

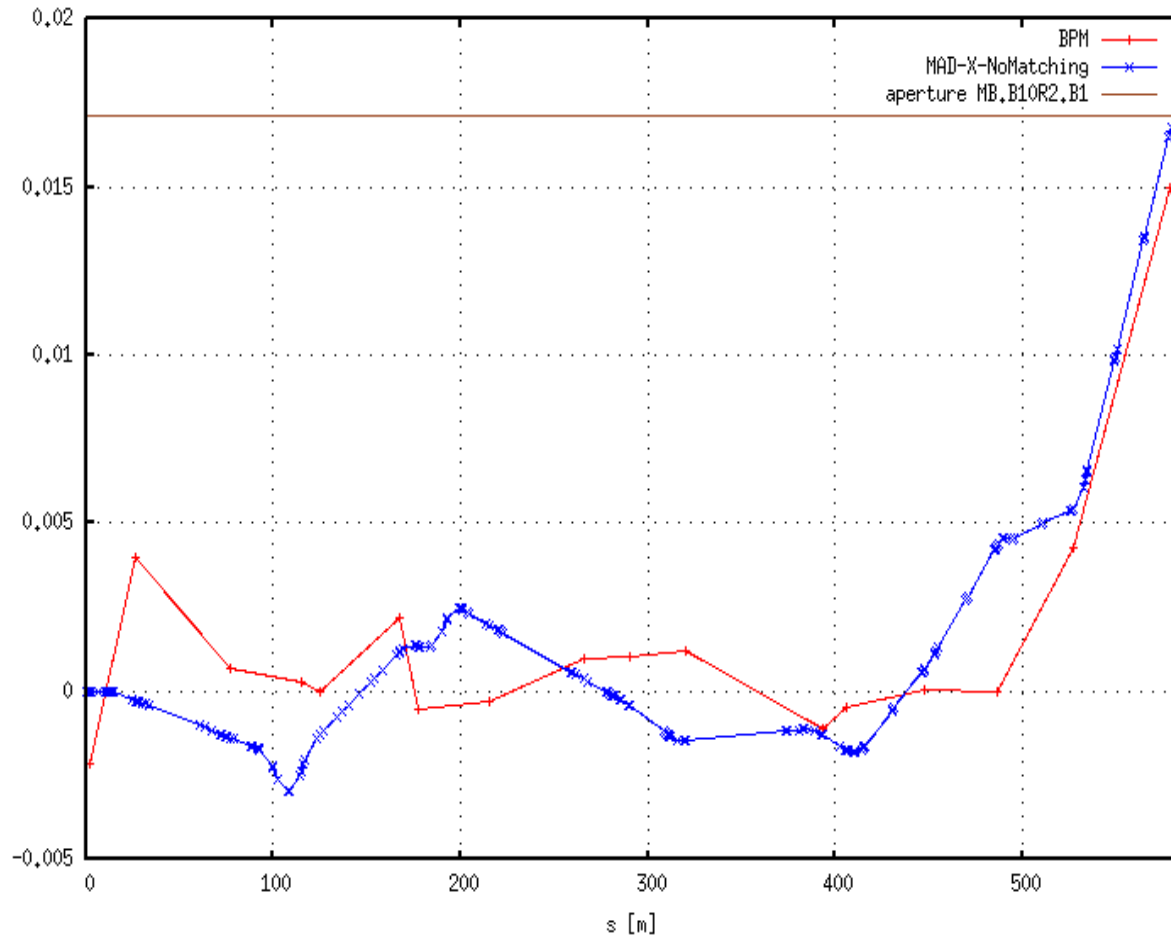
# MADX Studies for MB.B10R2.B1 Quench

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# Quench

- 2008/09/07 during aperture scan in IR2
- Pilot bunch Inject&Dump (collimators in IR3 closed)
- Beam kicked with MCBCV.9R2.B1 with different amplitude
- Mistyped 750 urad instead of 75 urad → beam hit the MB.B10R2.B1 → quench

# Comparison BPM/MAD-X



Correctors strengths

From Jorg:

