AGEING EFFECTS ON 3 DIFFERENT VERSION OF PADC FOR ALPHA DETECTION

Maria Hansen
Track Analysis Systems Ltd, UK

INTRODUCTION

- Ageing and fading is the main threat to a good track etch measurement using PADC, typically CR-39 or similar type of plastic.

- Main resource:

  About ageing and fading of Cr-39 PADC track detectors used as air radon concentration measurement devices

  M. Caresana a, M. Ferrarini a,*, L. Garlati a, A. Parravicini b

METHODS AND MATERIALS

Setup and materials:

- Egg incubator
- 3 different types of PADC: TT1, TT2 and TT3

The differences are in the type of monomer and plastisizer used as well as the concentrations.

METHOD

Each types of plastics split into 3 groups:

- freezer (-18°C)
- incubator (40°C temperature held to within ±1°C)
- ambient (between 20°C-24°C)

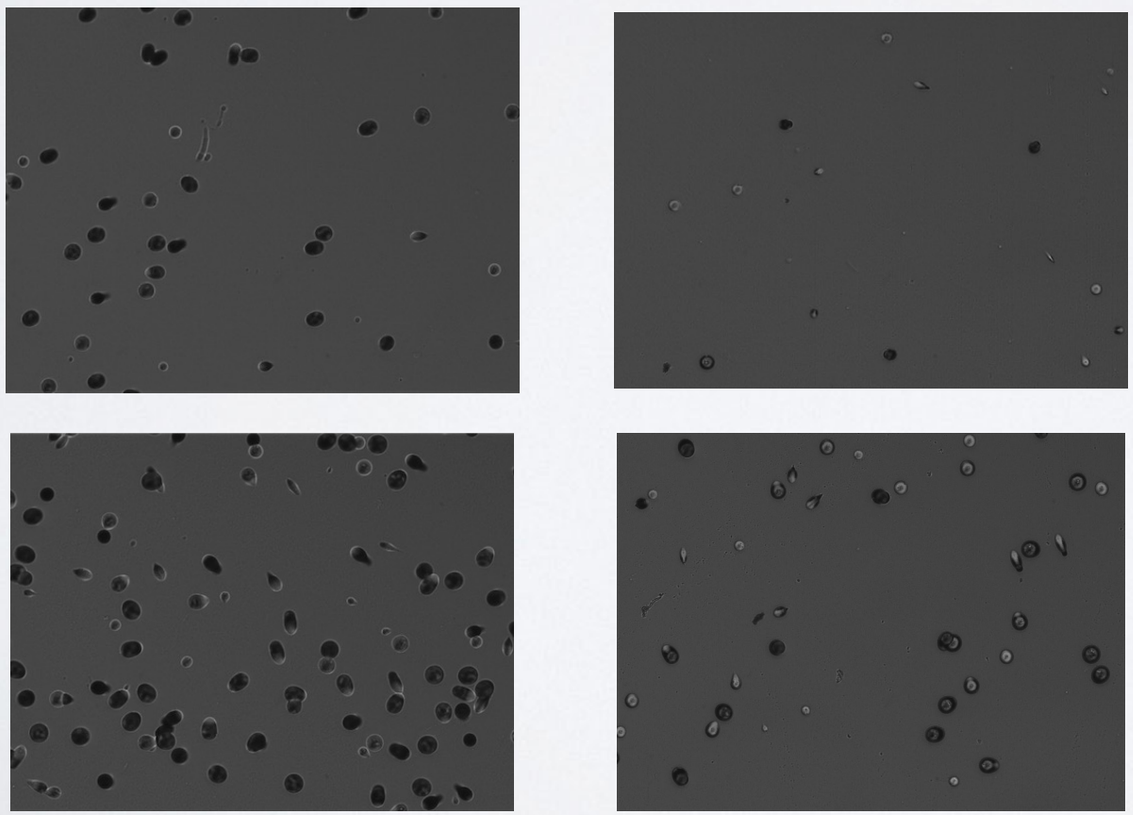
Half the samples exposed before being stored in freezer/incubator/ office, the other half exposed afterwards.

Analysed on a TasIImage analysis system.

ASSESSING THE AGEING AND FADING

Assumptions:

