

40m Dual Recycling Experiment Plans and Progress

- Recent achieved milestones
- Milestones to come
- Outstanding design issues

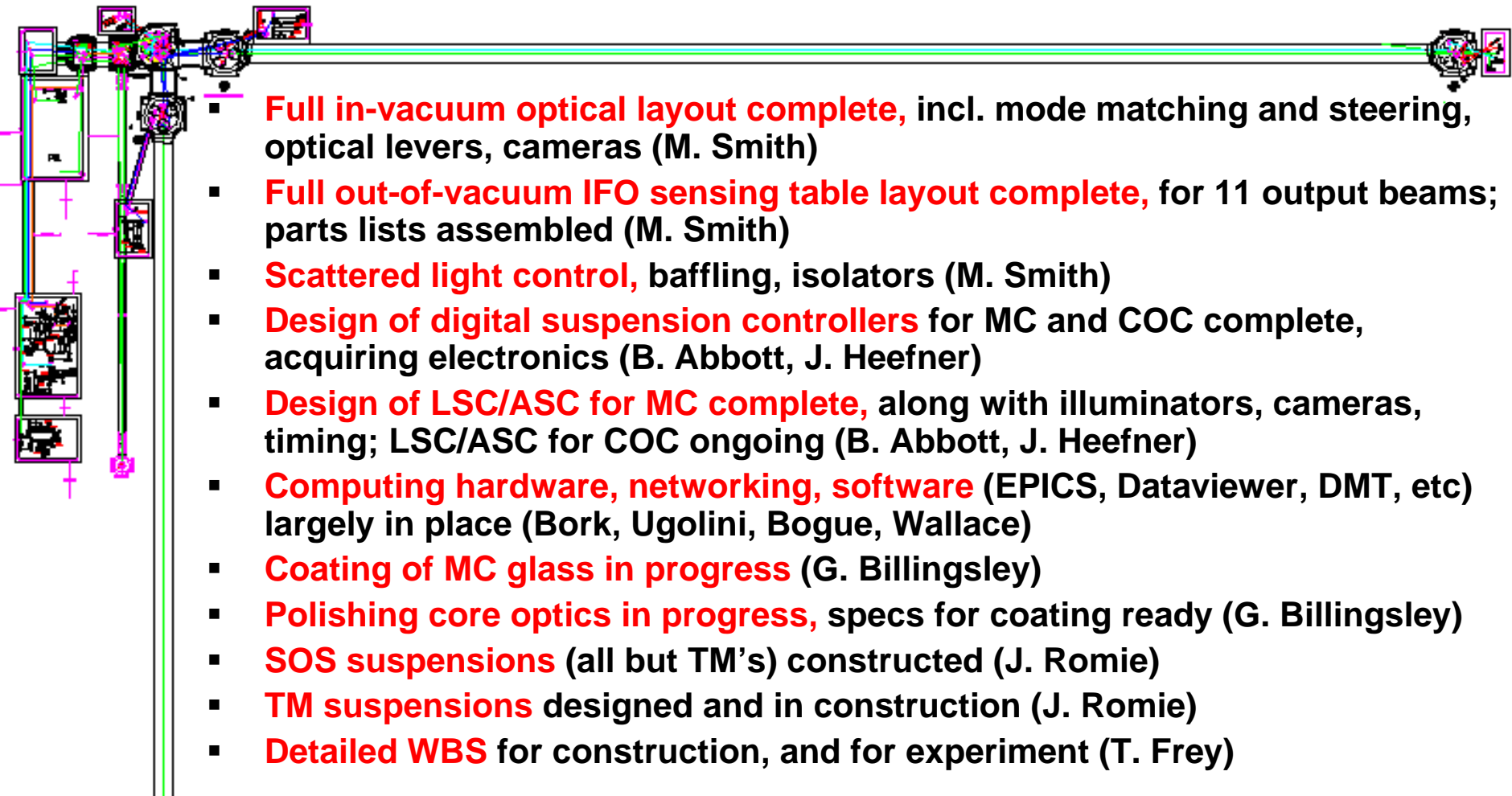


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40m Review Committee
G020063-00-0

