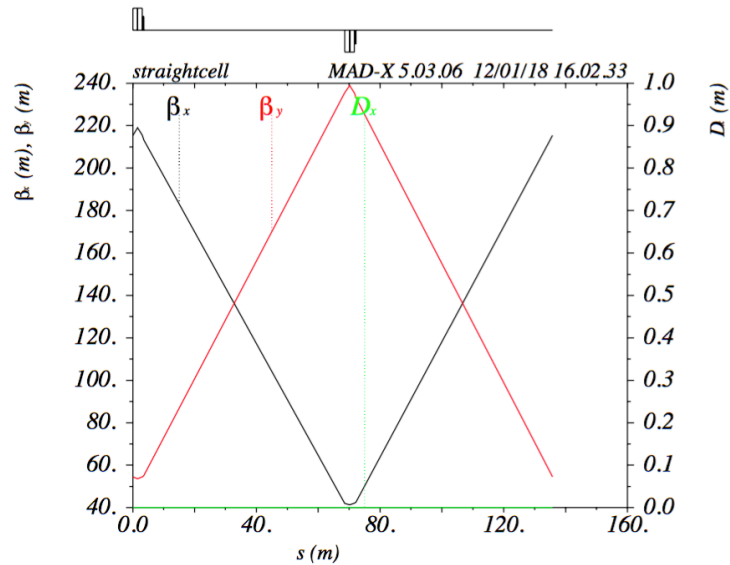
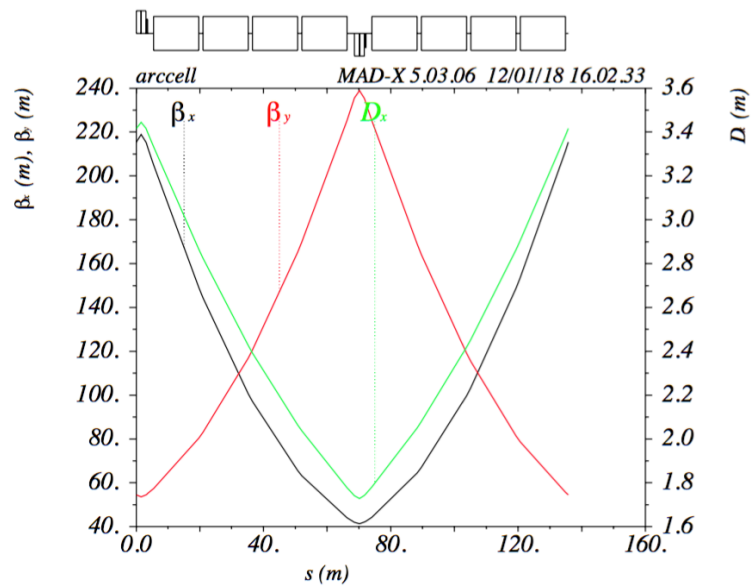


Problem 5.2.a):

The first regular fodo cell in the given lattice sits between 430 and 565 m from IP1. The basic straight cell (no bends) gives is plotted below:



while the regular arc cell is plotted below:



NOTE: the sextupoles following each dipole have been removed from the sequence, since they were OFF.

The source code is attached.

myJob.madx

```
1 // -----
2 /*  Eugenio Senes
3     JAI Course problem 5.2 a)
4     12.01.2018
5 */
6 // User defined variables — copied from the given macro
7 nrj = 450.; // Beam energy
8 emittance_norm = 2.5e-6;
9 npart = 2.2e11;
10 bunch_len=0.0755;
11
12 //-----
13 //calculations
14 gamma_rel=nrj/pmss;
15 epsx = emittance_norm /gamma_rel;
16 epsy = emittance_norm /gamma_rel;
17
18
19 call, file="cellSequence.seq";
20 // call, file="./optics/opt_inj.str";
21
22 BEAM, PARTICLE=proton, ENERGY=nrj, EX=emittance_norm/gamma_rel, NPART=1.15E11,
23 * SIGE=4.5e-4*sqrt(450./NRJ), EX:=epsx, EY:=epsy, SIGT:=bunch_len;
24
25 USE, SEQUENCE = arcCell;
26 TWISS;
27 PLOT , HAXIS=s, VAXIS1=betx,bety, VAXIS2=dx, colour=100;
28
29 USE, SEQUENCE = straightCell;
30 TWISS;
31 PLOT , HAXIS=s, VAXIS1=betx,bety, VAXIS2=dx, colour=100;
32
33 STOP;
34
```

