# Accepted Manuscript

Design of barrier bucket kicker control system

Fa-Fu Ni, Yan-Yu Wang, Jun Yin, De-Tai Zhou, Guo-Dong Shen, Yang-De. Zheng, Jian-Chuan Zhang, Jia Yin, Xiao Bai, Xiao-Li Ma

PII: S0168-9002(18)30268-7
DOI: https://doi.org/10.1016/j.nima.2018.02.086
Reference: NIMA 60615

To appear in: *Nuclear Inst. and Methods in Physics Research, A*

Received date : 28 July 2017
Revised date : 16 February 2018
Accepted date : 19 February 2018

Please cite this article as: F.-F. Ni, Y.-Y. Wang, J. Yin, D.-T. Zhou, G.-D. Shen, Y.-D. Zheng, J.-C. Zhang, J. Yin, X. Bai, X.-L. Ma, Design of barrier bucket kicker control system, *Nuclear Inst. and Methods in Physics Research, A* (2018), https://doi.org/10.1016/j.nima.2018.02.086

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

*Manuscript
Click here to view linked References

ACCEPTED MANUSCRIPT

# Design of Barrier Bucket Kicker Control System

Fa-Fu Ni[a,b], Yan-Yu Wang [a,*], Jun Yin[a,b], De-Tai Zhou[a], Guo-Dong Shen[a,b], Yang-De. Zheng[a,b], Jian-Chuan Zhang[a], Jia Yin[a], Xiao Bai[a,b], Xiao-Li Ma[a]

[a]Institute of Modern Physics, Chinese Academy of Sciences (CAS), Lanzhou 730000, China

[b]University of Chinese Academy of Sciences (UCAS), Beijing 100049, China

## Abstract

The Heavy-Ion Research Facility in Lanzhou (HIRFL) contains two synchrotrons: the main cooler storage ring (CSRm) and the experimental cooler storage ring (CSRe). Beams are extracted from CSRm, and injected into CSRe. To apply the Barrier Bucket (BB) method on the CSRe beam accumulation, a new BB technology based kicker control system was designed and implemented. The controller of the system is implemented using an Advanced Reduced Instruction Set Computer (RISC) Machine (ARM) chip and a field-programmable gate array (FPGA) chip. Within the architecture, ARM is responsible for data presetting and floating number arithmetic processing. The FPGA computes the RF phase point of the two rings and offers more accurate control of the time delay. An online preliminary experiment on HIRFL was also designed to verify the functionalities of the control system. The result shows that the reference trigger point of two different sinusoidal RF signals for an arbitrary phase point was acquired with a matched phase error below 1° (approximately 2.1 ns), and the step delay time better than 2 ns were realised.

**Key words**：Barrier bucket; Kicker; FPGA; ARM; Phase matching

## 1. Introduction

The barrier bucket (BB) method was proposed in 1983 by J.E. Griffin at Fermilab [1]. The concept is based on the application of a periodic radiofrequency (RF) voltage pulse synchronised with the revolution frequency of particles in a cyclic accelerator for storage and/or acceleration of charged particles [2]. By using this method, multiple injections and beam accumulation can be achieved through the

*Corresponding Author: yanyu@impcas.ac.cn (Yanyu Wang)

Download English Version:

https://daneshyari.com/en/article/8166368

Download Persian Version:

https://daneshyari.com/article/8166368

Daneshyari.com