Characterization of the XSS

ning Ionization Gas-discharge Source (PIGS)

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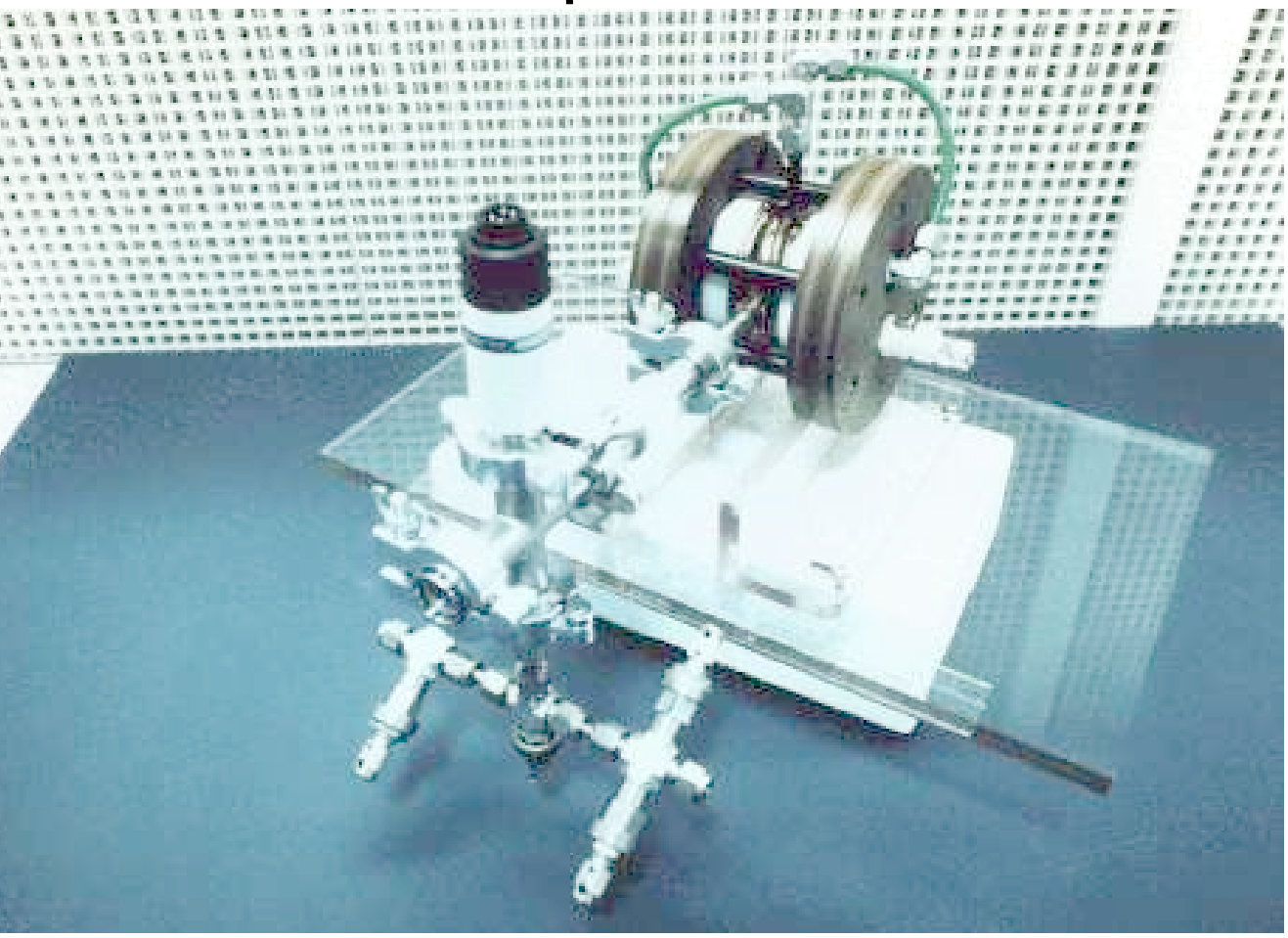
Characterization of the X-ray Source System (XSS)

Penning Ionization Gas-discharge Source PIGS-2

PIGS photo



Purpose

eatures

of narrow lines in XUV

ns for AXAF calibration

ne at 130 Å for LETG energy resolution

ne at 56 Å for MEG energy resolution (if line sufficiently
)

