On the QSM quadrupole

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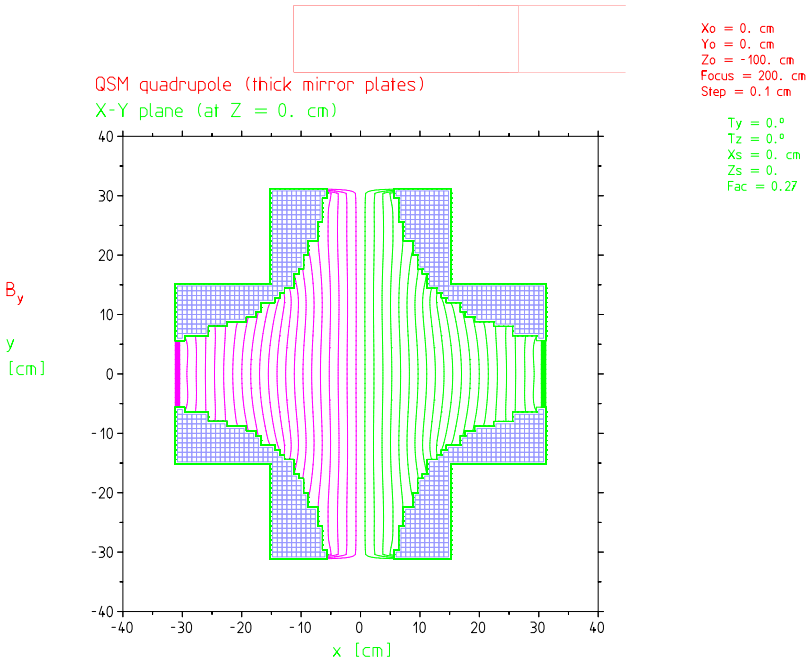

1 QSM quadrupole

1.1 Presentation

Here are the characteristics of this quadrupole which has now thick mirror plates (2cm):

Length [cm]	High [cm]	Width [cm]	Pole length [cm]	Aperture [cm]	Eff. length [cm]	Current [A]	High voltage [V]
50	134	128	30	40	39.7	500	70

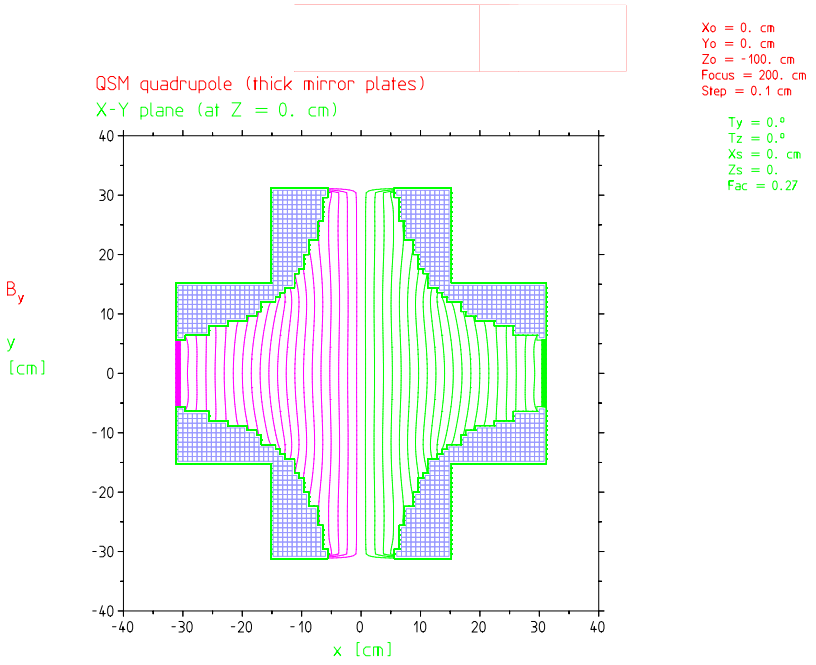

Figure 1:

