

What does this mean?

Doctoral Thesis

Development and simulated observations of the Jovian Neutrals Analyzer

Angèle Pontoni

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Wannberg

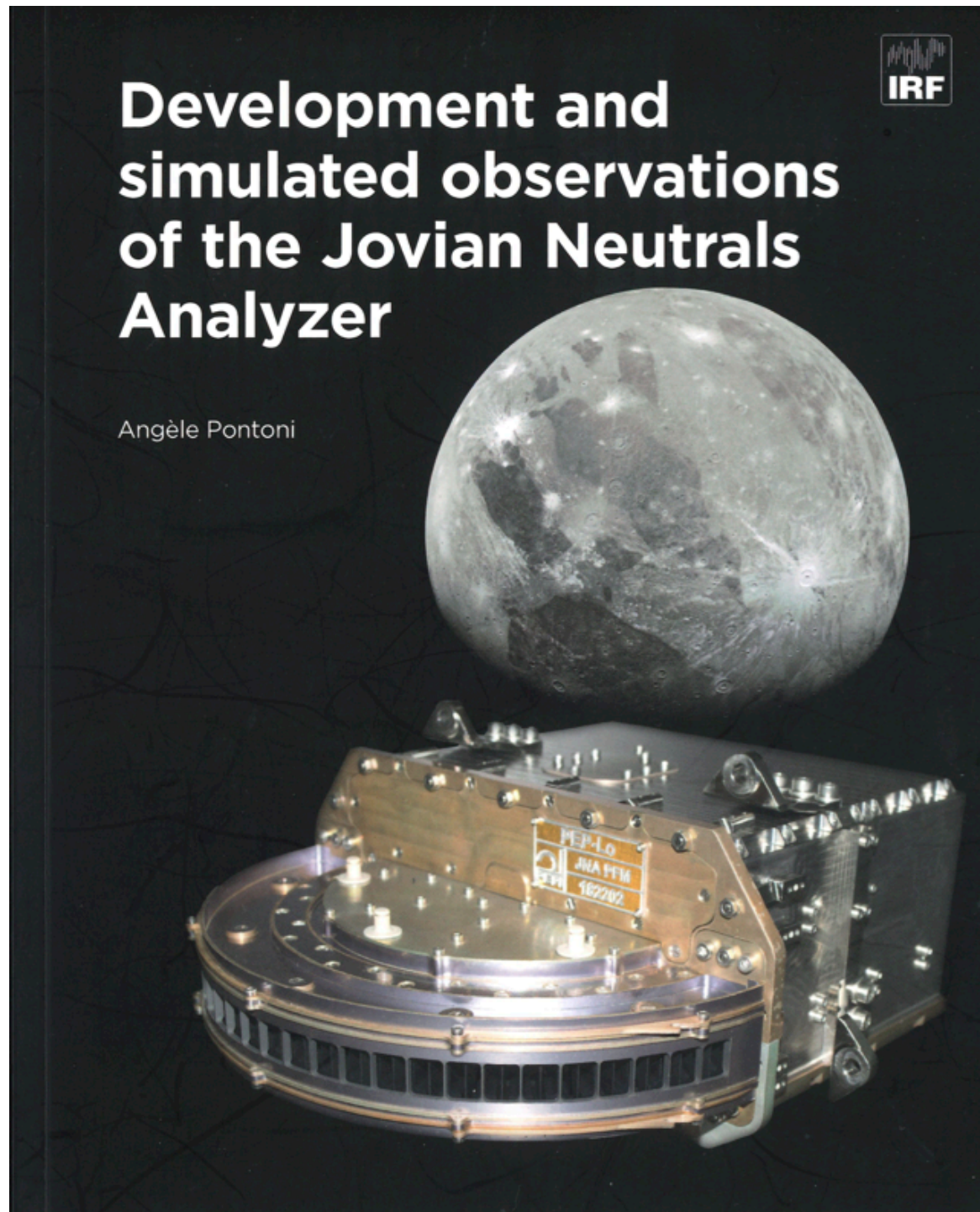
Dr. Nickolay Ivchenko

Dr. Mathias Milz

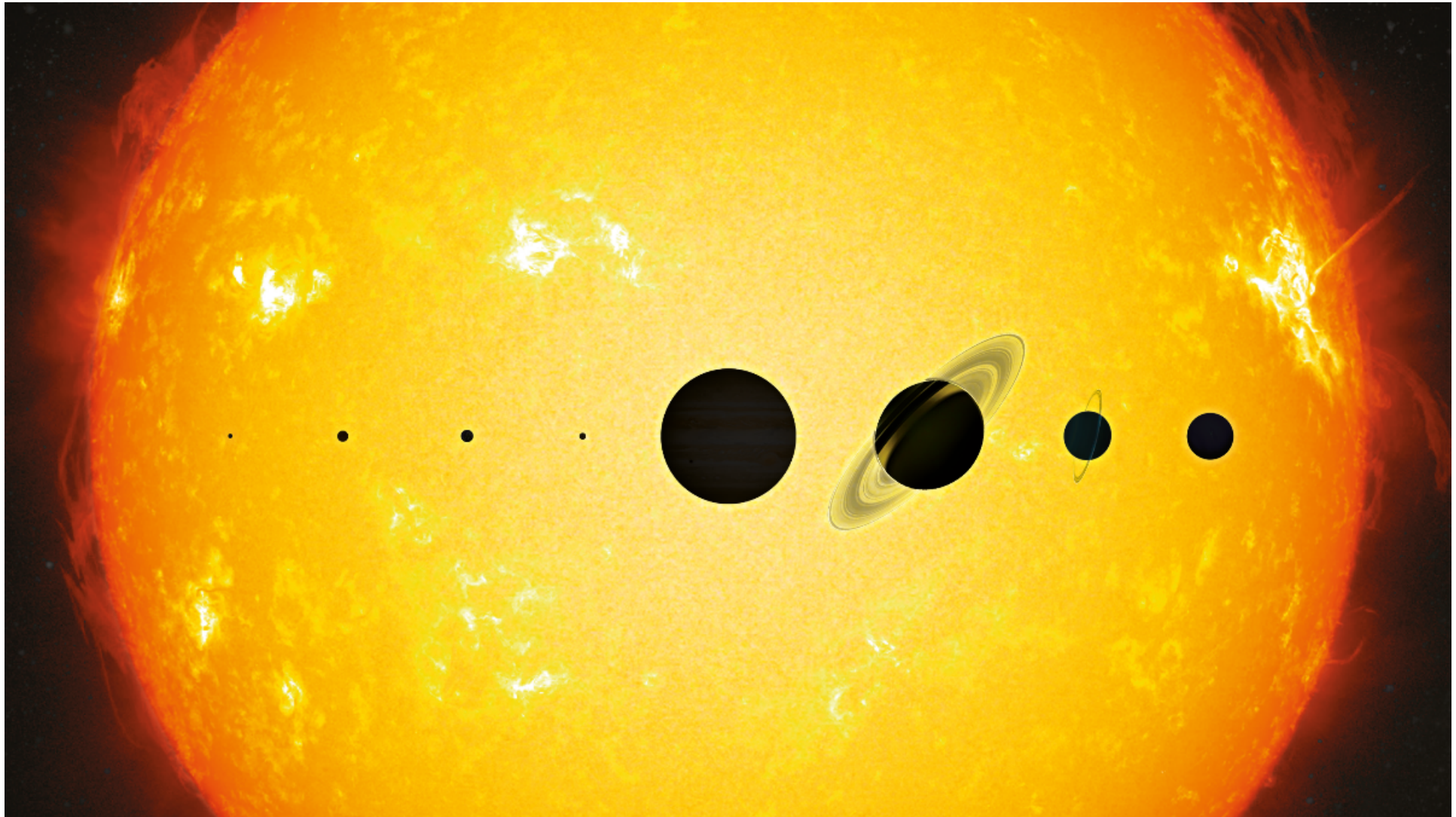


March 2022

Hint: 1
cover page

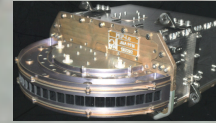


Hint 2: newsletter from SNSA, March 2022

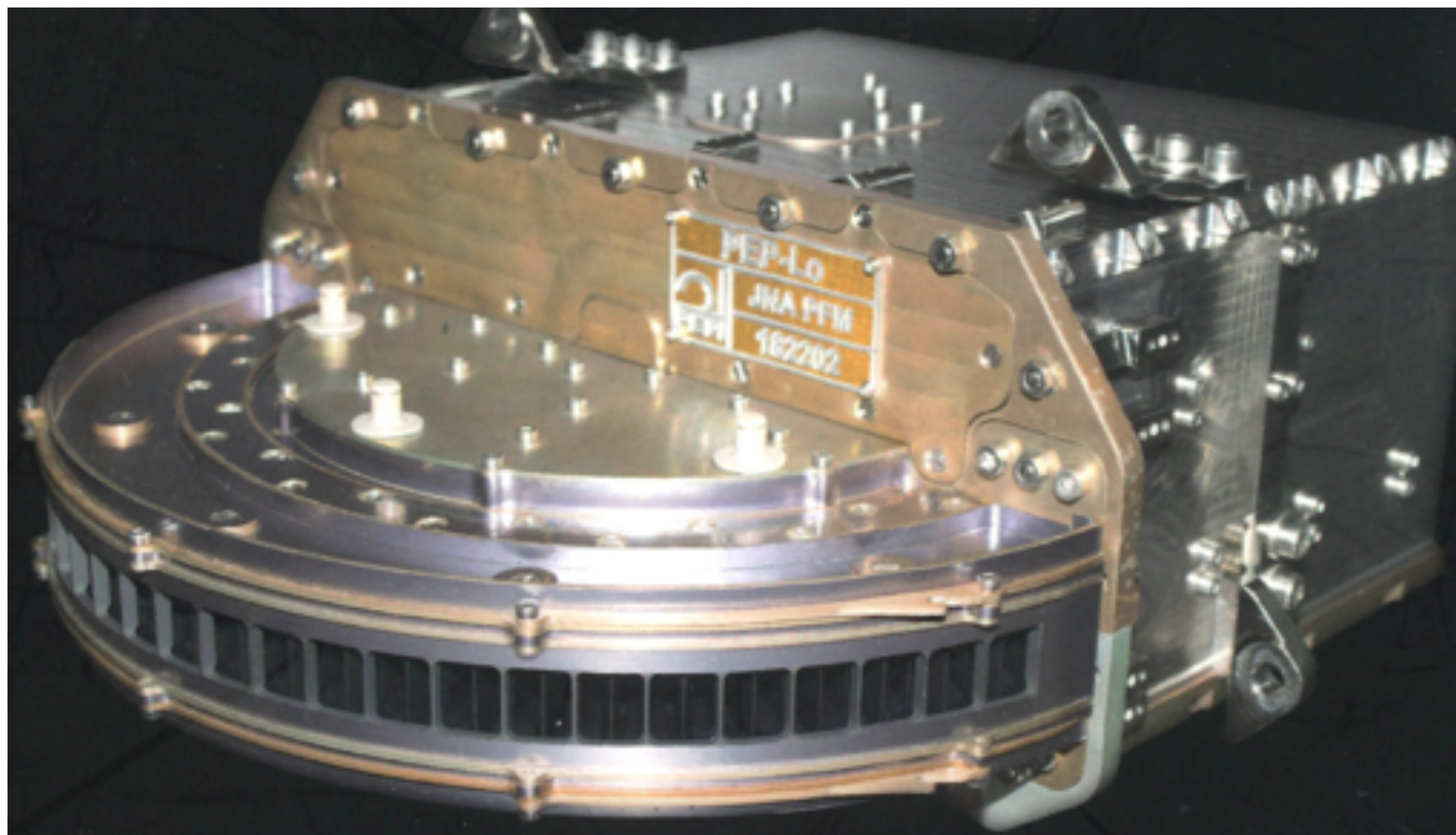


Correct size matters

