



# Experience using MAD-NG with CLIC 380 GeV BDS.

MAD-NG Version 0.9.3

A. Pastushenko, L. Deniau, R. Tomas

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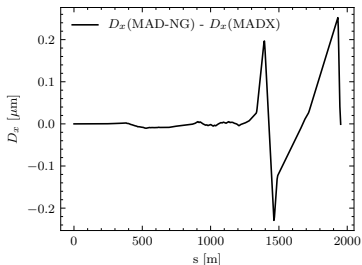
# Twiss comparison

- Twiss comparison

```
1 local tws = twiss {sequence = clic_bds, beam = clic_beam,  
method = 6, chrom = true, nslice = 3, ptcmodel = true, X0 =  
2 beta0 { beta11 = 33.07266007, beta22 = 8.962361942 }}
```

- The optics parameters are **identical**.
- Small difference observed for dispersion:

	MAD-X	MAD-NG
$D_x^* [\mu\text{m}]$	1.210831767	1.209952469



# Map generation

- DA-map generation

```
1 local trc = track {sequence = clic_bds, beam = clic_beam, method = 6,  
  nslice = 3, ptmodel = true, mapdef = {xy = 5}, savemap = true}  
2 trc["$end"].__map:print()  
3
```

- Different output map format:

## MAD-X+PTC:

```
1 etall 1, NO = 8, NV = 5, INA = 19  
2 *****  
3  
4 I COEFFICIENT ORDER EXPONENTS {x, px, y, py, pt, t}  
5 1 -0.1084412631860E-01 1 1 0 0 0 0  
6 -1.0844126318596992E-002  
7 2 0.3687241979644 1 0 1 0 0 0  
8
```

## MAD-NG:

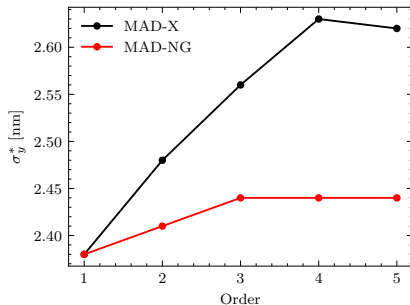
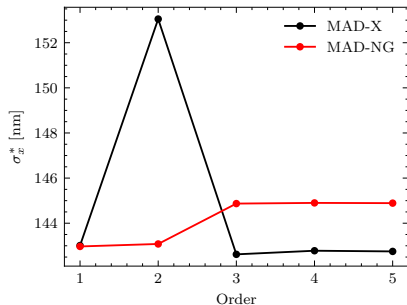
```
1 X : R, NV = 6, NO = 8  
2 *****  
3 I COEFFICIENT ORDER EXPONENTS {x, px, y, py, t, pt}  
4 1 -6.23726420537523E-02 1 1 0 0 0 0 0  
5 2 6.41069662642906E-02 1 0 1 0 0 0 0  
6 3 1.22793823244260E-06 1 0 0 0 0 0 1  
7
```

# Map generation

- Beam size calculated with Mapclass order by order:

Map order	IP horizontal beam size $\sigma_x^*$ [nm]				
	1	2	3	4	5
MAD-X+PTC	143.01	153.05	142.62	142.78	142.75
MAD-NG	142.97	143.08	144.87	144.9	144.89

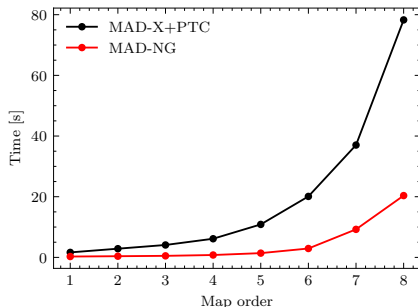
Map order	IP vertical beam size $\sigma_y^*$ [nm]				
	1	2	3	4	5
MAD-X+PTC	2.38	2.48	2.56	2.63	2.62
MAD-NG	2.38	2.41	2.44	2.44	2.44



# Map generation

- Map generation time (Ixplus):

Map order	Execution time [s]							
	1	2	3	4	5	6	7	8
MAD-X+PTC	1.647	2.866	4.090	6.146	10.869	20.097	37.032	78.282
MAD-NG	0.281	0.389	0.510	0.784	<b>1.403</b>	2.929	9.239	20.370



# Conclusion

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- Small dispersion discrepancy observed.
- The beam size  $\sigma_x^*$  and  $\sigma_y^*$  discrepancy should be understood.
- MAD-NG generates the map faster than MAD-X for orders checked 1 - 8.