FURUNO

Doppler Weather Radar System

Solution for meteorological monitoring and analysis

One of the smallest and lightest

Compact Dual Polarimetric X-band Doppler Weather Radar
Model: WR-2100

Compact X-band Doppler Weather Radar
Model: WR-50

www.furuno.com

FURUNO's solution for meteorological monitoring and analysis

Utilising the technical expertise FURUNO has accumulated through the development of marine Radar that has earned the leading market share, FURUNO, in close collaboration with universities and other business organisations, is now working on development of solution for meteorological monitoring and analysis. FURUNO's high quality compact X-band Doppler Weather Radar is indispensable for localised weather forecasting to materialise better safety in the society where the impact arising from the meteorological disasters can be diminished.

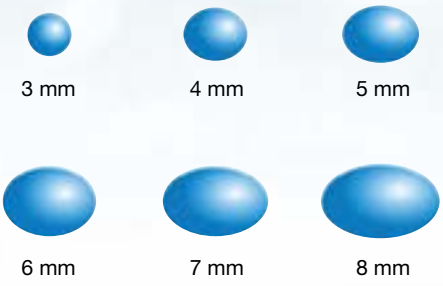
Soaring needs for Weather Radar that stem from intensifying extreme weather

A number of arguments on the global scale as to how to tackle problems arising from extreme weather, such as short localised rainstorms, tornados and other adverse phenomena, have been taking place recently. Subsequently, urgent needs have been recognised for the solution of localised weather forecasting as part of social infrastructure so as to protect human lives and assets from unexpected natural disasters, i.e., river floods, landslides, etc., hence delivering better safety and peace of mind to society.

Dual Polarimetric Doppler Weather Radar to contribute to prediction of occurrence of rainstorms

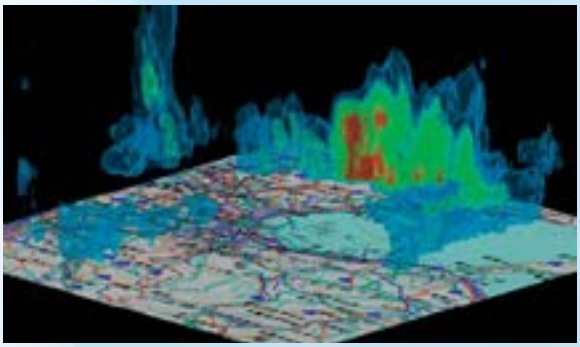
Dual Polarimetric Doppler Weather Radar simultaneously transmits and receives horizontally- and vertically-polarised radio waves. It is capable of computing the movement velocity of nimbus, as can be obtained from Single Polarimetric Doppler Weather Radar using horizontally-polarised radio waves, as well as precise precipitation intensity.

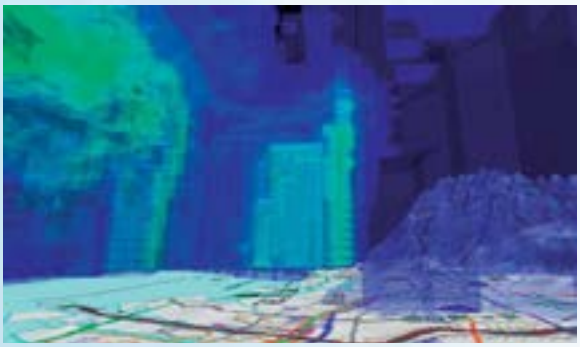
Shape of precipitation particles is horizontally-long oval, due to the effect from atmosphere and gravity. Using these characteristics, Dual Polarimetric Doppler Weather Radar obtains diameters of precipitation particles to compute precise precipitation intensity.



