ECL, GRM, ECLGRM]: LC, FLUENCE, HR and Lags**
 - Use the results of the previous tasks
 - [Output SP: flux light curves and peak flux, \(time-dependent\) fluences, hardness ratios and lags](#)

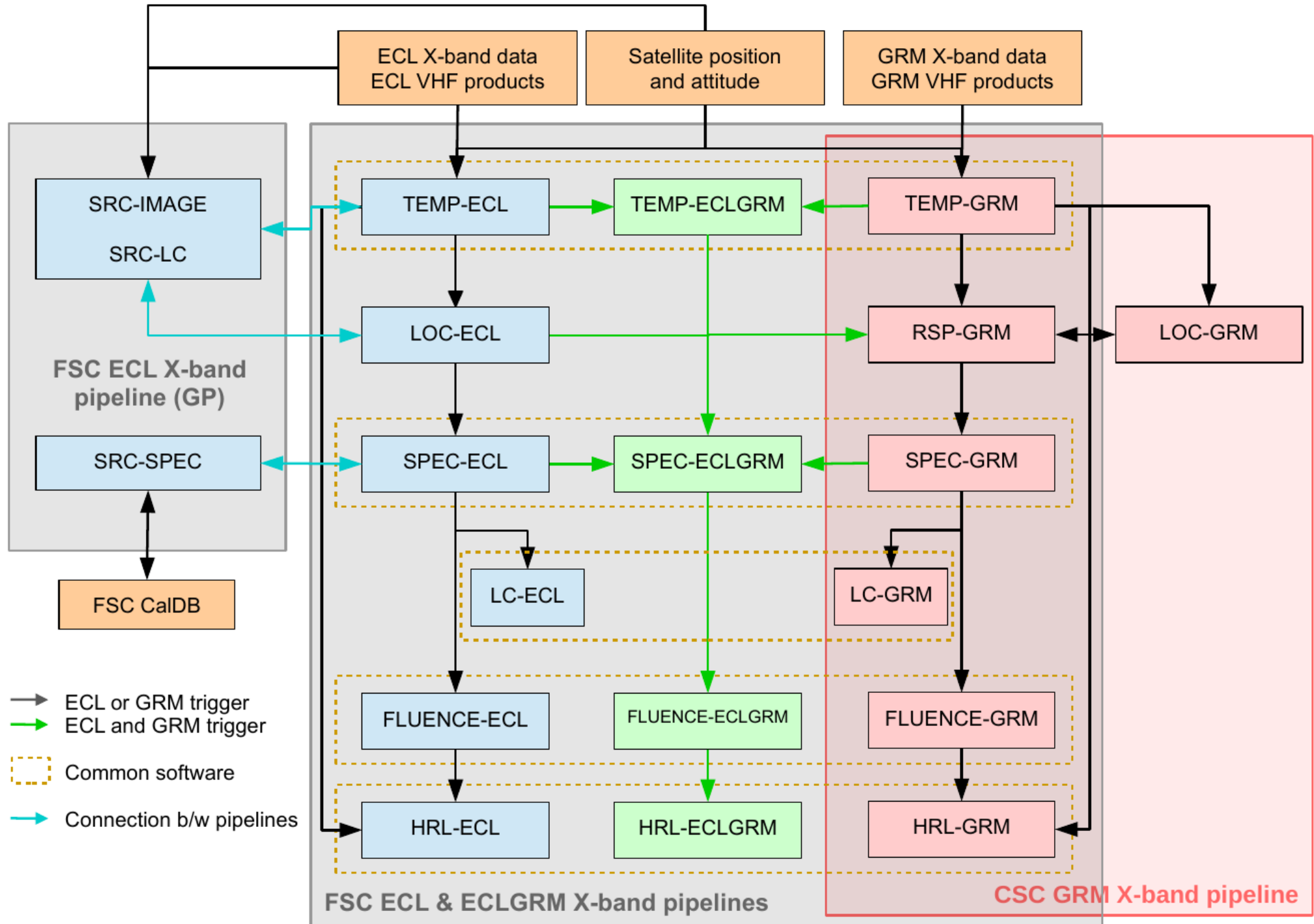
X-band data analysis tasks and scientific products

