ANALYSIS OF SENTINEL-1 MISSION CAPABILITIES

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1. INTRODUCTION

Sentinel-1 mission is designed to be a source of continuous and reliable collection of C-band SAR imagery. Requirements for Sentinel-1 end to end system, as part of the complete family of GMES Sentinels, guarantee continuity of C-band SAR data and products availability to scientific and institutional users who exploit satellite radar imagery since ERS 1 operations.
Typical drivers for Remote Sensing LEO satellite missions relate to the capability to rapidly access targets located within the accessible earth regions, acquire them and download data for final product generation and delivery to the requesting user.
On the other hand complete or almost complete Earth surface coverage is also required to the system.
Given geometric access capability, determined by LEO orbit characteristics and sensor swath, mission time performances only improve at the cost of increasing the number of satellites (constellation concept).
SAR power demand limits the satellite operational duty cycle implying trade-off between frequent acquisition of the same targets and extension of acquisition surface coverage.
A balance between fast access/response to (or frequent revisit of) a few regions of interest and maximization of geographical coverage within the satellite orbit repeat cycle is thus needed when no one of the above goals prevails as mission driver.
Sentinel 1 applies a relatively new mission operational concept: SAR acquisitions by Sentinel-1A (and Sentinel-1B when the constellation will be deployed) are being designed according to pre-defined operational sequences to ensure:

1. continuous and systematic acquisition of data all along the mission time (to maximize mission return and system exploitation efficiency)
2. a growing archive of "world-wide extended" data
3. maximum extension of coverage after any orbit repeat cycle (175 orbits in 12 days for Sentinel-1)
4. minimum possible revisit time on few selected regions (Maritime Transport zones and Europe)

but also

5. capability to include and perform, as an additional mission capability, less frequent data acquisitions coming from asynchronous user orders submitted to the system following for example requests for specific imagery during emergency occurrences.

The mission analysis process performed to define in detail the above operational concept will be outlined in this paper.