JRC/D.5/2016/21450

HR Image Acquisition Specifications for the CAP checks (CwRS) - HR and HHR profiles

Campaign 2017

Text highlighted in YELLOW contains changes from 2016

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Approved:	Pär Johan ÅSTRAND		
Date:	13/03/2017	***Int. ref:***	http://ies-intranet/h04/apps/Chrono/21450.docx earlier years: file://S:\FMPArchive\C\17362.doc (plus excel) file://S:\FMPArchive\C\16083.doc

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Document history

Version	Date	Comment	Author
1.0	01/03/2008 01/05/2008	1st release; information taken from CTS FMP 8451, Recs 1 FMP 5608, Recs 2 FMP 7658, Selection of Control sites and Risk Analysis FMP 8218, Geom. Guidelines FMP 2402 and from VHR Image Specifications for the CwRS Programme	ME, PA
1.1	30/05/2008	Final version after draft revision deadline 30/05/2008	ME, SPOT
1.2	02/04/2009	2009 Campaign update, introduction of RapidEye	ME, RapidEye
1.3	20/06/2009	Final review; edits Figures, Introduction of RE, and completion of text for RE.	PA
2.0	11/11/2011	Updates to EU legislation references and to the administrative requirements (restriction to the use of circles for zone identification; insertion and updates of sensor features and products for THEOS, DMC (constellation), Formosat2 and RapidEye, sensor benchmarking references.	PA, CA, EG, BV, SG, CA
2.2	12/11/2012	Unit name updated. SPOT4 sensor will not be available after 10/01/2013; RapidEye not available for CwRS 2013. Addition of Resourcesat-2. Changes to previous versions in RED. Image request - shapefiles. Changed text in IPR paragraph. Copyright terms updated.	CA, EG, PA, CD
3.0	20/02/2013	Rework of document to fit the Framework Contract for supply of Satellite Remote Sensing (SRS) data and associated services in support to checks within the Common Agricultural Policy (CAP) - HR profile tender: High Resolution (HR) sensor independent 'profile'	PA
3.1	04/07/2013	Final review	PA, EG, BV, ISM, AB, CD, CW
3.2	28/08/2013	Edited feasibility chapter, and reintroduced ortho image return.	PA, CW
3.3	13/02/2014	Introduction of G-LIO.NET as workflow management tool for 2014 campaign	GDM
4.0	16/03/2014	Final review after HR profile KO meeting held 17-18/02/2014	PA, ISM, CW, JB
4.1	17/11/2014	Airbus review for Campaign 2015	Airbus
5.0	01/12/2014	Check, acceptance, and insertion of certain elements regarding iteration of specified area/shapefile/corrections; update of profiles, and complete check of document for the 2015 Campaign	JRC
5.1	17/12/2014	Minor updates based on Airbus comments (e.g. Haze flag as from HR-1), update of HR profiles	JRC
5.2	16/10/2015	Updates by Airbus for 2016 campaign, including insertion of image return tables	JRC
5.3	21/11/2015	Updates by JRC after meeting with EUSI, and AB (12/10/2015, and 29/10/2015)	JRC
6.0	01/03/2016	Finalization after MS Administrations/contractors input	JRC
6.1	13/03/2017	Finalization after KO meeting HHR image provider 02/03/2017; and JRC finalisation (including edits on feasibility)	AB/JRC

Abbreviations, Acronyms & Terms

Abbreviation/Term	Explanation
AOI	Area Of Interest (of a control zone)
AR(s)	Acquisition Request(s)
Arid	Identifier of an Acquisition Request
CA	Contracting Authority
CAP	Common Agricultural Policy
CAPI	Computer Assisted Photo Interpretation
CC	Cloud Cover
CfT	Call for Tender
CID portal	Community Image Data portal
COTS	Commercial Off-The-Shelf software
CwRS	Control with Remote Sensing
DEM	Digital Elevation Model
DG AGRI	The Directorate General for Agriculture and Rural Development
DRA	Dynamic Range Adjustment
EC	European Commission
EC Services	in this text: Joint Research Centre of the European Commission
EFA	Ecological Focus Area
EPSG	European Petroleum Survey Group
EU	European Union
EULA	End User Licence Agreement
FC(s)	Framework Contract(s)
FW Contractor	The successful tenderer who is awarded the present FWC
FWC	Framework Contract
G^{4}CAP	Final evolution of *LIO systems, available from August 2015 on
GAEC	Good Agricultural and Environmental Condition (CAP Cross Compliance)
GCP	Ground Control Point
GEO/GEOSS	Group on Earth Observations / Global Earth Observation System of Systems
GSD	Ground Sampling Distance, the nominal size of one sensor pixel projected onto the imaged surface
HR	High Resolution (SRS imagery)
IACS	Integrated Administration and Control System (CAP)
ICP	Independent Check Point (used in ortho image external QC)
ICT	Information and Communication Technology
IDQA	Input Data Quality Assessment
IES	Institute for Environment and Sustainability, Joint Research Centre
INSPIRE	Infrastructure for Spatial Information in the European Community
IP(s)	Image Provider(s), in this document considered the successful IP or successful consortium of Image Providers who has signed a FC with the JRC as of Ref 4 – in the text referred to as FW Contractor
JRC	Joint Research Centre of the EC
LioDotNet, G-LIO.NET, NG-LIO.NET, G^{4}CAP	JRC Web-based software for the management of image acquisition

Abbreviation/Term	Explanation
LPIS	Land Parcel Identification System
LPIS QA	Land Parcel Identification System Quality Assurance
MARS	Monitoring Agricultural ResourceS Unit, JRC IES
MS	Member State(s)
MS Administration (or its contractor)	A contractor of the MS Administration responsible for the CAP subsidy diagnosis of the MS using the SRS imagery.
MS Contractor	Terms used in the CwRS community for a contractor of the MS Administration responsible for the CAP subsidy diagnosis of the MS using the SRS imagery delivered by this framework contract
MSP	Multispectral
OTSC	On-The-Spot checks
PAN	Panchromatic
PSH	Pansharpened
QA	Quality Assurance
QC	Quality Control
QL(s)	Quick-Look (s)
SMR	Statutory Management Requirement (CAP Cross Compliance)
SPS	Single Payment Scheme
SRS	Satellite Remote Sensing
UTM	Universal Transverse Mercator
VHR	Very High Resolution (SRS imagery)
WGS 84	World Geodetic System 1985

1. Introduction

1.1 HR and HHR Image Acquisition for the CAP checks Programme

1.1.1 Since 1993, DG AGRI has promoted the use of "Controls with Remote Sensing" (CwRS) as an appropriate control system suitable to checking if aids are correctly granted. The legal basis of the CwRS is the Council Regulation (EC) 1306/2013 (Articles 6(b), 21) and in its implementing regulations No. 908/2014 (Article 26), No. 809/2014 (Articles 24, 38, 39, 40), and No. 2333/2015 [ref 1].On this basis the Commission Services are required to centralize the Satellite Remote Sensing (SRS) image acquisition. This task was transferred to DG JRC in 1998 (September 1998/VI/34942) and it is managed through a horizontal co-delegation (Type I) between DG AGRI/DG JRC (via DG BUDG) to implement the yearly CAP image acquisition work programme.

