CU5 Software Development Plan

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approved by: DPAC Project Office
reference: GAIA-C5-PL-IOA-FVL-001
issue: 11
revision: 4
date: 2012-03-26
status: Issued

Abstract

This is the Software Development Plan for CU5, photometric data processing.

Document History

Issue	Revision	Date	Author	Comment
11	4	2012-03-26	FVL	Approved by PO, issued
11	3	2012-03-08	FVL	Final comments from CJ incorporated, ready for approval
11	2	2012-02-09	FVL	Comments from FDA and PJR incorporated
11	1	2012-02-06	FVL	Finished draft end-of-cycle 11 release
11	0	2012-01-16	FVL	Start of end-of-cycle 11 release
10	5	2011-08-02	FVL	Added comments from CC
10	4	2011-07-26	FVL	Added comments from FDA
10	3	2011-07-26	FVL	Further comments from PJR
10	2	2011-07-25	FVL	Incorporated comments from PJR
10	1	2011-07-14	FVL	Start of end-of-cycle 10 release
10	0	2011-01-07	FVL	Start of end-of-cycle 9 release
9	0	2010-06-29	FVL	Start end-of-cycle 8 release
8	4	2010-01-14	FVL	updated Gantt charts
8	3	2010-01-12	FVL	updated development section
8	2	2010-01-11	PJR	added CIL and descriptions to PA compliance matrix
8	1	2010-01-07	FVL	updated WP descriptions for DU02, DU11, DU13, DU14
8	0	2009-12-21	FVL	Start preparation for end-of-cycle-7 release
7	1	2009-08-03	FVL	Adjusted section headings after questions from PO
7	0	2009-06-14	FVL	Prepared for end-of-cycle 6 release
6	1	2009-04-15	FVL	Final adjustments from project office
6	0	2009-03-26	FVL	Prepared for CDR
5	3	2009-03-12	DWE	Revised DU15 section
5	2	2008-12-08	FVL	Added 2007 manpower figures following request by Drimmel
5	1	2008-11-27	FVL	Incorporated comments from PJR and issued to Livelink
5	0	2008-11-25	FVL	First adjustment end cycle 5 release
4	1	2008-07-22	FVL	Added summary table in introduction
4	0	2008-07-15	FVL	Released version for end cycle 4
3	8	2008-07-09	PJR	Changed Total Effort to Effort in MM/yr in WP template.
3	7	2008-07-09	FVL	Added coordination tasks to 501 and corrected 518
3	6	2008-06-27	FVL	Added cycle 4 achievements and cycle 5 goals, updated the product tree figure
3	5	2008-05-20	PJR	Added RMP reference + minor changes to text
3	4	2008-05-17	FVL	Adjustments to template, updated gantt charts
3	3	2008-05-16	PJR	Updates following the SRR
3	2	2008-02-24	AB	Changed name of DU18 work package from ‘2D image restoration’ to ‘Source environment analysis’

3	1	2007-09-28	PJR	Further adjustment to SDP specifications
3	0	2007-09-01	FVL	Started adjustment to SDP specifications
2	0	2006-12-07	FDA, FVL	Comments from CJ and AB on the general part taken into account. Several minor changes and adoption of the DPAC document class.
1	1	2006-11-06	FVL	Inclusion of updated WP descriptions received by all DU managers
1	0	2006-06-20	FVL	Creation

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1 Introduction

1.1 Scope

This document describes the development units and work packages for the photometric processing coordination unit (CU5) in the Gaia data processing and analysis consortium, DPAC. As such it covers the activities planned for the design, development, testing and implementation of the software for the photometric data processing, related calibrations, and related shell tasks: non-variability detection as required for selection of calibration standards, the flux-based science alerts and the source-environment analysis.

Some CU5 tasks carried out by CU5 will be implemented by a different unit. These are: CTI mitigation, background determination and PSF and LSF calibration (developed by CU5-DU10 and implemented in CU3); First Look (FL) processes for CCD health monitoring (CODC) and LSF/PSF calibration (LODC). Testing of these tasks has now been brought back to CU5. Thus, CU5 develops processes that become part of the initial data treatment (IDT), First Look and intermediate data update (IDU).

1.2 Applicable Documents

WOM-017	Project Implementation Plan for Gaia DPAC
RD-010	Gaia DPAC Project Development Plan
WOM-001	Work Breakdown Structures for Gaia DPAC
TL-001	DPAC Product Assurance Plan
WOM-012	DPAC Software Configuration Management Plan
MP-011	Document Reference Codes for Gaia
RD-008	DPAC Risk Management Plan
TLO-001	ECSS Tailoring
RG-004	DPAC System Validation and Test Plan

1.3 References

[GA-004], Altavilla, G., Pancino, E., Marinoni, S., et al., 2011, *Instrument Familiarization Plan for ground based observations of SPSS. I. CCD Shutter Characterization and Linearity Evaluation*,
GAIA-C5-TN-OABO-GA-004,
URL http://www.rssd.esa.int/llink/livelink/open/3075673

[RBG-003], Burgon, R., 2011, *AlertPipe Xmatch Classification Implementation*,
GAIA-C5-TN-OU-RBG-003,
URL http://www.rssd.esa.int/llink/livelink/open/3105523

[RBG-004], Burgon, R., 2011, *AlertPipe Xmatch Catalogue Search Implementation*, GAIA-C5-TN-OU-RBG-004, URL http://www.rssd.esa.int/llink/livelink/open/3105659

[RBG-005], Burgon, R., 2011, *AlertPipe Publisher Implementation*, GAIA-C5-TN-OU-RBG-005, URL http://www.rssd.esa.int/llink/livelink/open/3105735

[GB-003], Busso, G., 2010, *Virtual Objects for the Blue and Red Photometers*, GAIA-C5-TN-LEI-GB-003, URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/GAIA-C5-TN-LEI-GB-003/GAIA-C5-TN-LEI-GB-003.pdf

[GB-006], Busso, G., 2011, *Description of the charge injection measurement task for BP/RP in IDT*, GAIA-C5-TN-LEI-GB-006, URL http://www.rssd.esa.int/llink/livelink/open/3102251

[GB-007], Busso, G., 2011, *Background Measurements for BP/RP in IDT*, GAIA-C5-TN-LEI-GB-007, URL http://www.rssd.esa.int/llink/livelink/open/3102305

[GB-008], Busso, G., 2011, *Background Treatment in the new PhotPipe infrastructure*, GAIA-C5-TN-LEI-GB-008, URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/GAIA-C5-TN-LEI-GB-008/GAIA-C5-TN-LEI-GB-008.pdf

[GB-009], Busso, G., 2011, *Proposal for the treatment of non-nominal windows in BP/RP*, GAIA-C5-TN-LEI-GB-009, URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/GAIA-C5-TN-LEI-GB-009/GAIA-C5-TN-LEI-GB-009.pdf

[JMC-012], Carrasco, J., Jordi, C., 2011, *XP passbands flux calibration model*, GAIA-C5-TN-UB-JMC-012, URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/GAIA-C5-TN-UB-JMC-012/GAIA-C5-TN-UB-JMC-012.pdf

[JMC-010], Carrasco, J.M., Jordi, C., Fabricius, C., 2011, *Approaches to epoch spectra calibration*, GAIA-C5-TN-UB-JMC-010, URL http://www.rssd.esa.int/llink/livelink/open/3086150

[JMC-011], Carrasco, J.M., Montegriffo, P., Jordi, C., et al., 2011, *Design proposal for elements of the BP/RP full-forward model*, GAIA-C5-TN-UB-JMC-011, URL http://www.rssd.esa.int/llink/livelink/open/3086149

[RSC-001], Collins, R., Hambly, N., 2010, *Description of the LevenbergMarquardt Algorithm*, GAIA-C5-TN-IFA-RSC-001, URL http://www.rssd.esa.int/llink/livelink/open/3036283

[NJC-005], Cross, N.J.G., Heyrovsky, A., 2011, *Specifying diagnostic tests in CU5 DU10 DFLM diasgnostics*, GAIA-C5-TN-IFA-NJC-005, URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/GAIA-C5-TN-IFA-NJC-005/GAIA-C5-TN-IFA-NJC-005.pdf

[MDV-010], Davidson, M., 2011, *Proposal for a DU10 Simulator*, GAIA-C5-TN-IFA-MDV-010, URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/GAIA-C5-TN-IFA-MDV-010/GAIA-C5-TN-IFA-MDV-010.pdf

[MDV-011], Davidson, M., 2011, *Discussion on CDM03*, GAIA-C5-TN-IFA-MDV-011, URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/GAIA-C5-TN-IFA-MDV-011/GAIA-C5-TN-IFA-MDV-011.pdf

[FDA-024], De Angeli, F., 2011, *PhotPipe 10.0 Software Release Note*, GAIA-C5-SP-IOA-FDA-024, URL http://www.rssd.esa.int/llink/livelink/open/3107344

[FDA-025], de Angeli, F., 2011, *DPCI configuration item list*, GAIA-DI-SP-IOA-FDA-025, URL http://www.rssd.esa.int/llink/livelink/open/3086252

[RD-014], DPAC Project Office, 2011, *DPAC Risk Register*, GAIA-CD-PL-DPAC-RD-014, URL http://www.rssd.esa.int/llink/livelink/open/2859834

[DWE-031], Evans, D., De Angeli, F., 2011, *Calibrating BP/RP epoch spectra using the exact solution method*, GAIA-C5-TN-IOA-DWE-031, URL http://www.rssd.esa.int/llink/livelink/open/3082068

[DWE-03], Evans, D.W., 2011, *Definition of Time Intervals for CU5 calibrations*, GAIA-C5-TN-IOA-DWE-03, URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/GAIA-C5-TN-IOA-DWE-03/GAIA-C5-TN-IOA-DWE-03.pdf

[DWE-029], Evans, D.W., De Angeli, F., Riello, M., et al., 2011, *Calibration plan for flux and BP/RP observations*, GAIA-C5-SP-IOA-DWE-029, URL http://www.rssd.esa.int/llink/livelink/open/3056000

[CF-012], Fabricius, C., Jordi, C., van Leeuwen, F., et al., 2009, *Proposal for internal calibration of XP spectra*,
GAIA-C5-TN-UB-CF-012,
URL http://www.rssd.esa.int/llink/livelink/open/2922510

[DJF-022], Fyfe, D., 2011, *CalibrationTools 10.0.0 Software Release Note*,
GAIA-C5-SP-UOL-DJF-022,
URL http://www.rssd.esa.int/llink/livelink/open/3088559

[DJF-023], Fyfe, D., Hambly, N., 2011, *CalibrationTools 10.0.0 Software Test Report*,
GAIA-C5-TR-UOL-DJF-023,
URL http://www.rssd.esa.int/llink/livelink/open/3088226

[DJF-018], Fyfe, D., Hambly, N., Heyrovsky, A., et al., 2011, *CalibrationTools Software Test Specification*,
GAIA-C5-SP-UOL-DJF-018,
URL http://www.rssd.esa.int/llink/livelink/open/3088556

[DJF-020], Fyfe, D., Hambly, N., Heyrovsky, A., et al., 2011, *PSF/LSF Calibration Software Test Specification*,
GAIA-C5-SP-UOL-DJF-020,
URL http://www.rssd.esa.int/llink/livelink/open/3088557

[DJF-021], Fyfe, D., Hambly, N., Ouzounis, A., et al., 2011, *PSF/LSF Calibration Software Design Document*,
GAIA-C5-SP-UOL-DJF-021,
URL http://www.rssd.esa.int/llink/livelink/open/3088558

[DJF-017], Fyfe, D., Hambly, N., Voss, H., et al., 2011, *CalibrationTools Software Design Document*,
GAIA-C5-SP-UOL-DJF-017,
URL http://www.rssd.esa.int/llink/livelink/open/3088225

[DJF-019], Fyfe, D., Hambly, N.C., Davidson, M., et al., 2011, *PSF/LSF Calibration Workpackage Software Requirements Specification*,
GAIA-C5-SP-UOL-DJF-019,
URL http://www.rssd.esa.int/llink/livelink/open/3085890

[DJF-026], Fyfe, D., Ouzounis, A., Hambly, N., 2011, *PSF/LSF Calibration Software Test Report*,
GAIA-C5-TR-UOL-DJF-026,
URL http://www.rssd.esa.int/llink/livelink/open/3088227

[RG-004], Guerra, R., leaders CU leaders, D., 2011, *DPAC System Validation and Test Plan*,
GAIA-C1-SP-ESAC-RG-004,
URL http://www.rssd.esa.int/llink/livelink/open/2898933

[NCH-016], Hambly, N., 2011, *OITF Progress Report for Implementation Review*, GAIA-CH-PR-IFA-NCH-016, URL http://www.rssd.esa.int/llink/livelink/open/3093088

[NCH-006], Hambly, N.C., Davidson, M., Collins, R.S., 2011, *CTI mitigation - implementation and development issues*, GAIA-C5-TN-IFA-NCH-006, URL http://www.rssd.esa.int/llink/livelink/open/3093085

[SHO-005], Hodgkin, S., Wyrzykowski, Ł.., 2011, *AlertPipe Software Design Description*, GAIA-C5-SP-IOA-SHO-005, URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/GAIA-C5-SP-IOA-SHO-005/GAIA-C5-SP-IOA-SHO-005.pdf

[CJ-041], Jordi, C., 2011, *Photometric relationships between Gaia photometry and existing photometric systems*, GAIA-C5-TN-UB-CJ-041, URL http://www.rssd.esa.int/llink/livelink/open/2760608

[CJ-048], Jordi, C., 2012, *BP/RP Bandwidth non-uniformity*, GAIA-C5-TN-UB-CJ-048, URL http://www.rssd.esa.int/llink/livelink/open/3107451

[TL-001], Levoir, T., Damery, J., Hoar, J., et al., 2010, *DPAC Product Assurance Plan*, GAIA-C1-PL-CNES-TL-001, URL http://www.rssd.esa.int/llink/livelink/open/2439085

[TLO-001], Lock, T., 2007, *Software Engineering Standards (ECSS-E-40B) - Tailored for Gaia Science Ground Segment*, GAIA-C1-TN-ESAC-TLO-001, URL http://www.rssd.esa.int/llink/livelink/open/2786522

[RD-008], Mercier, E., Drimmel, R., Lock, T., 2009, *DPAC Risk Management Plan*, GAIA-CD-PL-DPAC-RD-008, URL http://www.rssd.esa.int/llink/livelink/open/2785681

[RD-010], Mercier, E., Drimmel, R., O'Mullane, W., et al., 2011, *DPAC Project Development Plan*, GAIA-CD-PL-INAF-RD-010, URL http://www.rssd.esa.int/llink/livelink/open/2786669

[PMN-007], Montegriffo, P., 2011, *A forward model for the calibration of XP mean spectra*, GAIA-C5-TN-OABO-PMN-007, URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/GAIA-C5-OABO-PMN-007/GAIA-C5-TN-OABO-PMN-007.pdf

[PMN-008], Montegriffo, P., 2011, *XP LSF modelling*,
GAIA-C5-TN-OABO-PMN-008,
URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/GAIA-C5-OABO-PMN-008/GAIA-C5-TN-OABO-PMN-008.pdf

[WOM-001], O'Mullane, W., Lammers, U., 2007, *Work breakdown structures for DPAC*,
GAIA-C1-TN-ESAC-WOM-001,
URL http://www.rssd.esa.int/llink/livelink/open/497865

[WOM-017], O'Mullane, W., Drimmel, R., Mignard, F., et al., 2008, *Project Implementation Plan (PIP)*,
GAIA-CD-PL-ESAC-WOM-017,
URL http://www.rssd.esa.int/llink/livelink/open/2812481

[WOM-012], O'Mullane, W., Nguyen, A.T., Hoar, J., et al., 2009, *DPAC Configuration Management Plan*,
GAIA-C1-PL-ESAC-WOM-012,
URL http://www.rssd.esa.int/llink/livelink/open/2760363

[PFO-007], Ortiz, P.F., 2008, *The PSF/LSF processing algorithms in IDA for IDT/FL*,
GAIA-C5-TN-UOL-PFO-007,
URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/GAIA-C5-TN-UOL-PFO-007/GAIA-C5-TN-UOL-PFO-007.pdf

[PFO-019], Ortiz, P.F., 2011, *Organising the PSF/LSF library by transit properties and source's SED*,
GAIA-C5-TN-UOL-PFO-019

[PFO-020], Ortiz, P.F., 2011, *Initial calibration of the optical images during the commissioning phase.*,
GAIA-C5-TN-UOL-PFO-020

[PFO-021], Ortiz, P.F., 2011, *A charge-injection free period at the beginning of the mission.*,
GAIA-C5-TN-UOL-PFO-021

[PFO-022], Ortiz, P.F., 2011, *Description of the LSF calibration in IDU*,
GAIA-C5-TN-UOL-PFO-022,
URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/GAIA-C5-TN-UOL-PFO-022/GAIA-C5-TN-UOL-PFO-022.pdf

[AO-001], Ouzounis, A., Hambly, N., 2010, *Description of Linear fitting algorithms for CalibrationTools*,
GAIA-C5-TN-IFA-AO-001,
URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/GAIA-C5-TN-IFA-AO-001/GAIA-C5-TN-IFA-AO-001.pdf

[AO-002], Ouzounis, A., Hambly, N., 2011, *Description of Bias Non Uniformity algorithms for CalibrationTools*,
GAIA-C5-TN-IFA-AO-002,
URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/GAIA-C5-TN-IFA-AO-002/GAIA-C5-TN-IFA-AO-002.pdf

[EP-007], Pancino, E., Altavilla, G., Bellazzini, et al., 2011, *Ground-based observations of the Gaia Spectrophotometric Standard Stars. Present status and future steps.*,
GAIA-C5-TN-OABO-EP-007,
URL http://www.rssd.esa.int/llink/livelink/open/3081178

[EP-008], Pancino, E., Altavilla, G., Rossetti, et al., 2011, *The local Bologna archive of SpectroPhotometric Standard Stars observations*,
GAIA-C5-TN-OABO-EP-008,
URL http://www.rssd.esa.int/llink/livelink/open/3081255

