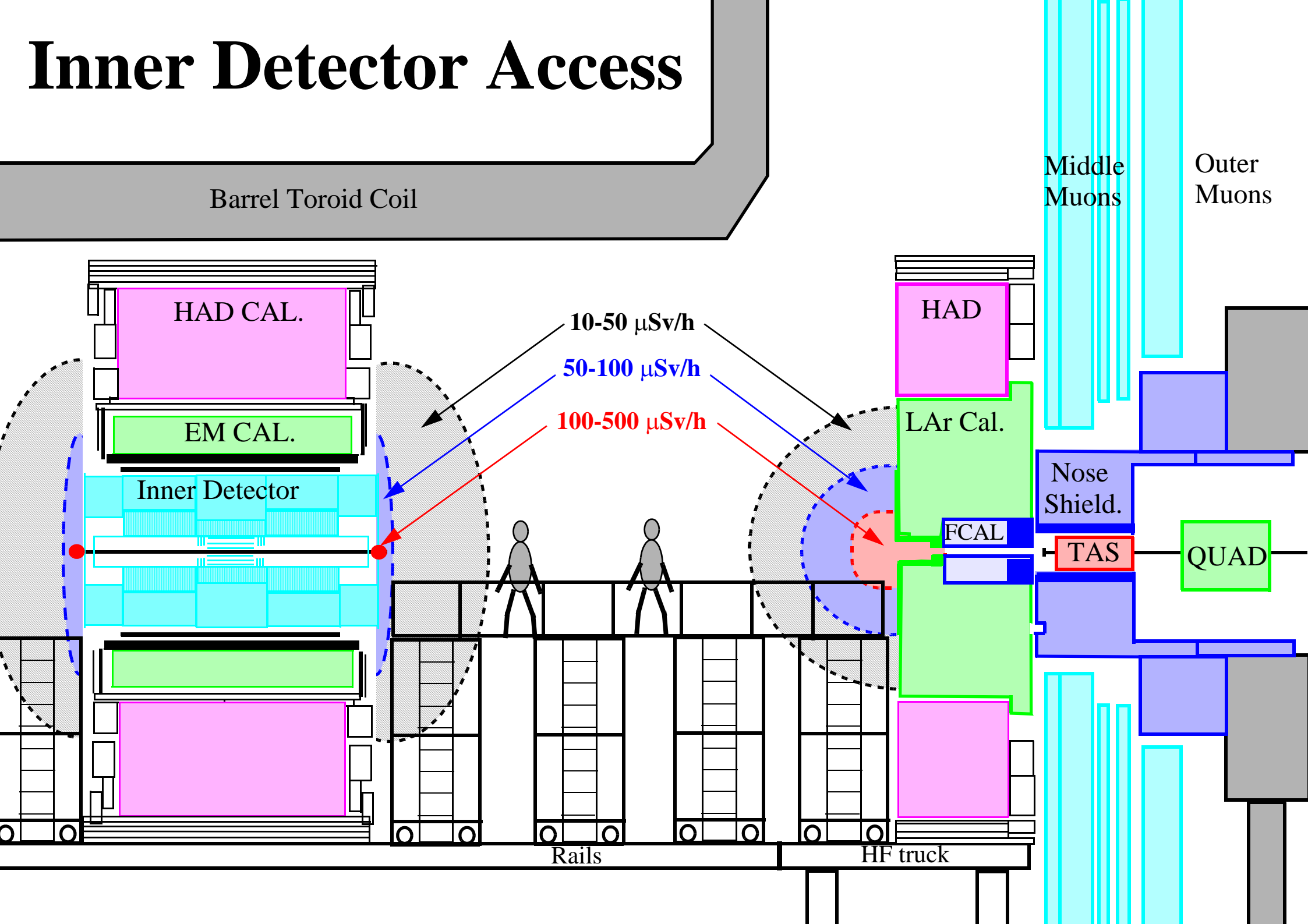
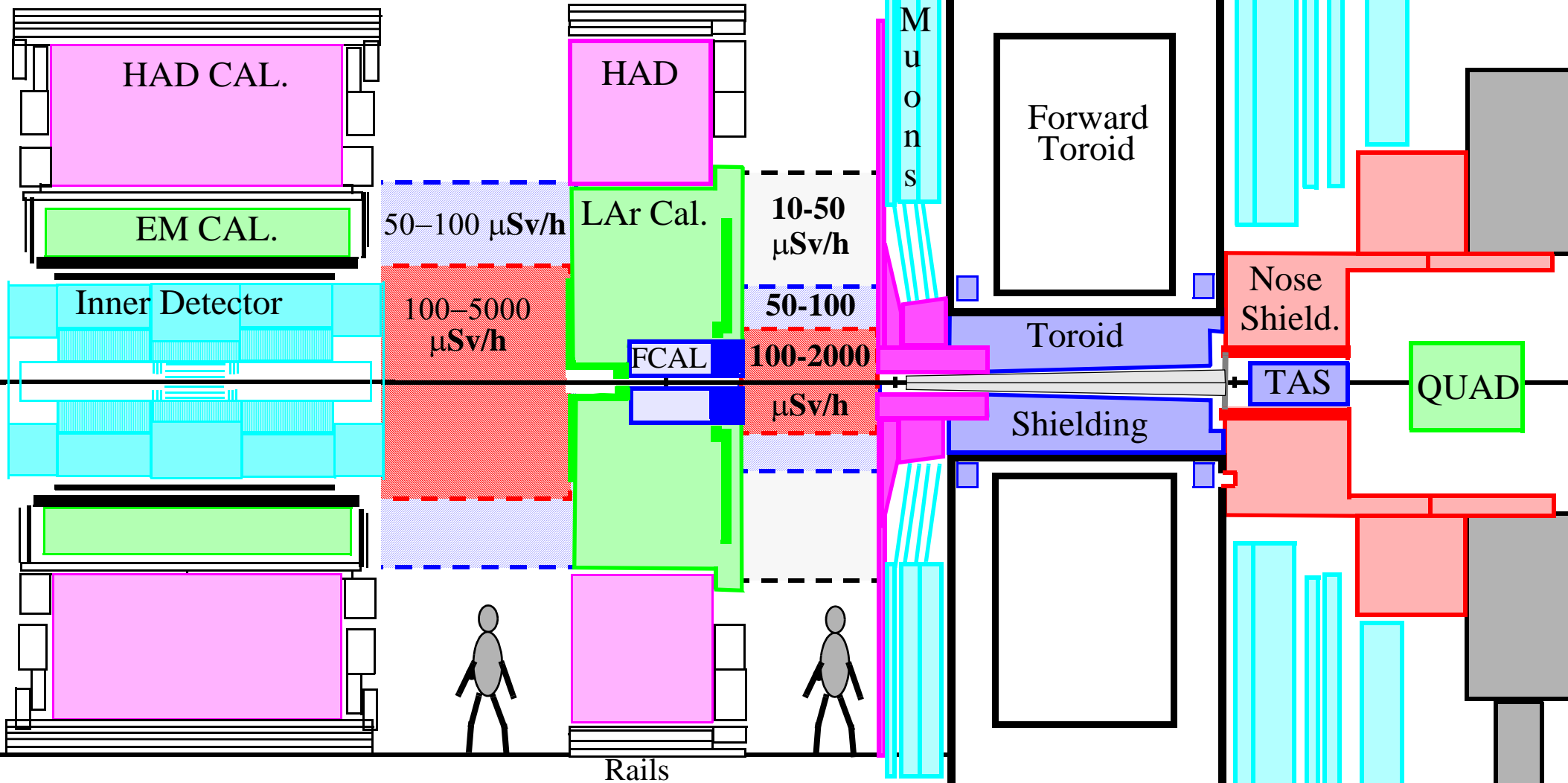


# Inner Detector Access

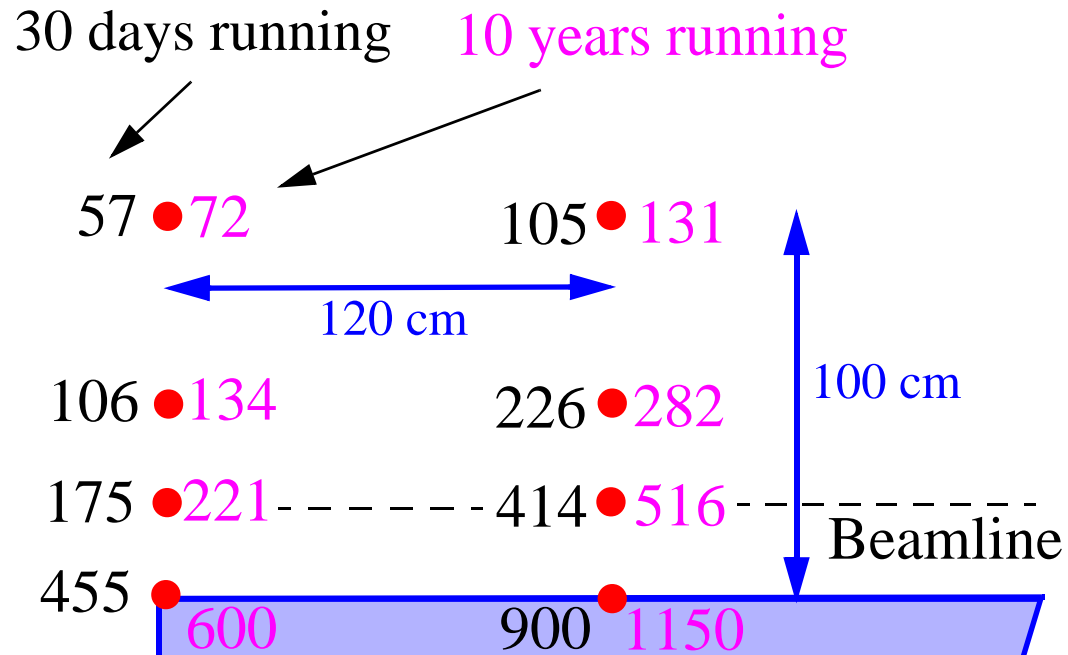


# Standard access

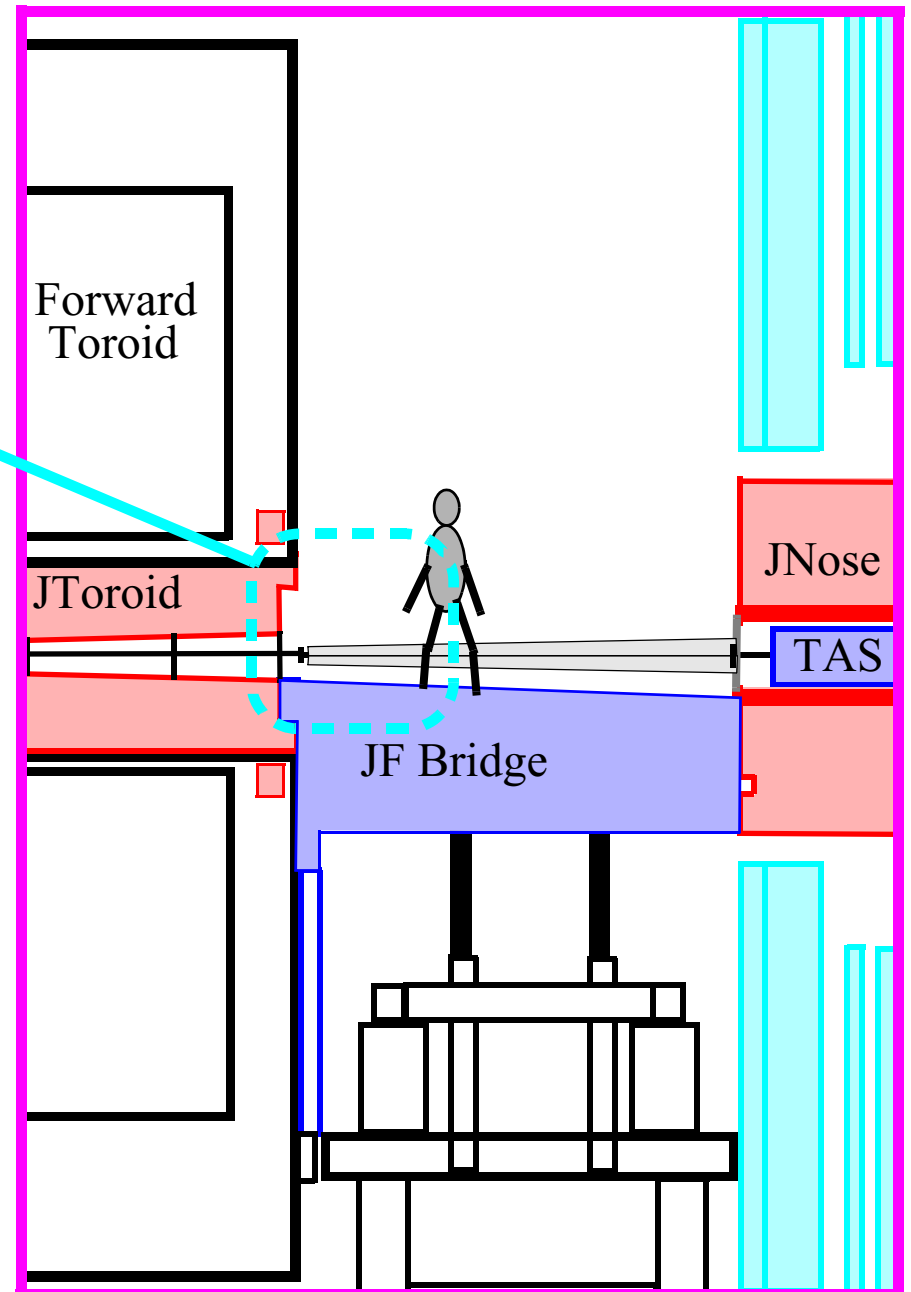
Barrel Toroid Coil



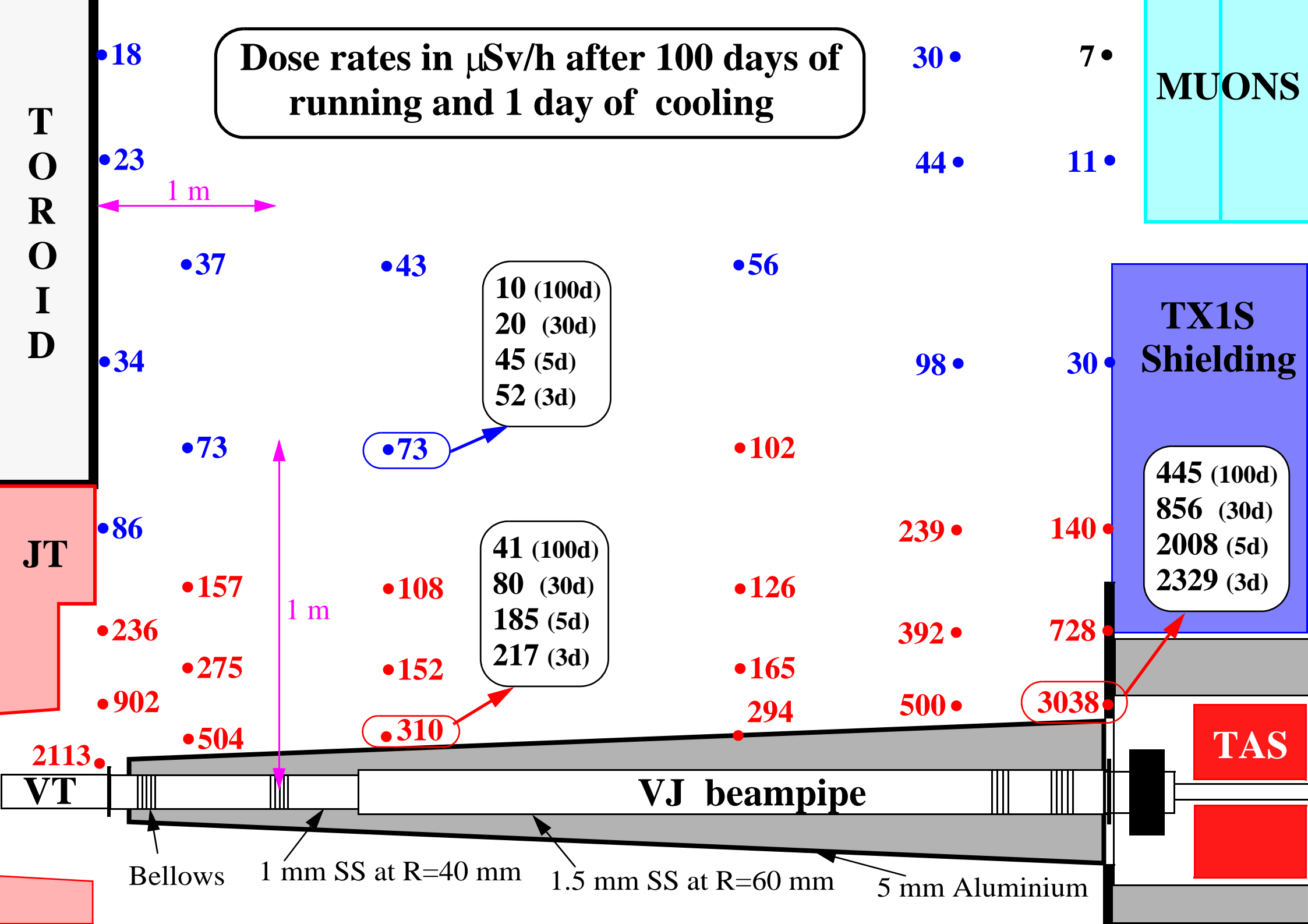
# Dose rates in $\mu\text{Sv/h}$ after 1 day of cooling



The bridge section of the forward shield (cast ductile iron)



**Dose rates in  $\mu\text{Sv/h}$  after 100 days of running and 1 day of cooling**



T  
O  
R  
O  
I  
D

JT

VT

**Dose rates in  $\mu\text{Sv/h}$  after 100 days of running and 1 day of cooling**

**MUONS**

**TX1S  
Shielding**

**TAS**

**VJ beampipe**

Bellows

1 mm SS at R=40 mm

1.5 mm SS at R=60 mm

5 mm Aluminium

•18  
•23  
•34  
•73  
•86  
•236  
•275  
•902  
•504  
•2113

1 m

1 m

•37

•43

•56

•30  
•44  
•98  
•239  
•392  
•500

•7  
•11  
•30  
•140  
•728  
•3038

10 (100d)  
20 (30d)  
45 (5d)  
52 (3d)

•73

41 (100d)  
80 (30d)  
185 (5d)  
217 (3d)

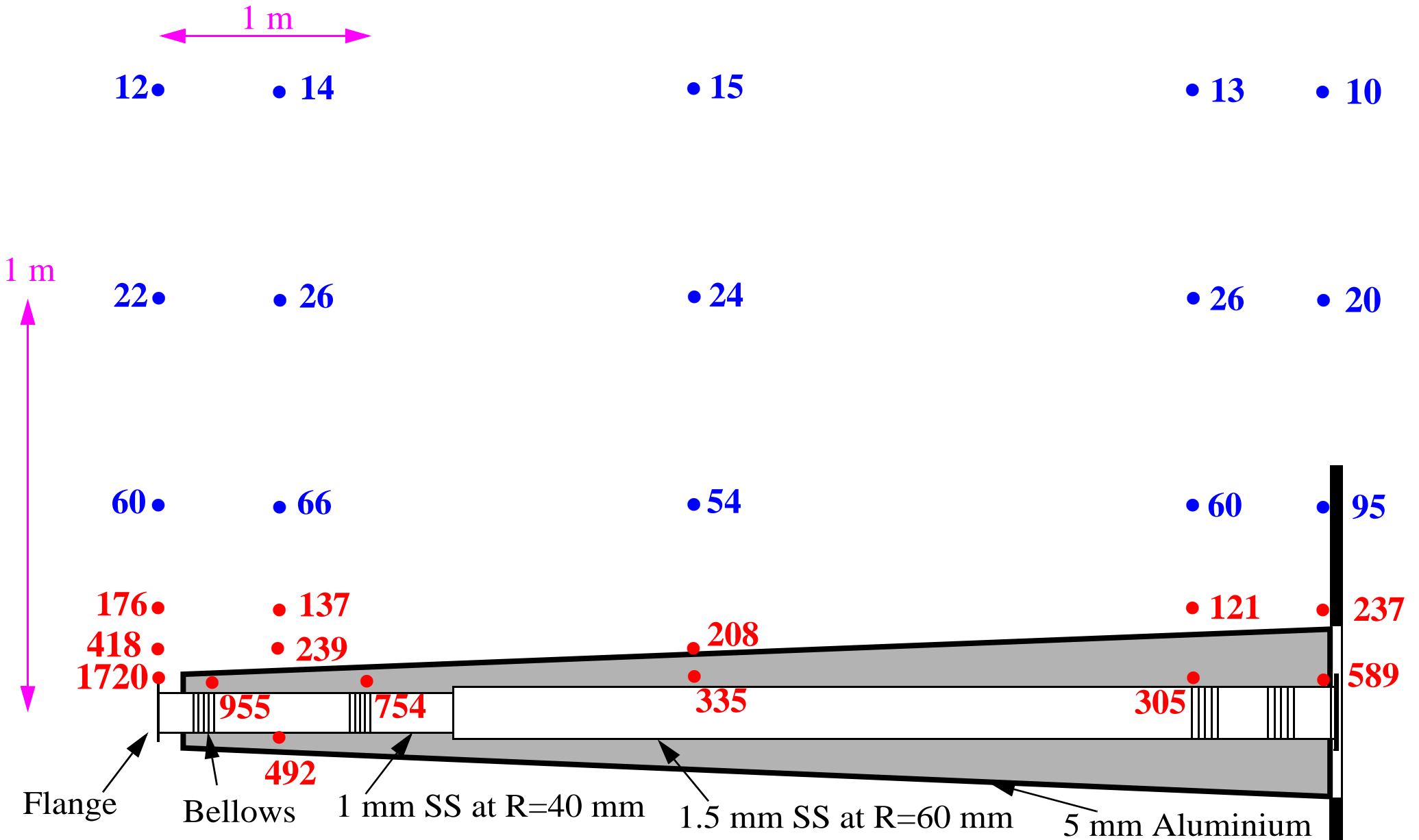
•310

•102  
•126  
•165  
•294

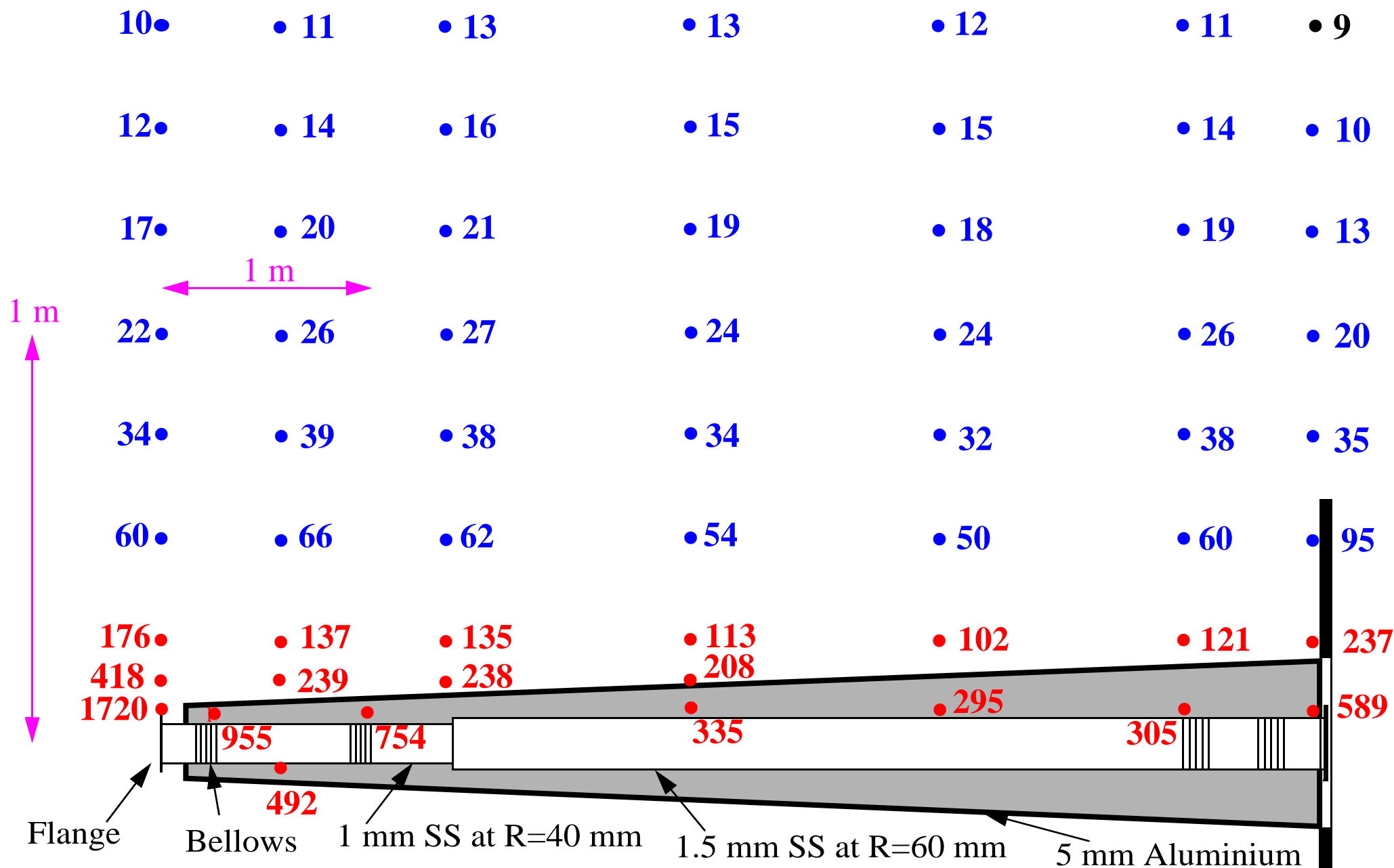
445 (100d)  
856 (30d)  
2008 (5d)  
2329 (3d)

