

OPAL / OPAL-X - 2025 - Drift

Merlin6

OPAL in: ~adelmann/git/opal/build/src/

OPALX in: ~adelmann/opal-x/build/src/

run old opal:

~adelmann/git/opal/build/src/opal ~adelmann/opal/input-files/Drift-0/Drift-0.in

~adelmann/git/opal/build/src/opal ~adelmann/opal/input-files/Drift-1/Drift-1.in

~adelmann/git/opal/build/src/opal ~adelmann/opal/input-files/Drift-2/Drift-2.in

run opalx:

~adelmann/opalx/build/src/opalx ~adelmann/opalx/input-files/Drift-0.in --info 5

~adelmann/opalx/build/src/opalx ~adelmann/opalx/input-files/Drift-1.in --info 5

~adelmann/opalx/build/src/opalx ~adelmann/opalx/input-files/Drift-2.in --info 5

drift-0.in Results

OPAL and OPALX data directories on Merlin

```
opaldir  = '/psi/home/adelmann/git/opal-src-4-opalx-debug/input-files/Drift-0/'
opalxdir = '/psi/home/adelmann/opalx/input-files/'
```

Compare Beamsizes

```
opalstat = load_dataset(opaldir, fname='Drift-0.stat').dataframe
opalxstat = load_dataset(opalxdir, fname='Drift-0.stat').dataframe
```

```
print(opalstat[['rms_x', 'rms_y', 'rms_s', 'rms_px', 'rms_py', 'rms_ps', 'dE']])
```

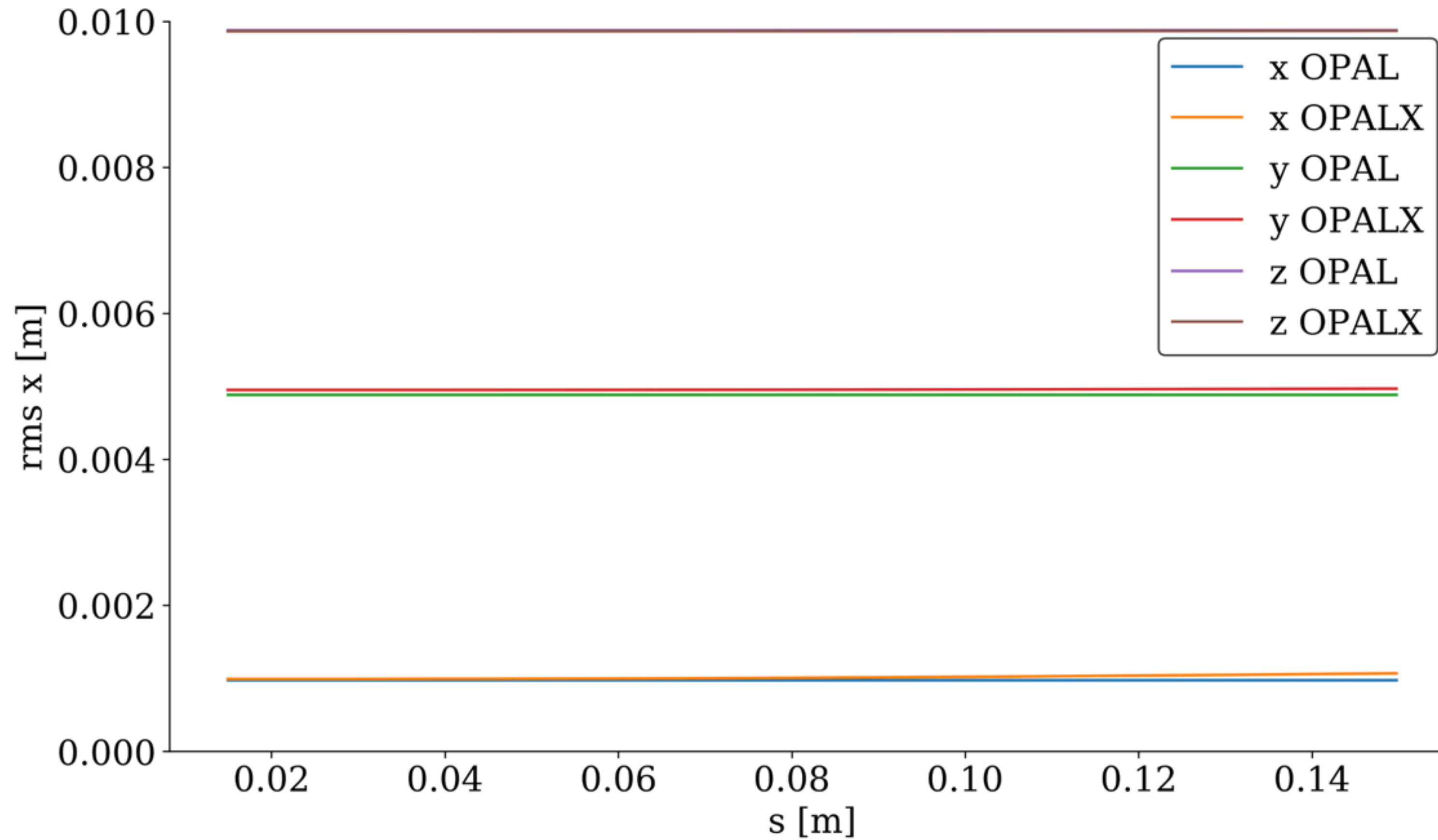
	rms_x	rms_y	rms_s	rms_px	rms_py	rms_ps	\
0	0.00097	0.004884	0.00988	9.717738e-07	9.721841e-07	9.838149e-07	
							dE
0							5.021339e-07

```
print(opalxstat[['rms_x', 'rms_y', 'rms_s', 'rms_px', 'rms_py', 'rms_ps', 'dE']])
```

