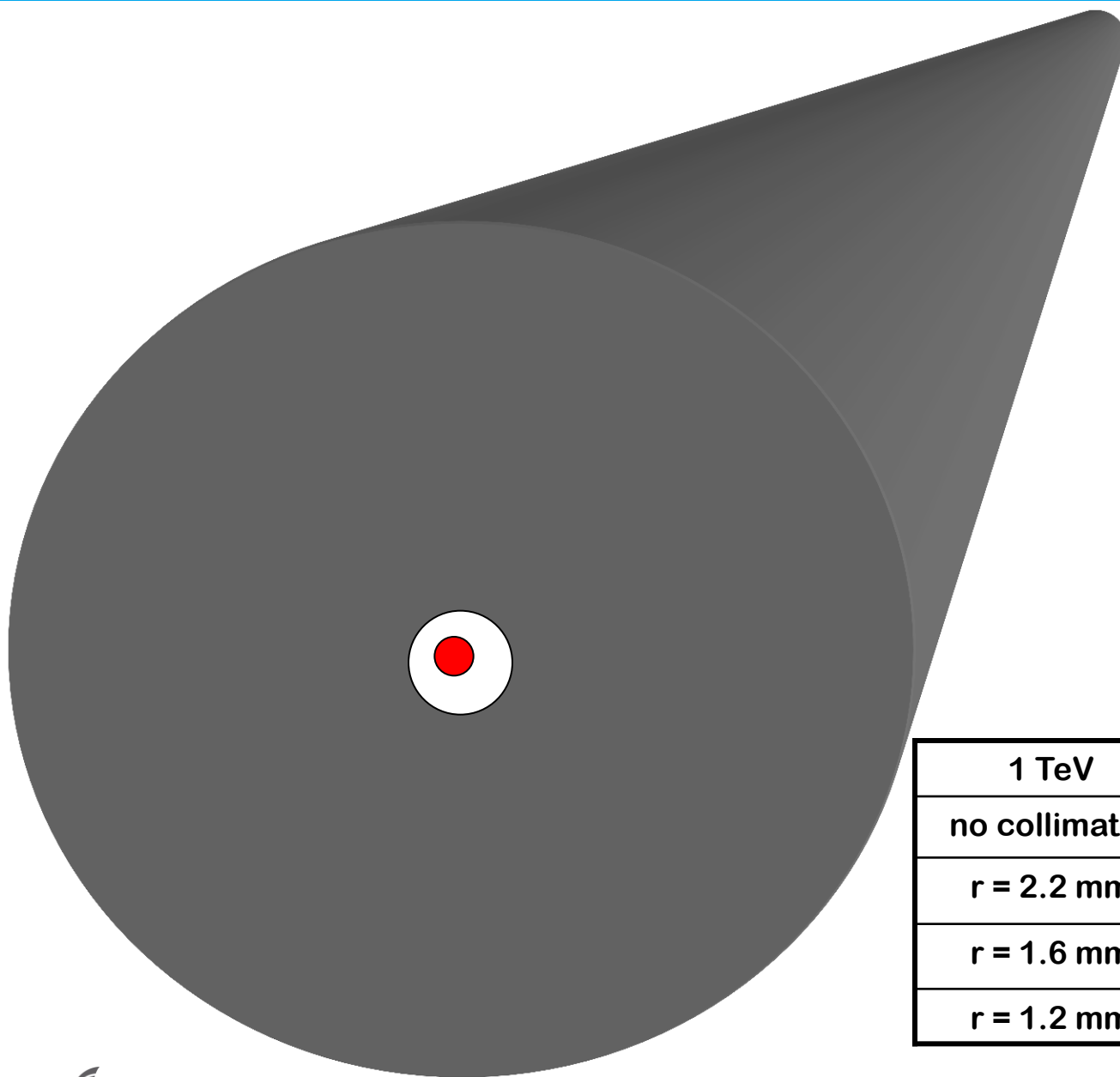


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²DESY

- temperature simulations in the photon collimator system
- stress simulations for the collimator system with ANSYS software
- PEDD for different collimator settings and drive beam energies



$L_{\text{und}} = 176 \text{ m}, K=3.0$

1 TeV	Pe+	Yield [e+/e-]
no collimator	11.2 %	1.5 (L=55m)
r = 2.2 mm	19.3 %	4.4
r = 1.6 mm	38.7 %	3.1
r = 1.2 mm	52.2 %	1.5

