A Dual Functional Current Monitor for Stripping Efficiency Measurement in CSNS*

W. L. Huang†, R. Y. Qiu, F. Li, A. X. Wang, M. Y. Liu, M. Y. Huang, T. G. Xu
Institute of High Energy Physics ,China Spallation Neutron Source, Dongguan, China

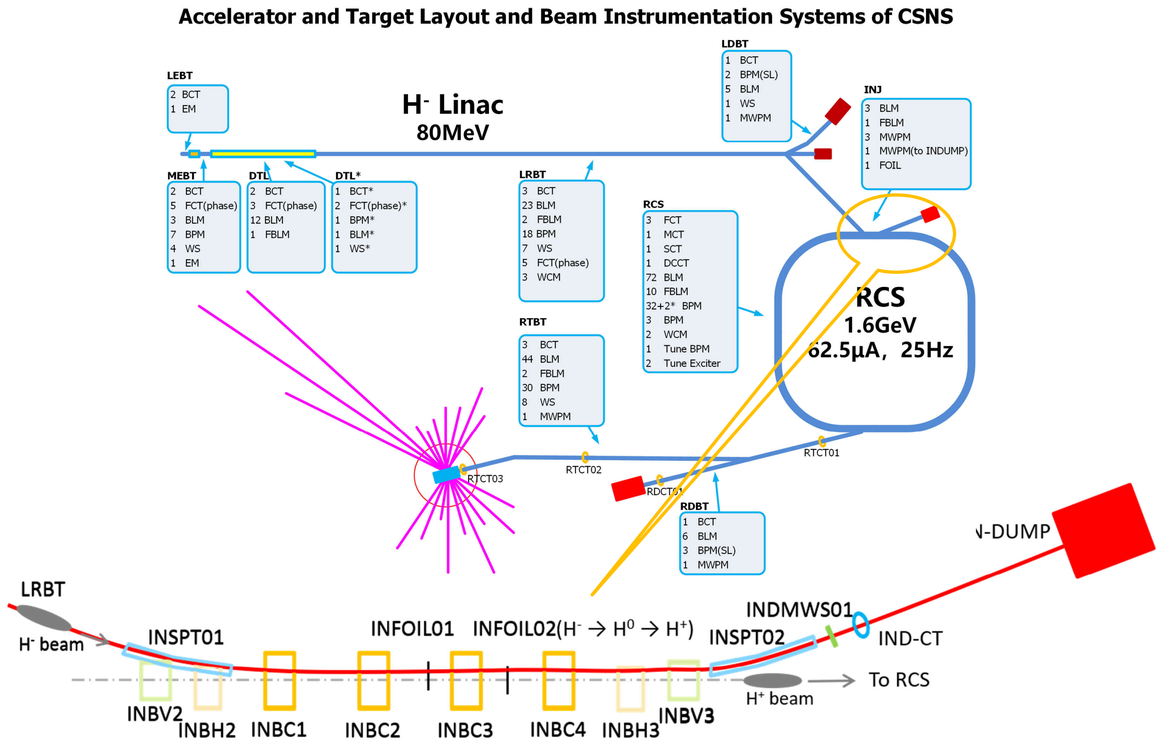
IBIC MALMÖ, SWEDEN International Beam Instrumentation Conference 8-12 SEPTEMBER 2019
MOPP011 (Monday)

Introduction

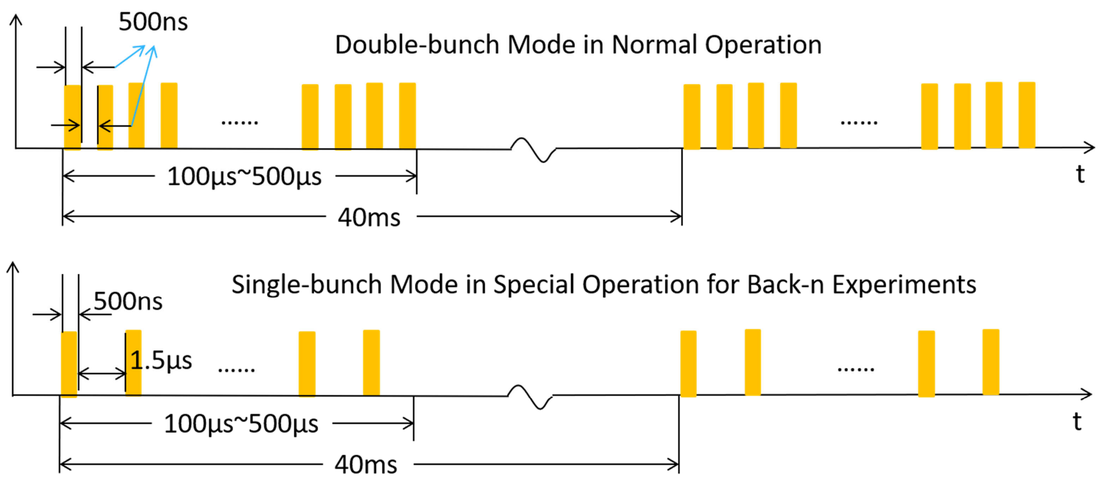
Main parameters of CSNS

Project Phase	I	II
Beam Power on target [kW]	100	500
Proton energy [GeV]	1.6	1.6
Average beam current [μA]	62.5	312.5
Pulse repetition rate [Hz]	25	25
Linac energy [MeV	80	250
Linac type	DTL	+Spoke
Linac RF frequency [MHz]	324	324
Macropulse. ave current [mA]	15	40
RCS circumference [m]	228	228

