



SUBJECT

Measuring AM modulation with a VSA

NAME

McGinnis

DATE

1-11-02

REVISION DATE

Purpose

Use the Vector Signal Analyzer to measure properties of AM modulation.

Equipment

Vector Signal Analyzer (VSA)
Waveform Generator (WG)
Oscilloscope (Scope)

Procedure

1.) Set the WG to:

Sine Wave carrier
Carrier Freq 1 MHz
Amplitude 50mV_p
AM modulation
Modulation Freq 1 kHz
Modulation Depth 50%
Modulation Type Sine Wave

2.) Sketch the display on the Scope

3.) Setup the VSA in spectrum mode

- a) preset the VSA
- b) Instrument Mode: Vector
- c) Center Freq 1 MHz
- d) Span 20 KHz
- e) Resolution Bandwidth Ratio: Arbitrary
- f) Ch 1 input 50 Ω AC
- g) Adjust Ch 1 range



SUBJECT

Measuring AM modulation with a VSA

NAME

McGinnis

DATE

1-11-02

REVISION DATE

- 4) Sketch the display on the VSA
Explain the spectrum
- 5) De-modulate the signal with the VSA
 - a) Set the Instrument Mode to Analog Demodulation
 - b) Set the Demodulation type to AM
 - c) Set the Display to 2 grids
 - d) Set the Measure Data for Window A to Ch. 1 spectrum
 - e) Set the Measure Data for Window B to Ch. 1 Main Time
 - f) Adjust the vertical scales on both windows.
 - g) Pause the measurement.
 - h) Sketch the result of Window A
What are the X & Y units of the trace
What do these units mean?
 - i) Sketch the result of Window B
What is the period of the waveform
What is the amplitude of the waveform
- 6.) Adjust Properties of AM signal on WG and repeat steps ② - ⑤ for each of the following.
 - a) AM modulation type = Square Wave
 - b) AM modulation depth = 100%
modulation type = Square Wave
 - c) AM modulation Freq = 2 kHz



SUBJECT

Measuring FM modulation with a VSA

NAME

McGinnis

DATE

1-11-02

REVISION DATE

Purpose

Use the Vector Signal Analyzer to measure properties of FM modulation.

Equipment

Vector Signal Analyzer	VSA
Waveform Generator	WG
Oscilloscope	Scope

Procedure

- 1.) Set the WG to:
 - FM modulation
 - Carrier = 1 MHz Sine Wave 50mV_r
 - Modulation Freq = 1 kHz
 - Modulation Depth = 300 Hz
 - Modulation Type = Sine Wave
- 2.) Setup the VSA in vector spectrum mode
 - a) preset the VSA
 - b) Set the Instrument Mode = Vector
 - c) Center Freq = 1 MHz
 - d) Span = 20 kHz
 - e) Resolution Bandwidth Ratio = Arbitrary
 - f) Ch. 1 Input = 50Ω AC
 - g) Adjust Ch. 1 range
- 3) Sketch the display of the VSA
Explain the spectrum.



SUBJECT

Measuring FM modulation with a VSA

NAME

McGrinnis

DATE

1-11-02

REVISION DATE

- 4.) De-modulate the signal with the VSA
- Set the Instrument Mode to Analog Demodulation
 - Set the Demodulation type to FM
 - Set the Display to 2 grids
 - Set the Measurement Data for Window A to Ch. 4 spectrum.
 - Set the vertical Scale for Window A to linear.
 - Autoscale Window A
 - Set the Measurement Data for Window B to Ch. 1 Main Time
 - Auto scale Window B
 - Pause the Measurement
 - Sketch the result of Window A
What are the X & Y units of the trace
What do these units mean?
 - Sketch the result of Window B.
What is the period of the waveform?
What is the amplitude of the waveform?
- 5.) Adjust the properties of the FM signal on the WG and repeat steps ②-④ for each of the following.
- FM modulation type = Square Wave
 - FM modulation Depth = 600 Hz
 - FM modulation Freq = 2 kHz



