

A new 18 GHz ECR ion source for the single event effects research cyclotron at CIAE

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Abstract:

In order to meet the requirements of ion beam for the single event effect experiment, the ion source needs to supply ion beams of N, Ne, Si, Ar, Fe, Kr, Xe, and so on for the cyclotron. The most effective way to increase the energy of the cyclotron is to increase the charged state, and the Kr ion charge state reaches +22 while the Xe ion charge state reaches +35. A new room-temperature Electron Cyclotron Resonance (ECR) ion source operating at 18 GHz has been developed and assembled at CIAE. This new ECR ion source is based on the Lanzhou Electron Cyclotron Resonance ion source No.5 (LECR5) developed at IMP. The magnetic confinement of the new ECR ion source is realized by the axial mirror field provided by two set of room temperature pancake coils while the radial hexapole field is supplied by a permanent magnet hexapole. A multi-sputter disk injection component was designed for the production of metallic cocktail ion beams. This paper will give the detailed design of this ion source, and some preliminary highly charged ion beam production results will also be presented.

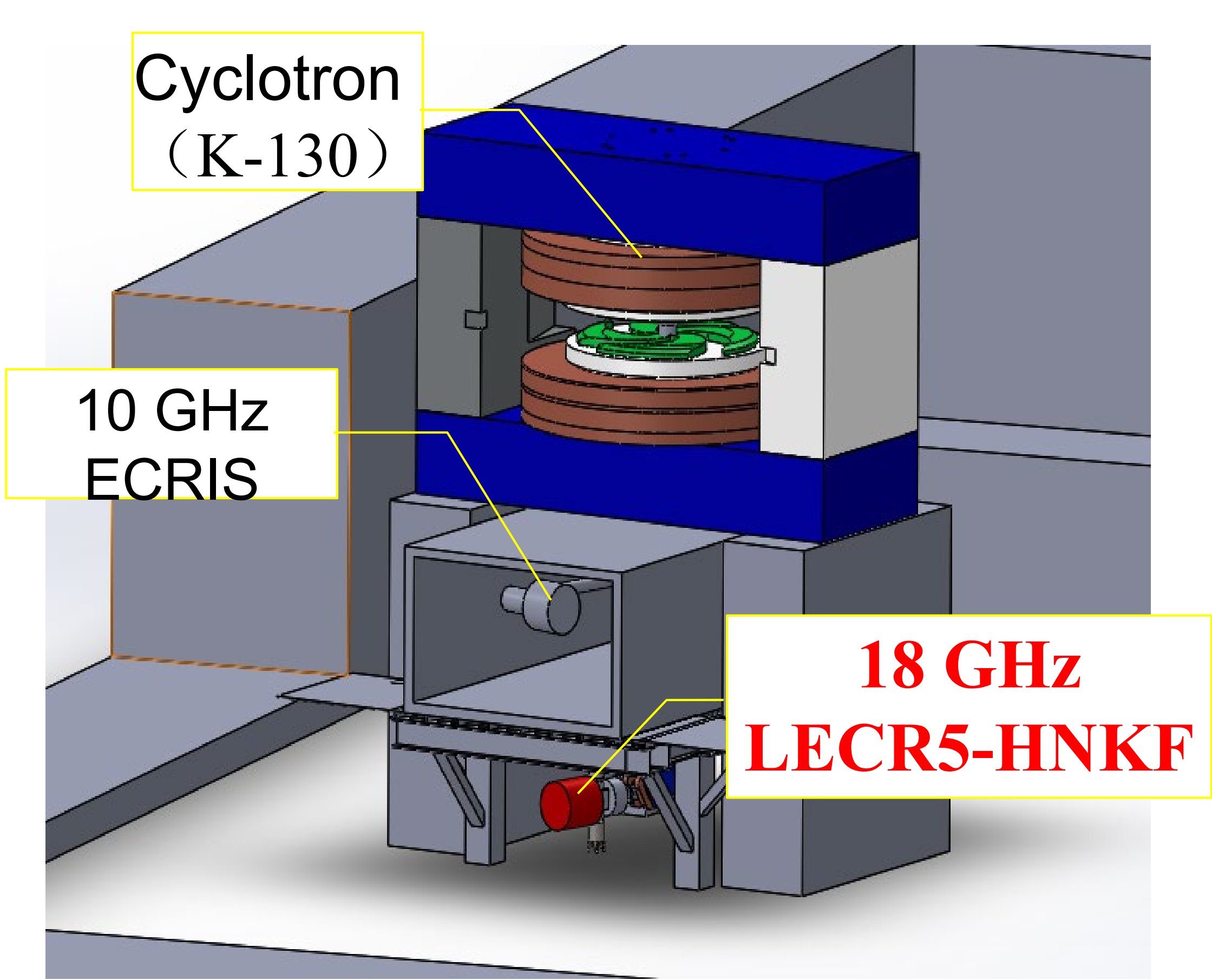
Introduction

Beam Requirements of Ion source

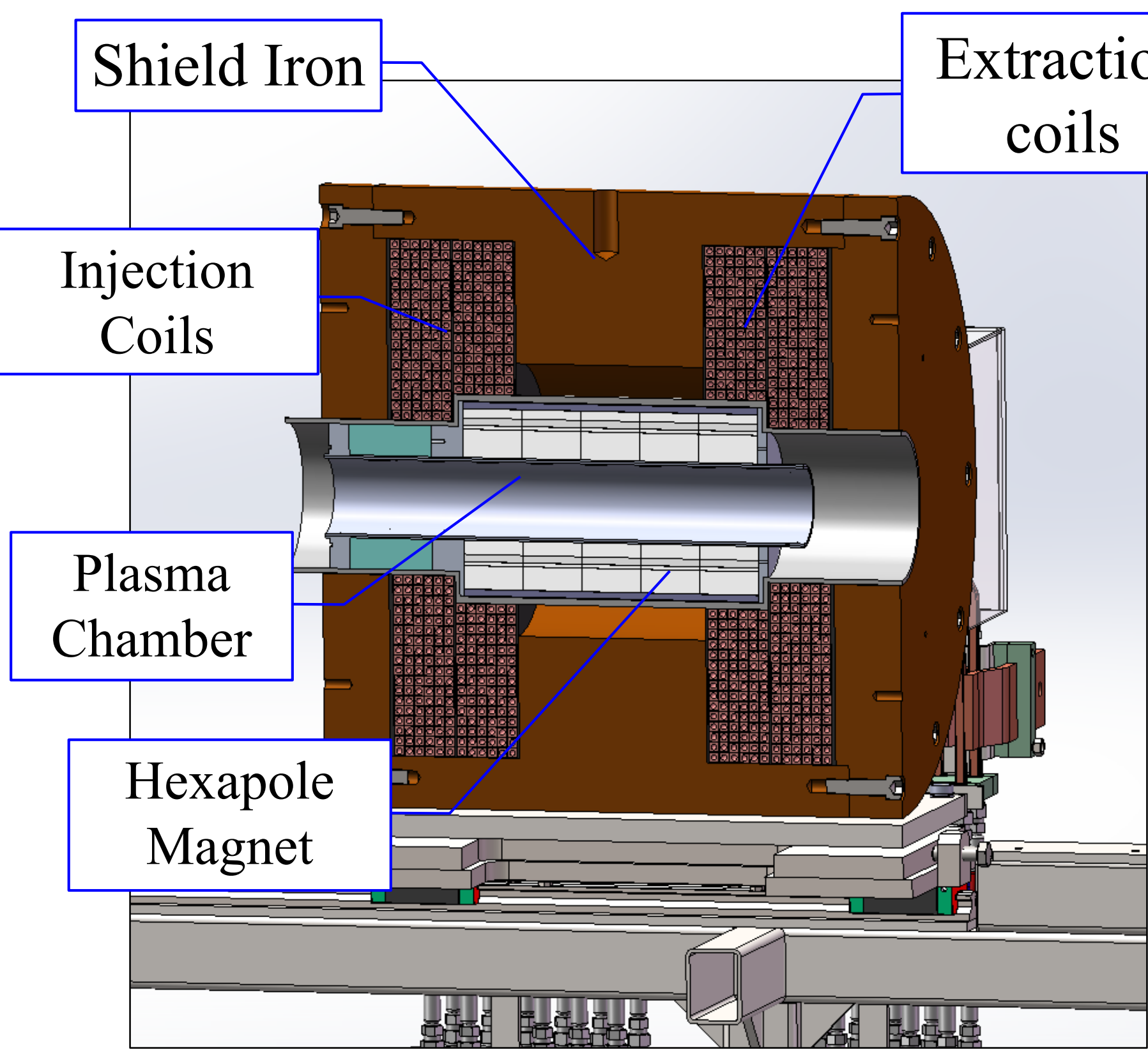
Ions	Intensity (eμA)	RMS
¹⁵ N ⁴⁺	≥10	≤100 π.mm.mrad (95%)
²⁰ Ne ⁶⁺	≥10	
³⁰ Si ⁸⁺	≥10	
⁴⁰ Ar ¹²⁺	≥10	
⁵⁶ Fe ¹⁵⁺	≥5	
⁸² Kr ²²⁺	≥5	
¹³¹ Xe ³⁵⁺	≥1	

