



Teledyne e2v

Detector Developments in UV/VIS/NIR and IR

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Factory Status

A successful year despite the challenges

- Chelmsford manufacturing site has been continuously operational
- All staff that can work from home are doing so, resulting in about 50% attendance on site
- Large lateral flow test capacity now installed for staff testing
- Space Imaging and Quantum business has had a good year, with revenue and profit targets met or exceeded
- Although the future working practices are uncertain, we have the tools to succeed



Overview

- CCD Status and Developments
- CMOS Image Sensor Developments
- IR Sensor Status and Developments
- Technology Development

CCD Status and Developments

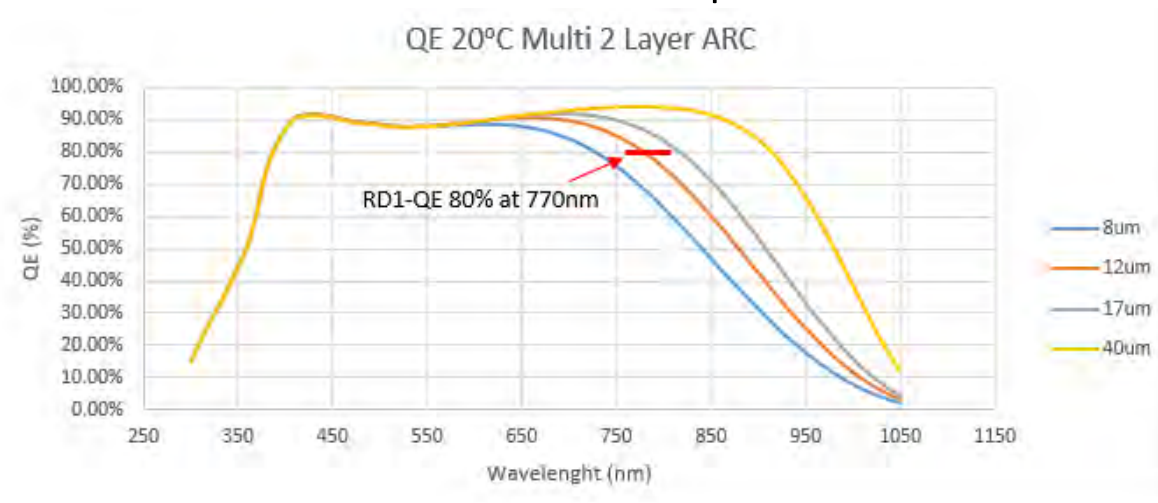
- CCD manufacturing is alive and well!
- CCDs are still the detector choice for many demanding applications,
 - Very high dynamic range
 - High uniformity
 - Many variants and optimisations available
- CCD demand is growing, driven by industrial and scientific imaging applications
 - Instrument spectroscopy
 - Life Sciences
 - Ground based astronomy

CCD Developments

- ESA Aeolus Follow-on CCD contract (€2.8M) to develop, manufacture and characterise an update to the Aeolus Aladin CCD for Wind Lidar applications
- Exploitation of CCD275 (from Sentinel 5p TropOMI) in hyperspectral instruments in China
- Collaboration with NASA JPL in use of “Delta Doping” back surface passivation for high and stable UV performance
- Industrialisation of “Curved Sensor” technology under ESA/UKSA and ESO funding to give accurate and repeatable curved focal plane

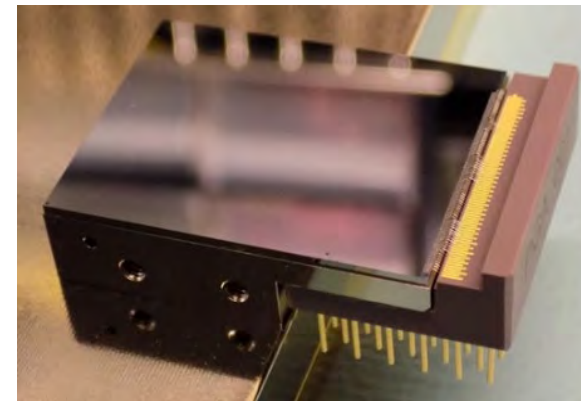
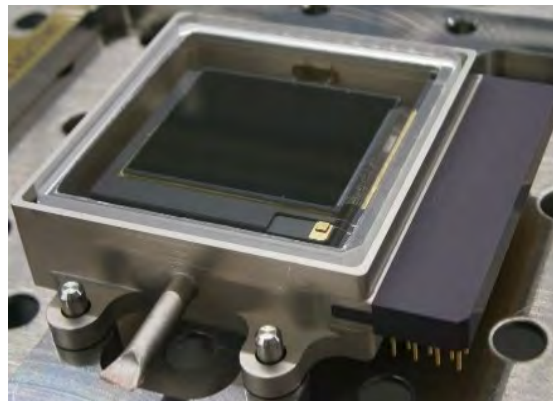
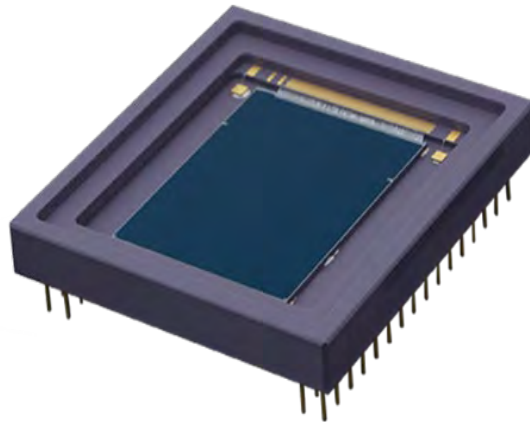
CMOS Image Sensor Status and Developments

