Optical Aberrations in a Gas Lenses

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Gas Lenses

- Gas Lenses and M²
- Spinning Pipe Gas Lens
  - CFD Model
  - Experimental Results
- Flame Lens
  - CFD Model
  - Experimental Results
- Conclusion

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Aberrations and M²

Φ

Φ

Incoming flat

Incoming aberrated wavefront

σ

M²=1

M²>1

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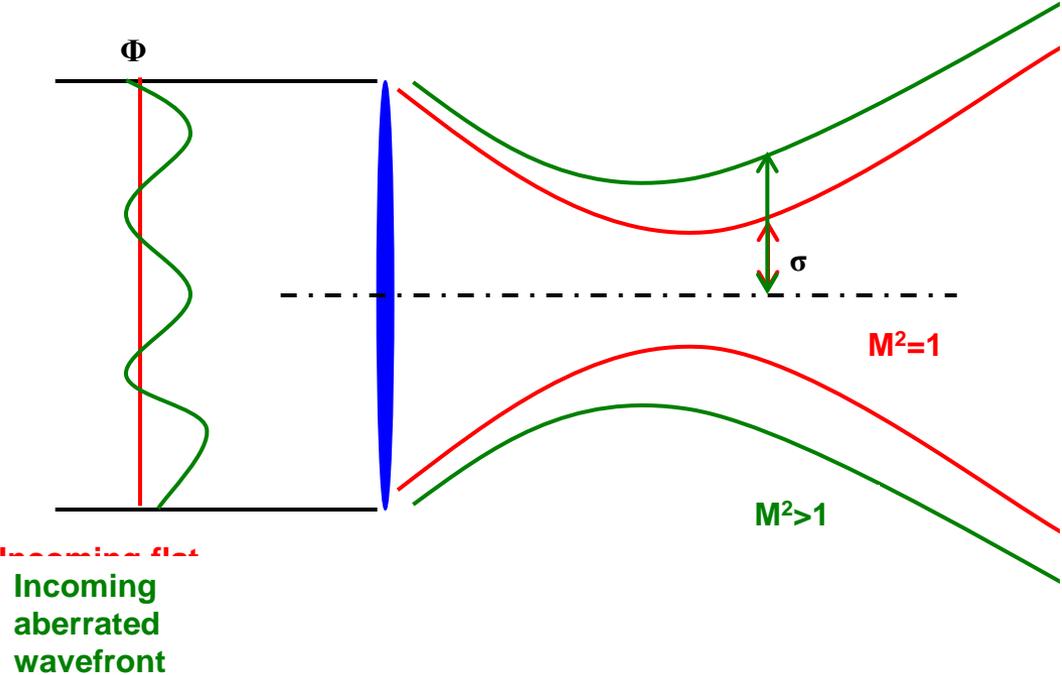
CFD Models – velocity vectors