[MP-011], Perryman, M., 2011, *Document reference codes for Gaia*,
GAIA-CG-PL-ESA-MP-011,
URL http://www.rssd.esa.int/llink/livelink/open/497672

[AP-001], Piersimoni, A., De Luise, F., Busso, G., 2011, *Reconstruction of BP/RP spectra for decontamination*,
GAIA-C5-TN-OATE-AP-001,
URL http://www.rssd.esa.int/llink/livelink/open/3088232

[SR-003], Ragaini, S., Montegriffo, P., Cacciari, C., 2011, *A new model for the absolute calibration of AF integrated photometry*,
GAIA-C5-TN-OABO-SR-003,
URL http://www.rssd.esa.int/llink/livelink/open/3102249

[PJR-008], Richards, P.J., 2011, *CU5 Software Product Assurance Report for Cycle 10*,
GAIA-C5-PR-RAL-PJR-008,
URL http://www.rssd.esa.int/llink/livelink/open/3093843

[MR-005], Riello, M., de Angeli, F., 2011, *DPCI Development Plan*,
GAIA-DI-PL-IOA-MR-005,
URL http://www.rssd.esa.int/llink/livelink/open/3042635

[GTR-013], Rixon, G., 2011, *Software Test Report for AlertPipe 10.2*,
GAIA-C5-TR-IOA-GTR-013,
URL http://www.rssd.esa.int/llink/livelink/open/3088351

[GTR-015], Rixon, G., 2011, *GB-Obs data-products Software Test Report*,
GAIA-C5-TR-IOA-GTR-015,
URL http://www.rssd.esa.int/llink/livelink/open/3086656

[GTR-017], Rixon, G., 2011, *PhotPipe 10.0 Software Test Report*,
GAIA-C5-TR-IOA-GTR-017,
URL http://www.rssd.esa.int/llink/livelink/open/3096668

[GTR-012], Rixon, G., Evans, D.W., 2011, *PhotPipe Software Test Report – 3G and SSCal*,
GAIA-C5-SUM-IOA-GTR-012,
URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/ECSS/STR/GAIA-C5-SUM-IOA-GTR-012/GAIA-C5-SUM-IOA-GTR-012.pdf

[GTR-014], Rixon, G., Pancino, E., Altavilla, G., 2011, *GB-Obs Software Test Specification*,
GAIA-C5-SP-IOA-GTR-014,
URL http://www.rssd.esa.int/llink/livelink/open/3086630

[SMR-002], S. Marinoni, e.a., 2011, *Instrument Familiarization Plan for ground based observations of SPSS II. Calibration Frames Study and Recommendations*,
GAIA-C5-TN-OABO-SMR-002,
URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/GAIA-C5-TN-OABO-SMR-002/GAIA-C5-TN-OABO-SMR-002.pdf

[SMR-003], S. Marinoni, e.a., 2011, *Data Reduction Protocol for Ground Based Observations of SpectroPhotometric Standard Stars. III. Quality Control on SPSS Photometric Frames and Photometric Catalogues Production*,
GAIA-C5-TN-OABO-SMR-003,
URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/GAIA-C5-TN-OABO-SMR-003/GAIA-C5-TN-OABO-SMR-003.pdf

[SMR-004], S. Marinoni, e.a., 2011, *Data Reduction Protocol for Ground Based Observations of SpectroPhotometric Standard Stars. IV. Short Variability Monitoring: Light Curves production and analysis*,
GAIA-C5-TN-OABO-SMR-004,
URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/GAIA-C5-TN-OABO-SMR-004/GAIA-C5-TN-OABO-SMR-004.pdf

[CS-004], Soubiran, C., Mignard, F., Allende-Prieto, C., et al., 2008, *GBOG Terms of Reference*,
GAIA-CD-PL-LAB-CS-004,
URL http://www.rssd.esa.int/llink/livelink/open/2856717

[FFS-001], Suess, F.F., van Leeuwen, F., 2011, *Description of data types for input to CU5 Quality Control processes*,
GAIA-C5-TN-IOA-FFS-001,
URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/GAIA-C5-TN-IOA-FFS-001/GAIA-C5-TN-IOA-FFS-001.pdf

[FVL-068], van Leeuwen, F., 2011, *Differential dispersion and geometric calibration for BP/RP*,

GAIA-C5-TN-IOA-FVL-068,
URL http://www.rssd.esa.int/llink/livelink/open/3093034

[FVL-085], van Leeuwen, F., 2011, *CU5 Progress Report for end of Cycle 10*,
GAIA-C5-PR-IOA-FVL-085,
URL http://www.rssd.esa.int/llink/livelink/open/3085643

[FVL-086], van Leeuwen, F., 2011, *QC Operations Scenario*,
GAIA-C5-TN-IOA-FVL-086-11,
URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/GAIA-C5-TN-IOA-FVL-086/GAIA-C5-TN-IOA-FVL-086.pdf

[FVL-089], van Leeuwen, F., 2011, *Options for graphics displays in CU5-QC*,
GAIA-C5-TN-IOA-FVL-089,
URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/GAIA-C5-TN-IOA-FVL-089/GAIA-C5-TN-IOA-FVL-089.pdf

[FVL-074], van Leeuwen, F., Richards, P., 2011, *CU5 top-level Software Requirement Specifications*,
GAIA-C5-SP-IOA-FVL-074,
URL http://www.rssd.esa.int/llink/livelink/open/3073983

[FVL-062], van Leeuwen, F., Riello, M., 2011, *CU5/DPCI Operations plan*,
GAIA-C5-TN-IOA-FVL-062,
URL http://www.rssd.esa.int/llink/livelink/open/3056342

[FVL-070], van Leeuwen, F., Brown, A., Cacciari, C., et al., 2011, *PhotPipe Software Requirement Specifications*,
GAIA-C5-SP-IOA-FVL-070,
URL http://www.rssd.esa.int/llink/livelink/open/3073809

[FVL-084], van Leeuwen, F., Brown, A., Cacciari, C., et al., 2011, *CU5 Internal Report 2011.06*,
GAIA-C5-PR-IOA-FVL-084,
URL http://www.rssd.esa.int/llink/livelink/open/3086098

[FVL-087], van Leeuwen, F., Brown, A., Cacciari, C., et al., 2011, *CU5 Internal Report 2011.07*,
GAIA-C5-PR-IOA-FVL-087,
URL http://www.rssd.esa.int/llink/livelink/open/3097207

[FVL-088], van Leeuwen, F., Brown, A., Cacciari, C., et al., 2011, *CU5 Internal Report 2011.08*,
GAIA-C5-PR-IOA-FVL-088,
URL http://www.rssd.esa.int/llink/livelink/open/3099909

[FVL-090], van Leeuwen, F., Brown, A., Cacciari, C., et al., 2011, *CU5 Internal Report 2011.09*,
GAIA-C5-PR-IOA-FVL-090,
URL http://www.rssd.esa.int/llink/livelink/open/3102616

[FVL-091], van Leeuwen, F., Brown, A., Cacciari, C., et al., 2011, *CU5 Internal Report 2011.10*,
GAIA-C5-PR-IOA-FVL-091,
URL http://www.rssd.esa.int/llink/livelink/open/3107191

[FVL-079], van Leeuwen, F., Fabricius, C., Voss, H., et al., 2011, *Non-linear responses in LSF/PSF calibration and application for the AF and SM detectors*,
GAIA-C5-TN-IOA-FVL-079,
URL http://www.rssd.esa.int/llink/livelink/open/3089106

[FVL-071], van Leeuwen, F., Hodgkin, S., Wyrzykowski, L., 2011, *AlertPipe Software Requirement Specifications*,
GAIA-C5-SP-IOA-FVL-071,
URL http://www.rssd.esa.int/llink/livelink/open/3096432

[FVL-072], van Leeuwen, F., Pancino, E., Altavilla, G., 2011, *GB-Obs Software Requirement Specifications*,
GAIA-C5-SP-IOA-FVL-072,
URL http://www.rssd.esa.int/llink/livelink/open/3086593

[HV-018], Voss, H., 2011, *Column response non-uniformity of the Gaia XP FM CCDs*,
GAIA-C5-TN-UB-HV-018,
URL http://www.rssd.esa.int/llink/livelink/open/3098991

[HV-017], Voss, H., Evans, D., 2011, *Simulation non-linearity saturation*,
GAIA-C5-TN-UB-HV-017,
URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/GAIA-C5-TN-UB-HV-017/GAIA-C5-TN-UB-HV-017D.pdf

[HV-012], Voss, H., Evans, D.W., 2011, *Description of the taker AccumulationInterpreter in the DU16StandardSelection package of the CU5 pipeline PhotPipe*,
GAIA-C5-TN-UB-HV-012,
URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/GAIA-C5-TN-UB-HV-012/GAIA-C5-TN-UB-HV-012D.pdf

[HV-016], Voss, H., Evans, D.W., 2012, *Results from the standard selection integration test*,
GAIA-C5-TN-UB-HV-016,
URL http://www.rssd.esa.int/llink/livelink/open/3109538

[HV-007], Voss, H., Jordi, C., Fabricius, C., 2012, *Saturation and non-linearities - expected characteristics and their simulations*,

GAIA-C5-TN-UB-HV-007,
URL http://www.rssd.esa.int/llink/livelink/open/3109586

[LW-012], Wyrzykowski, Ł., Japelj, J., 2011, *Suggestions for post-launch data-processing cycles*,
GAIA-C5-TN-IOA-LW-012,
URL http://gaia.esac.esa.int/dpacsvn/DPAC/CU5/docs/GAIA-C5-TN-IOA-LW-012/GAIA-C5-TN-IOA-LW-012.pdf

1.4 Acronyms

The following table has been generated from the on-line Gaia acronym list:

Acronym	Description
AC	ACross scan (direction)
AF	Astrometric Field (in Astro)
AL	ALong scan (direction)
BP	Blue Photometer
CCB	Configuration Control Board
CCD	Charge-Coupled Device
CDR	Critical Design Review
CI	Charge Injection
CIL	Critical Items List
CMP	Configuration Management Plan
CODC	CCD One-Day Calibration (FL)
CPU	Central Processing Unit
CTI	Charge Transfer Inefficiency
CU	Coordination Unit (in DPAC)
DDP	DPCDevelopment Plan
DDT	Definition, development and testing
DFLM	Detailed First Look Monitor
DPAC	Data Processing and Analysis Consortium
DPACE	Data Processing and Analysis Consortium Executive
DPC	Data Processing Centre
DPCI	Data Processing Centre (Institute of Astronomy) Cambridge
DU	Development Unit
DUL	DU Leader
E2ES2	End-to-End Stage 2
ECSS	European Cooperation for Space Standardisation
ESAC	European Space Astronomy Centre (VilSpa)
FL	First Look
FM	Flight Model
FOV	Field of View (also denoted FOV)
FTE	Full-Time Equivalent
FoV	Field of View (also denoted FOV)
GAIA	Global Astrometric Interferometer for Astrophysics (obsolete; now spelled as Gaia)
GB	GigaByte
GBOG	Ground-Based Observations for Gaia (DPAC)
GUI	Graphical User Interface
GWP	Gaia Work Package

ICD	Interface Control Document
IDT	Initial Data Treatment
IDU	Intermediate Data Update
IFP	Instrument Familiarization Plan
IOA	Institute of Astronomy
IfA	Institute for Astronomy (Edinburgh)
IoA	Institute of Astronomy (Cambridge; also denoted IOA)
LEI	Leiden Observatory
LODC	LSF/PSF One-Day Calibration (FL)
LSF	Line Spread Function
MDB	Main DataBase
OABO	Osservatorio Astronomico di Bologna
OITF	Offset-Instability Task Force
OU	Open University
PA	Product Assurance
PAP	Product Assurance Plan
PDP	Project Development Plan
PEM	Proximity Electronics Module
PO	(DPAC) Project Office
PSF	Point Spread Function
QA	Quality Assurance
QC	Quality Control
QE	Quantum Efficiency (CCD)
RAL	Rutherford Appleton Laboratory (UK)
RMP	Risk Management Plan
RP	Red Photometer
RTF	Radiation Task Force (DPAC internal)
RVS	Radial Velocity Spectrometer
SDD	Software Design Document
SDP	Software Development Plan
SED	Spectral Energy Distribution
SEG	Software Engineering Guidelines
SIP	Science Implementation Plan
SM	Sky Mapper
SOC	Science Operations Centre
SPAR	Software Product Assurance Report
SPMP	Software Project Management Plan
SPSS	Spectro-Photometric Standard Stars
SRN	Software Release Note
SRR	System Requirements Review
SRS	Software Requirement Specification

STR	Software test Report
STS	Software Test Specification
SVN	Subversion version control system
TB	TeraByte
TBD	To Be Defined (Determined)
TDI	Time-Delayed Integration (CCD)
UB	University of Barcelona (Spain)
UK	United Kingdom
WP	Work Package

2 CU5 role and structure

2.1 Role of CU5

The key functions at the CU5 are the following:

Position	Name	Description
CU5 Leader	(F. van Leeuwen)	RD-010 (Section A.2.1)
CU5 Technical Manager	(F. De Angeli)	RD-010 (Section A.2.2)
Configuration Manager	(M. Riello)	WOM-012 (Section 3.1)
Quality Assurance Leader	(P. Richards)	TL-001 (Section 4)
Risk Manager	(P. Richards)	RD-008 (Section 5)
Test Manager	(G. Rixon)	RG-004 (Test Personnel sections)

The role of CU5 in the Gaia data processing is to ultimately provide the processed photometric data, as well as a number of related tasks, namely the PSF/LSF and CTI calibration for AF/SM and BP/RP, the source environment analysis and photometric science alerts. CU5 contains currently around 84 members, most of which are situated in the UK, Italy, Spain or The Netherlands. Of these, around 50 are directly involved in the software developments, spending about 32.3 FTE over the past 12 months on the Gaia project (UK:19.0, Italy:8.5, Spain: 3.65, Netherlands:1.15).

2.2 Organisation and members

CU5 is led by a management team of currently 4 people. These are the overall manager of CU5, F. van Leeuwen (UK contributions), the science manager C. Cacciari (internal and external calibrations and Italian contributions), the Quality Assurance manager P. Richards, and the technical manager F. De Angeli (DPCI management). Management meetings are generally also attended by A. Brown (Dutch contributions) C. Jordi (Spanish contributions). D. W. Evans maintains contacts with CU7, F. van Leeuwen the contacts with CU3 and CU2 (Attitude model), and C. Jordi the contacts with CU2 (Simulations). Contact is maintained with the IDT Team (CU3) by DU10 (see below) for FL tasks, CTI mitigation, background determination and PSF and LSF calibration and DU11 (A. Brown) for BP/RP.

The management team has meetings through desktop video conferencing about every 3 to 5 weeks, and meet for half a day preceding the CU5 plenary meeting. These plenary meetings

have been held once a year, nominally in April or May. The next meeting will take place in Bologna on 17 to 19 April 2012. The meetings rotate in location over the four main countries involved: UK, Italy, Netherlands and Spain. They last two to three days, and can be combined with a similar meeting of another CU (such joint meetings have taken place in Barcelona with CU2, in Bologna with CU7, and in Barcelona with CU3). Between the plenary meetings one or more specialized discussion meetings are organized, such as the BP/RP spectral data processing meeting held in Barcelona on 10 and 11 October 2012.

The activities of CU5 are spread over 4 countries and 10 institutes. They are distributed over five management and technical support DUs (DU01 to DU05), which are (more or less) common work packages for all CUs and are described in more detail in WOM-001. In CU5, the tasks of DU02, DU03, DU04, and DU05 are partly covered by DPCI. DU05 now also covers as main task the development of the quality-control software. The tasks for the management units are the following (in brackets FTE used over the past 12 months):

- DU01: Management (Cambridge, 1.29)
- DU02: Hardware support (Cambridge, 0.15)
- DU03: QA (RAL, 0.53)
- DU04: DPCI, PhotPipe (Cambridge, 4.07)
- DU05: Support, QC (Cambridge, 1.55)

There are 9 development DUs (DU10 to DU18). Each DU is led by a DU manager, who is responsible for the day-to-day running of activities covered by the DU, as well as for planning proposals and regular reporting. Monthly or bi-monthly written reports have been in place for CU5 since November 2006. Ten reports are issued each year, covering activities, documents produced and manpower spent. These reports are available through Livelink. A summary spreadsheet on the manpower usage since November 2006 is also available and forms the basis for our FTE usage.

The development DUs can be roughly divided into four categories:

- Pre-processing, covered by DU10 for PSF/LSF, CTI mitigation and CCD calibrations, DU11 for pre-processing of BP/RP data, and input from CU5 for various FL processes;
- Internal calibrations, covered by DU12 (design studies), DU15 (implementation of the core processes), DU16 (selection of standard stars);
- External flux calibrations, covered by DU13 (ground-based observations) and DU14 (external calibration processing);

- Ancillary processes, covered by DU17 (Science Alerts) and DU18 (source environment analysis).

The main contributions for the development DUs come from (in brackets are given the FTE over the past 12 months):

- DU10: Leicester (leading), Edinburgh, Open University (8.15);
- DU11: Leiden (leading), Rome, Teramo (3.67);
- DU12: Barcelona (leading), Cambridge, Leiden (2.90);
- DU13: Bologna (leading), Barcelona (3.63);
- DU14: Bologna (leading), Barcelona, Cambridge (2.44);
- DU15: Cambridge (leading), Barcelona (2.05);
- DU16: Barcelona (leading), Cambridge (0.70);
- DU17: Cambridge (leading), OU (1.86);
- DU18: Cambridge (leading), OU (1.03);

For a full list of members use the Gaia People finder and select the Group CU5. Here is a convenient link to the list (one must be logged in to the Gaia portal first)

2.2.1 CU5 Configuration Control Board (CCB)

The CCB will form an important part of the CU5 in checking releases and the management of Mantis issues relating to Configuration Items. Specifically the CCB:

- Approves software change requests (but not bug fixes) to CU5 products.
- Approves all Software Release Notes within CU5
- Approves all changes to CU5 SRSs.

