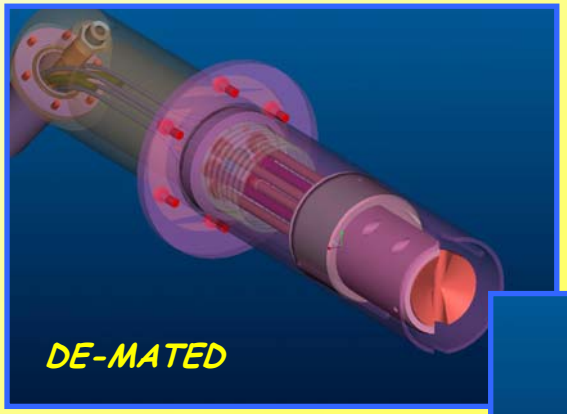
VLVnT08, 22-24 April, Toulon

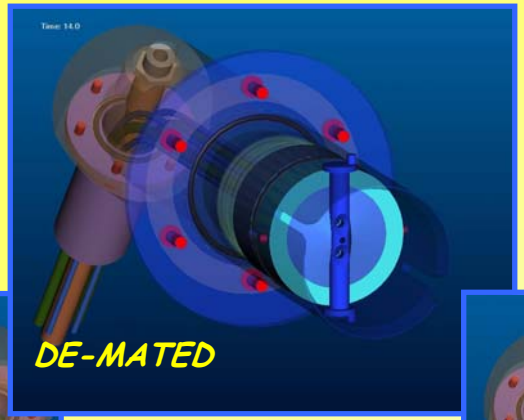
"KM3NET Deep sea wet mateable connector: report of performed tasks and results"

(Diego Torazza)

DISTINCTIVE FEATURES & WHY R&D?

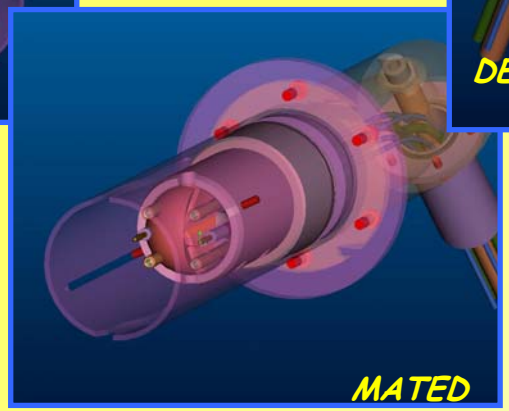
- **DISTINCTIVE FEATURE: IT CAN BE SIMPLY OPERATED IN DEEP UNDERSEA ENVIRONMENT BY R.O.V. (oil filled)**
- **COMMERCIAL CONNECTORS ARE VERY EXPENSIVE: one interlink system (2 connectors + cable) costs about 50.000€. In a km^3 telescope total cost will be about 2-5 M€ !**
- **The NEW (patented) concept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