	TASK		SCIENTIFIC PRODUCTS <i>(and other products)</i>		COMMON SOFTWARE ?
X-BAND DATA ANALYSIS	LOC	ECL	PO_ECL	Source position - ECLAIRs	NO
		GRM	PO_GRM	Source position - GRM	
	TEMP	ECL	T90_ECL	Duration - ECLAIRs	YES
		GRM	T90_GRM	Duration - GRM	
		ECLGRM	Joint analysis to define common time intervals for the spectral analysis		
	RSP	GRM	GRM Detector Response Matrices including Earth/SC scattering effects		NO
	SPEC	ECL	SP_ECL	Spectra in physical units - ECLAIRs	YES
		GRM	SP_GRM	Spectra in physical units - GRM	
		ECLGRM	SP_ECLGRM	Spectra in physical units - ECLAIRs and GRM	
	LC	ECL	LC_ECL	Light curves in physical units - ECLAIRs	YES
			PF_ECL	Peak fluxes - ECLAIRs	
		GRM	LC_GRM	Light curves in physical units - GRM	
			PF_GRM	Peak fluxes - GRM	
	FLUENCE	ECL	FLUENCE_ECL	Fluences - ECLAIRs	YES
		GRM	FLUENCE_GRM	Fluences - GRM	
		ECLGRM	FLUENCE_ECLG	Fluences - ECLAIRs and GRM	
	HRL	ECL	HR_ECL	Hardness ratios - ECLAIRs	YES
			LAG_ECL	Time lags between light curves - ECLAIRs	
		GRM	HR_GRM	Hardness ratios - GRM	
			LAG_GRM	Time lags between light curves - GRM	
		ECLGRM	HR_ECLGRM	Hardness ratios - ECLAIRs and GRM	
			LAG_ECLGRM	Time lags between light curves - ECLAIRs and GRM	

See the [IAP SP database](#) for details on scientific products and methods

- Many SP will be generated by the same software
 - Similar methods (*_ECL and *_GRM “mirror” SP) or joint analyses (*_ECLGRM SP)
- Few tasks are specific to an instrument: no common software for LOC-ECL, LOC-GRM and RSP-GRM

X-band data analysis workflow



Activation of X-band pipelines, notices

Activation condition	X-band pipeline to be run	Notice	Sent out by
ECL trigger (regardless of GRM)	FSC X-band ECLGRM	N3 ECL (trigger validation / cancellation or new burst)	FSC
GRM trigger (regardless of ECL)	CSC X-band GRM	N3 GRM (trigger validation / cancellation or new burst)	CSC
ECL trigger and GRM trigger	FSC X-band ECLGRM	N3 ECLGRM (*) (if both triggers validated)	FSC

(*) To add to the SRa (“SVOM alert distribution strategy”)

See backup slides for more details on notices (definition, distribution)

- **Reminder: if both ECL and GRM trigger, the ECLGRM joint analyses will run at FSC**
 - Because the ECL data analysis heavily relies on the GP ECL pipeline at FSC
- **Note: three N3 notices if common detection (both ECL and GRM triggers validated)**
 - N3 for ECL, N3 for GRM, N3 for ECLGRM