1 m

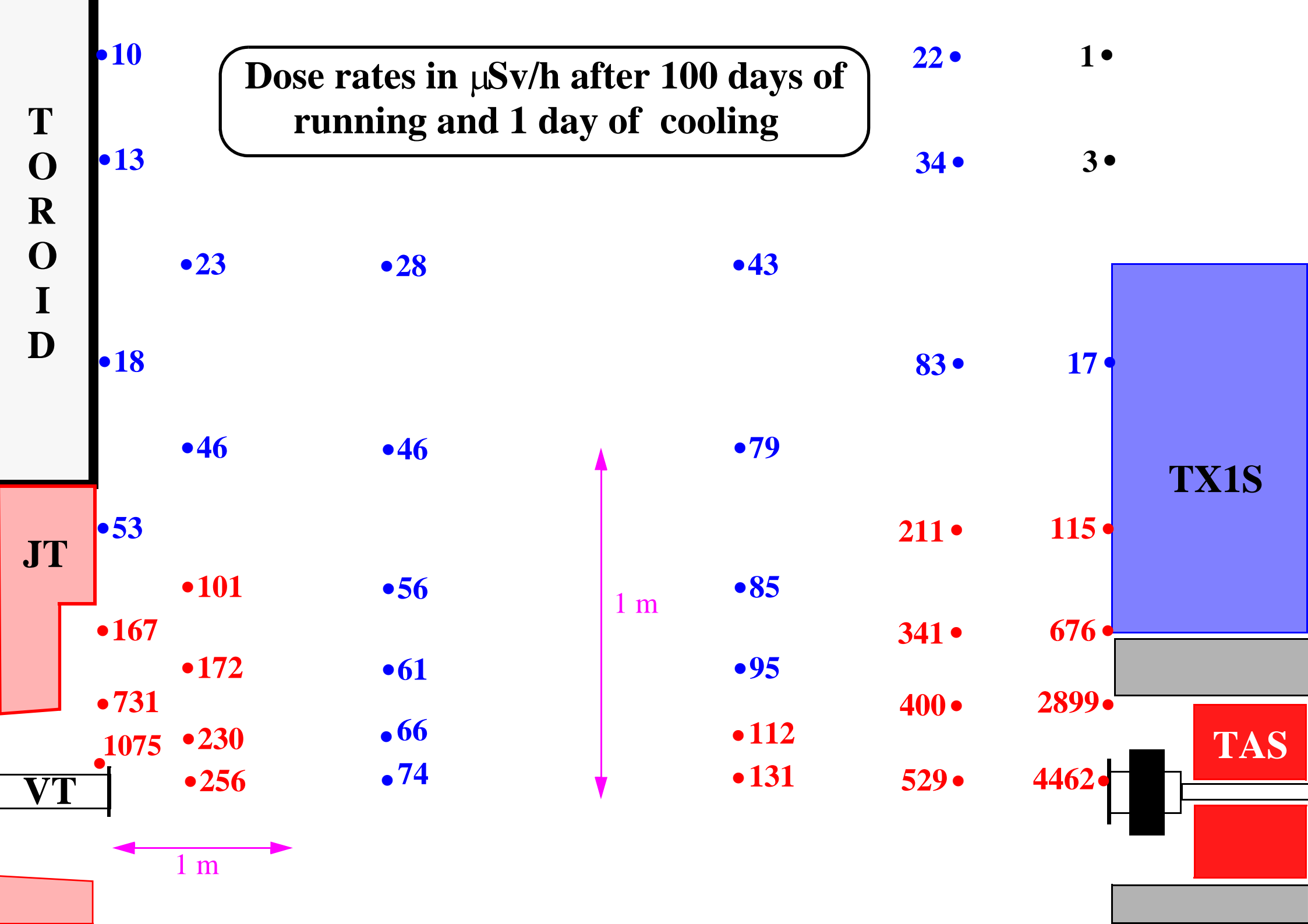
**Dose rates in  $\mu\text{Sv/h}$  after 100 days of running and 1 day of cooling**



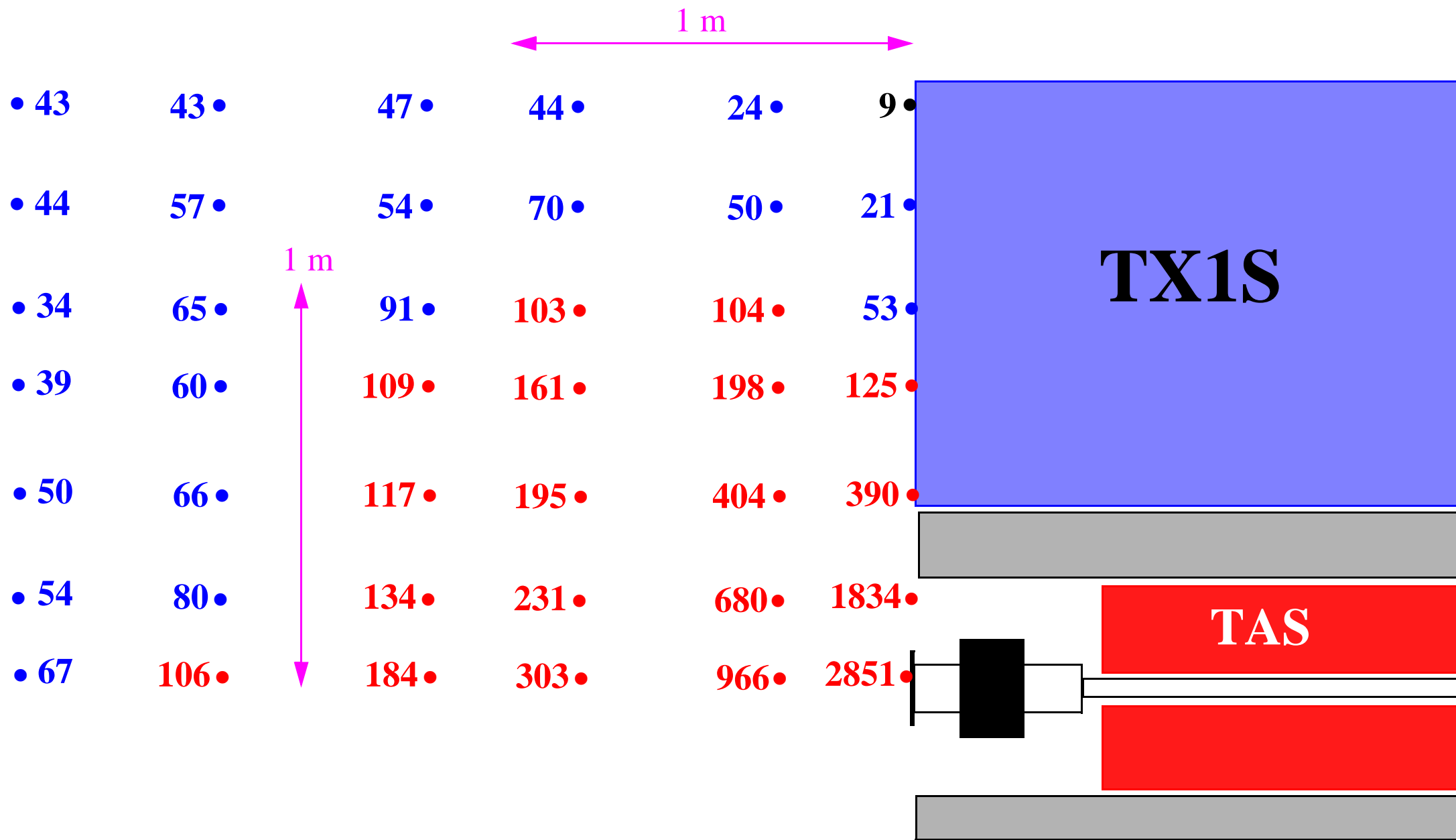
# Dose rates in $\mu\text{Sv/h}$ after 100 days of running and 1 day of cooling



Dose rates in  $\mu\text{Sv/h}$  after 100 days of running and 1 day of cooling



**Dose rates in  $\mu\text{Sv/h}$  after 100 days of running and 5 day of cooling**





# TOROID SHIELDING

Dose rate in  $\mu\text{Sv/h}$  from only the VT beampipe (100 day running, 1 day cooling)

Contact dose rate calculated by Shupe and Hedberg using omega factors  
30 day run / 1 day cool

1-2 mSv/h

- 167
- 223
- 340
- 827

10 mm

VT Beampipe

- 156
- 209
- 318
- 776

Beampipe support

- 57
- 53
- 49
- 150
- 144
- 118
- 206
- 204
- 157
- 304
- 343
- 220
- 494
- 770
- 316
- 1039
- 1821
- 423
- 469

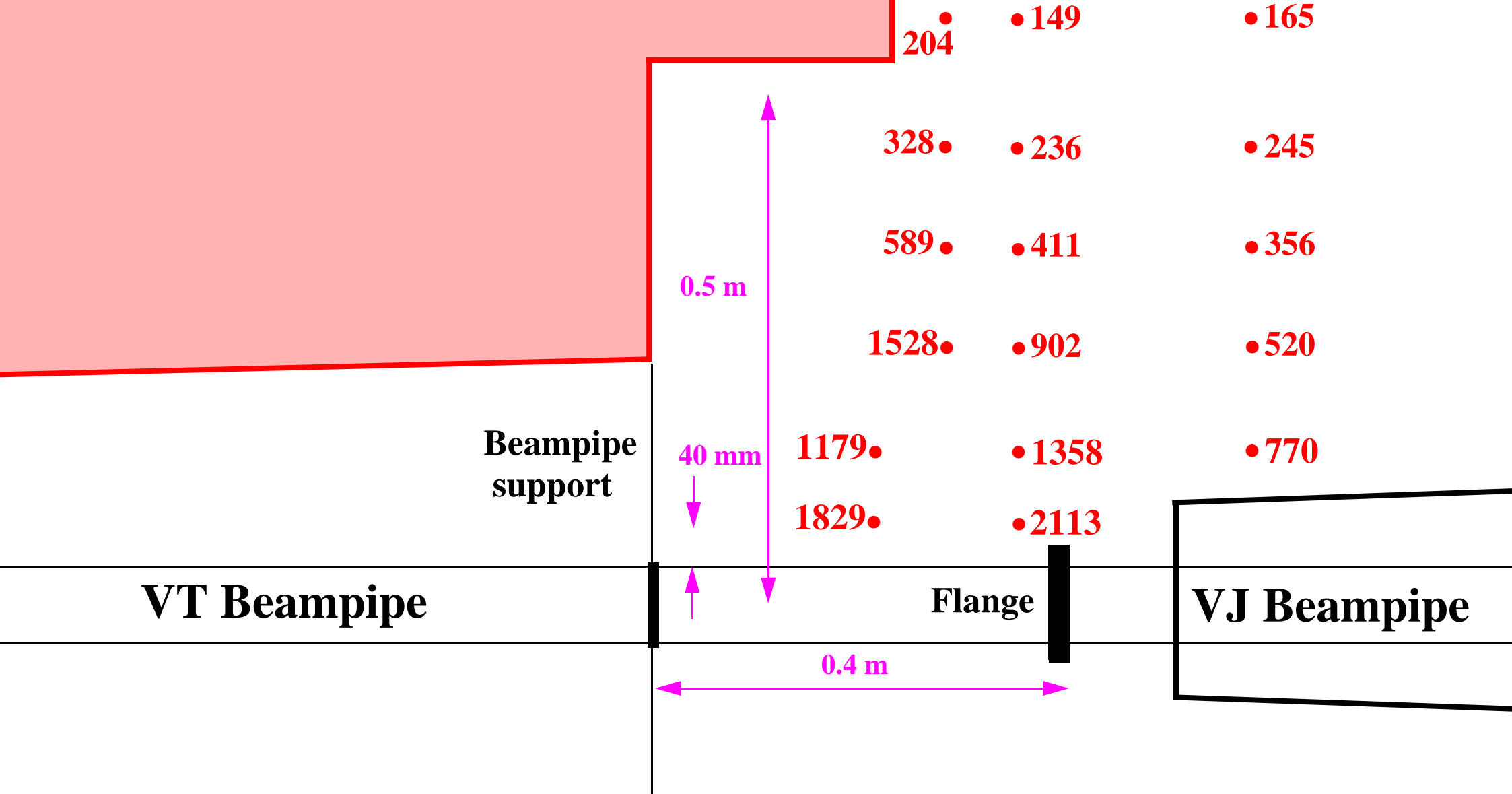
Flange

0.4 m

0.5 m

# TOROID SHIELDING

Dose rate in  $\mu\text{Sv/h}$  for  
100 days of running and  
1 day of cooling.



M  
U  
O  
N  
E  
C

Dose rates in  $\mu\text{Sv/h}$  after 100 days of running and 1 day of cooling

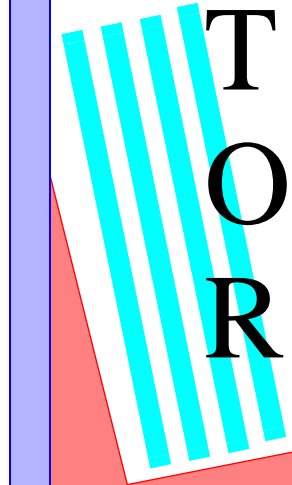
T  
O  
R  
O  
I  
D  
M  
A  
R  
G  
I  
N  
E  
T

5.7 m

1 m

1m

60 mm



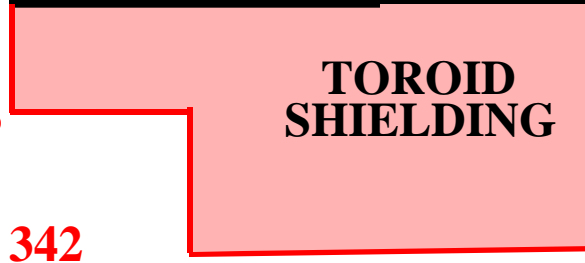
T  
O  
R

•17	•20	•26	•25	•21	15•	12•
•25	•32	•45	•38	•31	25•	19•
•45	•60	•80	•65	•47	56•	36•



DISC SHIELDING

•105	•161	•169	•117	•78	102•	133•
•659	•397	•241	•140	228•	208•	•342
•1560	•959	•543	•295	638•		



TOROID SHIELDING

VA Beampipe

VT Beampipe

VJ Beampipe

M  
U  
O  
N  
E  
C

Dose rates in  $\mu\text{Sv/h}$  after 100 days of running and 1 day of cooling

5.7 m

1 m

T  
O  
R  
O  
I  
D  
M  
A  
R  
G  
I  
N  
E  
T

T  
O  
R

•17	•20	•26	•25	•21	15•
•25	•32	•45	•38	•31	25•
•45	•60	•80	•65	•47	56•
•105	•161	•169	•117	•78	102•
•659	•397	•241	•140	•228	•228
•1560	•959	•543	•295	•638	•638

1 m

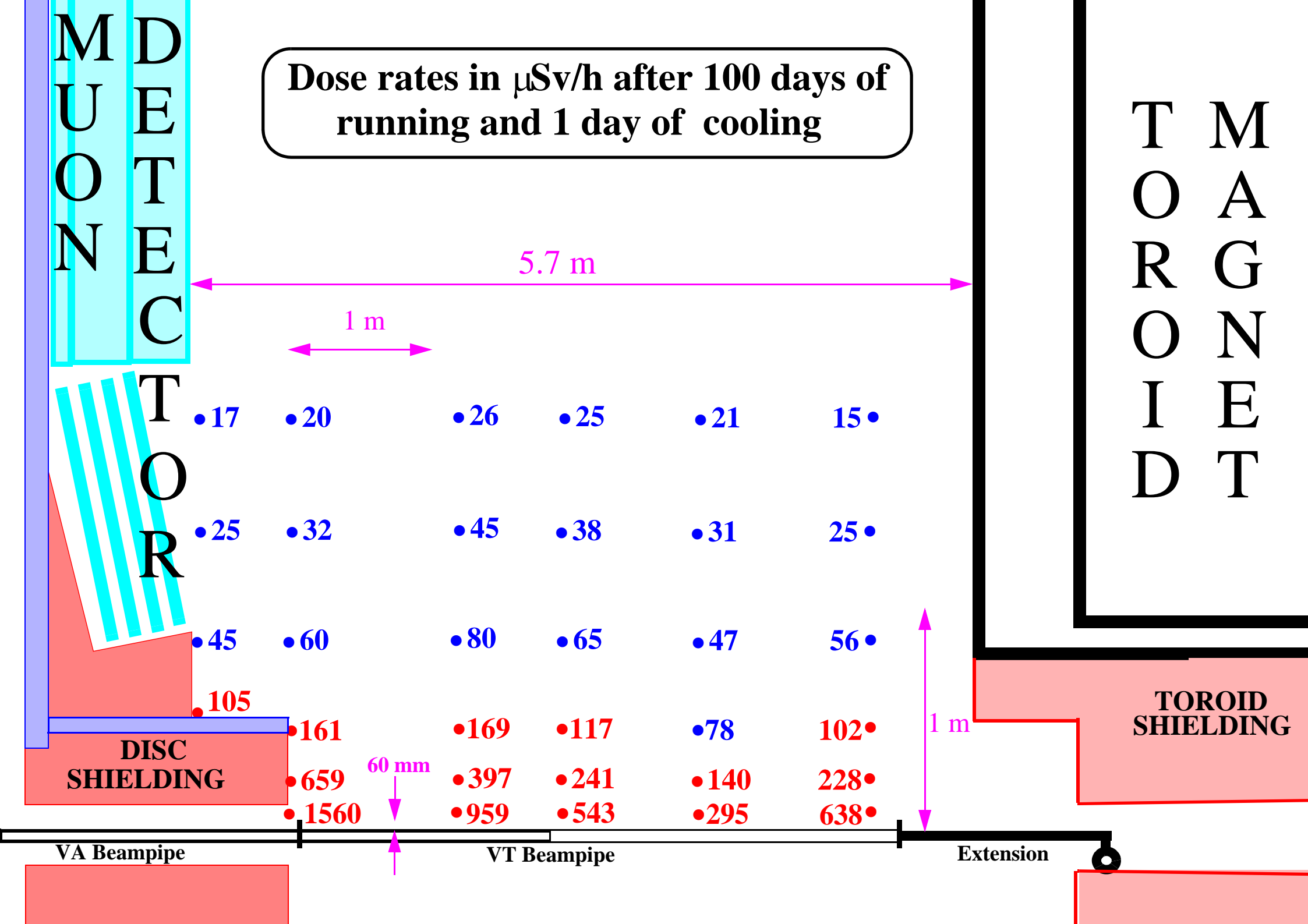
TOROID SHIELDING

VA Beampipe

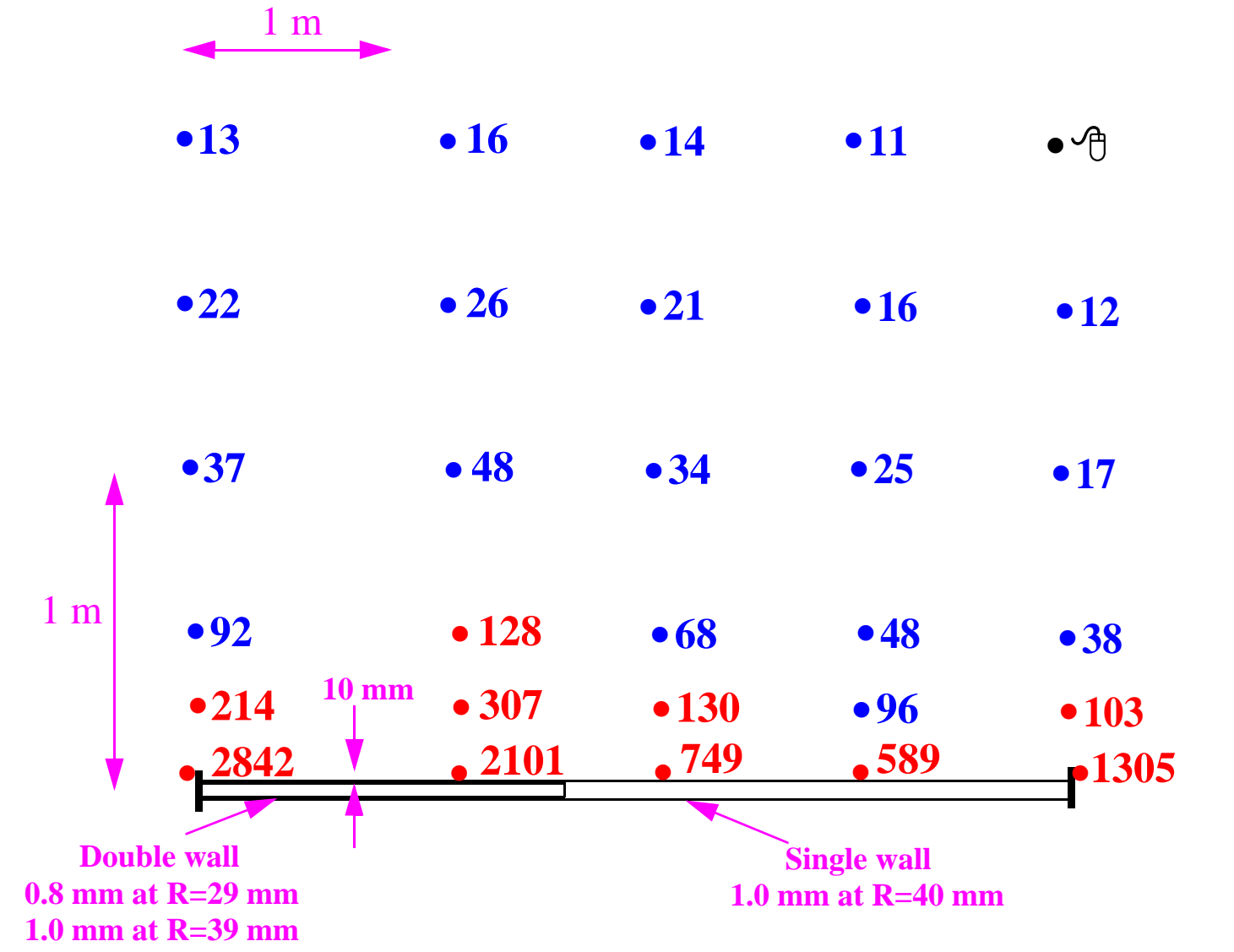
VT Beampipe

Extension

60 mm



**Dose rates in  $\mu\text{Sv/h}$  from the VT beampipe after 100 days of running and 5 days of cooling.**



M  
U  
O  
N  
E  
C

Dose rates in  $\mu\text{Sv/h}$  after 100 days of running and 1 day of cooling

5.7 m

1 m

1 m

T  
O  
R  
O  
I  
D  
M  
A  
R  
G  
I  
N  
E  
T

T  
O  
R

•6	•5	•8	•7	•6	3•	1•
•10	•9	•14	•10	•8	6•	3•
•24	•19	•18	•15	•11	22•	8•
•79	•80	•26	•17	•15	27•	76•
•500	•32	•32	•18	•15	30•	89•
•1309	•32	•17	•16	•16	32•	92•

