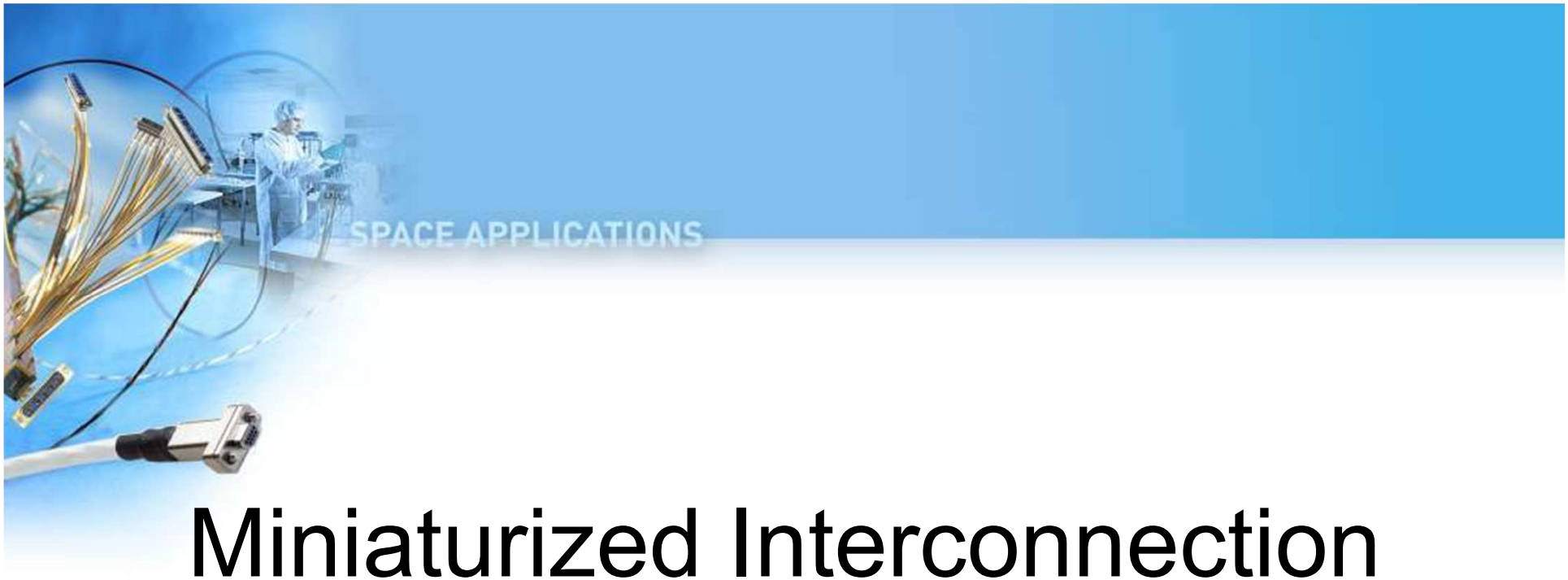



# Miniaturized Interconnection Systems

AXON‘ Kabel GmbH

Germany

Prepared for ESTEC June2010

# Brief introduction of AXON'

**Communications Module**
One to three floors

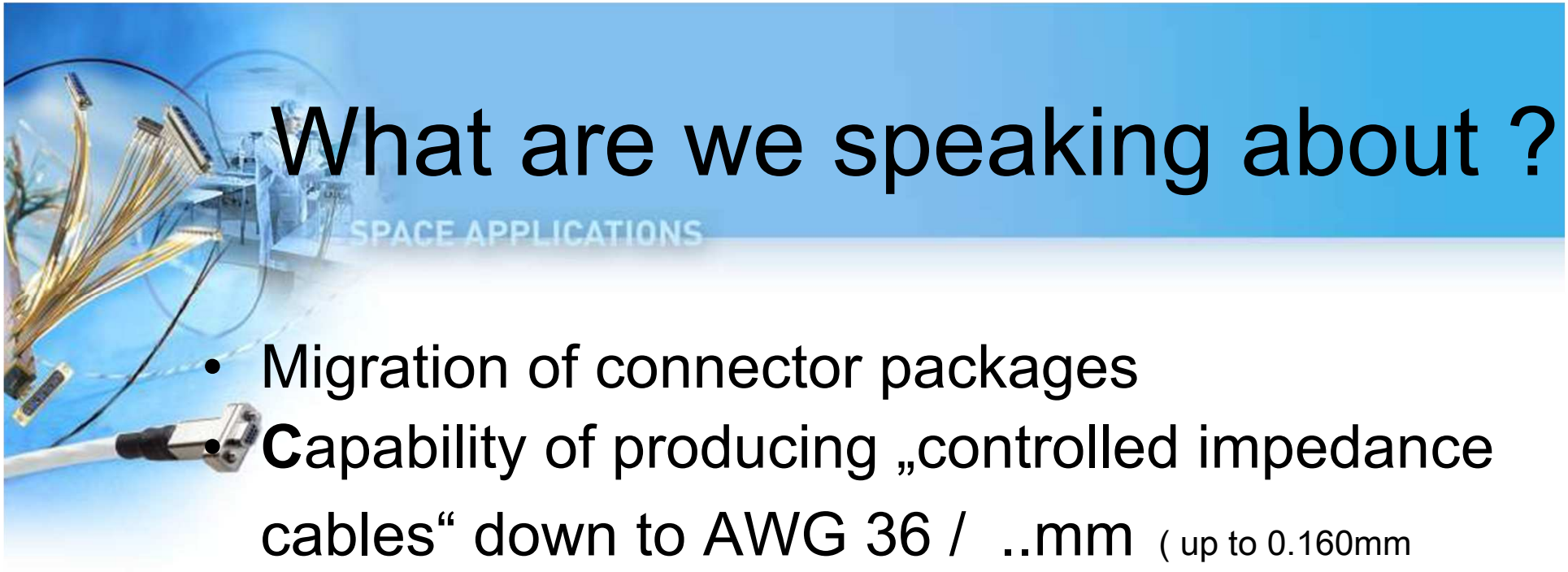
**Solar array**
3 to 5 panels per wing
2 panel sizes

**Propulsion**
Chemical only or
Chemical + Electric (Plasma)

Several CPS tank capacities

**Scalable power supply**
Modular PSR concept
Range of 9 to 26 power modules

**Batteries**
Li-Ion cells




# What are we speaking about ?

- Migration of connector packages
- **C**apability of producing „controlled impedance cables“ down to AWG 36 / ..mm ( up to 0.160mm diameter)
- High density packages using µ-housing & Nano contacts
- Combo packages using power-, coax- and signal contacts
- New isolating techniques with „a-coax“ to save size and weight

