# アカデミックプラン

# NIFS-EBITを用いた多価イオン研究

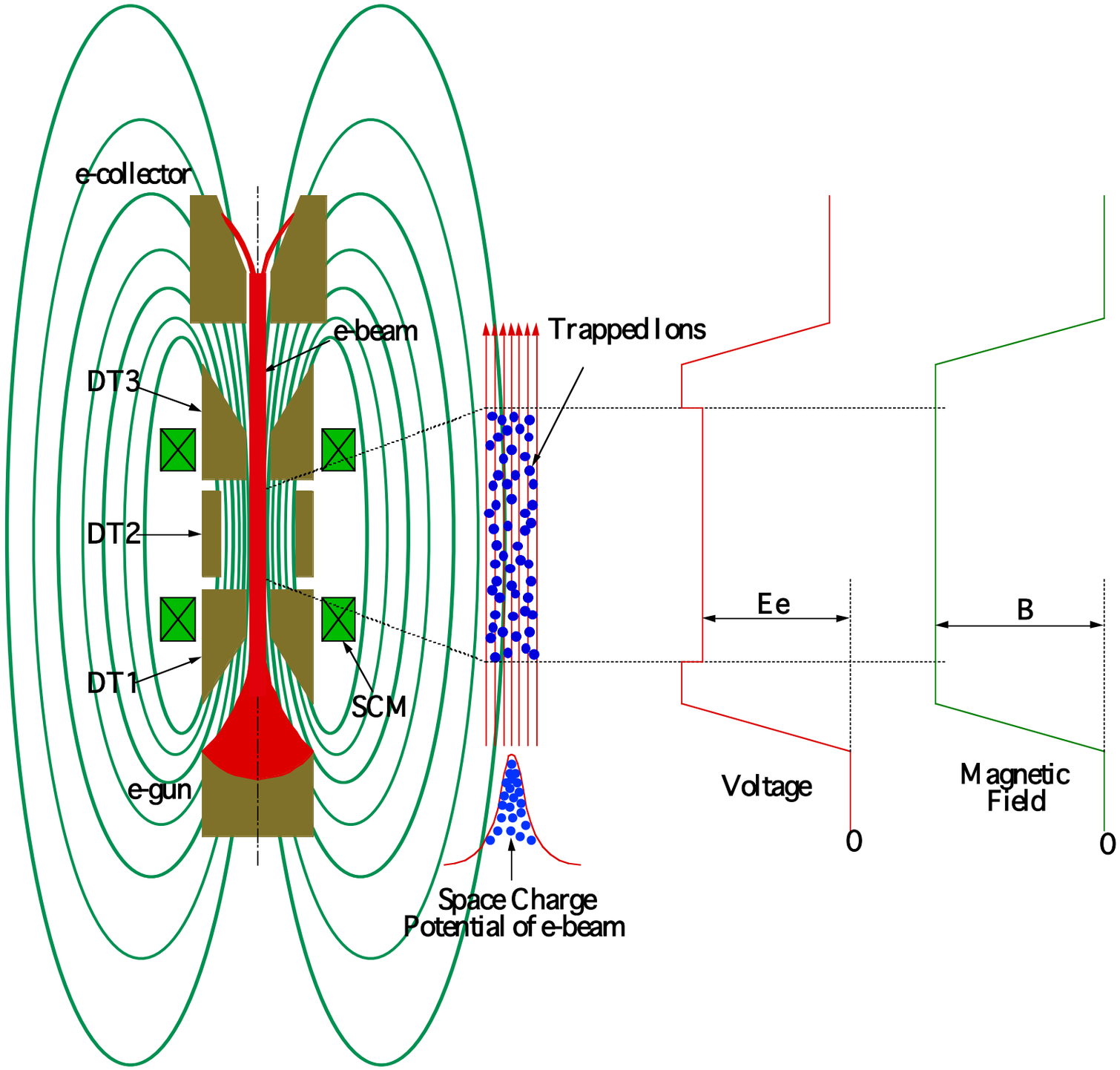
## 無冷媒方式高温超伝導EBITの開発

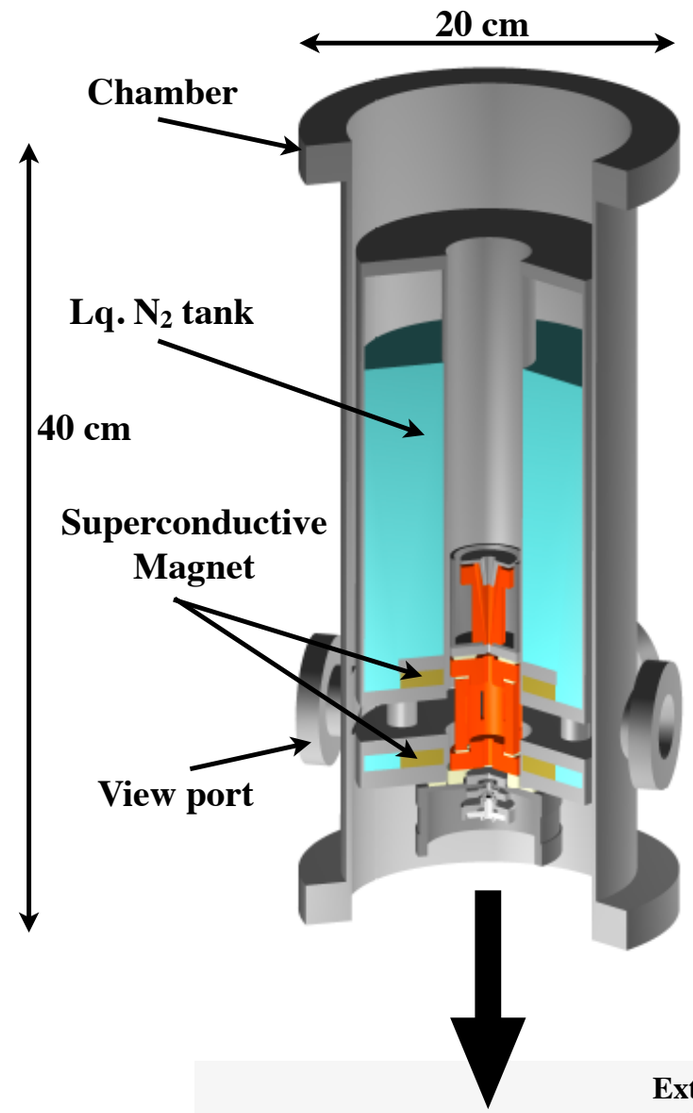
## Development of an EBIT using a cryogen-free HTS split magnet