	rms_x	rms_y	rms_s	rms_px	rms_py	rms_ps	dE
0	0.000989	0.00495	0.009862	9.970670e-07	9.971723e-07	0.000001	0.000162

Observation:
- dE differs

drift-1.in Results



Observation:
- x increases a bit

drift-1.in Results

```
[5]: print(opalstat[['xpx', 'ypy', 'zpz']])  
     print(opalxstat[['xpx', 'ypy', 'zpz']])
```

	xpx	ypy	zpz
0	0.000485	0.002669	0.000039
1	0.000486	0.002669	0.000039
2	0.000486	0.002669	0.000039
3	0.000487	0.002669	0.000039
4	0.000488	0.002669	0.000039
5	0.000489	0.002669	0.000039
6	0.000489	0.002669	0.000039
7	0.000490	0.002670	0.000039
8	0.000491	0.002670	0.000039
9	0.000491	0.002670	0.000039

	xpx	ypy	zpz
0	-0.001277	0.002690	0.003871
1	-0.001200	0.002640	0.003851
2	-0.001121	0.002589	0.003830
3	-0.001040	0.002538	0.003809
4	-0.000958	0.002487	0.003788
5	-0.000875	0.002435	0.003767
6	-0.000792	0.002384	0.003745
7	-0.000709	0.002332	0.003724
8	-0.000627	0.002280	0.003703
9	-0.000546	0.002228	0.003681