X-band data analysis tasks, products and developers

	TASK		SCIENTIFIC PRODUCTS <i>(and other products)</i>		RUNNING AT		DEVELOPERS		COMMON SOFTWARE ?
					FSC	CSC	F	C	
X-BAND DATA ANALYSIS	LOC	ECL	PO_ECL	Source position - ECLAIRs	X		CEA		NO
		GRM	PO_GRM	Source position - GRM		X		Nanning/IHEP	
	TEMP	ECL	T90_ECL	Duration - ECLAIRs	X		IAP / LUPM		YES
		GRM	T90_GRM	Duration - GRM	X	X	IAP / LUPM	Nanning	
		ECLGRM	Joint analysis to define common time intervals for the spectral analysis		X		IAP / LUPM	Nanning	
	RSP	GRM	GRM Detector Response Matrices including Earth/SC scattering effects		X	X		Nanning/IHEP	NO
	SPEC	ECL	SP_ECL	Spectra in physical units - ECLAIRs	X		LUPM		YES
		GRM	SP_GRM	Spectra in physical units - GRM	X	X	LUPM	Nanning	
		ECLGRM	SP_ECLGRM	Spectra in physical units - ECLAIRs and GRM	X		LUPM	Nanning	
	LC	ECL	LC_ECL	Light curves in physical units - ECLAIRs	X		LUPM		YES
			PF_ECL	Peak fluxes - ECLAIRs					
		GRM	LC_GRM	Light curves in physical units - GRM	X	X	LUPM	Nanning	
			PF_GRM	Peak fluxes - GRM					
	FLUENCE	ECL	FLUENCE_ECL	Fluences - ECLAIRs	X		LUPM		YES
		GRM	FLUENCE_GRM	Fluences - GRM	X	X	LUPM	Nanning	
		ECLGRM	FLUENCE_ECLG	Fluences - ECLAIRs and GRM	X		LUPM	Nanning	
	HRL	ECL	HR_ECL	Hardness ratios - ECLAIRs	X		IAP		YES
			LAG_ECL	Time lags between light curves - ECLAIRs					
		GRM	HR_GRM	Hardness ratios - GRM	X	X	IAP	Nanning	
			LAG_GRM	Time lags between light curves - GRM					
		ECLGRM	HR_ECLGRM	Hardness ratios - ECLAIRs and GRM	X		IAP	Nanning	
			LAG_ECLGRM	Time lags between light curves - ECLAIRs and GRM					

- Goal for the DC-2 (12/2020): develop all tasks above
- GRM group at IHEP committed to help develop the LOC-GRM and RSP-GRM tasks
- GRM group in Nanning **committed (TBC)** to develop the GRM X-band pipeline at CSC, in collaboration with IAP/LUPM for the common analysis software

Outline

- **Overview of the VHF pipelines for ECLAIRs and GRM at FSC**
 - Excerpts from the Core Program Software Description Document
 - High-energy scientific products
- **The VHF ECLGRM pipeline at FSC**
 - Scientific products and related tasks
 - Activation conditions
 - Developers & plans for the FSC DC-1
- **The X-band ECLAIRs and GRM pipelines at FSC and CSC**
 - Scientific products and related tasks
 - Activation conditions
 - Developers
- **Organization of the software development**
 - Gitlab
 - Redmine

Working environment for scientific software development

- All packages dedicated to ECLGRM data processing are located under <https://drf-gitlab.cea.fr/svom/eclgrm>

The screenshot shows the GitLab web interface for the 'eclgrm' group. The browser address bar displays 'https://drf-gitlab.cea.fr/svom/eclgrm'. The left sidebar contains navigation links: Overview, Details (selected), Activity, Issues (0), Merge Requests (0), and Members. The main content area shows the 'eclgrm' group details, including the group ID (575) and a description: 'Subgroup for storing projects dealing with Eclairs+GRM data processing.' Below this, there are tabs for 'Subgroups and projects', 'Shared projects', and 'Archived projects'. The 'Subgroups and projects' tab is active, showing a list of projects: 'eclgrm-monitor' (Eclgrm pipeline supervision function), 'eclgrm-analysis' (Filing for the algorithmic part of the "eclairs and grm" pipeline), 'eclgrm-common' (For common Classes, marked as a Developer project), and 'eclgrm-pipeline' (Contribution DC-1 - Combined ECLAIRs/GRM data traitement, marked as a Developer project).

GitLab deposit for data analysis algorithms: clone then commit software development

GitLab deposit for data analysis common classes: clone to build the eclgrm-common package

What is useful for users (scientists) to start developing s/w?

