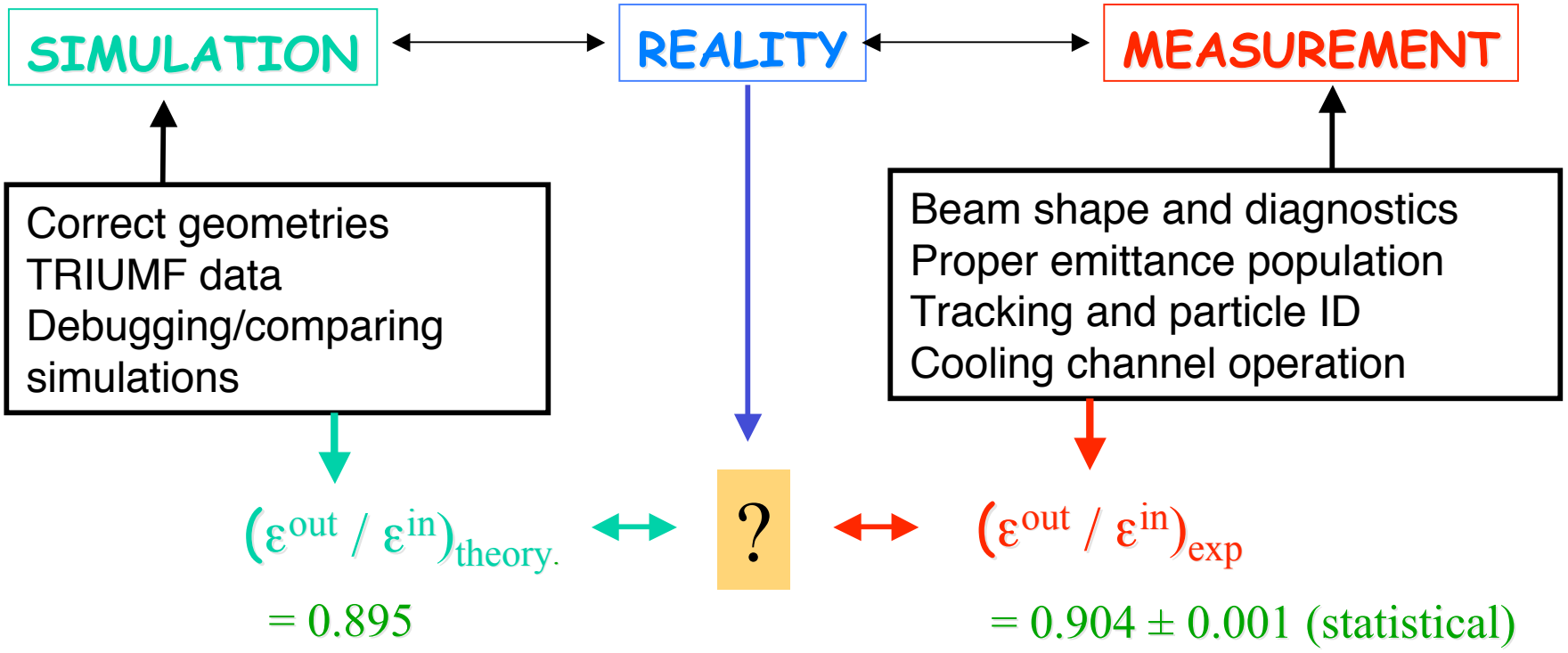
MICE Physics

Theory uncertainties
Model and simulation choices
Currently,
systematics at ~ 50%

Experimental uncertainties
Design of detectors/cooling elements
Currently,
systematics at ~ 0.1-1.0%



On the experimental side, now we must start thinking about the systematic uncertainties and how we determine them

Systematics: assumptions and questions

- Stated Goal: $\varepsilon^{out}/\varepsilon^{in}$ of $\pm 10^{-3}$
- Assume there will be a standard (or agreed to) definition of 6-D cooling.
- Assume that the tracker can give us precision particle position and momemtum that this won't contribute significantly to the error.
- Assume particle ID < 1% error
- The main sources of systematic errors are in the COOLING CHANNEL and detector solenoids, which will need to be under control to a level such that up to 10 independent sources of systematics will be $< 10^{-3}$
- Suggested goal to keep each source of error $<3*10^{-4}$ level if at all possible.
- What are the beam diagnostics concerns in a single particle experiment? How is beam diffusion controlled? Backgrounds?