cellSequence.seq

```

1 // -----
2 /*  Eugenio Senes
3     JAI Course problem 5.2 a)
4     12.01.2018
5     Sequence file
6 */
7 //-----
8 // Magnets definitions
9 //strengths
10 kqf = 0.00672058135316;
11 kq12.r1b1 = -0.00601678958300;
12 ksf = 0.02541420325915;
13 ksd = -0.05229014955827;
14
15 // bends
16 b: sbend,l:= 14.18000000000000,angle:= 0.00490873852123,e1:=
  * 0.00000000000000,e2:= 0.00000000000000;
17 // quads
18 qfh: quadrupole,l:= 1.55000000000000,k1:=kqf ;
19 mq.12r1.b1: qfh,k1:=kq12.r1b1 ;
20 // sextupoles
21 ms: sextupole,l:= 0.36900000000000;
22 ms.11r1.b1: ms,k2:=ksf ;
23 ms.12r1.b1: ms,k2:=ksd ;
24 //-----
25
26 // Sequence definitions
27 // arc cell
28 arcCell: SEQUENCE, l = 564.52885466731368 + 1.55 - 430.31563529613766;
29 qfh, at = 430.31563529613766 + 0.775 - 430.31563529613766;
30 qfh, at = 431.86563529613761 + 0.775 - 430.31563529613766;
31 ms.11r1.b1, at = 432.98513529613757 + 0.775 - 430.31563529613766;
32 b, at = 442.08904037053810 + 0.775 - 430.31563529613766;
33 b, at = 457.62954106186726 + 0.775 - 430.31563529613766;
34 b, at = 473.17004175319636 + 0.775 - 430.31563529613766;
35 b, at = 488.71054244452552 + 0.775 - 430.31563529613766;
36 mq.12r1.b1, at = 498.93394751892595 + 0.775 - 430.31563529613766;
37 mq.12r1.b1, at = 500.48394751892590 + 0.775 - 430.31563529613766;
38 ms.12r1.b1, at = 501.60344751892586 + 0.775 - 430.31563529613766;
39 b, at = 510.70735259332639 + 0.775 - 430.31563529613766;
40 b, at = 526.24785328465543 + 0.775 - 430.31563529613766;
41 b, at = 541.78835397598459 + 0.775 - 430.31563529613766;
42 b, at = 557.32885466731364 + 0.775 - 430.31563529613766;
43 ENDSEQUENCE;
44
45 // straight cell
46 straightCell: SEQUENCE, l = 564.52885466731368 + 1.55 - 430.31563529613766;
47 qfh, at = 430.31563529613766 + 0.775 - 430.31563529613766;
48 qfh, at = 431.86563529613761 + 0.775 - 430.31563529613766;
49 ms.11r1.b1, at = 432.98513529613757 + 0.775 - 430.31563529613766;
50 mq.12r1.b1, at = 498.93394751892595 + 0.775 - 430.31563529613766;
51 mq.12r1.b1, at = 500.48394751892590 + 0.775 - 430.31563529613766;
52 ms.12r1.b1, at = 501.60344751892586 + 0.775 - 430.31563529613766;
53 ENDSEQUENCE;
54
55 // NOTE1 on the distances: at = (position in the HE-LHC model V.0.2) + (length
  * of a half qfh) - (position of the first qfh in the HE-LHC model)
56 // NOTE2: all the sextupoles after the dipoles ms.xxxx.b1 are OFF! --> so have
  * been removed

```