



# Polarimetric Observations of Young Disks

Tracing Magnetic Fields with a MIDI Instrument Upgrade

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# Science Questions

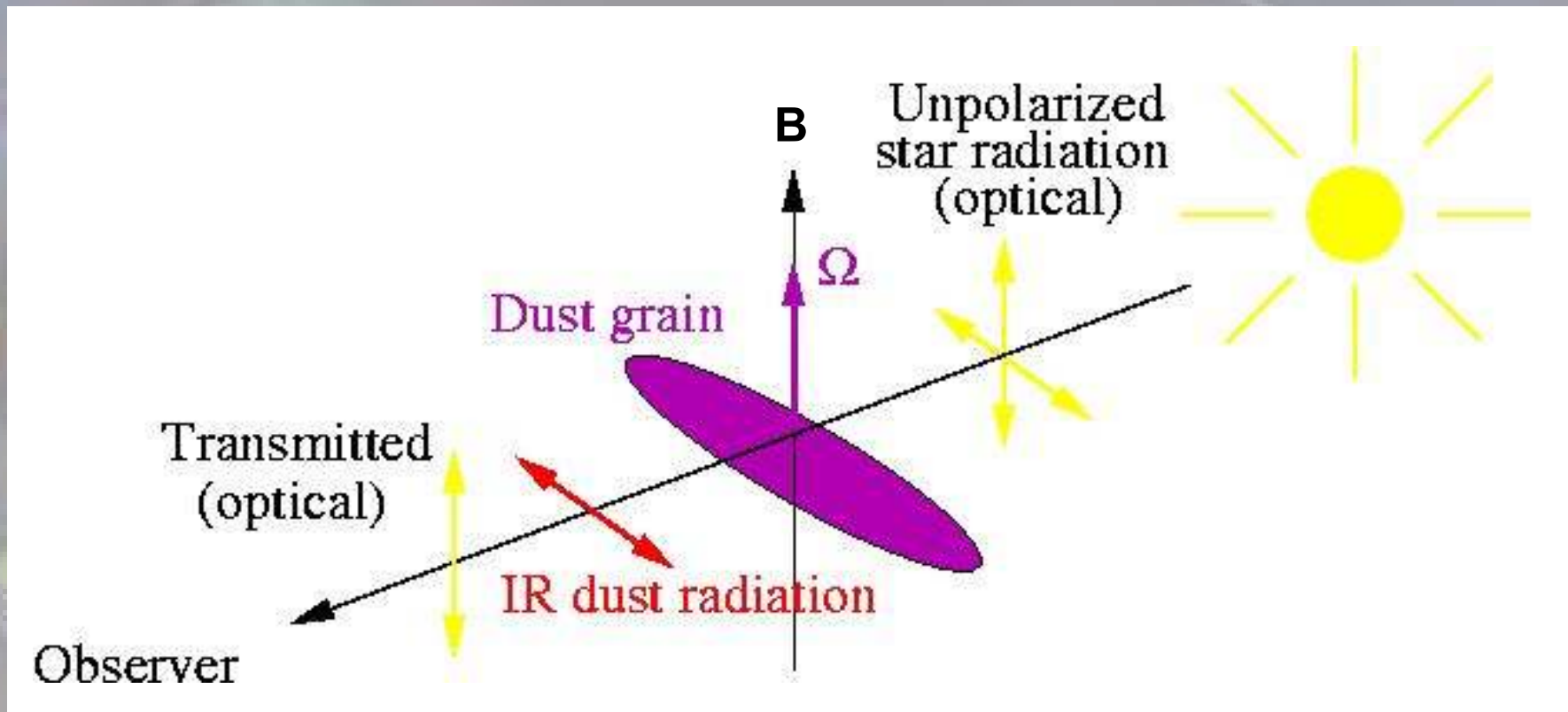
- ❑ Are magnetic fields important in circumstellar disks?
- ❑ What role do magnetic fields play in the dust evolution?
- ❑ Are the grains aligned to the magnetic field?
- ❑ Are the magnetic field lines perpendicular to the disk plane?
- ❑ Is the grain alignment correlated with size or composition?

