

ARTS 9510(Automotive Radar Target Simulators)



ROHDE & SCHWARZ

Euro NCAP requirements for the 76 Ghz



“Additional points are awarded for cars equipped with a Blind Spot Monitoring system”

⌚ Introduced in 2014. Updated in 2016.

“Euro NCAP evaluates the automatic brake function and the forward collision warning function in three different driving scenarios”

⌚ Introduced in 2014



Automotive Technology Overview

ADAS

Advanced Driver Assistance Systems

Sensor Fusion

The integration of various sensors for data collection with ADAS.

Connected Drive

Integration of assistant services into the automotive environment.

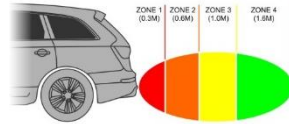


Source: Continental

ADAS Technology Overview

For short range detection, ultrasonic sensors could be used (e.g. parking distance).

- + cheap
- small range



Source: parksave.com.au

For long range detection, Lidar sensors could be used.

- + High range
- Sensitive to day / night



Source: Continental

A complete view of the environment can be achieved using cameras.

- + Resolution
- Expensive (cost + calculation)



Source: Mercedes-Benz

Radars can be used for long- and short range views. Insensitive to light changes.

- + Range
- Data Processing

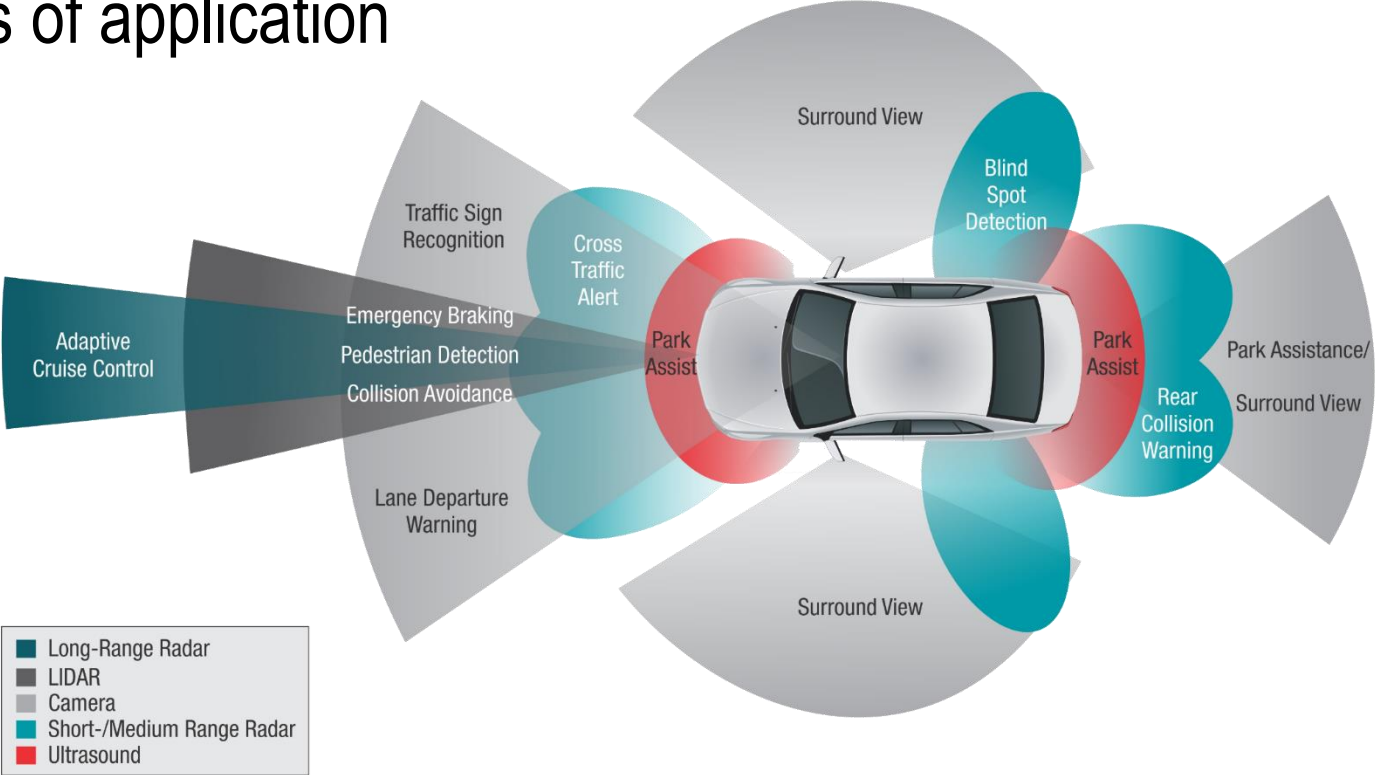


Source: Continental



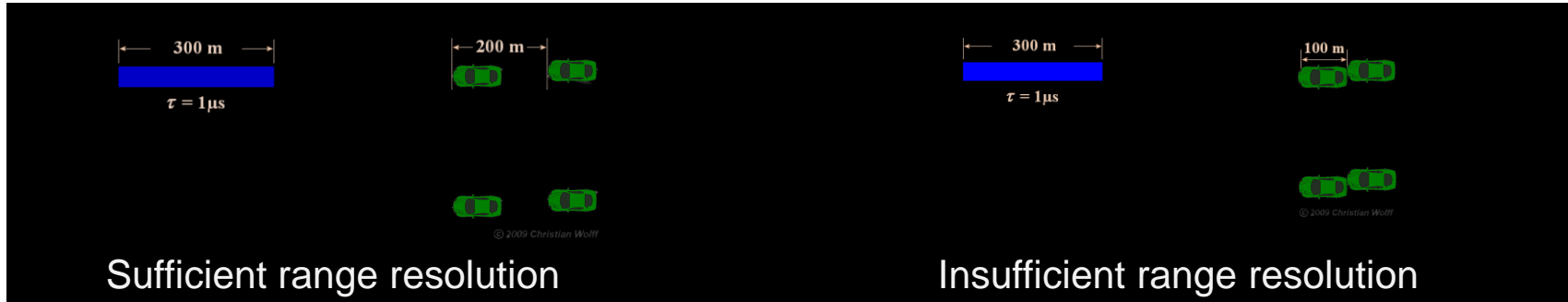
Automotive Radar

Fields of application



Radar Measurement

Range Resolution



Source: radartutorial.eu

Pulsed

$$\Delta R = \frac{c_0 \cdot \tau}{2}$$

FMCW

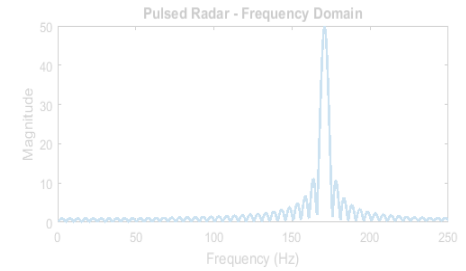
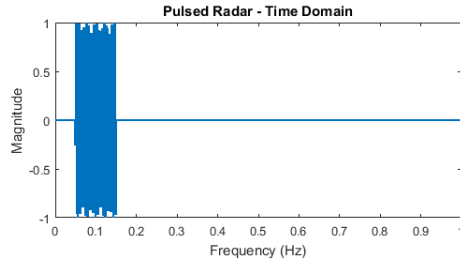
$$\Delta R = \frac{c_0}{2B}$$

