Beam optics information of ATF2 beamline

Toshiyuki Okugi, KEK
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ATF3 operation task force meeting

Newest optics deck for ATF2 beamline was recorded
in the file "/atf/op/sad/operation/daihon/atf2daihonnew.sad"

```
! ---    Original Magnet Set by G.White
!read "/atf/op/sad/operation/daihon/ATF2_20120412.sad";
! ---    QMs were matched to 10x1 beta at IP
!read "/atf/op/sad/operation/daihon/ATF2_20120528.sad";
! ---    Add IP-BPM
!read "/atf/op/sad/operation/daihon/ATF2_20140313.sad";
! ---    Newest daihon
!read "/userhome/okugi/SAD/ATF/ATF2/daihon/ATF2_20151111.sad";
! ---    Newest daihon (reviced at 2016/02/15 by T.Okugi)
read "/userhome/okugi/SAD/ATF/ATF2/daihon/ATF2_20160215.sad";
! ---    Newest daihon (reviced at 2016/04/11 by T.Okugi)
read "/userhome/okugi/SAD/ATF/ATF2/daihon/ATF2_20160411.sad";



:%%-    atf2daihonnew.sad    All L6     SVN:535   (Fundamental)------
```

The optics deck was not updated since 2016.
- When the beamline arrangement was changed, we should prepare new optics deck file, and update the "atf2daihonnew.sad" with comments.

Hardware update since 2016.
- Octupoles (OCT1, OCT2) were installed.
  - Installed by CERN for ultra-low beta study.
- Location ZVFB1X, ZVFB2X
  - To use the external jitter source for dynamic wakefield study (from 2023/04).

Plan for beamline magnet updates

QD0FF
- to be replace at 2023 summer shutdown.
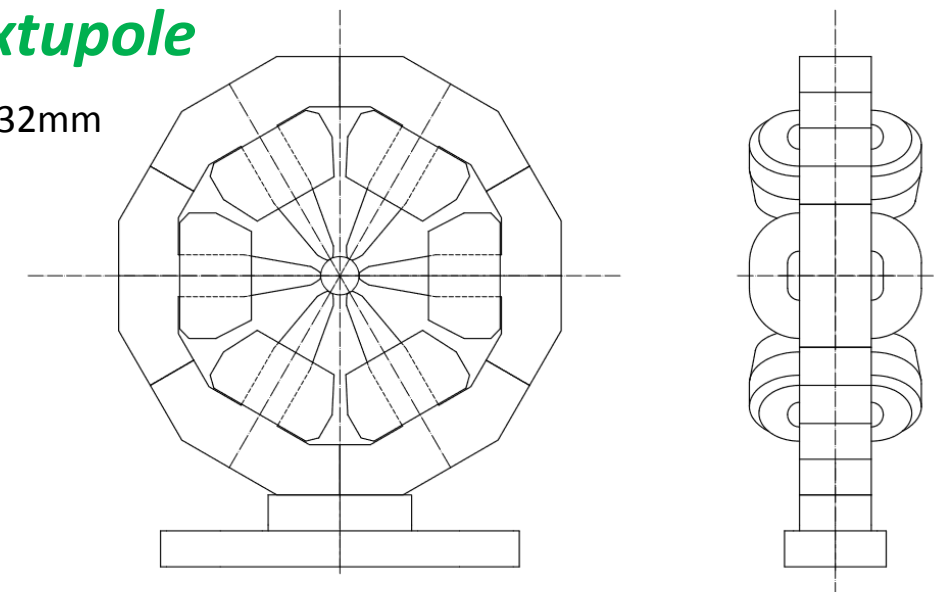- We don't have to change the optics deck for almost same geometry of present QD0FF magnet.
- We should replace the magnetic field data for the QD0FF

4 skew sextupoles
- to be replace at 2024 summer shutdown.
- We must change the optics deck and magnetics field data, because the geometry (aperture and length) are different.

