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Multi level RTS in proton irradiated CMOS image sensors manufactured in deep submicron technology*

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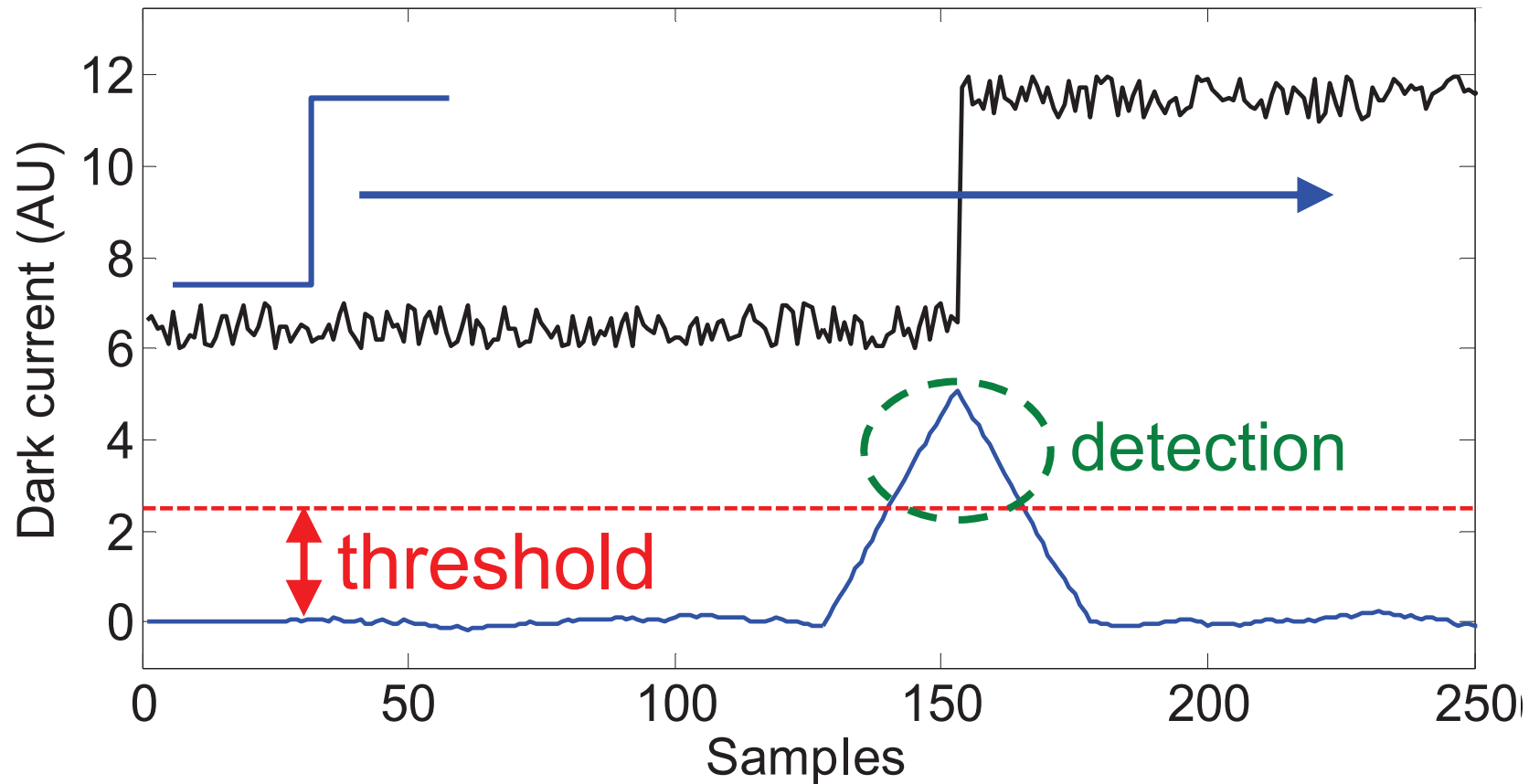
September 12, 2008 in Jyväskylä, Finland

