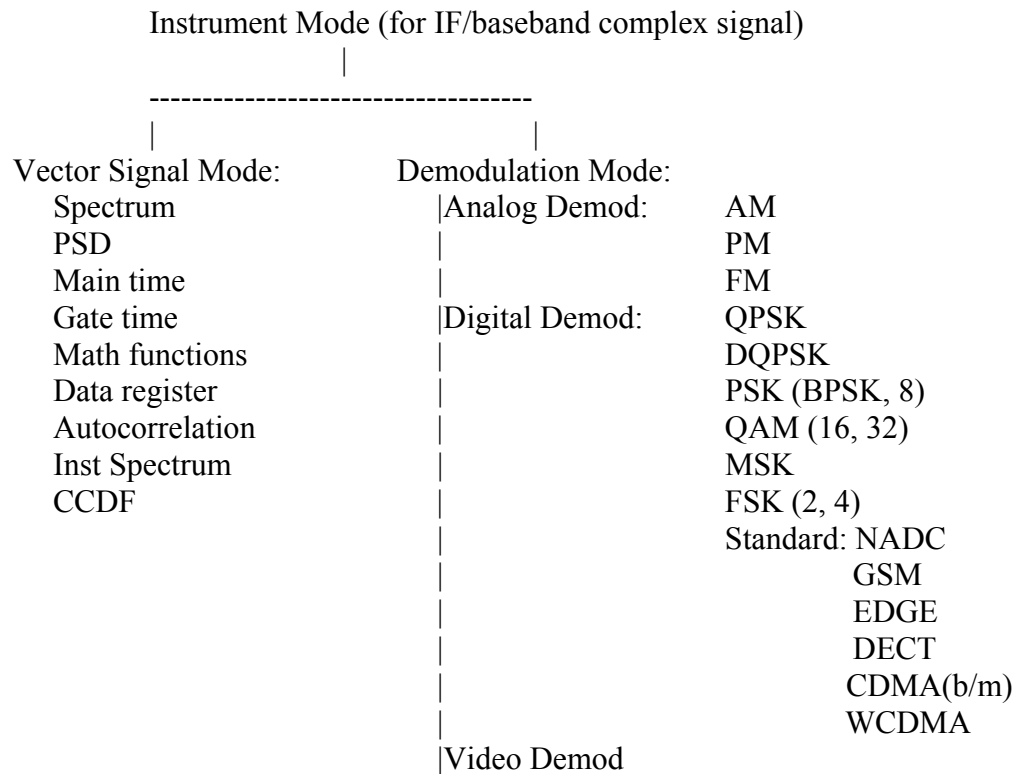


Functionality and User Interface Comparison between HP 89441A Vector Signal Analyzer and WAND Baseband Software

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I. HP Functionality Summary and Difference between HP and WAND

HP functionality summary



WAND baseband software difference and discussion:

1. Vector Signal Mode and Demodulation Mode in WAND software will not run simultaneously. That is, no background program running – the program only runs for what it shows.
2. More precisely for 1, in order to save computation power, the digital demodulation will be processed in time domain only. Spectrum or PSD will not be shown together with eye diagram, constellation, etc. User has to switch back to measurement mode to view the result of FFT. This is open to discussion, since processing in frequency domain was mentioned before.

3. HP has several built-in demodulation standards, e.g. GSM, WCDMA. WAND software has basic demodulation schemes. Specifically, BPSK, QPSK and the display of various measured/processed data will be a priority of WAND software.
4. WAND software will add the feature of single-side band (SSB) demodulation in Analog Demodulation.
5. No video demodulation in WAND software.
6. HP has math function that can manipulate the input/file signals. WAND software will not have math function when receiving baseband signal.
7. HP has time gating function for applications of burst signal. WAND software will not consider receiving signal which uses a burst carrier.

II. User Interface Difference between HP and WAND

Display

1. HP has format of single grid, 2 grids, and 4 grids quad / stack. WAND software can not generate 4 grids quad in a single C window, only 4 grids stack. Instead, WAND can have multiple grids stack, e.g. 3 grids stack. The 4 grids quad display in the previous demo version was actually formed by two C windows, each with 2 grids stack. To save CPU time, now we only open one C window for either Measurement Mode or Demodulation Mode.
2. Close data label and marker in the HP display will be put in one location (preferably at the bottom of all grids) to indicate for individual plots.
3. HP can set user defined plot title. WAND may only show the assigned title for the data, e.g. "Eye Diagram".
4. HP has view overlay. WAND software will not have view overlay, except IQ overlay.
5. HP has plot color setup, e.g. brightness, hue, saturation, luminosity. WAND software will not have these, but can change trace color offline when needed.
6. In HP, Spectrogram is a display method that applies to almost every plot, that is, a 3D display with time delay. However, WAND only used spectrogram for spectrum – Actually they contain the same information. We will as well apply spectrogram to various plots, provided that the CPU time permits.

7. HP spectrogram has normal/inverse color/black-white and contrast adjustment. WAND software has normal color spectrogram, but will have contrast adjustment as well.
8. WAND software will not have “waterfall” display format. Since we have spectrogram, waterfall will be a future option.
9. HP has single sweep. WAND has display pause and restart accordingly.

Measured Data

1. HP can set reference signal, therefore it is feasible to view the IQ reference and IQ magnitude / phase error. I will discuss with professors how to generate decision-feedback reference signals in an efficient way, and add it to the WAND software.

Data Format

1. HP can set the x-axis interchangeable between linear scale and log scale. WAND software will not change the x-axis to log scale.
2. HP can change symbol display format (dots/bars), ideal state (cross/circle), and state size. WAND software may be fixed to only one choice of each display format.

Frequency Span and Range

1. HP allows user to define number of frequency points and step size. WAND software will allow user to choose center frequency and span, but the number of frequency points will be chosen to be 2^N , in order for efficient FFT calculation.
2. HP applies windowing with flat top, Gaussian top, Hanning window and uniform window. Beside these, WAND will have Blackman, Blackman Harris, Cosine, Hamming and Kaiser windows.
3. HP display has Auto Scale function. This may not be needed in WAND software, since presumably, the receiver will have automatic gain control (AGC). However, zooming function will be implemented in WAND software.