A shadow sensor device for KAGRA gravitational wave telescope

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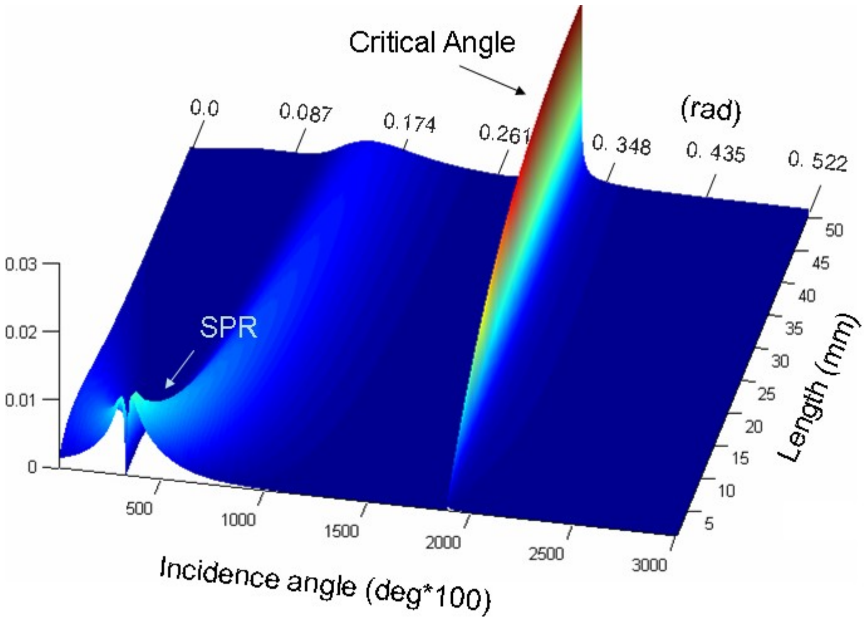


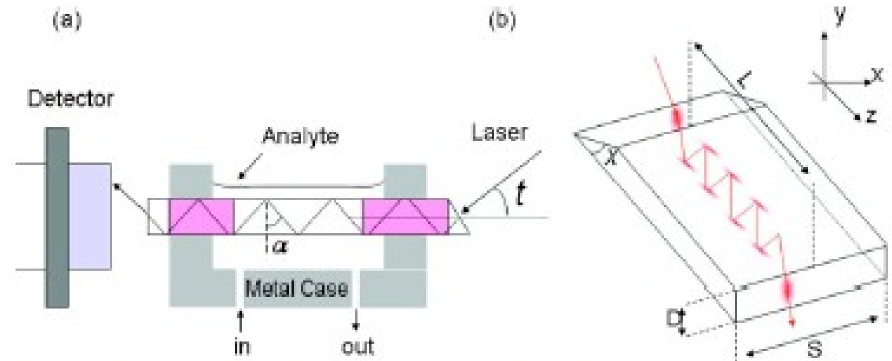
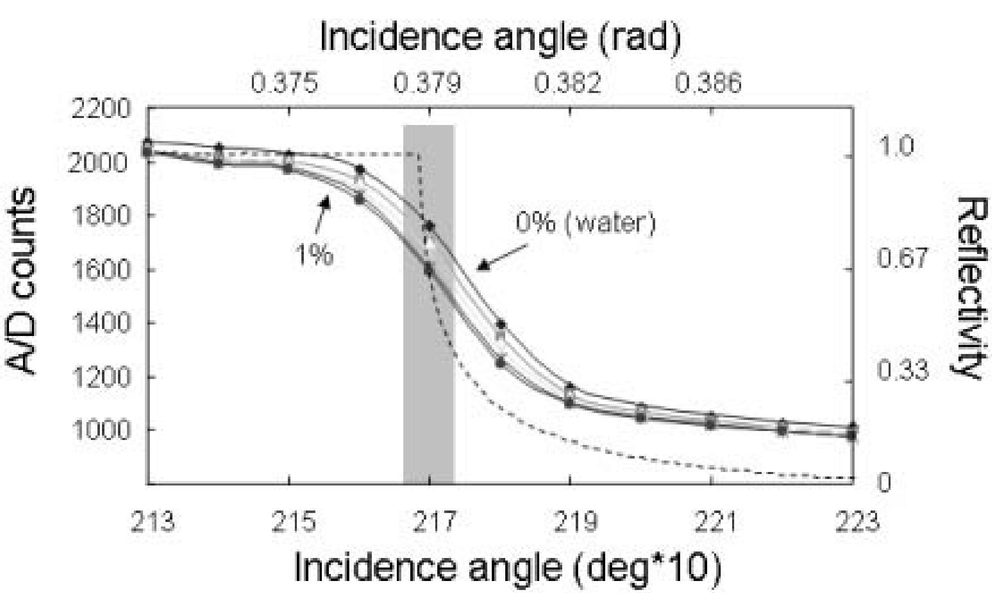


Fig. 3. (Color online) Core of the test device. (a) Planar glass is immersed in a flow cell with the analyte liquid. Light is applied at incidence angle t from a $\chi = 45°$ surface. (b) Three-dimensional sketch of the planar glass.