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CFD Model - density

STAR
pro-STAR 3.2
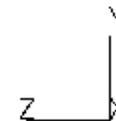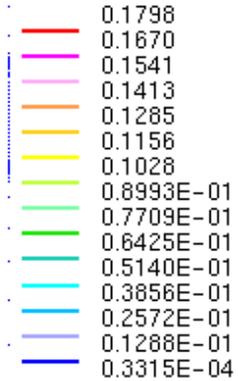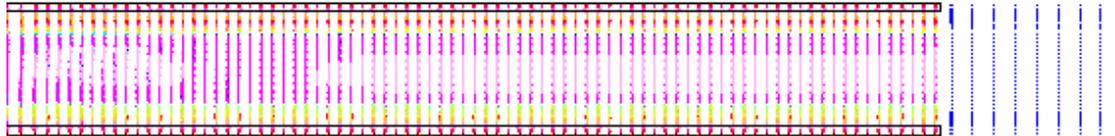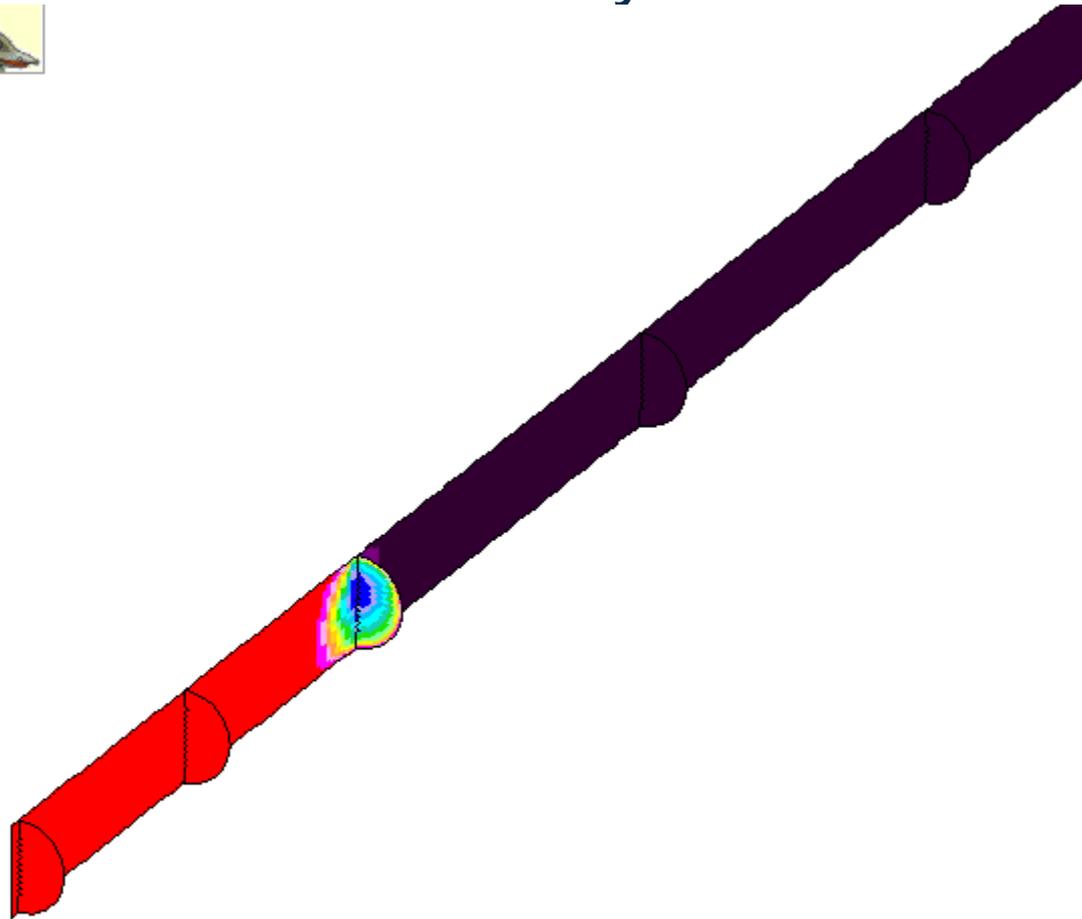
DENSITY
KG/M**3
TIME = 0.100000E-02

■	1.019
	1.009
■	0.9990
■	0.9890
■	0.9790
■	0.9690
■	0.9590
■	0.9490
■	0.9390
■	0.9290
■	0.9190
■	0.9090
■	0.8990
■	0.8890
■	0.8790
■	0.8690
■	0.8590
■	0.8490
■	0.8390
■	0.8290
■	0.8190

Gas Lens
0Hz, 373K

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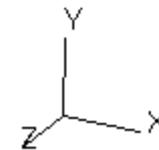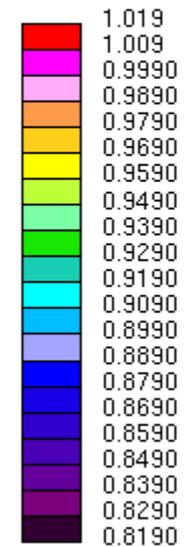
Spinning Pipe Gas Lens (SPGL)

