Escola d'Enginyeria de Telecomunicació i Aeroespacial de Castelldefels
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Lab Report
RADIOLOCALIZATION

PULSED RADAR

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1.1. Design a MATLAB function allowing to plot a pulse burst modulating a RF carrier arriving to a radar (assume 50 ohms impedance). Function inputs and outputs are provided in the following table:

Inputs	Pulsewidth [s]
	Pulse repetition interval (PRI) [s]
	Carrier frequency [Hz]
	Transmitted pulse peak power [dBW]
	Signal losses [dB]
	Number of pulses to plot
	Sampling frequency [Hz]
	Distance to target [m]
Outputs	Minimum usable range (blind range) [m]
	Unambiguous range [m]
	Pulse repetition frequency (PRF)
	Range resolution [m]
	Duty cycle [%]
	Mean received power [dBm]
	Pulse energy [J]
	Vector having the pulse voltage burst samples [V]
	Vector having the time tags corresponding to the pulse burst samples [s]

1.2. Using the previously designed function make a plot of the pulse burst modulating the RF carrier. Consider the following (academic) parameters:

Pulsewidth:	1 µs
Pulse repetition interval (PRI):	5 µs
Carrier frequency:	5 MHz
Transmitted pulse peak power:	1 MW
Signal losses:	70 dB
Number of pulses to plot:	5
Sampling frequency:	100 MHz
Distance to target:	0 m

1.3. Make a plot of the signals reflected by two targets: Target_1 is at 450 m from the radar and Target_2 is at 1 NM. Signal from Target_1 is attenuated 3dB and signal from Target_2 is attenuated 6 dB, both with respect to the transmitted signal. Also answer next questions:

- Is it possible to correctly find the range of both targets?
- In case that this won't be possible, suggest a solution to find the range without ambiguity.

1.4. Using MATLAB functions ***fft*** and ***fftshift*** find the frequency spectrum of the signal of exercice 1.2.

- First find the spectrum of a (unmodulated) single pulse.
- Next find the spectrum of the unmodulated pulse burst.
- Finally find the spectrum of the modulated pulse burst.
- Justify the resulting spectra (position of spectral lines, envelope shape and zeroes,…).

SUGGESTIONs:
Additionally to MATLAB functions, it is suggested that you write a script solving the questions corresponding to each lab session.