

A 3D cutaway rendering of a deep-sea wet mateable connector. The image shows two cylindrical components being joined. The left component is purple and has a yellow band near its base. The right component is blue and has a purple band near its top. Red bolts are visible around the flanges of both components. The interior of the components shows various internal structures, including pipes and seals. The background is a solid blue color.

*KM3NET meeting, 10-13 March, Catania*

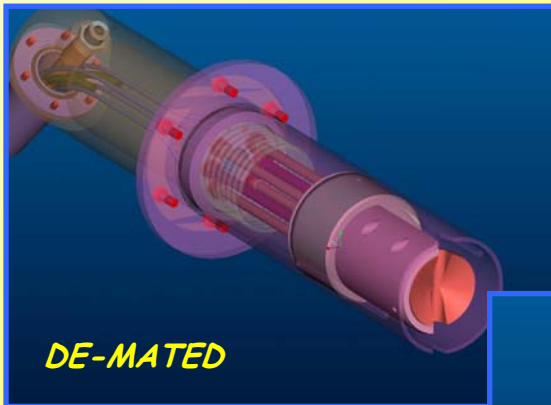
**"KM3NET Deep sea wet mateable connector: report of performed tasks and results"**

*(Diego Torazza)*

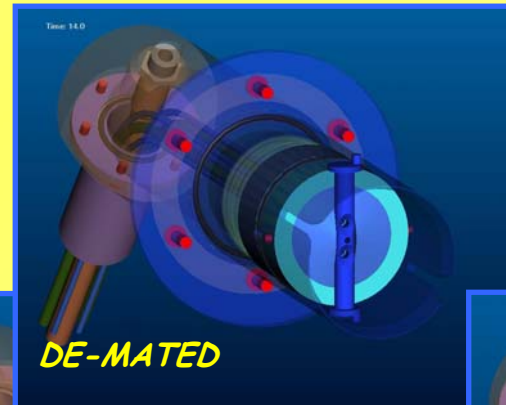


# DISTINCTIVE FEATURES & WHY R&D?

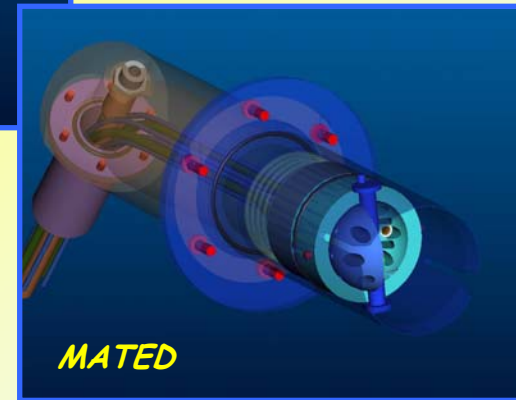
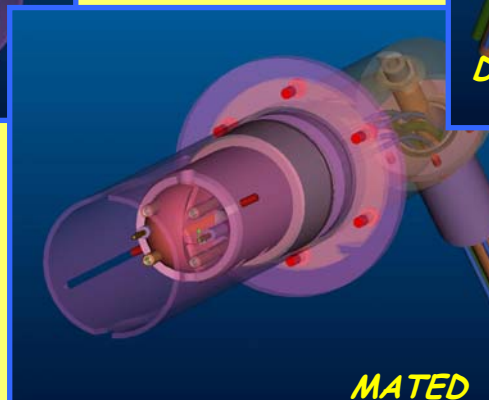
- **DISTINCTIVE FEATURE: IT CAN BE SIMPLY OPERATED IN DEEP UNDERSEA ENVIRONMENT BY R.O.V.** (oil filled)
- **COMMERCIAL CONNECTORS ARE VERY EXPENSIVE:** one interlink system (2 connector+cable) costs about 50.000€. **In a km<sup>3</sup> telescope total cost will be about 2-5 M€ !**
- The **NEW** (patented) concept is that seal devices are two **half spheres** rotated during operation by a **strong driving mechanism**.