For CU5 the CCB activities will be covered by the CU5 management team within their regular meeting schedule as required, with additional inputs from the CU Configuration Manager.

2.2.1.1 Members

The members of the CU5 CCB are:

- F van Leeuwen (CU-L, Chair),
- M Riello (CU-CM)
- F De Angeli (CU-T)
- P J Richards (CU-Q)
- A Brown
- C Cacciari
- C Jordi

2.3 Product Tree

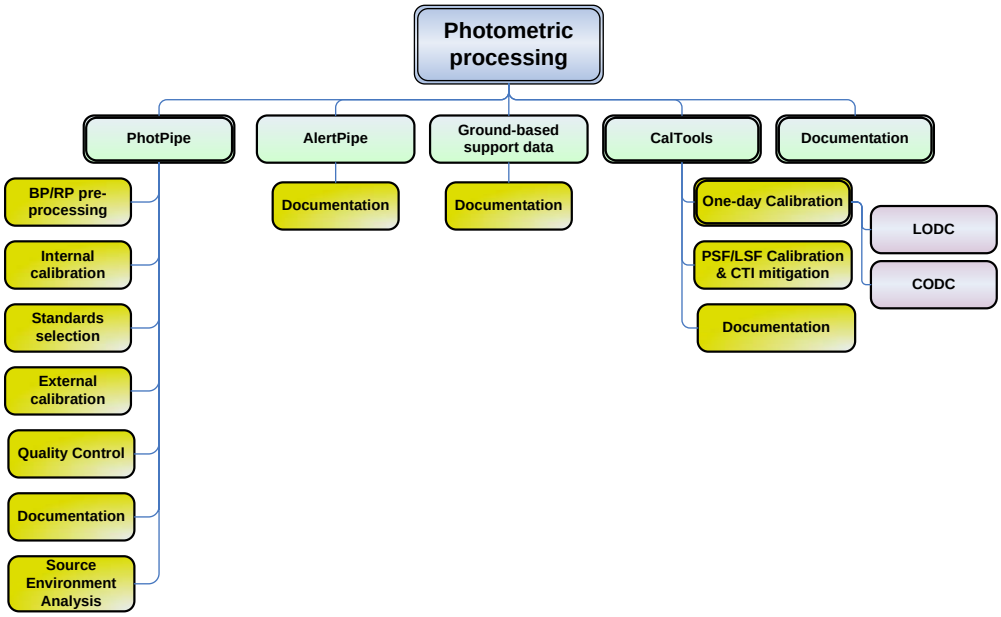


FIGURE 1: The CU5 product tree

The product tree for CU5 is shown in Fig. 1. Next to general documentation, CU5 recognizes 4 main products:

- PhotPipe, covering the internal and external photometric calibrations, implemented at the DPCI;
- AlertPipe, covering flux-based science alerts, implemented by CU5;
- GB-Obs, the ground-based observations, managed by Bologna
- CalTools, a library prepared and tested by CU5.DU10 for AF/SM IDT, FL and IDU, and implemented by CU3, for calibration of LSF/PSF profiles, CTI mitigation, CCD health monitoring and background determination.

Each product has its own SRS, SDD, STS and STR documents.

2.4 Work Breakdown Structure and effort

Each Coordination Unit covers a number of development units which cover a set of work packages. A Development Unit or **DU** will generally cover a set of tasks all related to one specific aspect of the developments and will be the responsibility of a single or at most two to three institutes. A development unit will have some freedom in proposing solutions for their tasks as part of the evaluation phase, but any proposed solution will need to be properly documented in all aspects when presented at the relevant review meeting: the algorithmic and proposed software implementation. The development units for CU5 are listed together with their GAIA work packages (GWP) identifiers below:

GWP-M-501-00000	Planning, management, and coordination of CU5 activities
GWP-T-502-00000	Architecture and technical coordination of CU5
GWP-T-503-00000	Quality assurance and configuration management for CU5
GWP-T-504-00000	Integration, validation and operation of CU5
GWP-T-505-00000	Technical support
GWP-M-510-00000	CTI mitigation, PSF and LSF calibration
GWP-M-511-00000	BP/RP flux extraction and initial data treatment.
GWP-M-512-00000	Photometric calibration models for G and BP/RP
GWP-M-513-00000	Instrument absolute response characterisation: ground-based preparation
GWP-M-514-00000	Instrument absolute response characterisation: definition and application
GWP-M-515-00000	Internal photometric calibration and its application
GWP-M-516-00000	Selection of internal reference sources
GWP-M-517-00000	Flux and classification-based science alerts
GWP-M-518-00000	Source environment analysis

The detailed work package descriptions are given in Appendix B.

Table 4 summarizes the manpower available within CU5 for developments.

Table 4: Effort (FTE) Available per work package for CU5 and DPCI together.

WP Number	2007	2008	2009	2010	2011	**Total**
GWP-M-501	0.7	0.6	0.94	1.4	1.29	4.4
GWP-T-502	0.1	0.5	0.19	0.2	0.15	1.14
GWP-T-503	0.1	0.5	0.45	0.5	0.53	2.08
GWP-M-504	0.0	0.8	1.66	2.2	4.07	8.73
GWP-M-505	0.8	0.8	0.5	0.5	1.55	4.15
GWP-M-510	0.5	5.0	5.36	5.8	8.15	24.81
GWP-M-511	0.7	4.5	5.12	5.8	3.67	19.79
GWP-M-512	1.0	2.0	3.09	3.2	2.90	12.19
GWP-M-513	0.1	4.5	4.66	4.3	3.63	17.19
GWP-M-514	0.1	3.0	2.45	2.5	2.44	10.49
GWP-M-515	0.3	1.5	1.54	1.6	2.05	6.99
GWP-M-516	0.1	0.6	1.14	1.2	0.70	3.74
GWP-M-517	0.2	1.0	0.99	1.3	1.86	5.35
GWP-M-518	0.0	2.1	1.14	1.2	1.03	5.47
Total CU5	**4.6**	**27.3**	**29.23**	**31.7**	**32.3**	**125.33**

Table 5: Effort (staff months) Required per work package for CU5.

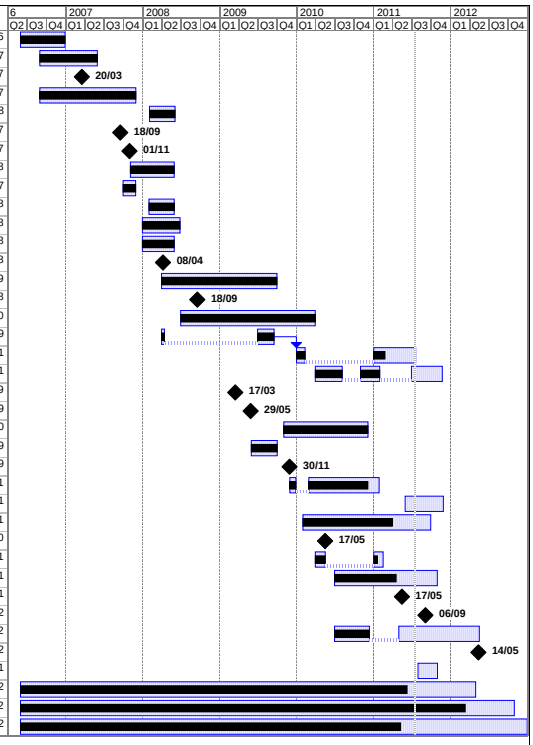
WP Number	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	**Total**
GWP-M-501	5	5	5	5	5	16	16	16	16	5	5	5	5	5	114
GWP-T-502	2	2	2	2	2	0	0	0	0	0	0	0	0	0	10
GWP-T-503	5	5	5	5	5	4	4	2	2	2	2	2	2	2	43
GWP-T-504	5	5	5	0	0	0	0	0	0	0	0	0	0	0	15
GWP-T-505	4	4	4	4	0	0	0	0	0	0	0	0	0	0	16
GWP-M-510	50	50	50	50	50	48	48	48	24	20	20	15	15	15	503
GWP-M-511	12	20	20	20	20	10	10	15	20	20	25	20	20	20	252
GWP-M-512	60	60	60	30	30	20	20	20	20	20	20	10	10	10	390
GWP-M-513	50	50	50	50	50	50	30	20	20	10	10	10	10	10	420
GWP-M-514	20	20	20	20	20	10	10	15	20	20	20	25	15	15	250
GWP-M-515	50	50	50	50	50	35	41	41	41	40	30	25	20	20	543
GWP-M-516	15	15	15	15	15	15	10	10	10	5	5	5	0	0	135
GWP-M-517	15	15	15	15	15	20	20	20	15	10	10	5	5	5	185
GWP-M-518	20	20	20	20	15	15	15	15	15	30	30	25	20	20	280
Total CU5	**313**	**321**	**321**	**286**	**277**	**241**	**222**	**222**	**203**	**182**	**177**	**147**	**122**	**122**	**3156**

3 Software management approach

The management approach has been driven by the software preparation process described in section 4 rather than cyclical approach outlined in the DPAC PDP (RD-010). This has partly been necessitated by the problems posed to the processing by the effects of radiation damage on the CCDs resulting in a longer than expected requirements definition phase. There have been in addition complications in the processing of the BP/RP data, caused by the instrument design.

3.1 Master schedule

ID	Task Name	Duration	Start	Finish
1	CU5 Software Development Plan	152 days?	Thu 01/06/06	Fri 29/12/06
2	CU5 Software Requirements Specification	195 days?	Fri 01/09/06	Thu 31/05/07
3	CU5 internal review #3, Bologna	2 days?	Tue 20/03/07	Wed 21/03/07
4	CU5 Data Processing Flow Charts	326 days?	Fri 01/09/06	Fri 30/11/07
5	CU5 Data Processing Framework Prototype Development	87 days?	Mon 04/02/08	Tue 03/06/08
6	CU5 internal review #4, Leiden	2 days?	Tue 18/09/07	Wed 19/09/07
7	Software Requirements Review	22 days?	Thu 01/11/07	Fri 30/11/07
8	CU5 Interface Control Document	150 days?	Mon 05/11/07	Fri 30/05/08
9	CU5 Processing Framework Software Design Document	44 days?	Mon 01/10/07	Thu 29/11/07
10	CU5 Database construction	86 days?	Fri 01/02/08	Fri 30/05/08
11	CU5 Framework development	129 days?	Tue 01/01/08	Fri 27/06/08
12	CU5 Data-takers development plan	109 days?	Tue 01/01/08	Fri 30/05/08
13	CU5 internal review #5, Barcelona	2 days?	Tue 08/04/08	Wed 09/04/08
14	CU5 Data-takers developments	392 days?	Tue 01/04/08	Wed 30/09/09
15	CU5 internal review #6, Edinburgh	2 days?	Thu 18/09/08	Fri 19/09/08
16	CU5 Data-takers and framework testing	457 days?	Tue 01/07/08	Wed 31/03/10
17	CU5 Trend-monitoring modules, development plan	66 days?	Tue 01/04/08	Thu 17/09/09
18	CU5 Trend-monitoring modules, developments	173 days?	Fri 01/01/10	Thu 21/07/11
19	CU5 Trend-monitoring modules, testing	262 days?	Thu 01/04/10	Thu 24/11/11
20	CU5 Internal review #7, Bologna	2 days?	Tue 17/03/09	Wed 18/03/09
21	Design Review	8 days?	Fri 29/05/09	Tue 09/06/09
22	PhotPipe on Hadoop, developments	286 days?	Mon 02/11/09	Mon 06/12/10
23	CU5 Iteration start-up procedures plan	89 days?	Mon 01/06/09	Thu 01/10/09
24	CU5 internal review #8, Barcelona	4 days?	Mon 30/11/09	Thu 03/12/09
25	CU5 Operations plan	52 wks	Tue 01/12/09	Fri 28/01/11
26	CU5 Iteration start-up procedures testing	130 days?	Wed 01/06/11	Tue 29/11/11
27	Science alerts pipeline	87 wks	Mon 01/02/10	Fri 30/09/11
28	CU5 internal review #9, Leiden	5 days?	Mon 17/05/10	Fri 21/05/10
29	CU5 Final integration plan	66 days?	Thu 01/04/10	Wed 16/02/11
30	CU5 Final integration implementation and testing	348 days?	Thu 01/07/10	Mon 31/10/11
31	CU5 internal review #11, Frascati	3 days?	Tue 17/05/11	Thu 19/05/11
32	Qualification and Acceptance Review	85 days?	Tue 06/09/11	Mon 02/01/12
33	CU5 End-to-End Test	78.4 wks	Thu 01/07/10	Fri 18/05/12
34	CU5 internal review #12, Cambridge	4 days?	Mon 14/05/12	Thu 17/05/12
35	CU5 Final acceptance	67 days?	Mon 01/08/11	Tue 01/11/11
36	CU5 Documentation	1543 days?	Thu 01/06/06	Mon 30/04/12
37	SPSS observation campaigns	1675 days?	Thu 01/06/06	Wed 31/10/12
38	SPSS data reduction and analysis	1718 days?	Thu 01/06/06	Mon 31/12/12



Page 1

FIGURE 2: The master schedule for CU5

The software development of CU5 will follow the high-level schedule outlined in Fig. 2.

3.2 Milestones

The upcoming milestones for the CU5 developments as set by the DPAC reviews and development cycles are:

- E2E2 tests (...-June 2012)
- CU5 plenary meeting (17–19 April 2012)
- End of cycle 12 (31 May 2012)
- End of cycle 13 (30 Nov.2012)

- Launch (August 2013)
- Start data processing (Launch + 3 months)

The CU5 plenary meetings are held once every 12 months. The milestones are shown in Fig. 3.

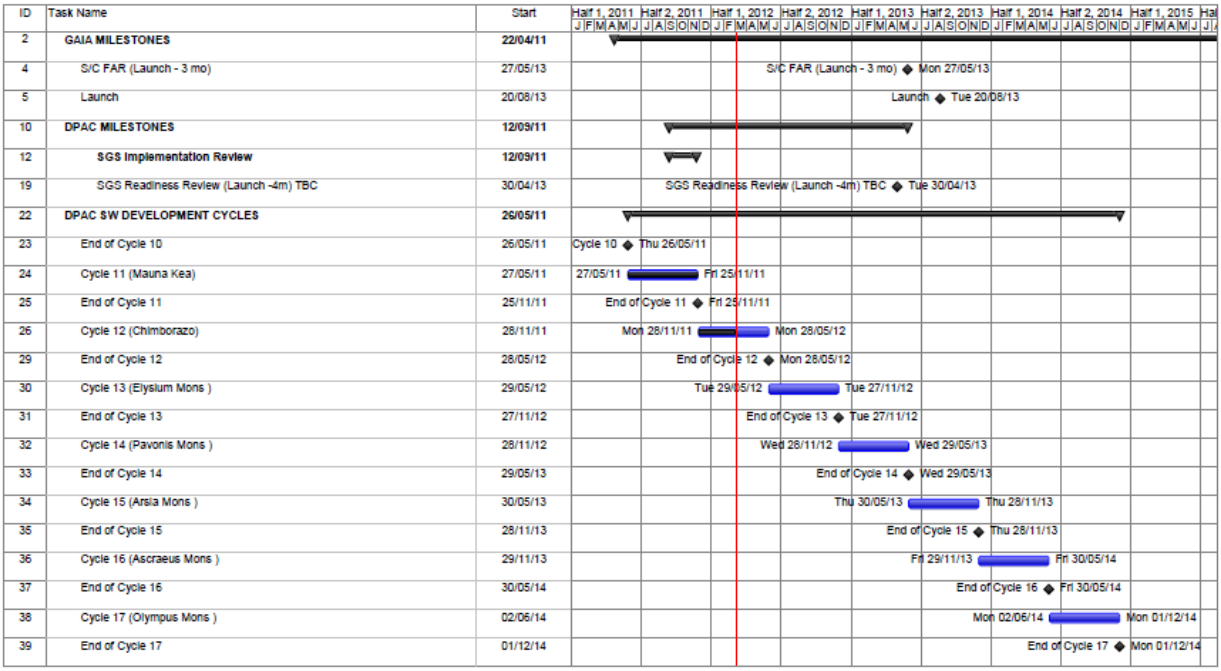


FIGURE 3: The DPAC milestones.

3.3 CU5 developments

The developments schedule is given in Fig. 4. This schedule covers all activities on the development, testing and implementation of the production software for CU5. The main CU5 processing pipeline is PhotPipe, and there is a parallel pipeline for flux-based science alerts.

3.4 DPCI developments

The DPCI developments are fully integrated with those of CU5. They are described in the DPCI-DP, MR-005.

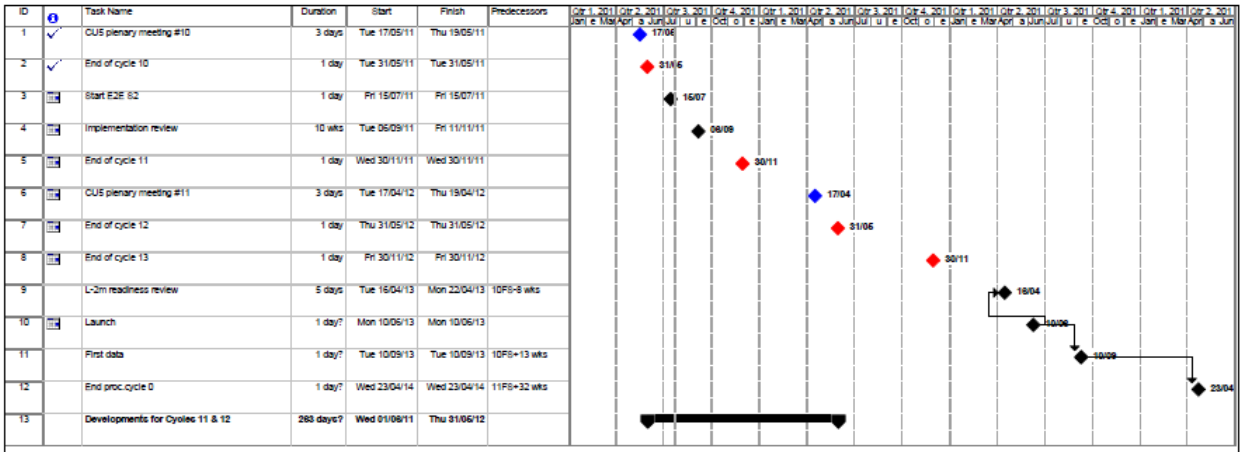


FIGURE 4: Developments for CU5.

