

WE LOOK AFTER THE EARTH BEAT

# Contactless Power & Data Transfer for an Instrument Scan Mechanism

CEOI Technology Conference 2015

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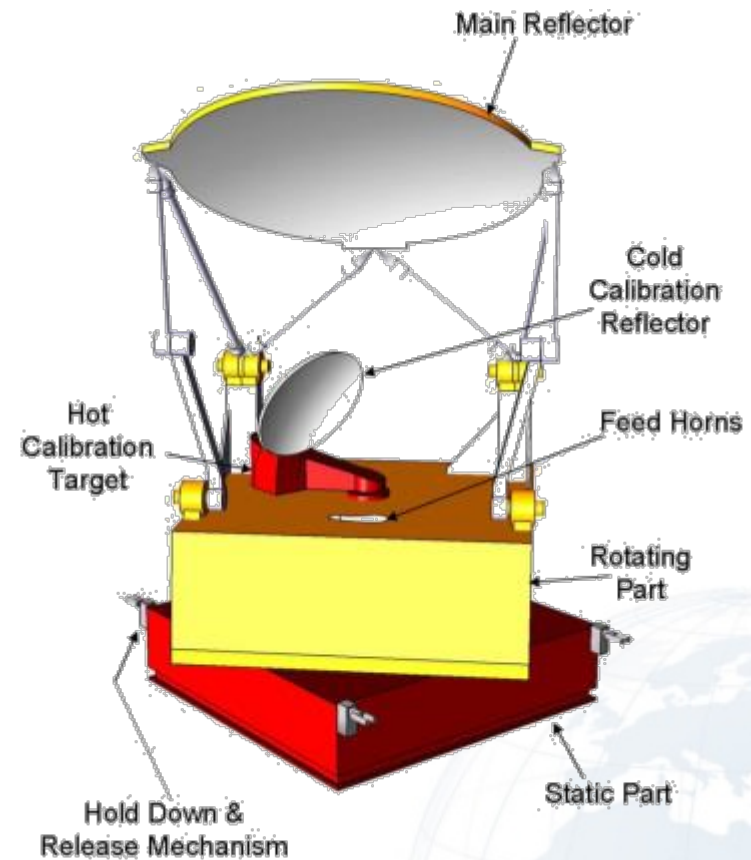
A Hyder Consulting group company, Hyder

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## Project Background

- ESA TRP Long Life Contactless Power and Data Transfer (LLCPDT)<sup>2</sup>;
- Aimed at future radiometric instruments, e.g. Metop2G ICI and MWI;
- 8.5 years life, 240 million revs;
- Centrally mounted, stiff, large diameter, target support required;
- Central volume now allocated;
- Large bearings;
- Sliding distance for contacting technologies ~ 40,000km;
- Pushing the limits of contacting technologies;
- Need to develop a contactless alternative;