- **Ask jean-paul.lefevre@cea.fr (with a copy to piron@in2p3.fr) for a login to access <https://drf-gitlab.cea.fr>**
- **Install the eclgrm-common package and exploit the eclgrm-analysis deposit**
 - Follow the installation procedure from the Wiki tab
 - <https://drf-gitlab.cea.fr/svom/eclgrm/eclgrm-common>
 - <https://drf-gitlab.cea.fr/svom/eclgrm/eclgrm-analysis>
- **Directories**
 - eclgrm-analysis/inputs → to use data input
 - eclgrm-analysis/outputs → to store results
 - eclgrm-analysis/src/eclgrm_analysis → to implement new code for science
 - eclgrm-analysis/src/eclgrm_analysis/sample → example of commands and scripts
 - eclgrm-analysis/src/eclgrm_analysis/sdb → example to read/write on the SDB
 - eclgrm-analysis/examples → set of example scripts
- **Unit tests should be saved under eclgrm-analysis/tests**
 - Input data for tests in eclgrm-analysis/tests/data
 - Temporary data in eclgrm-analysis/tests/tmp (this one doesn't appear on GitLab deposit)
- **As software deliveries progress, engineers will perform the qualitative testing and integration into eclgrm-pipeline**

ECLGRM group and meetings

- **ECLGRM group active since Spring 2019, gathering scientists and engineers from CEA, IAP, IRAP, LUPM and IHEP**
 - Mailing list will be created soon
 - Add colleagues in Nanning: **please send names & email addresses to piron@in2p3.fr**
- **GRM-IT wiki page on the SVOM redmine**
 - To organize the ECLGRM teleconferences
 - To collect informations on simulations, analysis software, data products, calibration, etc.

The screenshot shows a web browser displaying the GRM-IT wiki page on the SVOM Redmine project. The browser address bar shows the URL: <https://forge.in2p3.fr/projects/grm-it/wiki>. The page header includes navigation links: Home, My page, Projects, Scrum statistics, Help. The user is logged in as 'fpiron' with links for 'My account' and 'Sign out'. The main content area is titled 'GRM SIMULATIONS, DATA PRODUCTS AND ANALYSIS SOFTWARE'. Below the title, there is a description: 'This page collects information on GRM simulations as well as technical documentation on the instrument data products and analysis software.' A yellow box contains a list of topics: GRM SIMULATIONS, DATA PRODUCTS AND ANALYSIS SOFTWARE, Meetings (ECLGRM telecon 2019 Sep 27, 10AM France / 4PM China, ECLGRM telecon 2019 Sep 5, 10AM France / 4PM China, ECLGRM telecon 2019 June 19, 10AM France / 4PM China), GRM simulations (Simulations to support the development of data processing pipelines, GRD angular response, GRM background, Other simulations, GRM response, GRM background), GRM data products (GRM VHF packets, GRM X-band data, GRM Detector Response Matrices), GRM flight software, GRM localization performance, and GRM calibrations. On the right side, there is a 'WIKI' section with links: Start page, Index by title, and Index by date.

