

# Image synthesis for better understanding of in-orbit phenomena



Aeolus 3<sup>rd</sup> Anniversary – Taormina 2022

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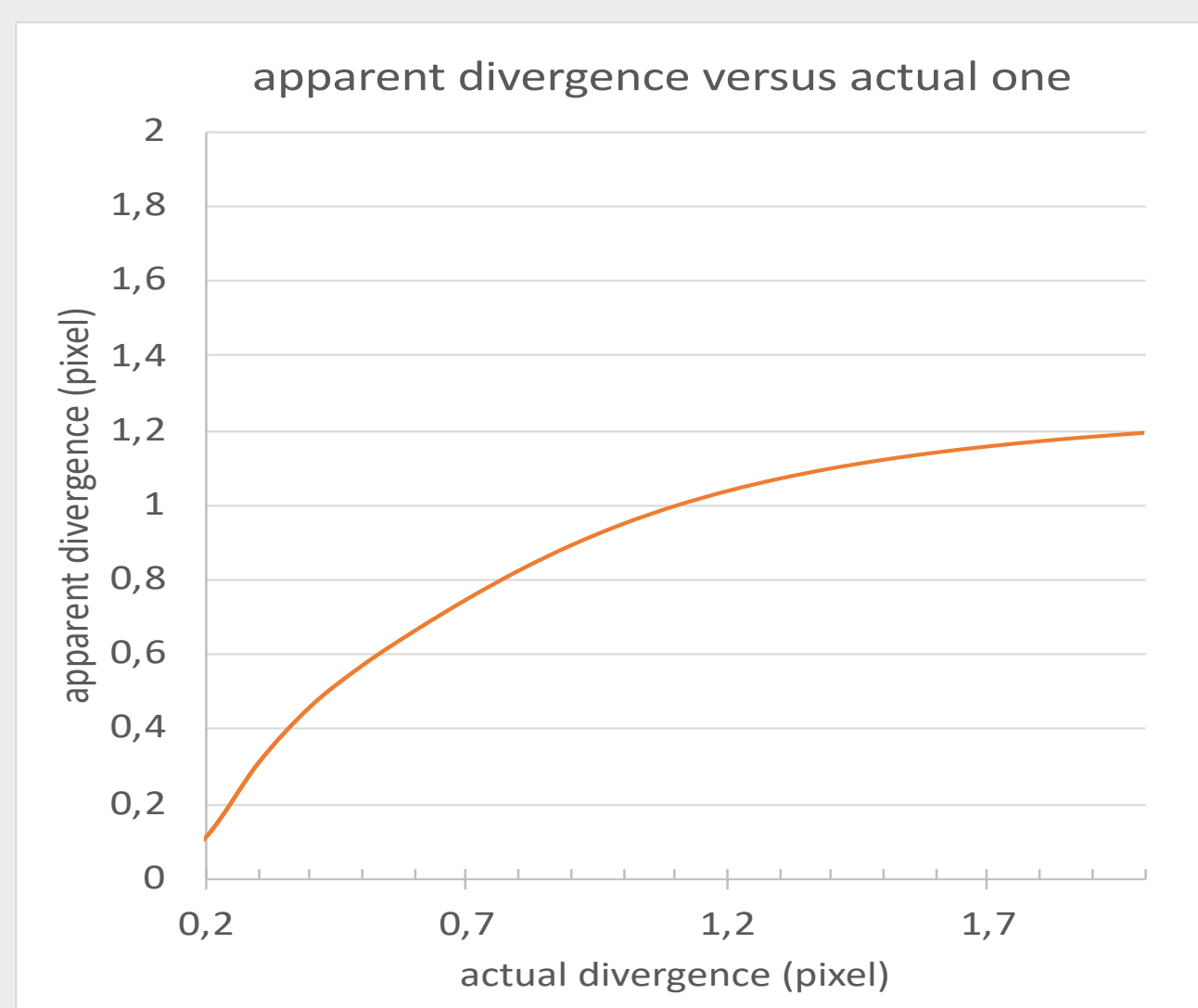
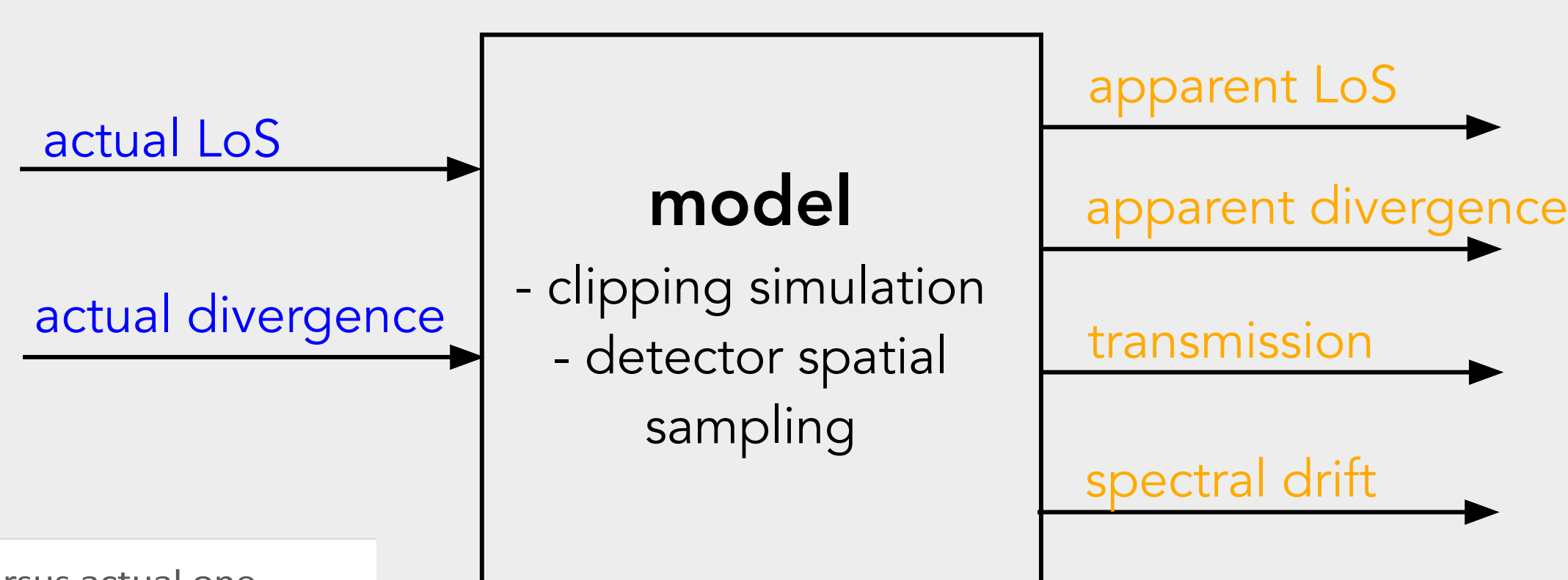
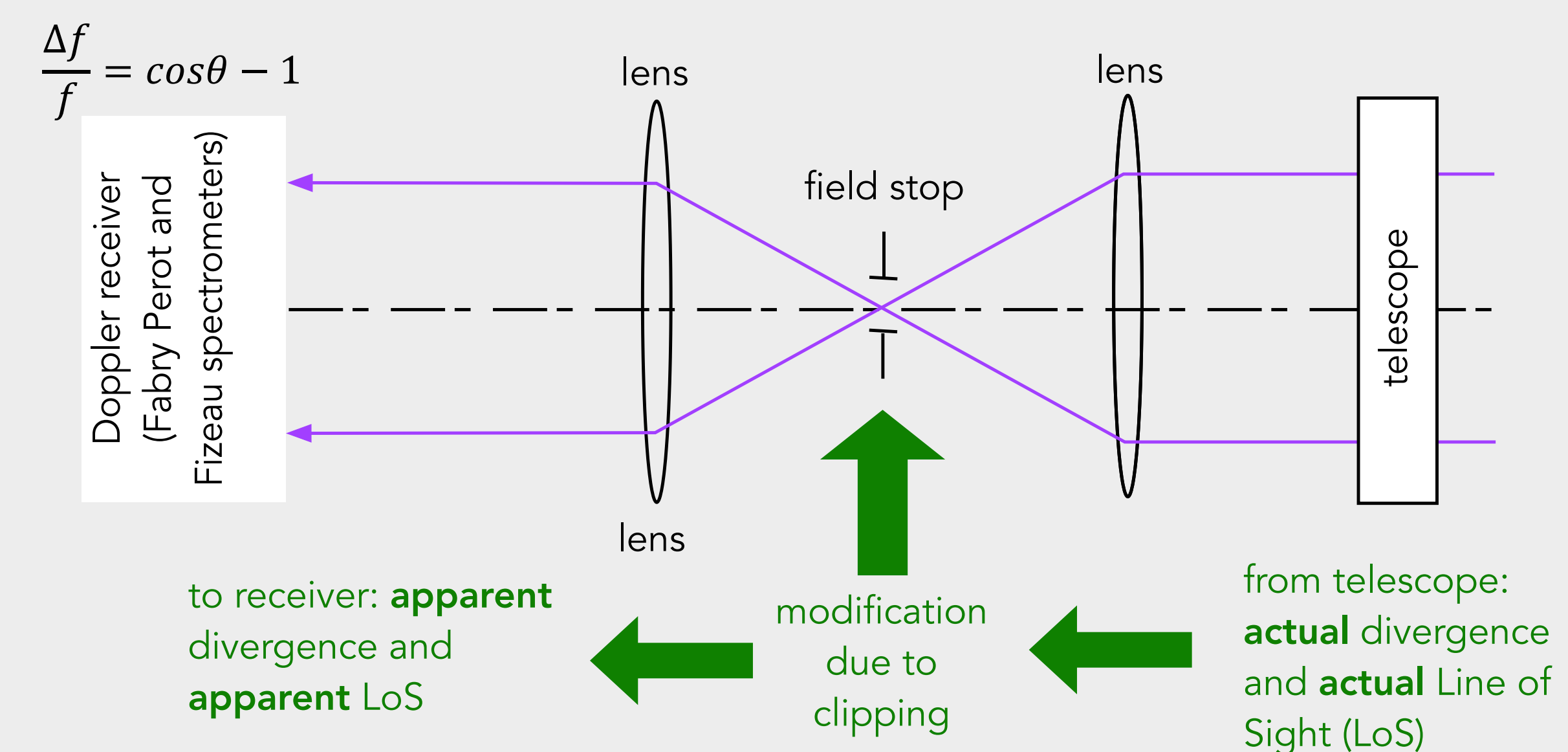
## Motivation