3.5 Planning for CU5 Documentation

The CU5 documentation will conform to the generic requirements for CU's in the document tree for DPAC and SOC. The documents are listed in Tab. 6.

Other documentation has been produced during each development cycle starting from cycle 4:

- Software Test Report - to report on testing of each product prior to delivery
- Software Release Note - to accompany each product delivery
- CU5 Software PA Report - to report on the software quality of all CU5 products

3.5.1 Deliverables

The PhotPipe products will be delivered to the DPCI for science operations during the mission. AlertPipe will be a (largely) stand-alone system operated by CU5. In addition the following deliveries have been, or will be, made to other CUs:

CU1:

- Interface file specifications for the MDB ICD, delivered in cycle 5

CU3:

TABLE 6: CU5 Documentation Schedule

Document	**Reference Code or Due Date**
CU5 Software Development Plan	GAIA-C5-PL-IOA-FVL-001
CU5 Top-level Software Requirements Specification	GAIA-C5-SP-IOA-FVL-074
CU5 Data Processing Flow Charts	GAIA-C5-SP-IOA-FDA-003
CU5 Data Model	GAIA-C5-SP-IOA-DWE-009
PhotPipe Software Requirements Specification	GAIA-C5-SP-IOA-FVL-070
PhotPipe Software Design Description	GAIA-C5-SP-IOA-FVL-036
PhotPipe Software Test Specification	GAIA-C5-SP-IOA-GTR-003
PhotPipe Software User Manual	Q2 2012
AlertPipe Software Requirements Specification	GAIA-C5-SP-IOA-FVL-071
AlertPipe Software Design Description	Q4 2011
AlertPipe Software Test Specification	GAIA-C5-SP-IOA-GTR-009
AlertPipe Software User Manual	GAIA-C5-SP-IOA-LW-011D
CalTools Software Design Description	GAIA-C5-SP-UOL-DJF-0017
CalTools Software Test Specification	GAIA-C5-SP-UOL-DJF-018
PSF/LSF Calibration Software Requirements Specification	GAIA-C5-SP-UOL-DJF-019
PSF/LSF Calibration Software Design Description	GAIA-C5-SP-UOL-DJF-021
PSF/LSF Calibration Software Test Specification	GAIA-C5-SP-UOL-DJF-020
PSF/LSF Calibration Test Report	GAIA-C5-SP-UOL-DJF-026
GB-Obs Software Requirements Specification	GAIA-C5-SP-IOA-FVL-072
GB-Obs Software Test Specification	GAIA-C5-SP-IOA-GTR-014

- PSF/LSF & CTI calibration module for IDU, end of cycle 12
- CCD one day monitoring for First Look, end of cycle 10, 11
- PSF/LSF one day calibration for First Look, cycle 12
- BP/RP basic flux extraction module for IDT (G_RVS estimates and parameters describing the source SED shape, such as effective wavenumber, integrated BP/RP, etc), end of cycle 10

The associated documentation will be part of the documentation listed in section 3.5.

3.6 Assumptions, dependencies and constraints on CU5

3.6.1 Dependencies and constraints with respect to other CUs

Interfaces need to be defined with the following CUs:

- **CU1** Interfaces with the Main Database: first delivered in cycle 5, and updated at the end of every cycle
- **CU3** Interfaces with the IDT, IDU and FL pipelines: delivered in cycle 6, and updated at the end of every cycle.

Also requirements for simulation data used for testing have to be submitted to CU2 prior to the development cycle in which they are generated. Subsequently the CU5 development depends on the timely delivery of well-documented simulated data by CU2. There are in addition indirect dependencies with CU4 (for Source Environment Analysis), CU7 (input to variability analysis) and CU8 (Processing and representation of BP/RP spectra).

3.6.2 Other dependencies and constraints

The determination of the absolute flux calibration of the Gaia G-band and BP/RP photometry depends on ground observations of several hundred spectrophotometric standard stars (SPSS). This requires the allocation of telescope time for observations of the SPSS in several observing facilities in both hemispheres. This forms part of DPAC-coordinated activities through GBOG (CS-004).

3.7 Risk Management

The risk management for CU5 is carried out in accordance with the procedures in the DPAC risk management plan (RMP) ((RD-008)). The CU5 Risk Manager is responsible for submitting CU5 risks to the DPAC Risk Management Team to be assessed and added to the active risks published in the Risk Register (RD-014).

The CU5 risk register consists of a GaiaWiki page which contains risks raised by the DU managers and is maintained by the CU5 Risk Manager. This risk register is reviewed in its entirety by the CU5 Management Team every six months as part of a management meeting. Risks with a very high risk index are reviewed at every management team meeting (3-5 weeks). The DU managers may raise a new risk at any time (through a Mantis issue) and this will be assessed by the management team at their next meeting.

3.8 Monitoring mechanisms

CU5 Management video-conferences are held every 3 to 5 weeks. Written progress reports are submitted to Livelink monthly except for December/January and July/August when they will appear bi-monthly.

There is a Plenary Meeting of the whole Consortium every 12 months shortly before the end of a development cycle. Intermediate topic meetings are taking place on a regular basis.

4 Software development approach

4.1 CU5 software development strategy

The rules on coding, testing and documentation will be set by the Data Processing and Analysis Consortium Executive (DPACE) and CU1, and these rules are adhered to by CU5. In particular, all developments are controlled through a single Subversion (SVN) system hosted at ESAC and use an agreed release version of the Java programming language.

Current developments are tuned towards implementation testing, with a few processes still to be finalized in coding. Testing is done at various levels, from small-scale testing of algorithms to full verification of the pipeline. The latter depends largely on the provision of substantial amounts of simulated data as provided by CU2. Despite the huge efforts and resources put into simulating Gaia-like data, there are still a number of effects in the data that are beyond the capacity for simulations. Modifications of the data by such effects, and their removal, has to be implemented in the software with only very limited pre-launch testing possibilities. This applies in particular to aspects of the models used to mitigate the effects of CTI.

4.2 Achievements for Cycle 11

The following technical notes were issued or re-issued to Livelink during cycle 11:

- JMC-011 Design proposal for elements of the BP/RP full-forward model
- EP-007 Ground-based observations of the Gaia Spectrophotometric Standard Stars. Present status and future steps.
- EP-008 The local Bologna archive of SpectroPhotometric Standard Stars observations
- FVL-085 CU5 Progress Report for end of Cycle 10

- DWE-031 Calibrating BP/RP epoch spectra using the exact solution method
- JMC-010 Approaches to epoch spectra calibration
- FVL-072 GB-Obs Software Requirement Specifications
- DJF-021 PSF/LSF Calibration, Software Design Document
- DJF-017 CalibrationTools, Software Design Document
- DJF-022 CalibrationTools 10.0.0 Software Release Note
- GTR-015 GB-Obs data-products Software Test Report
- GTR-014 GB-Obs Software test specification
- AP-001 Reconstruction of BP/RP spectra for decontamination
- FDA-024 IntegratedPhotPipe 10.0 Software Release Note
- FVL-079 Non-linear responses in LSF/PSF calibration and application for the AF and SM detectors.
- DWE-029 Calibration plan for flux and BP/RP observations
- FVL-068 Differential dispersion and geometric calibration for BP/RP
- NCH-006 CTI mitigation: implementation and development issues
- FVL-071 AlertPipe Software Requirement Specifications
- CJ-041 Photometric relationships between Gaia photometry and existing photometric systems
- FVL-070 PhotPipe Software Requirement Specifications
- GTR-017 PhotPipe 10.0 Software Test Report
- FVL-062 CU5/DPCI Operations plan
- GTR-013 Software Test Report for AlertPipe 10.2
- DJF-019 PSF/LSF Calibration Workpackage Software Requirements Specification
- DJF-020 PSF/LSF Calibration Software Test Specification
- DJF-018 CalibrationTools Software Test Specification
- DJF-026 PSF/LSF Calibration Software Test Report
- DJF-023 CalibrationTools 10.0.0 Software Test Report

- HV-018 Column response non-uniformity of the Gaia XP FM CCDs
- GB-007 Background Measurements for BP/RP in IDT
- GB-006 Description of the charge injection measurement task for BP/RP in IDT
- SR-003 A new model for the absolute calibration of G fluxes.
- RBG-005 AlertPipe Publisher Implementation
- RBG-004 AlertPipe Xmatch Catalogue Search Implementation
- RBG-003 AlertPipe Xmatch Classification Implementation

The following studies are ongoing, and draft reports are available on SVN:

- GA-004 Instrument Familiarization Plan for ground based observations of SPSS. I. CCD Shutter Characterization and Linearity Evaluation
- SMR-002 Instrument Familiarization Plan for ground based observations of SPSS II. Calibration Frames Study and Recommendations
- SMR-003 Data Reduction Protocol for Ground Based Observations of SpectroPhotometric Standard Stars. III. Quality Control on SPSS Photometric Frames and Photometric Catalogues Production
- SMR-004 Data Reduction Protocol for Ground Based Observations of SpectroPhotometric Standard Stars. IV. Short Variability Monitoring: Light Curves production and analysis
- MDV-010 Proposal for a DU10 Simulator
- PFO-007 Description of PSF/LSF related algorithms
- PFO-019 Organising the PSF/LSF library by focal plane properties and source's SED
- PFO-020 Initial calibration of the optical images during the commissioning phase.
- PFO-021 A charge-injection free period at the beginning of the mission.
- PFO-022 Description of the LSF calibration in IDU
- AO-001 Description of Linear fitting algorithms for CalibrationTools
- AO-002 Description of Bias Non Uniformity algorithms for CalibrationTools
- NJC-005 Specifying diagnostic tests in CU5 DU10 DFLM diasgnostics

- CF-012 Proposal for internal calibration of XP spectra
- HV-017 Proposal for the simulation of non-linearity and saturation effects in Gaia AF and SM data
- FVL-086 Use-case scenario for CU5/DPCI Quality Control activities
- SHO-005 AlertPipe Software Design Description
- GTR-012 Software User Manual for DPCI Notification System
- GB-003 Virtual Objects for the Blue and Red Photometers
- HV-012 Detailed description of the package DU16StandardSelection
- GB-008 Background Treatment in the new PhotPipe infrastructure
- DWE-03 Definition of Time Intervals for CU5 calibrations
- NCH-016 OITF Progress Report for Implementation Review
- MDV-011 Discussion on CDM03
- GB-009 Proposal for the treatment of non-nominal windows in BP/RP
- PMN-007 A forward model for the calibration of XP mean spectra
- PMN-008 XP LSF modelling
- FVL-089 Options for graphics displays in CU5-QC
- FFS-001 Description of data types for input to CU5 Quality Control processes
- JMC-012 XP passbands flux calibration model
- LW-012 Classification of Rapid Transient Sources
- RSC-001 Description of the LevenbergMarquardt Algorithm
- HV-016 Results from the standard selection integration test
- HV-007 Saturation and non-linearities - expected characteristics and their simulations
- CJ-048 BP/RP Bandwidth non-uniformity

In addition, 5 CU5 internal reports were issued: FVL-084, FVL-087, FVL-088, FVL-090, FVL-091, all of which can be found on Livelink. The SPAR was produced for cycle 10, PJR-008.

In cycle 11 the following goals have been achieved:

- CTI mitigation, background, LSF calibration: testing in IDT, re-design following difficulties shown in tests.
- BP/RP pre-processing: Processing software is now being implemented in PhotPipe, following a series of workshops.
- Calibration model for photometric reductions: differential calibration methods fully tested and being implemented in PhotPipe.
- Broad band photometry: Testing of calibration software on E2ES2 data.
- Absolute calibration:Good progress on ground-based observations and absolute calibration models for BP/RP and AF.
- The pipeline for science alerts was further developed and tested.
- Early detection statistics and characterization developed and tested.
- Test and implementation of the software for the mitigation of non-linearity and saturation effects in CalTools, IDT and FL

4.3 Detailed description of CU5 cycles 11 & 12

The major aims of this cycle are:

- Implementation and testing of LSF/PSF reconstruction software in IDT/IDU
- Implementation and testing of CTI mitigation software in IDT/IDU
- Implementation and testing of BP/RP pre-processing software in PhotPipe
- Implementation and testing of complete AF/SM photometric reduction chain in PhotPipe
- Implementation and testing of first phase of BP/RP spectral processing in PhotPipe
- Implementation and testing of standard star selection and application in PhotPipe for AF/SM and BP/RP
- Completion of the observational campaign for the ground-based calibration-support data
- Completion of the reductions of the photometric ground-based data for a significant fraction of the SPSS
- Implementation and testing of first phase BP/RP absolute calibration

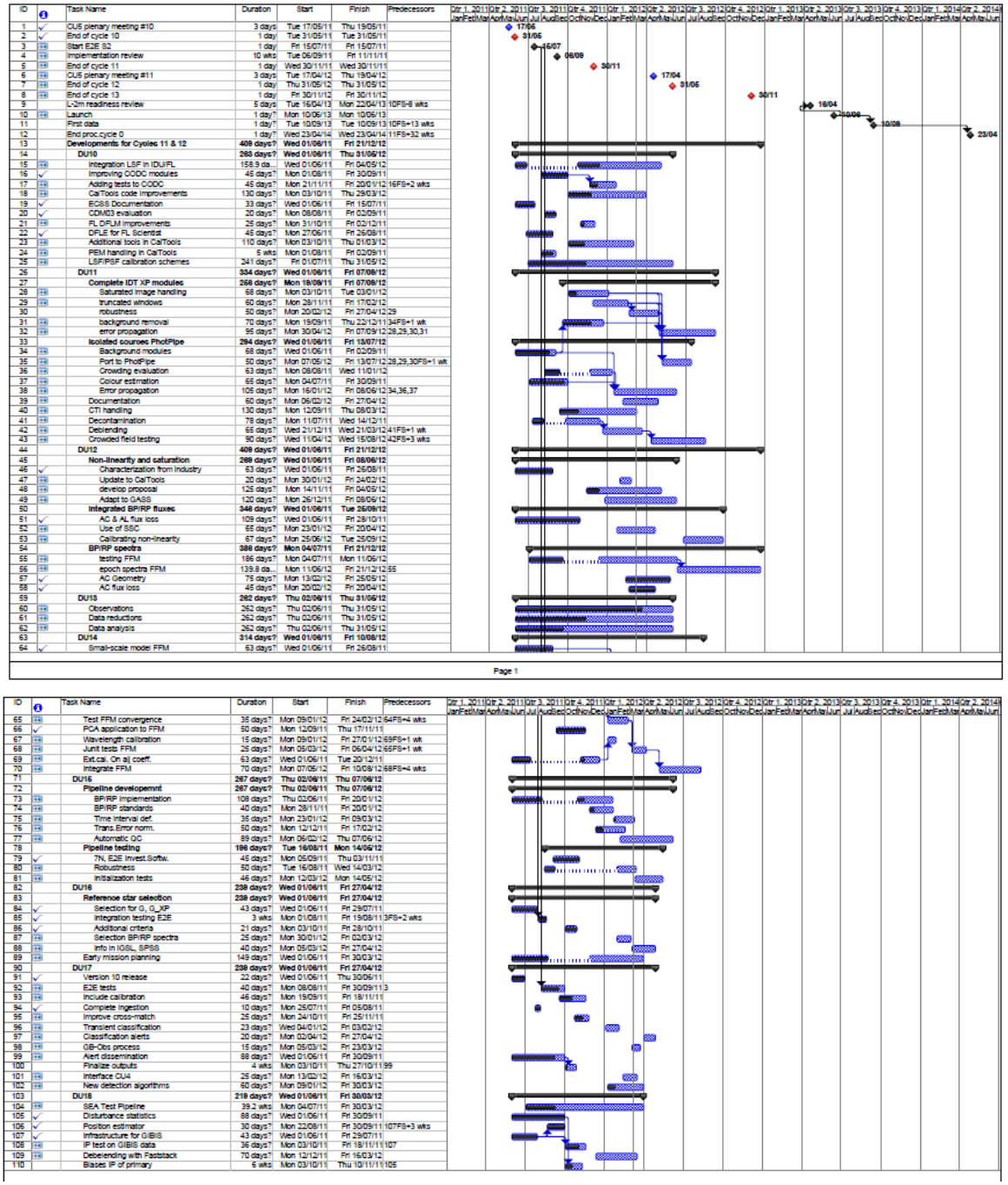


FIGURE 5: The detailed schedule for cycle 11 & 12 for CU5

- Completion and testing of AlertPipe
- Test pipe line for Source Environment Analysis
- Prepare and release the documentation for the IR
- Design and implement the calibration strategy for non-linearity and saturation effects
- Continue the investigations on the Full-Forward Model for BP/RP spectra calibration

The major deliveries from cycle 12 will be:

- Cycles 12 release for PhotPipe
- Cycles 12 release for AlertPipe
- Cycles 12 release of CalTools

4.4 Internal reviews and associated documentation

CU5/DPCI has a plenary meeting to review development every 12 months close to the end of a development cycle where the overall development status of all CU5 and DPCI products and documentation is evaluated. The planning and resources for each DU are also reviewed at these meetings.

4.5 Relationship with Gaia overall development life cycle

As required, CU5 shall participate in the SOC/DPAC reviews. The CU5 items to be reviewed are as follows:

- **Implementation Review:**
  - CU5 Software Requirements Specification
  - CU5 Software Detailed Design Documents
  - CU5 Software Test Specifications
  - CU5 Software Test and Validation Reports
  - CU5 Software Product Assurance Reports
  - CU5 Risk Register

5 Software Configuration Management

The software configuration management process and procedures used by CU5 are those described in the DPAC Configuration Management Plan WOM-012.

5.1 Configuration Item List and Baseline

The Configuration Item List (CIL) is a list of Configuration Items (CI) with unique identifiers as specified in the DPAC Configuration Management Plan.

