

WBS 1.01 Project Management

Brian Fujikawa
LBNL

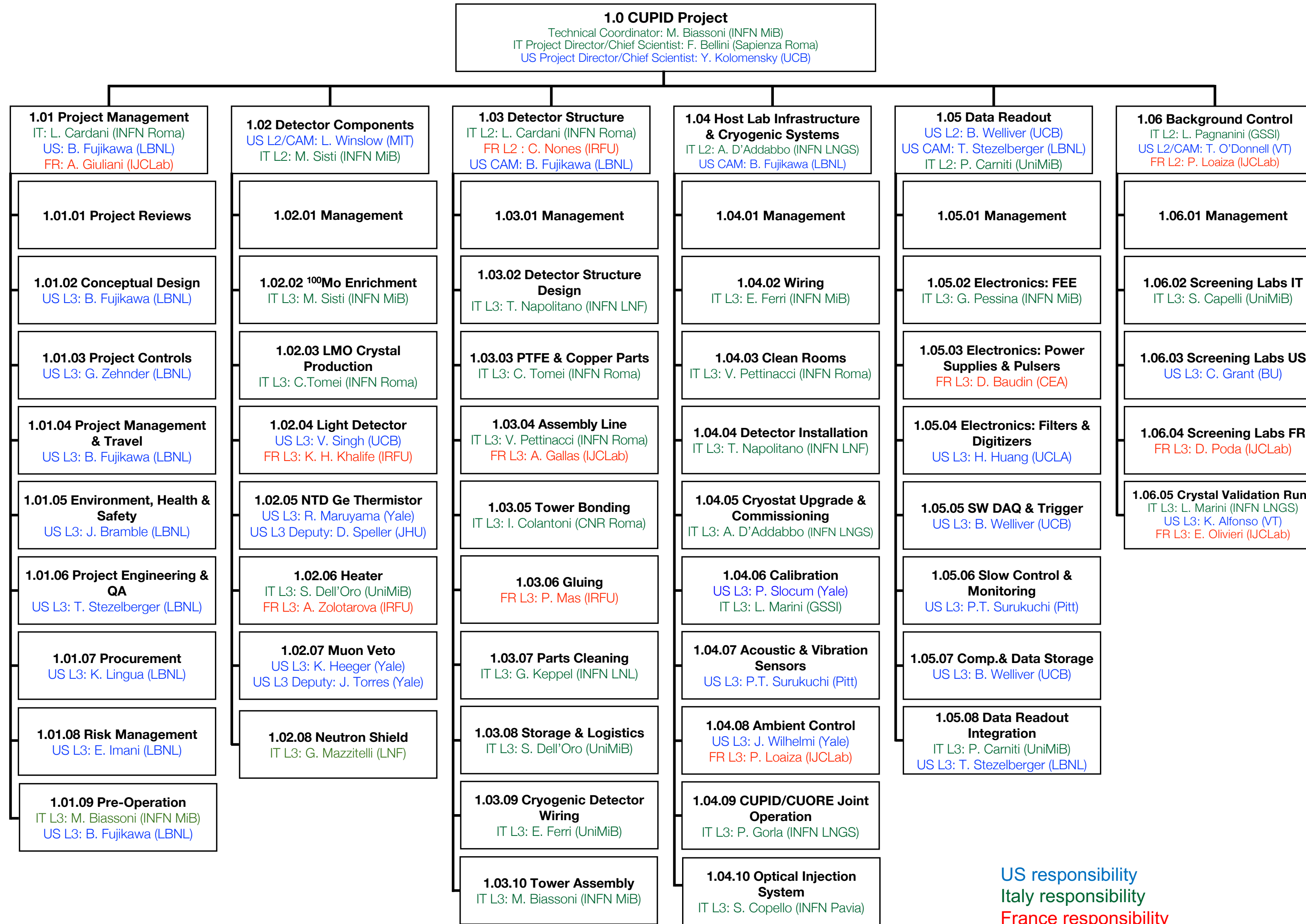
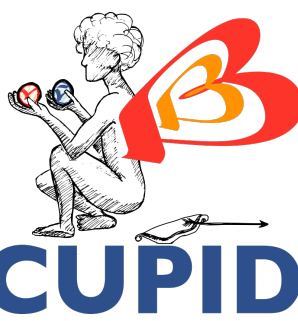
CUPID LBNL Project Review
December 16-17, 2024



Outline

- Organization
- Methodology
- Risk Registry
- Interface Control
- EH&S
- Lessons Learned
- Oversight
- WBS 1.03 & 1.04
- Summary

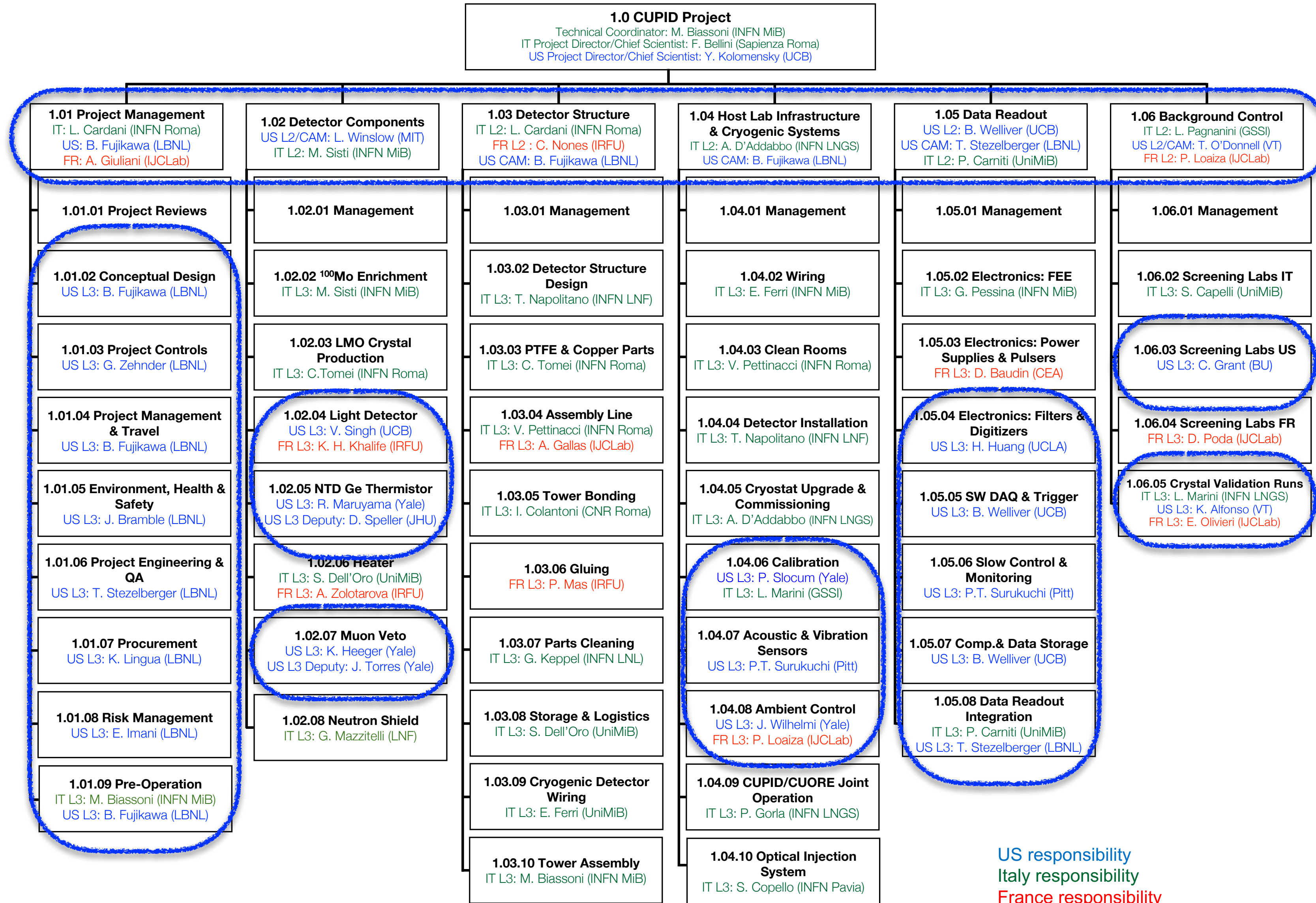
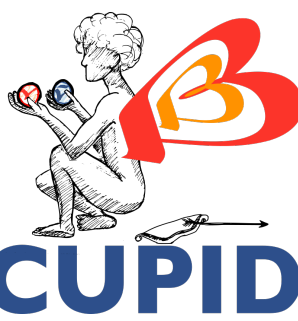
CUPID WBS Diagram



