Searching for the HOMs in SLSA: Vertical Plane

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September 21, 2015

General Methodology

- Use iGp12 to map out instability growth rates as a function of IVU gaps;
- Set up an improvised antenna in the tunnel to observe HOM signals;
- Fill the ring with a single bunch to excite a comb of revolution harmonics;
- For each measured even-fill eigenmode M, perform a scan of revolution harmonics $N \times h + M$ from the lowest one to 8 GHz;
- At each frequency, record signal levels at two IVU gap settings that produce a large change in the growth rate;
- Lines that are sensitive to the IVU gap changes are our prime suspects.

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- We use an uncontrolled sensing method, many paths to the antenna;
- Many modes are above the beam pipe cut-off;
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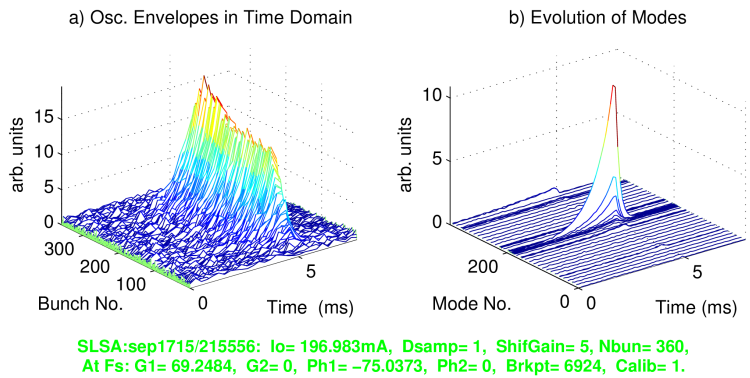

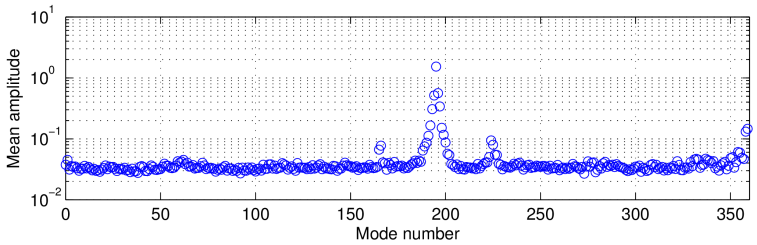

- Grow/damp measurement at 197 mA;
- Sector 5 IVU at 6.31 mm;
- Modes 166, 195, 224, and 359 grow;
- These are even fill eigenmodes, but the fill is uneven.
- How to separate projections of the same mode from independent eigenmodes?

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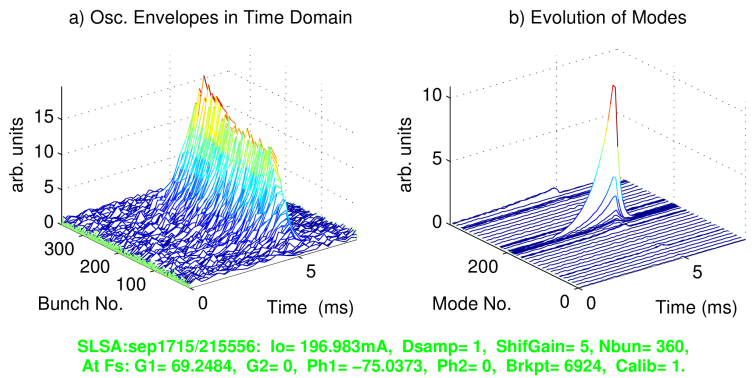