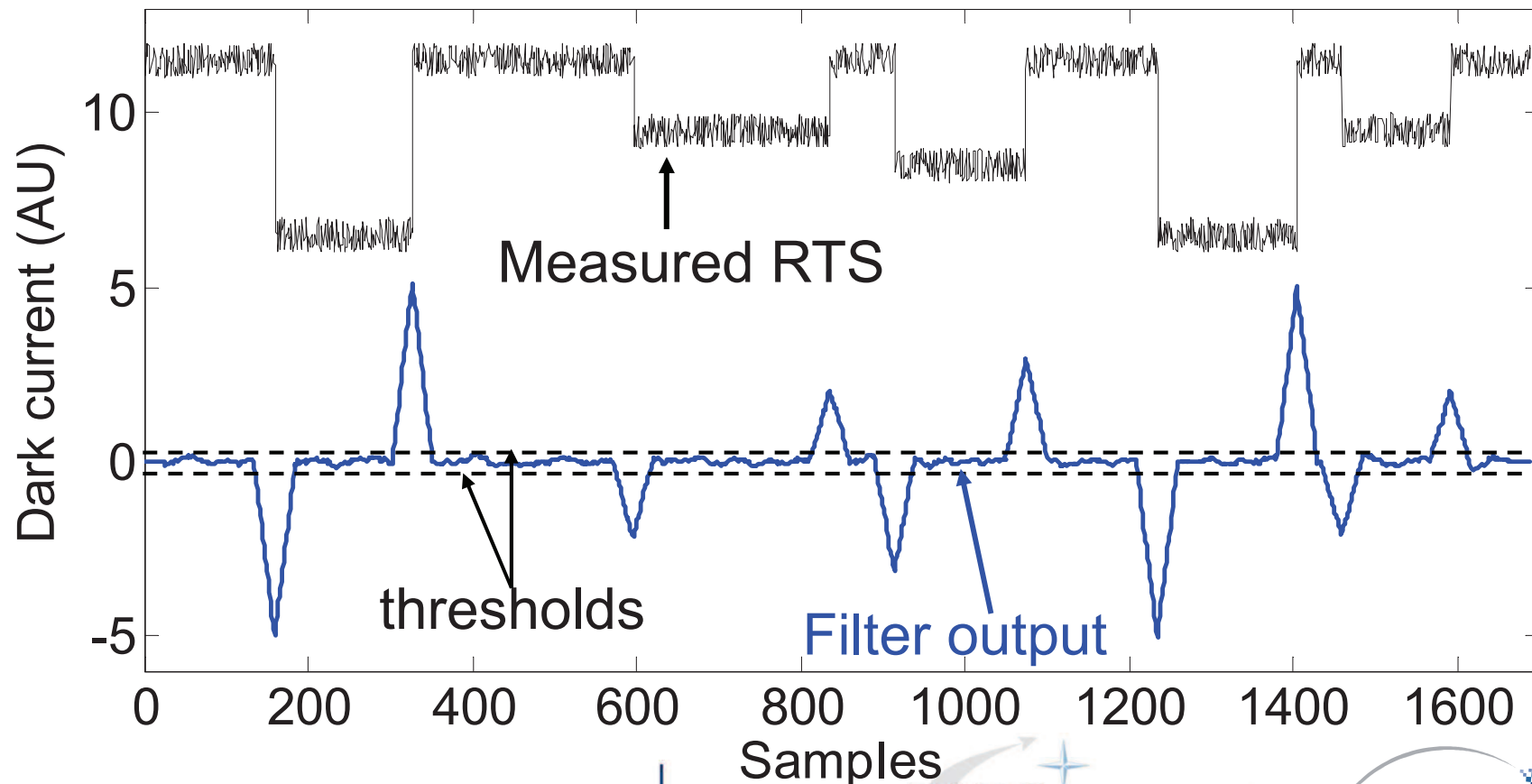
*PhD research supported by CNES and EADS Astrium