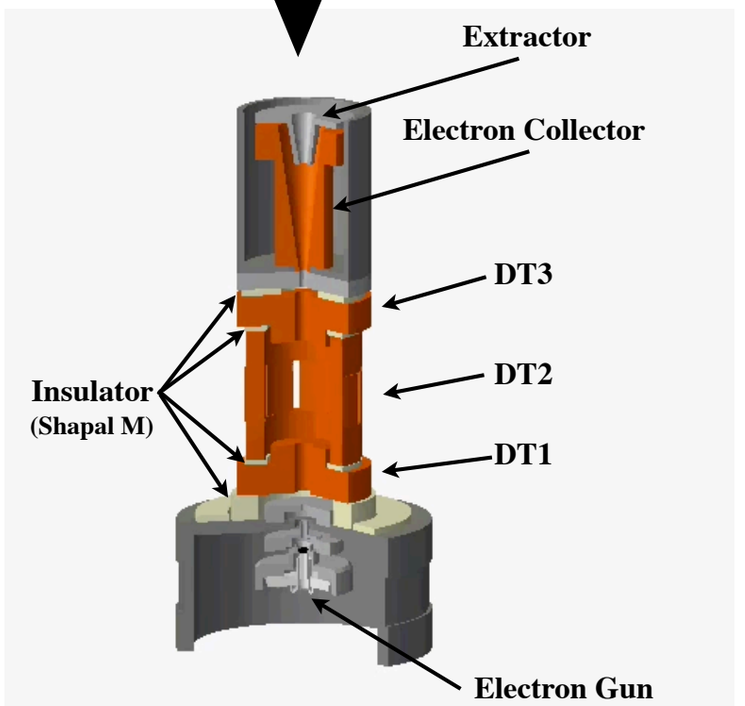
プラズマ量子プロセスユニット
坂上裕之

2024.05.08

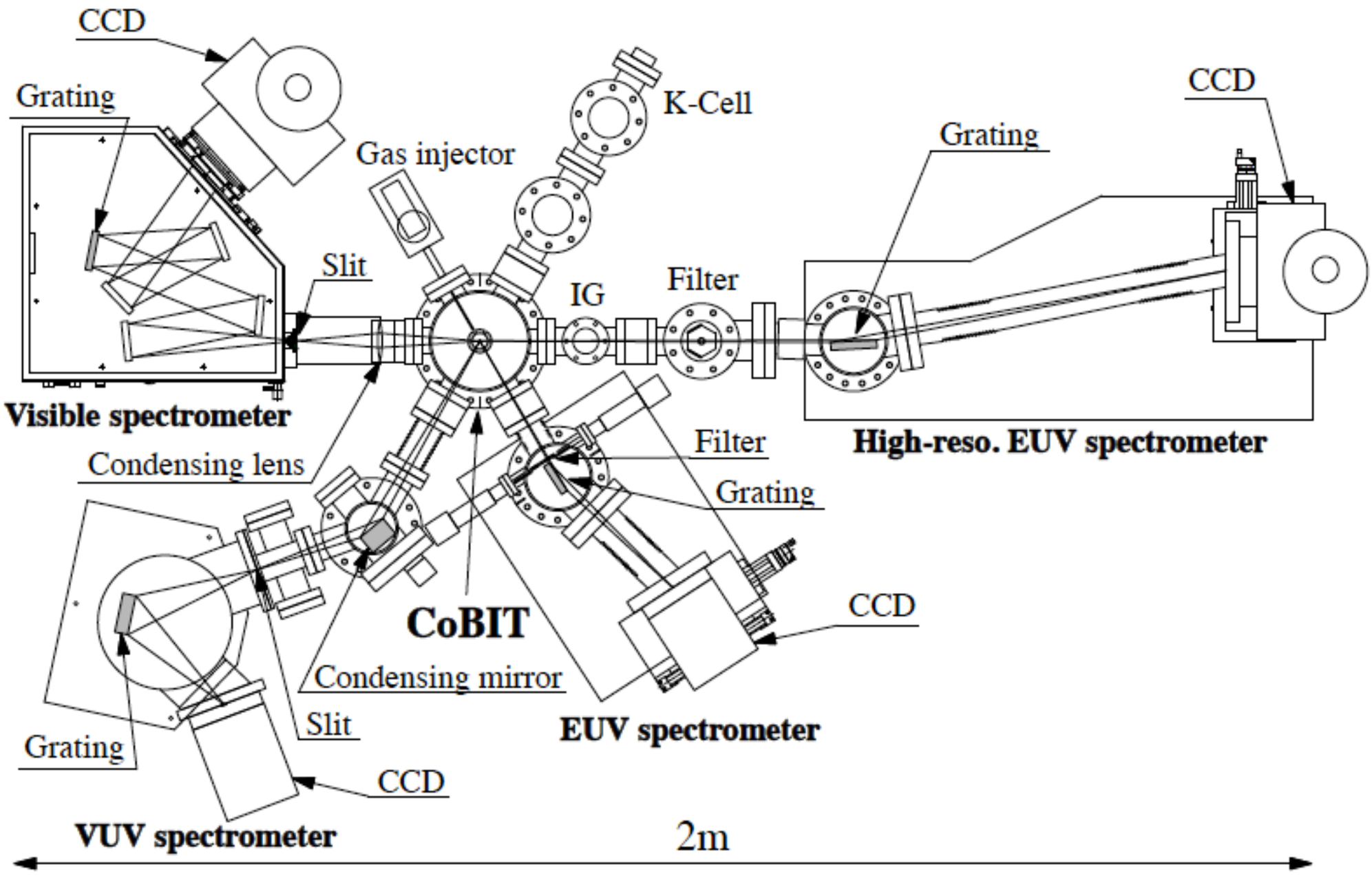
# 電子ビームイオントラップ
# Electron Beam Ion Trap (CoBIT)