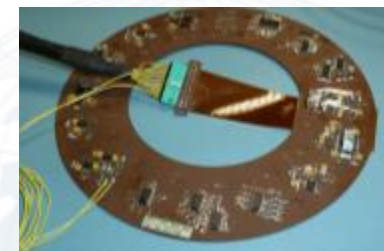
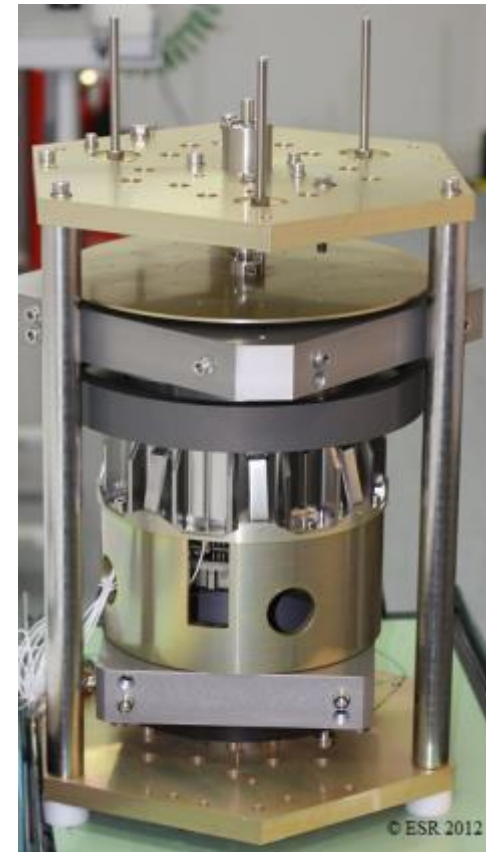
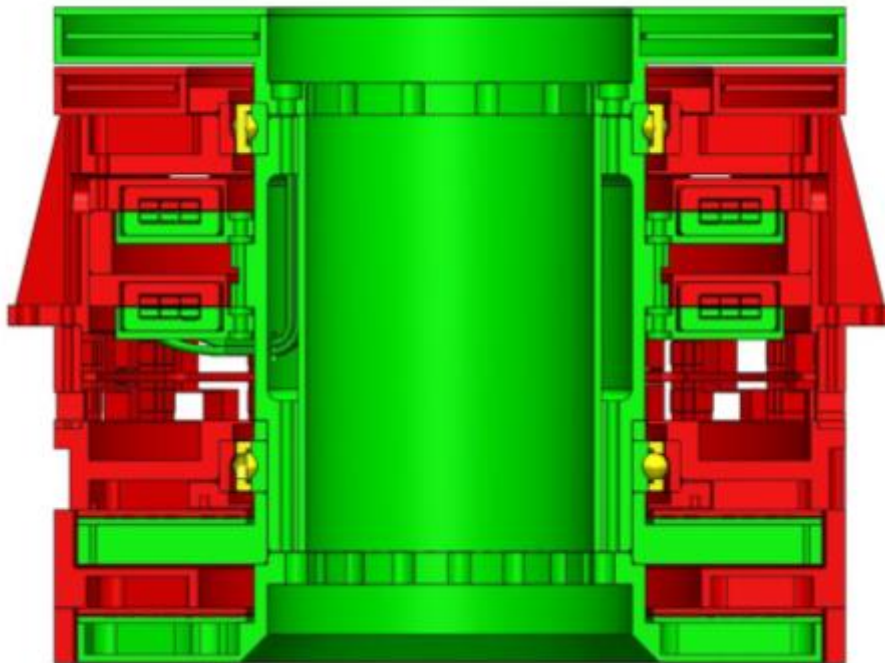
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# ESA TRP Device