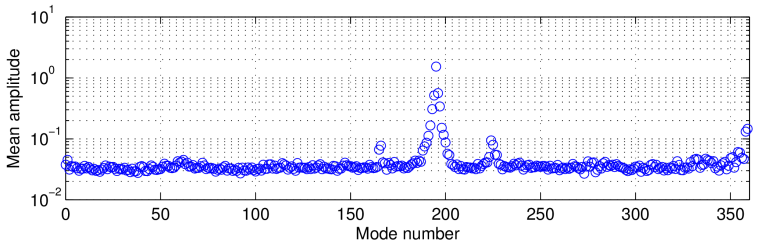

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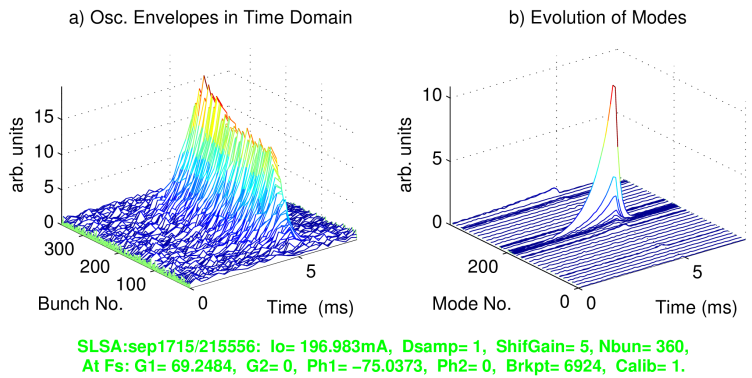

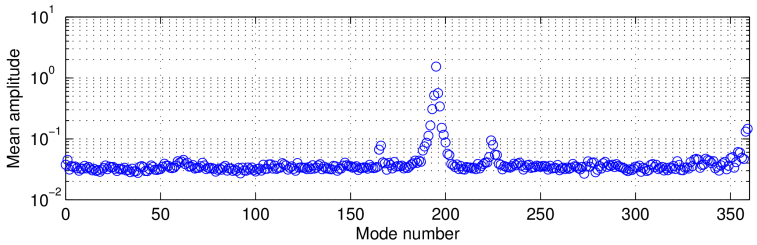

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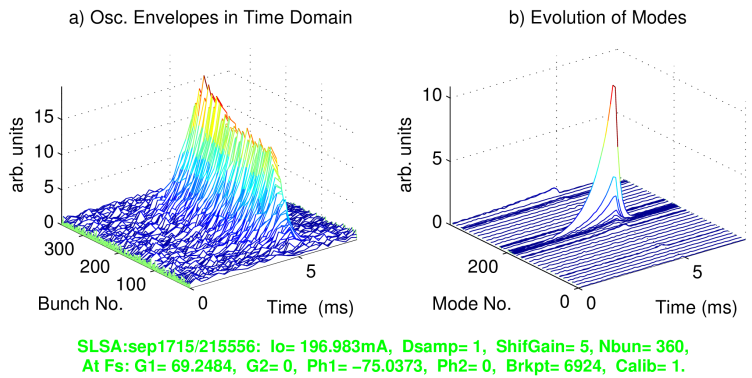

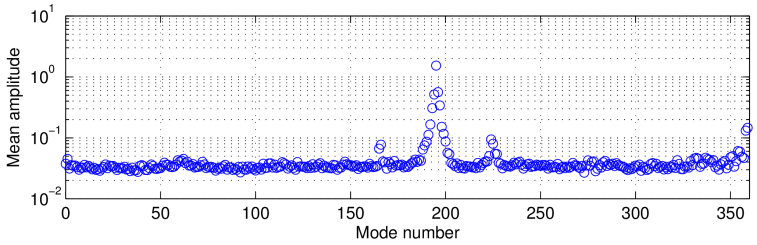

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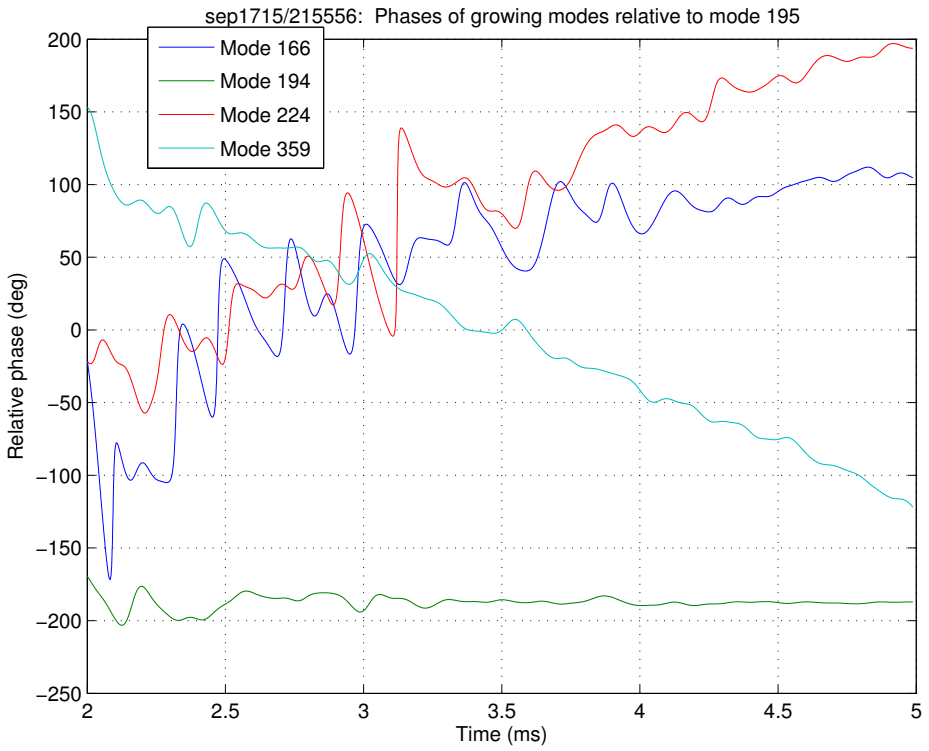

