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LIGO

MISSION, EVOLUTION,

CONFIGURATION, & EARLY OPERATIONS

8 Pages

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1) MISSIONS

The LIGO shall be designed and constructed to accommodate three primary missions:

- a) Development - the capability for full functional testing of new interferometer-based detector concepts, whose component parts have been maximally developed in campus R&D facilities.
- b) Observation - the capability for conducting continuous observations with (a) previously developed detector(s) subsequently dedicated to the observation mission.
- c) Special investigations - the capability to accommodate competitively selected detectors to carry out scientific investigations with unique objectives.

d) The three LIGO missions

i. Development

ii. Observations

iii. Special investigations

shall be conducted independently without
mutual interference.

2.) EVOLUTION:

The LIGO shall evolve in two phases:

- a) Phase A (ΦA) shall provide for effective conduct of the development and observation missions with minor technical constraints on the capabilities provided, consistent with economy.
- b) Phase B (ΦB) shall provide for the removal of the technical constraints permitted in ΦA and shall add the capability for the special investigations mission.

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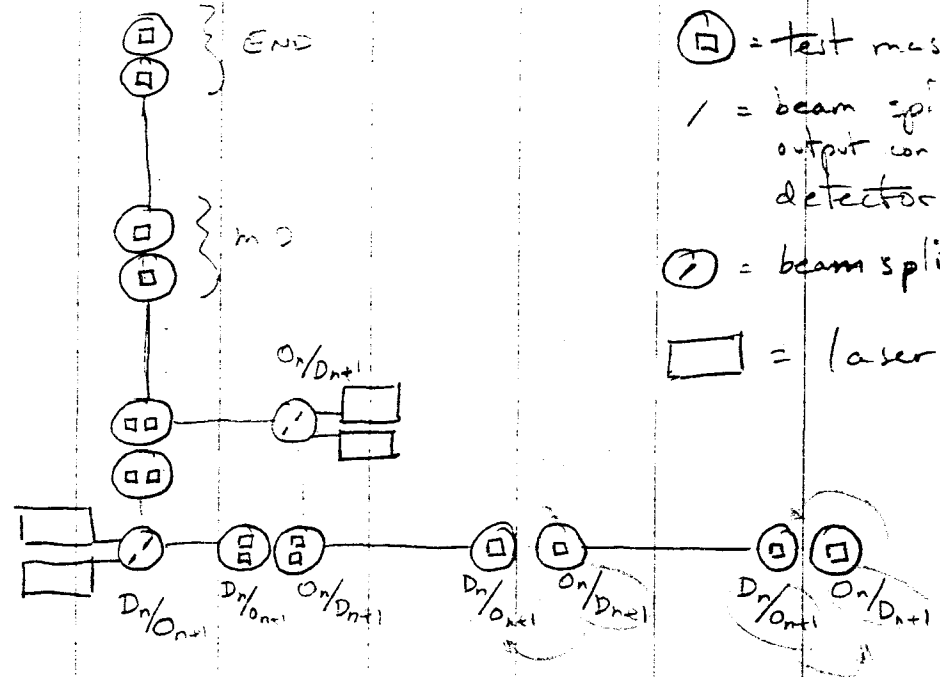
2.) CAPABILITIES

- a. The LIGO shall consist of "L"-shaped vacuum tubes at two sites to provide for spatially separated coincidence detections
- b. Ports shall be provided in the vacuum system to accommodate one detector for each mission.
- c. One detector shall consist of up to three interferometers, as follows:
 - i. One full-length interferometer at each site.
 - ii. One mid-length interferometer at one site.
- d. It is permissible, during ϕ_A , for parts of one detector (of a given mission) to share a port to the vacuum system with some loss of functional capability (i.e., two test masses in a corner test mass tank; two beam splitters in a single tank).

