

MDA CHORUS Mission Overview and Calibration Plan

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ABSTRACT

MDA CHORUS is a next-generation Earth Observation dual-frequency commercial SAR mission providing continuity for RADARSAT-2 users, and enhanced capabilities to address emerging customer needs. It comprises a C-band and an X-band satellite (trailing by 1 hour) in a mid-inclined orbit (53.5°), to provide improved coverage between $\pm 62.5^\circ$ latitude. CHORUS is currently in detailed design and build with launch targeted for Q4 2025.

CHORUS-C can image over a 700 km accessible swath, either right or left-looking, for 20 minutes per orbit. Like RADARSAT-2, CHORUS-C supports dual-aperture on receive with the antenna split fore and aft, permitting high-resolution wide-swath imaging. While dual-aperture is only used for some RADARSAT-2 modes, it is used for all CHORUS-C modes. All CHORUS-C modes also use stepped receive, with the receive beam scanned in elevation in discrete steps. Initially developed to improve RCM sensitivity and range ambiguities, stepped receive was further developed to support CHORUS-C. Imaging modes include:

- Vessel Detection: 5 modes optimized for vessel detection with simultaneous imaging and downlink, Minimum Detectable Vessel Length of 15m to 65m.
- ScanSAR: coarser resolution (20m – 100m) wide swaths (250km – 700km) for marine applications. Available both with single and dual azimuth looks.
- Stripmap: modes are available at 8m, 5m and 3m resolution (50km to 175km swath) at multiple beam positions across the entire 700 km accessible swath.
- Spotlight: 3 m x 1 m imaging is supported across the entire accessible swath. Single, dual and compact-pol. will be available for all modes except high-incidence vessel detection modes, which are only single pol. Nominal azimuth and range ambiguity ratios are -20 dB or better across the full accessible swath for all modes except Spotlight. Vessel detection modes have a range ambiguity ratio of better than -25 dB. All modes are downlinked with 3 or 4-bit BAQ.

CHORUS-X is supplied by a leading provider of X-band SAR. CHORUS-X will offer left- and right-look imaging, for 3 minutes per orbit. CHORUS-X offers sub-metre resolution Spotlight, Stripmap and ScanSAR modes.

CHORUS will be maintained in an orbital tube suitable for interferometric exploitation of Stripmap and Spotlight data. Interferometric observations from the mid-inclination CHORUS orbit will be along line-of-sight vectors that are not observed by SSO SARs. Combining CHORUS data from different geometries, or combining CHORUS data with SSO SAR, will enable 3D deformation monitoring. The calibration plan for CHORUS is still in development. CHORUS-C calibration will use a similar approach RADARSAT-2, combining observations over point and distributed targets and non-imaging calibration. Calibration will need to address expanded use of dual-receive and stepped receive and thermal variation due to the mid-inclined orbit. CHORUS-X calibration is the responsibility of the supplier.

Preferred sessions for this paper, in order of priority:

1. Calibration of Future Missions
2. Calibration Methodology and Techniques
3. Calibration of Multi-channel and DBF Systems