1.1.2 Regards to timing of the operations the Commission Implementing Regulation (EU) No 908/2014, mentioned above, in its art 26, says:

1. For the purposes of Article 21 of Regulation (EU) No 1306/2013, each Member State shall inform the Commission by 1 November of each year at the latest, as to: (a) whether it wishes the Commission to acquire the satellite images necessary for its programme of checks and/or for its Land Parcel Identification System Quality Assessment; (b) the area to be checked and the number of planned control zones.
2. Member States requesting the Commission to obtain the satellite images shall finalise, in cooperation with the latter and before 15 January following the communication of information referred to paragraph 1, the zones to be covered and the timetable for obtaining those images.

1.1.3 HR and HHR imagery may be used in the CwRS Programme (in addition to VHR imagery) for crop, and/or land use identification, checking if the requirement of keeping the land in Good Agricultural and Environmental Conditions (GAEC) is maintained and further checks of the new 'greening' requirements defined in the CAP reform implemented as of 2015. A series of images over the control zones suitably acquired during the crop cycle is supplied to the MS Administrations (or their contractors), in order for them to fulfil their area-based subsidy control in accordance with EC Regulation 809/2014 [ref. 1]. The control methods are further described in the "Guidance for on the-spot checks and area measurement" [ref. 2].

1.1.4 As from the 2014 Campaign the detailed management of HR image acquisitions - to cover the correct areas required for the CAP checks at the correct times of the growing season - has passed to industry to enact under the quality control of the JRC. This choice has been made since there are today several suppliers of Satellite Remote Sensing (SRS) imagery having a proven competency of supplying efficiently the imagery needed for the CAP checks, adhering to JRC quality specifications.

1.1.5 There may be one or more FW contractor/s appointed by the Contracting Authority (CA) JRC, to perform the HR and HHR image acquisition management. In these specifications the Image Provider (IP) therefore refers to the FW contractor/s with whom the JRC has signed a Framework Contract (FWC). At the moment Airbus DS GEO SA holds two contracts: HR profile, and HHR profile respectively [ref. 4], the first of which will be discontinued after the 2017 Campaign.

1.2 Objectives and structure of the document

1.2.1 This document constitutes the HR profile and HHR profile-based specifications to be used within the CAP checks programme. Its objective is to give the stakeholders[1] clarity regarding the technical details of the process of SRS image acquisition (see **Figure 1**)

1.2.2 The JRC has an overarching role as responsible for the well-functioning of the framework contracts, and of the Quality Control (QC) of the operations, while most of the interaction necessary within the image acquisition process takes place between the FW contractor/s and the MS Administrations (or their Contractor/s performing the CAP checks). These specifications intend to describe these interactions.

1.2.3 This document is available in the Documentation section of G^{4}CAP Website [ref 8].

1.2.4 Several references are made here: to "Guidance for on the-spot checks and area measurement" [ref. 2]; to the Guidelines for Best Practice and Quality Checking of Ortho Imagery [ref. 10]; to the VHR profile-based specifications [ref. 3], that shall be used in conjunction with the present document. Reference is also made to the terms and conditions of the Framework Contracts (FWCs) for image procurement to the EC Services [ref. 4].

[1] Stakeholders, or actors are the JRC, the DG AGRI, the FW Contractor/s acting as image providers and operators and the Member State (MS) Administrations (or their contractor performing the CAP Checks).

1.2.5 In the following Figure we are representing in a graphical way the overall process of the SRS image acquisition process, split in macro-actions and colored in function of the type of user responsible for the single macro-action. This document tries to follow the same flow as the one depicted here after.

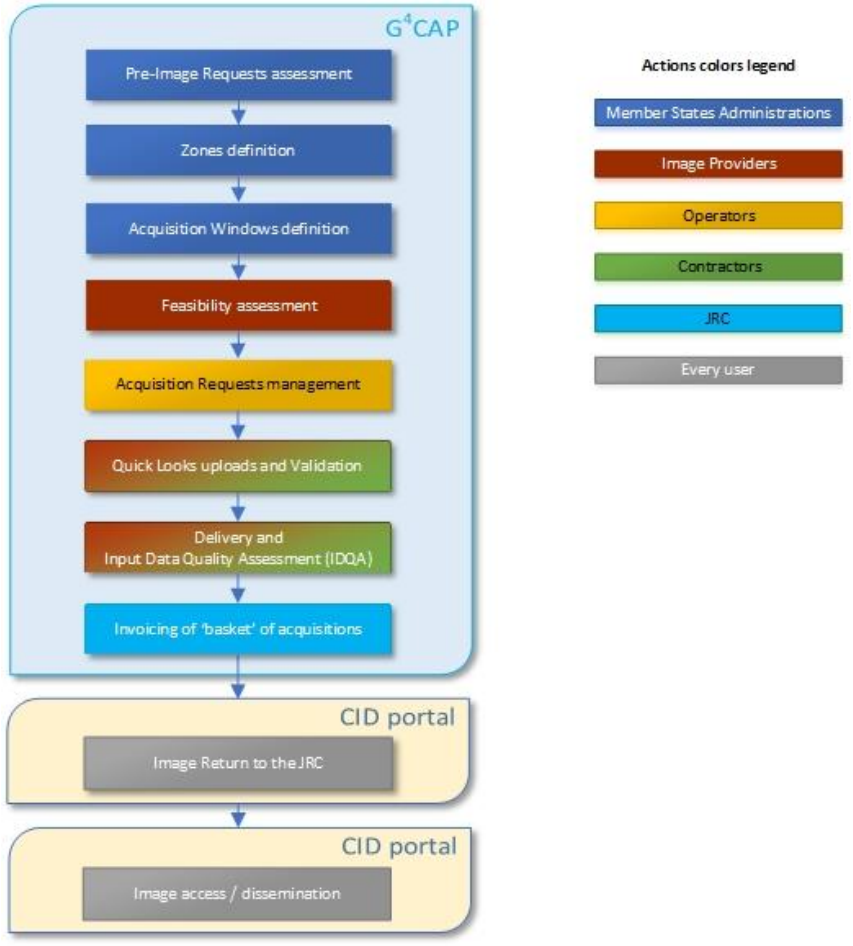

Figure 1 - Figure showing structure of this document and the SRS image acquisition process

1.3 G4CAP

1.3.1 The *LIO systems, that were born in 2005 to manage the CwRS Campaigns online, have been replaced in 2015 by the G4CAP system, a Web application that will be kept updated and constantly improved by the JRC to enhance the daily working experience of the campaign stakeholders.