High precision 3D meteorological monitoring of FURUNO Multi-Radar System

Sample images of 3D meteorological monitoring





In order to predict the development of short localized rainstorms, following the abrupt development of a cumulonimbus, high spatiotemporal resolution monitoring of meteorological phenomena is required.
By downsizing both Dual Polarimetric Doppler Weather Radar and Single Polarimetric Doppler Weather Radar, FURUNO makes remarkable reduction on the deployment cost a possibility. Also, it has become easier to create “Multi-Radar System” by combining both Radar units.
High spatiotemporal resolution 3D monitoring of meteorological phenomena by “Multi-Radar System” makes possible the provision of precautious information about prospective sediment disasters as well as information about evacuation routes, shelter location, etc., in case of foreseen rainstorms in real-time.

*The map data used in this page has been provided through Digital Japan Web System of Geospatial Information Authority of Japan.
*The terrain elevation data of the background has been obtained from "Shuttle Radar Topography Mission (SRTM)", conducted by Jet Propulsion Laboratory, the US.

System Configuration

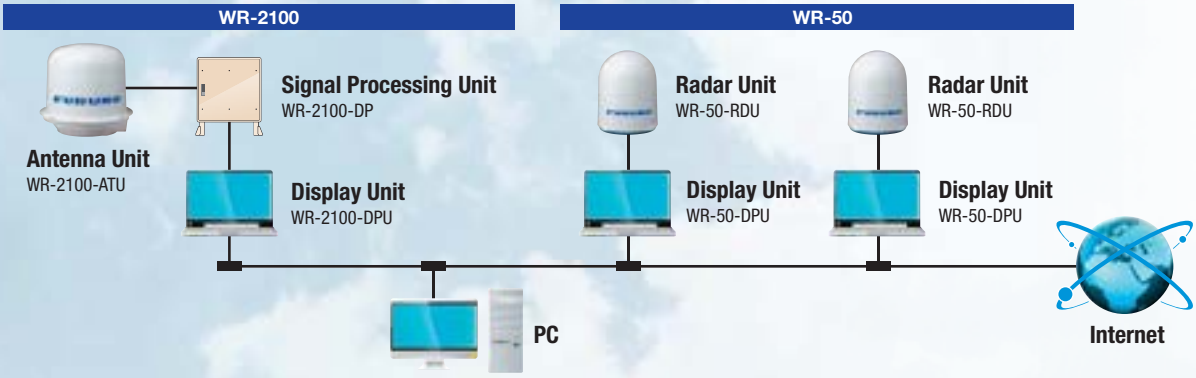
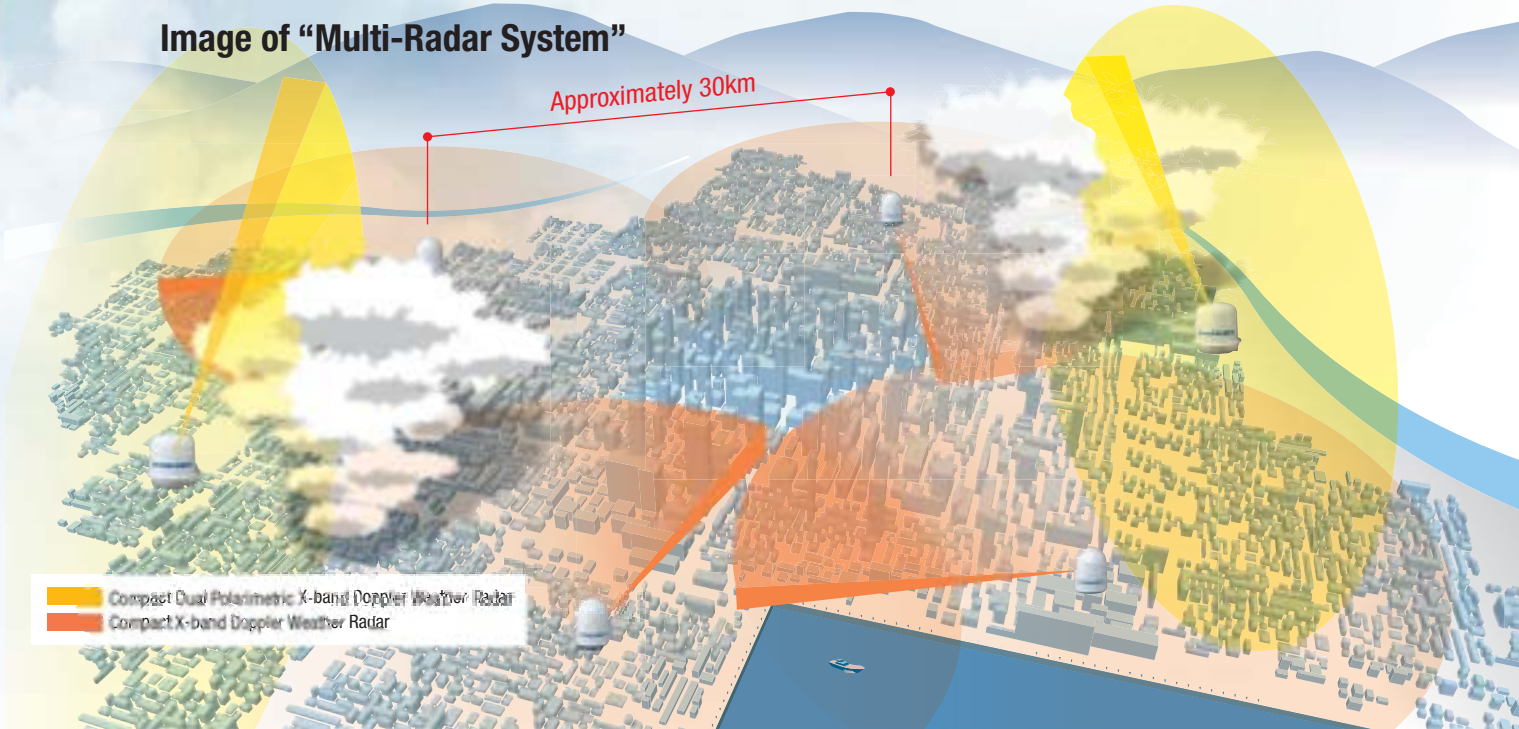