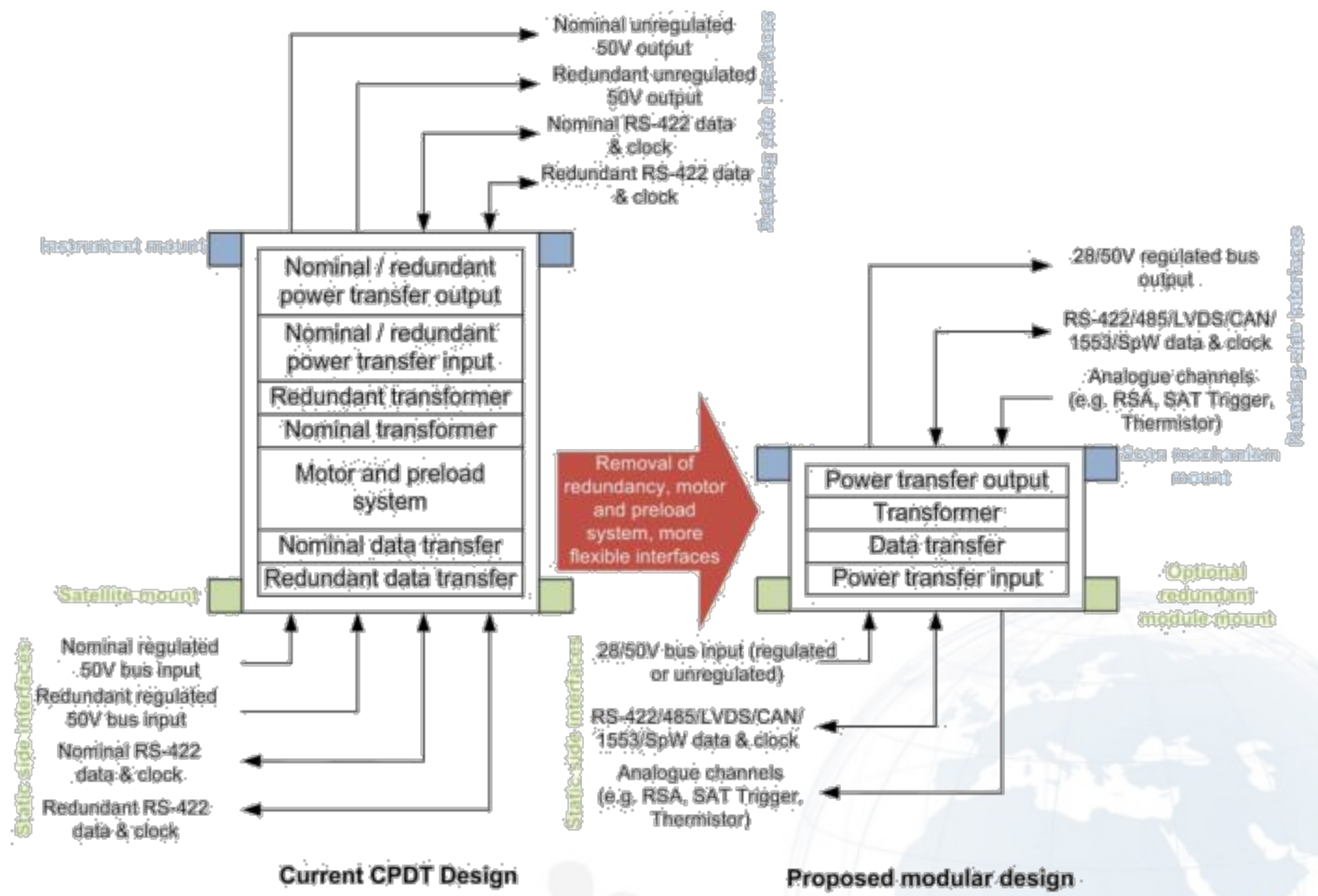
- 9.5kg, can rotate a 100kg instrument at 45RPM for >110M revs;
- 200W power transfer at 50V (>95.2% efficiency);
- 5Mbps full duplex data transfer (RS422);
- 199.3mm(H), 235mm(OD), 75mm(ID);
- Fully redundant, radiation hardened;



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# CEOI Project Goals

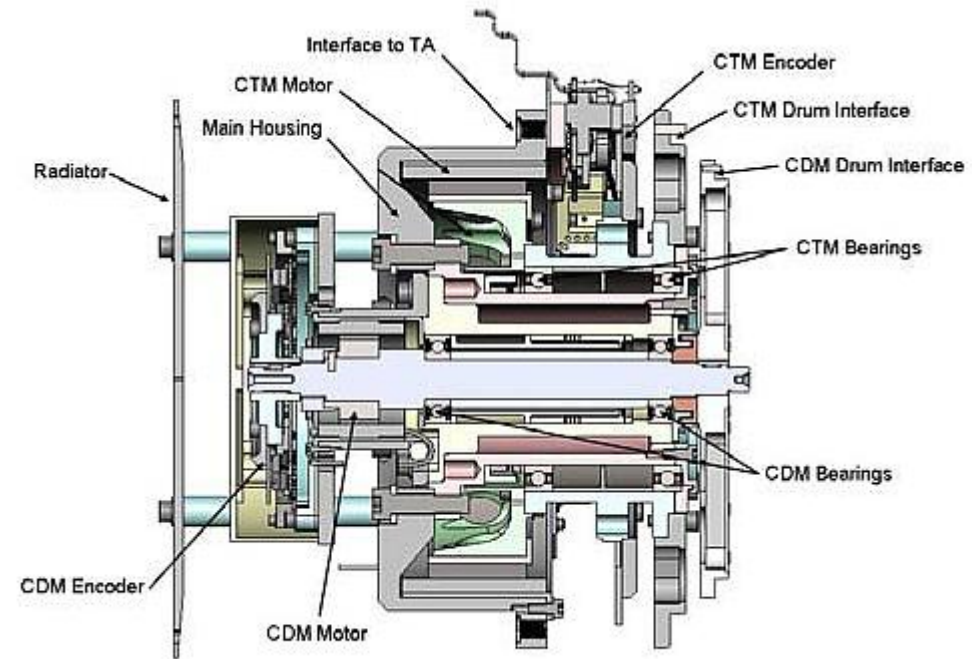
- Targeting applications beyond MetOp;
- Primary goal is to modularise the existing LLCPDT design to accommodate:
  - Higher data rates (>10Mbps);
  - More data interfaces (LVDS, analog);
  - 28V buses, regulated and unregulated;
  - Volume reduction and modularisation of assembly (optional redundancy or extra power/data channels);
  - Removal of motor housing;