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- Projections of one eigenmode are phase locked;
- True eigenmodes typically have tune shifts, i.e. phase slope;
- Mode 194 is phase locked to 195, others show tune shifts.

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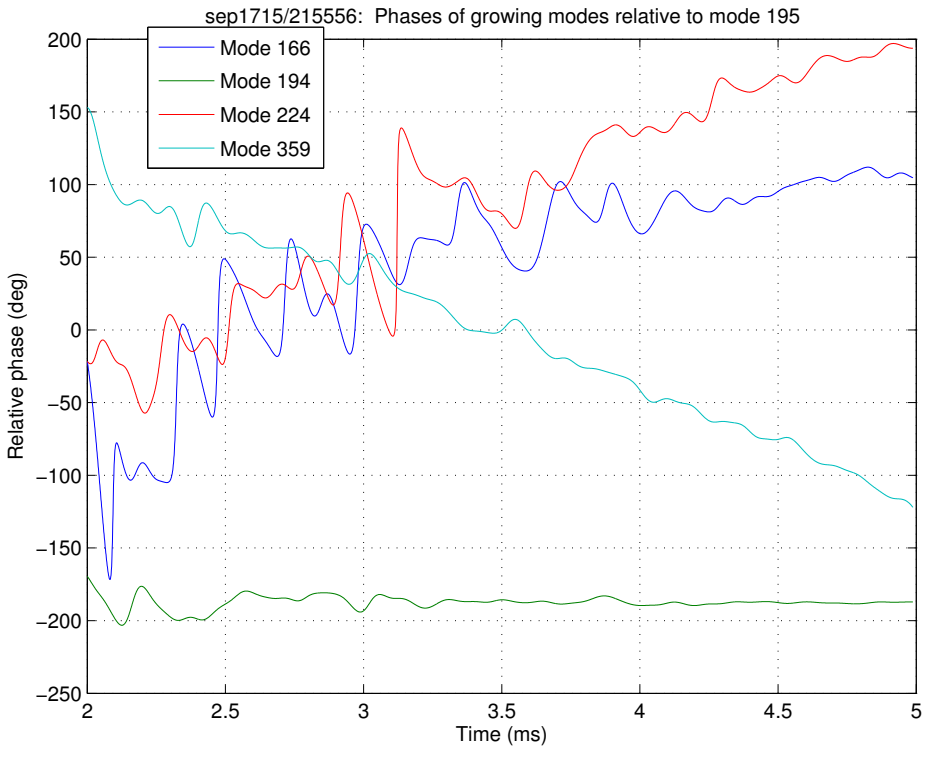

