

First results of FMA analysis for SuperKEKB

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SuperKEKB optics meeting

Jul. 17, 2012

1. Introduction

Frequency map analysis (FMA):

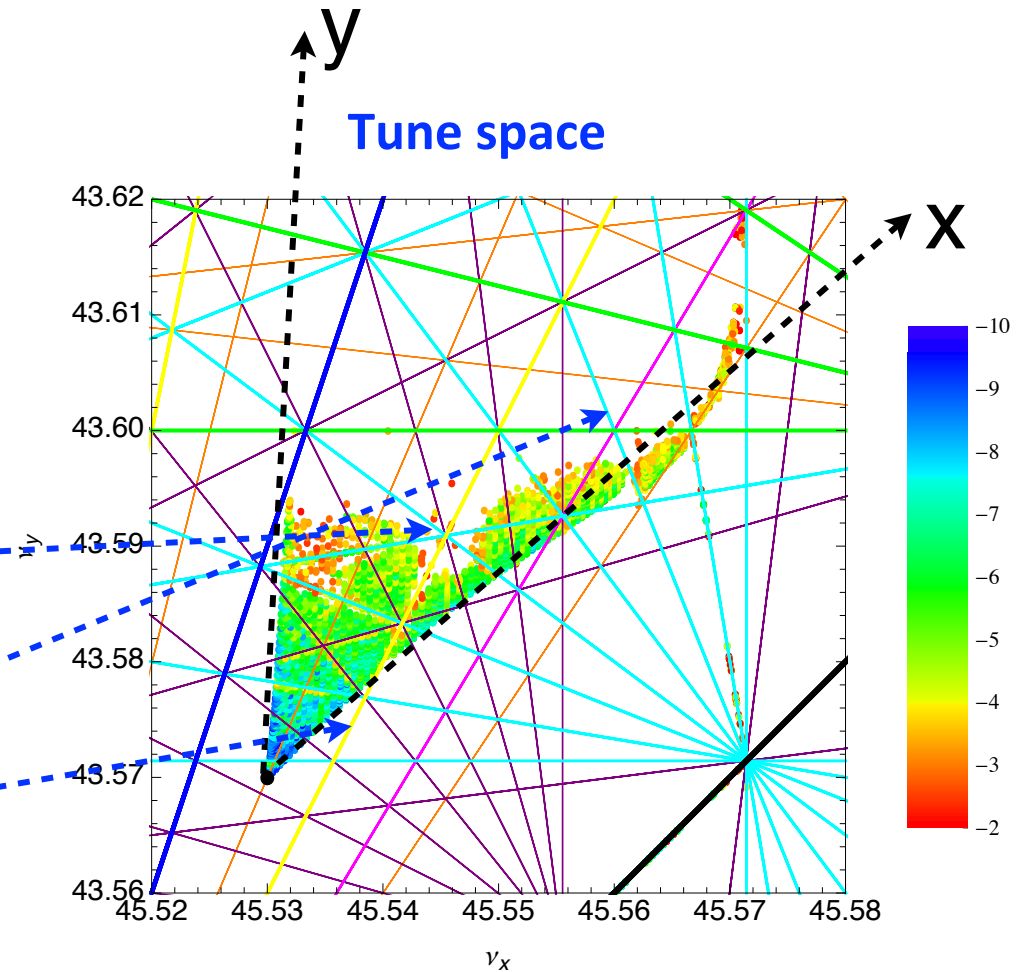
