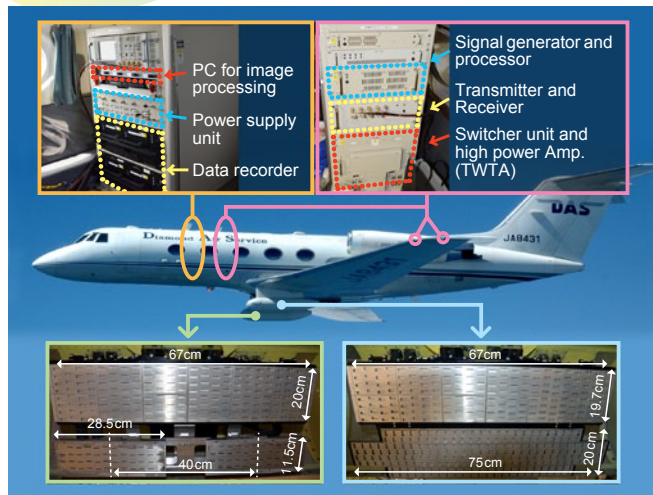


Development of Pi-SAR2

The National Institute of Information and Communications Technology (NICT) developed the second X-band airborne polarimetric and interferometric synthetic aperture radar (Pi-SAR2) system in 2008, as seen in Fig. 1. Its performance is much better than that of the first Pi-SAR. Table 1 compares Pi-SAR and Pi-SAR2, and Table 2 summarizes the observation modes for Pi-SAR2. Its performance was verified to be within the specifications with calibration instruments. Pi-SAR2 observations have been carried out and applied to research in various fields such as hydrology, geology, oceanography, and environmental and disaster monitoring since early 2011.

Fig. 1 Pi-SAR2 system



Left: Sub antenna radome (At top is antenna for cross-track interferometry. At bottom is antenna for along-track interferometry.)
 Right: Main antenna (At top is V polarization slotted waveguide antenna. At bottom is H polarization slotted waveguide antenna.)

Fig. 2 Color composite amplitude image around Haneda airport

Red:HH, Green: HV, Blue: VV

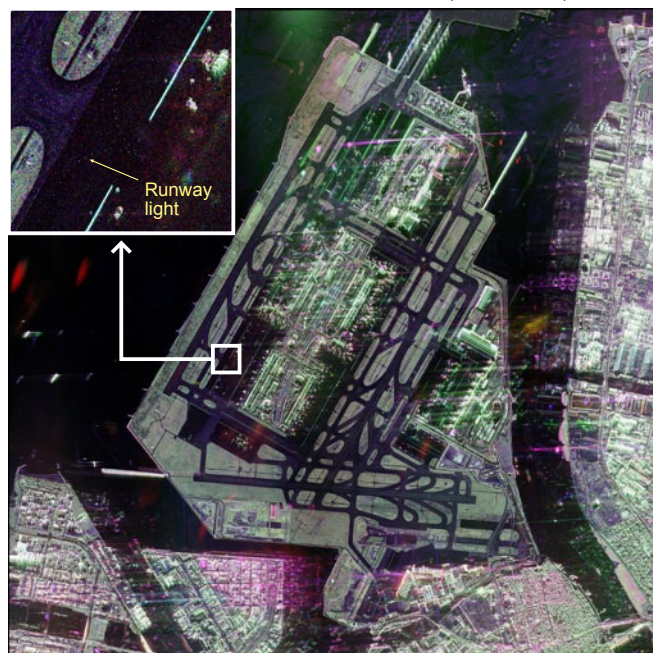


Fig. 2 shows Haneda airport (5 × 5 km) observed by Pi-SAR2 on March 31, 2011. The runway lights are visible.

Table 1 Comparison of Pi-SAR and Pi-SAR2

	Pi-SAR	Pi-SAR2
First flight	1996	2008
Center Frequency	9.55 GHz	9.55 GHz / 9.65 GHz
Bandwidth	100 MHz	500 MHz / 300 MHz / 150 MHz
Slant range resolution	1.5 m	0.3 m / 0.5 m / 1.0 m
Azimuth resolution	1.5 m (4looks)	0.3 m (1look) / 0.6 m (2looks)
Swath width (ground range)	> 10 km	> 10 ~ 5 km
Noise Equivalent σ^0	< -33 dB	< -23 dB / -27 dB / -30 dB
Data rate	32 MB/s x 2ch.	200 MB/s x 3ch.
Data recorder	D1 tape recorder x 2ch.	3.5 in. HD array (500GB x 8) x 3ch.
Radome position	fore part of body	base of wings
Antenna Azimuth movement	-	Sliding spotlight (optional mode)

Table 2 Observation modes for Pi-SAR2

	Mode 0	Mode 1	Mode 2	Mode 3
Bandwidth	500 MHz	500 MHz	300 MHz	150 MHz
method	Sliding spotlight	Strip map	Strip map	Strip map
Slant range resolution	0.3 m	0.3 m	0.5 m	1.0 m
Azimuth resolution	0.5 ~ 0.3 m (2looks)	0.3 m (1look)	0.6 m (2looks)	0.6 m (2looks)
Swath width	4 ~ 9 km	5 ~ 10 km	7 ~ 10 km	> 10 km
Azimuth length	3 ~ 7 km	-	-	-
NE σ^0	< -25 dB	< -23 dB	< -27 dB	< -30 dB

Along-track interferometric SAR

Many requirements need to be satisfied to detect moving targets and measure their speeds with SAR. NICT is now developing an along-track interferometric SAR system for Pi-SAR2 to detect moving targets (i.e., cars, trucks, and ships) both on the ground and at sea.

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