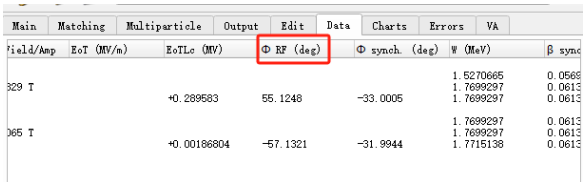
Dear Didier,

I have question about meaning of phi_Rf, as shown in the following figure



In the past, I think the meaning of phi_Rf is

$E = E\_0 * \cos(w(t-t\_0) + phi\_Rf)$

The phi_Rf is the phase of the cavity when the particle reaches the entrance of the cavity, and I always use cavity of the same frequency, So I never had a problem.

But this time, I use cavity of the different frequency, and I encountered some problem. I also ran into a problem with Superpose field maps. When the phase of 2 cavity are both 162.5 MHz, the 2 group of lattice have the same result.

Lattice 1

```
-------------------------------------------
FREQ 162.5
lattice 3 1

;CELL 1
DRIFT 85 20 0 0 0
superpose_map 0 0 0 0 0 0
FIELD_MAP 70 350 0 20 0.531 1 0 0 solenoid 0
superpose_map 345.0 0 0 0 0 0
SET_SYNC_PHASE
FIELD_MAP 7700 210 -33 20 -1.36 1.36 0 0 electromagnetic 0

freq 162.5
lattice 3 1

DRIFT 85.13 20 0 0 0
FIELD_MAP 70 345.1 0 20 0.572458 1 0 0 solenoid 0
SET_SYNC_PHASE
FIELD_MAP 7700 210 -32 20 -1.5 1.5 0 0 electromagnetic 0

End
-------------------------------------------
```

Lattice 2

```
FREQ 162.5

lattice 3 1


;CELL 1

DRIFT 85 20 0 0 0

superpose_map 0 0 0 0 0 0

FIELD_MAP 70 350 0 20 0.531 1 0 0 solenoid 0

superpose_map 345.0 0 0 0 0 0

SET_SYNC_PHASE

FIELD_MAP 7700 210 -33 20 -1.36 1.36 0 0 electromagnetic 0


freq 162.5

lattice 3 1

DRIFT 85.13 20 0 0 0

superpose_map 0 0 0 0 0 0

FIELD_MAP 70 350 0 20 0.572458 1 0 0 solenoid 0

superpose_map 345.1 0 0 0 0 0

SET_SYNC_PHASE

FIELD_MAP 7700 210 -32 20 -1.5 1.5 0 0 electromagnetic 0

End
```

The result of lattice 1 are as follows

Main | Matching | Multiparticle | Output | Edit | Data | Charts | Errors | VA

Φ RF (deg)	Φ synch. (deg)	W (MeV)	β synch.	Length (mm)	Abs. Φ (deg)
		1.5270665	0.05698361	85	291.07448
		1.7699297	0.061335915	640	2175.1125
55.1248	-33.0005	1.7699297	0.061335915	640	2175.1125
		1.7699297	0.061335915	725.13	2445.9463
		1.7699297	0.061335915	1070.23	3543.8526
84.4187	-32.0005	2.1066758	0.066898915	1280.23	4190.9646

The result of lattice 2 are as follows

Φ RF (deg)	Φ synch. (deg)	W (MeV)	β synch.	Length (mm)	Abs. Φ (deg)
		1.5270665	0.05698361	85	291.07448
		1.7699297	0.061335915	640	2175.1125
55.1248	-33.0005	1.7699297	0.061335915	640	2175.1125
		1.7699297	0.061335915	725.13	2445.9463
		2.1067534	0.066900143	1280.23	4190.9655
84.4135	-32.0005	2.1067534	0.066900143	1280.23	4190.9655

As you can see, the result is almost the same. They have same length. The only difference is that in cell2, the solenoid part of the superposition field is removed,

When I change the frequency of the second cavity,

Lattice 3

```
FREQ 162.5
```

```
lattice 3 1

;CELL 1
DRIFT 85 20 0 0 0
superpose_map 0 0 0 0 0 0
FIELD_MAP 70 350 0 20 0.531 1 0 0 solenoid 0
superpose_map 345.0 0 0 0 0 0
SET_SYNC_PHASE
FIELD_MAP 7700 210 -33 20 -1.36 1.36 0 0 electromagnetic 0

freq 325
lattice 3 1

DRIFT 85.13 20 0 0 0
FIELD_MAP 70 345.1 0 20 0.572458 1 0 0 solenoid 0
SET_SYNC_PHASE
FIELD_MAP 7700 210 -32 20 -1.5 1.5 0 0 electromagnetic 0
End
-----------------------------------------------



Lattice 4

FREQ  162.5
lattice 3 1

;CELL 1
DRIFT 85 20 0 0 0
superpose_map 0 0 0 0 0 0
FIELD_MAP 70 350 0 20 0.531 1 0 0 solenoid 0
superpose_map 345.0 0 0 0 0 0
SET_SYNC_PHASE
FIELD_MAP 7700 210 -33 20 -1.36 1.36 0 0 electromagnetic 0

freq 325
lattice 3 1
DRIFT 85.13 20 0 0 0
superpose_map 0 0 0 0 0 0
FIELD_MAP 70 350 0 20 0.572458 1 0 0 solenoid 0
superpose_map 345.1 0 0 0 0 0
SET_SYNC_PHASE
FIELD_MAP 7700 210 -32 20 -1.5 1.5 0 0 electromagnetic 0
End
-----------------------------------------------
```

The result of lattice 3 is

Φ RF (deg)	Φ synch. (deg)	W (MeV)	β synch.	Length (mm)	Abs. Φ (deg)
		1.5270665	0.05698361	85	291.07448
		1.7699297	0.061335915	640	2175.1125
55.1248	-33.0005	1.7699297	0.061335915	640	2175.1125
		1.7699297	0.061335915	725.13	2445.9463
		1.7699297	0.061335915	1070.23	3543.8526
-72.1169	-32	1.8374688	0.062491858	1280.23	4206.5521

The result of lattice 4 is

Main | Matching | Multiparticle | Output | Edit | Data | Charts | Errors | VA

Φ RF (deg)	Φ synch. (deg)	W (MeV)	β synch.	Length (mm)	Abs. Φ (deg)
		1.5270665	0.05698361	85	291.07448
		1.7699297	0.061335915	640	2175.1125
55.1248	-33.0005	1.7699297	0.061335915	640	2175.1125
		1.7699297	0.061335915	725.13	2445.9463
		1.8374642	0.062491779	1280.23	4206.5438
-90.0214	-32	1.8374642	0.062491779	1280.23	4206.5438

These two results are different. Now I mainly have two questions. One is what is the definition of phi_RF, and my original understanding should be wrong; the other is that there is something wrong with my understanding of the Superpose field maps. In my opinion, the vertical results of these two cases should be similar.

And, I have written a program to calculate the synchronization phase corresponding to phi_RF, and it seems that -72.1169 is more correct.

And I also have a question, I directly change the frequency of the cavity in cell2, whether this is feasible.

Best regards,
Li