PERTURBATION OF PHASE SPACE DOWNSTREAM BY PARAMETERS UPSTREAM

MARY PW CHIN

[1]ESS (European Spallation Source), SE-22100 Lund, Sweden

[2]CERN, Department EN/STI, CH-1211 Geneve 23, Switzerland

mary.chin@cern.ch

as presented at SATIF10 (Geneva) by me@marychin.org

SPALLATION NEUTRON SOURCE

(p,xn) *on something**

A RELATIVELY GENEROUS NEUTRON SUPPLY

* Chin MPW et al. *Proton and neutron penetration of candidate target materials for the ESS.* ICANS-XIX Grindelwald 2010

‘NEUTRON YIELD’
could sometimes be misleading

(p,xn)

GENEROUS

Q1. Where... at the point of creation?

Q2. How many of them usable?

(p,xn)

USE *THESE*

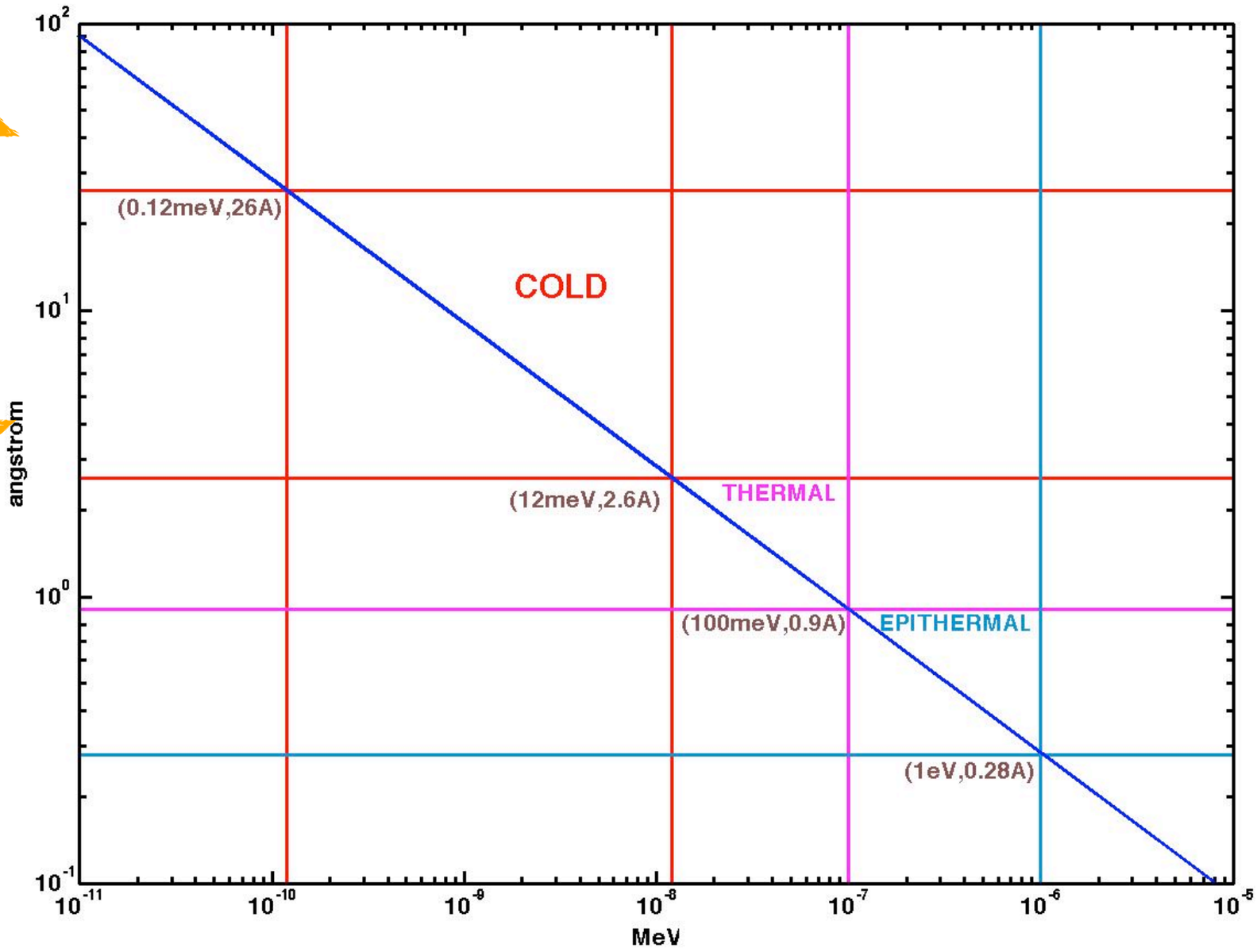
FOR NEUTRON DIFFRACTION?

PROBABLY WE ARE GOING TO

DO NO EXPERIMENT

KILL OUR DETECTORS

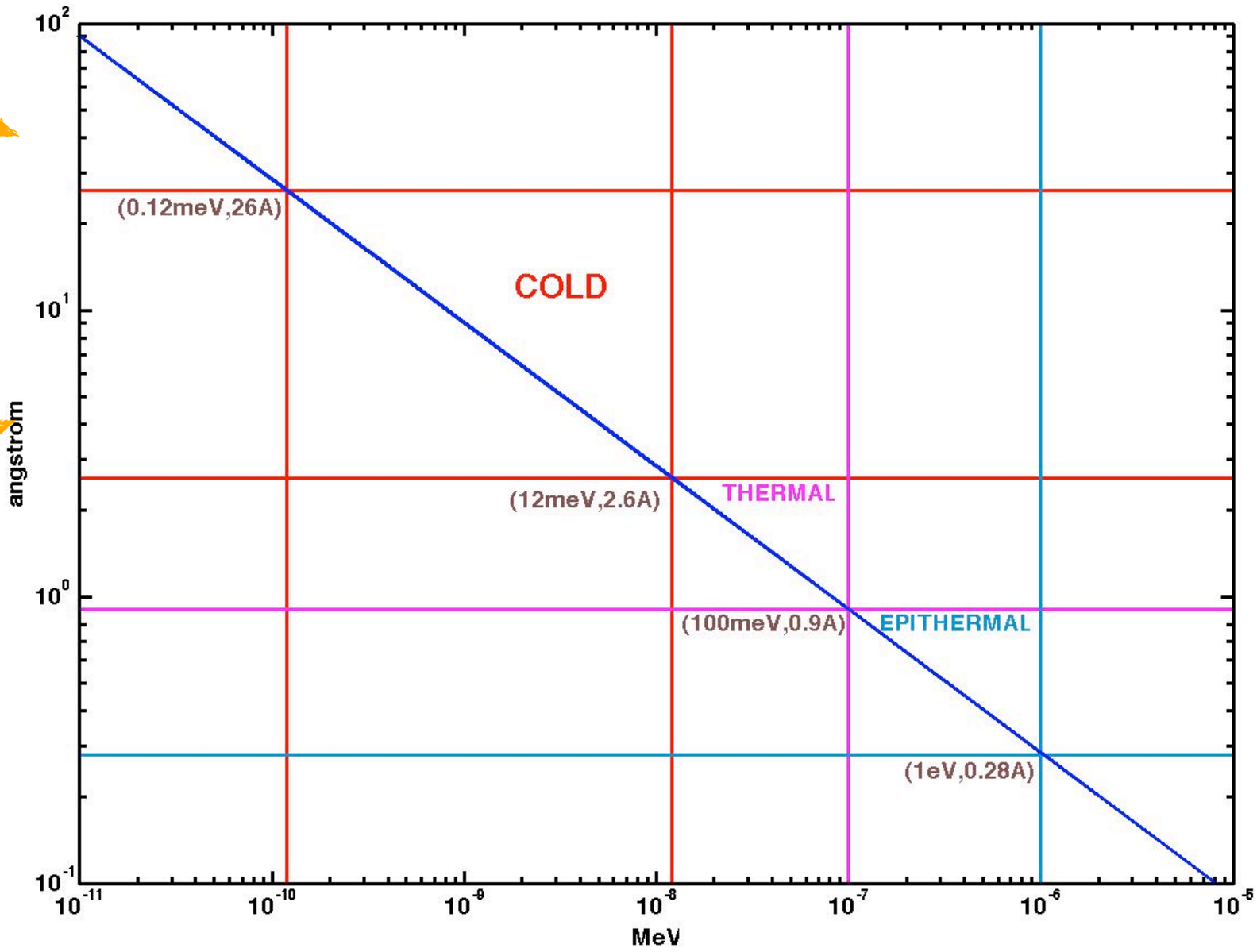
experimental interests



we are way off

(p,xn) GeV neutrons

experimental interests



we are way off

TO GET BACK TO SENSIBLE RANGES

WE NEED NOT ONLY (p,xn) on a target

BUT ALSO CRYOGENIC MODERATORS

REFLECTORS

SOMETIMES ALSO DECOUPLERS & LINERS

AND MORE

IF WE CHANGE THE BEAM ATTRIBUTES WILL IT AFFECT SHIELDING REQUIREMENTS?

upstream

downstream

(p,xn) @ TARGET

upstream

LONG & WINDING HISTORY

LICENSING & DESIGN PEOPLE: WHO WAITS FOR WHO?