Software configuration items are software products, or sub-products, that will be placed under configuration control. The starting point to identify them is the product tree, which defines the different software products that are produced by a CU. For each CI which is a product, the SVN repository contains the following objects:

- the documentation:
  - Software Requirement Specification (SRS)
  - Software Design Document (SDD)
  - Software Test Specifications (STS)
  - Software Test Report (STR)
  - Software Release Note (SRN)
- the trunk, where developments are done
- the tags, where we can find the last releases
- the branches, where fixes and difficult developments are made

The CU5 product tree is shown in Fig. 1. The corresponding CIL for CU5 is shown in Tab. 7 which contains both software and documentation configuration items.

The PhotPipe product consists of sub-products developed as modules by several DUs. The sub-products have CI identifiers which depart from the strict definition in (WOM-012), since the sub-products each have a unique WP number. For CU5 products, only the documentation is currently under configuration control.

The PSF/LSF Calibration & CTI Mitigation software being developed by DU10 consists of several algorithms developed for integration into the IDT, FL and IDU pipelines. The requirements are specified in the CU5 PSF/LSF Calibration Workpackage SRS. Following delivery to CU3, software will be integrated into the above list of SVN objects for the IDT, FL and IDU pipelines.

The CU5 configuration baseline is as specified in the CU5 SRSs (FVL-074; FVL-070; FVL-071; FVL-072; DJF-019). The CI for the integrated PhotPipe is contained in the DPCI CIL (FDA-025).

	CI-ID	Conf. Item	Description
	CU5 Software Configuration Items		
1	SW_511_1	BP/RP pre-proc	BP/RP pre-processing module developed by DU11
2	SW_514_1	External cal	PhotPipe external calibration module developed by DU14
3	SW_515_1	Internal cal	PhotPipe internal calibration module developed by DU15
4	SW_516_1	Internal cal select	PhotPipe internal calibrator selection module developed by DU16
5	SW_518_1	Source Environment Analysis	Source Environment Analysis module developed by DU18
6	DT_513_1	Ground-based Observations	Ground-based observations for photometric calibrations
7	SW_510_1	CalTools	Calibration Tools, as implemented in IDT/FL/IDU
8	SW_510_1.1	LODC, CODC	One-day Calibration
9	SW_510_1.2	PSF/LSF Cal & CTI	PSF/LSF Calibration & CTI Mitigation
10	SW_517_1	AlertPipe	AlertPipe modules developed by DU17
	CU5 Hardware Configuration Items		
11	HW_517_1	AlertPipe	Processor
12	HW_517_2	AlertPipe	Server
	CU5 Document Configuration Items		
13	DC_501_1	CU5 SDP	CU5 Software Development Plan
14	DC_501_2	CU5 Operations Plan	Operations plan for CU5
15	DC_501_3	CU5 SRS	CU5 top-level SRS
16	DC_501_4	CU5.PhotPipe SRS	CU5 SRS for PhotPipe
17	DC_501_5	CU5 SDD	PhotPipe SDD
18	DC_501_6	CU5 STS	PhotPipe STS
19	DC_501_7	CU5.AlertPipe SRS	AlertPipe SRS

20	DC_501_8	CU5.AlertPipe SDD	AlertPipe SDD
21	DC_501_9	CU5.AlertPipe STS	AlertPipe STS
22	DC_501_7	CU5.CalTools SRS	CalTools SRS
23	DC_501_8	CU5.CalTools SDD	CalTools SDD
24	DC_501_9	CU5.CalTools STS	CalTools STS
22	DC_501_7	CU5.GB_Obs SRS	GB_Obs SRS
24	DC_501_9	CU5.GB_Obs STS	GB_Obs STS

Table 7: CU5 Configuration Items

5.2 Configuration Control Board

The Configuration Control Board organisation and members are described in Section 2.2.1.

6 CU5 Specific Policies

The initial development during the requirements specification and initial design phase has not strictly followed the DPAC development cycles.

A Product Assurance compliance matrix

The requirements from the DPAC PAP (TL-001) with their level of compliance for CU5 and a brief description of the requirement. The levels of compliance (Comp) are Full(F), Partial(P), and Non Compliant(NC).

Requirement	Vers	Comp	Description
CU1-SPAP-Q-REQ-020	1.2	P	DPAC requirements shall follow the scheme in the PAP.
CU1-SPAP-Q-REQ-040	3.0	P	Requirements of the same scope shall be grouped together in SRS.
CU1-SPAP-Q-PLN-020	3.0	F	Each CU shall produce a SDP.
CU1-SPAP-Q-PLN-040	1.1	F	Mantis shall be used to manage issues, actions and risks.
CU1-SPAP-Q-PLN-060	1.3	P	MS-Project should be used to manage planning and resources.
CU1-SPAP-Q-PLN-080	3.1	F	SDP shall define a list of documents to be produced by CU.
CU1-SPAP-Q-PLN-100	1.1	F	Software product development cycle is iterative.
CU1-SPAP-Q-PLN-120	1.1	F	Cycles are described in the SDP.
CU1-SPAP-Q-PLN-140	1.1	F	CU meeting held at least once per cycle.
CU1-SPAP-Q-PLN-160	1.3	F	Internal review is carried out before each formal review.
CU1-SPAP-M-RSK-020	1.1	F	Identification of risks and maintenance of a risk register.
CU1-SPAP-Q-SPC-020	1.3	F	For each cycle a requirements analysis is carried out.
CU1-SPAP-Q-SPC-040	1.2	F	Traceability matrices are produced to trace requirements to higher level.
CU1-SPAP-Q-SPC-060	1.2	P	For each cycle, analysis of functions, data flow and constraints to complement requirements analysis.
CU1-SPAP-Q-SPC-080	3.0	F	During early cycles, demonstrations to prove the feasibility of implementation.
CU1-SPAP-Q-SPC-100	3.0	F	SRS for any subsystem shall contain performance requirements.
CU1-SPAP-Q-SPC-120	1.1	F	At CU level, a functional analysis of the system is performed.
CU1-SPAP-Q-SPC-140	1.3	F	Constraint requirements for CU software executing at DPC are in SRS.
CU1-SPAP-Q-SPC-160	1.2	F	Software with GUIs have prototype interfaces early in development.
CU1-SPAP-Q-DES-020	1.3	F	Software products shall be designed according to SRS + ICD following SEG.

CU1-SPAP-Q-IMP-020	1.1	F	Software products shall be implemented according to SDD following SEG.
CU1-SPAP-Q-VAL-020	1.1	F	Software products shall be validated according to the STS following SEG.
CU1-SPAP-Q-VAL-040	1.2	F	System validation shall be clearly scheduled.
CU1-SPAP-Q-VAL-060	1.2	F	Validation tests shall cover the requirements in the SRS.
CU1-SPAP-Q-INT-020	1.2	F	Delivery to the DPC is performed according to the DPAC CMP.
CU1-SPAP-Q-INT-060	1.3	F	Integration activity is described in the DDP + DPC STS.
CU1-SPAP-Q-ACP-020	1.2	F	Acceptance activity is performed on delivered products at DPC level.
CU1-SPAP-Q-PRF-020	1.1	F	At CU level, a performance estimation and measurement activity is carried out.
CU1-SPAP-Q-MNT-020	1.1	F	Maintenance of software product is under responsibility of the DU-L to 2020.
CU1-SPAP-Q-MNT-040	3.0	F	Plans for software maintenance are defined in SDP and carried out as required.
CU1-SPAP-Q-MNT-060	1.2	F	During the maintenance phase, measurement, verification, etc are defined as for development
CU1-SPAP-Q-MNT-080	1.1	F	For large modifications, the maintenance life cycle becomes a development life cycle.
CU1-SPAP-Q-MNT-100	1.1	F	Version of software product for which maintenance starts is identified in the SDP.
CU1-SPAP-Q-CNF-020	3.1	F	CU shall conform to the DPAC CMP for configuration management activities.

Notes on requirements with partial compliance:

- REQ-020 - CU5 uses a different SCOPE specification.
- REQ-040 - lower level requirements are grouped per DU.
- PLN-060 - MS-Project is used for planning. The use of resources is tracked via the monthly reports.
- PLN-140 - CU meetings have been held once per cycle when required. From cycle 9, a full CU meeting has been held once a year with an additional specialised meeting to address a particular issue.

- SPC-060 - The analysis of functions, data flow, etc is carried out as required which is not necessarily every cycle.
- SPC-100 - This not relevant for one of the CU5 products, GB-Obs, for all other products performance has always been a main criterion in the developments.
- SPC-140 - For CU5 there is a single general SRS, and separate SRS documents for the four main products:PhotPipe, AlertPipe, CalTools and GB-Obs.
- SPC-160 - GUIs are only used for interfaces in the ob-control and quality control activities, for which the developments have started in cycle 10. The definition of the GUIs depends very much on the interface requirements for these processes, and therefore will not be done until late in cycle 11.
- MNT-040 - Maintenance plans will be defined in the SDP in the cycle before software maintenance is due to start.

B Detailed Work Package Descriptions for CU5

Gaia DPAC WP:		GWP-M-501-00000
Title: Planning, management, and coordination of CU5 activities		
Provider(s): IOA		
Manager(s): F. van Leeuwen		
Start: 01/10/2006	**End**: 31/03/2012	**Effort**: 5 mm/yr
Objective: Planning, management and coordination of CU5 activities		

Tasks:

1. Plan and coordinate the activities of the CU5 management team
2. Through the management team, plan, coordinate and monitor the activities of the DUs
3. Coordinate the CU5 activities with those of other CUs, where relevant, through the DPACE
4. Through the management team, manage the resources assigned to the DUs
5. Through the management team, collect, monitor and adjust where necessary the CU5 requirements
6. Collect and monitor input for monthly reporting by DU managers
7. Prepare progress reports for Livelink
8. Prepare reports for national funding agencies
9. Organize reviews and other meetings, including teleconferences, where and when necessary
10. Report on the progress of CU5 to the DPACE
11. Maintain the risk register
12. Provide the interface with CU7
13. Provide the interface with CU2

Input:
Progress reports from DU managers, report on resources from national coordinators

Output:
Documents and reports

Deliverables:
Documents

Dependencies:

Interfaces:
National funding negotiations, other CUs through the DPACE

Remarks:

WP number	Description
GWP-M-501-00000	**Planning, management, and coordination of CU5 activities**
GWP-M-501-00100	Compile the science implementation plan
GWP-M-501-00200	Compile the software management plan
GWP-M-501-00300	Coordinate activities and developments
GWP-I-501-00310	Ensure coordination of developments between the different DUs within CU5
GWP-I-501-00320	Ensure coordination of developments with other CUs through DPACE
GWP-M-501-00400	Monitor progress
GWP-I-501-00420	Collect and review monthly the development progress reports from all DUs
GWP-I-501-00430	Collect and evaluate requests for adjustments of the requirements
GWP-M-501-00500	Maintain the risk register
GWP-I-501-00510	Review risks on a monthly basis within the management team
GWP-I-501-00520	Manage risks through re-distribution of activities when and where relevant
GWP-M-501-00600	In consultation with the management team, adjust when and where necessary the requirements
GWP-M-501-10000	**Resource management**
GWP-M-501-10100	Pre-launch: define the resource requirements for developments
GWP-M-501-10110	Establish and monitor resource requirements for each participating institute
GWP-M-501-10120	Ensure required resources are in place when commitments are made
GWP-M-501-10200	Post launch: define the resource requirements for operations
GWP-M-501-10210	Establish and monitor resource requirements for each participating institute
GWP-M-501-10220	Ensure required resources are in place when commitments are made
GWP-M-501-20000	**Communication**
GWP-M-501-20100	Prepare reports
GWP-M-501-20110	Provide progress reports to funding agencies
GWP-M-501-20120	Provide regular progress reports to Livelink
GWP-M-501-20130	Provide reports on internal review meetings to Livelink
GWP-M-501-20140	Provide end-of-cycle reports to Livelink
GWP-M-501-20200	Organize meetings
GWP-M-501-20210	Organize internal review meetings (6-monthly)
GWP-M-501-20220	Organize the end-of-cycle reviews by the management team
GWP-M-501-20230	Prepare for and participate in Gaia DPAC review meetings
GWP-M-501-20300	Provide interfaces with other CUs
GWP-M-501-20310	Collecting CU5 proposals for data simulations
GWP-M-501-20320	Coordinating, where relevant, CU5 activities with CU2 developments

GWP-M-501-20330	Coordinating interface developments between CU5 and CU7
GWP-M-501-30000	**Representation**
GWP-M-501-30100	Represent CU5 in the Gaia DPACE
GWP-M-501-30200	Represent the Gaia mission for contacts with scientific community
GWP-M-501-30300	Represent the Gaia mission for public outreach

Work packages 502, 504 and 505 are now covered by the DPCI

Gaia DPAC WP:		GWP-T-503-00000
Title: Quality assurance and configuration management for CU5		
Provider(s): RAL, IOA		
Manager(s): P. J. Richards		
Start: 01/10/2006	**End**: 31/03/2012	**Effort**: 5 mm/yr

Objective:
The objectives of this work package are:

1. to ensure that the software is developed according to the software requirements specification and conforms to the software quality assurance standards,
2. to provide the required configuration management services to the CU to ensure that it meets its quality assurance(QA) responsibilities.

The QA standards and responsibilities are specified in the Software Product Assurance Plan for DPAC (Levoir et al. (TL-001)).

Tasks:

1. Software Quality Assurance.
2. Software configuration management. This includes monitoring the state and contents of the CU source code stored in the repository at ESAC to ensure that it conforms to the Configuration Baseline, maintain the Configuration Item List and provide input into software releases (ChangeLogs etc).
3. Software release management. Monitoring the production and delivery of a software release ready for deployment at the DPC, including production or collation of the Configuration Items, Software Release Notes and software test results.
4. Operational configuration management. Management of the software and hardware configuration at the Data Processing Centre, including maintenance of the Operational Configuration Baseline.
5. Issue tracking. Ensuring that non-conformances and change requests are tracked and actioned according to the standards.
6. Document reviewing for compliance with CU/DPAC standards.

Input:

1. Software Product Assurance Plan for DPAC
2. DPAC Software Configuration Management Plan
3. DPAC Software and System Specification
4. DPAC Risk Management Plan

Output:

1. PA and configuration management input to SDP
2. CU5 Software Quality Assurance Report
3. Scientific Quality Assurance Plan

Deliverables:
Dependencies: The PA and configuration management activities follow the DPAC guidelines.
Interfaces: This work package contributes to the overall QA activities of the DPAC
Remarks:

WP number	Description
GWP-T-503-00000	**Quality assurance and configuration management for CU5**
GWP-M-503-00100	Plan and schedule relevant WPs
GWP-M-503-00110	Prepare and maintain the Gantt charts
GWP-M-503-00200	Supervise developments
GWP-M-503-00300	Report on developments
GWP-I-503-00400	Provide interface contacts
GWP-T-503-10000	**Software quality assurance**
GWP-T-503-10100	Contribute product assurance sections to the SDP
GWP-T-503-10200	Review documents
GWP-T-503-10300	Review software processes
GWP-T-503-10400	Prepare Software Product Assurance Report
GWP-T-503-10500	Participate to the Configuration Control Board activities
GWP-T-503-20000	**Configuration management**
GWP-T-503-20100	Contribute configuration management sections to the SDP
GWP-T-503-20200	Manage and monitor software configuration
GWP-T-503-20300	Monitor software releases
GWP-T-503-20400	Manage issues, anomalies and changes
GWP-T-503-20500	Participate in the Configuration Control Board activities
GWP-T-503-30000	**Scientific quality assurance**
GWP-T-503-30100	Prepare scientific quality assurance plan
GWP-T-503-30200	Review documents
GWP-T-503-30300	Review science validation tests
GWP-T-503-30400	Participate in the Configuration Control Board activities

Gaia DPAC WP:		GWP-T-510-00000
Title: PSF and LSF calibration		
Provider(s): UOL, IfA, OU		
Manager(s): D. Fyfe		
Start: 01/10/2006	**End**: 31/03/2012	**Effort**: 60 mm/yr

Objective:
DDT of software for PSF and LSF calibrations and modelling of CTI effects, in AF and SM.

Tasks:

1. Provide models, procedures and documentation for the PSF and LSF calibration, CTI mitigation and background determination (sky and charge release) in AF and SM over the course of the mission.
2. Implement and test the software required for PSF and LSF calibration, CTI mitigation and background determination (sky and charge release), in AF and SM.
3. Provide models, procedures and documentation for the CCD bias and PEM offset determination over the course of the mission.
4. Implement and test the software required to determine the CCD bias and PEM offset.
5. Provide procedures, software and documentation to monitor the CCD Health (eg. radiation damage levels, dead columns and changing CCD response) and cosmetics over the course of the mission.
6. Provide procedures, software and documentation to monitor the provided algorithms and models over the course of the mission.
7. Provide procedures and interfaces to calibrate parameters and monitor the performance of procedures over the course of the mission.

Tasks:

8. Provide a CCD pixel model and simulate the physical effects of radiation damage on the GAIA SM and AF CCDs using relevant test data.
9. Interface with laboratory data, particularly dealing with issues like radiation damage, charge injection, virtual objects and introduction of gates during the pre-launch phase.
10. Integration of software modules into the appropriate CU3 pipelines of IDT, FL and IDU.

Input:

- Instrument (CCD) characteristics;
- SM and AF1-9 1D and 2D windows including virtual objects;
- BP/RP derived colours;
- Charge injection logs;
- Pre-scan and ASD7 data for CCD bias and PEM offset determination;
- Source catalogue cross-match data for transit history;

Output:

- Model radiation damaged profiles;
- Calibrated PSF and LSF models;
- CCD bias (including PEM offset) corrections;
- Background solutions incorporating sky background and charge release background;
- Model parameters and goodness of fit statistics;
- CTI model parameters;
- Evaluation of CCD health including new CCD bad column table entries;
- Notification if analysis suggests some unexpected behaviour of the telescope/detectors;

Deliverables:

- Software and documentation for:
  - PSF/LSF calibration;
  - A PSF/LSF model;
  - Radiation damage mitigation;
  - Radiation damage model calibration;
  - Background determination;
  - CCD Bias and PEM offset determination;
  - CCD health and cosmetics monitoring;
  - Performance monitoring (eg. residuals);
  - CCD One Day Calibration;
  - LSF One Day Calibration;
- An assessment of the expected reconstruction accuracy and limitations of methods used;
- A pixel level physical model of radiation damage of GAIA SM and AF CCD.
- An a assessment of CCD pixel charactersitics derived from the physical model.