1.3.2 G4CAP is the Web-based application used to manage the whole campaign workflow. Its functionalities are described in its manual, available on-line at the G4CAP Web site under the Documentations Tab., [ref. 8]. G4CAP is also the main communication tool between the CAP checks actors during the Campaign: its automatic e-mails exchange is used to synchronize actions between different actors.

1.3.3 It is compulsory to use G4CAP by all the stakeholders involved in the CAP checks from 2015 campaign onwards.

2. Zones definition

2.1 General

2.1.1 The regulatory basis for the CwRS programme (see **Error! Reference source not found.**) allow MS to use remote sensing techniques as a means of carrying out On The Spot (OTS) checks on agricultural parcels. Guidance to this Regulation is given in the document "Guidance for on the-spot checks and area measurement" [ref. **Error! Reference source not found.**], which describes that a "control zone" is a geographical area defined on the basis of GIS analysis, taking account of technical constraints (e.g. standard satellite 'scenes'). These technical constraints, which are further detailed below, include swath widths, elevation angles, Area Of Interest (AOI) definition, window adjustments, feasibility assessment, etc.

2.1.2 The MS Administrations are required to appoint one contact person (name and e-mail) of the Administration for interfacing with the FW Contractor/s in all communications. It is also of utmost importance that the MS Administrations communicate one contact person for their contractors to the FW Contractor/s as soon as the contractors are appointed.

2.2 Definition of Zone parameters for the Image Request

2.2.1 Reference is made to the VHR profile based image acquisition specifications for the CAP checks [Ref. 3] regarding the definition of a CwRS zone or AOI.

2.2.2 The swath of the HR and HHR satellite sensors is usually not a constraint in the HR and HHR image acquisition since scene sizes are significantly larger than the control zones. With the new sensors that are prone to be integrated in the HHR image profile (e.g. Deimos-2), this can be a constraint and the AOIs may be covered by one or two images or image strips from these satellites. In his case same rules apply for such HHR sensors' acquisitions as for the VHR sensors [ref. 3 Chapter 2.2 where applicable].

2.2.3 All MS Administrations participating in the CAP Checks Campaign insert in the pre-Image Request module of G^{4}CAP his requests of imagery for the Campaign. These parameters give information on:

- Relevant control method description;
- Number of zones and sum area to be acquired (rounded to whole km², UTM); for each type of prime profile (see Chapter 12);
- Number and type of window/s (PERIODS);
- Shapefiles of the control zones (files with extensions .shp, .shx, .dbf, .sbx, .sbn, .prj (Lat/Long, WGS84)).

2.2.4 It is the FW contractor/s' responsibility to finalize the remaining zone parameters (see §2.2.5 below) in its contacts with the MS Administrations (or their Contractors). The G^{4}CAP Web application shall be used also for this purpose, where all relevant parameters shall be inserted in the Zone Definition and Image Requests modules by the MS Administrations. The FW contractor/s is responsible for this process and the check on completeness of all the parameters serving his feasibility assessment to be undertaken within G^{4}CAP (see

Chapter 4). When the FW contractor/s has completed this task, he shall report to the JRC who will validate final results inserted in G^{4}CAP, before the feasibility starts.

2.2.5 The remaining zone definition parameters are:

- Zone name (≤ 5 characters), it needs to be unique for the whole Campaign;
- Zone (AOI) area (rounded to whole km², UTM) in accordance with the shapefile area handled to the FW contractor/s by the JRC;
- HR/HHR profile per zone and if applicable per Period
- Image request (IR) definition including acquisition windows (from and to dates), and relevant window parameters (e.g. dead period, earliest start date, latest start date, previous window etc., if applicable);
- Product or image mode: bundle, multispectral, or pansharpened; primary or orthorectified level[2];
- Delivery: FTP or DVD, not both.

[2] Pls. note that if the PSH product mode is requested it will be delivered as an orthorectified product. In this case the MS Administration will choose cartographic projection to be used (GDlib library will be shown in G4CAP). If no specific projection is chosen the default UTM, WGS84 will be used by the image provider (FW Contractor/s) ; further information see: http://www.intelligence-airbusds.com/en/4594-spot-67-products)

3. Acquisition Windows

3.1.1 For HR and HHR imagery acquisition windows, dead periods (minimum time between the last acquisition in the previous window and the starting date of the current one) and earliest/latest start dates are defined. Acquisition windows are the time intervals in which the HR and HHR satellites are programmed. One or two windows before or after the VHR windows are normally defined within the crop season. More windows may be defined in accordance with the JRC if Cross-compliance and Good Agricultural and Environmental Condition (GAEC), or 'greening' requirements need to be controlled. Such HR and HHR windows can also reside between two VHR windows (see HRB1 and HRB2 §3.1.3 below). The minimum HR or HHR window length is minimum **four weeks, preferably longer (6 weeks)**, and HR and HHR windows must have at least **one week** dead period before it opens. It should be mentioned that the MS Administrations should make correct use of the earliest/latest start dates of their HR/HHR windows fitting their crop calendars. This is of great importance since a correct use of these dates gives best acquisition success possibility (see 4.1.4).

3.1.2 The number of multi-temporal HR images programmed over a control zone may vary depending on MS control strategy and agriculture. JRC needs to accept this information at the beginning of each Campaign at the pre-IR stage or latest at the basic zone definition stage (ref Chapter 2).

3.1.3 It is to be noted that from the 2015 campaign, 2 new optional HR or HHR periods have been added between the two VHR periods. These periods are called HRB1 and HRB2, their relative order is fixed and HRB2 can be asked for just if HRB1 is required too and there are enough calendar days to fit it. HRB1 and HRB2 windows can only be defined if there are two VHR windows.

3.1.4 The HR and HHR windows are named as follows: autumn, winter, HR-1, HRB1, and HRB2, HR + 1, HR + 2 and HR + 3. The names of the HR and HHR windows indicate season or their position in relation to the VHR window (satellite or aerial VHR). The possible sequence of windows in this case is: autumn, winter, HR-1, VHR1, HRB1, HRB2, VHR2, HR + 1, HR + 2, HR + 3. If there is only one VHR window then the possible sequence of windows is as follows: autumn, winter, HR-1, VHR1, HR+1, HR+2, HR+3. The JRC recommendation for number of windows to use is 1 VHR plus 3 HR/HHR, or 2 VHR and 2 HR/HHR, but exceptions to this rule may occur: **the methodology must be justifiable by the MS Administrations**.