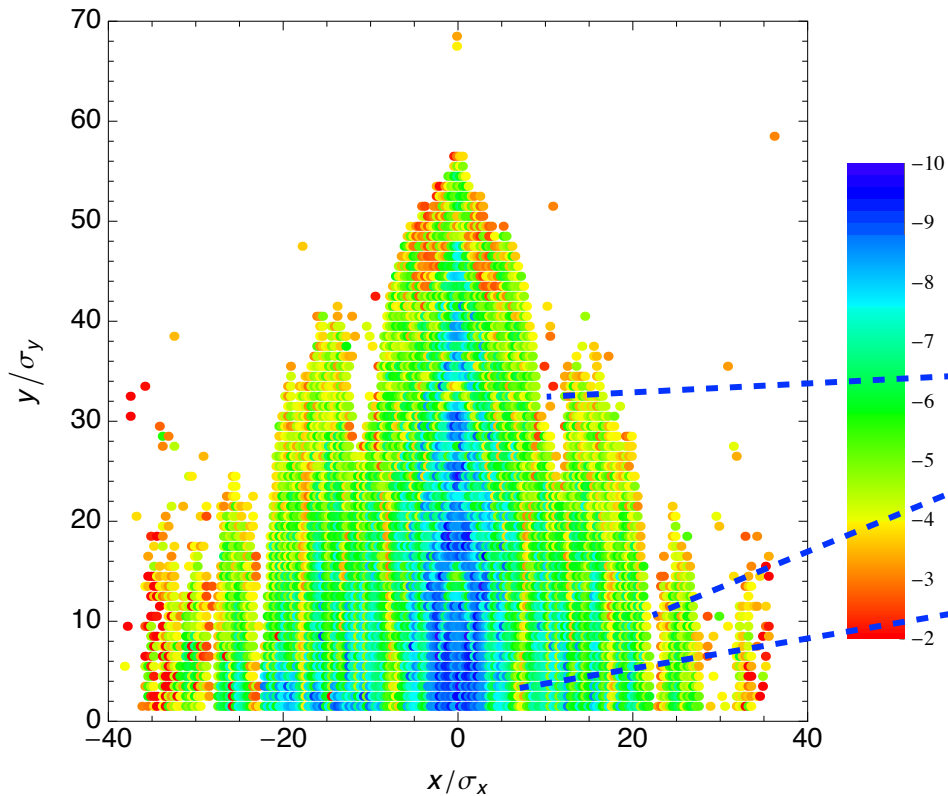
- 1) Visual information about resonances (width, strength and location) in the planes of betatron amplitude and tunes.**
- 2) Beam-beam interaction can be introduced.**

