RFQ2 Update

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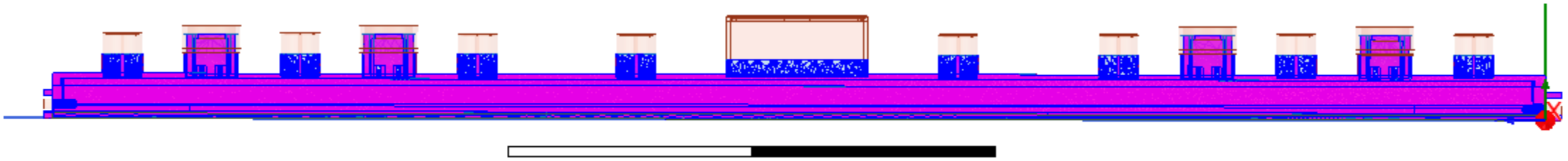
Recap

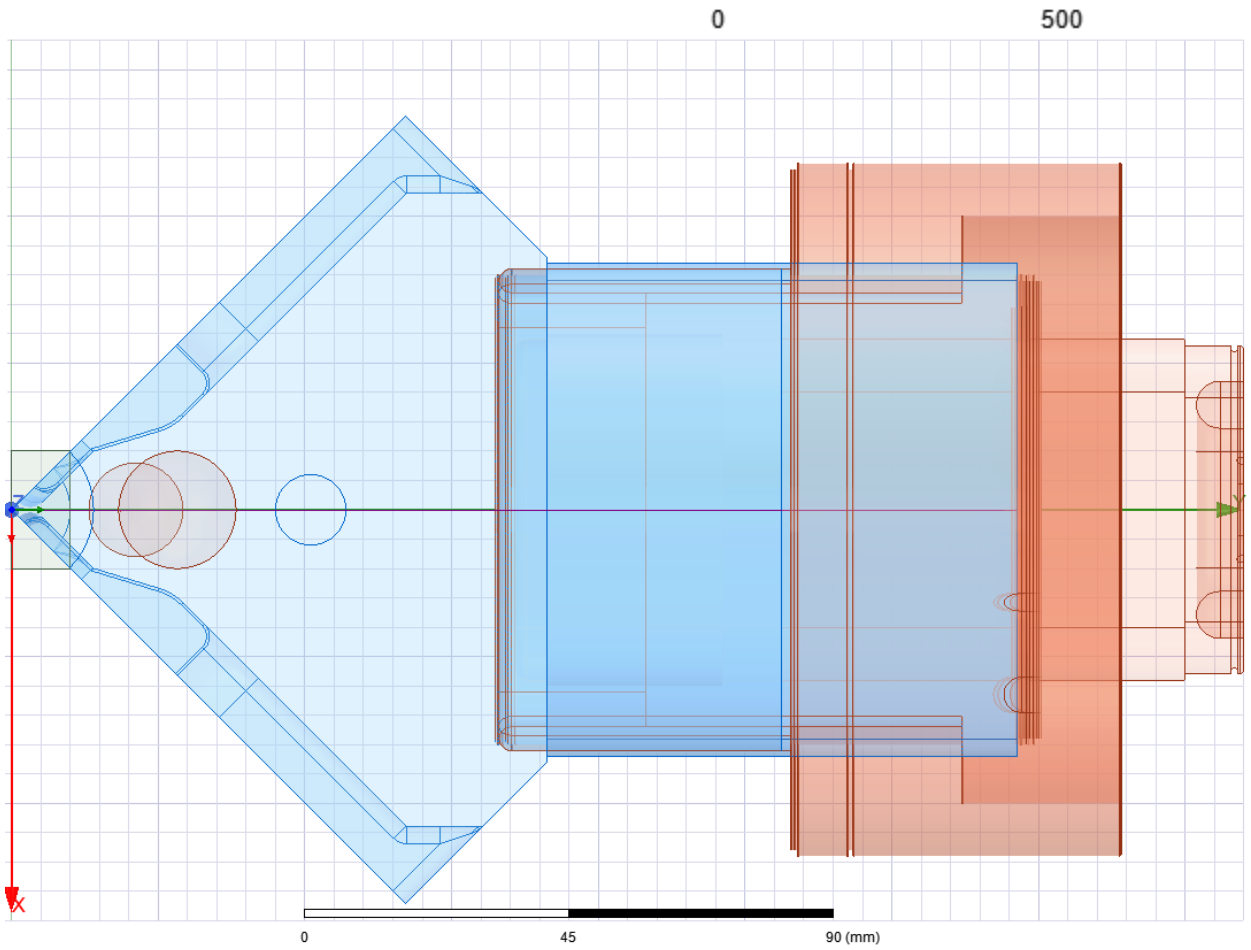
Q factor of the first RFQ was 6772, The Q factor of the new RFQ (RFQ2) seems to be ~5200.