emerging particles

downstream

(p,xn) on TARGET

CRYOGENIC MODERATORS

REFLECTORS

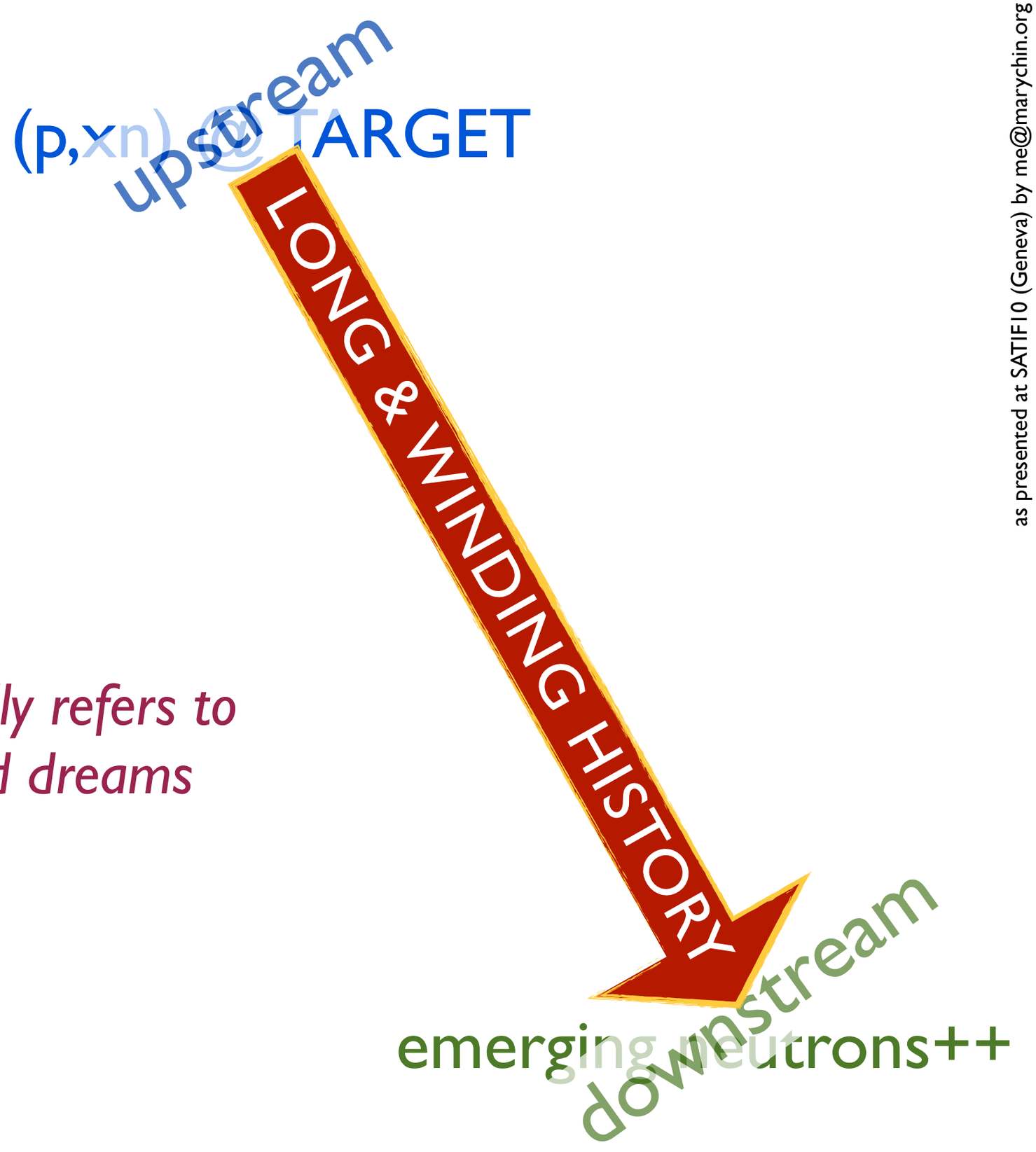
DECOUPLERS & LINERS

夜 NIGHT

长 LONG

梦 DREAM *usually refers to bad dreams*

多 MORE



THE LONGER THE NIGHT THE MORE THE BAD DREAMS

夜 NIGHT

长 LONG

梦 DREAM

多 MORE

at some point it becomes
tricky to know
what differences / similarities
we are looking at

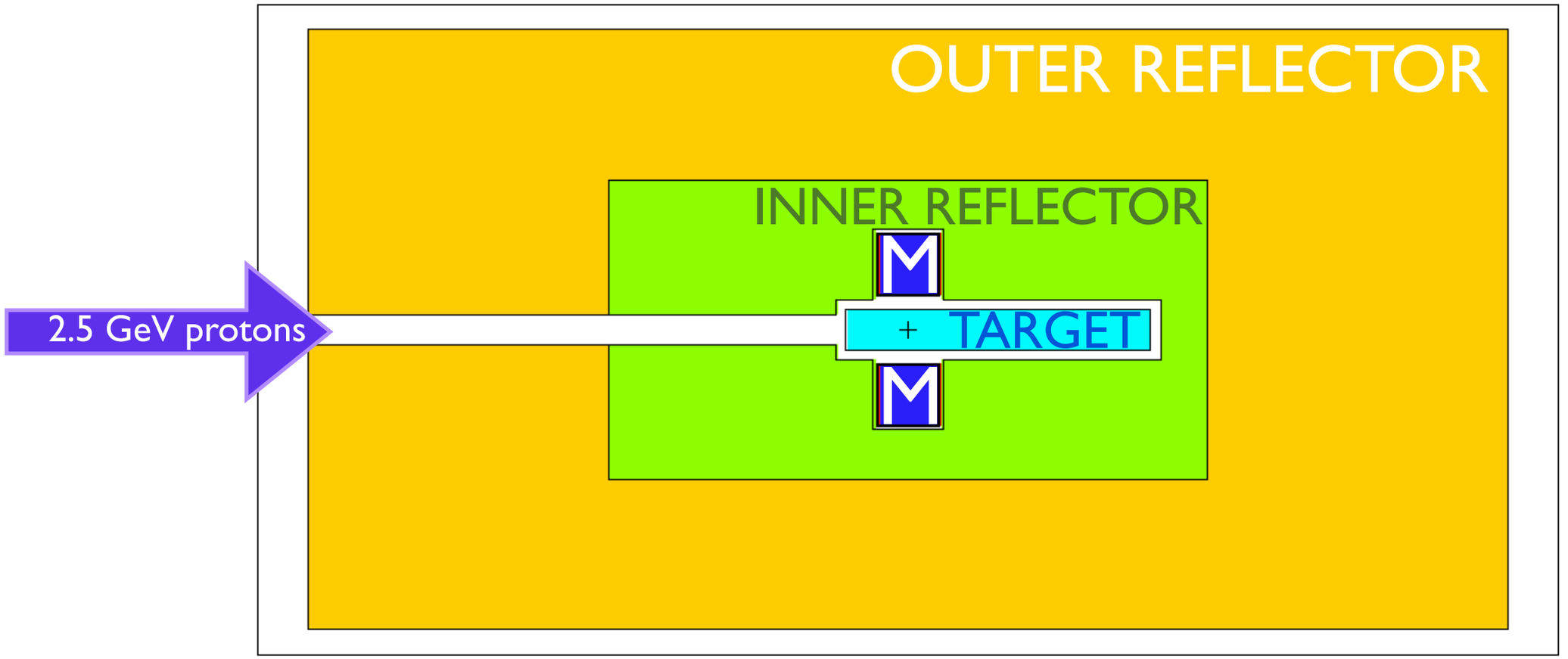
eg#1. cancelling effects

eg#2. we might think we are
comparing spallation models
when in fact the
dominant effect is the
multiple-scattering theory

NOT EASY TO COMPARE MONTE CARLO CODES

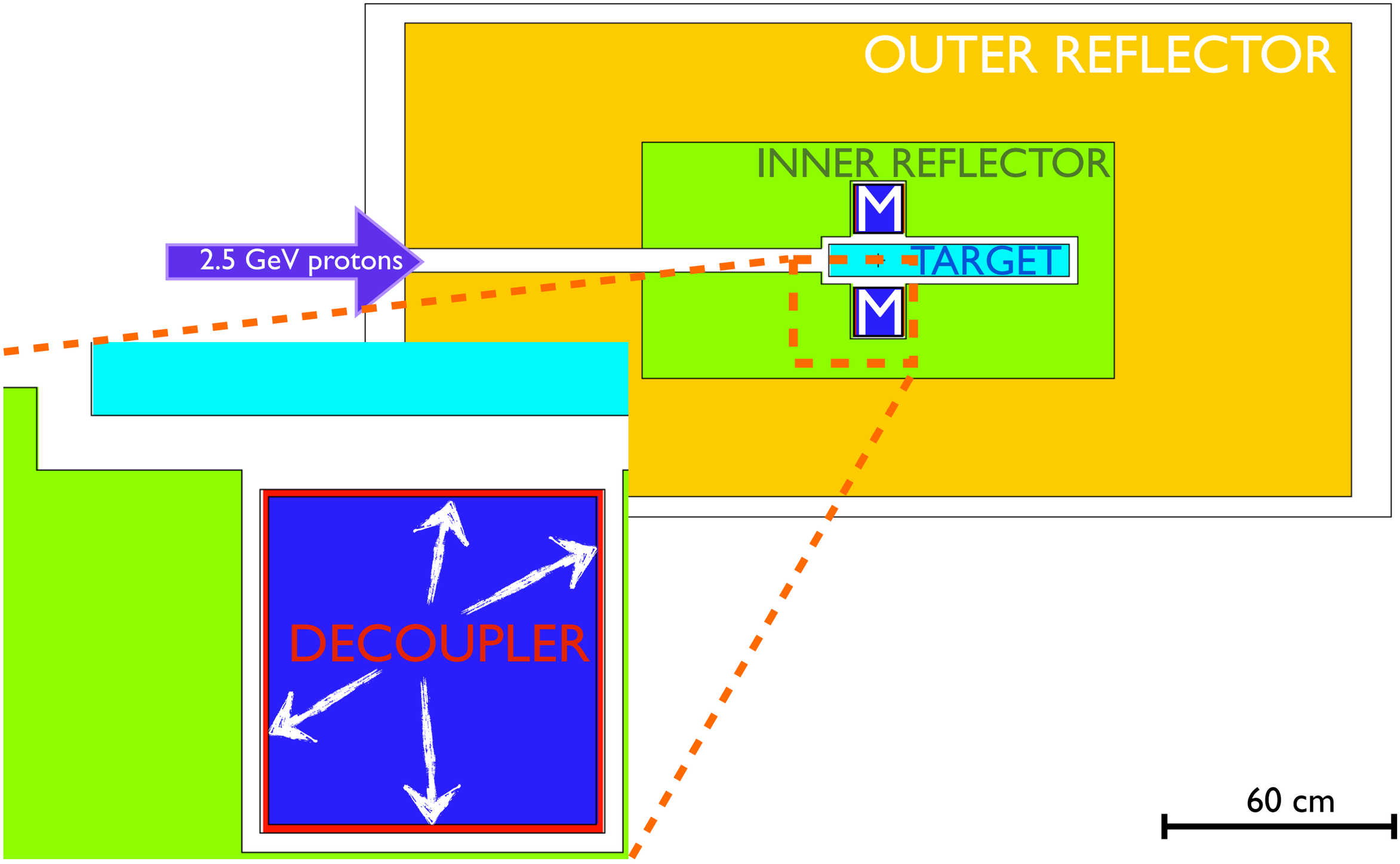
setting the same *energy cuts* is not good enough

