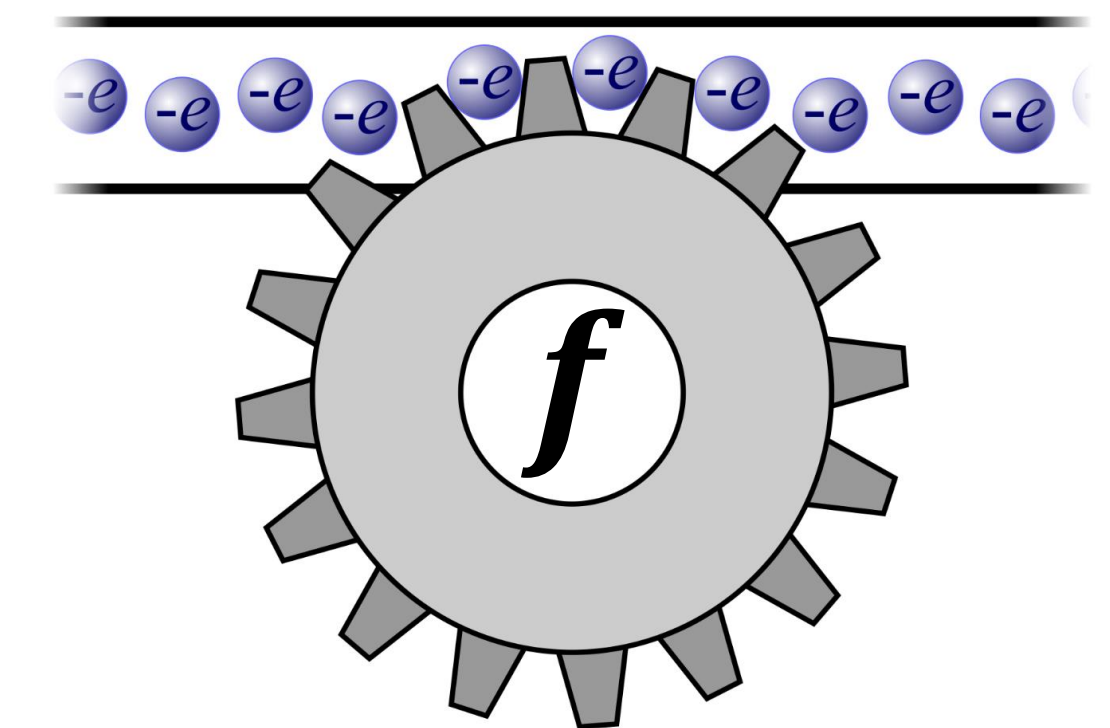


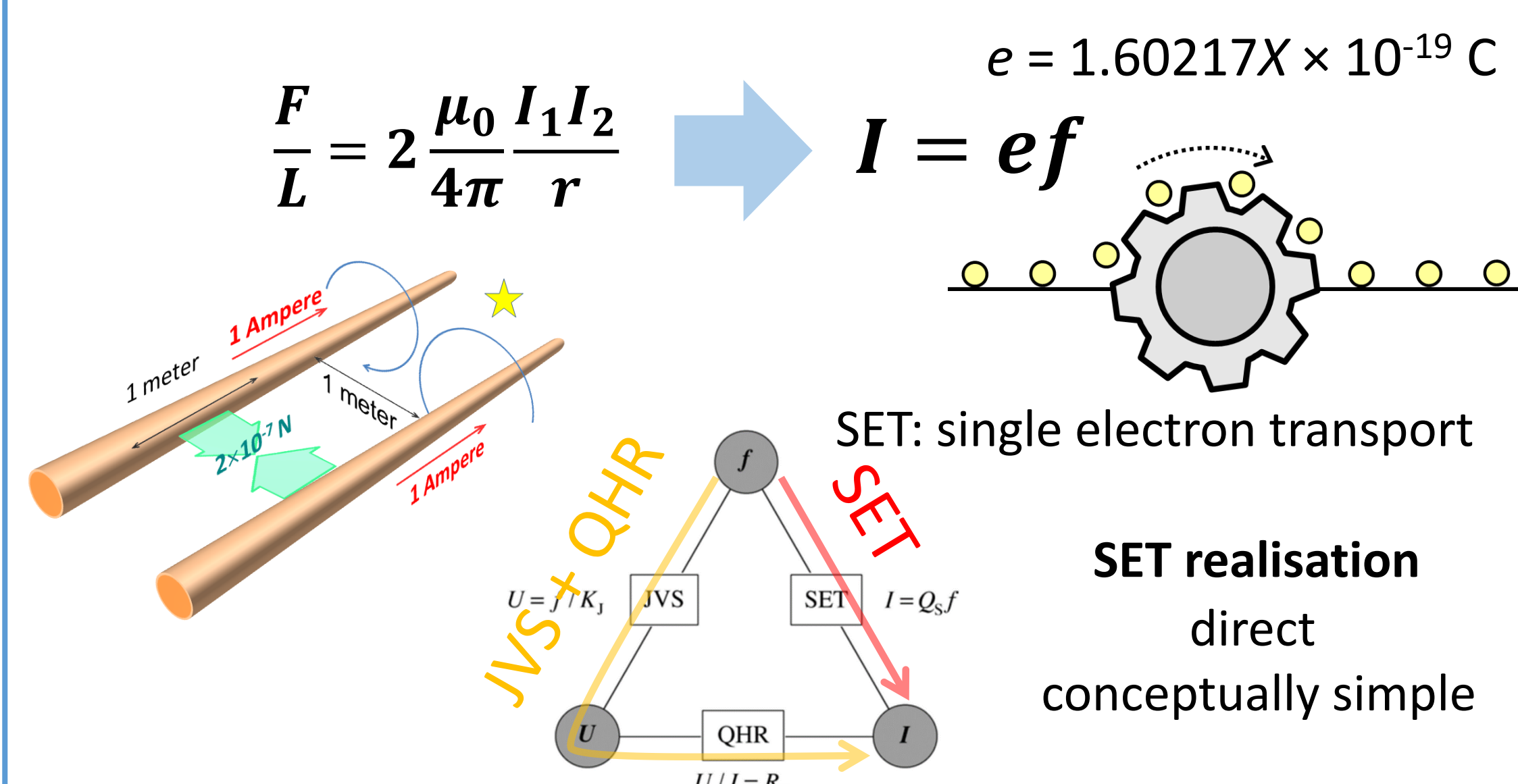
## Objectives

1. To develop single-electron-based current sources with accuracy at or below 1 part in  $10^7$  → **WP1, WP2**
2. To test the universality, robustness and reproducibility of single-electron sources → **WP2**
3. To implement high-accuracy current measurement capability → **WP3**
4. To develop guidelines for testing single-electron current standards → **WP2, WP4**
5. To facilitate the take-up of small-current measurement technology → **WP4**