Dependencies:

- CU3: Input data stream, auxiliary and derived data; integration with CU3 infrastructures and use of CU3 DPC databases.
- CU2: Simulated data for model and software evaluation.
- RTF: Radiation damage model

Interfaces:
CU3 and CU2

Remarks:
Any aspects of PSF and LSF for BP/RP are taken care of in DU11. It should further be noticed that CTI calibration and LSF/PSF calibration are mutually dependent processes.

WP number	Description
GWP-M-510-10000	**PSF and LSF calibration managerial tasks**
GWP-M-510-10100	Plan and schedule relevant WPs
GWP-M-510-10101	Prepare and maintain the flow charts
GWP-M-510-10102	Prepare and maintain the Gantt charts
GWP-M-510-10103	Preparation of Interface Control Document (ICD)
GWP-M-510-10200	Supervise developments
GWP-M-510-10300	Report on developments
GWP-I-510-10400	Provide interface contacts
GWP-T-510-20000	**PSF and LSF calibrations for SM and AF1-9**
GWP-T-510-20100	Define procedures and requirements
GWP-T-510-20200	Identify and evaluate algorithms and data types
GWP-S-510-20300	Implement algorithms in software
GWP-T-510-20400	Define software testing and evaluation procedures
GWP-S-510-20500	Perform software testing and evaluation
GWP-T-510-20600	Define scientific validation procedures and data requirements
GWP-S-510-20700	Develop software for scientific validation
GWP-S-510-20800	Perform and report on scientific validation
GWP-T-510-20900	Provide an assessment of the expected reconstruction accuracy and limitations of the delivered software
GWP-I-510-21000	Provide ICD for external interfaces and data types
GWP-S-510-30000	**Radiation damage Control and testing.**
GWP-T-510-30100	Test TDI Model against Astrium Lab Data
GWP-T-510-30200	Perform simulations using existing TDI model
GWP-T-510-30300	Perform simulations using new developed model
GWP-T-510-30400	Document physical characteristics derived from simulations
GWP-T-510-40000	**Charge release history**
GWP-T-510-40100	Define procedures and requirements
GWP-T-510-40200	Identify and evaluate algorithms and data types
GWP-S-510-40300	Implement algorithms in software
GWP-T-510-40400	Define software testing and evaluation procedures
GWP-S-510-40500	Perform software testing and evaluation
GWP-T-510-40600	Define scientific validation procedures and data requirements
GWP-S-510-40700	Develop software for scientific validation
GWP-S-510-40800	Perform and report on scientific validation
GWP-I-510-41000	Provide ICD for external interfaces and data types
GWP-T-510-50000	**Trend analysis**
GWP-T-510-50100	Define procedures and requirements
GWP-T-510-50200	Identify and evaluate algorithms and data types
GWP-S-510-50300	Implement algorithms in software
GWP-T-510-50400	Define software testing and evaluation procedures
GWP-S-510-50500	Perform software testing and evaluation

GWP-T-510-50600	Define scientific validation procedures and data requirements
GWP-S-510-50700	Develop software for scientific validation
GWP-S-510-50800	Perform and report on scientific validation
GWP-I-510-51000	Provide ICD for external interfaces and data types
GWP-T-510-60000	**CCD health monitoring**
GWP-T-510-60100	Define procedures and requirements
GWP-T-510-60200	Identify and evaluate algorithms and data types
GWP-S-510-60300	Implement algorithms in software
GWP-T-510-60400	Define software testing and evaluation procedures
GWP-S-510-60500	Perform software testing and evaluation
GWP-T-510-60600	Define scientific validation procedures and data requirements
GWP-S-510-60700	Develop software for scientific validation
GWP-S-510-60800	Perform and report on scientific validation
GWP-I-510-61000	Provide ICD for external interfaces and data types
GWP-T-510-70000	**Background Determination**
GWP-T-510-70100	Define procedures and requirements
GWP-T-510-70200	Identify and evaluate algorithms and data types
GWP-S-510-70300	Implement algorithms in software
GWP-S-510-70400	Integrate software into relevant pipelines
GWP-T-510-70500	Define software testing and evaluation procedures
GWP-S-510-70600	Perform software testing and evaluation
GWP-T-510-70700	Define scientific validation procedures and data requirements
GWP-S-510-70800	Develop software for scientific validation
GWP-S-510-70900	Perform and report on scientific validation
GWP-I-510-71100	Provide ICD for external interfaces and data types
GWP-T-510-80000	**CCD Bias and PEM offset**
GWP-T-510-80100	Define procedures and requirements
GWP-T-510-80200	Identify and evaluate algorithms and data types
GWP-S-510-80300	Implement algorithms in software
GWP-T-510-80400	Define software testing and evaluation procedures
GWP-S-510-80500	Perform software testing and evaluation
GWP-T-510-80600	Define scientific validation procedures and data requirements
GWP-S-510-80700	Develop software for scientific validation
GWP-S-510-80800	Perform and report on scientific validation
GWP-I-510-81000	Provide ICD for external interfaces and data types
GWP-T-510-90000	**Documentation**
GWP-T-510-90100	Provide the documentation for the PSF and LSF calibrations for SM and AF
GWP-T-510-100000	**Integration into IDT Pipeline**
GWP-I-510-100100	Interface with IDT developers
GWP-T-510-100200	Monitor and report on IDT/FL requirements and schedule
GWP-S-510-100300	Integrate algorithms into pipeline
GWP-T-510-100400	Define integrated software testing and evaluation procedures

GWP-T-510-100500	Evaluate and document integrated software tests
GWP-T-510-110000	**Integration into IDU Pipeline**
GWP-I-510-110100	Interface with IDU developers
GWP-T-510-110200	Monitor and report on IDU requirements and schedule
GWP-S-510-110300	Integrate algorithms into pipeline
GWP-T-510-110400	Define integrated software testing and evaluation procedures
GWP-T-510-110500	Evaluate and document integrated software tests
GWP-T-510-120000	**Integration into FL Pipeline**
GWP-I-510-120100	Interface with FL developers
GWP-T-510-120200	Monitor and report on FL requirements and schedule
GWP-S-510-120300	Integrate algorithms into pipeline
GWP-T-510-120400	Define integrated software testing and evaluation procedures
GWP-T-510-120500	Evaluate and document integrated software tests

Gaia DPAC WP:		GWP-M-511-00000
Title: BP/RP flux extraction and initial data treatment		
Provider(s): LEI, IOA, Roma/Teramo		
Manager(s): A. Brown		
Start: 01/10/2006	**End**: 31/03/2012	**Effort**: 23.5 mm/yr
Objective: DDT of the BP/RP flux extraction software package and BP/RP initial data treatment.		
Tasks:		

1. Perform spectral extraction for ‘normal’ sources, bright (saturated) sources and for complex or multiple sources.
2. Explore, define, implement and test methods for background determination for dispersed images over the full range of brightness and for multiple sources and crowded regions.
3. Incorporate the management of radiation damage effects into the spectral extraction methods.
4. Incorporate the management of CCD bias non-uniformity effects into the spectral extraction algorithms.
5. Incorporate the management of CCD serial register CTI effects into the spectral extraction algorithms.
6. Define broad-band flux and colour parameters from single extracted BP/RP spectra.
7. Explore, define, implement and test the algorithms for the determination of the effective wavenumber from BP/RP spectra.
8. Explore the possible use of different parameter sets for saturated images.
9. Prepare software modules for the processing of BP/RP spectra in the initial data treatment (determining colours/effective wavenumbers and RVS fluxes).

Input: Raw BP/RP data (2D or 1D dispersed images), tools and data necessary to make transit predictions for BP and RP for each source in the two fields of view, G-band fluxes, calibrated LSFs/PSFs, tools and data necessary for the radiation damage management. It would be desirable to have also information on contamination from the other FOV available, this needs to be assesed with respect to costs and benefits.
Output: Extracted BP/RP spectra, sky background measurements, broad-band uncalibrated flux estimates (including RVS band), broad-band colour estimates, effective wavenumber estimates.
Deliverables: BP/RP spectral extraction, effective wavenumber, broad-band flux- and colour-parameter estimation packages. A simplified version of these for implementation in the IDT/FL pipeline. Test packages for all software. Documentation.
Dependencies: CU3 for providing the tools and data to make transit predictions for BP/RP.
Interfaces: CU1, requirements for input data and CU3 for defining the colour information and IDT/FL BP/RP processing requirements and for providing the tools and data to make transit predictions for BP/RP.
Remarks:

WP number	Description
GWP-M-511-00000	**BP/RP flux extraction and initial data treatment**
GWP-M-511-00100	Plan and schedule relevant WPs
GWP-M-511-00110	Prepare and maintain the flow charts
GWP-M-511-00120	Prepare and maintain the Gantt charts
GWP-M-511-00200	Supervise developments
GWP-M-511-00300	Report on developments
GWP-I-511-00400	Provide interface contacts
GWP-M-511-05000	**Incorporation of CCD image section CTI, serial register CTI, and bias non-uniformity effects in the flux extraction algorithms**
GWP-S-511-05100	Scientific definition of the algorithm
GWP-T-511-05200	Implement algorithm
GWP-T-511-05300	Integrate algorithm
GWP-T-511-05400	Test and optimize algorithm
GWP-M-511-10000	**BP/RP flux extraction algorithm for isolated single point or extended sources**
GWP-S-511-10100	Scientific definition of the algorithm
GWP-T-511-10200	Implement algorithm
GWP-T-511-10300	Integrate algorithm
GWP-T-511-10400	Test and optimize algorithm
GWP-M-511-20000	**BP/RP flux extraction algorithm for binary or multiple point sources**
GWP-S-511-20100	Scientific definition of the algorithm
GWP-T-511-20200	Implement algorithm
GWP-T-511-20300	Integrate algorithm
GWP-T-511-20400	Test and optimize algorithm
GWP-M-511-30000	**BP/RP flux extraction algorithm for crowded regions**
GWP-S-511-30100	Scientific definition of the algorithm
GWP-T-511-30200	Implement algorithm
GWP-T-511-30300	Integrate algorithm
GWP-T-511-30400	Test and optimize algorithm
GWP-M-511-35000	**Algorithm for background modelling (sky plus other sources of background)**
GWP-S-511-35100	Scientific definition of the algorithm
GWP-T-511-35200	Implement algorithm
GWP-T-511-35300	Integrate algorithm
GWP-T-511-35400	Test and optimize algorithm

GWP-M-511-40000	**Algorithm for background modelling (sky plus other sources of background) in crowded regions**
GWP-S-511-40100	Scientific definition of the algorithm
GWP-T-511-40200	Implement algorithm
GWP-T-511-40300	Integrate algorithm
GWP-T-511-40400	Test and optimize algorithm
GWP-M-511-50000	**BP/RP flux extraction algorithm for 2D dispersed images of bright and possibly saturated stars**
GWP-S-511-50100	Scientific definition of the algorithm
GWP-T-511-50200	Implement algorithm
GWP-T-511-50300	Integrate algorithm
GWP-T-511-50400	Test and optimize algorithm
GWP-M-511-60000	**BP/RP flux extraction algorithm for solar system objects**
GWP-S-511-60100	Scientific definition of the algorithm
GWP-T-511-60200	Implement algorithm
GWP-T-511-60300	Integrate algorithm
GWP-T-511-60400	Test and optimize algorithm
GWP-M-511-70000	**Broad-band colour and flux estimation algorithms (including RVS-band)**
GWP-S-511-70100	Scientific definition of the algorithm
GWP-T-511-70200	Implement algorithm for CU5
GWP-T-511-70300	Implement algorithm for IDT/FL
GWP-T-511-70400	Integrate algorithm in CU5 pipeline
GWP-T-511-70500	Integrate algorithm in IDT/FL pipeline
GWP-T-511-70600	Test and optimize algorithms
GWP-M-511-80000	**Effective wavenumber estimation algorithms**
GWP-S-511-80100	Scientific definition of the algorithm
GWP-T-511-80200	Implement algorithm for CU5
GWP-T-511-80300	Implement algorithm for IDT/FL
GWP-T-511-80400	Integrate algorithm in CU5 pipeline
GWP-T-511-80500	Integrate algorithm in IDT/FL pipeline
GWP-T-511-80600	Test and optimize algorithms
GWP-T-511-90000	**Documentation**
GWP-T-511-90100	Provide the documentation for BP/RP flux extraction
GWP-T-511-90200	Provide the documentation for sky background modelling
GWP-T-511-90300	Provide the documentation for broad-band flux and colour estimation

Gaia DPAC WP:		GWP-T-512-00000
Title: Photometric calibration models for G and BP/RP		
Provider(s): UB, IoA, LEI		
Manager(s): C. Jordi		
Start: 01/10/2006	**End**: 31/12/2012	**Effort**: 60 mm/yr

Objective:
Providing adequate and effective models for the internal calibrations of G and BP/RP photometry and spectrophotometry.

Tasks:
This DU is in charge of the research into the internal photometric calibration models. It includes :

1. exploring provisions for the wide range of large- and small-scale influences on the observed fluxes and wavelength scale,
2. defining methods for comparing and combining different dispersion spectra,
3. accommodating in the calibration models the effects of CTI and ageing of the instrument.

Input:
Descriptions of the instrument and its expected evolution with time. Description of available data for every transit. Description of house-keeping data with impact on photometry calibration.

Output:
Description of the calibration models for SM, AF and BP/RP relating aspects of the instrument and of the observations with a set of parameters for the internal photometric calibration.

Deliverables:
One or more photometric-calibration models research papers.

Dependencies:
DU11 (for BP/RP data), CU3/CU1 (for G in SM, AFs and source data), DU15 (for feasibility of implementation of model), DU16 (for internal reference sources)

Interfaces:
CU1, CU3, CU2 (for available information and description of instrument)

Remarks:
The integration of the models in the CU5 pipeline is the responsibility of DU15.

WP number	Description
GWP-M-512-00000	**Photometric calibration models for G and BP/RP**
GWP-M-512-00100	Plan and schedule of WPs
GWP-M-512-00110	Prepare and maintain the flow charts
GWP-M-512-00120	Prepare and maintain the Gantt charts
GWP-M-512-00200	Supervise developments
GWP-M-512-00300	Report on developments
GWP-I-512-00400	Provide interface contacts (DUs in CU5 and other CUs)
GWP-T-512-00500	Validate deliverables
GWT-T-512-00600	Contribute to documents (SRS, SDP, ICD, etc)
GWP-S-512-10000	**Photometric G, integrated BP and RP passbands throughput model**
GWP-S-512-10100	Compile information about the instrument
GWP-S-512-10110	Compile information about large scale throughput changes in mirrors
GWP-S-512-10120	Compile information about overall QE differences from one CCD to another
GWP-S-512-10130	Compile information about pixel-response non-uniformities
GWP-S-512-10140	Compile information about non-linearity
GWP-S-512-10150	Compile information about changes with time
GWP-S-512-10160	Compile information about polarization
GWP-S-512-10200	Identify and define calibration units (FoV, CCD, column, gate, time, colour, mag, ...)
GWP-S-512-10300	Evaluation of window cut-off AC (FoV, CCD, column, gate, time, colour, mag, pos, motion)
GWP-S-512-10400	Evaluation of CTI effects on throughput
GWP-S-512-10500	Evaluation of observing conditions (bright stars, charge injection, cross talk,..)
GWP-S-512-10600	Evaluation of throughput changes
GWP-S-512-10700	Evaluation of non-linearity
GWP-I-512-10800	Define set of parameters of the calibration model and their relationship with the instrument
GWP-T-512-10800	Testing of models (in software of DU15)
GWP-I-512-10810	Define input and auxiliary data requests
GWP-I-512-10820	Define test data requests
GWP-T-512-10830	Develop/test
GWP-S-512-10900	Evaluate goodness of calibration model
GWP-S-512-10910	Define criteria of goodness
GWP-S-512-10920	Evaluate random residuals
GWP-S-512-10930	Evaluate systematic residuals
GWP-S-512-10940	Evaluate feasibility
GWP-S-512-11000	Evaluation of polarisation
GWP-S-512-12000	Interaction of saturation and non-linearity with IDT

GWP-T-516-12010	Define input and auxiliary data requirements
GWP-T-516-12020	Define requirements of test data
GWP-T-516-12030	Define data types
GWP-T-516-12040	Develop Java class
GWP-T-516-12050	Develop software test
GWP-S-512-20000	**Spectrophotometric BP/RP throughput**
GWP-S-512-20100	Compile information about the instrument
GWP-S-512-20110	Compile information about large scale throughput changes in mirrors
GWP-S-512-20120	Compile information about overall QE differences from one CCD to another
GWP-S-512-20130	Compile information about pixel-response non-uniformities
GWP-S-512-20140	Compile information about non-linearity
GWP-S-512-20150	Compile information about throughput changes in filters and prisms
GWP-S-512-20160	Compile information about changes with time
GWP-S-512-20170	Compile information about polarization
GWP-S-512-20200	Identify and define calibration units (FoV, CCD, column, gate, time, colour, mag, ...)
GWP-S-512-20300	Geometric calibration model for AC (FoV, CCD, column, gate, time, colour, mag, pos, motion)
GWP-S-512-20400	Evaluation of window cut-off AC (FoV, CCD, column, gate, time, colour, mag, pos, motion)
GWP-S-512-20500	Evaluation of window cut-off AL (FoV, CCD, column, gate, time, colour, mag, pos, motion)
GWP-S-512-20600	Evaluation of CTI effects on throughput
GWP-S-512-20700	Evaluation of observing conditions (bright stars, charge injection, cross talk,..)
GWP-S-512-20800	Evaluation of throughput changes
GWP-S-512-20900	Evaluation of non-linearity
GWP-S-512-21000	Modelling the instrument sensitivity through a set of parameters
GWP-T-512-21000	Testing of models (in software of DU15)
GWP-I-512-21010	Define input and auxiliary data requests
GWP-I-512-21020	Define test data requests
GWP-T-512-21030	Develop/test
GWP-S-512-21100	Evaluate goodness of calibration model
GWP-S-512-21110	Define criteria of goodness
GWP-S-512-21120	Evaluate random residuals
GWP-S-512-21130	Evaluate systematic residuals
GWP-S-512-21140	Evaluate feasibility
GWP-S-512-21100	Evaluation of polarisation
GWP-S-512-30000	**Wavelength scale and geometry**
GWP-S-512-30100	Compile information about the instrument