SIDE VIEW

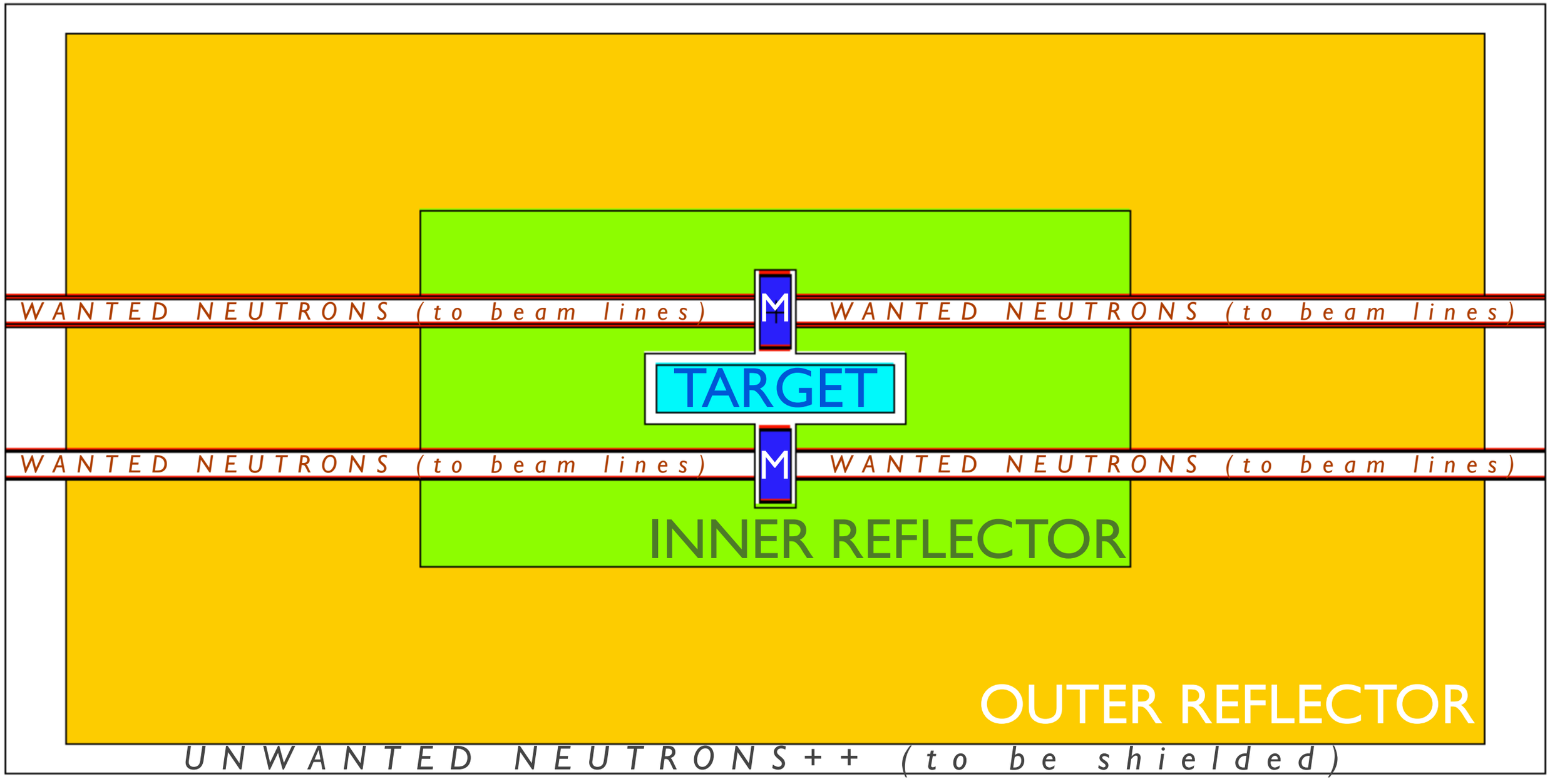


60 cm

SIDE VIEW

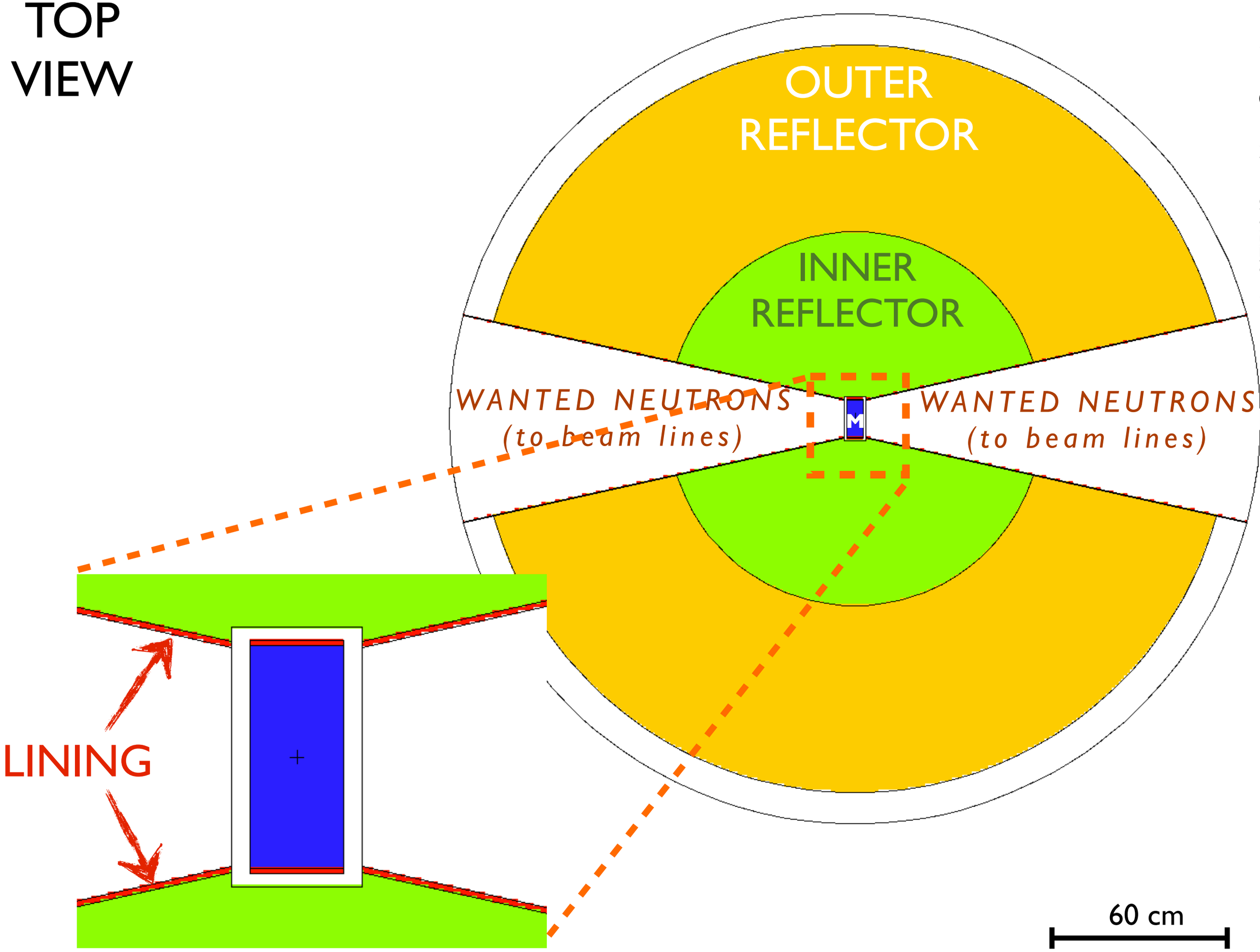


BEAM'S EYE VIEW

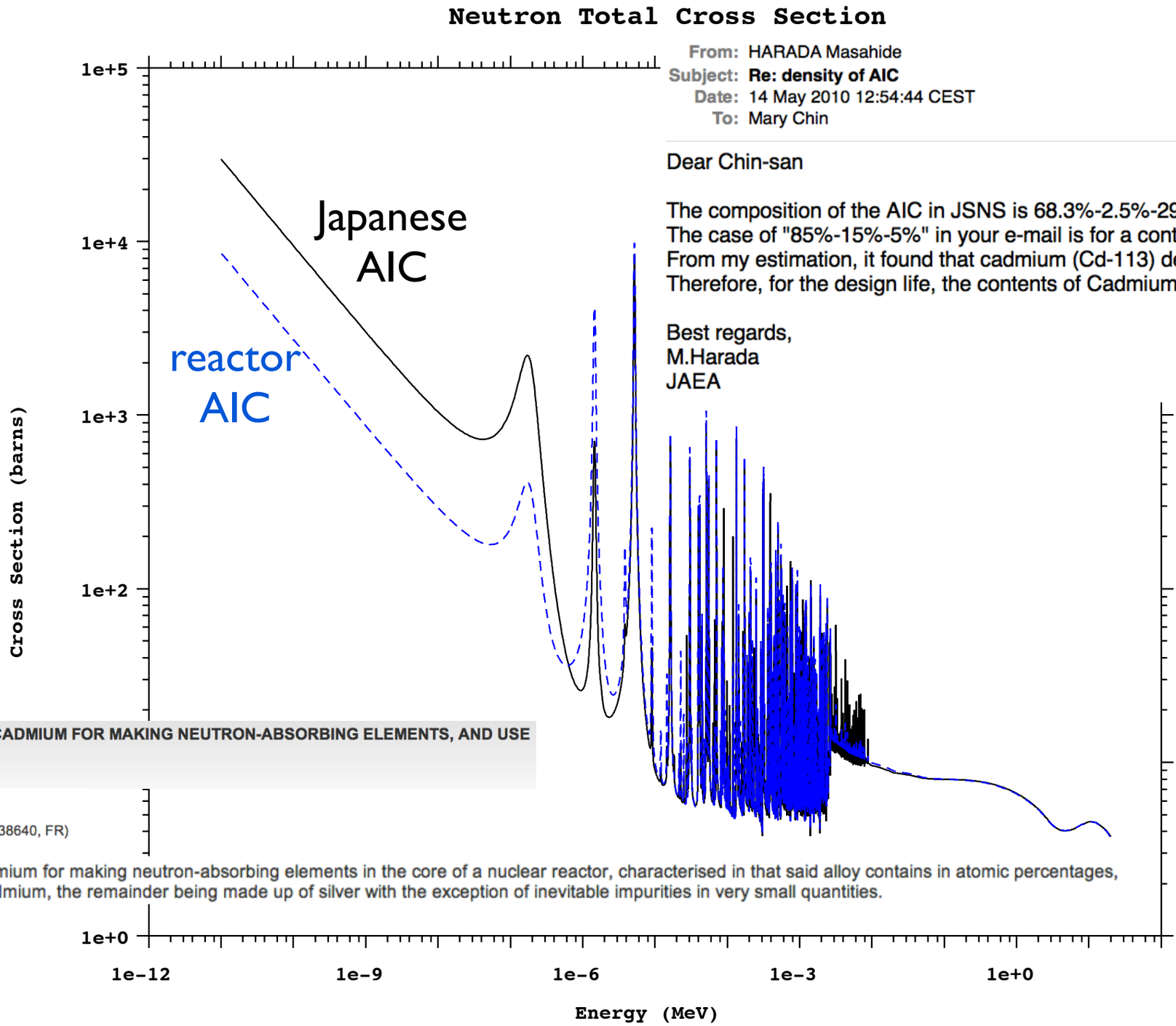


60 cm

TOP VIEW



Japanese vs reactor AIC



From: HARADA Masahide
Subject: **Re: density of AIC**
Date: 14 May 2010 12:54:44 CEST
To: Mary Chin

Dear Chin-san

The composition of the AIC in JSNS is 68.3%-2.5%-29.2% of Ag, In and Cd by weight.
The case of "85%-15%-5%" in your e-mail is for a control rod in a reactor.
From my estimation, it found that cadmium (Cd-113) decreased most in operation.
Therefore, for the design life, the contents of Cadmium had to be increased.

Best regards,