**acbyvs4.l2b1** := -21.85e-6;

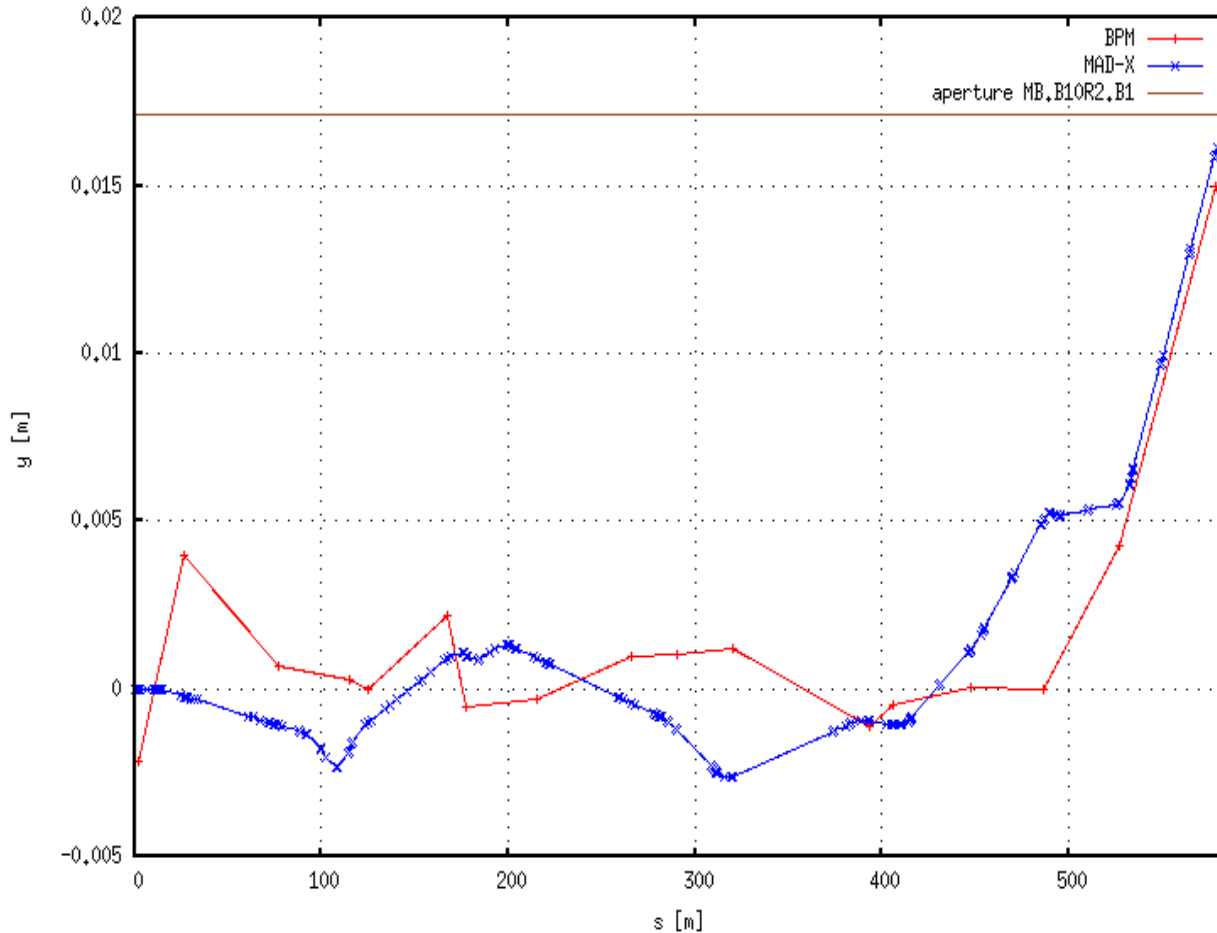
**acbxv1.r2** := -2.64 e-6;