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# Applications

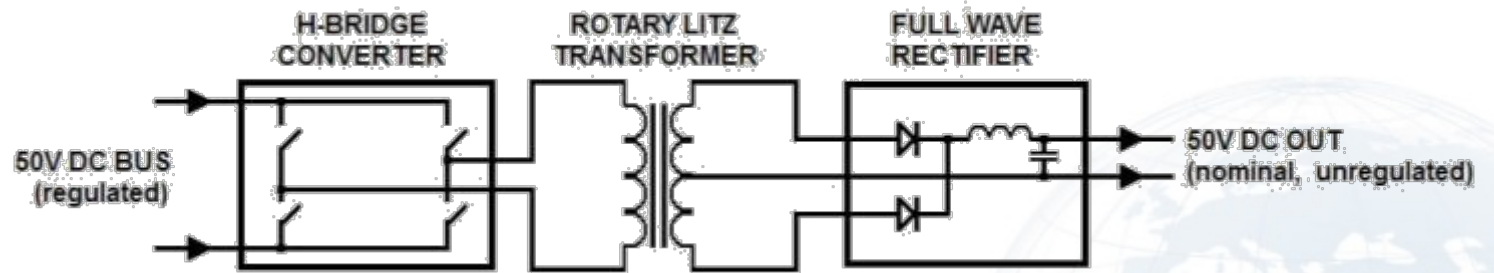
- Any device that requires slip rings for power and/or data transfer; particularly those in harsh environments or requiring long life.
- Conical scanning mechanisms (e.g. successors to SLSTR, BBR)
- Inter-satellite links (LASER and RF)
- Shock proof Antenna scan mechanisms, requiring thousands of start/restart cycles;
- Spin-outs: e.g. terrestrial turret and radar systems