M.Harada
JAEA

SILVER ALLOY CONTAINING INDIUM AND CADMIUM FOR MAKING NEUTRON-ABSORBING ELEMENTS, AND USE THEREOF

European Patent EP0737357 **Kind Code:** B1

Inventors:

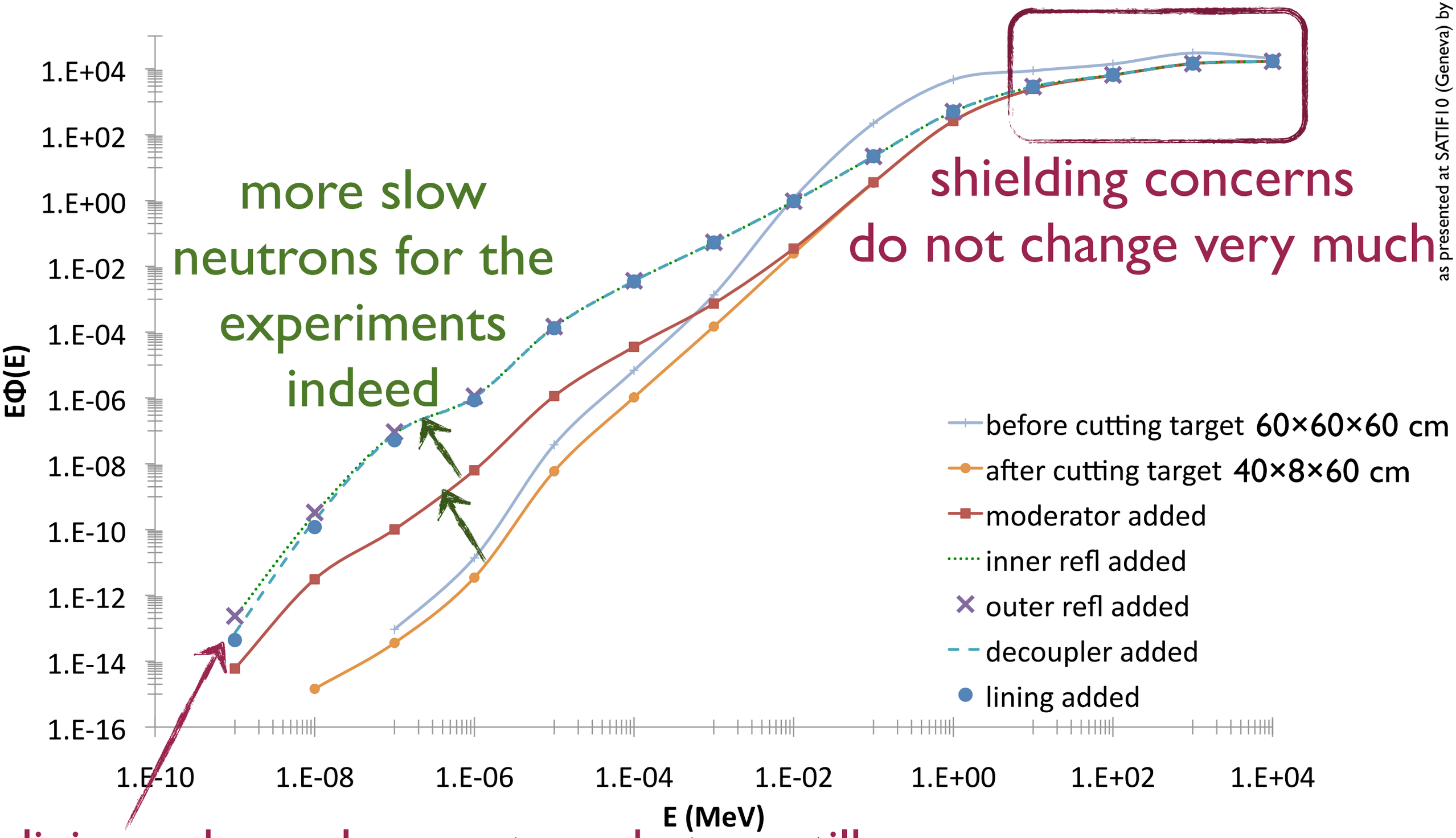
Defoort, Françoise (27, chemin de la Côte, Claix, F-38640, FR)
Pillet, Luc (79, rue Paul-Bert, Lyon, F-69003, FR)

1. Silver alloy containing indium and cadmium for making neutron-absorbing elements in the core of a nuclear reactor, characterised in that said alloy contains in atomic percentages, 9 to 12% of indium and 4 to 5.35% of cadmium, the remainder being made up of silver with the exception of inevitable impurities in very small quantities.