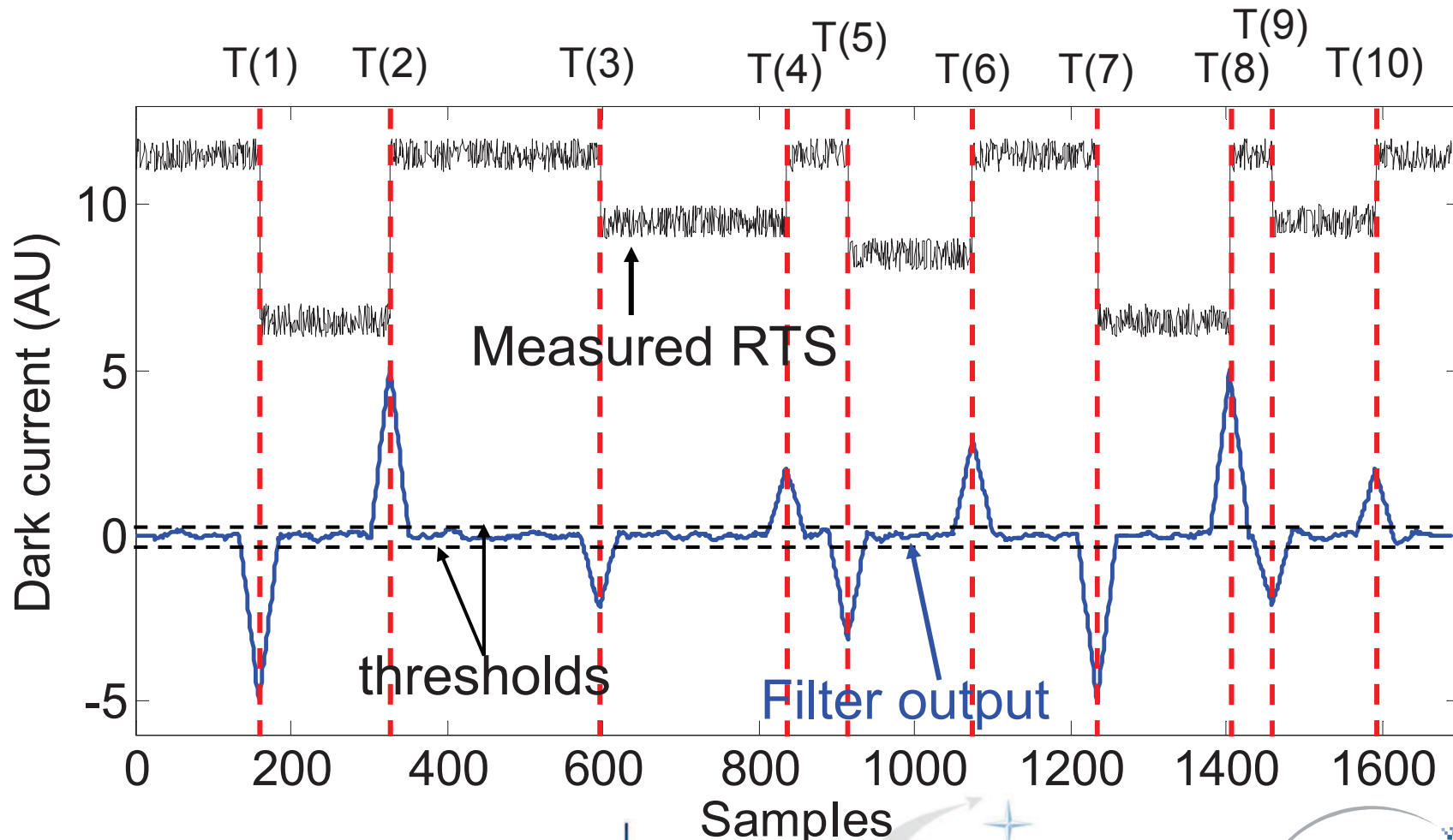
- Proposed RTS detection method
 - Detection principle
 - Parameter extraction principle
 - Illustration
- Proposed technique first results
 - Experimental details
 - RTS amplitude distribution
 - Photodiode bias effects on RTS
- Conclusions and perspectives

- Detection principle :
 - Based on a classical edge detection technique
 - Convolution of a digital step shaped filter and the signal