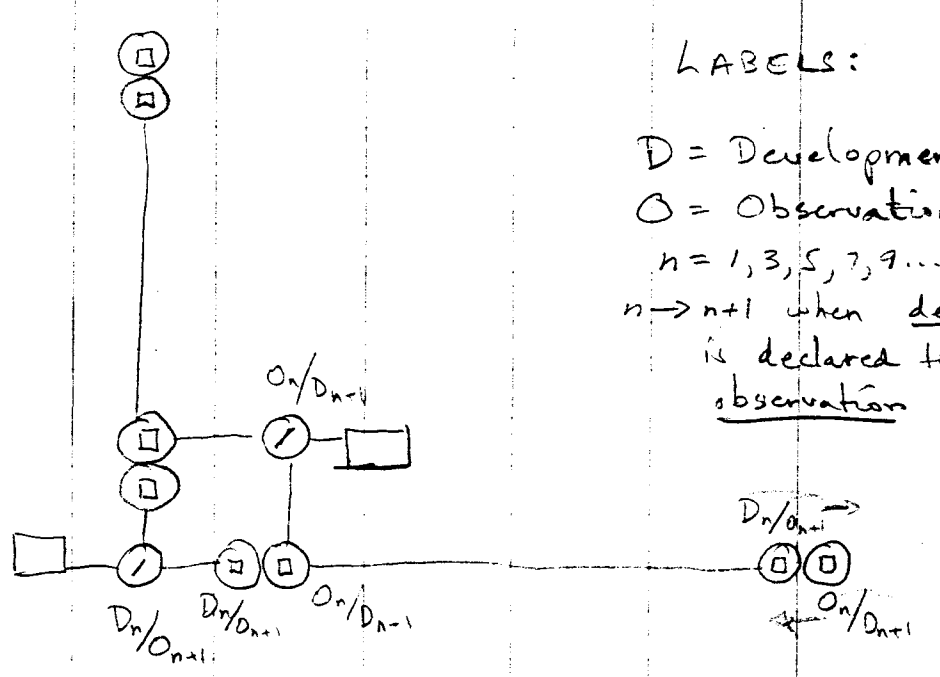
3.) CONFIGURATION:

Phase A:

Site 1



Site 2



Symbols:

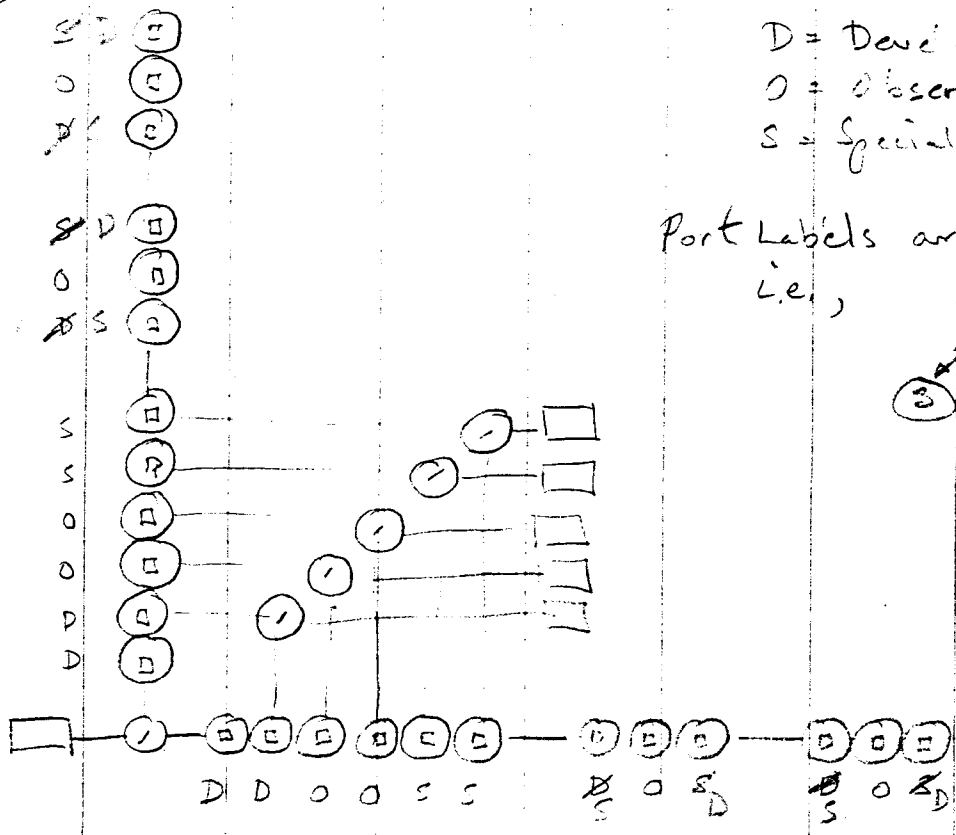
- = test mass
- ⊠ = test mass ~~chamber~~
- / = beam splitter, input & output conditioning optics, detector
- ⊙ = beam splitter tank(s)
- ▭ = laser