Bandwidth

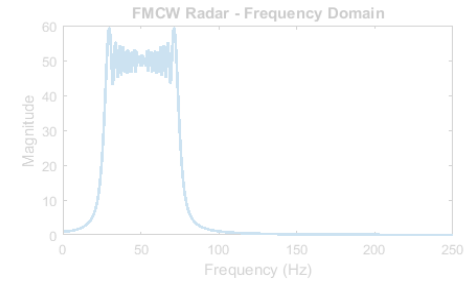
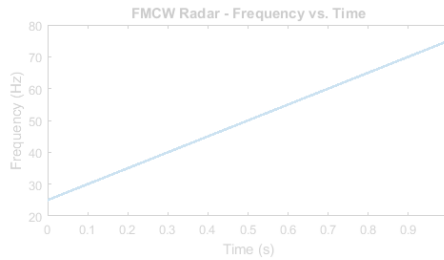
Common Types of Radar Usage



Pulsed Radar

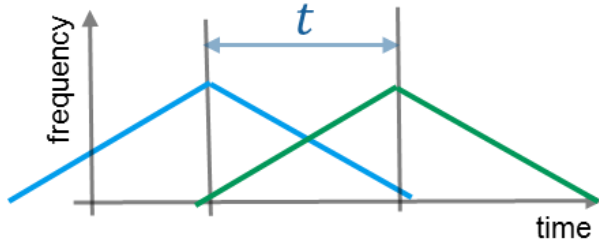


FMCW Radar

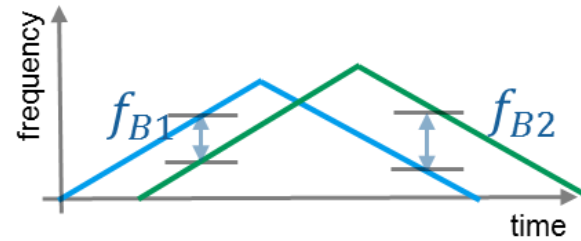


FMCW Radar Measurement

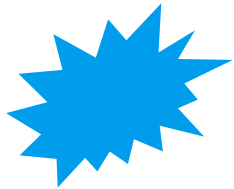
Range



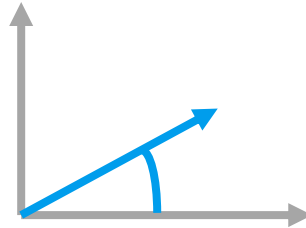
Speed + Range



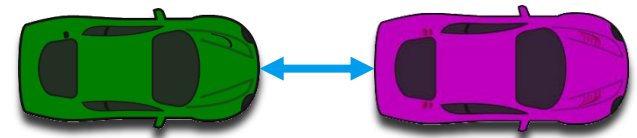
Radar Cross Section



Angle of Arrival



Range Resolution



ARTS 9510 – Automotive Radar Test Simulator



- Operating at 24 and 76 GHz automotive radar bands.*
- Up to 1000 MHz bandwidth
- 2017.4Q 4000 MHz bandwidth support
- Delay Range: 9m – 2400m
step size: 6cm
- Speed Range: 0km/h – 700km/h
step size: < 4mm/s

*) Other frequencies on request.



