



"Forum della ricerca sperimentale e tecnologica in INAF"
22-24 giugno Bologna

Elettronica Custom Progettazione e sviluppo



Cesare Molfese – INAF-OACN – cesare.molfese@inaf.it

Elettronica Custom - Progettazione e sviluppo

Commercial-Off-The-Shelf vs Custom, quando preferire la seconda opzione? (Make or Buy?)

1- Ottimizzazione della Configurazione (massa/ingombri/consumi)

2- Qualifica (p.es applicazioni spaziali o terrestri 'harsh environment')

3- Costo (i costi di commercializzazione dei componenti COTS moltiplicano x2/x3 il reale valore di produzione)

4- Manutenzione (anche le soluzioni basate su componenti COTS devono gestire l'obsolescenza, quindi mancata disponibilità dei ricambi che puo' rendere necessario un re-design sostanziale!)

5- Svantaggi: **RISCHIO!!!** (costi, tempi e... performance!)

Elettronica Custom - Progettazione e sviluppo

EXPERTISE

- 1- Progetto di sistema/studio di fattibilità (architettura, interfacce)
- 2- HW Analogico: condizionamento di segnale
- 3- Mixed Signals: A/D e D/A
- 4- HW Digitale di controllo: schede a μ P e μ C
- 5- HW Digitale: I/F di comunicazione e Field Bus
- 6- Alimentazione Lineare/Switching, Power Conversion/Distribution

Elettronica Custom - Progettazione e sviluppo

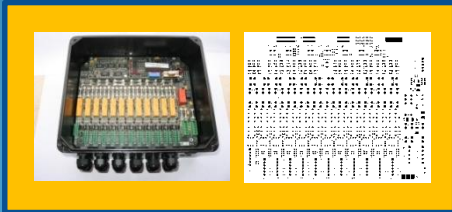
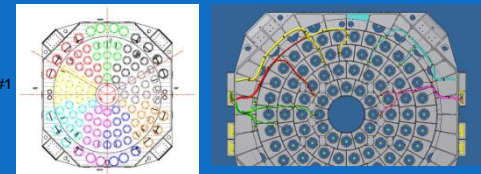
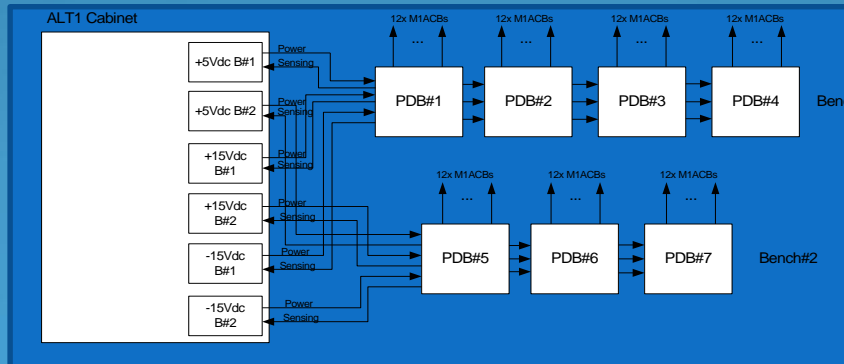
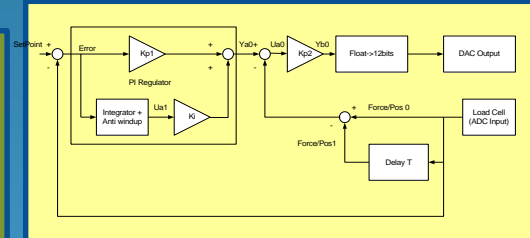
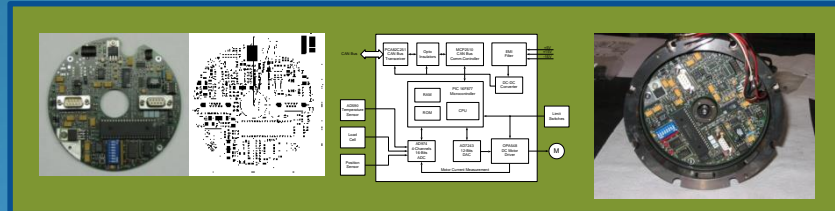
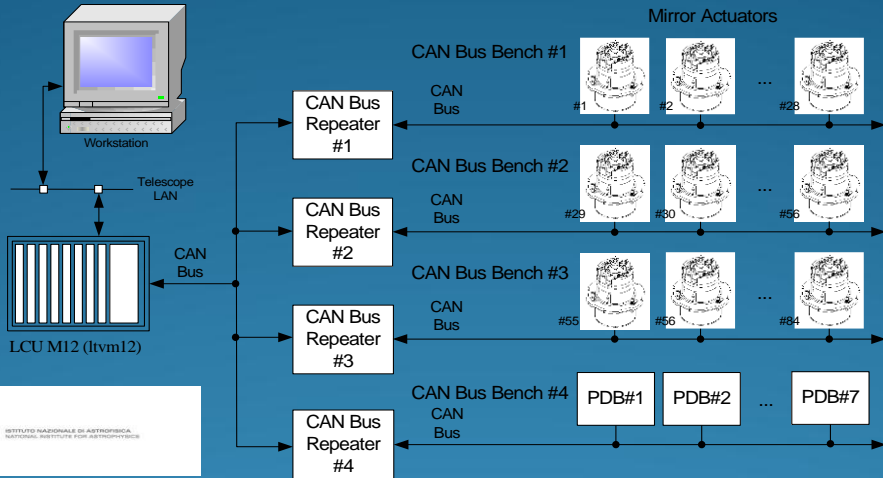
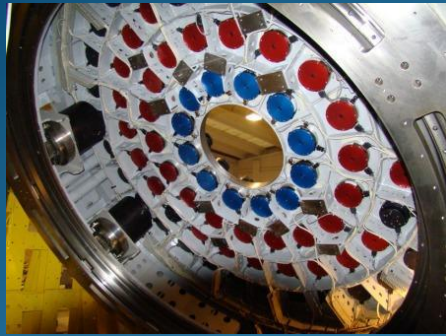
METODOLOGIA