New skew sextupole

Bore diameter : 32mm
Length : 60mm

2

```
!
! Energy 1.282000 GeV
!

  qvatf2={
     {"QM6R",-7.00603e-01},
     {"QM7R", 4.12467e-01},
     {"QF1X", 1.07600e+00},
     {"QF3X", 6.70774e-01},
     {"QF4X", 6.78966e-01},
     {"QF6X", 1.14662e+00},
     {"QF7X", 3.82503e-01},
     {"QF9X", 7.63145e-01},
     {"QF21X", 2.86032e-01},
     {"QD2X",-9.41556e-01},
     {"QD5X",-9.21248e-01},
     {"QD8X",-5.89886e-01},
     {"QD14X",-1.01543e+00},
     {"QD20X",-3.50070e-01},
     {"QK1X", 0.00000e+00},
     {"QK2X", 1.89225e-03},
     {"QK3X", 1.89225e-03},
     {"QK4X", 0.00000e+00},
     {"QS1X",-2.24906e-02},
     {"QS2X", 2.97428e-03},
     {"QD10X",-1.16707e+00},
     {"QF11X", 1.02332e+00},
     {"QD12X",-1.02333e+00},
     {"QF15X", 1.36824e+00},
     {"QD16X",-1.02332e+00},
     {"QF17X", 1.02332e+00},
     {"QD18X",-6.86062e-01},
     {"QF19X", 6.55165e-01},
     {"QM16FF", 2.74884e-39},
     {"QM15FF", 1.98333e-01},
     {"QM14FF",-1.61137e+00},
     {"QM13FF", 9.56672e-01},
     {"QM12FF",-3.33808e-01},
     {"QM11FF", 2.18141e-01},
     {"QD10AFF",-2.90004e-01},
     {"QD10BFF",-2.90014e-01},
     {"QF9AFF", 3.78662e-01},
     {"QF9BFF", 3.78646e-01},
     {"QD8FF",-6.04341e-01},
     {"QF7FF", 5.50184e-01},
     {"QD6FF",-6.02351e-01},
     {"QF5AFF", 3.76068e-01},
     {"QF5BFF", 3.76007e-01},
     {"QD4AFF",-2.96788e-01},
     {"QD4BFF",-2.96816e-01},
     {"QF3FF", 5.52735e-01},
     {"QD2AFF",-2.89726e-01},
     {"QD2BFF",-1.98703e-01},
     {"QF1FF", 7.41956e-01},
     {"QD0FF",-1.35245e+00}};
```

```
  svatf2={
     {"SF6FF", 8.19988e+00},
     {"SF5FF",-8.09265e-01},
     {"SD4FF", 1.36277e+01},
     {"SF1FF", 2.50887e+00},
     {"SD0FF", 4.29206e+00},
     {"SK1FF",-4.07990e-02},
     {"SK2FF", 5.90748e-01},
     {"SK3FF", 2.95653e-01},
     {"SK4FF", 6.49990e-01}};

  zvatf2={
     {"ZH1X",-9.78473e-05},
     {"ZH2X", 0.00000e+00},
     {"ZH3X",-3.78896e-07},
     {"ZH4X",-2.96251e-07},
     {"ZH5X",-2.76464e-07},
     {"ZH6X",-1.81243e-04},
     {"ZH7X",-3.78054e-07},
     {"ZH8X", 2.02318e-04},
     {"ZH9X", 3.04079e-05},
     {"ZV1X",-9.26975e-04},
     {"ZV2X", 2.36320e-04},
     {"ZV3X",-7.51778e-05},
     {"ZV4X", 0.00000e+00},
     {"ZV5X", 0.00000e+00},
     {"ZV6X",-5.70343e-05},
     {"ZV7X", 1.19633e-04},
     {"ZV8X", 1.80842e-07},
     {"ZV9X",-6.47183e-05},
     {"ZV10X",-1.63430e-05},
     {"ZX1X", 0.00000e+00},
     {"ZX2X", 0.00000e+00},
     {"ZH10X", 7.19554e-05},
     {"ZH1FF", 7.49661e-05},
     {"ZV11X", 1.26495e-04},
     {"ZV12X",-8.80888e-05},
     {"ZV1FF", 1.63103e-04},
     {"ZVFB1FF", 8.48202e-05},
     {"ZVFB1X", 0.00000e+00},
     {"ZVFB2X", 0.00000e+00},
     {"ZHFB1X", 0.00000e+00},
     {"ZHFB2X", 0.00000e+00},
     {"ZHFB1FF",-5.46314e-05}};
```