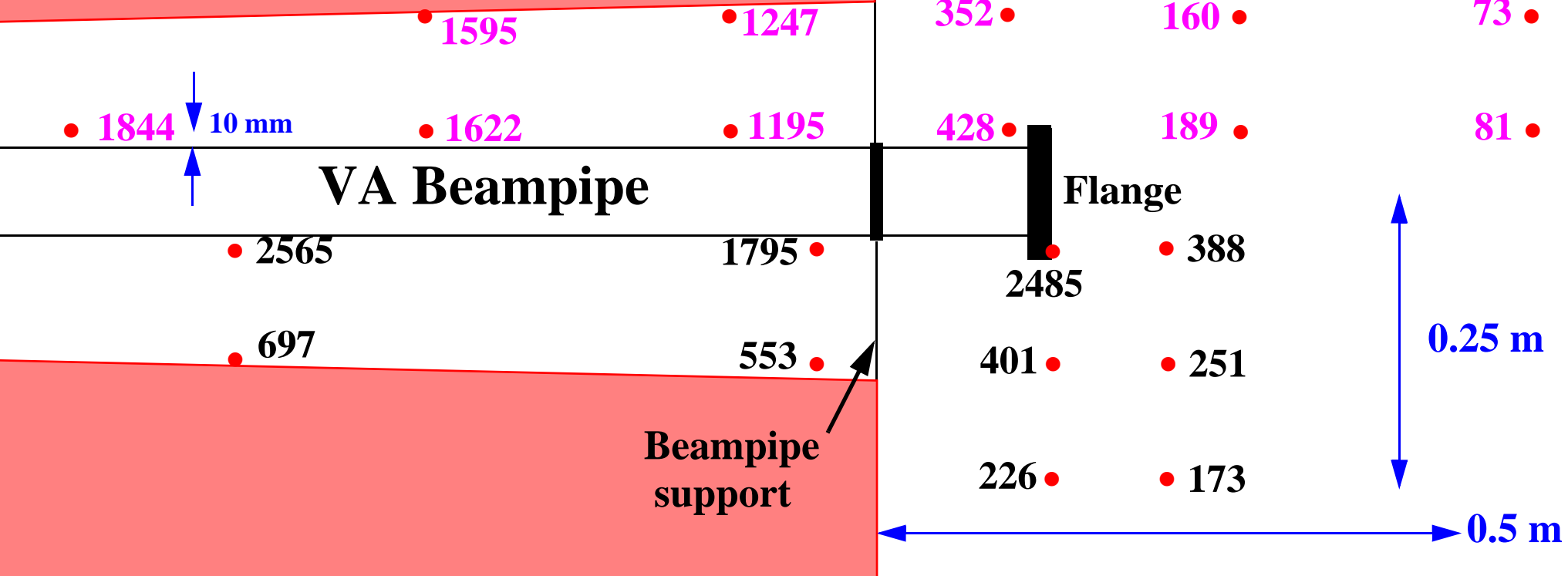
DISC  
SHIELDING

TOROID  
SHIELDING

VA Beampipe

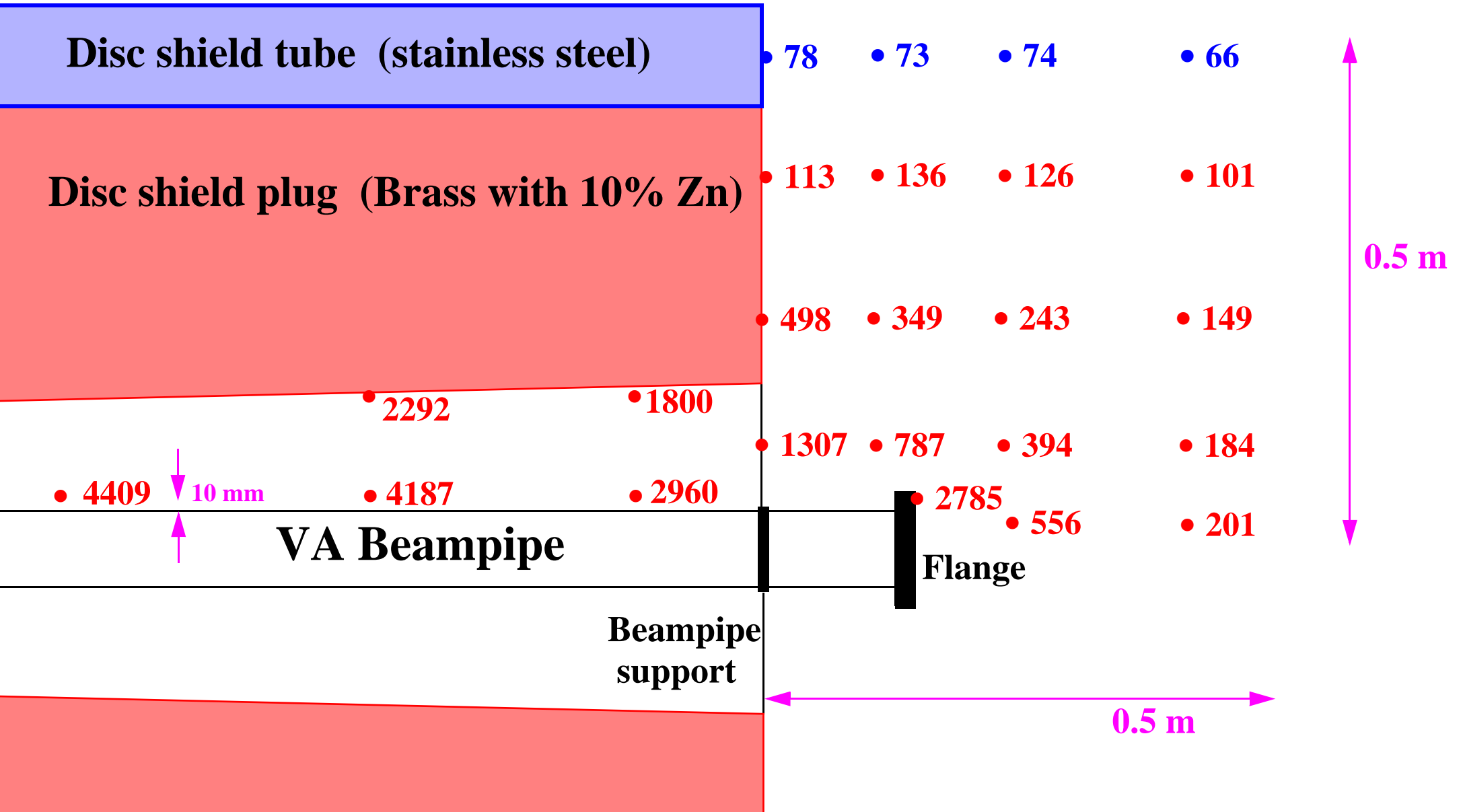
# DISC SHIELDING

Dose rates in  $\mu\text{Sv/h}$  from the disc shield after 100 days of running and 5 days of cooling



Dose rates in  $\mu\text{Sv/h}$  from the VA beampipe after 100 days of running and 5 days of cooling

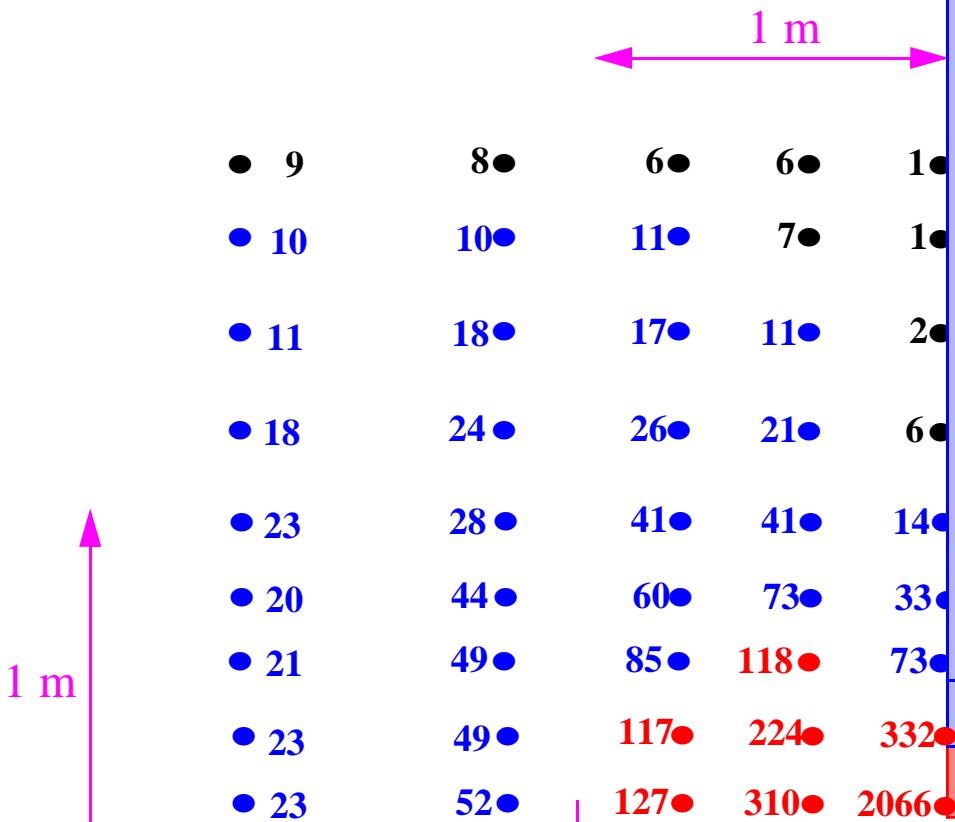
**Dose rates in  $\mu\text{Sv/h}$  after 100 days of running and 5 days of cooling**



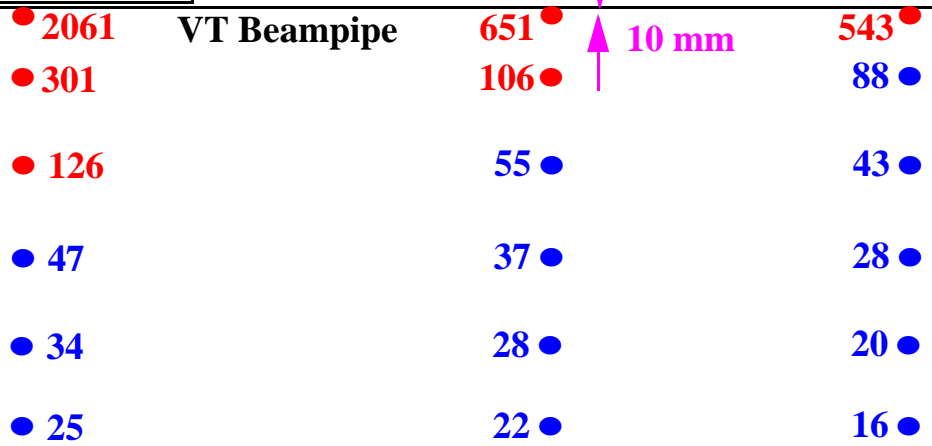


**Dose rates in  $\mu\text{Sv/h}$  after 100 days of running and 5 days of cooling.**

**Dose rate from the disc shield:**



**Dose rate from the beampipe:**



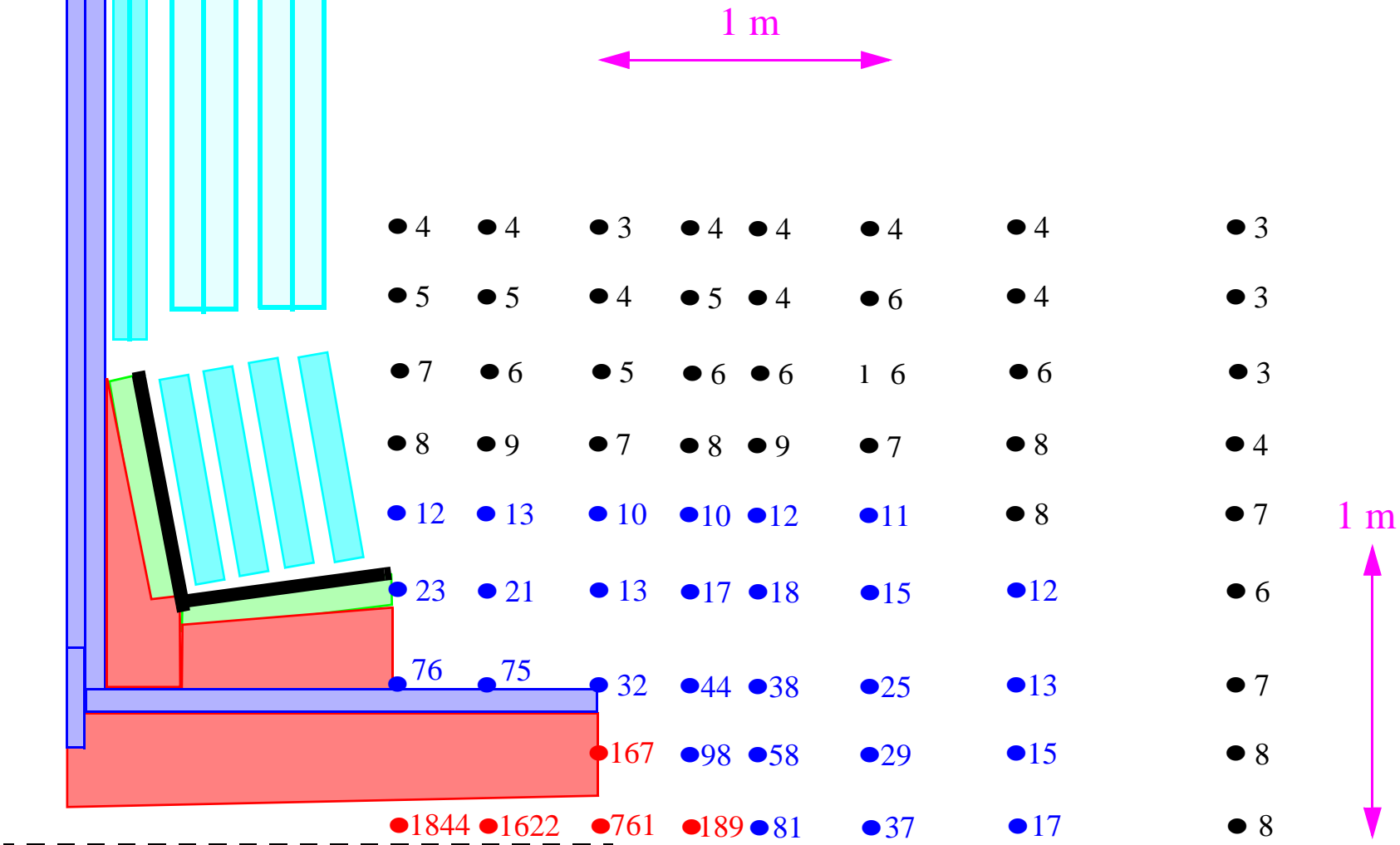
**MUON DETECTORS**

**TOROID**

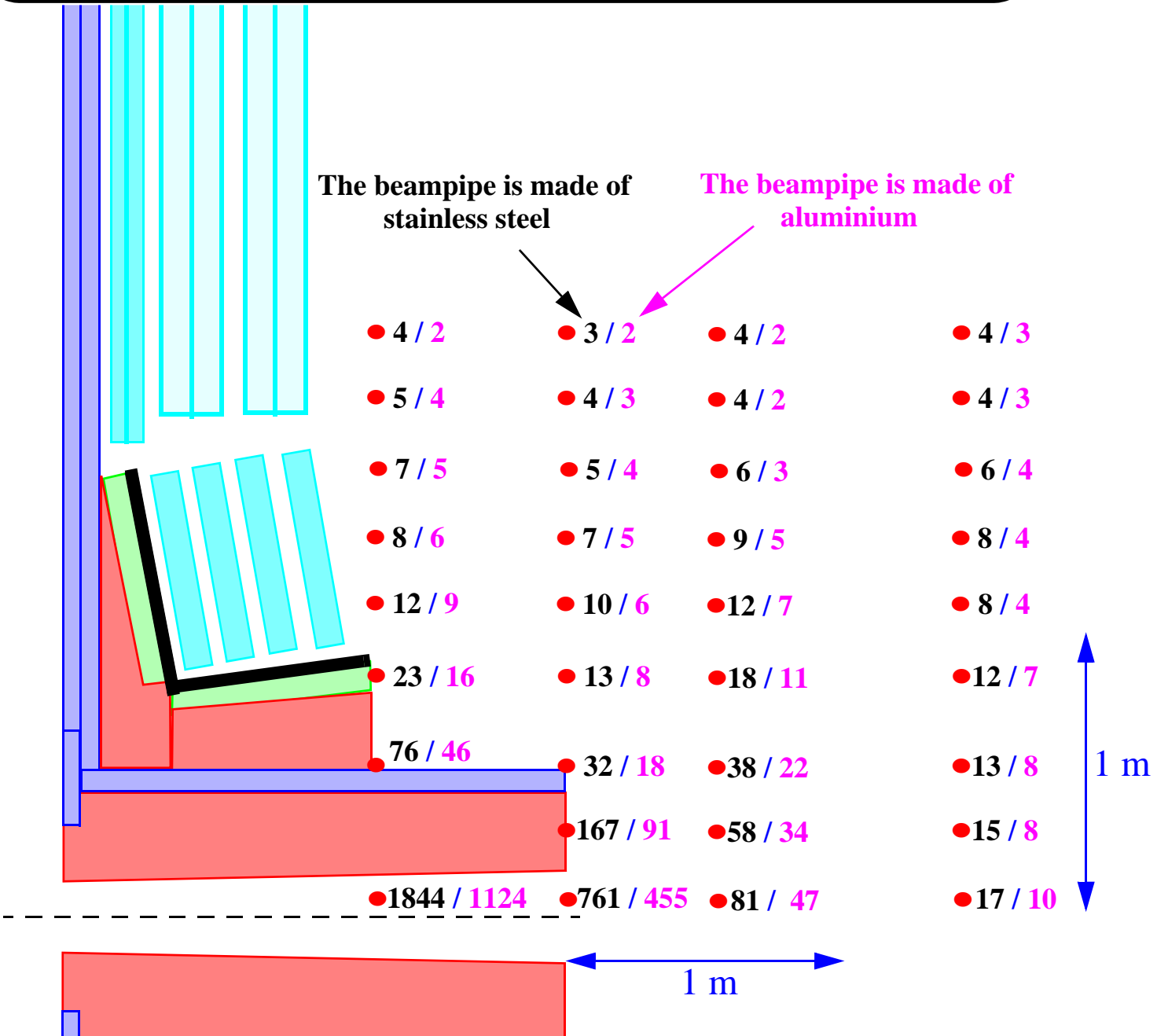
**TOROID SHIELD**

**DISC SHIELD**

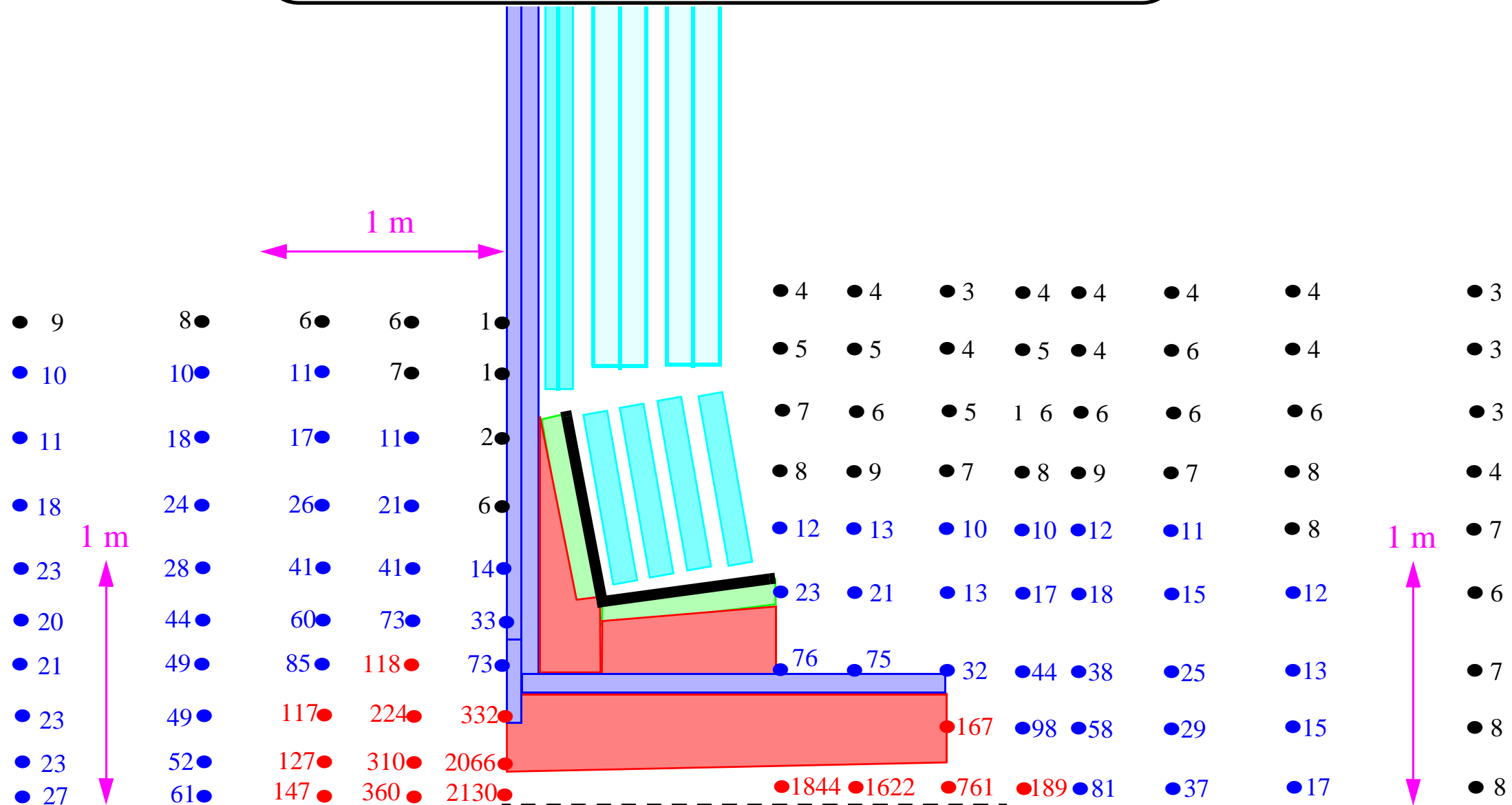
**Dose rates in  $\mu\text{Sv/h}$  from the disc shield after 100 days of running and 5 days of cooling.**



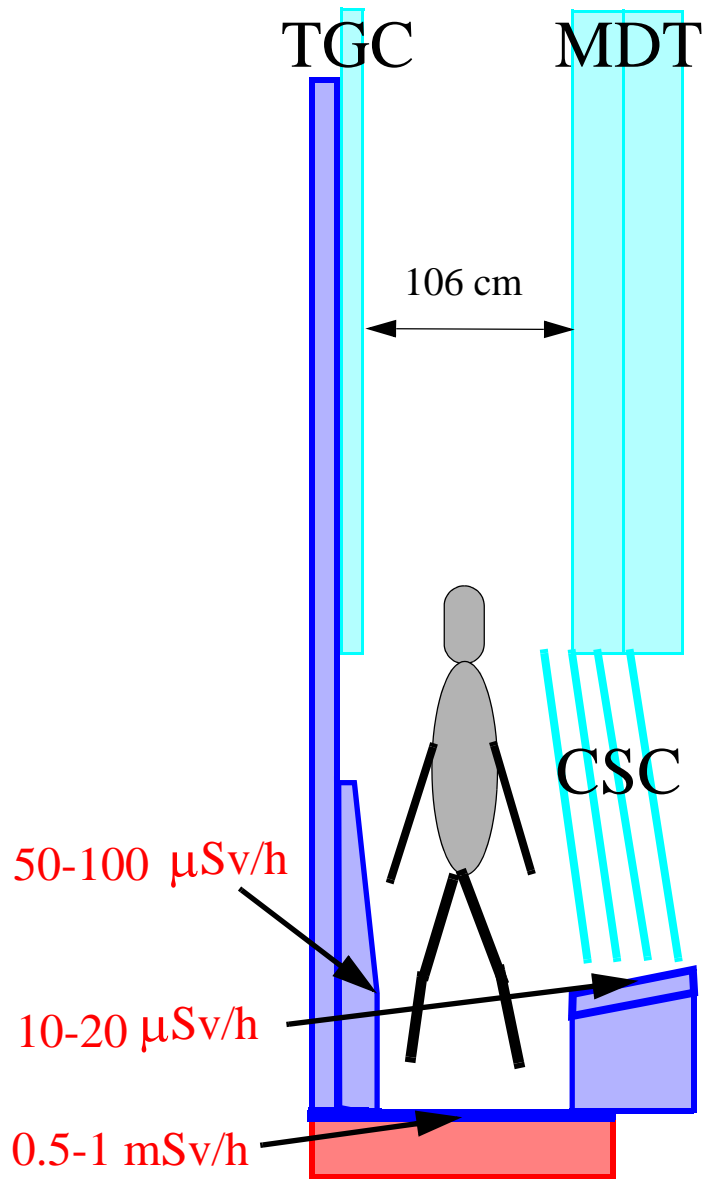
**Dose rates in  $\mu\text{Sv/h}$  from the disc shield after 100 days of running and 5 days of cooling.**



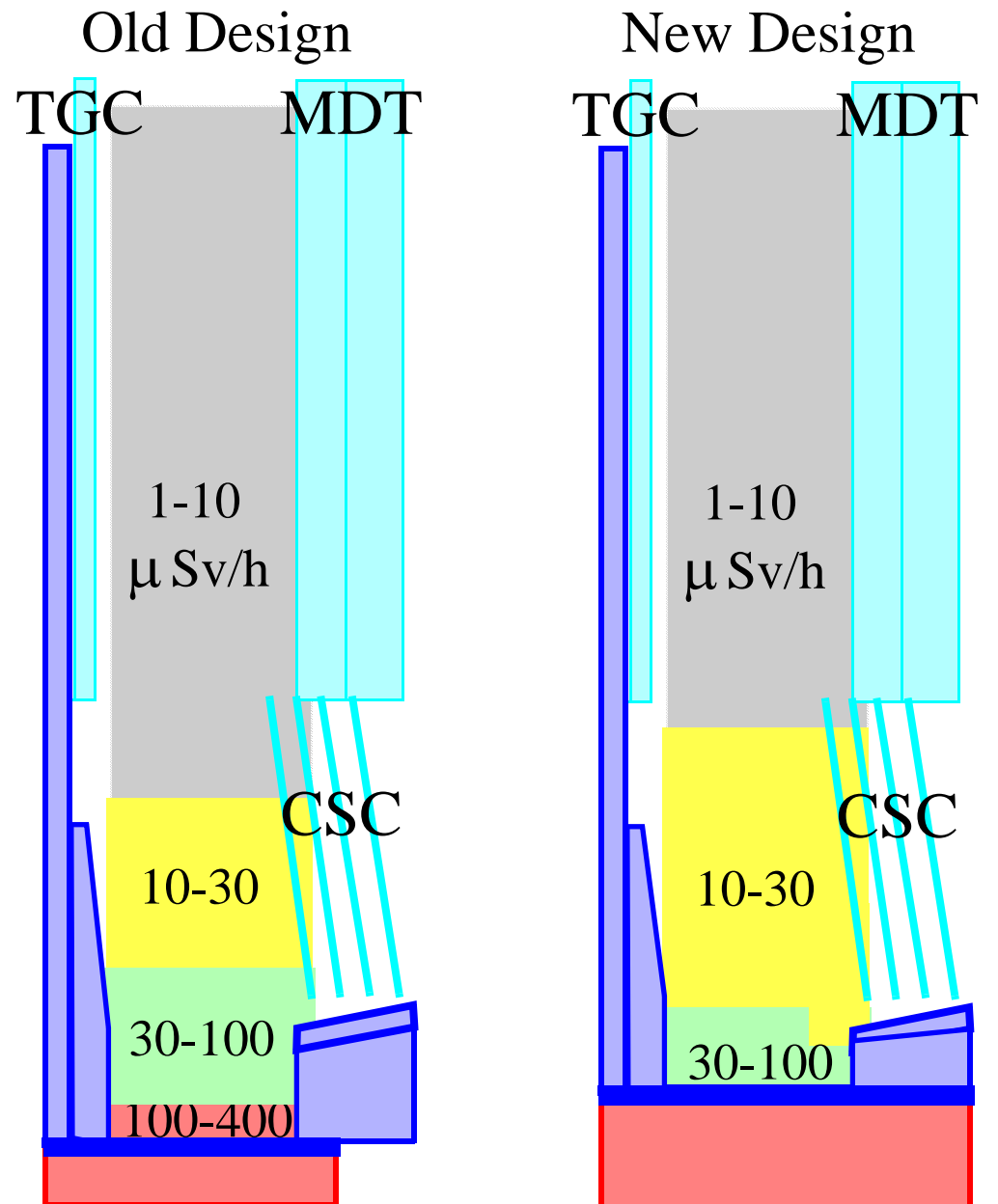
**Dose rates in  $\mu\text{Sv/h}$  from the disc shield after 100 days of running and 5 days of cooling.**