Milestones achieved so far

- **Old IFO dismantled**, surplus equipment distributed
- **Lab infrastructure complete**, including new conditioned power, new 12" cable trays, new CDS racks
- **EPICS-based vacuum control system complete** (D. Ugolini)
- **Active seismic isolation system installed**, commissioned (Vass, Jones, etc)
- **Vacuum envelope** for 12m MC and output optic chamber installed (Vass, Jones)
- All but one **optical table** in place (Vass, Jones)
- **12m MC seismic stack** installed and cabled (Vass, Jones)
- **Remaining on infrastructure**: install seismic stack for OOC; all other in-vacuum cabling; combine contents of output optical tables
- **DAQ system installed**, logs frames continuously (R. Bork)
- **PSL installed, commissioned**; full tuning and characterization in progress (P. King, L. Cardenas, R. Karwoski, P. Russell, D. Ugolini, B. Abbott, SURFs)
- **Many PEM devices installed**, in EPICS and DAQS, and in routine use (vacuum gauges, weather station, dust monitor, STACIS, accelerometer, mics, ...) (Ugolini, SURF Tsai)

More milestones achieved



- **Full in-vacuum optical layout complete**, incl. mode matching and steering, optical levers, cameras (M. Smith)
- **Full out-of-vacuum IFO sensing table layout complete**, for 11 output beams; parts lists assembled (M. Smith)
- **Scattered light control**, baffling, isolators (M. Smith)
- **Design of digital suspension controllers** for MC and COC complete, acquiring electronics (B. Abbott, J. Heefner)
- **Design of LSC/ASC for MC complete**, along with illuminators, cameras, timing; LSC/ASC for COC ongoing (B. Abbott, J. Heefner)
- **Computing hardware, networking, software** (EPICS, Dataviewer, DMT, etc) largely in place (Bork, Ugolini, Bogue, Wallace)
- **Coating of MC glass in progress** (G. Billingsley)
- **Polishing core optics in progress**, specs for coating ready (G. Billingsley)
- **SOS suspensions** (all but TM's) constructed (J. Romie)
- **TM suspensions** designed and in construction (J. Romie)
- **Detailed WBS** for construction, and for experiment (T. Frey)

Milestones through 2002

- **4Q 2001: Infrastructure complete**
 - » PSL, 12m MC envelope, vacuum controls, DAQS, PEM.
 - » Conceptual design review. Begin procurement of CDS, ISC, etc.
- **2Q 2002:**
 - » All in-vacuum cables, feedthroughs, viewports, seismic stacks installed.
 - » 12m input MC optics and suspensions, and suspension controllers.
- **3Q 2002:**
 - » Begin commissioning of 12m input mode cleaner.
 - » Acquisition of most of CDS, ISC, LSC, ASC.
- **4Q 2002:**
 - » Core optics (early) and suspensions ready. Ten suspension controllers. Some ISC.
 - » Glasgow 10m experiment informs 40m program
 - » Control system finalized

Milestones through 2004

- **2Q 2003:**
 - » Core optics (late) and suspensions ready.
 - » Auxiliary optics, IFO sensing and control systems assembled.
- **3Q 2003: Core subsystems commissioned, begin experiments**
 - » Lock acquisition with all 5 length dof's, 2x6 angular dof's
 - » Measure transfer functions, noise
 - » Inform CDS of required modifications
- **3Q 2004: Next round of experiments.**
 - » DC readout. Multiple pendulum suspensions?
 - » Final report to LIGO Lab.

LSC Deliverables

- IFO design (optics, sensing, control, etc) needs **careful review by experts, double-check LSC, ASC calculations** – volunteers are welcome! Visit?
- **180 MHz PD's** for WFS, LSC. **Double demodulation** ($180 \oplus 9$ MHz for AdvLIGO, $166 \oplus 33$ MHz for 40m)
- **Output mode cleaner** – will PSL-PMC-like device be adequate for 40m and/or AdvLIGO? Suspended?
- Design **servo filters for LSC, ASC!**
- **Offset-lock arms** - algorithms, software.
- **DC GW PD** – in vacuum? Suspended? Also need **noise analysis.**
- **Lock acquisition studies with E2E/DRLIGO.** Develop lock acquisition algorithms, software. Big job!
- **Report from Glasgow 10m** to LSC/LIGO