

Pak-SBAS Update

2023

(ICG-17)

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SUPARCO

Pakistan Space & Upper Atmosphere
Research Commission





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Introduction



- Pakistan Space Based Augmentation System (Pak-SBAS) program was initiated in 2019
- Space and Upper Atmosphere Research Commission - SUPARCO (www.suparco.gov.pk) - the National Space Agency of Pakistan is responsible for development and operation of the System
- Pakistan Civil Aviation Authority - PCAA (www.caapakistan.com.pk) is supporting SUPARCO in the implementation of the System
- The System is envisaged to significantly promote adoption of precise positioning GNSS services in the socio-economic sectors of Pakistan



Introduction



- Program objectives:
 - To meet Safety-of-Life (SoL) positioning requirements of the transportation sector (aviation, marine, land, rail) in a phased manner (initially IOC, later FOC)
 - To meet positioning requirements of other national sectors such as surveying & mapping, precision agriculture, urban planning & infrastructure development, disaster management, etc



Overview

■ Constellations GPS, BeiDou

■ Signals L1, L5, B2b

■ Services Public (meter level accuracy)

Authorized (decimeter level accuracy) with convergence time:

■ 30 minutes (IOC)

■ 01 minute (FOC)



Overview



- Public Service:

- The Pak-SBAS will comply with the SBAS requirements of ICAO published in Annex 10 - Aeronautical Communications, Volume I, Radio Navigation Aids
- L1 SIS (Signal-In-Space) will comply with the corresponding requirements in the SBAS Minimum Operational Performance Standards (MOPS, DO-229E) published by RTCA (Radio Technical Commission for Aeronautics)
- L5 SIS will comply with the SBAS L5 DFMC (Dual Frequency Multi Constellation) Interface Control Document (version 1.3) developed by the SBAS Interoperability Working Group (IWG)



Overview

- Authorized Service:
 - The B2b SIS will comply with corresponding requirements in the BeiDou Navigation Satellite System SIS Interface Control Document Precise Point Positioning Service Signal PPP-B2b (version 1.0) published by China Satellite Navigation Office (CSNO)
 - The Service will acquire real-time IGS data products in RTCM (Radio Technical Commission for Maritime Services) format & non-real time IGS data products in RINEX (Receiver INdependent EXchange) format transferred through NTRIP (Network Transport of RTCM via Internet Protocol) & FTP (File Transfer Protocol) respectively

