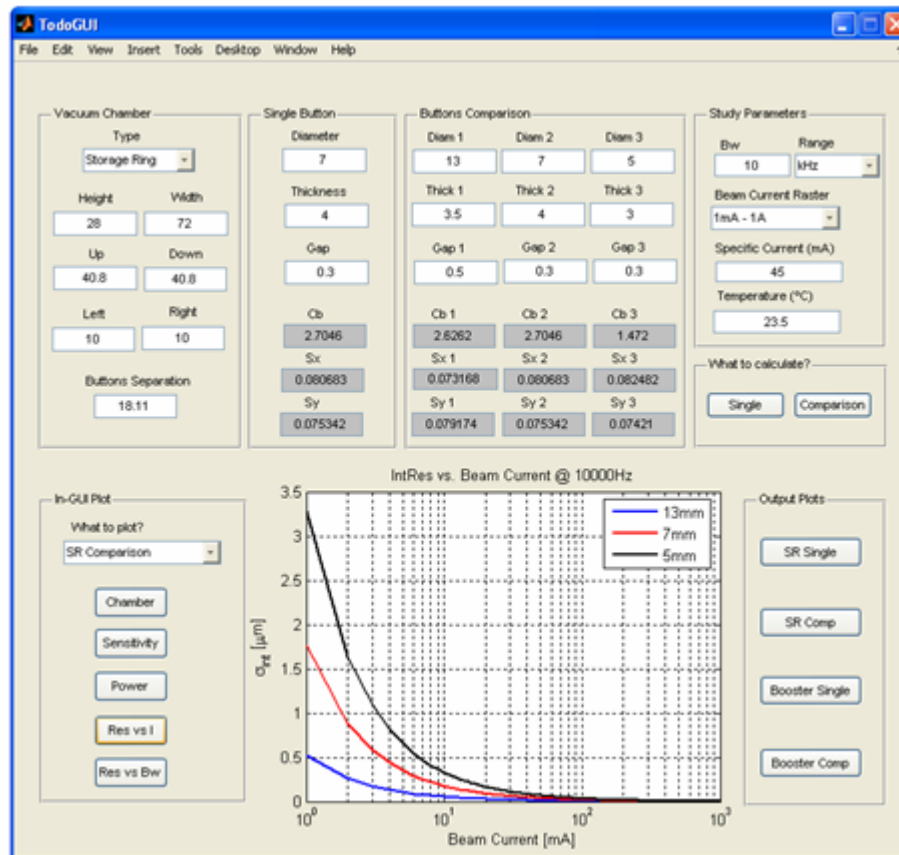


# BPMs GUI

Created by [aolmos](#) — last modified Nov 23, 2010 08:20 AM

This Matlab GUI calculates BPMs parameters like sensitivity, induced power on the pickups and intrinsic resolution (click to enlarge).



It is based on G. Rehm (Diamond) code and can be used for round (Booster type) and octagonal (Storage Ring type) BPM chambers analysis.

## Utilities

Following calculations can be performed, for a defined button geometry (single) or for 3 different ones (comparison):

- Buttons positioning on the chamber
- Non-Linear BPM response
- Buttons capacitance calculation
- BPM sensitivity
- Induced power on a 50 ohms load
- BPM Intrinsic Resolution vs. Beam Current

- BPM Intrinsic Resolution vs. Measurement Bandwidth

## Downloads

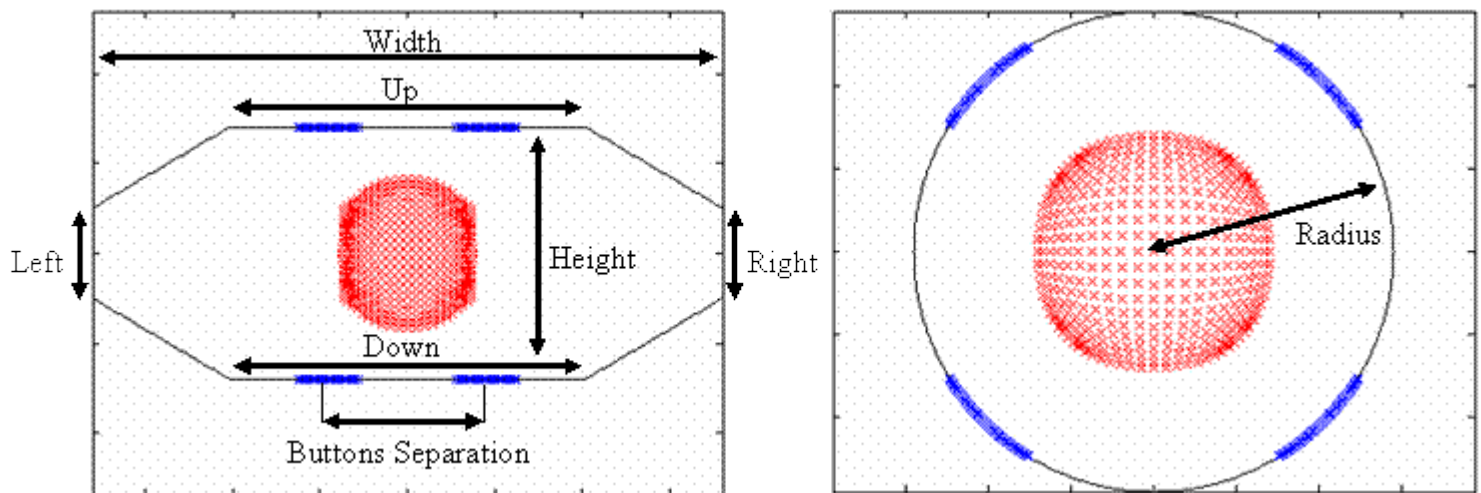
Matlab files needed for running the GUI:

