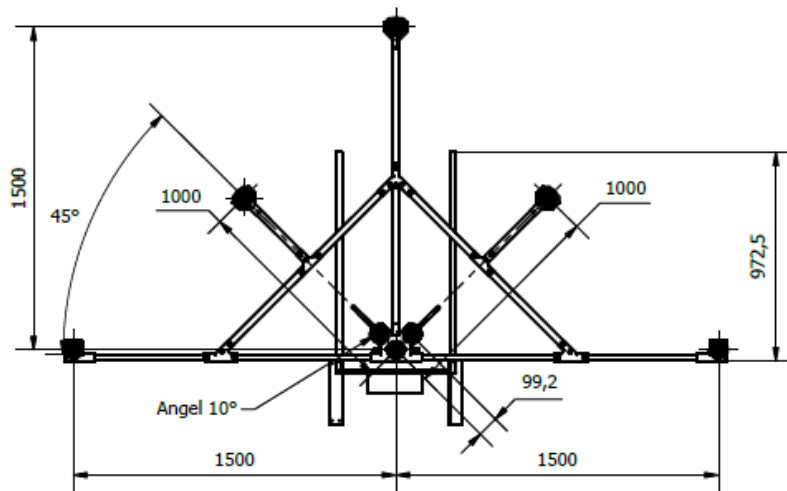


Annex 2: Assessment of potential for impacts as a result of licensable activity

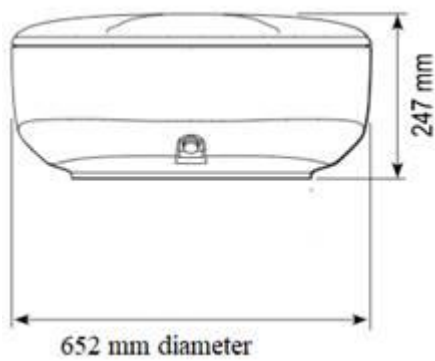
Receptor identified within EOWDC Operational phase impact assessment*	Impacts predicted as a result of licensable activity
Coastal Processes	No route to impact identified.
Marine Ecology, Intertidal Ecology, Sediment and Water Quality	No route to impact identified.
Ornithology	No route to impact identified.
Bats	No route to impact identified, as, to the applicant's knowledge, there have been no studies which have suggested that radar (operating at any frequency) attract bats. Therefore no alteration the findings of the original EOWDC assessment in relation to bats is proposed. Impact significance remains negligible.
Marine mammals	No route to impact identified as the radar only detects velocity or the distance of the sea surface based on the reflected signal. The frequency used is the same as the one used in automotive radars + doppler with no known impact on ecology.
Electromagnetic fields	No route to impact identified.
Shipping and Navigation	No route to impact identified due to radar operating frequency out with Marine Frequency Bands.
Aviation	No route to impact identified due to radar operating frequency out with relevant aviation Bands.
Ministry of Defence (firing range)	No route to impact identified.
Marine and Maritime archaeology	No route to impact identified.
Seascape, Landscape and Visual	No route to impact identified.
Cultural Heritage	No route to impact identified.
Commercial Fisheries	No route to impact identified as the radar only detects velocity or the distance of the sea surface based on the reflected signal. The frequency used is the same as the one used in automotive radars + doppler with no known impact on ecology.
Salmon and Sea trout	No route to impact identified as the radar only detects velocity or the distance of the sea surface based on the reflected signal. The frequency used is the same as the one used in automotive radars + doppler with no known impact on ecology.
Socioeconomics Recreation and Tourism	No route to impact identified.
In Air Noise	No route to impact identified.
Electromagnetic Interference	No route to impact identified. The sensor does not interfere with any other radar devices.
Other Marine Users	No route to impact identified. NB: No additional vessels are required for installation / maintenance / decommissioning

