

# New MAD9 examples

## ❑ Example collection still in:

`/afs/cern.ch/user/j/jowett/public/MAD9/Testing/  
MAD job LHCSampleJobNew.mad`

## ❑ More tables tested

TWISS tables:        MATRIX, EIGEN, TWISS3, ...

Full SURVEY

STATIC to order 3

Demonstration of table combination and uses in notebook

**MAD9TableTestNew.nb**

# SURVEY

## ❑ Complete LHC survey (all 12600 elements and drifts)

⇒ 1.15 MB TFS file

Drops easily into Excel or Mathematica

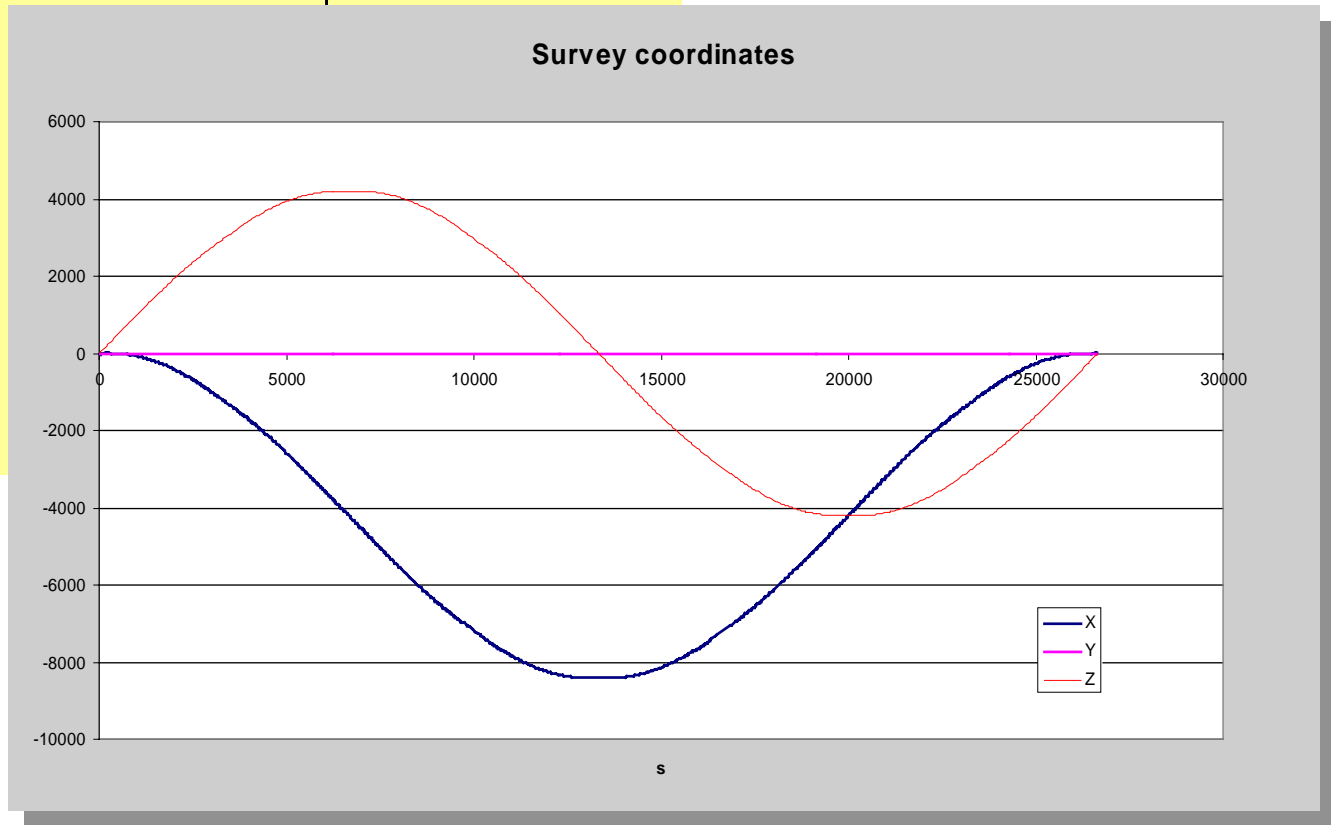
⇒ common desktop applications have no problem dealing with the largest structures likely to be used with MAD9 in foreseeable future.