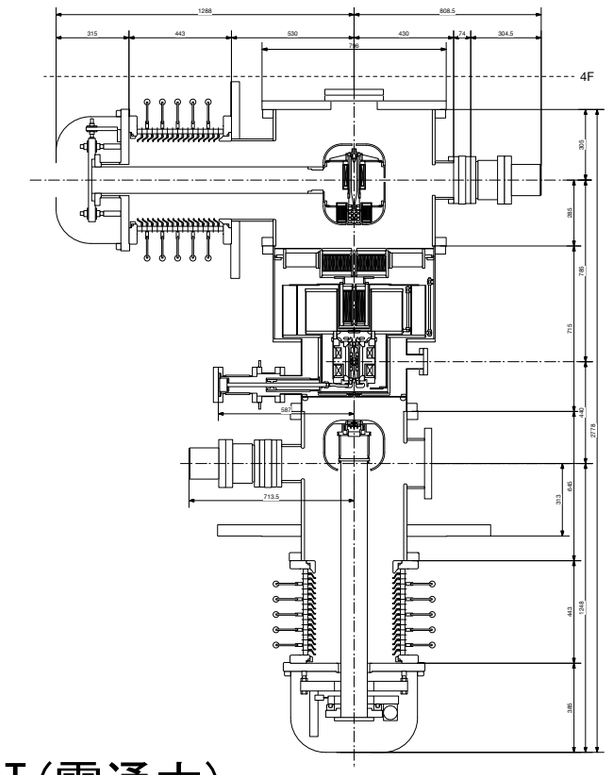



# NIFS Compact EBIT(CoBIT)

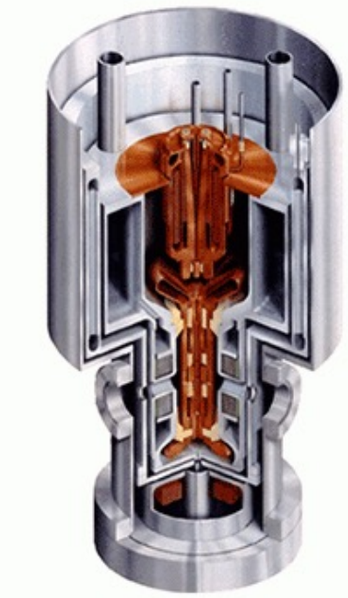


# 世界のEBIT


Compact-EBIT（NIFS）
Ee<2keV, Ie=20mA

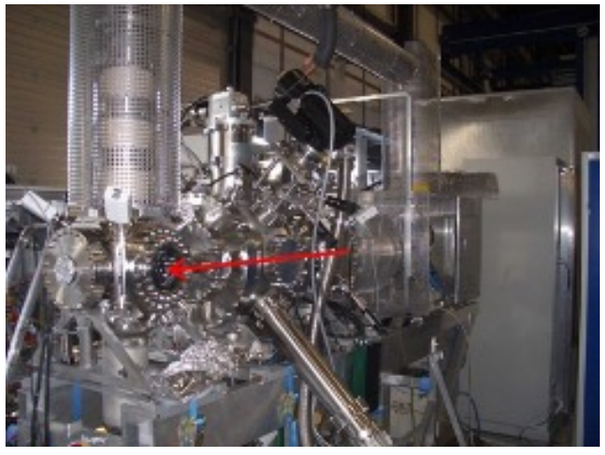



Tokyo-EBIT(電通大)
Ee<200keV Ie=300mA

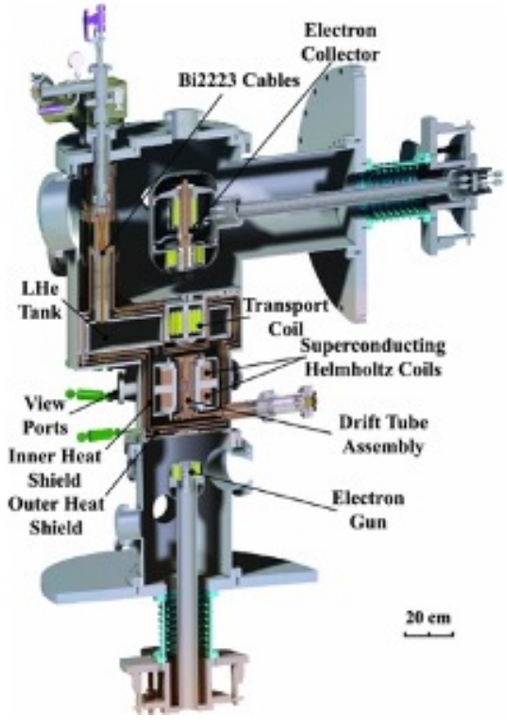


Livermore-EIBT(米国)
Ee<200keV Ie=300mA

NIST-EBIT(米国)
Ee<33keV, Ie=150mA



Max Planck-EBIT(EU)
Ee<200keV Ie=550mA



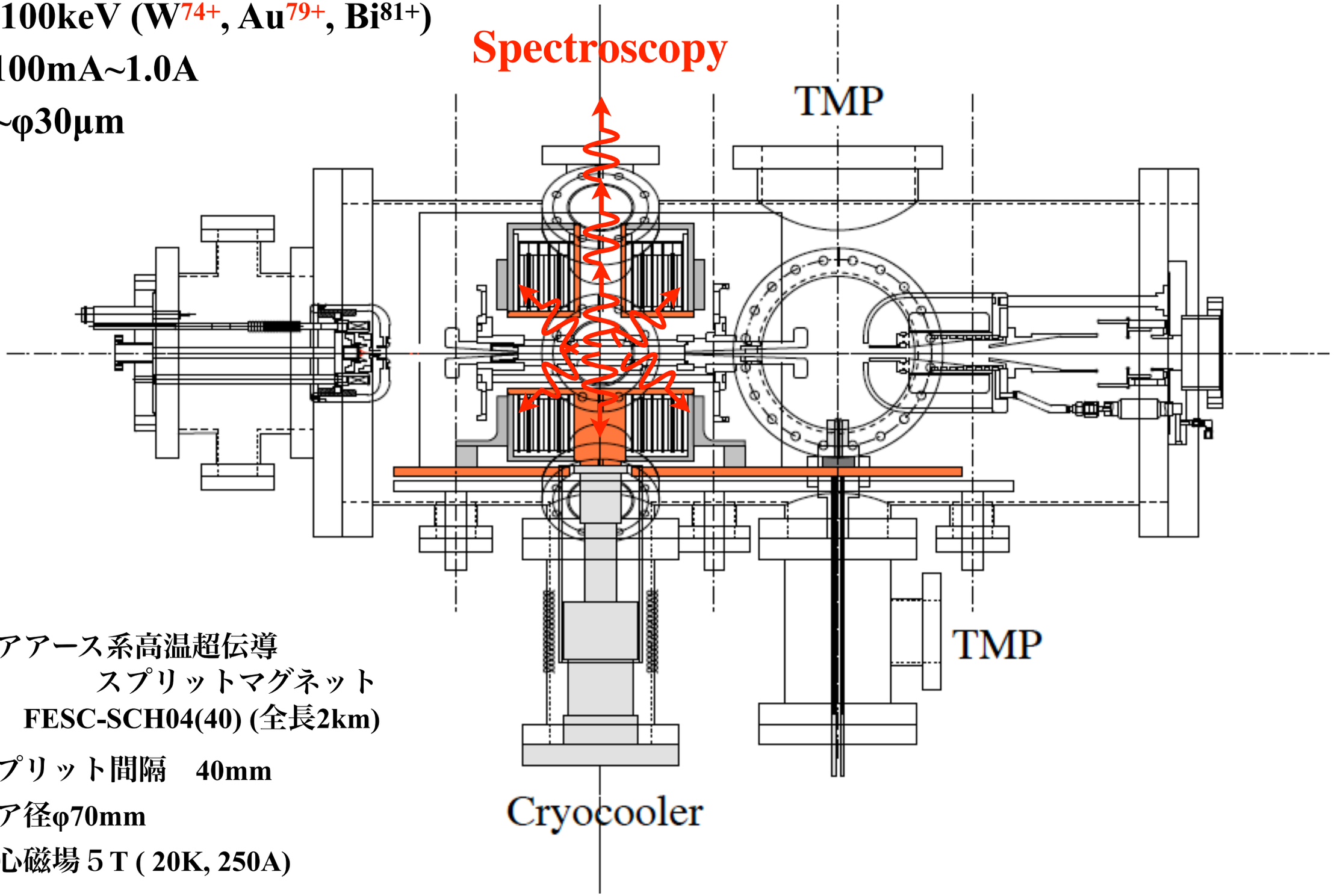

上海-EBIT(中国)
Ee<150keV, Ie=200mA

# New type EBIT using a cryogen-free HTS split magnet

$E_e$=100keV ($W^{74+}$, $Au^{79+}$, $Bi^{81+}$)

$I_e$=100mA~1.0A

$r_e$=~φ30μm




・レアアース系高温超伝導
スプリットマグネット
FESC-SCH04(40) (全長2km)

・スプリット間隔　40mm

・ボア径φ70mm

・中心磁場５T ( 20K, 250A)