FMA for SuperKEKB:

- 1) Based on SAD (both tracking and FMA)**
- 2) weak-strong beam-beam**

2. sher_5740

Dynamic aperture (w/o beam):
Real space

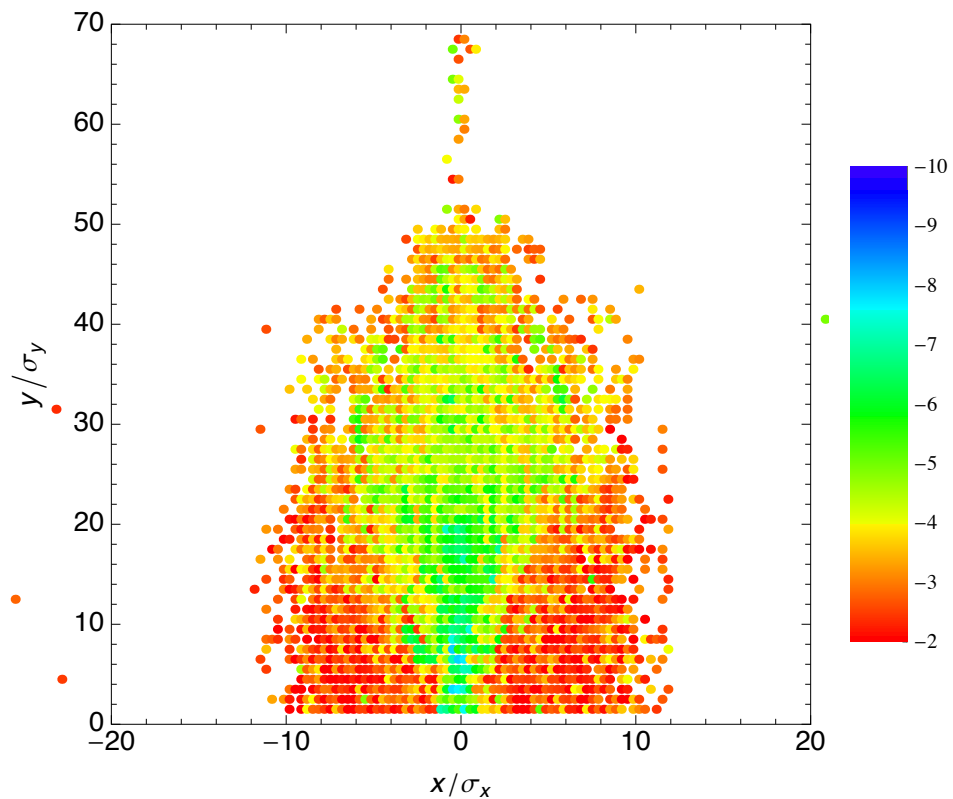


Resonance lines:
Blue: 4th order
Green: 5th order
Yellow: 6th order
Cyan: 7th order