1.2 Results from TRANS and FIELD programmes

The following file is for **Trans** programme :

```
QSM (thick mirror plates)
50.  50.  2.
.5 100. .5 100 5  28.
D  0.8015
F  .1067 -.0140 0.0272 IN
Q  1.0  0.397  0.20 QSM61
F  .1067 -.0140 0.0272 OUT
D  0.8015
ZONE
```

and yields the following first order matrix

```
QSM (thick mirror plates)

0.5000  100.0000     0.5000    100.0000      5.0000     28.0000

Focus = 2.0000 m

                First order matrix

  -0.8109     +0.0194     +0.0000     +0.0000     +0.0000
 -17.6322     -0.8109     +0.0000     +0.0000     +0.0000
  +0.0000     +0.0000     +3.4748     +0.4375     +0.0000
  +0.0000     +0.0000    +25.3137     +3.4748     +0.0000
  +0.0000     +0.0000     +0.0000     +0.0000     +1.0000

        Detx  = +0.9990 ; Dety = +0.9989

                  Det  = 0.9979
```

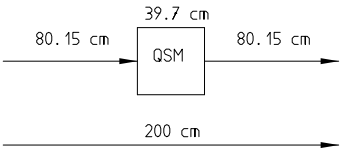

Figure 2:

Here are results from **Field** and **Trans** programmes

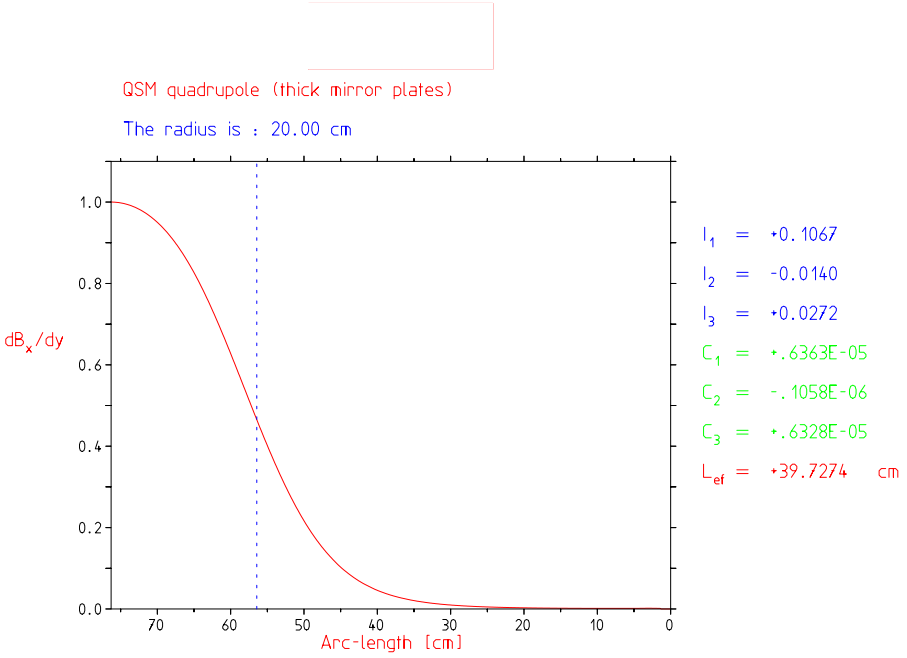

Figure 3:

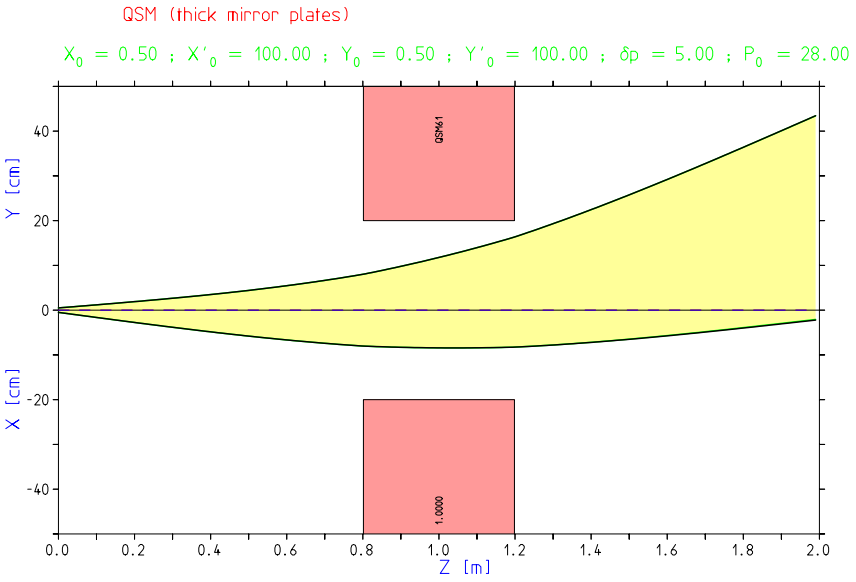

Figure 4:

1.3 Results from TRAJG programme

The following file (qsma.set) is for **Trajg** programme :

```
MAPINPUT
qsm01a

ADJUST
 1     0.270000    0.0000      0.0000      0.0000      0.0000      0.0000

KINE
   28.000     0.000    0.000   -100.000    0.000    0.100    0.000    139.570

STANDARD
  1  0.1000E-02  0.1000E-01   5500      80.00      40.00

FOCUS
      200.0000

WINDOW
 -150.0000    150.0000    -40.0000     40.0000    -40.0000     40.0000
 -150.0000    150.0000    -40.0000     40.0000    -40.0000     40.0000
 -150.0000    250.0000    -40.0000     40.0000    -40.0000     40.0000

MATRICE
    5.5000     10.0000      5.5000     10.0000      1.0000  1

INTERPOL
Yes

CAPTION
         QSM quadrupole (thick mirror plates)

MARGE
YES

OLD
NO

ZONE
```

and produces the following first order matrix

```
QSM quadrupole (thick mirror plates)
************************************

Po =    28.0000 MeV/c    dP =     0.0000 MeV/c

Fac       Xs [cm]     Ys [cm]     Zs [cm]     Ty []     Tz[]    dpm [MeV/c]
0.2700     0.0000      0.0000      0.0000      0.0000        0.0000      0.0

Xo =     0.00 cm  Yo =     0.00 cm  Zo =  -100.00

Foc =   200.0000 cm    Step =     0.10 cm  Eps = 0.1000E-02

Detx = 0.1008E+01    Dety = 0.1076E+01

             Determinant = 0.1084E+01

                *TRANSFORM* 1

 -0.79180   0.02226   0.00000   0.00000   0.00000
-17.43362  -0.78315   0.00000   0.00000   0.00000
  0.00000   0.00000   3.43114   0.43273   0.00000
  0.00000   0.00000  24.66460   3.42418   0.00000
  0.00000   0.00000   0.00000   0.00000   1.00000
```

For the following figures the rays where :

$$x = \pm 0.5 \text{ cm} = y \quad ; \quad x' = \pm 100 \text{ mrad} = y' \quad ; \quad \delta p = \pm 5 \text{ \%}$$