ARTS 9510 – Automotive Radar Test Simulator



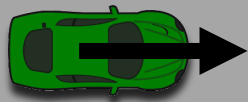
START



ENGINE

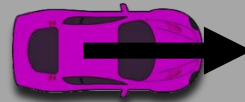


Scenario 1: same speed



Our car
Speed: 80 km/h

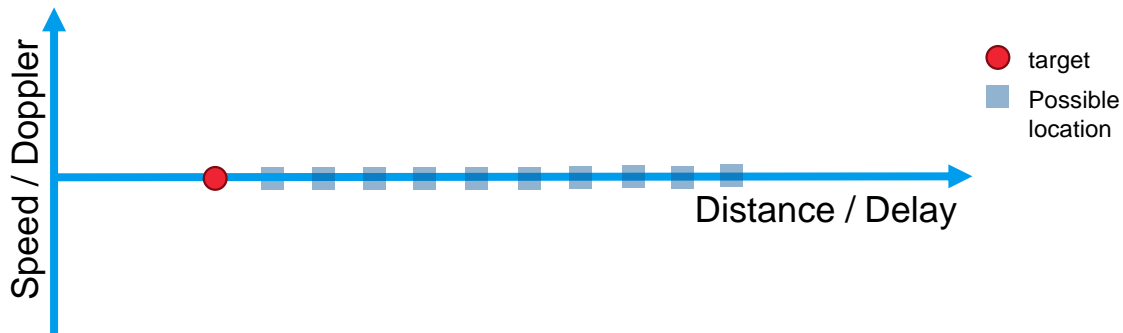
Both targets
have the same
speed



Target 1
Speed: 80 km/h
Distance: 100 m



No Doppler
offset



Scenario II: two targets but different speeds

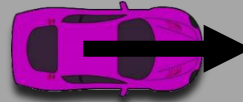
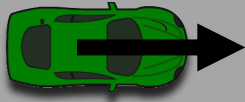
Target 2
Speed:
Distance:

180 km/h
increasing



Doppler
Delay

negative Doppler
Increasing delay

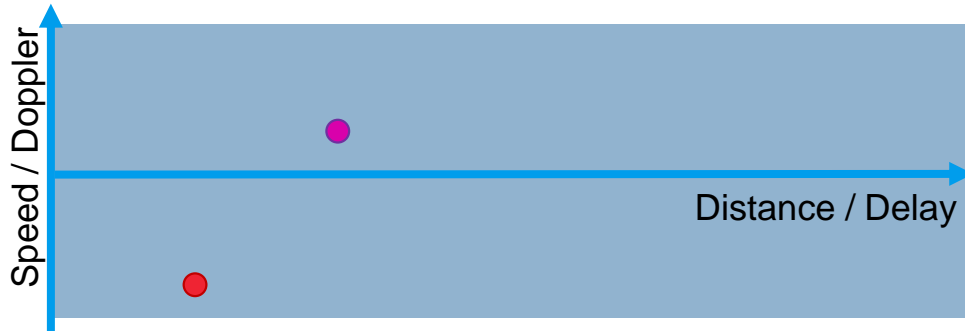


Our car
Speed: 80 km/h

Target 1
Speed: 75 km/h
Distance: decreasing

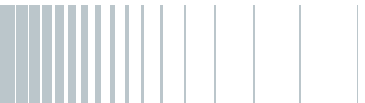


Positive Doppler
Decreasing delay



● target 1
● target 2

■ Possible location



Radar Target Generation

RF Frequency Control

RF Freq (GHz)

Gain Control

RX IF Attenuation (dB)

TX IF Attenuation (dB)

ADC Saturation Detect Backoff

Backoff from Full Scale (dB)