Backup

Notice levels

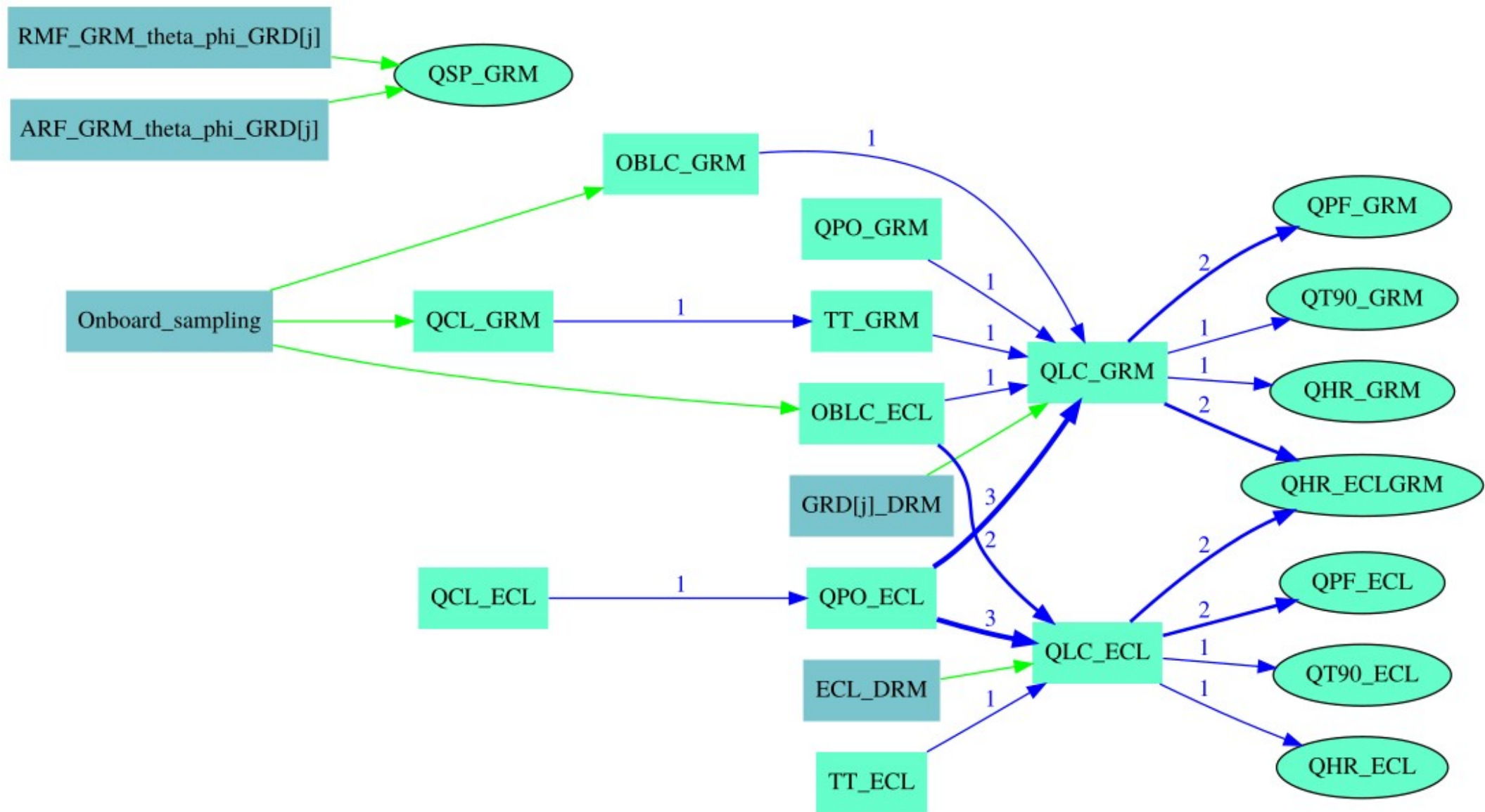
From the “SVOM alert distribution strategy” document
(SV-SY-AN-53-JPO)

Table 1 — Definition of alert levels for notices.

