

Objectives

- 6 to 8 μm single pass upconversion unit for hyperspectral imaging with a broadband illumination source
- Mid-IR Hyperspectral imaging using tunable QCL as narrowband illumination source (ESR 12)
- Application of tunable MOPA system as tunable mixing laser for hyperspectral imaging (ESR 5)
- Hyperspectral Imaging of oesophageal cancer tissues (ESR 1)

Goals achieved

- MIR upconversion using AGS non-linear crystal and 1.064 μm mixing laser
- Scanning of the phase matching condition is done via crystal rotation
- Post processing of the simulated images to get monochromatic images
- Upconversion with narrow band light source i.e. QCL
- Spatial Resolution of 14.3 lines/mm (70 μm) has been achieved

Setup

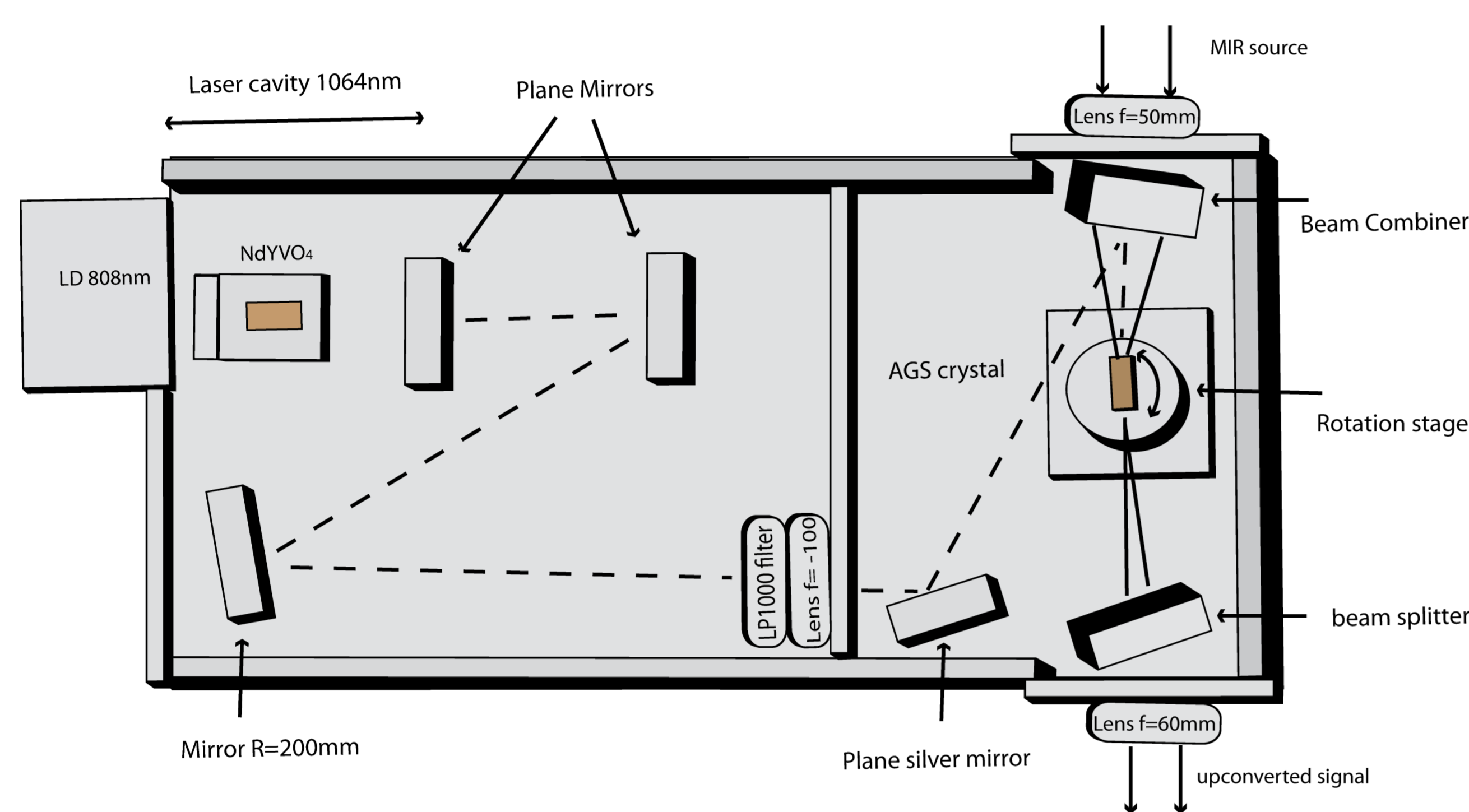


Figure 1 : Upconversion unit containing AGS crystal and 1064nm mixing laser

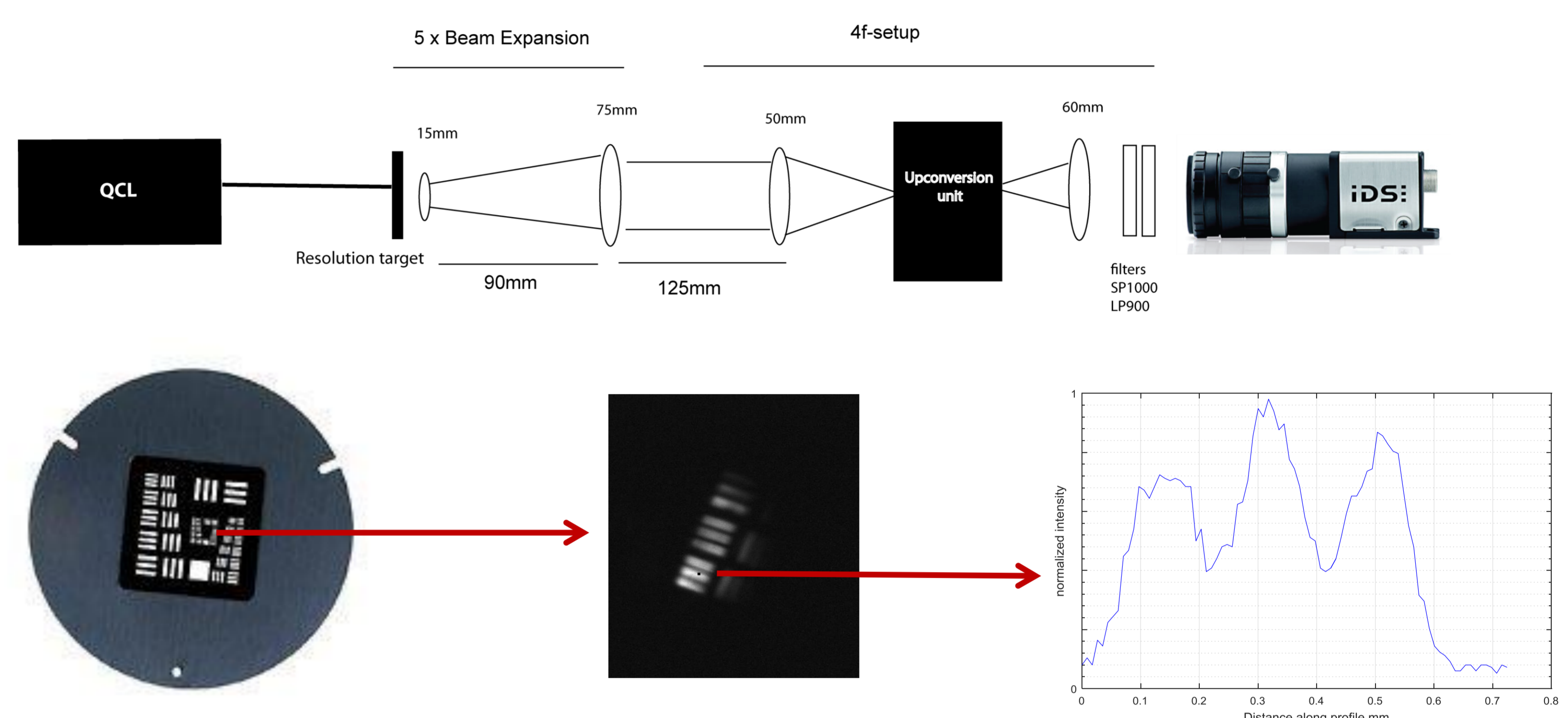


Figure 2 : Setup for hyperspectral imaging using a QCL as narrowband illumination source. Resolution of 14.3 lines/mm has been achieved