2004年(平成16年)4月1日　木曜日

低価格、高感度のセンサー

知的クラスター成果

京都ナノテククラスターのルジェロ・ミケレット研究員と臨床検査機器などを手掛けるテラメックス（京都市伏見区）は、表面プラズモン共鳴（SPR）と呼ばれる光学現象を利用して高感度で安価なバイオセンサーを製造する技術を開発した。従来のSPRセンサーに比べて価格が約十分の一で済み、がんの早期診断や環境汚染物質の検出などに威力を発揮する。

ミケレット研究員らが開発したSPRバイオセンサー（京都市西京区・京都大桂キャンパス）

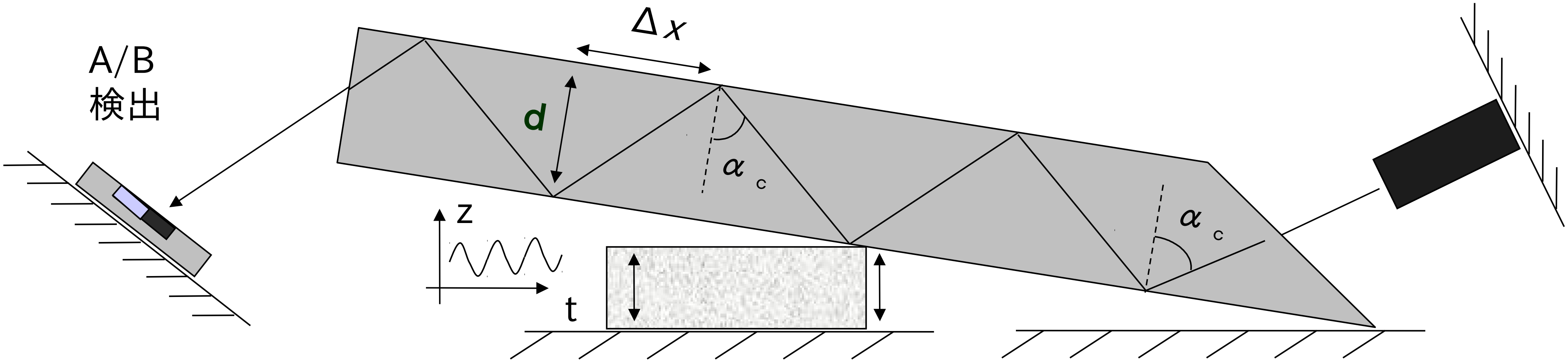
バイオセンサーの仕組み

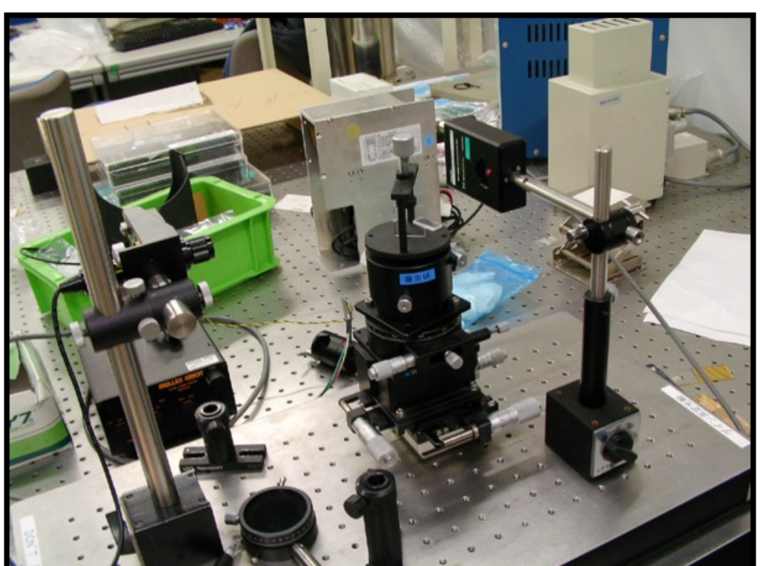
薄膜を張り付けたプリズムに特定の角度から光を当てると、薄膜表面の自由電子と光が共鳴し、光が吸収される現象。薄膜に抗体を結合させてお