US responsibility
 Italy responsibility
 France responsibility

L3 first name: primary responsibility
 L3 second name: secondary responsibility

CUPID WBS Diagram

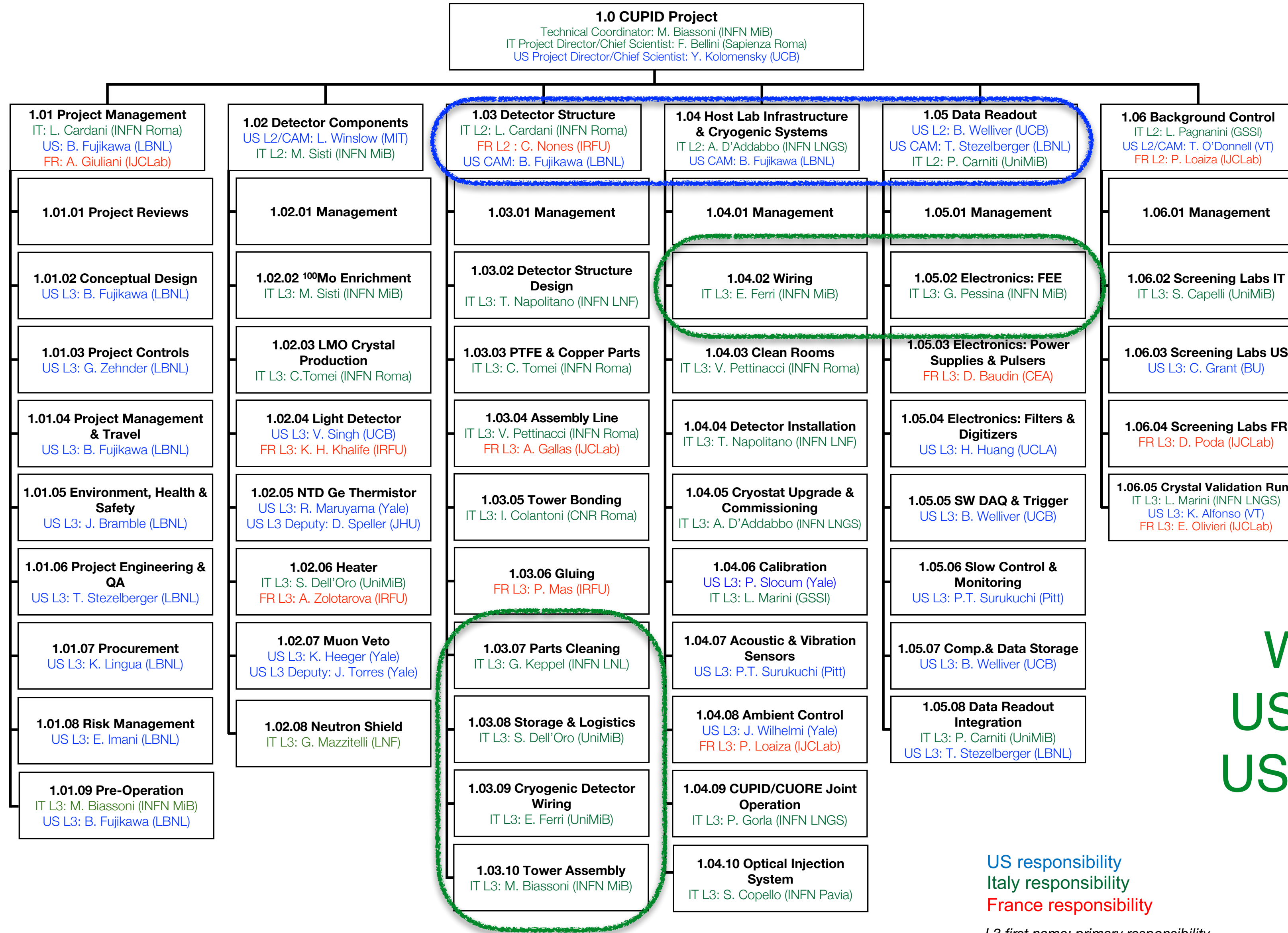


Significant US Involvement

US responsibility
 Italy responsibility
 France responsibility

L3 first name: primary responsibility
 L3 second name: secondary responsibility

Non-US Tasks with US Obligations



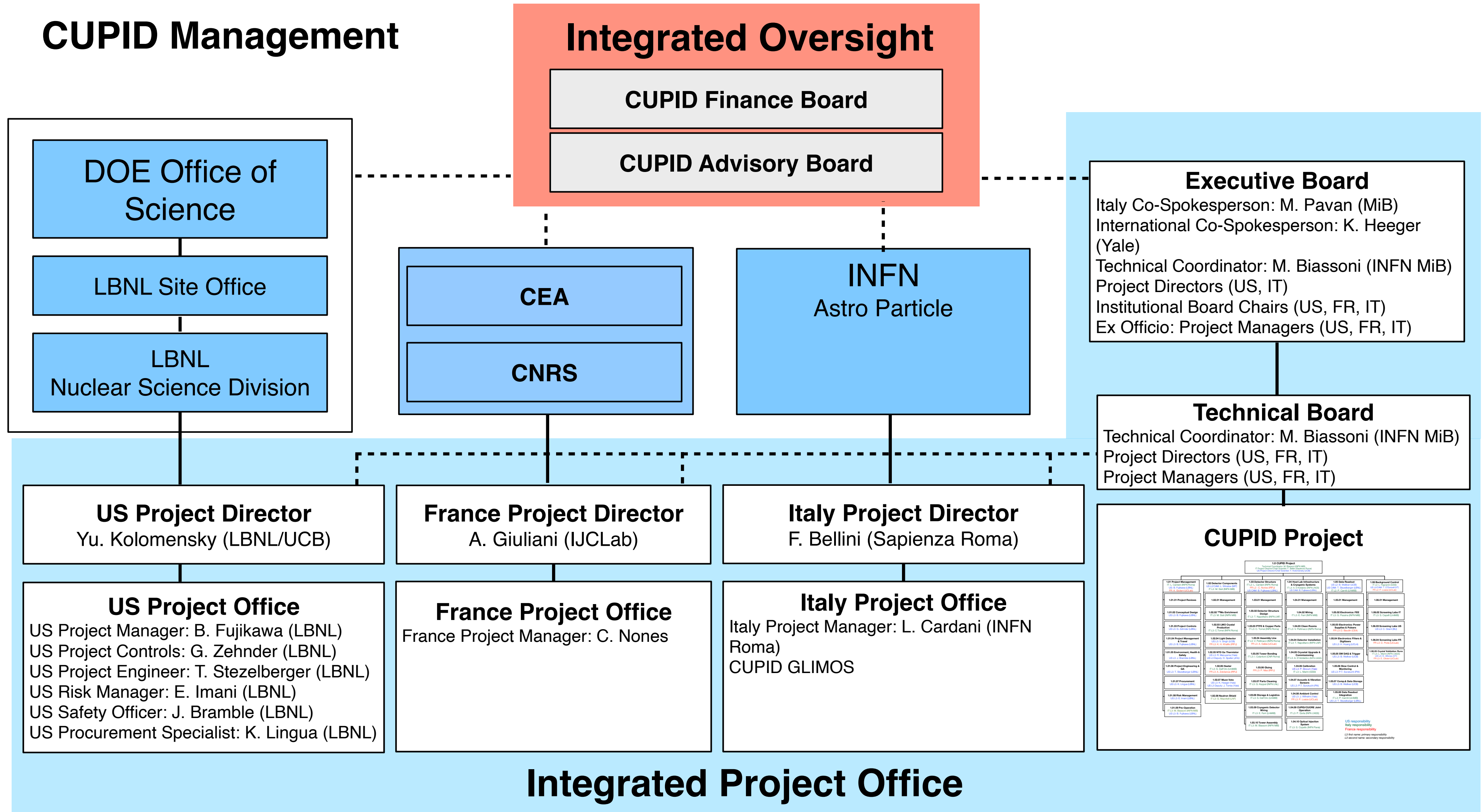
US L2 or CAM

WBS Tasks with US Obligations w/o US L3 Management

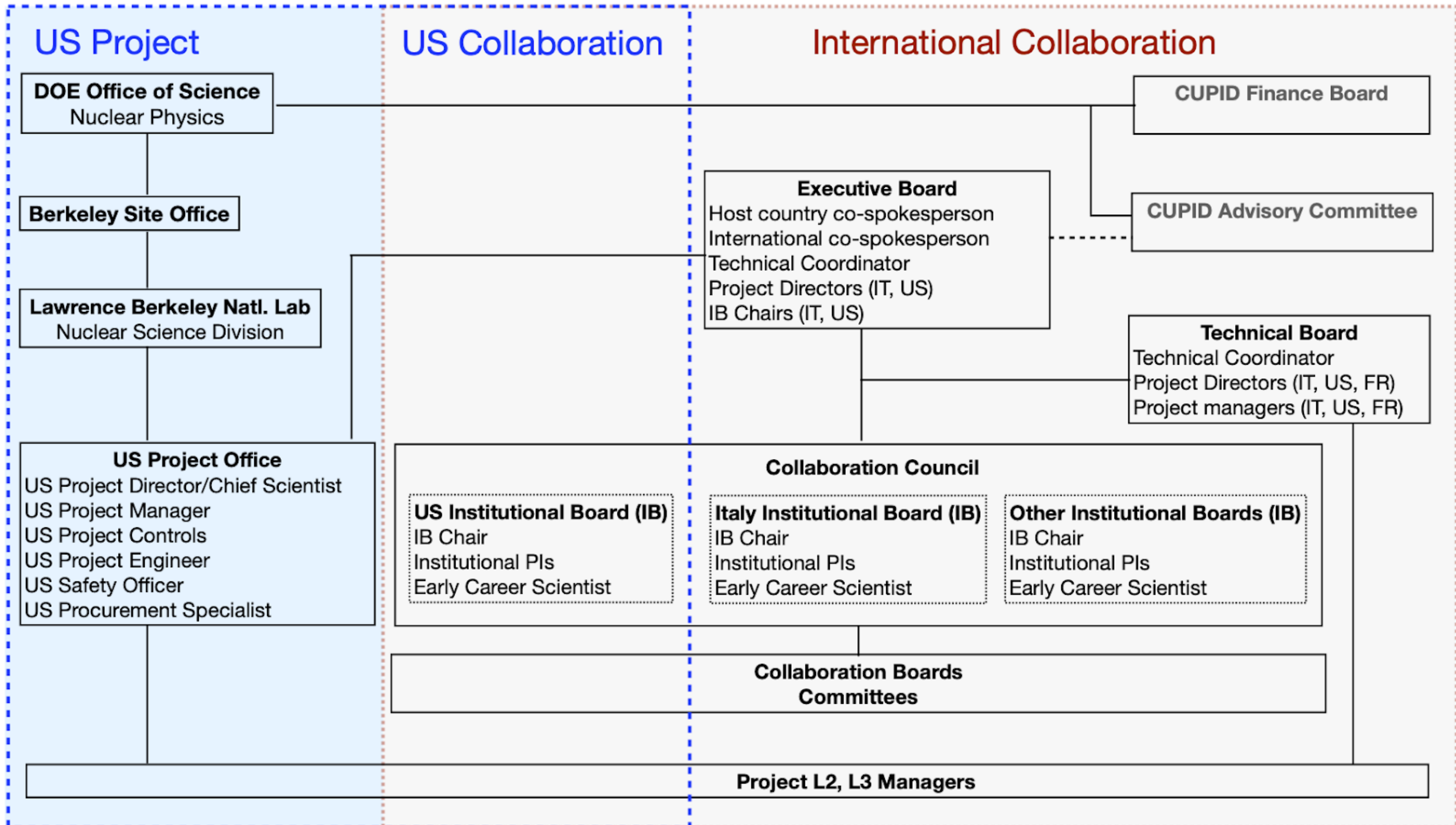
US responsibility
 Italy responsibility
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L3 first name: primary responsibility
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CUPID Project Organization



CUPID Organization (International Context)



CUPID Collaboration Communication

- Collaboration Meetings: 2 per year at LNGS
 - hybrid: in-person ($\sim 2/3$) and Zoom ($\sim 1/3$)
- Executive Board: weekly on Zoom
- Institutional Board: monthly on Zoom
- Technical Control Board: monthly on Zoom
- US Project Team: weekly on Zoom
- US Meeting: weekly on Zoom (US PI monthly)
- L2 & L3 P6 Scrubbing Meetings: as needed on Zoom
- Slack

US Presence at LNGS

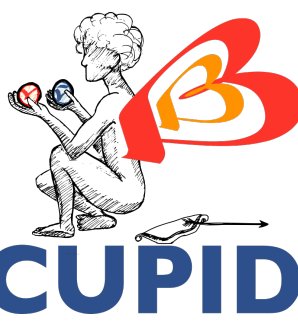
- CUORE
 - 1 US person (postdoc level or higher) based at LNGS
 - 1 or 2 US-supported local engineers and technicians
 - Report the status of LNGS activities to US collaboration members
 - Demonstrates US commitment to CUORE
- CUPID
 - Beginning in 2024, at least 1 US person based at LNGS
 - Supports VSTT, CCVR, etc.