Characterization activities

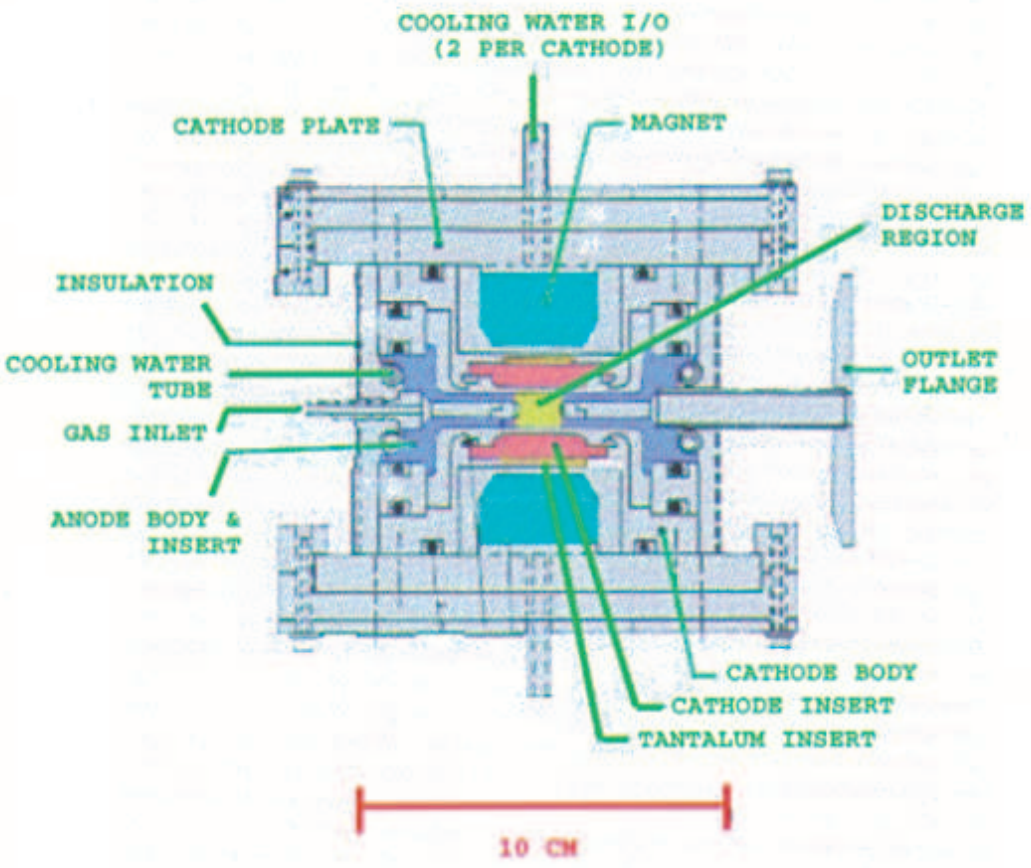
re counting rates in lines of interest with FPC500.
endence upon PIGS gas pressure and discharge current
poral variation
ine typical lifetime of PIGS head.

ontent
e PIGS spectrum through HIREFS with HRI.
rse scan to survey lines
scan to measure line widths

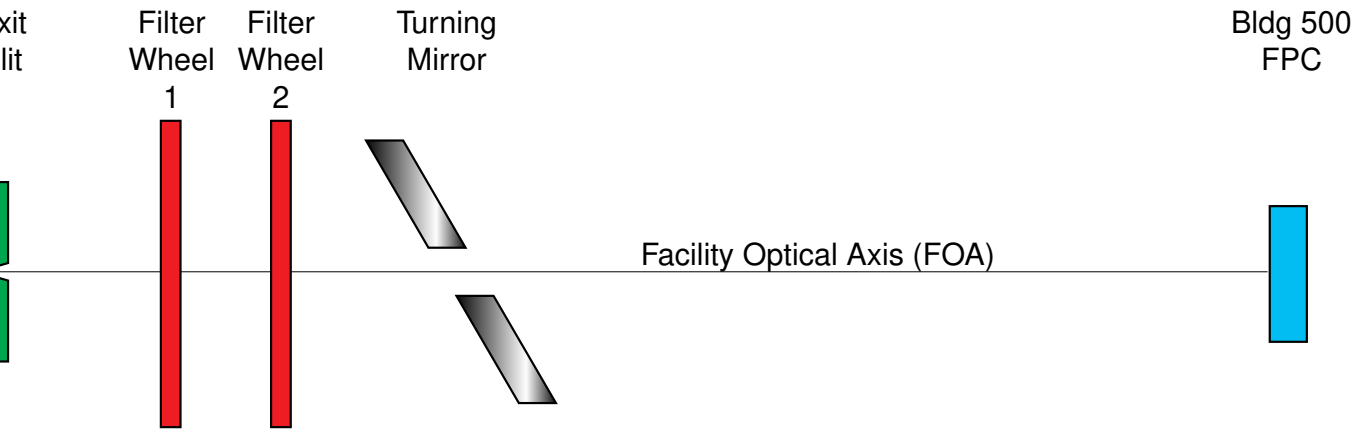
ormity
re with FPC500 mapper.

pinhole image with FPC500 mapper.