Last week we agreed to:

1. **Investigate surface roughness (simulate the cavity, check measured values).**
2. **Measure Q_0 vs tuner position (simulate and compare with measurement).**
3. **Investigate how individual tuners affect Q while forming the matrix which will be used for tuning.**

1: Surface Roughness Investigation (Alexej’s slides)





Finite Conductivity Boundary

Finite Conductivity Boundary | Defaults

Name: FiniteCond1

Parameters

Conductivity: 58000000 Siemens/m

Relative Permeability: 1

Use Material: vacuum

Infinite Ground Plane

Advanced

Surface Roughness Model: Groisse Huray

Surface Roughness: Ra

Hall-Huray Surface Ratio:

Set DC Thickness: 0 mm

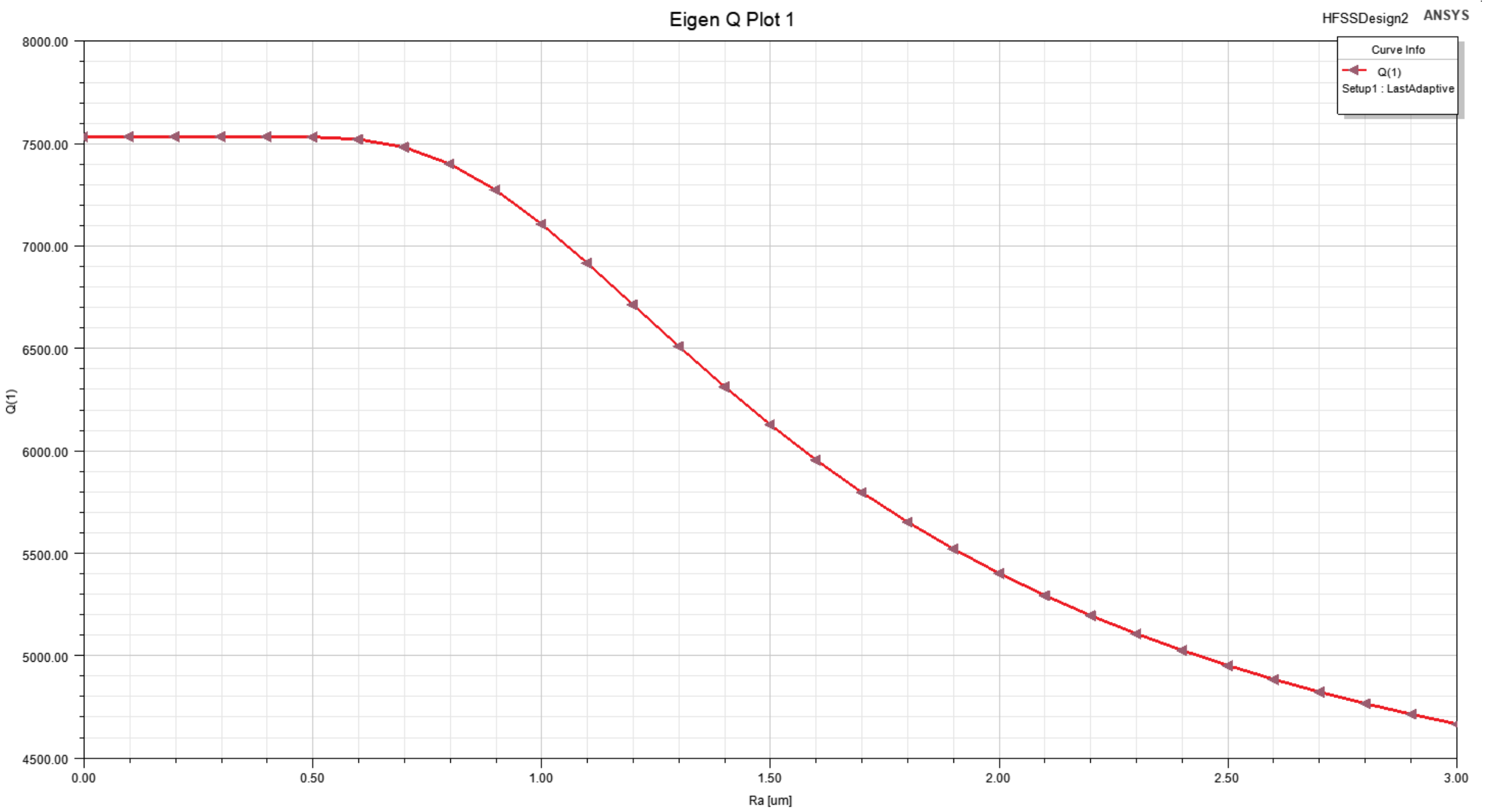
One sided Object is on outer boundary

Two sided

Use classic infinite thickness model

Use Defaults

OK Cancel


Eigen Q Plot 1
HFSSDesign2
ANSYS
Curve Info
Q(1)
Setup1 : LastAdaptive
8000.00
7500.00
7000.00
6500.00
6000.00
5500.00
5000.00
4500.00
Q(1)
0.00
0.50
1.00
1.50
2.00
2.50
3.00
Ra [um]

2: Q_0 vs Tuner Position

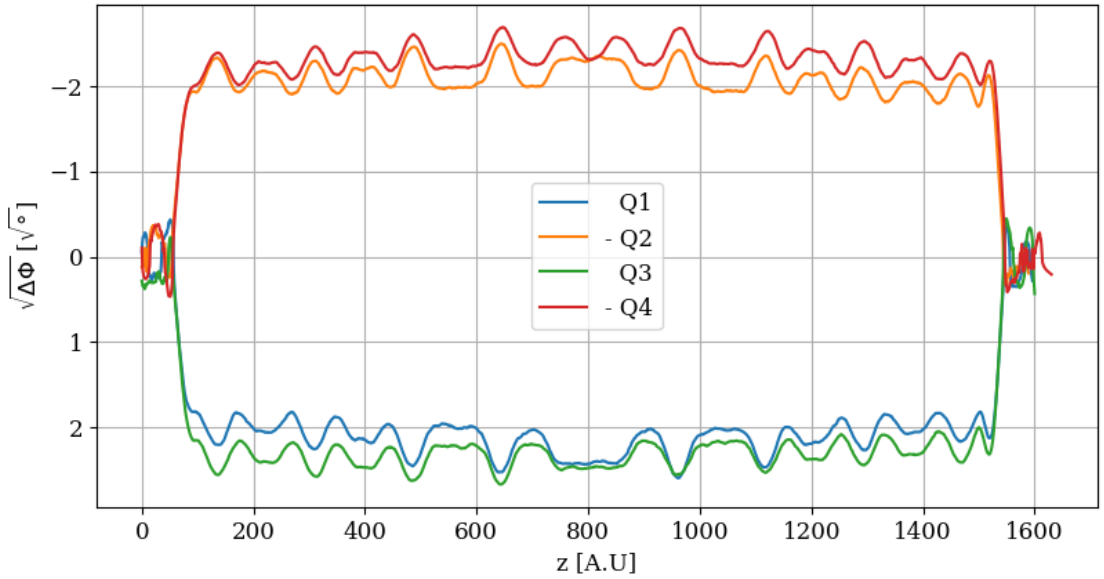
Q_0 vs Tuner Position

A few things to note:

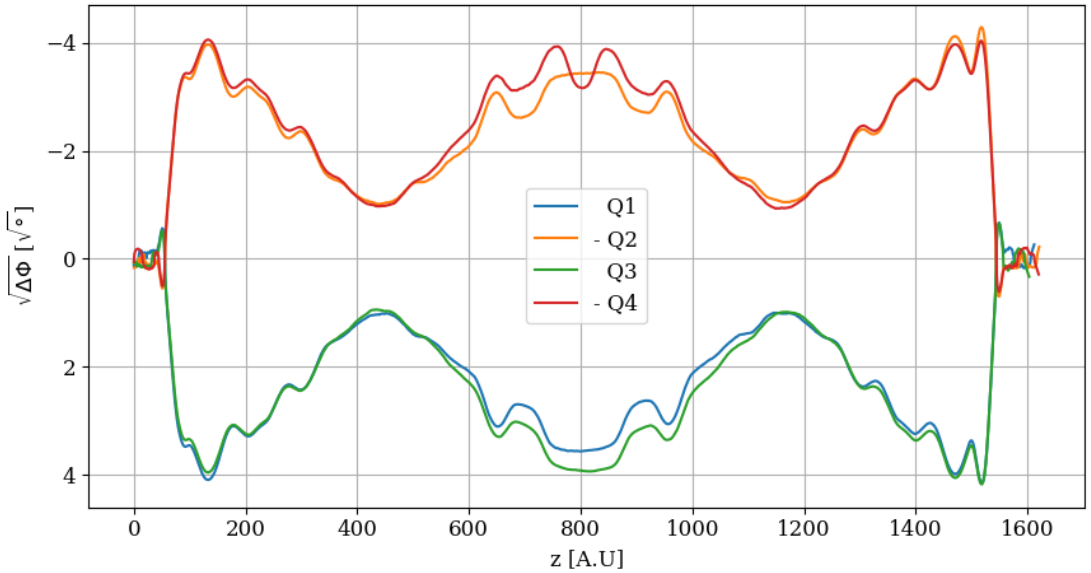
- **Two quadrupole modes measured.**
- **8 measurements performed for both modes over the full tuner range (flange-to-flange to 45 mm retraction).**
- **Frequency change is ~25 MHz in this range.**

Q_0 vs Tuner Position

Mode 1 (operating mode)