## Need

### Future SI ampere realisation

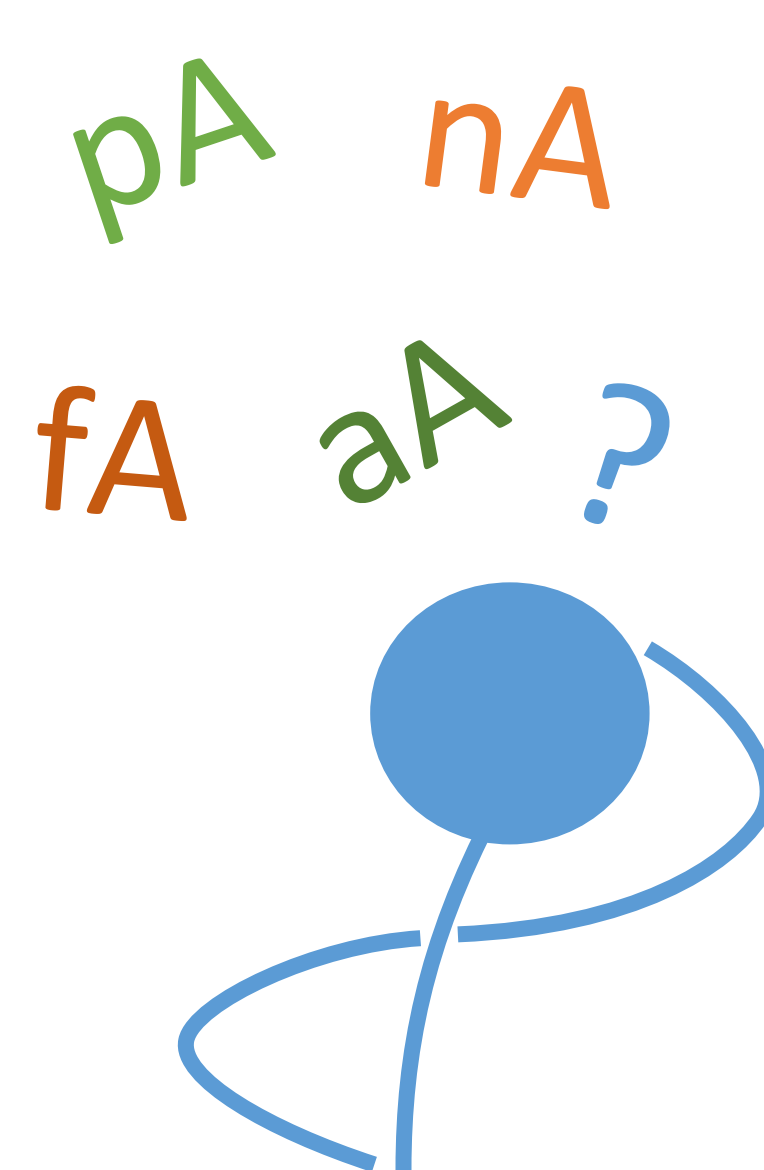


### Small-current measurement