Results

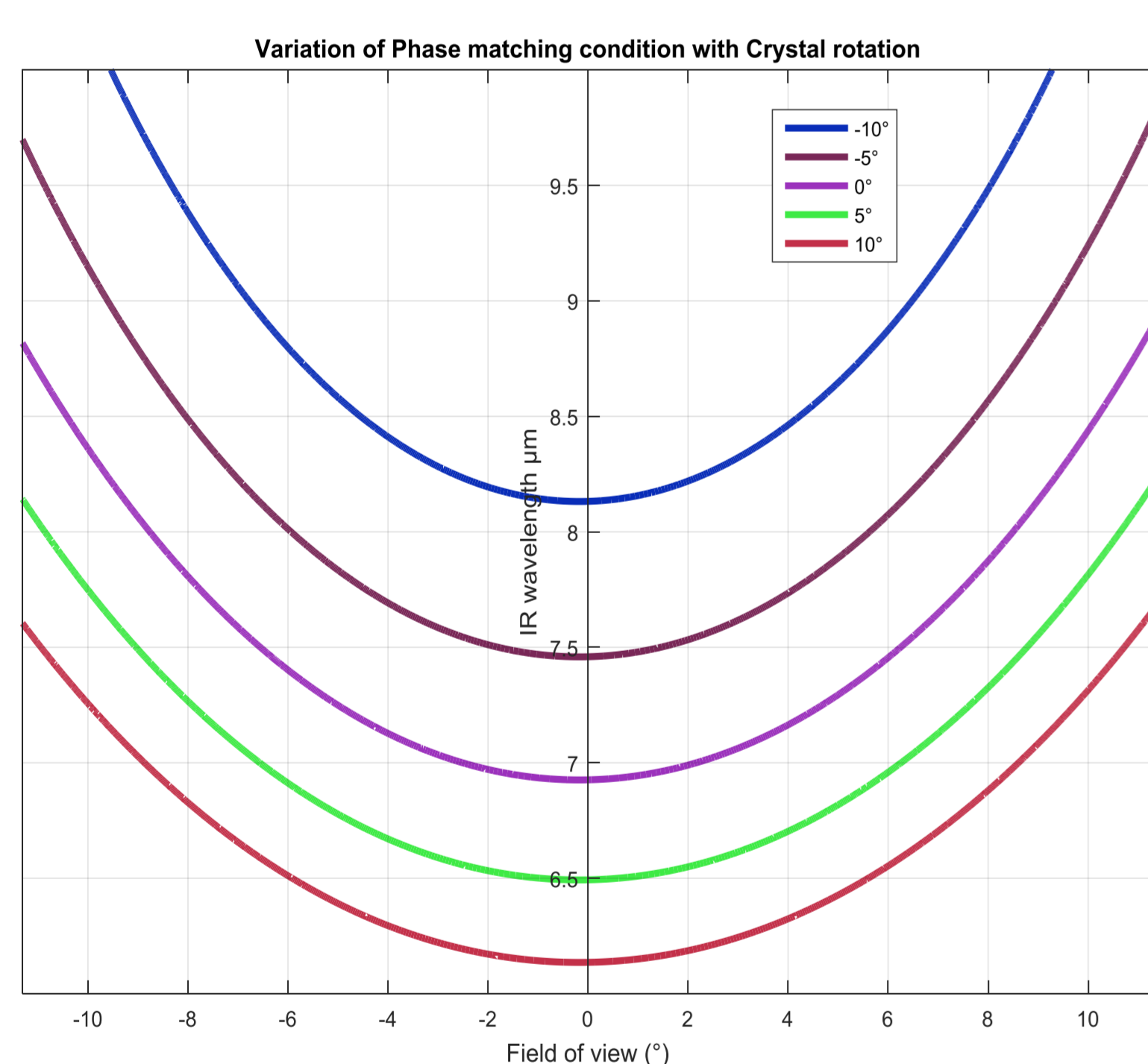


Figure 3: Non-collinear phase matching with crystal rotation