3.1.5 For autumn/winter and early spring (HR-1) windows, the JRC suggests acquisition only if the sun angle is higher than 20 degrees to ensure sufficient contrast and to minimize the effect of shadows. The FW Contractor/s is informed that validated imagery, i.e. cloud cover ≤1%, will not be accepted if quicklooks are not interpretable (e.g. too dark).

3.1.6 In general only perennial snow is allowed in any validated imagery, and it is the MS Administrations task to warn the Image Provider/Operator (FW Contractor/s) in due time in case of extraordinary weather conditions (e.g. snow) in order to move window. In case of no notice from MS Administration, and in doubt the FW Contractor/s shall upload a snow covered image as validated but with the special 'meteo' flag [ref. 3 § 7.1.8]. Please refer to the VHR profile based specifications [ref 3, §3.1.4.] for details regarding windows change due

to climatic conditions, where the MS Administrations should inform the FW Contractor in due time if window needs to be moved.

3.1.7 In case of overlap between HR-1 and VHR windows occurs after import of final dates after feasibility, (in exceptional there is e.g. the possibility of ±3 days to adjust the optimum number of passes) HR-1 will be shifted to prevent overlap. The shift will also imply modifying the starting date of the HR-1, so that the length of window remains as before. In case the AR for the HR-1 has been already opened, it will close and open again according to the shifted dates. The same operations may be made for the ending dates. When therefore the start of the HRB1, HRB2 or HR+1 window is delayed by VHR feasibility result, the HRB1, HRB2 or HR+1 window end date will also be delayed with same number of days. This process will be automatically checked by G^{4}CAP.

3.1.8 Also, if the VHR window is extended by the MS Administration (or its contractors) due to a lack or incomplete coverage of the control zone (e.g. due to adverse weather conditions), the subsequent HR or HHR window opening and closing dates will slide by same number of days, in order to leave the HR window last as much as it was originally defined. This process will be automatically checked by G^{4}CAP.

3.1.9 If an HRB1 window comes to an end without acquisition it can only be extended as long as dead period and HRB2 windows fit before the subsequent VHR2 opening. If this limit is exceeded the HRB1 will be considered failed, and the HRB2 will open.

3.1.10 In case of aerial VHR, it is important that the MS Administration (or its contractors) informs the HR FW Contractor/s about the acquisition date, in order to define the starting date of any subsequent HR/HHR window. The acquisition date of the VHR aerial acquisitions should be inserted in G^{4}CAP by the MS Administration (or its contractor) in the aerial acquisition windows (AW) management module.

3.1.11 MS Administrations (or their contractors) should indicate the earliest/latest possible starting date of the HRB1, or the HR+1 window. The HRB2, or the HR+2 window will open after HRB1, or the HR+1 and are defined by adding the dead period to the date of acquisition of the HRB1, or the HR+1 image. The same applies for the HR+3.

3.1.12 When a HR/HHR image has been acquired by the FW Contractor and has been accepted by the MS Administration (or its contractors) for a given acquisition window, the window will be closed automatically in G^{4}CAP. The opening of the next window will be defined automatically by taking the dead period into account. The dead period must be a minimum of 1 week.

3.1.13 If no image has been acquired at the end of the HR-1 window, or if the whole area has not been acquired, MS Administration (or its contractors) can request an archive search for the period of the window or earlier windows if applicable. Also the HR-1 window may be extended up to the opening of the VHR window or the start date of the aerial photo flight. The MS Administration (or its contractors) can request that HR+1, HR+2 and HR+3 windows are extended until the image has been acquired or until the MS Administration (or its contractors) indicates that the AR should be considered failed. It is here however strongly advised to use Copernicus Sentinel 2 (S2) imagery.

3.1.14 If the VHR image is acquired late in the window, the MS Administration (or its contractors) may request an archive search for a suitable HR/HHR image acquired during the first part of the VHR window. The FW Contractor/s should obtain permission from the JRC before such SRS image is approved, and may be delivered. It is also here strongly advised to use Copernicus Sentinel 2 (S2) imagery.

3.1.15 MS Administrations (or their contractors) are required to communicate to the FW Contractor requests for changes, such as extensions or closure of ARs, as soon as possible, no later than 3 days before the end of the window.

3.1.16 MS Administration (or its contractors) is notified about windows coming to an end by selecting the dedicated e-mail selection feature in G^{4}CAP. If no request for the extension of a window is received by the FW Contractor/s, the window will close at planned closure (end date window).

3.1.17 MS Administration should not allow a window to extend longer than any MS contractor contract end date. If the MS Administrations allows this, they will themselves be responsible for the proper use of the imagery in their controls procedure.

4. Feasibility

4.1.1 It is referred to the VHR Specification [ref. 3, Chapter 4] for information on the feasibility process. Also in the HR/HHR case the FW Contractor/s will receive the basic zone parameters through the 'Reporting' and 'Zone' modules of G^{4}CAP. They shall be made available to the FW Contractor by the JRC a minimum of 6 weeks before the first window starts. The basic parameters also form the basis for the relevant specific contracts (SCs) set up between the JRC and the HR/HHR FW contractor/s.

4.1.2 The main difference between HR/HHR and VHR feasibility is that windows for most of the HR/HHR acquisitions (excluding autumn, winter, and HR-1) are not known since they depend on a preceding VHR or aerial acquisition. In this case, the FW Contractor should first make a check on the correctness of the windows (e.g. that the window is placed correctly in time and that there is time enough for it to fit between any already defined windows) and that the MS Administrations is making the correct use of the earliest/latest starting dates (e.g. in case the MS Administration is systematically setting these to be equal to each other, the MS Administration should be contacted). Any iterations can take place with the MS Administrations in this respect. Thereafter, the 'Feasibility' module in G^{4}CAP regarding these HRB and HR+ windows will allow the FW Contractor to interact with the MS Administration giving them two results, each with the possible values GOOD, MEDIUM, LOW (GREEN, YELLOW, RED), and any suggestion on changes:

- (Earliest start date of window to latest start date plus window 4/6 week) -> result 1 (a.k.a. 'best case');
- (Latest start date of window to window 4/6 weeks) -> result 2 (a.k.a. 'worst case').

4.1.3 Therefore, for the autumn, winter, and HR-1 windows a normal feasibility approach is followed, similar to the VHR one [ref. 3, Chapter 4], starting from initially requested windows. Extended dates will be optional in the case of MEDIUM, and compulsory in the case of LOW feasibility results.