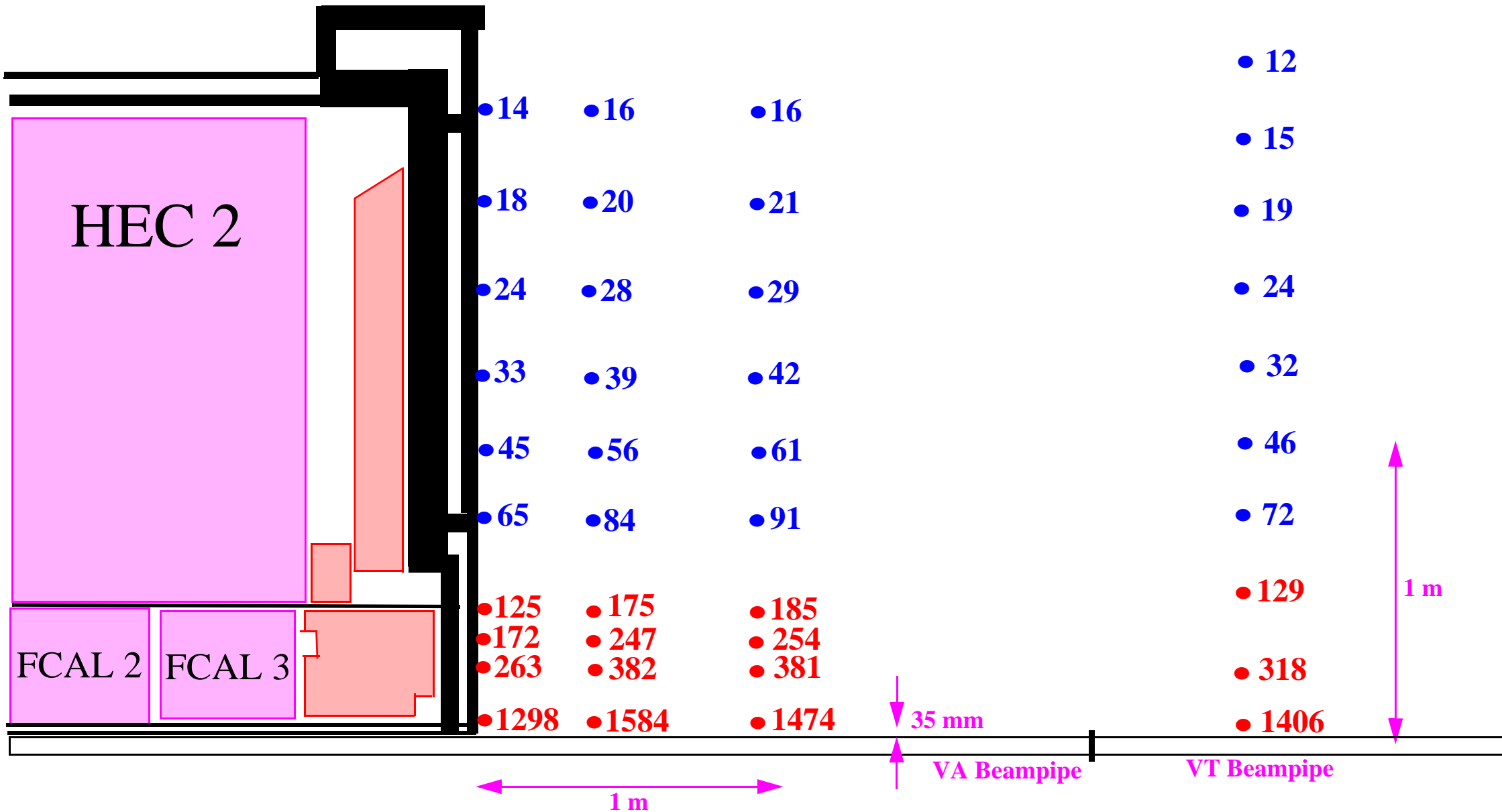
Contact dose rate calculated by Shupe and Hedberg using omega factors.  
30 day run / 1 day cooling



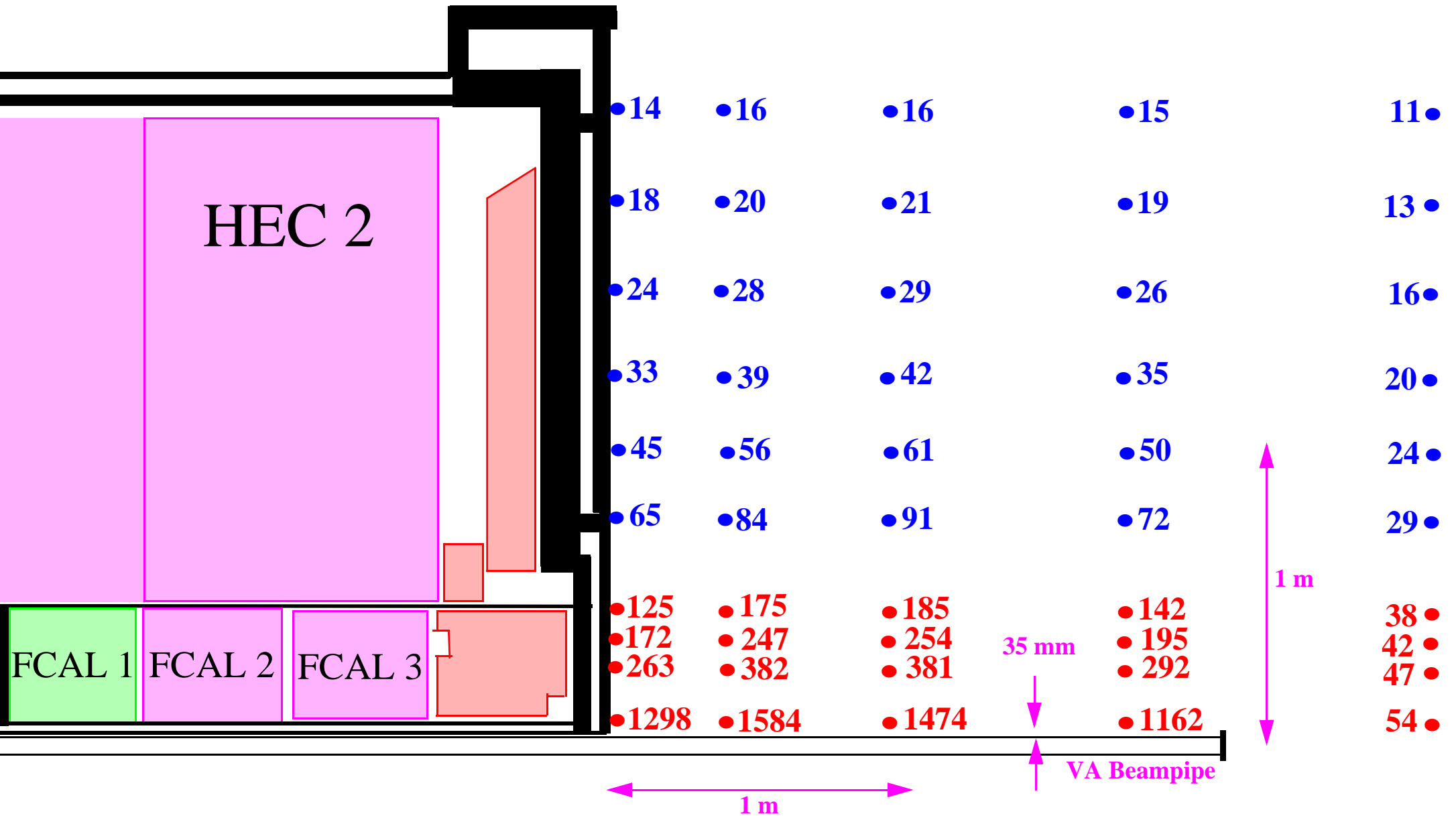
Dose rates in the small wheel after 100 days of running and 5 days of cooling.  
Calculation by M. Morev.



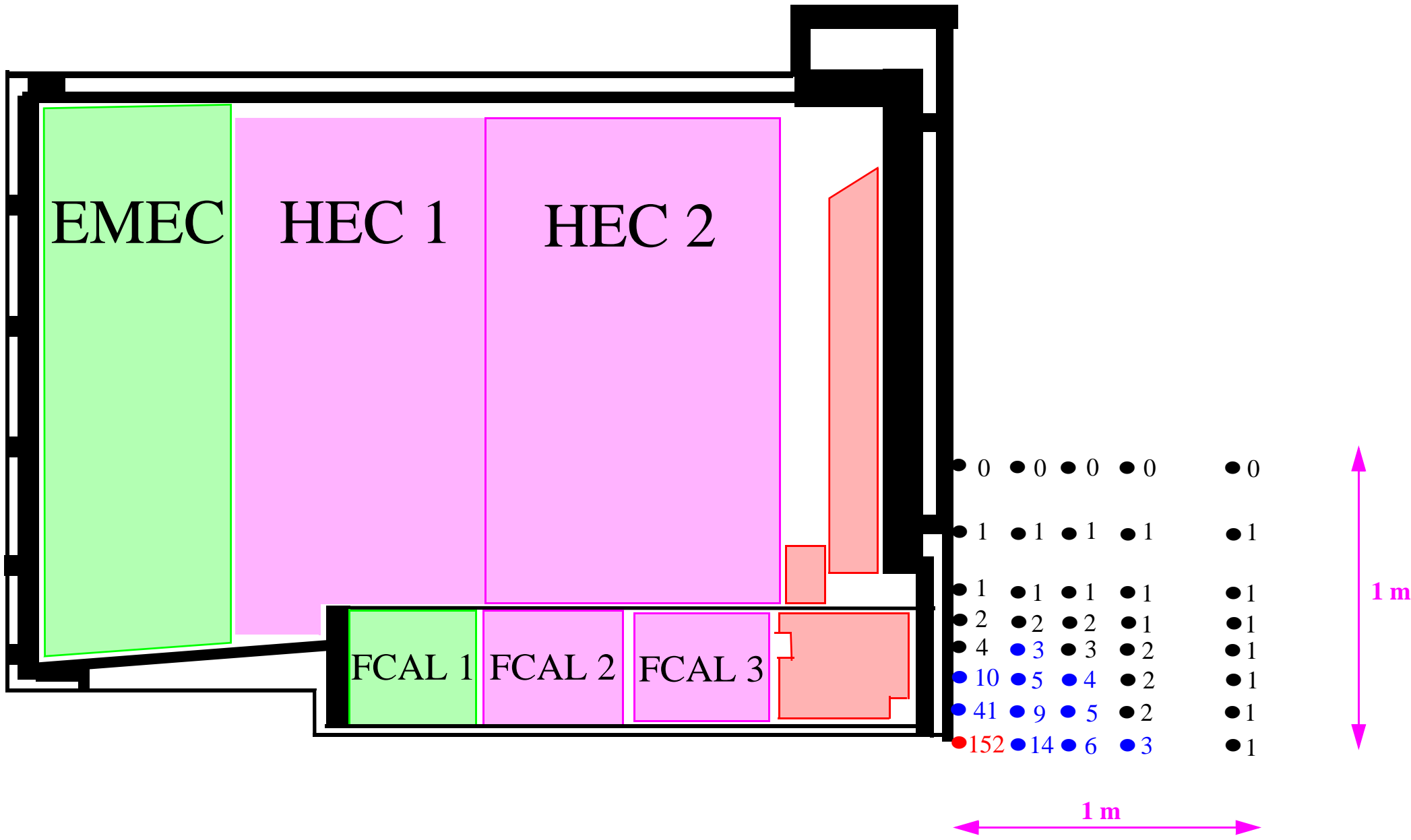
# Dose rates in $\mu\text{Sv/h}$ after 100 days of running and 5 days cooling