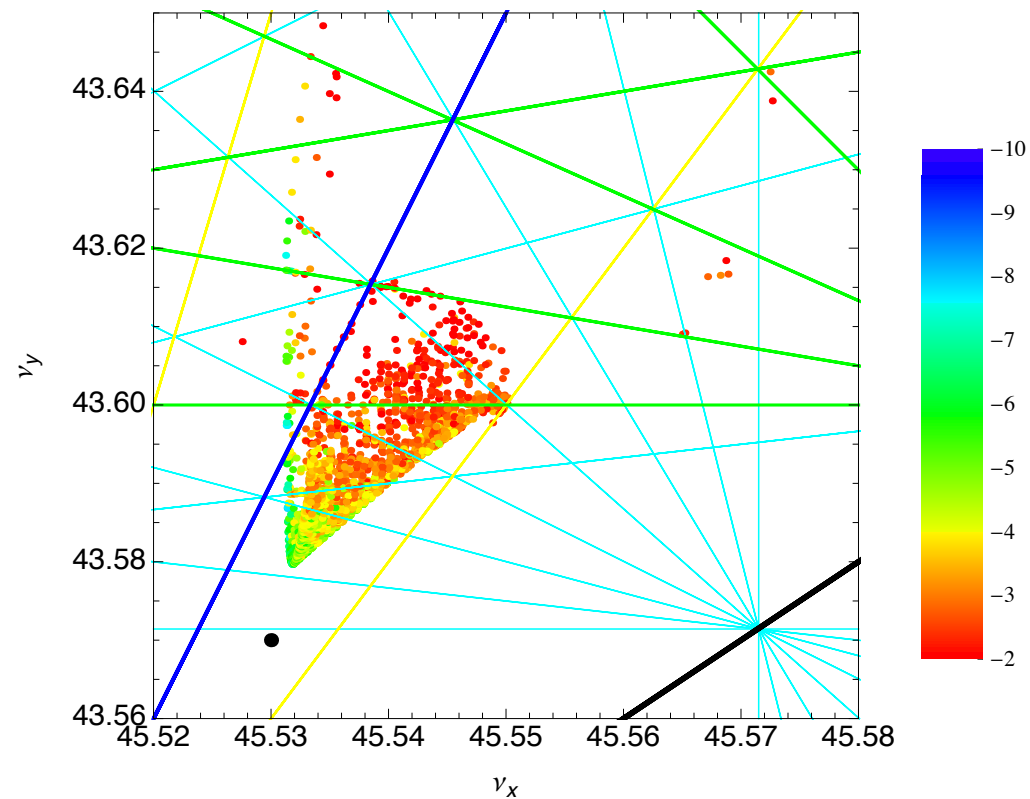
2. sher_5740

Dynamic aperture (w/ beam):