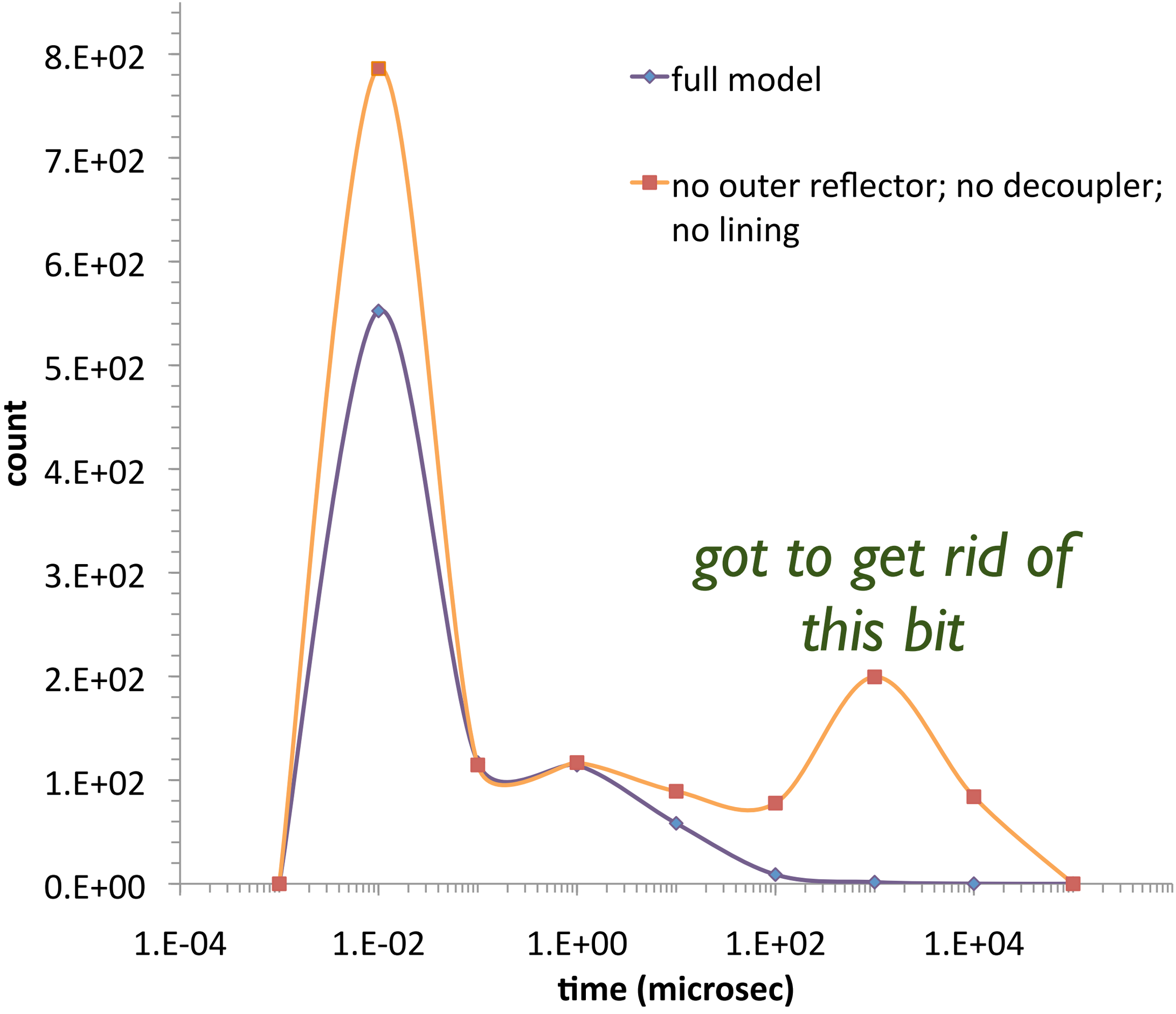
Assembling the TMR step-by-step

more slow neutrons for the experiments indeed

shielding concerns do not change very much

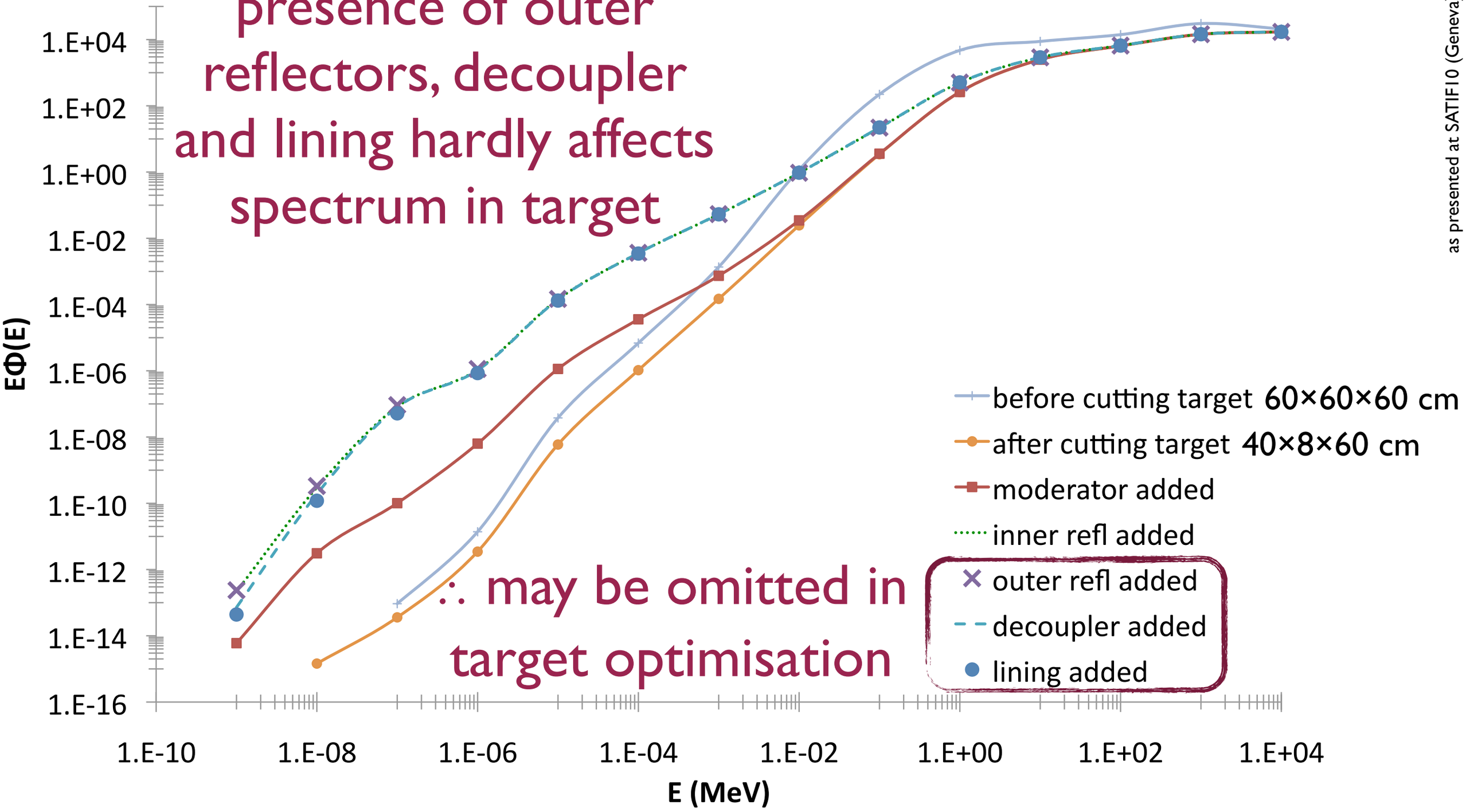


lining reduces slow neutrons but we still need lining to keep pulses slim



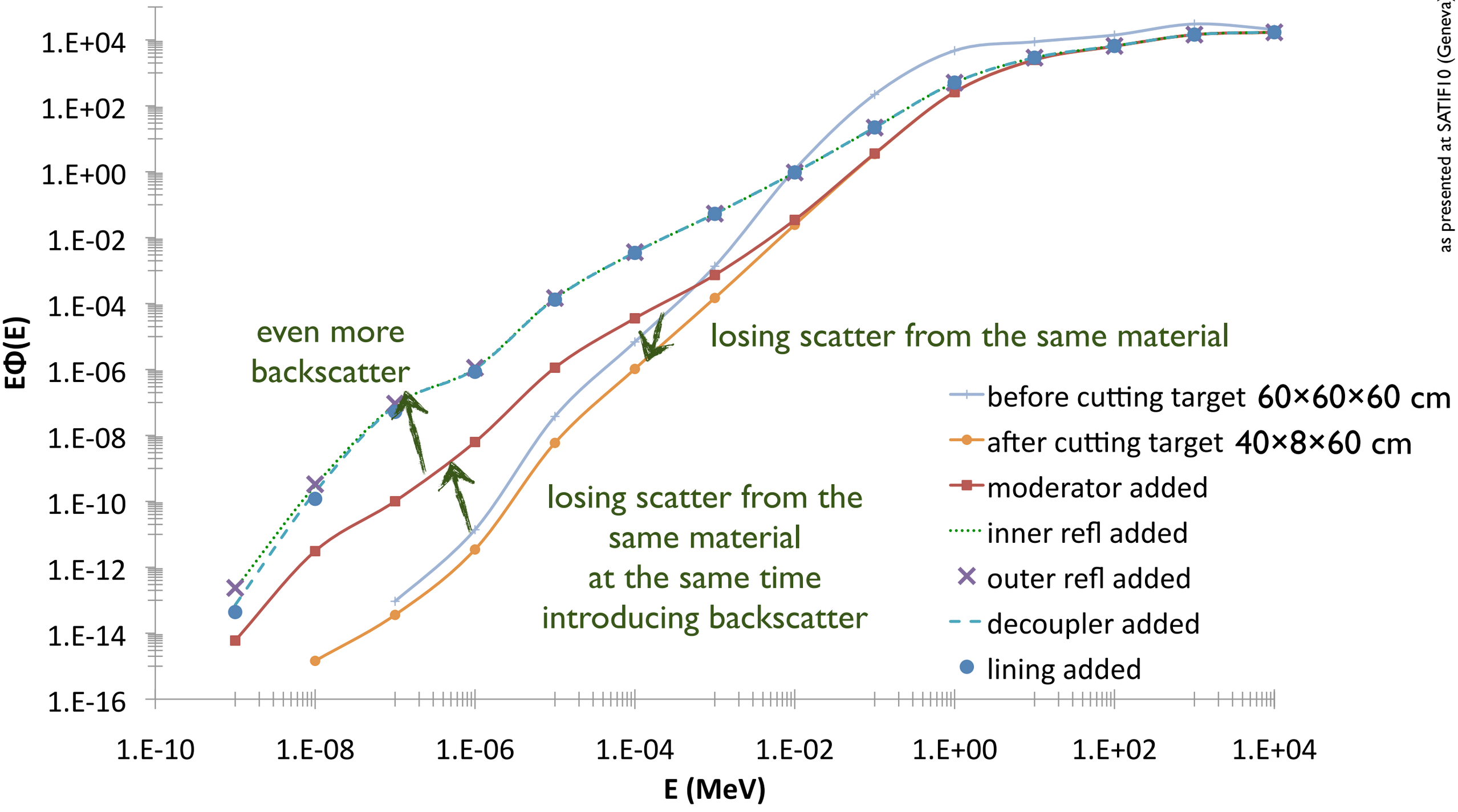
Assembling the TMR step-by-step

presence of outer reflectors, decoupler and lining hardly affects spectrum in target