4.1.4 The HRB and HR+ windows iteration will, as mentioned above, give two results to the MS Administration: a best case and a worst case, and possibly suggested date changes. This situation will give MS Administrations best basis for judging the feasibility of acquisition success. MS Administrations will then be able to change the following parameters: earliest start, latest start, or window length, before another iteration is performed. At the end it will be up to the MS Administrations to accept or reject within the constraints of adjacent windows and crop calendars. For details on the BLACK feasibility category, valid also for HR/HHR, refer to the VHR Specifications [ref. 3, Chapter 4].

4.1.5 The final scenario should be accepted or rejected within G^{4}CAP by the MS Administrations.

5. Acquisition Requests (ARs)

5.1.1 Reference is made to the VHR profile based technical specifications for the CAP checks [ref. 3], Chapter 5.

6. QL (browse image) upload

6.1.1 Reference is made to the VHR profile based technical specifications for the CAP checks [ref. 3], Chapter 6, regarding the QuickLook (QL) upload and relevant messaging triggered.

6.1.2 The use of the haze flag is mandatory also for HR/HHR images, see [ref. 3], Chapter 7.

6.1.3 The FW Contractor/s is requested to upload SRS image QLs to best fit the shape file provided by the MS Administrations (or their contractors), with the minimum possible surface excess. In case of HHR imagery, and depending on the sensor swath, 2 images can be uploaded for a unique zone (see 2.2.2)

7. Validation

7.1.1 The evaluation of the quality of an SRS image (cloud cover, haze, snow, etc.) made by FW Contractor/s follows the same procedure as described in the VHR profile based technical specifications for the CAP checks [ref. 3, Chapter 7] are valid. This applies to uploads which cover the whole AOI, or to partial uploads.

7.1.2 For a HR zone and each open window, the HR and HHR profile image uploaded by the FW Contractor/s with cloud cover ≤1% is considered as Validated. For Autumn/Winter imagery, please refer also to point 3.1.5.

7.1.3 If the AOI has cloud cover > 1%, dense haze, etc., then:

- if cloud cover over the AOI is ≤ 5%, the QL of the HR/HHR profile image is uploaded as **Proposed** in G^{4}CAP by the FW Contractor/s. Upon accept by MS Administration (or its contractors) the FW Contractor/s may close the AR, upon reject the FW Contractor/s shall continue programming;
- if 5% < cloud cover ≤ 20%, the image is **Retained**. The MS Administration (or its contractors) shall accept the image as soon as possible if it is usable for the CAP checks, but the FW Contractor/s will continue programming until such acceptance is received;
- if cloud cover > 20%, the FW Contractor/s should not upload the QLs. In exceptional cases, only upon request of the MS Administration (or its contractors), such QLs may be uploaded (e.g. when a window has come to an end without a validated acquisition).

7.1.4 MS Administrations (or their contractors) should accept/reject proposed/retained SRS imagery in G^{4}CAP within 3 working days after upload.

8. Ordering

8.1.1 Ordering follows procedures set up in the FWC signed by the FW contractor/s and the JRC [ref. 4]. This is managed via signature of specific contracts (SCs) within the FWC.

9. Delivery

9.1.1 Reference is made to the VHR profile based image specifications for the CAP checks [ref. 3], Chapter 9.

10. Pricing and Invoicing

10.1.1 Pricing for products will be in accordance with the FWC signed by the FW contractor/s/s and the JRC [ref. 3], Chapter 10].

11. Image data provision to the JRC and image access

11.1 HR/HHR Image data provision to JRC by FW contractor/s

11.1.1 The FW contractor/s shall provide the SRS image data to JRC for incorporation into the CID Image Portal. This applies to both source imagery and orthorectified imagery, derived from the source data that are created and processed by the MS Administrations (or their Contractors). All acquisitions must be accompanied with a metadata XML file, by default named jrc_metadata.xml, describing minimum metadata homogeneously for any type of sensor. The XML schema files are available from JRC under the following locations:

For the source data:

http://cidportal.jrc.ec.europa.eu/public-tools/schema/image-acquisition/jrc_metadata_hr_source.xsd

For the ortho data:

http://cidportal.jrc.ec.europa.eu/public-tools/schema/image-acquisition/jrc_metadata_hr_ortho.xsd

11.1.2 Reference is made to VHR profile based image specifications for the CAP checks [Ref. 3], Chapter 11.1, and 11.2.

11.1.3 The deadline for this data collection and provision to the JRC is at the end of the control Campaign year (i.e. 31st December of each year for CwRS).

11.2 HR/HHR Ortho image return by the Member States to the FW contractor

11.2.1 Airbus DS is in charge of HR/HHR Ortho image return for JRC. This section explains how to process for this phase; for all information, please contact Airbus.

11.2.2 Access to FTP account of FW contractor

Ortho data have to be delivered on Airbus FTP server:

⇨ http://geodelivery.astrium-geo.com/login.html

Login and password will be provided in dedicated e-mail.

11.2.3 Directory structure by HR period:

Figure 2 - Directory structure for the ortho image return of the MS

11.2.4 Data must be delivered:

- per period ; corresponding folders will be available on the FTP site with explicit name
- Data files have to contain Zone name or stored in a folder with the Zone name.
- metadata information for each ortho image: the FW contractor will provided an Excel file, the "Ortho Image Product" part needs to be completed by MS. Please find details in Annex 18.2 XML - Excel

11.2.5 All further requests on the HR/HHR Ortho image return of the Member States are similar to the VHR OIR, so Reference is made to VHR profile based image specifications for the CAP checks (Ref. 3.Chapter 11.2).

11.3 HR/HHR Image Access

11.3.1 Reference is made to the VHR profile based image specifications for the CAP checks [ref. 3], Chapter 11.4

11.3.2 The EC Service purchases a limited right of use, but the images themselves remain the property of the FW contractor/s. In addition, according to the EULA [ref. viii, § 6 on IPRs] imagery must have proper references. When using the imagery, the Licensee needs to refer to the supplier with the exact display of the credits as specified in the product's metadata which will take the form:

"© owner or supplier name or mission name (year of acquisition, or validity of Framework Contract), all rights reserved)"

In addition, the End User should indicate the following information:

"Data received via the Joint Research Centre of the European Commission under FWC xxx.yyy "

where the FWC number is available from the EC Services (JRC)

11.3.3 For the presently running FWC 389.912, and FWC 198.995 [ref.4] with Airbus DS GEO SA the first sentence above shall be substituted with:

- Spot 6/7 © Airbus DS (year of acquisition)
- DMC Constellation, UK-DMC2 image © [year] Airbus DS, All rights reserved.
- Deimos Imaging (DMI) and DMC International Imaging. (DMCII) © [Year] All rights reserved.

