Application Note

Introduction to Digitize Function

MS2690A/MS2691A/MS2692A
Signal Analyzer

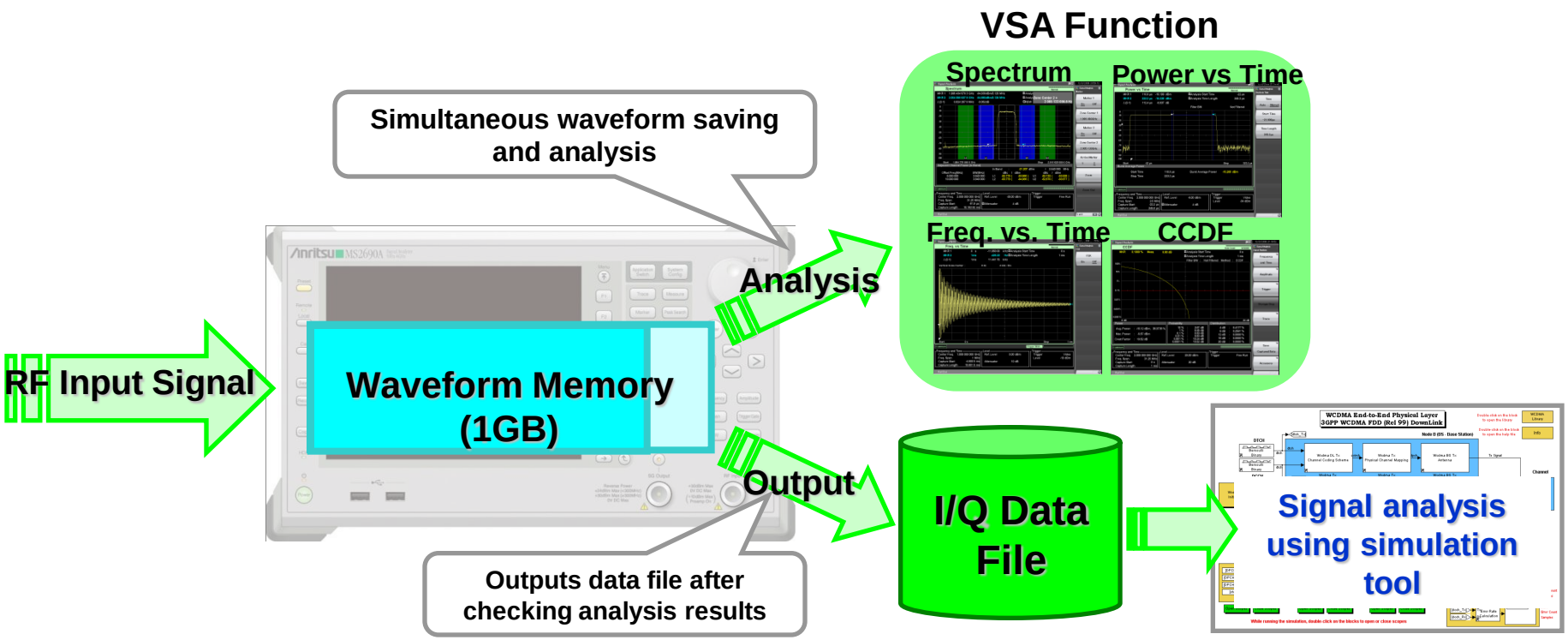
Introduction to Digitize Function

Version 2.01

ANRITSU CORPORATION

Digitize Function

The Digitize function records sampled RF input signals in waveform memory as I/Q data. I/Q data in waveform memory can be used by the Vector Signal Analysis (VSA) function and by simulation tools.