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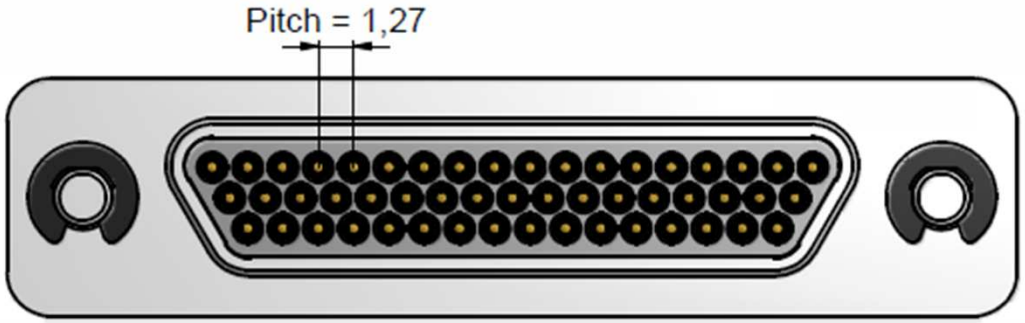
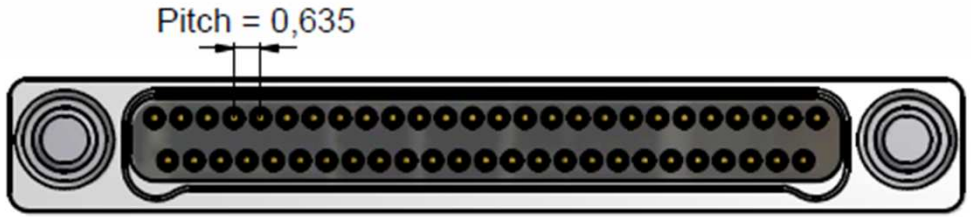
# Migration from „µ“ to Nano

SPACE APPLICATIONS


51 ways Micro-D male connector (scale 4:1)




51 ways Nano-D male connector (scale 6:1)

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# Smaller cables and less mass

| AWG18 | AWG26 | AWG30 | AWG42 | **AWG46** |
|---|---|---|---|---|
| 19 st (30) | 19 st (38) | 19 st (42) | 7 st (50) | **7 st (54)** |
| 0.254mm | 0.102mm | 0.063mm | 0.025mm | **0.015 mm** |

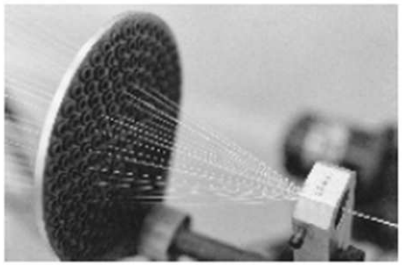
**63 st (44 (0.050mm))** **105 st (50 (0.025mm))**

Conductor : central conductor of wires / Shielding

Thin Insulation (50µm FEP)

Braiding AWG52 (Better EMI)
Served Shield AWG54 (Smaller dia.)

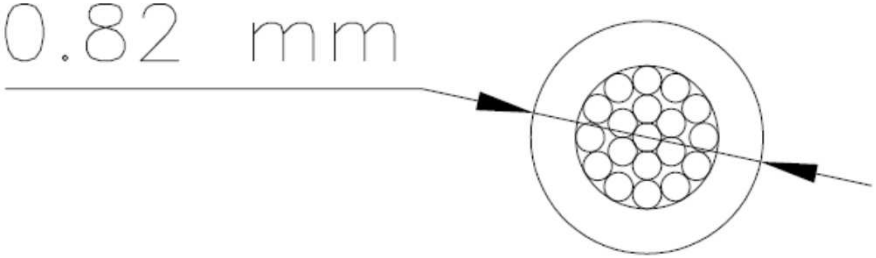
Extremely small and ultra-Flexible wires



# Smaller cables and less mass

SPACE APPLICATIONS

Comparison between AWG 26 and AWG 46




KT2619
250 V A.C.
-90°C/+200°C


UUKT4607
30 V A.C.
-50°C/+100°C

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# Smaller cables and less mass


## Coaxial lines

Size

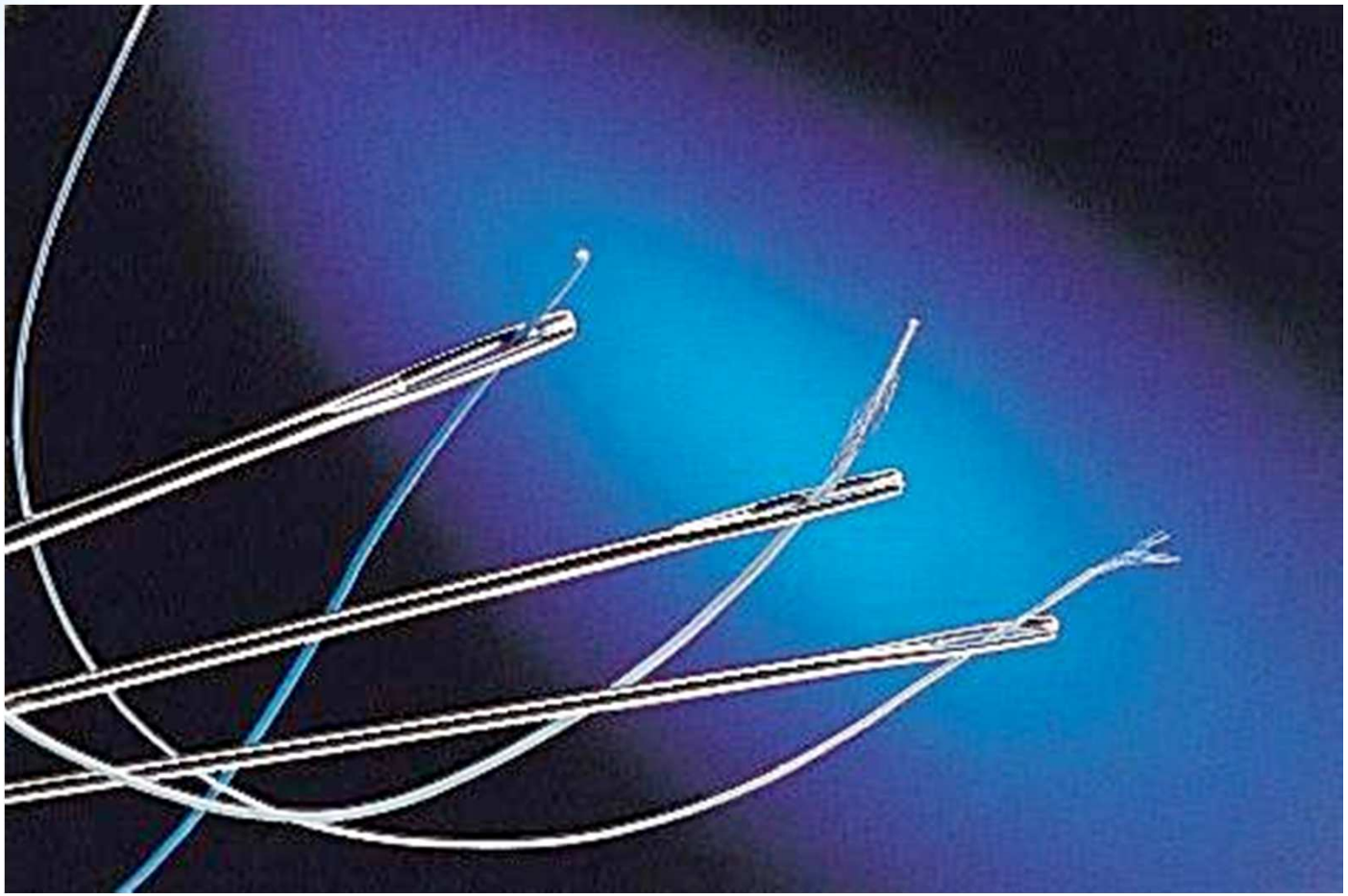
| Axowave28 | Axowave8F | RG178 | Wifi | Pico Coax | |
|---|---|---|---|---|---|
| 28mm | 8mm | 2.8mm | 1.37 to 0.8mm | 0.25mm | |
| 0.15 | 0.25 | 1.7 | 1.5 to 3.5 | >5 | (dB/m @ 1 Ghz) |