Major US Deliverables

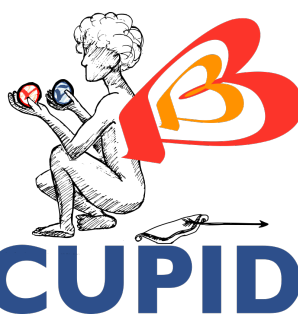
- WBS 1.02.04 Light Detectors
- WBS 1.02.05 NTD Ge Thermistors
- WBS 1.02.07 Muon Veto
- WBS 1.05.02 Electronics: Frontend Electronics
- WBS 1.05.04 Electronics: Filters & Digitizers
- WBS 1.05.05 Software DAQ & Trigger
- WBS 1.05.07 Computing & Data Storage
- WBS 1.06.03 Screening Labs US
- WBS 1.06.05 Crystal Validation Runs

WBS 1.02.04 Light Detectors (LD) KPP



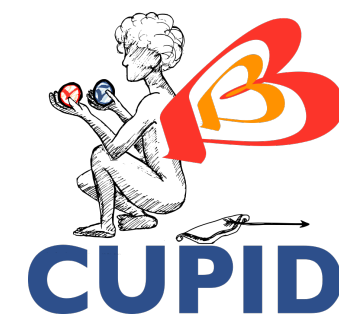
Description	Threshold KPP	Ultimate KPP
Light Detectors	Delivery to LNGS of the required set of LDs meeting or exceeding technical requirements on energy and time resolution as demonstrated on a 5% sample of delivered detectors	Delivery to LNGS of the required set of LDs meeting or exceeding technical requirements on energy and time resolution as demonstrated on a 30% sample of delivered detectors

WBS 1.02.05 NTD Ge Thermistor KPP



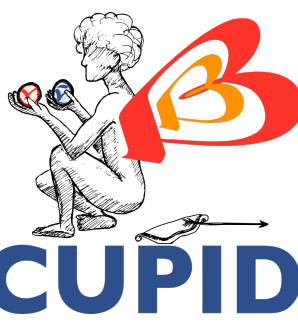
Description	Threshold KPP	Ultimate KPP
NTD Ge Thermistor	Delivery to LNGS of required set of NTDs meeting or exceeding technical requirements as demonstrated on a 5% sample of delivered sensors	Delivery to LNGS of required set of NTDs meeting or exceeding technical requirements as demonstrated on a 30% sample of delivered sensors

WBS 1.02.07 Cosmic Ray Muon Veto KPP



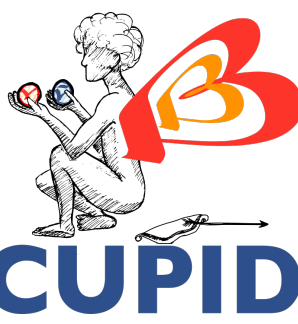
Description	Threshold KPP	Ultimate KPP
Muon Veto	Delivery to LNGS of Muon Veto System meeting or exceeding technical requirements as demonstrated on a 5% sample of delivered panels	Delivery to LNGS of Muon Veto System meeting or exceeding technical requirements as demonstrated with a fully deployed system

WBS 1.05 Data Readout KPP



Description	Threshold KPP	Ultimate KPP
Data Readout & Room Temperature Sensors	Delivery to LNGS of room-temperature electronics and sensor systems with the following performance requirements: > 95% of the required channel count satisfy technical specifications; uptime > 99%	Delivery to LNGS of room-temperature electronics and sensor systems meeting or exceeding technical requirements as demonstrated with a fully deployed system

WBS 1.06 Background Control KPP



Description	Threshold KPP	Ultimate KPP
Background Screening	Delivery to LNGS of screening results of samples with required screening technique and sensitivity	Same as threshold

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Schedule and Cost Estimating Methodology

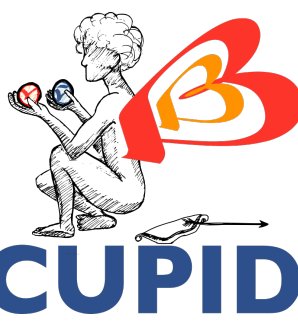
- Duration and level of effort established from bottom to top by L3 & L2 Managers, Project Controls, Project Managers, Project Director, and Technical Coordinator
 - Duration and labor estimated using expert judgment and recent experience with CUORE
 - Multiple “scrubbing” meetings with L1, L2, and L3 Managers for each task
- Prices and estimates:
 - Vendor quotes where possible
 - Take advantage of CUORE experience
 - Labor rates from LBNL and collaborating US institutions
 - Contingency
- LBNL approved overheads and escalation rates
- Resource-loaded schedule integrated with COBRA
 - Utilizing LBNL EVMS enterprise tools (e.g., P6, COBRA, Hammer CET) with all appropriate resources and LBNL overheads

CUPID BOE Type & Estimate Uncertainty		
Code	Estimate Type	Estimate Uncertainty Value
L0	No Contingency	1.00
L1	Level of Effort	1.15
L2	Standard Activity	1.15
L3	Similar Design Done	1.25
L4	Conventional Design	1.30
L5	Conceptual Design	1.40
L6	Not Defined Yet	1.80
M0	No Contingency	1.00
M1	Recent Firm Quotes (<1yr)	1.15
M2	Firm Quote (sole or <2yr)	1.15
M3	Budgetary Quote	1.25
M4	Conceptual Design	1.30
M5	Novel Fabrication	1.40
M6	Preconceptual Design	1.80
M7	Recent Firm Quotes (<1yr); Foreign	1.25
M8	Firm Quote (sole or <2yr); Foreign	1.25
M9	Preliminary Design; Foreign	1.35
T1	Standard contingency level for all travel	1.20

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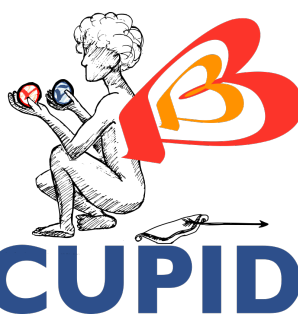
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Risk Consequence Matrix



	Marginal (M)	Significant (S)	Critical (C)
Cost Impact on project contingency is:	< \$100k	\$100k to \$500k	> \$500k
Schedule Impact on project schedule is:	None	Delay to milestone of ≥ 3 months	Delay to project finish date
Technical Impact on project performance is:	Minor	Significant impact on performance	Will not meet design requirements

Risk Categorization Matrix

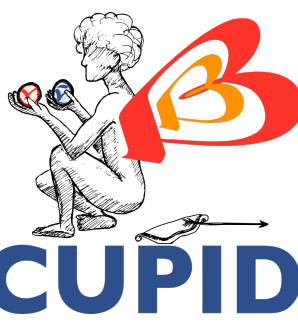


	Consequence		
Likelihood	Marginal (M)	Significant (S)	Critical (C)
Very Likely (Probability > 80%)	Medium	High	High
Likely (25% < Probability ≤ 80%)	Low	Medium	High
Unlikely (Probability ≤ 25%)	Low	Low	Medium