# New type EBIT

Cryogen-free HTS split magnet

Penning trap

5 T

To Collector

B

Hollow Cathode

E

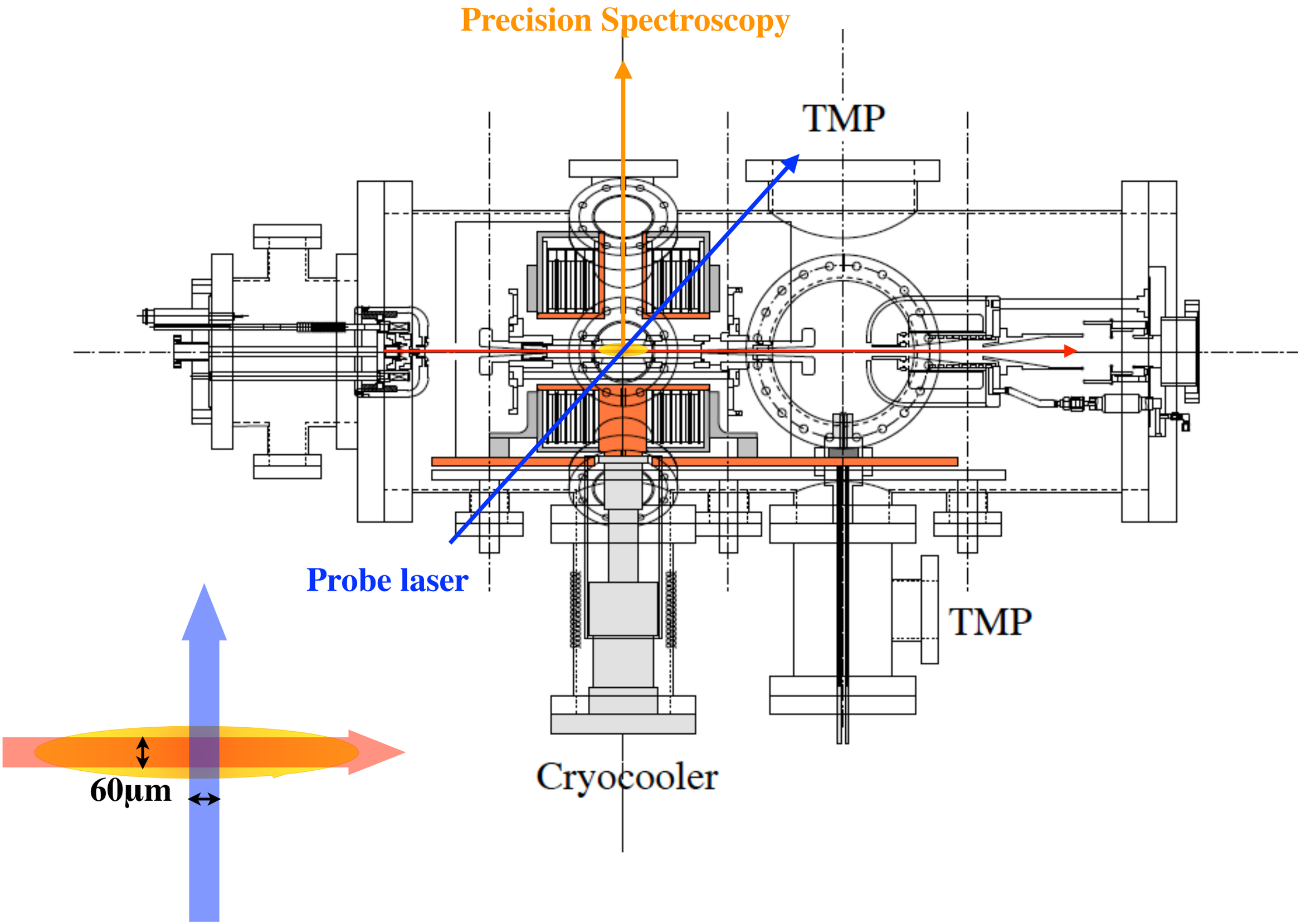
Probe laser

$C^{6+}$

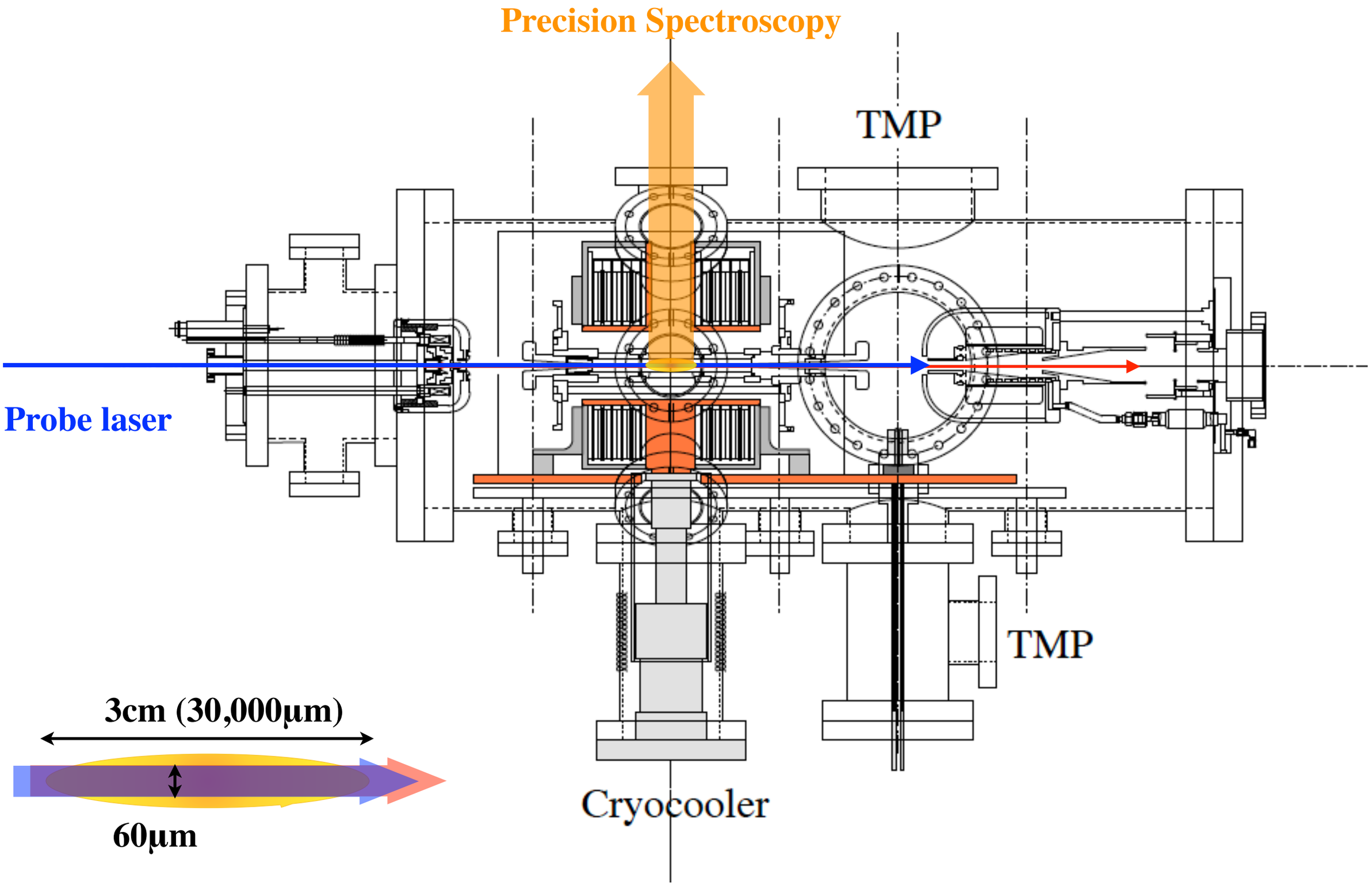
HCI Plasma

HCI's are linearly trapped