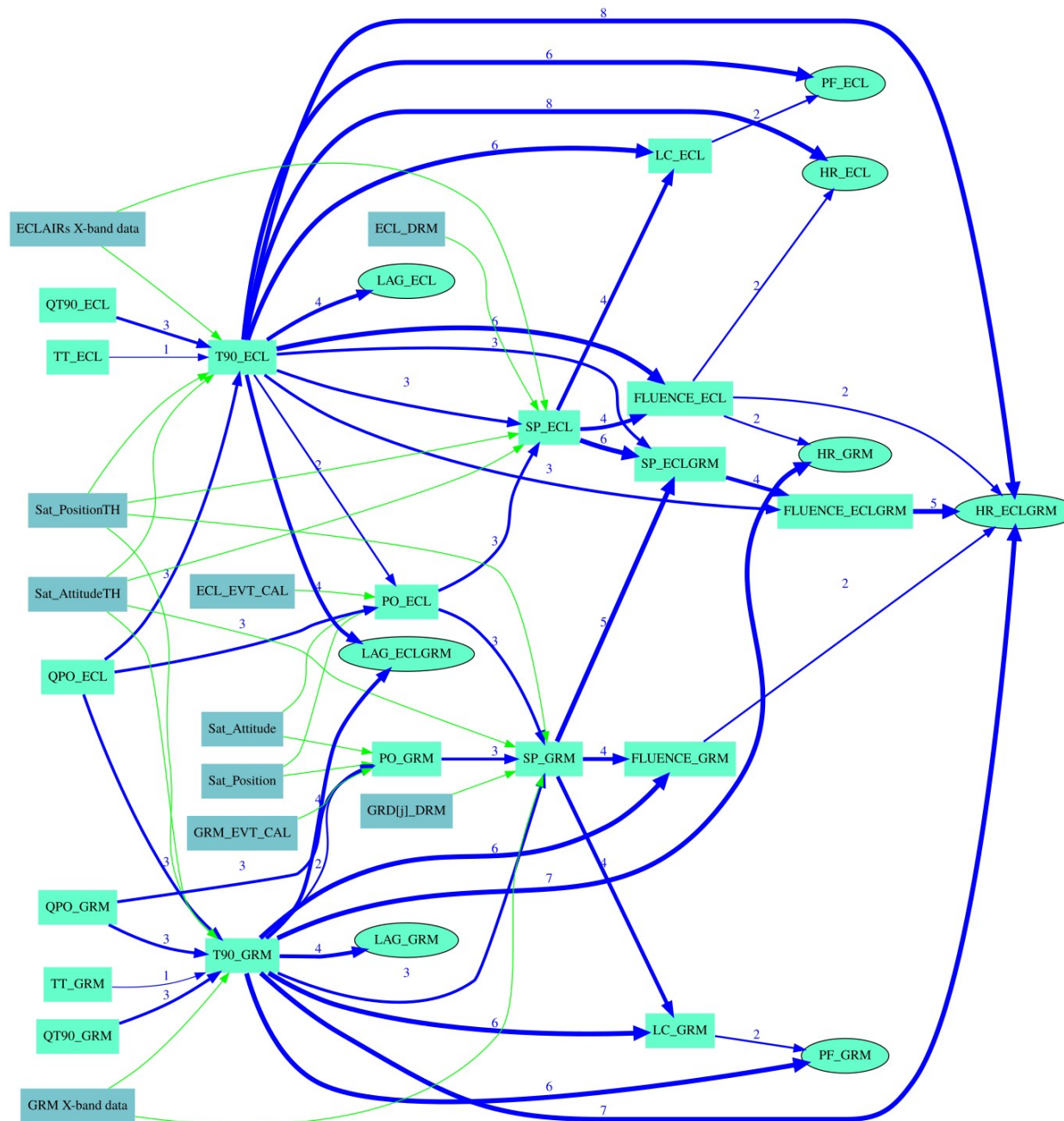
Prompt alert phase	N1	ECLAIRs localization (SNR above threshold)
	N1a	ECLAIRs localization (SNR below threshold)
	N1b	GRM only detection (raw localization)
	N2a	Burst parameters derived from a subset of ECLAIRs and GRM data ¹
	N2b	MXT localization (only if platform slew)
	N2c	VT localization (only if platform slew)
	N2d	F-GFT, C-GFT and GWAC results
Final alert phase	N3	Final results for a validated trigger Or Cancellation of previous notices for a false trigger Or New burst detected by the ground data processing or confirmed after counterpart has been found (N1a, N1b)