Real space



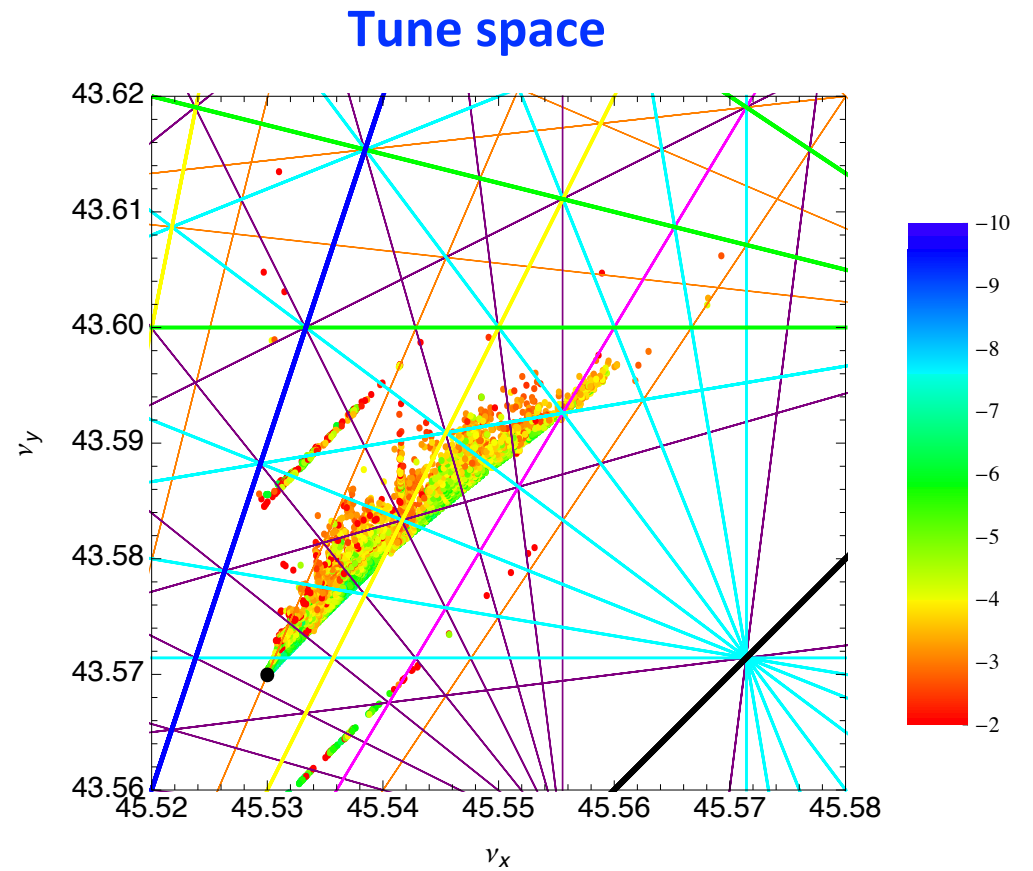
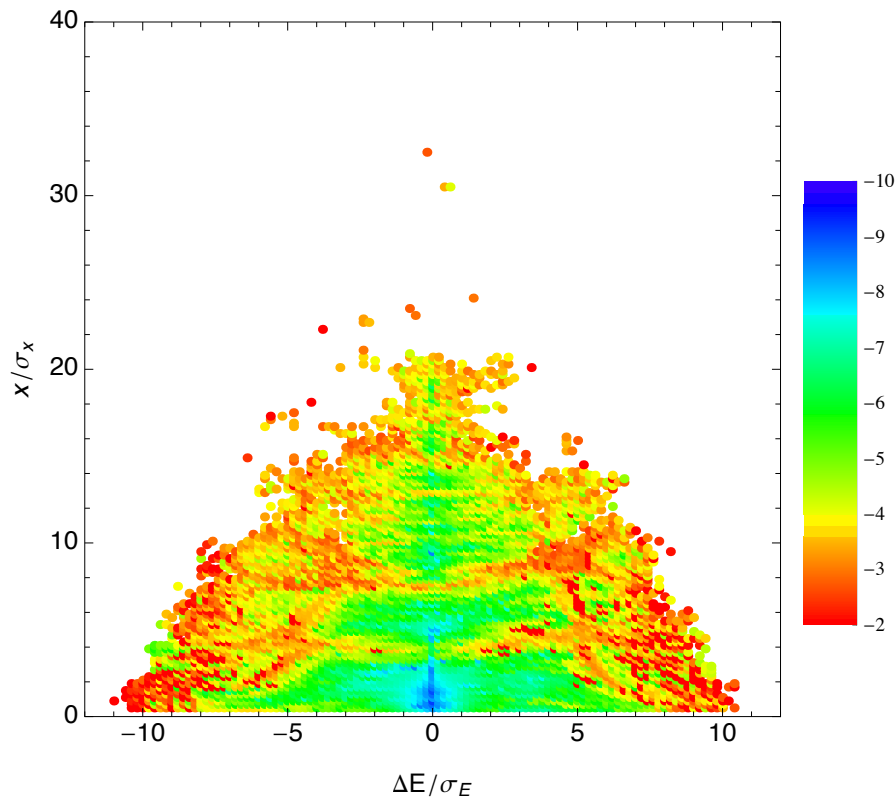
Tune space