PIGS diagram

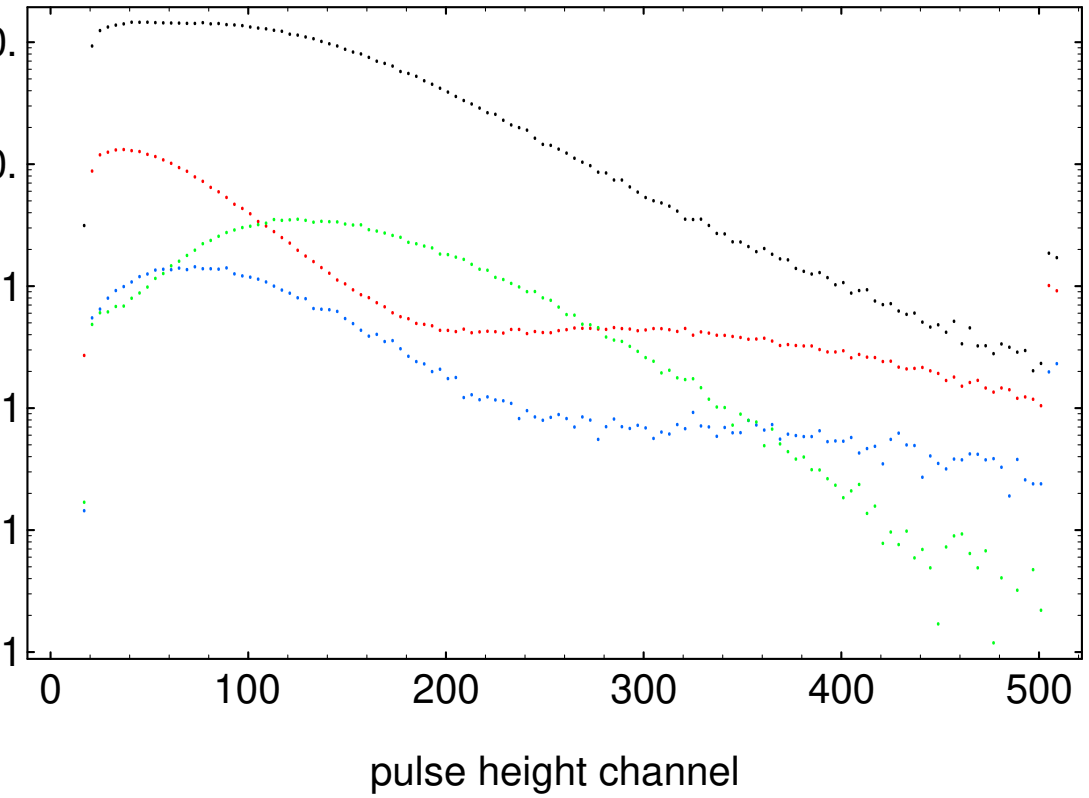


On-line configuration



PIGS pulse-height spectra

Penning Source; 800 mA; 4.8 mTorr; 1.15 kV
Unfiltered:Black; BeK2:Red; BK2:Blue; CK2:Green



Model of Penning Source

y 16 brightest lines from published spectra*, and our own
al survey with HIREFS/HRI.

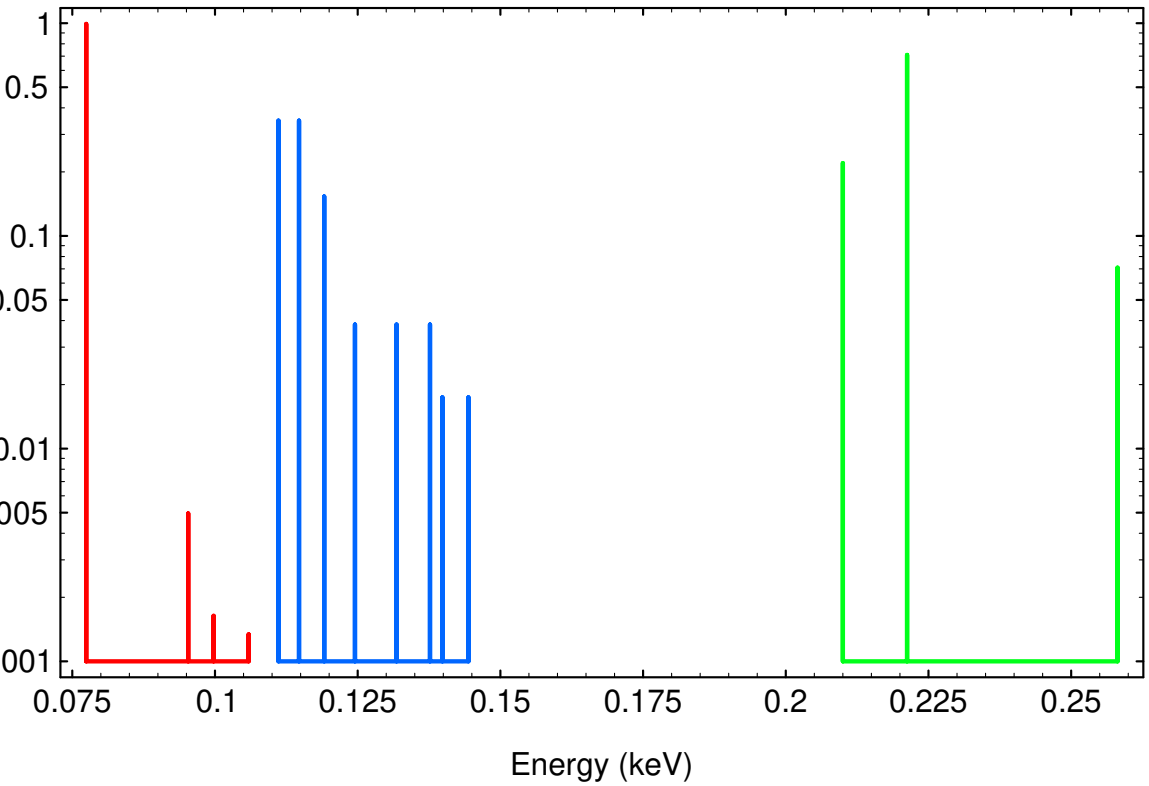
the 16 brightest lines into 3 groups partitioned by Be, B and
K-edge energies.

