Change Record for “aLIGO System Design”

Changes from –v2 to –v3 of T010075

1) section 1:   
- Explained the situation with aLIGO's 3rd interferometer (H2) in the introduction.  
- Added citation of the CQG overview paper on Advanced LIGO  
  
2) section 2.3: Added comments and reference on availability.  
  
3) section 2.4: Noted ground tilt sensing as a possible environmental sensing upgrade in the future.  
  
4) section 2.5: Revised calibration requirements per Lindblom's paper.  
  
5) section 3:   
- updated figure 1 of the interferometer configuration. PRC full power is 5.2 kW, was 5.6 kW; arm cavity full power is 750 kW, was 800 kW.  
- updated table 1 of interferometer parameters. Schnupp asymmetry is 8 cm, was 5 cm; Added IMC length & finesse; added PRC & SRC lengths.  
  
6) section 3.1:   
- To be consistent with the "ALIGO Interferometer Integration" plan (T1200437), dropped reference to operating without signal recycling (mode-0) and updated Figure 2 and Table 2 accordingly.  
- Changed the SRM transmission to 35% (from 20%) for the low power, zero degree detuning case.  
  
7) section 3.3: Clarified that remote tuning of the mode-matching of the beam to the interferometer beam in the IO section is a possible future upgrade (not part of the aLIGO baseline).  
  
8) section 3.4:   
- Changed the tense (from current to past) regarding the implementation of DC readout for eLIGO.  
- Added reference for DC readout in eLIGO.  
- Replaced the reference for the 40m DC readout experiment from G070447 to P070125.  
- Noted that balanced homodyne readout is a possible future upgrade path.  
  
9) section 3.7: Removed the historical reference to a high initial choice for the aLIGO arm cavity finesse (1200). Listed the technical considerations in the trade-off analysis for the 450 design value for the arm cavity finesse.  
  
10) section 3.9: Added some notes and a reference regarding the trade-off study on test mass aspect ratio.  
  
11) section 3.10:   
- Added note that HWS probe beam considerations did not influence the TM coating design.  
- Added the reference on titania-doped tantala/silica coatings.  
  
12) section 3.11: Revised the loss breakdown design budget into terms and values more consistent with the COC DRD.  
  
13) section 3.12:  
- Corrected ITM ROC: was 1935 m, is 1934 m.  
- Corrected CP thickness: was 13 cm, is 10 cm.   
- Corrected CP mass: was 26 kg, is 20 kg.  
- Removed the H2 FM optic from the table.  
- Removed reference to H2 interferometer from Table 3 caption.  
  
14) section 3.16:   
- Removed the H2 Fold Mirror from Table 4.  
- Corrected the RC optic noise requirement: was 3e-17, is 1e-17 m/rHz  
- Corrected the OMC noise requirement: was 1e-11, is 1e-13 m/rHz  
  
15) section 3.17  
- Removed reference to bull's-eye sensors and phase cameras; they are not part of the aLIGO system.  
- Removed reference to the dual-beam optical lever for ROC monitoring; this was never baselined.  
  
16) section 3.19: Updated the parametric instability discussion and status; noted observation of PI in L1 and its mitigation with the ring heater.  
  
17) section 3.20: Updated the electro-static charging discussion to include ion pump charging and its mitigation. Pending delivery of the Test Mass Discharge System (TMDS) is also noted.  
  
18) section 4.1: replaced Figure 3 with gwinc-v3 plot. (slightly different than T010075-v2; same as in P1400117). Noted that gwinc-v3 is used (no longer gwinc-v2)  
  
19) section 4.1.1: Updated the quantum noise comparison plot to exclude "mode 0", the case with no SRM, and changed the legend to name modes as per revised Figure 2 and P1400117.  
  
20) section 4.1.3: Updated to gwinc-v3 and a newer M. Barton file derived from the Mathematica model, as recommended on the gwinc-v3 wiki site. Revised all figures generated with gwinc-v3.  
  
21) section 5: For each subsystem, added the document tree root reference and the acceptance documentation references.