# Tesla and the Disk



Artists impression of a young source observed with the **Super Huge Interferometric Telescope**.

# Probing magnetic fields with polarization



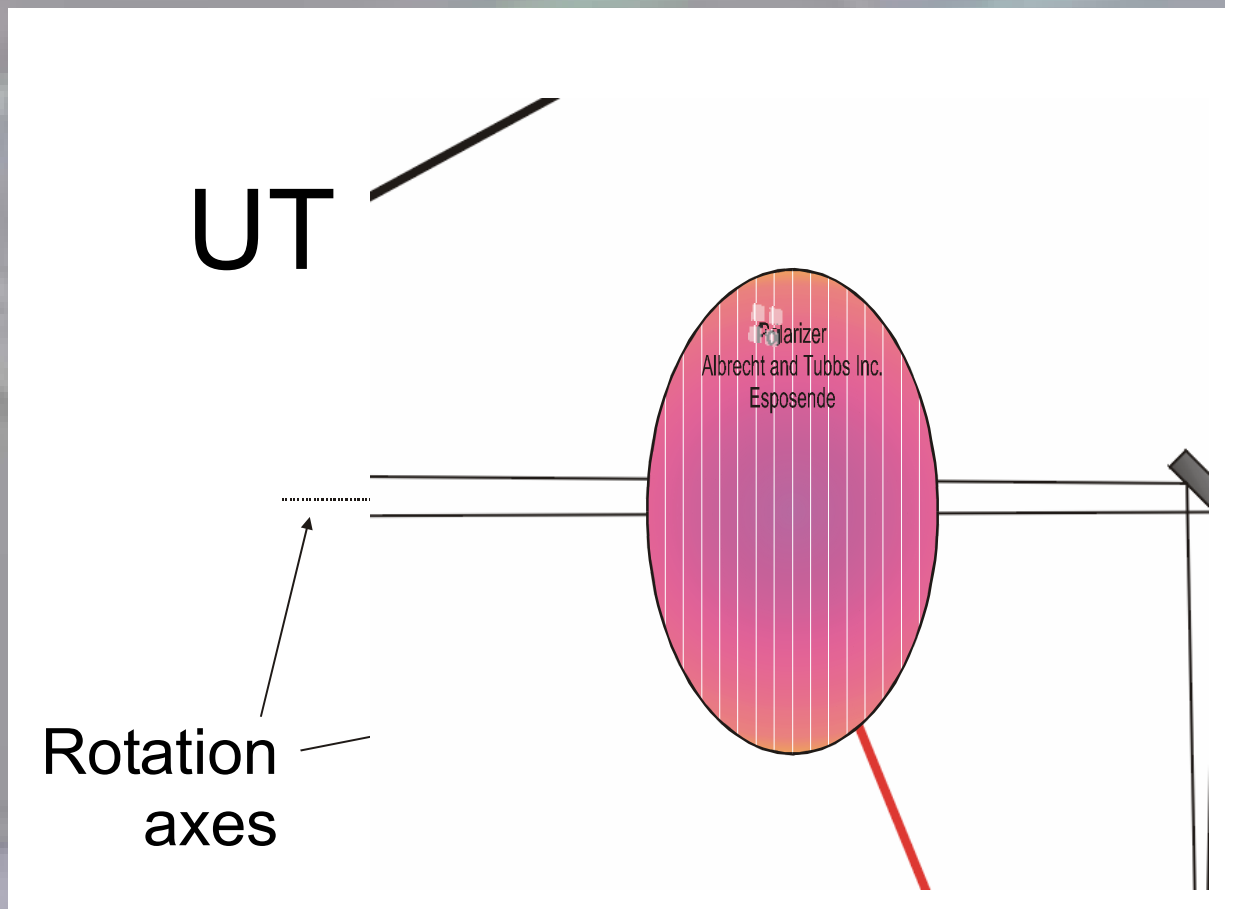
# Science Targets

- Young stars with and without jets
- Disks with low to high inclination (i.e. no edge-on disks)
- Range of stellar masses

