

GEO WORK ON INTERFEROMETRY

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TOPICS

GARCHING PROTOTYPE (DUAL RECYCLING)

POWER RECYCLING

AUTO-ALIGNMENT

[SIGNAL RECYCLING]

see
over.

HANNOVER*

SIGNAL RECYCLING TESTS.

GEO 600

OPTICS CHOICES

SENSITIVITY OF MSR TO
DISTURBANCES
→ DESIGN CONSTRAINTS

MODELLING EFFORT
(LOCKING)

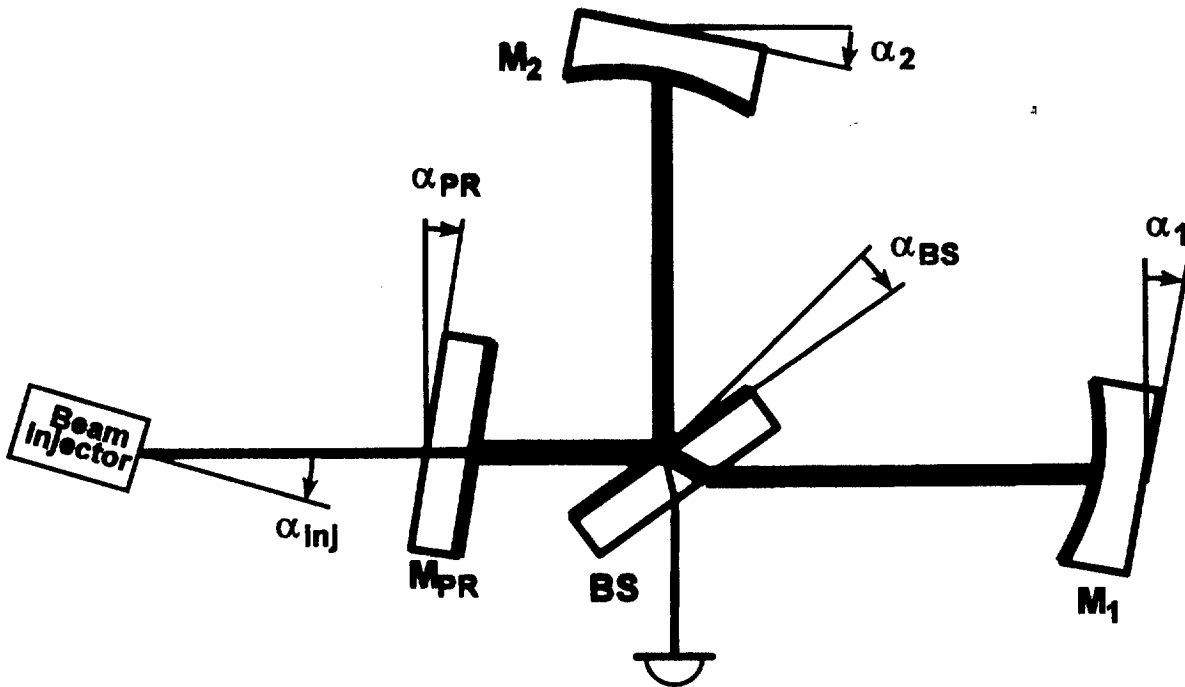
OPTICAL TRANSFER
FUNCTIONS

CONFIGURATIONS

ANALYSIS

COMPARISON OF RSE/OR
EFFECT ON CONTRAST.

Automatic beam alignment



For perfect interference we need to control 6 angular degrees of freedom:

The **Michelson interferometer** has 2 d.o.f.: the “differential” modes of the end mirrors.

The **PR cavity** has 4 d.o.f.: the PR mirror and the “common” modes of the end mirrors.

Furthermore we control the beam injector and beamsplitter in order to fix the beam spot positions on the end mirrors (4 d.o.f.).

GARCHING PROTOTYPE.

POWER RECYCLED AUTO-ALIGNED

MICHELSON.