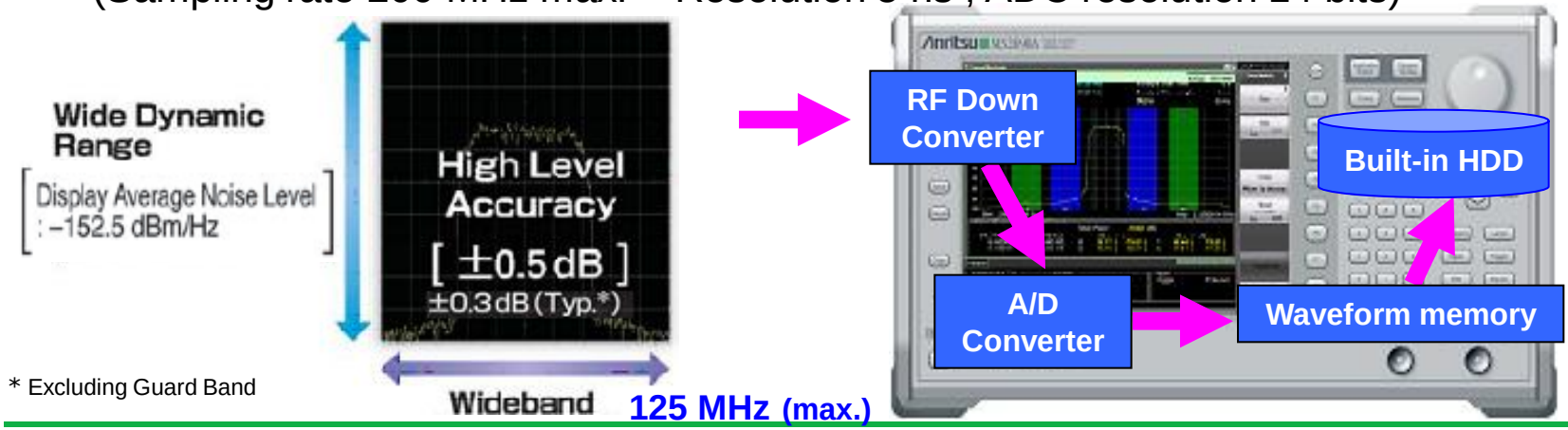
Key Features of Digitize Function

- ★Max 125 MHz broadband signals capturing
- ★Long time capturing with no signal dropout
- ★Easy re-sampling function
- ★No-calibration absolute values data recording
- ★Easy file reading with simulation tool

Max 125 MHz Broadband Signals Capturing

The MS269xA Digitize function support sampling with maximum resolution of 200 Msps/14 bit (standard: resolution of 50 Msps/16 bit). Based on the excellent level accuracy and wide dynamic range of the MS269xA, a signal with an FFT analysis bandwidth of up to 125 MHz can be captured with a level accuracy of ±0.3 dB (typ.).

Standard: 31.25 MHz max.
(Sampling rate 50 MHz max. = Resolution 20 ns, ADC resolution 16 bits)
Opt.004：125MHz max.
(Sampling rate 200 MHz max. = Resolution 5 ns , ADC resolution 12 bits)
Opt.077：62.5MHz max.
(Sampling rate 100 MHz max. = Resolution 10 ns , ADC resolution 14 bits)
Opt.077+078：125MHz max.
(Sampling rate 200 MHz max. = Resolution 5 ns , ADC resolution 14 bits)



* Excluding Guard Band

Long Time Capturing with No Signal Dropout

The "Analysis bandwidth × Analysis time" signal is held in internal memory and saved to hard disk. Up to 100 Msamples of data can be saved to memory for one measurement.

