

# Units for HIE-ISOLDE 2016

RIB intensity and purity:

$$I = \Phi \sigma N \varepsilon_{\text{release}} \varepsilon_{\text{ion}}$$

Cross  
section

Release  
Efficiency

Ionization  
Efficiency

Proton beam  
Intensity

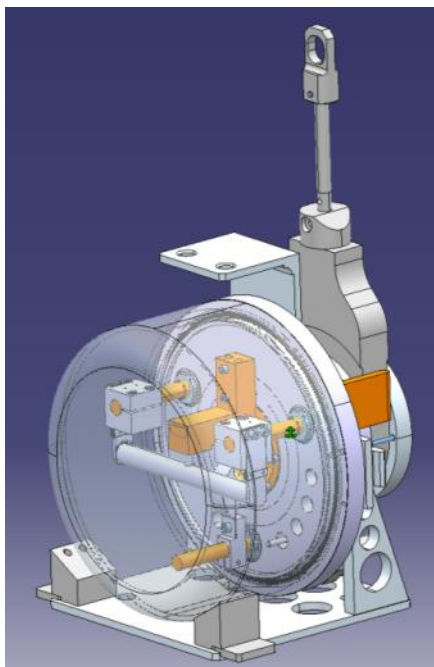
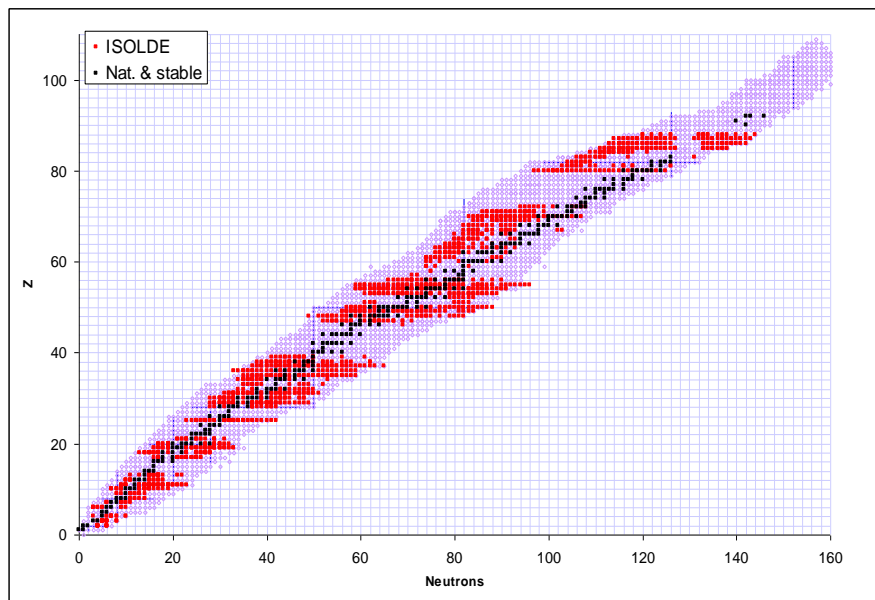
Target  
thickness

Material  
(nanostructured  
Targets, molten salts)

Chemistry  
(adsorption enthalpy,  
molecule formation)

Ion sources  
(cathod, plasma, ...)

Targetry  
(secondary reactions)



# Units for HIE-ISOLDE 2016

Information received from Karl :

Foreseen beams :

$^{142}\text{Xe}$ ;  $^{132}\text{Sn}$ ;  $^{108}\text{Sn}$ ;  $^{80}\text{Zn}$ ;  $^{70}\text{Se}$ ;  $^{66}\text{Ni}$ ;  $^{59}\text{Cu}$ ;  $^9\text{Li}$ ;

Preliminary schedule :

The same as the list but only one difference  $^{65}\text{Ni}$  instead of  $^{66}\text{Ni}$  :  
this would not change the required target unit

# Units for HIE-ISOLDE 2016

## $^{142}\text{Xe}$

$^{142}\text{Xe}$  : Already done at REX (in 2005;  $^{138}$ ,  $^{140}$ ,  $^{144}\text{Xe}$  done since)

UCx target + VD7 ion source (FEBIAD+cold line) ;

Since 2015, we have a new batch of  $\text{UO}_2$ , seems to perform well, stable yields over time.