12. HR and HHR profile products

12.1 Profiles

12.1.1 Satellite sensors are divided into HR and HHR profiles as follows:

- HR prime - CwRS [std] (multispectral, pansharpened), validated, proposed, retained;
- HR archive - CwRS [std] (multispectral, pansharpened), upon request as Campaign requires.
- HHR prime - CwRS [HHR], HHR [std. ortho], (bundle, multispectral, pansharpened), validated, proposed, retained
- HHR archive ortho - CwRS (multispectral, pansharpened, bundle), upon request as Campaign requires.

12.1.2 A summary of the profile characteristics is given in the table below. (Please note that the profiles F0, and G will be discontinued after the 2017 years' HR-1 window).

Image Profile ID	Description	Spatial Resolution	Radiometric resolution (*) and spectral bands		abs. 1-D rmse	Cloud Cover (CC) over AOI	Acquistion programming	Remarks	Example of sensors
F0. HR prime - CwRS [std]	Multispectral	GSD≤25m	3 bands at least including G, R, NIR (preferrably also B, and SWIR)		x,y ≤ 1.5 x GSD	≤ 1% validated (profile F01) ≤ 5% proposed (profile F02) ≤ 20 % retained (profile F03)	Priority programming		SPOT5**/6/7, UK-DMC2, DEIMOS-1
	Pan-sharpened	GSD≤5m							SPOT5**/6/7
F1. HHR prime - CwRS [HHR]	Pan+Multispectral (Bundle)	GSD≤3m	4 bands including B, G, R, NIR	> 50 deg	x,y ≤ 5m	≤ 1% validated (profile F11) ≤ 5% proposed (profile F12) ≤ 20 % retained (profile F13) -archive (profile F14)	Priority programming (excl F14)	new profile	SPOT 6/7, and any other not benchmarked sensor
		GSD≤12m							
F2. HHR prime - CwRS [ORTHO]	Pan+Multispectral (Bundle)	GSD≤3m	4 bands including B, G, R, NIR	> 50 deg	x,y ≤ 5m	-≤ 1% validated (profile F21) -≤ 5% proposed (profile F22) -≤ 20 % retained (profile F23) -archive (profile F24)	Priority programming (excl F24)	new profile; ortho rectified using Ref3D	SPOT 6/7, and any other not benchmarked sensor
		GSD≤12m							
	Multispectral	GSD≤12m			x,y ≤ 1.5 x GSD (MSP)				
	Pan-sharpened	GSD≤3m			x,y ≤ 5m				
G. HR archive - CwRS [std]	Multispectral	GSD≤25m	3 bands at least including G, R, NIR (preferrably also B, and SWIR)		x,y ≤ 1.5 x GSD	archive	archive		SPOT5**/6/7, UK-DMC2, DEIMOS-1
	Pan-sharpened	GSD≤5m							SPOT5**/6/7

(*) - minimum 8 bits/pixel, preferrably 11-12.
(**) - SPOT5 will be de-commissioned in March 2015

Table 1 - HR and HHR profiles adopted within the CAP checks

12.1.3 As the MS Administration selects his profile in G[4]CAP he will therefore choose HR prime, or HHR prime - CwRS 'validated' (primary/ortho – multispectral/pansharpened/bundle) profile[3], and he will be served by the following sensors:

- F0 - HR prime[4] - Multispectral will be served by Spot 6 , 7, UK-DMC2, or Deimos-1;
- F0 - HR prime - Pansharpened will be served by Spot 6, 7; this option is chosen when entering image mode for the Acquisition Window (AW) in G[4]CAP
- F1 - HHR prime Bundle - will be served by Spot 6 and 7 and any potential benchmarked satellite;
- F2 - HHR prime Ortho - will be served by Spot 6 and 7 and any potential benchmarked satellite. For ortho cartographic projections available pls. refer to item 2.2.5 (footnote 3) or options implemented in G[4]CAP; this profile is available as bundle, multispectral, and pansharpened

12.1.4 For a complete description of image processing levels and data formats, please consult the technical documentation regarding respective sensors (Chapters **Error! Reference source not found.**).

13. Quality Assurance / Quality Control

13.1.1 Reference is made to the VHR profile based image specifications for the CAP checks [ref. 3], Chapter 13.

14. Risk of satellites failures

14.1.1 Reference is made to the VHR profile based image specifications for the CAP checks [ref. 3], Chapter 14.

15. JRC responsibles and e-mail addresses

15.1.1 D Sustainable Resources / Unit D.5 / scientific image acquisition par-johan.astrand@ec.europa.eu

15.1.2 D Sustainable Resources / Unit D.5 / contractual FWC and scientific CAP related issues philippe.loudjani@ec.europa.eu

[3] The proposed, retained, and archive profiles are accepted by the MS Administration (or their contractors) own judgment in G[4]CAP as they are uploaded, otherwise programming continues. For the case of retained, and archive profiles this area cannot exceed 10% of the requested specific profile HR area of the MS Administration.

[4] FWC 389.912 will be discontinued after 1st half of campaign 2017; it is suggested to the MS Administration to use free of charge Copernicus S2 data to replace these sensors

16. References

1 EUR Lex Access to European Union law: http://eur-lex.europa.eu/homepage.html

2 Technical Guidance document (campaign 2016) for On-The-Spot Checks (OTSC) and area measurement
Technical Guidance document on the On-The-Spot Check of Crop Diversification requirements
Technical Guidance document on the On-The-Spot Check of Ecological Focus Areas requirements
https://marswiki.jrc.ec.europa.eu/wikicap/index.php/Main_Page

3 VHR profile based Technical Specifications (ref. http://ies-intranet/h04/apps/Chrono/21955.docx). See also G^{4}CAP under Documentation.

4 FWs for SRS imagery purchase administered by the JRC:

a. Framework contracts for supply of Satellite Remote Sensing (SRS) data and associated services in support to checks within the Common Agricultural Policy (CAP); (1) VHR profile FWC 389.911 (expiry after campaign 2017), VHR profile II FWC 931.886, VHR+ profile FWC 199.309, with **European Space Imaging** GmbH, (2) HR profile FWC 389.912 (discontinued after campaign 2017), and HHR profile FWC 198.995 both with **Airbus Defence and Space**.

b. Framework contract for supply of any type of Satellite Remote Sensing Data; broker FWC 391.782.