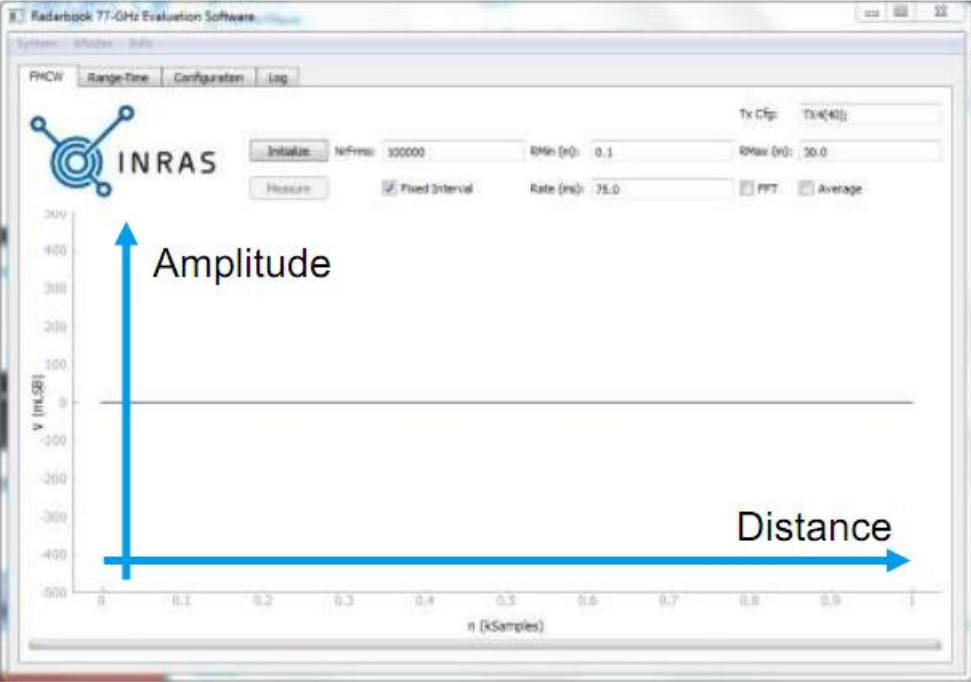
Dynamic Target Generation

Doppler Bypass

RADAR Frequency (GHz) Waveform File

	Target 1	Target 2	Target 3	Target 4	
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Start Speed (km/hr)	<input type="text" value="115.00"/>	<input type="text" value="4.5"/>	<input type="text" value="-60.00"/>	<input type="text" value="10.00"/>	<input type="button" value="Browse"/>
Stop Speed (km/hr)	<input type="text" value="140.00"/>	<input type="text" value="4.5"/>	<input type="text" value="0.00"/>	<input type="text" value="10.00"/>	<input type="button" value="Retrieve File"/>
Start Position (m)	<input type="text" value="39.00"/>	<input type="text" value="40.00"/>	<input type="text" value="180.00"/>	<input type="text" value="100.00"/>	<input type="button" value="Create File"/>
Stop Position (m)	<input type="text" value="500.00"/>	<input type="text" value="65.00"/>	<input type="text" value="90.00"/>	<input type="text" value="250.00"/>	
Digital Atten (dB)	<input type="text" value="2.8"/>	<input type="text" value="15.0"/>	<input type="text" value="7.3"/>	<input type="text" value="27.0"/>	<input checked="" type="checkbox"/> R^4 Atten