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Experimental set-up

FM

FM

FM

Beam expander ×10

Neutral density filters

HeNe laser

Shack-Hartmann wavefront sensor

Spinning pipe gas lens

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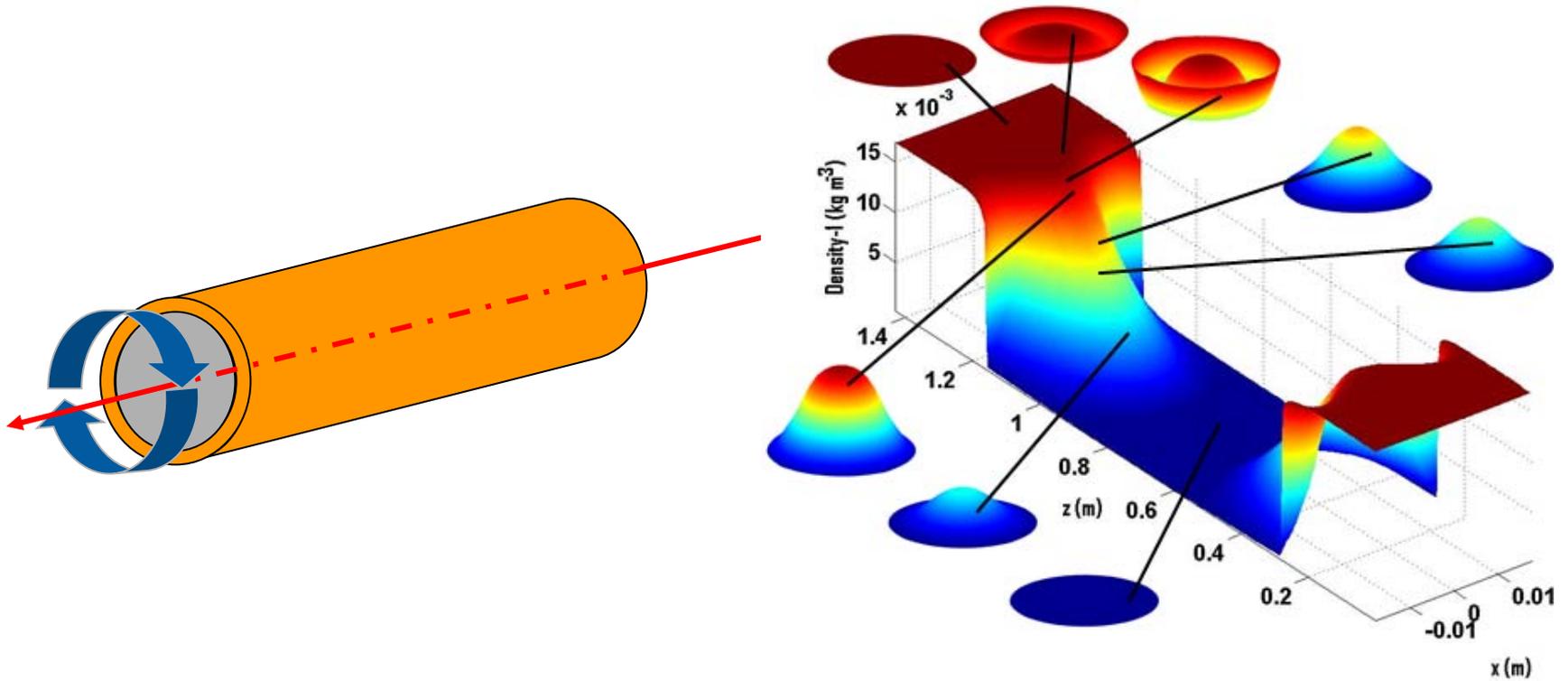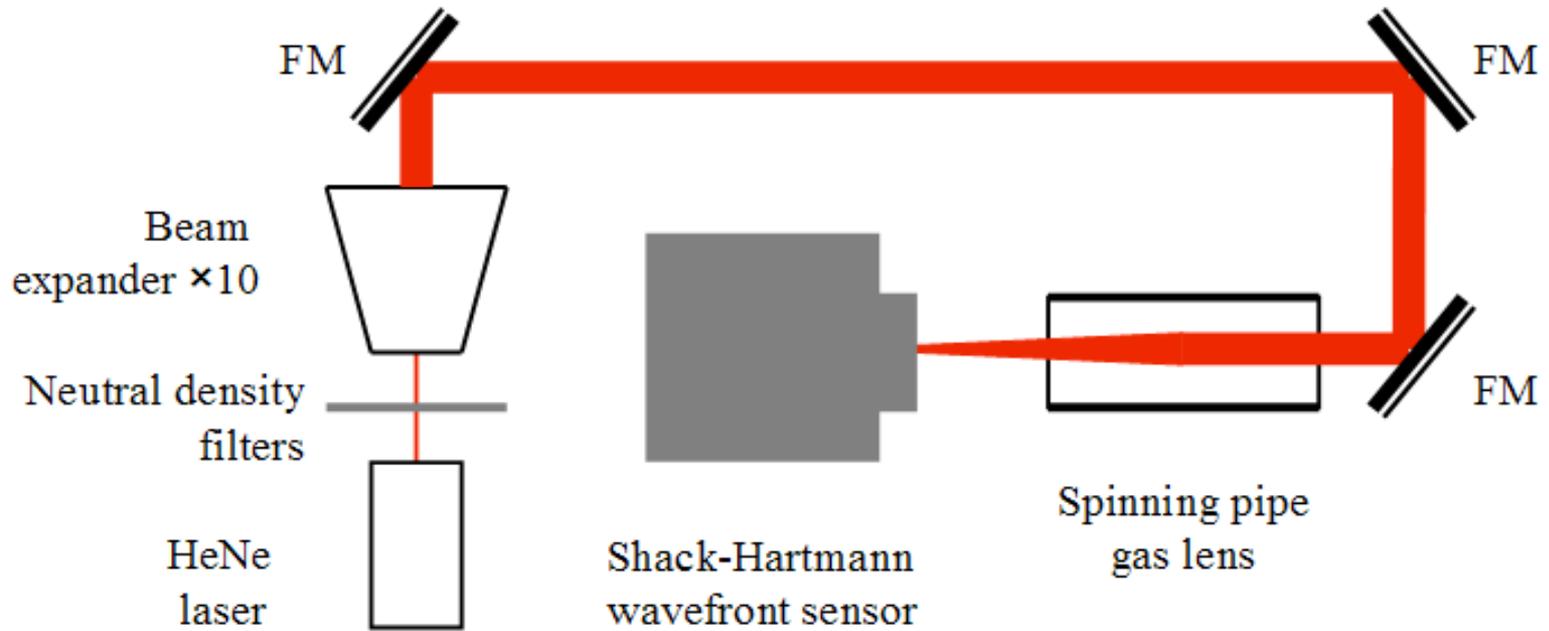
Model and experiment