LABELS:

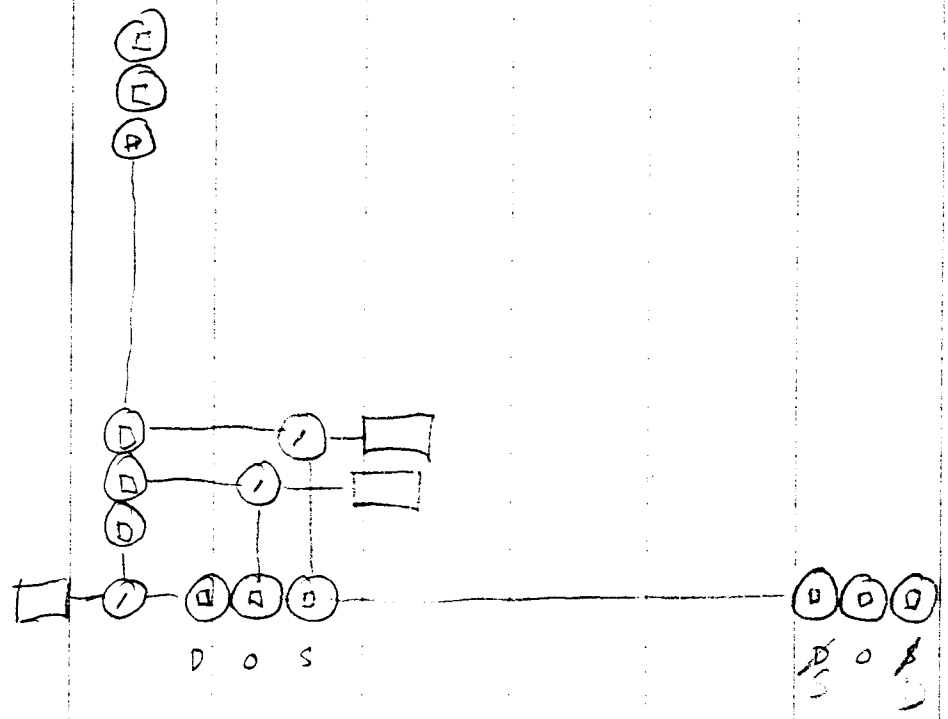
- D = Development
- O = Observation
- n = 1, 3, 5, 7, 9, ...
- n → n+1 when development defect is declared to be an observation detector

Phase B:

Site 1



Site 2



4) EARLY OPERATIONS:

Year 1 (upon completion of vacuum system at site 1)

- site 2 still under construction
- Install and debug 1st full length interferometer at site 1
- shake down site 1 facilities

Year 2:

- install/debug mid-length interferometer at site 1
- install/debug full-length interferometer at site 2
- shake down site 2 facilities

Year 3:

- Declare 1st observation detector operational
- Major effort to understand 1st laser interferometer coincidence detector
- Shake down data analysis procedures, equip, S/W
- Begin campus development of Mk II interferometer

Year 4:

- Install/debug Mk II interferometers at sites 1 & 2