- Ageing is the degradation of the plastic
- Fading is the change in the track

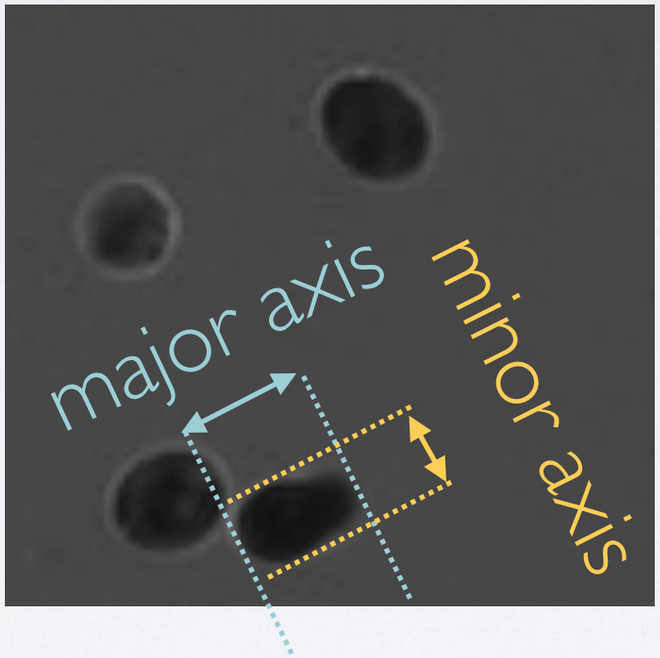


TT3

TT2

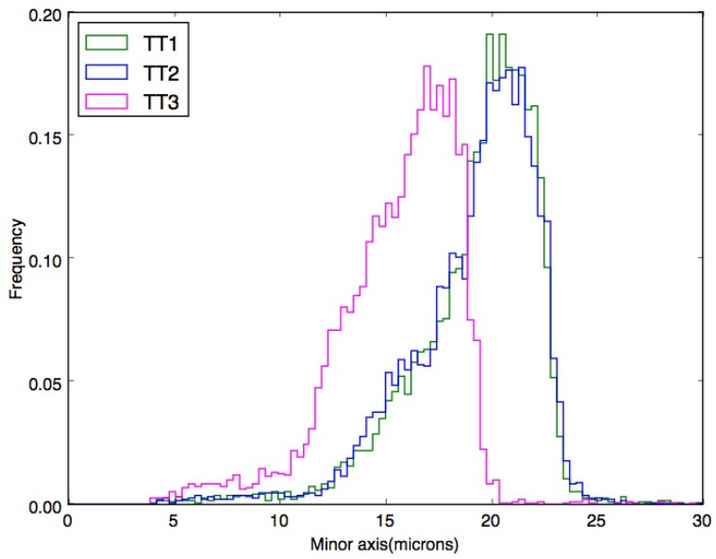
TRACK PARAMETERS

- Etch conditions: 1 hr at 98°C in 6.25M NaOH
- Minor axis
- Major axis
- Optical density
- Eccentricity