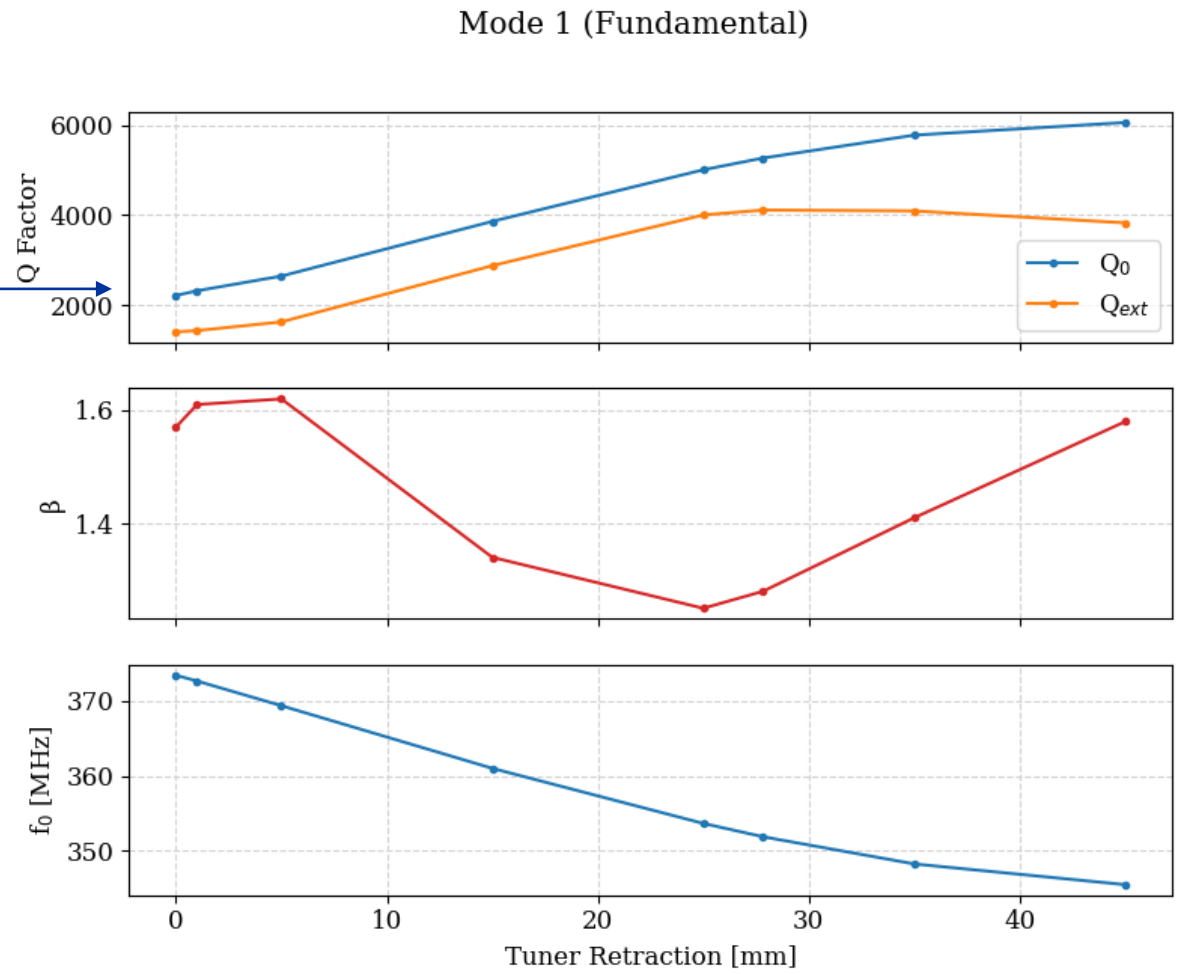
Mode 2



Field profiles for “nominal” tuner position shown.