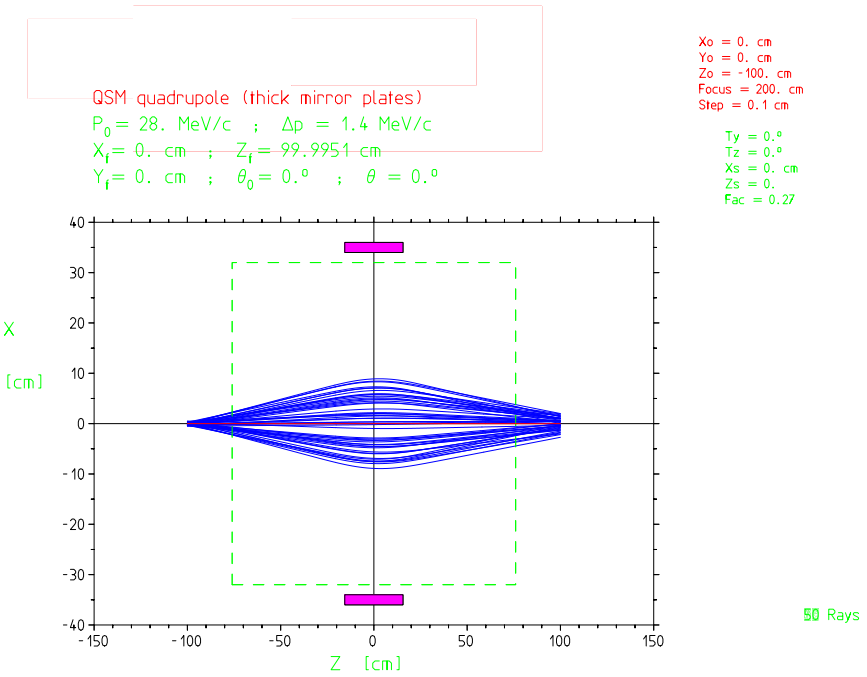

Figure 5:

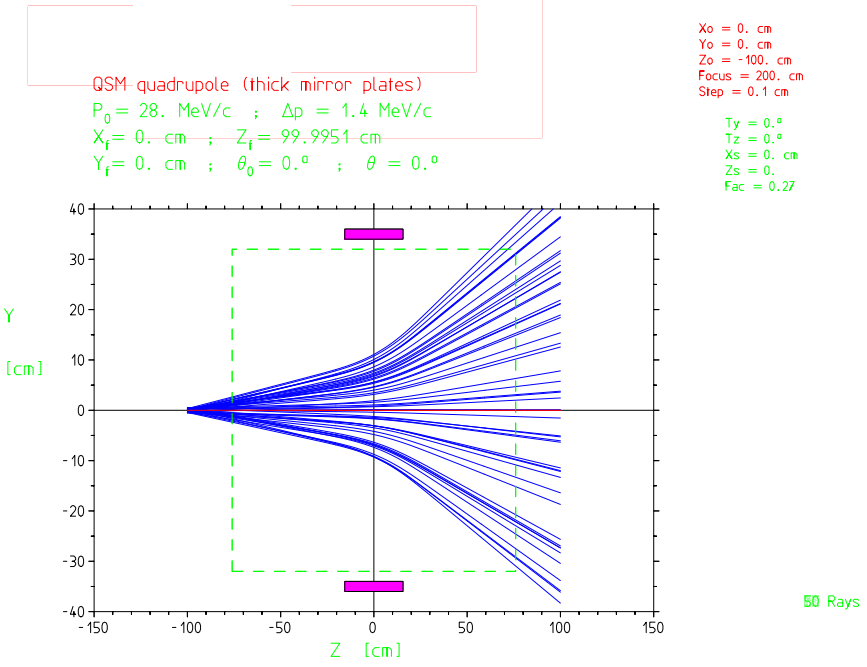

Figure 6:

1.4 Comparison between TRANS and TRAJG

Coefficient	TRANS	TRAJG
R_{11}	-0.81	-0.79
R_{12}	0.019	0.022
R_{21}	-17.63	-17.43
R_{22}	-0.81	-0.78
R_{33}	3.47	3.43
R_{34}	0.437	0.433
R_{43}	25.31	24.66
R_{44}	3.47	3.42

Coefficient	TRANS	TRAJG
T_{116}	$1.49\,10^{-2}$	$1.51\,10^{-2}$
T_{126}	$1.53\,10^{-3}$	$1.53\,10^{-3}$
T_{216}	$1.40\,10^{-1}$	$1.42\,10^{-1}$
T_{226}	$1.49\,10^{-2}$	$1.49\,10^{-2}$
T_{336}	$-2.88\,10^{-2}$	$-2.81\,10^{-2}$
T_{346}	$-2.73\,10^{-3}$	$-2.63\,10^{-3}$
T_{436}	$-2.99\,10^{-1}$	$-2.87\,10^{-1}$
T_{446}	$-2.88\,10^{-2}$	$-2.78\,10^{-2}$

The correspondence between **Trans** and **Trajg** for 1 KG is

$$1.0\,\mathrm{KG} \;\rightarrow\; \mathrm{Fac} \;=\; 0.27$$

Therefore

$$B_{\mathrm{Trans}} \;=\; \frac{\mathrm{Fac}}{0.27} \quad ; \quad \mathrm{Fac} \;=\; 0.27\, B_{\mathrm{Trans}}$$

Contents