5 Benchmarking THEOS

a) WorldView-2, GeoEye-1, Cartosat-2, Kompsat-2, RapidEye and THEOS image [JRC Oral presentation Cat3.4 JRC60286 JRC IPSC/G03/C/JNO/jno D(2010)(12136), Int. ref file://S:\FMPArchive\C\12136.ppt – Presented at the MARS Unit's GEOCAP Action's Control Methods Workshop - 2010 campaign; 13-14 April 2010; Ispra (Italy); Authors: Nowak Da Costa J.K, Åstrand P.J].

b) THEOS Geometric Image Quality Testing – Initial Findings - JRC Scientific and Technical Report Category 2.2 no.24655 EN, ISSN 1831-9424, ISBN 978-92-79-18908-1. JRC PUBSY No. JRC61992, Int. ref: file://S:\FMPArchive\C\12154.pdf, Authors: Walczynska, A, Nowak Da Costa, J.K., 2010].

c) Nowak Da Costa J.K., Walczynska A. Evaluating the WorldView-2, GeoEye-1, DMCII, THEOS and KOMPSAT-2 Imagery for use in the Common Agricultural Policy Control with Remote Sensing Programme. Oral presentation in: 16th Conference on `Geomatics in support of the CAP`; 24 November 2010; Bergamo (Italy); GeoCAP Action of the MARS Unit, IPSC, DG JRC (Organiser). 2010. JRC61995.

d) THEOS Geometric Quality Assessment for use in the Common Agricultural Policy Control – Scientific poster for the 16th Conference on "Geomatics in support of the CAP" in Bergamo, Italy, 24-26 November 2010. [JRC PUBSY No. JRC61994, Poster Presentation Category 3.5, Authors: Nowak Da Costa, J.K., Walczynska, A., 2010]. PUBSY: http://publications.JRC.ec.europa.eu/repository/.

6 Benchmarking SPOT7; [PUBSY JRC93987, EUR 27063, ISBN 978-92-79-45053-2, ISSN 1831-9424 doi:10.2788/17914]; http://publications.jrc.ec.europa.eu/repository/

7 End User License Agreement (EULA), CID Portal EULA:
http://cidportal.jrc.ec.europa.eu/home/idp/licensing/eula.

8 URL to G^{4}CAP is https://g4cap.jrc.ec.europa.eu

9 G^{4}CAP manual, see under Documents in G^{4}CAP: https://g4cap.jrc.ec.europa.eu

10 Guidelines for Best Practice and Quality Checking of Ortho Imagery, Issue 3.0 available at: http://mars.jrc.ec.europa.eu/mars/News-Events/New-version-of-the-Guidance-for-Best-Practice-and-Quality-Checking-of-Ortho-Imagery

17. Annexes

17.1 XML metadata file specification for image providers used for the QL upload

17.1.1 Pls. see VHR Specifications (ref.3, Annexes 17.1)

17.2 XML / EXCELS

17.2.1 In addition to the data centralization, Airbus – as HR and HHR operator – should provide XML reports information for each ortho image. In order to fulfil these reports, it is asked to the MS Administration (or its contractor) to complete the Excel file attached to this e-mail

- **"Acquisition Request information" part**: already completed by FW Contractor
- **"Acquisition source information" part**: should be completed by FW contractor thanks to the source metadata (Dimap) file. This file could be found in the same folder than the source image delivered.
- SPOT6/7 file : DIM_*.XML
- DEIMOS / UK-DMC2 file : *.dim
- **"Ortho product information" part**: to be completed with Ortho information by MS admin or MS contractor. For some fields, information can be retrieved from the source metadata (e.g. band order and description).
  - ⇨ A descriptive table could be found in the section below.

17.1 Ortho information Table:

	Excel Fields	Explanation	Example	SPOT6/7 Dimap file location	UK-DMC2 Dimap file location	Comment
Acquisition Request information	**Period**	HR period				Already completed
	Zone	Zone Name				
	Country	Country Name				
	Country Code	Country Code				
	Contractor	Contractor Name				
	AR ID	Acquisition Request ID in G4CAP/NG-Lio/G-Lio				

	Excel Fields	Explanation	Example	SPOT6/7 Dimap file location	UK-DMC2 Dimap file location	Comment
	Acquisition ID	Acquisition ID in G^{4}CAP				
	AcqDate	Acquisition Date				
	Requested AREA	Zone Area (sqkm)				
	Acquired AREA	Acquired Zone Area (sqkm)				
	Cc	Cloud Cover %				
	Sensor	Sensor Name				
	HR image type	Requested image Type				
Acquisition source information	**Source ID**	Image Source Identifier	DS_SPOT6_20141219101 1169_FR1_FR1_FR1_FR1 _E007N44_01871	//Dataset_Sources/Source_Identification/SOURCE_ID		
	Imaging Date	Date of Acquisition	2014-12-19	//Dataset_Sources/Source_Identificatio n/Strip_Source/IMAGING_DATE	//Dataset_Sources/Source_Informati on/Scene_Source/IMAGING_DATE	Format : YYYY-MM-DD
	Imaging Time	Date Time of Acquisition	10:11:16	//Dataset_Sources/Source_Identificatio n/Strip_Source/IMAGING_TIME	//Dataset_Sources/Source_Informati on/Scene_Source/IMAGING_TIME	Format : hh:mm:ss
	Sensor Elevation		78	90 - //Geometric_Data/Use_Area/Located_G eometric_Values[LOCATION_TYPE='Cent er'] /Acquisition_Angles/INCIDENCE_ANGLE	90 - //Dataset_Sources/Source_Informati on/Scene_Source/INCIDENCE_ANGL E	90°-Incidence Angle. Should be >0

	Excel Fields	Explanation	Example	SPOT6/7 Dimap file location	UK-DMC2 Dimap file location	Comment
	Viewing Angle		11,0767112784	//Geometric_Data/Use_Area/Located_Geometric_Values[LOCATION_TYPE='Center'] /Acquisition_Angles/VIEWING_ANGLE	//Dataset_Sources/Source_Information/Scene_Source/VIEWING_ANGLE	
	Sun Azimuth		161,037791153	//Geometric_Data/Use_Area/Located_Geometric_Values[LOCATION_TYPE='Center'] /Solar_Incidences/SUN_AZIMUTH	//Dataset_Sources/Source_Information/Scene_Source/SUN_AZIMUTH	
	Sun Elevation		20,5767668707	//Geometric_Data/Use_Area/Located_Geometric_Values[LOCATION_TYPE='Center'] /Solar_Incidences/SUN_ELEVATION	//Dataset_Sources/Source_Information/Scene_Source/SUN_ELEVATION	
	NB BANDS	Number of bands	4	//Raster_Dimensions/NBANDS		
	BAND INDEX 1	Band number	1	//Raster_Display/Raster_Index_List/Raster_Index : ./BAND_ID *List*	//Image_Interpretation/Spectral_Band_Info: ./BAND_INDEX *List*	
Ortho product information	**BAND DESCRIPTION 1**	Band value	RED	//Raster_Display/Band_Display_Order : *Node List*	//Image_Interpretation/Spectral_Band_Info: ./BAND_DESCRIPTION *List*	
	BAND INDEX 2		2	"	"	
	BAND DESCRIPTION 2		GREEN	"	"	
	BAND INDEX 3		3	"	"	
	BAND DESCRIPTION 3		BLUE	"	"	
	BAND INDEX 4		4	"	"	