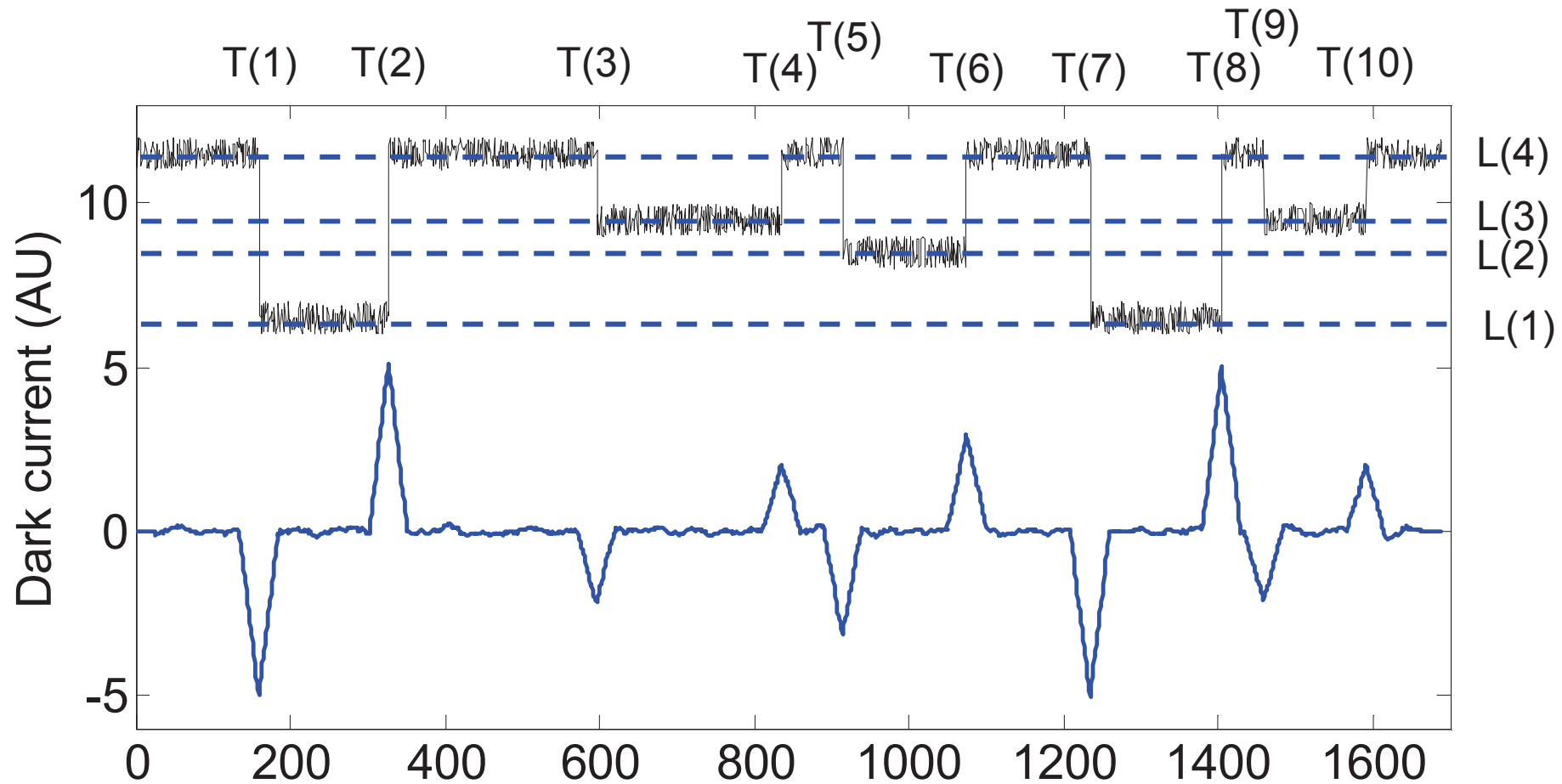




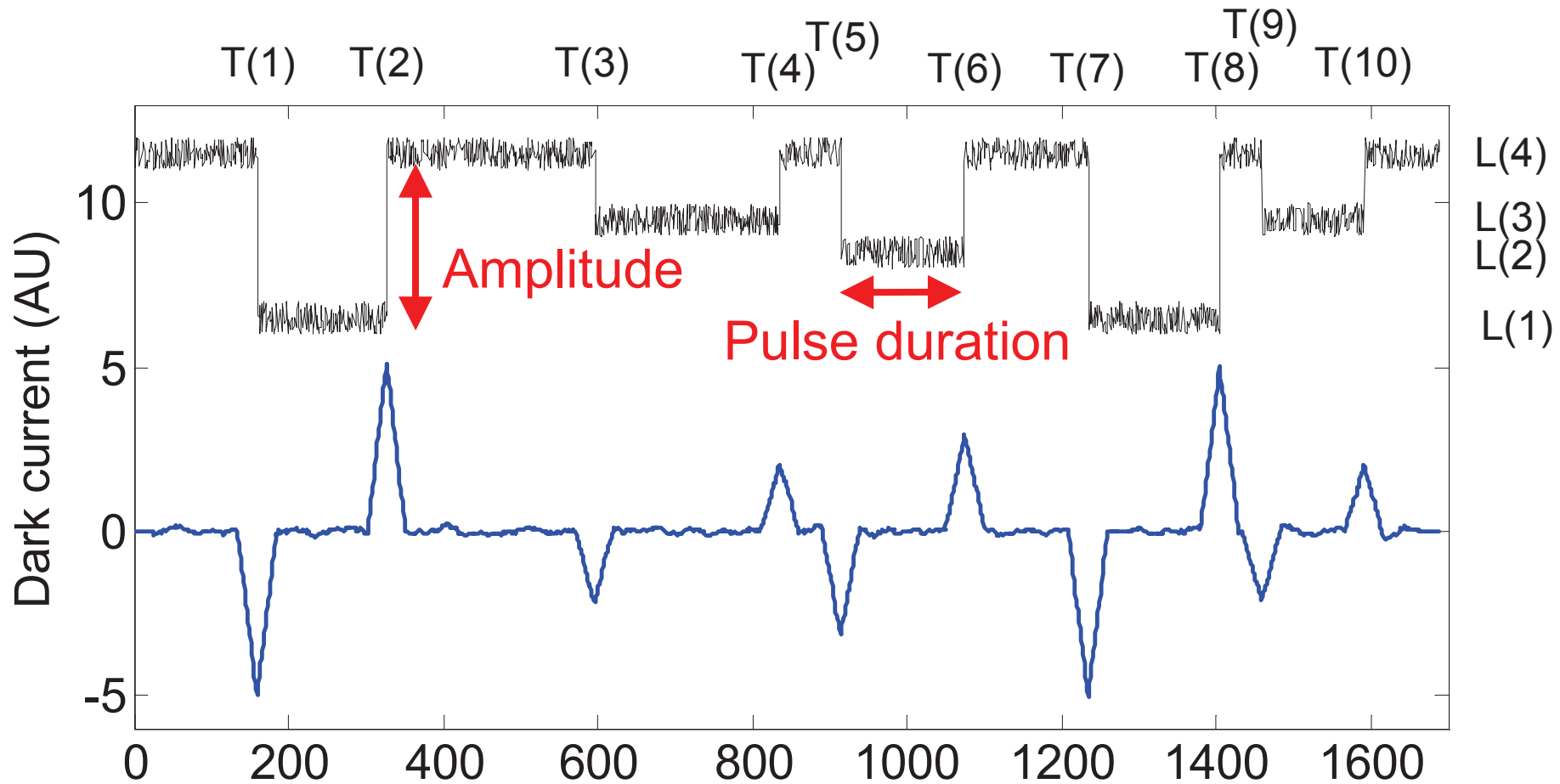
- Transition time index extraction



- Transition time index extraction
- Level value extraction