More careful analysis: D. Shatilov, PRST-AB 14, 014001 (2011)

2. sher_5740

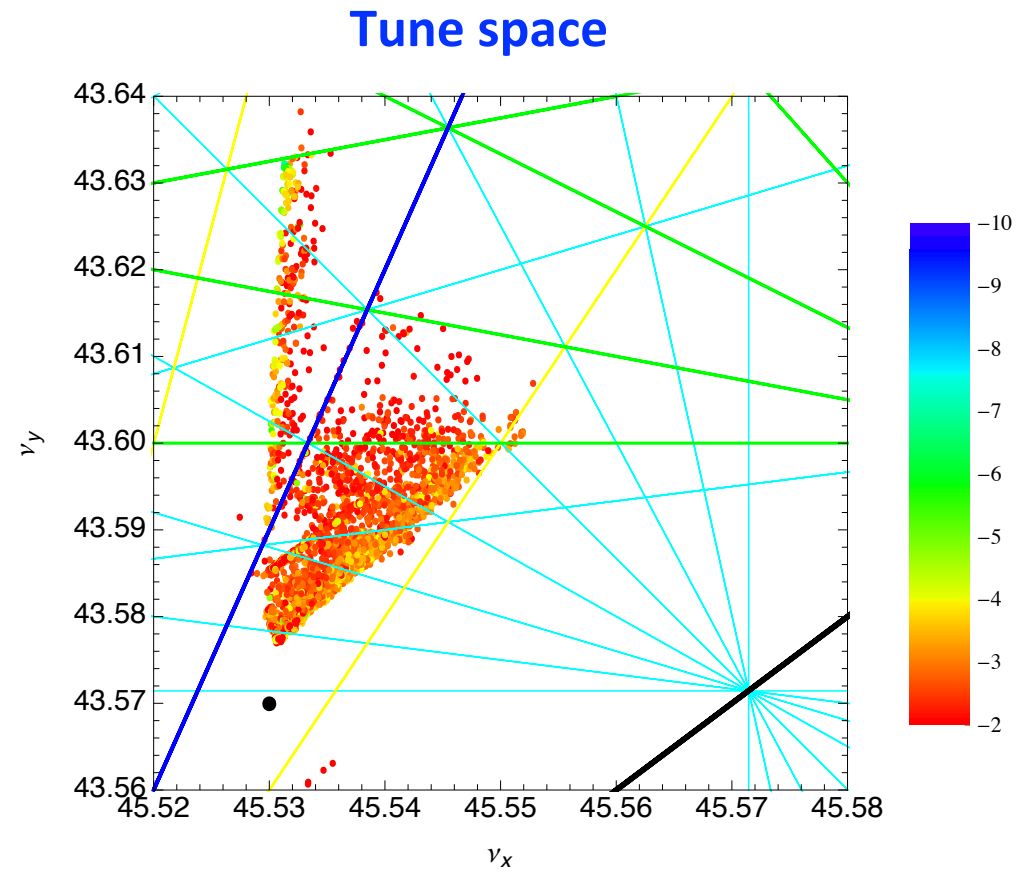
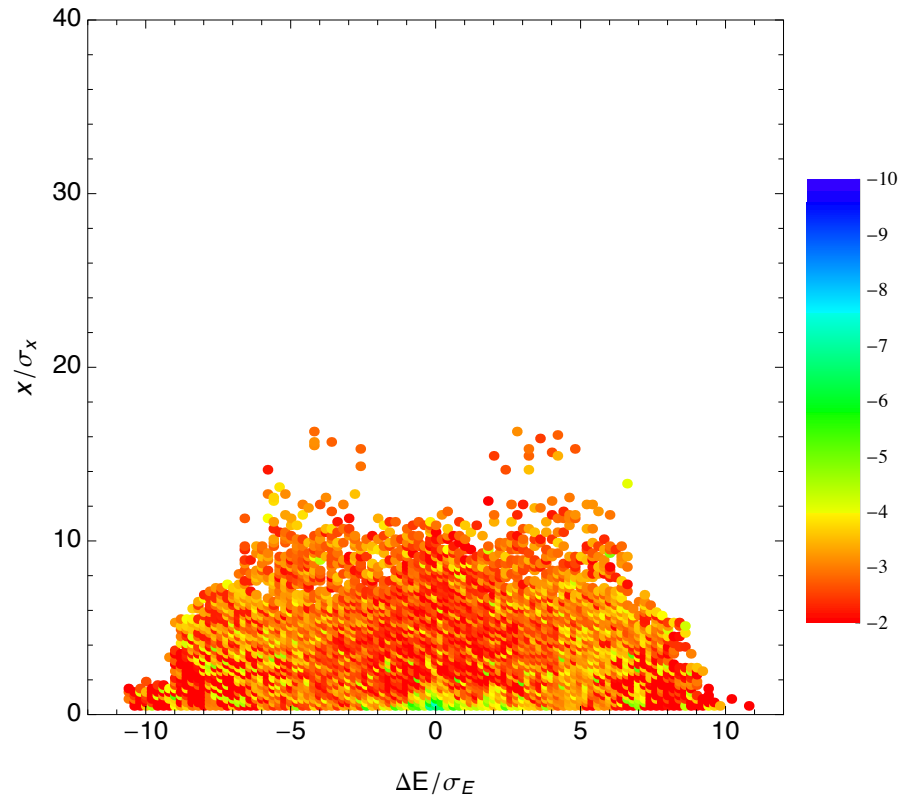
Momentum aperture (w/o beam):
 δ -x space