fixed intragroup relative line strengths.

elative intergroup strengths as fit parameters.

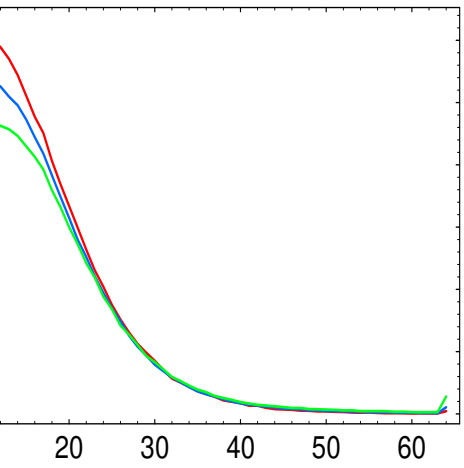
PIGS line groups

Penning Source Model
Be group:Red; B group:Blue; C group:Green



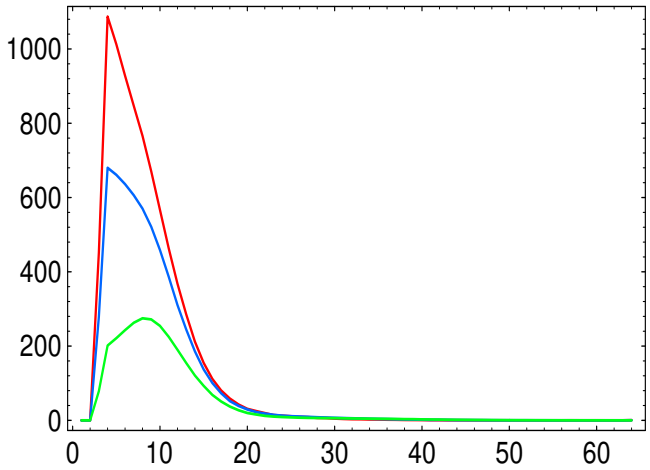
Flux versus cathode age

e height dependence on cathode age
r; Early:red; mid:Blue; late:Green



pulse height channel

Pulse height dependence on cathode age