**acbxv3.r2** := -8.10e-6;

**acbcv7.r2b1** := 34.69e-6;

**acbcv9.r2b1** := **80.00e-6;**

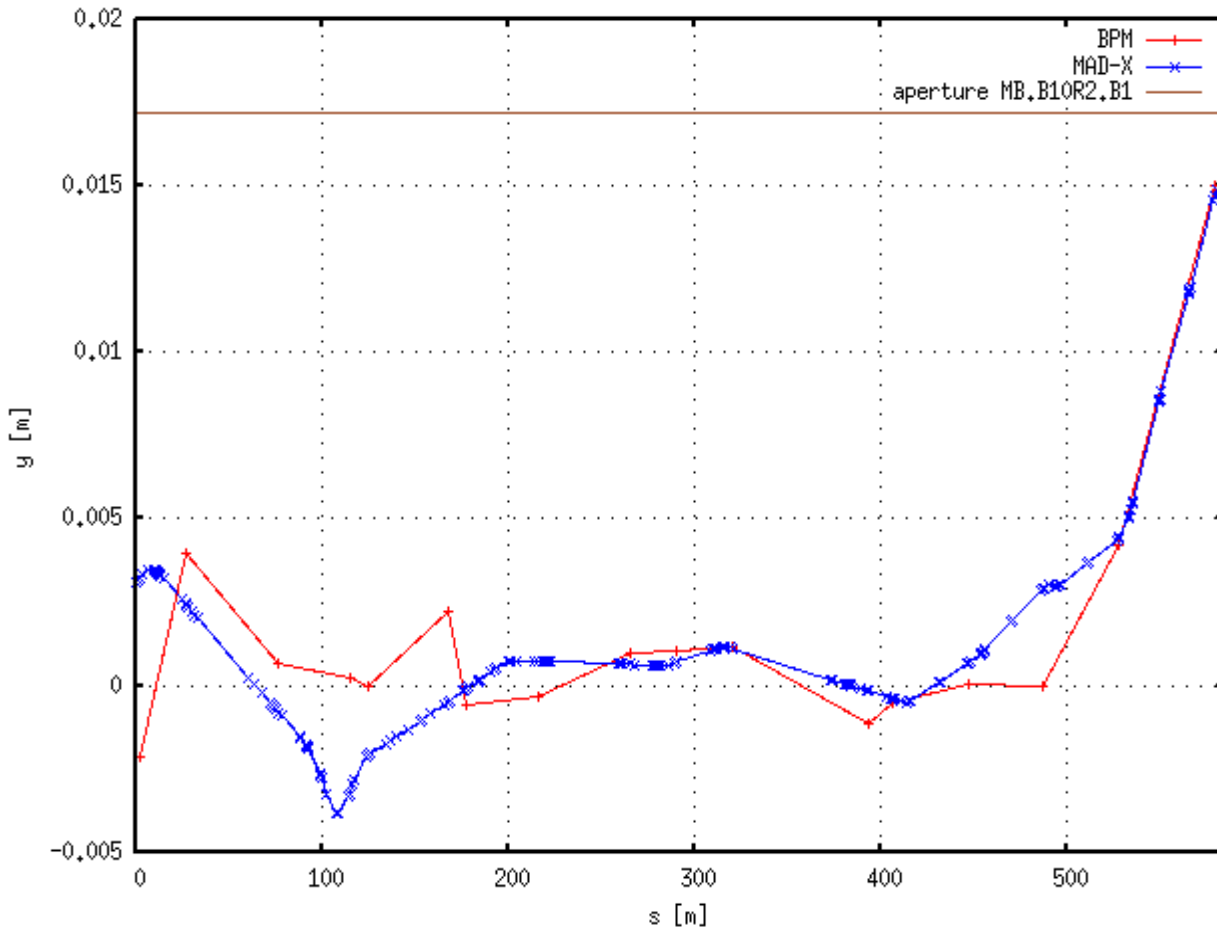
# Comparison BPM/MAD-X



Corrector strengths  
after matching (quadrupole  
misalignment?):

acbyvs4.l2b1 := -1.70396e-05;  
acbxv1.r2 := -2.12000e-05;  
acbxv3.r2 := -3.20000e-06;  
acbcv7.r2b1 := 3.02000e-05;  
acbcv9.r2b1 := 8.06442e-05;

