<u>"Determine, as much as possible, the power generated by the readout for all tracking technologies"</u>

Presumably this question is driven by a desire to understand the power dissipated within the detector volume.

- For the silicon it makes sense to express this as a function of silicon area. This allows for the scaling of power dissipation for different detector layouts.
- For silicon sensors under consideration, the power dissipation for ALPIDE is known, the dissipation for ITS3 like sensors is scaled, and the numbers for MALTA are a private communication from Heinz Pernegger.
- The dissipation in the detector volume has 2 components, the direct power dissipation on the sensors and the power dissipated in the cables that bring the power to the sensors. The ratio is preserved between the options.
- The RDO boards sit outside of the detector volume and are not part of the power dissipation budget.
- For all sensors the power is divided into analog (matrix) power and digital (usually periphery) power which will be shown as estimates for all sensors.
- In general, the power dissipation for MAPS based detectors is low in comparison to other silicon technologies.
- These are estimates (except for ALPIDE) but should be good for power budgeting purposes.

Power estimates:

For ITS2 like sensors (ALPIDE):
1 module = 63 cm^2 VDD = 2.1V @ 1.3A, VDA = 1.9V @ 0.3A => 3.3W so 100 cm^2 = 5.24W dissipated in the sensors and power cables.

ITS3 like sensors scaled:
0.5 x 0.52W/100 cm^2 = 2.6W/100cm^2

For MALTA:
Same silicon process (TJ 180 nm) 75 mW/cm^2 Analog + 10 mW/cm^2 Digital = 85mW/cm^2 for sensor.
Assume power delivery is same so 30% additional power dissipated in cabling => 110.5 mW/cm^2 or 11.05 W/100cm^2

Sensors	Power dissipated / 100 cm^2 in detector volume (W)
ALPIDE	5.24 W
ITS3 like	2.6 W
MALTA	11.05 W