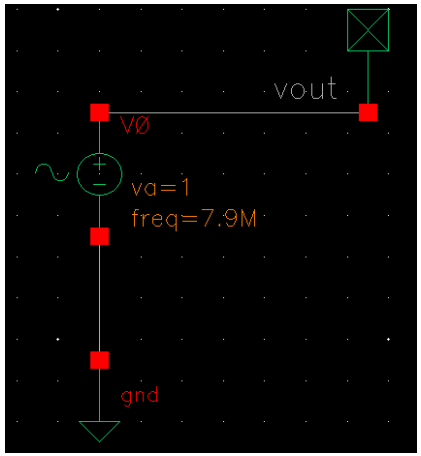
Envelope Sim

Sum of two tones of 1V and 0.5V at 7.9MHz and 6.9MHz respectively.

Amplitude	1 V
Initial phase for Sinusoid	
Frequency	7.9M Hz
Amplitude 2	500.0m V
Initial phase for Sinusoid 2	
Frequency 2	6.9M Hz



We know that all frequency transforms use FFT, we therefore work with powers of 2

Use a FFT resolution frequency of 10KHz, so that any signal falling on that grid will be represented perfectly.

This gives a base simulation time of 100us or its multiples.

We then use a sampling frequency fs = 2048 x 10K = 20.48MHz

That is sufficient to analyze our circuit since f_{Nyq} = fs/2 = 10.24MHz

Another **very** important step is to have the data *strobed* to avoid the simulator to interpolate between data points when applying the sampling as post-process.

Shooting

pz sp envlp pss
pac pstb pnoise pxf
psp qpss qpac qpnoise
qpxf qpsp hb hbac
hbnoise hbsp

Envelope Following Analysis
Classic Wireless
Engine: Shooting Harmonic Balance

Stop Time: 200u — Start ACPR Wizard

Clock Info
Period
Fund Frequency: (10k*2048)
Clock Name
Number of Harmonics: 1

Time Step Control: fixed adaptive

Oscillator

Accuracy Defaults (errpreset)
conservative moderate liberal

HB

Engine: Shooting Harmonic Balance

Stop Time: 200u — Start

Tones: Frequencies Names

Number of Tones: 1 2 3 4

Tone 1
Fundamental Frequency:)k*2048
Number of Harmonics: 1
Oversample Factor: 1
Freqdivide Ratio: 1