- 1- Progettazione/simulazione al CAD (Suite Cadence e Siemens-PADS)
- 2- Breadboarding in-house delle funzioni piu' critiche
- 3- Realizzazione dei PCB e montaggio presso fornitore certificato ISO 9001

CASE STUDY: L'elettronica custom sviluppata per il E/E Control Hardware del telescopio VST non ha avuto nessuna failure a partire dalla prima luce tecnica (fine 2010) !!!

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VST - Primary Mirror Active Optics Distributed Control System



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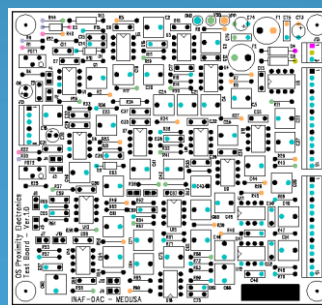
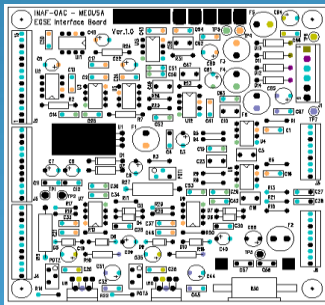
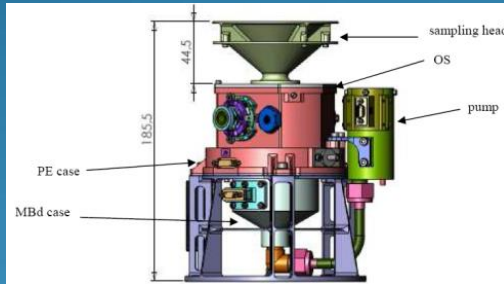
Electronica Custom - Progettazione e sviluppo

MEDUSA B/B implemented by INAF-OACN

Custom Electronics for the B/B of MEDUSA, scientific instrument selected for ExoMars ESA mission.