$t^2 = 5\%$ or 0.5%
PR

ALL DEGREES

$\approx 0.1\%$ MINIMUM

(1000:1 CONTRAST)

a) EXTERNAL MODULATION

- PREDICTABLE
- COMPLEX
- LIMITED PERFORMANCE

b) SCHNAPP (IN-LINE) MODULATION

- NOW PREDICTABLE (NEW TOOLS)
- SIMPLER
- CLOSER TO OPTIMUM PERFORMANCE WITH SINE-WAVE (SINGLE FREQUENCY) PHASE MODULATION.

WORK BY S. MIZUNO & OTHERS ALLOWS DETAIL UNDERSTANDING OF SYSTEM WITH SCHNAPP MODULATION

- OPTIMISATION OF ARM LENGTHS & MODULATION FREQUENCIES ETC.

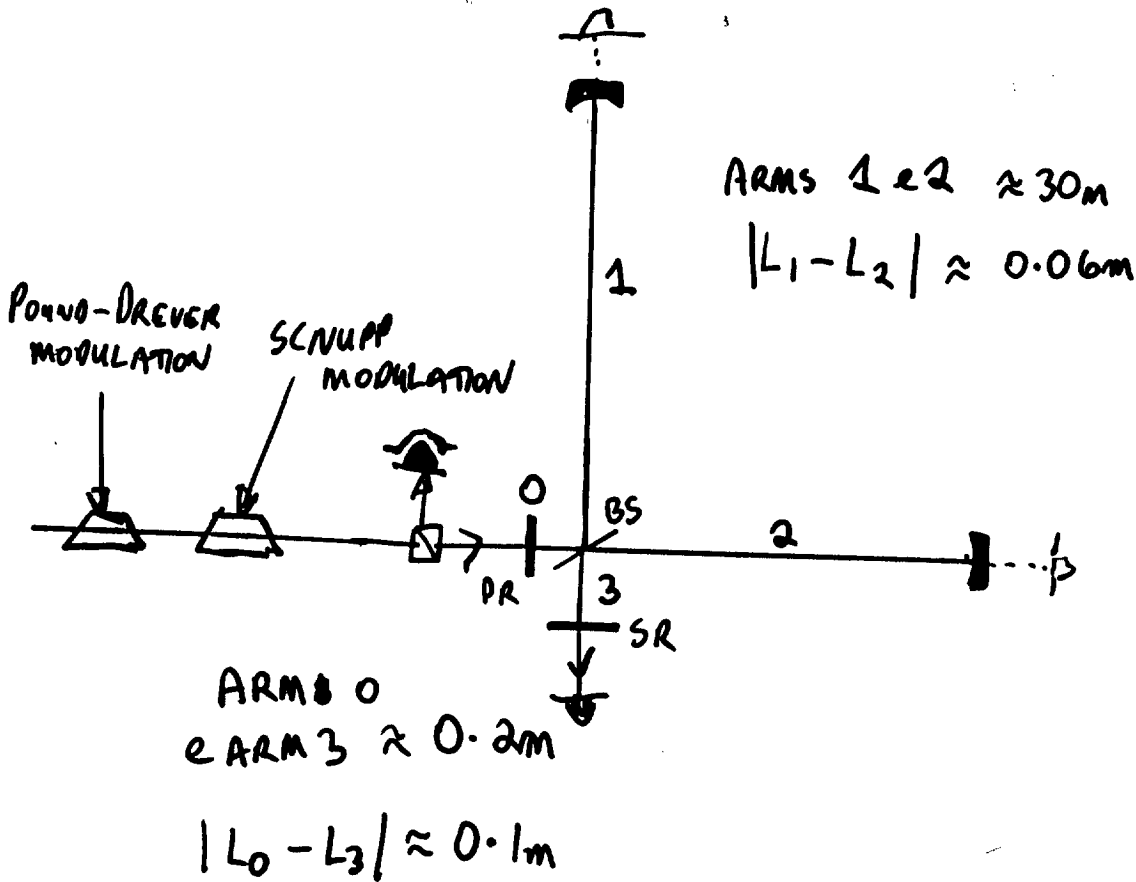
THE CHANGE OVER WAS MADE (LAST YEAR) WITHOUT CHANGE TO P.R./A-A, SERVO LOOPS (ETC.)

