2-nd harmonic Cavity
Bias System
Current Ramp

The need to recalculate the current ramp came from the decision to use only one power supply to power the bias magnet. As the magnet has been configured for using two power supplies, the two coils are to be connected in series.

New number of turns is 59.

Inductance of the coil at the injection level is 4.7 mH

Required frequency ramp - data

Injection

t (ms)	f (MHz)
0	75.7316
0.1	75.7384
0.2	75.7592
0.3	75.7938
0.4	75.8422
0.5	75.9042
0.6	75.9796
0.7	76.0686
0.8	76.1708
0.9	76.286
1	76.4142
1.1	76.555
1.2	76.7082
1.3	76.8736
1.4	77.0508
1.5	77.2394
1.6	77.4394
1.7	77.6502
1.8	77.8716
1.9	78.1032
2	78.3444
2.1	78.5952
2.2	78.8548
2.3	79.123
2.4	79.3994
2.5	79.6836
2.6	79.975
2.7	80.2732
2.8	80.578
2.9	80.8886
3	81.2046

Transition

t (ms)	f (MHz)
15.8	104.0934
15.9	104.1264
16	104.1586
16.1	104.1902
16.2	104.221
16.3	104.2512
16.4	104.2808
16.5	104.3096
16.6	104.3378
16.7	104.3654
16.8	104.3924
16.9	104.419
17	104.4448
17.1	104.47
17.2	104.4948
17.3	104.519
17.4	104.5428
17.5	104.566
17.6	104.5886
17.7	104.6108
17.8	104.6326
17.9	104.654
18	104.6748
18.1	104.6952
18.2	104.7152
18.3	104.7348
18.4	104.7538
18.5	104.7726
18.6	104.791
18.7	104.809
18.8	104.8266
18.9	104.844
19	104.8608
19.1	104.8774
19.2	104.8936

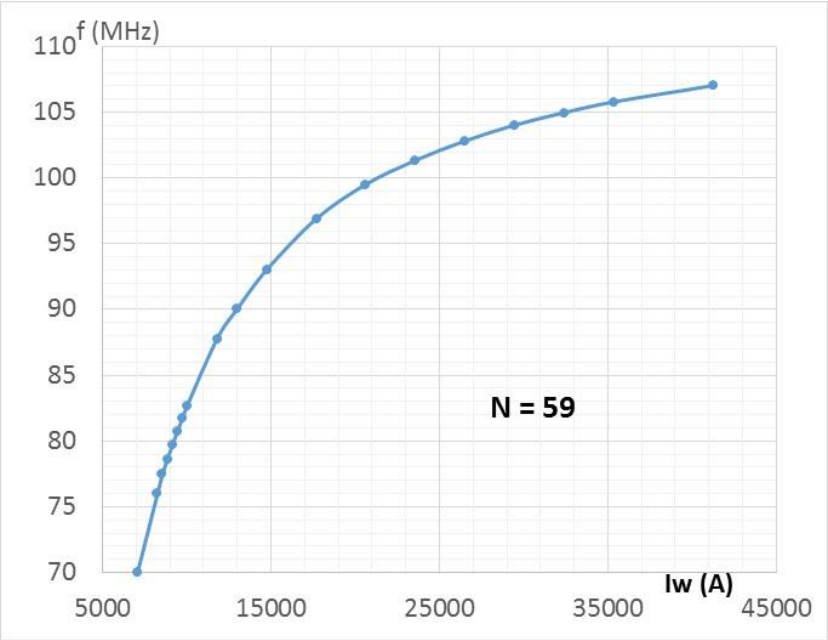
Extraction

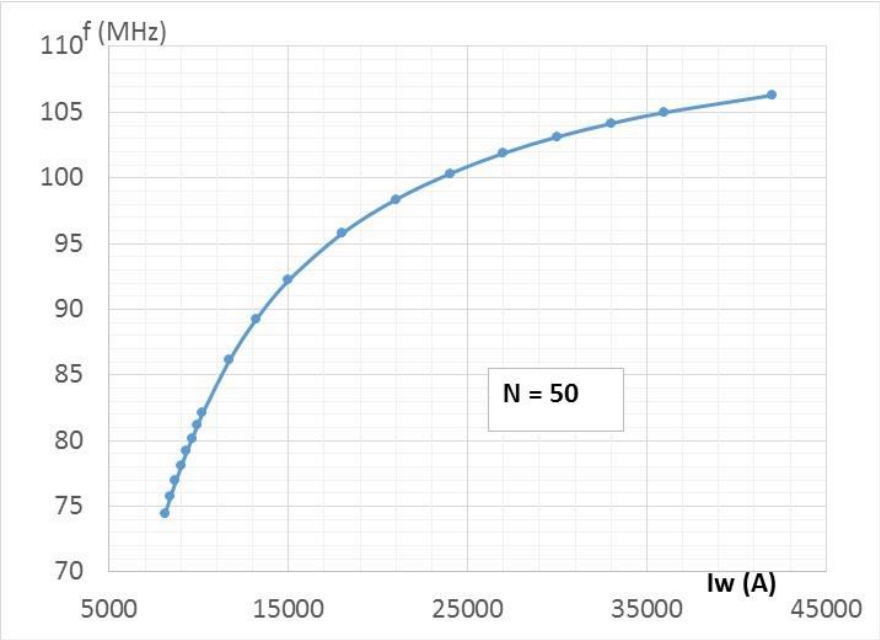
29.8	105.6046
29.9	105.6062
30	105.6078
30.1	105.6094
30.2	105.611
30.3	105.6124
30.4	105.6138
30.5	105.6152
30.6	105.6166
30.7	105.6178
30.8	105.619
30.9	105.6202
31	105.6212
31.1	105.6224
31.2	105.6234
31.3	105.6242
31.4	105.6252
31.5	105.626
31.6	105.627
31.7	105.6276
31.8	105.6284
31.9	105.6292
32	105.6298
32.1	105.6304
32.2	105.6308
32.3	105.6314
32.4	105.6318
32.5	105.6322
32.6	105.6326
32.7	105.6328
32.8	105.6332
32.9	105.6334
33	105.6336
33.1	105.6336
33.2	105.6338
33.3	105.6338
33.4	105.6338
33.5	105.6338
33.6	105.6336
33.7	105.6334
33.8	105.6334