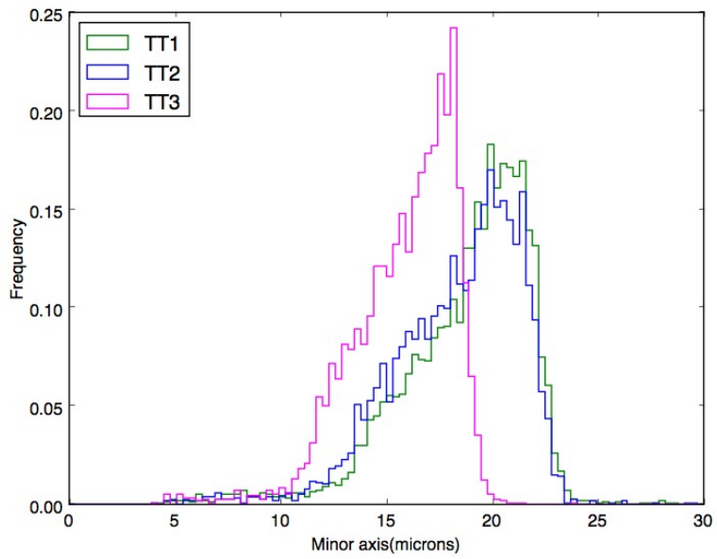


MINOR AXIS DISTRIBUTIONS

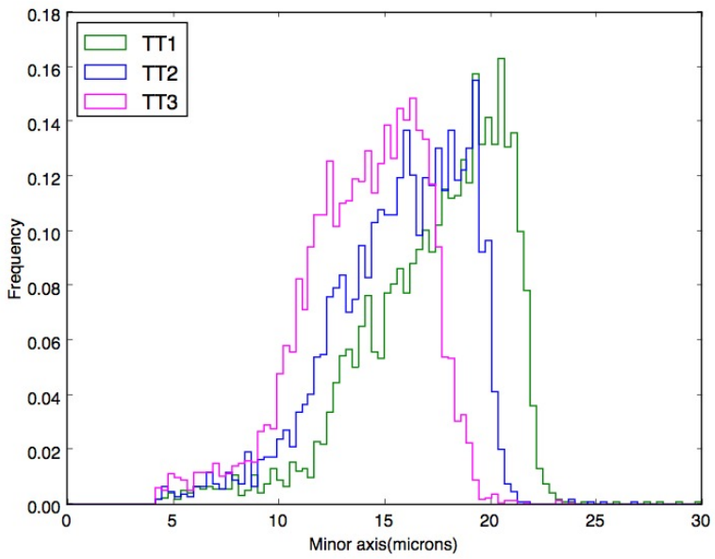
Top aged and faded, bottom aged



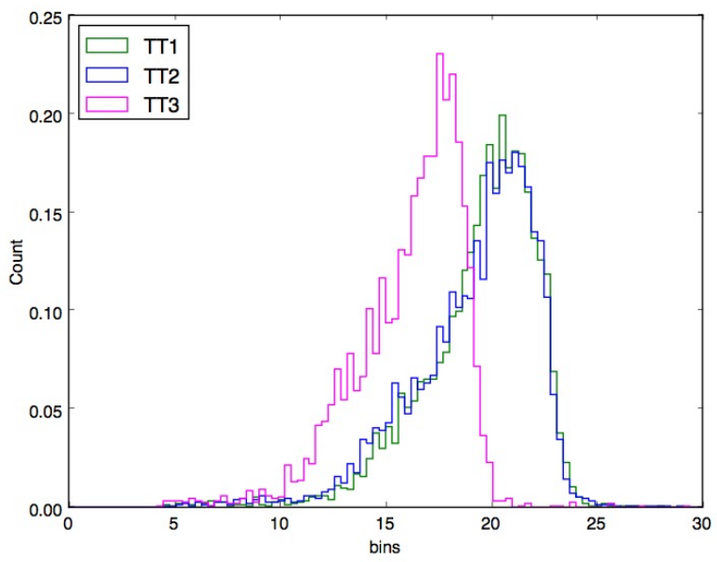
Freezer

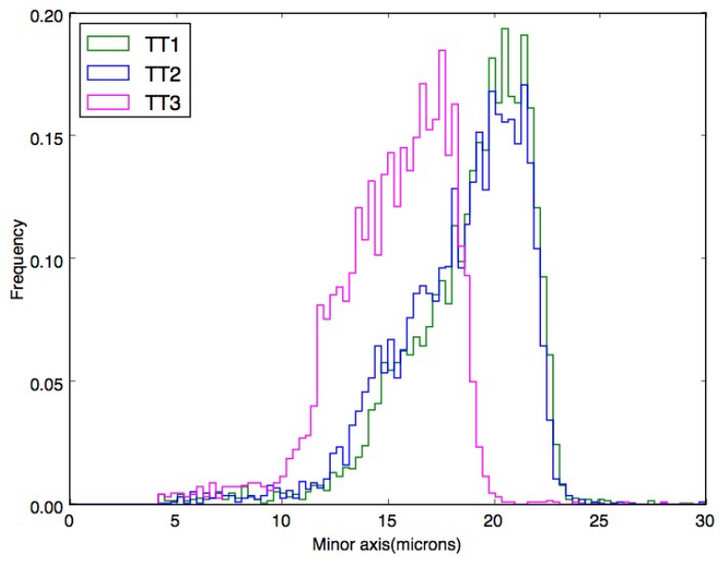


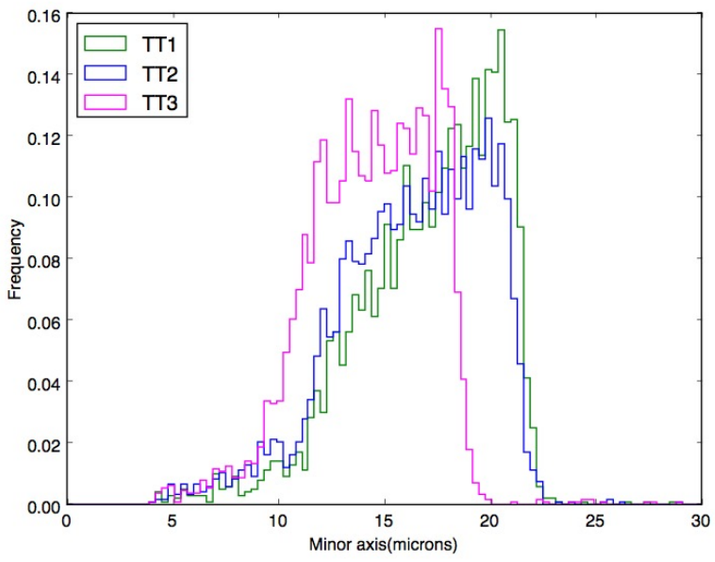