- [TodoGUI3](#) (.fig file of the GUI)
- [Additional M-files](#) (.zip file)
- [Index of M-Files](#) (.txt file)

## How does it work?

### 1 - Vacuum chamber definition

First thing to be done is the selection of the "Vacuum Chamber" type. Storage ring stands for octagonal chambers and booster for the round ones. Storage ring octagonal chambers are defined by the following dimensions:



Booster vacuum chambers are just defined by their duct inner radius and the buttons are placed in a  $45^\circ$  symmetry from axis. Vacuum chamber parameters are set with the following edit controls in the GUI.

Vacuum Chamber

Type  
Storage Ring

Height: 28      Width: 72

Up: 40.8      Down: 40.8

Left: 10      Right: 10

Buttons Separation: 18.11

Vacuum Chamber

Type  
Booster

Storage Ring

Booster

Chamber Radius: 14.5

## 2 - Buttons geometry

Next step is the definition of the buttons geometry. Here we can either define a "Single Button" geometry to perform a calculation based on this button or define up to 3 different geometries to perform a "Buttons Comparison" study.

Single Button

Diameter: 7

Thickness: 4

Gap: 0.3

Cb: 2.7046

Sx: 0.095277

Sy: 0.095693

Buttons Comparison

Diam 1	Diam 2	Diam 3
10	7	4
Thick 1	Thick 2	Thick 3
4	4	4
Gap 1	Gap 2	Gap 3
0.3	0.3	0.3
Cb 1	Cb 2	Cb 3
3.8172	2.7046	1.5915
Sx 1	Sx 2	Sx 3
0.077998	0.080683	0.08316
Sy 1	Sy 2	Sy 3
0.076645	0.075342	0.073767

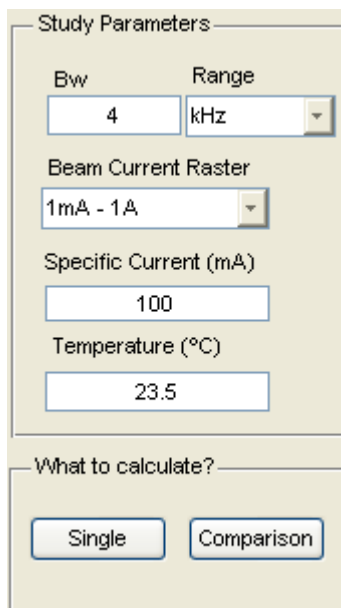
Buttons are defined as:

- **Diameter:** electrode diameter [mm]
- **Thickness:** electrode thickness [mm]
- **Gap:** gap between the electrode edge and the vacuum chamber [mm]

Once the calculations are performed, output data like button capacitance ( $C_b$  in pF) and BPM sensitivities ( $S_x$  and  $S_y$  in mm-1) are shown at the bottom.



### 3 - Study parameters

These parameters refer to the specific environment we want to emulate in our calculations.



The 'Study Parameters' dialog box is shown. It has a title bar 'Study Parameters'. Inside, there are several input fields and a section for calculation type. The 'Bw' field contains '4', and the 'Range' dropdown is set to 'kHz'. The 'Beam Current Raster' dropdown is set to '1mA - 1A'. The 'Specific Current (mA)' field contains '100'. The 'Temperature (°C)' field contains '23.5'. Below these fields, there is a section titled 'What to calculate?' with two buttons: 'Single' and 'Comparison'.