Q_0 vs Tuner Position: Mode 1

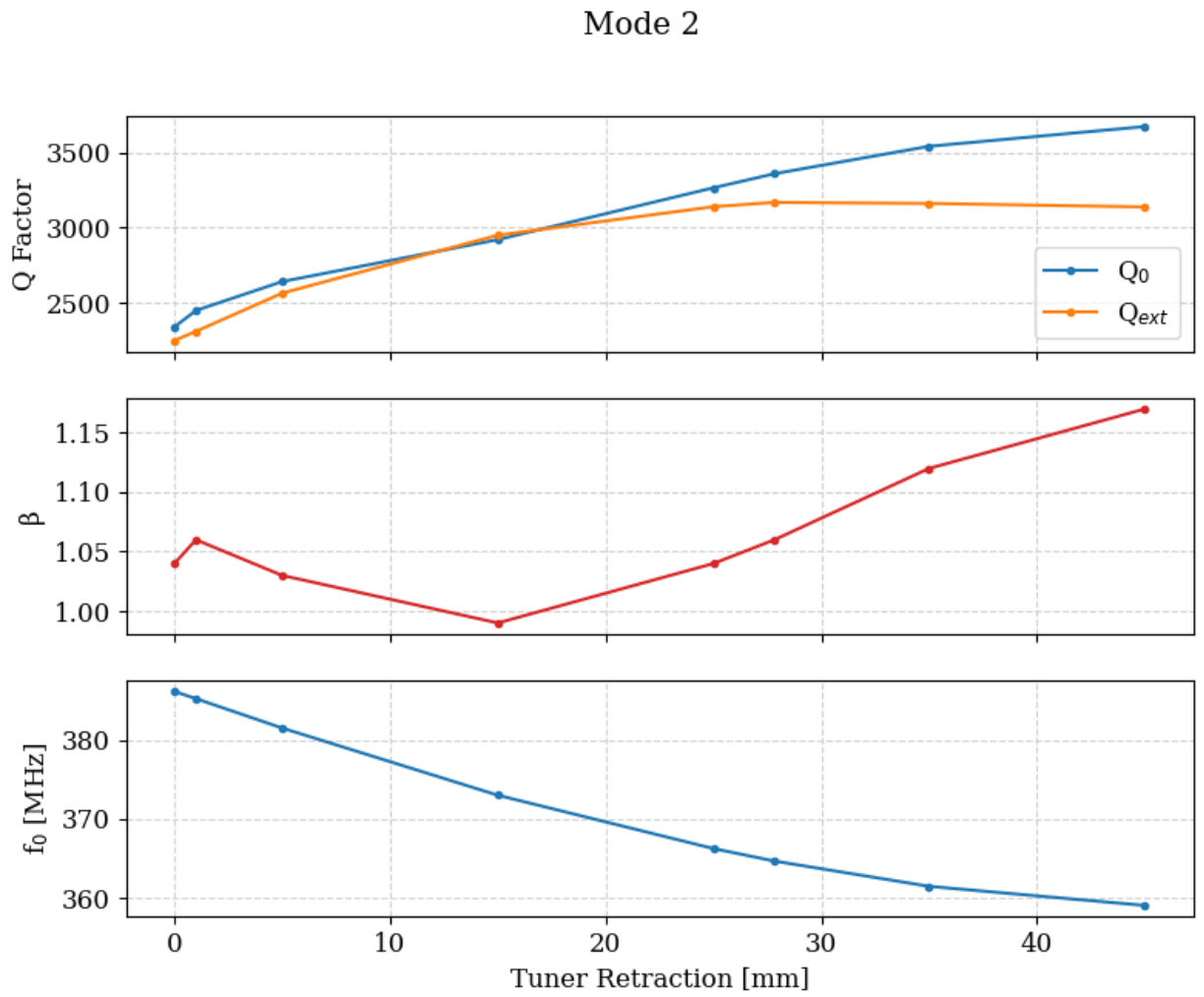
Small difference between flange-to-flange and 1 mm gap.



Saturates at ~6000.

Page 154 of RFQ1 report mentions a similar measurement, simulated Q_0 was 8000.

Q_0 vs Tuner Position: Mode 2



Conclusion

Results indicate the tuners are probably not the cause of the losses.

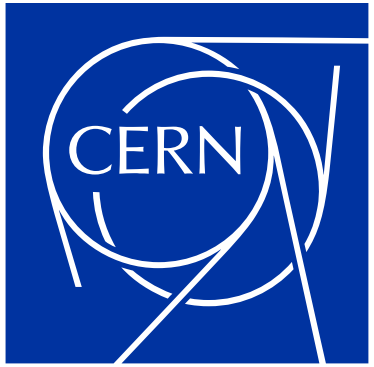
Results haven’t been compared with simulations yet, this work is ongoing.

3: Effect of Individual Tuners

Effect of Individual Tuners

Idea is to measure how individual tuners affect Q_0:

- **Field and surface current change as tuners are moved. By measuring Q_0 we can “localise” losses to an extent.**
- **Can use this data to form the matrix we need for tuning. This needs to be done anyway, no time lost!**
- **First 12 bead pulls performed last week, work to resume today.**



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