P10; Early:red; mid:Blue; late:Green

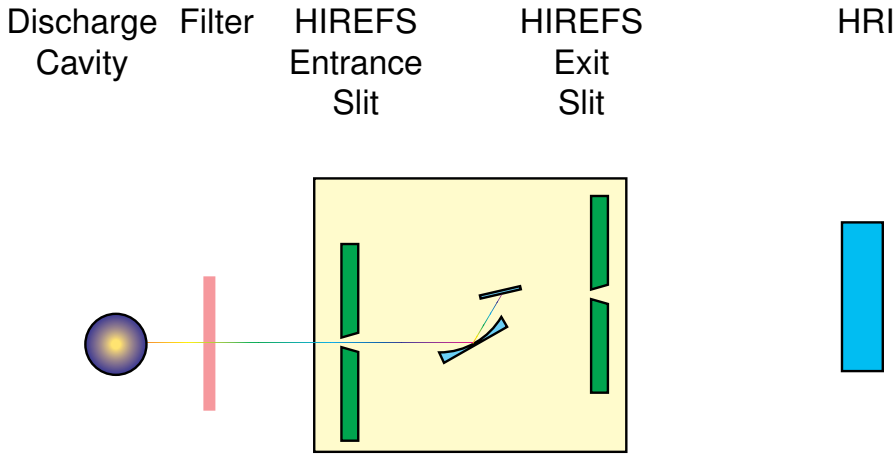


pulse height channel

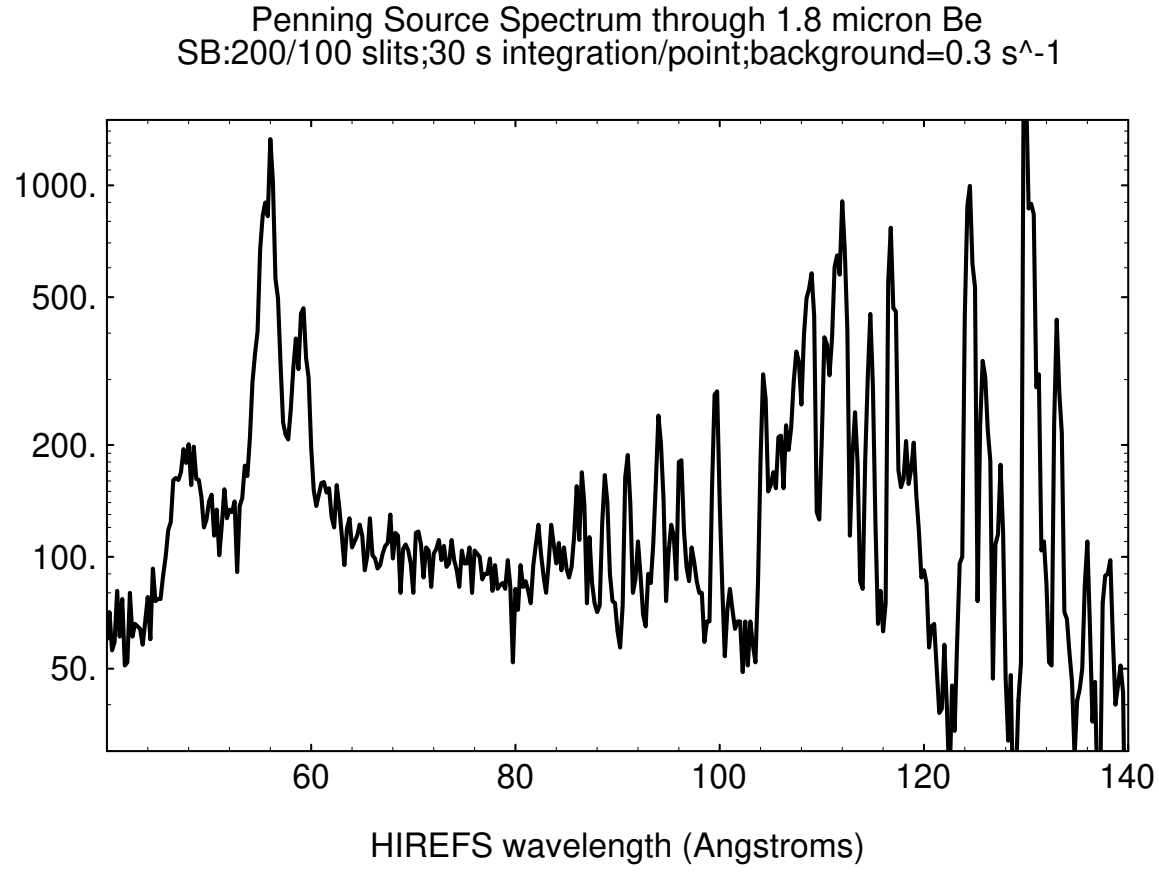
trum changes with cathode age in a manner consistent with a
in the Al line-flux much more quickly than the Ar-line flux.

omenon was even more pronounced with P10 as the gas.

Configuration for sampling PIGS spectrum

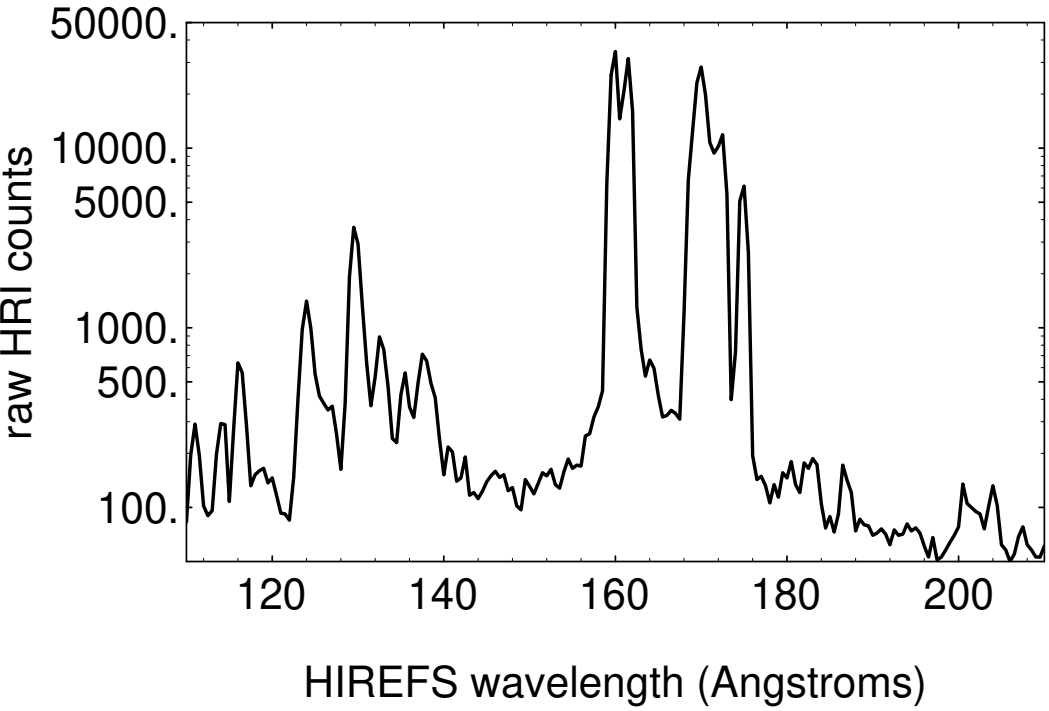


Coarse scan with HIREFS(SB)