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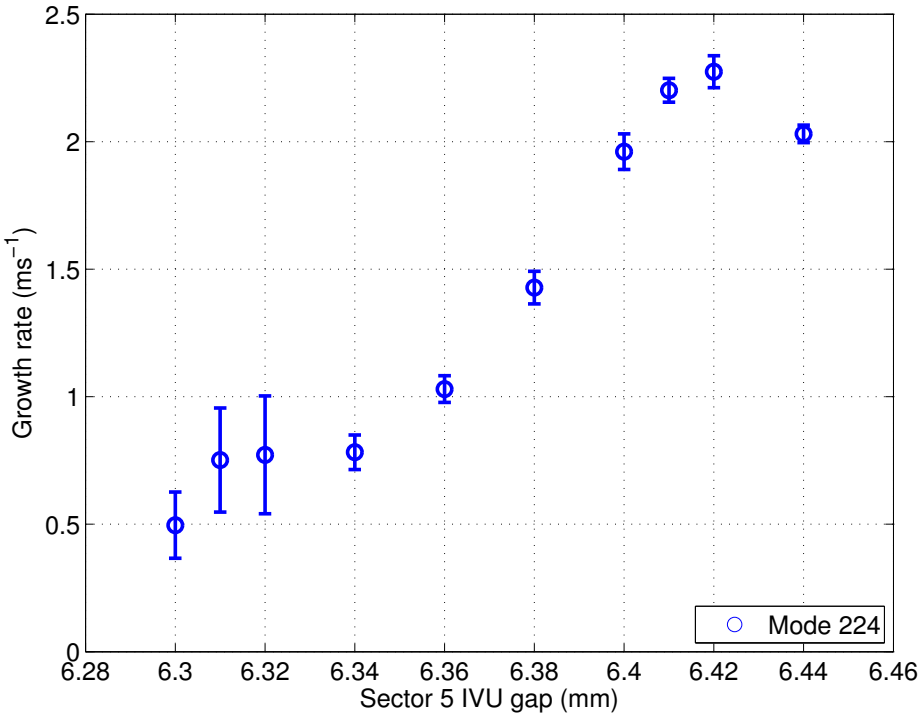
Growth Rates vs. Sector 5 IVU Gap



- 128 data sets, 1.1 Gbytes;
- Other IVU gaps are 7.63 and 7.46 mm;
- Mode 224 clearly responds to the gap changes;
- Mode 195 is constant;
- Mode 166 is also constant.

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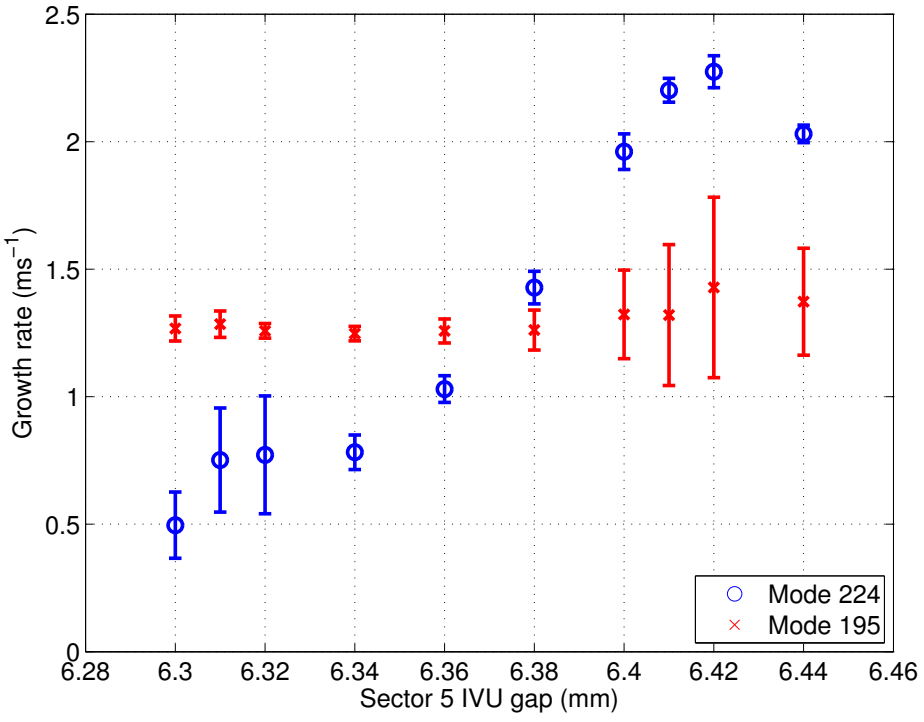