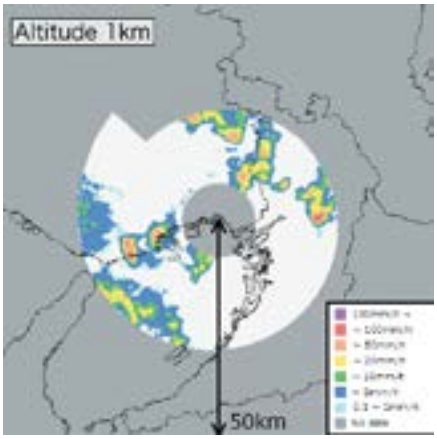
Image of “Multi-Radar System”



CAPPI (Constant Altitude Plan Position Indicator) observation

by the WR-2100

Data from the identical altitude is to be extracted and monitored, suitable for observing the development of a cumulonimbus. (Altitude: 1-9 km)



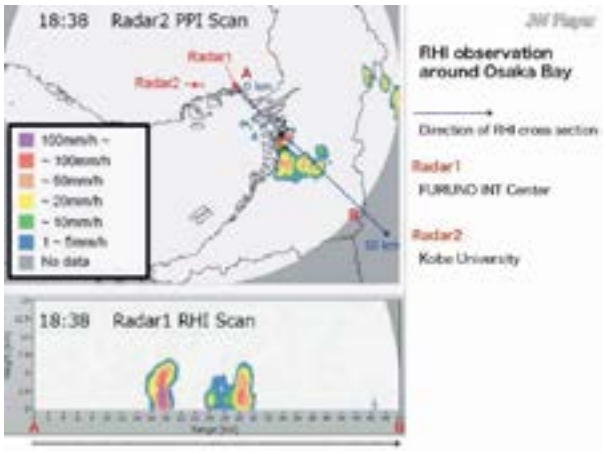
(July 6, 2013, 19:03 to 19:05)

On CAPPI observation, horizontal cross-section scans of a cumulonimbus are conducted at the equal altitudes. The altitude of a developed cumulonimbus top may exceed 10 km. Precipitation can be observed at higher altitude in a greatly developed cumulonimbus.