# Units for HIE-ISOLDE 2016

## $^{132}\text{Sn}$

$^{132}\text{Sn}$ ; UCx+Ta cavity+RILIS in schedule;

Yields in DB :  $3^{\text{e}8}/\mu\text{C}$  on target

High risk of stable  $^{132}\text{Ba}$  + radiogenic  $^{132}\text{Cs}$  (T1/2 6.5days) in the beam:

We should test the level of contaminant on another unit beforehand,

Or change the unit into Ucx+VD5 (FEBIAD) +  $^{34}\text{S}$  mass marker to form SnS+  
and molecular break up in REX-EBIS

# Units for HIE-ISOLDE 2016

## 108Sn

108Sn; LaCx + Ta hot cavity + RILIS

Already operated at REX;  
108In impurity (40% in last REX run ) :

suppression on 108In impurity,  
by proton pulse sequence, tuning target and ion source temperature  
Eventually at the expense of some Sn yield.

# Units for HIE-ISOLDE 2016

## 80Zn

80Zn;

Unit UC549-Ta cavity + neutron converter + RILIS

operated in 2015 in a conservative way : target and line 1950/1950deg C

74Zn – 1.1E8 /uC (from peak of FCup measurement – some error is present),

Laser on/off beta activity ratio: 81

76Zn - 2.1E7 /uC (release curve in attachment), Laser on/off beta activity ratio: 71

78Zn – 4.6E6 /uC (release curve in attachment), Laser on/off beta activity ratio: 50

80Zn – 1.2E3 /uC (lower estimate from laser on/off signal),

Laser on/off beta activity ratio: 1.2

# Units for HIE-ISOLDE 2016

## 70Se

70Se;

produced from ZrO<sub>2</sub> felt target + VD5; produced as 70SeCO<sup>+</sup> molecular ion  
And break-up in REX Trap+EBIS;  
Expected 3<sup>e</sup>5/uC (done in 2005)  
measured at 3e4/muC this year from ZrO551 with Se:SeCO 10:1  
(1:1 or better is expected)

# Units for HIE-ISOLDE 2016: 66Ni

66Ni;

Produced from Ucx-Ta cavity – neutron converter – RILIS

Was done proton on target UC418 in 2009; 66Ni ok, 13% 68Ni and rest was 68Ga

Use n-converter to suppress 66Ga contaminant or beam on/off on target since large T1/2 difference between 66Ga and 66Ni



# Units for HIE-ISOLDE 2016

## $^{59}\text{Cu}$

$^{59}\text{Cu}$ ;

Produced from  $\text{ZrO}_2$  felts or Nb target + Ta cavity + RILIS

In DB  $1.5\text{-}7\text{e}6/\text{uC}$  from Isolde

# Units for HIE-ISOLDE 2016

## 9Li

9Li; highly produced from Ta target-W surface ion source :  $1.7e7/uC$

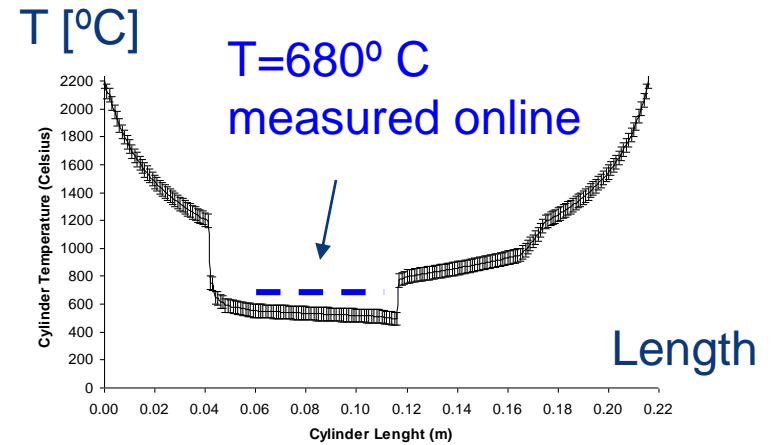
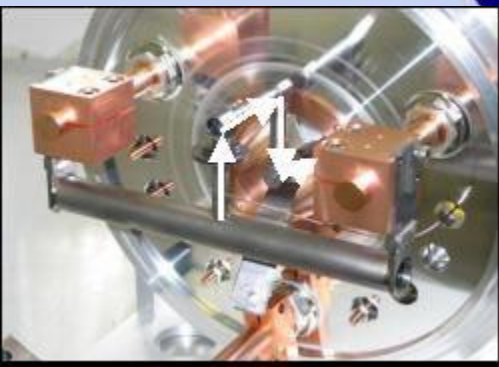
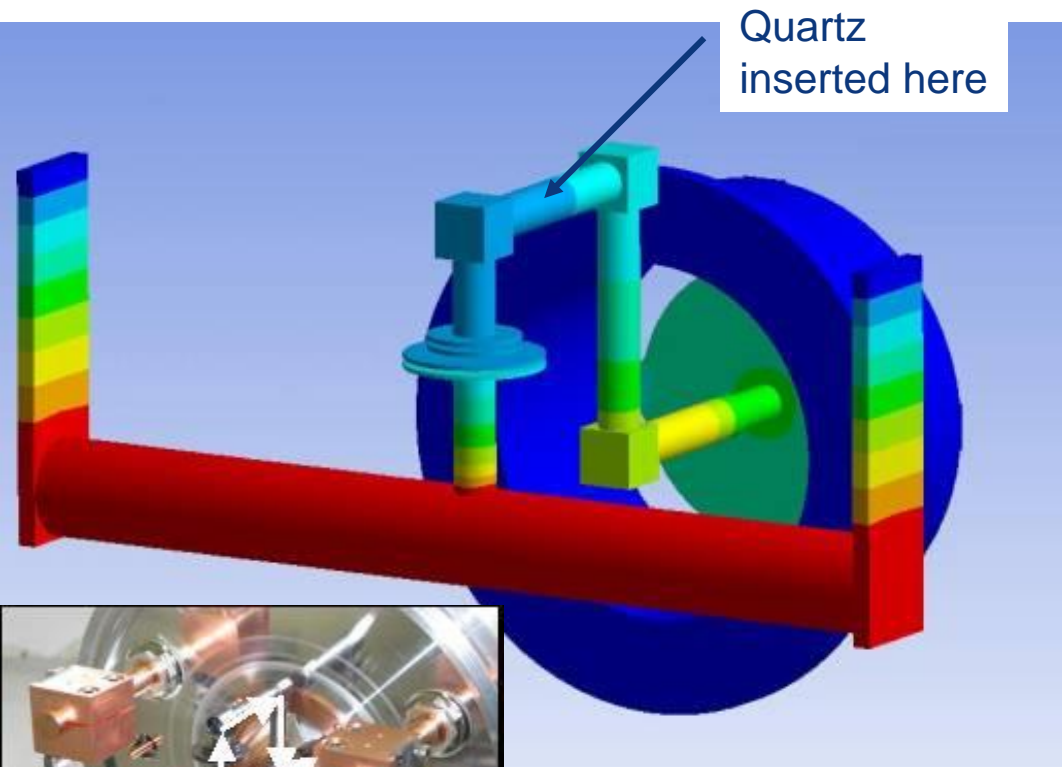
From Isolde.

