Controls, Lasers, Instrumentation and Cabling

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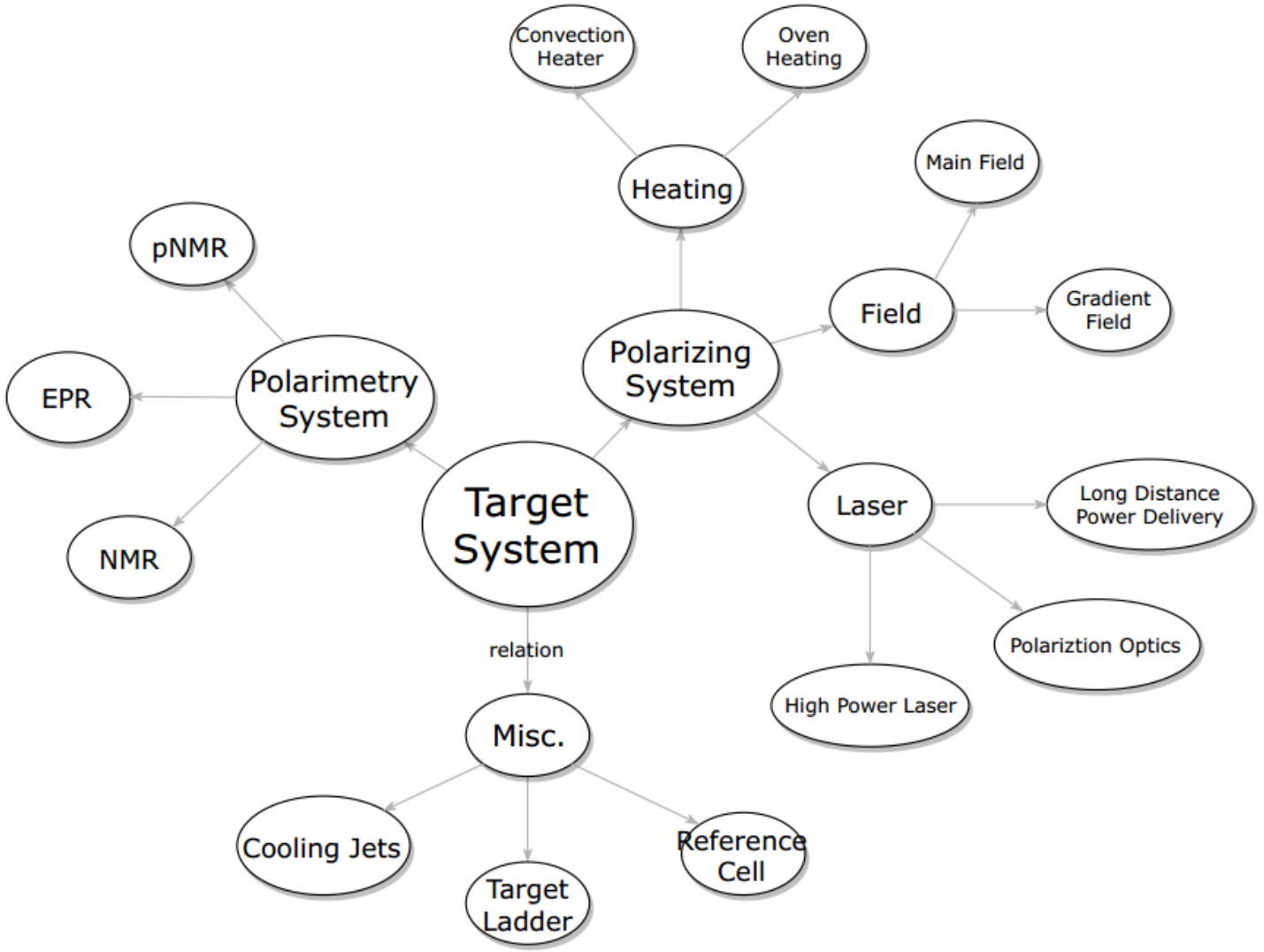
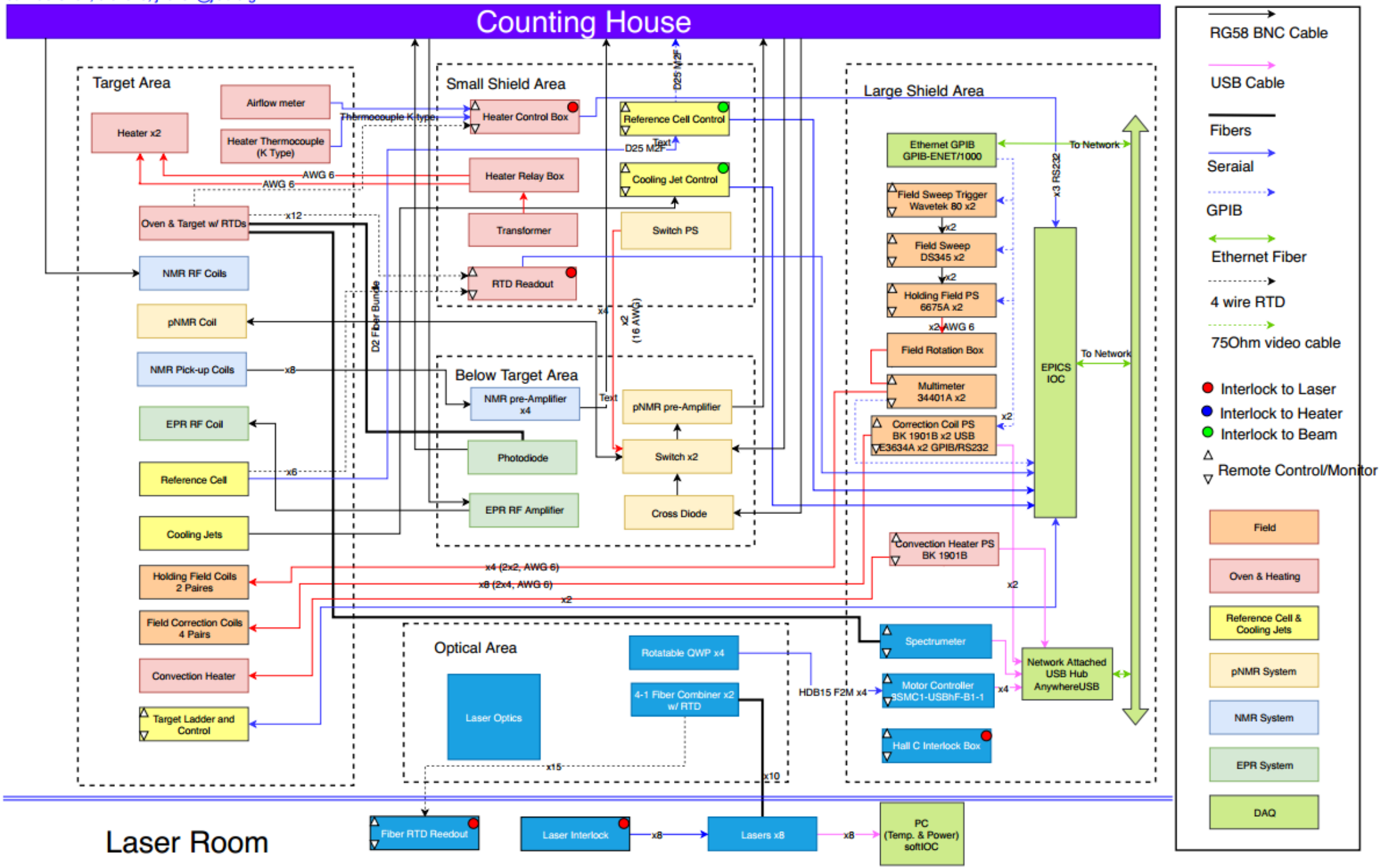
Polarized ^3He Target System Overview



