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中国科学院高能物理研究所
Institute of High Energy Physics
Chinese Academy of Sciences

WAO 2023
September 10 - 15, 2023
Tsukuba, Japan

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China Spallation Neutron Source, Dongguan, Guangdong Province.

Summary of the operation of CSNS accelerator since its official opening in 2018

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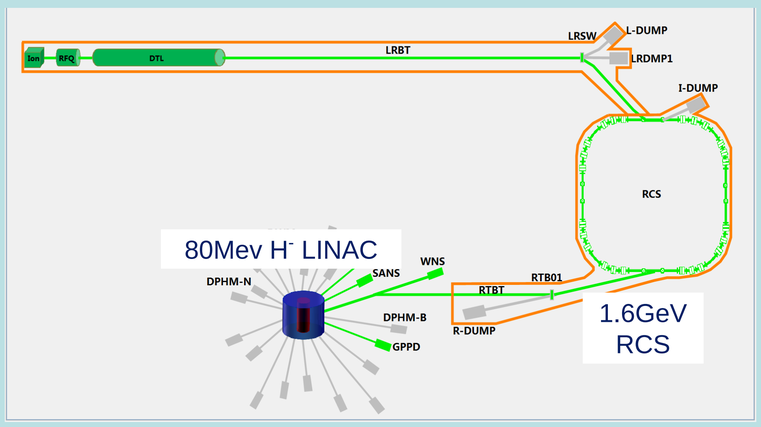
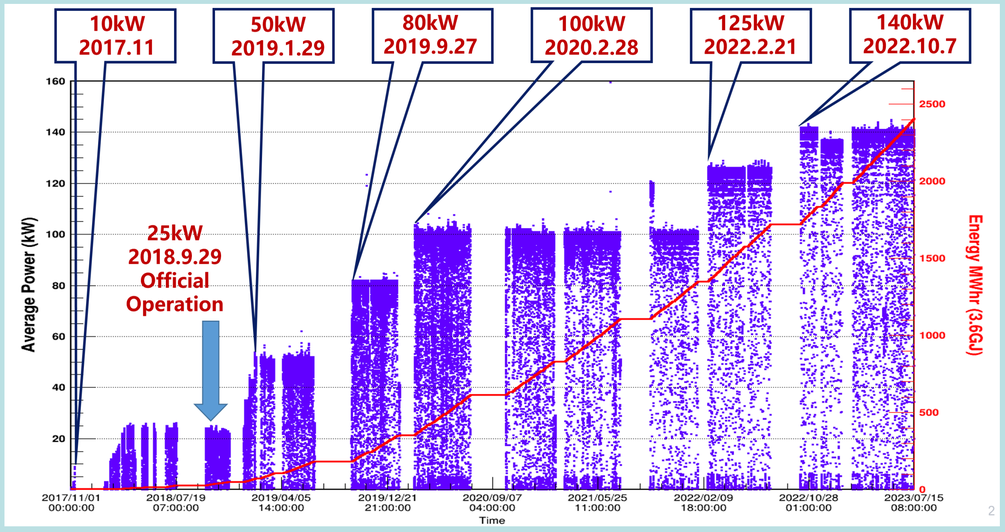
Abstract
China Spallation Neutron Source (CSNS) is a large-scale scientific research facility located in Dongguan, China. It is a pulsed neutron source that uses a proton accelerator to produce neutrons, which are then used to study the structure and properties of materials at the atomic and molecular level. Since its opening, CSNS has steadily improved its operating efficiency and beam power year by year. In particular, during the 2021-2022 operating year, the beam time and beam efficiency reached their highest levels，and was also the advanced level of similar facilities. This poster will present the operation and commissioning of the CSNS accelerator in the past five years since its official opening in 2018.

Introduction
China Spallation Neutron Source (CSNS) is a high intensity accelerator based facility. Its accelerator consists of an H- injector and a proton Rapid Cycling Synchrotron (RCS). The injector includes the front end and linac. The RFQ accelerates the beam to 3MeV, and then the Drift Tube Linac (DTL) accelerates it to 80MeV.