Tilt (heated but stationary)
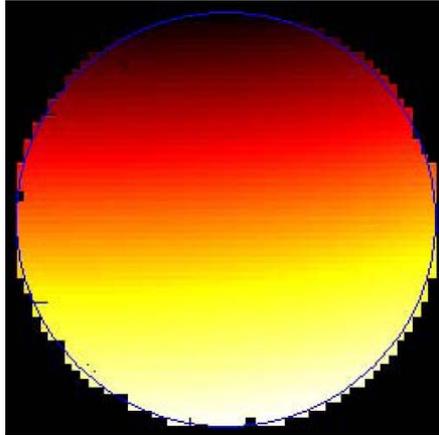
Defocus (steady state rotation)
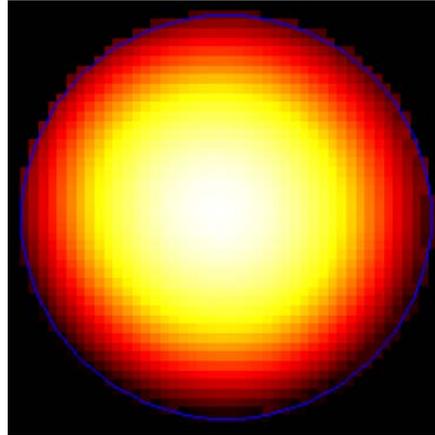
Phase minus defocus + tilt
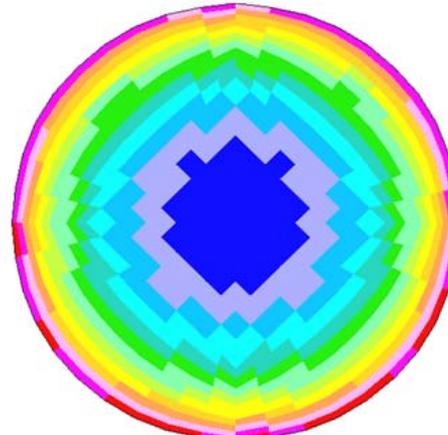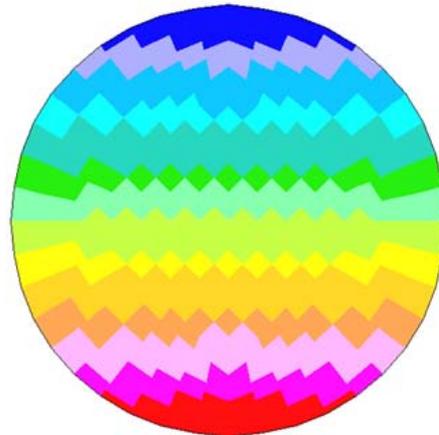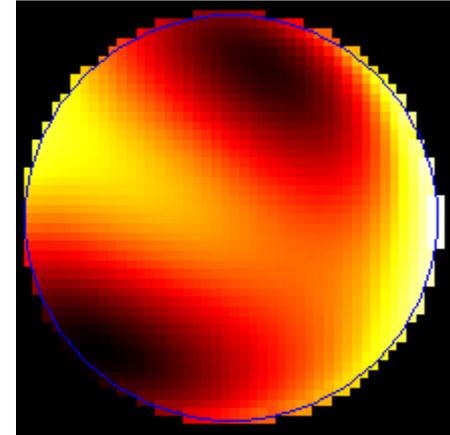
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Tilt