# Dose rates in $\mu\text{Sv/h}$ after 100 days of running and 5 days cooling

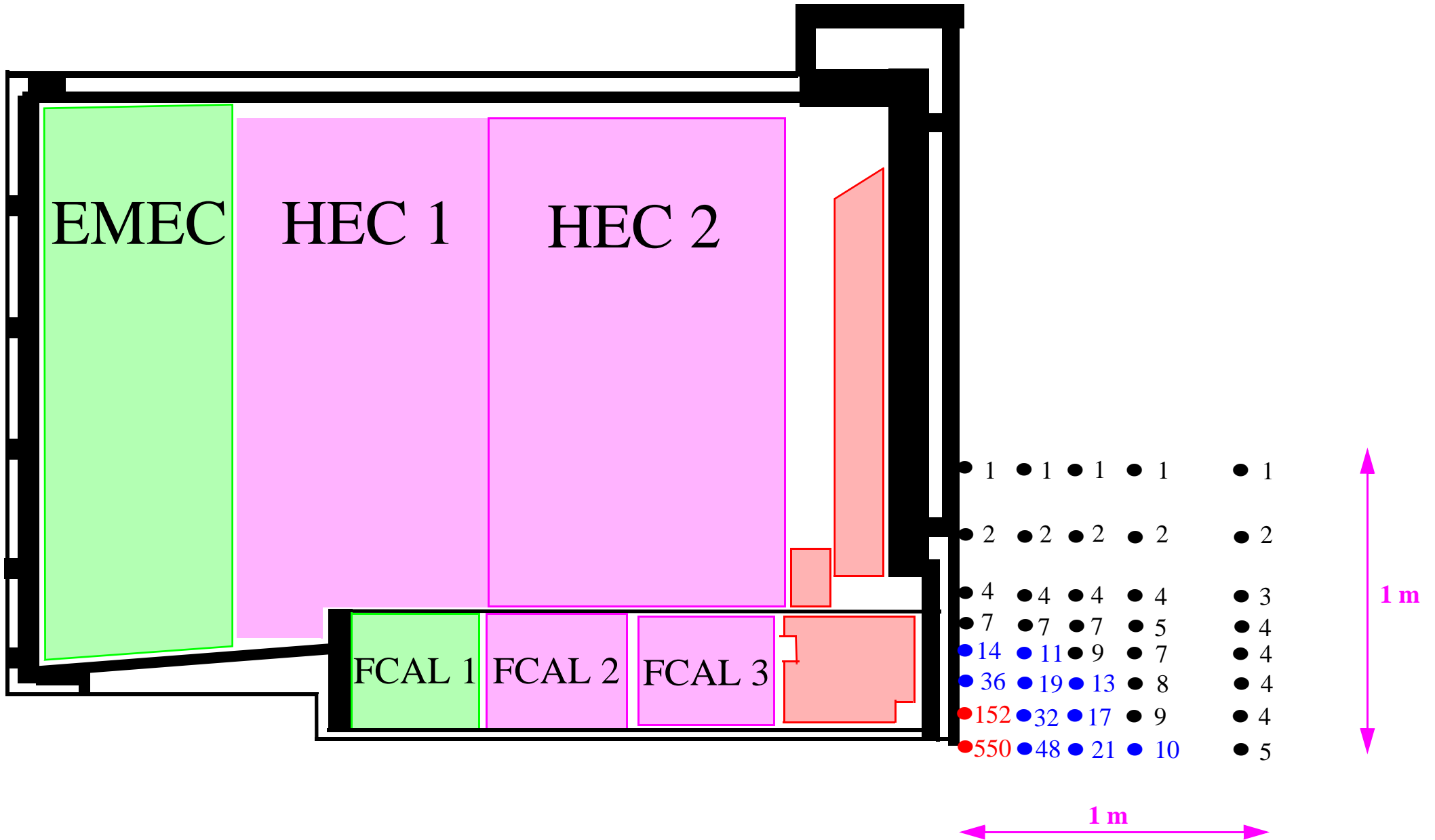


Dose rates in  $\mu\text{Sv/h}$  after 100 days of running and 5 days cooling

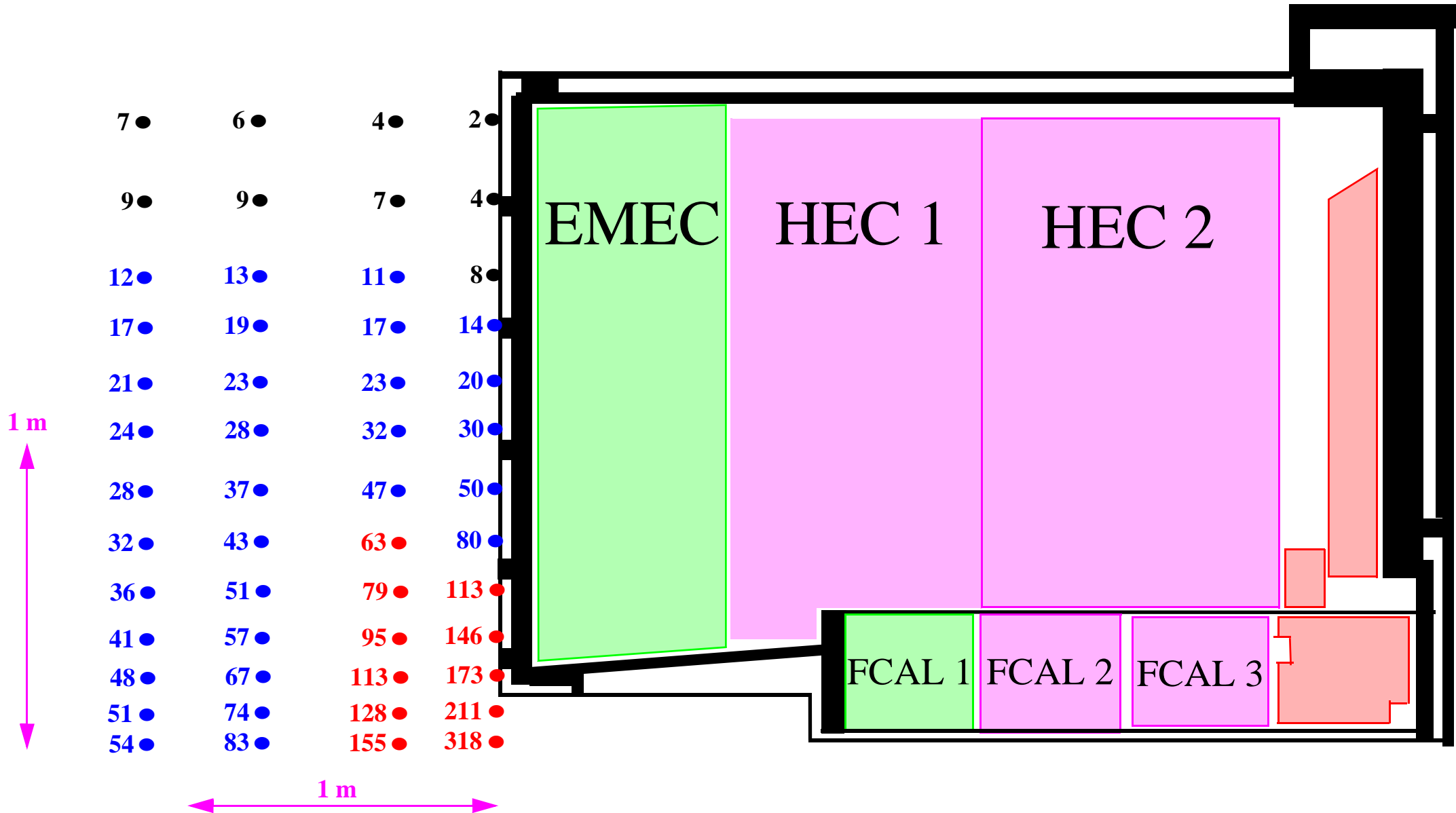




# Dose rates in $\mu\text{Sv/h}$ after 10 years running and 5 days cooling

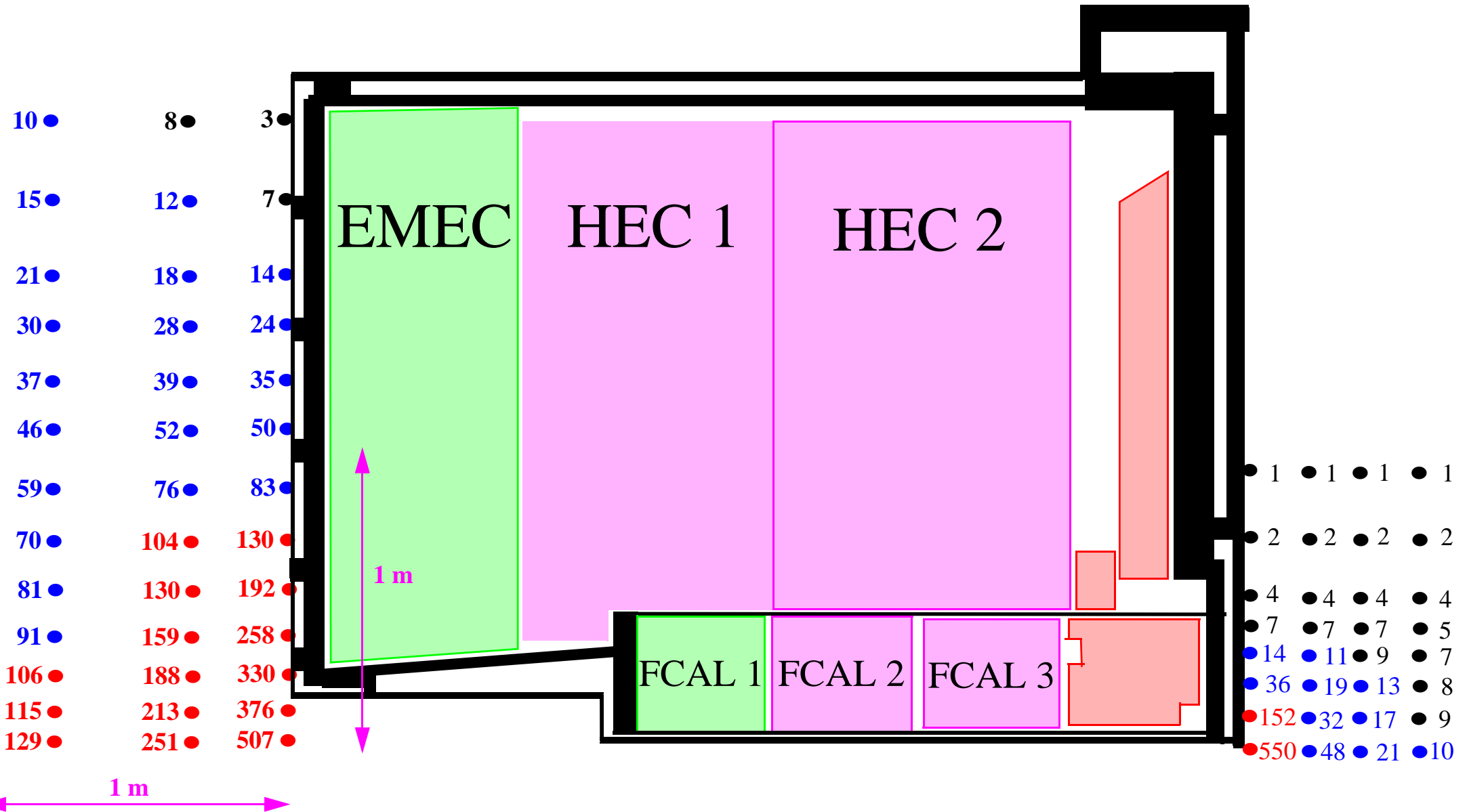


# Dose rates in $\mu\text{Sv/h}$ after 100 days of running and 5 days cooling

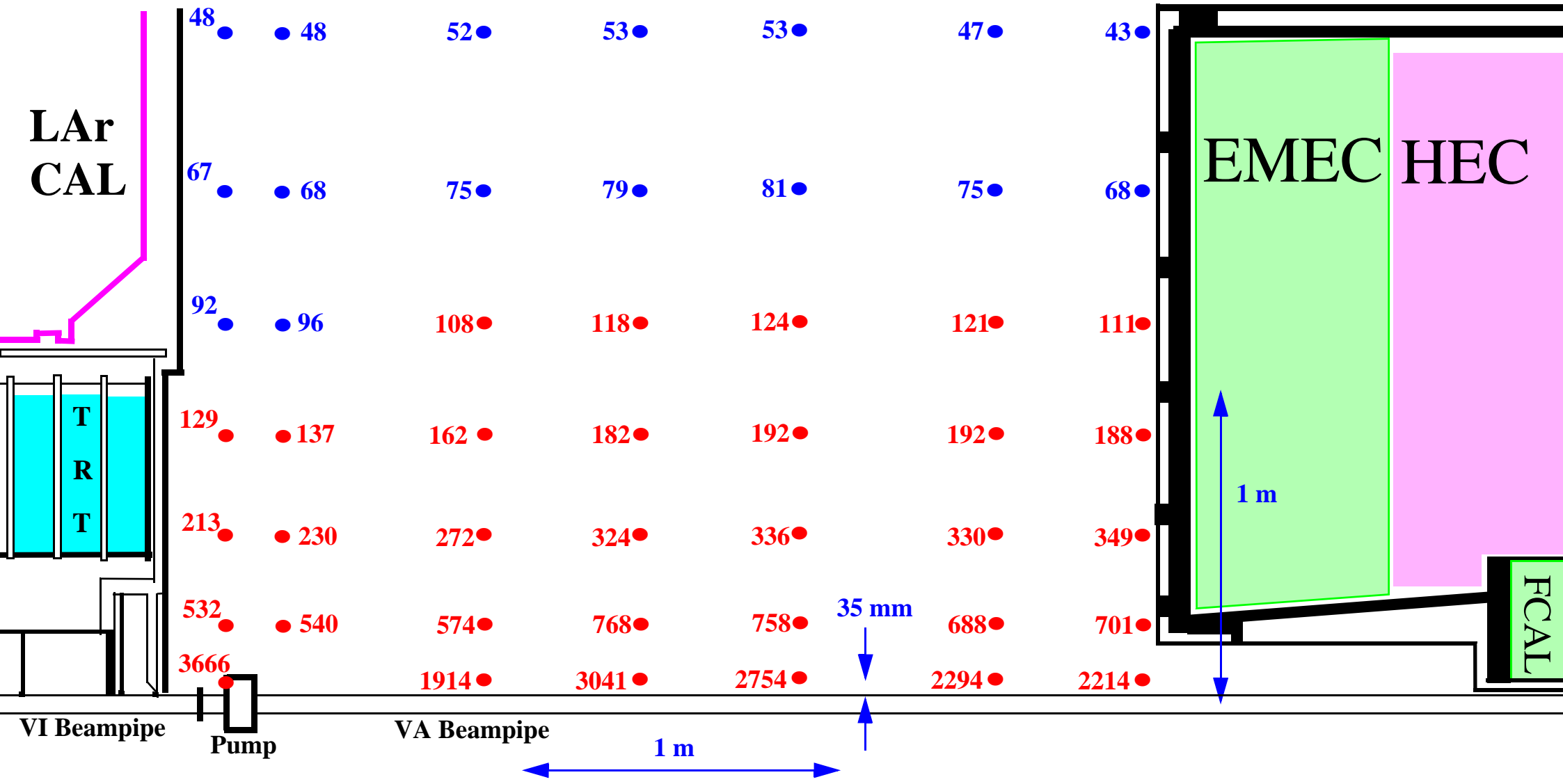




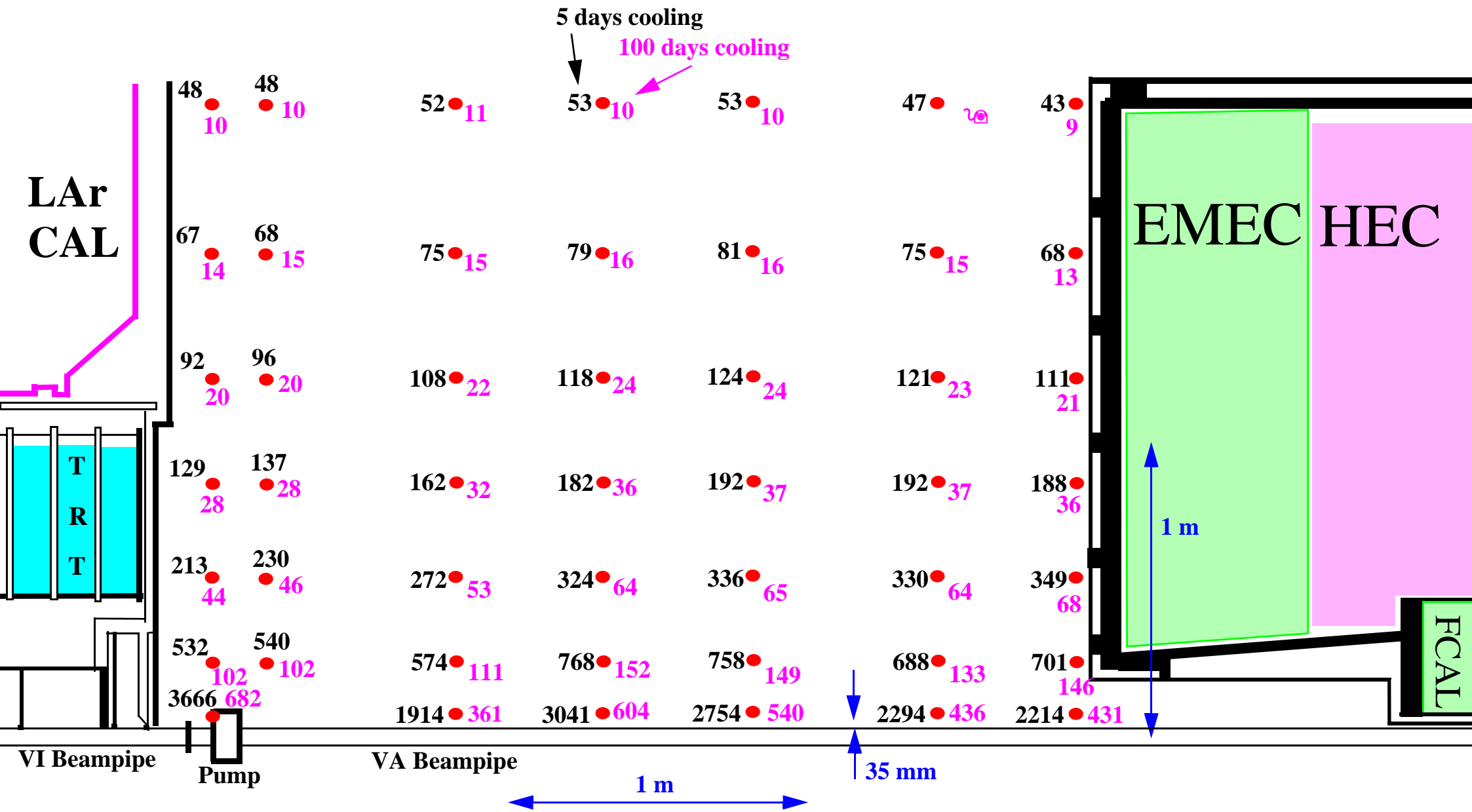
# Dose rates in $\mu\text{Sv/h}$ after 10 years running and 5 days cooling



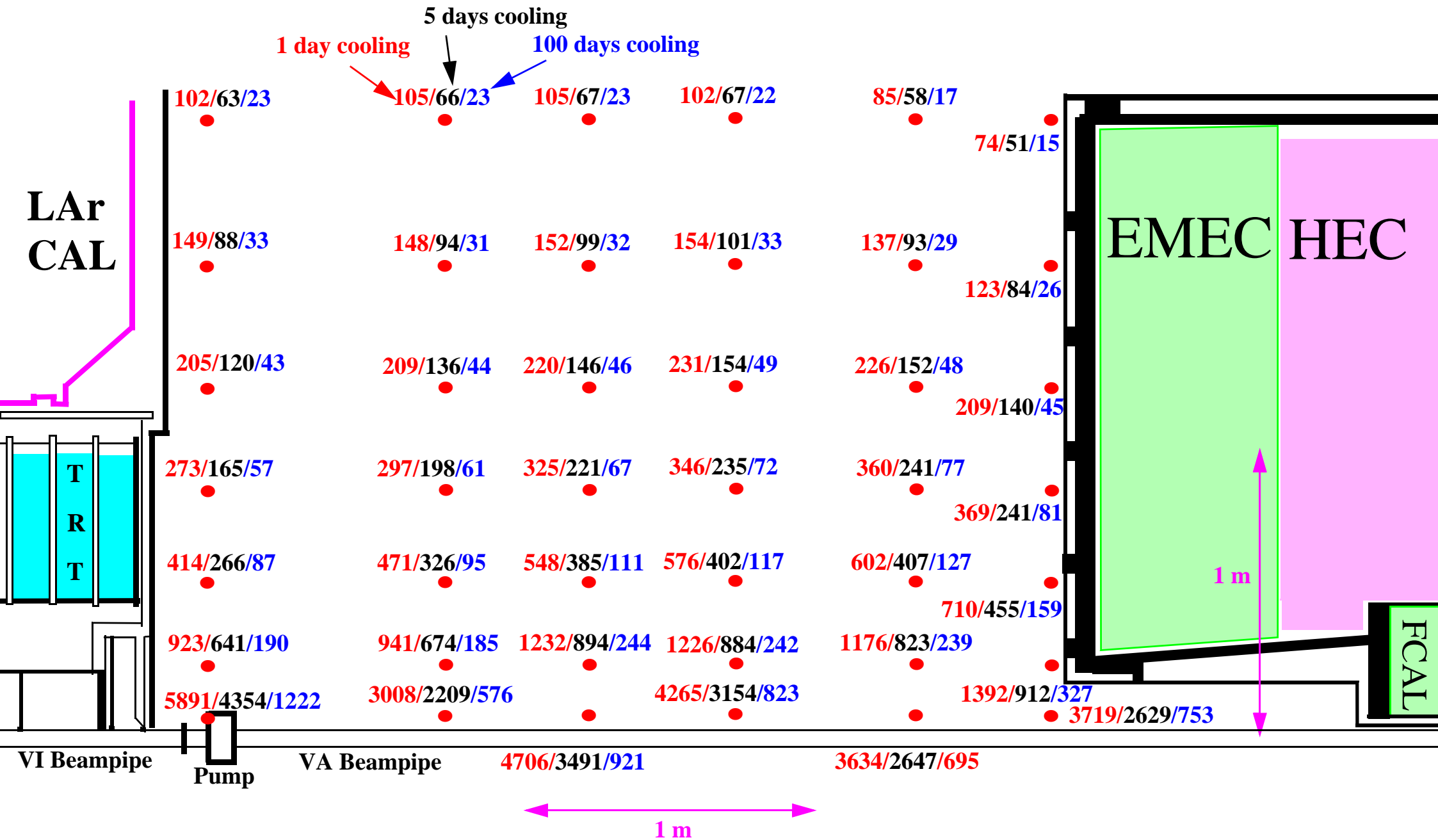
# Dose rates in $\mu\text{Sv/h}$ after 100 days of running and 5 days cooling



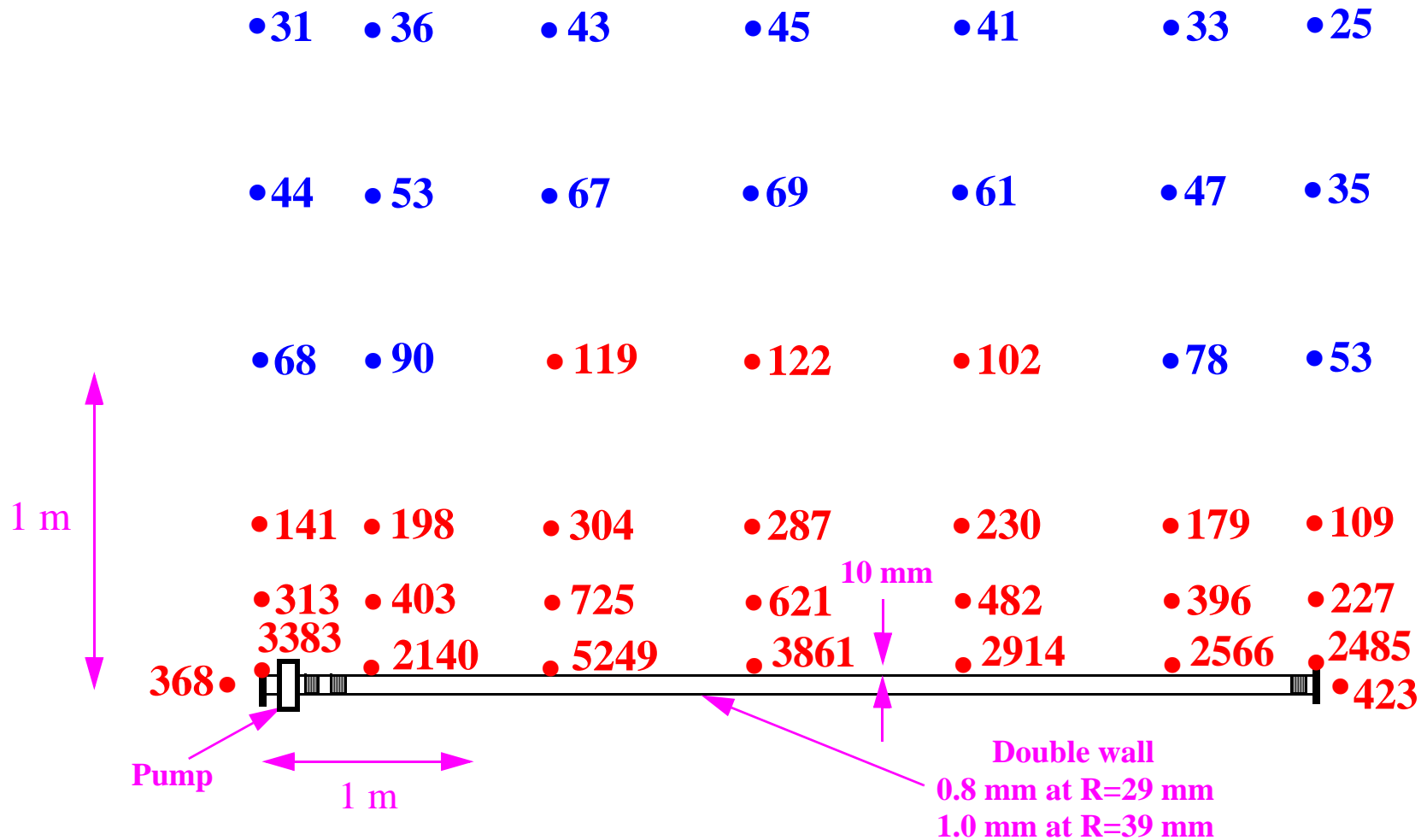
# Dose rates in $\mu\text{Sv/h}$ after 100 days of running and 5 and 100 days cooling



# Dose rates in $\mu\text{Sv/h}$ after 10 years of running



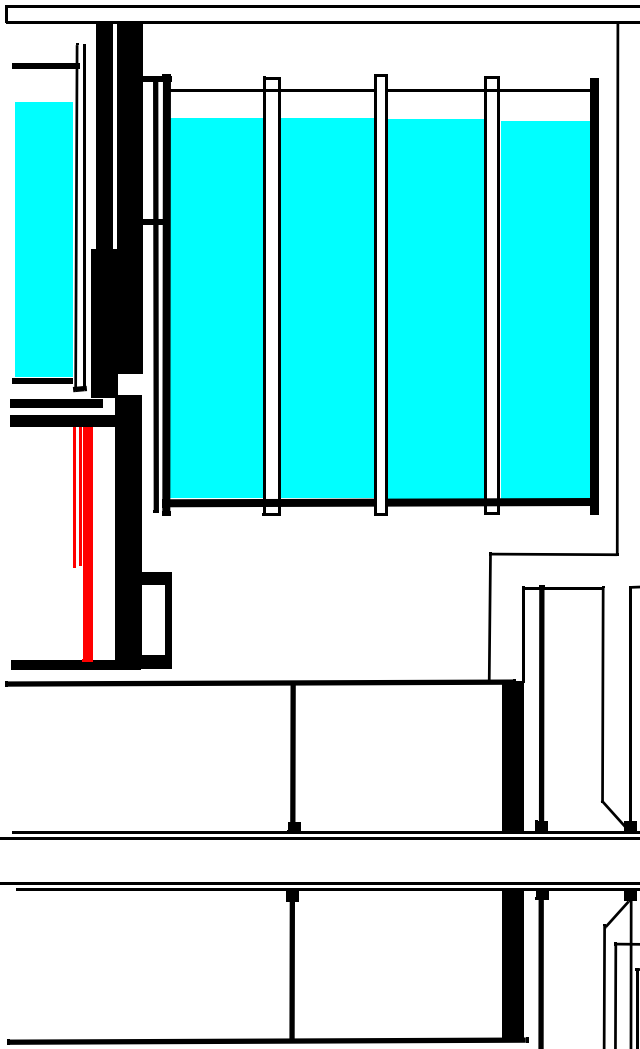
**Dose rates in  $\mu\text{Sv/h}$  from the VA beampipe after 100 days of running and 5 days of cooling.**





LAr Calorimeter

Dose rates in  $\mu\text{Sv/h}$  from the VA beampipe after 100 days of running and 5 days of cooling.



68 ●	77 ●	90 ●	103 ●	119 ●
92 ●	106 ●	126 ●	148 ●	177 ●
141 ●	169 ●	198 ●	238 ●	304 ●
313 ●	399 ●	403 ●	495 ●	725 ●
585 ●	771 ●	657 ●	823 ●	1334 ●
3383 ●	2629 ●	2140 ●	2752 ●	5249 ●

10 mm

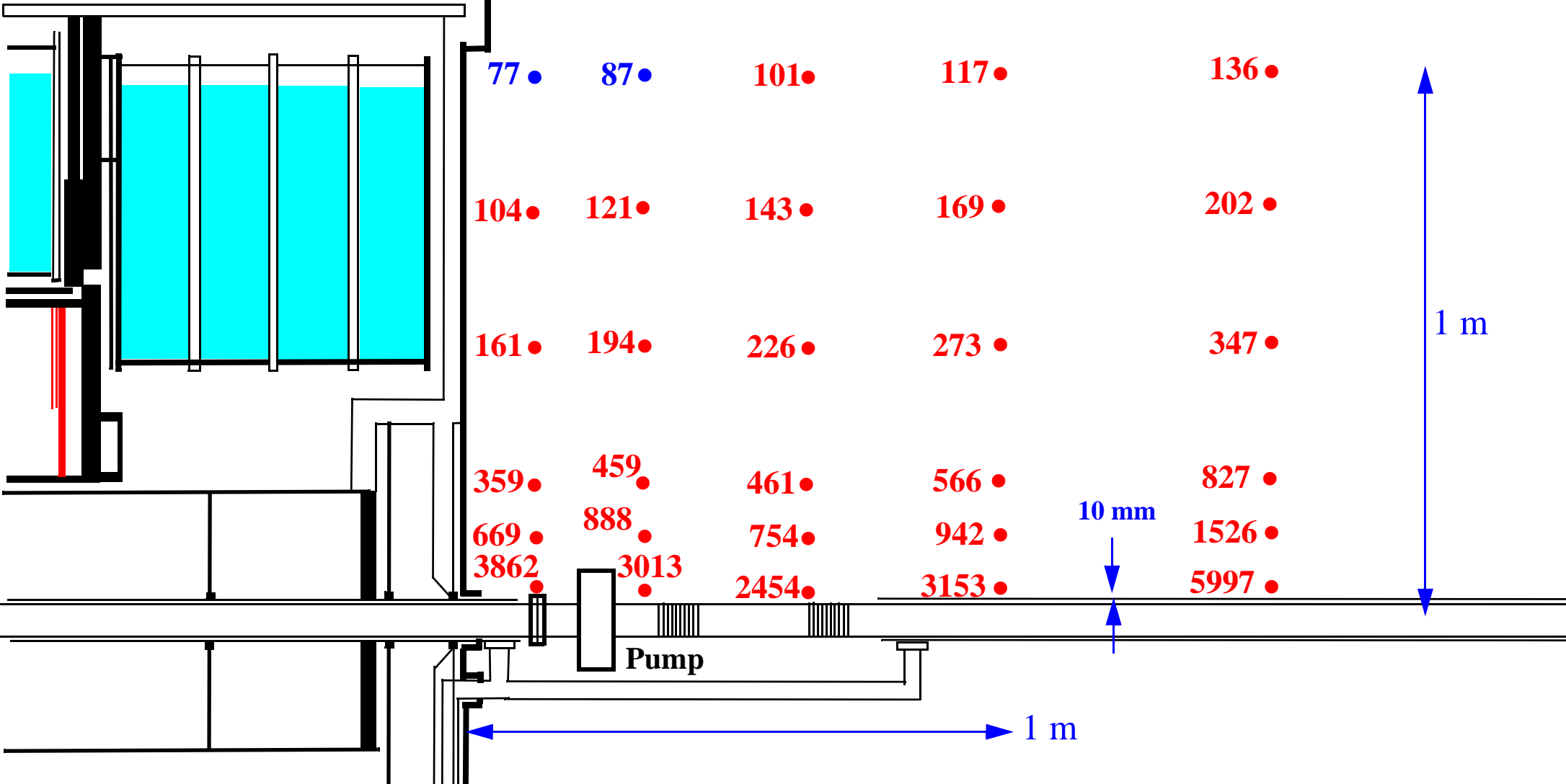
1 m

Pump

1 m

LAr Calorimeter

Dose rates in  $\mu\text{Sv/h}$  from the VA beampipe after 10 years of running and 5 days of cooling.

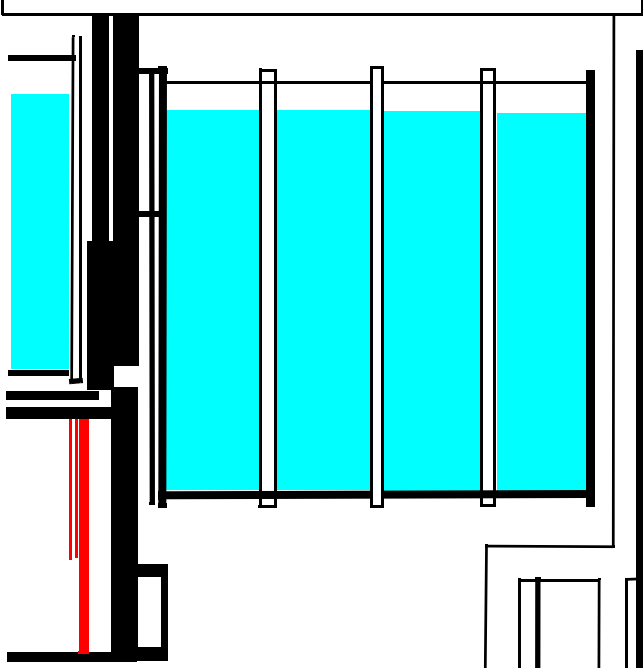


**Dose rates in  $\mu\text{Sv/h}$  from the VA beampipe after 100 days of running and 5 days of cooling.**

LAr Calorimeter

Stainless steel  
beampipe  
0.8+0.8 mm

Aluminium  
beampipe  
1.5+1.5 mm



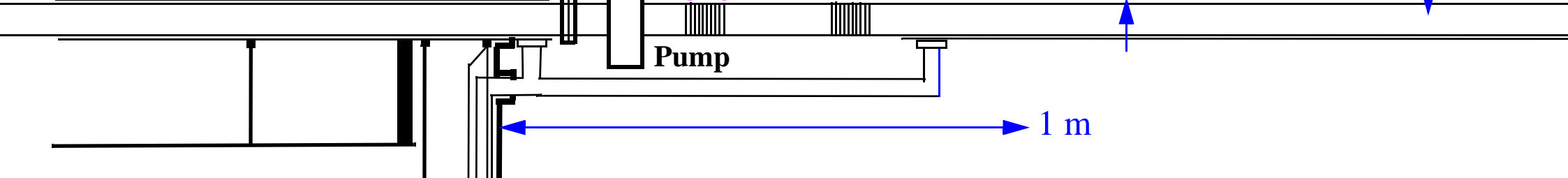
68 • 5	77 • 5	90 • 5	103 • 4	119 • 4
92 • 7	106 • 8	126 • 7	148 • 6	177 • 5
141 • 15	169 • 15	198 • 12	238 • 9	304 • 9
313 • 49	399 • 54	403 • 22	495 • 16	725 • 18
585 • 104	771 • 126	657 • 31	823 • 23	1334 • 32
3383 • 239	2629 • 316	2140 • 59	2752 • 67	5249 • 127

