

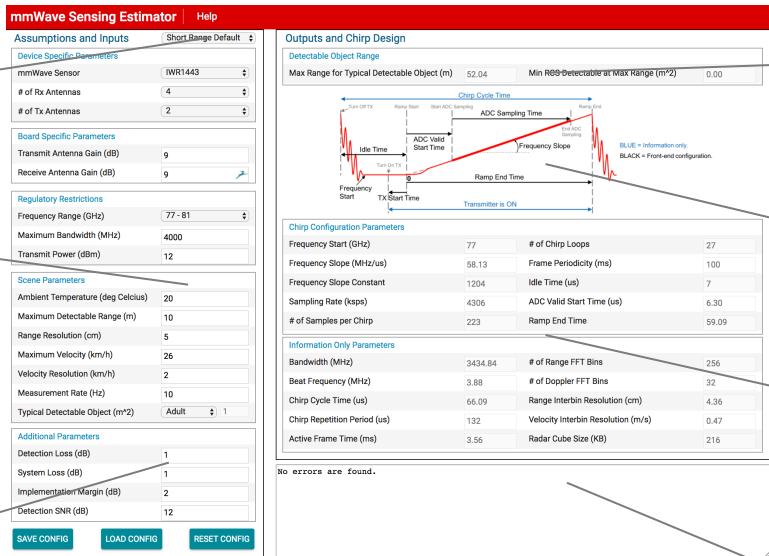
# mmWave Studio – Sensing Estimator

Prototype chirp designs rapidly with real-time feedback!

Load sensible default values to quickly start from a valid configuration.

Input system level parameters about the scene the sensor needs to detect. Experiment with different parameters to design the perfect chirp.

Enables saving and reloading of the work for future adjustment.



Estimates maximum range for different size objects

Visualize the chirp configuration parameters as they affect the chirp.

Calculates the chirp parameters instantly on input changes.

Detects out of bounds inputs and provides tips on how to get back into bounds.

<https://dev.ti.com/mmWaveSensingEstimator>

# Getting Started – Step #1

Select the default values to start with:

- Option #1: Short Range Default
  - Designed to reflect the out of box demo for proximity in short range with high resolution
- Option #2: Long Range Default
  - Designed to detect vehicle at long range

mmWave Sensing Estimator | Help

**Assumptions and Inputs**

Short Range Default ▼

**Device Specific Parameters**

mmWave Sensor: xWR1443 ▼

# of Rx Antennas: 4 ▼

# of Tx Antennas: 2 ▼

**Board Specific Parameters**

Transmit Antenna Gain (dB): 8

**Output**

Detection

Max

Chirp

Valid

Range

Range

# Getting Started – Step #2

1. Select the device family and number of active Tx and Rx antennas.

2. Input the transmission gain of the antenna on your PCB. TI EVMs are 8dB for both.

3. Input regulatory restrictions based on where the sensor will deploy.

## Assumptions and Inputs

Short Range Default

### Device Specific Parameters

mmWave Sensor xWR1443

# of Rx Antennas 4

# of Tx Antennas 2

### Board Specific Parameters

Transmit Antenna Gain (dB) 8

Receive Antenna Gain (dB) 8

### Regulatory Restrictions

Frequency Range (GHz) 77 - 81

Maximum Bandwidth (MHz) 4000

Transmit Power (dBm) 12

# Getting Started – Step #3

1. Input the desired maximum parameters of your scene.
2. Input additional parameters to build in engineering margin into the design. Defaults are a good start for most applications
3. Optional: Save the current configuration or load an existing one from the PC.

Transmit Power (dBm)	12
----------------------	----

Scene Parameters	
Ambient Temperature (deg Celcius)	20
Maximum Detectable Range (m)	70
Range Resolution (cm)	45
Maximum Velocity (km/h)	65
Velocity Resolution (km/h)	2
Measurement Rate (Hz)	25
Typical Detectable Object (m^2)	Car ▾ 5

Additional Parameters	
Detection Loss (dB)	2
System Loss (dB)	1
Implementation Margin (dB)	2
Detection SNR (dB)	12

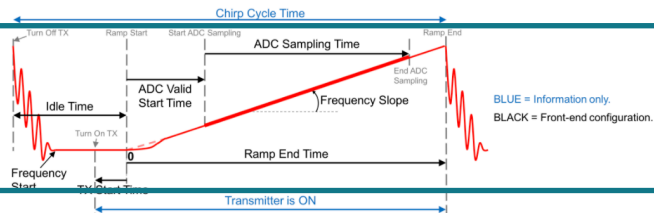
SAVE CONFIG

LOAD CONFIG

RESET CONFIG

# Getting Started – Results

Detectable Object Range			
Max Range for Typical Detectable Object (m)	52.04	Min RCS Detectable at Max Range (m <sup>2</sup> )	0.00



Calculated maximum detectable range for the selected typical object size.