- Low loss cable
  → Bigger Diameter
  ➔ Celloflon° = Smaller diameter

| | Standard Coaxial | Celloflon° Coaxial |
|---|---|---|
| Inner Conductor | 7x0.17mm<br>0.51mm | 7x0.17mm<br>0.51mm |
| Dielectric | PTFE solid<br>1.52mm | Celloflon°<br>**1.35mm** |
| Jacket | FEP<br>2.7mm | FEP<br>**2.4mm** |
| Electrical performances | 50 ohms<br>100pf/m<br>0.5dB/m<br>@200Mhz | 50 ohms<br>100pf/m<br>0.5dB/m<br>@200Mhz |

# Smaller cables and less mass

SPACE APPLICATIONS



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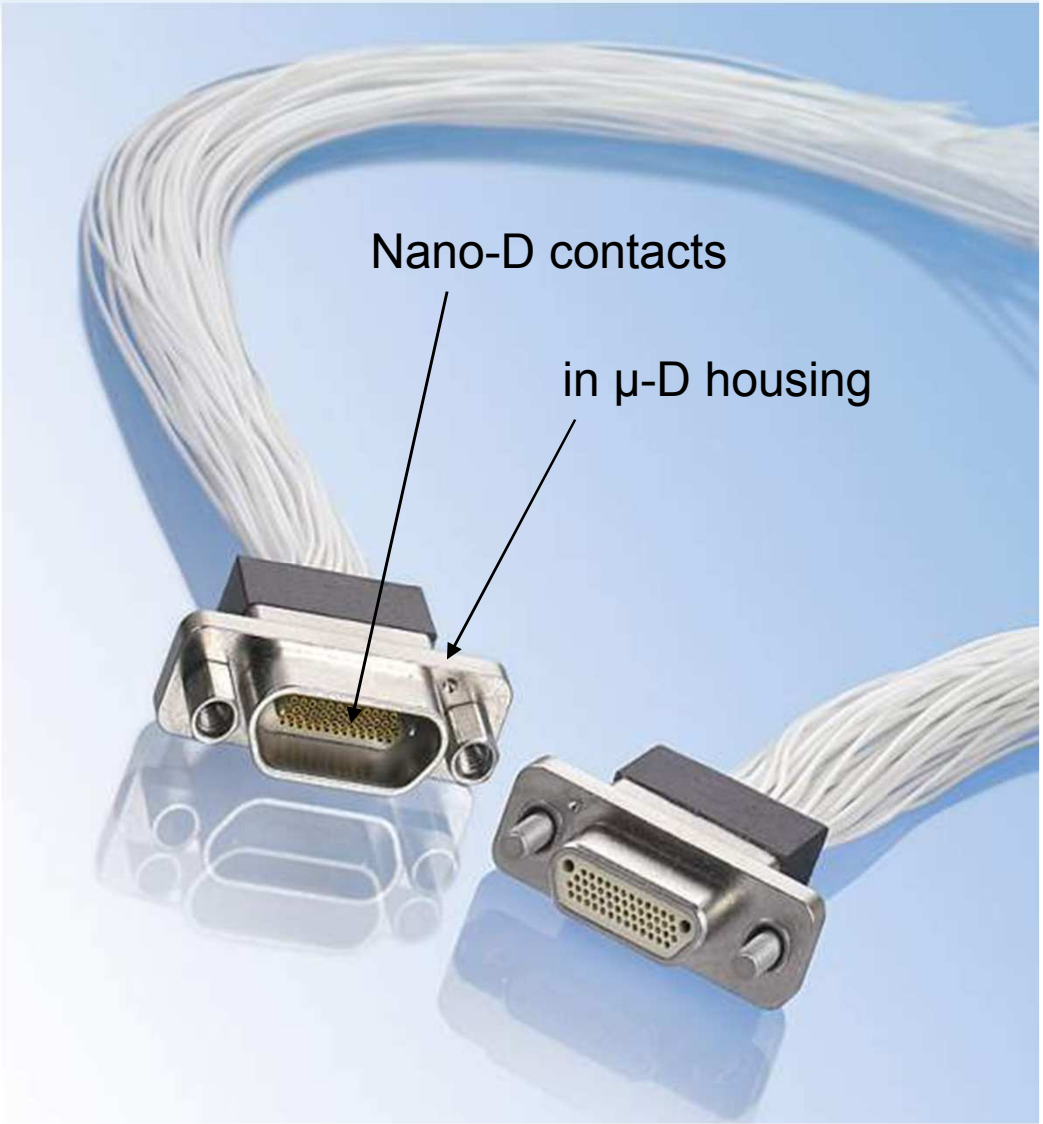
# High density packages


Simple, but very efficient way to reduce size and weight for  a high number of contacts !

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# Small packages with Combo‘s


Savings in size, weight and number of interconnections through integration of POWER and COAXIAL contacts within a standard connector.

Custom solutions possible and available.