Risk Registry Methodology

- Risk registry is populated by L1, L2, & L3 Managers
 - Recent experiences with CUORE
 - Experience with CUPID R&D
- Risk registry is evaluated by RM (E. Imani), PC (G. Zehnder), & PM (B. Fujikawa)

115 Entries in the Risk Registry



WBS	Description	Low	Med	High	Ret.
1.02	Detector Components	42	14	5	3
1.03	Detector Structure	13	5	2	0
1.04	Host Lab Infrastructure & Cryogenic Systems	4	0	0	0
1.05	Data Readout	14	3	0	3
1.06	Background Control	3	3	0	1
Total		76	25	7	7

High-Risk Items (US Scope)

- ID 202040004
 - WBS 1.02.04 Light Detector (LD)
 - Difficulty setting up antireflective coating facility at ANL, leading to delay in LD production
- ID 102040076
 - WBS 1.02.04 Light Detector (LD)
 - Failure to achieve HV on NTL LD, leading to the degradation of LD performance and pileup discrimination
- ID 302050012
 - WBS 1.02.05 NTD Ge Thermistor
 - E-Beam machine downtime, leading to delay in thermistor production
- ID 302050014
 - WBS 1.02.05 NTD Ge Thermistor
 - Loss of LBNL fabrication personnel, leading to delay in thermistor production
- ID 106030055
 - WBS 1.06.03 Screening Labs US
 - Instrument expert leaves position, leading to delayed screening schedule

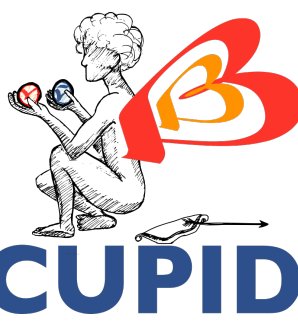
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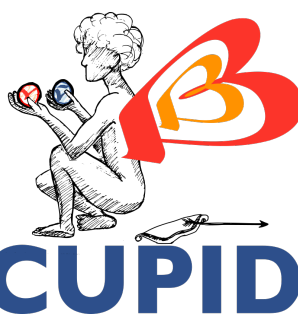
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Environmental Health & Safety



- WBS 1.01.05 L3 Manger: Jeff Bramble (LBNL)
 - GRETA Safety Officer
 - NSD Safety Coordinator
- Develop Hazard Analysis Report (HAR) with input from all L2 Managers with PD, PM, Safety Officer, Project Engineer, LNGS Group Leader In Matters of Safety (GLIMOS), and other LNGS safety personnel.
- Leverage the extensive safety knowledge and experience from CUORE





CUORE/CUPID Offsite WPC Activity NS-0051

ACTIVITY SUMMARY

NS-0051 - CUORE/CUPID TECHNICAL WORK OFFSITE LNGS
ACTIVITY VERSION: 9
ACTIVITY STATUS: ACTIVE



Activity Risk Level



Activity Lead: Brian Fujikawa

Activity Name: CUORE/CUPID Technical Work Offsite LNGS

Activity Approved Date: November 20, 2023

Renewal Due Date: November 20, 2025

Activity Division: Nuclear Science

Project Lead: Fujikawa, Brian K

Project: CUORE

Activity Lead Designee:

Activity Locations: Laboratori Nazionali del Gran Sasso (LNGS), ITALY

[Offsite Detail](#)

BRIEF DESCRIPTION

Technical work related to the operations of the CUORE and CUPID experiments at the Laboratori Nazionali del Gran Sasso (LNGS), ITALY.

- WPC triggers training requirements by the identified safety hazards
- In addition to the local LNGS safety training, all LBNL affiliated personnel must complete the required training to perform work at LNGS
- Encourage non-LBNL US personnel to become LBNL affiliates, accept the assignments with NS-0051, and comply with the NS-0051 training requirements

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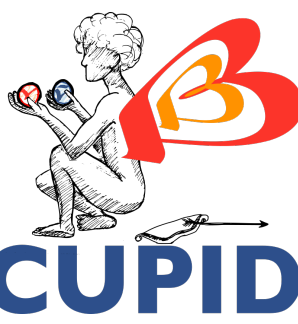
Lessons Learned

- from CUORE
 - Project Management challenges in an international collaboration with a foreign host laboratory
 - Safety culture differences in an international collaboration
 - e.g., who is allowed to stop work?
 - Value of having a continuous US on-site presence at the foreign host laboratory
- EVMS from other LBNL projects (e.g., LZ, GRETA, etc.) and PMO

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Oversight

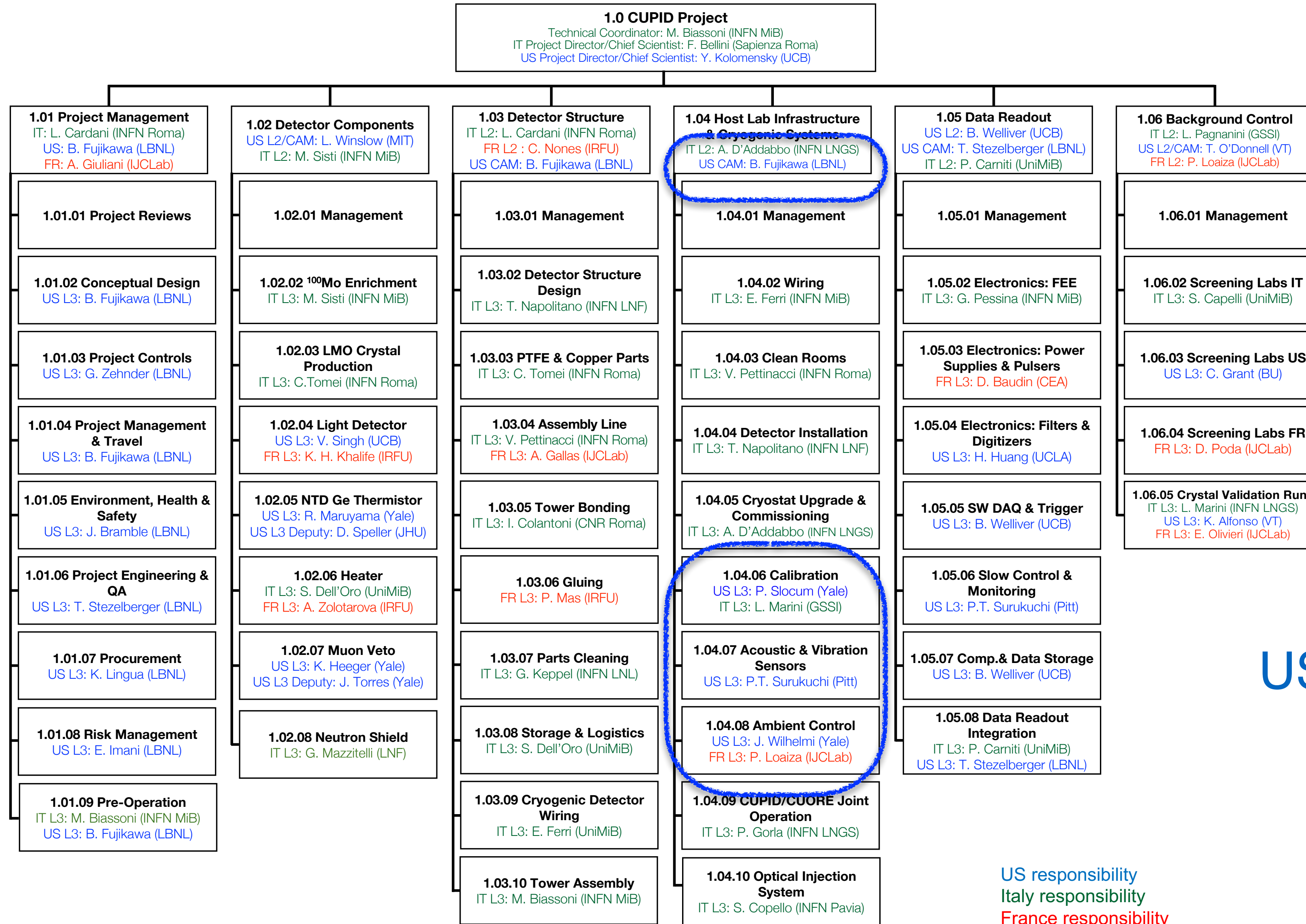
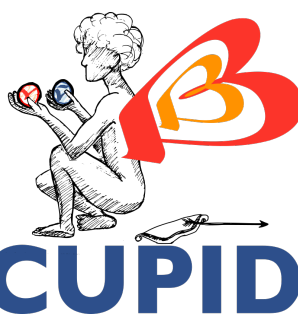