RECENT IMPROVEMENTS FOR MORE RELIABLE LOCKING & BETTER NOISE PERFORMANCE VIA (IMPROVED FREQUENCY STABILISATION & P.R. LOOPS)

NEXT STEP

DUAL RECYCLING.

3



CONTROL

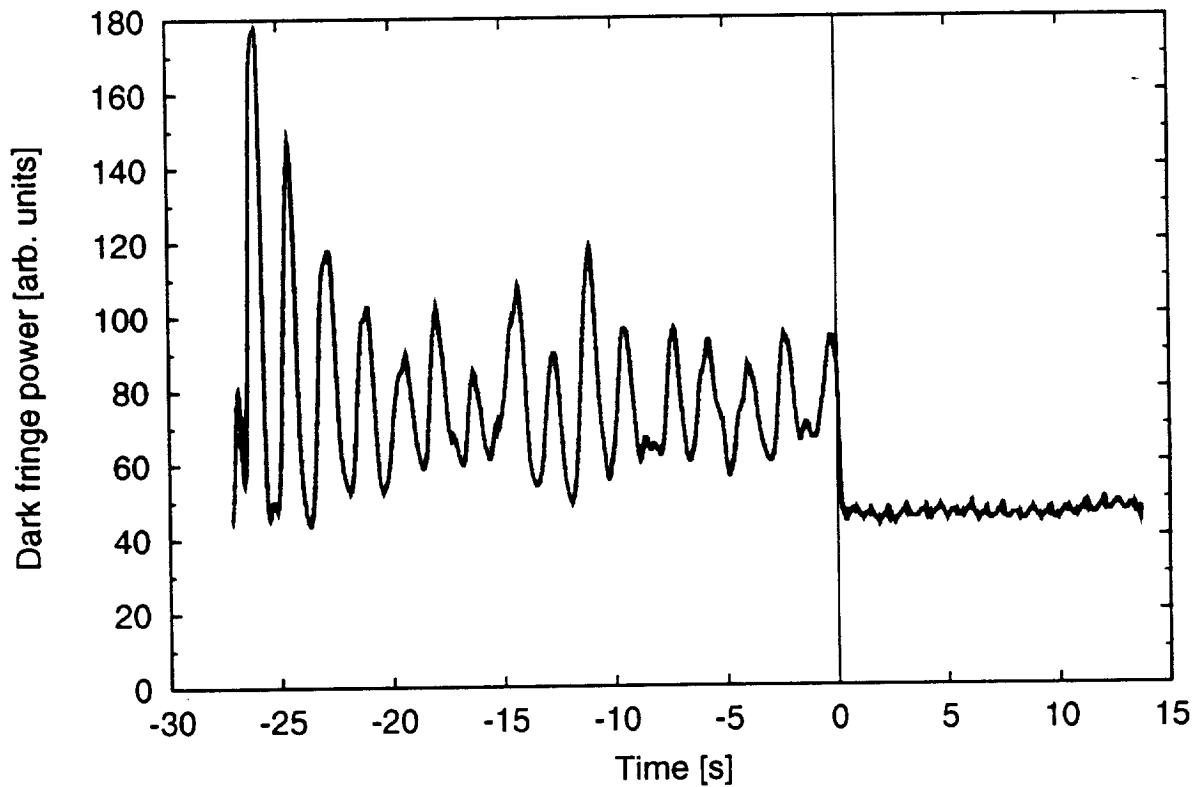
3 LOOPS

DETECT

MODULATION

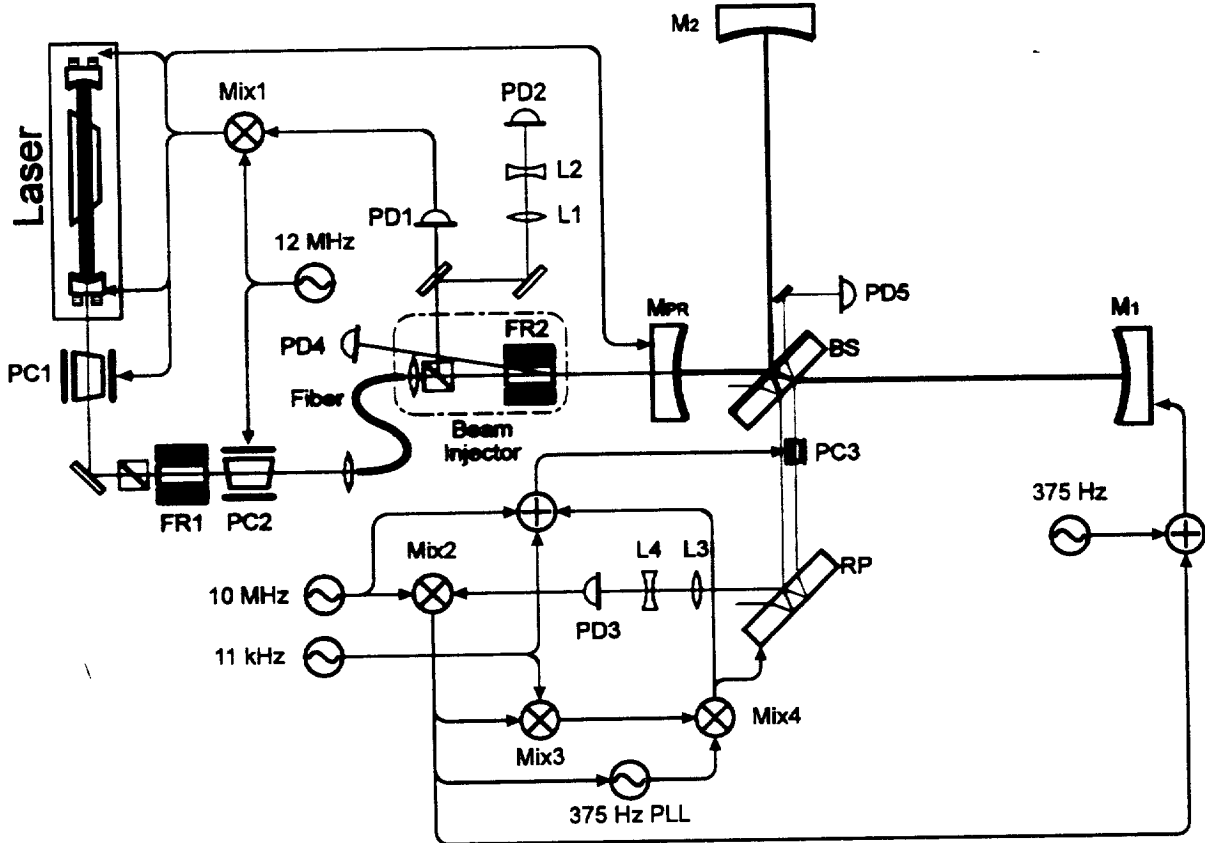
	<u>DETECT</u>	<u>MODULATION</u>	
① P.R.	REFLECTED LIGHT	POUND-DREVER	} ALREADY OPERATES ALREADY OPERATES
② DARK FRINGE	TRANSMITTED LIGHT (MAIN OUTPUT)	SCHNUPP.	
③ SIGNAL RECYCLING	ARM LIGHT OR REFLECTED LIGHT	SCHNUPP.	} TESTED AT HANNOVER

Autoalignment results 2



The power at the dark fringe port is well stabilized by the autoalignment system. Especially slow drifts, which otherwise lead to an unacceptable loss of contrast, are well compensated.

The Garching 30 m prototype



Note 1, Linda Turner, 04/21/98 09:42:28 AM
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