Tuning Curve
G.R. July 14, 2017

N = 59		
I (A)	Iw (A)	f (MHz)
120	7080	70.000
140	8260	76.000
145	8555	77.450
150	8850	78.600
155	9145	79.700
160	9440	80.700
165	9735	81.700
170	10030	82.700
200	11800	87.760
220	12980	90.000
250	14750	93.000
300	17700	96.880
350	20650	99.500
400	23600	101.320
450	26550	102.800
500	29500	104.000
550	32450	104.950
600	35400	105.760
700	41300	107.000

Tuning curve

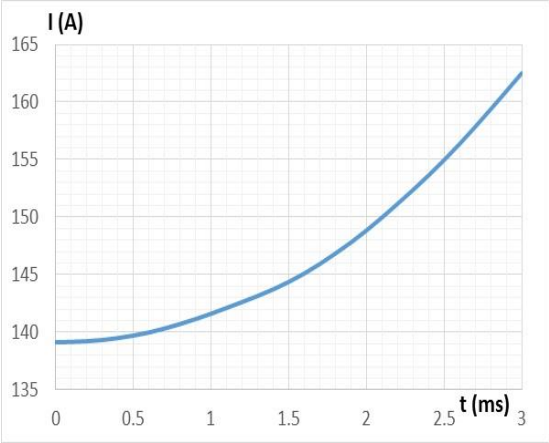




Required current at each time point is found using the required frequency ramp tables and the tuning curve.
Linear interpolation was used.
The procedure works only for the stationary case.

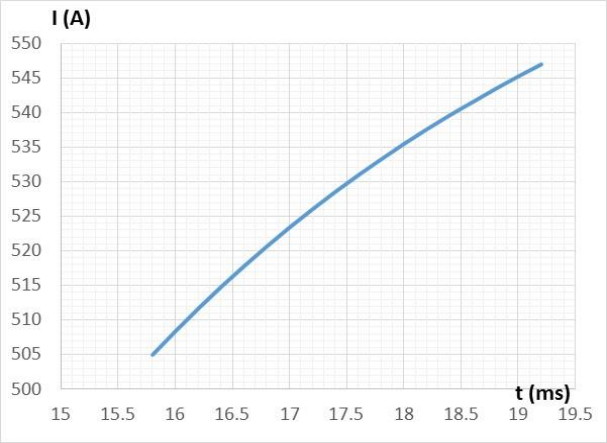
Current Ramp

Injection



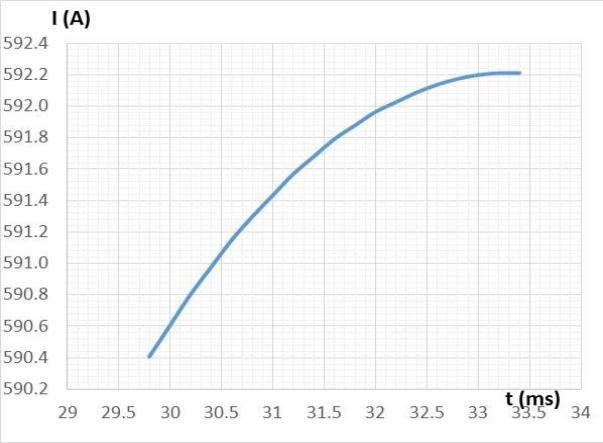
Maximum dI/dt = 16,000 A/s
Maximum inductive voltage Um = 80 V

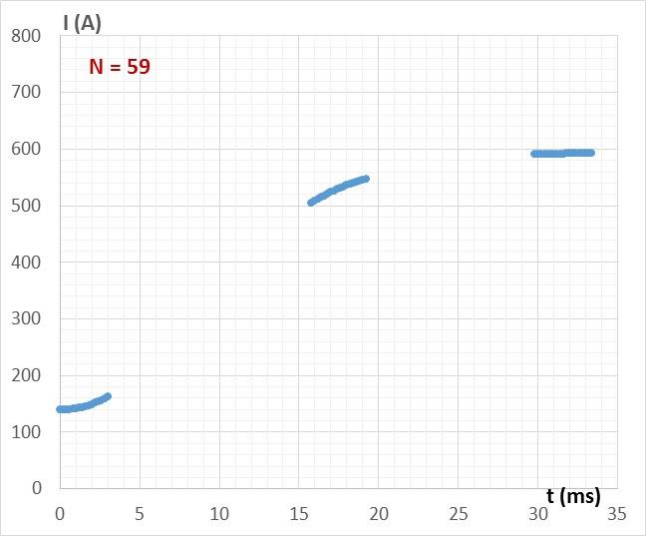
Transition



Maximum dI/dt = 17,000 A/s
Maximum inductive voltage Um = 70 V

Extraction



Maximum dI/dt = 1,000 A/s
Maximum inductive voltage Um = 3 V

Average current ramp rate between the Injection and the Transition stages:
dI/dt = 26,600 A/s --> Um = 135 V