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# Power Transfer

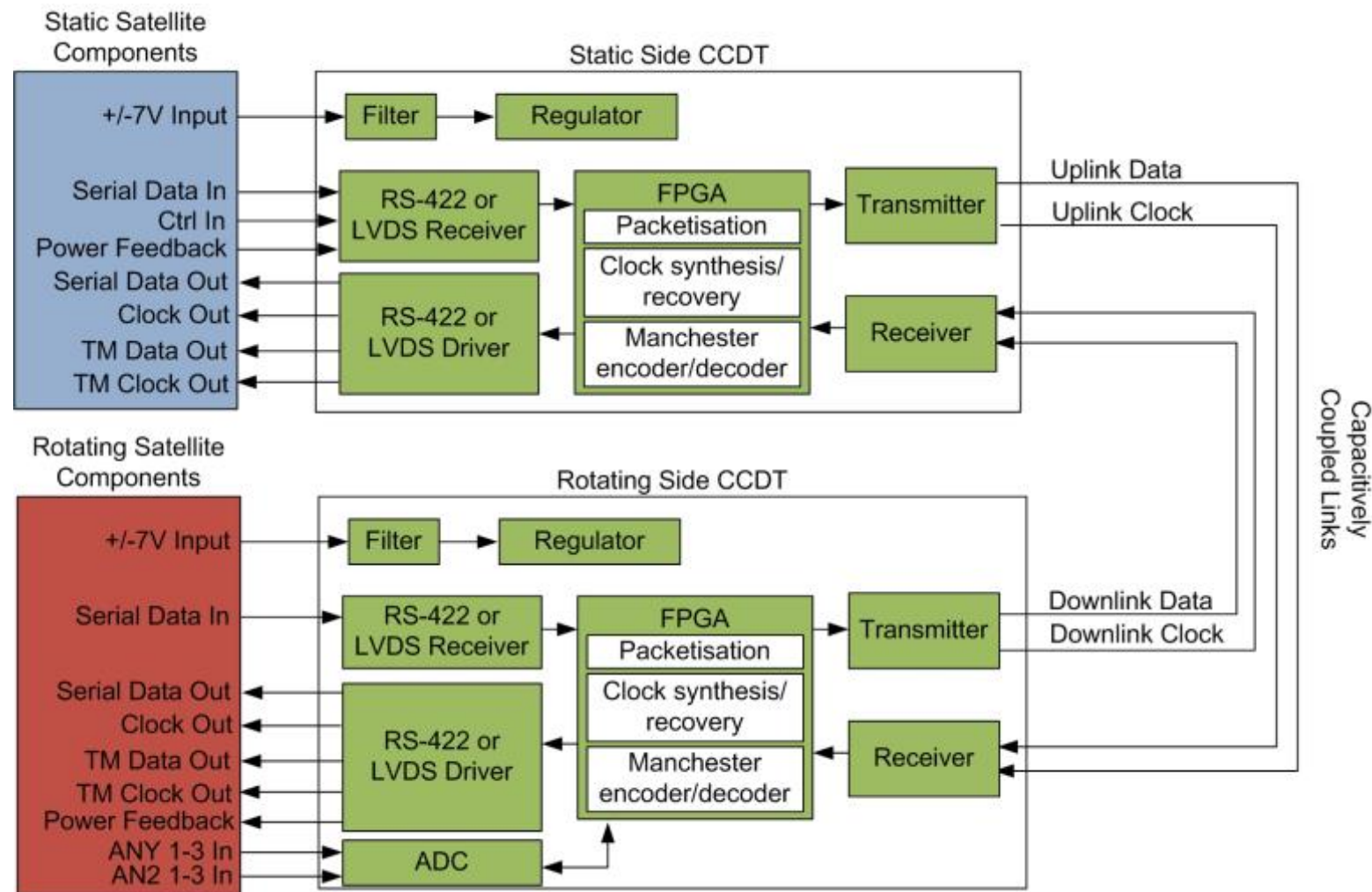
- TRP device was 200W 50V +1%/-3% >95% end to end efficiency;
  - Not an ESA bus standard;
- New device will have several options:
  - 28V regulated, 140W;
  - 28V un-regulated, 140W;
  - 50V regulated, 200W.
- New regulation will be to ESA bus standards;



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# Data Transfer

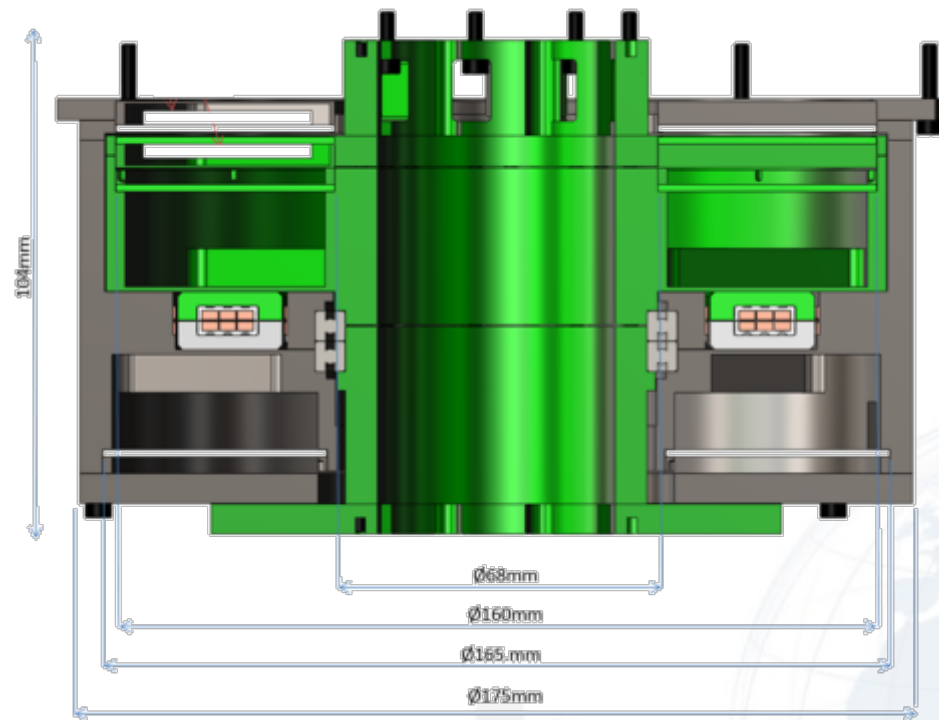
- Redesigned electronics to accommodate more than one channel:
- >10Mbps full duplex serial data channel;
- Power transfer feedback;
- 3x Thermistor inputs (ANY) on rotating side
- 3x Analog inputs (AN2) on rotating side