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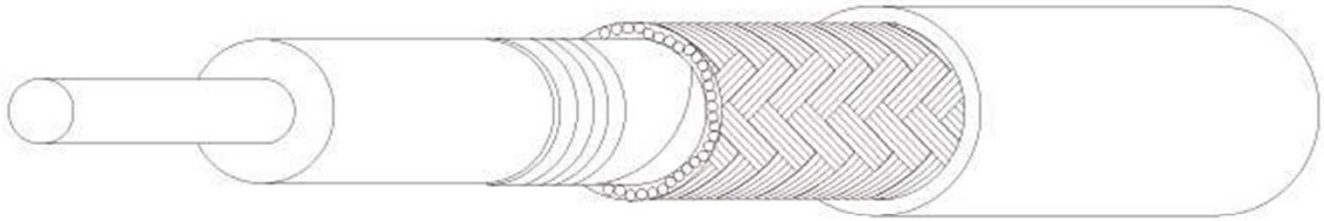
# A-Coax for low mass solutions

## a-coax® low loss coaxial cables

| Item | | | Electrical Characteristics | | | | | Construction | | | | | | | | | | | General Characteristics | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Designation | Reference | Cable Code | Impedance (Ohms) | Typical Attenuation (dB/m) | | | | Inner conductor | | | | Dielectric | | Outer Conductor | | | Jacket | | | | |
| | | | | 2,45 GHz | 5,8 GHz | 8 GHz | 12 GHz | Material | AWG | Composition | Dia. (mm) | Material | Dia. (mm) | Material | AWG | Dia. (mm) | Material | Dia. (mm) | Weight (g/m) | Voltage Rating (Vac) | Temperature Rating (°C) |
| a-coax 1,13mm | P540787 | 10 | 50±2 | 2,45 | 3,90 | 4,90 | 6,50 | SPC | 3007 | 7x0,102mm | 0,306 | a-PTFE | 0,78 | TPC | 43 | 1,03 | FEP | 1,13+0,13/-0,10 | 3,5 | 200 | 150 |
| a-coax 1,37mm | P536443 | 11 | 50±2 | 2,10 | 3,50 | 4,30 | 5,60 | SPC | 2807 | 7x0,127mm | 0,381 | a-PTFE | 0,95 | TPC | 43 | 1,20 | FEP | 1,37±0,10 | 5 | 200 | 150 |

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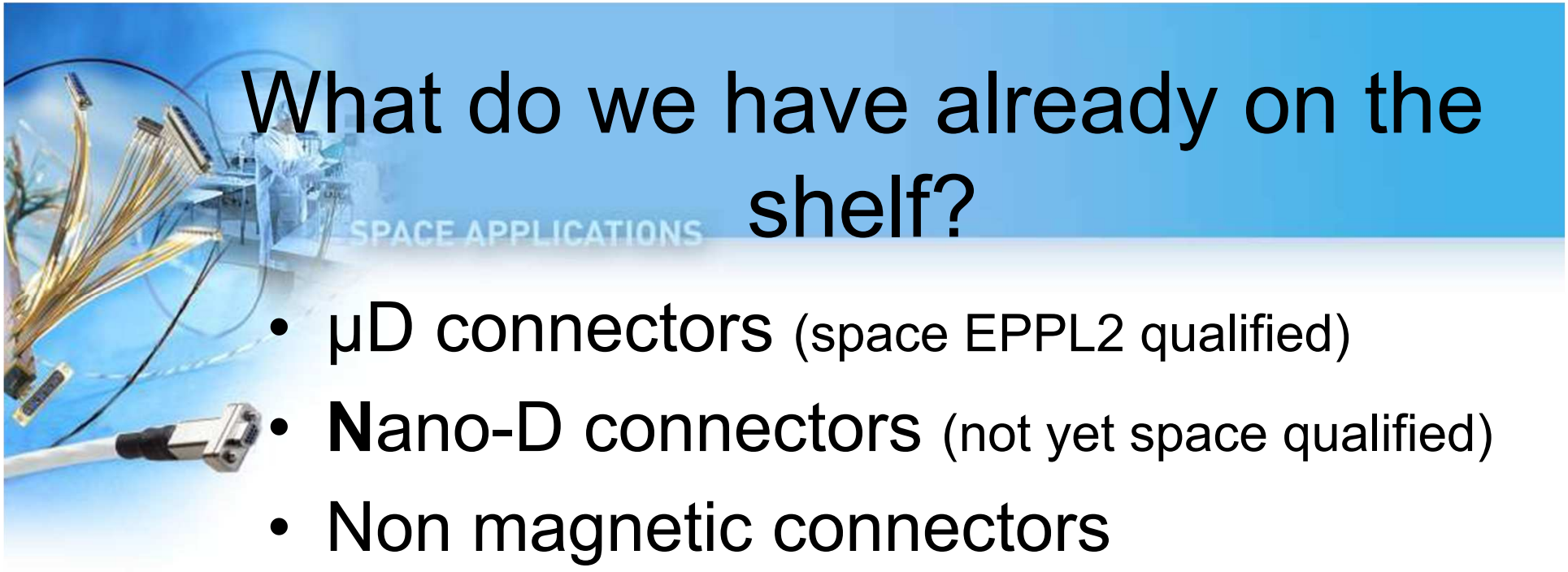


# What do we have already on the shelf?

- µD connectors (space EPPL2 qualified)
- **N**ano-D connectors (not yet space qualified)
- Non magnetic connectors
- 120 PIN connectors
- High density Nano contacts in µD size connectors (see slide #9)
- High datarate connectors & cables (120Ω)
- Space Wire (100Ω)

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# µ-D connectors (ESCC 3401/029)

- Metall shell:
  - Aluminium 6061
  - Titanium
- Contact:  max. 3 A
  - Copper & Berillium Copper with Gold plating over Nickel underplate
  - Twist PIN technology
- Encapsulant:
  - Space grade epoxy resin
- Possible wire types:
  - AWG 26  to  AWG 28

„MDSA“ range

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# Nano-D connectors

SPACE APPLICATIONS

- Extreme Miniaturisation
  - Twist pin contact, crimped technology
  - 1 Amp continuous contact in standard
  - Insulation Resistance : 5000Mohms/100VDC

**Micro D** **NanoD**
**Twist Pin contacts**

# Non – Magnetic solutions

SPACE APPLICATIONS

| MDN | 1A | 51 | S | 4 | L | 050 | B |
|---|---|---|---|---|---|---|---|

**SERIES**

**MDN** : Micro-D Non magnetic series.

**CONNECTOR TYPE**

**1A** : < 200 nT - Nickel aluminium shell + potting 200°C.
**2A** : < 20 nT - Nickel aluminium shell + potting 200°C.

**HARDWARE**

Titanium or CuBe parts .

| | |
|---|---|
| Residual Magnetic Level | NMB * : 200 gamma residual magnetism level<br>NMC on demand* : 20 gamma residual magnetism level |

- For strong magnetic field environments.
- Minimal magnetic disturbance.
- High performance metal connector and PTFE wire.
- Environmentally sealed.
- Operating temperature : 200°C.
- 9 to 100 contacts.