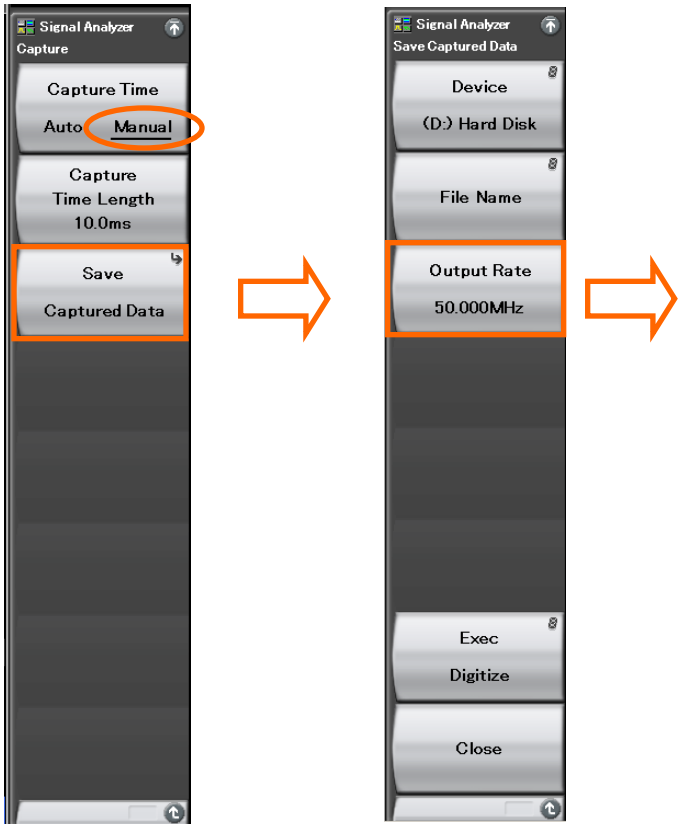
For example, it can records 1000 frames (10 s) of W-CDMA (FDD) 5 MHz band signal.

- **Frequency Span**
  - 1 kHz to 31.25 MHz
  - 1 kHz to 125 MHz (Opt-004)
  - 1 kHz to 62.5 MHz (Opt-077)
  - 1 kHz to 125 MHz (Opt-077+078)
- **Sampling Rate**
  - 2 kHz to 50 MHz
  - 2 kHz to 200 MHz (Opt-004)
  - 2 kHz to 100 MHz (Opt-077)
  - 2 kHz to 200 MHz (Opt-077+078)
  - (Automatic frequency span setting)
- **Attenuator:** 0 to 60 dB
- **Trigger:** Video / Wide IF Video / External / SG Marker

Span	Sampling Rate	Capture Time	Max. Sampling Data
1 kHz	2 kHz	2000 s	4 M
2.5 kHz	5 kHz	2000 s	10 M
5 kHz	10 kHz	2000 s	20 M
10 kHz	20 kHz	2000 s	40 M
25 kHz	50 kHz	2000 s	100 M
50 kHz	100 kHz	1000 s	100 M
100 kHz	200 kHz	500 s	100 M
250 kHz	500 kHz	200 s	100 M
500 kHz	1 MHz	100 s	100 M
1 MHz	2 MHz	50 s	100 M
2.5 MHz	5 MHz	20 s	100 M
5 MHz	10 MHz	10 s	100 M
10 MHz	20 MHz	5 s	100 M
25 MHz	50 MHz	2 s	100 M
31.25 MHz	50 MHz	2 s	100 M
50 MHz	100 MHz	500 ms	50 M
62.5 MHz	100 MHz	500 ms	50 M
100 MHz	200 MHz	500 ms	100 M
125 MHz	200 MHz	500 ms	100 M

Resample Function

Resampling function allows to convert captured waveform data sampling rate to user-specified sampling rate by simple operation.