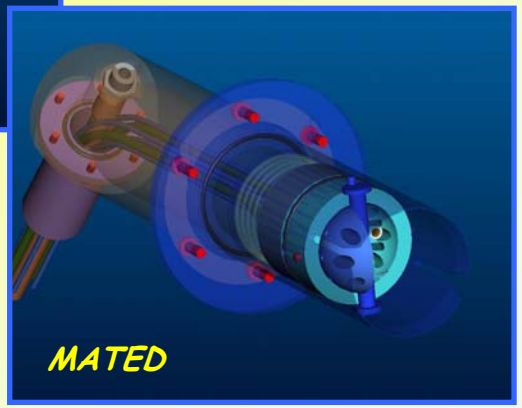




MALE CONNECTOR

FEMALE CONNECTOR





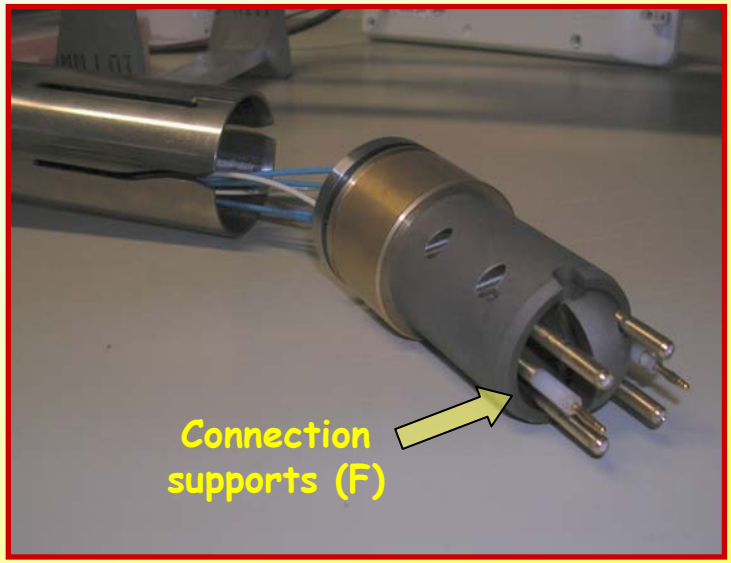
TARGET & SPECIFICATIONS

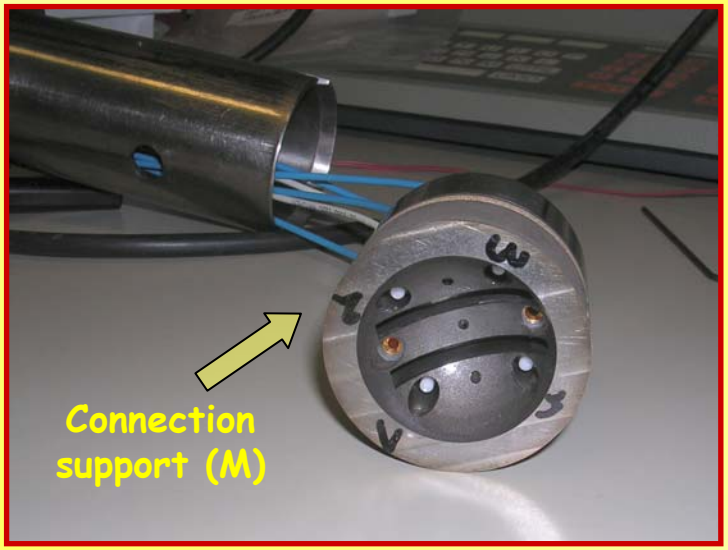
TO DESIGN, TEST AND QUALIFY A NEW CONCEPT WET-MATEABLE CONNECTOR, USEFUL FOR NEUTRINOS UNDERSEA TELESCOPES

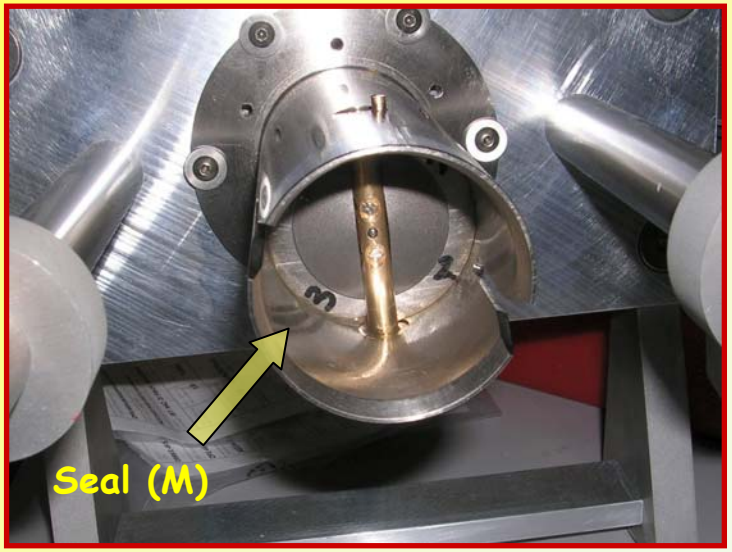
Technical specifications
(first prototype)