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# Mechanism

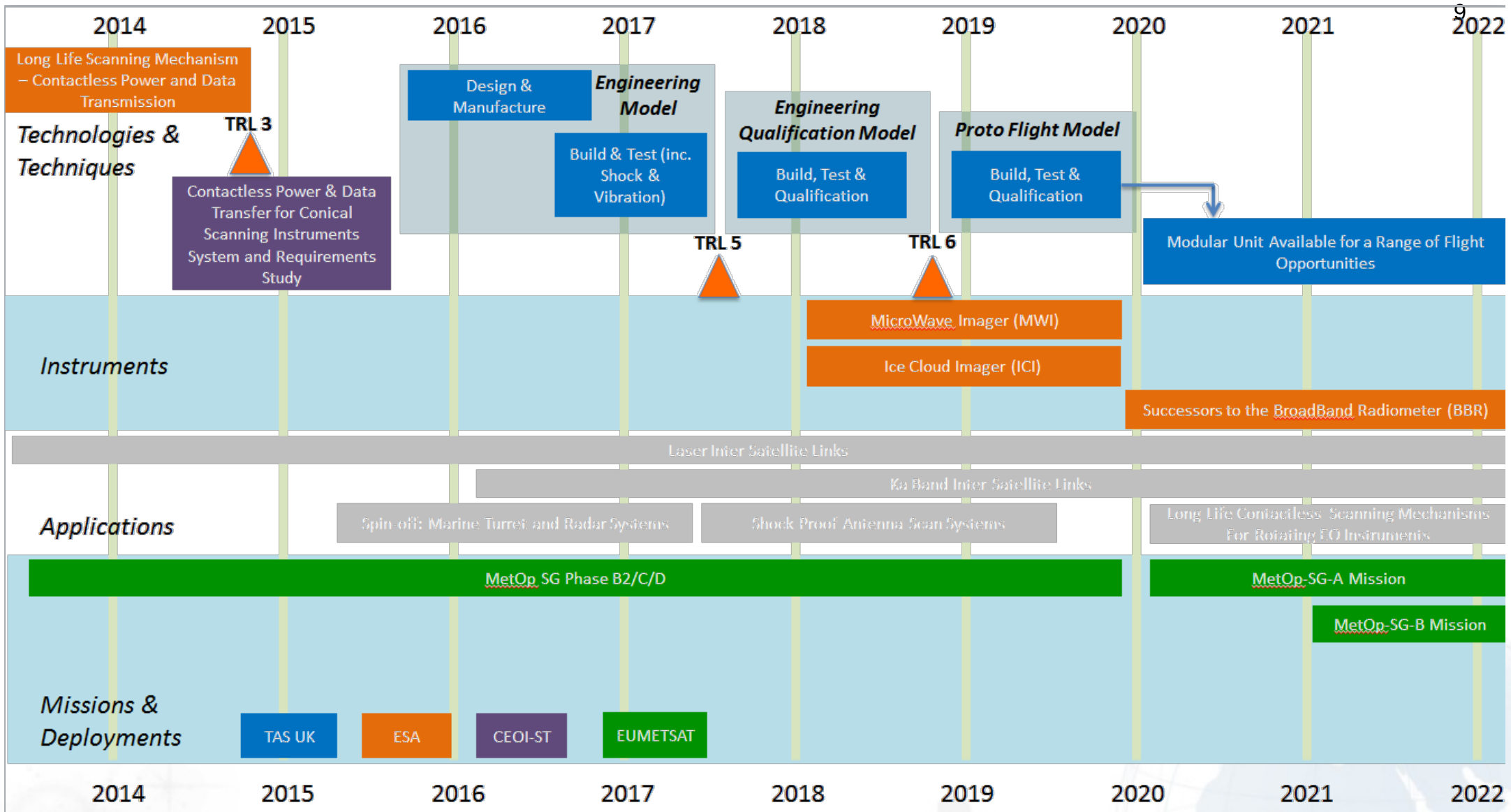
- 104mm(H), 175mm(OD), 50mm(ID);
- Modular design;
- Stacking possible - providing more power, data channels and redundancy;
- >110M Revs;
- <5kg mass total;
- 75g Quasi-static load.