Radar Dimensions

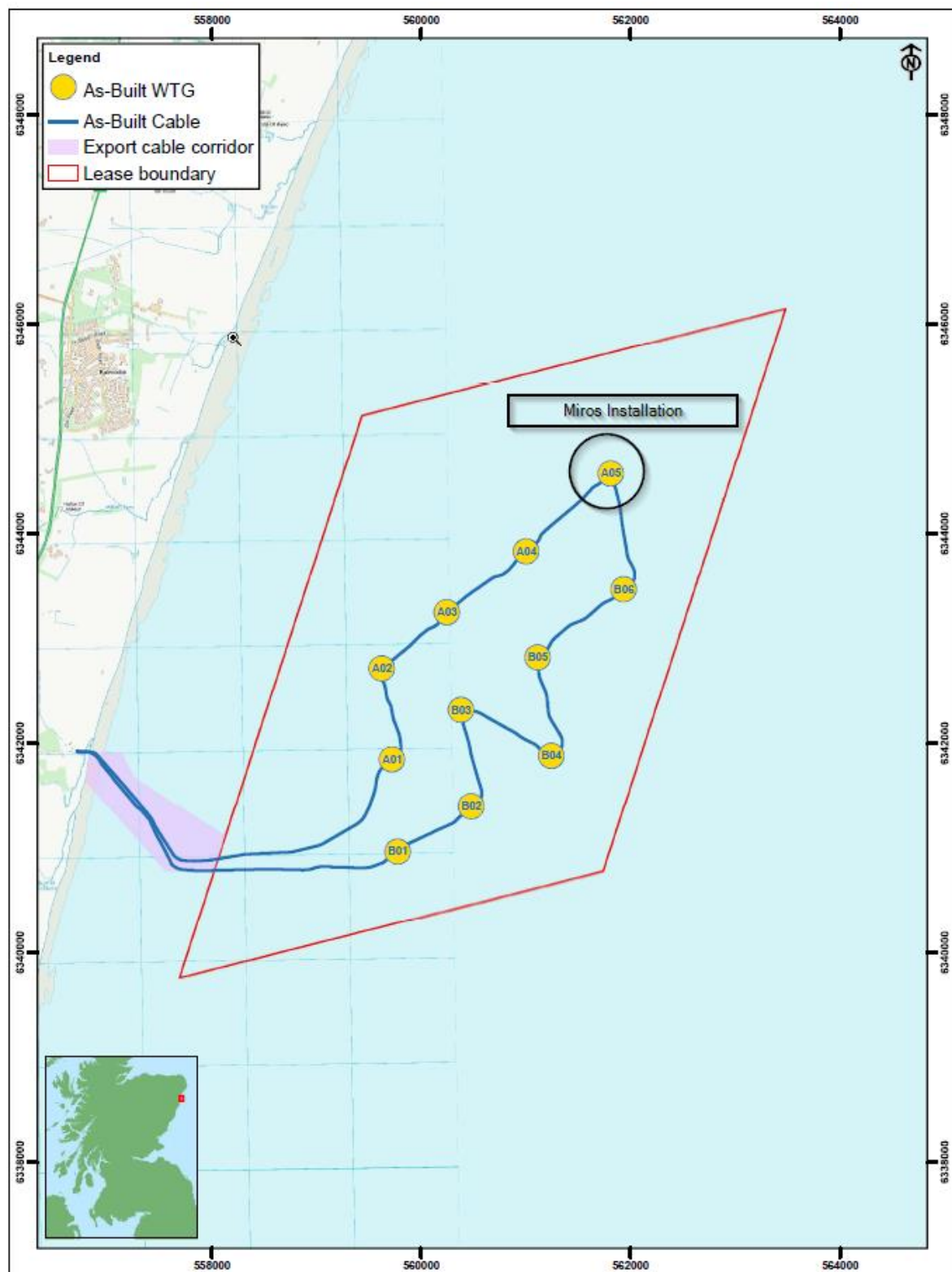
New Generation Radar



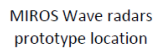
Fusion Sensor



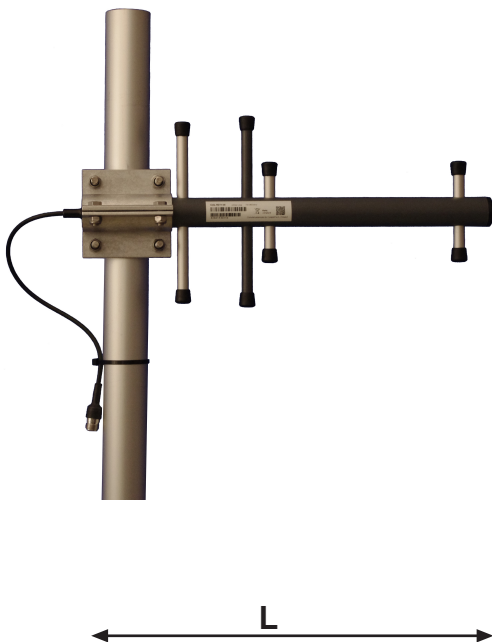
Windfarm Location



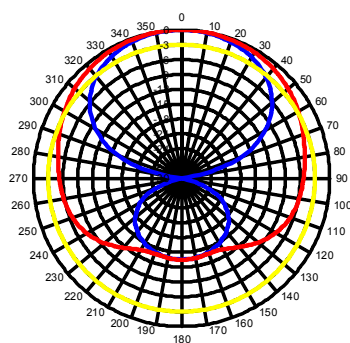
Installation of the MIROS radar on the NE corner of the platform



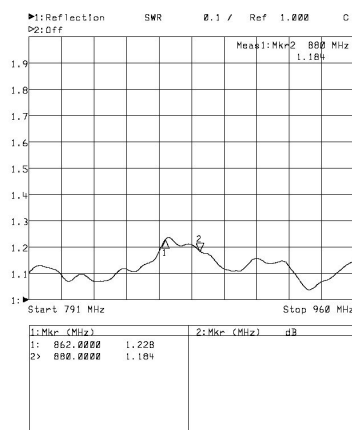
ComAnt[®] Communications Antennas



RADIATION PATTERN 826.5 MHz



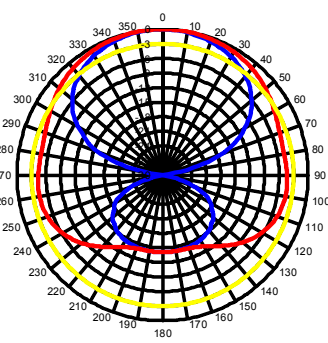
— E dB — H dB



FREQUENCY INDEPENDENT DATA

Description: LTE yagi
 Frequency: 791-960MHz
 Impedance: 50 ohm
 Gain: 6 dBi
 Polarization: vertical/horizontal
 Connector: N-female
 VSWR: < 1.3
 Radome: UV resistant ABS, RAL 7012, PU foam filling
 Radiator: copper
 Passive elements: coated aluminium
 Attachment: Ø 35-60 mm, aluminium alloy bracket, stainless steel V-bolts and self locking nuts
 Lightning protection: DC-short circuited
 Temperature: -40° - +80° C
 IP: 67

RADIATION PATTERN 920 MHz



— E dB — H dB

CompleTech
 ComAnt[®]-antennas by CompleTech, Finland

CALTEY+ LTE YAGI

MIROS WAVE & CURRENT RADAR

ACCURATE MEASUREMENTS OF DIRECTIONAL WAVE SPECTRA & SURFACE CURRENTS

DATASHEET



The Miros Wave & Current Radar is a unique high-performance remote sensor for the measurement of directional wave spectra and surface currents. It is the only sensor which utilises the dual-footprint pulse Doppler method for wave measurements, and the microwave dual frequency method for measuring surface currents.

The sensor enables data to be easily and securely accessed both locally and remotely using modern IoT technologies. The sensor provides excellent quality wave spectrum and wave parameter data. The accuracy has been verified in a number of independent comparisons, contact Miros for more details.

The Miros Wave & Current Radar has proven its ruggedness and reliability through many years of service in extreme weather conditions, including heavy precipitation, all over the world.

KEY FEATURES

- Easy data access, locally and remotely
- No parts submerged in water
- Low maintenance costs
- For fixed or floating installations
- Not impacted by fog, rain or mist
- Web-based user interface
- Embedded data processing and web server

ESSENTIAL FOR

- Real-time sea state and surface current monitoring
- Weather-critical maritime operations
- Structural integrity verification
- Collection of in-situ data, on- or offshore
- Improvement of forecasts



The Miros Wave & Current Radar observes the ocean surface in a semi-circle at a distance of 180 - 450 m depending on the installation height, typically 18 - 80 m. The radar frequency gives a strong echo from capillary waves which are normally present at wind speeds > 2 m/s.