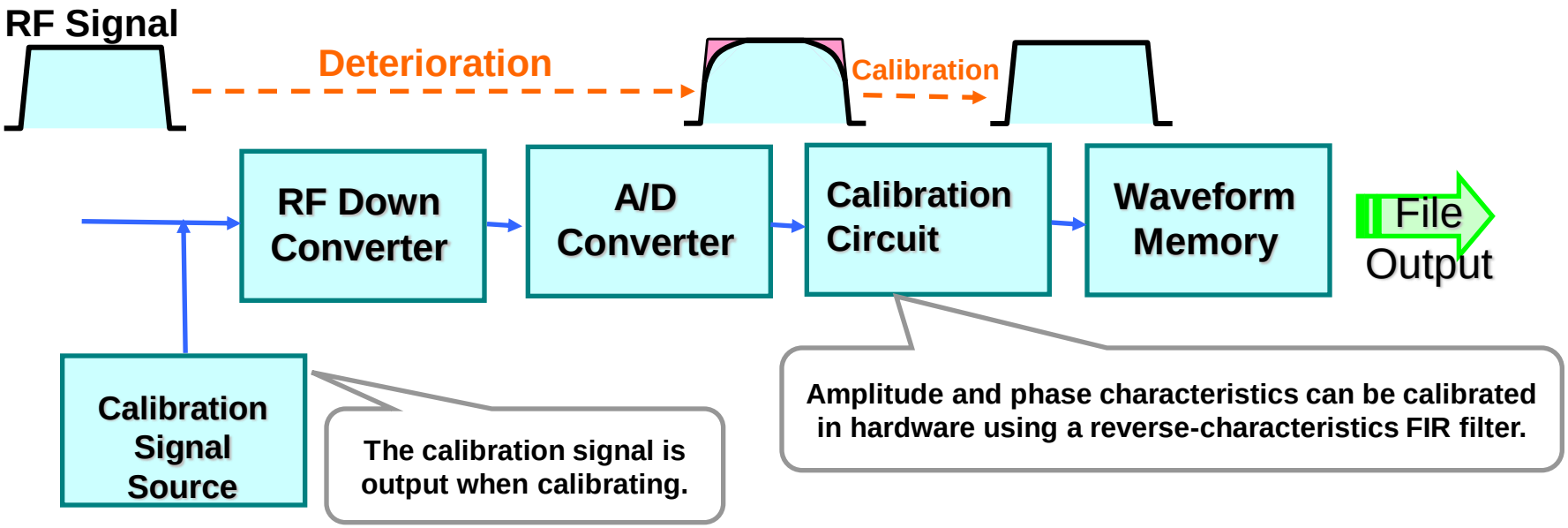
Frequency Span	Output Rate		
	Minimum	Maximum	Resolution
1 kHz	1 kHz	2 kHz	1 Hz
2.5 kHz	2 kHz	5 kHz	1 Hz
5 kHz	5 kHz	10 kHz	1 Hz
10 kHz	10 kHz	20 kHz	1 Hz
25 kHz	20 kHz	50 kHz	1 Hz
50 kHz	50 kHz	100 kHz	1 Hz
100 kHz	100 kHz	200 kHz	1 Hz
250 kHz	200 kHz	500 kHz	1 Hz
500 kHz	500 kHz	1 MHz	10 Hz
1 MHz	1 MHz	2 MHz	10 Hz
2.5 MHz	2 MHz	5 MHz	10 Hz
5 MHz	5 MHz	10 MHz	100 Hz
10 MHz	10 MHz	20 MHz	100 Hz
25 MHz	20 MHz	50 MHz	100 Hz
31.25 MHz	20 MHz	50 MHz	100 Hz
50 MHz *	50 MHz	100 MHz	1 kHz
62.5 MHz *	50 MHz	100 MHz	1 kHz
100 MHz *	100 MHz	200 MHz	1 kHz
125 MHz *	100 MHz	200 MHz	1 kHz