Junhao Chen, 07/2019, jhchen@jlab.org



Slow Control Remaining Tasks

- EPICS Communication
  - Field
    - Main Coil Multimeter readback
  - Heater
    - Oven Heater Controller
    - Target Cell RTDs readback
  - Target Ladder control
  - Reference Cell Pressure readback
  - Cooling Jets Airflow readback

- General Control Program
  - Field
    - Correction Coil Control
  - Lasers
    - A multi-channel laser control program
    - Quarter-wave Plate Rotation Control
    - Fiber Ends RTDs readback

Manpower:

Dr. Brad Sawatzky

Dr. Arun Tadepalli

EPICS Group

Junhao Chen

Outside Help:

Raytum Photonics

Cable Count

Cable type	#	Length	Explain
Series	1	S2C	Target position, RG59 75ohm video cable
	1	Internet	Cooling jets airflow meter, Digital signal
	1	S2C	Reference Cell Control, Patch cable 25D Male to Female
	1	T2S	Oven airflow meter, (Shielded 4 conductor cable 22AWG)
	1	T2S	Reference Cell Control, Patch cable 25D Male to Female
	18	S2L	RTD readout, analog signal
	14	Short	USB
	3	S2L	Oven airflow + Oven temp + Heater temp, RS232
BNC RG58	13	C2U	4 NMR + 3 PNMR + 1 EPR
	1	C2U	EPR RF, ~20 MHz, 50 Ohm coaxial, but not RG58
	2	C2T	1 NMR RF
	10	T2U	
	26	Short	
RTD	18	T2S	Oven & Cells (Shielded 4 conductor cable 22AWG)
	17	OA2LR	Shielded twisted pair, AWG 20, for 12 RTDs
Thermocouple	1	T2S	
Power Cable	2	T2L	twisted 2 conductor cable 6 AWG
	4	T2L	twisted 2 conductor cable 6 AWG
	1	T2S	Ul sjtw vw-1 75C 300V 3/c AWG 10
	1	T2S	14-3 (UL) SOW-A DRY 90C(-35C) AND Water Resistant 60C E42543 CSA 90C LL24508 P-158-18 MSHA
GPIB	14	Short	
2 wire Interlock Connection	1	L2LR	
	2	S2L	
	1	OA2L	
	2	Short	

: Cables need help from Andy and Jack
: Cables prepared by Target Lab

2: to
S: small shield area
C: counting house
T: target are
L: large shield area
LR: laser room
OA: optical area
Short: 6~9 feet

Cables in Hall for Target Ladder Control, Cooling Jet Control and Reference Cell Control not included

Cabling

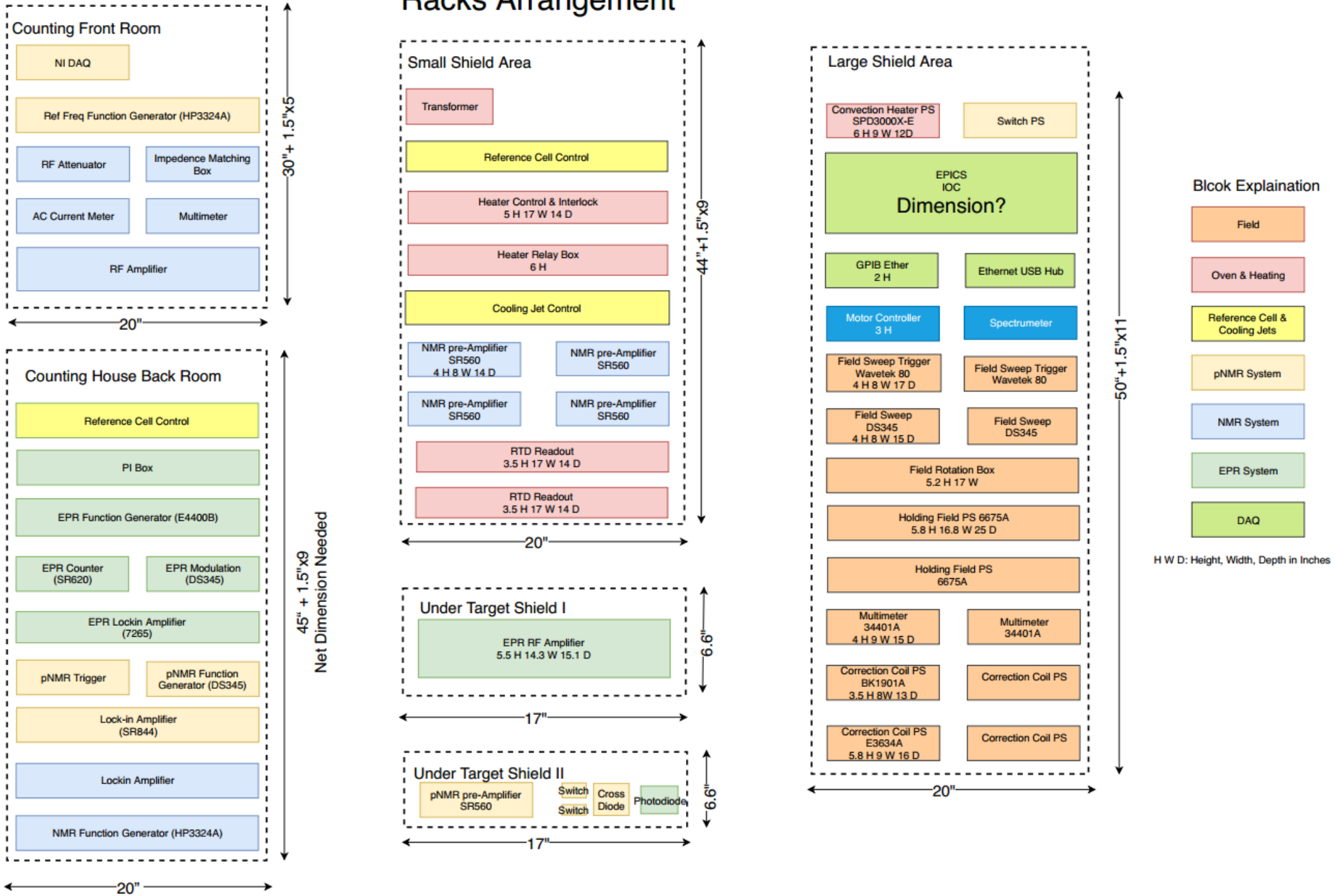
- Long Cables: from Hall C counting room and laser room into Hall C
  - Prepared by Andrew Kenyon, Jack Segal
- Short Cables
  - Have been listed
  - Need to confirm individual length and be ordered
  - Also need help from Andy and Jack for making short cables