FEMALE  
CONNECTOR



MALE  
CONNECTOR



# TARGET & SPECIFICATIONS

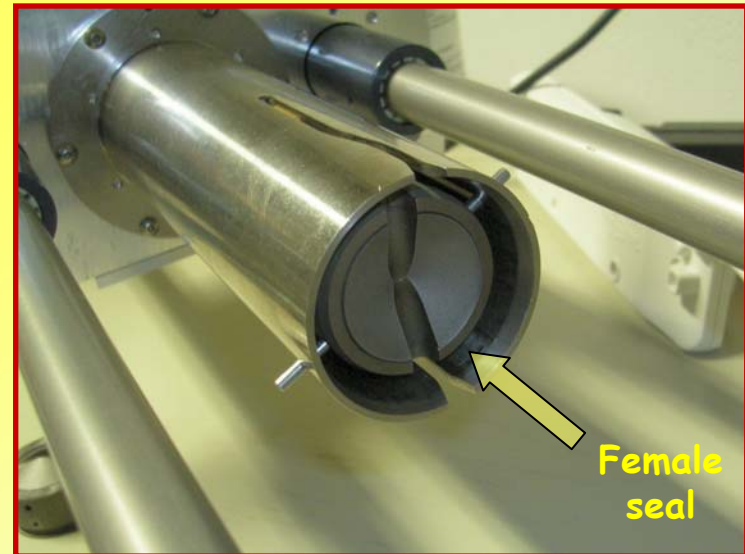
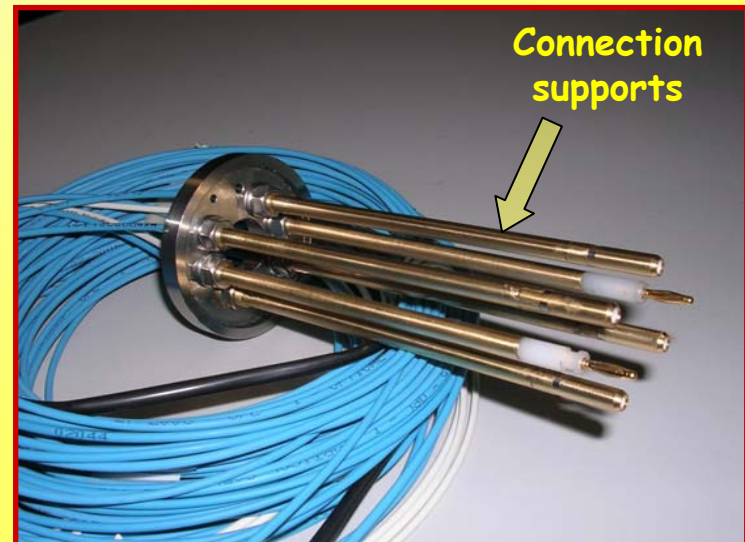
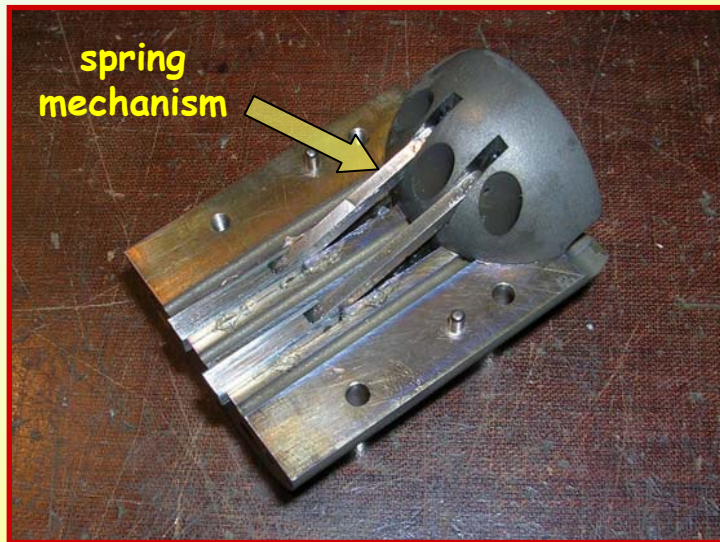
DESIGN, TEST AND QUALIFY A NEW CONCEPT WET-MATEABLE CONNECTOR, USEFUL FOR NEUTRINOS UNDERSEA TELESCOPES