Time Step Control: fixed adaptive

Oscillator

Accuracy Defaults (errpreset)
conservative moderate liberal

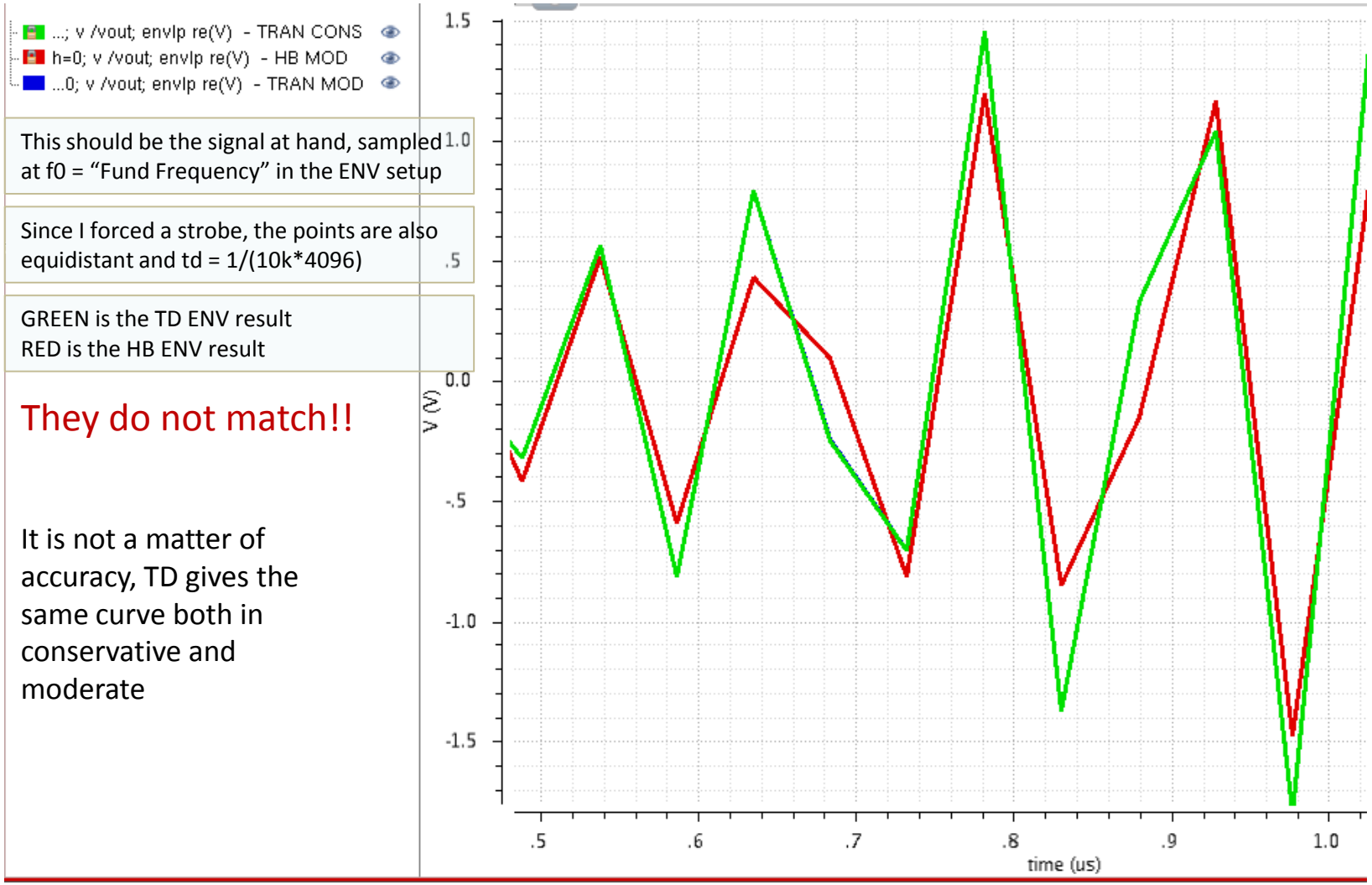
Fast envlp mode: off level1 level2

With all this said, these are the simulation setup windows:

Same Stop Time (2x min required)
Same fundamental, n. of harms, accuracy, time step.

strobeperiod	1/(10k*4096)
transtrobeperiod	
matlaboutput	no yes

Envelope Sim – Harmonic Time waveforms



This should be the signal at hand, sampled at f0 = “Fund Frequency” in the ENV setup