Opt-004/077/078 is necessary

No-calibration Absolute Values Data Recording

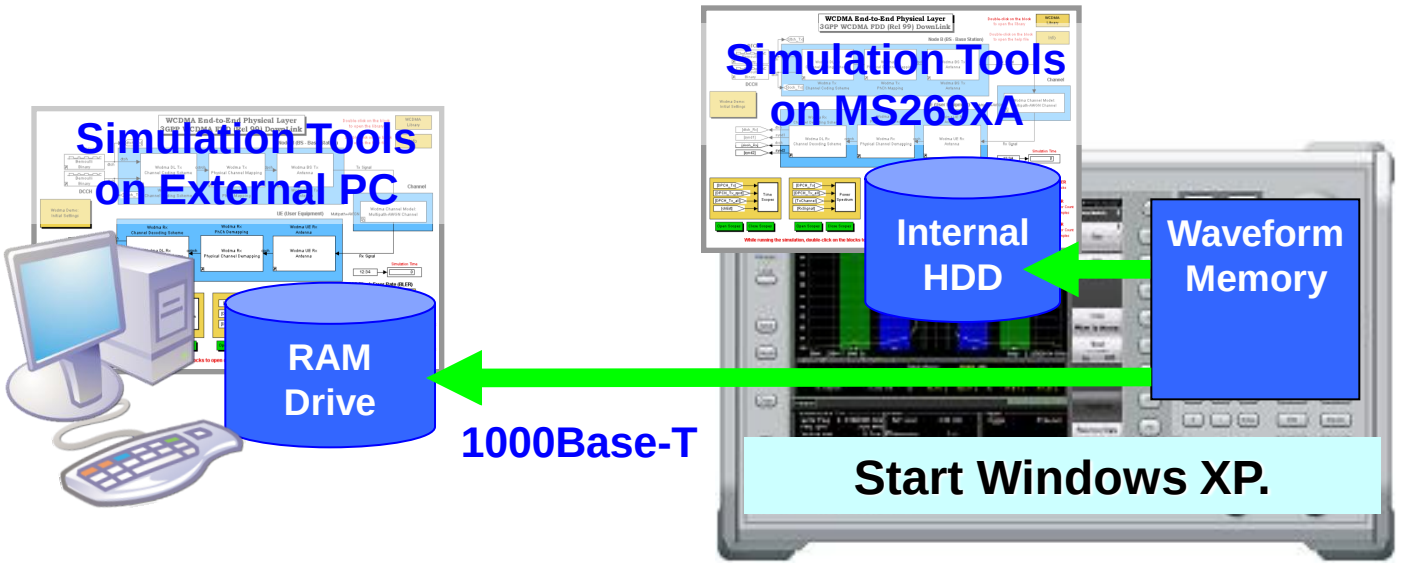
Usually, modulation/phase errors are observed with RF signal in the process of down-convert etc., so error calibration is necessary in the signal analysis.

Due to the unique modulation and phase calibration circuit, the MS269xA record data as absolute values by calibrating measurement instrument internal error in real time. Captured data with the MS29xA can be used with customers' analysis tools/programs without expert calibration knowledge.



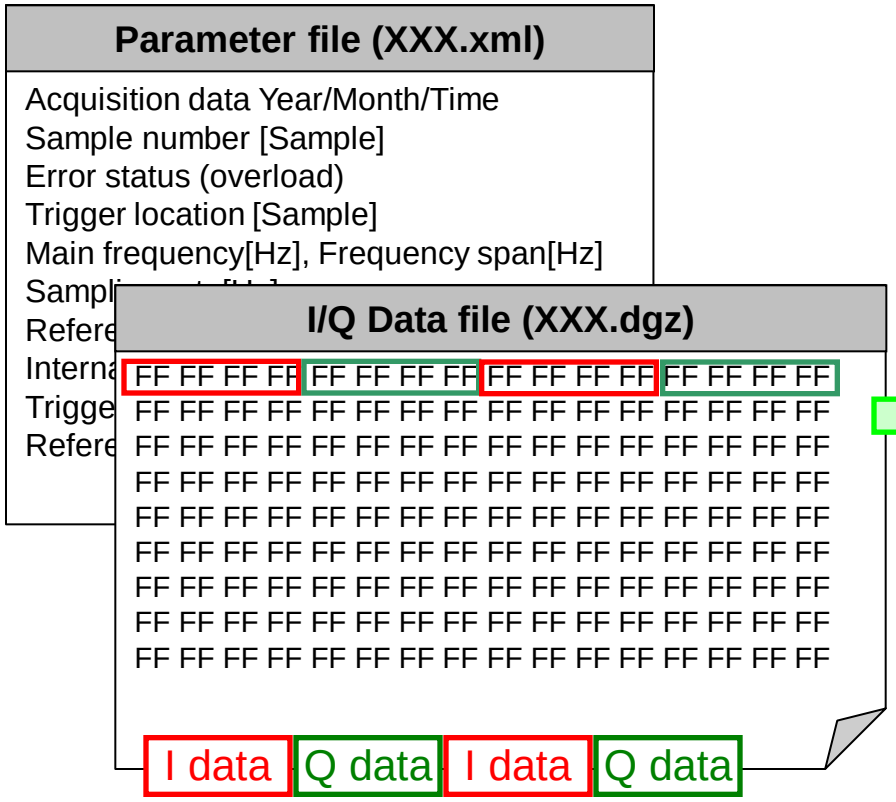
Easy File Reading with Simulation Tool (1)

A sampling data file can be created on a specified drive (hard disk/network drive/USB memory).
Creating a file on the internal hard disk allows simulation tools to run on the built-in Windows XP PC.
High-speed file transfer by 1000Base-T brings stress-free analysis in the simulation on external PC.