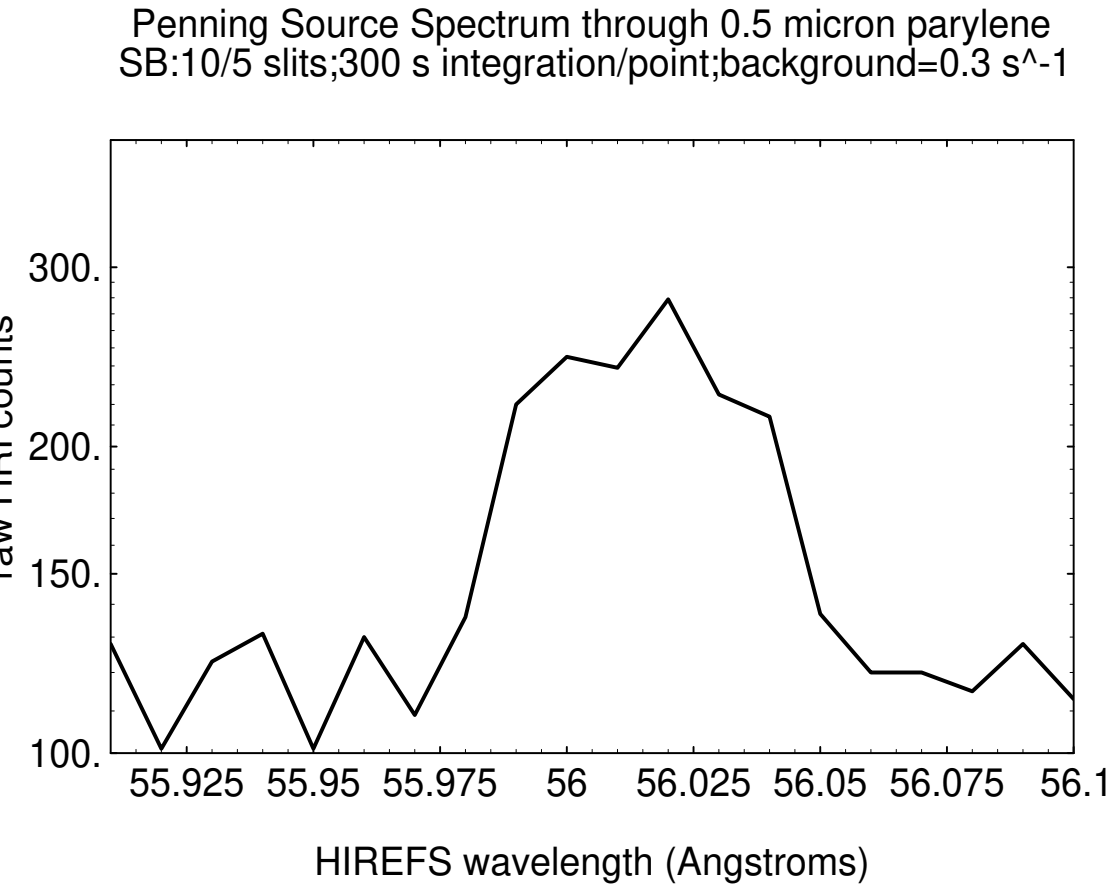


Coarse scan with HIREFS(SC)

Penning source spectrum through 0.5 micron parylene
SC:200/100 slits;40 s integration/point;background=0.3 s^-1