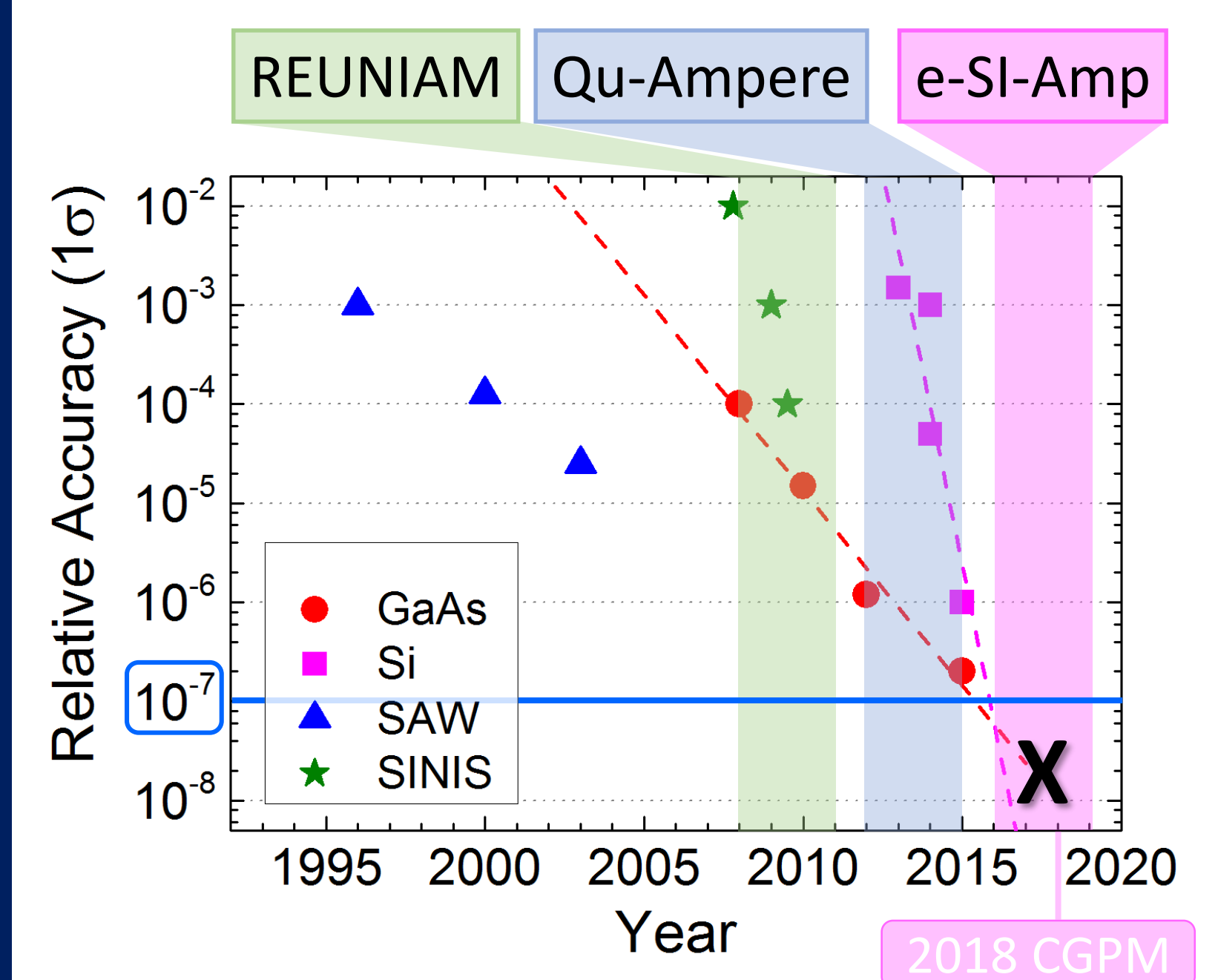
Solutions for small-current measurement in academia and industry



