Planning for the commissioning of EAR-1 and EAR-2

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EAR1 – EAR2 Commissioning Proposals

EAR1 proposal

- outline to be approved by CB
- to be presented to INTC on February 12, 2014,
- Total number of protons proposed: **34 x 1e17**

EAR2 proposal

- has been presented to INTC on October 23, 2013.
- Total number of protons **98 x 1e17** requested and accepted.

EAR1 Commissioning

Changes in beamline EAR1

1. Realignment of collimator 1
2. Reduce inner diameter of final vacuum tube
3. Position of 185-m vacuum window before collimator 2

→ **need for commissioning**

Focus commissioning EAR1 on

1. Beam profile
2. Resolution Function and TOF-E_n calibration
3. Background
4. Response/test of existing/new detectors

EAR1 – Beam profile

Beam profile measurements in capture collimator configuration

Need for sufficient statistics.

- New transparent XY-MGAS (1 for EAR1, 1 for EAR2)
- New SiMon2 with ^{6}Li?
- New/old PPACs?

Use detectors simultaneously.

6 x 10^{17} protons

Resolution function

Need for sufficient statistics, RF also with TAC

- TAC+C_6D_6 with ^{56}Fe (high E) and ^{238}U (low E)
  INPTC-P-249: 2.3e17 protons for 1000 #reactions in 181 keV resonance of ^{56}Fe
  - TAC - ^{56}Fe: 2.3e17 p ^{238}U: 0.7e17
  - C_6D_6 - ^{56}Fe: 12e17 p ^{238}U: 3.5e17

19 x 10^{17} protons

EAR1 – Background

Background on TAC

- influence of upstream in-beam material (detectors)
- influence of in-beam samples (C (several), Au, Fe, empty)

Background on C_6D_6

- influence of in-beam samples (C (several), Au, U, empty) on low-energy background, down to thermal

4 x 10^{17} protons

Detector response functions

- current detectors PPAC, MGAS, C6D6, TAC
- new detectors, LaBr3, HPGe, CsI, others?

2 x 10^{17} protons

Summary EAR1 Commissioning

	x1e17 protons
1. Beam profile	6
2. Resolution function	19
3. Background	4
4. Detectors tests	2
5. Unforeseen	3
total	**34**

Additional points for EAR1 Commissioning

- Expand time range of DAQ to go down to near thermal (Eric: chaining Acqiris modules for ^{241}Am)

acquisition time		lowest energy
16 ms	→	700 meV
96 ms	→	19 meV

- Try in-beam thick Pb/Bi filter to lower gamma flash
- Record full EAR (1 and 2) configuration in logbook
- Implement a local (EAR1) reference grid (zero offset)

EAR2 Commissioning

EAR2 proposal

- presented to INTC on October 23, 2013.
- Total number of protons requested and accepted:

98 x 1e17

– Neutron flux	24
– Beam profile	12
– Resolution function	9
– Backgrounds	35
– Detectors tests	8
– Unforeseen	10

EAR2 – Flux and background

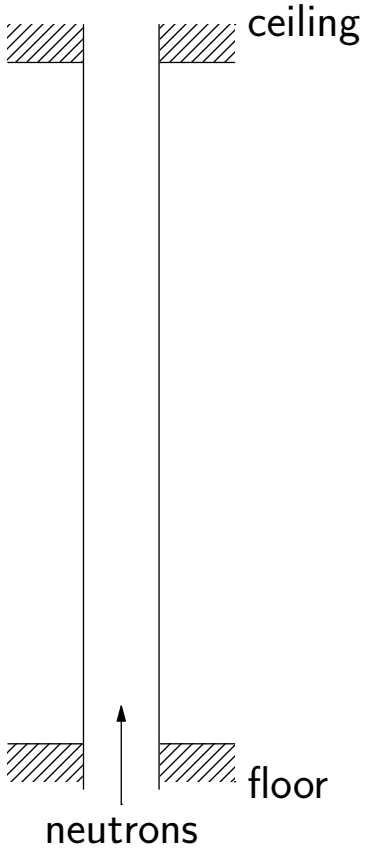
Start with flux and backgrounds

- Optimize changes in and around EAR2,
  Two collimator-setups (one “fission” and one “capture” setup), change only once.