1 m

10 mm

Pump

1 m

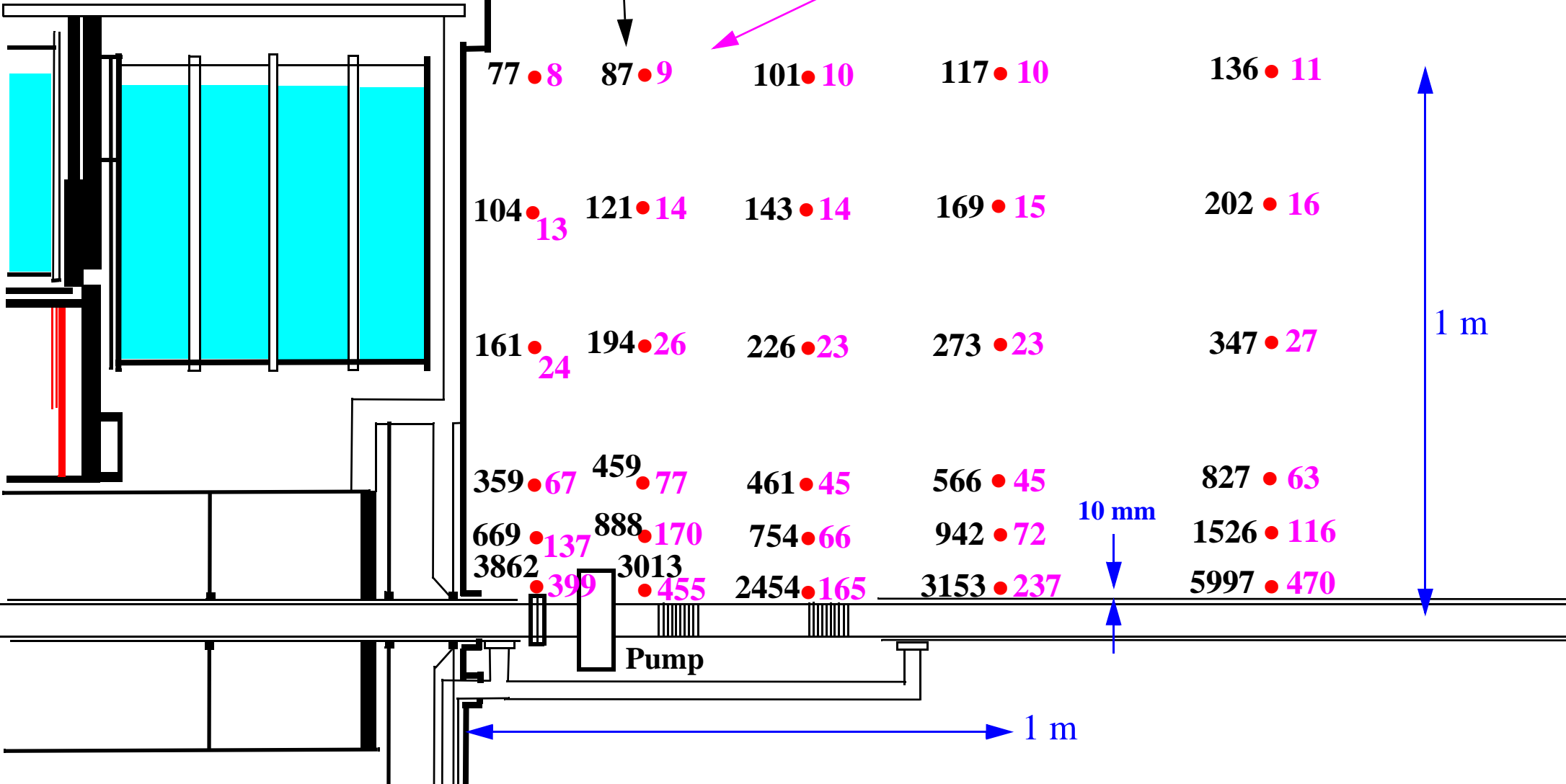


**Dose rates in  $\mu\text{Sv/h}$  from the VA beampipe after 10 years of running and 5 days of cooling.**

LAr Calorimeter

Stainless steel  
beampipe  
0.8+0.8 mm

Aluminium  
beampipe  
1.5+1.5 mm

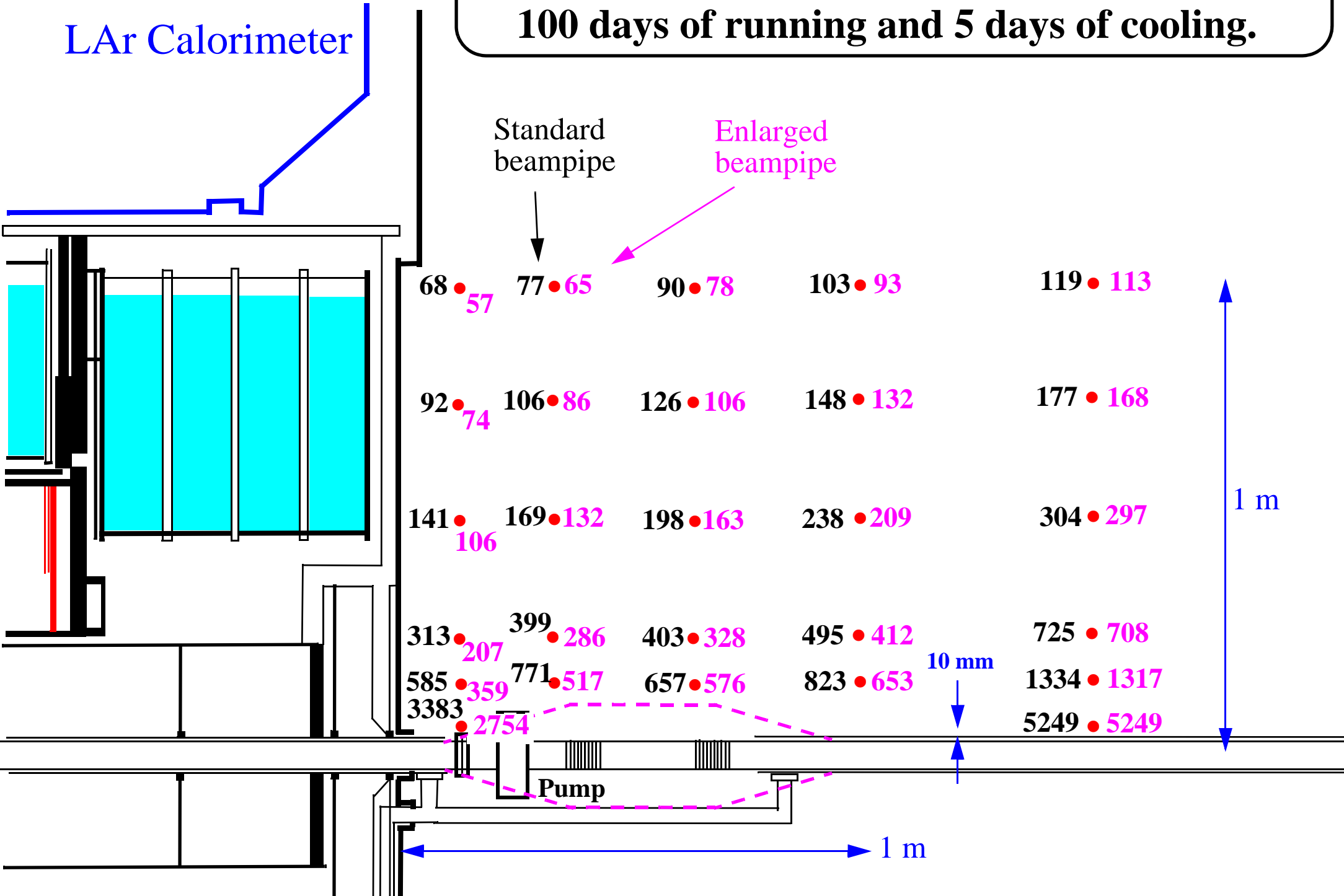


**Dose rates in  $\mu\text{Sv/h}$  from the VA beampipe after 100 days of running and 5 days of cooling.**

LAr Calorimeter

Standard  
beampipe

Enlarged  
beampipe

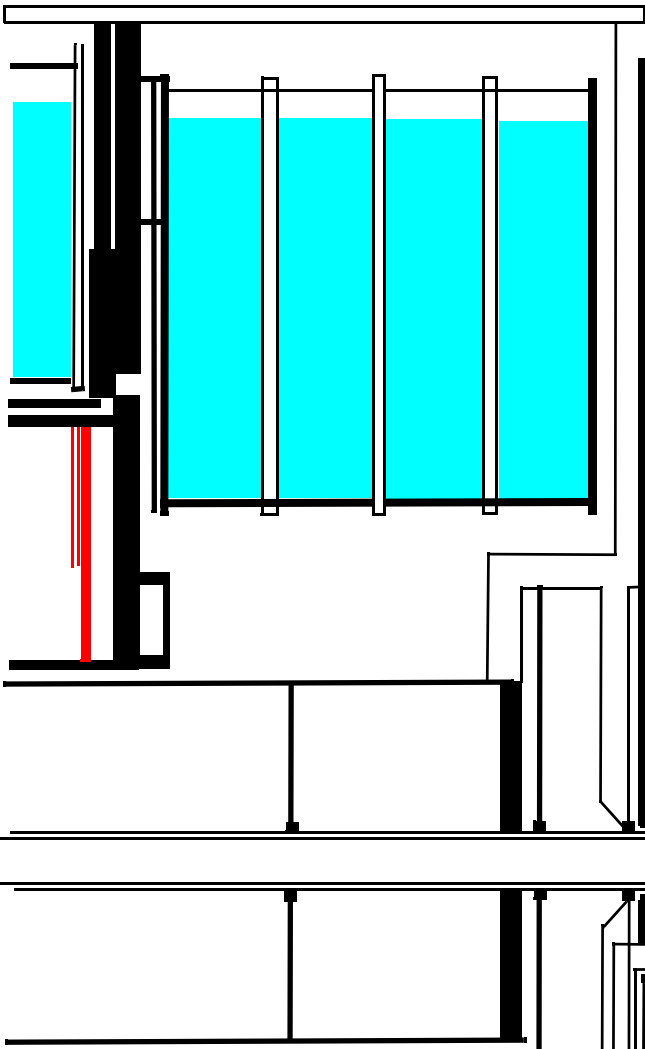


**Dose rates in  $\mu\text{Sv/h}$  from the VA beampipe after 100 days of running and 5 days of cooling.**

LAr Calorimeter

Standard  
beampipe

Removed  
beampipe



Standard beampipe	Removed beampipe	Removed beampipe	Removed beampipe	Removed beampipe
68 ● 46	77 ● 53	90 ● 63	103 ● 82	119 ● 105
92 ● 57	106 ● 67	126 ● 86	148 ● 116	177 ● 159
141 ● 75	169 ● 91	198 ● 120	238 ● 179	304 ● 279
313 ● 131	399 ● 160	403 ● 192	495 ● 342	725 ● 693
585 ● 234	771 ● 233	657 ● 253	823 ● 537	1334 ● 1300
3383 ● 2544	2629 ● 325	2140 ● 327	2752 ● 1703	5249 ● 5208

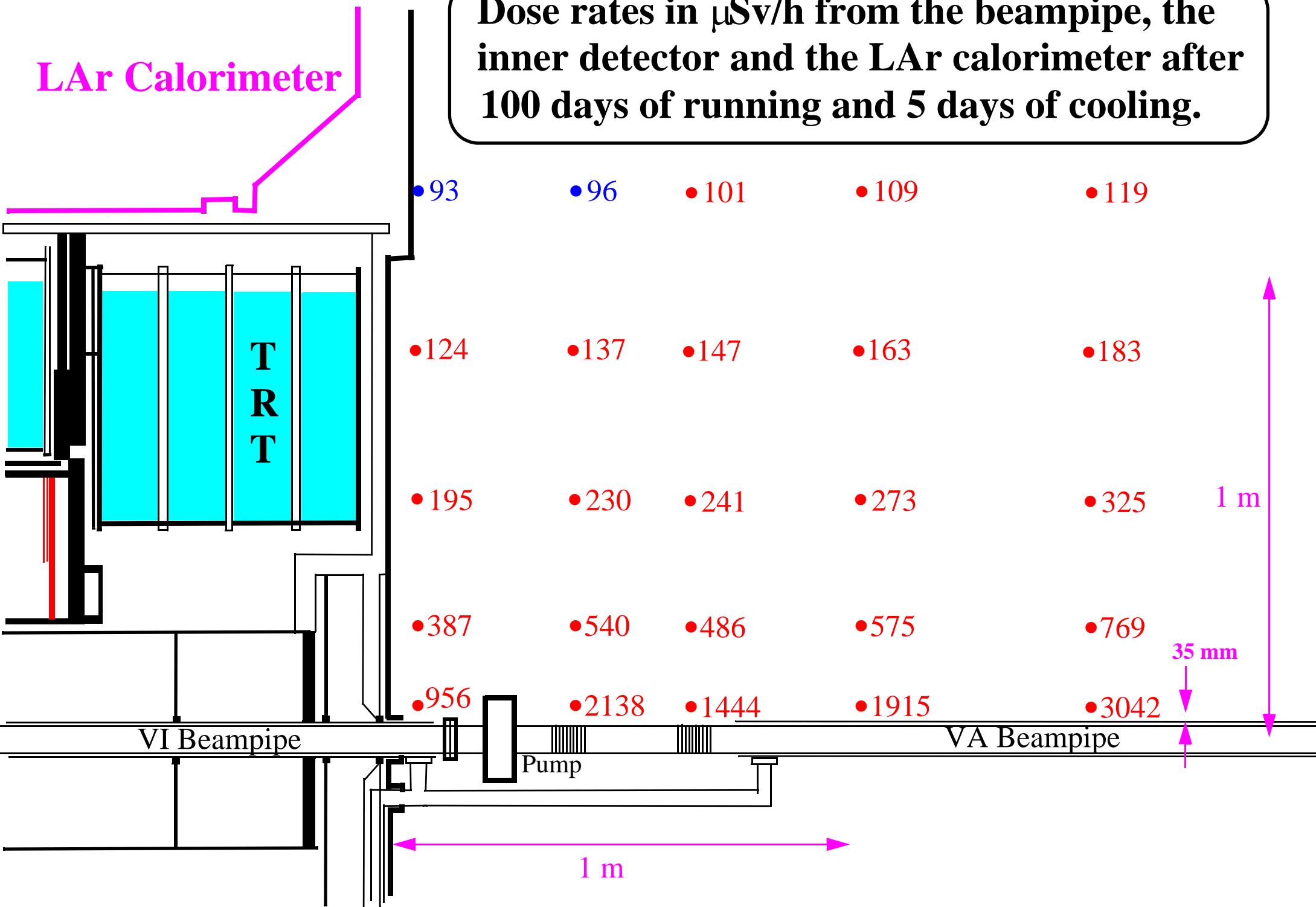
1 m

10 mm

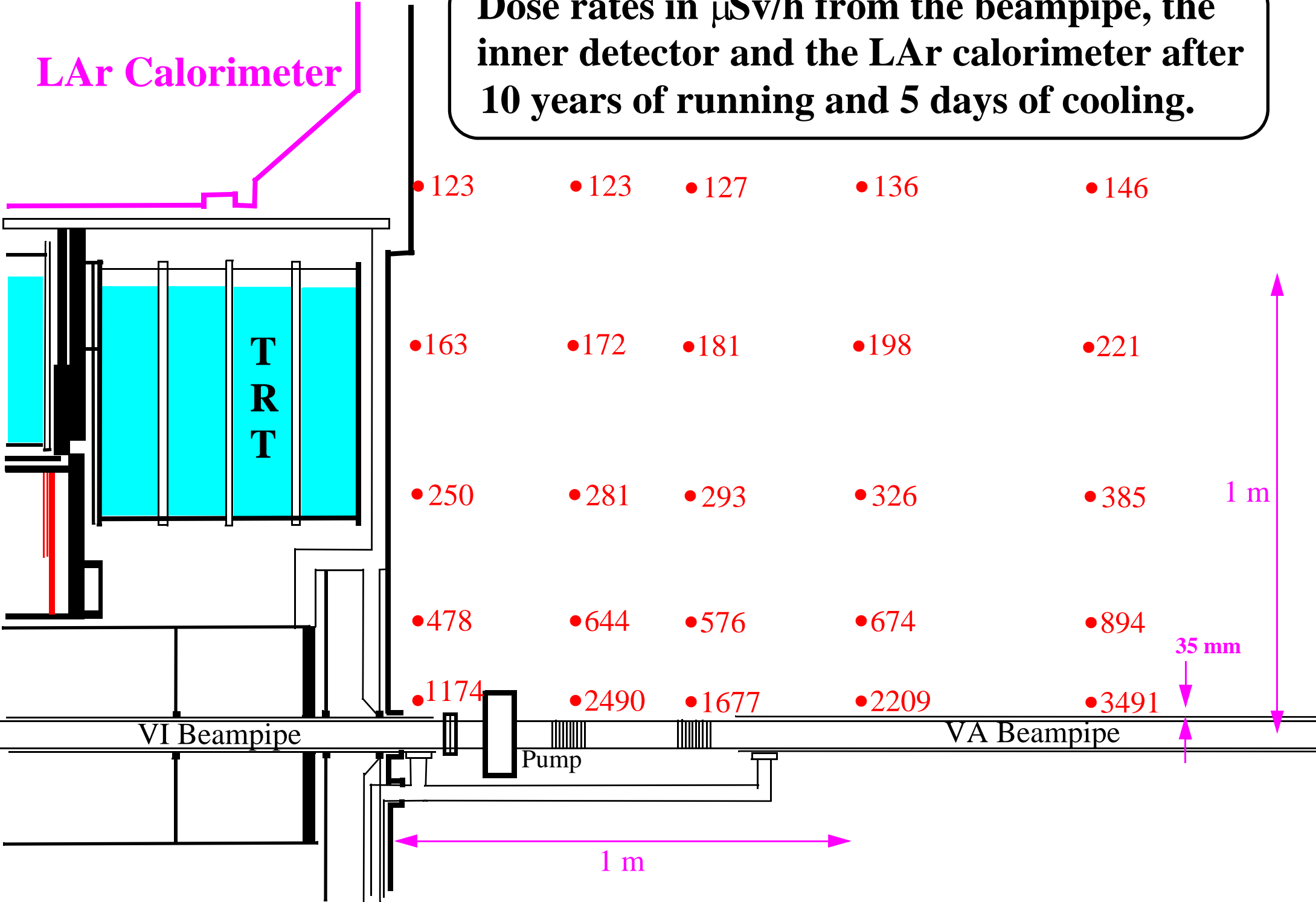
Pump

1 m

**Dose rates in  $\mu\text{Sv/h}$  from the beampipe, the inner detector and the LAr calorimeter after 100 days of running and 5 days of cooling.**

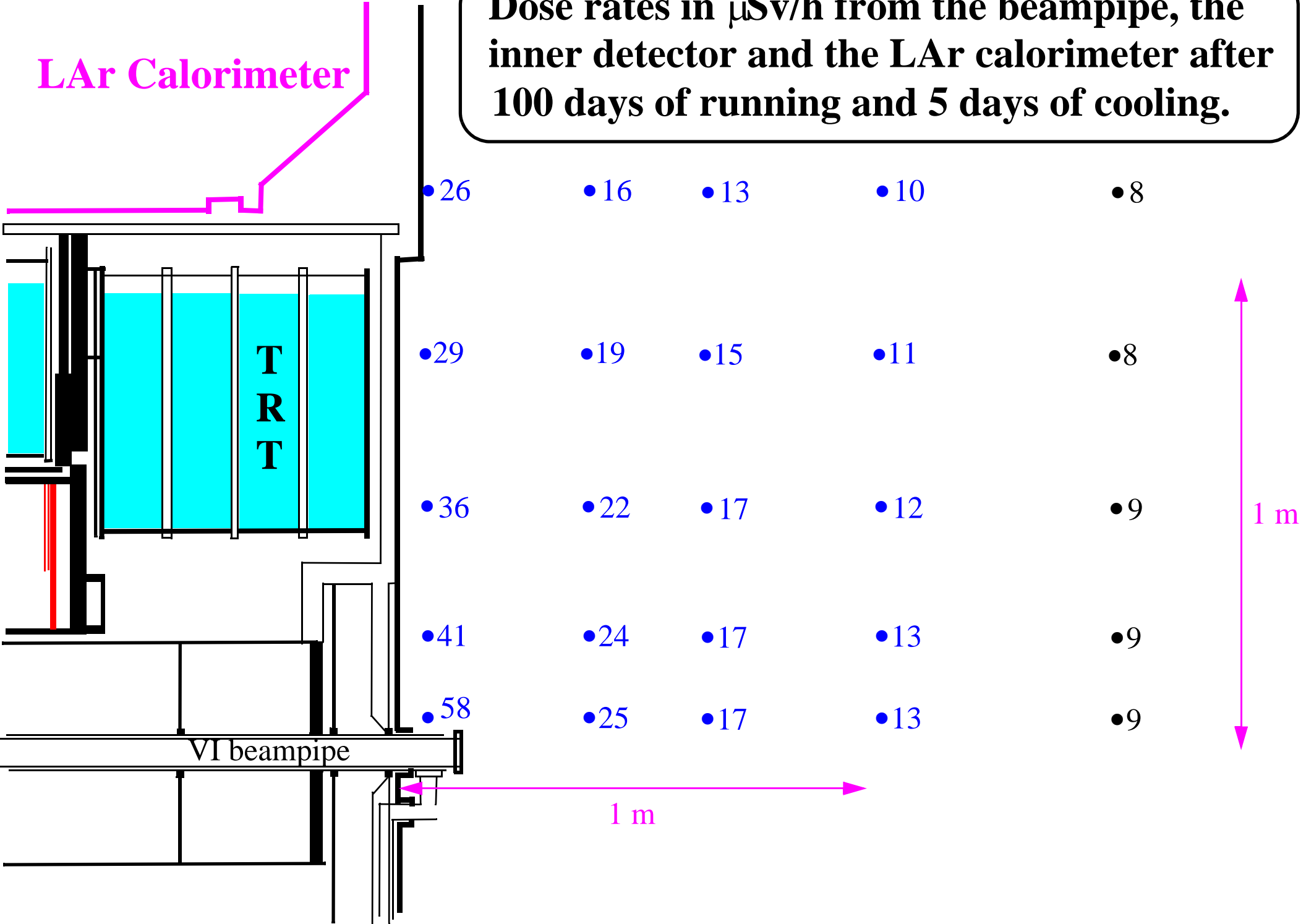


**Dose rates in  $\mu\text{Sv/h}$  from the beampipe, the inner detector and the LAr calorimeter after 10 years of running and 5 days of cooling.**

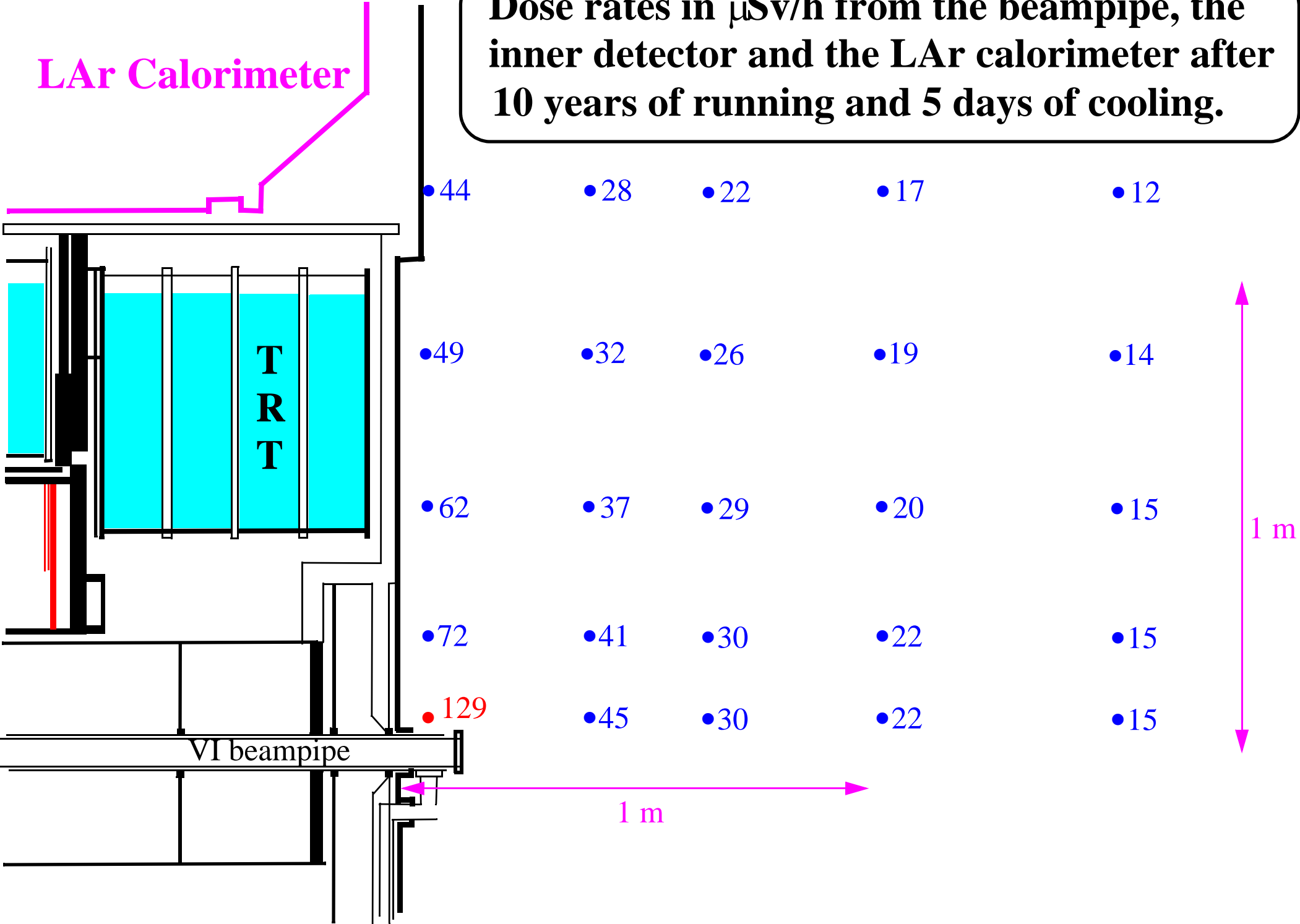




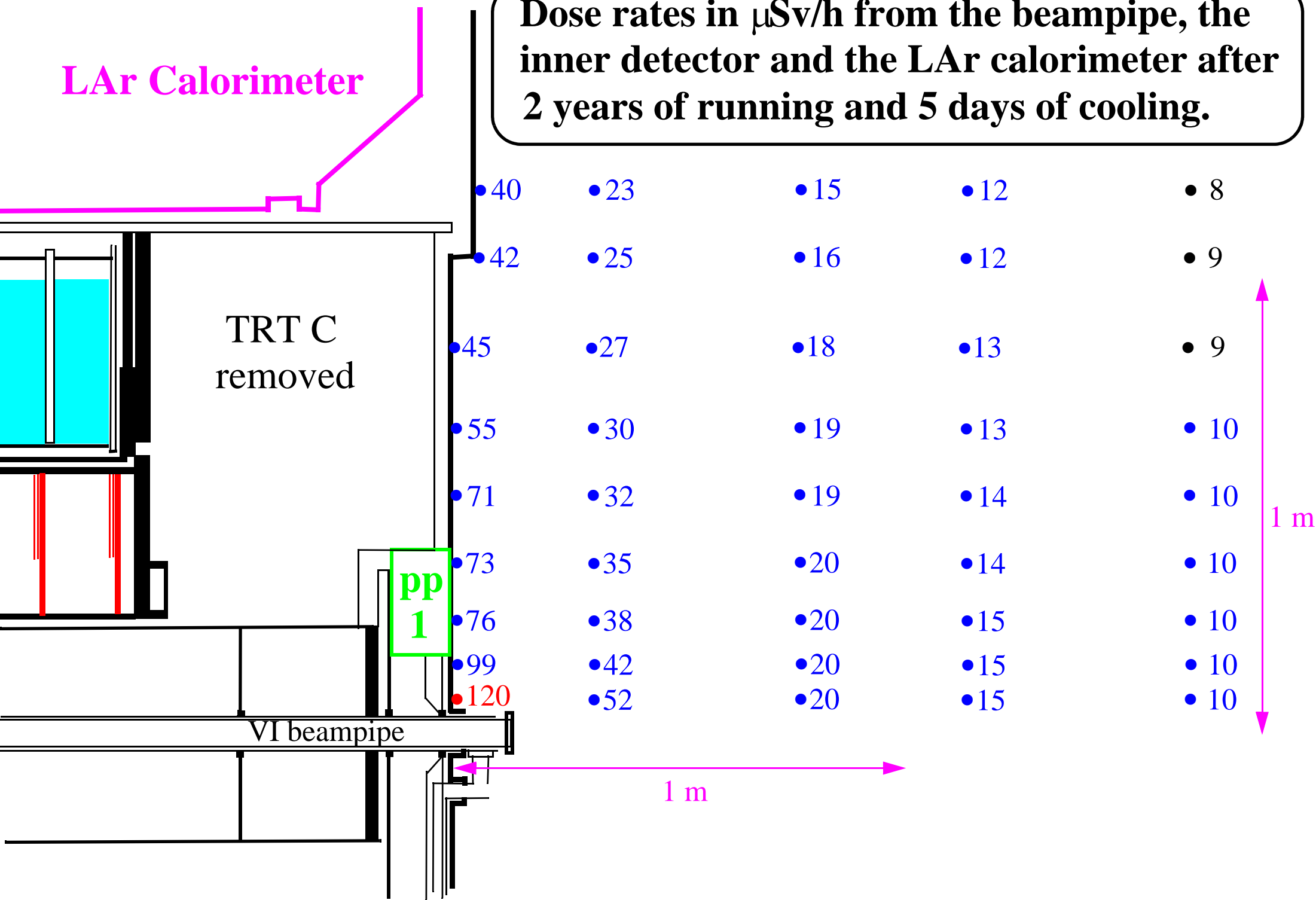
**Dose rates in  $\mu\text{Sv/h}$  from the beampipe, the inner detector and the LAr calorimeter after 100 days of running and 5 days of cooling.**