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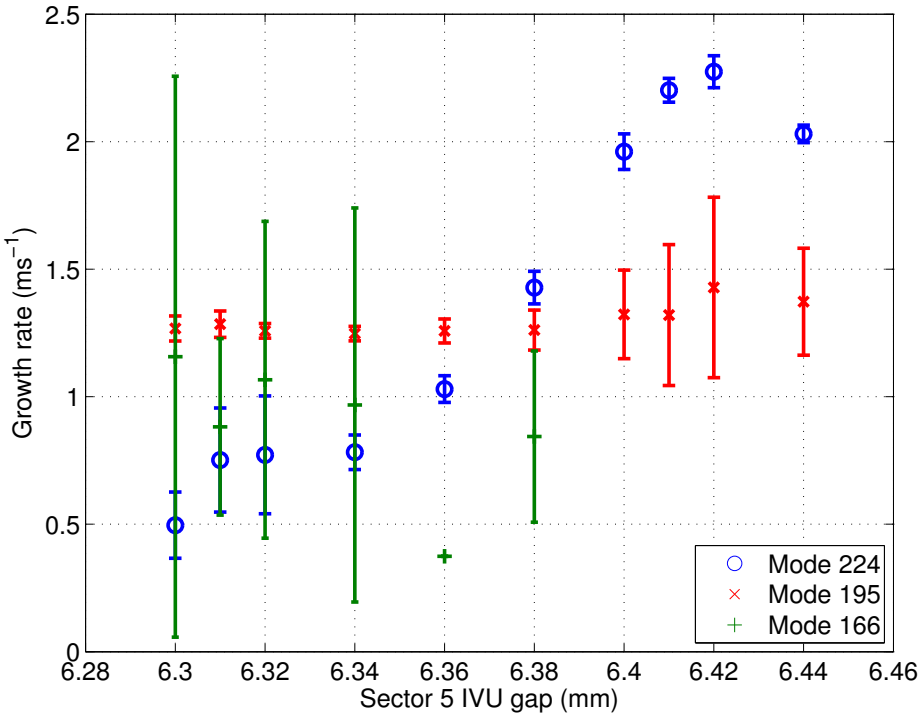

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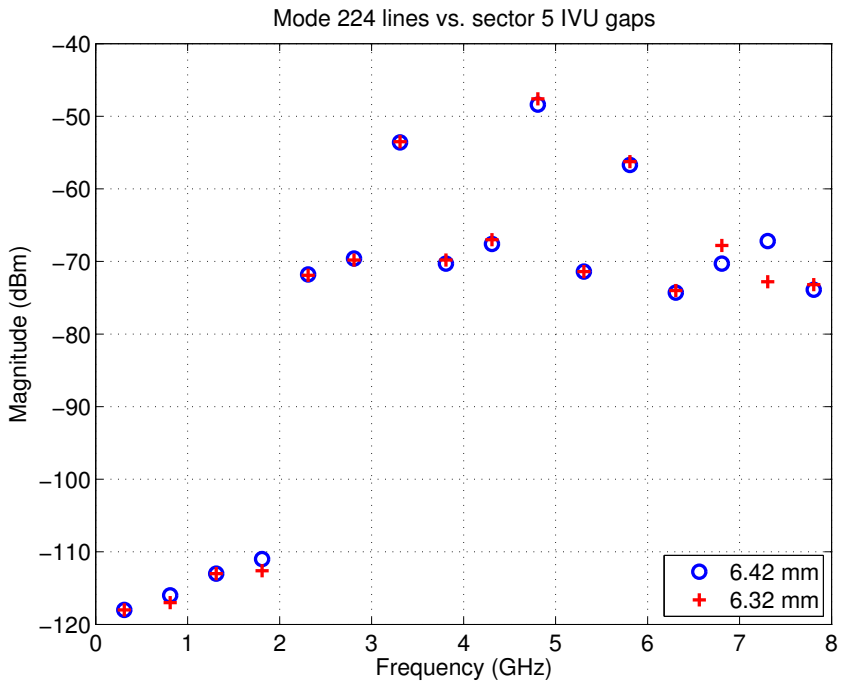

- Search lines at $f_{\mathrm{rf}} \times (N + 224/360)$;
- Clearly see beam pipe cut-off;
- Measure at two IVU gap settings that give a large growth rate change;
- Detailed scan of IVU gaps points to 7.3 GHz;
- Imperfect agreement, maybe a wider growth rate scan is needed.