Resonance lines:
Blue: 4th order
Green: 5th order
Yellow: 6th order
Cyan: 7th order

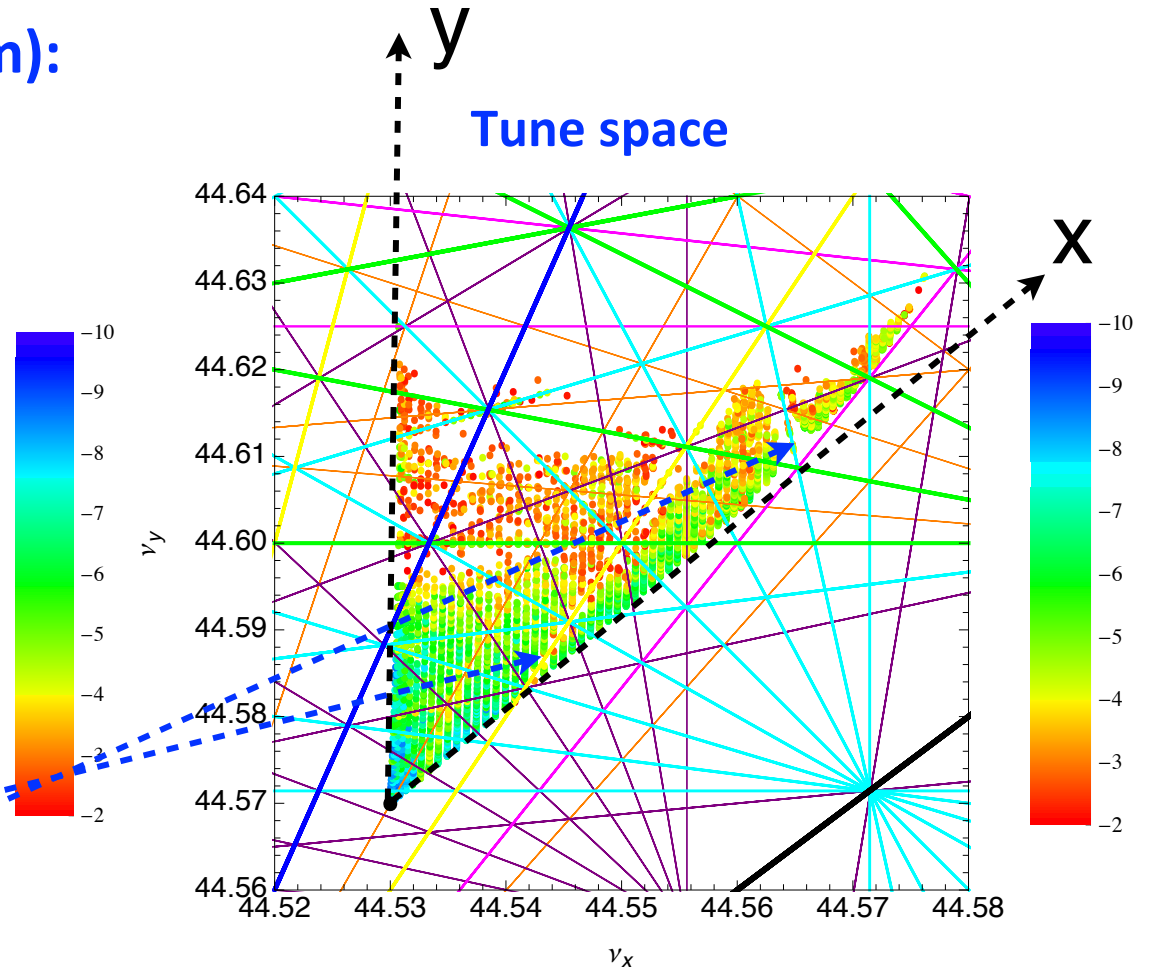
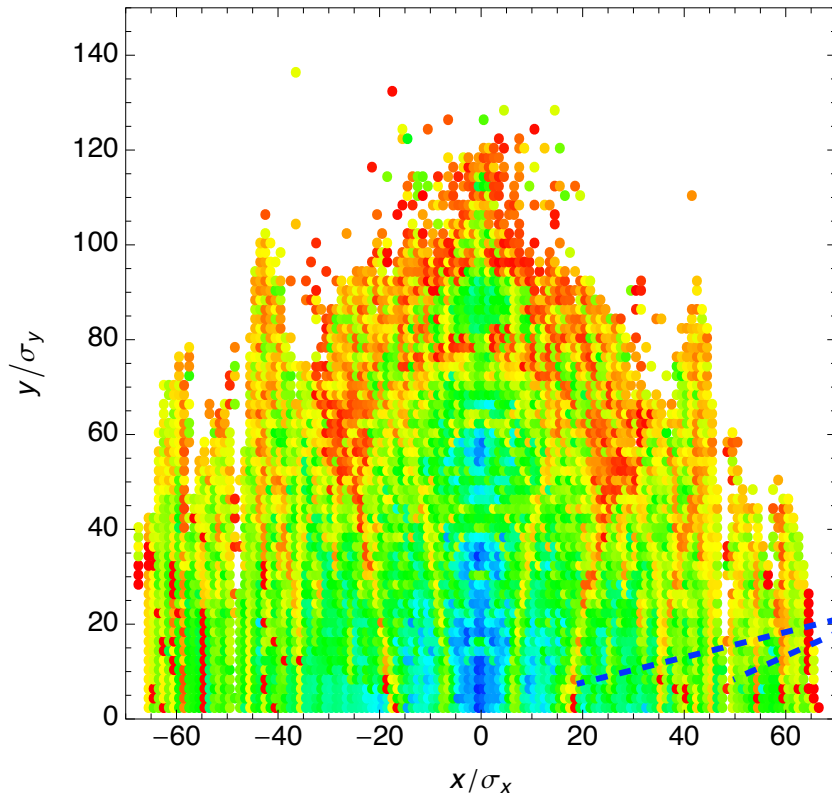
2. sher_5740