Laser System Ongoing Work

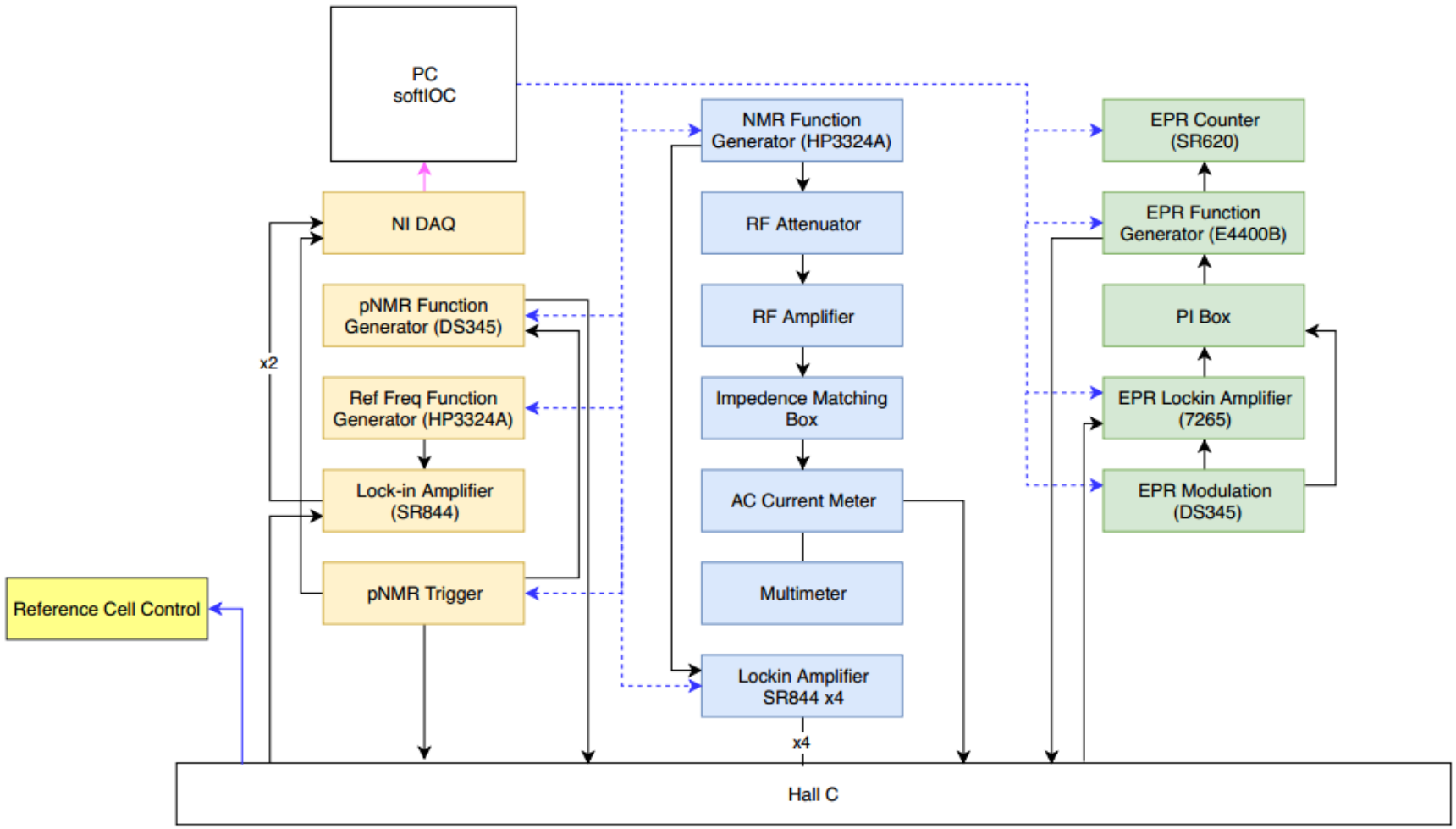
- Fiber combiner: wrong fiber diameter is delivered, the company will replace them within two month complimentarily
- Fiber combiner & long fiber coupling: fiber to fiber coupling using fiber coupler, compensate length with 0.001” shims
- Lasers: due to some outdated TEC and Diode drivers, need significant amount of support from Raytum to implement a multi-channel laser control program controlling all, eight, operating lasers