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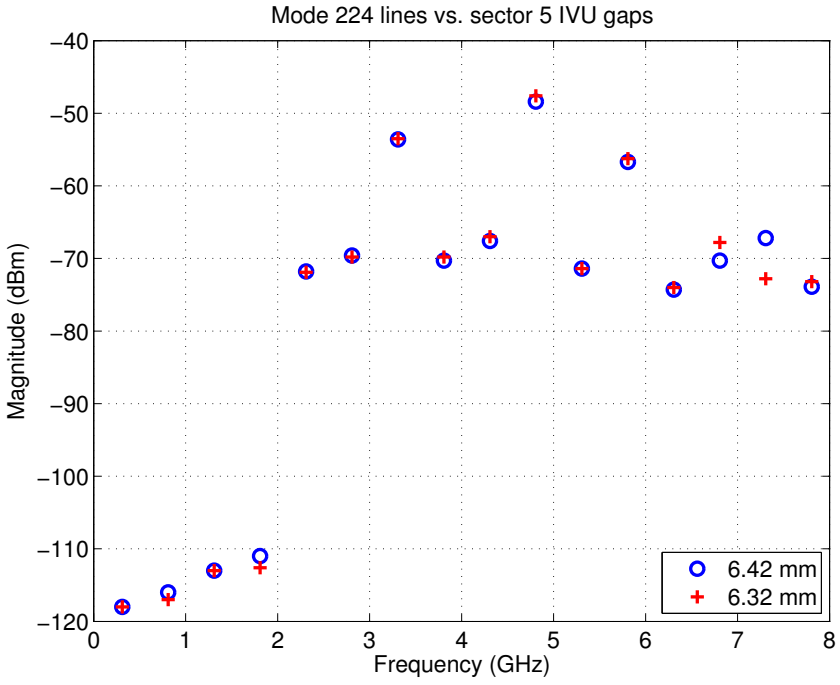

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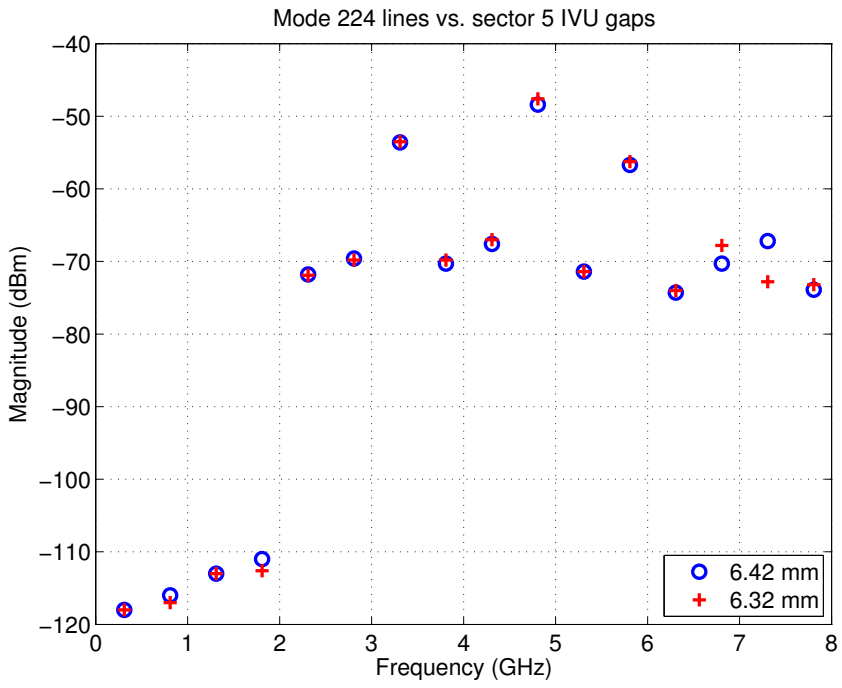