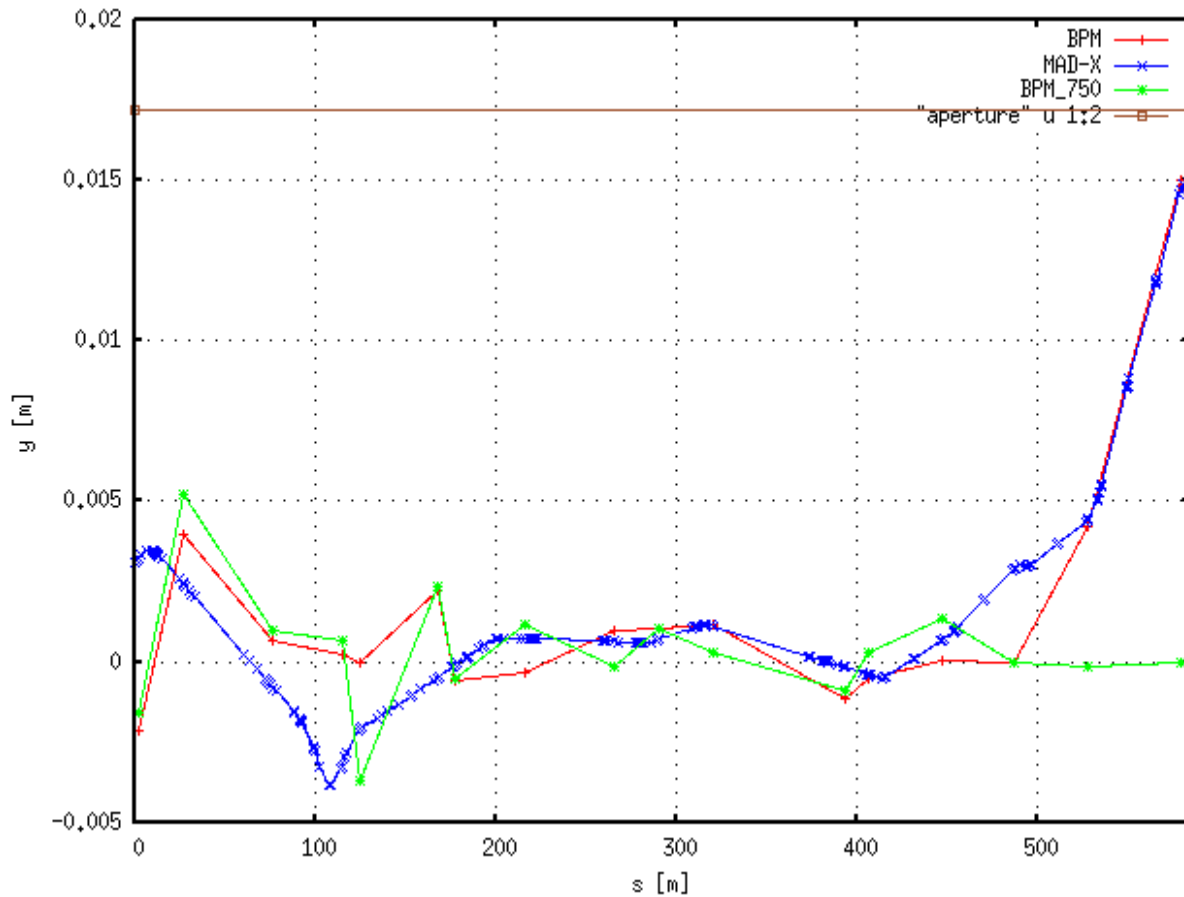
# Comparison BPM/MAD-X



Corrector strengths  
after matching varying  $y_0, y_{0p}$   
(injection error):

$acbyvs4.l2b1 := -1.72000e-05;$   
 $acbxv1.r2 := -2.36833e-05;$   
 $acbxv3.r2 := -1.06272e-05;$   
 $acbcv7.r2b1 := 3.66343e-05;$   
 **$acbcv9.r2b1 := 8.41560e-05;$**   
 **$y_0 := 3.07727e-03;$**   
 **$y_{0p} := 8.16283e-05;$**

