Contribution ID: **214**   Type: **Poster Presentation**

A full digital beam position and phase measurement signal processing algorithm based on FPGA designed for linear accelerator

Tuesday, 10 September 2024 16:00 (1h 30m)

A digital beam position and phase measurement (BPPM) signal processing algorithm has been designed and implemented. This designed structure has been conceived to be patterned, charged particle independent, and reconfigurable so that it could eventually be used in different kinds of linear accelerators. The BPPM digital signal processing algorithm includes the measurement both of the fundamental and the second harmonic signal simultaneously. Direct under-sampling beam signals by using five ADCs as well as the reference signal, the position, and phase information is retrieved by using the in-phase and quadrature (IQ) demodulation method. The processing algorithm units consist of three parts. The first part is the quadrature I and Q signals generated directly by the Hilbert transform algorithm based on the reference signal in digital, including the 1st and 2nd IQ groups. The second part is the digital down converter and the phase and position bandwidth online reconfigure unit, which could realize more than one kind of bandwidth and data rates result. The third part is a multi-coefficient mapping position correction module to realize the beam position measurement in the nonlinear region. The laboratory test result shows the achieved phase resolution is better than 0.03 degree and position resolution better than 7 um under the input signal less than 45 dBm. This design pattern algorithm BPPM prototype processor has been used in different kinds of linear accelerators at IMP.

Footnotes

Funding Agency

I have read and accept the Privacy Policy Statement

Yes

Primary author: NI, Fafu (Institute of Modern Physics, Chinese Academy of Sciences)

Co-authors: LI, Zhixue (Institute of Modern Physics, Chinese Academy of Sciences); WEI, Yuan (Institute of Modern Physics, Chinese Academy of Sciences); TIAN, Ruixia (Institute of Modern Physics, Chinese Academy of Sciences); XIE, Hongming (Institute of Modern Physics, Chinese Academy of Sciences); ZHANG, Yong (Institute of Modern Physics, Chinese Academy of Sciences); ZHU, Guangyu (Institute of Modern Physics, Chinese Academy of Sciences); WU, Junxia (Institute of Modern Physics, Chinese Academy of Sciences)

Presenter: NI, Fafu (Institute of Modern Physics, Chinese Academy of Sciences)

Session Classification: TUP: Tuesday Poster Session

Track Classification: MC3: Beam Position Monitors