Seen on Faraday cup; more issues with operational aspects, eg mass regulation, Foil stripping, etc.

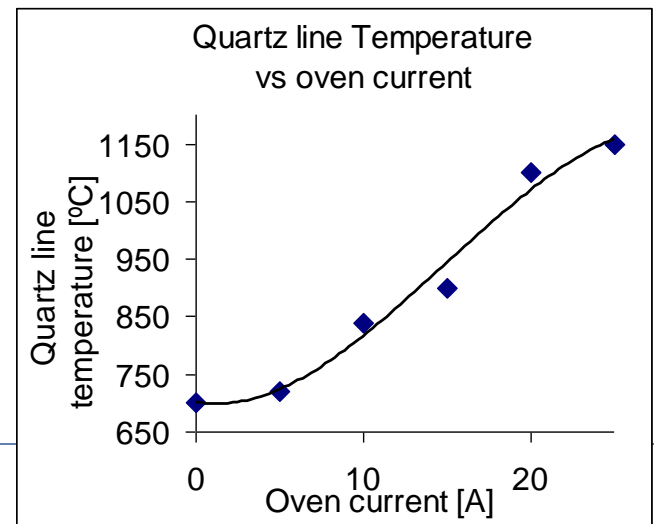
Comments, questions ?

# 1<sup>st</sup> quartz target unit at Isolde-PSB UC-313, operated in 2005 with RILIS (at SC, in 1980's with FEBIADs)

$\Delta T = 600 - 1100^\circ\text{C}$  to suppress Alkalis (Cs, Rb) for pure beams of Cd, Zn



Numerical simulation of temperature profile along the transfer line



E. Bouquerel et al.

# Target units in production for HIE-ISOLDE

78Zn at REX in 2010: UC439 (n conv) , 30% Ga/Rb,  $3 \cdot 10^6$  78Zn/uC

80Zn at REX in 2006: UC329, 45%Ga, 20%Rb,  $1 \cdot 10^4$  80Zn/uC

Last quartz units for Zn beam: UC415, and UC462 in 2011 for 82Zn at ISOLTRAP

Several « cold » quartz units operated for Cd (different version) :

UC338, 362, 454, 473, 510

In 2015 :

New UO2 batch from Westinghouse, Sweden: Very good yields of exotic Cu, Mg, Mn

From UC539, UC547, UC548, UC550,

2 New Target units in production for HIE-ISOLDE:

UC542 (n-conv, quartz) and UC549(n-conv)

Mass Markers : excess Zn, Rb-dispenser or excess Ga ?