## Technical specifications (first prototype)

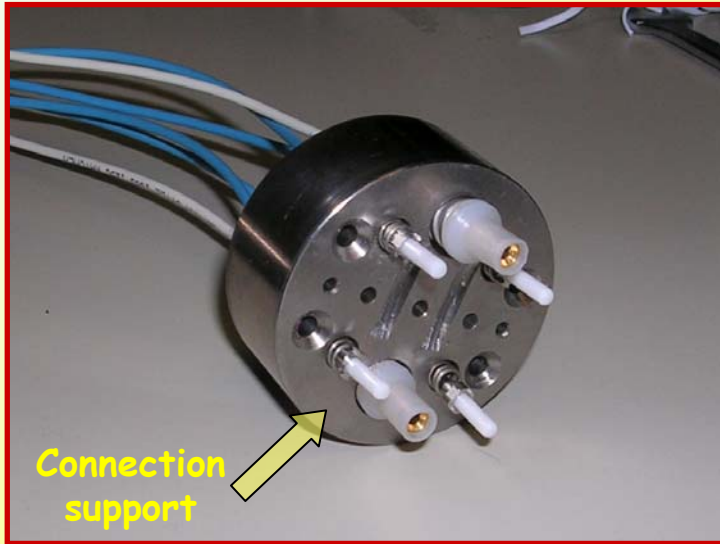
- **FOUR** 8/125 monomode optical fibres connections (loss <0.5dB)
- **TWO** 500V A.C. 5A electrical cables connections
- **In-Service** pressure up to **400 bars**
- **50 mate/de-mate cycles** without maintenance
- **10 years** expected lifecycle



# FIRST PROTOTYPE ASSEMBLING (F)

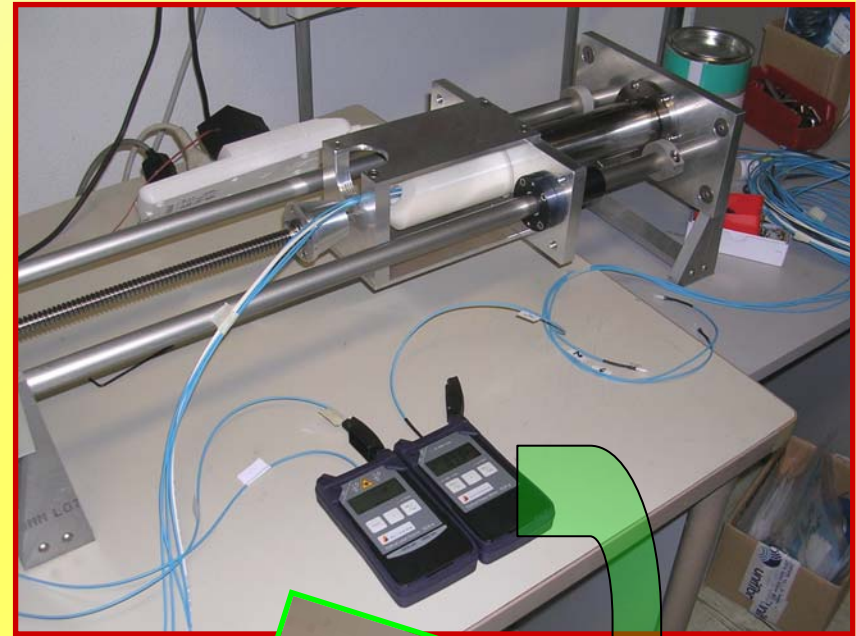


# FIRST PROTOTYPE ASSEMBLING (M)





# FIRST CONNECTION TEST



**Preliminary** first dry connection test was performed last week.

- mating operation was OK
- All electrical connection within specs
- 50% of optical connection within specs



# INDUSTRY COLLABORATION

After first tests and improvements, in order to reach the needed reliability, the qualification phase is very important.