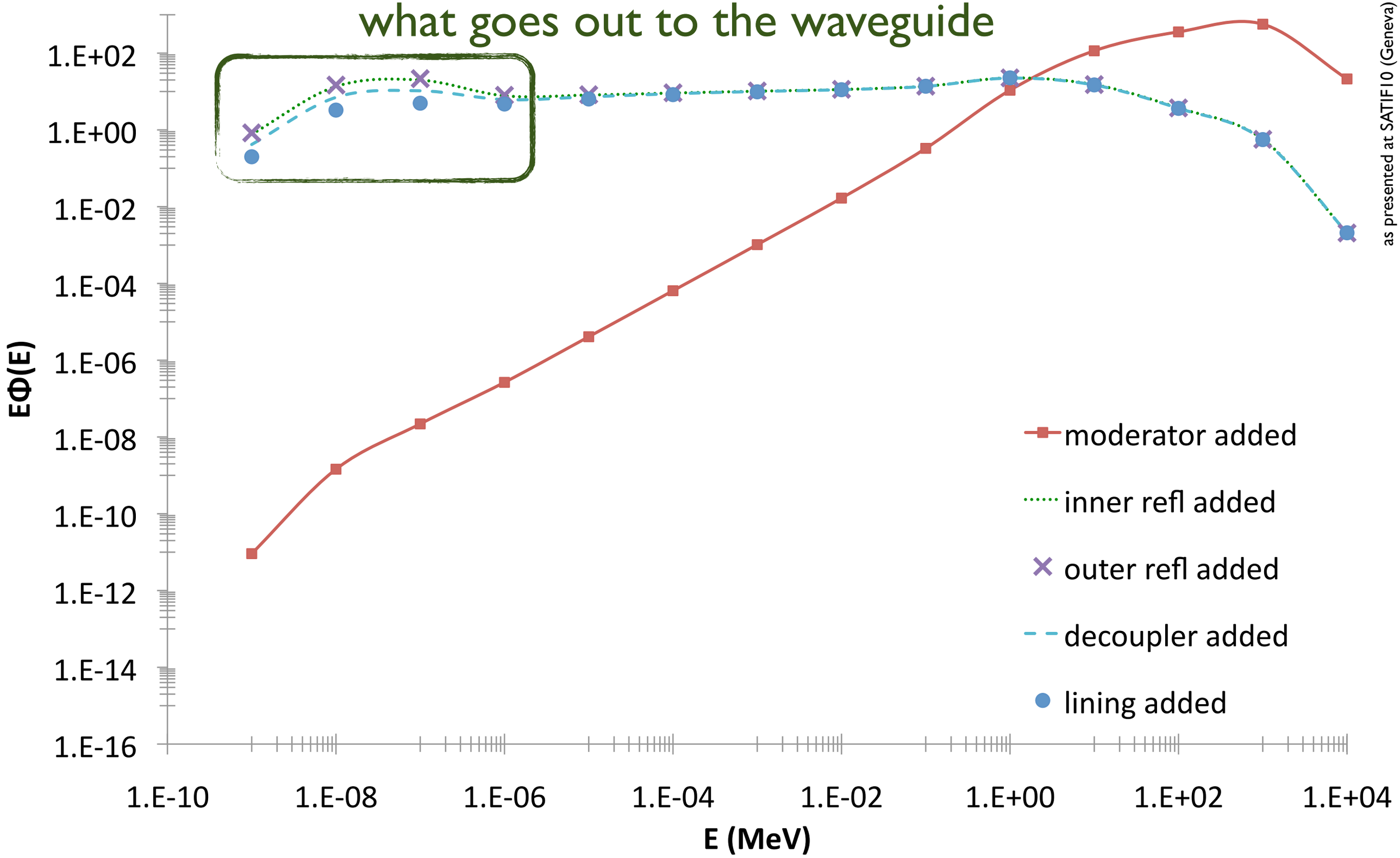
∴ may be omitted in target optimisation

Assembling the TMR step-by-step



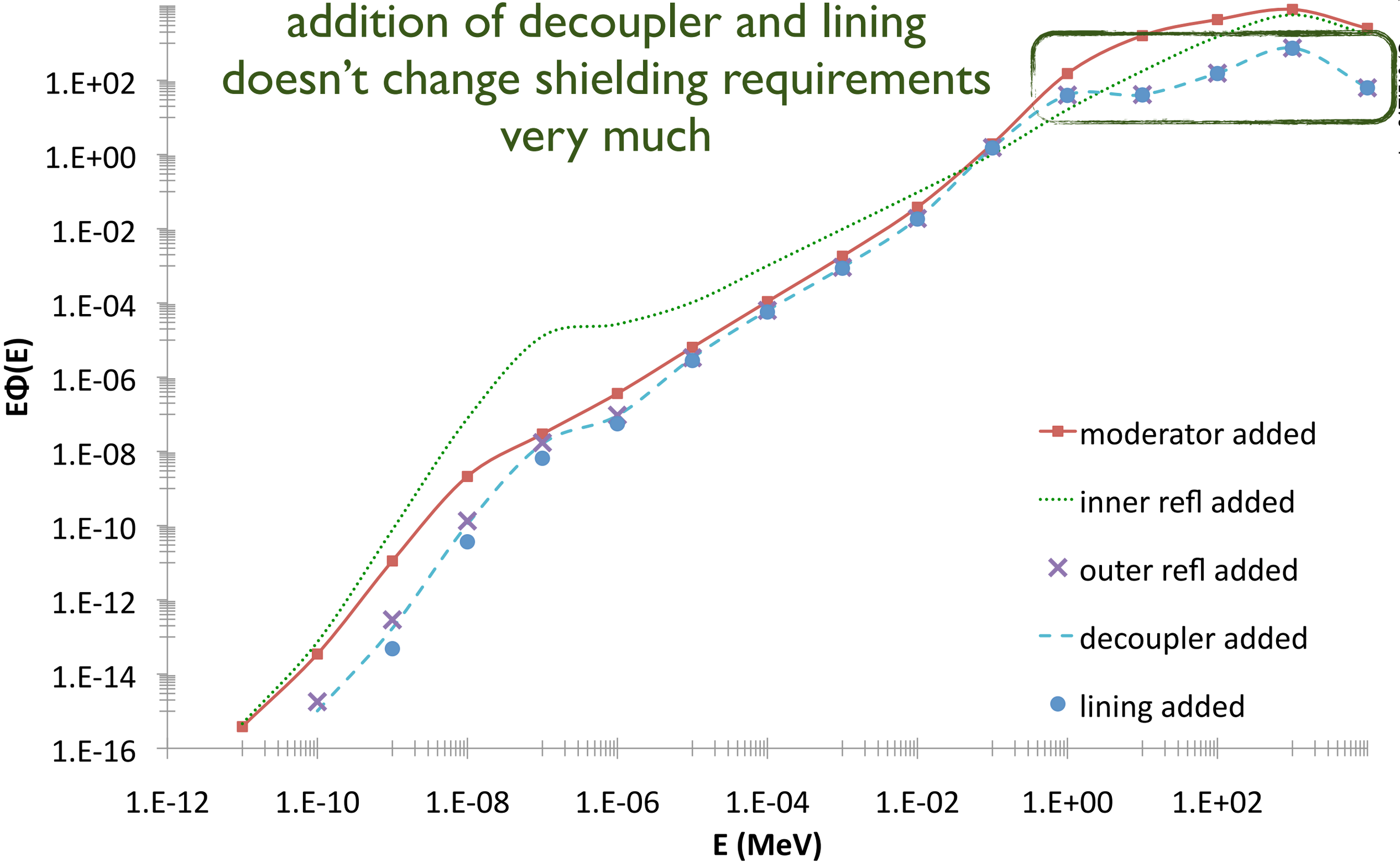
In the moderator

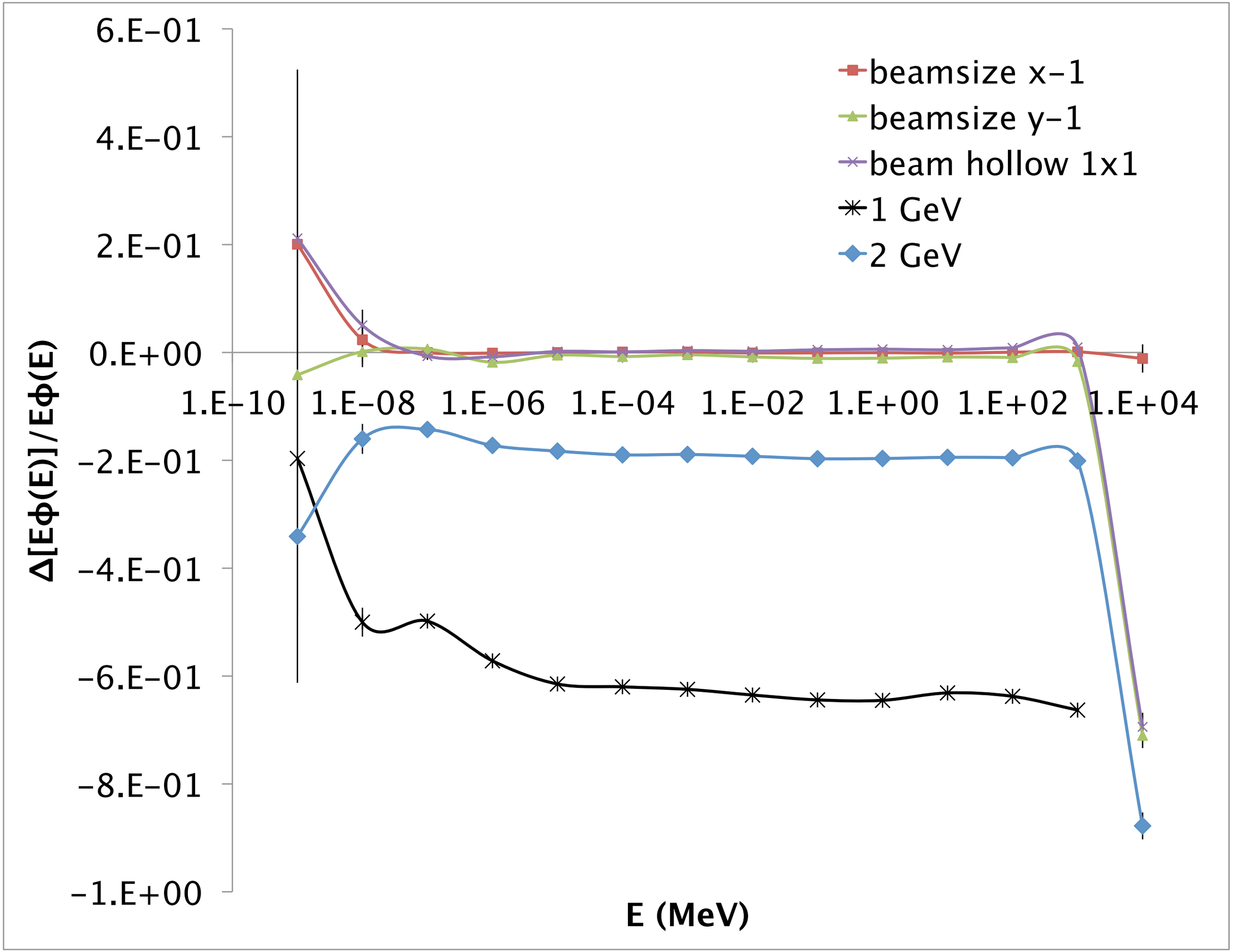
subtle differences ➔ important implication in what goes out to the waveguide