Observation:
- zpz correlation wrong

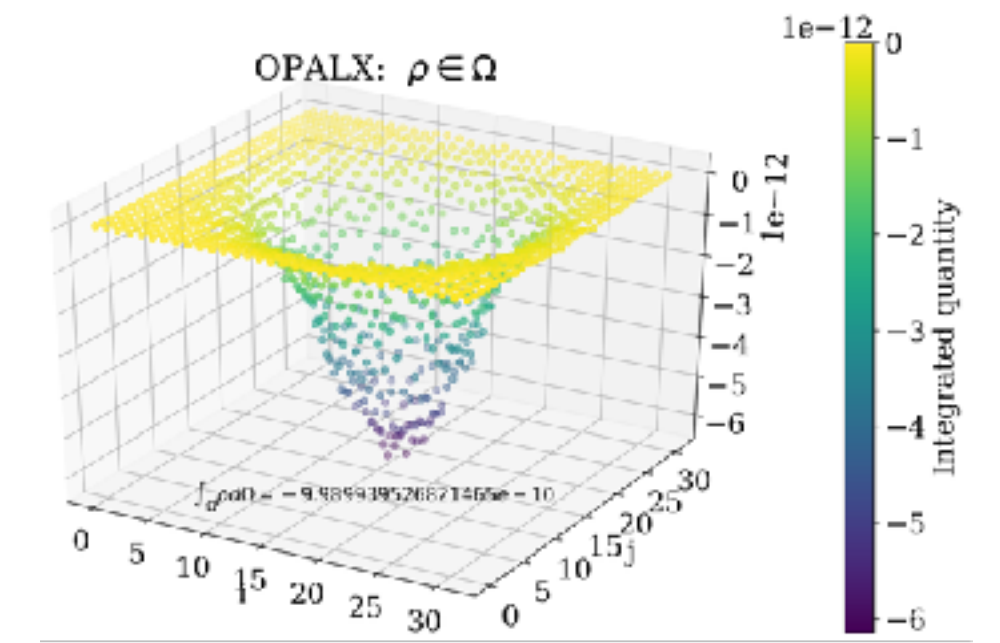
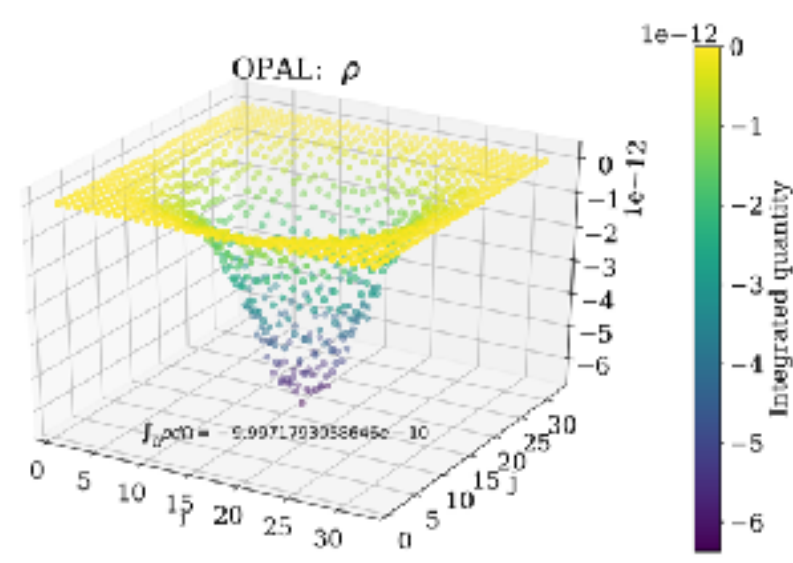
drift-1.in Results

```
OPAL> * ***** B U N C H *****
OPAL> * NP = 100000
OPAL> * Qtot = 1000.000 [pC] Qi = 10.000 [fC]
OPAL> * Ekin = 10.000 [MeV] dEkin = 0.502 [eV]
OPAL> * rmax = ( 2.99463 , 14.99441 , 30.02289 ) [mm]
OPAL> * rmin = ( -2.98525 , -14.98814 , -29.94005 ) [mm]
OPAL> * rms beam size = ( 0.96981 , 4.88413 , 9.88027 ) [mm]
OPAL> * rms momenta = ( 9.71774e-07 , 9.72184e-07 , 9.83815e-07 ) [beta gamma]
OPAL> * mean position = ( -0.00000 , 0.00000 , -0.00000 ) [um]
OPAL> * mean momenta = ( 1.04820e-23 , 8.97200e-23 , 2.05452e+01 ) [beta gamma]
OPAL> * rms emittance = ( 4.58712e-11 , 2.31113e-10 , 4.73121e-10 ) (not normalized)
OPAL> * rms correlation = ( 4.84149e-04 , 2.66842e-03 , 3.92423e-05 )
OPAL> * hr = ( 0.19290 , 0.96718 , 1.93429 ) [mm]
OPAL> * dh = 1.00000e-10 [%]
OPAL> * t = 0.000 [fs] dT = 50.000 [ps]
OPAL> * spos = 0.000 [um]
OPAL> * *****
OPAL > * ***** B U N C H *****
OPAL > * NP = 100000
OPAL > * Qtot = 1000.000 [pC] Qi = 10.000 [fC]
OPAL > * Ekin = 10.000 [MeV] dEkin = 0.502 [eV]
OPAL > * rmax = ( 2.99465 , 14.99441 , 30.02289 ) [mm]
OPAL > * rmin = ( -2.98525 , -14.98815 , -29.94005 ) [mm]
OPAL > * rms beam size = ( 0.96981 , 4.88413 , 9.88027 ) [mm]
OPAL > * rms momenta = ( 9.71774e-07 , 9.72184e-07 , 9.83815e-07 ) [beta gamma]
OPAL > * mean position = ( 0.00000 , -0.00000 , -0.00000 ) [um]
OPAL > * mean momenta = ( 1.04820e-23 , 8.97200e-23 , 2.05452e+01 ) [beta gamma]
OPAL > * rms emittance = ( 4.58712e-11 , 2.31113e-10 , 4.73121e-10 ) (not normalized)
OPAL > * rms correlation = ( 4.91451e-04 , 2.66987e-03 , 3.92458e-05 )
OPAL > * hr = ( 0.19290 , 0.96718 , 1.93429 ) [mm]
OPAL > * dh = 1.00000e-10 [%]
OPAL > * t = 500.000 [ps] dT = 50.000 [ps]
OPAL > * spos = 149.719 [mm]
OPAL > * *****
----
```