e.g. traceable calibration of radioactive sources



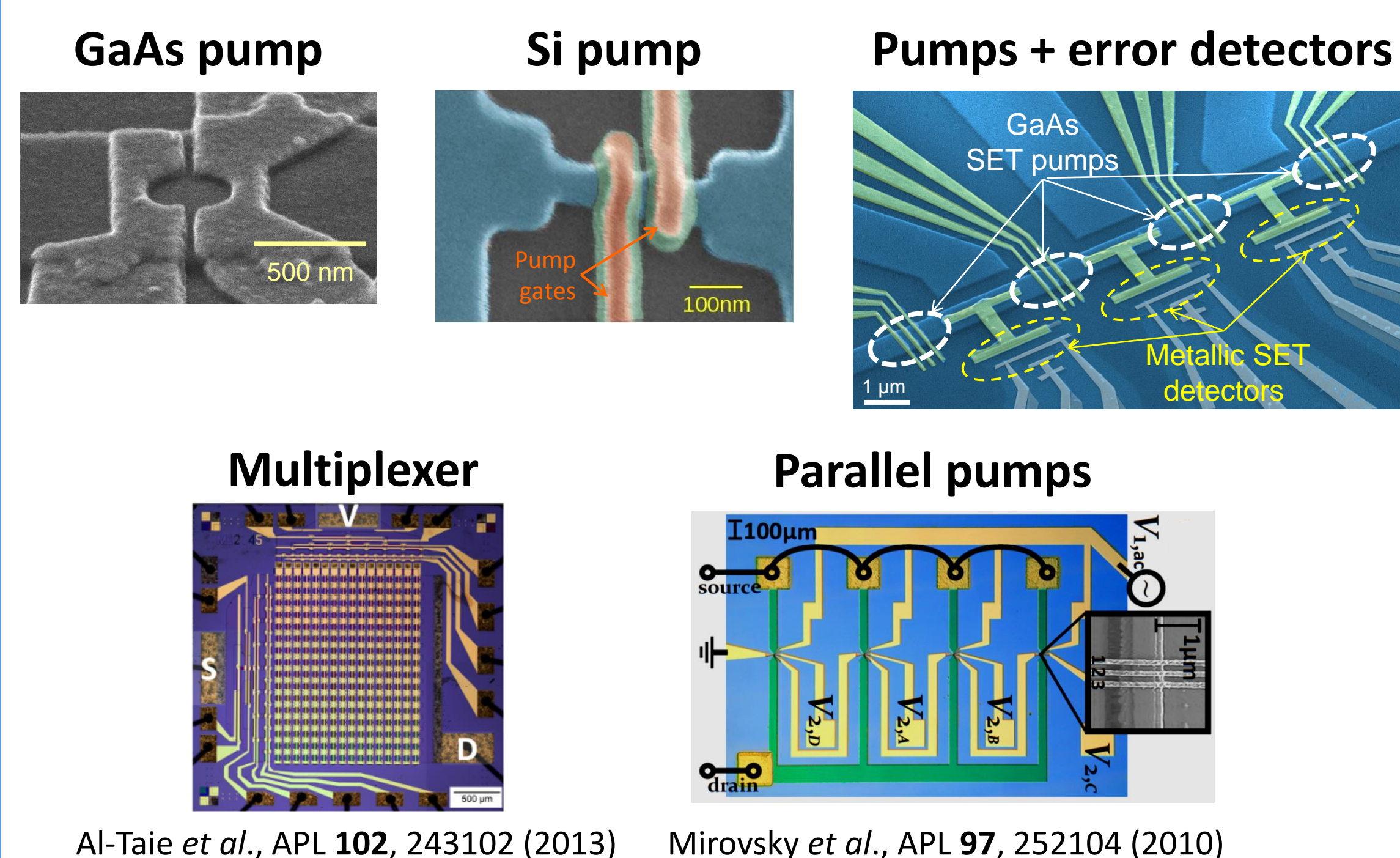
## State of the art



## Work package structure

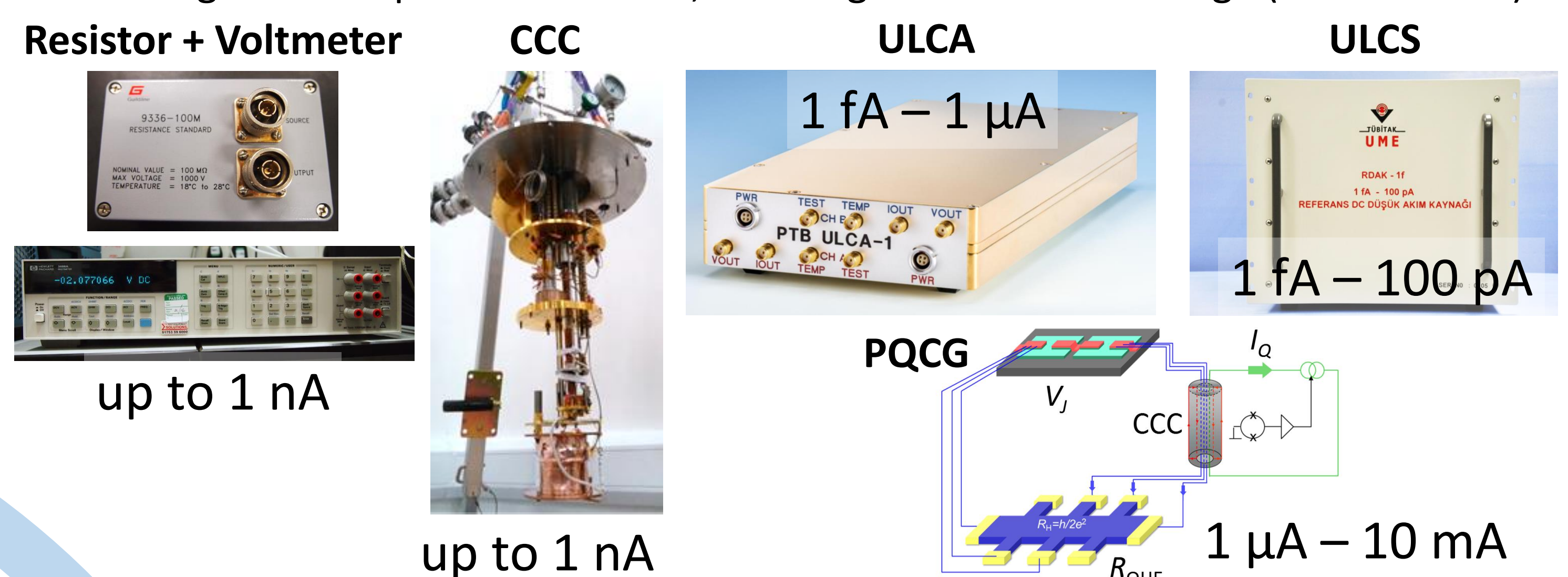
### WP1: Development of SET devices

Design, fabrication, and characterisation of single-electron current sources producing 100 pA – 1 nA



### WP3: Small-current measurement systems

Development of traceable current measurement/source systems capable of resolving femtoamperes and below, covering a wide current range (1 fA – 10 mA)