In this phase, a collaboration agreement with industry (Seacon or Ocean Design i.e.) will be very useful for us because:

- Industry knows well production quality standards and how to reach it in a cheap way
- Industry experience in testing and qualification could help us to obtain a better product

**...and industry will get in return a new promising connector for the market...**

# PATENT EXTENSION ?

- Italian Patent Enquiry was submitted on **April, 3<sup>o</sup>, 2007**
- The Italian patent can be extended in Europe and World by **1 year** (so until 3/4/2008).
- World extension costs about **10 K€**
- If patent is not extended everyone can develop, manufacture and sell this connector outside Italy...

**PROSPETTO MODULO A**  
DOMANDA DI BREVETTO PER INVENZIONE INDUSTRIALE

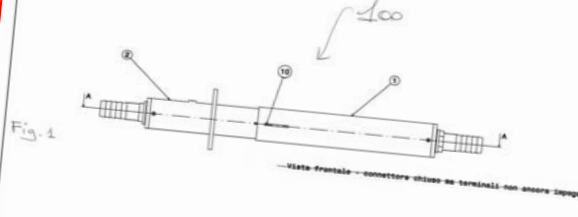
NUMERO DI DOMANDA:  DATA DI DEPOSITO: **3 Aprile 2007**

A. RICHIEDENTE (COGNOME E NOME) / DENOMINAZIONE, RESIDENZA (STATO):  
**Istituto Nazionale di Fisica Nucleare**  
Via E. Fermi, 40 - 00044 Frascati (RM), ITALIA

C. TITOLO:  
"Connettore subacqueo per contatti elettrici e/o ottici e/o idraulici e relativo sistema di connessione operabile da sottomarino o ROV"

E. CLASSE PROPOSTA:

O. RIASSUNTO:  
L'invenzione riguarda un connettore (100) subacqueo, e relativo sistema di connessione operabile da sottomarino o ROV, per contatti elettrici e/o ottici e/o idraulici, il connettore (100) presentando un'estensione longitudinale (29) e comprendendo un elemento maschio (1) e uno femmina (2) provvisti rispettivamente di un otturatore maschio (13,8) e femmina (12,7), in cui detto otturatore maschio (13,8) e femmina (12,7) comprendono rispettive porzioni complementari (12,13) di una sfera (30), le quali comprendono uno o più fori passanti e sono a partire da dette porzioni complementari, presenta uno o più fori passanti (27,28) e detto sfera (30) è ricostituita ad opportuni mezzi (20,25) di rotazione, attorno ad un asse (25) perpendicolare a detto asse longitudinale, grazie al movimento nel moto di chiusura del connettore (100) fino a che detti uno o più fori passanti (27,28) non si dispongono longitudinalmente; i contatti elettrici e/o ottici e/o idraulici (16) essendo così connettabili longitudinalmente attraverso detti uno o più fori passanti (27,28).

F. DISEGNO PRINCIPALE:  


FIRMA DEL / DEI RICHIEDENTE / I

Even if I.N.F.N. has no commercial purposes a world patent will give more contractual power in an future collaboration with industry...



# Performed tasks

- **February, 2007:** First prototype CAD model and drawings completed
- **April, 2007:** Connector design patented in Italy
- Hybrid (plastic & metal parts) mock-up for first tests ready
- Raw materials and components procured
- **December, 2007:** Connector manual test device ready
- **January, 2008:** Hi-pressure test tank ready and qualified
- **March, 2008:** Full-titanium prototype for dry, wet and pressure tests ready

# Future activity...

- First prototype dry connection tests
- Motorization of connector test device for wet and pressure tests
- First prototype wet and pressure mechanical, electrical and optical connection tests
- Post tests design improvements and “second generation” prototype manufacturing
- Qualification tests of final prototype

**...final task is to converge on a patented, working prototype, qualified**

*Thank you for the attention*

*Diego Torazza*

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