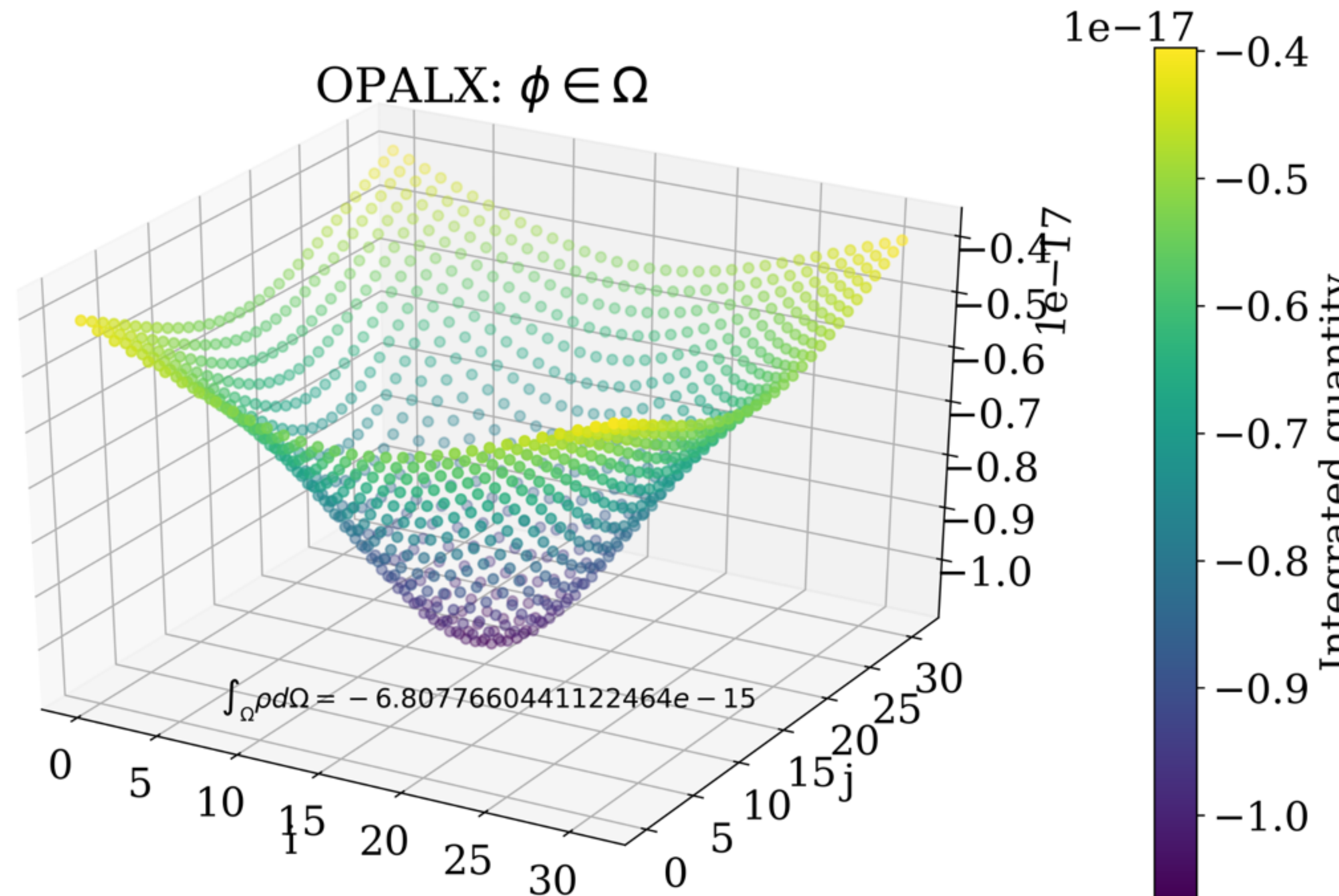
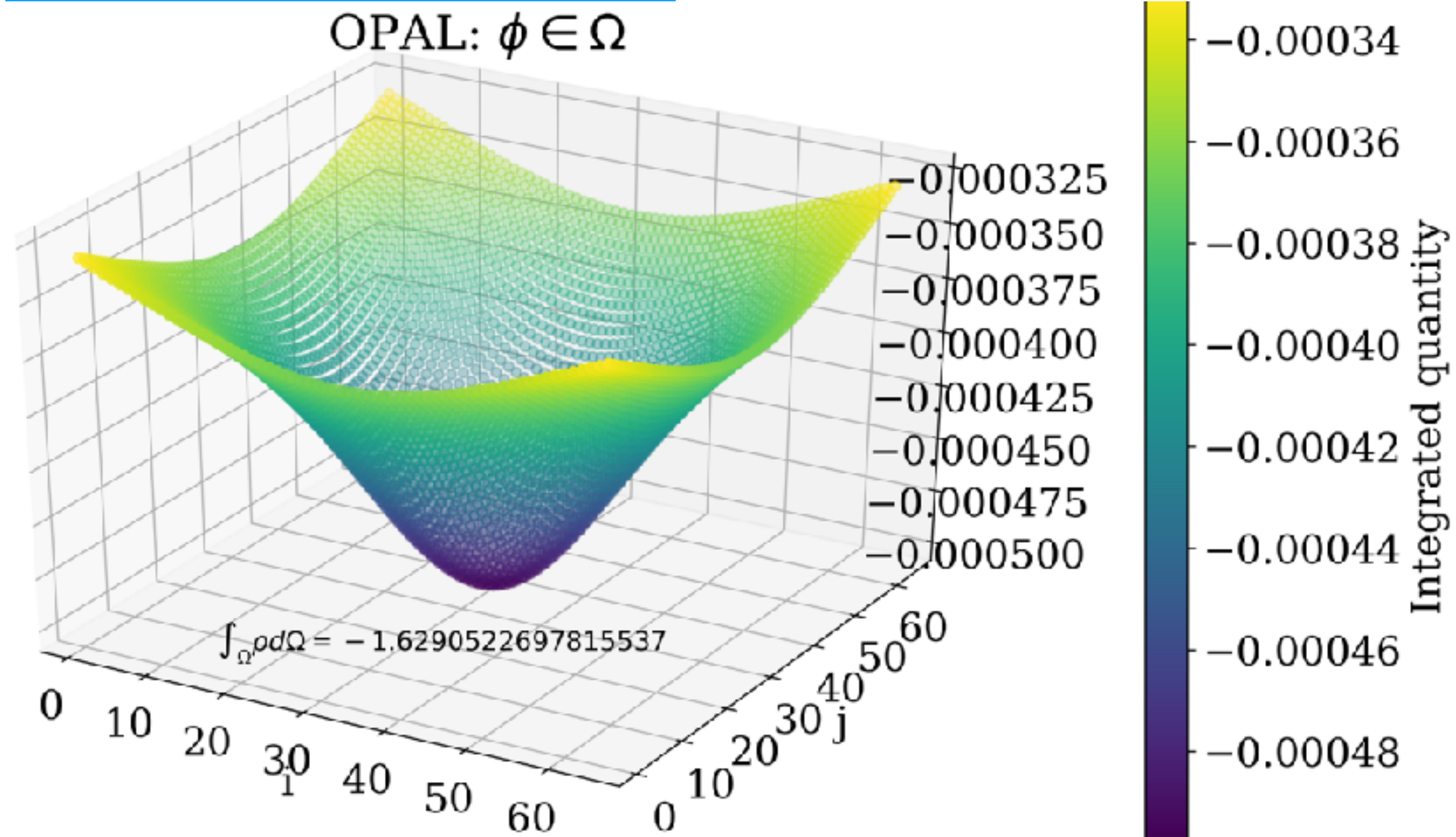
```
OPAL-X> * ***** B U N C H *****
OPAL-X> * PARTICLES = 100000
OPAL-X> * CHARGE = -1.000000e-15 (Cb)
OPAL-X> * INTEGRATOR = LF2
OPAL-X> * MIN R (origin) = ( -2.99430 , -14.96617 , -29.98979 ) [mm]
OPAL-X> * MAX R (max ext) = ( 3.00048 , 14.99957 , 29.96972 ) [mm]
OPAL-X> * RMS R = ( 0.98867 , 4.95020 , 9.86188 ) [mm]
OPAL-X> * RMS P = ( 9.970670e-07 , 9.971723e-07 , 1.003247e-06 ) [beta gamma]
OPAL-X> * Mean R: ( 1.695475e-20 , 4.201674e-19 , -4.084840e-19 ) [m]
OPAL-X> * Mean P: ( 3.511824e-09 , 3.151079e-10 , 2.054519e+01 ) [beta gamma]
OPAL-X> * MESH SPACING = ( 0.19670 , 0.98325 , 1.96742 ) [mm]
OPAL-X> * COMPDOM INCR = 5.000000e+00 (%)
OPAL-X> * FIELD LAYOUT = Domain = {[0:31:1],[0:31:1],[0:31:1]}