- 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

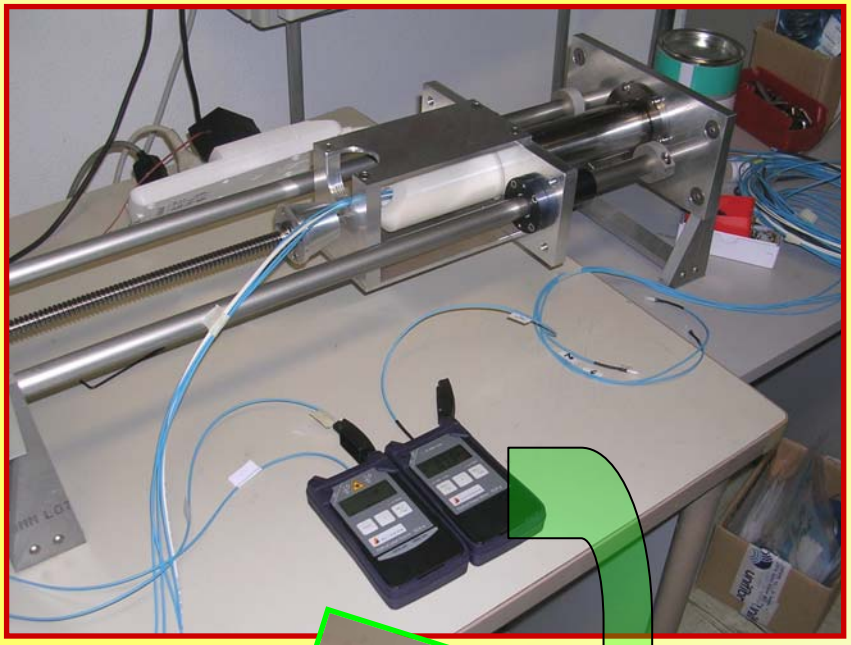
PROTOTYPE ASSEMBLING







PRESENT ACTIVITY

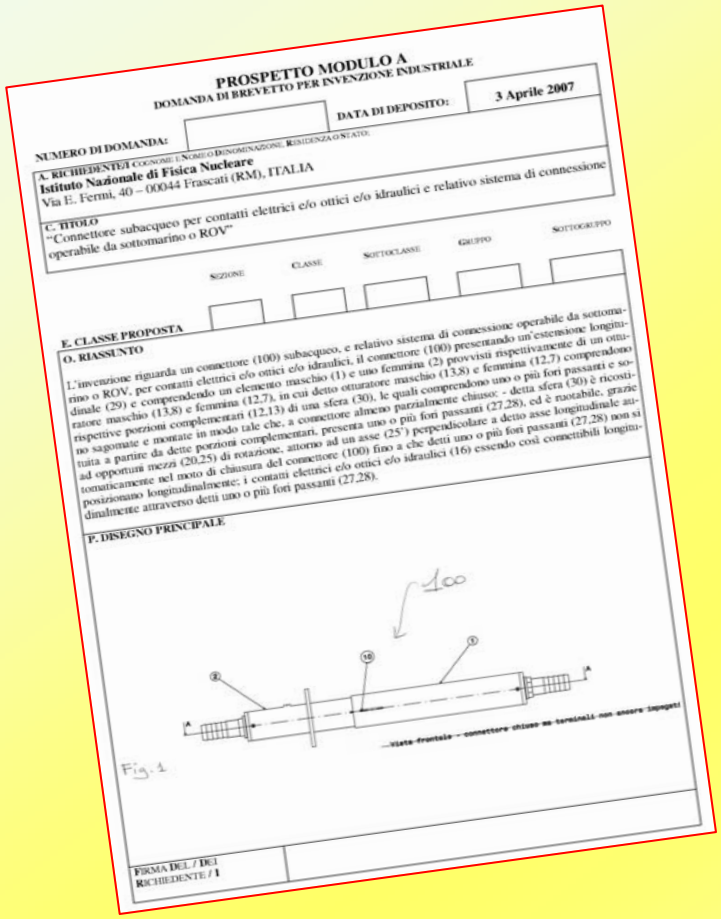


Currently the driving mechanism is under test (dry) in order to obtain a smooth operation and avoid risk of unexpected locks during wet and pressure tests.

- mating operation is OK
- electrical connections within specs
- 50% of optical connections within specs (why 2 optical conns failed?)

PATENT & INDUSTRY COLLABORATION

Italian Patent Enquiry was submitted on April, 3°, 2007



PROSPETTO MODULO A
DOMANDA DI BREVETTO PER INVENZIONE INDUSTRIALE

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

A. RICHIEDENTE/I COGNOME E NOME O DENOMINAZIONE, RESIDENZA O 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"

SEZIONE | CLASSE | SOTTOCLASSE | GRUPPO | SOTTOGRUPPO

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 ottiratore maschio (13,8) e femmina (12,7), in cui detto otturatore maschio (13,8) e femmina (12,7) comprendono rispettive porzioni complementari (12,7), in cui detto otturatore maschio (13,8) e femmina (12,7) comprendono no sagomate e montate in modo tale che, a connettore almeno parzialmente chiuso; - detta sfera (30) è ricostituita a partire da dette porzioni complementari, presenta uno o più fori passanti (27,28), ed è ruotabile, grazie ad opportuni mezzi (20,25) di rotazione, attorno ad un asse (25') perpendicolare a detto asse longitudinale automaticamente nel moto di chiusura del connettore (100) fino a che detti uno o più fori passanti (27,28) non si posizionano longitudinalmente; i contatti elettrici e/o ottici e/o idraulici (16) essendo così connettibili longitudinalmente attraverso detti uno o più fori passanti (27,28).

P. DISEGNO PRINCIPALE

Fig. 1

FIRMA DEL / DEI RICHIEDENTE / I

After first tests and improvements, in order to reach the needed reliability, the qualification phase is very important:
A collaboration agreement with industry (Seacon or Ocean Design i.e.) will be very useful for us because:

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

...and industry will get a promising connector for the market !

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
- April, 2008: Preliminary dry connection tests

Future activity…

- Final 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, qualified prototype

Thank you for the attention

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