- Do a background mapping with **off-beam** detectors (C_6D_6, ^3He, others) for each change of **in-beam** elements (like windows, detectors)

EAR2 – Flux and background

Nothing in beam

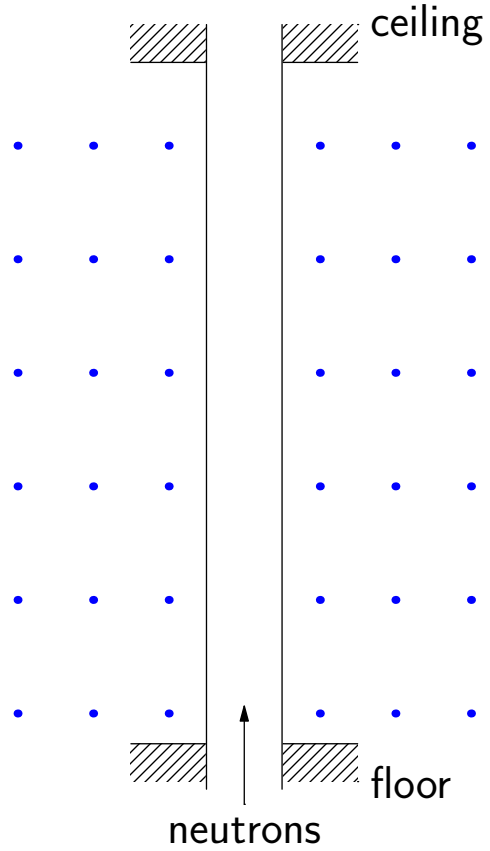


EAR2 – Flux and background

Nothing in beam

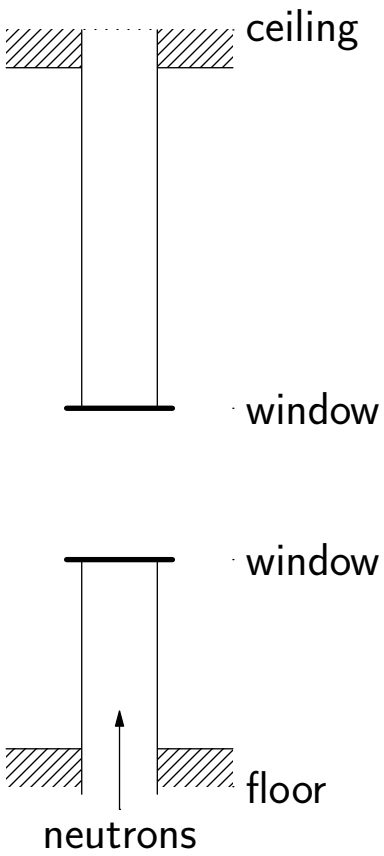
measure background at grid positions (C_6D_6, ^3He)

Finetune beam dump



EAR2 – Flux and background

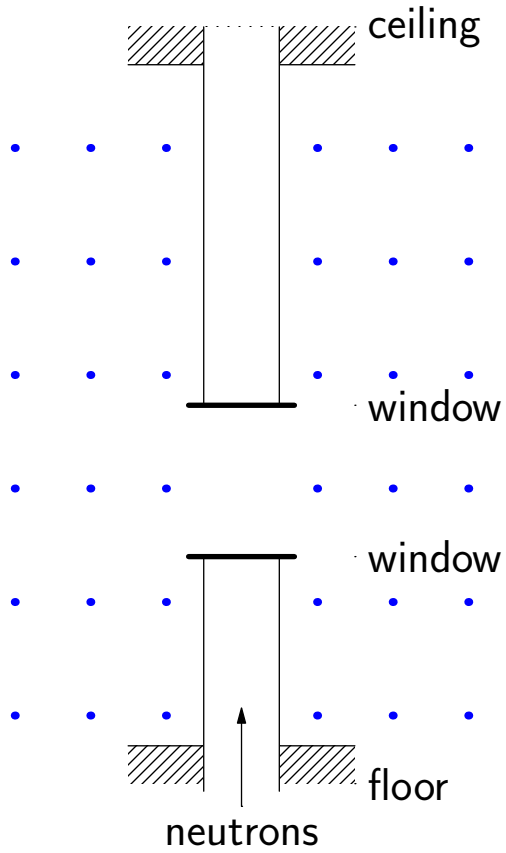
Add material in beam (windows)