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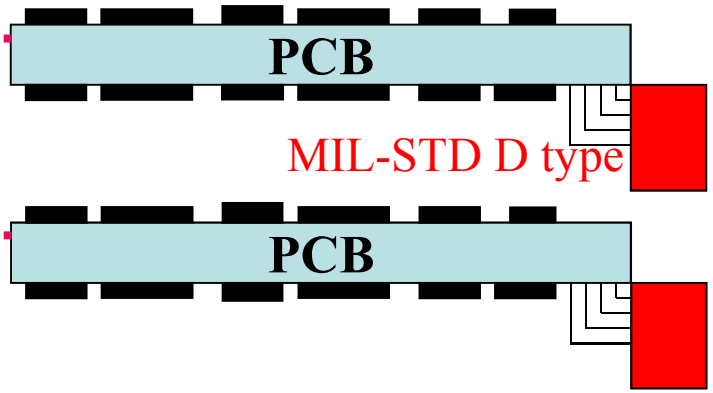
# 120 PIN connector


**MIL-STD D type**

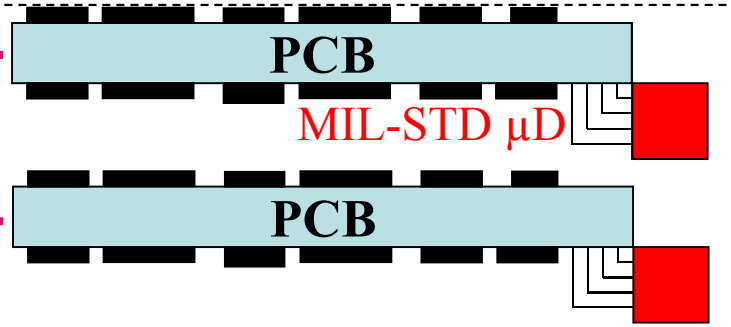


**19mm Pitch**



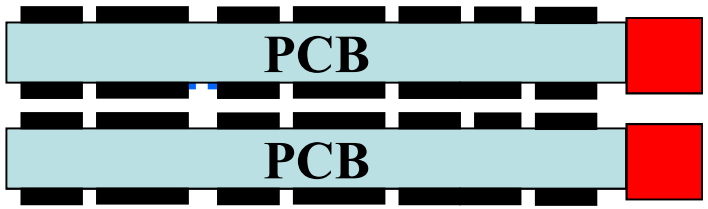

**MIL-STD µD**

**16mm Pitch**




**AXON'S µD**

**11mm! Pitch**

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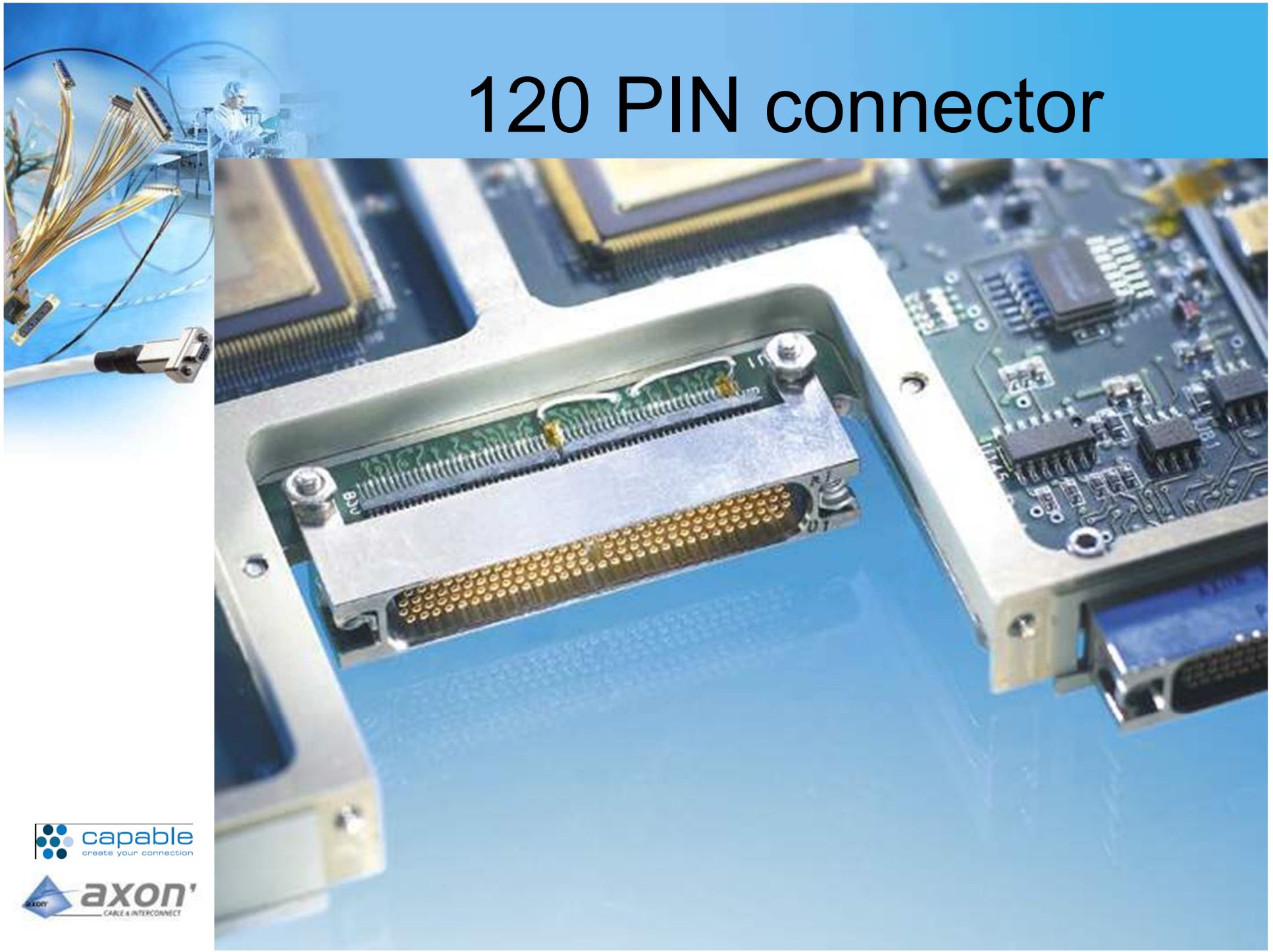
# 120 PIN connector