- CUPID
 - Weekly US Project Team Meetings
 - Monthly Technical Control Board Meetings
- LBNL
 - Monthly meetings with NSD Director and PSA ALD
 - Monthly reports to PMAB-SE followed by meetings with advisors
 - Quarterly presentations to PMAB-SE
- DOE
 - Report status to DOE via PARS and monthly meetings
 - OPA Reviews
 - Earned Value Management Systems surveillance
- International
 - CUPID Finance Board
 - CUPID Advisory Board

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WBS 1.04 Host Lab Infrastructure & Cryogenic Systems



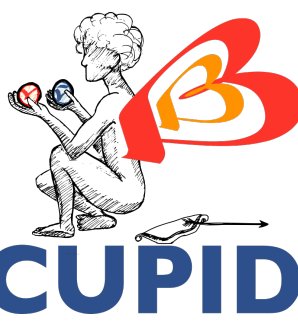
US CAM

US L3 Management

US responsibility
 Italy responsibility
 France responsibility

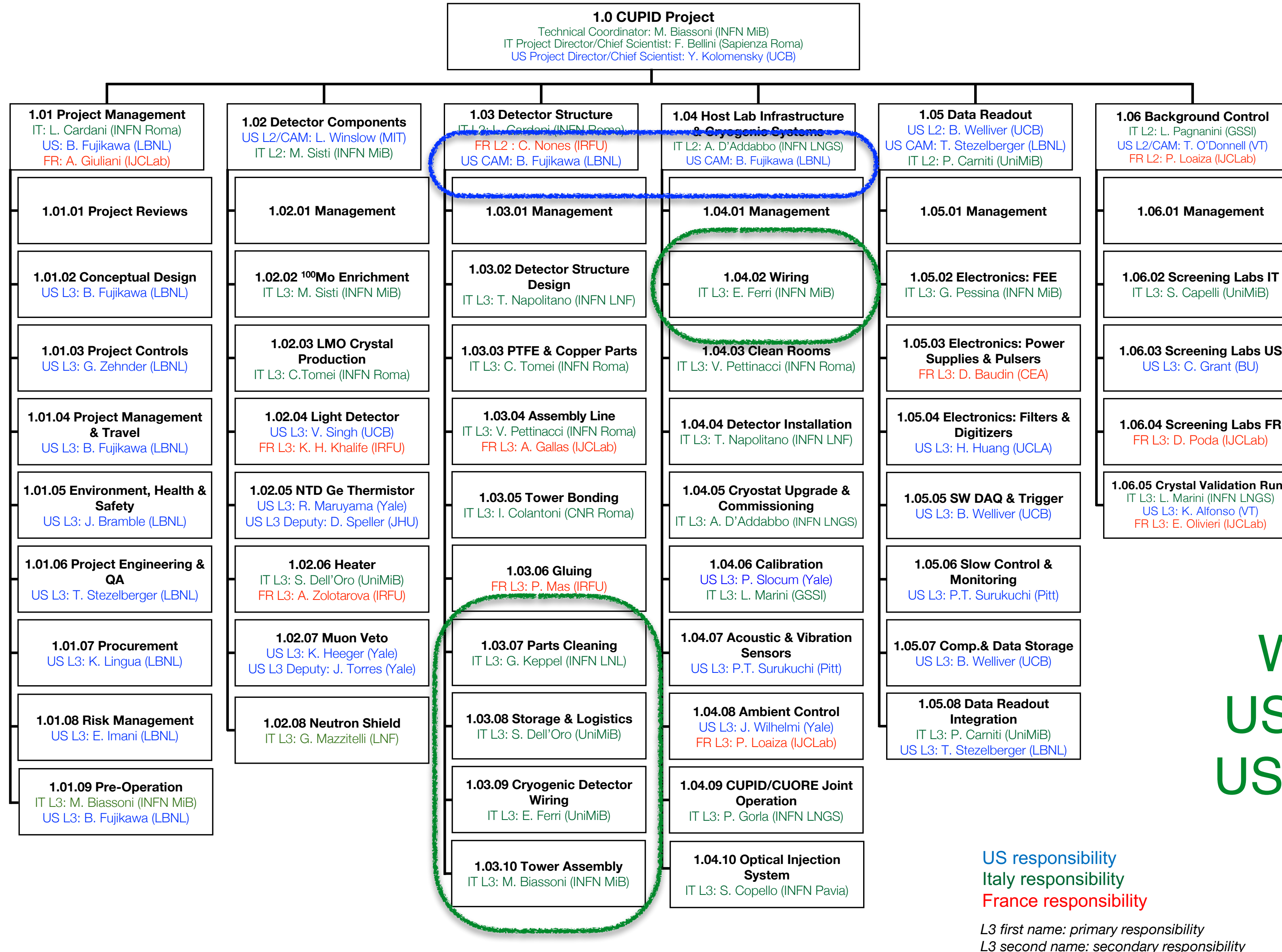
L3 first name: primary responsibility
 L3 second name: secondary responsibility

WBS 1.04 Host Lab Infrastructure & Cryogenic Systems



- WBS 1.04.06 Calibration
 - US L3: P. Slocum (Yale)
 - ~\$138k for calibration source deployment system
- WBS 1.04.07 Acoustic & Vibration Sensors
 - US L3: P.T. Surukuchi (Pitt)
 - ~\$29k for sensors
 - ~\$16k for travel to LNGS for installation & testing
- WBS 1.04.08 Ambient Control
 - US L3: J. Wilhelmi (Yale)
 - ~\$183k for evaluation & possible repair/replacement of low-radon air system

WBS 1.03 & 1.04



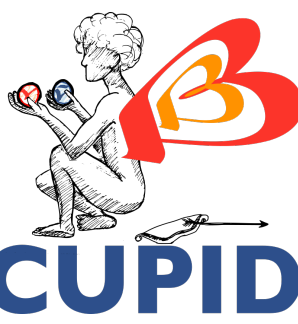
US CAM

WBS Tasks with US Obligations w/o US L3 Management

US responsibility
 Italy responsibility
 France responsibility

L3 first name: primary responsibility
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WBS 1.03 & 1.04 US Obligations w/o US L3 Management