# Standard EBIT



# New type EBIT



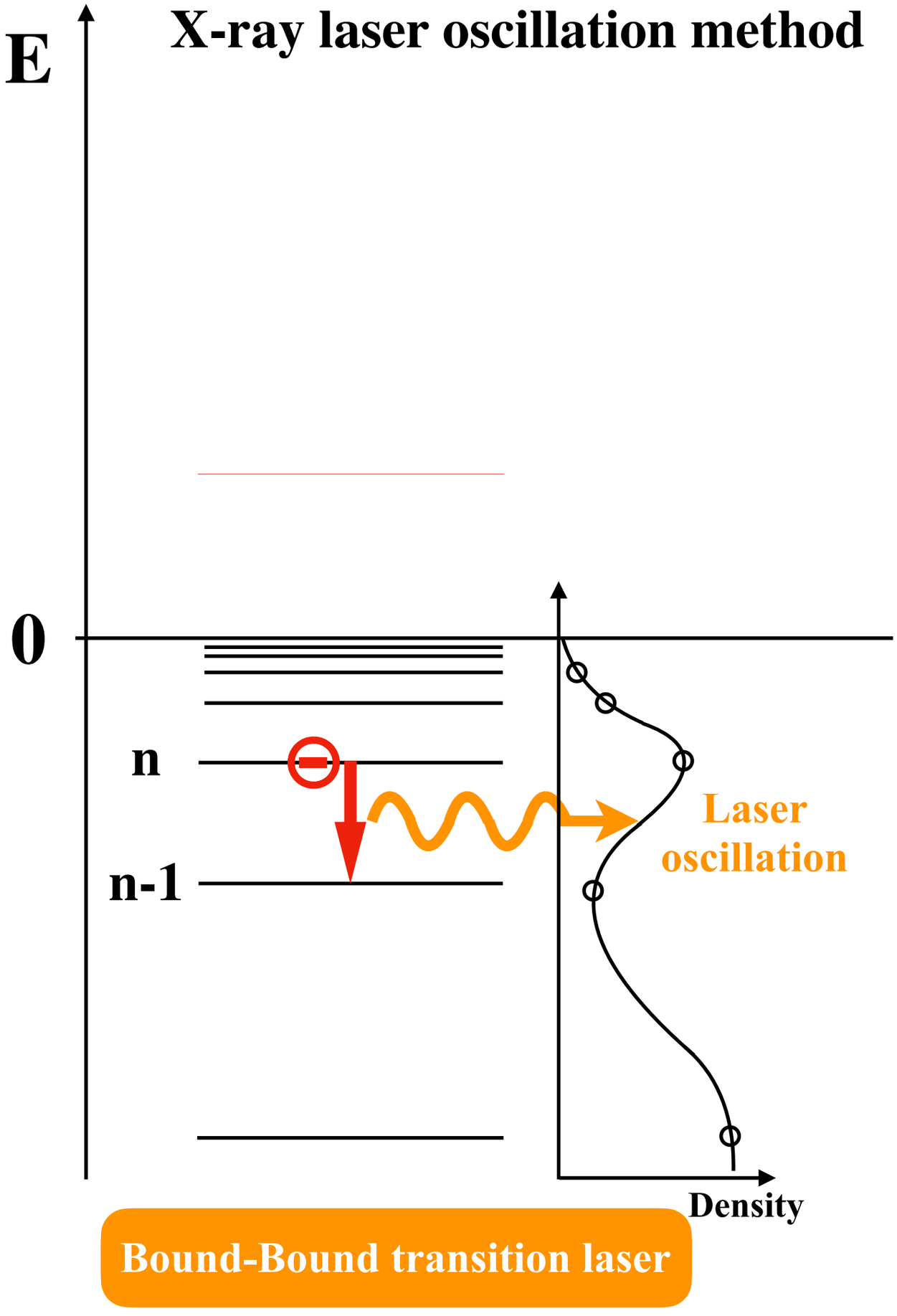
# 番外編

Extra edition

# 第三のレーザー発振方法

# The third laser oscillation method

# X-ray laser oscillation method



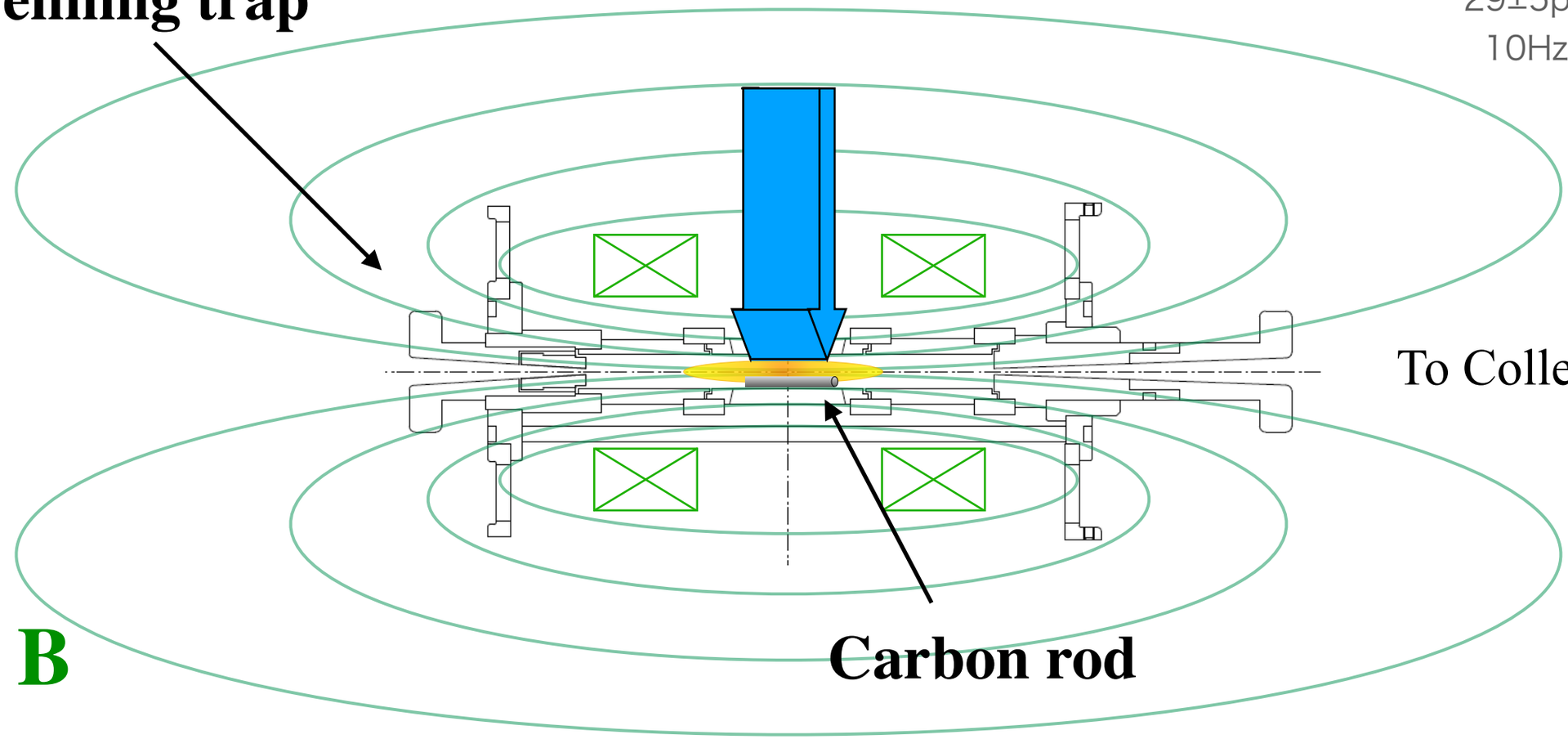

**Bound-Bound transition laser**

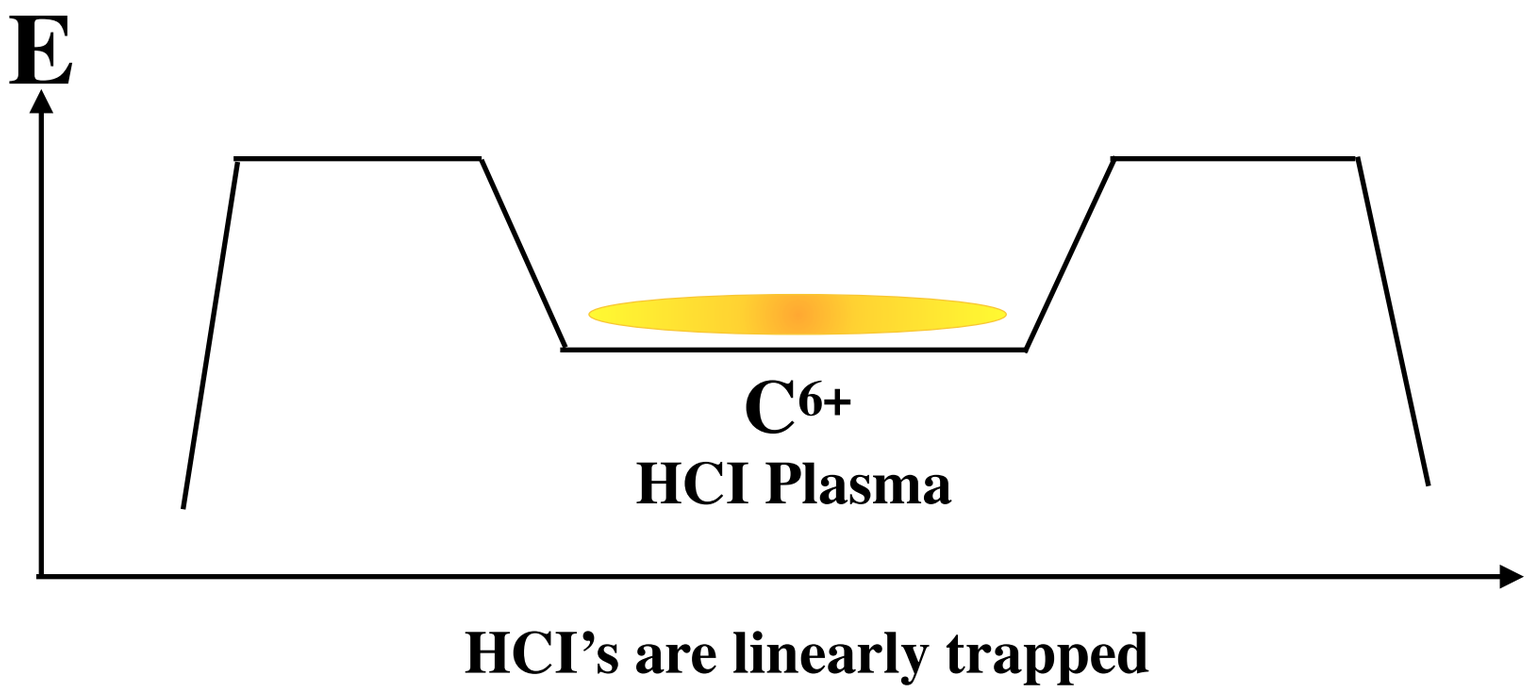