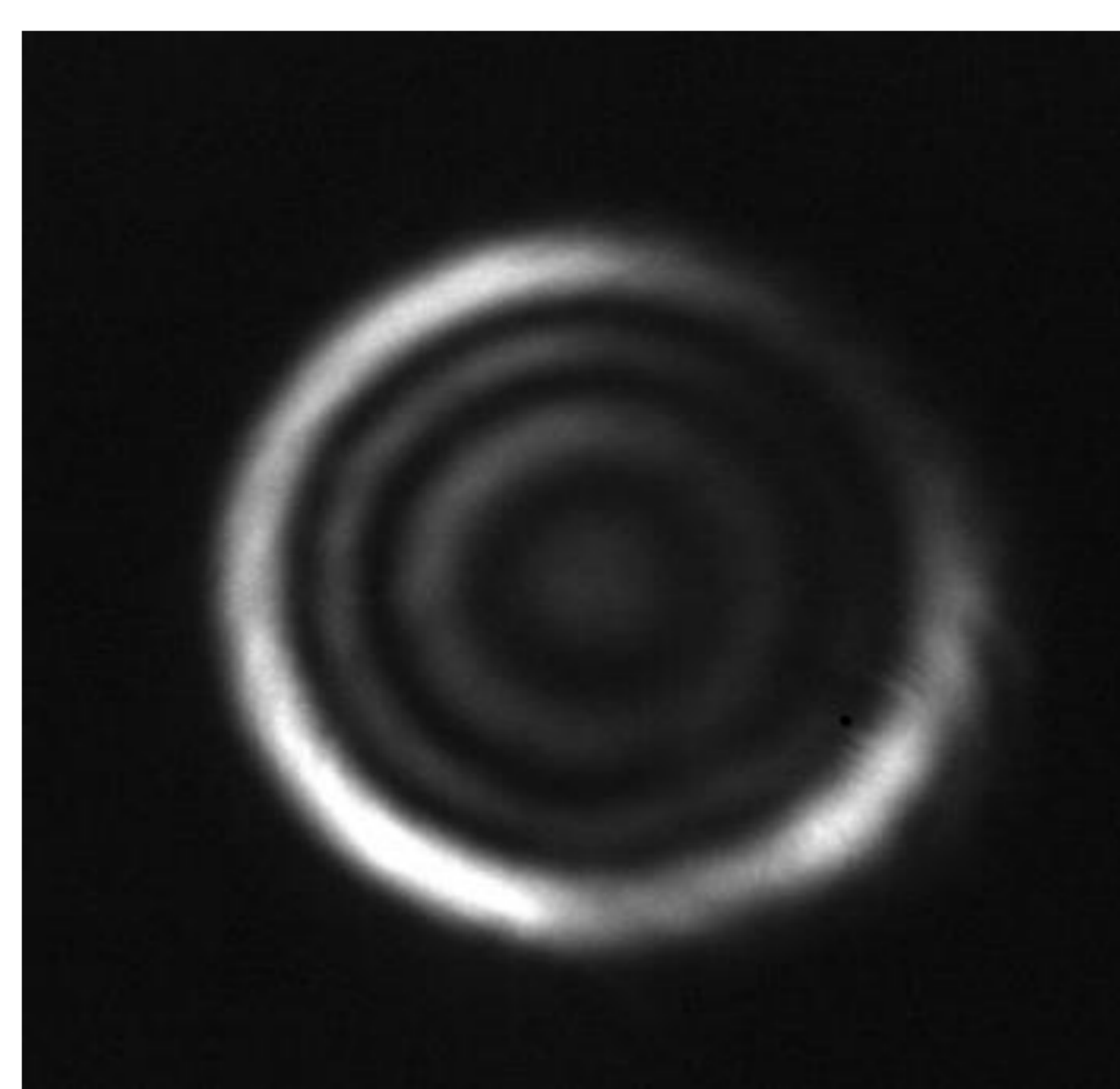


Figure 4: Upconversion using a narrowband illumination source (QCL@6.17 μm) at crystal rotation angle -8.4°