SPECIFICATIONS

Directional Spectra	Bins	Range	Resolution
Directions:	36	1 - 360°	10°
Frequencies:	37	0.03 - 0.3 Hz	0.0078 Hz

Waves	Range	Resolution	Accuracy
Height:	0 - 1 m	0.1 m	±0.2 m
	1 - 30 m	0.1 m	±5 %
Period:	3 - 30 s	0.1 s	±5 %
Direction:	1 - 360°	1°	±7°
Update Interval 128 s. Default averaging time approx. 40 min.			

Surface Currents ⁴	Range	Resolution	Accuracy
Speed:	0 - 2.5 m/s	0.01 m/s	±0.05 m/s
Direction:	1 - 360°	1°	±7°
Update Interval 128 s. Default averaging time approx. 40 min.			

Physical interface	
Standard interface:	CAT5e STP

Displays/GUI	
Data, Status, Configuration:	Web GUI

Integration options	
Local:	NMEA (proprietary formats)
Remote:	CSV and JSON formats from Miros Cloud

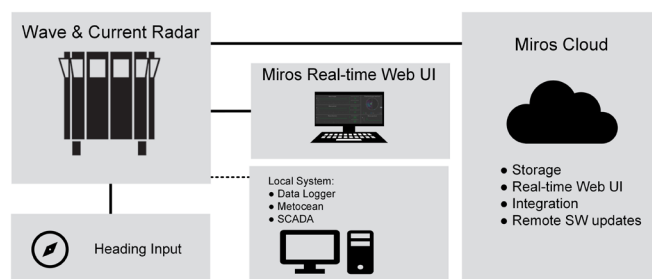
Input Interfaces	
Heading:	NMEA - HDT
Date/Time:	NTP

Electrical Data	
Frequency of Operation:	5.8 GHz pulse
Bandwidth:	20 MHz
Transmitted Power:	275 mW average (10 W peak)
Supply Voltage:	110 VAC or 230 VAC ±10 %
Power Consumption:	SM-050/04/SF: 85 W
	SM-050/04/TM: 365 W
EMC:	2014/30/EU

The Miros Wave & Current Radar is a modern IoT-enabled device that can easily and securely integrate with both local and remote systems.

The device can also be complemented with various value adding Cloud services from Miros, such as web displays, database integration, data processing and device management services.

Cloud integration enables all relevant stakeholders to securely access critical data simultaneously, allowing for a shared situational awareness, supporting decision-making in real time as conditions develop.



Environmental Specifications

Temperature:	-15°C (-25°C) ¹ to +40°C (+50°C) ²
Humidity:	0 - 100 %RH
Ingress Protection:	IP 66

Physical Specifications

Dimensions (HxWxD):	860 x 897 x 696 [mm]
	870 x 1100 x 980 [mm] ²
Weight:	53,2 kg (standard version)
	74,6 (tropical version)
Material:	Al. EN AW 5052-H32
Finish/Colour:	Enameled / Grey RAL 7035

Versions

SM-050/04/S	S = Standard temperature range
SM-050/04/T	T = Tropical temperature range ²
Both versions can be equipped with the motion reference unit (MRU) for floating installations ³	