if more realistic size

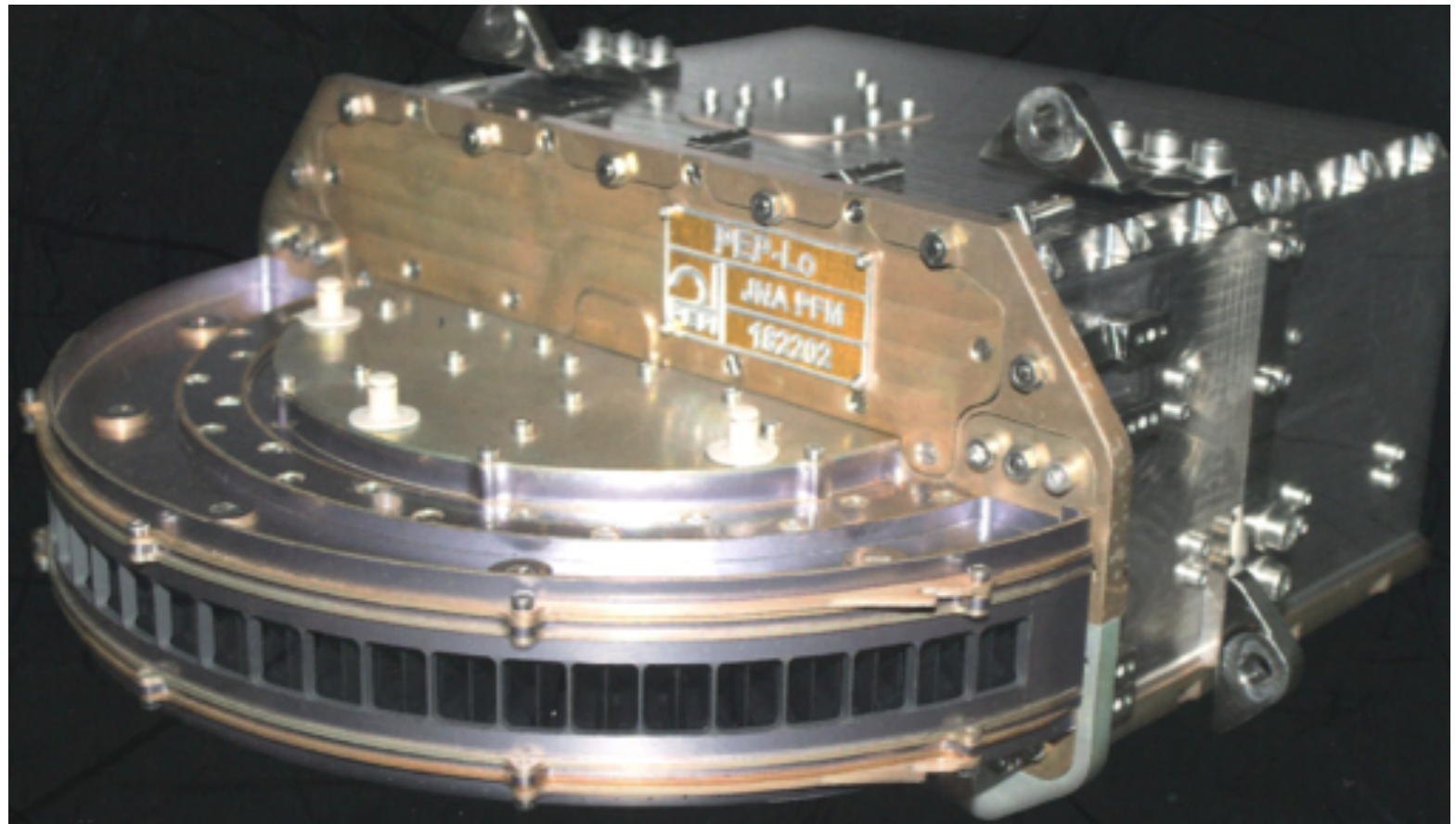


So, Angéle wanted to indicate re-sizing





approach



drumstick



hit !

Drums and cymbals



drumstick



hit !

Drums and cymbals

Shimoyama

Stas



Drums and cymbals on JUICE

with Japanese player



Japanese heavy metal drummer Yoshiki's  drum riser at Madison Square Garden

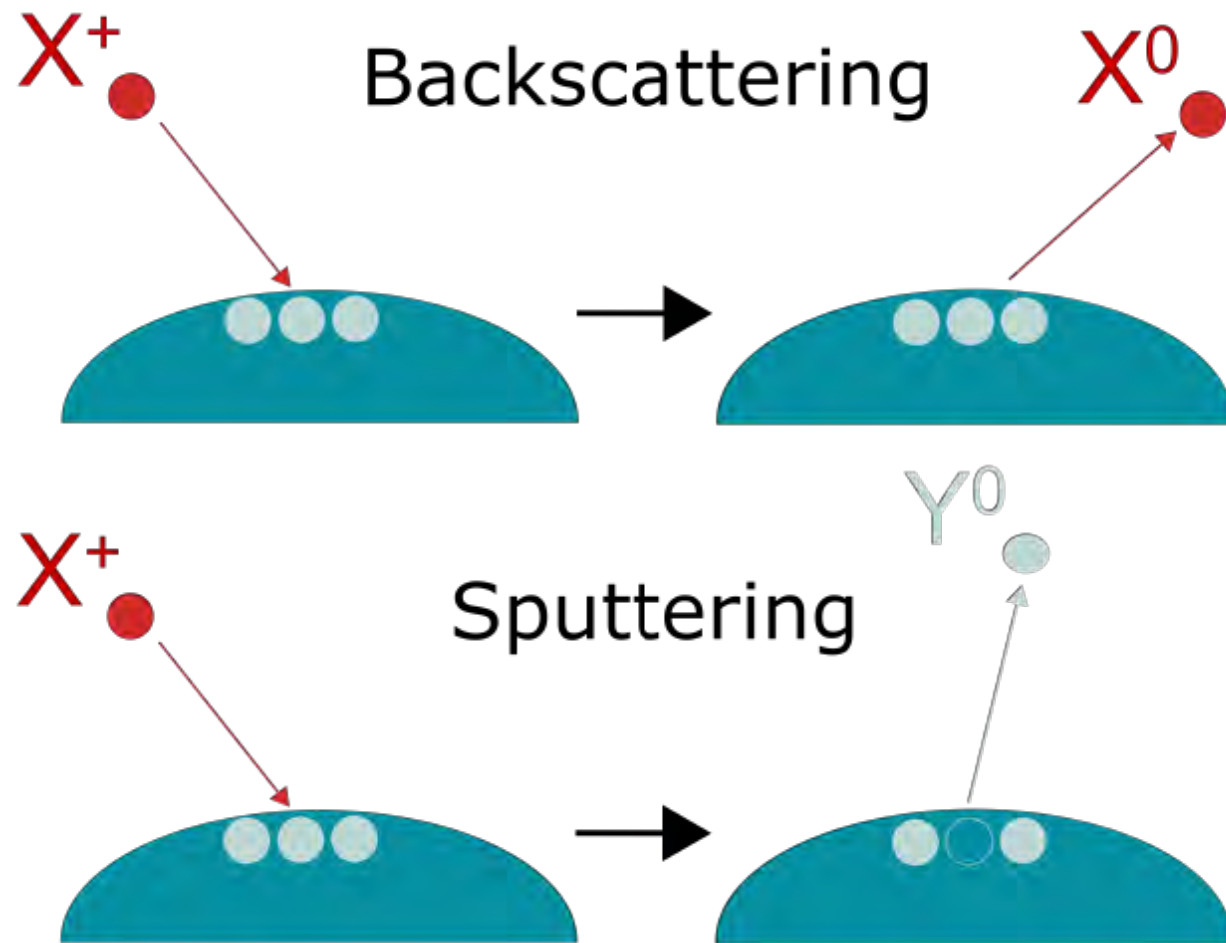
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Development and simulated
observations of the Jovian Neutrals
Analyzer