RHI (Range Height Indicator) observation

by the WR-2100

Vertical cross-section scan on a cumulonimbus is conducted, suitable for observing the development of a cumulonimbus.



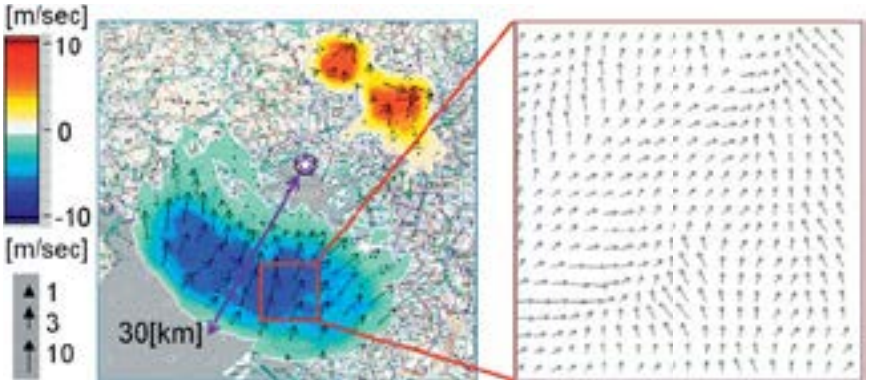
(August 6, 2013, 18:30 to 18:59)

On RHI observation, vertical cross-section scans of a cumulonimbus are conducted, hence easily grasping development status of a cumulonimbus. This case example clearly shows the active up-and-down movement of nimbus.

Doppler velocity observation

by the WR-2100 and the WR-50

Suitable for monitoring nimbus movement velocity and wind field.



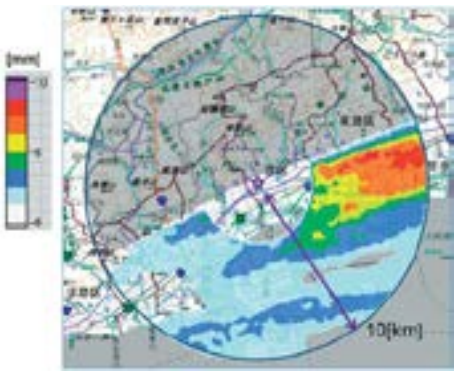
(December 6, 2013, 10:00) Detailed nimbus movement and velocity

On Doppler observation, by monitoring Doppler velocity of the nimbus, moving velocity of the nimbus, namely, wind speed and direction, can be computed. In this example, warm colors indicate the winds that move away from the Radar antenna, while cold colours indicate the winds that move towards the Radar antenna. The arrow lengths and direction indicate the wind speed and direction, respectively.

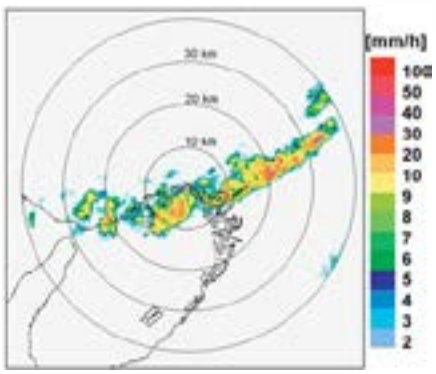
PPI (Plan Position Indicator) observation

by the WR-2100 and the WR-50

Monitoring is to be conducted at a fixated elevation angle, suitable for rainfall amount on the ground and low-level wind shear observation.



(Rainfall amount observation / June 26, 2013, 14:00 to 15:00)



(Precipitation intensity observation / November 13, 2012, 17:26)

The antenna is rotated while fixing its elevation angle. PPI observation at low elevation angle generates rainfall amount on the ground. Also, when the rainfall amount data is accumulated for the duration of 1 hour, accumulated rainfall amount for 1 hour can be calculated. Also, by analysing the Doppler velocity obtained by PPI observation at low elevation angle, low-level wind shear can be obtained.