- Optical System Proximity Electronics Test Board
- EGSE Interface Board

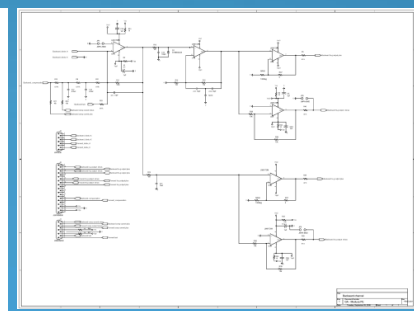
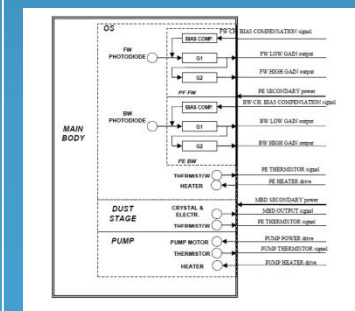
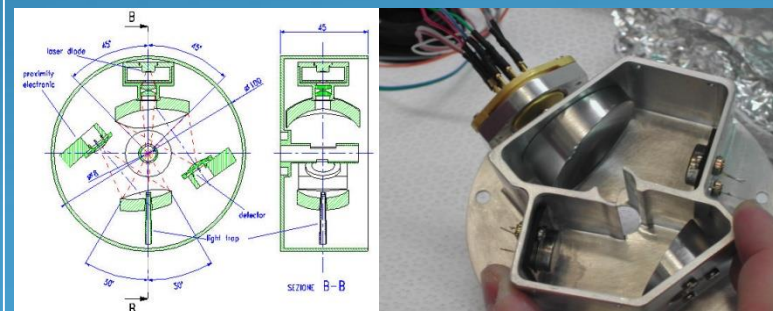
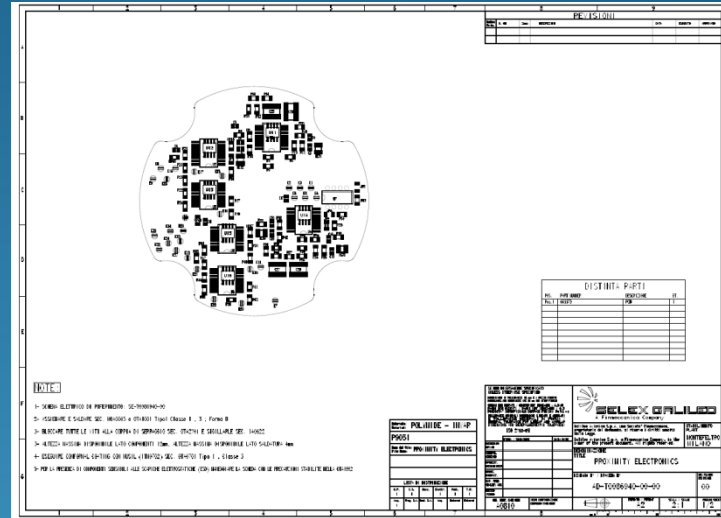
OS Performance: 6 decades (current), 0.2-10 μ m (dust)



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Elettronica Custom - Progettazione e sviluppo

MEDUSA industrial B/B implemented by Leonardo S.p.A. and INAF-OACN



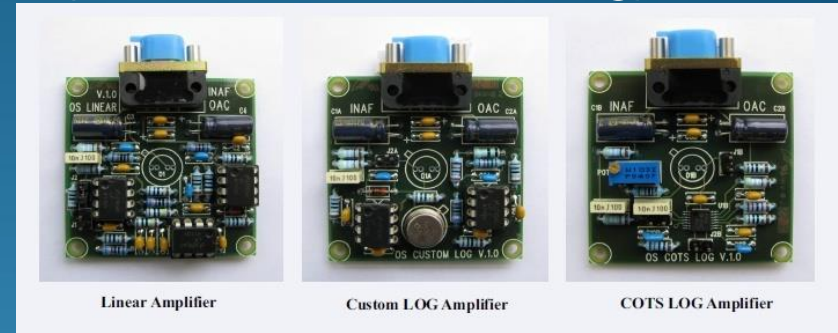
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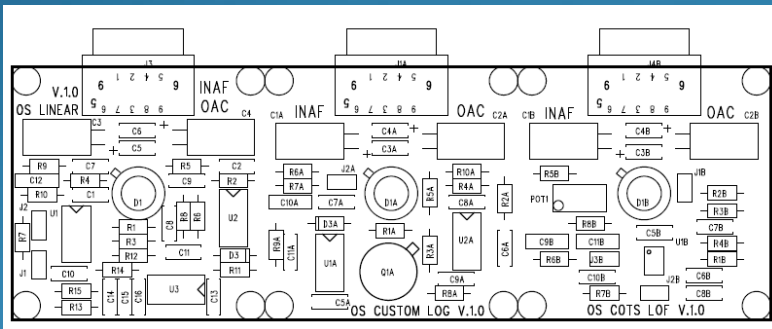
ExoMars/MicroMed Proximity Electronics (trade-off breadboarding)

Objective:

- Wide bandwidth, about 100 kHz
- Wide dynamics, about 7 decades
- Low power consumption
- Stray light compensation