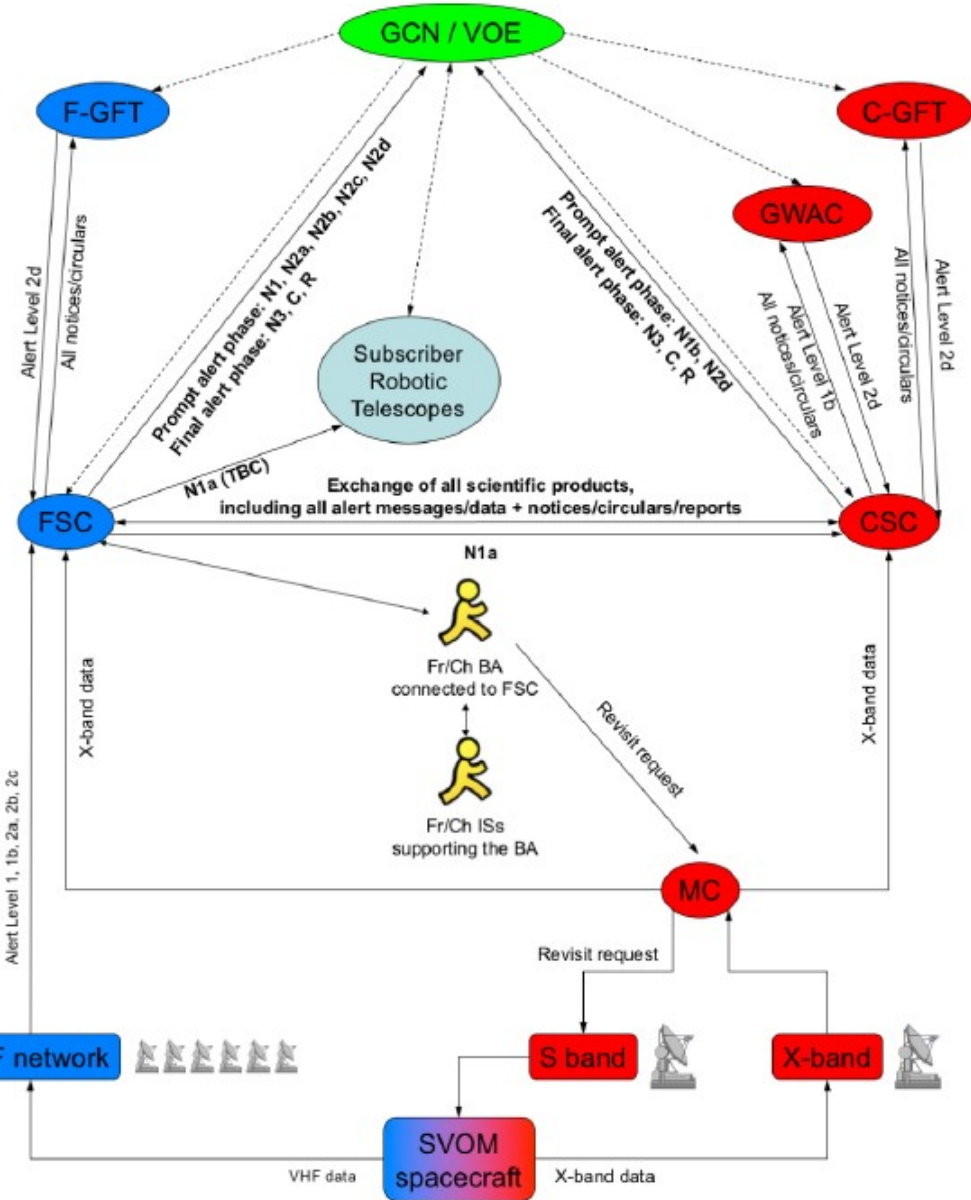
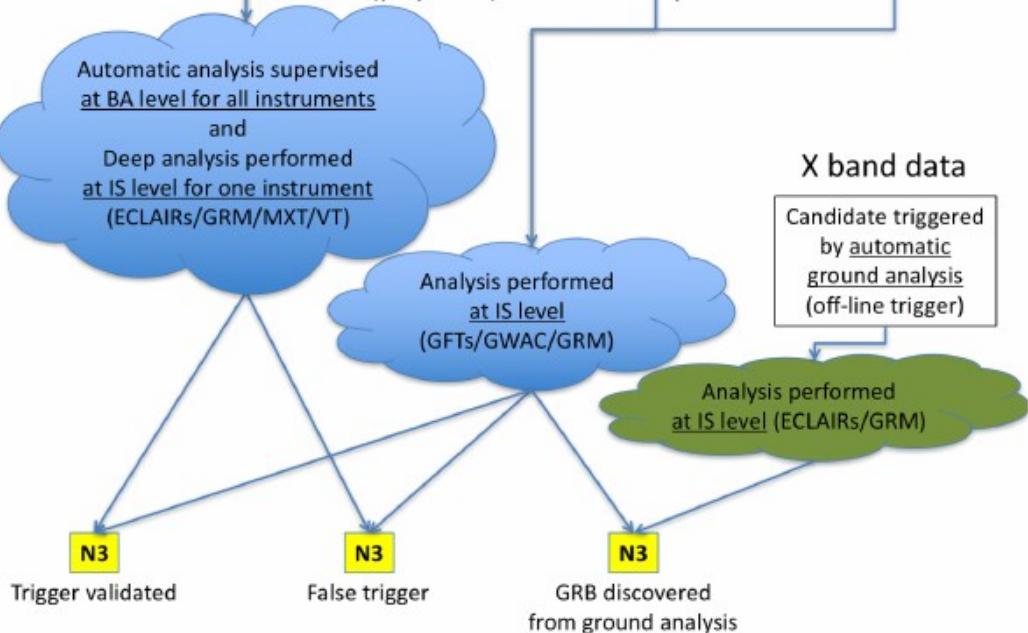
¹ The data set downloaded through alert level 2a contains data from ECLAIRs and also from GRM in several large energy bands.