Sample file **Survey.xls**

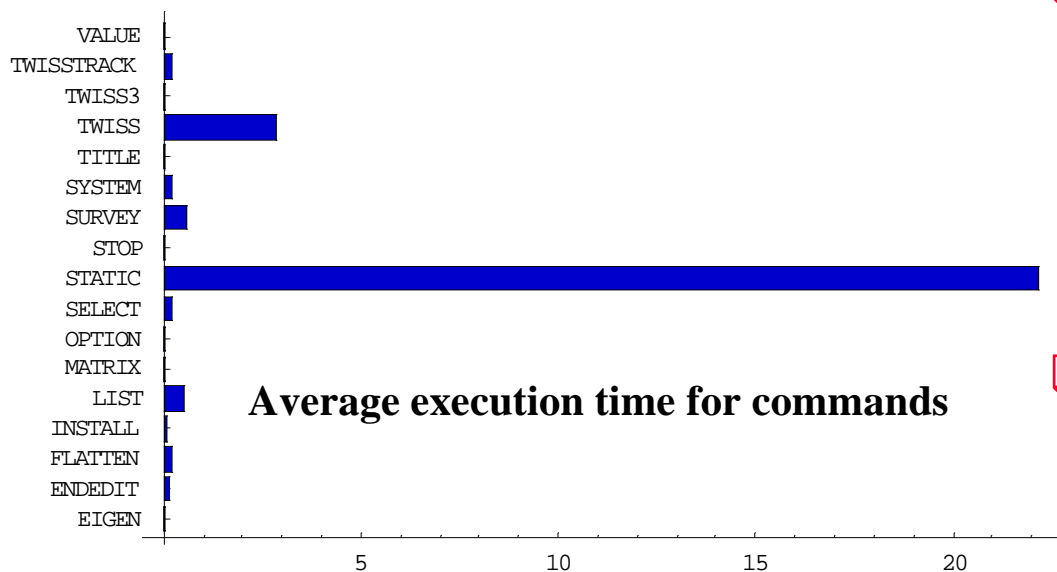
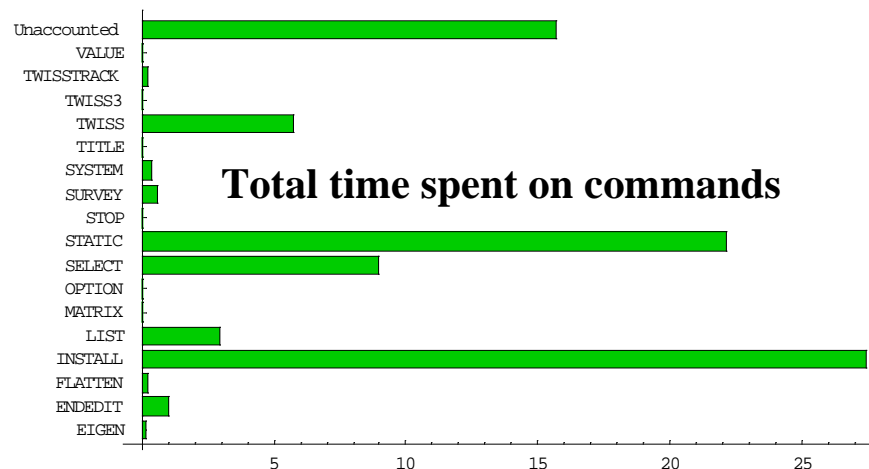
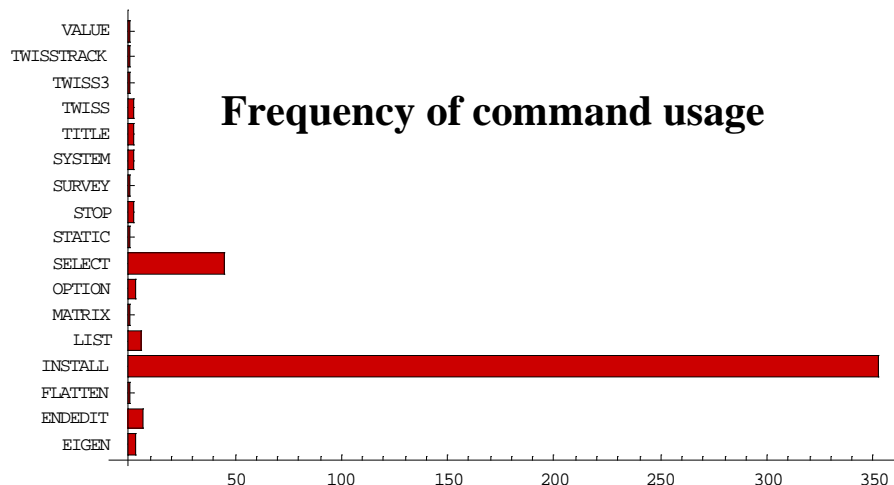
OK for Survey group, *modulo element names.*