EAR2 – Flux and background

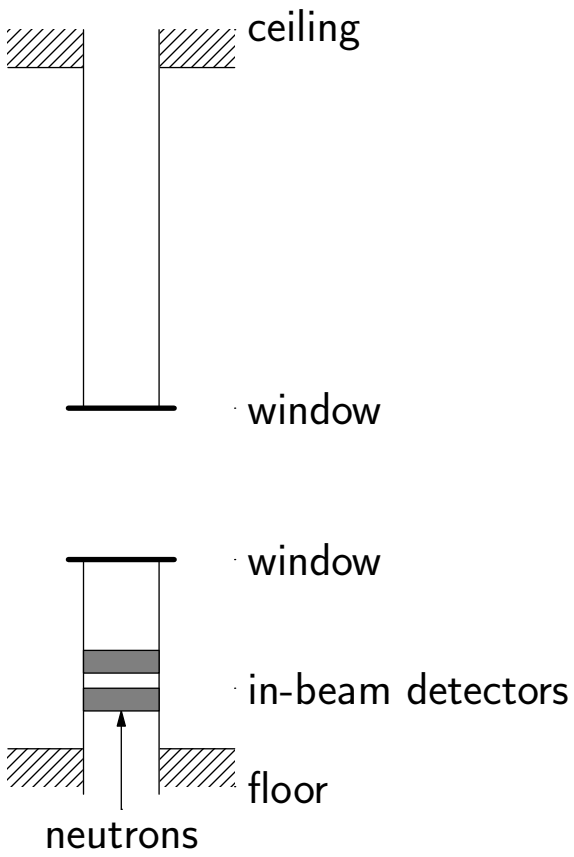
Add material in beam (windows)

measure background at grid positions (C_6D_6, ^3He)



EAR2 – Flux and background

Add material in beam (flux detectors)

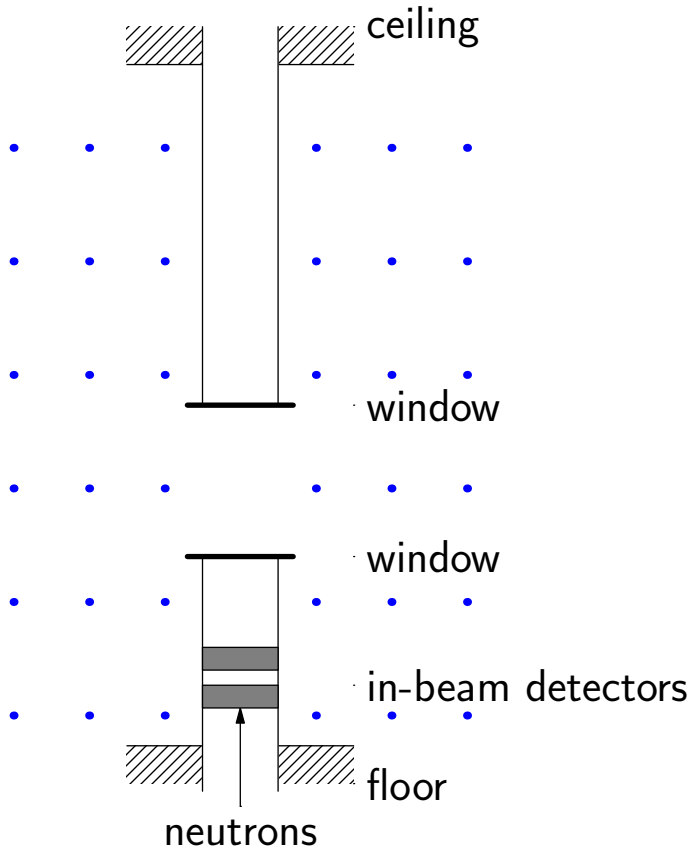


EAR2 – Flux and background

Add material in beam (flux detectors)