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Lensing

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Aberrations and M²

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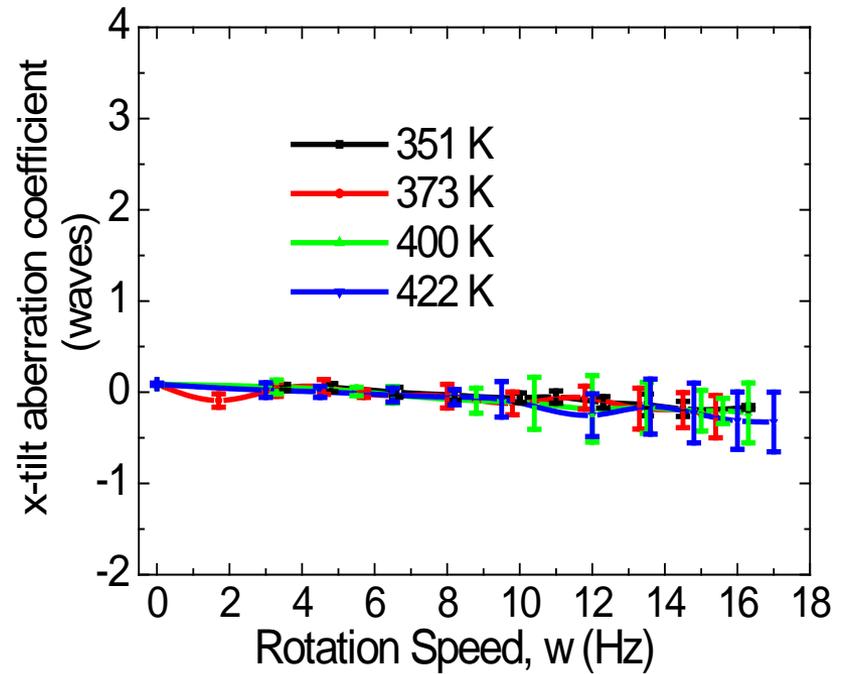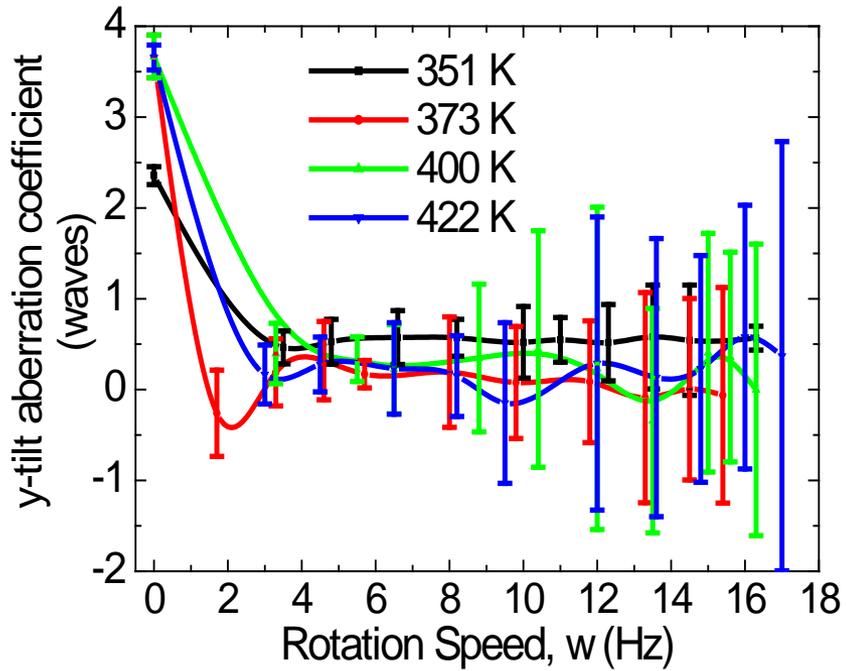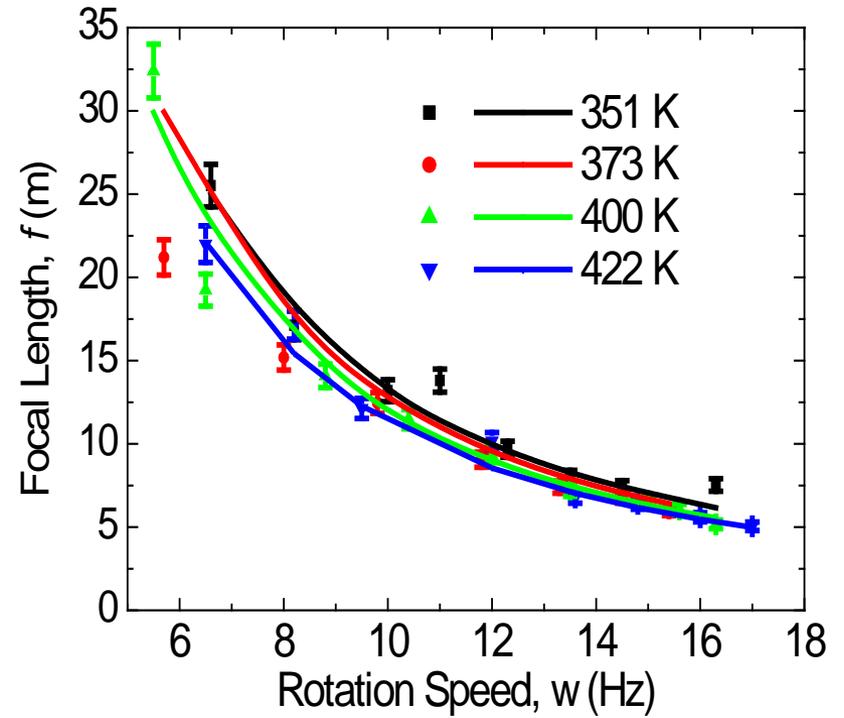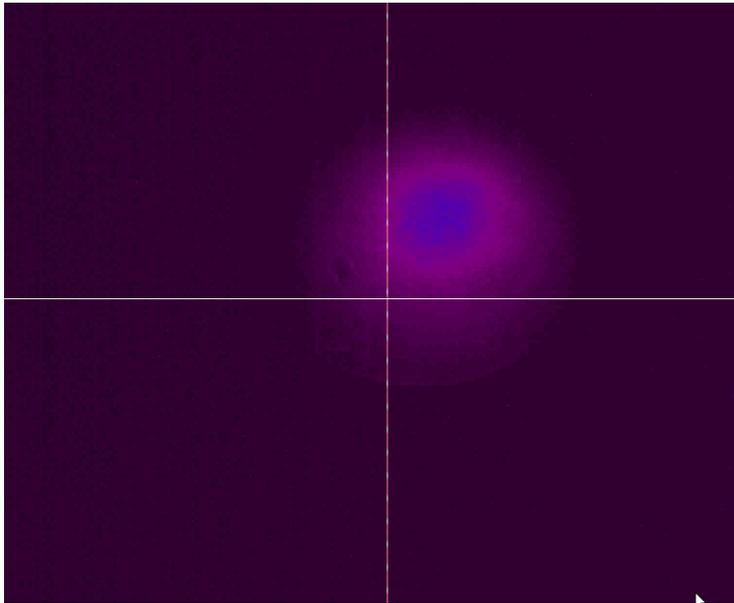