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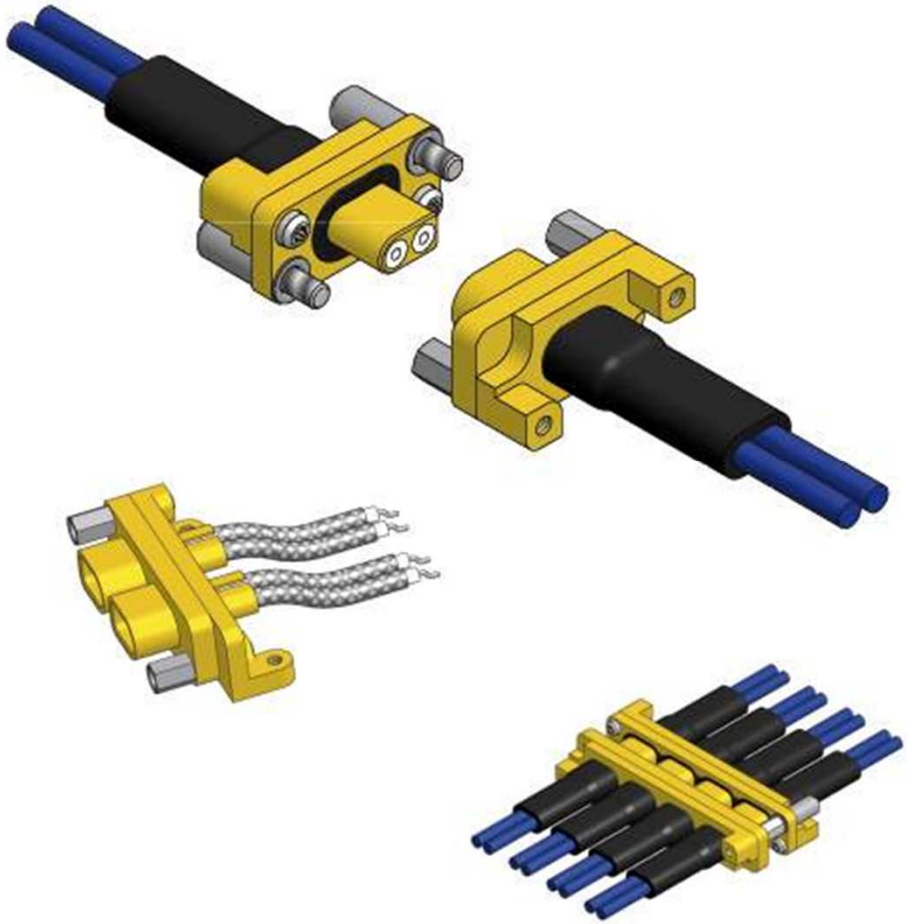
# Interfaces for high datarates

SPACE APPLICATIONS

- High data rate 10 GBit connectors and harnesses



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# What is in development and soon available ?

- Nano-D connectors for Space (ESA project # AO/1-6126/09/NL/CO )
- Self crimpable µD contacts and connectors
- Low mass Space wire (ESA project # AO/1-6214-09/NL/LvH )
- µD connector with Fiber contacts

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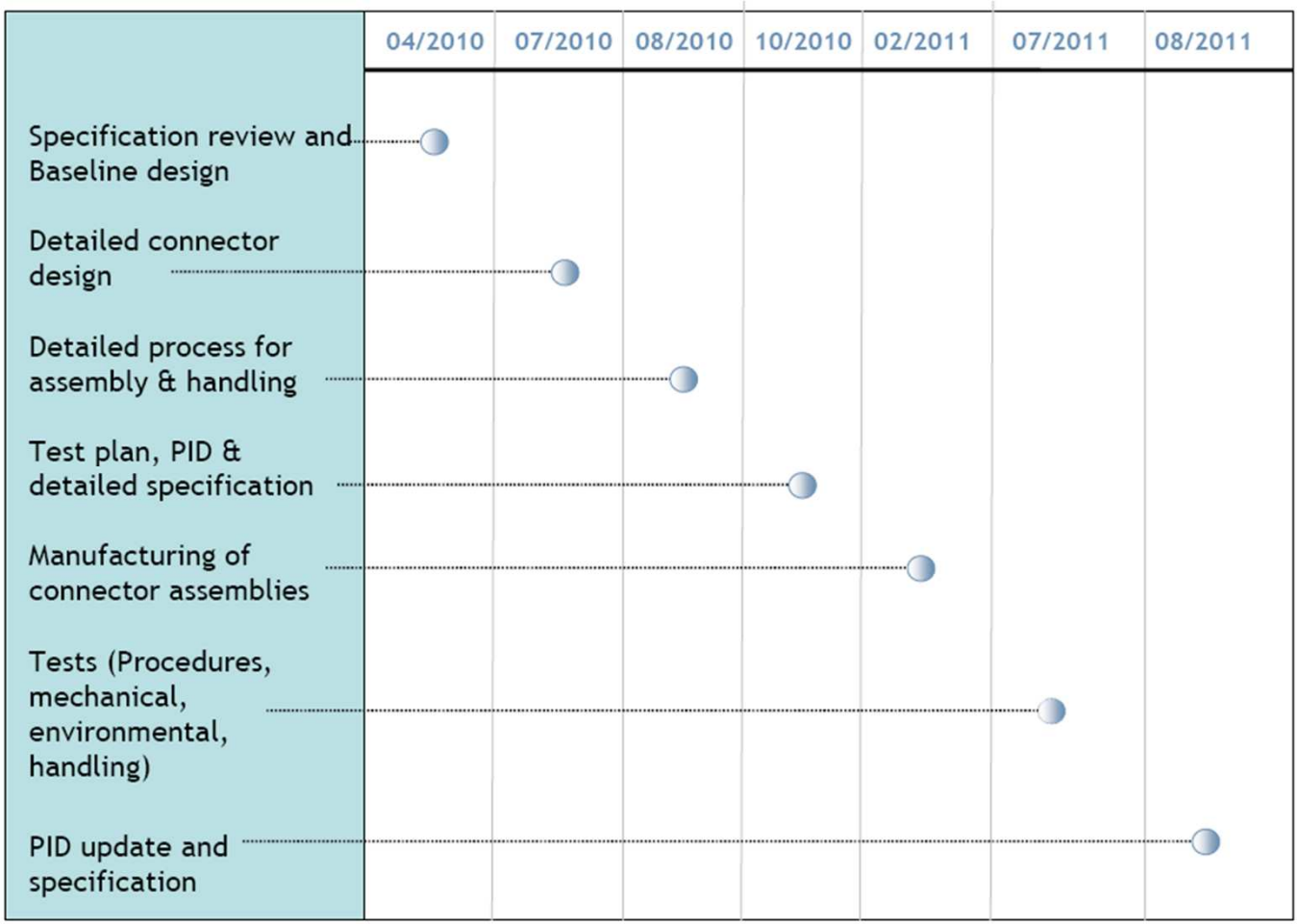
# Nano-D connectors (Evaluation)