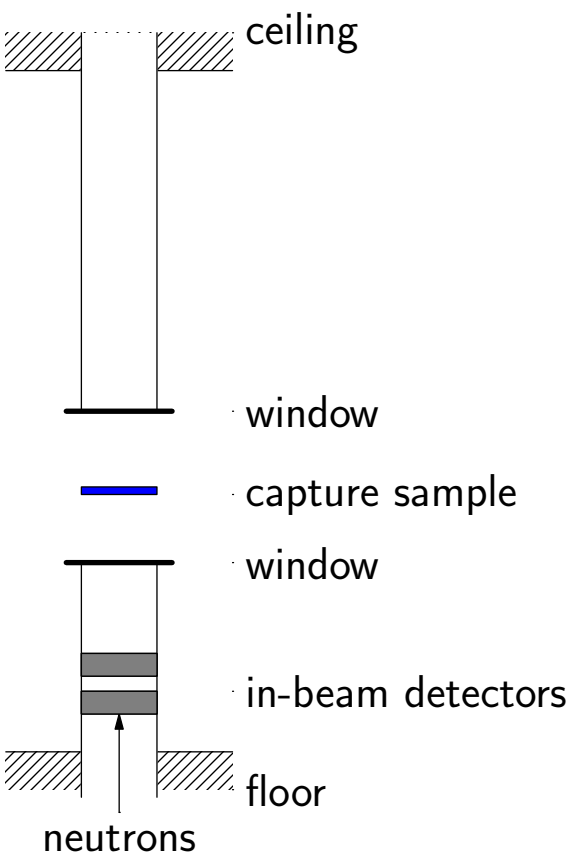
measure background at grid positions (C_6D_6, ^3He)

measure flux



EAR2 – Flux and background

Add material in beam (capture sample)

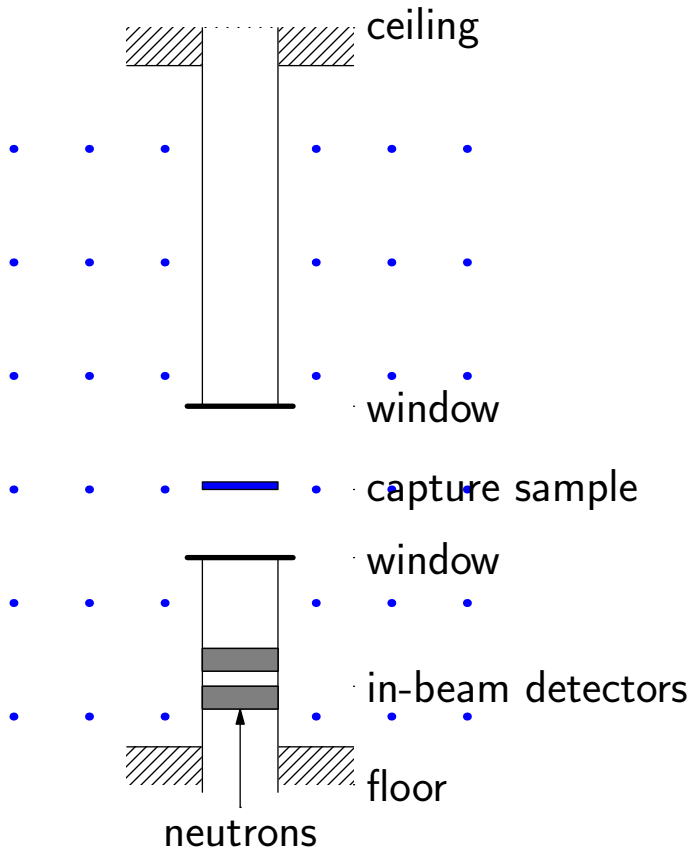


EAR2 – Flux and background

Add material in beam (flux detectors)

measure background at grid positions (C_6D_6, ^3He)

measure flux



Background mapping

- neutrons:
^{3}He-array, CR39, PPAC/MGAS outside beam, ^{6}Li glass, Timepix, BC501

- gamma:
C_6D_6, $LaBr_3$/$LaCl_3$/$CeBr_3$, HPGe, others

Add detectors in fixed position (monitors)

35 x 10^{17} protons

Neutron flux

Neutron flux measurements

- New PPAC (^{235}U, ^{10}B, ^{6}Li, (n,p)?)
- New MGAS (^{235}U, ^{10}B, ^{6}Li)
- New SiMon (^{6}Li)
- PTB (^{235}U), or calibrate PPAC/MGAS at PTB
- Activation of gold foils

24 x 10^{17} protons

Beam profile

Beam profile measurements

- New transparent XY-MGAS
- New SiMon with ^{6}Li inside strip-sandwich (dedicated beam)
- New PPAC
- CR39
- Beam halo with Au activation

12 x 10^{17} protons

Detector response functions

- C_6D_6 (all types)
- $LaBr_3/LaCl_3$
- BaF_2
- (n,cp) detectors
- HPGe
- CsI, others?