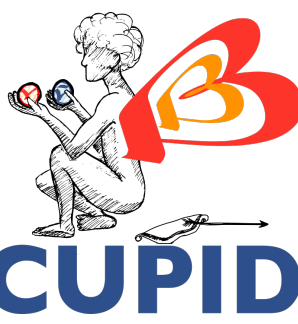


- US L2 CAM, but no US L3 Managers
- WBS 1.03.07 Parts Cleaning
 - ~\$1.1M chemicals for surface cleaning of tower parts, etc.
- WBS 1.03.08 Storage & Logistics
 - ~\$426k for dry nitrogen-flushed storage cabinets
- WBS 1.03.09 Cryogenic Detector Wiring
 - ~\$867k for Cu-PEN cables
- WBS 1.03.10 Tower Assembly
 - ~\$342k for technical contract labor
- WBS 1.04.02 Wiring
 - ~\$722k for connectors, wiring, etc.
- US obligations constrained by scope swap MOU

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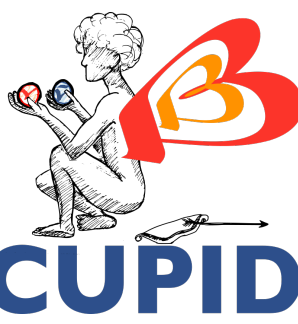
Summary



- CUPID management team is well-integrated
 - Project Director, Project Manager, Project Controls, Project Engineering, Procurement, Risk Management
 - International Management Team
- Budget and schedule in place
- Risk Registry with mitigation strategies

Backup

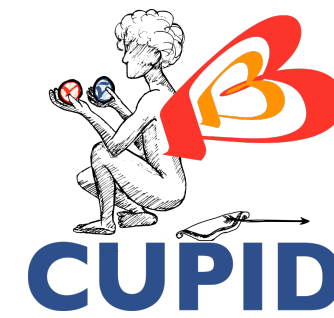
WBS 1.01 FY Budget Summary



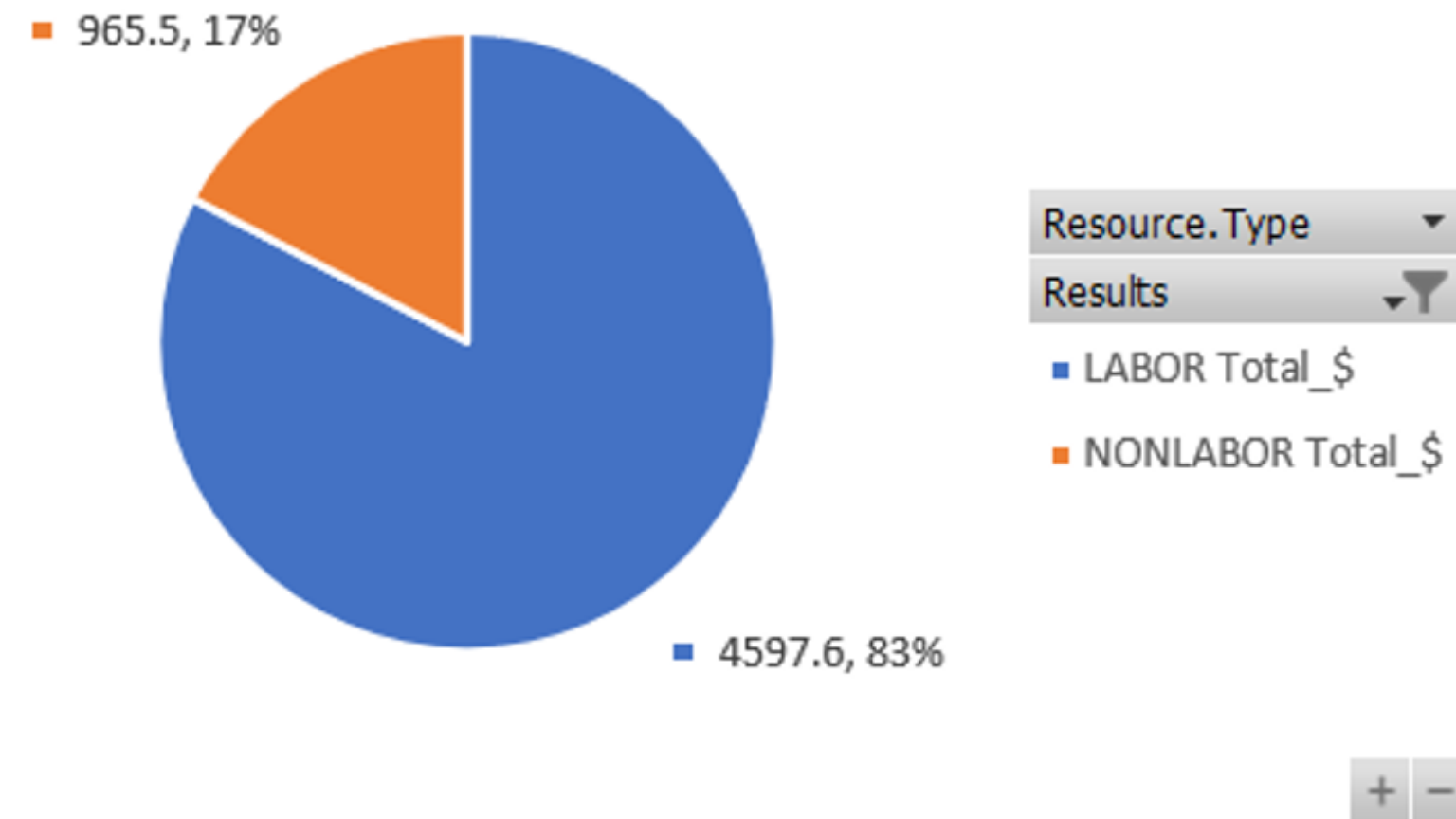
Sum of Value	Column Labels															Total_ \$ Total	
Row Labels	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37	Total_ \$ Total
US	28.6	562.0	281.0	1034.9	1047.6	905.5	934.8	768.7	803.6	831.5	875.6	962.8	826.5	.6	663.9	334.5	10862.1
Phase 1	28.6	562.0	281.0	1034.9	1047.6	905.5	934.8	768.7									5563.1
Phase 2									803.6	831.5	875.6	962.8	826.5	.6	663.9	334.5	5299.1
Grand Total	28.6	562.0	281.0	1034.9	1047.6	905.5	934.8	768.7	803.6	831.5	875.6	962.8	826.5	.6	663.9	334.5	10862.1