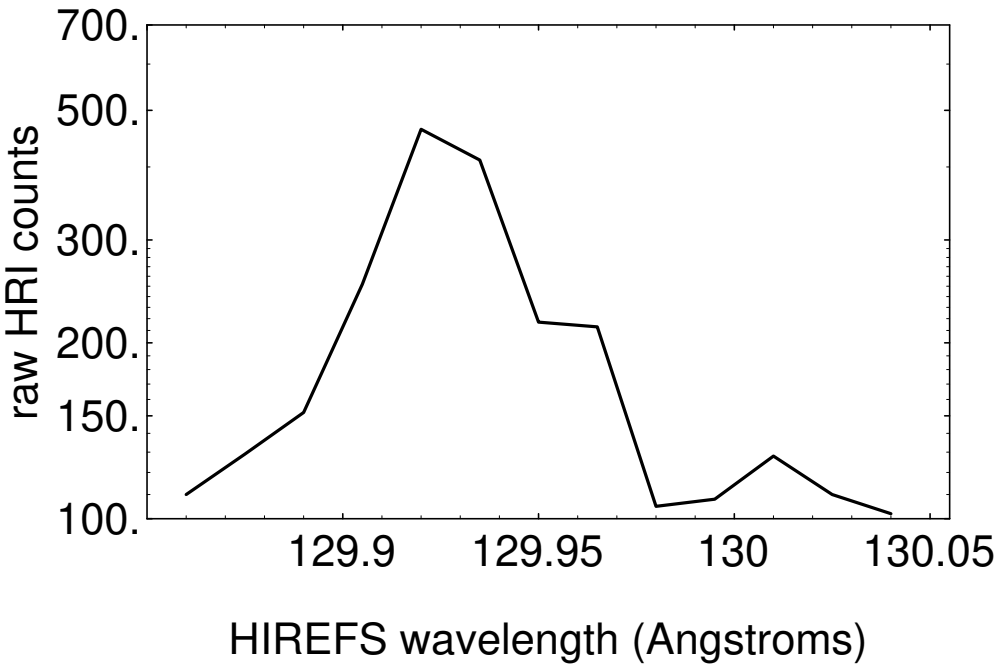


Fine spectrum around 56 Å



Fine spectrum around 129 Å

Penning Source Spectrum through 0.5 micron parylene
SB:10/5 slits;300 s integration/point;background=0.3 s^-1



Spot-size measurement

ion

as for flux measurements, except with an 800–μm pinhole in heel 1.

is obtained by raster scan using FPC500 mapper.

al direction

defined by the 0.5 mm exit slit.

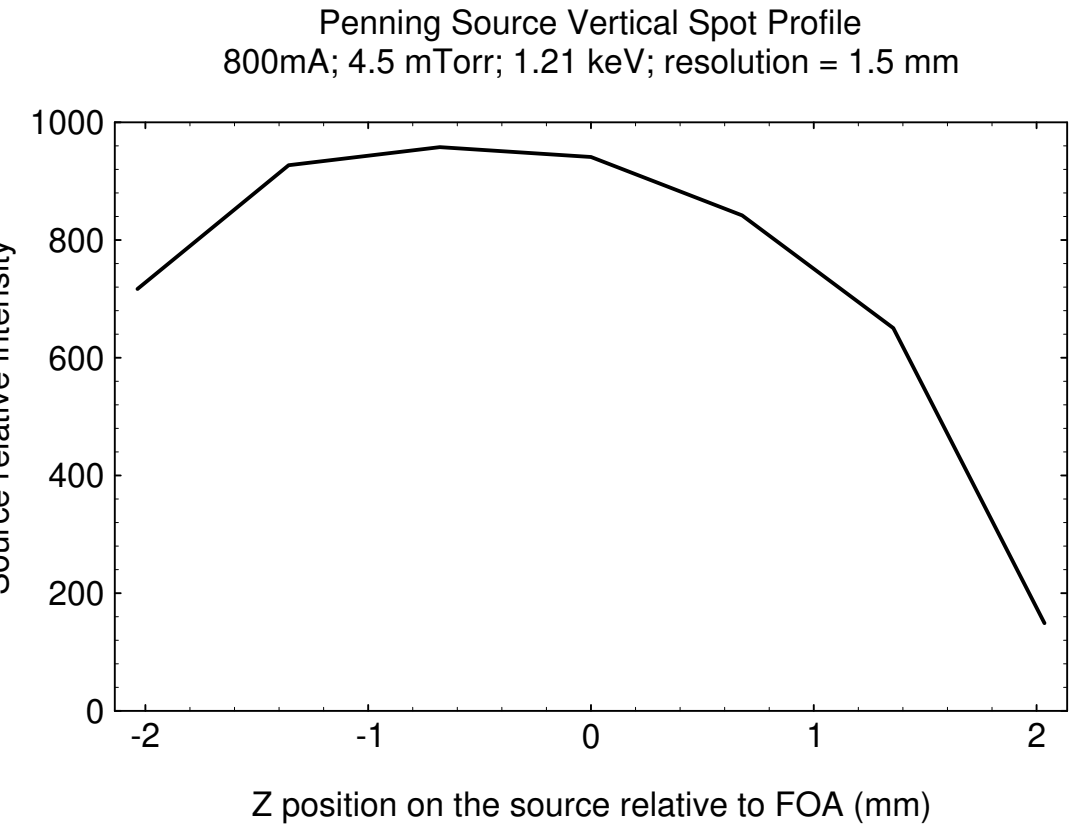
ution across the slit is assumed flat.

direction

ght defines the total spot size.

