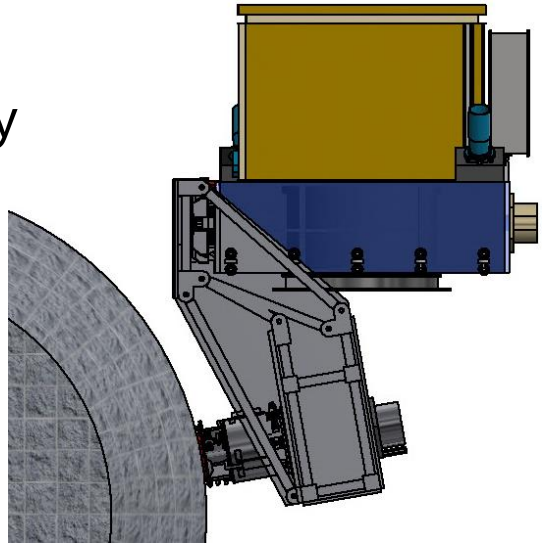
Constraints from CAST

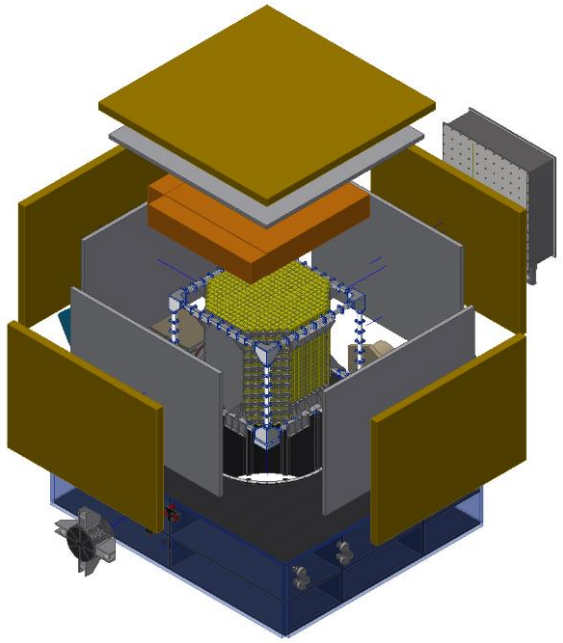
- Paper feedback from CAST was received and discussed.
- Transportation
  - Combined arm supports <3t; enhanced arm has low accuracy and requires upgrades of cargo ship
    - Response: two proposals (see next pages)
- Operation
  - Interferences to arm operation on docking ships
    - Response: reduce height(1.2m), farther to node module (2.5m)
  - Shock input to frame structure of EM I
    - Response: reduce weight (4.3t)
  - Thermal dissipation capability within 1000W
    - Response: reduce power consumption(1.4kW), add radiators
  - Blocking FOV of antennas
    - Response: reduce height(1.2m)

Proposal 1

- Separate HERD into HERD main and a bridge
  - HERD main < 3t to fit the small arm capability
  - The bridge <0.5t(?) and overall HERD <3.5t
- Height of HERD detectors above EM I is <1.1m
- Remove side FIT
  - Shrink all envelope dimensions
  - Reduction of area of PSD, SCD and general

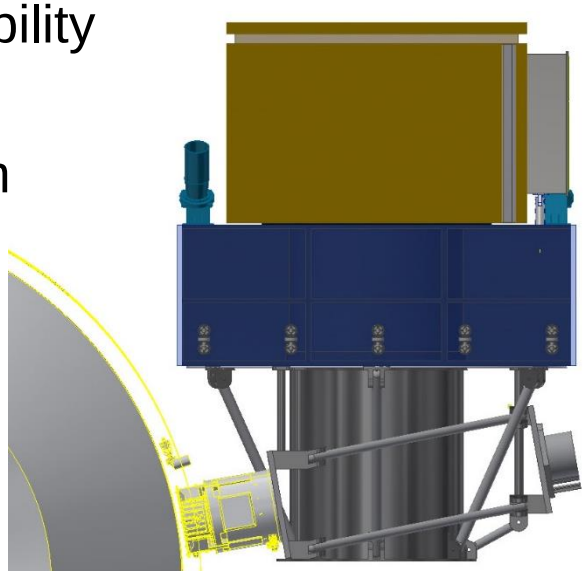


Instrument	Configuration	Envelope(mm)	Mass(kg)	Power(W)
CALO	7497 crystals	900*900*800	1850	200
FIT	TOP FIT only	1050*1050*180	120	30
PSD	Two 5mm tile layers	1400*1400*50 1250*1000*50	200	30
SCD	Two super-layers	1400*1400*100 1250*1000*100	290	160
TRD	6 units		100	70
General	Service box		440	60
SUM	-	2200*1900*1900	3000	~800



Proposal 2

- One HERD <3.6t to fit the enhanced arm capability
  - Installation feasibility study needed
- Height of HERD detectors above EM I is <1.1m
- All five-side detectors remained
  - More compact design
  - Common supporting structure
  - Robust and removable structure



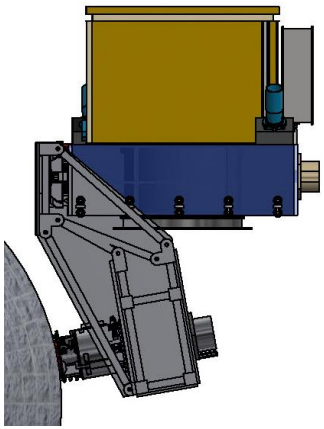
Instrument	Configuration	Envelope(mm)	Mass(kg)	Power(W)
CALO	7497 crystals	900*900*800	1850	200
FIT	Five sides	1050*1050*180 1100*800*180	300	80
PSD	Two 5mm tile layers	1550*1550*50 1400*1000*50	300	40
SCD	Two super-layers	1550*1550*100 1400*1000*100	330	180
TRD	9 units	-	150	80
General	Service box		600	80
SUM	-	2400*2200*3200	3530	~950

Payload optimization

- More compact design
  - Tradeoff between less weight and backsplash impact
- Common supporting structure
  - CALO & FIT; PSD & SCD; CALO & FIT & PSD & SCD
- Removable structure
- Robust detector design?
  - CALO: different sampling
  - FIT: layer numbers vs. total thickness
  - PSD: overlap solutions; scintillator glued on both faces of one panel
  - SCD: layer numbers
- Payload configuration candidates for simulation
  - Minor changes based on proposal 1, proposal 2
  - Other ideas?

Proposals comparison

- CMSA officials were not satisfied with the feasibility of proposal 1 and proposal 2.
- CSU & IHEP are working on proposal 3 based on half-open cargo ship and combined arm. (layout similar with proposal 1)
  - Keep as many as possible detectors, (TOP+ 2 SIDE FIT)
  - General electronics and power units moved to bridge
  - Customized connection between HERD main and bridge
    - To meet the requirements from robotic arm
    - Mechanical connection first, then electronic and thermal



	Proposal 1	Proposal 2	Proposal 3	Future ?
Payload	Full(fewer layers)	No side FIT	TOP + 2 SIDE FIT	Full
One/two parts	One	Two	Two	TBD
Detector Constraints	<3.8t	<3t	<3t <2.4*1.9*1.5m3	TBD
Cargo ship	Full-open	Full-open	Half-open	Customized
Launch times	Once	Once or two times	Two times	Once
Robotic arm	Enhanced	Combined	Combined	TBD
Transportation	Once	Two times	Two times	TBD