# New type EBIT

Nd:YAG LASER
EPL-PL2251C
100mJ at1064nm
29±5ps
10Hz

**Picosecond Laser**

**Penning trap**




**HCI's are linearly trapped**

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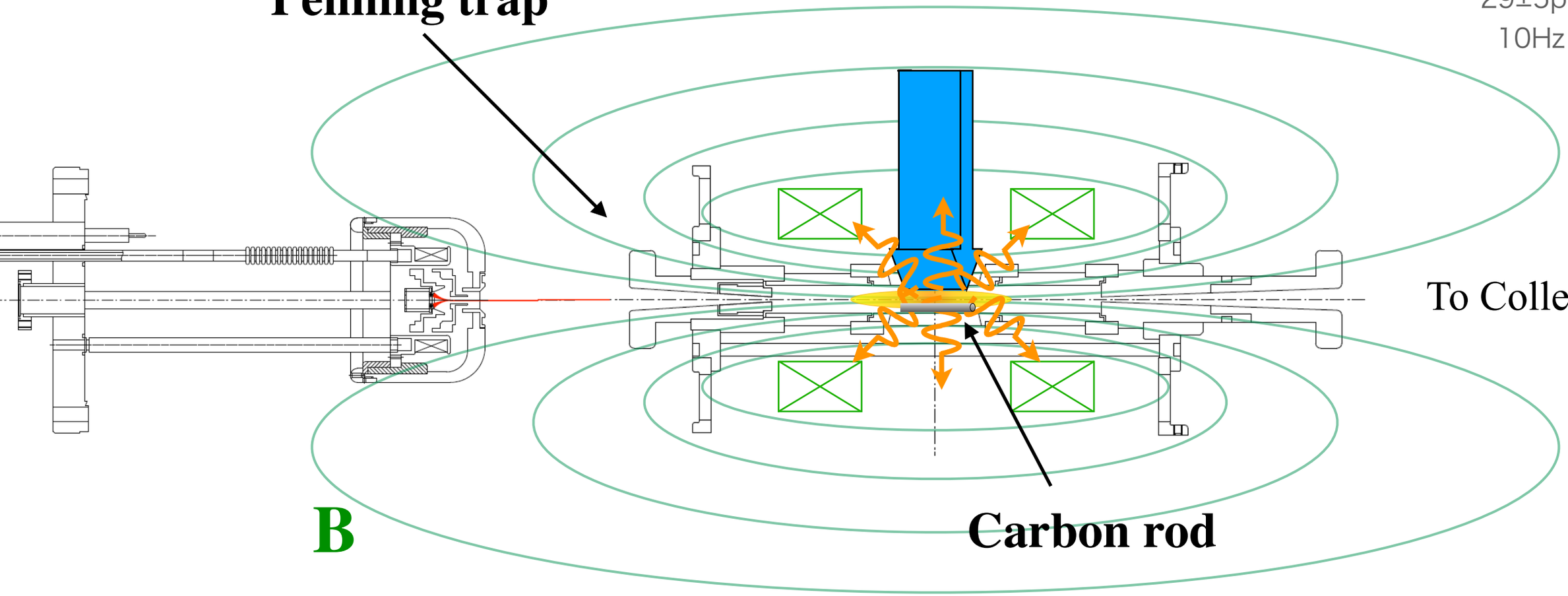
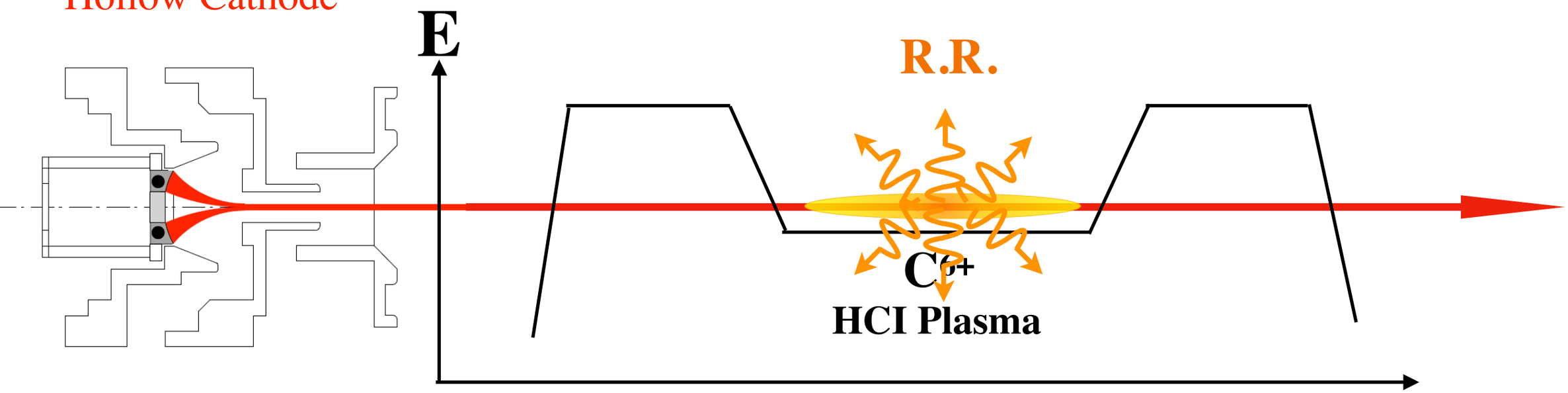