TYPE	SURVEY		A number of custom views of the data are saved in the menu <b>View/CustomViews</b>							
NAME	RING1_GEOMETRY									
DATE	8/10/99									
TIME	17.09.08		<a href="http://wwwslap.cern.ch/~fci/mad/mad9/user/node7.html">http://wwwslap.cern.ch/~fci/mad/mad9/user/node7.html</a>							
ORIGIN	MAD_9.3									
COMMENT	"LHC version 6.0, injection optics (THICK lens)"									
LINE	"LHC"									
LENGTH	26658.86								<i>Derived Columns</i>	
NAME	S	X	Y	Z	THET	PHI	PSI	Element Length	R(X,Y,Z)	
#S	0	0	0	0	0	0	0		0	
[DRIFT]	0	0	0	0	0	0	0	0	0	
IP1	0	0	0	0	0	0	0	0	0	
[DRIFT]	19	0	0	19	0	0	0	19	19	
TAS1.R1	20.8	0	0	20.8	0	0	0	1.8	20.8	
[DRIFT]	22.58	0	0	22.58	0	0	0	1.78	22.58	
PU.Q1.R1	22.8	0	0	22.8	0	0	0	0.22	22.8	
[DRIFT]	23	0	0	23	0	0	0	0.2	23	
Q1.R1	29.3	0	0	29.3	0	0	0	6.3	29.3	
[DRIFT]	29.62	0	0	29.62	0	0	0	0.32	29.62	

TYPE	SURVEY			A number of custom views of the data							
NAME	RING1_GEOMETRY			are saved in the menu							
DATE	8/10/99			<b>View/CustomViews</b>							
TIME	17.09.08			<a href="http://wwwslap.cern.ch/~fci/mad/mad9/user/node7.html">http://wwwslap.cern.ch/~fci/mad/mad9/user/node7.html</a>							
ORIGIN	MAD_9.3										
COMMENT	"LHC version 6.0, injection optics (THICK lens)"										
LINE	"LHC"										
LENGTH	26658.86									<i>Derived Columns</i>	
NAME	S	X	Y	Z	THET	PHI	PSI	Element Length	R(X,Y,Z)		
Q1.R1	29.3	0	0	29.3	0	0	0	6.3	29.3		
Q2A.R1	37.3	0	0	37.3	0	0	0	5.5	37.3		
Q2B.R1	43.8	0	0	43.8	0	0	0	5.5	43.8		
QS4.Q2.R1	44.35	0	0	44.35							
Q3.R1	53.6	0	0	53.6							
Q4.R1	171.25	0.097	0	171.25							
Q5.R1	198.89	0.097	0	198.89							
Q6.R1	231.89	0.097	0	231.89							
Q7A.R1	263.874	0.097	0	263.874							
Q7B.R1	267.674	0.097	0	267.674							
QD8.R1	306.255	-0.12424	0	306.2541							
QF9A.R1	342.921	-0.69497	0	342.9155							
QF9B.R1	346.721	-0.77248	0	346.7147							
QD10.R1	385.787	-1.79055	0	385.7672							
QT.QF11.R1	435.2235	-3.62989	0	435.1692							
QF11.R1	438.5985	-3.76755	0	438.5414							
QT.QD12.R1	488.6449	-6.18899	0	488.5287							



# CPU Time Analysis of MAD jobs



## Conclusions

Overheads for TWISS table transformations are not large.

Typical LHC jobs spend a lot of time installing elements.

Order 3 STATIC already takes some time.

## Package available and easy to use

Use it to check your MAD9 jobs!

# MAD9 developments

## ❑ MAD9 discussion group: [cern.mad](mailto:cern.mad)

Please use it for discussion, proposals, questions, not bugs.

## ❑ MAD resources Web page

Link from usual MAD home page:

[http://wwwslap.cern.ch/~fci/mad/mad\\_home.html](http://wwwslap.cern.ch/~fci/mad/mad_home.html)

Please contribute!

## ❑ Basic MAD9 job for LHC Version 6.-2

[/afs/cern.ch/user/j/jowett/public/MAD9/Testing/LHCsampleJob.mad](afs/cern.ch/user/j/jowett/public/MAD9/Testing/LHCsampleJob.mad)

No errors yet.

## ❑ Upgrade of Madtomma 'Mfs packages

Work for MAD8 *and* MAD9.

New features for combining tables (e.g. SURVEY and TWISS, ... ).