The Aladin instrument is equipped with a field stop to limit the receive field of view.

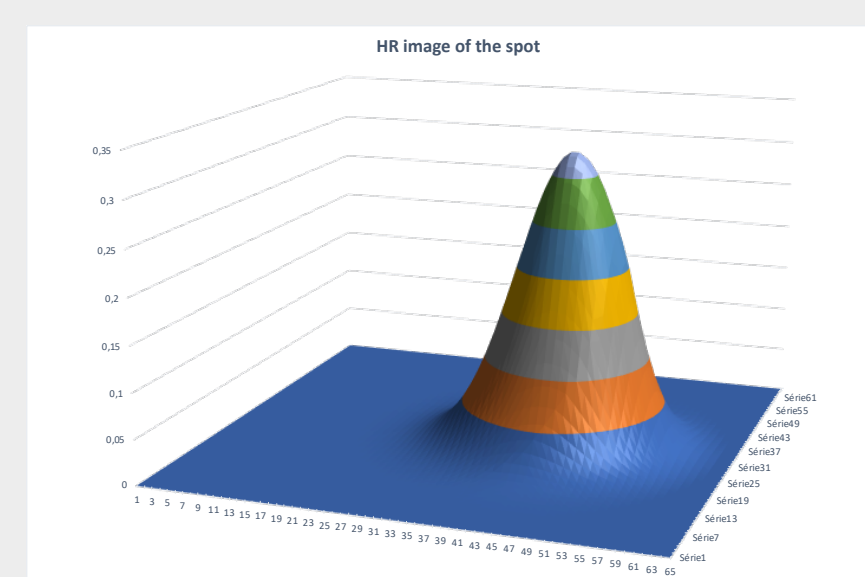
The study aims at evaluating the impact of clipping by this field stop:

- on the divergence, and on the mean angle of incidence on the spectrometer,
- on the transmission,
- on the spectral drift of the Doppler receiver.