To Collector

**Carbon rod**

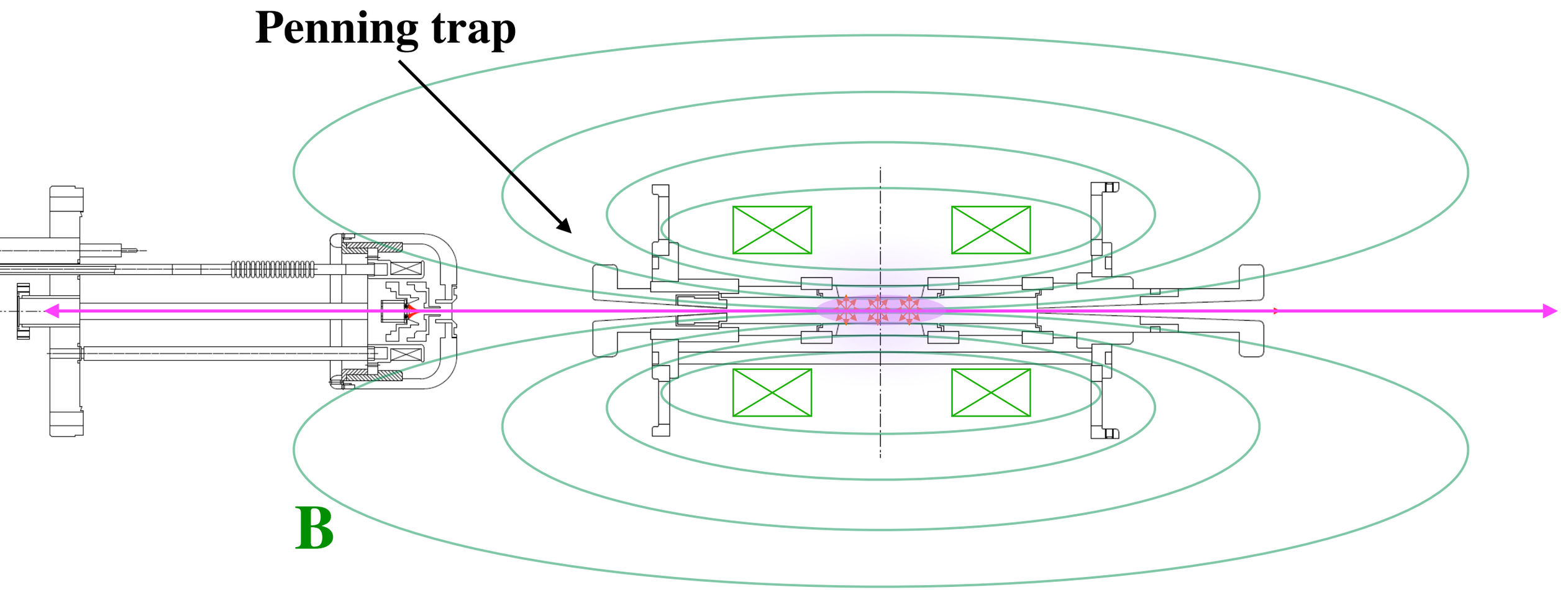
**B**

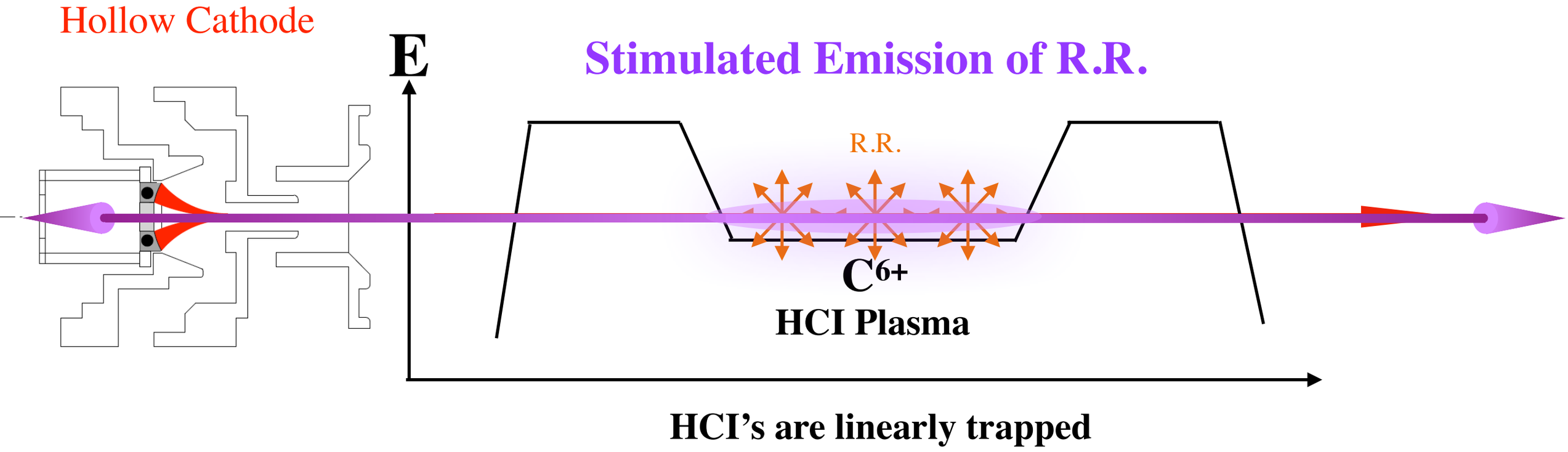
Hollow Cathode




**HCI's are linearly trapped**

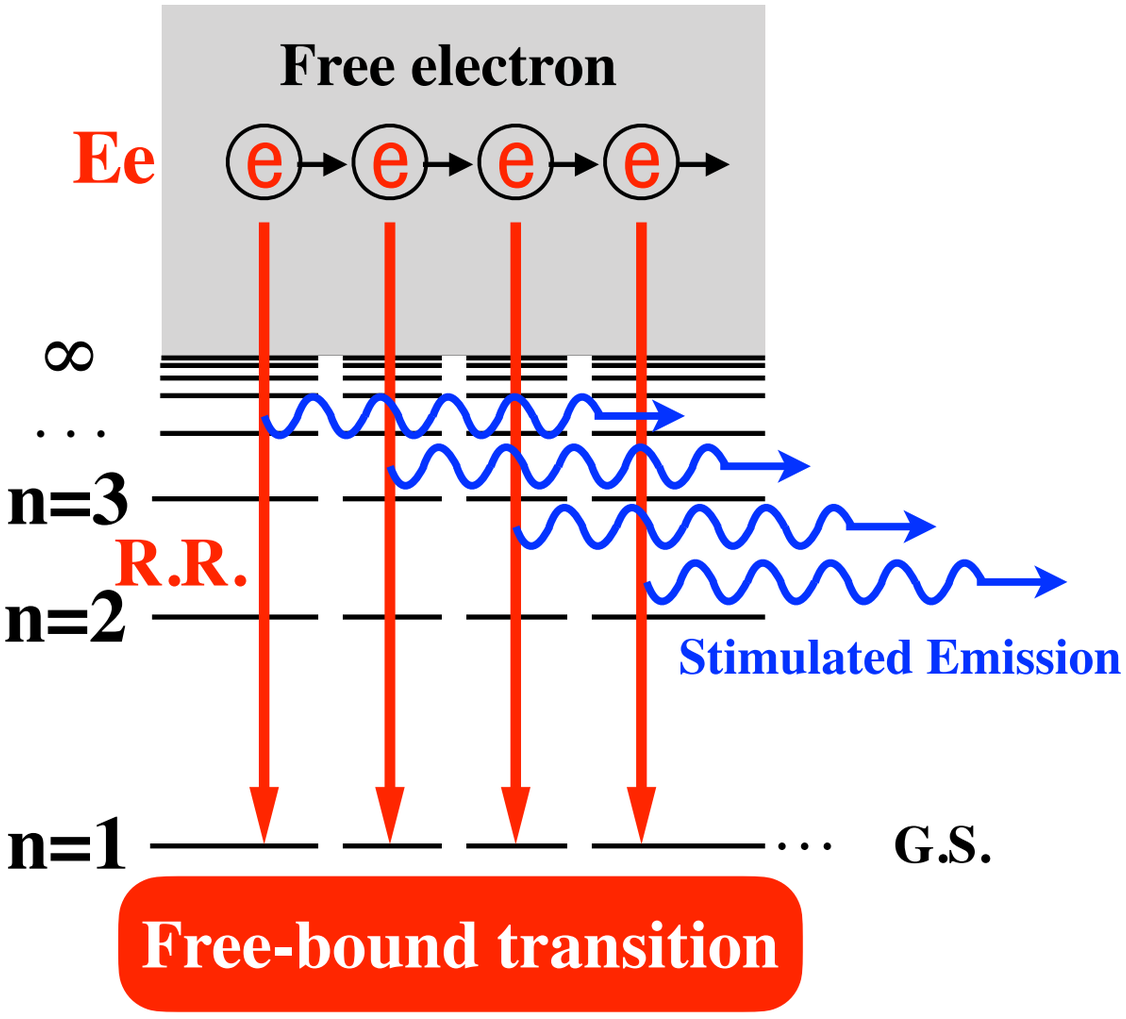