SPACE APPLICATIONS

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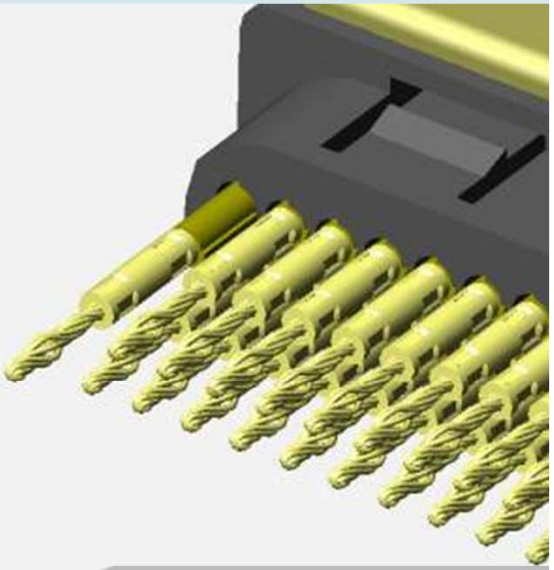
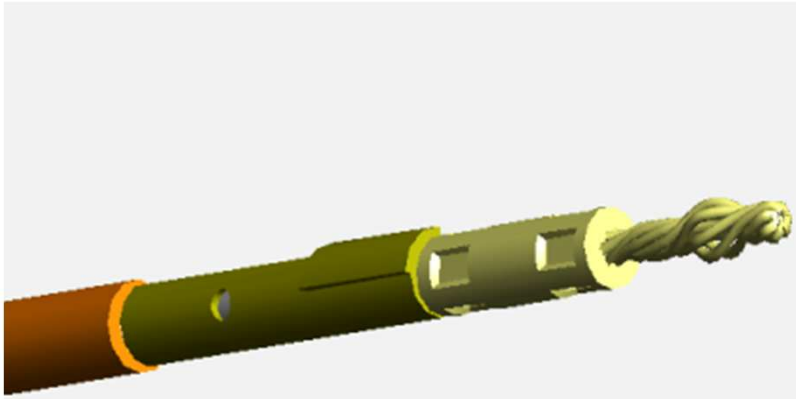
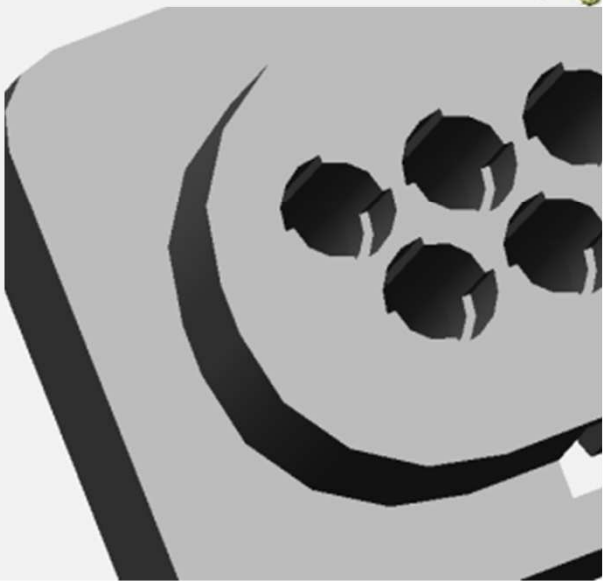
# µ-D contacts for custom use

SPACE APPLICATIONS

- Self crimpable µDs
- Simple Key System : could be remove by hand, after back cover remove.







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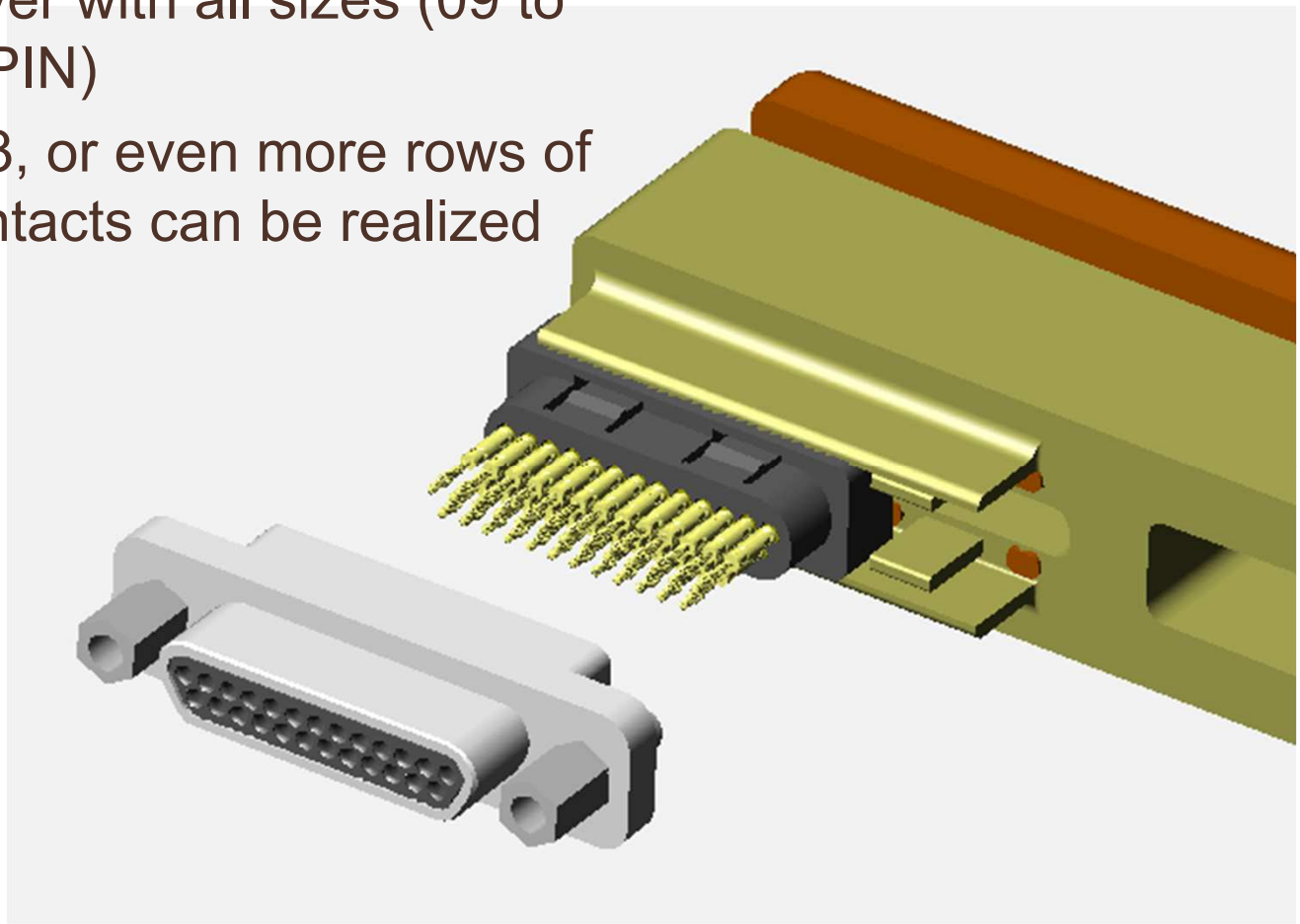
# µ-D contacts for custom use

