www.urad.es

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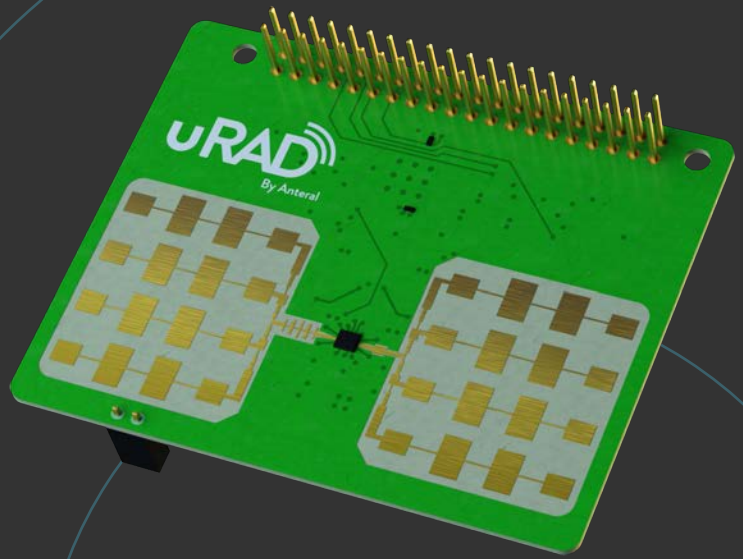

uRAD Raspberry Pi v1.2

24 GHz radar, velocity and 1D positioning

DESCRIPTION

uRAD, in its version uRADRP12, is a tiny shield for Raspberry Pi that transforms your board into a **completely functional microwave radar**. Operating in the **free emission 24 GHz ISM frequency band**, uRAD has four different operation modes that are ease programmed with Python. You will be able to measure distance, velocity and other magnitudes of your surrounding world with great accuracy.

Moreover, uRAD only needs 2 pins of your Raspberry Pi which does not limit your connections and facilitates integration with other sensors creating more complete and complex projects. Connect uRAD and discover the power of radar technology!

APPLICATIONS

uRAD is conceived as an evaluation platform to develop new and **innovative applications** or endowing other common objects with intelligence, supported by the power and versatility of Raspberry Pi.

Thanks to uRAD, you will be able to develop and create applications as:

- DISTANCE SENSOR
- SPEEDOMETER
- VITAL SIGNS
- MOVEMENT & PRESENCE DETECTOR
- VIBRATION SENSOR
- ALTIMETER

and much more!

CE

CERTIFIED
PRODUCT

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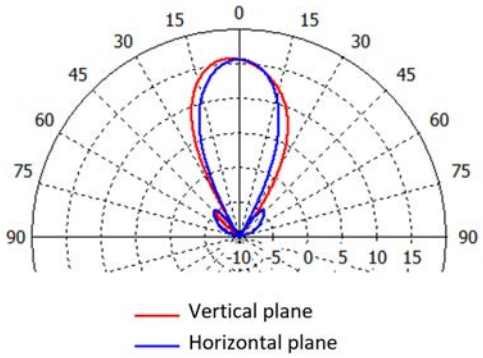
OPERATING CONDITIONS

Parameter	Typical value	Notes
Supply voltage	3.5 - 10 V	5V powered by Raspberry
Supply current	170 mA	
Operating temperature	-20 to +65 ºC	

RF PARAMETERS

Parameter	Typical value	Notes
Frequency bandwidth	24.005 - 24.245 GHz	ISM frequency band
Output power	19 dBm	EIRP (including antenna gain)
Antenna Gain	16.6 dB	4 x 4 array
Field of view	30 x 30 deg	
Side lobe levels	-19.8 to -21.3 dB	

Antenna Radiation Pattern

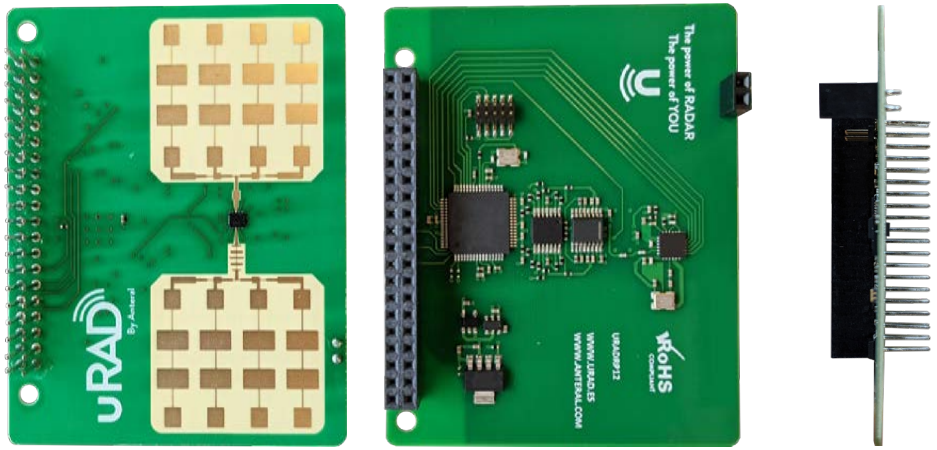


DIMENSIONS

Parameter	Typical value
Dimensions	56 x 70 x 18mm*
Weight	13 gr

** When connected, uRAD adds 10 mm to Raspberry Pi height*

OUTLINE



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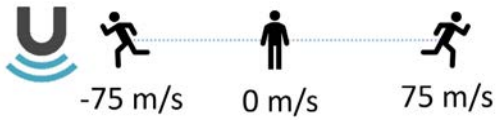
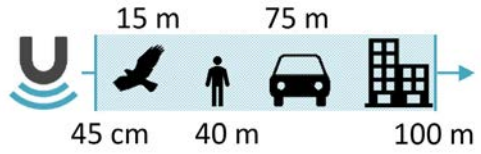
GENERAL