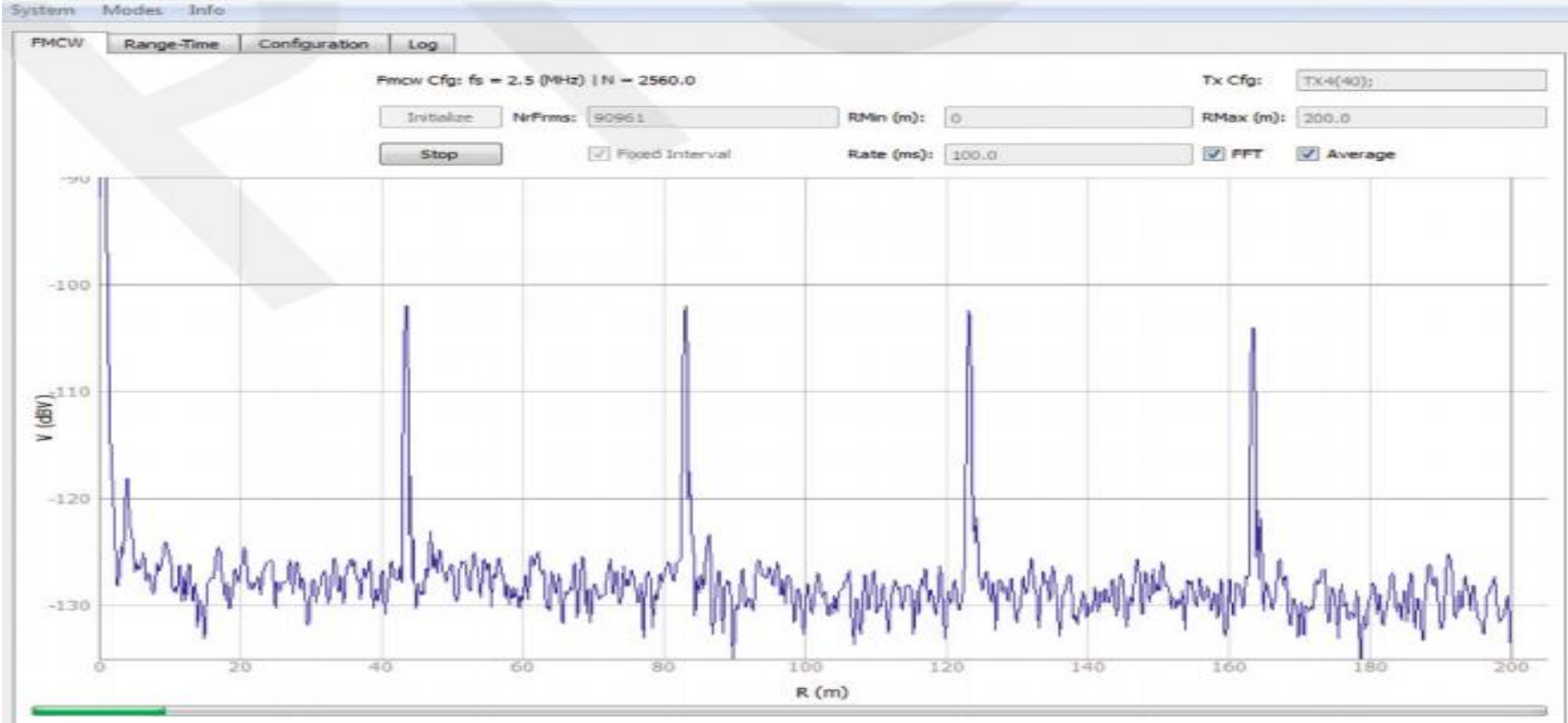
Radar Target Generation



ARTS



Radar Target Generation



ARTS Reference Customers



BOSCH

DELPHI

Innovation for the Real World

FUJITSU TEN

NXP



ARTS-Series ITS-9510A
77 GHz / 24 GHz Target Simulator
A New Instrument Standard
The picture shows the benchtop Version With MMI



TOYOTA

Continental 

DENSO

dSPACE



ROHDE & SCHWARZ



Specifications in brief

Specifications for the different models of the automotive radar test system			
Type	ARTS9510A*)		ARTS9510C
Supplier code	ITS-9510A		ITS-9510C
Electrical data			
Frequency range	75 GHz to 82 GHz		75 GHz to 82 GHz
Processing bandwidth	400 MHz		1000 MHz
Independent simulation targets	1, more upon request		1, 2, 3 or 4, more upon request
Delay range	66 m to 2.4 km		approx. 8 m to 3.6 km
Delay increment	60 cm		5.6 cm
Doppler range	± 700 km/h (± 100 kHz)		± 700 km/h (± 100 kHz)
Doppler resolution	< 1 mm/s (0.116 Hz)		< 0.2 mm/s (for custom waveform)
RCS dynamic range	> 90 dB		> 90 dB
TX/RX isolation mono-/bi-static	min. 25/50 dB		min. 30/50 dB
Maximum input power	0 dBm		0 dBm
Level at TX/RX IF ports	-20/-20 dBc		-20/-15 dBc
External reference	10 MHz		10 MHz



ARTS – Automotive Radar Test Simulator

Customer benefits



ARTS-Series ITS-9510A
77 GHz / 24 GHz Target Simulator
A New Instrument Standard
The picture shows the benchtop Version With MMI

- Minimize time-to-market
- Increase product quality
- Minimize downtimes
- Lower ramp-up costs
- Minimize lifecycle costs
- Simplify maintenance
- Automating test processes



Many thanks



**for
your interest!**