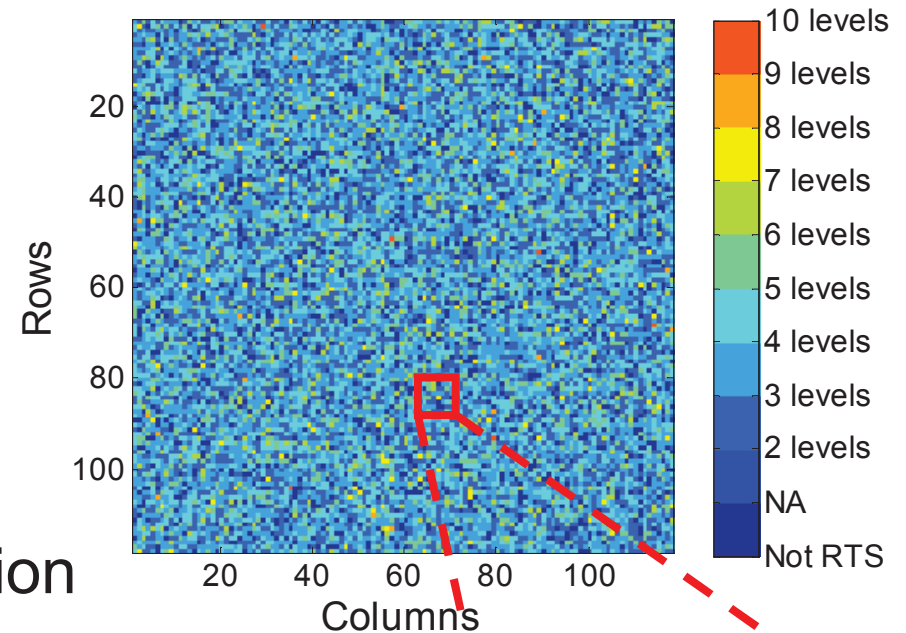


- Transition time index extraction
- Level value extraction



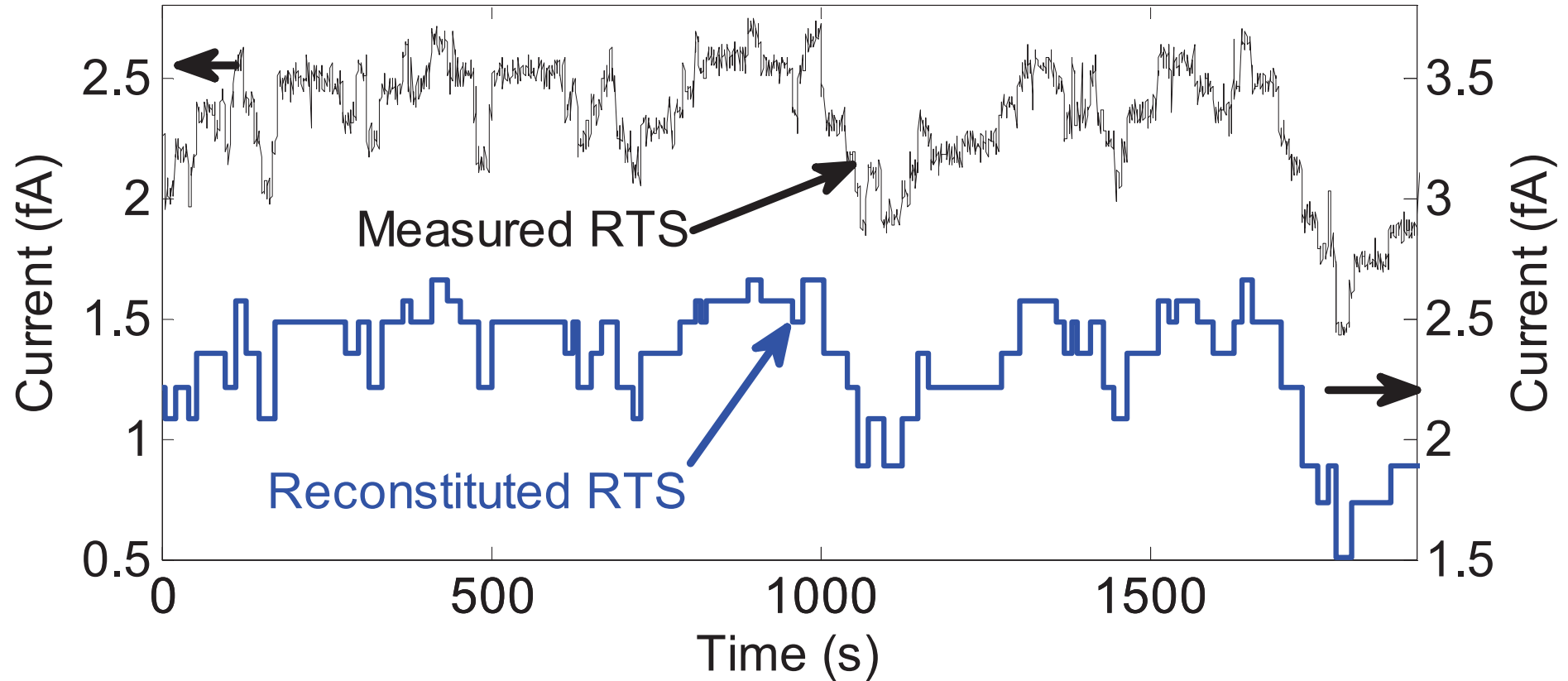
- This automated process yields:

- Levels $L(i)$:
 - RTS maximum amplitude
 - Inter level amplitude
 - Number of levels
- Transition time index $T(i)$:
 - Level time constant
 - Mean time before a transition