Accelerator and Target Layout and Beam Instrumentation Systems of CSNS

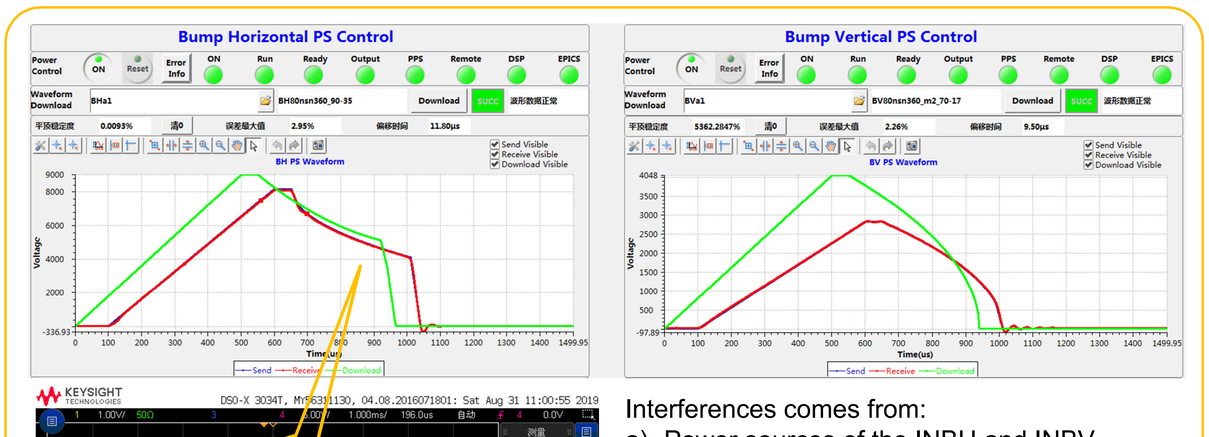


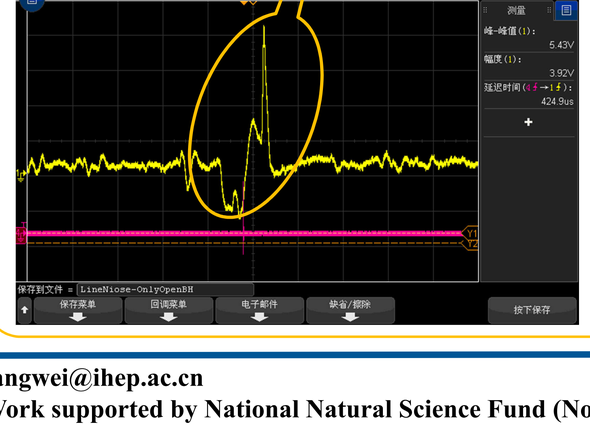
Layout of the injection region of CSNS



Time structure of the Beam in Different Operation Modes

Interference and noise sources



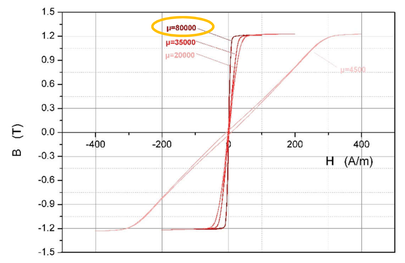


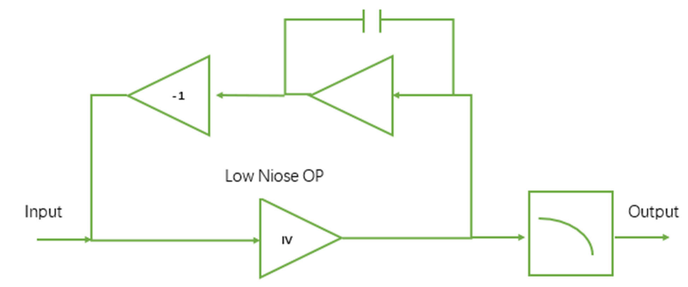
Interferences comes from:
a) Power sources of the INBH and INBV
b) 25Hz resonators of main magnets
c) Other environmental noises

Could be eliminated by
a) Two electronics:
(Signal + electronics) - (Noise + electronics)
b) One electronics (now used):
Sample (noise + electronics) firstly, then subtract from the (Signal + electronics)

