ECE 641 TERM PROJECT

DESIGN OF A QPSK MODULATOR BASED ON FPGA

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SUMMARY

- Description
- Modulation
- Simulation
- Demonstration
- References

DESCRIPTION

- This project proposed a simple design for a QPSK based on FPGA.
- VHDL programming code is used to generate QPSK digital signal.
- The input test signals data and carrier are interfaced to the FPGAs board.

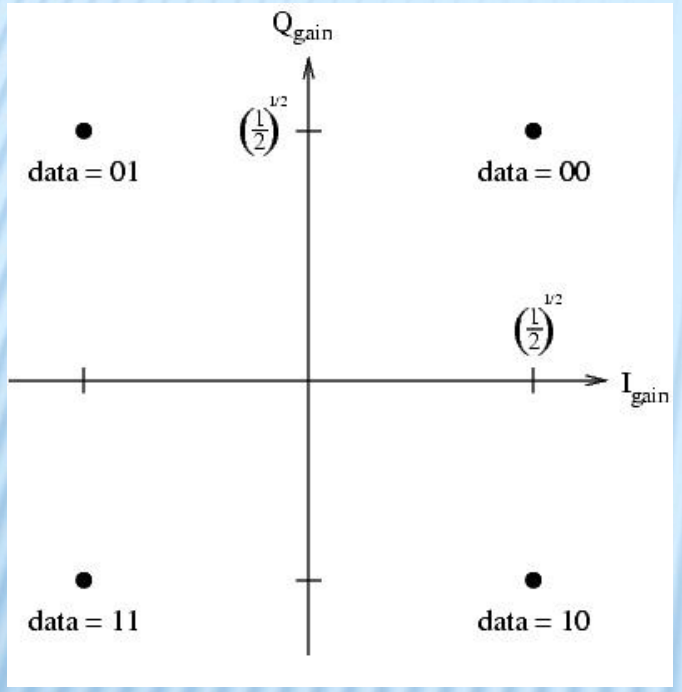
MODULATION

- Digital Modulation
- Digital modulation methods can be considered as digital-to-analog conversion;
- The most fundamental digital modulation techniques are based on keying, such as QPSK.

QPSK

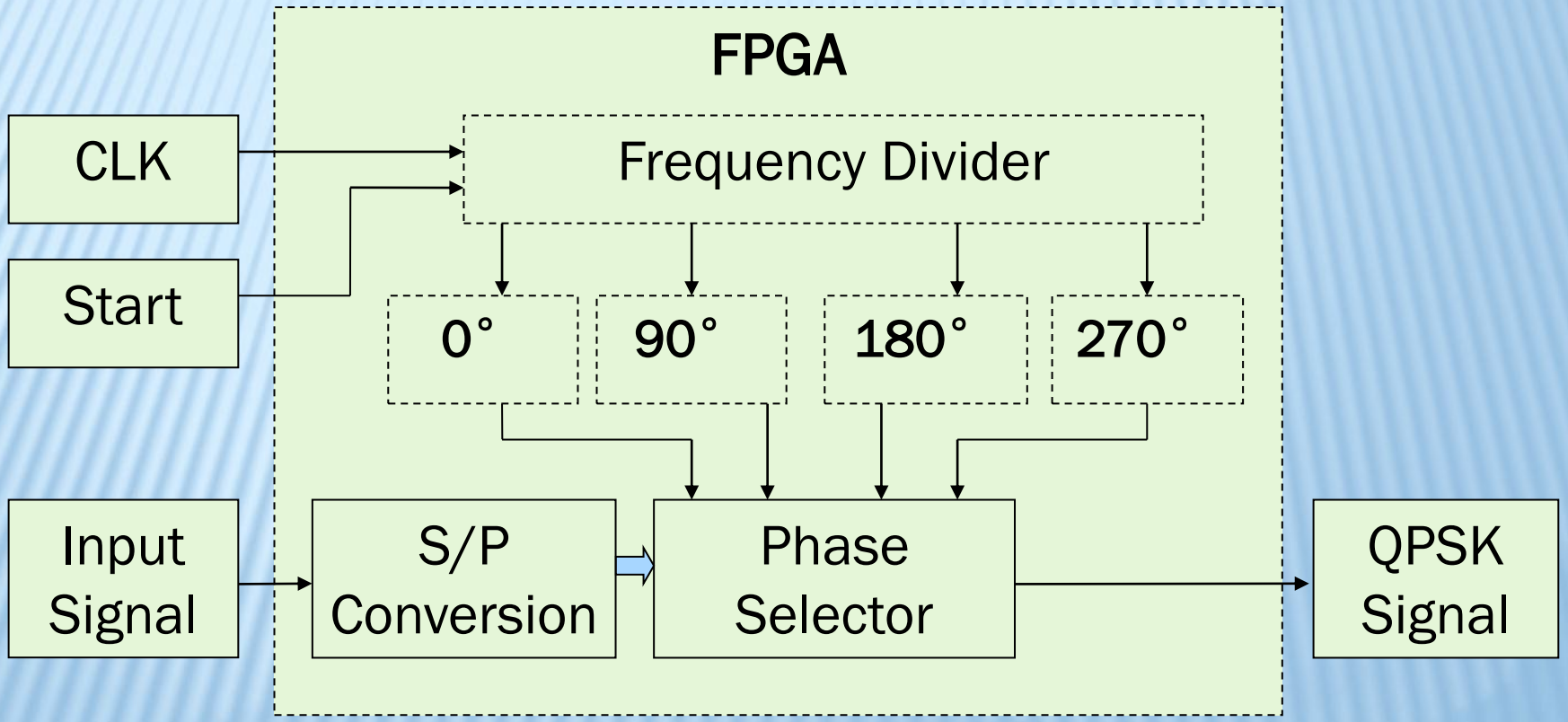
- QPSK stands for Quadrature Phase Shift Keying
- QPSK performs excellent on resistant to interference, keeping low bit error rate, utilizing frequency spectrum, etc.