"RT" 20-24°C



Incubator

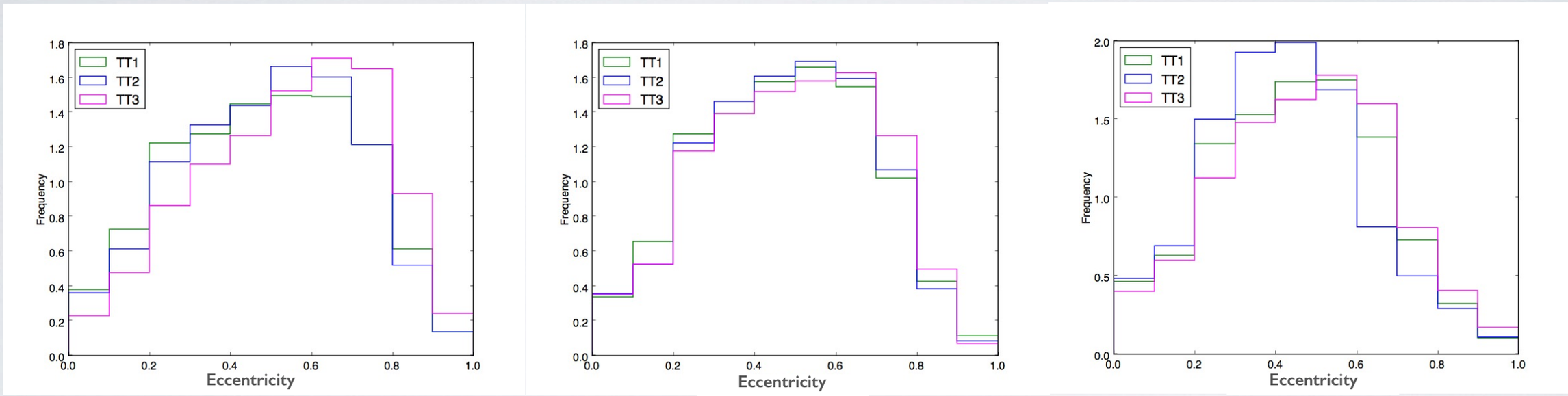




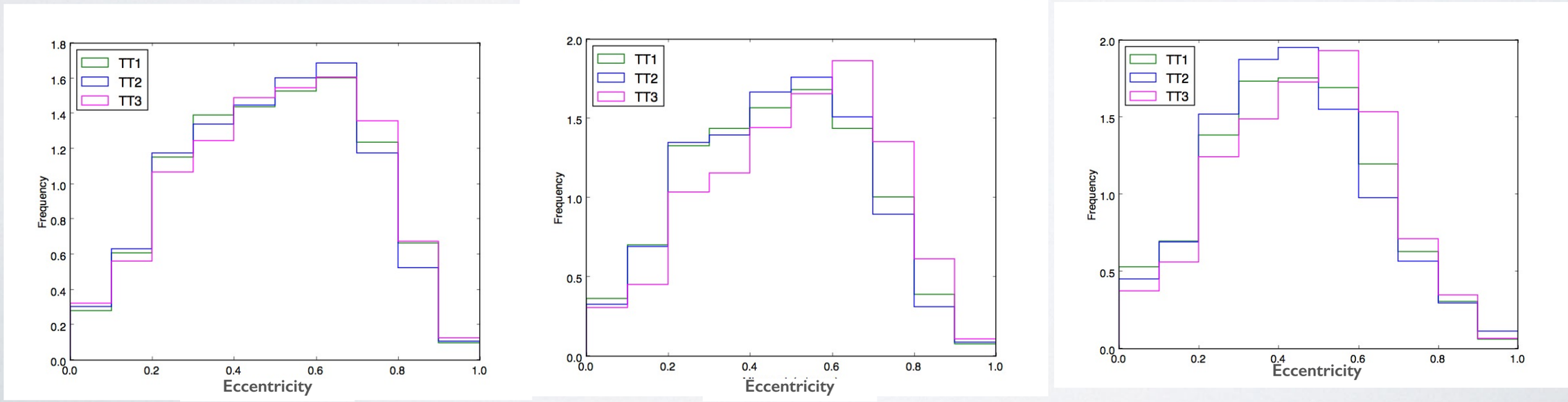


ECCENTRICITY DISTRIBUTIONS

Top aged and faded, bottom aged

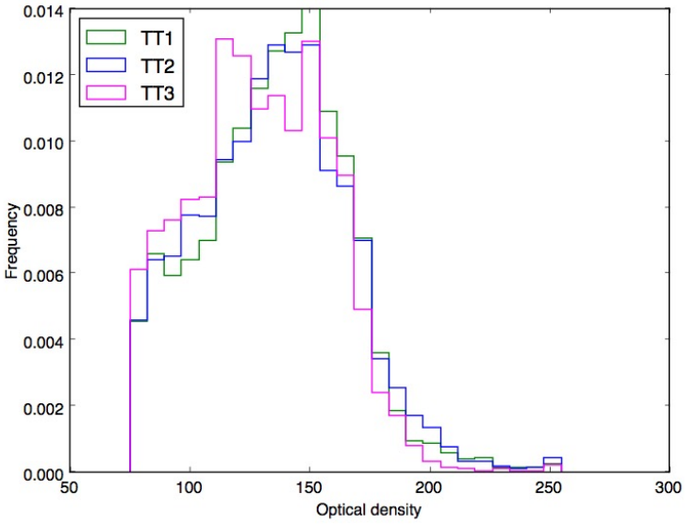


Freezer "RT" 20-24°C Incubator