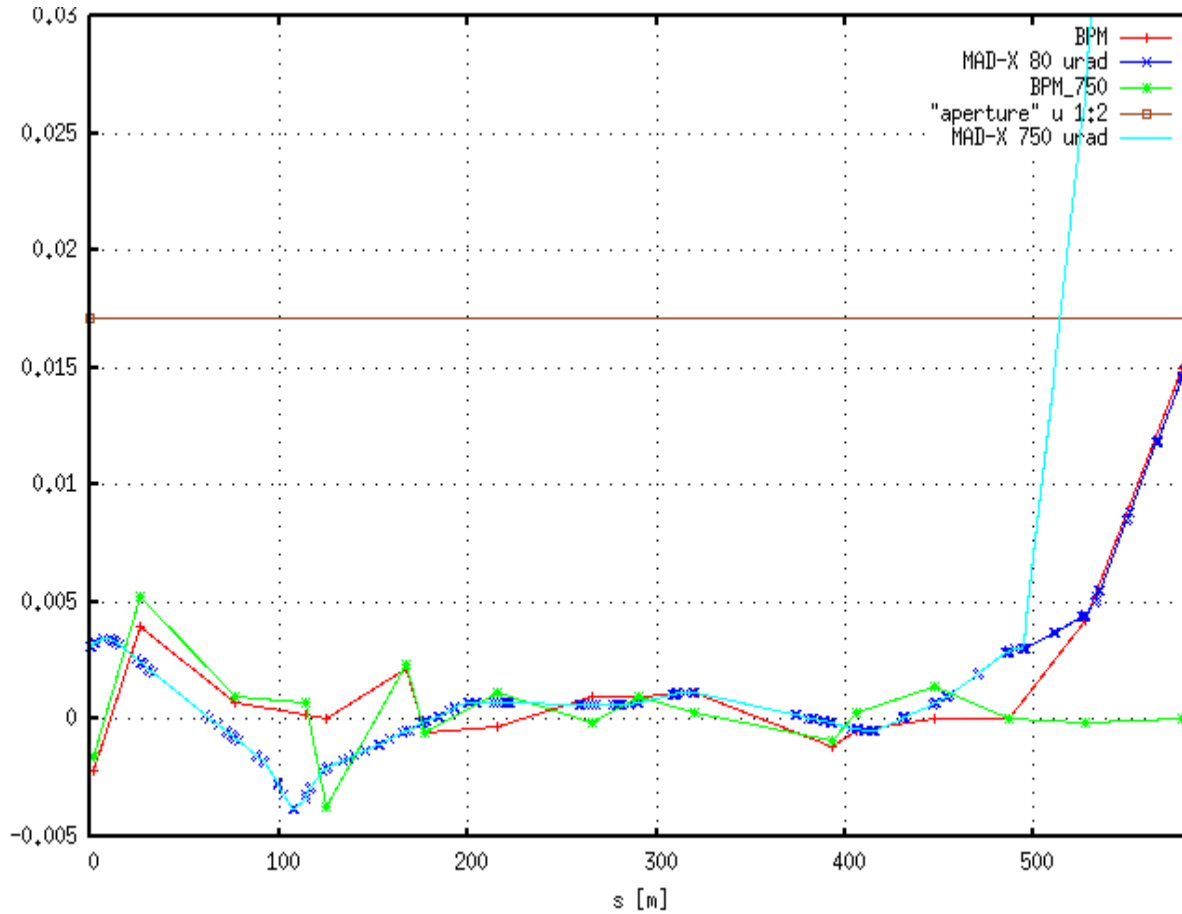
# Comparison BPM/MAD-X



Corrector strengths  
after matching varying  $y_0, y_{0p}$   
(injection error):

$acbyvs4.l2b1 := -1.72000e-05;$   
 $acbxv1.r2 := -2.36833e-05;$   
 $acbxv3.r2 := -1.06272e-05;$   
 $acbcv7.r2b1 := 3.66343e-05;$   
 **$acbcv9.r2b1 := 8.41560e-05;$**   
 **$y_0 := 3.07727e-03;$**   
 **$y_{0p} := 8.16283e-05;$**

