



SUBJECT

Beam Signals Lab.

NAME

DATE

REVISION DATE

Purpose

Understand concepts of AM and FM modulation

Equipment

Spectrum Analyzer (SA)

Waveform Generator (WG)

Procedure

1.) Set WG to

Sine Wave

Freq = 1 MHz

Amp = 50mV_{pp}

AM modulation on

Modulation freq = 1 Hz

Modulation Depth = 50%

2) Sketch a display of the scope.

3) Set the SA to

1 MHz = Center freq

0 MHz = Span

10 sec = Sweeptime

Scale = Linear.

Sketch the display on the SA



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4) Change modulation depth on WG to 100%
Sketch the display on the SA
Set mod. frequency to 2 Hz
Sketch the display on the SA

5) a) On the WG

Set mod freq to 1 kHz

Set mod depth to 25%

b) On the SA

Set span to 10 kHz

Set sweep time to auto

Set scale to log.

c) Record:

Number of sidebands

The frequency spacing of the sidebands

The amplitude of the sidebands
with respect to the carrier.

d) Change the modulation depth to 50%
and repeat 5c.

Change the modulation depth to 100%
and repeat 5c.



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5e.) Set the AM modulation depth to 50%
on the WG

Set the modulation frequency to 100 Hz

1 kHz

10 kHz

and repeat 5c. (You may have to change
the frequency span on the SA as you
change the modulation frequency.)

6) a) Turn the AM modulation off on the WG.

Turn on the FM modulation on the WG.

b) Set the modulation frequency to 1 kHz

Set the modulation depth to 100 Hz

1 kHz

10 kHz

Repeat 5c. (Do only the first 4 sidebands)

c) Set the modulation depth to 1 kHz

Set the modulation freq. to 100 Hz

1 kHz

10 kHz

Repeat 5c. (Do only the first 4 sidebands)



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7) Turn off FM modulation on the WG

Set the WG waveform shape to the Sinc function (under the Arb menu)

Set the frequency on the WG to 200 kHz

Sketch the waveform on the scope.

What is the width of the pulse?

What is the spacing between pulses?

Connect signal to SA.

Set SA start freq to 0 Hz

Set SA stop freq to 10 MHz

Set SA scale to linear

Sketch Spectrum

Zoom in on spectral line.

What is the spacing between lines.

Set the frequency on the WG to 100 kHz

Sketch the waveform on the scope

What is the width of the pulse.

What is the spacing between pulses.

Connect signal to the SA

Sketch the spectrum.

Zoom in on a spectral line.

What is the spacing between lines.



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8) Turn on AM modulation on WG.
Set AM Depth to 10%
Set AM freq to 30 kHz.
Sketch Freq Spectrum.

9) Turn off AM modulation on WG.
Set the Frequency to 200 kHz on WG
(still use the Sinc function)
Set the Burst Count to 10.
Set the Burst Rate to 20 kHz.
Sketch Display on scope
Sketch Spectrum.

Bessel Functions