Momentum aperture (w/ beam):
 δ -x space



3. sler_1670

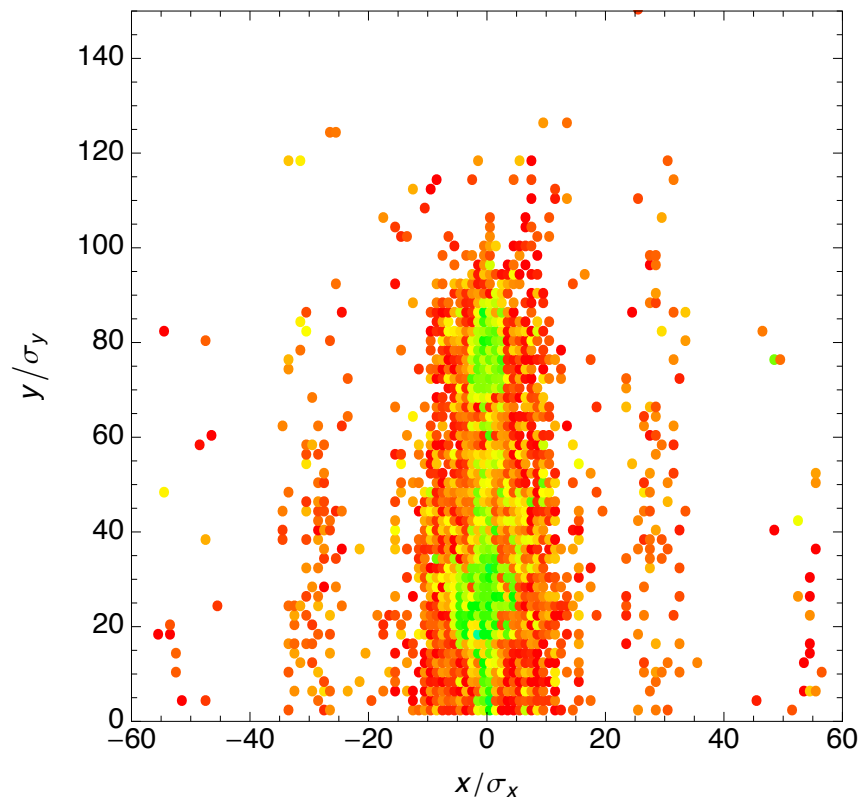
Dynamic aperture (w/o beam):
Real space



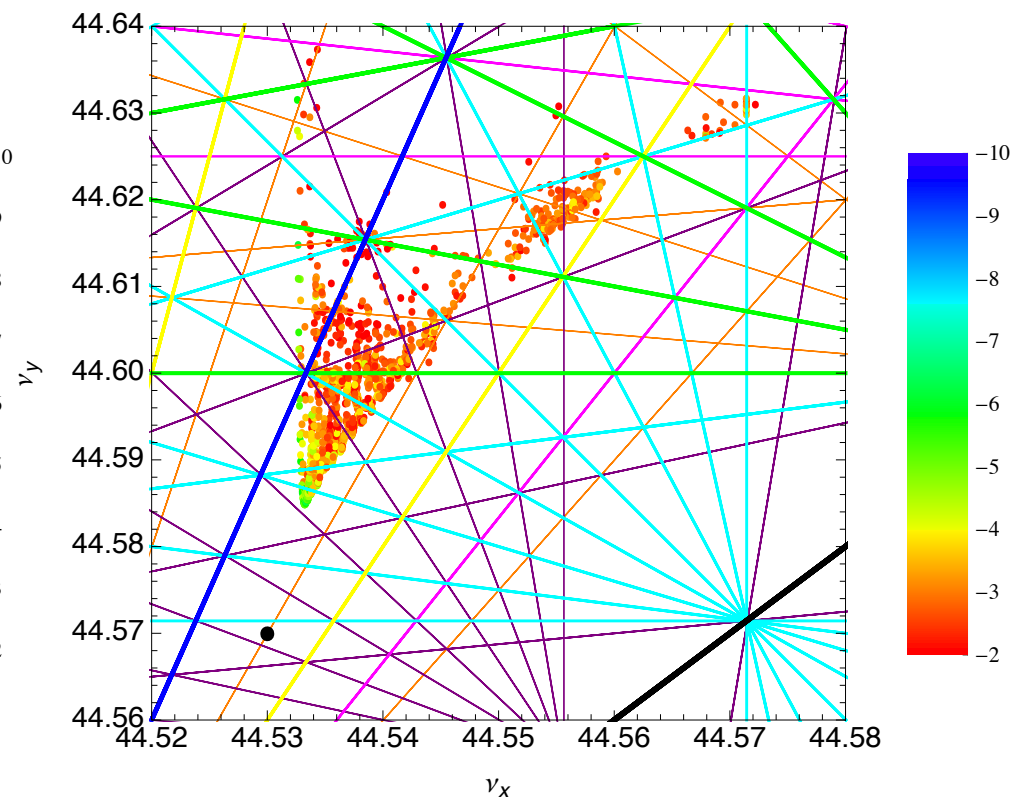
Resonance lines:
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3. sler_1670

Dynamic aperture (w/ beam):
Real space



Tune space



4. Future work

- Improve FMA for momentum aperture and beam-beam**
- Consider errors in FMA**
- Crab waist scheme**
- Investigate optics nonlinearities term by term**
- Strategies of optics optimization (like MOGA: Multi-Objective Genetic Optimization) with help of FMA**