SUBJECT

Transient Measurements with the VSA

NAME

McGinnis

DATE

1-11-02

REVISION DATE

Purpose

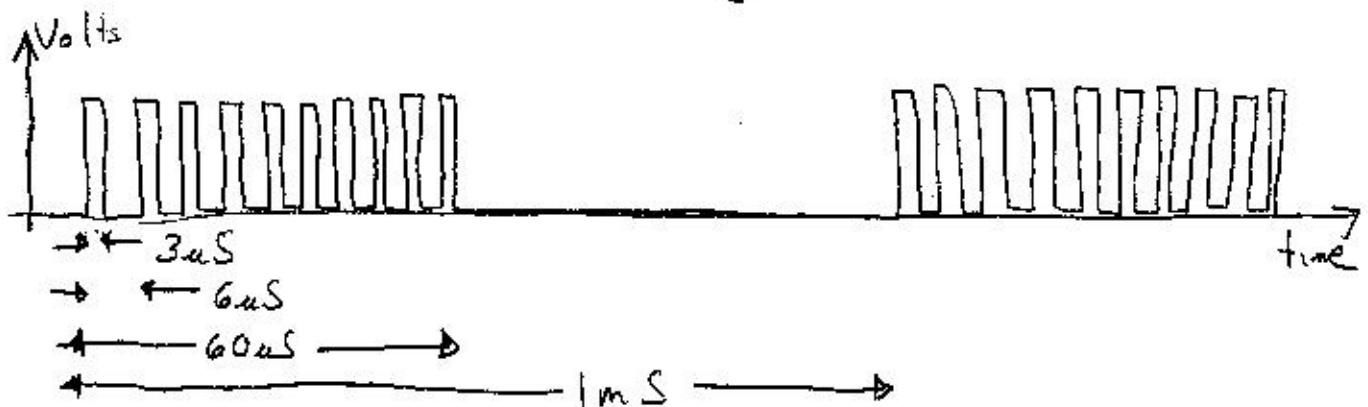
Use the Capture Mode on the Vector Signal Analyzer to examine transient frequency signals

Equipment

Vector Signal Analyzer	VSA
Waveform Generator	WG
Oscilloscope	Scope

Procedure

- 1.) Produce a waveform using the WG that looks like the following



10 pulses / Train
Pulse Width 3µs
Pulse Period 6µs
Train Period 1mS
Amplitude .1V



SUBJECT

Transient Measurements with the USA

NAME

McGinnis

DATE

1-11-02

REVISION DATE

2.) Setup the USA in Capture Mode

- a) Preset the USA
- b) Set Ch. 1 Input to 50Ω -AC
- c) Adjust the Range
- d) Set the Instrument Mode to Capture Buffer
- e) Set the Capture Buffer length to 10 mS
- f) Fill the Capture Buffer
- g) Set the Display to 2 grids
- h) Set the B window Measurement Data to Ch. 1 Spectrum
- i) Set the B window Display type to Spectrograph
- j) Set the Time Overlap to 80%
What does Time Overlap mean?
- k) Press Meas. Restart & view the results
- l) Pause measurement when Spectrograph "jumps"
- m) Explain the spectrum.



SUBJECT

NAME

DATE

REVISION DATE

USA as Network analyzer

Always use USA in vector mode

IF section.

1) Place ~~to~~ BNC ^{→ Preset} T on USA

2) Connect One end of ~~BNC~~ T to
ch 1

3) Set Input Z of ch 1 to 1M Ω
(why?)

4) Connect other end of T to
input of DUT (Filter) ~~connector~~

5) Connect output of DUT to
ch 2

6) Set USA source type to Random
Noise

7) Turn Source on

8) Adjust Range on ch 1 & ch 2

9) ~~to~~ Set Meas Data on ~~ch~~ Window
A to ~~to~~ freq response



SUBJECT

NAME

DATE

REVISION DATE

- 10) Turn Averaging on
- 11) Display 2 grids
Adjust B window mess data to
freq response
& Data Format to phase
- 12) Set Res BW to Arbitrary
- 13) Set Φ x-axis format to log
for both windows
- 14) Sketch Results



SUBJECT

VSA Lab.

NAME

DATE

REVISION DATE

Purpose

Use the vector signal analyzer to look at AM & FM modulation.