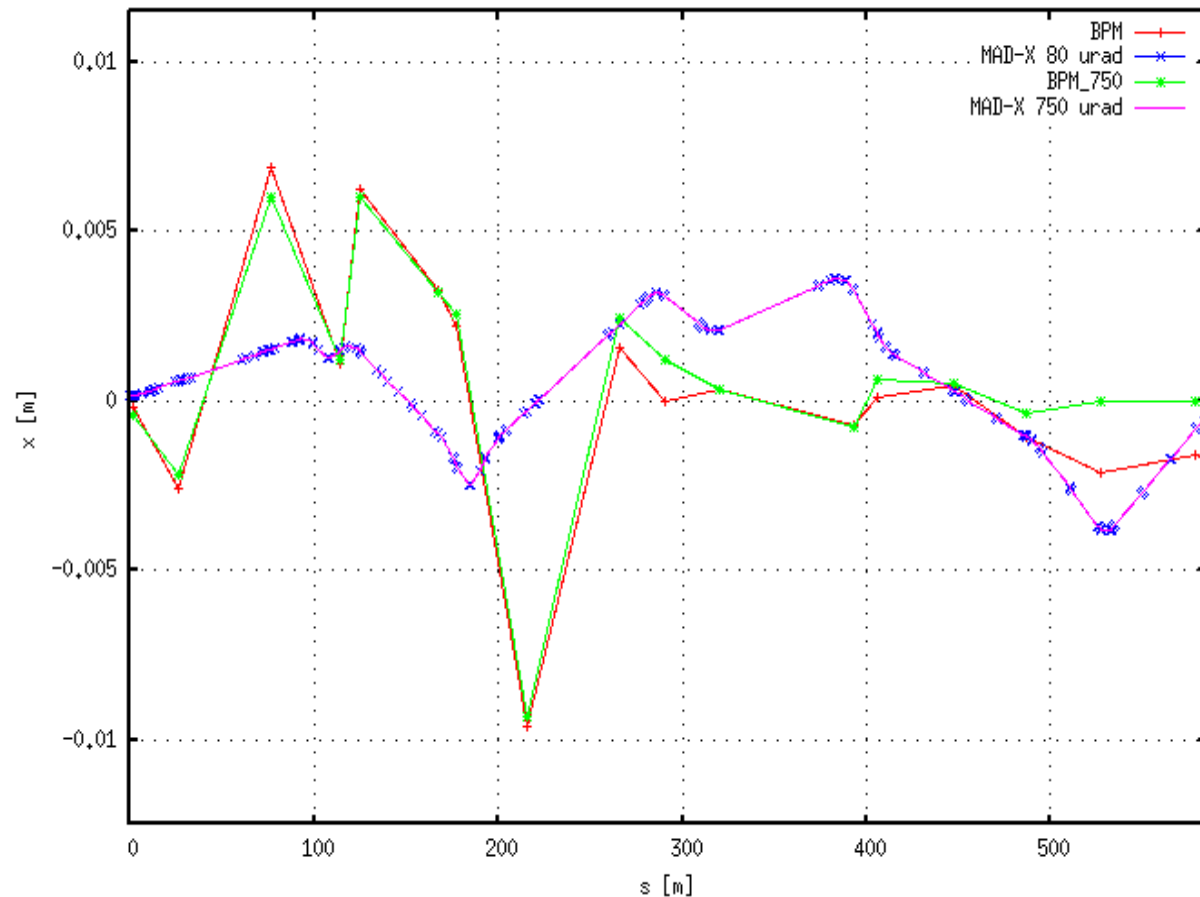
# Comparison BPM/MAD-X



Corrector strengths  
after matching varying  $y_0, y_{0p}$   
(injection error):

$acbyvs4.l2b1 := -1.72000e-05;$   
 $acbxv1.r2 := -2.36833e-05;$   
 $acbxv3.r2 := -1.06272e-05;$   
 $acbcv7.r2b1 := 3.66343e-05;$   
 **$acbcv9.r2b1 := 75.41560e-05;$**   
 **$y_0 := 3.07727e-03;$**   
 **$y_{0p} := 8.16283e-05;$**

# Comparison BPM/MAD-X



acbxh3.l2 := 13.41e-6;  
acbxh1.l2 := -28.00e-6;  
acbxh2.r2 := 22.60e-6;  
acbyh4.r2b1 := 16.95e-6;  
acbch8.r2b1 := 10.78e-6;