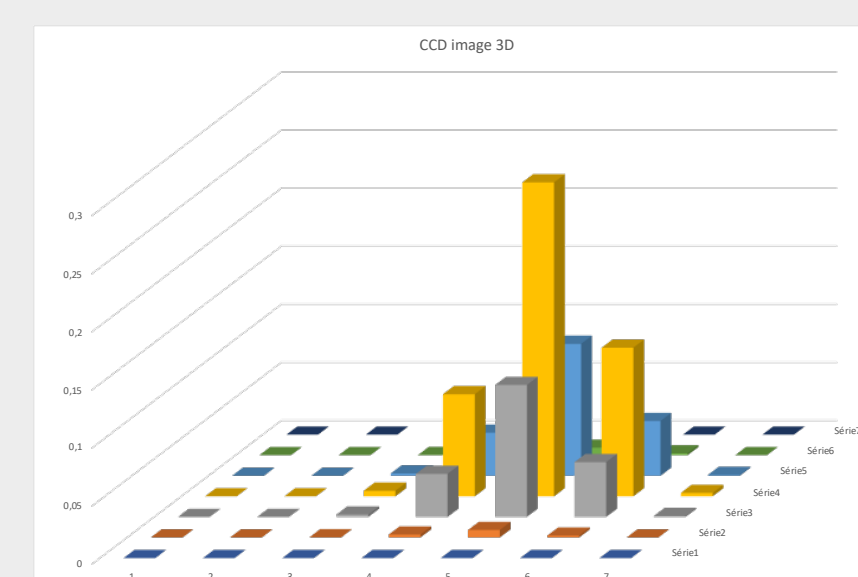
The field stop distorts the reality due to clipping



$$\frac{\Delta f}{f} = \frac{\sum_{h,k} Ehr(h,k) \cdot \frac{\Delta f}{f}(h,k)}{\sum_{h,k} Ehr(h,k)} = \frac{\sum_{h,k} Ehr(h,k) \cdot [\cos[phr \cdot \sqrt{h^2 + k^2}] - 1]}{\sum_{h,k} Ehr(h,k)}$$