Accessories

MP-309/03:	Pedestal
MP-294/03:	Shock absorber

Options

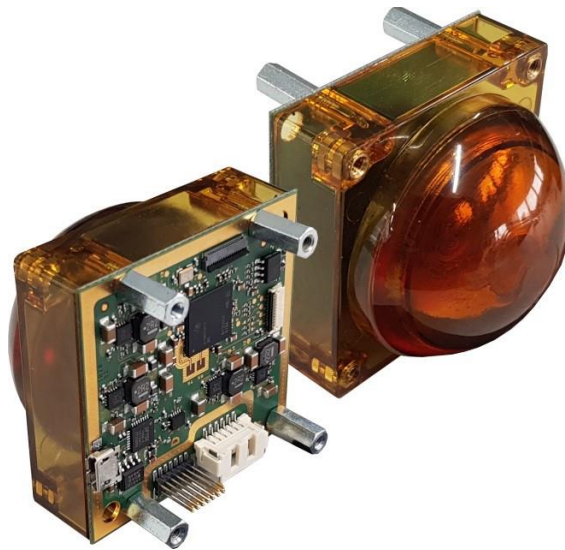
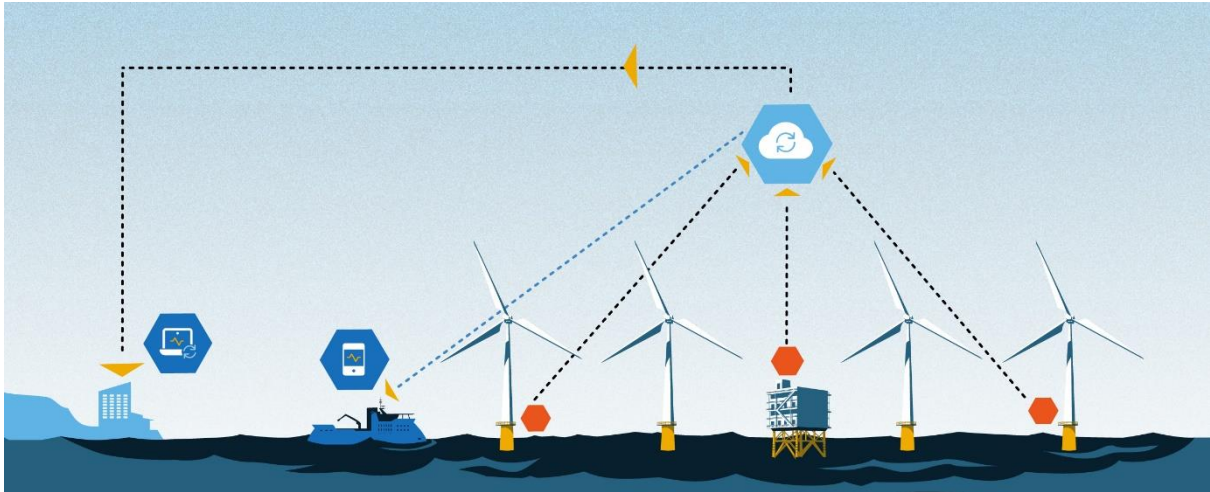
Cloud services:	Contact Miros for details
SM-050/04/xxA:	Alternative frequency ¹
Built-in Ethernet SHDSL Extender, for extended cable distance to several km.	

Notes

- On request. Contact Miros for details.
- Tropical version with sun shield and cooling door (versions SM-050/04/Tx) required when temperature exceeds 40°C.
- The radar is designed for stationary use, but reasonable measurements may be obtained during transit at speeds of up to 6-8 knots.
- Surface current measurements are only available in certain sea states. Contact Miros for more details.

Specifications are subject to change without prior notice.

Miros New Generation Radar



FEATURES:

- Radar-based distance measurement system working between 60 GHz to 64 GHz with intelligent μ C processing.
- Distance measurement with millimeter accuracy.
- Small size for easy installation to the different site types.
- Configurable detection range.
- Small beamwidth allowing precise measuring without the interference from the installation structures.
- Free for licensing in most countries.

Specifications

Parameter	Conditions	Min	Typ	Max	Units
Transmit frequencies		60		63.8	GHz
Output power (EIRP)			10		dBm
Detection distance	Depending on target 40 m @ static 20 m @ moving	0.1		40	m
Power supply					
Supply voltage		3.6		16	V
Characteristics at 3.6 V			360		mA
			1.3		W
Characteristics at 16 V			100		mA
			1.6		W
Environment					
Operating temperature		-40		+ 85	°C
Storage temperature		-40		+ 85	°C
Mechanical					
Outline dimensions	Height Length Width	47.1 50.5 50.5			mm
System Antenna Pattern					
System pattern (3 dB width)	horizontal		5.5		°
	vertical		5.5		°
Side-lobe suppression	horizontal		35		dB
	vertical		35		dB
Squinting angle	horizontal	-1	0	1	°
	vertical	-1	0	1	°

Detection Field of view

The antenna beamwidth in degrees specifies the off-boresight angle where the transmitted or received energy has dropped down to 50 % of the maximum value (3 dB beamwidth).

- The graph below shows the system pattern @ 62 GHz