Design Parameters of LECR5

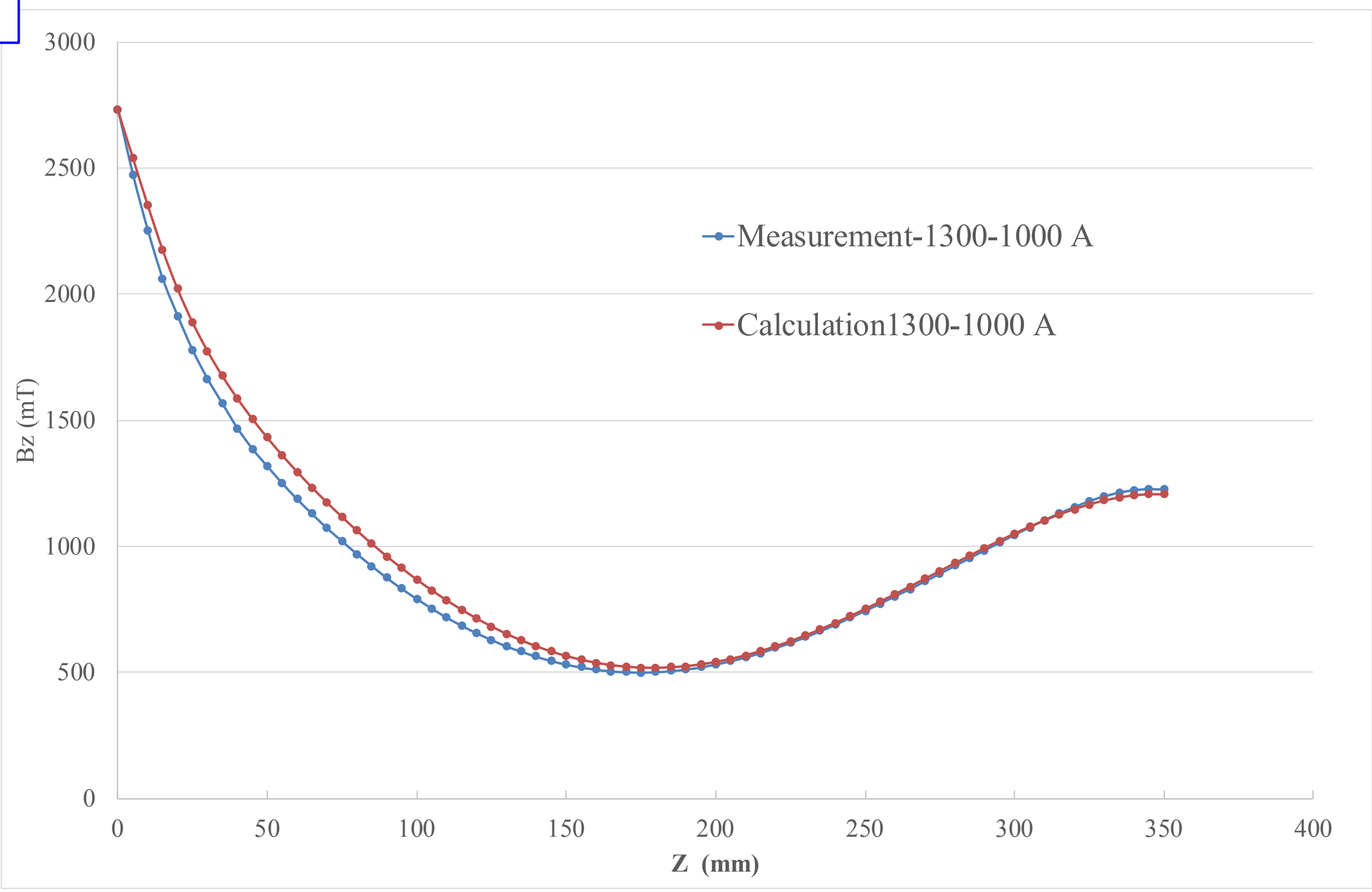
	LECR5 SESRI	LECR5 CAFE	LECR5 HNKF
f (GHz)	18	18	18
Bz (T)	2.6/1.4	2.6/1.4	2.6/1.4
ML (mm)	340	340	340
PC ID (mm)	80	80	80
Br (T)	1.2	1.2	1.2
Axial Magnet	3 Coils	3 Coils	2 Coils
Radial Magnet	PM	PM	PM