Easy File Reading with Simulation Tool (2)

Digitized parameter and I/Q data files can be output simultaneously. The I/Q data file format is binary in which each I/Q is recorded alternately as float format (4-byte), so it support easy-to-operate data input using simulation tools, such as MATLAB.



I/Q Data input with simple program

MATLAB (Simulink) Programming Example

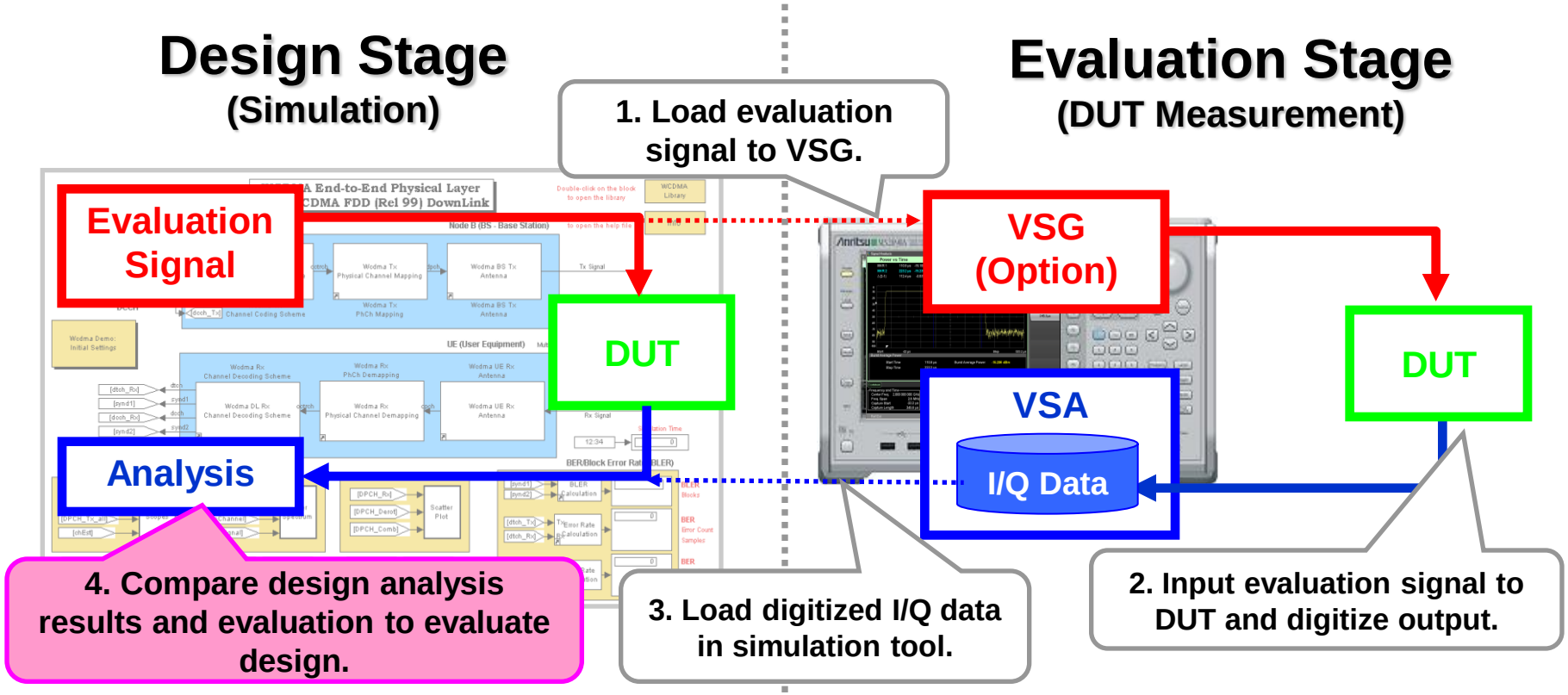
```
Input % dgz file
file = fopen( 'XXX.dgz', 'r' );
data = fread( file, 'float=>float' );
fclose(file);

Input in each field of % I/Q
I_dat = data(1:2:end);
Q_dat = data(2:2:end);

% END
```