GWP-S-512-30110	Compile information about dispersion changes on the focal plane
GWP-S-512-30120	Compile information about PSF changes on the focal plane and as function of wavelength
GWP-S-512-30130	Compile information about changes with time
GWP-T-512-30200	Identify and define calibration units (FoV, CCD, column, gate, time, colour, mag, ...)
GWP-S-512-30400	Evaluation of observing conditions (bright stars, charge injection, cross talk,..)
GWP-S-512-30500	Modelling dispersion characterisation through a set of parameters
GWP-S-512-30700	Modelling changes in the PSF on the focal plane
GWP-T-512-30900	Testing of models (in software of DU15)
GWP-I-512-30910	Define input and auxiliary data requests
GWP-I-512-30920	Define test data requests
GWP-T-512-30930	Develop/test
GWP-S-512-31000	Evaluate goodness of calibration model
GWP-S-512-31010	Define criteria of goodness
GWP-S-512-31020	Evaluate random residuals
GWP-S-512-31030	Evaluate systematic residuals
GWP-S-512-31040	Evaluate feasibility
GWP-M-512-40000	**Develop a detailed scientific understanding of the measurement of prism spectra in TDI mode**
GWP-S-512-40100	Develop detailed optical model of dispersed images
GWP-S-512-40200	Develop accurate definition of the dispersion curve in the context of TDI and geometrical calibration
GWP-S-512-40300	Develop detailed understanding of variations of the dispersion curve across the focal plane
GWP-S-512-40400	Develop detailed understanding of pixel-respone non-uniformities on BP/RP spectra
GWP-S-512-40500	Develop detailed understanding of CTI effects on the dispersed images
GWP-T-512-40600	Integrate the results into the BP/RP calibration model
GWP-S-512-50000	Internally calibrated mean and epoch BP/RP spectra
GWP-S-512-50100	Define requirements with DU14 and CU8
GWP-S-512-50200	Definition of calibrated spectrum
GWP-S-512-50300	Develop a model for mean spectrum computation
GWP-S-512-50400	Develop a model for epoch spectrum computation
GWP-S-512-50500	Testing of models
GWP-S-512-50510	Define input and auxiliary data requests
GWP-S-512-50520	Define test data requests
GWP-S-512-50530	Develop/test
GWP-S-512-50600	Evaluate goodness of spectrum model
GWP-S-512-50610	Define criteria of goodness

GWP-S-512-50620	Evaluate random residuals
GWP-S-512-50630	Evaluate systematic residuals
GWP-S-512-50640	Evaluate feasibility
GWP-S-512-60000	Interaction with DU15 for model implementation
GWP-S-512-60100	Implementation of throughput model calibration of G and integrated BP and RP
GWP-S-512-60200	Implementation of throughput model for BP/RP spectra
GWP-S-512-60300	Implementation of wavelength scale calibration
GWP-S-512-60400	Implementation of mean spectra computation
GWP-S-512-60500	Implementation of epoch spectra computation
GWP-T-512-70000	**Documentation**
GWP-T-512-70100	Provide documentation on the calibration model of SM and AF
GWP-S-512-70110	Modelling of AC flux loss
GWP-S-512-70120	Modelling of throughput variations
GWP-S-512-70130	Management of non-linearities
GWP-S-512-70130	Description of calibration units
GWP-S-512-70140	Requirements on internal reference sources selection
GWP-T-512-70200	Provide documentation on the calibration model of BP/RP
GWP-S-512-70210	Modelling of AC flux loss
GWP-S-512-70220	Modelling geometry
GWP-S-512-70230	Modelling wavelength scale
GWP-S-512-70240	Modelling throughput
GWP-S-512-70250	Description of calibration units
GWP-S-512-70260	Requirements on internal reference sources selection

Gaia DPAC WP:		GWP-M-513-00000
Title: Instrument absolute response characterisation: ground-based preparation		
Provider(s): OABO, UB		
Manager(s): E. Pancino		
Start: 01/10/2006	**End**: 31/12/2012	**Effort**: 50 mm/yr
Objective: Obtain the ground-based observations required for the absolute calibration of Gaia photometric data.		
Tasks: 1. Assessment of needed ground-based observations 2. Acquisition and reduction of those observations 3. Preparation of the data for the application in the CU5 pipeline		
Input: Requirements from GWP-M-514-00000 on the absolute calibration of the Gaia photometric systems		
Output: List of spectrophotometric standard stars (SPSS) and database of the fully reduced ground-based observations of these stars; a full accuracy assessment of these ground-based data		
Deliverables: Database of ground-based observations (flux tables) and documentation describing their characteristics		
Dependencies: The characteristics of the Gaia intruments have a deep impact on the SPSS selection process.		
Interfaces: GBOG (Ground Based Observations for Gaia) Working Group, for GB observations coordination; GWP-M-505-00000 for database and archive; GWP-M-514-00000		
Remarks:		

WP number	Description
GWP-M-513-00000	**Instrument absolute response characterisation: ground-based preparation**
GWP-M-513-00100	Plan and schedule relevant WPs
GWP-M-513-00110	Prepare and maintain the flow charts
GWP-M-513-00120	Prepare and maintain the Gantt charts
GWP-M-513-00200	Supervise developments
GWP-M-513-00300	Report on developments
GWP-I-513-00400	Provide interface contacts
GWP-S-513-10000	**Characterization of required Spectrophotometric Standard Stars (SPSS) sample**
GWP-S-513-10100	General requirements and strategy definition
GWP-S-513-10200	Perform simulations to estimate the optimum number, magnitudes, S/N and location of SPSS
GWP-S-513-10300	Perform simulations to estimate the absolute response curve sensitivity on spectral type and other parameters
GWP-S-513-10400	Establish criteria for selection of primary SPSS
GWP-S-513-10500	Establish criteria for selection of secondary SPSS
GWP-S-513-20000	**Selection of candidate primary SPSS**
GWP-S-513-20100	Search existing reference star catalogues and archives
GWP-S-513-20200	Extract a list of suitable candidate primary SPSS
GWP-S-513-30000	**Selection of candidate secondary SPSS**
GWP-S-513-30100	Search existing reference star catalogues and archives
GWP-S-513-30200	Extract a list of suitable candidate secondary SPSS
GWP-S-513-40000	**Ground-based observations**
GWP-I-513-40100	Coordination of GB observations through the GBOG WG
GWP-S-513-40200	Testing of procedures and observations of primary SPSS: pilot observations
GWP-S-513-40210	Define strategy and procedures for observations
GWP-S-513-40220	Selection of appropriate observation facilities
GWP-S-513-40230	Prepare and submit applications for observing time
GWP-S-513-40240	Carry out observations
GWP-S-513-40250	Refine strategy and procedures for observations
GWP-S-513-40300	Observations of secondary SPSS: main observational campaign
GWP-S-513-40310	Selection of appropriate observation facilities
GWP-S-513-40320	Prepare and submit applications for observing time
GWP-S-513-40330	Carry out observations
GWP-S-513-40400	Validation of SPSS: auxiliary observations

GWP-S-513-40410	Identify SPSS that need auxiliary observations
GWP-S-513-40420	Selection of appropriate observation facilities
GWP-S-513-40430	Prepare and submit applications for observing time
GWP-S-513-40440	Carry out observations
GWP-S-513-40500	Linearity checks and additional observations
GWP-S-513-40510	Investigate on the necessity and needs for additional observations
GWP-S-513-40520	Selection of appropriate observation facilities
GWP-S-513-40530	Prepare and submit applications for observing time
GWP-S-513-40540	Carry out observations
GWP-S-513-50000	**Data Reduction and Analysis**
GWP-T-513-50100	Instrument Familiarization Plan
GWP-S-513-50110	Define IFP procedures
GWP-S-513-50120	Complete CCD familiarization plan for all used instruments
GWP-S-513-50130	Complete instrument familiarization plan for all used instruments
GWP-S-513-50140	Complete site familiarization plan for all used instruments
GWP-T-513-50200	Reduce photometry data
GWP-S-513-50210	Define photometry pre-reduction procedures
GWP-S-513-50220	Define absolute photometry reduction procedures
GWP-S-513-50230	Define short-term variability reduction procedures
GWP-S-513-50240	Define long-term variability reduction procedures
GWP-T-513-50300	Reduce spectroscopy data
GWP-S-513-50310	Define spectroscopy pre-reduction procedures
GWP-T-513-50320	Derive 1D, wavelength & relative flux calibrated spectra
GWP-T-513-50330	Create telluric corrected spectra
GWP-T-513-50340	Absolute flux calibration of spectra obtained in photometric nights
GWP-S-513-50400	Analyse collected data
GWP-S-513-50410	Derive synthetic photometry from all reduced spectra
GWP-S-513-50420	Compare absolute photometry from different sites and runs
GWP-S-513-50430	Compare absolute spectrophotometry from different sites and runs
GWP-S-513-50440	Perform absolute calibration of non-photometric spectra with photometry
GWP-S-513-50450	Create uniform flux tables for all good SPSS with related uncertainties
GWP-T-513-60000	**Create and maintain SPSS internal data base and archive**
GWP-I-513-60100	Interface contacts with GWP-M-505-00000
GWP-T-513-60200	Design and test Database & Archive
GWP-S-513-60210	Define general requirements
GWP-T-513-60220	Design, build and test dummy Database & Archive
GWP-S-513-60230	Refine general requirements
GWP-T-513-60300	Implement, populate and maintain Database & Archive
GWP-T-513-60310	Design, build and test Database & Archive
GWP-T-513-60320	Populate Database with SPSS information

GWP-T-513-60330	Populate Archive with SPSS fits files
GWP-T-513-60340	Maintain Database & Archive
GWP-T-513-60400	Prepare deliverables for GWP-M-505-00000
GWP-T-513-60500	Prepare Documentation for Database & Archive
GWP-T-513-70000	**Create and maintain web-based information pages**
GWP-I-513-70100	Create and maintain DU13 internal, protected Wiki pages (Wiki-Bo)
GWP-T-513-70110	Create a Wiki server at OABO (Wiki-Bo)
GWP-T-513-70120	Maintain a General housekeeping and manpower section
GWP-T-513-70130	Maintain a Documentation section with literature, reports, and published DU13 documents
GWP-T-513-70140	Maintain an SPSS Observations section with proposals, tools, logs and summaries
GWP-T-513-70150	Maintain an SPSS Data Reduction section with procedures, notes, tools and summaries
GWP-T-513-70160	Maintain active links with the SPSS Database & Archive
GWP-I-513-70200	Interface internal Wiki-Bo pages with other official pages
GWP-T-513-70210	Maintain DU13 space and (password protected) links to Wiki-Bo within the DPAC-CU5 Wiki pages
GWP-T-513-70220	Maintain DU13 space and (password protected) links to Wiki-Bo within the DPAC-GBOG Wiki pages
GWP-T-513-70230	Maintain DU13 space and (password protected) links to Wiki-Bo within the OABO outreach public pages

Gaia DPAC WP:		GWP-M-514-00000
Title: Instrument absolute response characterisation: definition and application		
Provider(s): OABO		
Manager(s): C. Cacciari		
Start: 01/10/2006	**End**: 31/03/2012	**Effort**: 20 mm/yr

Objective:
DDT of the methods and software to solve for and apply the absolute photometric calibration model.

Tasks:
This unit is responsible for:

1. Explore, define, develop and test methods for calibration of the absolute response of the instrument;
2. Define and derive the reconstruction-accuracy expectations and limitations;
3. Provide Java classes to apply the absolute flux calibration procedure to the data;
4. Based on the method presently used for the flux calibration model definition of the BP/RP spectra, the wavelength zero-point calibration is provided as an additional product of the BP/RP spectra flux calibration procedure;
5. Depending on the quality of the mean BP/RP spectra and/or the number of available SPSS, information may be provided on the LSF as a function of wavelength.

Input:

- Flux tables and errors of SPSS, provided by DU13 (to be extracted from the CU5 database or MDB);
- G-band and BP/RP data, provided by DU15 (to be extracted from the CU5 database or MDB);
- Initial instrument model parameters (from the Parameter Data Base);

Output:

- The flux calibration models and parameters;
- The algorithms to determine and apply the absolute calibration to the internally calibrated photometry and BP/RP spectra;
- The G/BP/RP filter transmission curves;
- The wavelength zero-point calibration;
- The LSF parameterisation.

Deliverables:

- The instrument response characterisation models and parameters (including filter response curves, dispersion function, LSF), to be stored in the CU5 database and/or MDB;
- The Java classes to convert measured fluxes into absolute fluxes, for implementation in the pipeline;
- Documentation.

Dependencies:
Internal: DU12 (mean/epoch spectra characteristics/format); DU13 (SPSS data: number, types, fluxes, information on astrophysical parameters); DU15 (G-band and BP/RP data, auxiliary data); DU05 (CU5 database). External: CU2 (simulations); CU8 (library models)

Interfaces:
Internal: DU05, DU12, DU13, DU15. External: CU2, CU8

Remarks:
Because the BP/RP calibration model is derived from mean internally calibrated spectra, a fiducial - not real - instrument model is obtained.

WP number	Description
GWP-M-514-00000	**Instrument absolute response characterisation: definition and application**
GWP-M-514-00100	Plan and schedule relevant WPs
GWP-M-514-00110	Prepare and maintain the flow charts
GWP-M-514-00120	Prepare and maintain the Gantt charts
GWP-M-514-00200	Supervise developments
GWP-M-514-00210	Regular internal meetings
GWP-M-514-00220	Dedicated internal “workshops”
GWP-M-514-00300	Report on developments
GWP-M-514-00310	Provide Internal Report
GWP-M-514-00320	Provide Report and Planning at Review meetings
GWP-I-514-00400	Provide interface contacts (DUs in CU5, other CUs)
GWP-T-514-00500	Validate deliverables
GWP-M-514-00600	Contribute to documents (SRS, SDP, ICD, etc.)
GWP-M-514-10000	**Absolute calibration model and Java classes for the integrated G/BP/RP passbands**
GWP-S-514-10100	Scientific definition and test of the algorithm
GWP-T-514-10110	Define and prepare set of simulated data for the SPSS
GWP-T-514-10120	Define and prepare set of simulated data for the testbed
GWP-S-514-10130	Define and develop algorithm, and derive calibration model
GWP-T-514-10140	Test model dependence on astrophysical parameters using the testbed data set
GWP-T-514-10150	Test calibration accuracy and limitations using the testbed data set
GWP-T-514-10160	Optimize algorithm
GWP-T-514-10200	Implement algorithm in the pipeline
GWP-T-514-10210	Define data types
GWP-T-514-10220	Define and develop datataker
GWP-T-514-10300	Develop, test and optimize the calibration application function
GWP-M-514-20000	**Absolute calibration model and Java classes for the BP/RP spectra**
GWP-S-514-20100	Scientific definition and test of the algorithm
GWP-S-514-20110	Define and develop algorithm, and derive calibration model
GWP-T-514-20120	Test model dependence on astrophysical parameters using the testbed data set
GWP-T-514-20130	Test calibration accuracy and limitations using the testbed data set
GWP-T-514-20140	Optimize algorithm
GWP-T-514-20200	Implement algorithm in the pipeline
GWP-T-514-20210	Define data types
GWP-T-514-20220	Define and develop datataker
GWP-T-514-20300	Develop, test and optimize the calibration application function

GWP-M-514-30000	**Wavelength zero-point calibration model as derived from the flux calibration process of the BP/RP spectra**
GWP-T-514-30100	Definition and test of the method
GWP-T-514-30110	Define and develop algorithm, and derive calibration model
GWP-T-514-30120	Test feasibility
GWP-T-514-30130	Test accuracy
GWP-T-514-30200	Implement algorithm in the pipeline
GWP-T-514-30300	Develop, test and optimize the calibration application function
GWP-M-514-40000	**LSF parameterisation**
GWP-T-514-40100	Definition and test of the method
GWP-T-514-40110	Define and develop algorithm, and derive parameterisation
GWP-T-514-40110	Test feasibility
GWP-T-514-40120	Test accuracy
GWP-T-514-40200	Implement algorithm in the pipeline
GWP-T-514-40300	Develop, test and optimize the application function
GWP-T-514-50000	**Documentation**
GWP-T-514-50100	Provide documentation on the integrated G/BP/RP calibration model
GWP-M-514-50110	Report on tests and algorithm
GWP-M-514-50120	Report on accuracy and limitations
GWP-M-514-50130	Provide documentation on Java class
GWP-T-514-50200	Provide documentation on the BP/RP spectra calibration model
GWP-M-514-50210	Report on tests and algorithm
GWP-M-514-50220	Report on accuracy and limitations
GWP-M-514-50230	Provide documentation on Java class
GWP-T-514-50300	Provide documentation on the wavelength zero-point calibration
GWP-M-514-50310	Report on tests and algorithm
GWP-M-514-50320	Report on accuracy and limitations
GWP-M-514-50330	Provide documentation on Java class
GWP-T-514-50400	Provide documentation on the LSF parameterisation
GWP-M-514-50410	Report on tests and algorithm
GWP-M-514-50420	Report on accuracy and limitations
GWP-M-514-50430	Provide documentation on Java class

Gaia DPAC WP:		GWP-T-515-00000
Title: Internal photometric calibration and its application		
Provider(s): IoA		
Manager(s): D. W. Evans		
Start: 01/10/2006	**End**: 31/03/2012	**Effort**: 50 mm/yr

Objective:
DDT of the methods and software required for the internal photometric calibration and its application

Tasks:
This unit is responsible for:

- The development, testing and implementation of the internal photometric calibration procedures of AF/SM and integrated BP/RP data following models proposed by DU12;
- The development, testing and implementation of the internal spectroscopic calibration procedures of BP/RP spectral data following models proposed by DU12;
- The application of the internal and external calibration models to all sources for both photometric and spectral data;
- The design, development and testing of the methods and software for the accumulation of the mean flux information;
- The design, development and testing of the methods and software for the generation of mean spectral information;
- The selection of constant stars from the accumulated flux information;
- Trend monitoring of calibration parameters;
- The preparation of the processed data for release to the central data base;

Input:
Interface control documents, providing data descriptions for:

- photometric parameters for AF and SM;
- dispersion spectra in BP and RP (from CU3 and DU11);
- the internal calibration standards (from DU16);
- auxiliary information (identifiers, gates, AC postion, CCD number etc)

the external calibration model application functions (from DU14); the internal calibration model (from CU12); input requirements for the central data base (from CU1).