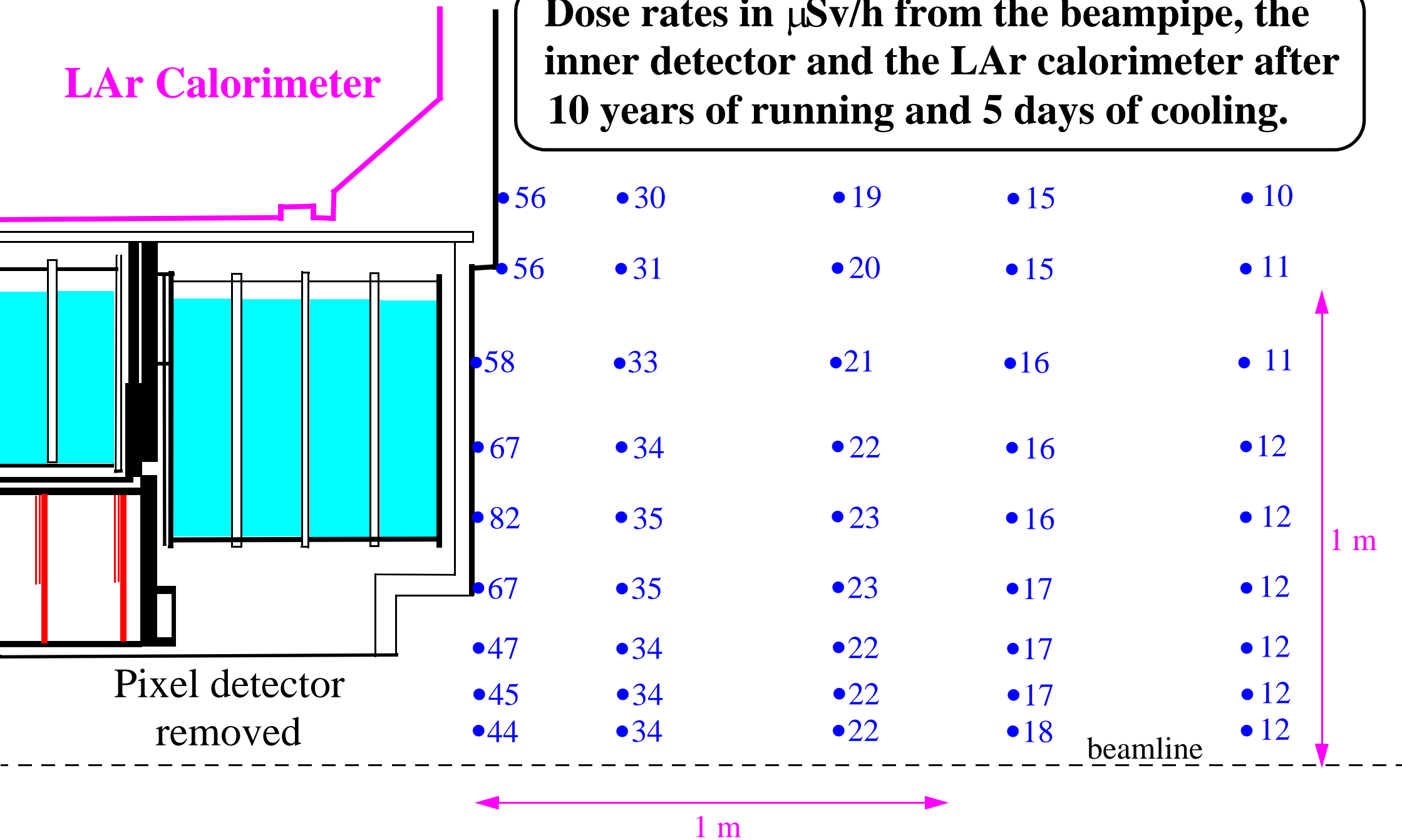
**Dose rates in  $\mu\text{Sv/h}$  from the beampipe, the inner detector and the LAr calorimeter after 10 years of running and 5 days of cooling.**



**Dose rates in  $\mu\text{Sv/h}$  from the beampipe, the inner detector and the LAr calorimeter after 2 years of running and 5 days of cooling.**

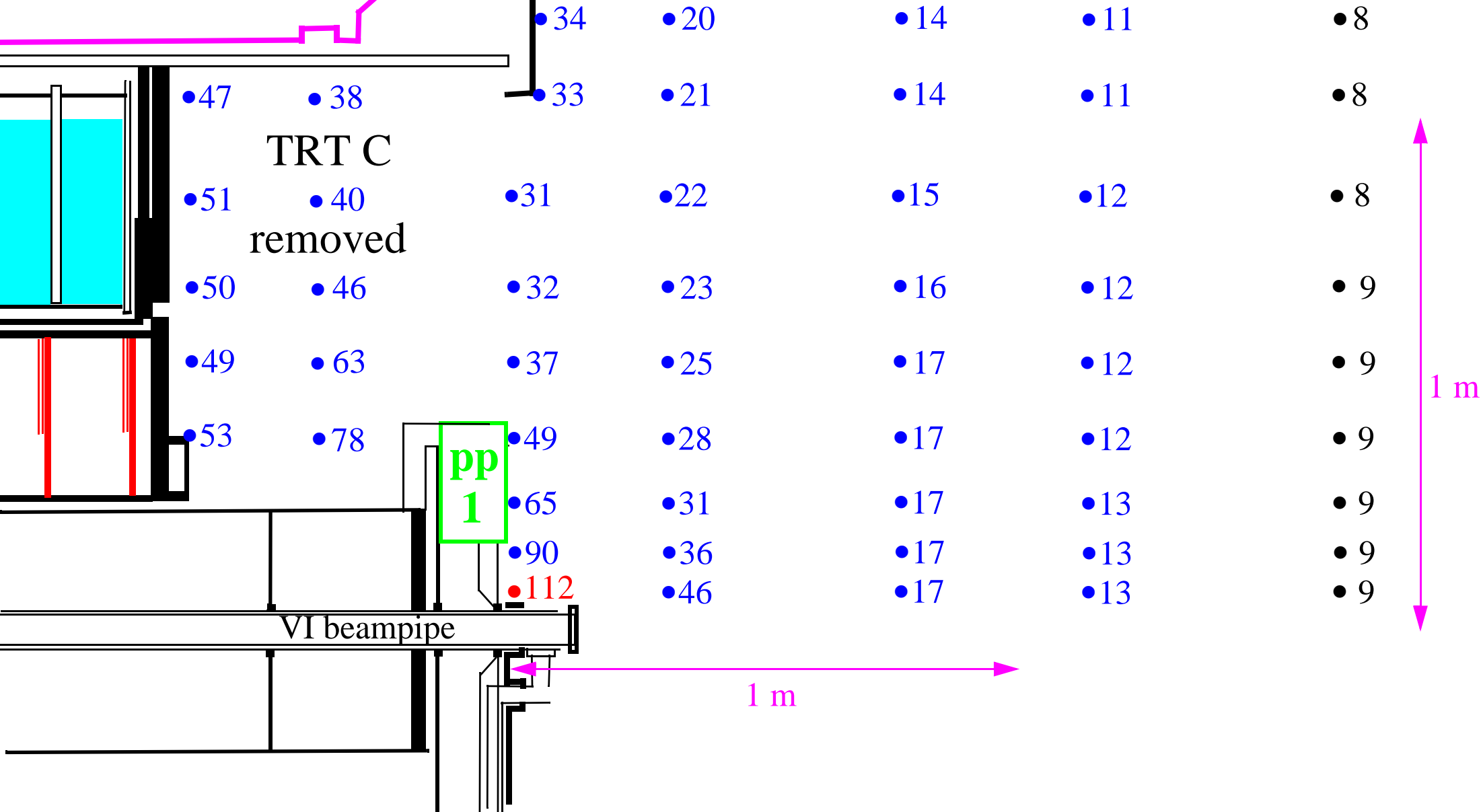


**Dose rates in  $\mu\text{Sv/h}$  from the beampipe, the inner detector and the LAr calorimeter after 10 years of running and 5 days of cooling.**



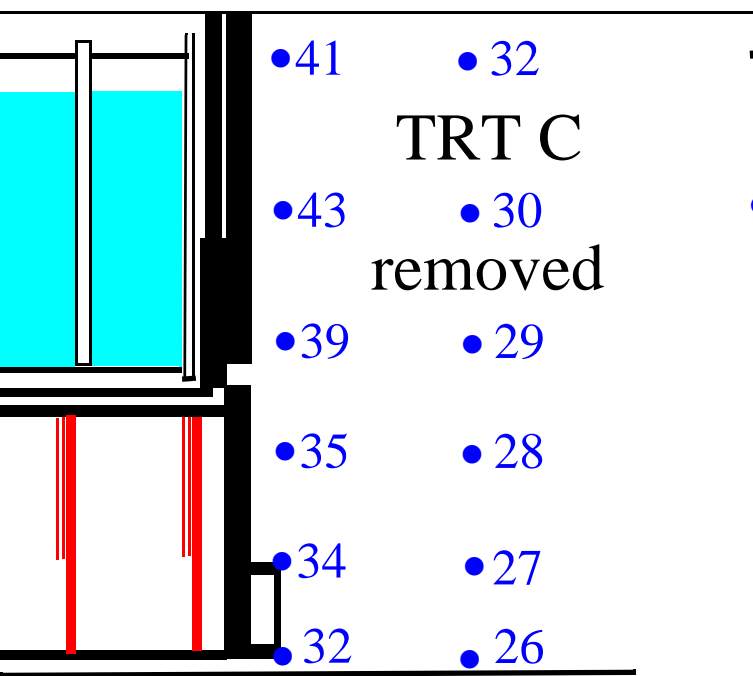
LAr Calorimeter

Dose rates in  $\mu\text{Sv/h}$  from the beampipe, the inner detector and the LAr calorimeter after 2 years of running and 5 days of cooling.



**Dose rates in  $\mu\text{Sv/h}$  from the inner detector and the LAr calorimeter after 2 years of running and 5 days of cooling.**

**LAr Calorimeter**



	• 30	• 17	• 11	• 9	• 7
	• 29	• 17	• 12	• 9	• 7
• 41	• 32				
• 43	• 30	• 25	• 17	• 12	• 10
• 39	• 29	• 23	• 17	• 13	• 10
• 35	• 28	• 22	• 17	• 13	• 10
• 34	• 27	• 22	• 17	• 13	• 10
• 32	• 26	• 22	• 17	• 12	• 10
• 32	• 26	• 22	• 17	• 12	• 11
• 32	• 26	• 22	• 17	• 12	• 11

TRT C  
removed

Pixels  
removed

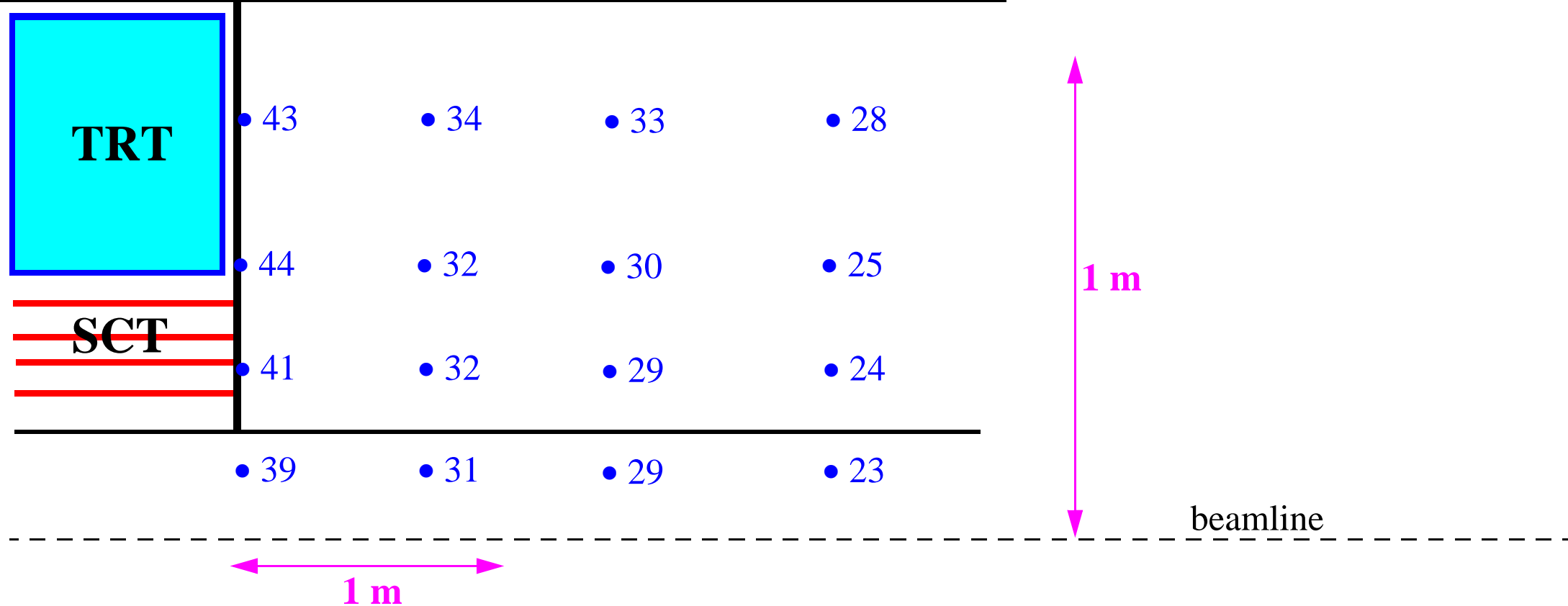
beamline

1 m

1 m

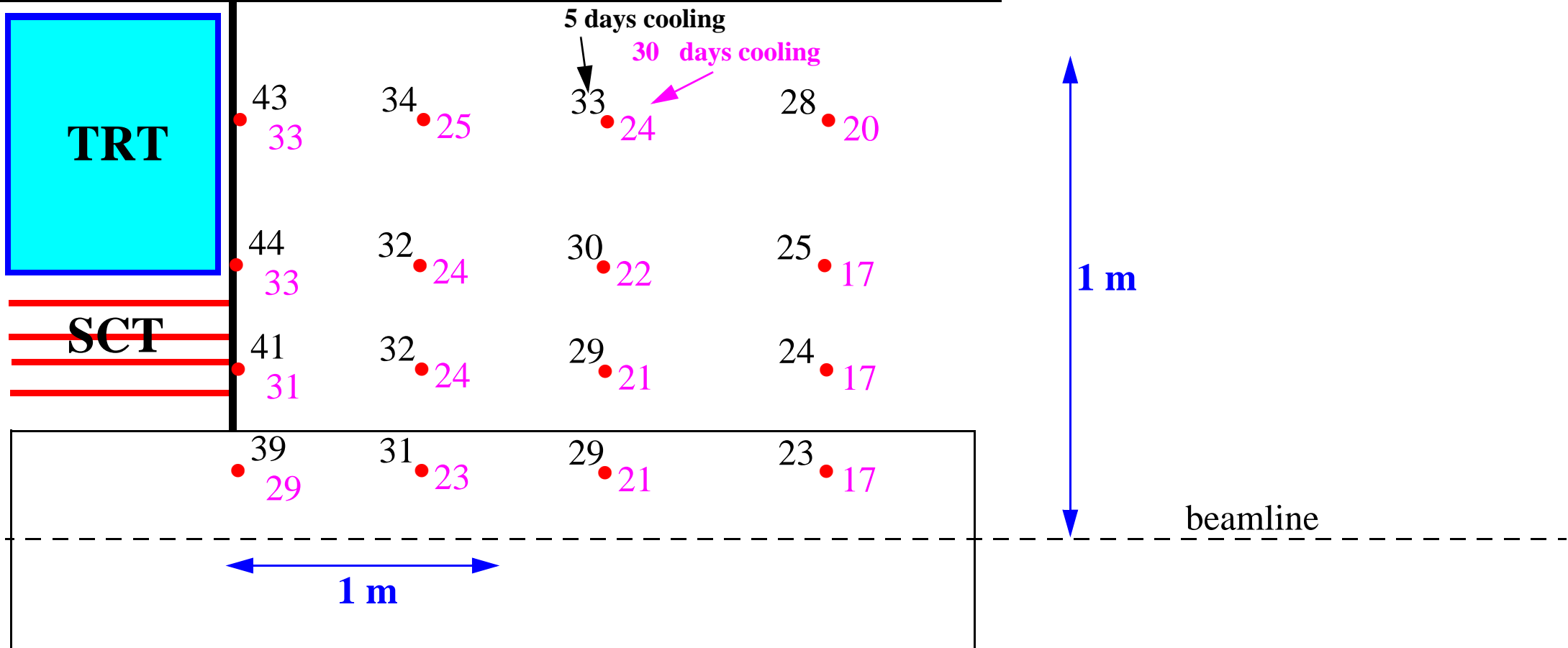
# LAr Calorimeter

Dose rates in  $\mu\text{Sv/h}$  from the inner detector and the LAr calorimeter after 10 years of running and 5 days of cooling.



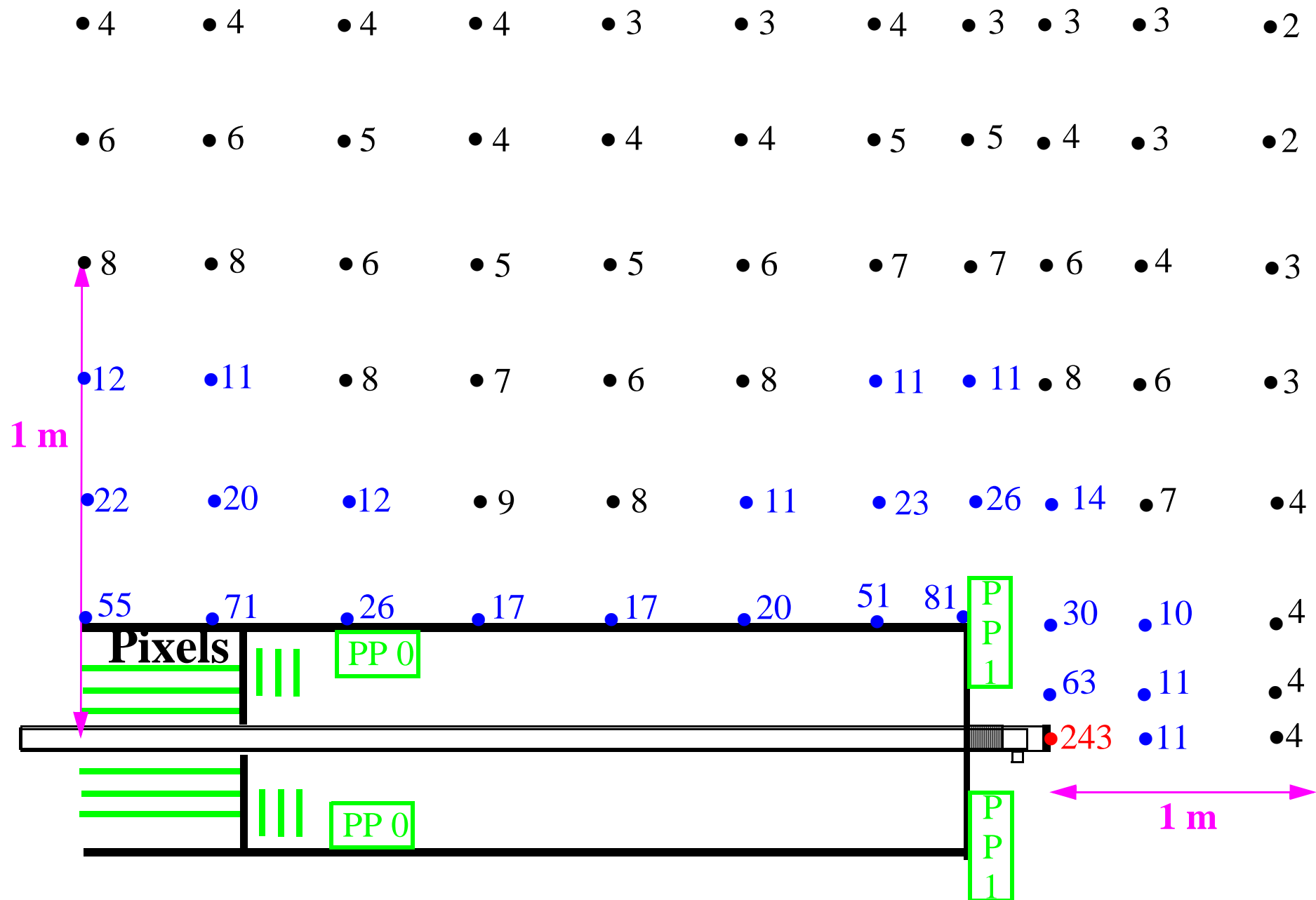
# LAr Calorimeter

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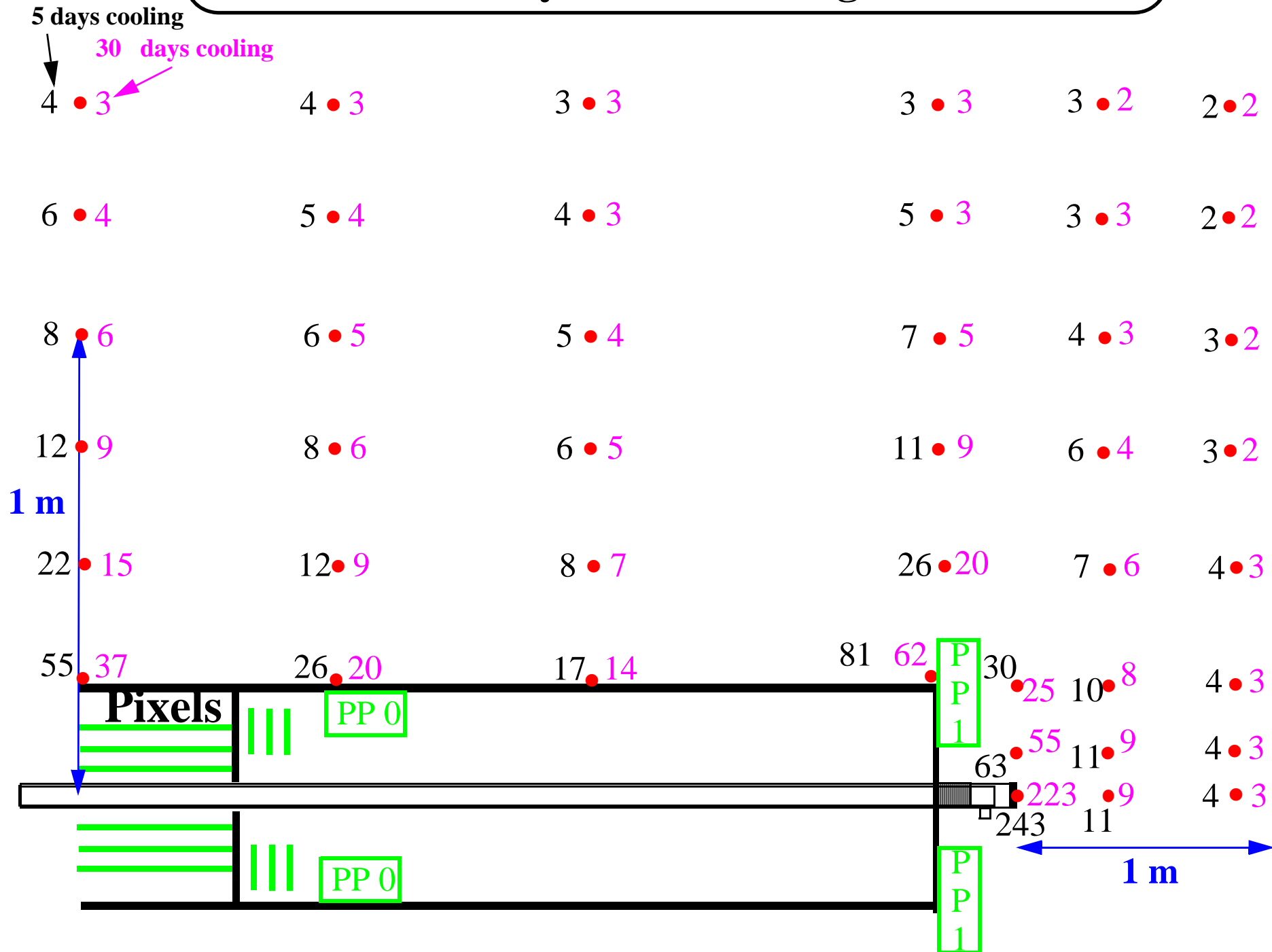