$E_{\max} = 101 \text{ J/g}$

$E_{\max} = 105 \text{ J/g}$

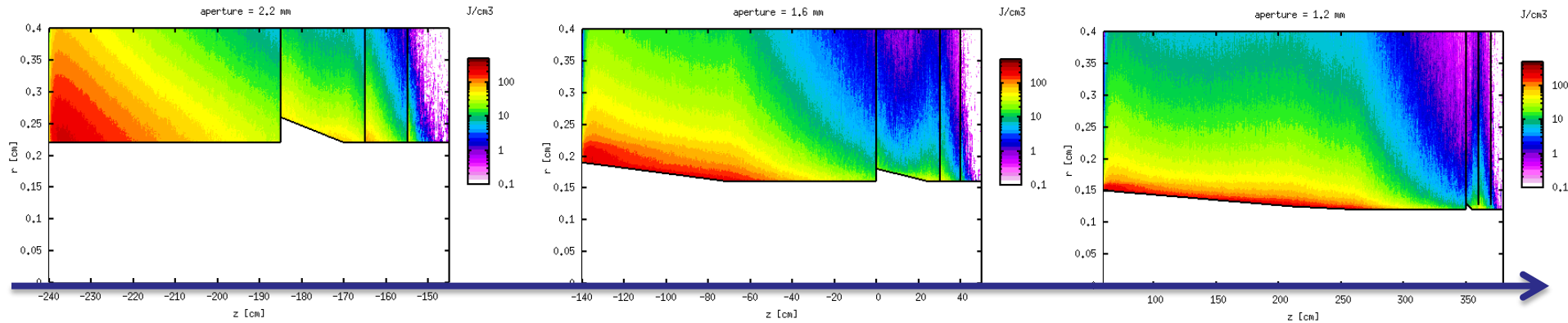
$E_{\max} = 104 \text{ J/g}$

C Ti Fe W

aperture = 2,2 mm

aperture = 1,6 mm

aperture = 1,2 mm



93.3 kW

$$z_{\text{coll}} = 95 \text{ cm} + 190 \text{ cm} + 320 \text{ cm} = 605 \text{ cm}$$

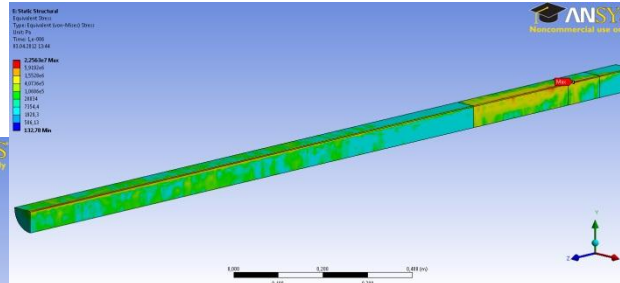
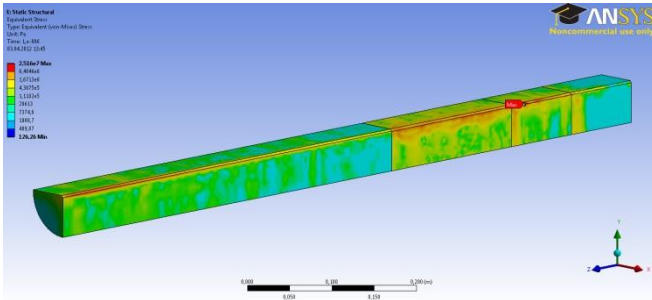
**10 %
9.3 kW**