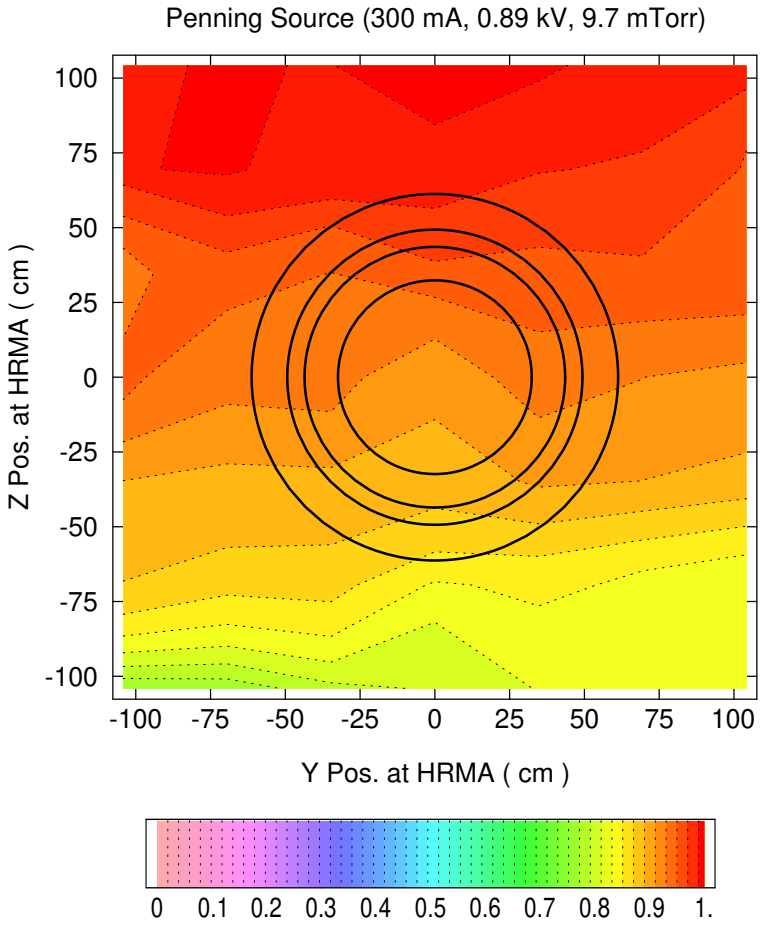
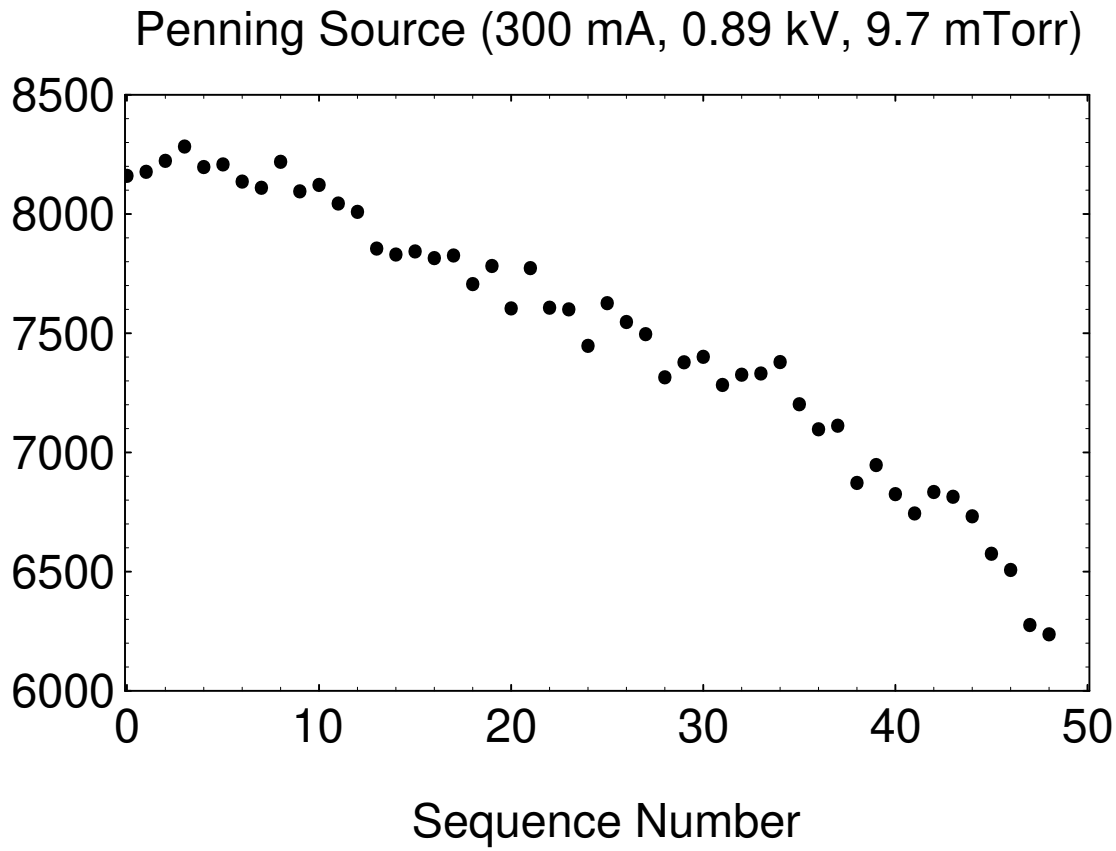
ay be non-uniform over the slit height.

PIGS spot


Penning Source Vertical Spot Profile
800mA; 4.5 mTorr; 1.21 keV; resolution = 1.5 mm
Source relative intensity
1000
800
600
400
200
0
-2
-1
0
1
2
Z position on the source relative to FOA (mm)

Characterization of the X-ray Source System (XSS)

Penning Ionization Gas-discharge Source PIGS-18



Beam-map flux versus time