Target	Inclination	Sp. T.	Jet
AB Aur	17°	A0 Ve	-
RY Tau	25°	F8 Ve	✓
DG Tau A	58°	G Ve	✓
FU Ori	55°	G3 Ve	-
HD 100453a	60 (?)	A9 Ve	-

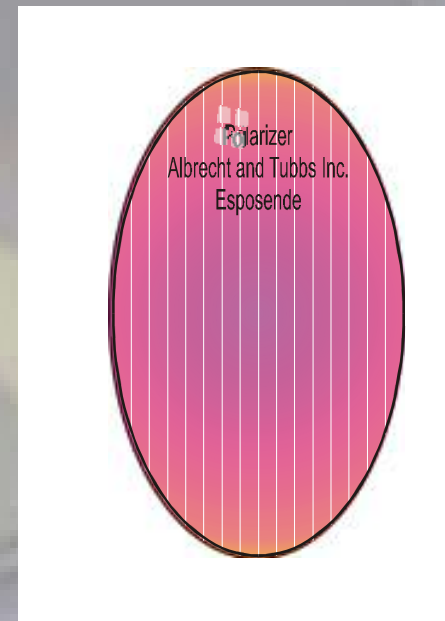
# VLT / MIDI with Polarimetry

- A polarizer at each UT
- Polarizers rotate
- MIDI takes high-frame rate data at the same time



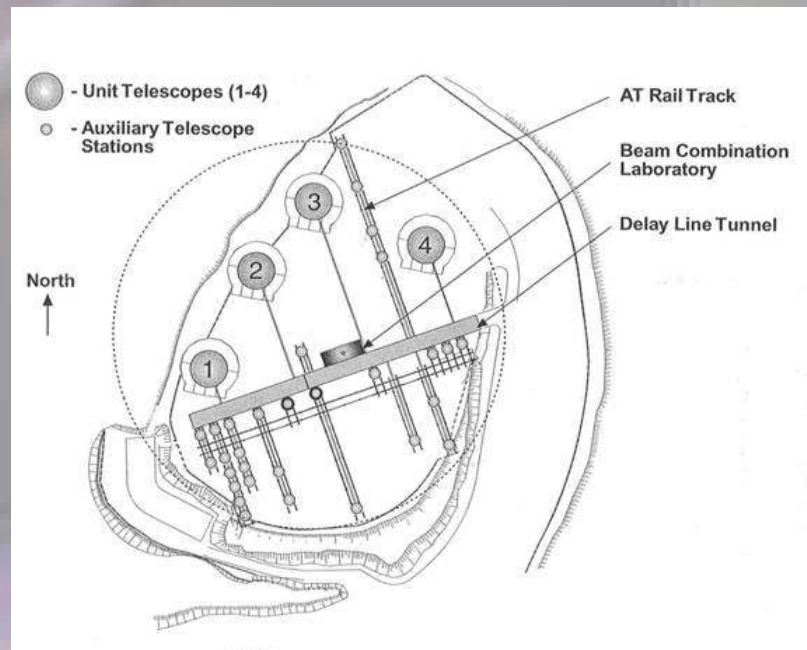
# VLT / MIDI with Polarimetry

- ❑ A polarizer at each UT
- ❑ Polarizers rotate
- ❑ MIDI takes high-frame rate data at the same time
- ❑ Observation of nearby calibration target
- ❑ Discussed in detail with Markus Schöller



# Observing Strategy

- On each target we aim to have two perpendicular long baselines which probes the inner regions of the accretion disk
- Single-dish MIDI data will be used to measure the polarization from the outer regions of the disk





# Data Analysis

- ❑ MIDI takes data at a high data frame rate
- ❑ Changes in polarization will be recorded
- ❑ Atmospheric piston can be tracked in the normal way in EWS software
- ❑ Instead of summing the data, we will select the Fourier component corresponding to the rotation period of the polarizer
- ❑ The MIDI photometric channels will provide single-dish polarization



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# Conclusions

- ❑ Excellent pilot study for second generation VLT instrument MATISSE
- ❑ Polarization is a powerful tool for studying the magnetic fields and dust properties in protoplanetary disks
- ❑ Even a non-detection will tell us something new