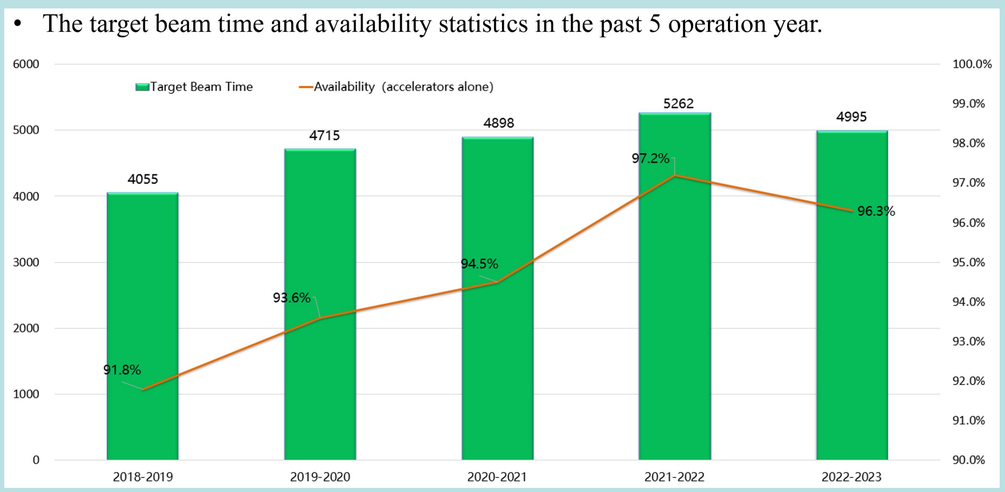


CSNS Accelerator Beam Power History Overview
Since its official opening in 2018, CSNS has gradually increased its beam power and is currently operating at 140 kW. After the maintenance shutdown during this summer, the beam power will be further increased to over 150 kW.

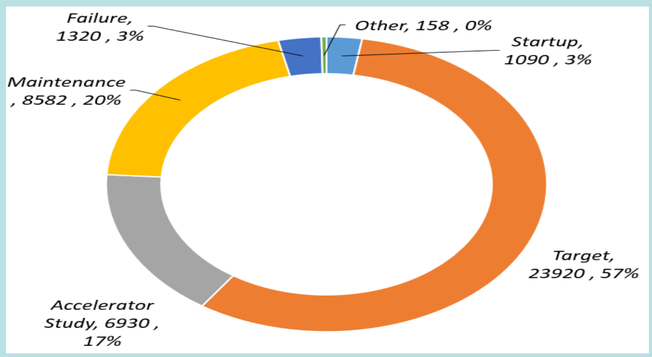


CSNS Accelerator Operation Overview
Since its official opening in 2018, the accelerator's target beam time and availability have been increasing year by year. In the operational year of 2021-2022, it reached its highest values, surpassing other similar international facilities and achieving the best performance level. Despite a slight decrease in beam availability and beam efficiency in the operational year of 2022-2023, the accelerator still maintained a beam availability of over 95% and a beam time of nearly 5000 hours.

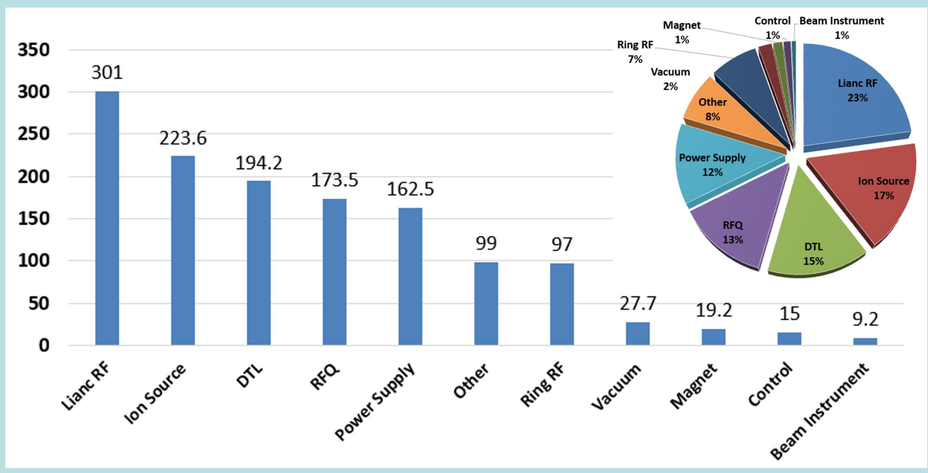
- The target beam time and availability statistics in the past 5 operation year.



CSNS Accelerator Operation Statistics
The overall beam time on target achieved since 2018 was 23920 hours. Knowledge of operating a high intensity proton machine and skills of operators are promoted a lot in the past 5 years.