Parameter	
Distance range	0.45 up to 100 m
Velocity range	0 up to ±75 m/s
Distance accuracy	max. ±0.04 m or 0.3%
Velocity accuracy	±0.05 m/s
Update rate	Up to 68 measurements/s (depending on the mode)
Modes of operation	Doppler and Frequency Modulated Continuous Wave*
Number of targets	Up to 5 different targets can be detected
Output data	Distance, Velocity, SNR, Movement detector and RAW data*
Compatible with	All Raspberry Pi boards with the 40-pins male connector
Pins used	Pin 2, 4 (5V): power supply Pins GND: ground Pin 11 (GPIO17): pin ON/OFF Pin 13 (GPIO27): pin CS for SPI communication
Communication	SPI via pin 21 (GPIO9-miso) 19 (GPIO10-miso) 23 (GPIO11-sclk)

** Further information available in the White Paper and the User Manual*





PERFORMANCE CHARACTERISTICS

Mode	1	2	3	4
Name	CW	Sawtooth	Triangular	Dual Rate
Waveform				
Measured parametes	Velocity	Distance	Velocity & Distance	Velocity & Distance
Movement detector	Yes	Yes	Yes	Yes
Distance range (m)	0.45 to 60	0.45 to 100	0.45 to 100	0.45 to 75
Distance accuracy (m)	-	max. ±0.04 m or ±0.3%	max. ±0.04 m or ±0.3%	max. ±0.04 m or ±0.3%
Distance resolution* (m)	-	1.5	Different velocity or 1.5	Different velocity or 1.5
Velocity range (m/s)	±0.7 to ±75	-	±0.2 to ±75	±0.2 to ±75
Velocity accuracy (m/s)	±0.05	-	±0.25	±0.25
Velocity resolution (m/s)	3	-	Different distance or 3	Different distance or 3
Update rate max. (samples/second)	68	45	28	16

** Distance or velocity resolution indicates de minimum distance or velocity that two targets with similar reflectivity must be separated to be discerned as a single target each one.*

OTHER

uRAD offers ad-hoc designs with different antenna patterns and making use of powerful microcontrollers or digital signal processors to comply with more demanding applications covering this way all the client/user requirements.

Contact us at **contact@urad.es** if you want to know more about these additional services.

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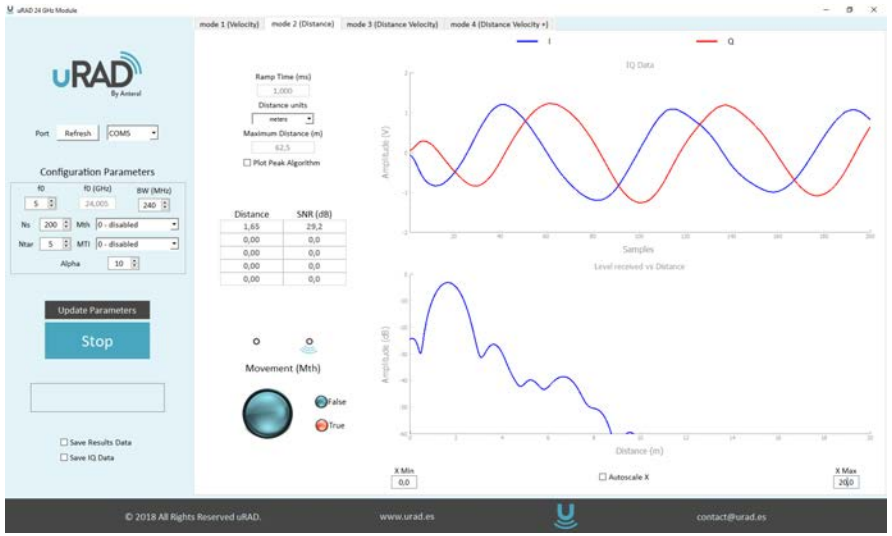
LIBRARIES AND GRAPHICAL USER INTERFACE

uRAD is controlled and configured in an easy and simple way through Python. Together with the shield, modules and libraries are distributed for the programming environments that facilitate the configuration and the obtaining of results. The user only needs to use two simple functions to configure and get the results. Example of use are also delivered. From these libraries and their functions, the user can create their own more complex applications.

In addition, uRAD comes with a graphical interface that allows the user to visualize in real time, not only the results of velocity, distance, movement and SNR, but also the total signal received in phase and quadrature and its frequency spectrum.

The graphical user interface also allows saving results and IQ signals (IF signals) in real time in order to process the results later.



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