Appropriate magnet current is put to the database "FILE" for optics load.
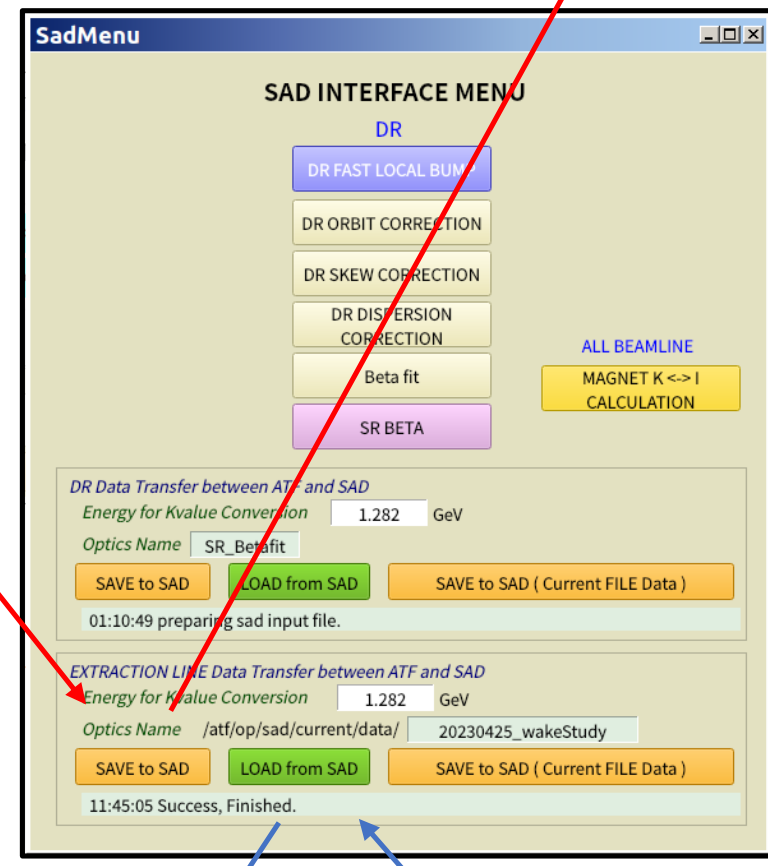
"Magnet current" information is in the epics database.

SadMenu

SAD INTERFACE MENU

DR

DR FAST LOCAL BUMP
DR ORBIT CORRECTION
DR SKEW CORRECTION
DR DISPERSION CORRECTION
Beta fit
SR BETA

ALL BEAMLINE
MAGNET K <-> I CALCULATION

DR Data Transfer between ATF and SAD
Energy for Kvalue Conversion 1.282 GeV
Optics Name SR_Betafit
SAVE to SAD | LOAD from SAD | SAVE to SAD (Current FILE Data)
01:10:49 preparing sad input file.

EXTRACTION LINE Data Transfer between ATF and SAD
Energy for Kvalue Conversion 1.282 GeV
Optics Name /atf/op/sad/current/data/ 20230425_wakeStudy
SAVE to SAD | LOAD from SAD | SAVE to SAD (Current FILE Data)
11:45:05 Success, Finished.