*The map data used in this page has been provided through Digital Japan Web System of Geospatial Information Authority of Japan.

Classified as one of the smallest and lightest Weather Radar available in the market*

FURUNO, which has earned the leading market share in marine Radar, provides Dual Polarimetric X-band Doppler Weather Radar WR-2100 and Doppler Weather Radar WR-50.

With ultra high definition spatiotemporal resolution capability, the WR-2100 Dual Polarimetric Doppler Weather Radar grasps omni-directional precipitation intensity in 50-metre-mesh in six-second-intervals. By conducting high spatiotemporal resolution monitoring of the development process, three-dimensional structure as well as movement of a cumulonimbus, which causes precipitation, the development of short localised rainstorms can be predicted. Moreover, the WR-2100 has been downsized during the development phase to the extent that can be classified as one of the smallest and lightest Dual Polarimetric Doppler Weather Radar available in the market.

Combining the two types of Weather Radar, FURUNO delivers “Multi-Radar System” capable of conducting real-time 3D monitoring of meteorological phenomena at a modest investment.

* as of June 2013 (Dual Polarimetric Doppler Weather Radar)

Compact Dual Polarimetric X-band Doppler Weather Radar

Model: WR-2100

Compact X-band Doppler Weather Radar

Model: WR-50

Compact Dual Polarimetric X-band Doppler Weather Radar WR-2100

With ultra high definition spatiotemporal resolution capability, the WR-2100 Dual Polarimetric Doppler Weather Radar grasps omni-directional precipitation intensity in 50-metre-mesh in six-second-intervals. Also, the WR-2100 monitors the development process, three-dimensional structure as well as movement of a cumulonimbus, which causes rainstorms in order to predict their development. Moreover, the WR-2100 has been downsized during its development phase to the extent that can be classified as one of the smallest and lightest Dual Polarimetric Doppler Weather Radar available in the market.

Compact X-band Doppler Weather Radar WR-50

The WR-50 detects the nimbus and tracks its movement. Its compact unit facilitates ease of installation.

When combined with Dual Polarimetric X-band Doppler Weather Radar, “Multi-Radar System” can be constructed at modest cost, which enables comprehensive, real-time meteorological monitoring.

Compact Dual Polarimetric X-band Doppler Weather Radar **WR-2100**

- **Classified as one of the smallest and lightest Dual Polarimetric Doppler Weather Radar available in the market (Radome diameter: 108 cm, Radome weight: 65 kg)**
- **High-precision, real-time monitoring of precipitation intensity (mm/h)**
- **Outputs moving velocity of nimbus**
- **Outputs dual polarimetric Doppler information (Zdr, Kdp) for computing diameter of precipitation particles as well as discriminating types of precipitation (rain, snow, etc.)**
- **3D scan to observe the vertical structure of a cumulonimbus**
- **Suitable for localised meteorological monitoring as well as for monitoring of short localised rainstorm, when networked into "Multi-Radar System"**

Compact and light weight!

The antenna unit can be tucked in a minivand to the monitoring location.

Compact X-band Doppler Weather Radar **WR-50**

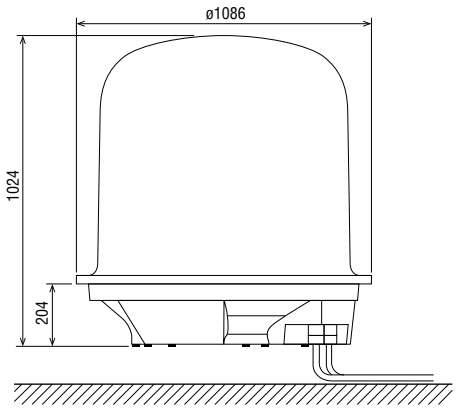
- **Compact, light-weight Radome antenna (Radome diameter: 60 cm, Radome weight: 28 kg)**
- **Outputs movement velocity of nimbus and detects horizontal movement of nimbus at a fast rate**
- **Straightforward interface with power supply cable and LAN cable for data communications**