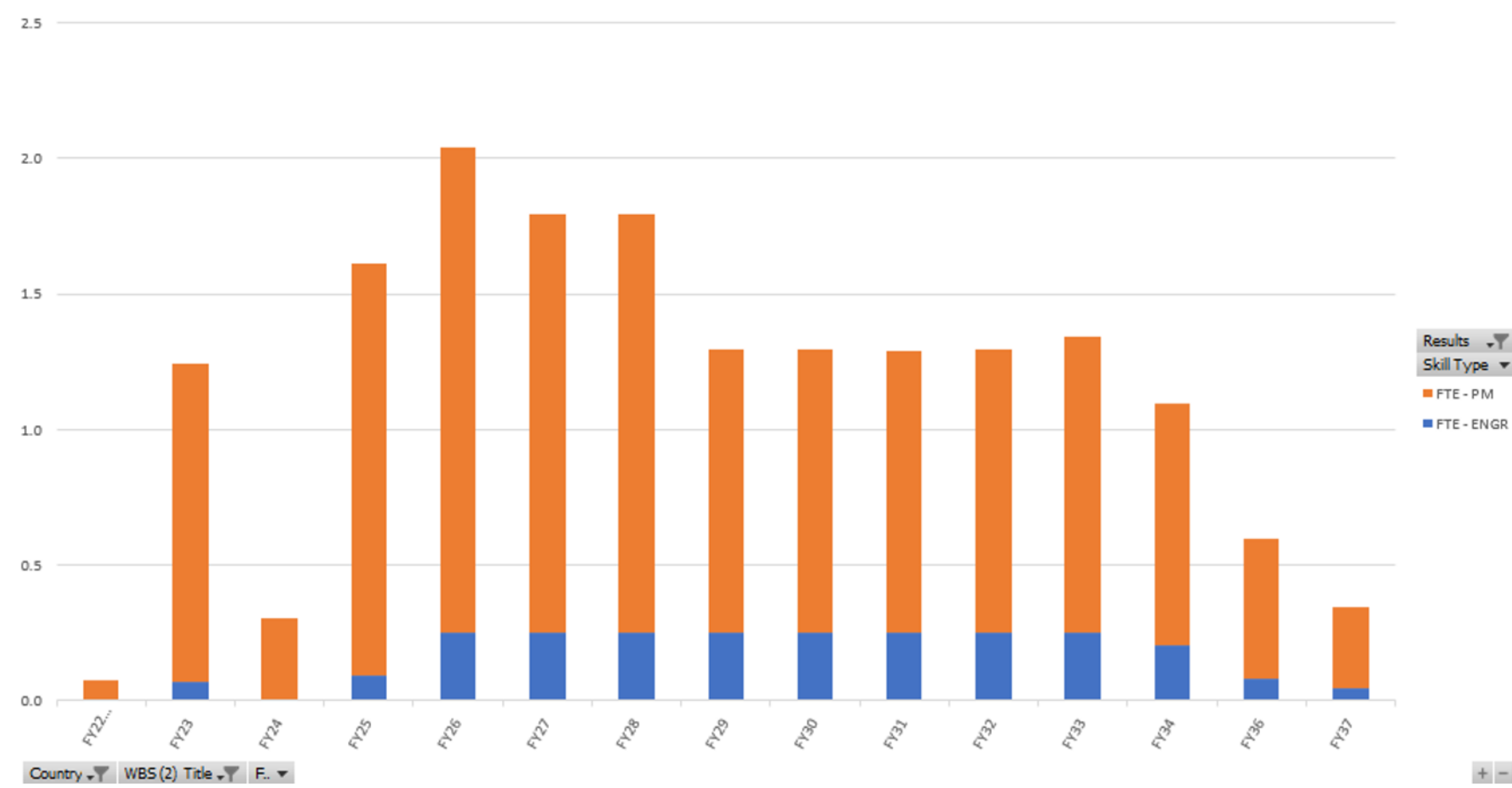
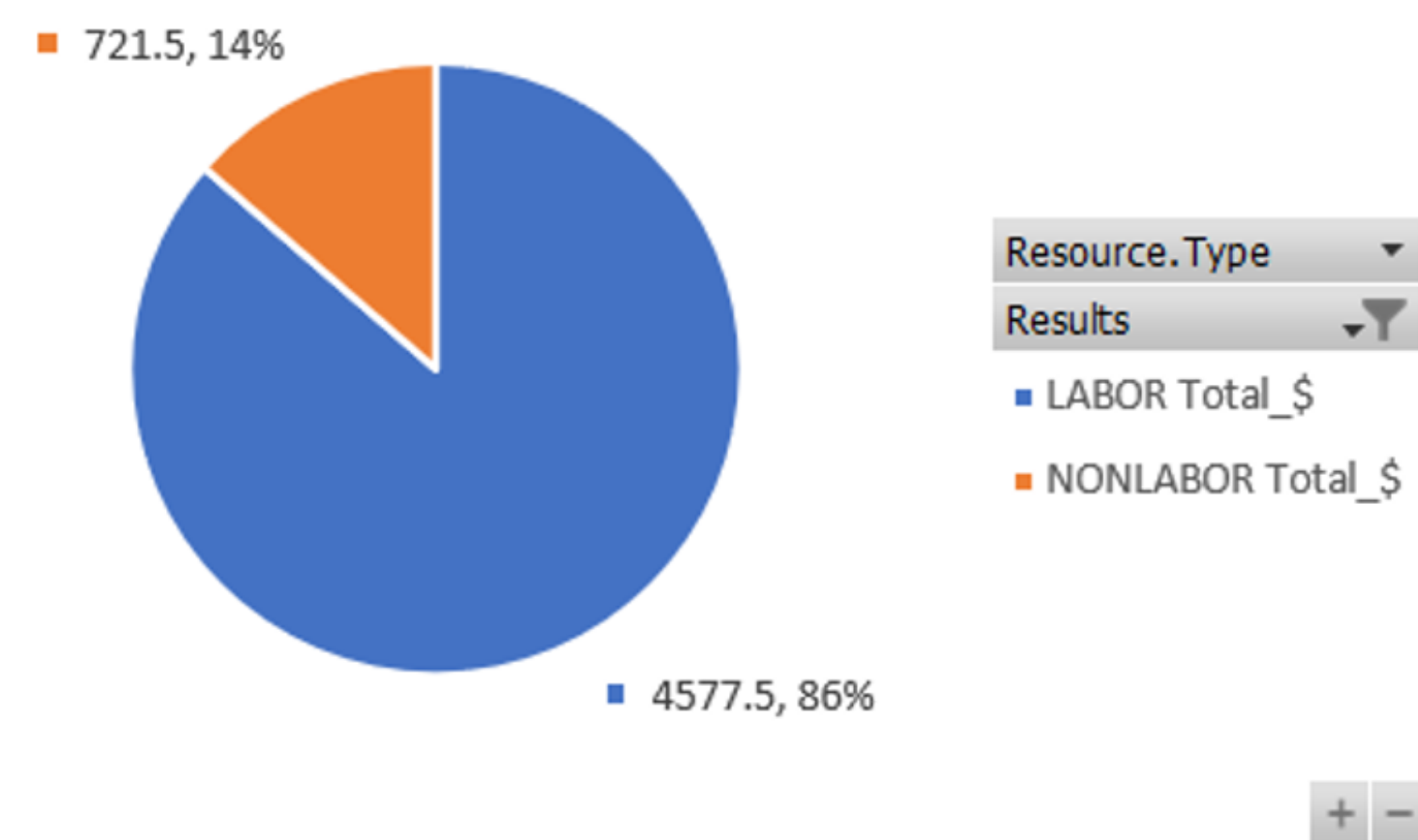
WBS 1.01 FY Budget Breakdown



Stage 1



Stage 2



100% LBNL Labor

WBS 1.01 Schedule