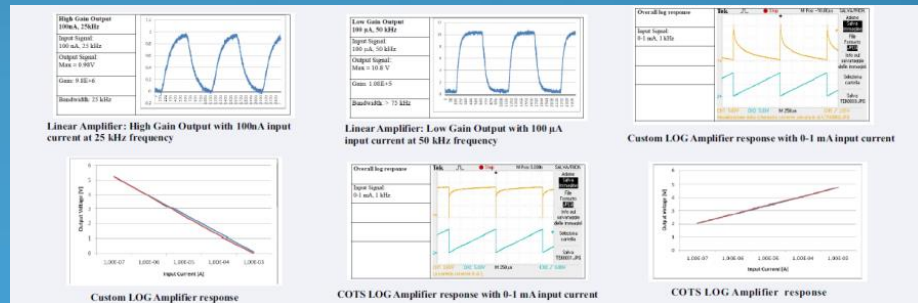


Three solutions were studied and implemented: Linear Amplifier, Custom Log Amplifier, COTS Log Amplifier. Further development of the Linear Amplifier to fulfill the bandwidth constraint imposed by the final optical design.



Performance achieved with the high speed version of the linear amplifier:

- Low Gain Output: 3MHz
- High Gain Output: 300kHz
- Power Consumption: <350mW

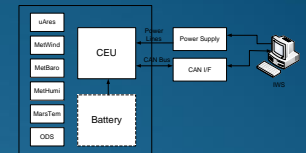


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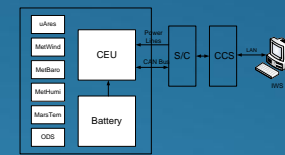
Electronica Custom - Progettazione e sviluppo

ExoMars DREAMS - Electrical Ground Support Equipment (EGSE)

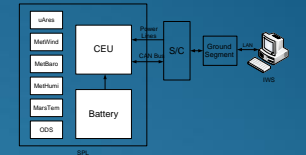
- To allow the operator to send commands to control the instrument;
- To acquire scientific and housekeeping data
 - To simulate power and communication I/Fs of the spacecraft, when the instrument is not integrated inside (tests at Instrument Level)
 - To communicate to the Instrument when it is integrated in the spacecraft (tests at CCS Level);
 - To support data retrieval during the flight operations (Ground Segment Level)



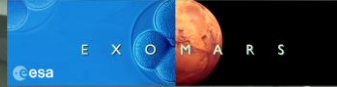
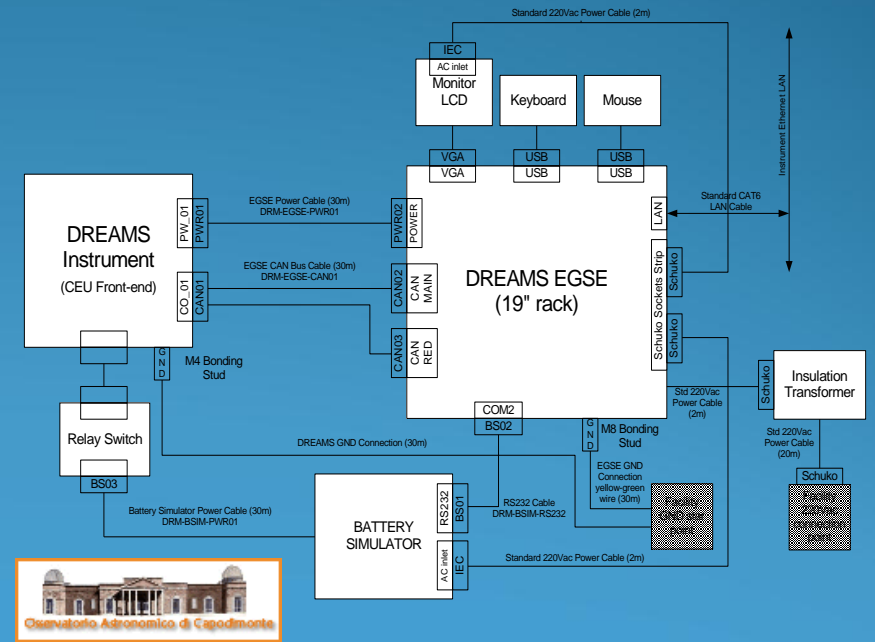
EGSE at Instrument Level Configuration



EGSE at CCS Level Configuration



EGSE at Ground Segment Level Configuration



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GRAZIE PER L'ATTENZIONE!

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