EXT QUADRUPOLES MAGNET

ATF2 Quadrupoles & BEND

	File	Set	I(A)	Status		File	Set	I(A)	Status
QF1X	49.438	49.538	50.213	R:ON	QM16FF	0.000	0.000	0.520	R:ON
QD2X	43.302	43.302	44.389	R:ON	QM15FF	9.028	9.028	9.027	R:ON
QF3X	30.816	30.816	31.542	R:ON	QM14FF	-74.429	104.429	-04.429	R:ON
QF4X	31.193	31.193	31.592	R:ON	QM13FF	44.133	44.133	44.133	R:ON
QD5X	42.360	42.360	42.890	R:ON	QM12FF	-15.201	-15.201	15.202	R:ON
QF6X	52.889	52.539	53.362	R:ON	QM11FF	9.892	9.892	9.891	R:ON
QF7X	55.100	55.100	56.436	R:ON	QD10BFF	13.312	13.312	13.314	R:ON
QD8X	27.129	27.129	27.743	R:ON	QD10AFF	13.297	13.296	13.296	R:ON
QF9X	35.067	35.067	35.591	R:ON	QF9BFF	17.336	17.336	17.338	R:ON
QD10X	53.535	53.535	52.537	R:ON	QF9AFF	17.372	17.372	17.372	R:ON
QF11X	47.117	47.117	46.324	R:ON	QD8FF	27.616	27.616	27.616	R:ON
QD12X	46.703	46.703	45.744	R:ON	QF7FF	25.253	25.254	25.253	R:ON
					QD6FF	27.617	27.618	27.617	R:ON
QD14X	95.434	95.434	97.801	R:ON	QF5BFF	17.337	17.335	17.335	R:ON
QF15X	129.059	129.059	125.688	R:ON	QF5AFF	17.237	17.237	17.237	R:ON
QD16X	47.013	47.013	46.926	R:ON	QD4BFF	13.532	13.533	13.533	R:ON
QF17X	46.973	46.973	46.096	R:ON	QD4AFF	13.638	13.638	13.638	R:ON
QD18X	31.457	31.457	31.402	R:ON	QF3FF	25.345	25.345	25.344	R:ON
QF19X	29.998	29.998	29.998	R:ON	QD2BFF	9.040	9.040	9.040	R:ON
QD20X	50.279	50.279	51.038	R:ON	QD2AFF	13.235	13.235	13.234	R:ON
QF21X	40.929	40.929	41.515	R:ON	QF1FF	123.216	123.335	23.335	R:ON
					QD0FF	129.107	128.356	28.356	R:ON
QS1X	-3.740	-4.530	-4.548	ON					
QS2X	1.220	0.430	0.428	ON	SF6FF	15.177	15.177	15.179	R:ON
QK1X	0.000	0.000	-0.010	ON	SF5FF	-1.514	-1.514	-1.506	R:ON
QK2X	0.369	0.369	0.377	ON	SD4FF	25.416	25.416	25.413	R:ON
QK3X	0.369	0.369	0.378	ON	SF1FF	3.652	3.652	3.652	R:ON
QK4X	0.000	0.000	-0.010	ON	SD0FF	6.253	6.253	6.253	R:ON
BH1X	367.696	366.496	374.534	R:ON	B5FF	150.269	150.269	50.268	R:ON
BH3X	369.796	369.196	377.283	R:ON	B2FF	87.750	87.750	87.751	R:ON
					B1FF	163.699	163.699	63.698	R:ON
SET	FILE	set23apr21_1843.dat			BDUMP	370.500	0.000	70.250	R:ON
ON	OFF	RESET							
					SK1FF	0.000	-0.112	-0.126	ON
					SK2FF	0.000	1.086	1.074	ON
					SK3FF	0.000	0.261	0.269	ON
					SK4FF	0.000	1.196	1.203	ON
					OC1FF	0.000	0.000	0.040	R:OFF
					OC2FF	0.000	0.000	-0.628	R:OFF

K-values for the magnet "SET" currents are put to in the directory "/atf/op/sad/current/data".

Optics calculation is carried out with the K-values in the file in SAD.

K-I conversion data was in ATF control system Each magnet has individual conversion file.

We also have database with the information of magnetic field (EXT&ATF2 only).

    ➢ *I think these database is also used in the FlightSimulator (?).*

- *DeviceName:blRead :   Bn*Leff   (n=0,1,2)*
- *DeviceName:blWrite : Bn*Leff   (n=0,1,2)*

I think it is convenient to use these database for your system.