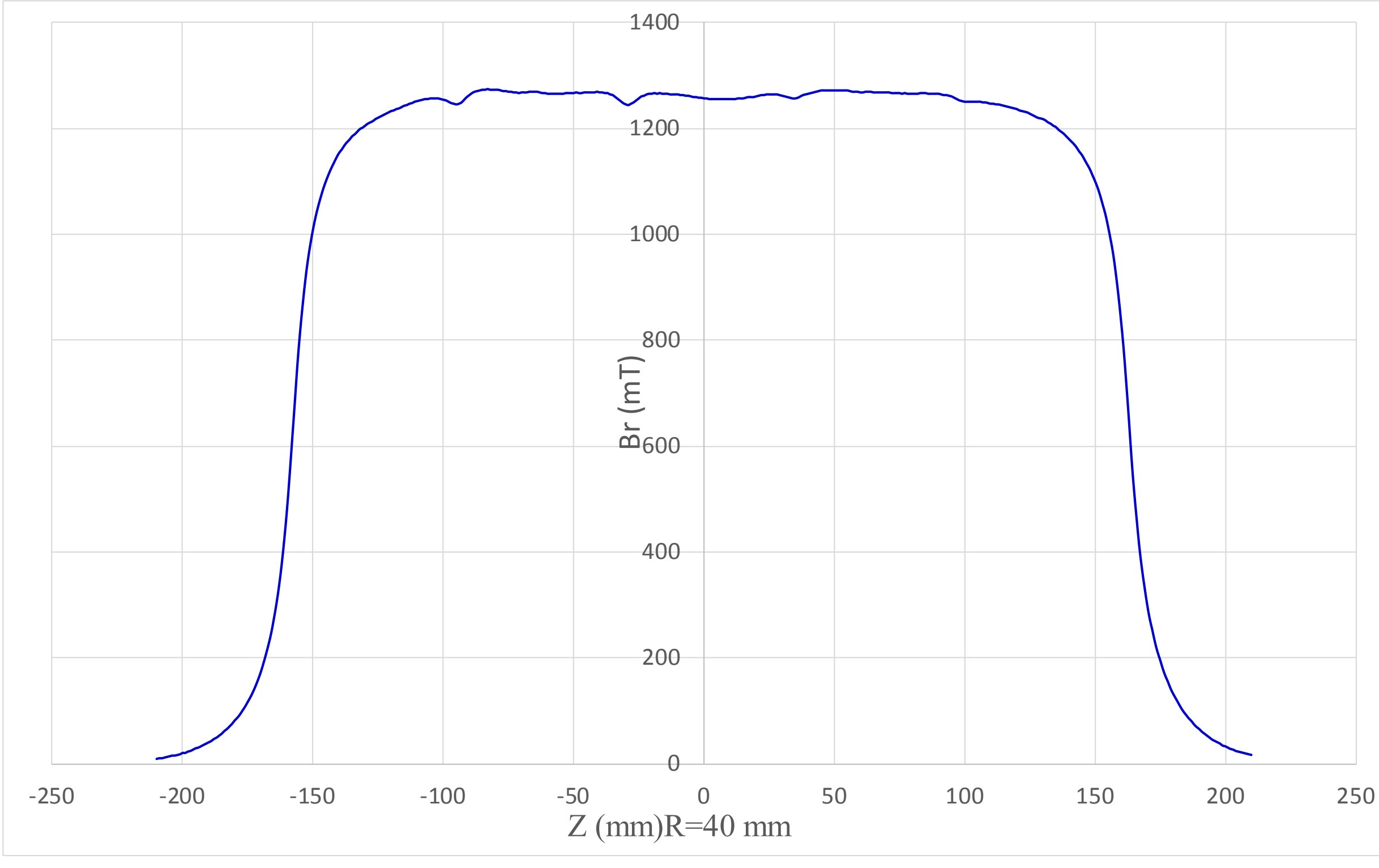
Magnetic Field Measurement



Axial Magnetic field

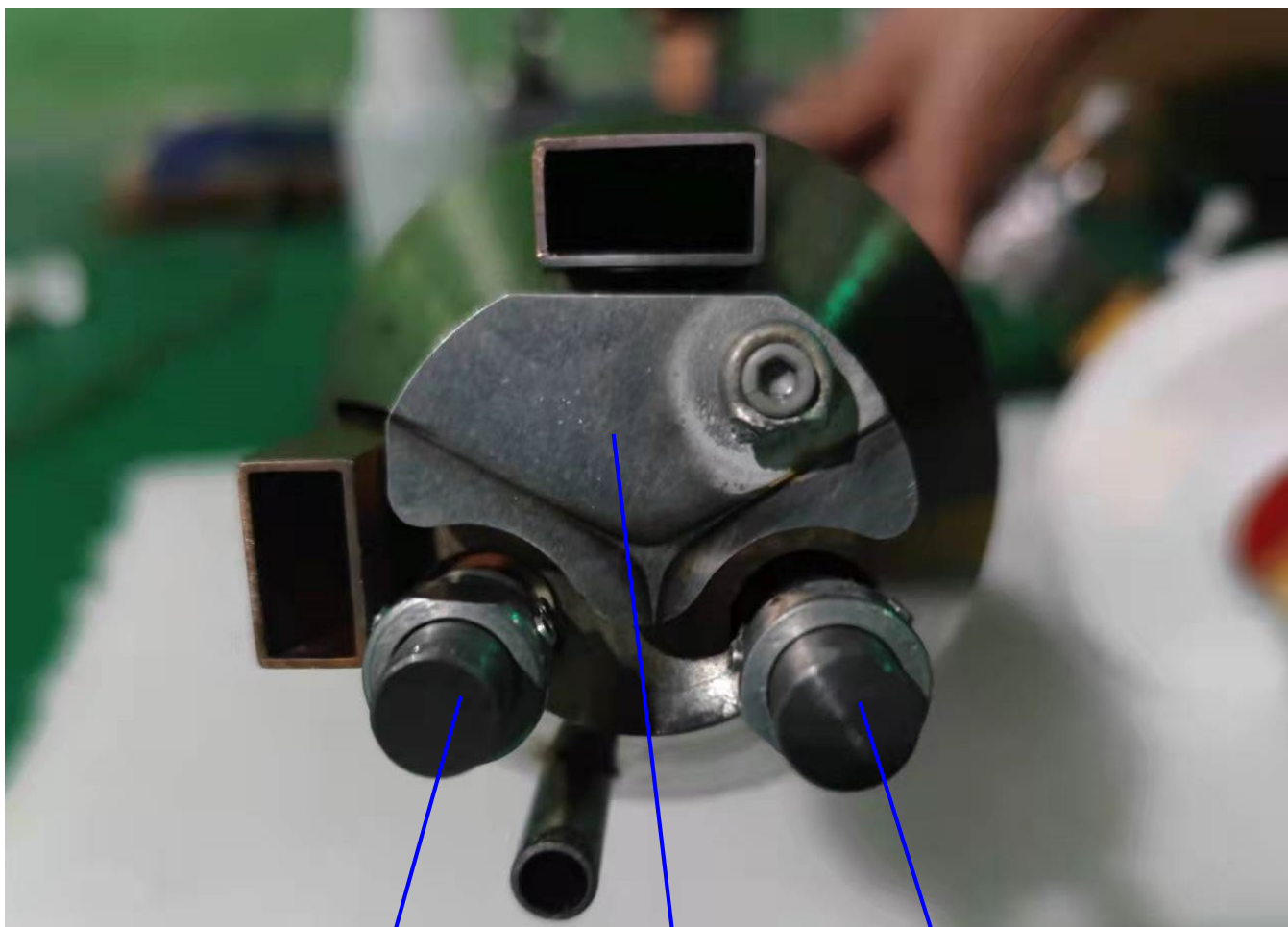


Radial Magnetic field



Project Development and Results

Injection Component



Sputter target 1

Bias Disk

Sputter target 2

Installation of Ion source, Solenoid, Dipole