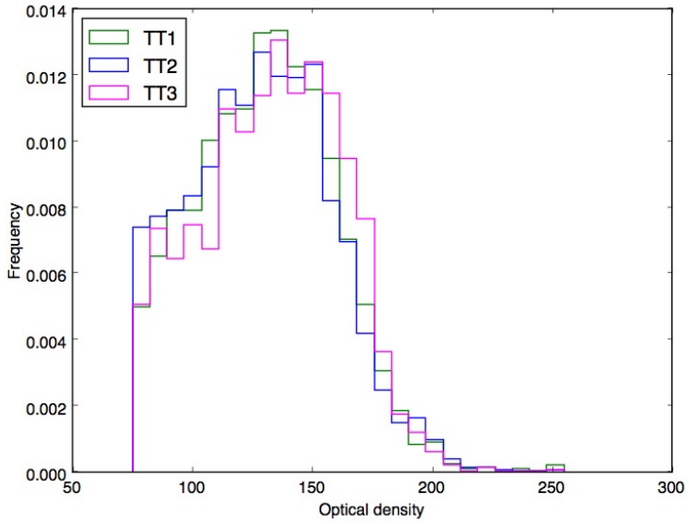


OPTICAL DENSITY DISTRIBUTIONS

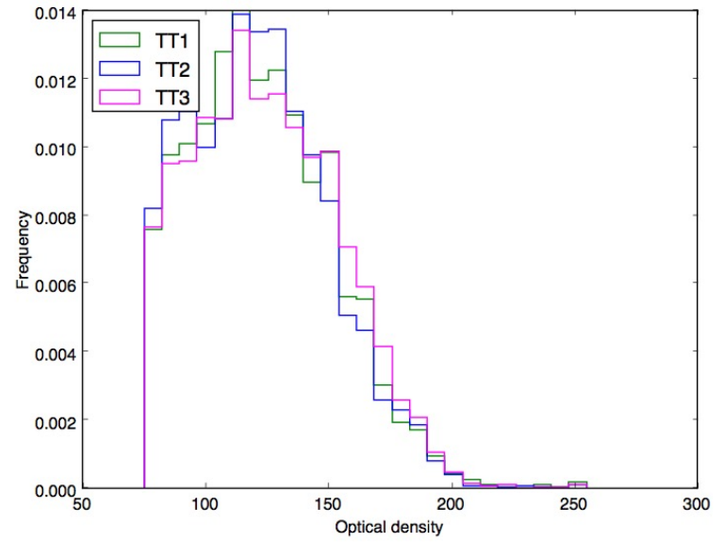
Top aged and faded, bottom aged



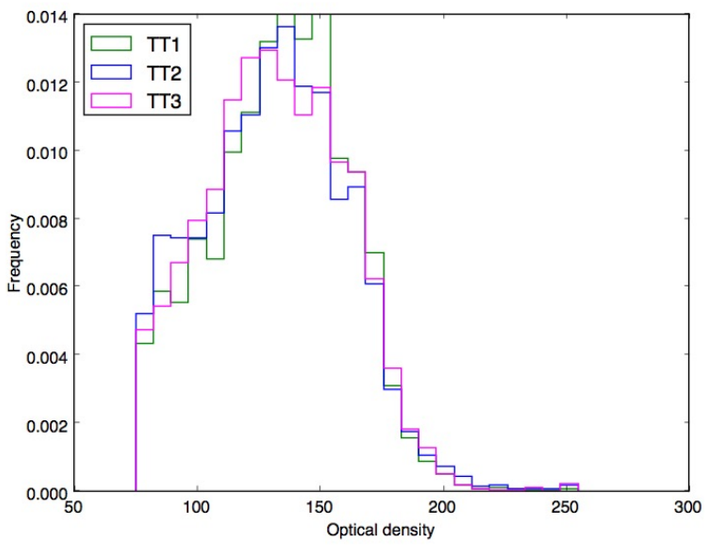
Freezer

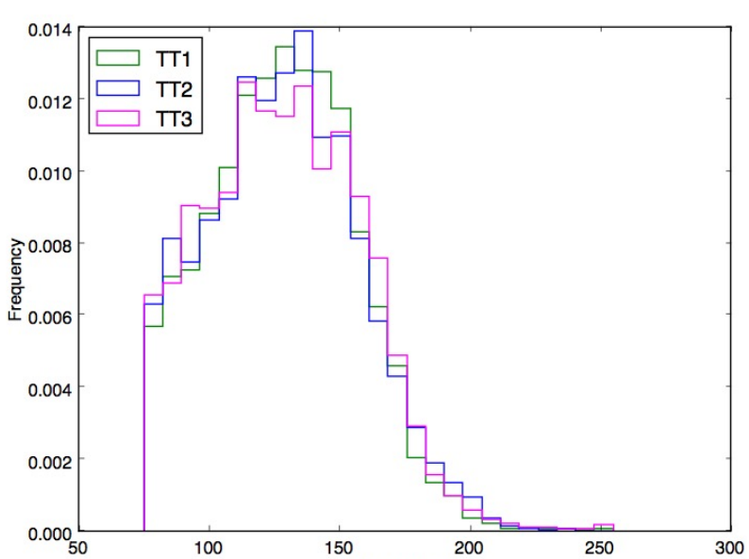


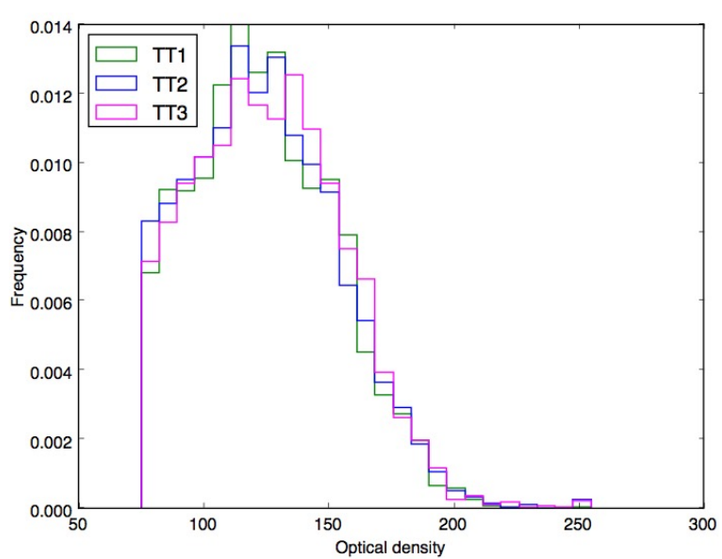
