



## NovaSAR-1 Acquisition Modes

NovaSAR-1 offers a range of imaging modes with a variety of swath widths and imaging resolutions that can be chosen to best suit the needs of the user. All modes can be operated in either right-looking or left-looking antenna pointing directions and from an ascending (South to North) or descending (North to South) orbit.

Mode	Stripmap	ScanSAR	ScanSAR Wide	Maritime
Resolution	6 m	20 m	30 - 50 m	Deliberately Ambiguous in Azimuth
Swath	13 - 20 km	50 & 100 km	50 - 195 km	400 km
Polarisation	HH or VV	HH, VV & HV	HH, VV & HV	HH only
Use Case	Detailed observations	Nominal mode	Large area monitoring	Ship detection in combination with AIS

Figure 1: NovaSAR-1 Baseline Acquisition Modes

The NovaSAR-1 modes we anticipate will be the most widely used and that are listed as options in the OPAL Acquisition table are defined in the table below:

Mode type	Mode Name	Polarisation			Ground range resolution	Incidence angles (at 580km altitude)	No. of Swaths	Swath width (across track)	Worst Case Sensitivity (NESZ)	No. of looks
<b>Maritime</b>	Maritime	Single	Co	HH	6m range, 13.7m azimuth	34.5-57.3°	1	400 km	<-9.7dB	1 (1 range, 1 azimuth)
<b>ScanSAR</b>	20m_ScanSAR_HHHV	Dual	CoCross	HH & HV	20m	12.95-31.18°	8	25-27km	<-20 dB	3 (1 range, 3 azimuth)
	20m_ScanSAR_HHV	Dual	Co	HH & VV	20m	13.98-30.6°	5	50-60 km	<-20.0 dB	3 (3 range, 1 azimuth)
	30m_ScanSAR_VVHHHV	Triple	CoCross	HH & VV & HV	30m	15.0-29.1°	3	50-56 km	<-27dB	2 (1 range, 2 azimuth)
	35m_ScanSAR_100km_VVHHHV	Triple	CoCross	HH & VV & HV	35m	14.39-29.08°	2	100 km	<-26 dB	1 (1 range, 1 azimuth)
<b>ScanSAR Wide</b>	33m_ScanSAR_195km_HH	Single	Co	HH	33m	11.82-30.26°	1	195 km	< -19.5 dB	3 (3 range, 1 azimuth)
	50m_ScanSAR_195km_HHHV	Dual	CoCross	HH & HV	50m	12.95-31.18°	1	195 km	<-19 dB (HH) <-22 dB (HV)	6 Co-pol (6 range, 1 Azimuth) 3 Cross-Pol (3 range, 1 azimuth)
<b>Stripmap</b>	6m_Stripmap_HH	Single	Co	HH	6m	16-25.38°	9	20 km	<-20 dB	3 (1 range, 3 azimuth)
						21.29-31.2°	11	13-20 km	<-19 dB	
	6m_Stripmap_VV	Single	Co	VV	6m	16-25.38°	9	20 km	<-20 dB	3 (1 range, 3 azimuth)
						21.29-31.2°	11	13-20 km	<-19 dB	

Table 1: NovaSAR-1 OPAL Modes

Further modes on offer are:

Mode type	Mode Name	Polarisation			Ground range resolution	Incidence angles (at 580km altitude)	No. of Swaths	Swath width (across track)	Worst Case Sensitivity (NESZ)	No. of looks
ScanSAR	20m_ScanSAR_HH	Single	Co	HH	20m	15.0-24.66°	2	100 km	<-20.0 dB	4 (2 range, 2 azimuth)
						24.51-28.94°		50 km	<-21.0 dB	
	20m_ScanSAR_VV	Single	Co	VV	20m	15.0-24.66°	2	100 km	<-20.0 dB	4 (2 range, 2 azimuth)
						24.51-28.94°		50 km	<-21.0 dB	
	30m_ScanSAR_HH	Single	Co	HH	30m	11.29-25.93°	2	150 km	<-21 dB	4 (2 range, 2 azimuth)
						27.35-32.01°		55 km	<-19.5 dB	
	30m_ScanSAR_VV	Single	Co	VV	30m	11.29-25.93°	2	150 km	<-21 dB	4 (2 range, 2 azimuth)
						27.35-32.01°		55 km	<-19.5 dB	
ScanSAR Wide	40m_ScanSAR_195km_HV	Single	Cross	HV	40m	12.95-31.18°	1	195km	< -23 dB	4 (2 range, 2 azimuth)
	40m_CoCross_ScanSAR_Mid_HHHV	Dual	CoCross	HH & HV	40m	12.95-31.18°	1	195km	<-21 dB	4 Co-pol (4 range, 1 azimuth) 1 Cross pol
	45m_ScanSAR_195km_HHHV	Dual	CoCross	HH & HV	45m	12.95-31.18°	1	195 km	< -26 dB	1 (1 range, 1 azimuth)
	50m_Co6+Cross1_ScanSAR_195km_HHHV	Dual	CoCross	HH & HV	50m	12.95-31.18°	1	195 km	<-19 dB (HH) <-27 dB (HV)	6 Co-pol (6 range, 1 Azimuth) 1 Cross pol

Table 2: Additional NovaSAR-1 Modes

Notes:

- The number of range looks is the number of distinct or partially overlapping coherently processed looks extracted from the pulse bandwidth which are combined after detection to form the image.
- The number of azimuth looks is the number of distinct or overlapping coherently processed looks extracted from the Doppler spectrum which are combined after detection to form the image.
- The sensitivity of the SAR system is the ability to detect radar returns above the noise level of the system. The sensitivity is usually expressed by the Noise Equivalent Sigma Zero (NESZ or  $NE\sigma_0$ ) parameter. Conventional SAR modes are typically designed to provide a sensitivity value of at least -18 dB, corresponding to a low noise image.