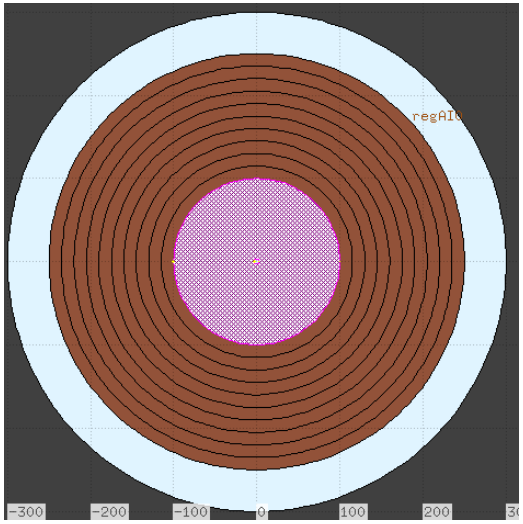
Solution: Biasing

Advanced FLUKA Course 2019

Geometry: layers

RCC shld1	0.0	0.0	-100.0	0.0	0.0	200.0	100.0
RCC shld2	0.0	0.0	-115.0	0.0	0.0	230.0	115.0
RCC shld3	0.0	0.0	-130.0	0.0	0.0	260.0	130.0
RCC shld4	0.0	0.0	-145.0	0.0	0.0	290.0	145.0
RCC shld5	0.0	0.0	-160.0	0.0	0.0	320.0	160.0
RCC shld6	0.0	0.0	-175.0	0.0	0.0	350.0	175.0
RCC shld7	0.0	0.0	-190.0	0.0	0.0	380.0	190.0
RCC shld8	0.0	0.0	-205.0	0.0	0.0	410.0	205.0
RCC shld9	0.0	0.0	-220.0	0.0	0.0	440.0	220.0
RCC shld10	0.0	0.0	-235.0	0.0	0.0	470.0	235.0
RCC shld11	0.0	0.0	-250.0	0.0	0.0	500.0	250.0



X-Y view

```
* 1st  shielding layer
regSH1    5    +shld2  -shld1
* 2nd  shielding layer
regSH2    5    +shld3  -shld2
* 3rd  shielding layer
regSH3    5    +shld4  -shld3
* 4th  shielding layer
regSH4    5    +shld5  -shld4
* 5th  shielding layer
regSH5    5    +shld6  -shld5
* 6th  shielding layer
regSH6    5    +shld7  -shld6
* 7th  shielding layer
regSH7    5    +shld8  -shld7
* 8th  shielding layer
regSH8    5    +shld9  -shld8
* 9th  shielding layer
regSH9    5    +shld10 -shld9
* 10th shielding layer
```

ToDo : Done

- Add photonuclear interaction bias (LAM-BIAS) in the target, knowing that your colleague already run the simulation and found that the probability to get a photon interaction in the target is few /1000

- If we want, for instance ~ 1 photonuclear/primary, we have to decrease the average interaction length by approx the same factor, for instance (might be optimized):

- LAM-BIAS -0.004 TUNGSTEN PHOTON PHOTON

ToDo : Done

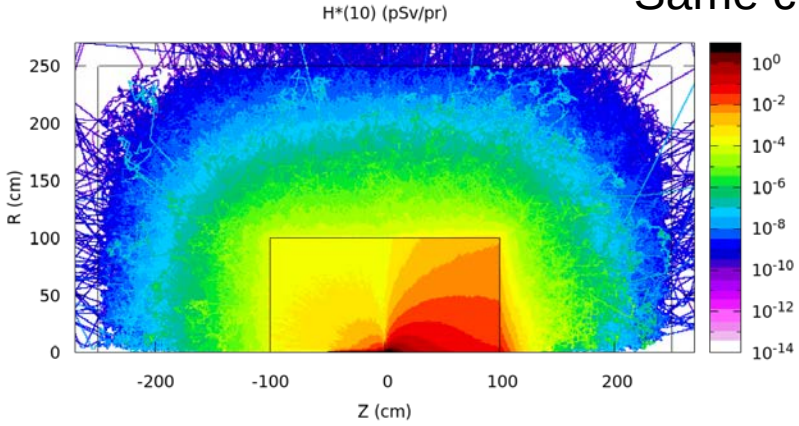
- Add importance bias in the shielding layers, for all particles,
- knowing that the same colleague found an attenuation factor for dose of the order of 1/500. (use round factors). Start splitting in the second shielding layer.

9 layers, x^9=~500 . 2^9 = 512, fine! Factor 2 each layer

```
BIASING          0.0001     1.0  @LASTREG
BIASING          0.0002   regSH2   regSH2
BIASING          0.0004   regSH3   regSH3
….
BIASING          0.0512  regSH10  regSH10
BIASING          0.0512     regAI0  regAI0
```

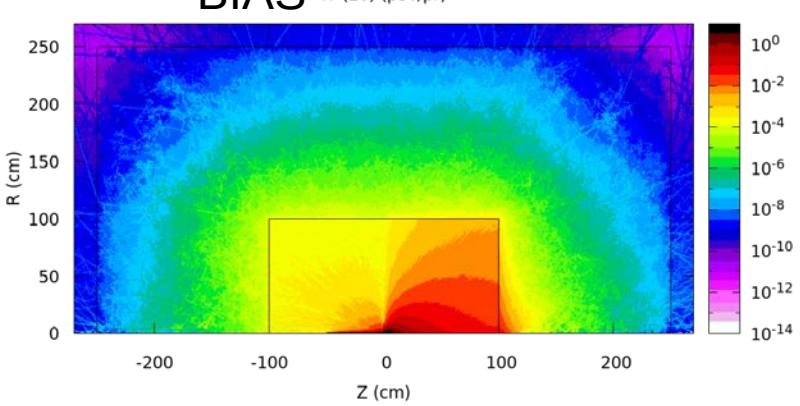
First line sets the “base” importance. Not to 1, because of the possible case with Concrete shield External air: same weight as last layer