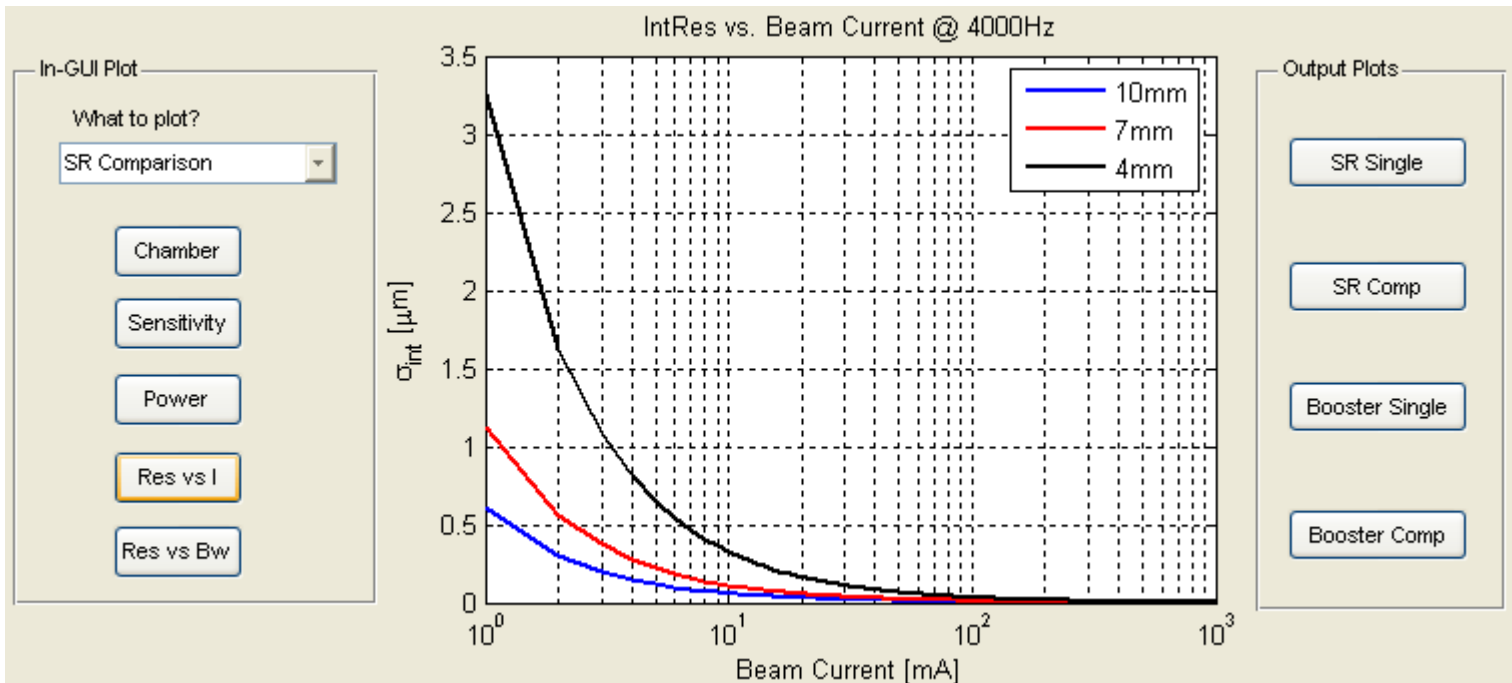
- Combination of **Bw** and **Range** will determine the "Measurement Bandwidth" setting for the resolution study
- **Beam Current Raster** defines the min and max beam current thresholds (usually lower currents for boosters and higher for storage rings)
- **Specific Current** sets the beam current value at which the Resolution vs. Measurement Bw study is done
- The temperature defined for all calculations is set in the **Temperature** control

After setting all the vacuum chamber dimensions, buttons geometry and study parameters, we just launch the desired calculation: **Single** or **Comparison** (and wait for a few seconds  )

### 4 - Output Information

Calculation results are presented in plots. Two different kinds of plots can be generated: **In-GUI** (shows each one of the studies in the graph located in the GUI) and **Output Plots**

(generates figures including all results).



For the **In-GUI** plots, first we have to select the study we want to show from the **What to plot?** combo-box menu (SR Single, SR Comparison, Booster Single or Booster Comparison). Then just pushing on the appropriate button, the desired calculation results are shown:

- **Chamber** creates a drawing of the vacuum chamber, including the pickups and the rastered beam
- **Sensitivity** shows the Delta-over-Sum curves that define the BPMs horizontal and vertical sensitivities
- **Power** shows the detected power signal on a 50ohms load (e.g. electronics) according to the beam current level
- **Res vs I** draws the curves for the calculated Intrinsic Resolution vs. Beam Current (@ the define Measurement Bw and Temperature)
- **Res vs Bw** draws the curves for the calculated Intrinsic Resolution vs. Measurement Bw (@ the Specific Current and Temperature)

Regarding the **Output Plots** buttons, they create an independent window figure showing 4 plots with all the study results in each case.