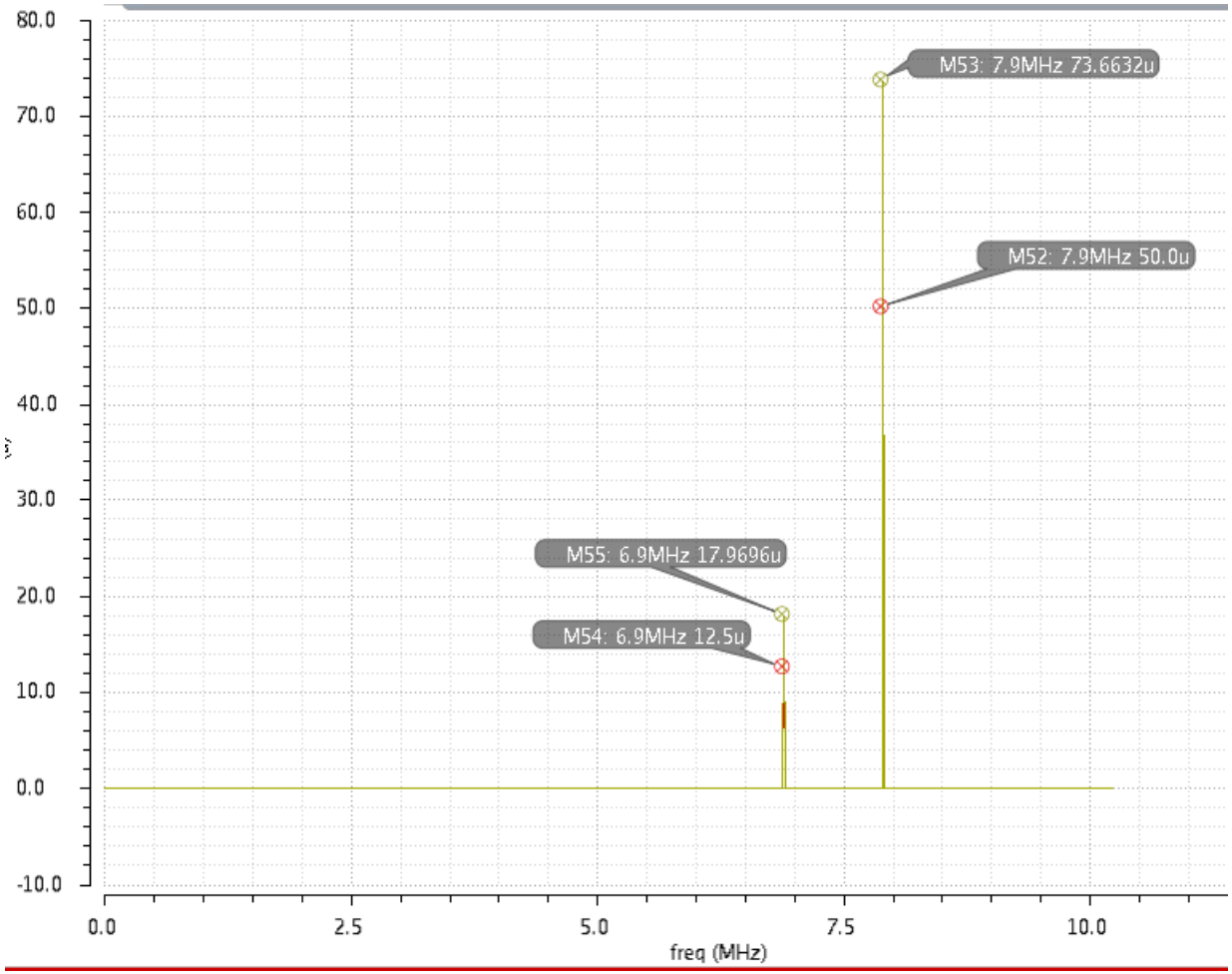
Since I forced a strobe, the points are also equidistant and td = 1/(10k*4096)

GREEN is the TD ENV result
RED is the HB ENV result

They do not match!!

It is not a matter of accuracy, TD gives the same curve both in conservative and moderate

Envelope Sim – psd(Harmonic Time)



Then it's no big surprise that the PSD relative to these two signals do not match.

They do not match by far

HB (M54 and M52) is correct: it gives 12.5u (V^2 / Hz) in a bin of 10KHz

$$V_{RMS} = \sqrt{\int_{f_{BIN}} PSD} = \sqrt{10k \cdot 12.5\mu} = \frac{0.5}{\sqrt{2}}$$

…where 0.5V is the peak voltage I input in the simulator.

```
psd(real(harmonic(v("/vout" ?result "envlp_fd") '0)) 100u 200u 2048 ?windowName
"Rectangular" ?smooth 0 ?windowSize 2048 ?detrending "None" ?cohGain 1 )
```

The question is then simple: WHY?

Why do I get entirely different waveform from the same circuit, under the same simulation conditions?