SPACE APPLICATIONS

- Only 1 Tool for removing back cover with all sizes (09 to 51PIN)
- 2, 3, or even more rows of contacts can be realized



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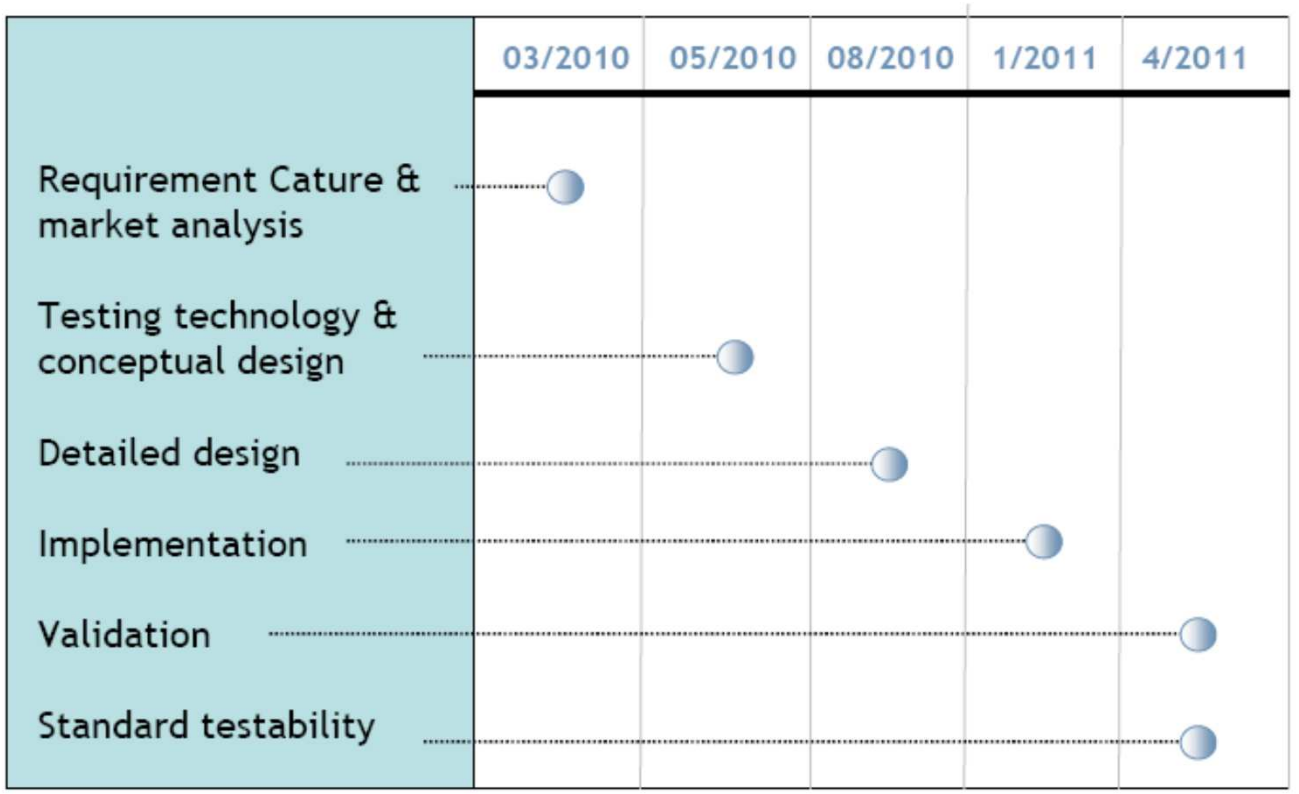
# Low mass space wire

## Project schedule

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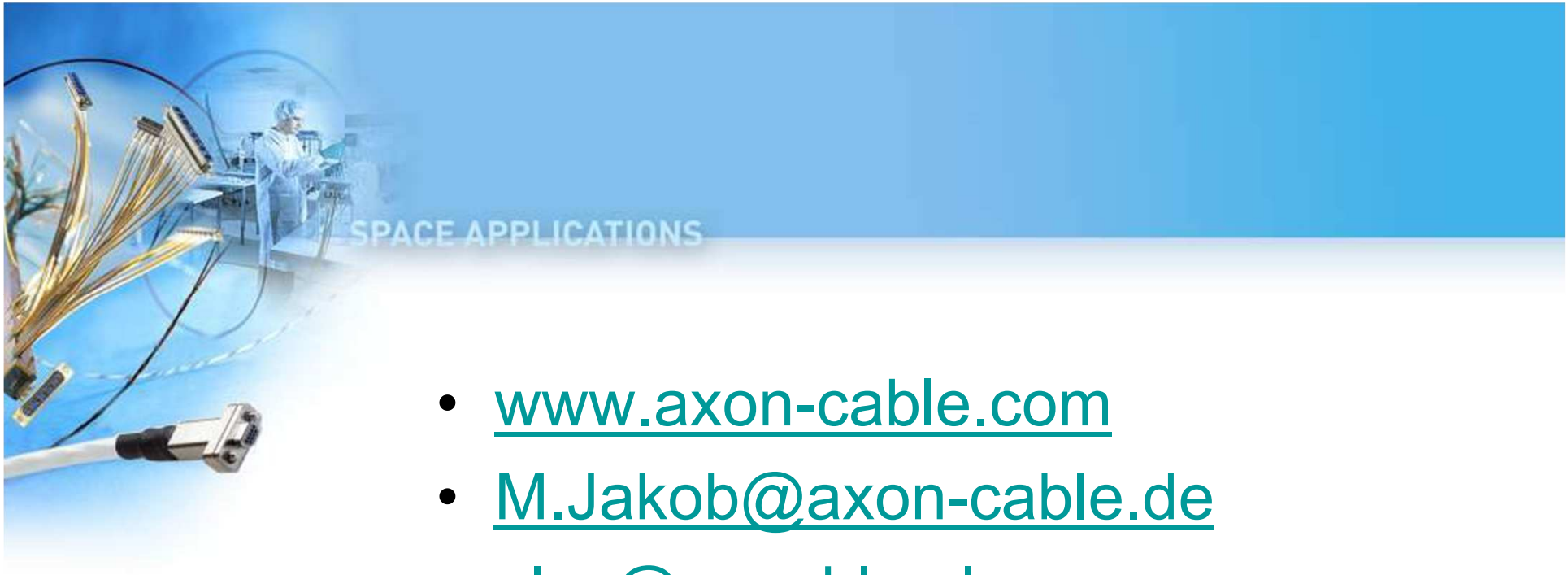
# What could we save for Space projects ?

- Size
- Weight
  - even more weight saving through smaller sized needs of radiation protective materials
  - Weight saving for the increased need of radiation resistance

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