Application Example (1): Device Design

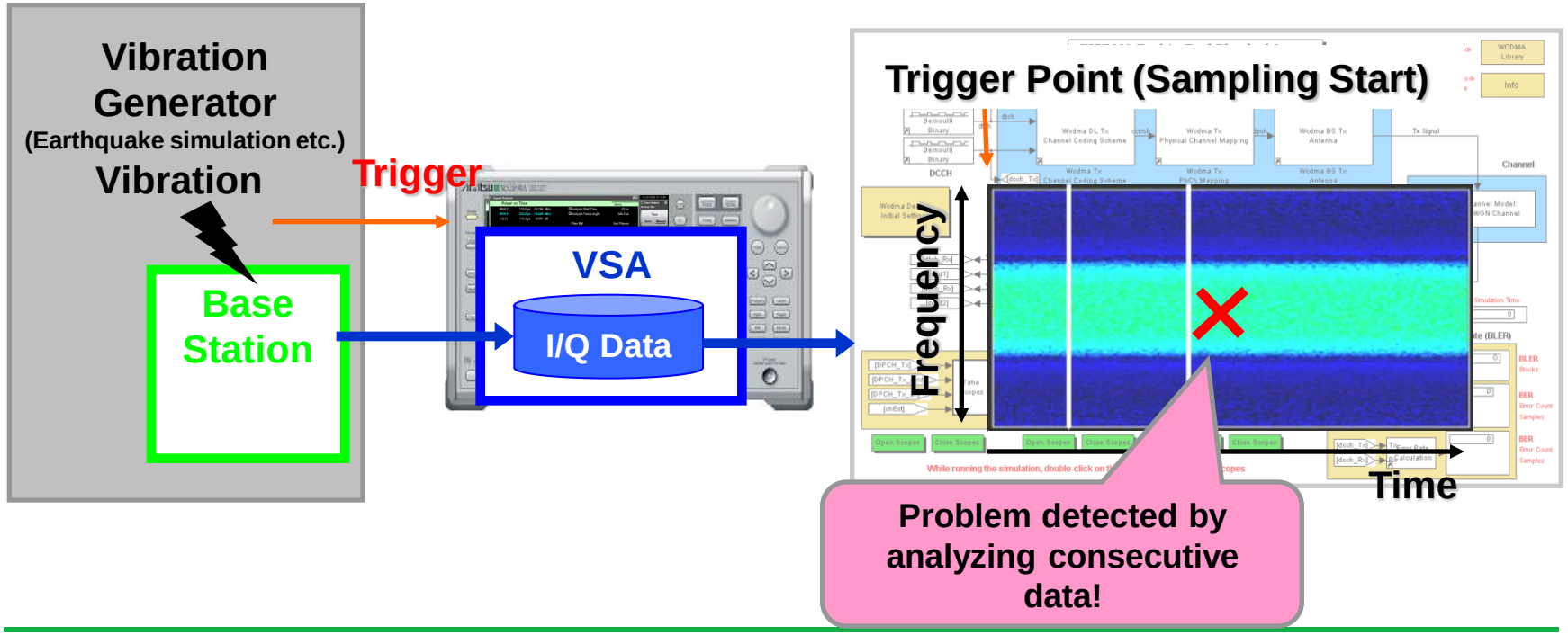
The Digitize function is useful for design feedback by comparing simulated results at the design stage and actual values at the evaluation stage. The MS269xA-020 Vector Signal Generator Option supports output of simulated evaluation signals.



Application Example (2): Environment Test

Transient phenomenon can be captured by analyzing consecutive sampling data recorded using an external trigger. Sampling can be started before trigger input by setting a trigger delay.

- Vibration Test Environment -



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