**15 %
14 kW**

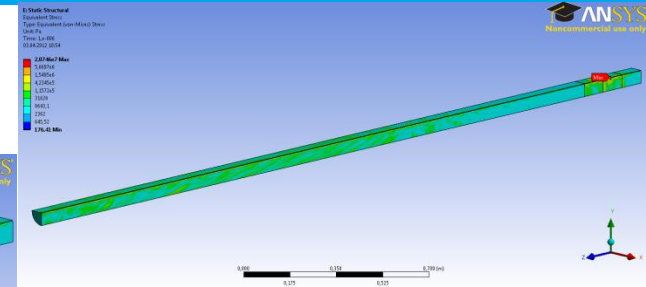
**18 %
17 kW**

multistage photon collimators / 1TeV

$P_{\max} = 25 \text{ MPa}$



$P_{\max} = 23 \text{ MPa}$



$P_{\max} = 21 \text{ MPa}$

multistage photon collimators / 1TeV

$$P_{\max} = 25 \text{ MPa}$$

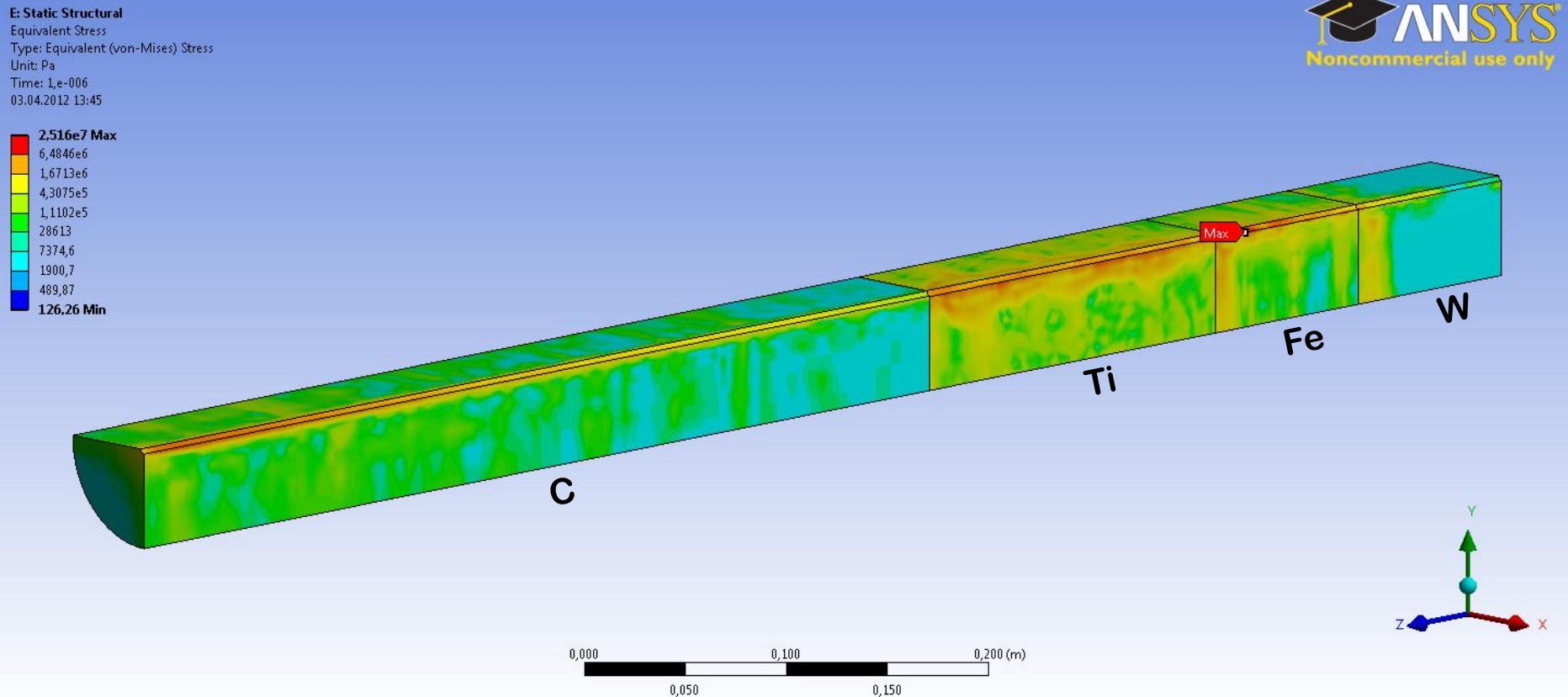
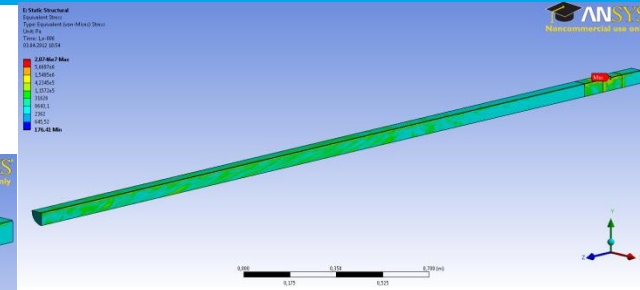
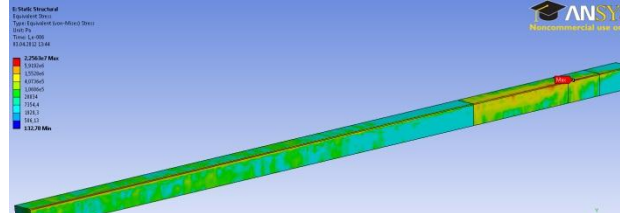