Systematics readout

- Areas:
  1. Beam shape and content
  2. Trackers and detectors
  3. Cooling channel

- Systematic handles:
  1. Using the beam itself: calibration runs
  2. Experiment staging and component combinatorics
  3. Defining tolerances
  4. Determining controls/monitoring readout onto the event record

- Controls:
  1. Enviromental and backgrounds
  2. Particle tracking and ID (determining samples and emittances)
  3. Systematics on the cooling channel

$$\frac{d\varepsilon_N}{ds} = -\frac{1}{\beta^2}\left|\frac{dE_\mu}{ds}\right|\frac{\varepsilon_N}{E_\mu} + \frac{\beta_\perp (0.014\,\mathrm{GeV})^2}{2\beta^3 E_\mu m_\mu X_0}$$

Cooling Channel Count Recap

- Cooling channel components # Engineering?

Absorber:	temperature	(8-16)*3	yes
	pressure	2*3	yes
	He temp	2*3	yes
	level	8*3	yes
	length (optical)	4*3	design
Magnetic:	power supply	2*3	
	probes	12*2*3	
	temperature	10*3	
Cryo:	pressure	?	
	He flow	1*3	
	He temperature	2*3	
	Hydride bed	?	
RF:	power	8	yes
	phase	8	yes
	temperature	8	yes
Vacuum	O2 monitors	?	
	H2 seal sensor		yes