	Excel Fields	Explanation	Example	SPOT6/7 Dimap file location	UK-DMC2 Dimap file location	Comment
	BAND DESCRIPTION 4		ALPHA	"	"	

	Raster Encoding TYPE	BYTE, SHORT, LONG	SHORT	//Raster_Encoding /NBITS :
				8 = BYTE; 16 = SHORT; 32 = LONG		

	Raster Encoding NBITS	8, 16, 32	16	//Raster_Encoding /NBITS		
	EPSG Ortho	used EPSG Code or WKT	2154			Integer
	WKT	Empty if EPSG specified				Plain text file
	IMAGE FORMAT	GEOTIFF, HFA (.IMG)	GEOTIFF			
	Production DATE		2015-01-14			Format : YYYY-MM-DD
	Comment	Any further information				

17.4 HHR/HR sensor details

SPOT6/7	
SATELLITE Specification	
Launch Information	Date: SPOT 6: 9/09/2012 Date: Spot 7: 30/06/2014 Launch Vehicle: PSLV C23 Launch Site: ISRO, India
Orbit	Altitude: 694 kilometers Type: Sun-synchronous, 10.00 am descending node Period: 98,79 minutes
Sensor Bands	Panchromatic: 450 - 745 nm 4 Multispectral: Blue: 450 - 520 nm Green: 530 - 590 nm Red: 625 - 695 nm NIR: 760 - 890 nm
Sensor Resolution GSD (Ground Sample Distance)	Panchromatic: 1.5m at nadir Multispectral: 6m at nadir
Dynamic Range	12-bits per pixel
Swath Width	60 kilometres at nadir
Retargeting Agility	Time to Slew 30° in every direction: 14s (stabilization time included)
Max Contiguous Area Collected in a Single Pass (at 30° ONA)	60 x 600 km mono
Revisit Frequency	3.5 days at 30° off-nadir
Geolocation Accuracy (CE 90)	35m CE90 without ground control and up to 30° 10m CE90 for orthorectified products when Reference3D available
PRODUCT Specification	
Tasking Level	Priority Tasking
Product Options	Level primary Level ortho (Elevation 30 (Reference3D)
Spectral combinations	Panchro, MS, Bundle and pansharpened
Resolution	Panchromatic: 0.7m Multispectral: 2.8m
Cloud Cover	Cloud cover “validated” 0 - ≤ 10 %, “proposed” 10 % < CC ≤ 30 %;
Resampling Kernel	Cubic Convolution, Nearest Neighbours
Format	DIMAP V2 containing a JPEG 2000/GeoTIFF image file
DRA	Off (optional)
Bit Depth	12bits for JPEG2000 and 16bits for GeoTIFF
Projection/ Datum	UTM/ WGS84 (default)
Tiling	Km^2
Delivery Medium	DVD or FTP

DEIMOS1	
SATELLITE Specification	
Launch Information	Date: 29th of July 2009 Launch Vehicle: Dnepr Launch Site: Baikonur (Kazakhstan)
Orbit	Altitude: 650 Km Type: Sun Synchronous Period: 98 mins (NORAD last data)
Sensor Bands	3 Multispectral: Green: 0.52 – 0.60 Red: 0.63 – 0.69 NIR: 0.77 – 0.90
Sensor Resolution GSD (Ground Sample Distance)	Multispectral: 22m at nadir
Dynamic Range	10 bits per pixel
Swath Width	650 km swath
Retargeting Agility	
Max Contiguous Area Collected in a Single Pass (at 30° ONA)	Up to 1400 km
Revisit Frequency	3-day worldwide
Geolocation Accuracy (CE 90)	L1R : 50 km L1T : 10 meters RMS error
PRODUCT Specification	
Tasking Level	
Product Options	L1R: All 3 Spectral channels combined into a band registered image using L0R data L1T: L1R data Orthorectified to sub-pixel accuracy (10 metres RMS error approximately) with respect to Landsat ETM+ reference data and the Hole-filled seamless SRTM DEM data V3, 2006 (90m)
Resolution	Multispectral: 22m
Cloud Cover	Cloud cover “validated” 0 - ≤ 10 %, “proposed” 10 % < CC ≤ 30 %;
Resampling Kernel	
Format	DIMAP containing a GeoTIFF image file
DRA	off
Bit Depth	8 / 10 bits per pixel
Projection/ Datum	UTM/ WGS84
Tiling	
Delivery Medium	FTP Pull, FTP Push, USB stick, HDU, or DVD

DMC-2	
SATELLITE Specification	
Launch Information	Date: 29th of July 2009 Launch Vehicle: Dnepr Launch Site: Baikonur (Kazakhstan)
Orbit	Altitude: 650 Km Type: Sun Synchronous Period: 98 mins (NORAD last data)
Sensor Bands	3 Multispectral: Green: 0.52 – 0.60 Red: 0.63 – 0.69 NIR: 0.77 – 0.90
Sensor Resolution GSD (Ground Sample Distance)	Multispectral: 22m at nadir
Dynamic Range	10 bits per pixel
Swath Width	650 km swath
Retargeting Agility	
Max Contiguous Area Collected in a Single Pass (at 30° ONA)	Up to 1400 km
Revisit Frequency	3-day worldwide
Geolocation Accuracy (CE 90)	L1R : 50 km L1T : 10 meters RMS error
PRODUCT Specification	
Tasking Level	
Product Options	L1R: All 3 Spectral channels combined into a band registered image using L0R data L1T: L1R data Orthorectified to sub-pixel accuracy (10 metres RMS error approximately) with respect to Landsat ETM+ reference data and the Hole-filled seamless SRTM DEM data V3, 2006 (90m)
Resolution	Multispectral: 22m
Cloud Cover	Cloud cover “validated” 0 - ≤ 10 %, “proposed” 10 % < CC ≤ 30 %;
Resampling Kernel	
Format	DIMAP containing a GeoTIFF image file
DRA	off
Bit Depth	8 / 10 bits per pixel
Projection/ Datum	UTM/ WGS84
Tiling	
Delivery Medium	FTP Pull, FTP Push, USB stick, hard disk or DVD

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