**Dose rates in  $\mu\text{Sv/h}$  from the pixel detector after 10 years of running and 5 days of cooling.**

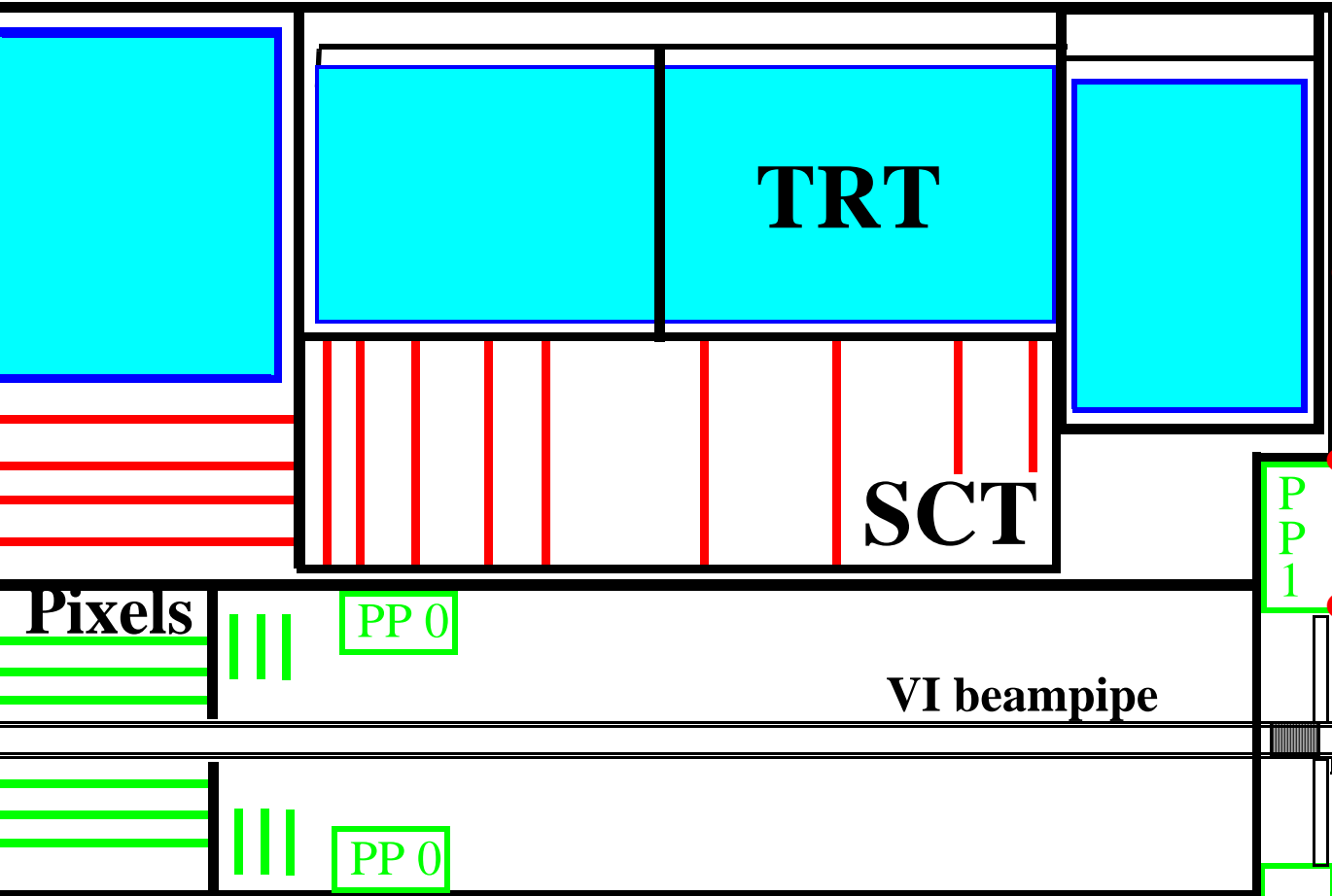


# Dose rates in $\mu\text{Sv/h}$ from the pixel detector after 10 years of running.



# LAr Calorimeter

Dose rates after 10 years of running and 5 days of cooling.



●  $78 \mu\text{Sv/h}$ :

	Pixels	SCT	TRT	LAr	VI
Dose rate	46	11	6	13	1
Neut. act.:	25%	35%	32%	16%	0%
Services:	77%	87%	61%		

●  $99 \mu\text{Sv/h}$ :

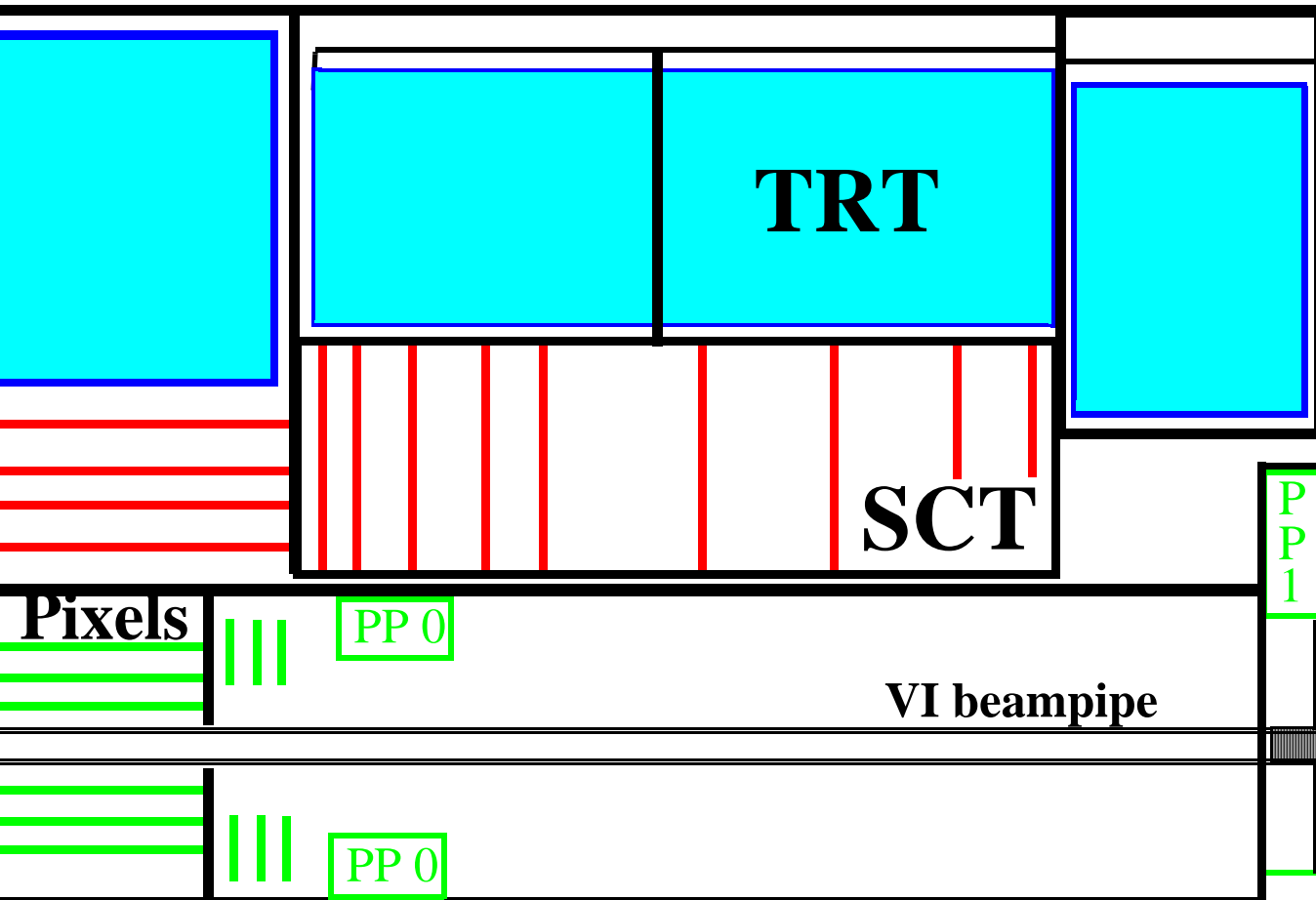
	Pixels	SCT	TRT	LAr	VI
Dose rate	66	10	5	14	3
Neut. act.:	15%	35%	32%	16%	0%
Services:	58%	85%	59%		

●  $183 \mu\text{Sv/h}$ :

	Pixels	SCT	TRT	LAr	VI
Dose rate	146	11	5	14	6
Neut. act.:	3%	34%	32%	16%	0%
Services:	9%	83%	59%		

# LAr Calorimeter

Dose rates after 10 years of running and 30 days of cooling.



58  $\mu\text{Sv/h}$ :

	Pixels	SCT	TRT	LAr	VI
	37	8	4	8	1
Neut. act.:	29%	42%	29%	23%	0%
Services:	78%	86%	64%		

73  $\mu\text{Sv/h}$ :

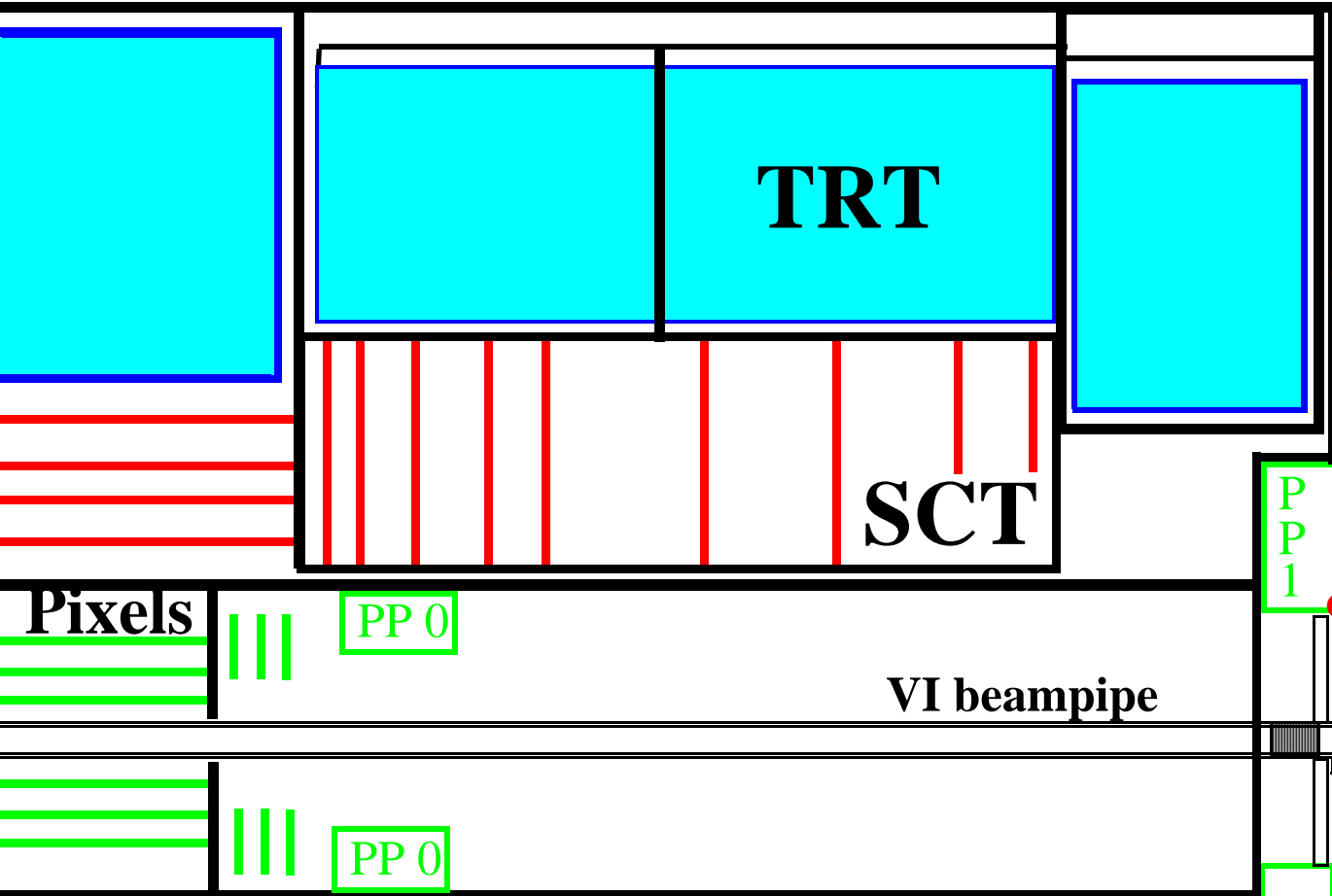
	Pixels	SCT	TRT	LAr	VI
	51	8	3	8	3
Neut. act.:	18%	41%	30%	25%	0%
Services:	59%	84%	63%		

144  $\mu\text{Sv/h}$ :

	Pixels	SCT	TRT	LAr	VI
	118	9	3	8	6
Neut. act.:	4%	41%	30%	25%	0%
Services:	9%	82%	62%		

# LAr Calorimeter

Dose rates after 10 years running

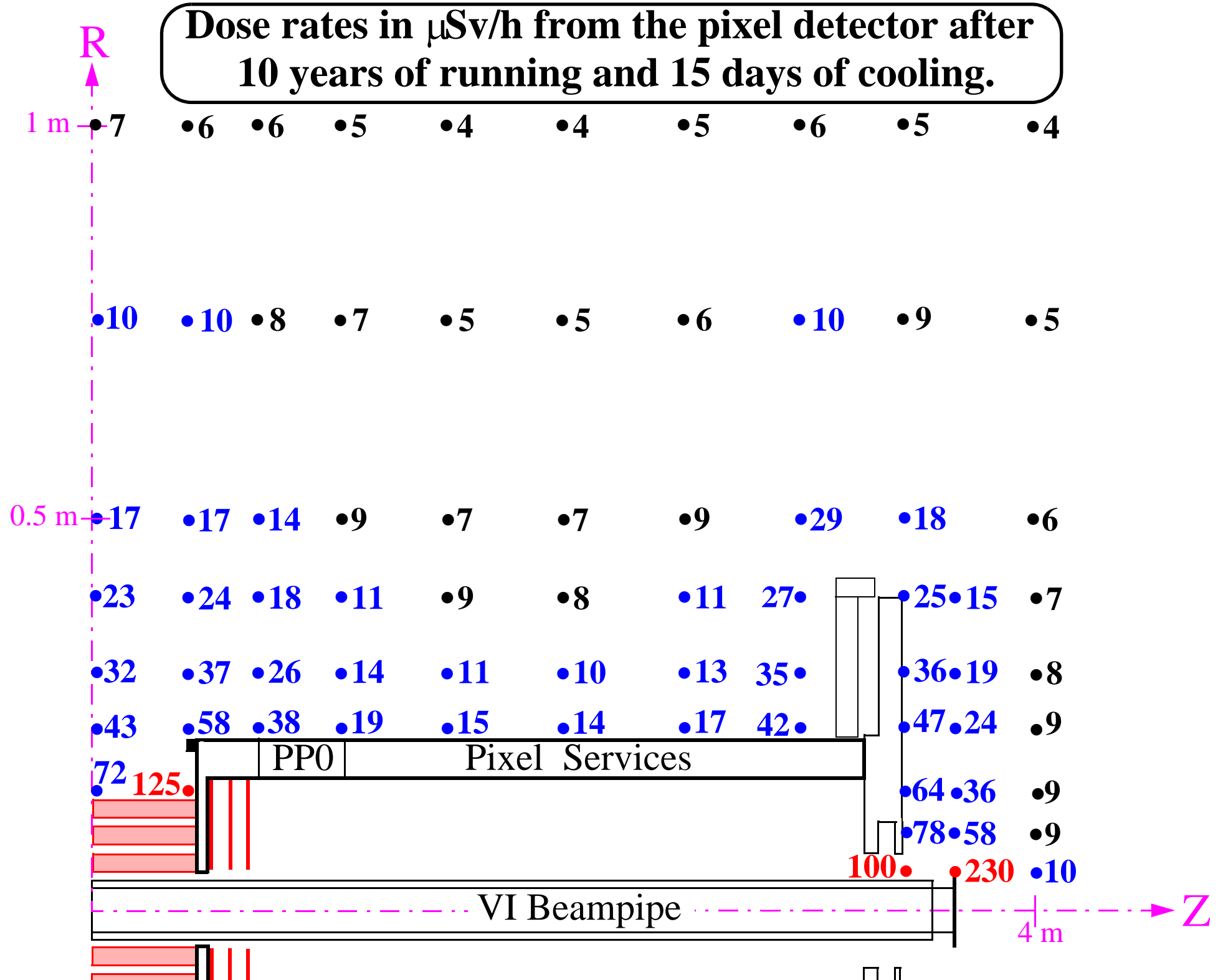


5 and 30 days of cooling:

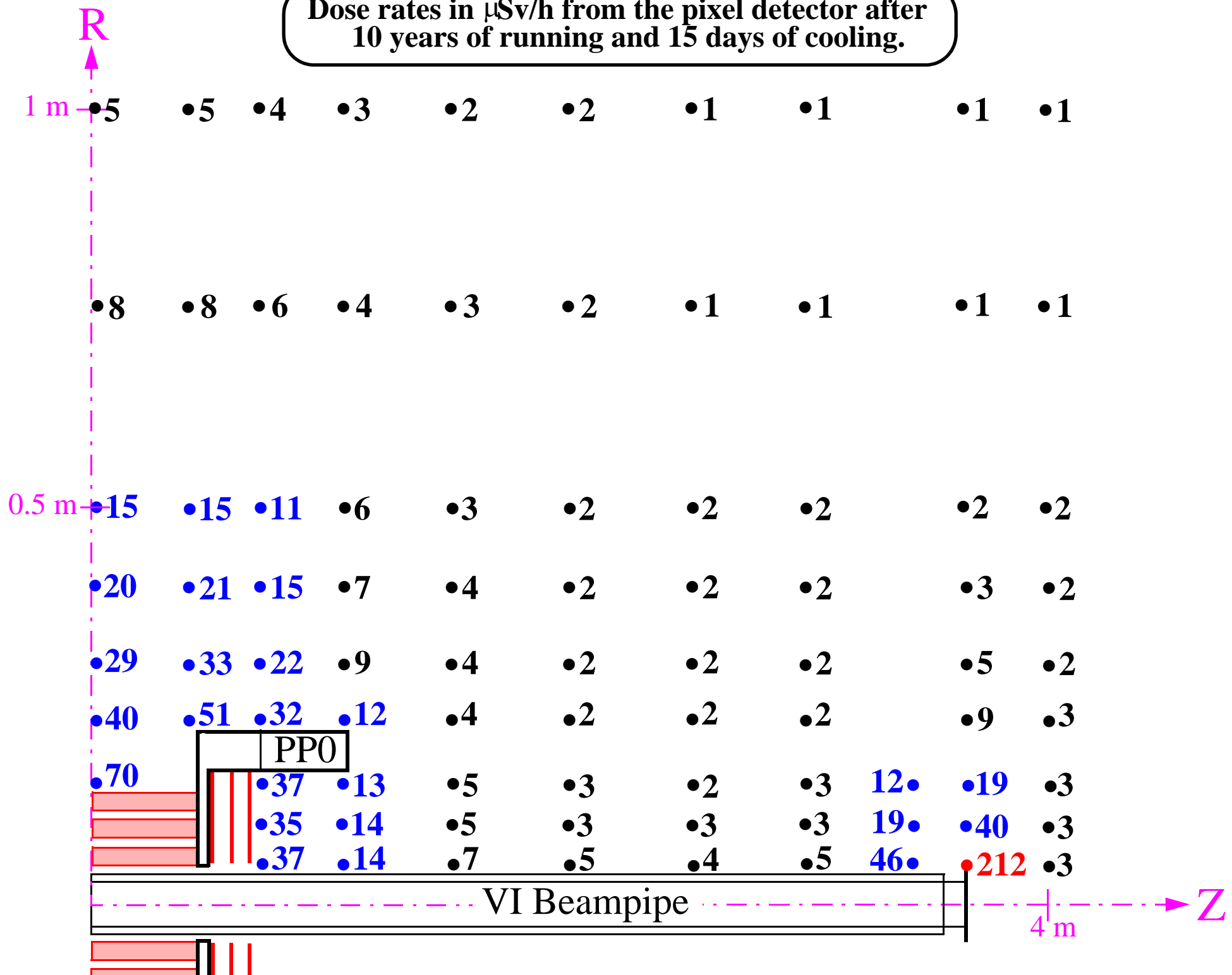
	Pixels	SCT	TRT	LAr	VI
<b>72 <math>\mu\text{Sv/h}</math>:</b>	40	11	6	13	1
Neut. act.:	29%	35%	32%	16%	0%
<b>54 <math>\mu\text{Sv/h}</math>:</b>	33	8	4	8	1
Neut. act.:	34%	42%	29%	23%	0%

	Pixels	SCT	TRT	LAr	VI
<b>173 <math>\mu\text{Sv/h}</math>:</b>	136	11	5	14	6
Neut. act.:	3%	34%	32%	16%	0%
<b>140 <math>\mu\text{Sv/h}</math>:</b>	114	9	3	8	6
Neut. act.:	4%	41%	30%	25%	0%

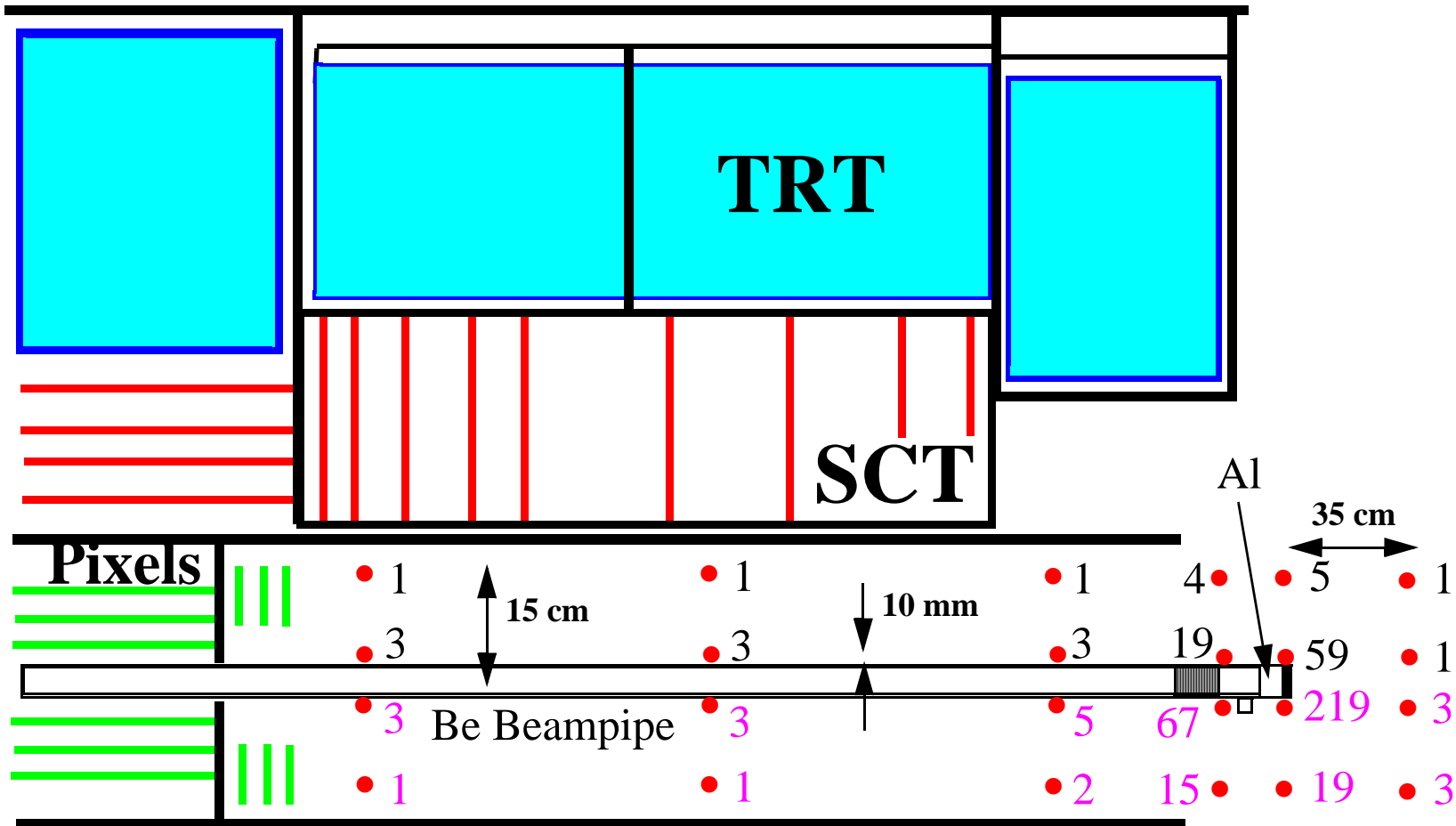
**Dose rates in  $\mu\text{Sv/h}$  from the pixel detector after 10 years of running and 15 days of cooling.**



Dose rates in  $\mu\text{Sv/h}$  from the pixel detector after 10 years of running and 15 days of cooling.



**Dose rates in  $\mu\text{Sv/h}$  from the VI beampipe.**



100 days running  
5 days cooling

10 years running  
5 days cooling



Dose rates in  $\mu\text{Sv/h}$  from the pixel detector after 10 years of running and 15 days of cooling.