Corrector strengths  
after matching varying  $x_0, x_{0p}$   
(injection error):

acbxh3.l2 := 17.8000e-06;  
acbxh1.l2 := -23.2000e-06;  
acbxh2.r2 := 27.8557e-06;  
acbyh4.r2b1 := 12.2000e-06;  
acbch8.r2b1 := 6.02809e-06;  
 $X_0$  := 1.58148e-4;  
 $X_{0p}$  := 9.98438e-6;



# Coordinates at MCBCV.9R2.B1

	MCBCV.9R2.B1		
	Start	End	
		80 urad	750 urad
S	493.5396048	494.4436048	
BETX	17.46617336	18.81607133	
BETY	132.568593	128.5921173	
DX	0.6364876	0.6674023	
DY	-0.03972453	-0.03930938	
X	-0.00136468	-0.00142911	
Y	<b>0.00299225</b>	<b>0.00299368</b>	<b>0.0032965</b>
ALFX	-0.70778236	-0.78546761	
ALFY	2.21958507	2.17917121	
MUX	1.49251139	1.50045112	
MUY	1.46519656	1.46629852	
DPX	0.0341264	0.0341264	
DPY	0.00046081	0.00046081	
PX	-0.00007127	-0.00007127	
PY	<b>-0.00004051</b>	<b>0.00004365</b>	<b>0.0007137</b>

# Coordinates at MB.A10R2.B1

	MB.A10R2.B1			
	Start		End	
	80 urad	750 urad	80 urad	750 urad
<b>S</b>	495.7593575		510.0593575	
<b>BETX</b>	21.03180464		64.30159545	
<b>BETY</b>	122.9350113		71.43495484	
<b>DX</b>	0.71239798		1.23787755	
<b>DY</b>	<b>-0.03876049</b>	<b>-0.03994489</b>	<b>-0.03279538</b>	<b>-0.0435577</b>
<b>X</b>	-0.00152288		-0.00254204	
<b>Y</b>	<b>0.00305111</b>	<b>0.0042355</b>	<b>0.00367529</b>	<b>0.0144407</b>
<b>ALFX</b>	-0.89853683		-2.12730079	
<b>ALFY</b>	2.12034971		1.48106039	
<b>MUX</b>	1.51098549		1.57454968	
<b>MUY</b>	1.46796407		1.4923457	
<b>DPX</b>	0.0341264		0.03922465	
<b>DPY</b>	0.00046081		0.00046083	
<b>PX</b>	-0.00007127		-0.00007127	
<b>PY</b>	<b>0.00004365</b>	<b>0.00071365</b>	<b>0.00004365</b>	<b>0.0007137</b>

# Coordinates at MB.B10R2.B1

	MB.B10R2.B1			
	Start		End	
	80 urad	750 urad	80 urad	750 urad
<b>S</b>	511.4188628		525.7188628	
<b>BETX</b>	70.2445686		151.9949325	
<b>BETY</b>	67.49056321		36.01237111	
<b>DX</b>	1.29130056		1.88967668	
<b>DY</b>	<b>-0.03222822</b>	<b>-0.04390122</b>	<b>-0.02626299</b>	<b>-0.04751198</b>
<b>X</b>	-0.00263892		-0.00365801	
<b>Y</b>	<b>0.00373464</b>	<b>0.01541089</b>	<b>0.00435882</b>	<b>0.02561607</b>
<b>ALFX</b>	-2.2441225		-3.47264866	
<b>ALFY</b>	1.42028294		0.78099434	
<b>MUX</b>	1.57776936		1.59986614	
<b>MUY</b>	1.49546209		1.54229976	
<b>DPX</b>	0.03922465		0.04432178	
<b>DPY</b>	0.00046083		0.00046084	
<b>PX</b>	-0.00007127		-0.00007126	
<b>PY</b>	<b>0.00004365</b>	<b>0.00071365</b>	<b>0.00004365</b>	<b>0.00071365</b>

# Conclusions

- Matching with MADX:
  - Only correctors used during aperture scan
  - Different strength wrt applied values ( up to 20% quadrupole misalignment)
  - Varied initial conditions to take into account for injection errors
- Matching depends strongly on initial conditions
- Poor statistic and info from BPM (in particular in critical region)
- Error:  $\sim 1\text{mm}$  offset and  $\sim 10\%$  kick at MCBCV.9R2.B1