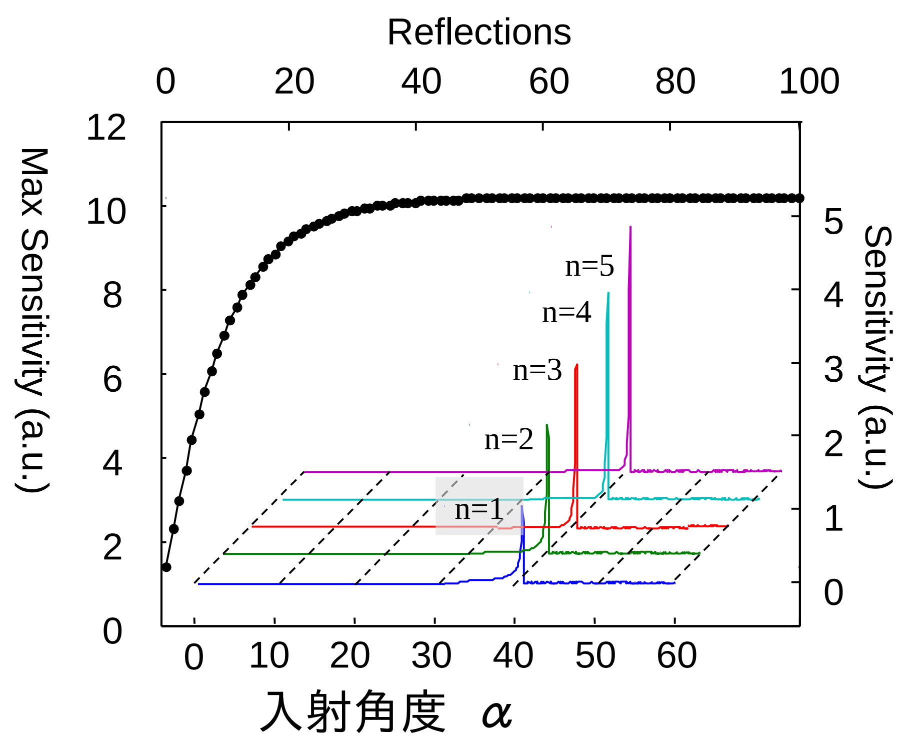
改善し、
ラスこ伝

A multiple reflection passive amplification vibration sensor

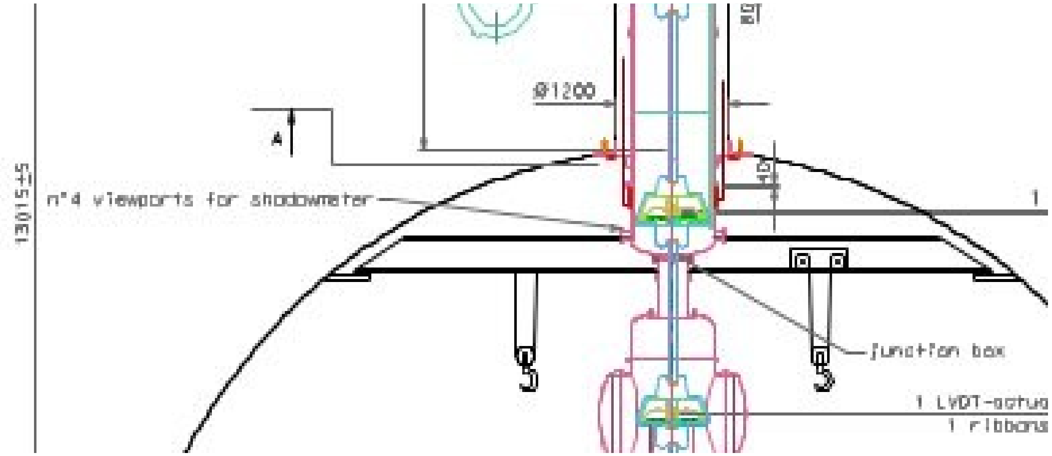
$S_{信号} = S_a - S_b$







Design goals:



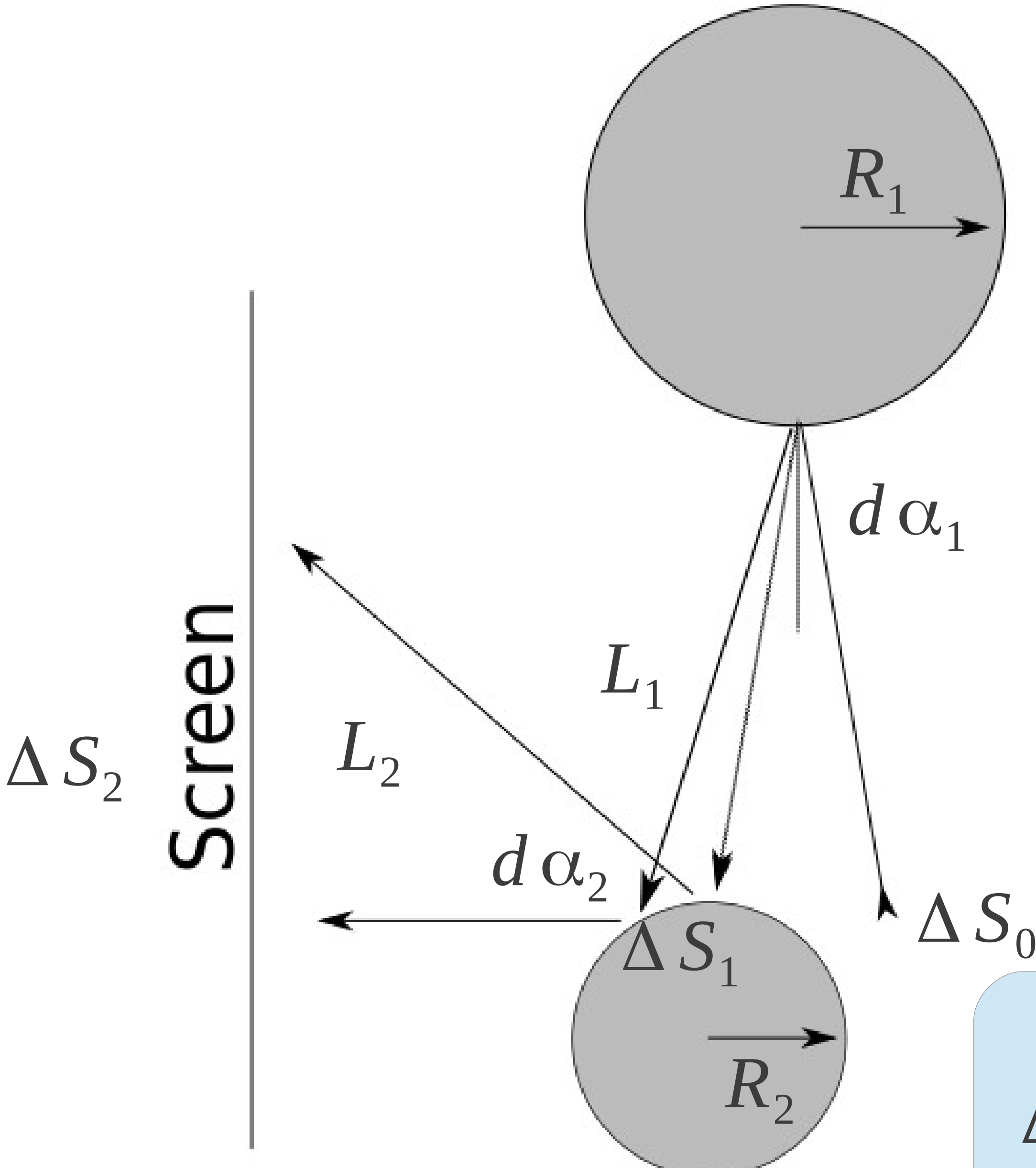
The shadowmeters, two for each test mass, will be located on the roof of the experimental halls, rigidly anchored to the ceiling rock, and will measure the longitudinal and transversal positioning of the suspension wire descending from the higher tunnel, with precision better than 10nm.

The LVDT of the inverted pendulum are sensitive to **both** the horizontal motion and tilt induced by the micro-seismic peak or other seismic activity. The shadow-meter and LVDT differential signal is sensitive **only to the tilt** of the rock, while the LVDT and shadow-meter common signal is sensitive to the horizontal motion of the rock

Geophysical interesting signals

Complement other KAGRA sensors

Passive signal amplification using multiple reflections



$$\Delta S_0 = R_1 d\alpha$$

$$\Delta S_1 = L_1(2\mathrm{d}\alpha_1) = \frac{2\mathrm{L}_1 \Delta S_0}{R_1}$$

$$\Delta S_2 = L_2(2\mathrm{d}\alpha_2) =$$

$$= L_2\left(2\frac{\Delta S_1}{R_2}\right) =$$

$$L_2\left(2\left[\frac{2\mathrm{L}_1}{R_1 R_2}\Delta S_0\right]\right)$$

$$\Delta S_n = \Pi_{i=1}^{n}\left(2\frac{L_i}{R_i}\right)\Delta S_0$$

The team:

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