SPECIFICATIONS

Model Name	WR-2100	WR-50
Antenna Polarity	Dual polarimetric (Vertical and Horizontal), simultaneously transmitted/received	Horizontal
Operating Frequency	9 GHz band	9GHz band
Beam Width	2.7 degrees (both horizontal and vertical beams)	5.0 degrees
Peak Output Power	100 W (both horizontal and vertical beams)	50 W
Vertical Scan Angle	-2 to 90 degrees (adjustable)	-2 to 90 degrees (adjustable)
Antenna Rotation Speed	16 rpm max. (adjustable)	16 rpm max. (adjustable)
Maximum Range	Approx. 30 km	Approx. 30 km
Scan Modes	PPI, CAPPI, RHI (Sector Scan available)	PPI, CAPPI
Data Processing Unit	Externally arranged	Incorporated
Output Data	Reflectivity factor Zh (dBZ), Doppler velocity V (m/s), Doppler velocity width W (m/s), Cross polarization difference phase φdp (deg), Specific differential phase KDP (deg/km), Correlation coefficient between two polarizations ρHV, Differential reflectivity factor ZDR, Rainfall intensity R (mm/h)	Reflectivity factor Zh (dBZ), Doppler velocity V (m/s), Rainfall intensity R (mm/h)
Data Correction	Distance attenuation, Rain attenuation, Excessive Doppler velocity, Suppression of signal returns from land, Clutter suppression	Distance attenuation, Rain attenuation, Excessive Doppler velocity, Suppression of signal returns from land, Clutter suppression
Communication Port	-	LAN 100Base-TX×1port
Power Supply	100-240 VAC, Single Phase, 50/60 Hz	100-240 VAC, Single Phase, 50/60 Hz
Power Consumption	650 W max	300 W max

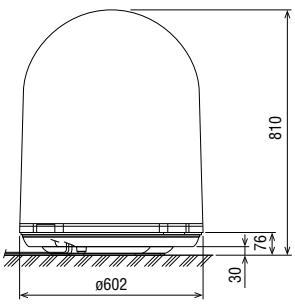
Compact Dual Polarimetric X-band Doppler Weather Radar

WR-2100
65 kg 144 lb



Compact X-band Doppler Weather Radar

WR-50
28 kg 62 lb



FURUNO ELECTRIC CO., LTD.
Nishinomiya, Hyogo, Japan
www.furuno.com

FURUNO U.S.A., INC.
Camas, Washington, U.S.A.
www.furunousa.com

FURUNO (UK) LIMITED
Havant, Hampshire, U.K.
www.furuno.co.uk

FURUNO FRANCE S.A.S.
Bordeaux-Mérignac, France
www.furuno.fr

FURUNO ESPAÑA S.A.
Madrid, Spain
www.furuno.es

FURUNO DANMARK A/S
Hvidovre, Denmark
www.furuno.dk

FURUNO NORGE A/S
Ålesund, Norway
www.furuno.no

FURUNO SVERIGE AB
Västra Frölunda, Sweden
www.furuno.se

FURUNO FINLAND OY
Espoo, Finland
www.furuno.fi

FURUNO POLSKA Sp. Z o.o.
Gdynia, Poland
www.furuno.pl

FURUNO EURUS LLC
St. Petersburg, Russian Federation
www.furuno.com.ru

RICO (PTE) LTD
Singapore
www.rico.com.sg

FURUNO DEUTSCHLAND GmbH
Rellingen, Germany
www.furuno.de

FURUNO HELLAS S.A.
Piraeus, Greece
www.furuno.gr

FURUNO (CYPRUS) LTD
Limassol, Cyprus
www.furuno.com.cy

FURUNO KOREA CO., LTD.
Busan, Korea

13103SK Printed in Japan
Catalogue No. R-203