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Thesis must be something about music

Hint: 3
Fig 2.7



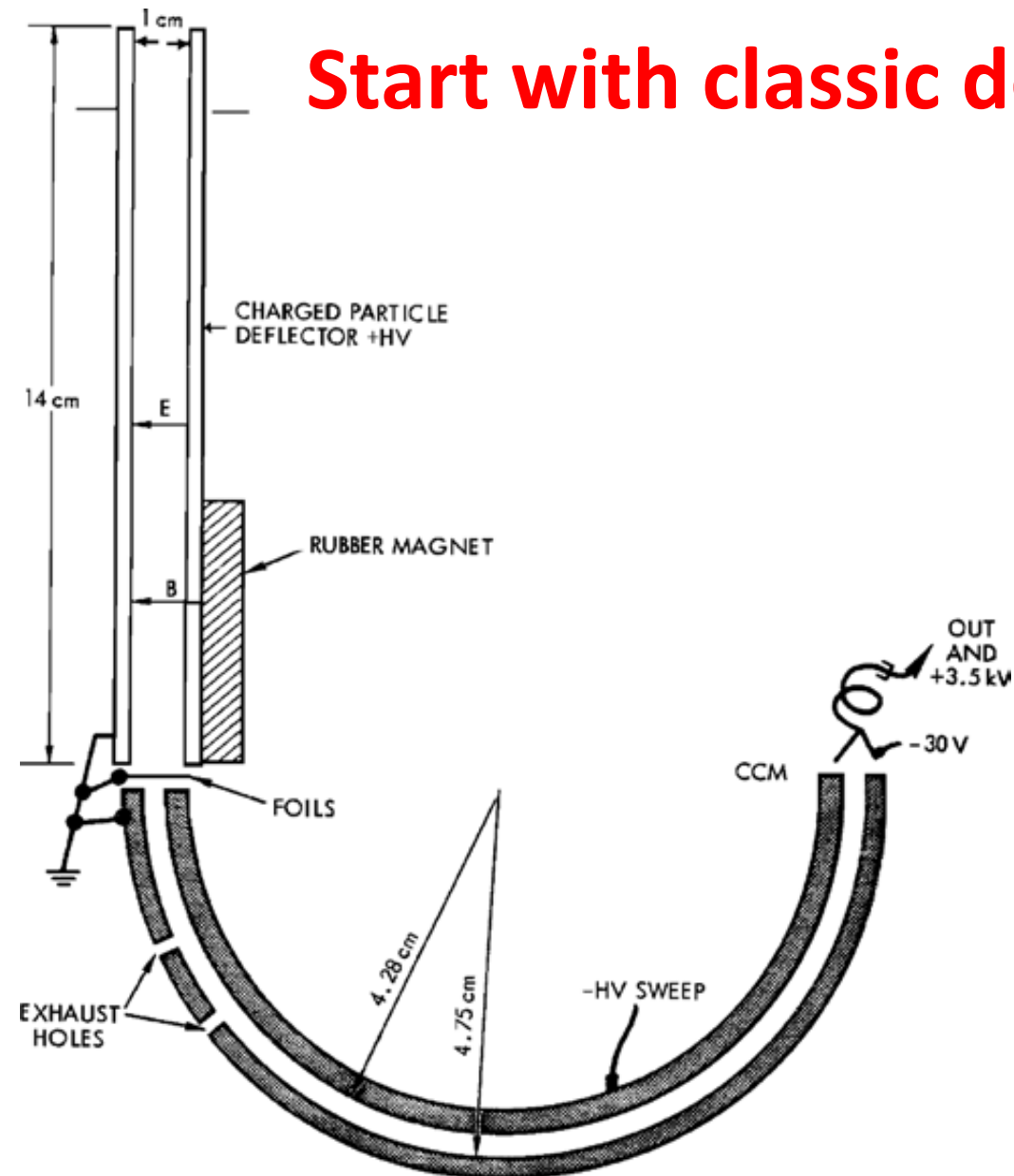
**when drumstick hit (surface impact),
a neutral sound comes out**

Doctoral Thesis

Development and simulated
observations of the Jovian ~~Neutrals~~
Analyzer **Percussion**

Angèle Pontoni

Hint: 4
Fig 3.1



Mozart K551 "Jupiter"

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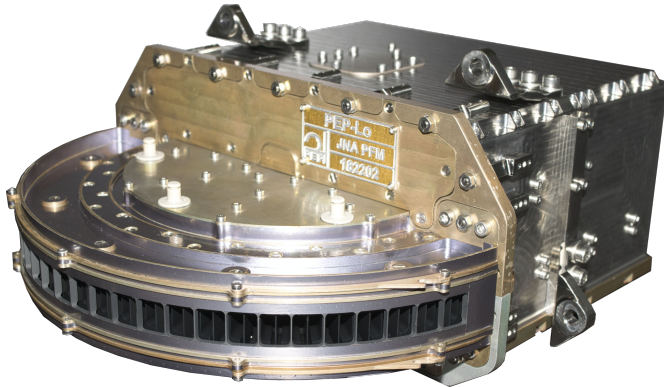
Development and simulated
observations of the **Jovian** ~~Neutrals~~

Analyzer

Percussion

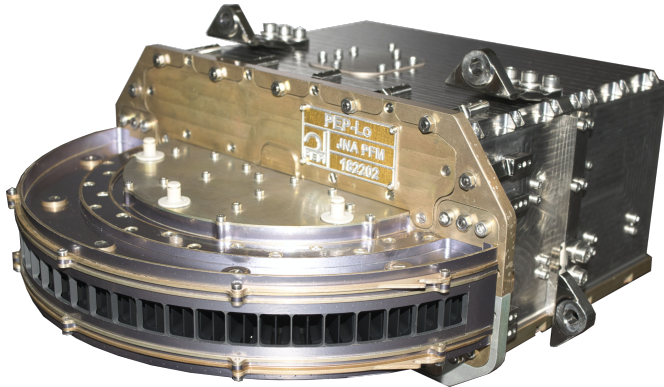
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Spec of JNA percussion instrument



JNA designed specifications						
Energy range	Energy resolution dE/E	Mass range	Masses resolved	Field-of-View	Angular resolution	Time resolution
10 eV – 3.3 keV	~100%	1 – 32 amu	1, Heavy	15° x 150°	7° x 25° (11 pixels)	Adjustable, minimum 0.5 seconds

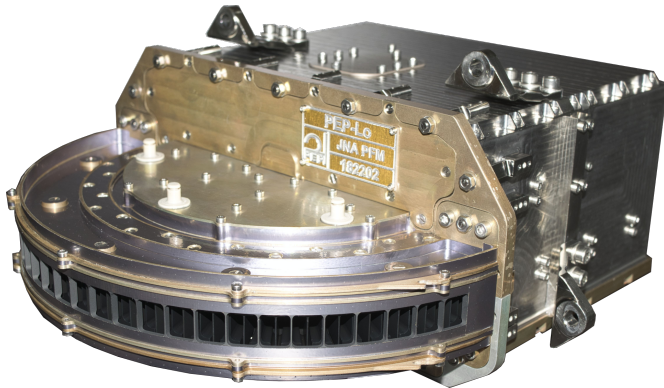
Target Spec of JNA



energy ~ frequency
~ mass

JNA designed specifications						
Energy range	Energy dE/E	Mass range	Masses resolved	Field-of-View	Angular resolution	Time resolution
10 Hz – 3.3 kHz	~100%	1 – 32 = 6 octave	1, Heavy sound	15° x 150°	7° x 25° (11 pixels)	Adjustable, minimum 0.5 seconds