# New type EBIT

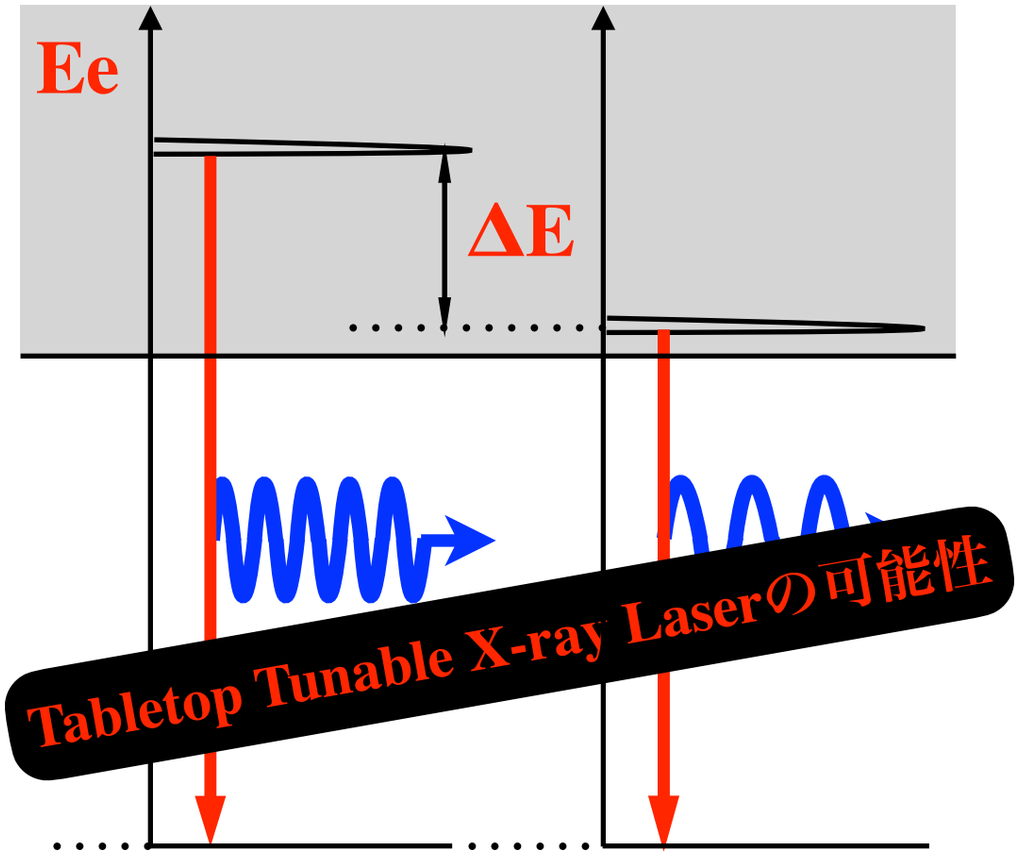


# 自由・束縛誘導遷移の誘導放射

## Free-bound Stimulated Emission



# New type EBIT

## Tabletop Tunable X-ray Laserの原理実証