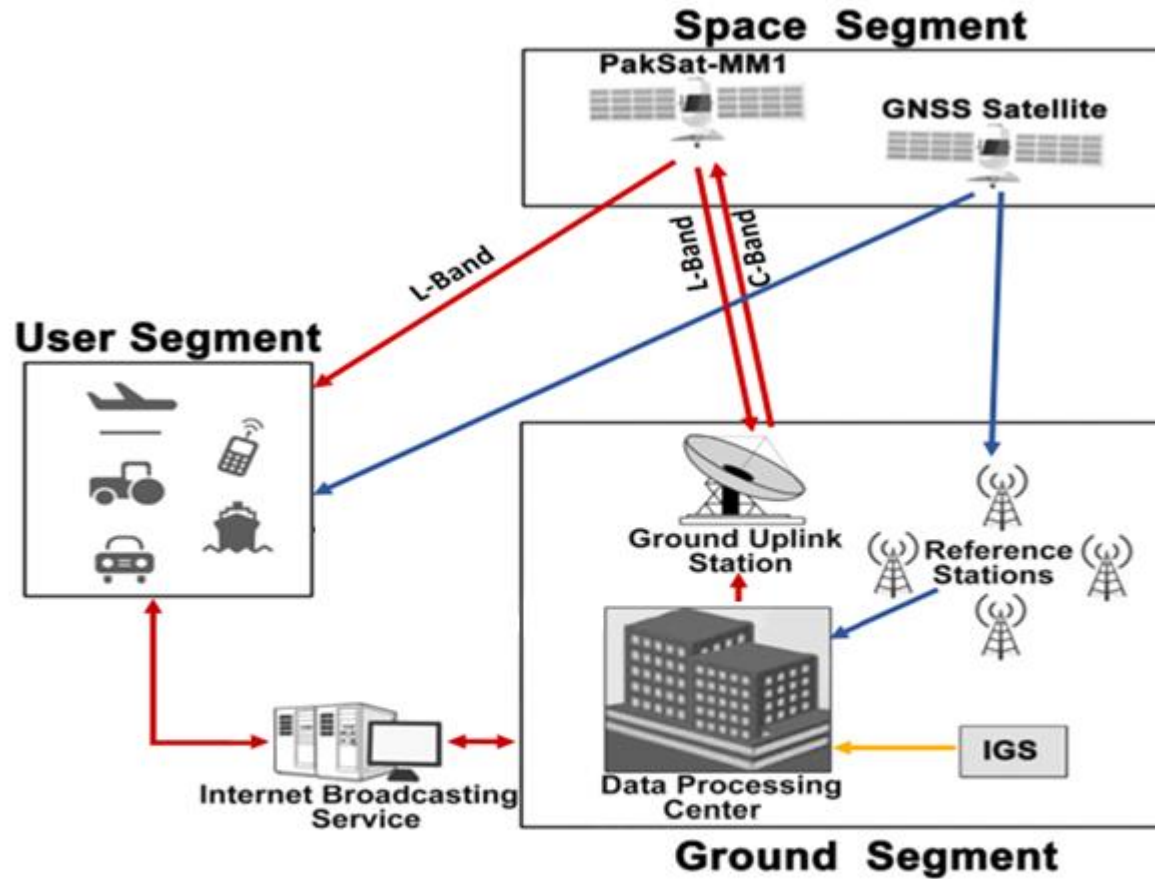


Configuration

- Space Segment
 - SBAS Payload onboard PakSat MM-1 satellite (GEO-1) at 38.2°
- Ground Segment
 - 01 x Data Processing Center (DPC)
 - 12 x Range and Integrity Monitoring Stations (RIMS)
 - 01 x Ground Uplink Station (GULS)
 - Data Communication Network
 - Interface with International GNSS Service (IGS)
- User Segment
 - Pak-SBAS receivers for aviation, marine, land users



Configuration



- Navigation Message
- Augmentation Message
- IGS Data & Products



Implementation Status



- Contract Nov 2020
- Kick-off Aug 2021
- PDR Dec 2021
- CDR Aug 2022
- IOC (GEO-1) Mid 2024



Implementation Status



- Frequency coordination:
 - C-Notice submitted in 2019
 - Coordination with 23 affected administrations in progress; closed with 02 administrations
 - Resolution 609 data for PakSat-MM1 L5 signal submitted to ITU in 2021
 - PakSat-MM1 filing successfully included in the List of RNSS Networks in 20th Resolution 609 meeting in 2021



Implementation Status



- GPS PRN codes:
 - ICAO Information Paper on Pak-SBAS presented at the 5th Meeting of APAC (Asia Pacific) GBAS - SBAS Implementation Task Force (GBAS - SBAS ITF - 5) on 23 Jun 2023 at Tokyo, Japan
 - Working Paper on Pak-SBAS for SBAS Service Provider ID planned to be presented in the 11th Meeting of the Joint Working Groups (JWGs/11) of ICAO Navigation System Panel (NSP) on 05 Dec 2023 at Montreal, Canada
- BeiDou PRN codes:
 - Test PRN code of BeiDou PPP-B2b issued to Pak-SBAS



Implementation Status



- The Pak-SBAS service is planned to be tested and commissioned by end-year 2024
- The launch of the second satellite (GEO-2) in the Pak-SBAS Space Segment is being considered in the year 2026
- The Ground Segment will also be augmented with the launch of GEO-2
- Certification of the System for Performance Based Navigation (PBN) services will be planned subsequently



Conclusion



- Pakistan is well poised for implementation of Pak SBAS in 2024
- Seeks constructive engagement with ICG for the compatibility, interoperability and transparency of Pak-SBAS
- Looks forward to the cooperation of ICG for adoption of GNSS technology implementation in the country
- Expects decision on the outcome of its application for ICG membership pending for three years now



Thank You