Target Spec of JNA

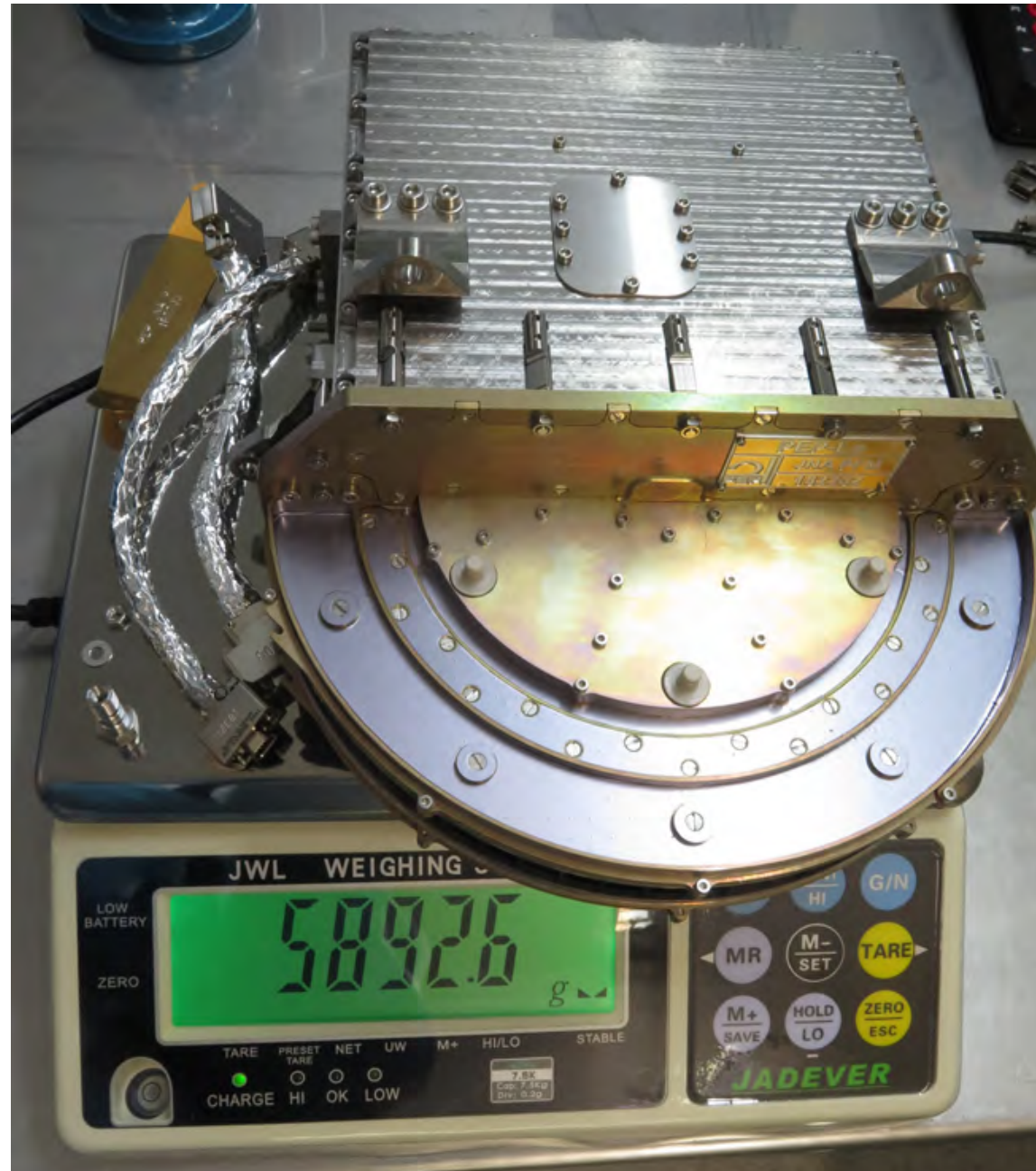


20 Hz – 3.3 kHz
(piano: 28 Hz – 4.2 kHz)

improve toward heavy sound 10-100 Hz
(human ear limit : 15 Hz)

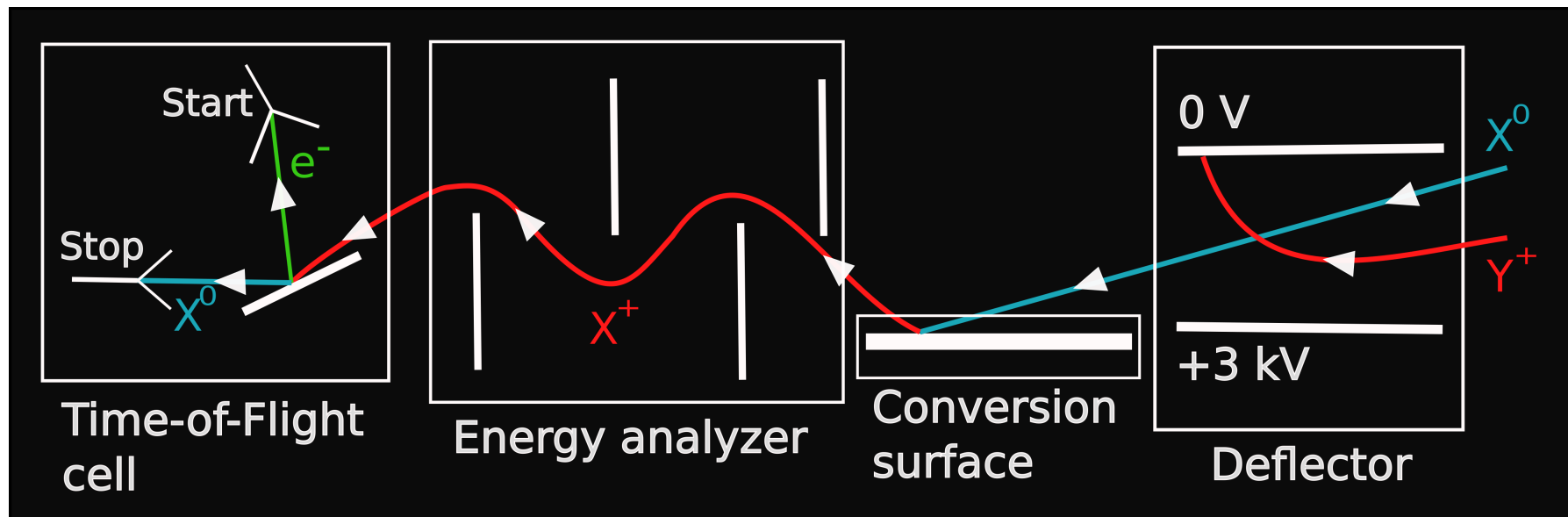
Challenge 1:

Light weight
instrument



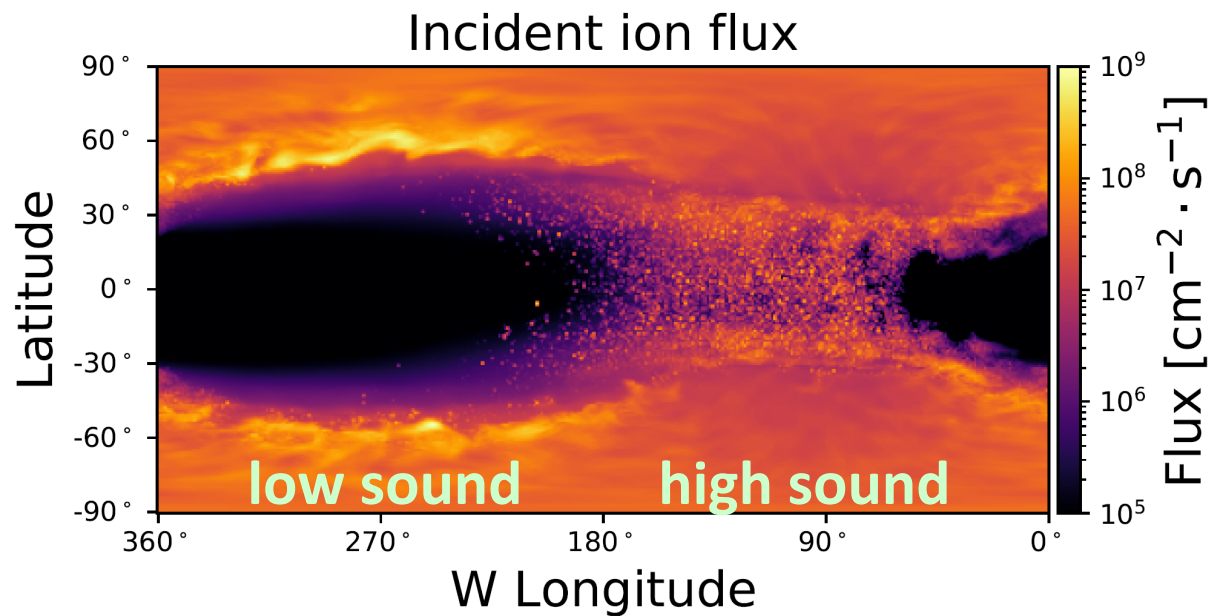
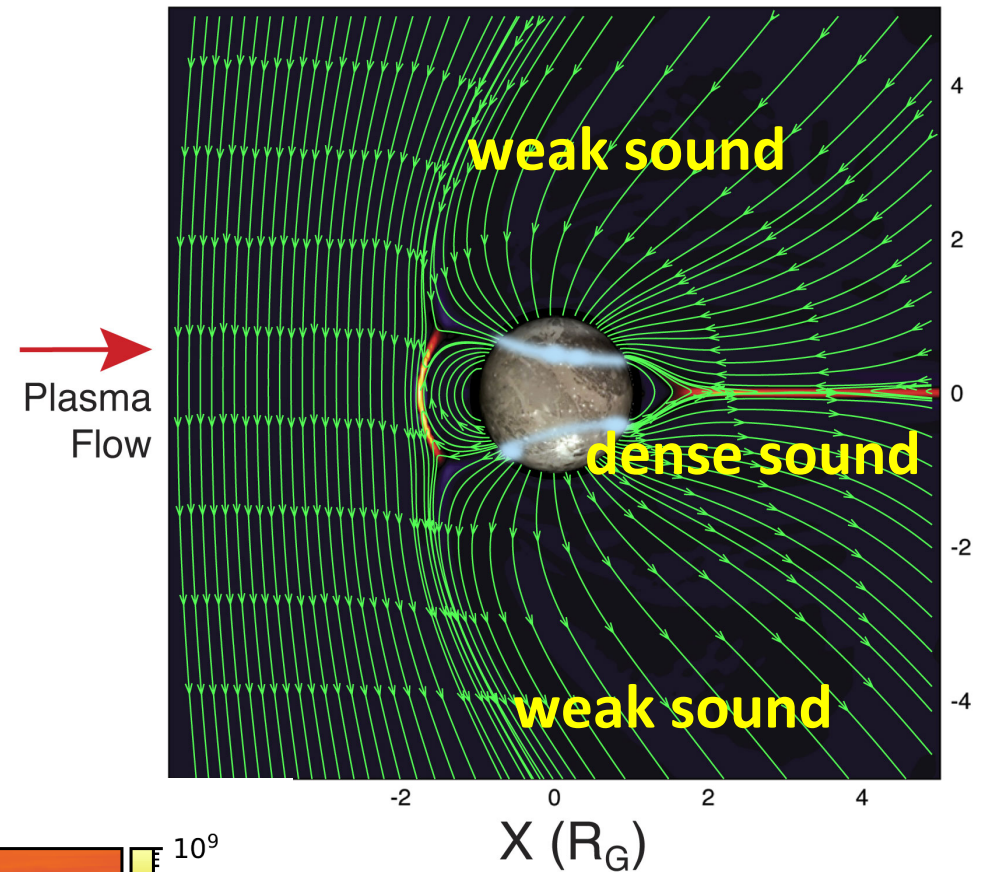
= difficult to make low (heavy) pitch