Calculated minimum object size at the inputted maximum detectable range.

Chirp Configuration Parameters			
Frequency Start (GHz)	77	# of Chirp Loops	27
Frequency Slope (MHz/us)	58.13	Frame Periodicity (ms)	100
Frequency Slope Constant	1204	Idle Time (us)	7
Sampling Rate (ksps)	4306	ADC Valid Start Time (us)	6.30
# of Samples per Chirp	223	Ramp End Time	59.09

Information Only Parameters			
Bandwidth (MHz)	3434.84	# of Range FFT Bins	256
Beat Frequency (MHz)	3.88	# of Doppler FFT Bins	32
Chirp Cycle Time (us)	66.09	Range Interbin Resolution (cm)	4.36
Chirp Repetition Period (us)	132	Velocity Interbin Resolution (m/s)	0.47
Active Frame Time (ms)	3.56	Radar Cube Size (KB)	216

Calculated chirp cpmfog parameters for the analog front-end. For explanation of each please see the User Guide:

mmWave Sensing Estimator | Help

Assumptions and Inputs

Device Specific Parameters

mmWave Sensor

# of Rx Antennas

# of Tx Antennas 1

View README.md

About

User Guide

# Getting Started – Errors & Tips

The screenshot displays a radar configuration interface with several sections. The 'Scene Parameters' section on the left includes fields for Ambient Temperature (20), Maximum Detectable Range (10), Range Resolution (1), Maximum Velocity (26), Velocity Resolution (2), Measurement Rate (10), and Typical Detectable Object (m²) (Adult, 1). Below this is the 'Additional Parameters' section with System Loss (1), Implementation Margin (2), and Detection SNR (12). At the bottom are buttons for 'SAVE CONFIG', 'LOAD CONFIG', and 'RESET CONFIG'. The main configuration area on the right is divided into two tables. The first table, 'Frequency Slope Constant', lists parameters like Sampling Rate (23596), # of Samples per Chirp (1112), Idle Time (7), ADC Valid Start Time (5.40), and Ramp End Time (53.53). The second table, 'Information Only Parameters', lists parameters like Bandwidth (17050.72), # of Range FFT Bins (2048), Beat Frequency (21.24), # of Doppler FFT Bins (32), Chirp Cycle Time (60.53), Range Interbin Resolution (0.54), Chirp Repetition Period (121), Velocity Interbin Resolution (0.50), Active Frame Time (3.51), and Radar Cube Size (1656). At the bottom, a scrollable area contains three error messages: Error 1 (Radar cube size too large), Error 2 (Frequency slope too high), and Error 3 (Sampling frequency too high). Red boxes highlight the values 23596, 17050.72, 21.24, and 1656, which correspond to the errors.

Scene Parameters	
Ambient Temperature (deg Celsius)	20
Maximum Detectable Range (m)	10
Range Resolution (cm)	1
Maximum Velocity (km/h)	26
Velocity Resolution (km/h)	2
Measurement Rate (Hz)	10
Typical Detectable Object (m²)	Adult 1

Additional Parameters	
System Loss (dB)	1
Implementation Margin (dB)	2
Detection SNR (dB)	12

Frequency Slope Constant	
Frequency Slope Constant	6598
Sampling Rate (kpps)	23596
# of Samples per Chirp	1112
Idle Time (us)	7
ADC Valid Start Time (us)	5.40
Ramp End Time	53.53

Information Only Parameters	
Bandwidth (MHz)	17050.72
# of Range FFT Bins	2048
Beat Frequency (MHz)	21.24
# of Doppler FFT Bins	32
Chirp Cycle Time (us)	60.53
Range Interbin Resolution (cm)	0.54
Chirp Repetition Period (us)	121
Velocity Interbin Resolution (m/s)	0.50
Active Frame Time (ms)	3.51
Radar Cube Size (KB)	1656

Error 1: The radar cube size is larger than the available memory on the device  
Tips: Increase the "Range Resolution"/"Velocity Resolution", decrease the "Maximum Range"/"Maximum Velocity", and/or reduce the "# of Rx Antennas"/"# of Tx Antennas"

Error 2: Frequency slope of this chirp design is too high (>100MHz/us)  
Tips: Increase the "Range Resolution" and/or decrease the "Maximum Velocity"

Error 3: Sampling frequency is higher than the maximum sampling frequency (>18.75 Mpps)  
Tips: Decrease the "Maximum Velocity", decrease the "Maximum Detectable Range", and/or increase the "Range Resolution"

Out of bounds values are highlighted to enable rapid prototyping.

Detected errors are explained and helpful tips to correct the errors are provided.