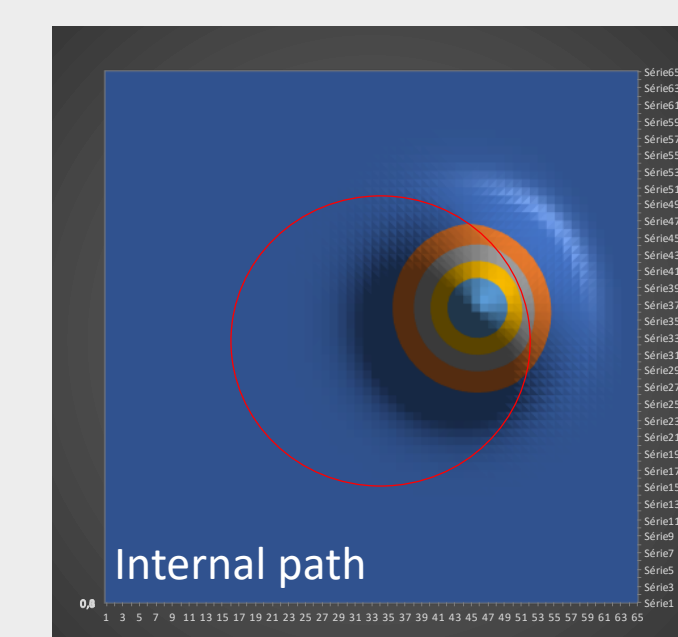
High resolution image



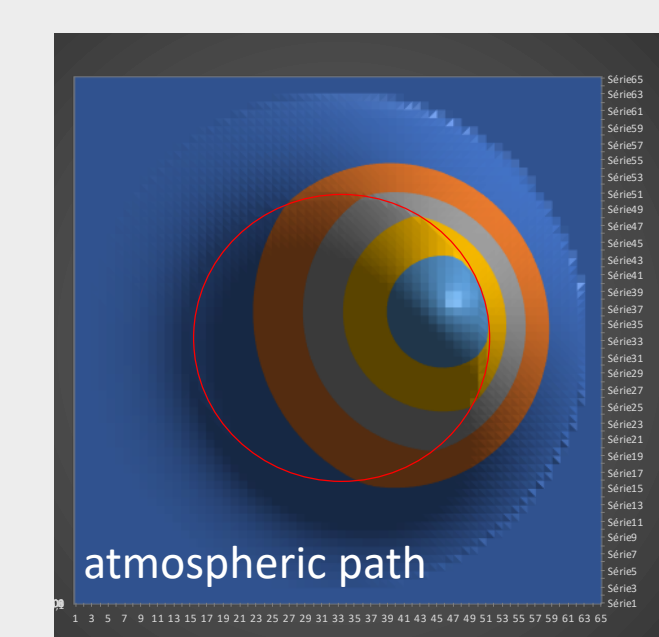
As seen at detector level

## The model

- Generation of a Gauss distribution,
- The field stop is simulated (trapeze shape)
- Image sampling at the detector pixel pitch
- Outputs are: apparent angle of incidence, apparent divergence, transmission and spectral drift at spectrometer level