Solution 1 = fancy design of sound trajectory

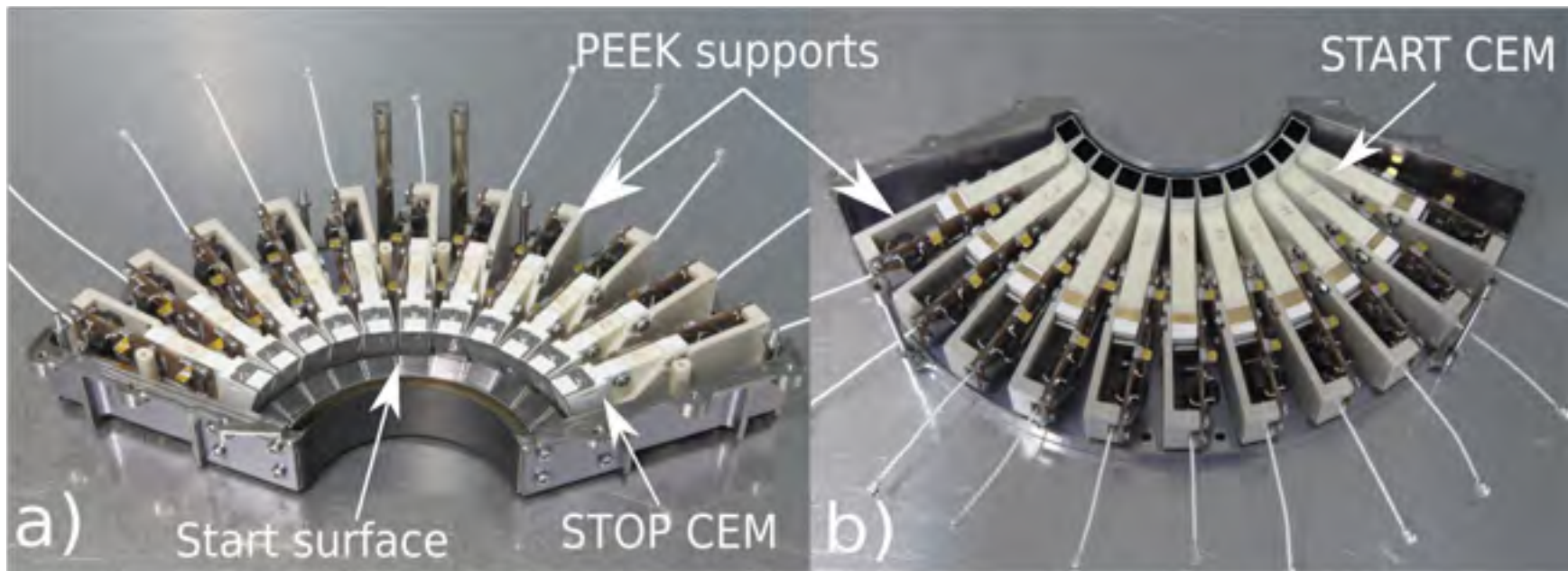


Challenge 2:

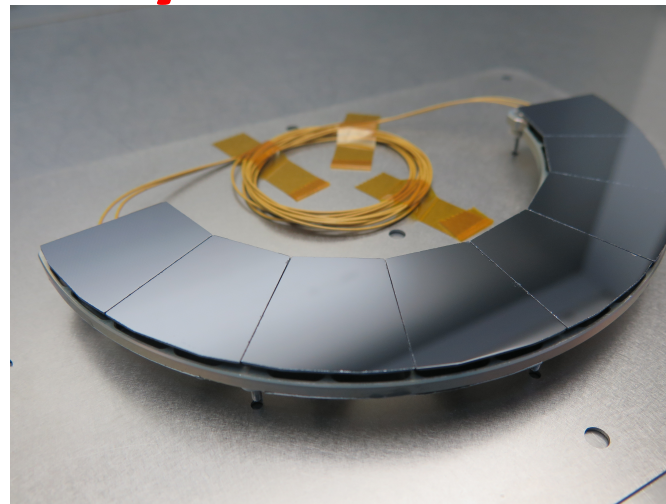
same sound
quality over
180°



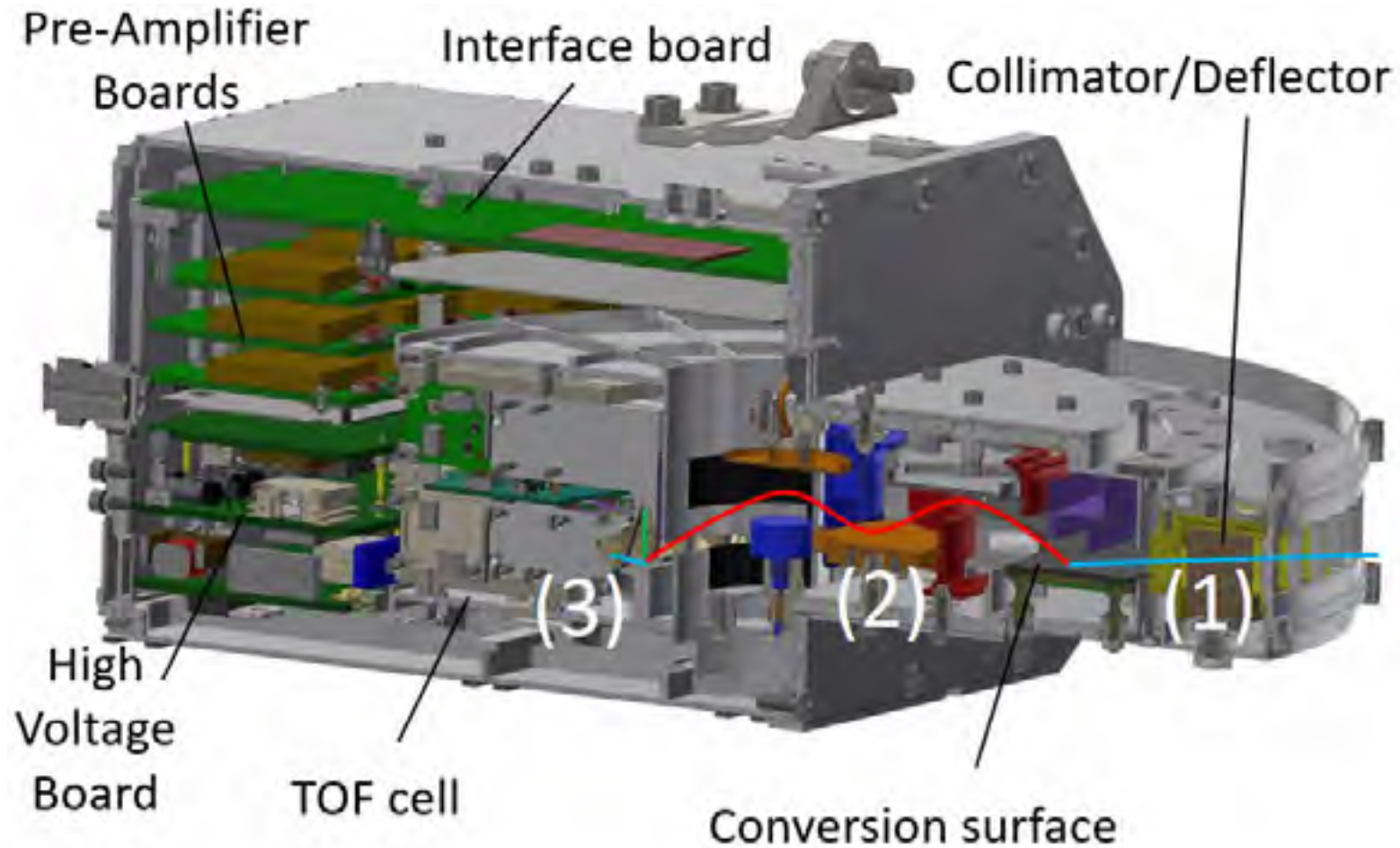
Solution 2 = piano-like small sectors



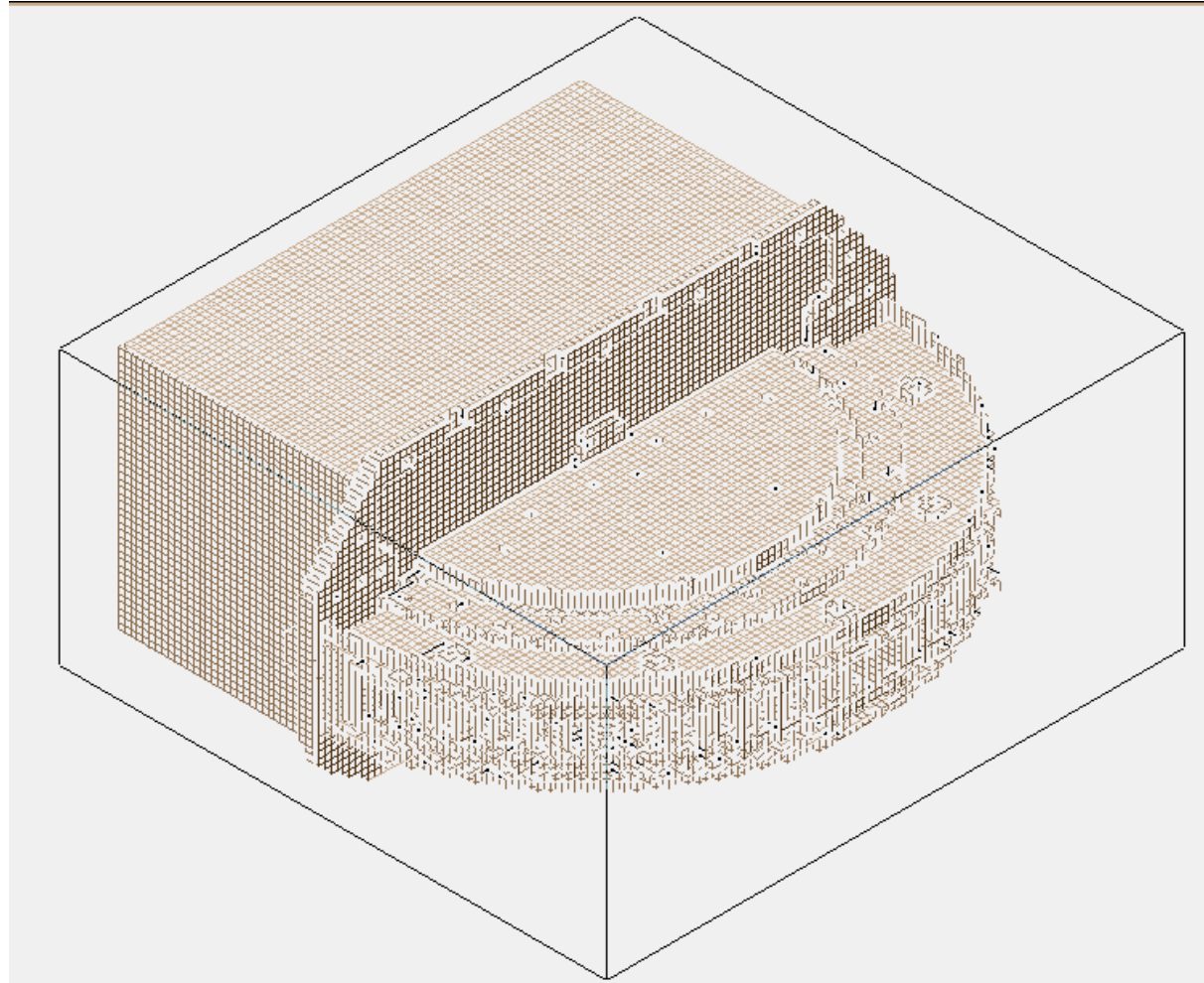
+ very smooth surface



Final design = complicated
= need fine simulation

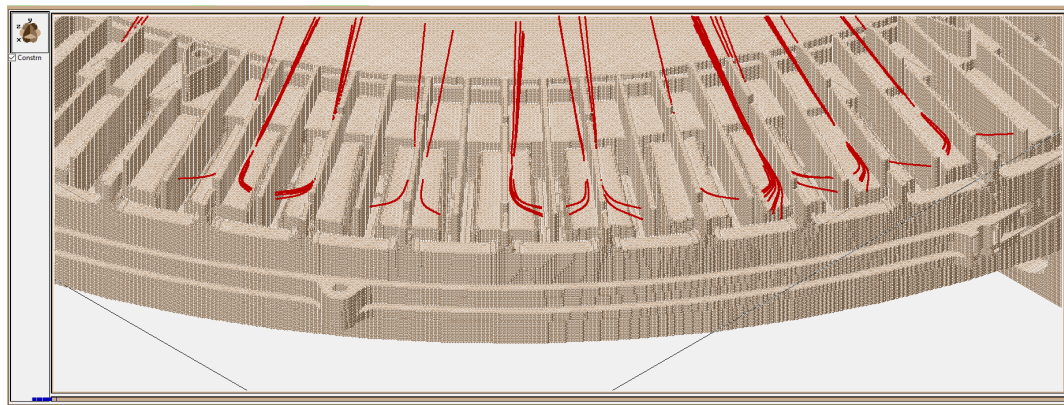


SIMION simulation

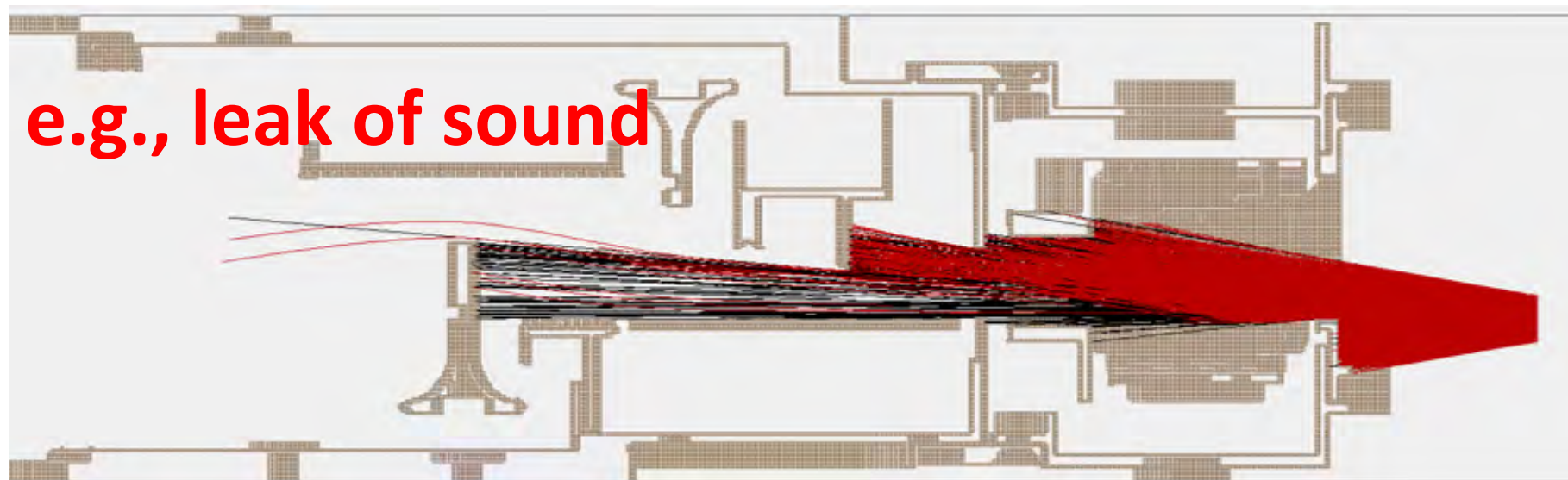


S (-seat) IMI (意味) -ON (音)