Output:
Internal photometric calibration model parameters; calibrated (internally and externally) photometric and spectral (BP/RP) observations; not-variable flags.

Deliverables:
The software and documentation for

- the internal calibration procedures;
- the application of the internal calibrations;
- mean calibrated data;
- the selection of non-variables;
- trend monitoring of the calibration parameters;
- the preparation of the data for release to ESAC.

Dependencies:
DU11 (BP/RP data), DU12 (model), DU14 (external calibration model), DU16 (standards), DU04 (internal data base), CU1 (main data base), CU3 (photometric parameters AF, SM, photometry for IDU, application of simplified photometric calibration model), CU7 (Requirements on epoch photoemtry)

Interfaces:
External: CU1 (central data base); Internal: DU11, DU12, DU14, DU16, DU17.

Remarks:

WP number	Description
GWP-M-515-00000	**Internal photometric and spectral calibration and its application**
GWP-M-515-00100	Plan and schedule of WPs
GWP-M-515-00110	Prepare and maintain the flow charts
GWP-M-515-00120	Prepare and maintain the Gantt charts
GWP-M-515-00200	Supervise developments
GWP-M-515-00300	Report on developments
GWP-I-515-00400	Provide interface contacts (DUs in CU5 and other CUs)
GWP-M-515-00500	Validate deliverables
GWP-M-515-00600	Contribute to CU5 system requirements document
GWP-M-515-10000	**Implementation of the large-scale photometric calibration model**
GWP-S-515-10100	Initialize calibration process
GWP-T-515-10110	Assess the data streams
GWP-S-515-10120	Research possible initialization procedure
GWP-T-515-10130	Evaluate and develop methods for creating a list of preliminary calibration stars
GWP-T-515-10140	Evaluate and develop methods for gradually refining the candidate list through iteration
GWP-T-515-10200	Normal operations
GWP-T-515-10210	Assess the data streams
GWP-S-515-10220	Evaluate and develop methods for extracting calibration stars from the data stream
GWP-T-515-10230	Evaluate and develop methods for solving the calibration model for AF
GWP-T-515-10240	Evaluate and develop methods for solving the calibration model for BP/RP
GWP-T-515-10300	Test of the normal-mode calibration model
GWP-T-515-10310	Assess model deficiencies
GWP-T-515-10320	Assess the normal-mode calibration convergence
GWP-M-515-20000	**Implementation of the small-scale photometric calibration model**
GWP-S-515-20100	Research of the methods
GWP-T-515-20110	Accumulate residual data
GWP-S-515-20120	Evaluate and develop methods for modelling the residuals on individual CCD level
GWP-T-515-20130	Assess the characteristics of the small-scale calibration parameters
GWP-T-515-20200	Normal operations
GWP-T-515-20210	Assess the data streams
GWP-S-515-20220	Evaluate and develop methods for extracting calibration stars from the data stream
GWP-T-515-20230	Evaluate and develop methods for solving the calibration model for AF

GWP-T-515-20240	Evaluate and develop methods for solving the calibration model for BP/RP
GWP-T-515-20300	Test of the normal-mode calibration model
GWP-T-515-20310	Assess model deficiencies
GWP-T-515-20320	Assess the normal-mode calibration convergence
GWP-M-515-25000	**Calibration of the spectral BP/RP data**
GWP-S-515-25100	Research of the methods
GWP-T-515-25200	Normal operations
GWP-T-515-25300	Test of the normal-mode calibration model
GWP-M-515-30000	**Trend monitoring of calibration parameters**
GWP-T-515-30100	Develop and test software for monitoring large-scale AF calibration parameters
GWP-T-515-30200	Develop and test software for monitoring large-scale BP/RP calibration parameters
GWP-T-515-30300	Develop and test software for monitoring small-scale AF calibration parameters
GWP-T-515-30400	Develop and test software for monitoring small-scale BP/RP calibration parameters
GWP-T-515-30500	Develop and test software for monitoring spectral BP/RP calibration parameters
GWP-T-515-40000	**Application of the internal calibration models (AF and BP/RP, large and small scale, photometric and spectral)**
GWP-T-515-40100	Optimize data stream
GWP-T-515-40200	Develop and test methods
GWP-T-515-50000	**Application of the external calibration models (AF, integrated BP/RP, spectral BP/RP)**
GWP-T-515-50100	Optimize data stream
GWP-T-515-50200	Develop and test methods
GWP-S-515-60000	**Accumulation of internally calibrated fluxes, G, intgrated BP and RP**
GWP-S-515-60100	Define, develop and test statistical accumulators
GWP-T-515-60200	Implement statistical accumulators in the data base updates
GWP-S-515-65000	**Generation of mean BP and RP spectra**
GWP-S-515-65100	Research data model and methods
GWP-T-515-65200	Develop and test methods to generate calibrated mean BP and RP spectra

GWP-S-515-70000	**Selection of non-variable objects**
GWP-S-515-70100	Define, develop and test methods for assessment of the noise contributions to the internally calibrated data
GWP-S-515-70200	Define and test criteria for variability assessment
GWP-S-515-70210	Define and test procedures for short-term variability (CCD-transit level)
GWP-S-515-70220	Define and test procedures for long-term variability (field-transit level)
GWP-T-515-70300	Implement and test the detection of constant stars
GWP-T-515-80000	**Preparation of data streams for central data base**
GWP-T-515-80100	Assess the photometry requirements from all CUs
GWP-T-515-80200	Define and describe output data streams
GWP-T-515-80300	Develop and test the output data stream preparation modules
GWP-T-515-90000	**Documentation**
GWP-T-515-90100	Prepare documentation for the initialization procedure
GWP-T-515-90200	Prepare documentation for the normal-mode large-scale calibration model
GWP-T-515-90300	Prepare documentation for the small-scale calibration model
GWP-T-515-90400	Prepare documentation for calibrated-flux accumulation and non-variability detection
GWP-T-515-90500	Prepare documentation for the spectral BP/RP calibration model
GWP-T-515-90600	Prepare documentation for the data releases

Gaia DPAC WP:		GWP-M-516-00000
Title: Selection of internal reference sources		
Provider(s): UB, IoA		
Manager(s): C. Jordi		
Start: 01/10/2006	**End**: 31/12/2012	**Effort**: 25 mm/yr

Objective:
Define, develop, implement and test the software for the selection of reference sources for internal calibration of fluxes (G and BP/RP) and instrument effects in BP/RP spectra except absolute wavelength scale.

Tasks:

1. Define suitable criteria for selecting the reference sources
2. Investigate the relation between number and quality of reference sources and the accuracy of the photometric calibration
3. Define, implement and test the software for the selection of reference sources

Input:
Mean G fluxes, mean BP and RP spectra, colour information, statistics of fluxes (from DU15), information about the kind of source and its parameters (from CU8), astrophysical information from CU6, results of variability analysis (from CU7), contamination (from DU18, CU4, ...), flags from other processing chains (CU1, CU3).

Output:
Suitable sources for flux calibration; suitable sources for wavelength scale calibration

Deliverables:
The package to be applied a few times during the mission for selecting internal reference sources

Dependencies:
DU12 (for the requirements), DU15 (for the statistics on the accumulated photometry), DU04 or DU19 (for the implementation in the CU5 pipeline and data model)

Interfaces:
CU1, CU2, CU3, CU4, CU6, CU7, CU8

Remarks:

WP number	Description
GWP-M-516-00000	**Selection of internal reference sources**
GWP-M-516-00100	Plan and schedule of WPs
GWP-M-516-00110	Prepare and maintain the flow charts
GWP-M-516-00120	Prepare and maintain the Gantt charts
GWP-M-516-00200	Supervise developments
GWP-M-516-00300	Report on developments
GWP-I-516-00400	Provide interface contacts (DUs in CU5 and other CUs)
GWP-M-516-00500	Validate deliverables
GWT-T-516-00600	Contribute to documents (SRS, SDP, ICD, etc)
GWP-M-516-10000	**Preparation of a set of flux reference sources**
GWP-S-516-10100	Establish the requirements according to instrument
GWP-S-516-10200	Establish the selection criteria
GWP-T-516-10300	DDT of software for the selection of the internal calibration sources
GWP-T-516-10310	Define input and auxiliary data requirements
GWP-T-516-10320	Define requirements of test data
GWP-T-516-10330	Define data types
GWP-T-516-10340	Develop Java class
GWP-T-516-10350	Develop software test
GWP-T-516-40000	**Documentation**
GWP-T-516-40100	Provide documentation on the reference sources for flux
GWP-T-516-40200	Provide documentation on the reference sources for wavelength scale
GWP-T-516-40300	Provide documentation on the reference sources for absolute zero wavelength
GWP-T-516-40400	Provide documentation on software and its implementation
GWP-T-516-40500	Provide documentation on the initialization procedure

Gaia DPAC WP:		GWP-T-517-00000
Title: Flux and classification-based science alerts		
Provider(s): IOA		
Manager(s): S. Hodgkin		
Start: 01/10/2007	**End**: 31/03/2012	**Effort**: 15 mm/yr
Objective: DDT for flux and classification-based anomaly detections.		
Tasks: 1. Define, develop, test and implement methods to provide rapid detection of large flux anomalies in a separate pipeline 2. Define, develop, test and implement methods for classification-based anomaly detections 3. Design methods to filter the anomaly candidates appropriately for suitable science alerts 4. Tests on the statistical success rate of the methods, and thus the reliability of the "alerts"		
Input: Raw photometry, spectrometry and whatever astrometry is available from the IDT, plus calibration set derived in CU5 pipeline		
Output: Science alerts together with their significance and priorities		
Deliverables: Flux and classification-based anomaly detection classes, software packages for the first-look flux anomaly detection		
Dependencies:		
Interfaces: CU4, CU6, CU7 and CU8		

Remarks:

WP number	Description
GWP-M-517-00000	**Flux and classification-based science alerts**
GWP-M-517-00100	Plan and schedule relevant WPs
GWP-M-517-00110	Prepare and maintain the flow charts
GWP-M-517-00120	Prepare and maintain the Gantt charts
GWP-M-517-00200	Supervise developments
GWP-M-517-00300	Report on developments
GWP-I-517-00400	Provide interface contacts
GWP-S-517-10000	**Define target objects and detection rates**
GWP-S-517-10100	Bursters: Novae and Supernovae
GWP-S-517-10200	Detect possible false positives
GWP-S-517-10210	Fast Movers: Near-Earth objects
GWP-M-517-20000	**Flux-based detection methods**
GWP-S-517-20100	Research detection methods
GWP-T-517-20200	Develop detection methods
GWP-T-517-20300	Test detection methods
GWP-M-517-30000	**Flux-based filtering procedures**
GWP-S-517-30100	Research filtering procedures
GWP-T-517-30200	Develop filtering procedures
GWP-T-517-30300	Test filtering procedures
GWP-M-517-40000	**Classification-based detection methods**
GWP-S-517-40100	Research detection methods
GWP-T-517-40200	Develop detection methods
GWP-T-517-40300	Test detection methods
GWP-M-517-50000	**Classification-based filtering procedures**
GWP-S-517-50100	Research filtering procedures
GWP-T-517-50200	Develop filtering procedures
GWP-T-517-50300	Test filtering procedures
GWP-M-517-60000	**Alert-reporting procedures**
GWP-S-517-60100	Research reporting procedures
GWP-T-517-60200	Develop reporting procedures
GWP-M-517-70000	**Documentation**
GWP-T-517-70100	Prepare documentation on detection implementation
GWP-T-517-70200	Prepare documentation on filtering implementation
GWP-T-517-70300	Prepare documentation on reporting implementation

Gaia DPAC WP:		GWP-M-518-00000
Title: Source environment analysis		
Provider(s): CAM, LEI, Bordeaux		
Manager(s): D. L. Harrison		
Start: 01/10/2006	**End**: 31/03/2012	**Effort**: 19.5 mm/yr

Objective:
DDT of the software required for carrying out a source environment analysis from SM1/2 and AF2/5/8 transits.

Tasks:

1. For each Gaia main catalogue source assess whether any disturbing sources are present nearby.
2. Whenever possible use the combined SM1/2 and AF2/5/8 data to produce a complete description of the sky, solving for the flux and the five standard astrometric parameters of the point sources present in the immediate vicinity of each disturbed Gaia source.
3. Make this description available in the form of a source list together with the point source photometric and astrometric parameters.
4. For the more complicated disturbances (binaries, extended sources, sky background structure, etc) provide sufficient information for further processing by CU4.

The output of this image processing will be a characterisation of the sky immediately around the target source and this information will be incorporated in a TBD way in the astrometric and photometric data processing. Also for complicated sky backgrounds and extended sources images will be produced.

Input:
SM1/2 and AF2/5/8 raw data, local plane coordinates for each of the input windows

Output:
List of sources and source parameters describing the contents of the sky around the target source. Information that can be used by CU4 to decide on further processing of the SM1,2 and AF2,5,8 data.

Deliverables:
Image reconstruction and analysis classes

Dependencies:
CU3 for the transformation to local plane coordinates

Interfaces:
CU3 for the delivery of the local plane coordinate data; CU3, CU4, CU6, CU7, CU8 for interface requirements (which image parameters are needed by these CUs)

Remarks:
The processing in this DU for each Gaia source consists of five steps:

1. For each source in the main catalogue examine the PSF/LSF fitting statistics and the astrometric solution statistics, both the result from CU3 processing, to decide if further investigation of the source is needed. If the statistics give no reason to suspect that the source may be disturbed the following steps are skipped and it is recorded that the source is considered undisturbed (to some specified level).

2. If further investigation of the source is warranted produce a first order 2D image under the assumption of zero motion for the sources in the sky. This will be okay in most cases as the majority of sources will have small parallaxes and proper motions (compared to the SM/AF sample sizes).

3. Analyze the first order image in order to decide what level of complication is necessary in the full sky modelling. This consists of source detection, source characterization (where for example an elongated source would imply the need to model its astrometric motion) and a characterization of the sky background.

4. Carry out a full sky modelling, only taking into account the flux and the five standard astrometric parameters for each source. If the modelling is successful record the source list and the source parameters (astrometry, epoch photometry), including an update of the main catalogue source parameters. Take the source parameters into account in the CU5 processing and also store them in the main database at ESAC.

5. If the modelling fails (e.g., due to motion curvature for binaries, source extension, complicated sky background etc) CU5 does nothing further but information about the 1st order 2D map and the sky modelling solution statistics is stored in the main database. This information can be picked up by CU4 in order to carry out more sophisticated processing of the data.

WP number	Description
GWP-M-518-00000	**Source environment analysis**
GWP-M-518-00100	Plan and schedule relevant WPs
GWP-M-518-00110	Prepare and maintain the flow charts
GWP-M-518-00120	Prepare and maintain the Gantt charts
GWP-M-518-00200	Supervise developments
GWP-M-518-00300	Report on developments
GWP-I-518-00400	Provide interface contacts (CU3, CU4 and CU6)
GWP-M-518-01000	**Algorithm to examine PSF/LSF fitting and astrometric solution statistics**
GWP-S-518-01100	Scientific definition of the algorithm
GWP-T-518-01200	Implement algorithm
GWP-T-518-01300	Integrate algorithm
GWP-T-518-01400	Test and optimize algorithm
GWP-M-518-10000	**First order 2D image reconstruction algorithm for SM1/2 windows**
GWP-S-518-10100	Scientific definition of the algorithm
GWP-T-518-10200	Implement algorithm
GWP-T-518-10300	Integrate algorithm
GWP-T-518-10400	Test and optimize algorithm
GWP-M-518-20000	**First order 2D image reconstruction algorithm for AF2/5/8 windows**
GWP-S-518-20100	Scientific definition of the algorithm
GWP-T-518-20200	Implement algorithm
GWP-T-518-20300	Integrate algorithm
GWP-T-518-20400	Test and optimize algorithm
GWP-M-518-30000	**Algorithm for automatic first order image characterization**
GWP-S-518-30100	Scientific definition of the algorithm
GWP-T-518-30200	Implement algorithm
GWP-T-518-30300	Integrate algorithm
GWP-T-518-30400	Test and optimize algorithm
GWP-M-518-33000	**Point source sky modelling algorithm for SM1/2 windows**
GWP-S-518-33100	Scientific definition of the algorithm
GWP-T-518-33200	Implement algorithm
GWP-T-518-33300	Integrate algorithm
GWP-T-518-33400	Test and optimize algorithm
GWP-M-518-36000	**Point source sky modelling algorithm for AF2/5/8 windows**

GWP-S-518-36100	Scientific definition of the algorithm
GWP-T-518-36200	Implement algorithm
GWP-T-518-36300	Integrate algorithm
GWP-T-518-36400	Test and optimize algorithm
GWP-T-518-40000	**Documentation**
GWP-T-518-40100	Provide documentation for the first order SM1/2 image reconstruction package
GWP-T-518-40200	Provide documentation for the first order AF2/5/8 image reconstruction package
GWP-T-518-40300	Provide documentation for the first order image characterization package
GWP-T-518-40400	Provide documentation for the full sky modelling package for SM1/2
GWP-T-518-40500	Provide documentation for the full sky modelling package for AF2/5/8