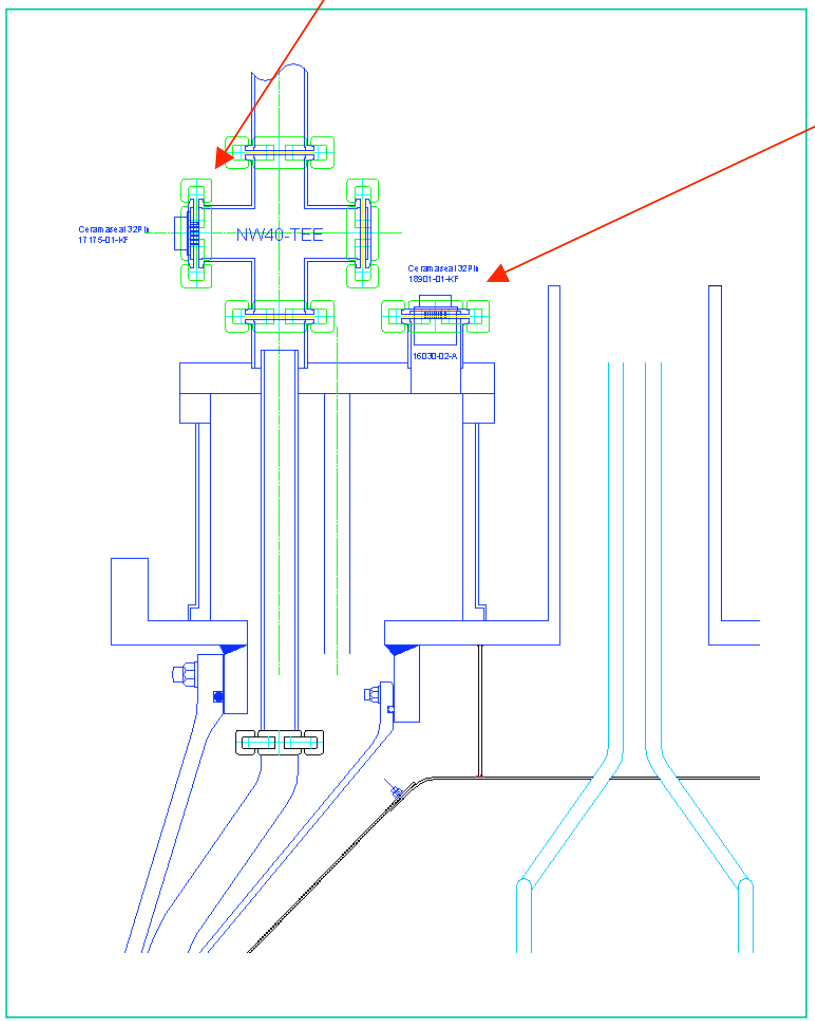
Wiring and Connecters for Absorber

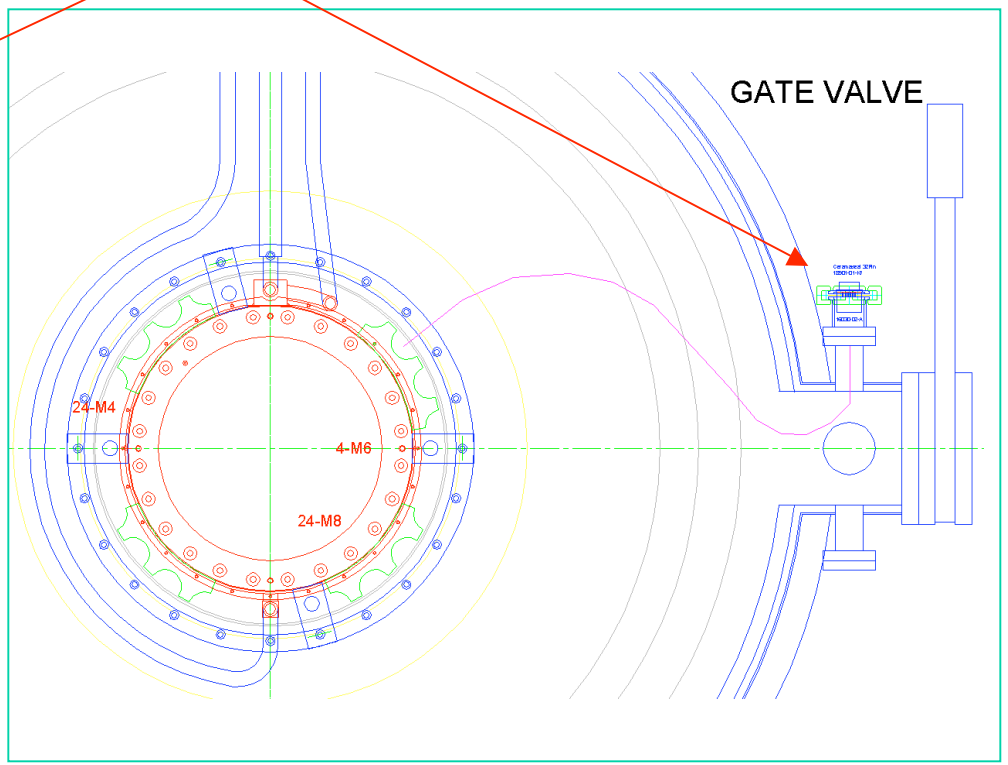
Thermometers and Level Sensor in LH2

32 pin Connecter on KF40

Thermometers in Vacuum

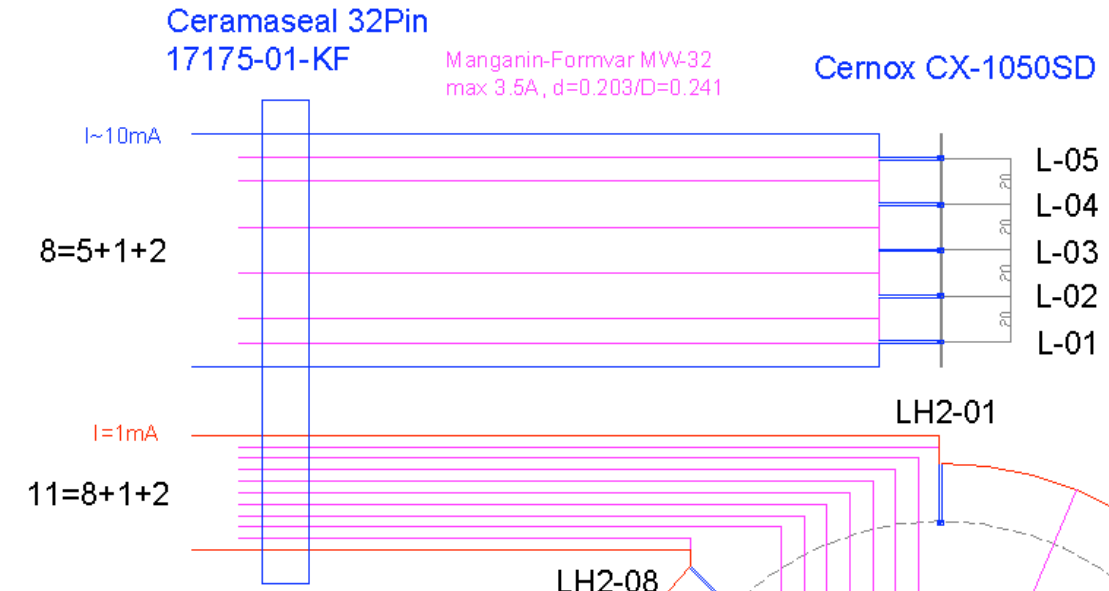
32 pin Connecter (1 of 2) on KF40

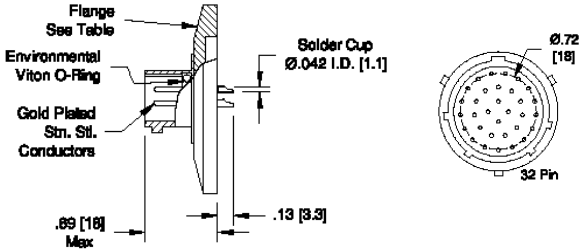