NO BIAS



Same cpu time

BIAS



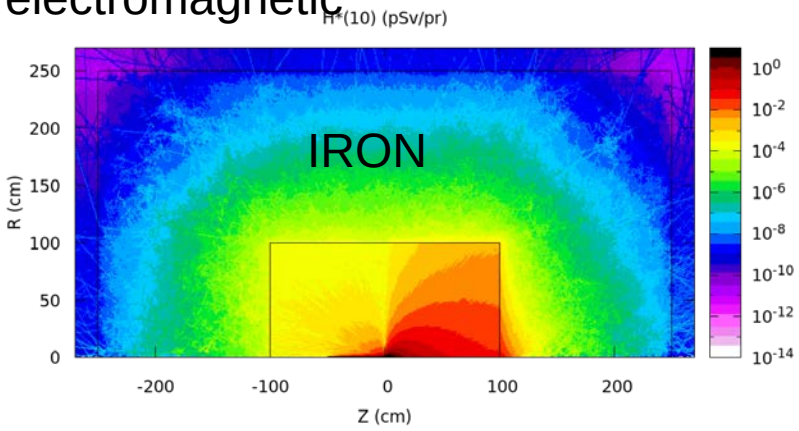
Option :Concrete

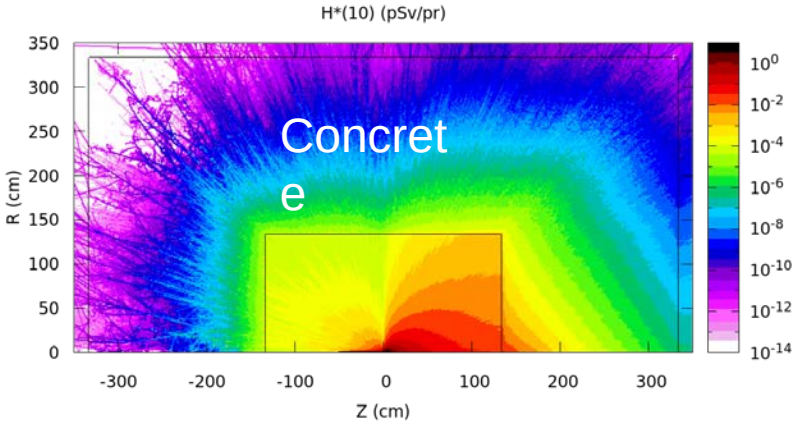
```
#ifdef ConcrShield
BIASING                    0.0001      1.0  @LASTREG
BIASING                    0.0003    regSH2    regSH2
BIASING                    0.0009    regSH3    regSH3
....
BIASING                    2.0000   regSH10   regSH10
BIASING                    2.0000    regAl0    regAl0
BIASING         3.0          0.0001      1.0  @LASTREG
BIASING         3.0          0.0006    regSH2    regSH2
BIASING         3.0          0.0036    regSH3    regSH3
...
```

First set the importances for all particles

Then supersede for low en neutrons only

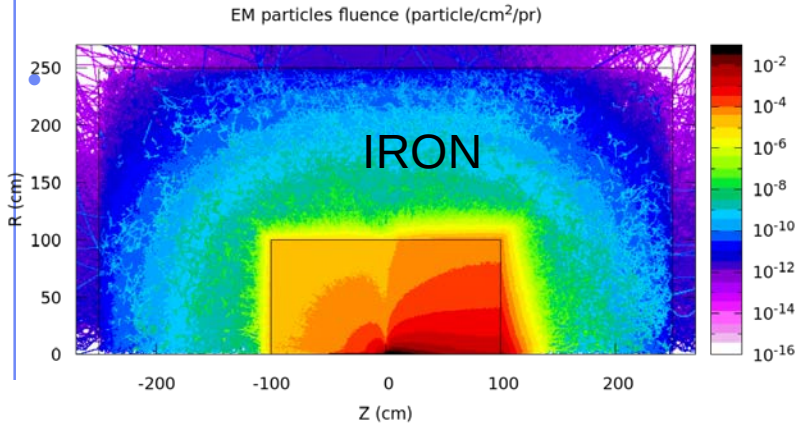
Dose distribution becomes much more directional, it is carried by electromagnetic

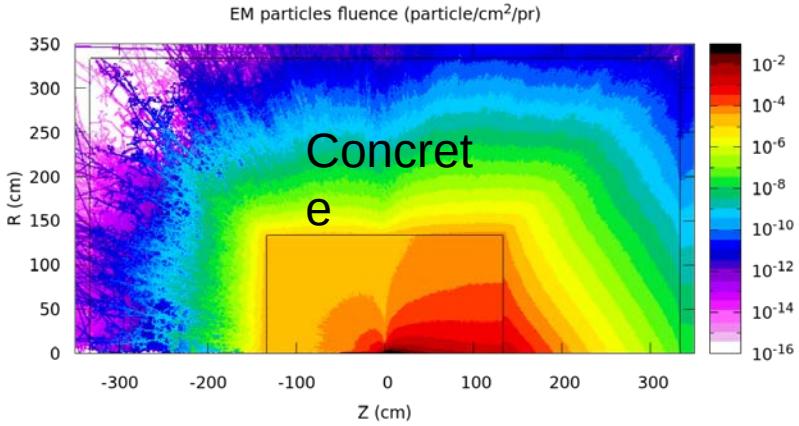




Option :Concrete

E-m Particle fluence travels further in concrete and dominates over neutrons





Neutrons are killed by concrete, even with bias