Backup Slides

Racks Arrangement



Instruments In Counting House



RG58 BNC Cable

USB Cable

Fibers

Seraial

GPIB

Ethernet Fiber

4 wire RTD

75Ohm video cable

Reference Cell & Cooling Jets

pNMR System

NMR System

EPR System

Laser Control Program

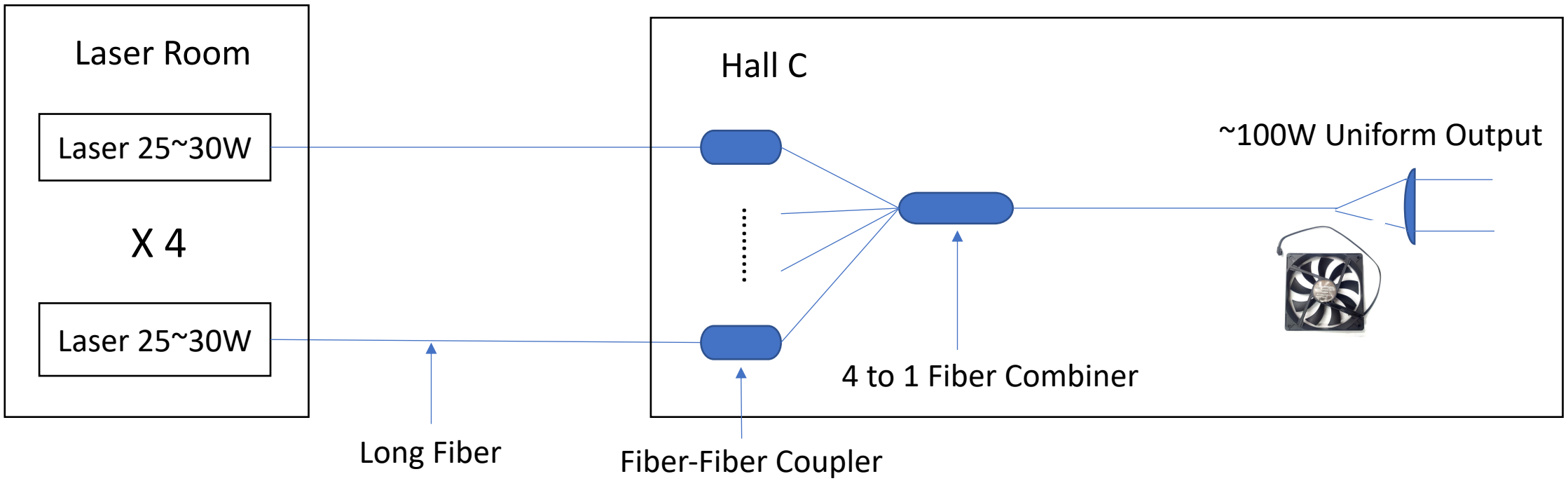
Lasers	Number	TEC Driver	Diode Driver
30W	4	Compact VueMetrix	
Old 50W	2	VueMetrix	DLM 8-75 (External Power Supply)
New 50W	3	VueMetrix	Picolas
May Order New Lasers	3	Picolas	Picolas

- TEC driver is hard to upgrade, driver upgrade/replacement is not recommended
- Picolas: compatible with their latest multi channel program
- Sorensen DLM 8-75: analog remote control, can be replaced with external Picolas Module at a cost of $2k/unit

What they can do:

- Need to write control programs for VueMetrix drivers
- Integrate different type control modules for different lasers into a single control program
- Need a formal software inquiry for implementing such functionality

Laser Power Delivery to Hall



- ✓ Need: 10 long fiber, 8 fiber-fiber coupler, 2 4-1 combiner
- ✓ 4-1 output end need cooling with fans
- ✓ 4-1 tested, steadily works 20 h with 100 W output power
- Still need test: fiber coupler

4-1 Specification
Input: 600 um, 0.22 NA
Output: 1320 um, 0.22 NA