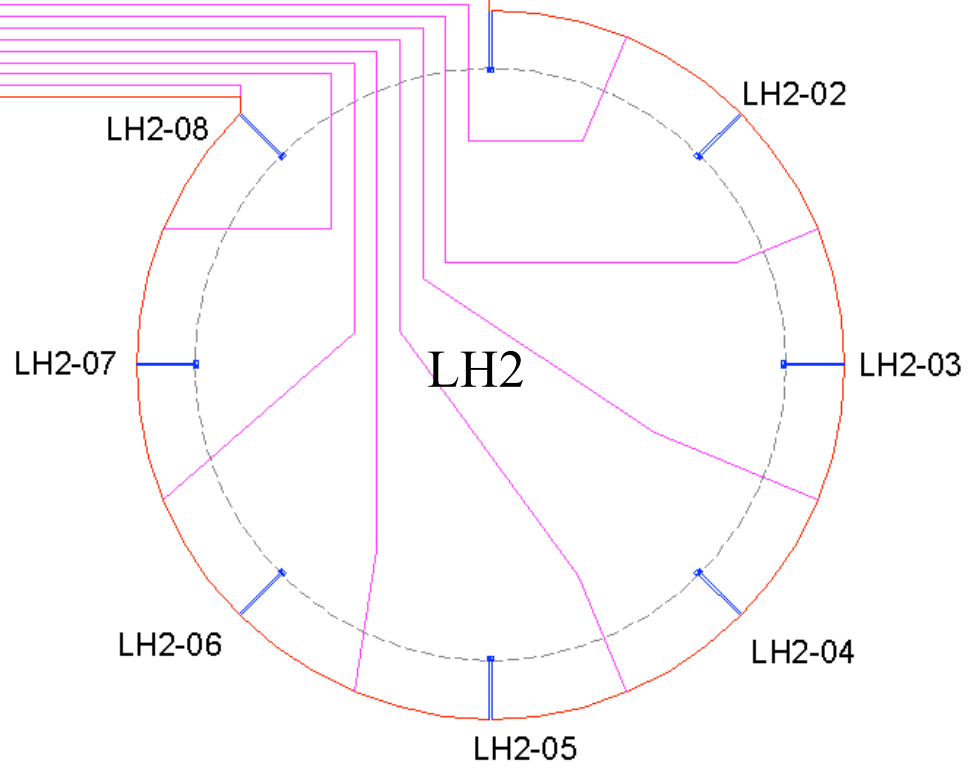


Wiring and Connecters

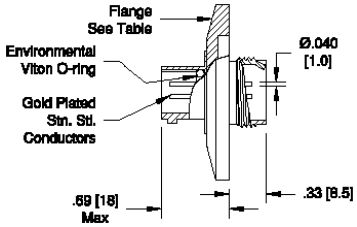
Thermometers and Level Sensor in LH2

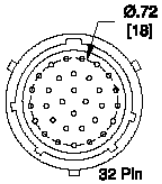






Wiring and Connecters





Ceramaseal 32Pin
18901-01-KF

Vacuum

Thermometers in Vacuum

32=8*4