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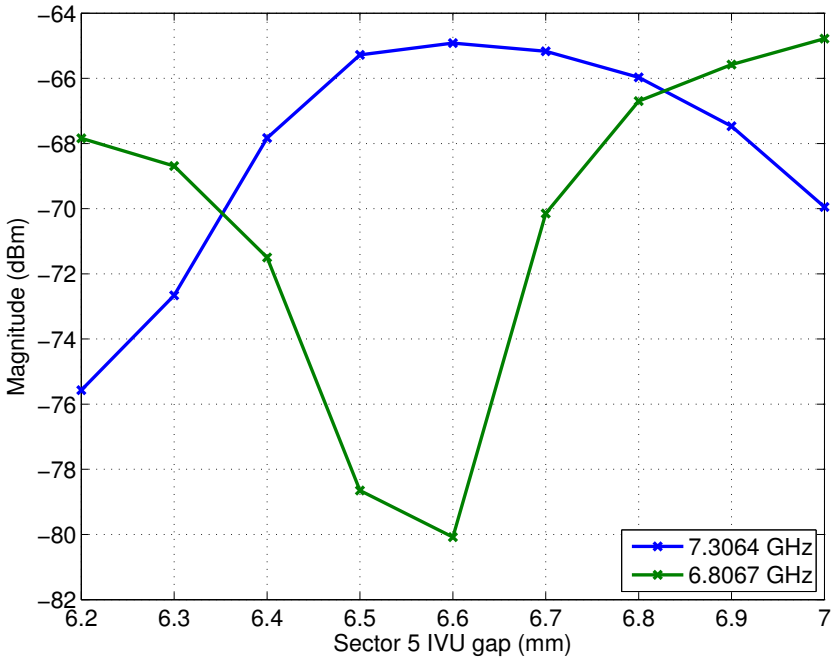

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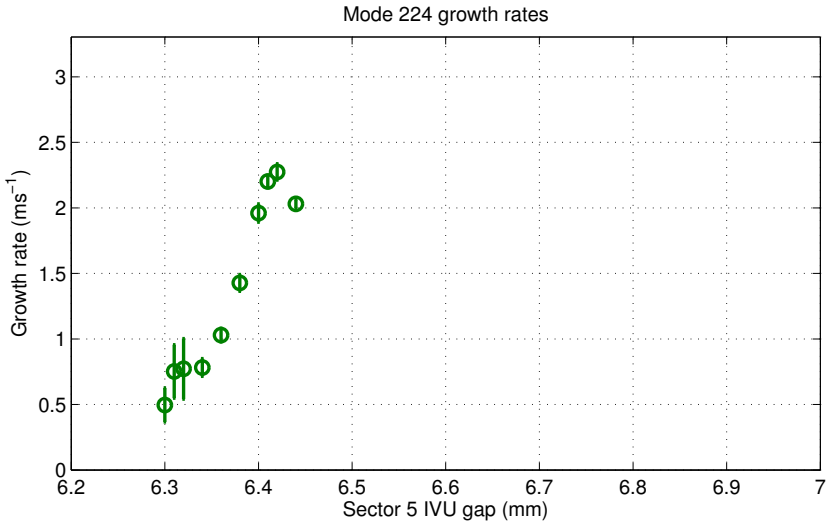

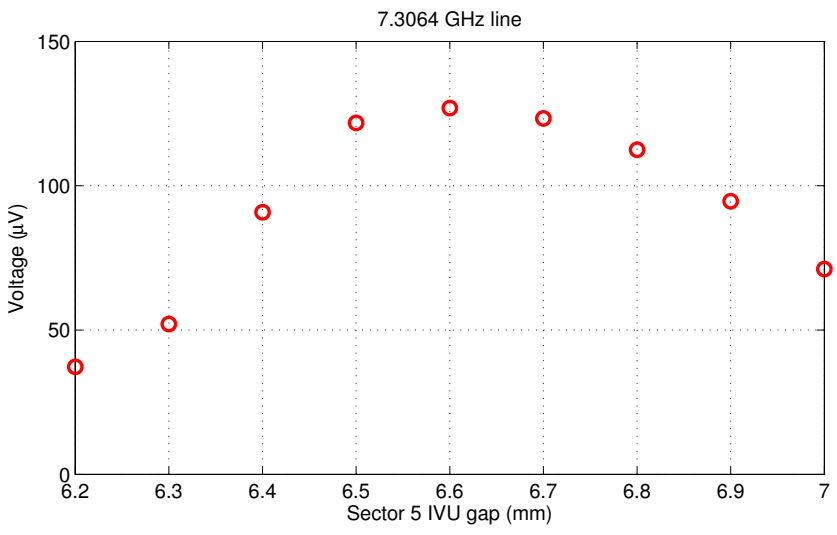

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