Equipment

Vector Signal Analyzer (VSA)
Waveform Generator (WG)
Oscilloscope (O)

Procedure

1). Set WG to

Sine Wave
Freq 1 MHz
Amp 50 mV_p
AM modulation ON
Modulation Freq 1 kHz
Mod Depth 50%
Mod Type Sine Wave

2) Sketch display on Scope

3) Preset VSA

Set VSA

~~1 MHz~~ Inst Mode Vector
IF section
Center Freq 1 MHz
Span 20 kHz
Res BW ARB

3a) Adjust Range on Ch 1
Adjust Input to 50Ω AC



SUBJECT

NAME

DATE

REVISION DATE

4.) Sketch the Display on the USA
Why does it look that way?

5.) SET the USA Inst Mode to Analog
Demodulation

Set the demodulation setup for Channel 1
to AM.

Sketch the result.

What is the units of the spectrum

What does it mean?

6.) Set the display to 2 grids

On ~~the~~ Screen B set the Meas. Data
to Main Time Channel 1.

Pause the Measurement

Sketch the B display.

What is the period of the waveform?

What is the amplitude of the waveform?



SUBJECT

NAME

DATE

REVISION DATE

- 7.) Change the AM modulation type on the ~~WG~~ WG to Square Wave
Repeat Steps 2-6
- 8.) Change the AM modulation depth to 100% on the WG. Keep the Square wave modulation repeat Steps 2-6
- 9.) Change the modulation frequency
Repeat Steps 2-6.
- 10.) Set the WG to
FM modulation
Carrier 1MHz
Mod. Depth 300Hz
Mod. Freq 1 kHz
Sine Wave Modulation.
- 11.) Preset USA
Set USA to
Inst. Mode Vector
IF Section
Center Freq 1MHz
Span 20kHz
Res BW ARB
Adjust Range
Adjust Input to 500AC



SUBJECT

NAME

DATE

REVISION DATE

12) Sketch Display on USA

13) Set the USA Inst Mode to Analog Demod

Set Modulation to FM

Set the Y Scale to linear

Auto scale the display

Sketch the Results

What is the X & Y units of
Spectrum mean?

14.) Set the display to 2 grids.

On Screen B set Mess Data

to Main Time Ch 1

Pause the Measurement

Sketch the B display

What is the period of the waveform?

What is the Amplitude of the waveform?

15). Re-do steps 11-14 for different

Mod. Depth, Mod Freq, Mod waveforms



SUBJECT

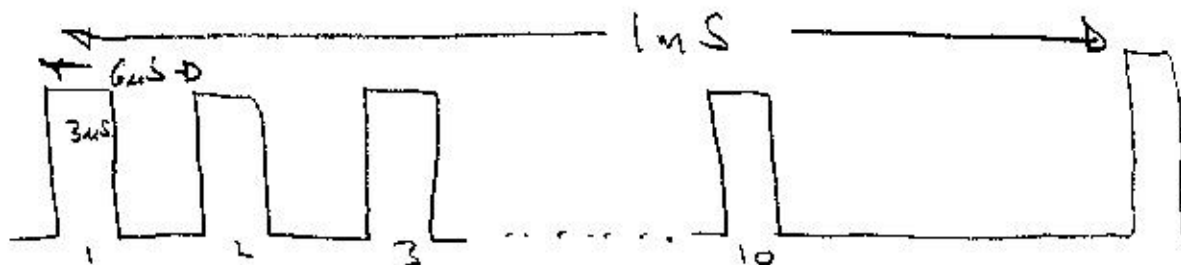
NAME

DATE

REVIS ON DATE

16.) On WG Set to Pulse Wave form
Set Pulse Period $300\mu\text{S}$
Set the Pulse Width to ~~$400\mu\text{S}$~~ $3\mu\text{S}$

17. Set the WG to the following
Wave form



10 pulses

Pulse width $3\mu\text{S}$

Pulse period $6\mu\text{S}$

Burst period 1mS

Amplitude ~~0.2V~~ 0.1V



SUBJECT

NAME

DATE

REVISION DATE

18) Preset the USA

Adjust Range

~~USE~~ USE IF section - Vector

Set Inst Mode to Capt. Bufferer

Set Buffer length to 10 mS

Fill Buffer

Display 2 Grids

Set B window Meas Data to

Ch 1 spectrum

Set B window Display type to spectrograph

Set Time Overlap to 80%

Hit Meas Restart & view results

Set Time Overlap to 20%

Hit Meas Restart to view results

Pause when spectrograph Jumps