QPSK

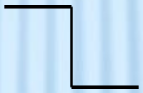
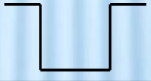
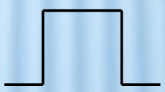


- Data bits are grouped into 4 pairs such as {00, 01, 10, 11}, and each pair is represented by a particular waveform, Sine or Cosine, called a symbol.
- $Si(t) = A\cos[2\pi fct + 2\pi(i-1)/4]$, $i = 1, 2, 3 \cdots$

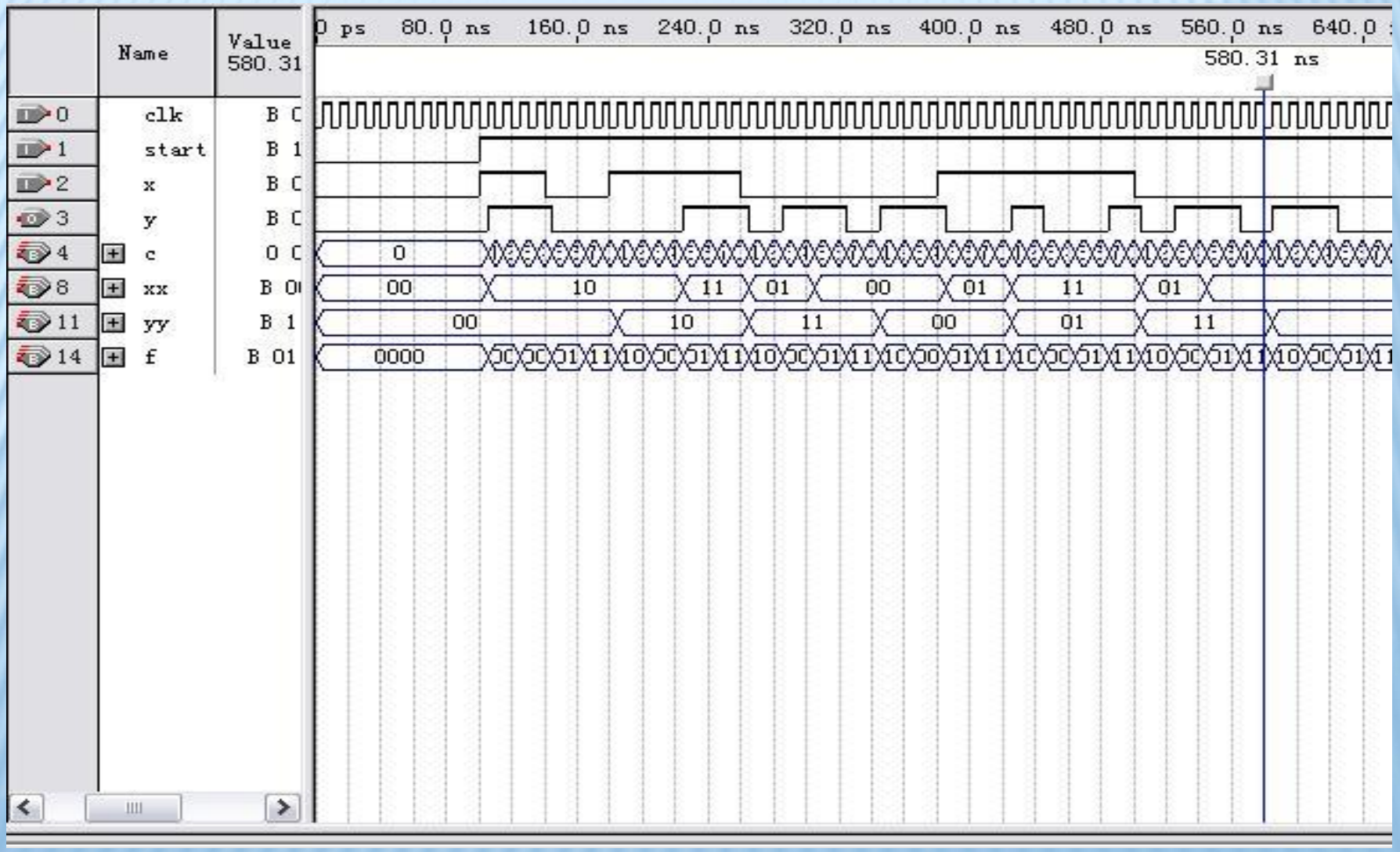
BLOCK DIAGRAM



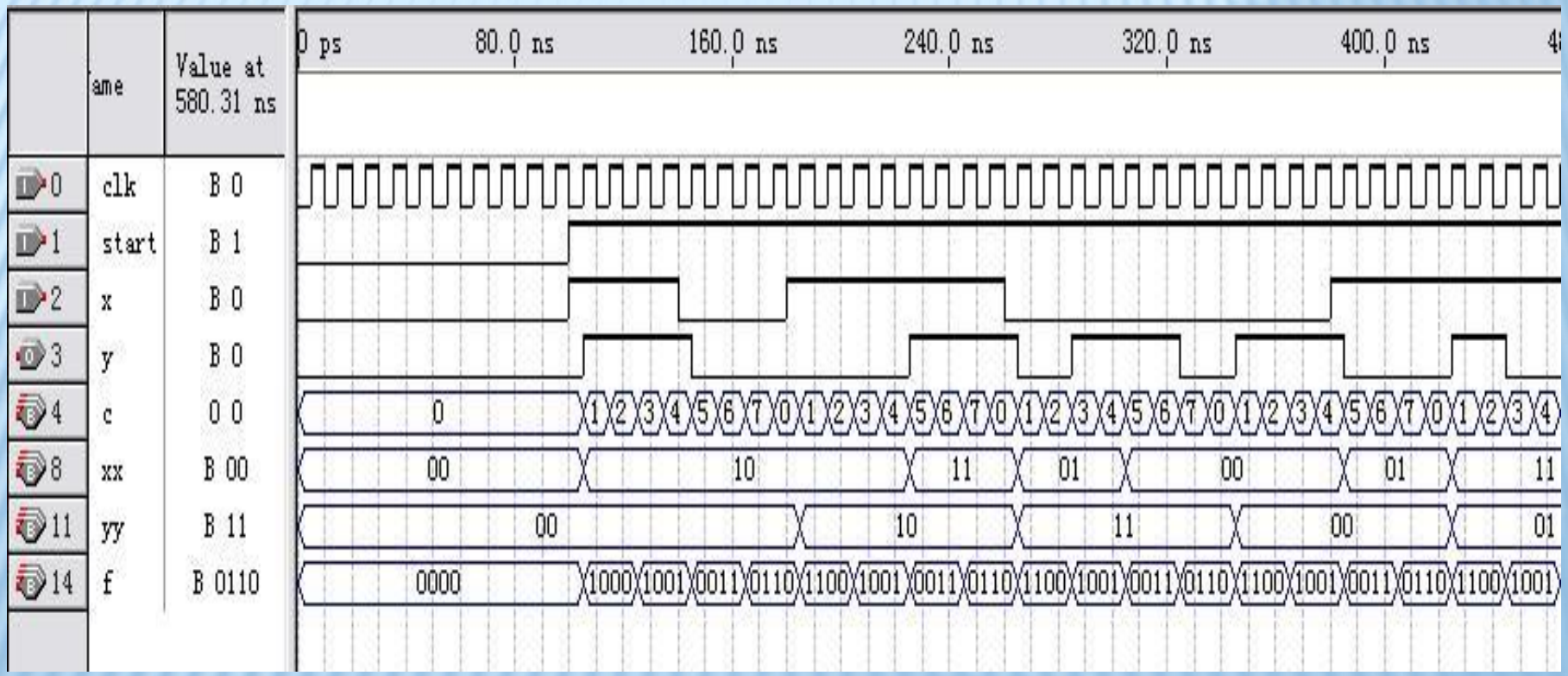
BLOCK DIAGRAM

yy	phase	waveform	carrier
“00”	0°		f3
“01”	90°		f2
“10”	180°		f1
“11”	270°		f0

SIMULATION(1)

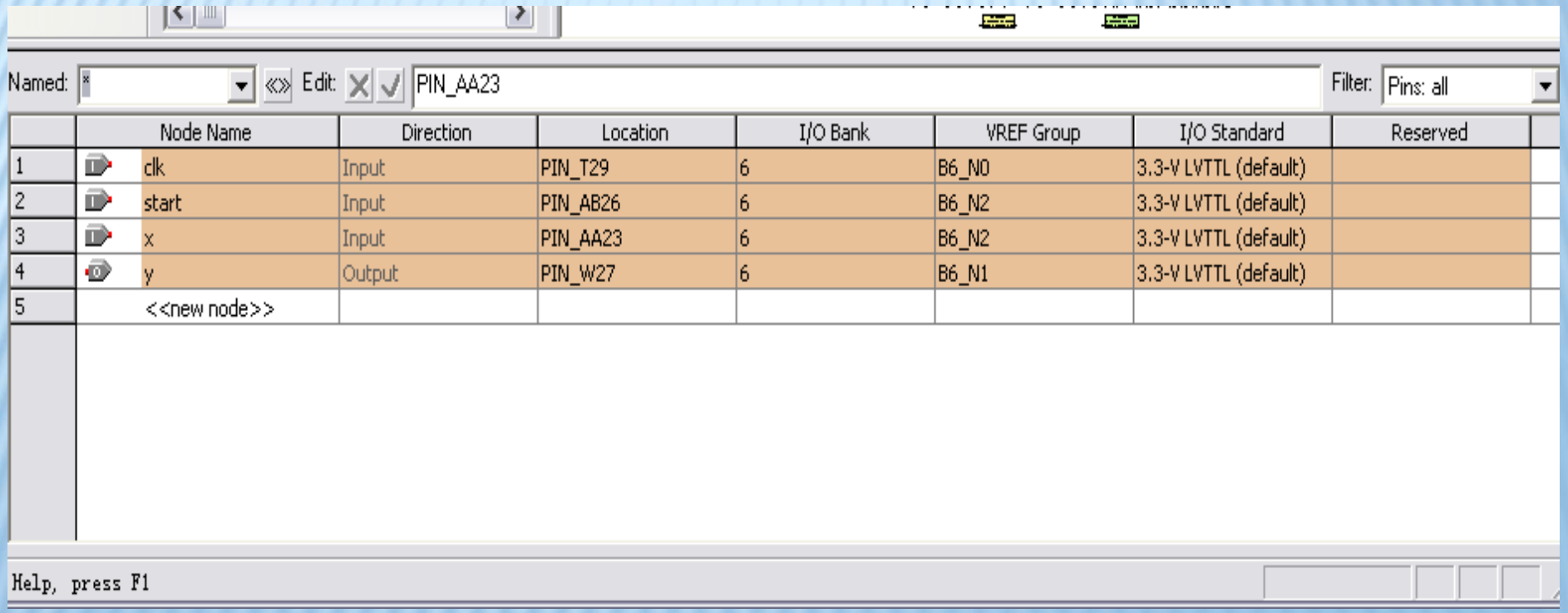


SIMULATION(2)



DEMONSTRATION

- Pin planner assignments



REFERENCES

[1] Gihad Elamary, Graeme Chester, Jeffrey Neasham “A Simple Digital VHDL QPSK Modulator Designed Using CPLD/FPGAs for Biomedical Devices Applications” Proceedings of the World Congress on Engineering, Vol I, July 1 - 3, 2009, London, U.K.

[2] ECE 641 Materials / DE2 additional lab exercises

[3] ALTERA DE2-70 User Manual Version 1.08