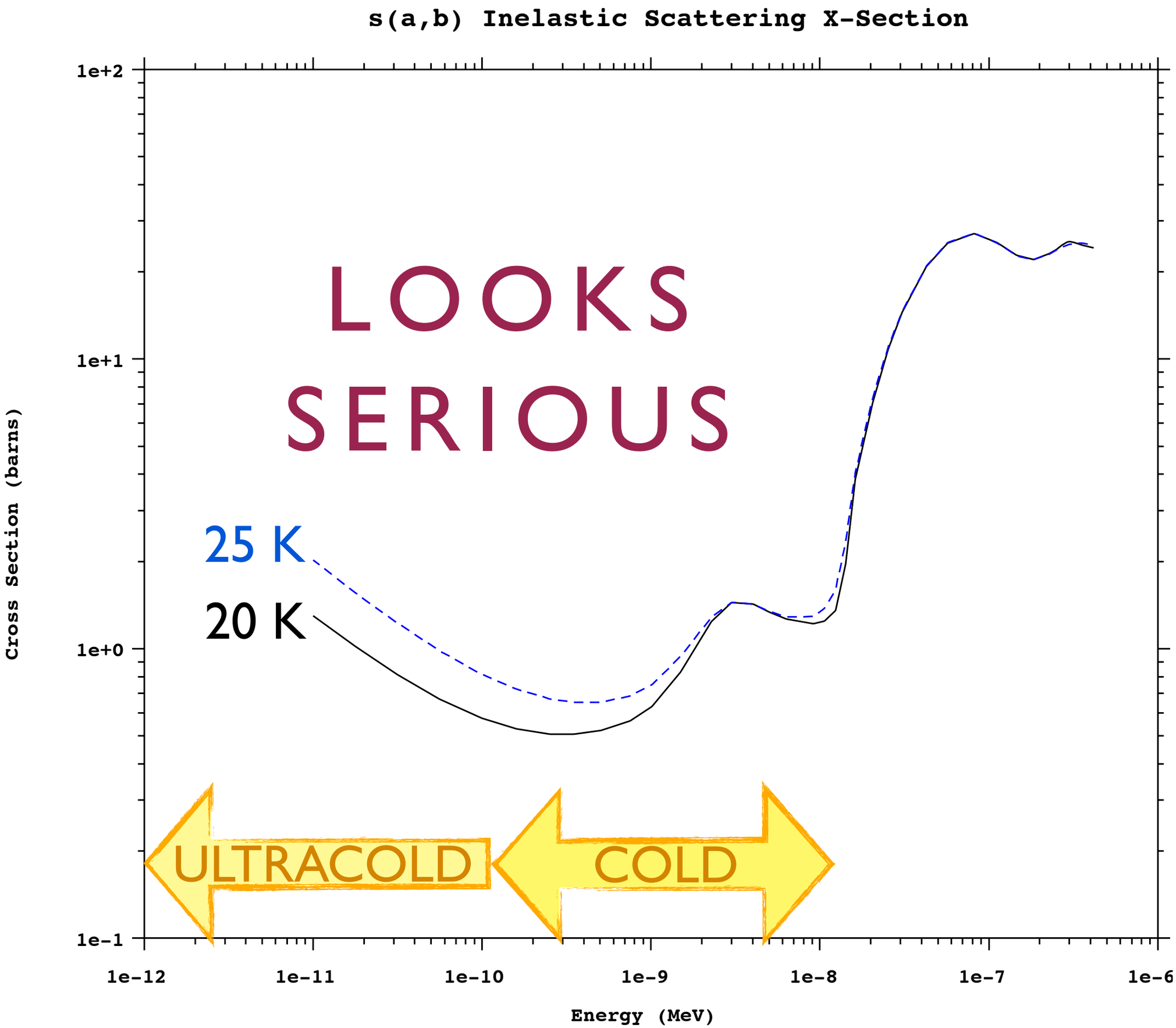
Neutrons escaping the TMR assembly

addition of decoupler and lining
doesn't change shielding requirements
very much



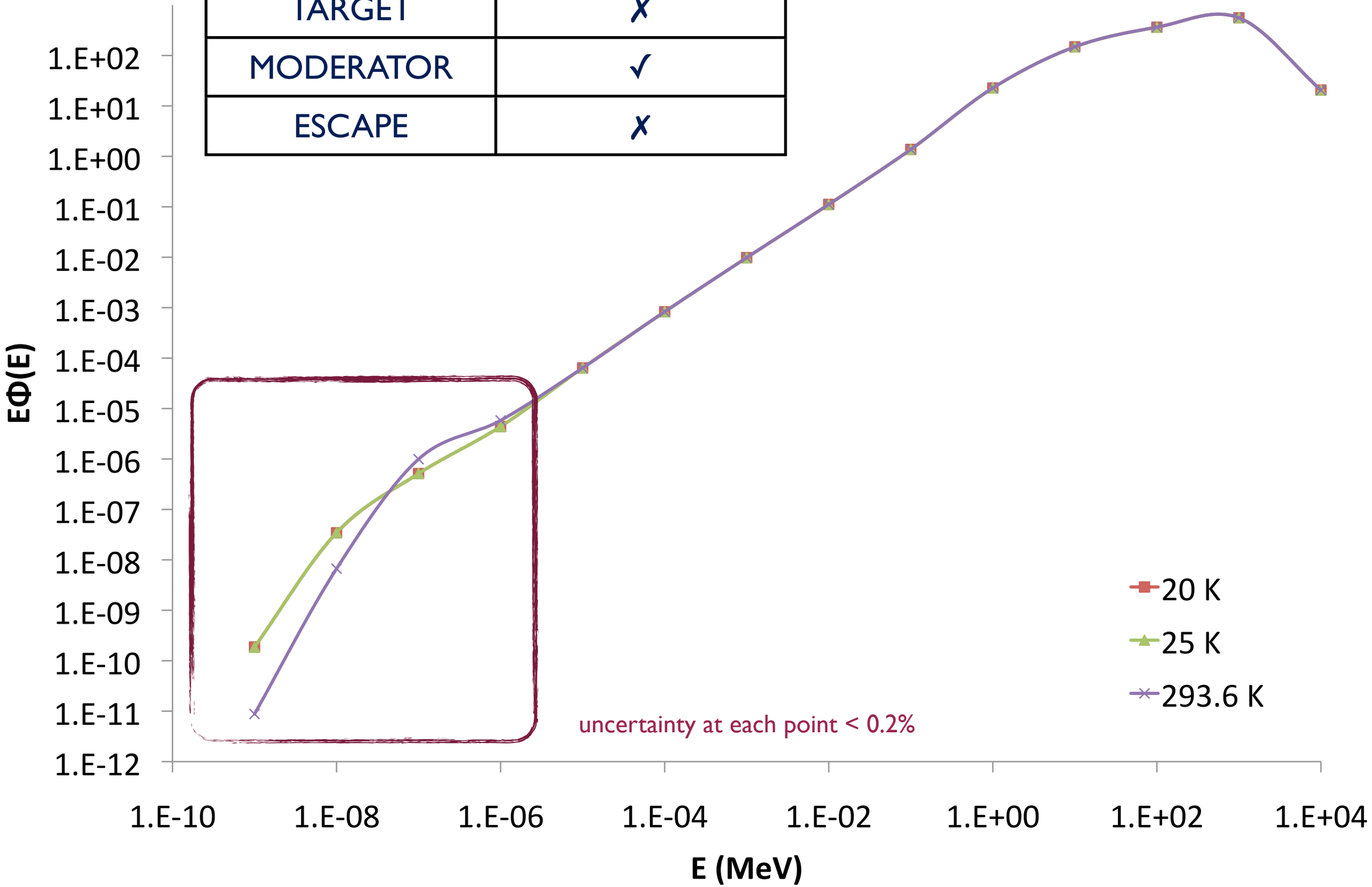


CHANGES IN HYDROGEN TEMPERATURE



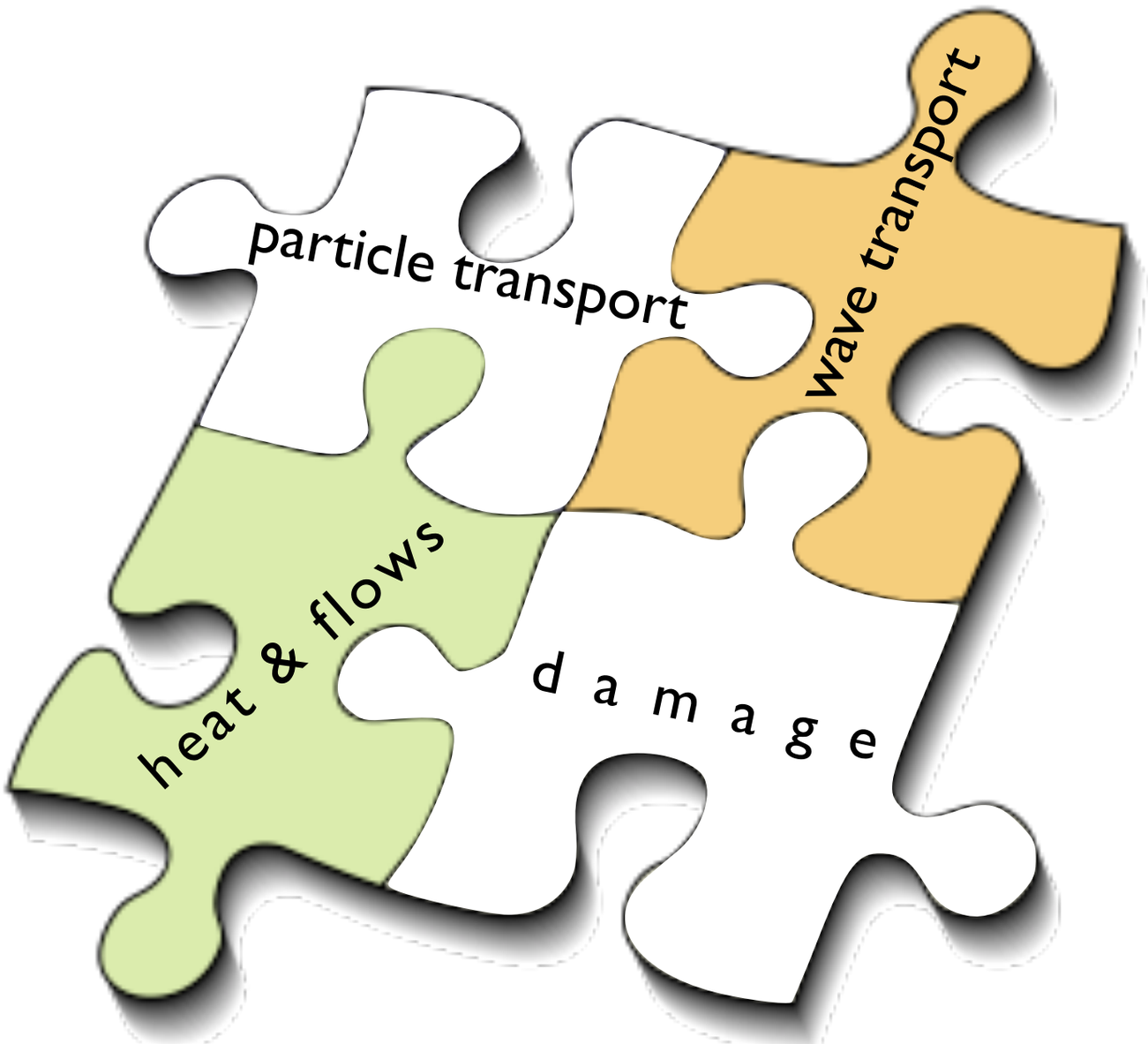
PERTURBATION IN HYDROGEN TEMPERATURE

EΦ(E)	difference
TARGET	✗
MODERATOR	✓
ESCAPE	✗



THE BIGGER PICTURE

still hammering on the upstream-downstream business



There is a clear direction of causality; one-way, single-headed arrow of causality.

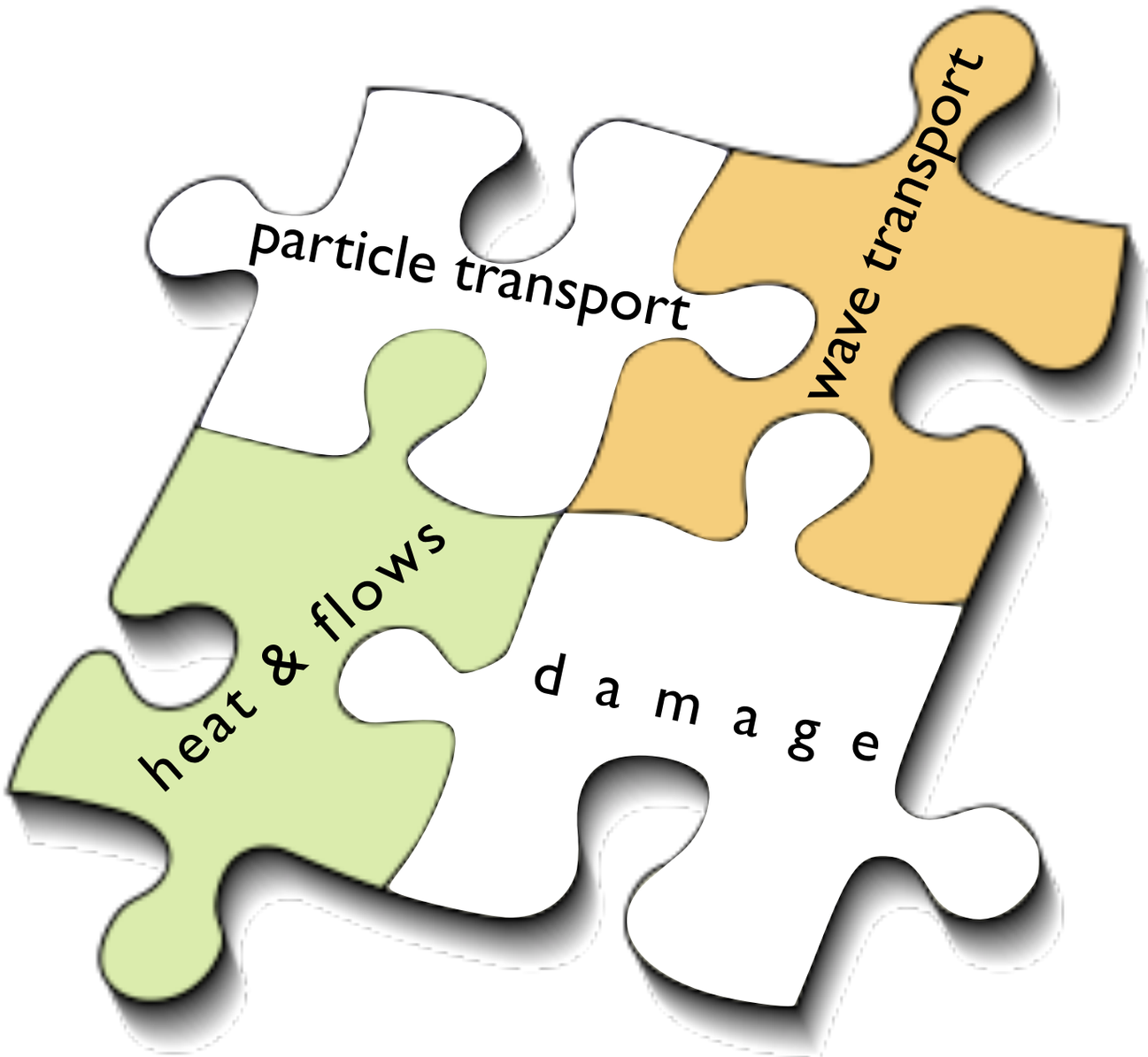
Heat and damage are consequences due to radiation, neither rewrites radiation histories.

The magic word 'coupled' is sometimes misused. No, we do not have:
- a soup of fuzzy parameters
- a chaos system
- confounding variables (eg pitting doesn't change the beam size!)

as presented at SATIF10 (Geneva) by me@marychin.org

THE DESIGN PROCESS

still hammering on the upstream-downstream business



Each component requires dedicated studies, experimental design and analysis.

There has been suggestions to 'chain' together FLUKA, ANSYS, McSTAS ... in a 'fully-automated optimisation tool'.

No! FLUKA, ANSYS and McSTAS simulations cannot be one-to-one. Otherwise, we probably do not know what we are doing.

OUR PROBLEM

we do not depend on
somebody's mood whether
he feels like buying a
UBS share, or
buying a MacBook, or
taking his Mercedes
for a spin

we have well-defined
radiation and heat
transfer principles

SOCIAL SCIENCE PROBLEMS

share market trends

consumer behaviour

traffic planning

where
knowledge of
underlying principles
is limited

as presented at SATIF10 (Geneva) by me@marychin.org

OUR MODELING & DESIGN

be careful
not to end up doing
a Monte Carlo
of a Monte Carlo
of another Monte Carlo
of yet another Monte Carlo
...

SOCIAL SCIENCE MODELING & DESIGN

statistical sampling of
input parameters

doing Monte Carlo on stochastic processes	✓
doing Monte Carlo because we are not sure what's happening	?