- CIS120 “Capella” 2k x 2k 10 micron pixel sensor established as a space product
 - Use for Copernicus CO2M for several instruments in UV/VIS/NIR, including the Multi-Angle Polarimeter, with attached polarizer and filters
 - Broad interest and design-in for NASA proposals
 - “HiRho” fully depleted thicker silicon version produced under ESA contract is performing well



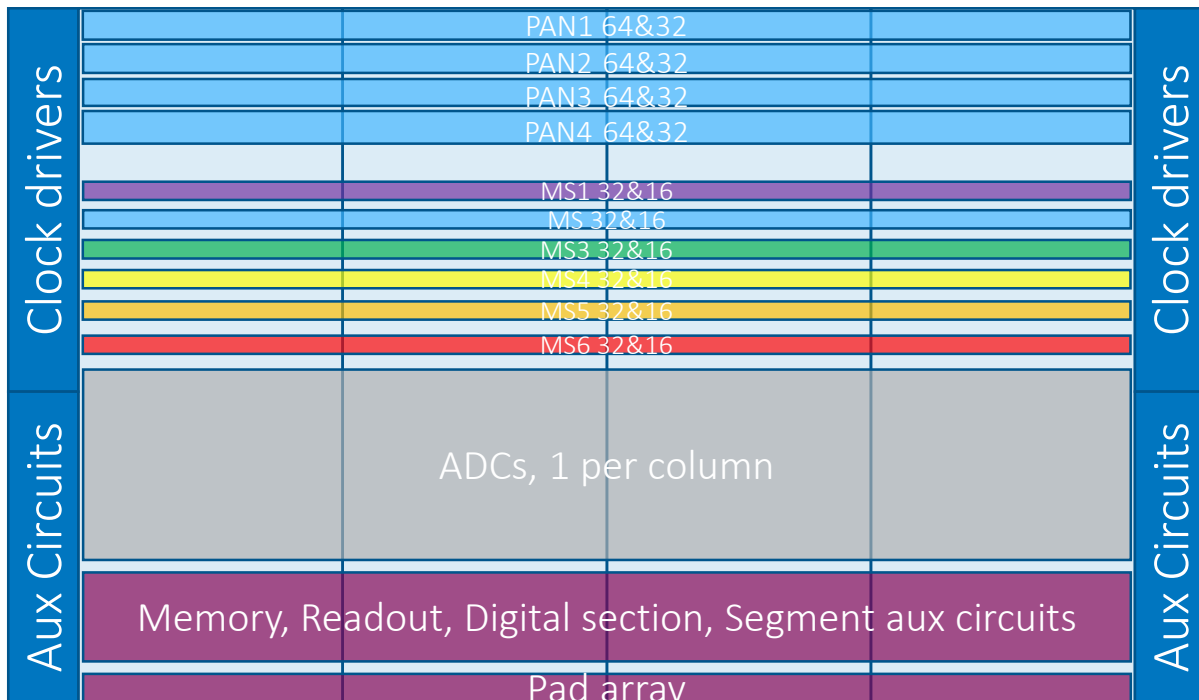
CMOS Image Sensor Status and Developments(cont)

- CIS120 “Capella” 2k x 2k 10 micron pixel sensor established as a space product
 - TRL 6 achieved this year
 - Various pixel and package variants now available



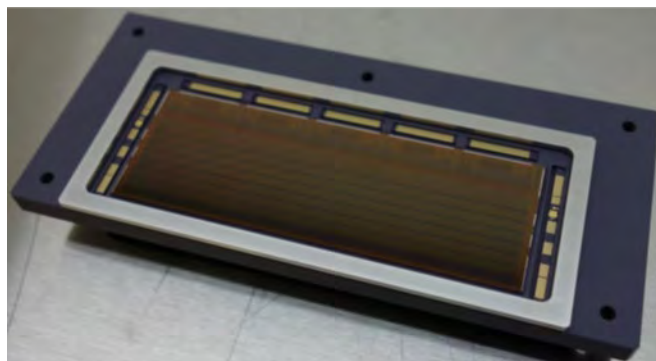
Multispectral qTDI CMOS CIS125

TDI CMOS Sensor for VHR Earth and Planetary Observation



| | |
|----------------------------------|---|
| Pan Channels | 4 pan – each made up of 2 sub TDI pan: 64 lines and 32 lines |
| MS Channels | 6 MS – each made up of 2 sub TDI MS: A & B 32 lines and 16 lines |
| Pixel pitch μm | 5 μm Pan, 10 μm MS |
| Number of pixels | Pan: 16k columns MS: 8k columns |
| Full Well Capacity (per pair) | Pan: 60ke- MS: 240ke- |
| Max. Line Rate | Up to 30 klines/s depending on configuration (55 klines/s with customisation) |
| Read-out speed at max. line rate | 2.0 Gbit/s |
| Other features | Antiblooming Bidirectional Radiation Tolerant |

- 20 x CML output
- 8b10b digital encoding
- 5 ground domains



IR Sensor Status and Developments

From concept to reality

- Highest performance MCT detectors from Teledyne Image Sensors in California assembled, tested and to be qualified in the UK
- Two ESA programmes underway:
 - Copernicus – CHIME, 3k x 512 pixel VIS/SWIR CHROMA-D Detector for hyperspectral imaging
 - EarthWatch TRUTHS, 2k x2k UV/VIS/SWIR CHROMA-D Detector for pre-development activity in Phase A/B1, plus design of dedicated 2k x 1k detector for flight system
- Successful set-up and commissioning of SWIR Electro-optical test facility
- Significant interest from other programmes for export



Thank You!

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