Scientific product dependencies (VHF)



Scientific product dependencies (X-band)





Note on the GRM response to GRBs

- The DRM of each GRD depends on the GRB-Earth-detector geometrical configuration
 - Due to the scattering of the GRB signal in the spacecraft and the Earth's atmosphere (and because the GRM is not an imager, unlike ECLAIRs)
- How does the GRM team plan to deliver these GRB-specific calibration products?
- For example, the Fermi/GBM response to a GRB can be retrieved in two ways
 - Either from the burst data products available at the Fermi Science Support Center
 - Or by running the GBM Response Generator available at the same site

From <https://fermi.gsfc.nasa.gov/ssc/data/access/qbm>
Trigger and Burst Data Products

The following data products are created by the GIOC and sent to the FSSC whenever a trigger has been detected, regardless of whether the trigger resulted from a gamma-ray burst (for example, a solar flare or an electron precipitation event may have caused the trigger). These data products have a latency of 1 day. Any of the products may be updated with new versions after the initial delivery. In particular, the catalog entry files (GS-105, GS-106, and GS-109) may be updated as trigger parameters are refined.

ID	Name	Description
GS-101	CTIME (burst version)	For each detector, the counts accumulated every 0.064 s in 8 energy channels
GS-102	CSPEC (burst version)	For each detector, the counts accumulated every 1024 s in 128 energy channels.
GS-103	GBM TTE (burst version)	Event data for the burst. There is one file for each detector.
GS-104	GBM DRMs	8 and 128 energy channel Detector Response Matrices (DRMs) for all 14 detectors. These files may not be produced for all triggers.
GS-105	GBM Trigger Catalog Entry	Classification of GBM trigger with some characteristics (e.g., trigger time, coordinates). This file is used to create the GBM Trigger Catalog .
GS-107	GBM TRIGDAT	All the GBM's messages downlinked through TDRSS. These messages are the basis of the GCN Notices for the burst.
	Quicklook Plots	Lightcurves and spacecraft pointing history files in GIF and PDF format.

From <https://fermi.gsfc.nasa.gov/ssc/data/analysis/gbm>
Documentation for the GBM Response Generator

SA_GBM_RSP_Gen.pl:

A routine that processes Fermi Gamma-ray Burst Monitor (GBM) science data and creates level 1 ICD-compliant FITS Detector Response Function files (GS-104 from GLAST-GS-ICD-0006). Written, Aug. 13, 2008, by RDP @ UAH.

(To install, please see the [Installation Instructions](#).)

NOTE: GRB trigger data from GBM already have a standard set of response functions delivered to the data archive, so there is generally no need to redo them.

The GBM response file generator has two modes of operation:

- 1) Production of response files for a triggered event from GBM, and
- 2) production of response files for an arbitrary source location at an arbitrary time.