8×10^{17} protons

Cross section validation measurements

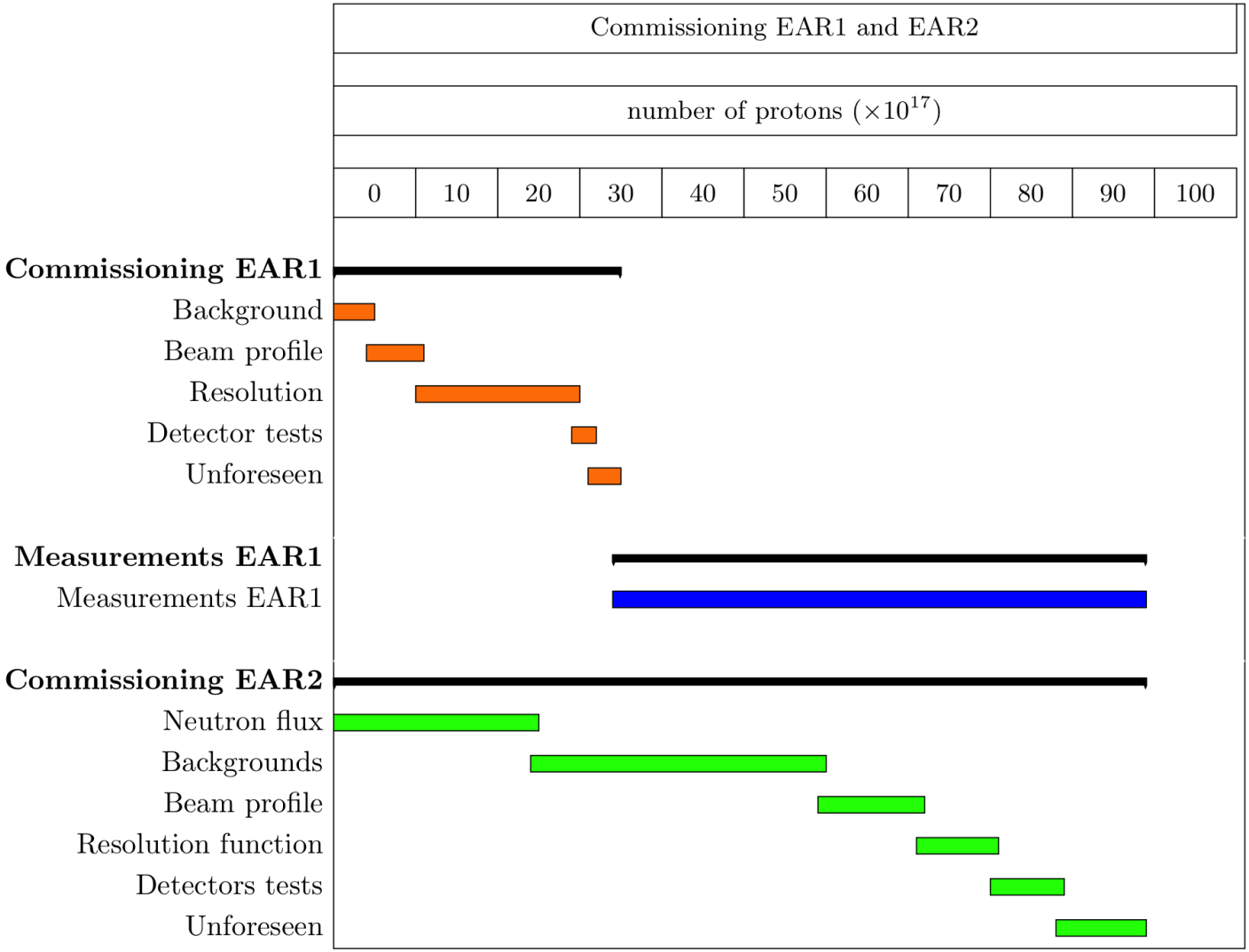
- C_6D_6 $^{197}Au(n,\gamma)$, $^{238}U(n,\gamma)$ or $^{56}Fe(n,\gamma)$
- PPAC $^{238}U/^{235}U$ (n,f)

0 x 10^{17} protons (already included)

Additional points for EAR2 Commissioning

- Try in-beam thick Pb/Bi filter to lower gamma flash
- Record full EAR configuration in logbook,
- Implement a local (EAR2) reference grid (zero offset)
- Get set of reference samples for EAR2 (Au, Ag, C, U, Fe, others)
- Assign contact persons for each detector
- Optimize pulse shape analysis for each detector
- Make quick analyses with time/amplitude spectra with centralized storage/documentation
- Adjust commissioning programme where necessary

Summary Commissioning EAR1 and EAR2



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Thank you for your attention.