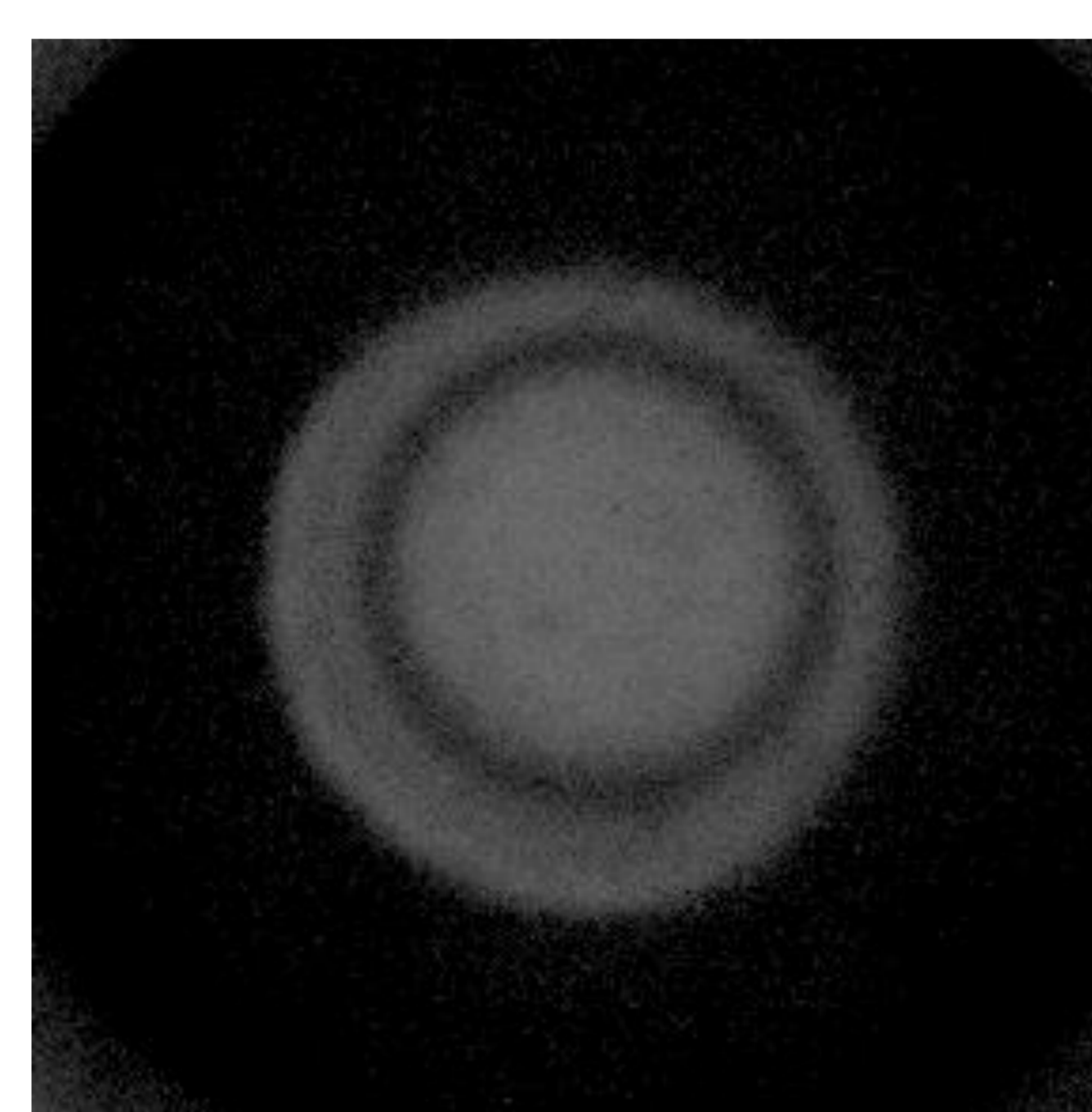


Figure 5: Upconversion using a broadband illumination source (glabar) With polystyrene absorption features

