General requirements of an automated scanning system for NTDs from MoEDAL

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Requirements of rare event search

- Search for rare events : A single event can herald a discovery
- Signature: collinear etch pits of roughly similar sizes on both sides of an NTD foil
- Can’t afford to miss out on any genuine event (i.e. zero tolerance for false negatives
- This implies somewhat higher tolerance for false positives
- For the MoEDAL exposed foils, ~ 25% of the image frames are showing false positive tracks when our (Kanik et. al) algorithm is applied.
- So a number of false positives are expected on any one side of every foil
- If human intervention is required for every foil, it defeats the very purpose of automated scanning
- Impossible to draw any definite conclusion from the automated scan of only one side of a foil

Scanning and analysis protocol

- To draw any meaningful conclusion, any automated scanning system must look at both sides of exposed foils
- As each side (25 cm x 25 cm) of a foil is scanned, images are to be tagged with foil number and position co-ordinates and stored.
- Image analysis algorithms will then detect and flag images with candidate tracks.
- In the next step, images from both sides of a foil with similar coordinates (i.e from the same region) will have to be compared for the presence of similar tracks.
- This will eliminate most of the false positives. Drastically cutting down the need for human intervention.

Off-line image analysis

- There could be a number of scanning systems of different designs at work simultaneously
- Ideally, images from all the systems will be uploaded to some central server where one can log in and do off-line analysis
- This will allow different algorithms to be run on the same data set, providing vital cross checks and further reducing the chance of false negatives
- This will also allow re-analysis of the data if/when some improved algorithm becomes available down the road

Trade-off between scanning speed and image analysis accuracy

- There is a trade-off between scanning speed and image analysis accuracy
- Use of lower magnification/lower resolution will improve scanning speed and also help with data transmission and storage. But it will come at the cost of lower accuracy of image analysis results
- An optimum balance between scanning speed and image analysis accuracy for various systems will have to be achieved through trial and error
- Images with different magnification/resolution will have to be analyzed and results compared, to come up with an optimum combination of speed and accuracy