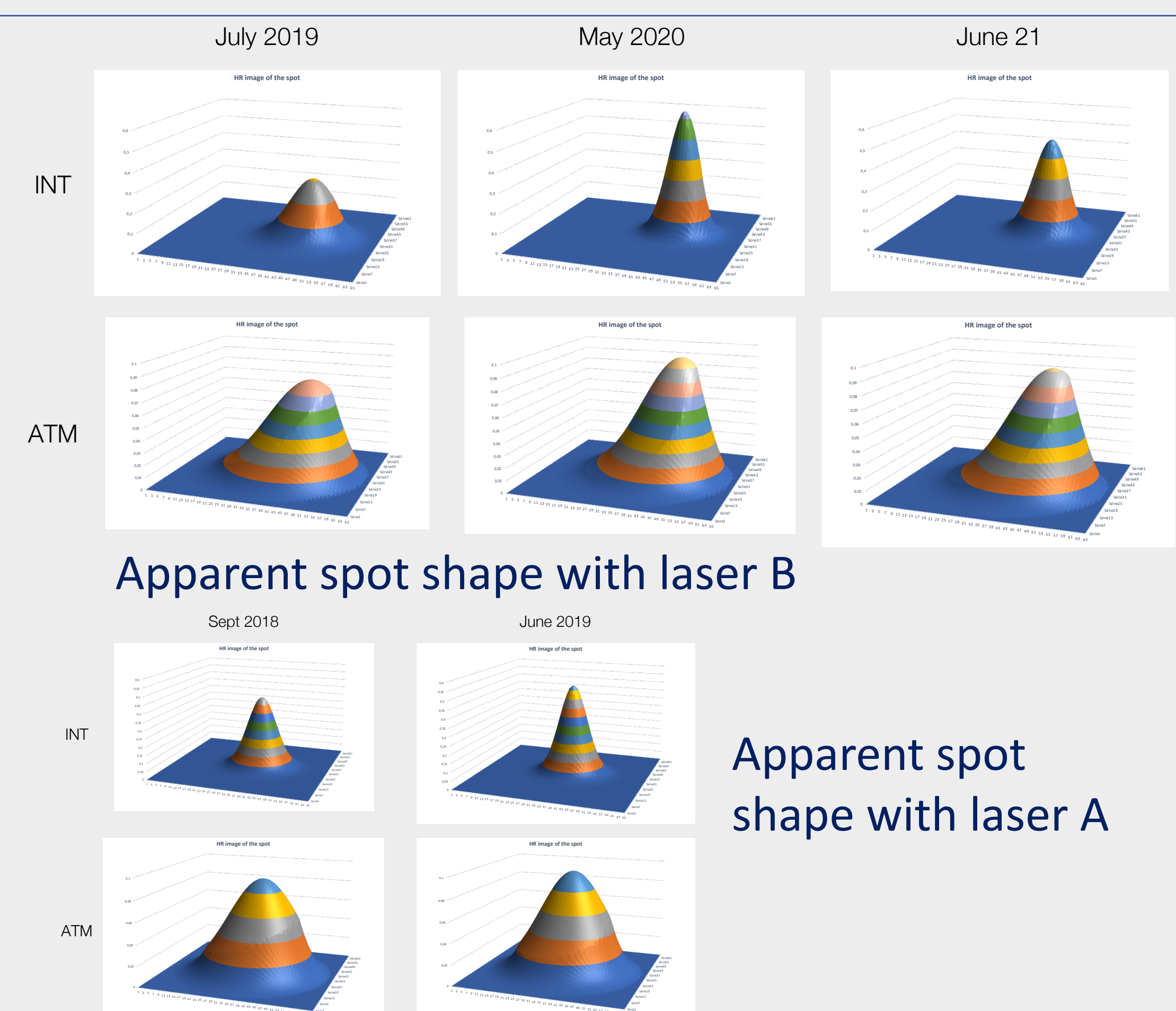
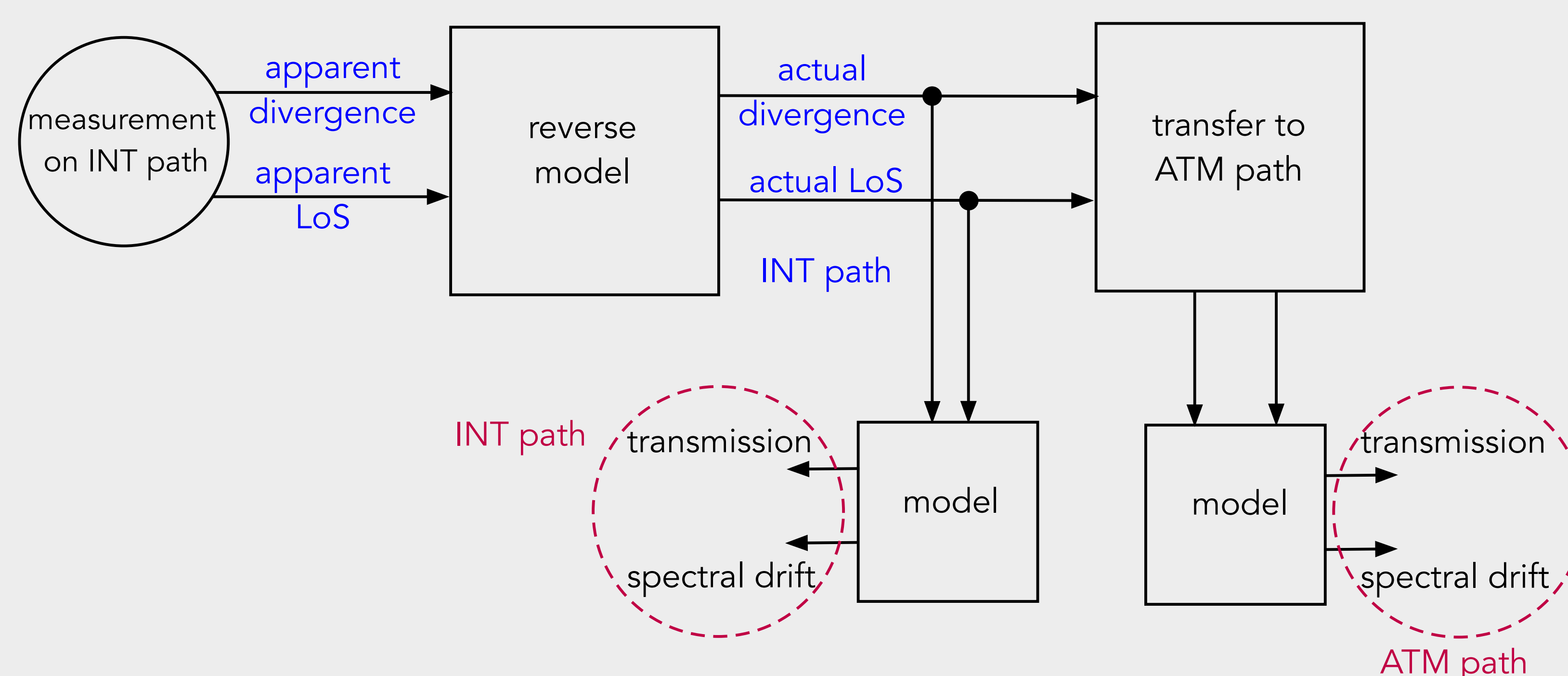


Internal path



atmospheric path

## Analysis method



## Main Outcomes

- The clipping on the field stop cannot explain all the signal loss, opening the door for other contributors: transmission loss due to Laser Induced Damage (LID) or Laser Induced Contamination (LIC)
- The spectral drift is different on INT path and ATM path, what explains a part of the wind measurement bias.