table with collimator settings

Photon Collimator Parameters				L upgrade			E _{cm} upgrade	
				Centre-of-mass energy E _{cm} (GeV)				
Variant	Parameter			250	350	500	500	1000
	Pulse repetition rate		Hz	5			5	4
	Number of bunches	n_b		1312			2625	2450
	Positron bunch population	N_+	$\times 10^{10}$	2			2	1,74
	undulator period length	λ_u	cm	1,15			1,15	4,30
	Effective undulator field	B_{und}	T	0,86			0,42 0,86 0,86	0,625 0,75
				K=0.92			K=0.45 K=0.92 K=0.92	K=2.5 K=3.0
	Photon Yield per electron	n_{ph}/e^-		1,95	1,94	0,52	1,94	1,63 1,77
	Active undulator length	L_{und}		231	196	70	147 70	143,5 176 176
	Photons per bunch train	$n_{ph}/train$	$\times 10^{15}$	11,8	10	3,56	4 7,13	14,62 12,2 13,3
	Average photon power	P_{photon}	kW	98,4	113,4	82,4	54,7 165	346,2 115,1 93,3
	Abs.ph. power in collim.	$P_{collimator}$	%	84,7	79,9	43,5	- 43,5	57,8 45,6 42,8
	Collimator radius	r	mm	2	1,4	1	- 1	0,7 1 1,2
	Positron Polarization	P_+	%	55,3	58,5	50,3	28,8 50,3	58,7 51,1 52,2
	collimator $r=2.2$ / Pyr. C	E_{max}	J/g					100,9
	collimator $r=2.2$ / Ti	E_{max}	J/g					14
	collimator $r=2.2$ / Fe	E_{max}	J/g					11,77
	collimator $r=2.2$ / W	E_{max}	J/g					2,176
	collimator $r=2.2$ / W	E_{max}	J/g					2,176
	collimator $r=2.0$ / Pyr. C	E_{max}	J/g	153,9	138,7	38,26	76,52	128,7
	collimator $r=2.0$ / Ti	E_{max}	J/g	41,33	37,11	9,556	19,11	23,11
	collimator $r=2.0$ / Fe	E_{max}	J/g	23,29	24,18	7,975	15,95	19,49
	collimator $r=2.0$ / W	E_{max}	J/g	3,575	3,886	1,347	2,694	2,85
	collimator $r=2.0$ / W	E_{max}	J/g					2,85
	collimator $r=1.6$ / Pyr. C	E_{max}	J/g					105,2
	collimator $r=1.6$ / Ti	E_{max}	J/g					9,556
	collimator $r=1.6$ / Fe	E_{max}	J/g					8,101
	collimator $r=1.6$ / W	E_{max}	J/g					1,347
	collimator $r=1.4$ / Pyr. C	E_{max}	J/g	128,7	54,35		108,7	131,7
	collimator $r=1.4$ / Ti	E_{max}	J/g	15,78	9,556		19,11	17,11
	collimator $r=1.4$ / Fe	E_{max}	J/g	12,53	7,722		15,44	14,18
	collimator $r=1.4$ / W	E_{max}	J/g	1,658	1,14		2,28	2,228
	collimator $r=1.4$ / W	E_{max}	J/g					2,228
	collimator $r=1.2$ / Pyr. C	E_{max}	J/g					103,9
	collimator $r=1.2$ / Ti	E_{max}	J/g					8,667
	collimator $r=1.2$ / Fe	E_{max}	J/g					8,734
	collimator $r=1.2$ / W	E_{max}	J/g					1,244
	collimator $r=1.2$ / W	E_{max}	J/g					1,244
	collimator $r=1.0$ / Pyr. C	E_{max}	J/g		60,43		120,9	174,3
	collimator $r=1.0$ / Ti	E_{max}	J/g		10		20	18,44
	collimator $r=1.0$ / Fe	E_{max}	J/g		8,354		16,71	16,2
	collimator $r=1.0$ / W	E_{max}	J/g		1,554		3,109	1,969

	Pyr. C	Ti	Fe (ST70)	W (annealed)	W26Re (hardened)
Fatigue Temperature : (Ansys) T	°C	900	600	130	185
Fatigue Energy : (Ansys) E _{fatigue}	J/g	753,3	313,8	58,37	23,68
Fatigue Yield Strength : (Ansys) P _{fatigue}	M Pa	40	340	280	440
Exp. Fatigue Yield Strength : 0.4 R _{max}	M Pa	36	356	280	440
Exp. Yield Strength : R _{max} / R _{elastic}	M Pa	90	890 / 820	700 / 340	1100 / 800