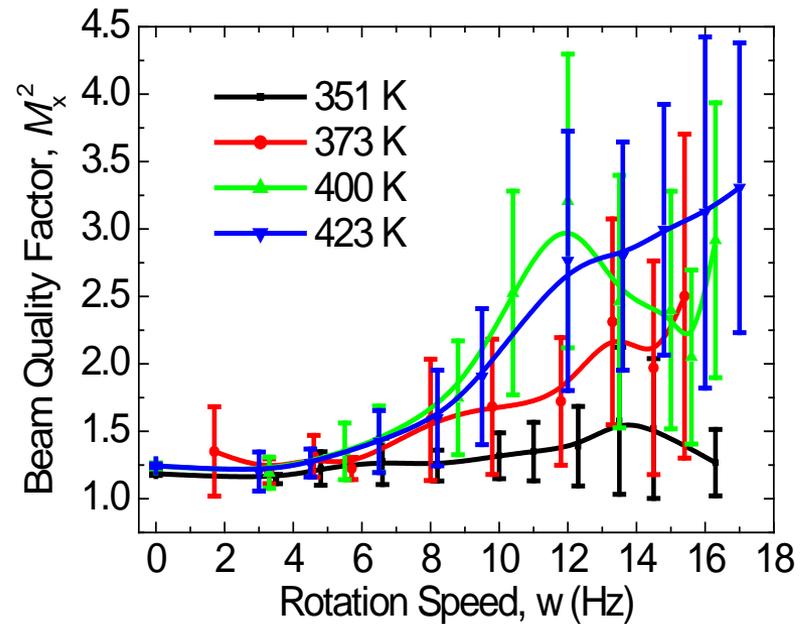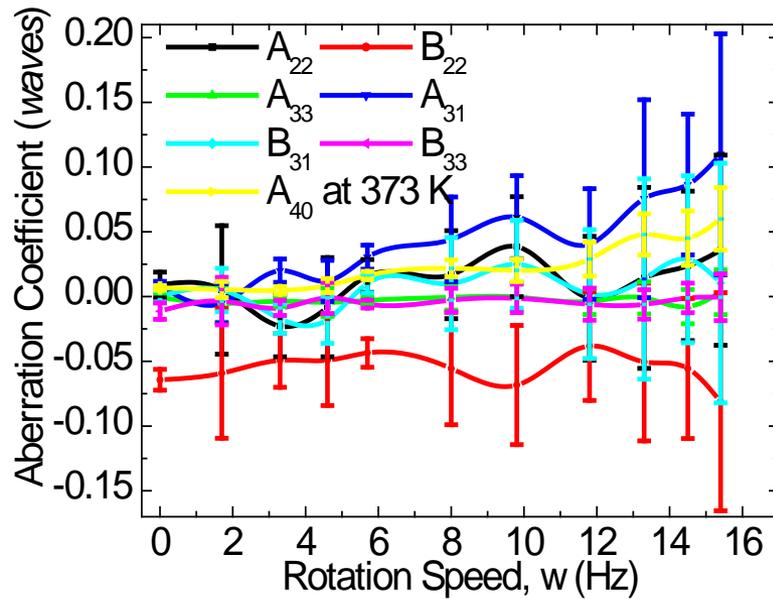
Future work

- Higher order aberrations leads to loss of beam quality which means we can improve M^2 by eliminating aberrations

- Measurement of changes to M^2 caused by selected amounts of specific aberrations

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Thank You