"RT" 20-24°C



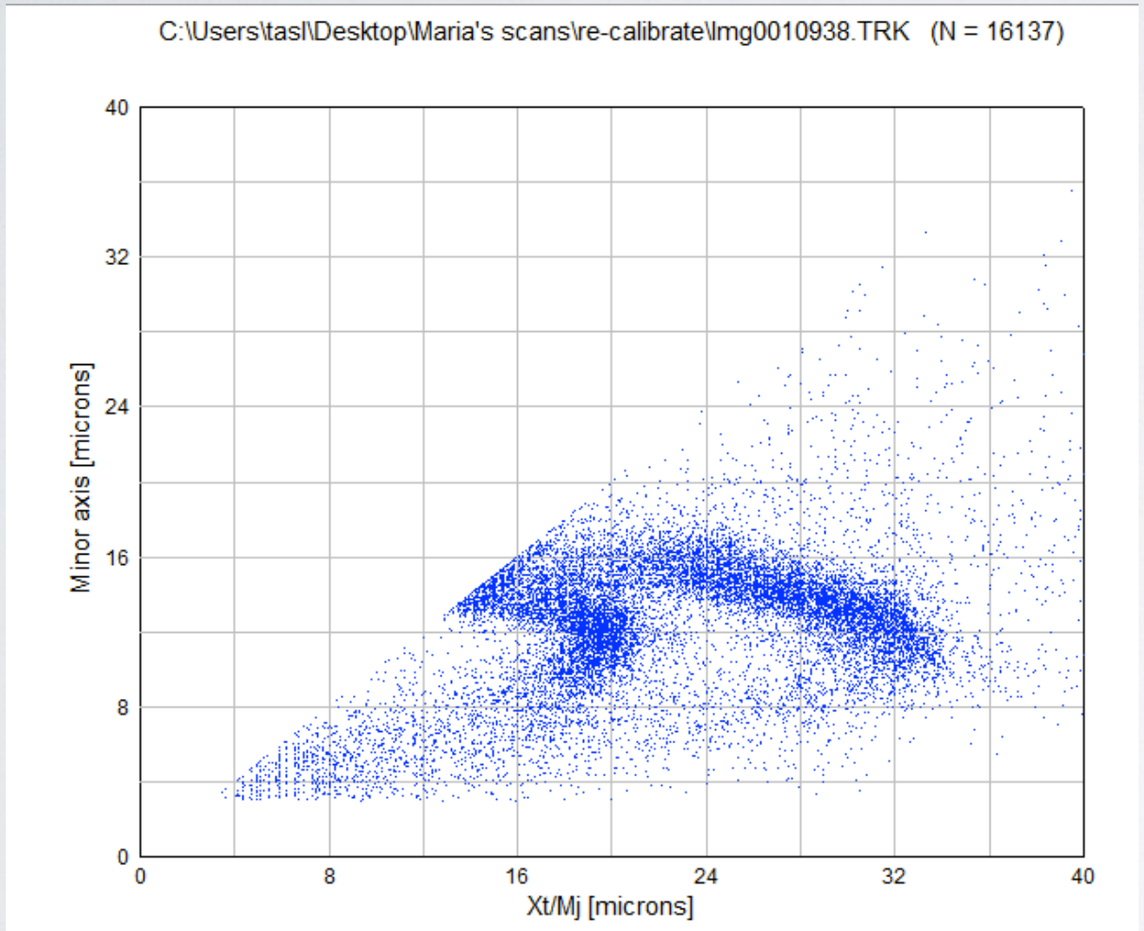
Incubator



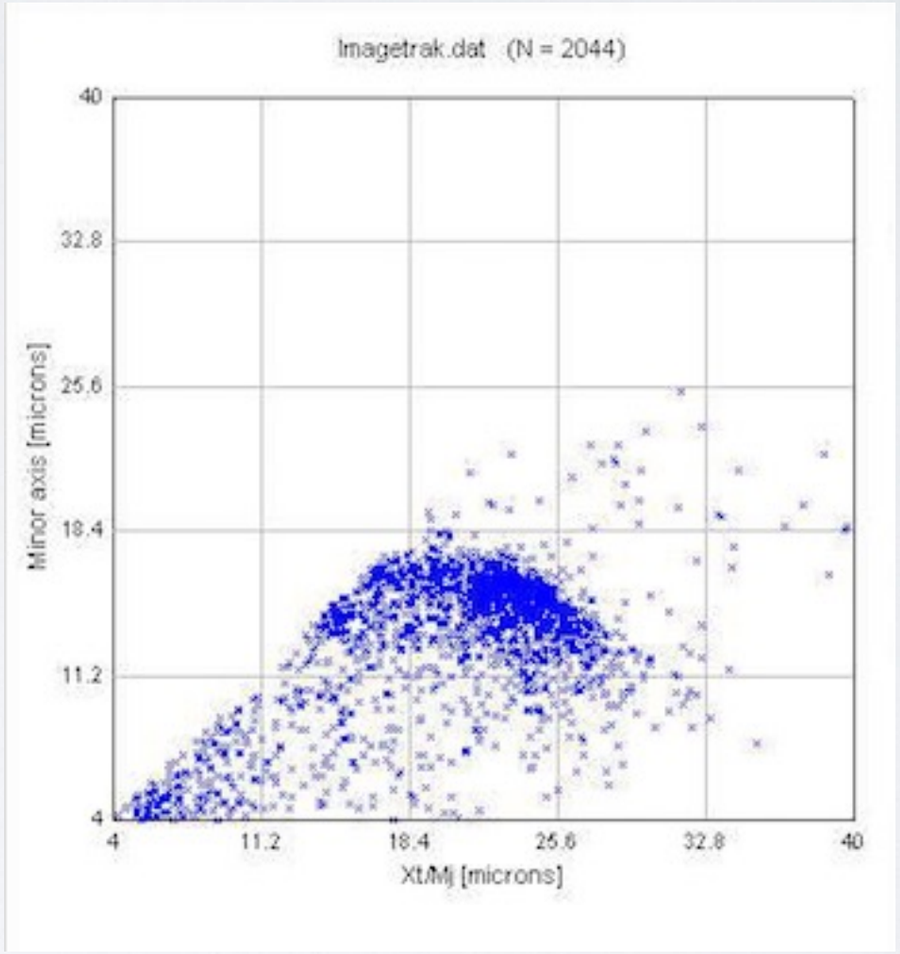




MAJOR VS MINOR PLOTS

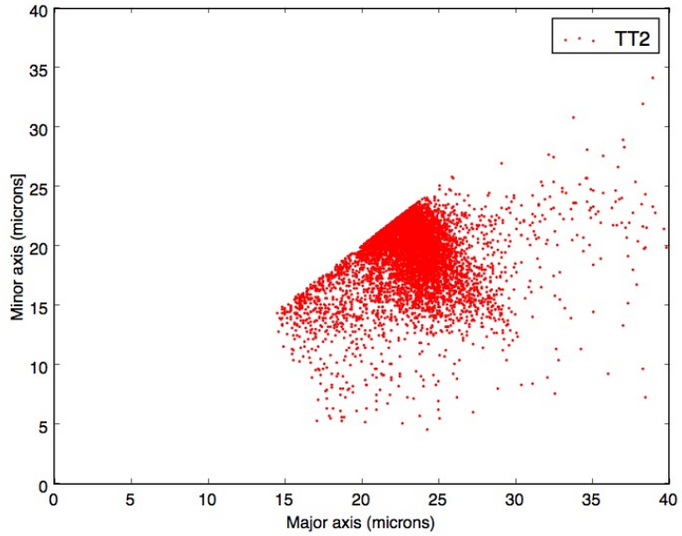


Lab intercomparison

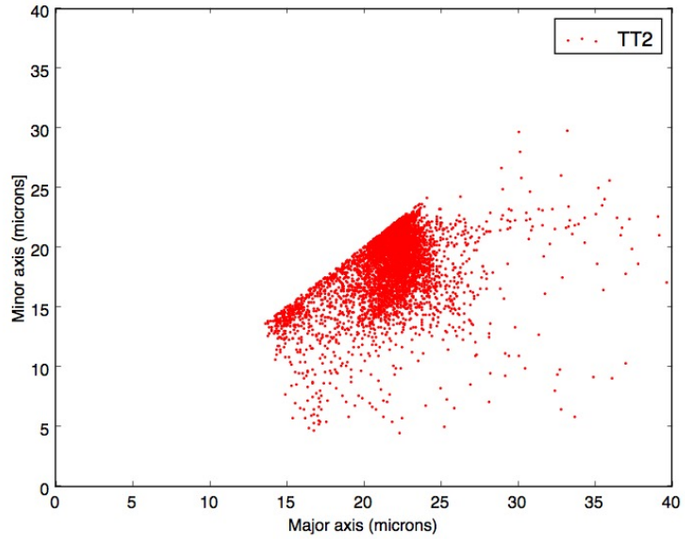


Field measurement