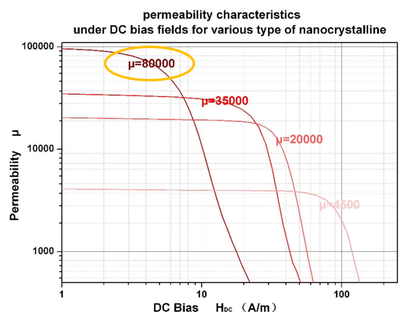
Design of BCT and FCT sensors

Specification	BCT	FCT
Range	±50 μA	-
Turns	50	20
τ_{rise}	< 10 μs	< 13.6 ns
Droop	< 1%/ms	< 1%/μs

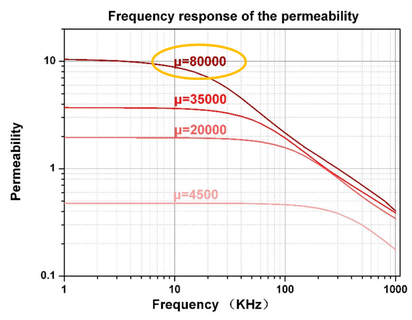




Electronics scheme of BCT (Gain=134dB)



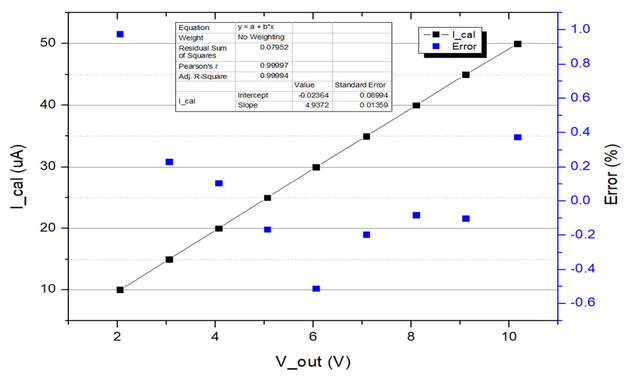
A 50-turn BCT and a 20-turn FCT



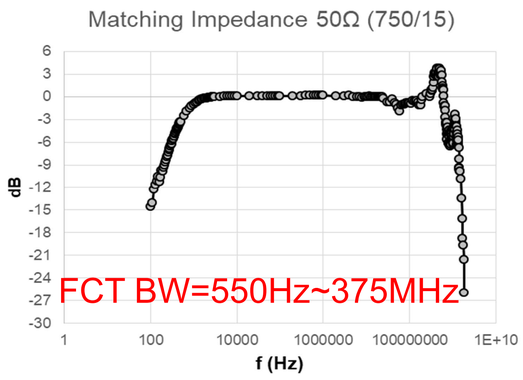
Various types of nanocrystalline

Sensors tested in the lab

Droop and risetime measurement of the BCT

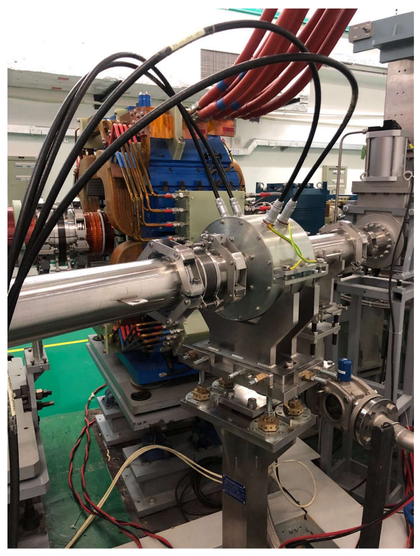


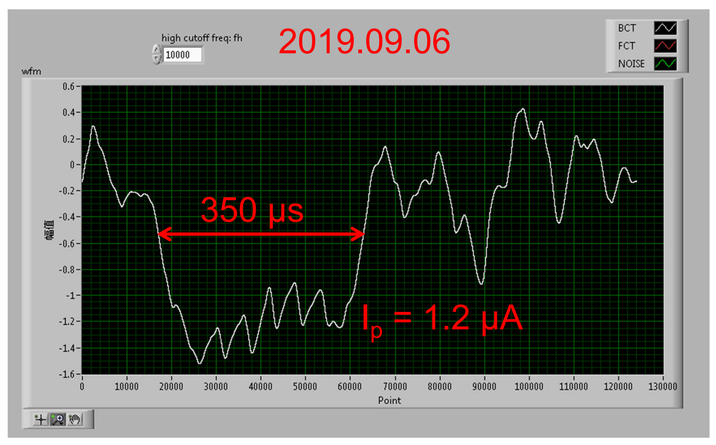
BCT Linearity : better than ±1%
Measure the stripping efficiency with LRCT03



FCT : ready for an FFT algorithm to calculate the stripping efficiency

IND-CT tested by beam





DAQ: NI PXIe-5172 digitizer
(100MHz, 8-ch, 14bit ADC and 125MSa/s)

IND-CT installed in the accelerator tunnel (Aug. , 2019) , tested by beam this commissioning

†huangwei@ihep.ac.cn
★ Work supported by National Natural Science Fund (No.11605214).

China Spallation Neutron Source, No. 1, Zhongziyuan Road, Dalang Town, Dongguan City, Guangdong Province, 523803, P.R. China