OPAL-X> Total number of boxes = 1
OPAL-X> Box 0 {[0:31:1],[0:31:1],[0:31:1]}
OPAL-X>
OPAL-X> * Centroid :
OPAL-X> * 1.695475e-15 3.511824e-04 4.201674e-14 3.151079e-05 -4.084840e-14 2.054519e+06
OPAL-X> * Cov Matrix :
OPAL-X> * 9.774728e-07 -1.231976e-12 -2.184526e-10 1.861267e-12 -8.284270e-08 -7.000636e-13
OPAL-X> * -1.231976e-12 9.941425e-13 -6.192102e-12 -2.362860e-15 -2.424782e-11 4.605772e-15
OPAL-X> * -2.184526e-10 -6.192102e-12 2.450452e-05 1.304903e-11 -3.937397e-08 1.880670e-11
OPAL-X> * 1.861267e-12 -2.362860e-15 1.304903e-11 9.943525e-13 1.019410e-11 -1.333848e-16
OPAL-X> * -8.284270e-08 -2.424782e-11 -3.937397e-08 1.019410e-11 9.725676e-05 3.816412e-11
OPAL-X> * -7.000636e-13 4.605772e-15 1.880670e-11 -1.333848e-16 3.816412e-11 1.006504e-12
OPAL-X> * * *****
```

Observation:
- final printout of bunch missing

drift-2.in Results



Observation:
- scale of solution not correct in OPALX



ToDo

AA: OPALX fix unit factor

644	!	case Algorithm::HOCKNEY:	660	!	case Algorithm::HOCKNEY:
645	!	rho2_mr = rho2_mr * 2.0 * nr_m[i] * hr_m[i];	661	!	rho2_mr = rho2_mr * pi * nr_m[i];
646		break;	662		break;
801		case Algorithm::HOCKNEY:	817		case Algorithm::HOCKNEY:
802	!	rho2_mr = rho2_mr * 2.0 * nr_m[i] * hr_m[i];	818	!	rho2_mr = rho2_mr * 2.0 * nr_m[i] * (4.0 * pi);
803		break;	819		break;
958		case Algorithm::HOCKNEY:	972		case Algorithm::HOCKNEY:
959	!	rho2_mr = rho2_mr * 2.0 * nr_m[i] * hr_m[i];	973	!	rho2_mr = rho2_mr * 2.0 * nr_m[i] * (4.0 * pi);
960		break;	974		break;

Mohsen OPALX

- propper Doxygen documentation of distribution
- compile Distribution (not all in .hpp)
- Drift-1: zpz correlation wrong