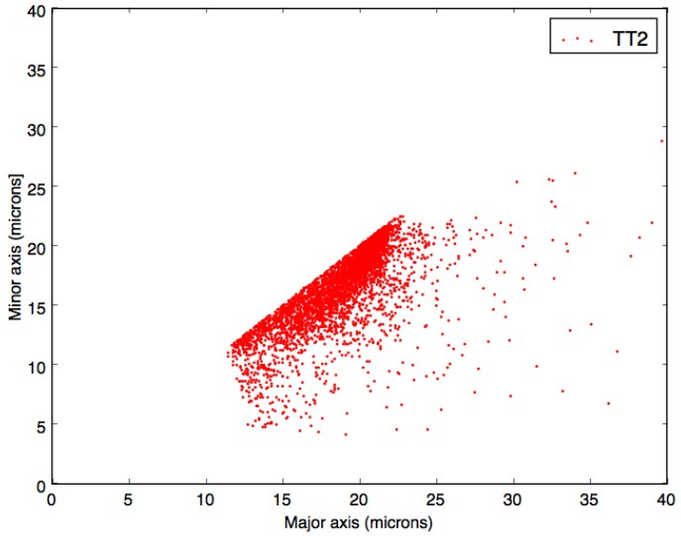
MAJOR VS MINOR PLOTS



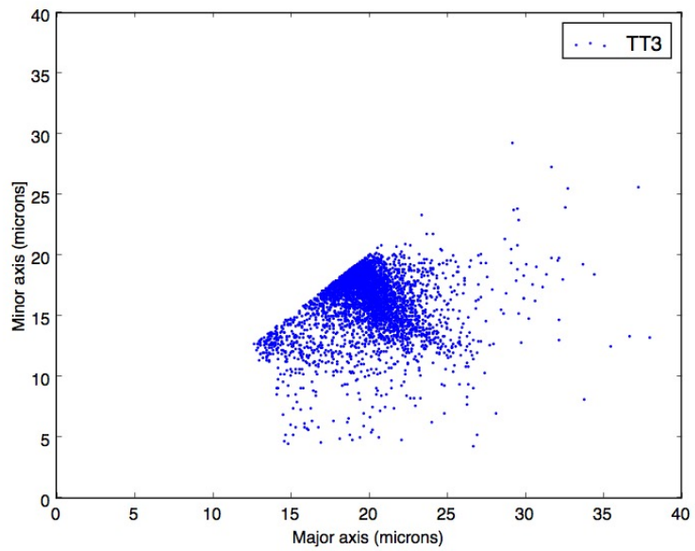
Freezer

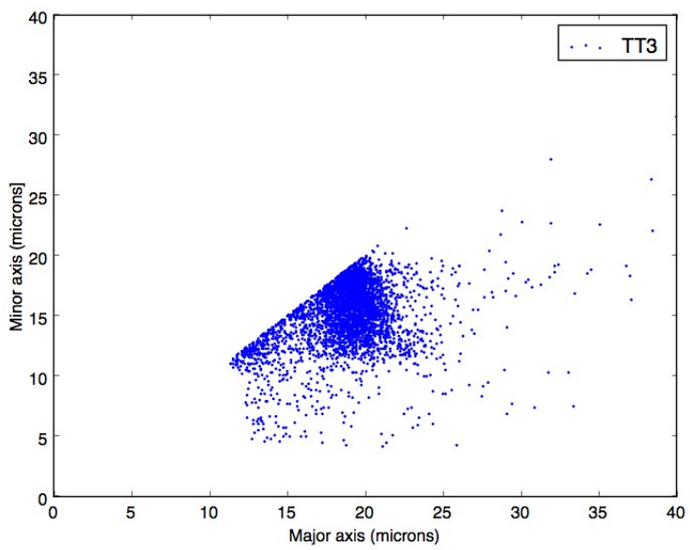


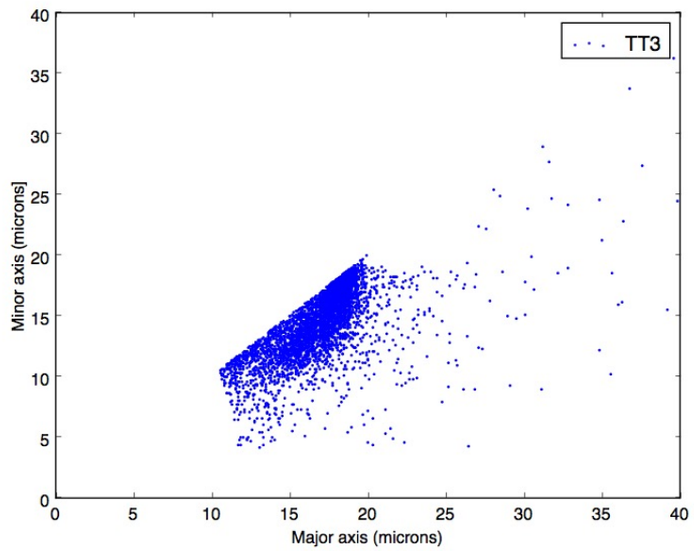
"RT" 20-24°C



Incubator







SUMMARY

- Despite the slightly different compositions of the 3 different types of PADC used, their behaviour were similar when subjected to heat
- The minor axis parameter is the most sensitive to change as also suggested in other studies.
- Ensuring minimal signal loss is important when formulating new types of PADC - if possible.