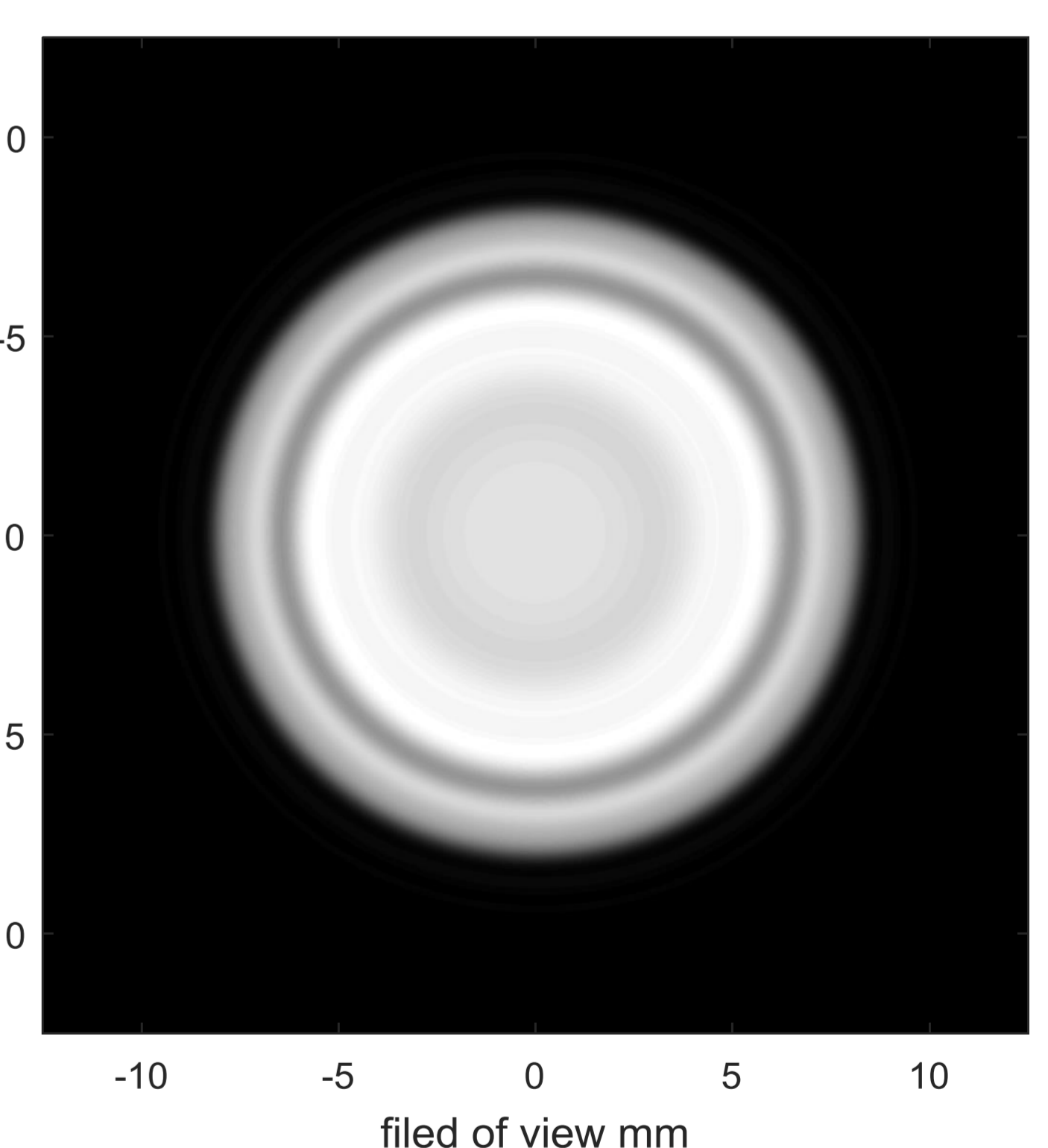


Figure 6: Simulated image of upconversion at 6 to 7 μm with polystyrene spectral features at crystal rotation of 10 degree

Planned Publications

- MIR upconversion based hyperspectral imaging using a broadband illumination source
- Narrow band Mid-IR Hyperspectral imaging using a tunable QCL as an illumination source (ESR 12)
- MIR upconversion based hyperspectral imaging using a tunable diode laser MOPA system as a mixing laser (ESR 5)
- Hyperspectral Imaging of oesophageal cancer tissues (ESR 1)

External stays

- Ferdinand Braun Institute for the application of tunable Diode Laser MOPA as a mixing laser in the upconversion system (ESR 5)
- Humboldt university for testing QCL as a narrowband illumination source for hyperspectral imaging (ESR 12)
- University of Exeter for Hyperspectral Imaging of oesophageal cancer tissues (ESR 1)