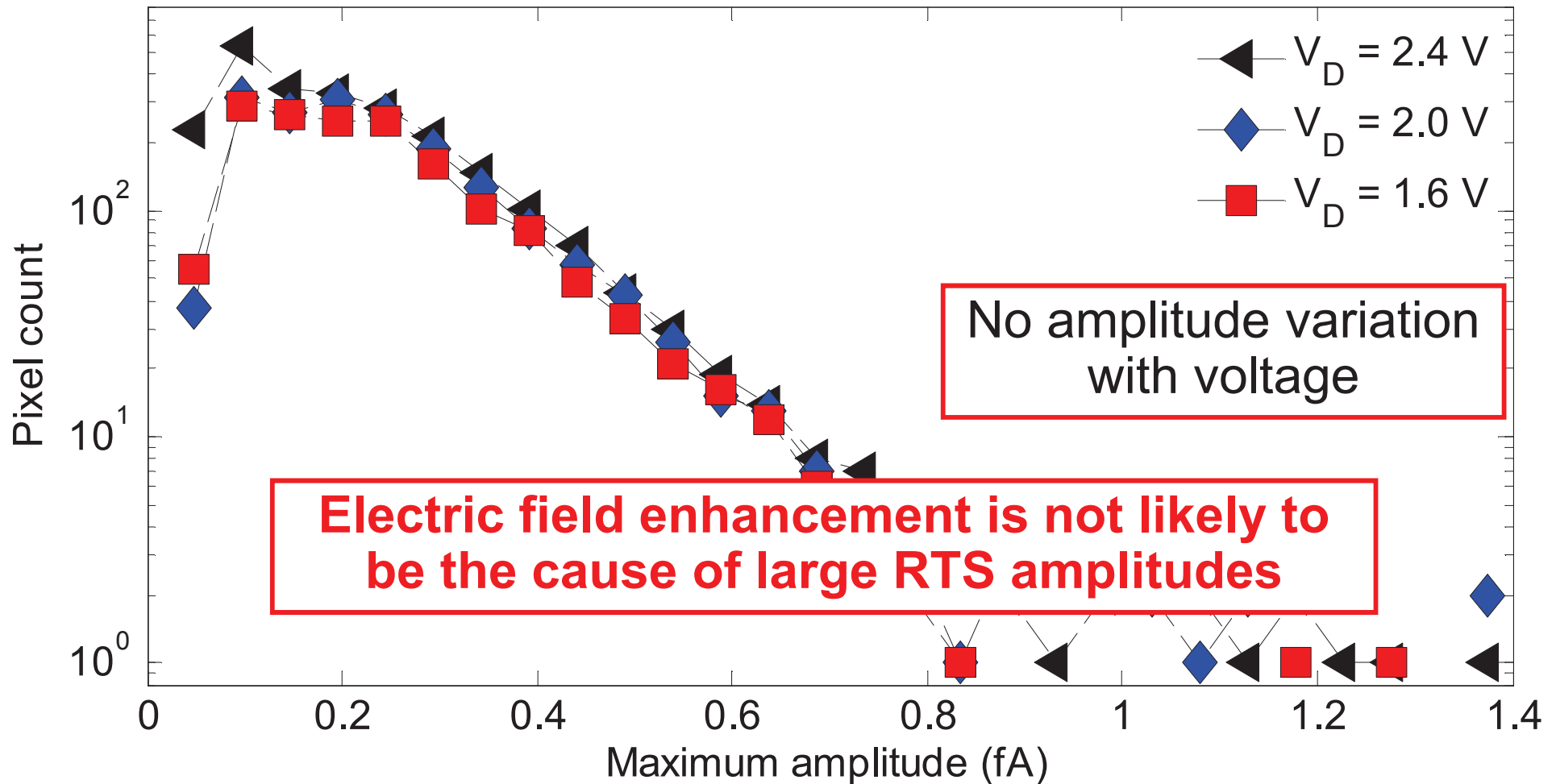
- Applied to a whole array

- Automated detection of RTS pixels
- Automated extraction of RTS characteristics



- All the level are recognized
- Most of the transition are detected

- The same trend is observed on the whole RTS population



- We have proposed a new RTS detection method
 - Based on a classical **edge detection** technique
 - Able to **automatically extract** multi level RTS **parameters**
- First results indicate that:
 - Large RTS amplitudes are **exponentially distributed**
 - A **universal mean RTS amplitude** exists : ~ 0.19 fA
 - The **number of RTS** defects scales with **total NIEL**
 - RTS distributions **can be predicted**
 - Electric field enhancement **can not explain** RTS amplitudes
- Future work
 - Explore the **alternative explanation** for RTS amplitudes
 - inter center charge transfer?
 - Use of lower fluences and larger arrays to **confirm** these results with **better statistics**
 - Study of **time constants** (inter transition time constant)

A world map rendered in shades of blue and white, serving as a background for the central text.

Thank you!

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