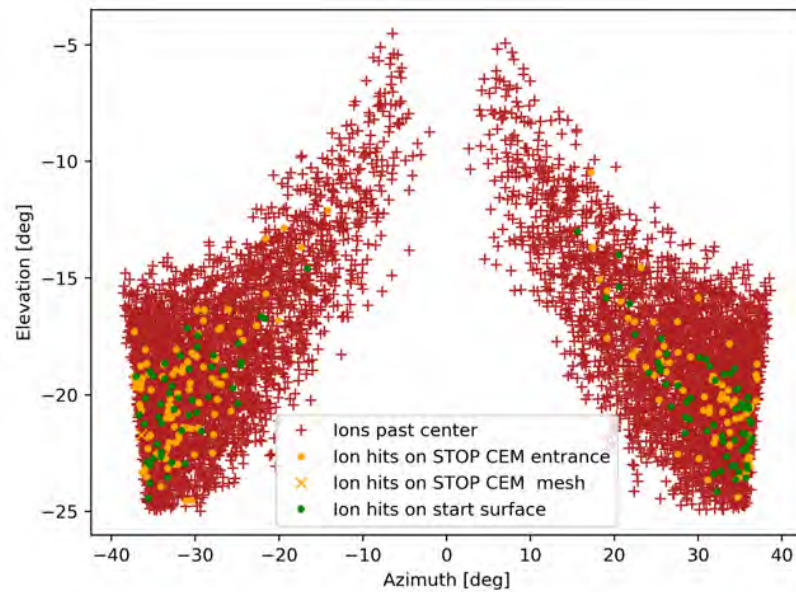
(1) instrument simulation



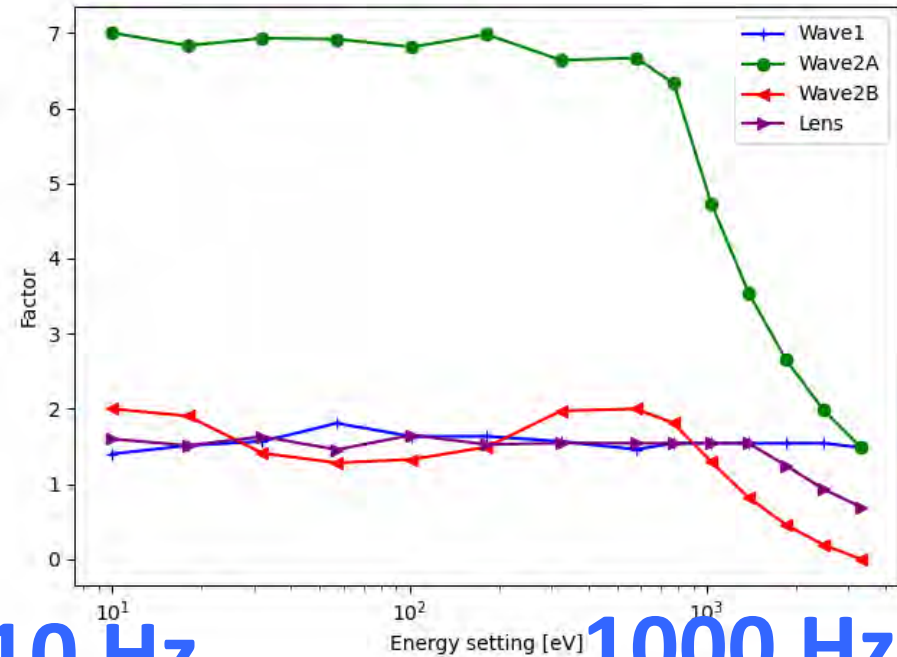
(2) Auditorium simulation



(1) instrument simulation



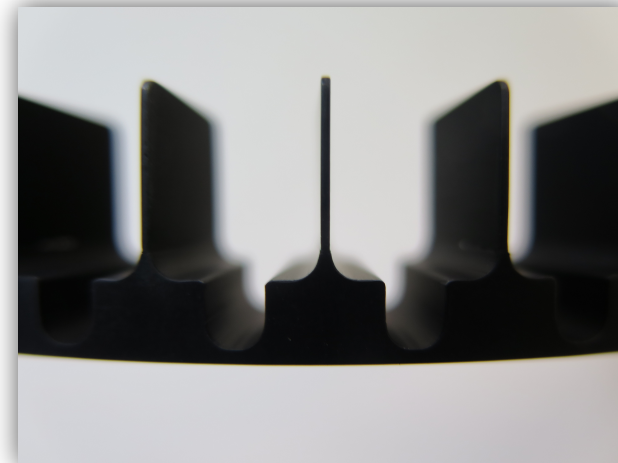
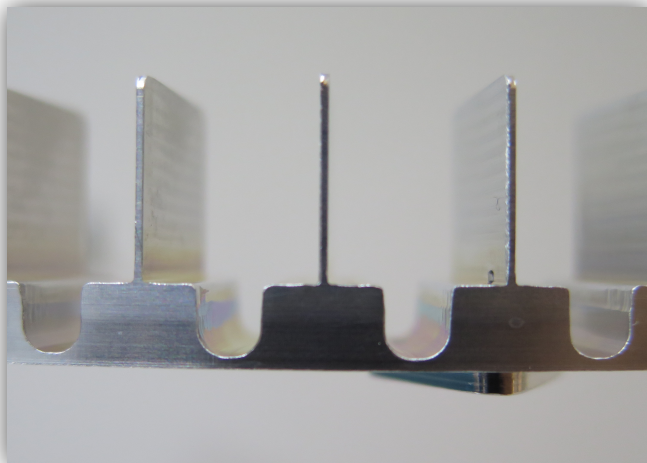
sound in ear



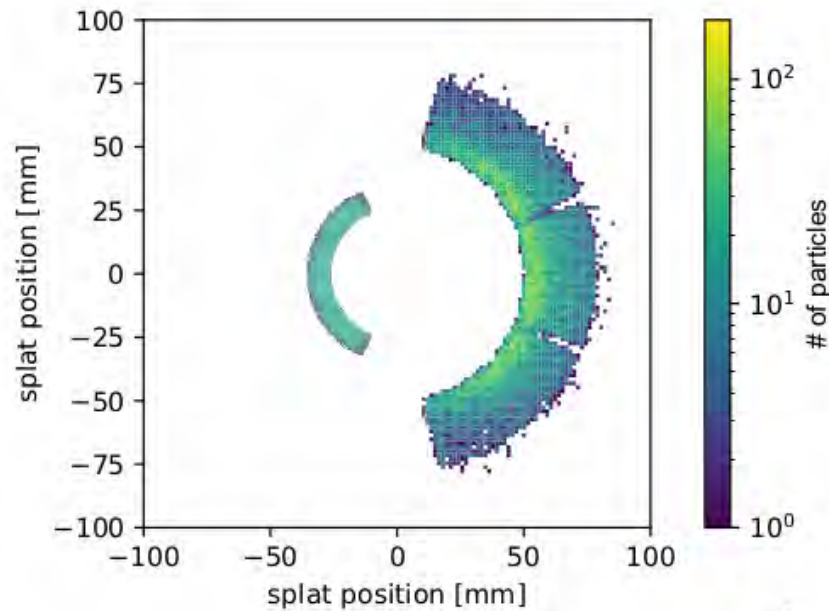
10 Hz

1000 Hz

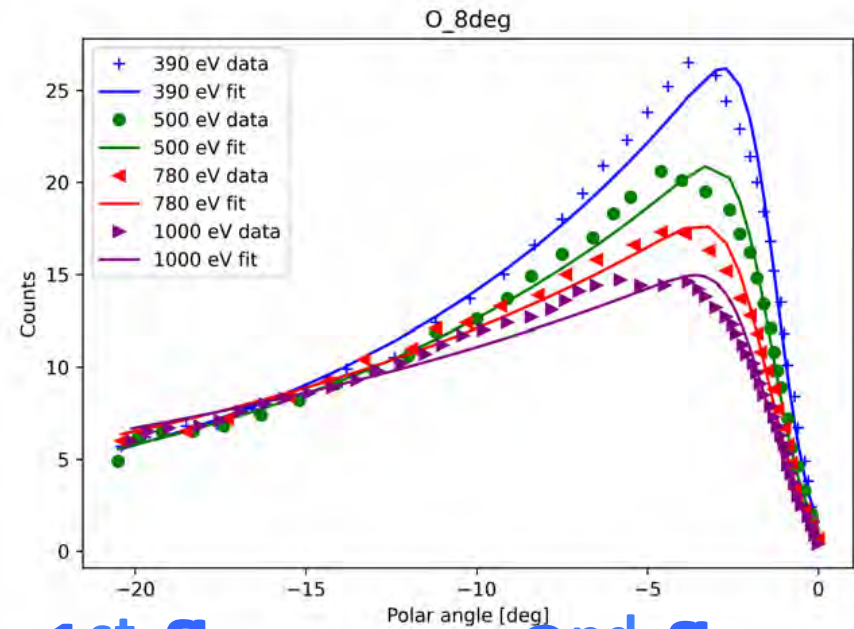
after many trial and error, new keyboard



(2) Auditorium simulation



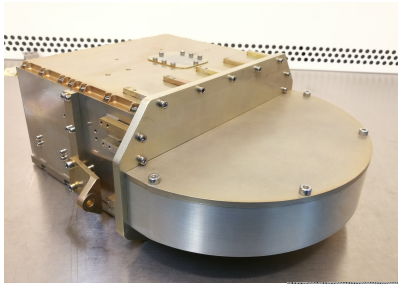
sound quality



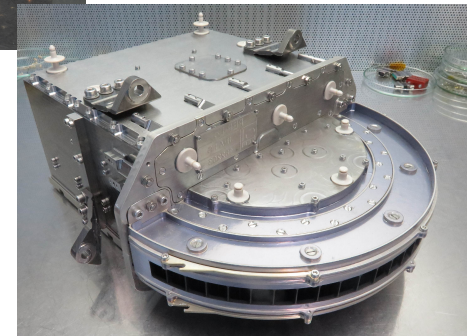
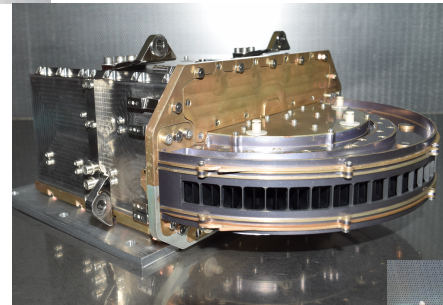
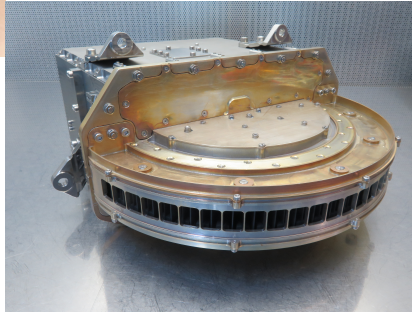
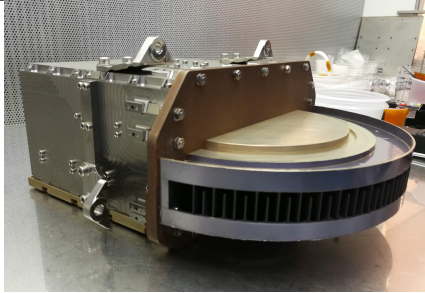
1st floor