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# Roadmap



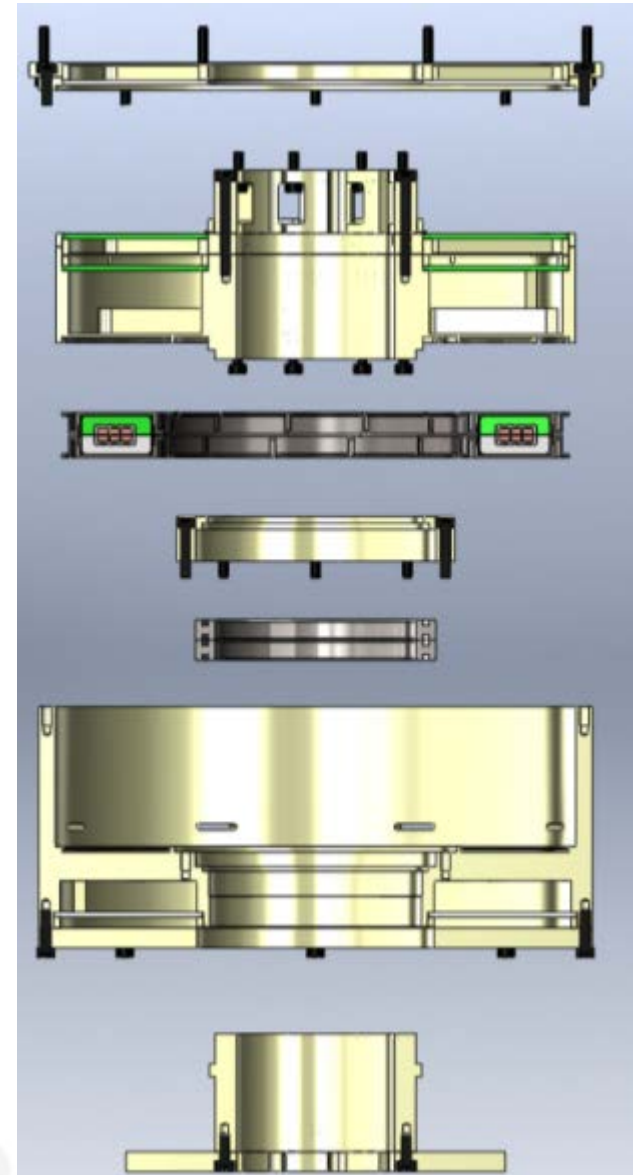
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## Summary

- Contactless power and data transfer device suitable for rotating mechanisms operating in harsh environments for long life times (>110M revs);
- Intended to be a direct replacement for slip-rings;
- 28 to 50V power transfer up to 200W;
- >10Mbps serial data transfer with 3 thermistors and 3 analog channels;
- Up to three units stackable for additional capability and/or redundancy;
- 50mm inner hole for calibration sources;



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