LIGO Scientific Collaboration Meeting
Hanford, WA ; 12 - 14 March 1998

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Working Group on Advanced Interferometer Configurations

A Play in 5 Acts :

Act I : Introducing the Players
Setting the Stage(s)

Act II : Deepening the Characterization

Act III : Tying the Knot

Act IV : Development of Competing Schemes

Act V : The Finale

Act I: Introducing the Players

introduce the protagonists
(noting that there are no antagonists)

(... see attached transparencies)

⋮

(... continue here:)

Ib: Setting the Stage(s)

Caltech	40 m prototype
MIT	phase sensitivity prototype
Florida	I/O optics
Stanford	10 m prototype; many activities

Garching	30 m prototype
Glasgow	10 m prototype
Hannover	1.5 m test rig
ACIGA	8 m prototype

Research Programs, USA (from Baton Rouge, August 1997)

- X Caltech/MIT
- X Stanford University
- JILA
- X University of Florida
- Louisiana State University
- Syracuse University
- University of Oregon
- Pennsylvania State University
- X Caltech Experimental Gravitation
- Eastern Michigan State University
- University of Michigan
- University of Wisconsin @ Milwaukee
- X Caltech Theory Group

Research Programs, foreign

- X VIRGO
- X GEO
- X TAMA
- X AIGO
- X MSU

X: particular interest in Advanced Interferometer Configurations

Country: / *Institute:*	USA MIT	USA Caltech	FRA CNRS	ITA INFN	GER MPQ	GBR Glasgow	JPN ISAS	JPN NAO	AUS Perth	AUS (all)	USA Stanford

Prototypes:

Start:	1972	1980	1983	1986	1975	1977	1986	1991	1991	1994	1994
Laser:	Ar^+	Ar^+	(Ar^+)	(Ar^+)	Ar^+	Ar^+	Ar^+	YAG	YAG	YAG	YAG
Arm length ℓ*:*	40 m		0.5 m		30 m	10 m	100 m	20 m	8 m	12 m	10 m
Strain sensitivity $\tilde{h}$ $[Hz^{-\frac{1}{2}}]$ *:*	$1 \cdot 10^{-20}$ 1995				$11 \cdot 10^{-20}$ 1986	$6 \cdot 10^{-20}$ 1992	$8 \cdot 10^{-20}$ 1996	10^{-17} 1994			

Sagnac

Large Interferometric Detectors:

Planning (start):	1982	1984	1986	1986	1985	1986	1987	1994	1990	1994	1994
Arm length ℓ*:*	4 km	2 km 4 km	3 km		600 m		300 m		500 m		400 m
Site (State)	Hanford (WA)	Livingston (LA)	Pisa ITA		Hannover GER		Mitaka JPN		Perth / ARI AUS		
Cost (10^6 US$):	292		90		7		11		12		
Project name:	LIGO		VIRGO		GEO 600		TAMA 300		AIGO 500		
special features:	autonomous: 2 + 1 interf.		super-attenuator low frequencies		advanced optics tunable		good isolation X-pendulum		ext'ble to 3 km suspension		

Act II: Deepening the Characterization

different schemes being explored:

Michelson-Derived Schemes (majority)

PR	Power recycling	all
DR	Dual (power + signal) rec.	GEO 600
RSE	Resonant Sideband extr.	(GEO) Caltech, MIT Florida, ACIGA
CRSE	Compound-Mirror RSE	ACIGA

Michelson schemes are furthest developed but still lots to do

Sagnac-type Interferometers

Stanford (GEO: not)

requires study and progress in many fields studies optimised if in one place

All-Diffractive Optics

Stanford (?)
CEGG

Unorthodox Approaches

MSU

Theory — input from theorists on desirability, emphasis

Act III: Tying the Knot

hope to use this meeting for tying activities into LIGO Sc. Coll.

have bilateral agreements between LIGO and individual institutions

perhaps extend some to multilateral agreements between labs and LIGO

that's what this meeting should accomplis

may lead to views and decisions on
timeliness
urgency
priority
of some of the fields of activity

Act IV. Development of Competing Schemes

we are in the middle of that:

- groups reported at first meeting in Baton Rouge (Aug 1997)
- various new developments reported in Aspen, CO (Jan 1998)
- expect further reports at this meeting in Hanford, WA (Mar 1998)

... and in future

General feeling:

some of the schemes (Michelson, Sagnac) have made good progress

Act V: The Finale

a final "showdown" ? "shoot-out" ?

Definitely not !

not in the sense of having one winner

rather:

plural intended

which schemes come to bear
in what order
in what priority
(in what combination)

We are far from that point,

at the moment must be

open to a wide range of possibilities

Preliminary Report of WG on Advanced Interferometer Configurations

Hanford, 13 March 1998

A. Rüdiger

small working group,
had detailed reports (status, plans) from

K. Strain	GEO DR, 30m, GEO 600; control
D. Tanner	UF Sign. Rec., DR, RSE
P. Beyersdorf	Stanf. Sagnac
S. Whitcomb	LIGO 2-sideband scheme
M. Fujimoto	TAMA status; plan RSE
C. Harb	for ANU (not Sagnac); RSE (C)

Results:

- identified fields of activities suited for LSC
- clear directions seen in goals
- indication of fields of common activities
  - one example: simulate control scheme suggested by Stan Whitcomb workshop at Garching
  - test case of pooling resources experience, tools, simulation progr.
- program items for next 6 months: seem well targeted for LSC.

Note 1, Linda Turner, 04/20/98 03:33:54 PM
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