2nd floor

after many trial and error, finally improved



construction: half-circular auditorium

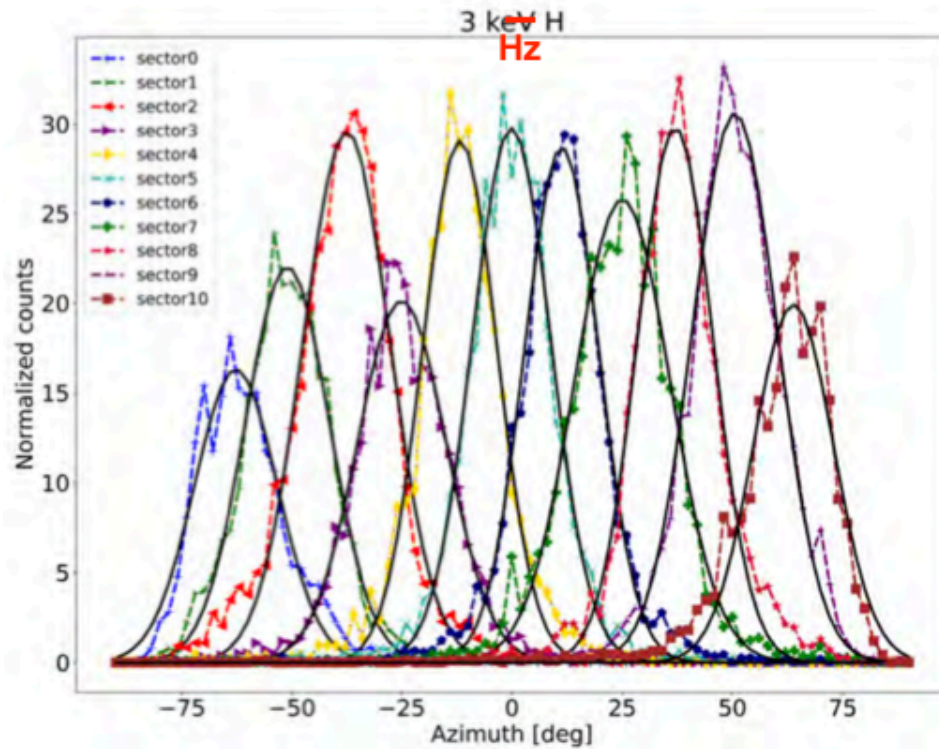


~ Kiruna city hall development

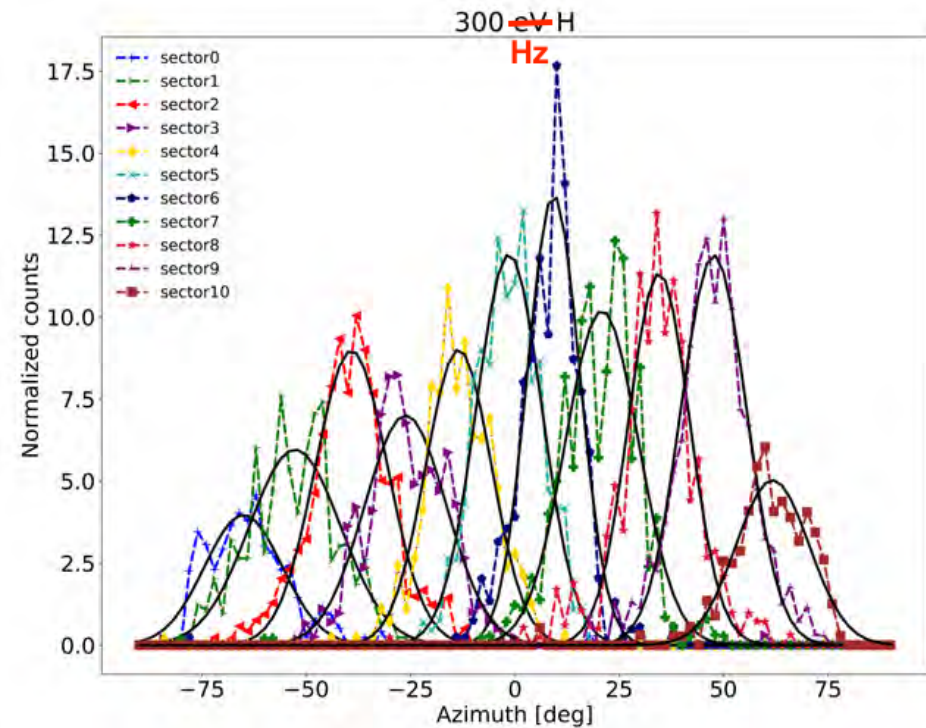
Calibration



3 kHz



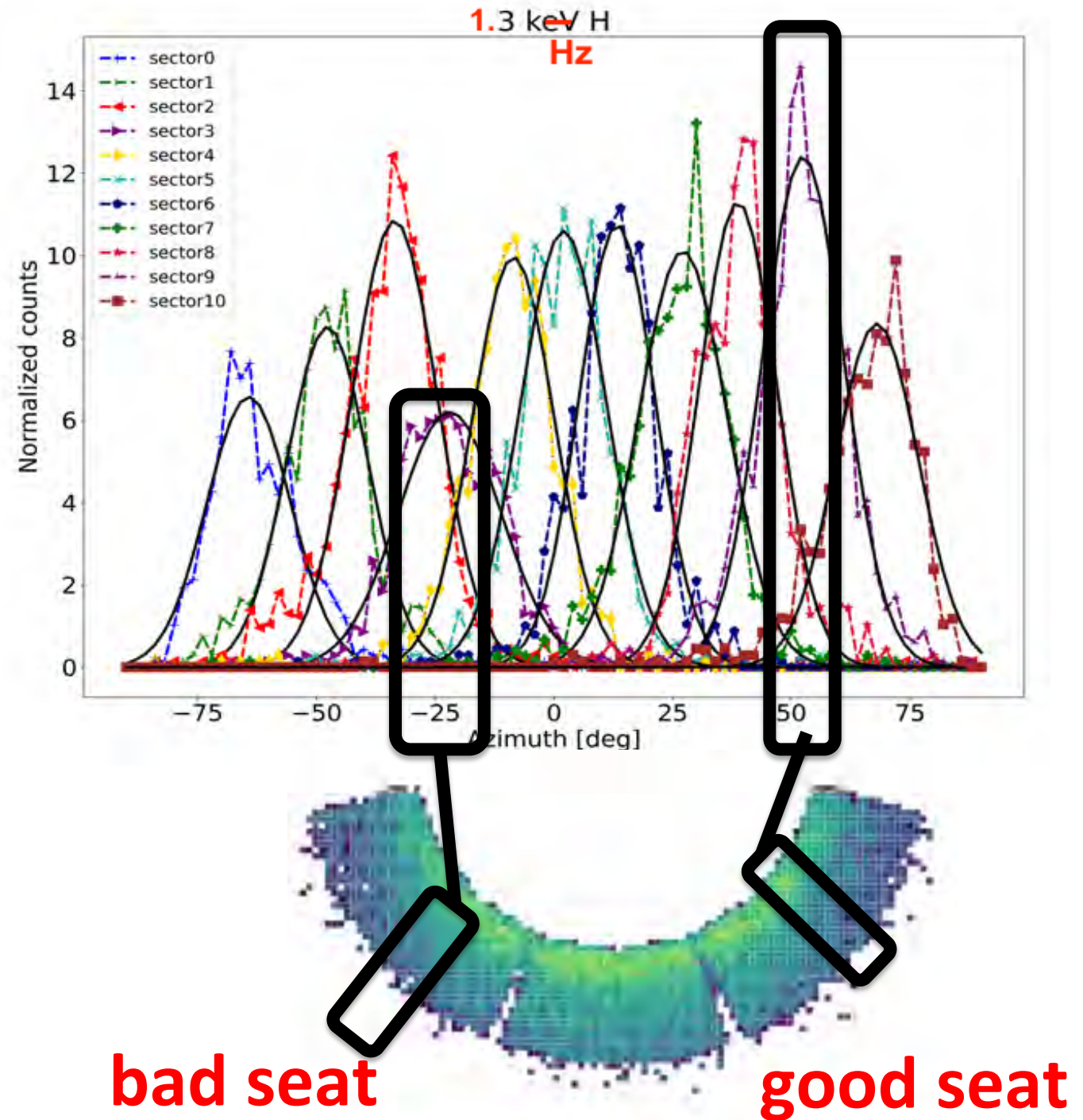
300 Hz



3 octave difference

~ similar result = excellent!

just example

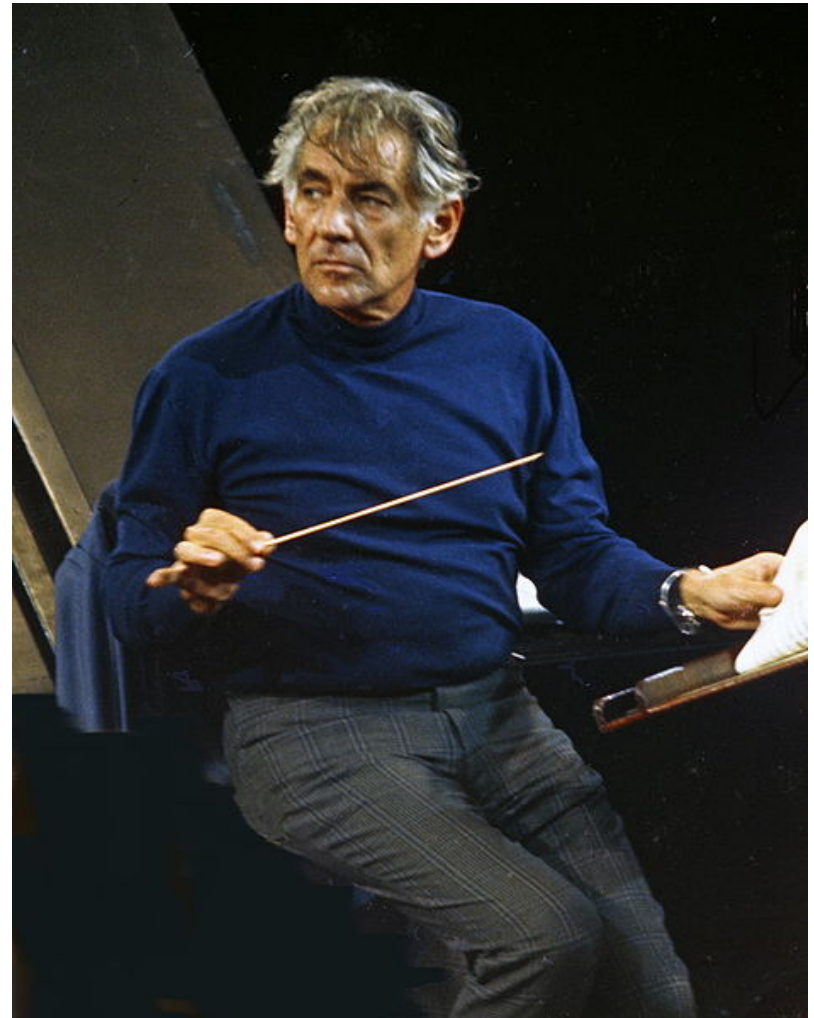


“If you think measuring ions is hard, try (measuring) the neutrals...they may be more interesting anyway...”



Dr. William (Bill) Bernstein 1924-1999

“Technique is
communication”



Leonard Bernstein 1918-1990