Simple example in:

[/afs/cern.ch/user/j/jowett/public/MAD9/Testing/MAD9TableTest.nb](afs/cern.ch/user/j/jowett/public/MAD9/Testing/MAD9TableTest.nb)

# Attribute tables

- ❑ Implemented as ATTLIST command

New sample job includes examples

- ❑ Merge with, e.g., TWISS tables

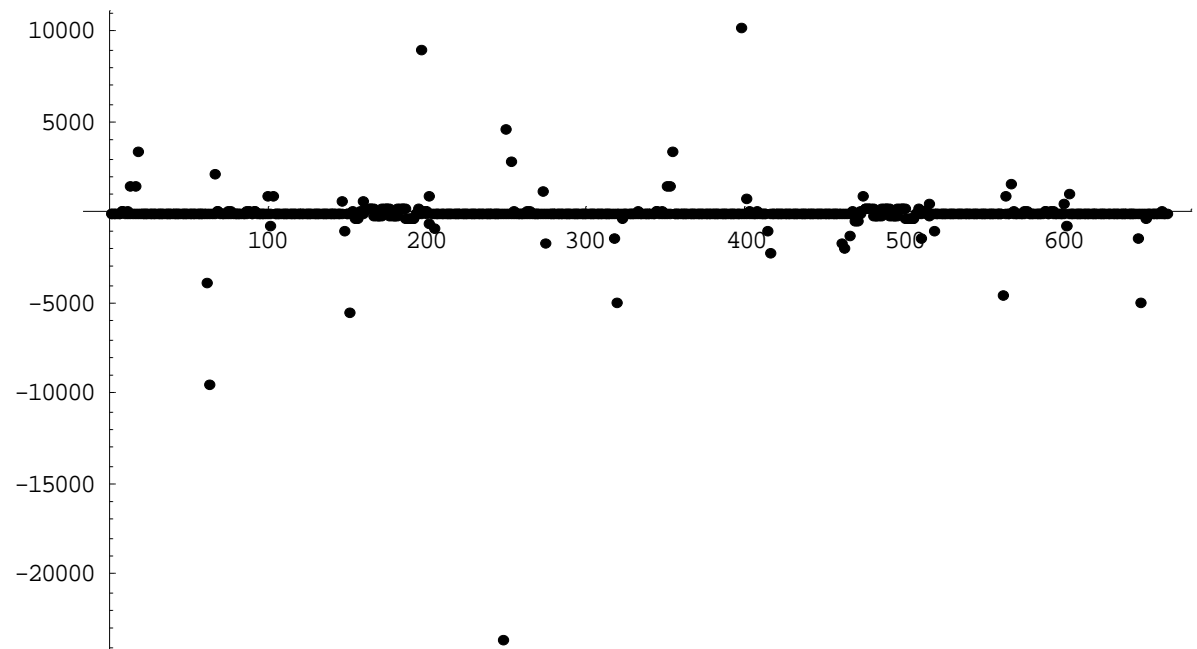
Compute derived quantities such as resonance strengths easily in interface programs.

Under test.

Some problems for now.

Quad names not unique in LHC?

Quad focal length /m



Focal length of LHC quads

# Strength bounds for matching

▢ Angeles' matching example: max value for the normalised strengths, e.g.,

```
CONSTRAINT, KQ4.L5 < 6.853E-3, WGT=1; // -> 160 T/M
```

Although p0 parameter for MAD run is 450 GeV, the maximum strength here actually allows for a beam of 7 TeV. Thus, it could be calculated as follows

```
pmax = 7000; // maximum beam momentum in GeV/c
dBdxMaxMQY=160; // maximum strength of MQY in Tesla/Meter
CONSTRAINT, KQ4.L5 < dBdxMaxMQY *CLIGHT/(1.e9*pmax),
WGT=1;
```

where I introduced a maximum gradient for the MQY hardware type of which Q4.L5 is an instance.

▢ Need named max (and, min) parameters for every hardware type

(yet another file to call ...)

*and* know hardware type when writing matching constraints.

▢ Past experience at LEP and LHC shows that we need a way to include excitation limits in the database and access them in a straightforward way.

# MAD9 style solution

- much easier, logical and safer to be able to write

```
CONSTRAINT, KQ4.L5 < (Q4.L5->dBdxMax)  
*CLIGHT/(1.e9*pmax), WGT=1;
```

- We can add an element attribute as an afterthought

So you might try to write

```
MQY->dBdxMax = 160.;
```

which would work now. But still not satisfactory.

- Limits must be defined in the LHC database for the most general element type to which they apply, MQY in this example.

Not even necessary to introduce individual names like `dBdxMaxMQY` for these, provided they are included in the element definitions, e.g.,

```
MQY: Quadrupole, l=0, dBdxMax=160., dBdxMin=2.;
```

- This solution is general enough to cover many so-far undreamt-of attributes.

ATTLIST command will list them all.