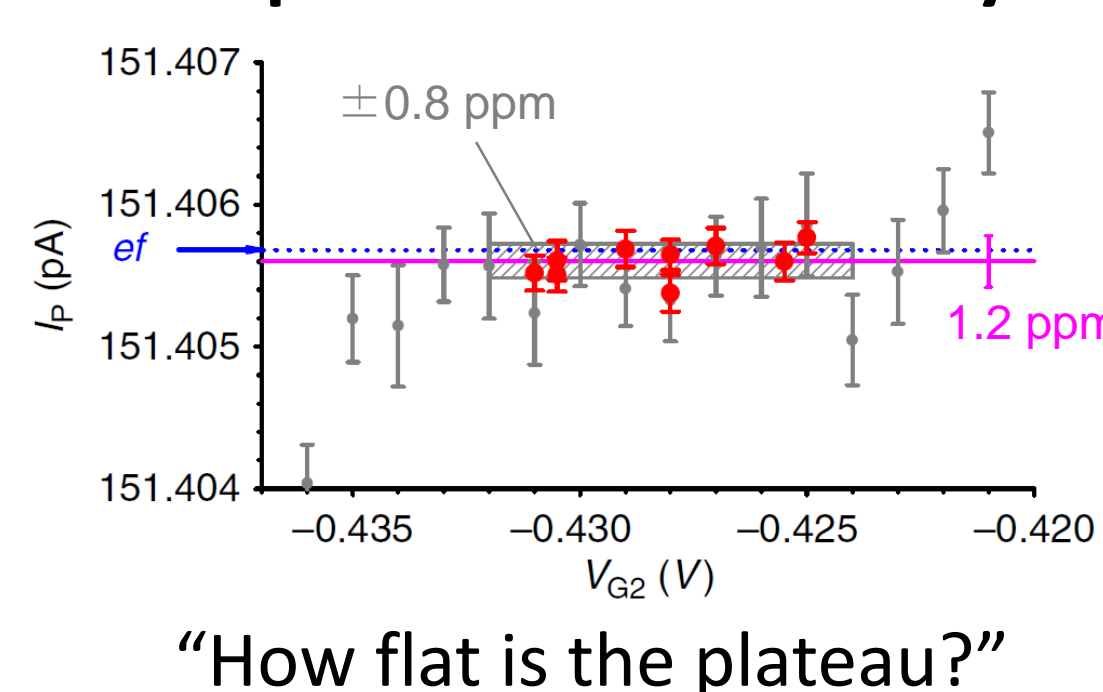
### WP2: Validation of SET devices

Testing the accuracy of single-electron current sources

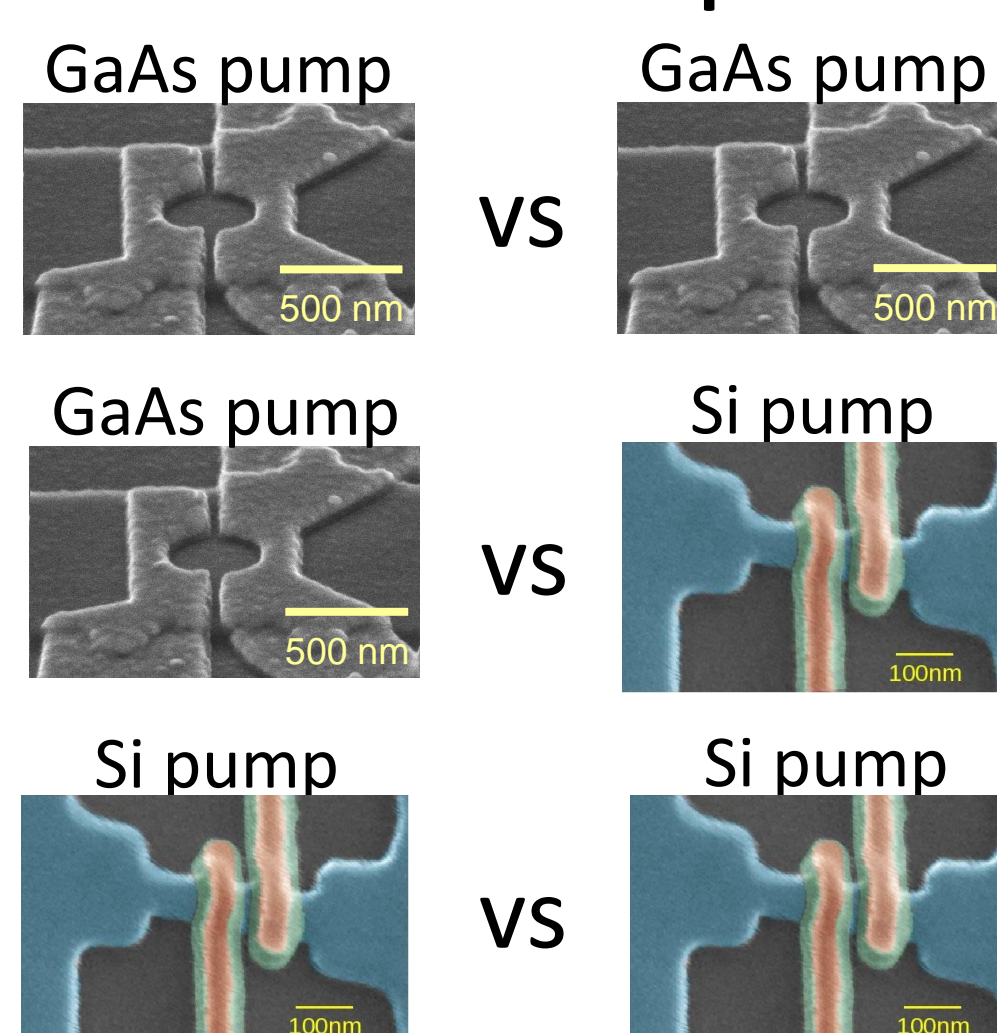
- Robustness and accuracy
- Reproducibility
- Universality

Target  $\sigma \leq 1 \times 10^{-7}$

Assessment of current-quantisation accuracy



#### Inter-device comparison



“Do different devices give same results?”

### WP4: Creating impact

#### Early impact

##### Scientific research

- Semiconductor quantum device
- Mesoscopic physics
- Nanotechnology
- Quantum information processing

##### Metrology / Industry

- Small-current calibration
- High-impedance calibration
- Aerosol-particle measurements
- Ionising-radiation measurements
- Radionuclides decay measurement
- Radiation dosimetry

#### Wider impact

- Diagnostic radiology
- Environmental monitoring
- Nuclear decommissioning
- Nuclear forensics
- Nuclear industry process
- Nuclear medicine
- Nuclear power industry
- Radiation therapy
- Semiconductor industry
- Steel manufacturing

- Publications
- Conferences

- Stakeholder interest group
- In-depth training
- Training/demonstration sessions

- CIPM/CCEM
- Guidelines

#### SI redefinition

