

# Pakistan Space Based Augmentation System

## Key Features

- Meter to sub meter accuracy
- Cis & Trans-frontier Coverage
- Cost effective, convenient and easy to use
- Compatible & interoperable



## Introduction

Pakistan has developed **Pakistan Space Based Augmentation System (Pak-SBAS)** for improving the accuracy, integrity and reliability of existing Positioning, Navigation, and Timing (PNT) service. Pak-SBAS will enable meter to sub-meter positioning which will fulfill the precise positioning requirements of civil/public users cis & trans frontier.



## Specification

Parameters	Technical Specification		
<b>Service Accuracy</b>	Public Service	Accuracy	$H \leq 1.5m, V \leq 2.5m$
		Signals	SFSC (GPS: L1) DFMC (GPS : L1 & L5)
		Constellation Supported	SFSC (GPS) DFMC (GPS & BDS)
		Convergence Time	Real-time
		Encryption	No
		Applications	IOC: Non-Safety-of-Life (Non-SoL) FOC: Safety-of-Life (SoL)
	Authorized Service	Accuracy	$H \leq 0.15m, V \leq 0.25m$
		Signals	PPP (B2b)
		Constellation Supported	PPP (GPS & BDS)
		Convergence Time	30 min
		Encryption	Yes
		Applications	Non-SoL
<b>Timing Accuracy</b>	$\leq 20$ ns		
<b>Coverage</b>	Pakistan & surrounding region		



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## Safety-of-Life (SoL) Applications

Application	Description	
<b>Aviation</b>	Pak-SBAS will enable Performance Based Navigation (PBN) to significantly enhance safety and efficiency by providing precise navigation en-route through to precision approach for safety, efficiency & capacity benefits.	
<b>Marine</b>	Pak-SBAS will enable integrity based positioning for Safety-of-Life at Sea (SoLAS) to improve accuracy and integrity for specific service areas (such as navigation in harbour entrances, harbour approaches and coastal waters).	
<b>Railway</b>	Pak-SBAS will enable integrity based positioning to improve safety and reliability in railway operations that includes monitoring track deformation at network scale and assessing natural hazard risks) while allowing reduced costs for on-site inspections. Further, continuous satellite-based monitoring at network scale enables a paradigm shift to predictive maintenance.	
<b>Intelligent Transportation</b>	Pak-SBAS will enable integrity based positioning for smart vehicles (V2V, V2X), smart toll collection system, HAZMAT asset tracking, monitoring traffic flow & rapid incident response.	






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## Non-SoL Applications

Application	Description	
<b>Precise GIS &amp; mapping</b>	Pak-SBAS services will enhance the reliability & efficiency of precise GIS & mapping operations thru provision of high-precision ubiquitous geospatial data for precise asset management.	
<b>Precision Agriculture</b>	Pak-SBAS services will aid precision farming practices by enabling precise machine guidance, accurate geolocation of crops, resources optimization and monitoring field conditions.	
<b>Precision Mining</b>	Pak-SBAS services will provide precise positioning information for exploring & identifying sites, extraction, machine guidance, grading, drilling, collision avoidance, mine-construction and hauling processes.	
<b>Deep Sea Exploration</b>	Pak-SBAS services will provide precise positioning information for offshore exploration and drilling for brining crude oil & natural gas to the surface.	



## Non-SoL Applications

Application	Description	
<b>Smart City, Urban Planning &amp; Infrastructure Development</b>	Pak-SBAS services will enable the precise positioning solutions for smart city through assistance in the development of precise digitized e-maps for efficient urban planning & land demarcation.	
<b>Disaster Management</b>	Pak-SBAS services will help in response for Search & Rescue operations and will aid disaster relief teams and public safety personnel.	
<b>Deformation Monitoring</b>	Pak-SBAS service will enable precise deformation monitoring of high-rise buildings, bridges, dams and glaciers.	
<b>Precise UAV/UGVs navigation</b>	Pak-SBAS service will enable precise navigation of UAVs/UGVs to enable smart mobility solutions.	



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