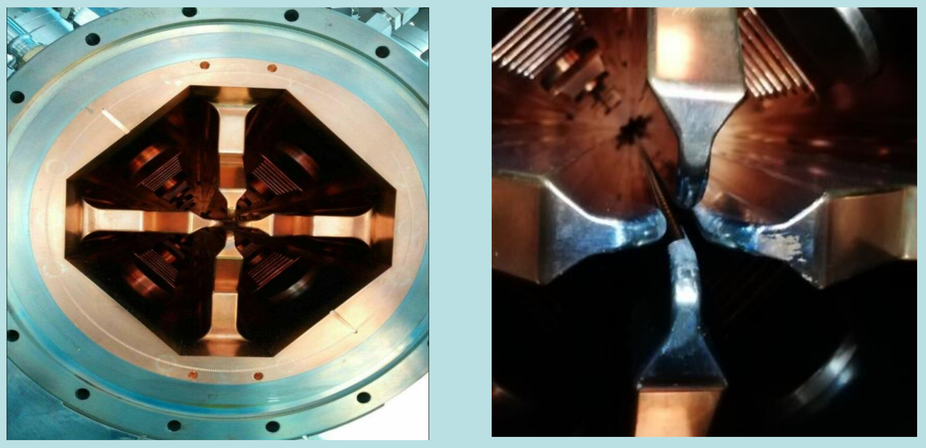


- **Operation statistics in the past 5 years(in hour)**



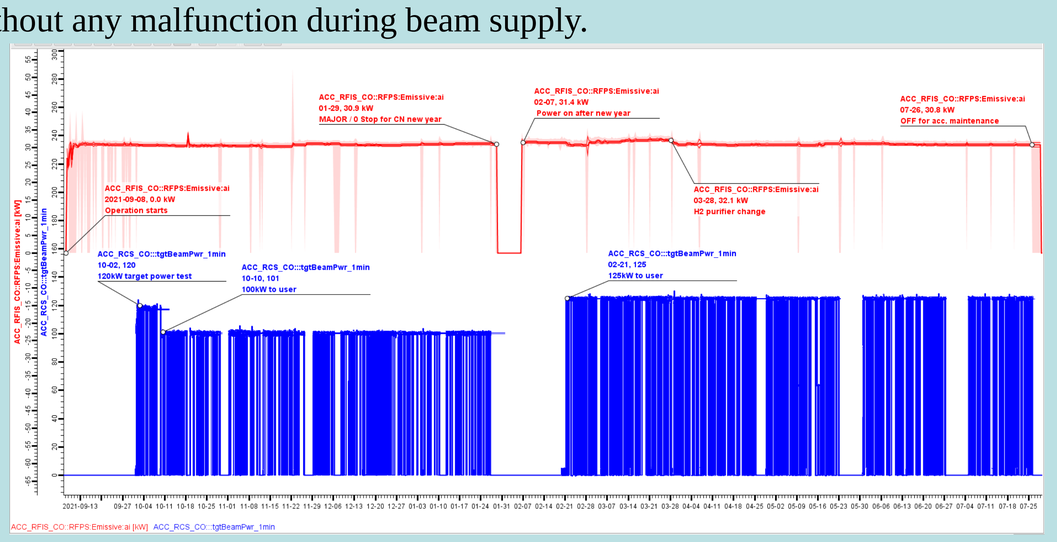
- **Downtime statistics in hours by system during user experiments**

Reliability Assurance and Improvement
The chopped beam lost in the vane of RFQ, is confirmed to be the reason of RFQ spark. By rotating the chopper 45 degrees, most of the chopped beam passed through the slit between to adjacent vanes.



2018.06 open RFQ cavity

By replacing the Penning H- Ion Source with an RF-driven source, the operational stability and lifetime of the ion source have been improved. The newly replaced ion source has operated for two consecutive operational years without any malfunction during beam supply.



~310 days of operation

Summary
CSNS accelerator has gradually increased its beam power after reaching the design power of 100 kW in 2020 and is currently operating at 140 kW. Through continuous improvement and optimization of hardware systems, as well as the enhancement of operational skills by the operators, the beam supply time and availability of the accelerator have been improving year by year, reaching an advanced level among international similar facilities. After the maintenance shutdown this summer, the beam power will be further increased to over 150 kW.

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The 13th WAO2023 International Workshop on Accelerator Operations***, WAO 2023, Tsukuba, Japan. 10-15 September 2023.***