

# PVLAS Day

Trieste, October 3rd 2006

## Summary for the discussion

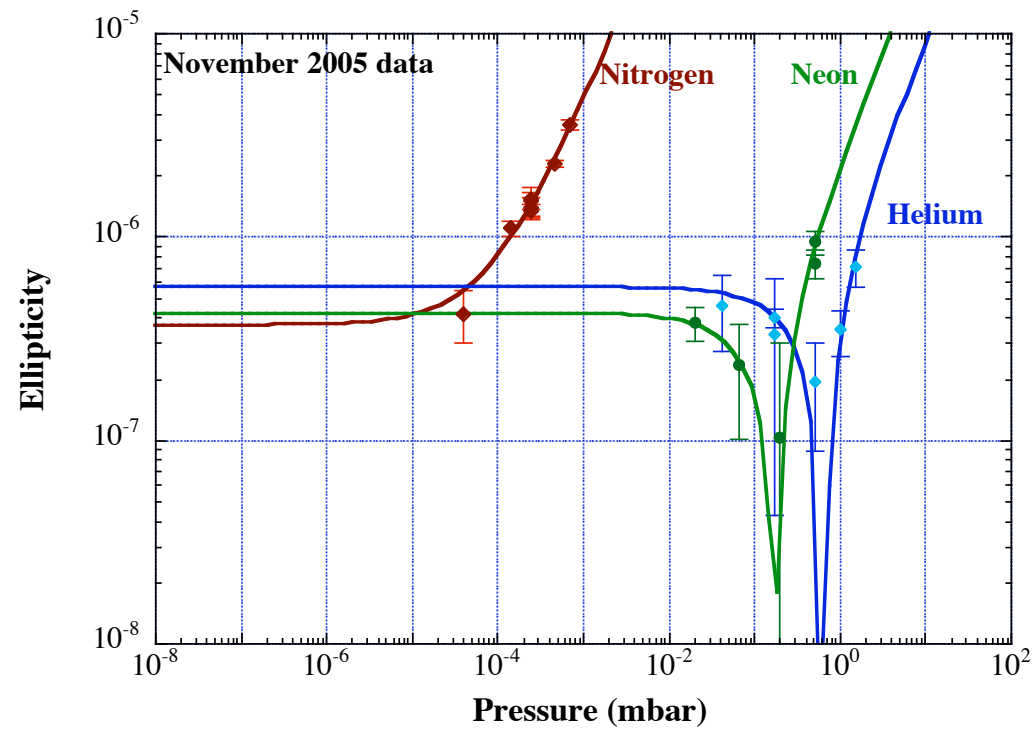
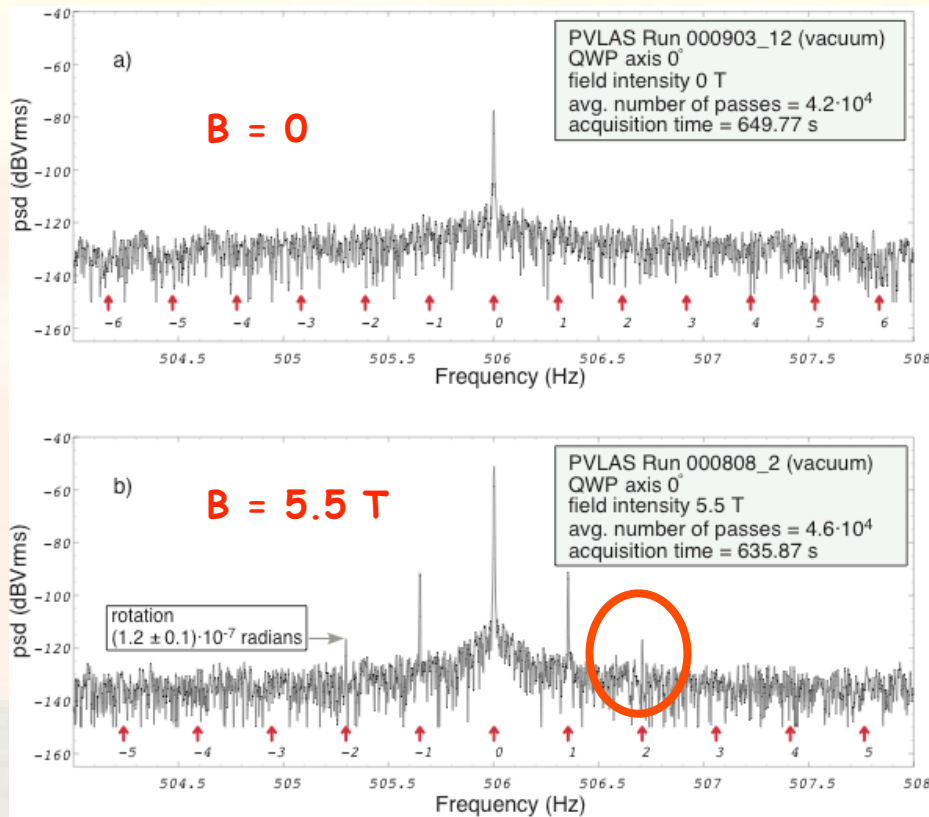
**G. Cantatore**

# Highlights

- **Experimental facts (E.Zavattini)**
  - Vacuum is a medium
  - PVLAS measures some of its properties
- **Ways and means**
  - Low pressure gas measurements
  - Particle interpretation -> photon regeneration
- **Widening interest...**
  - The sun and the stars -> CAST
  - A theoretical point of view
  - Working in the lab -> BMV (& others)

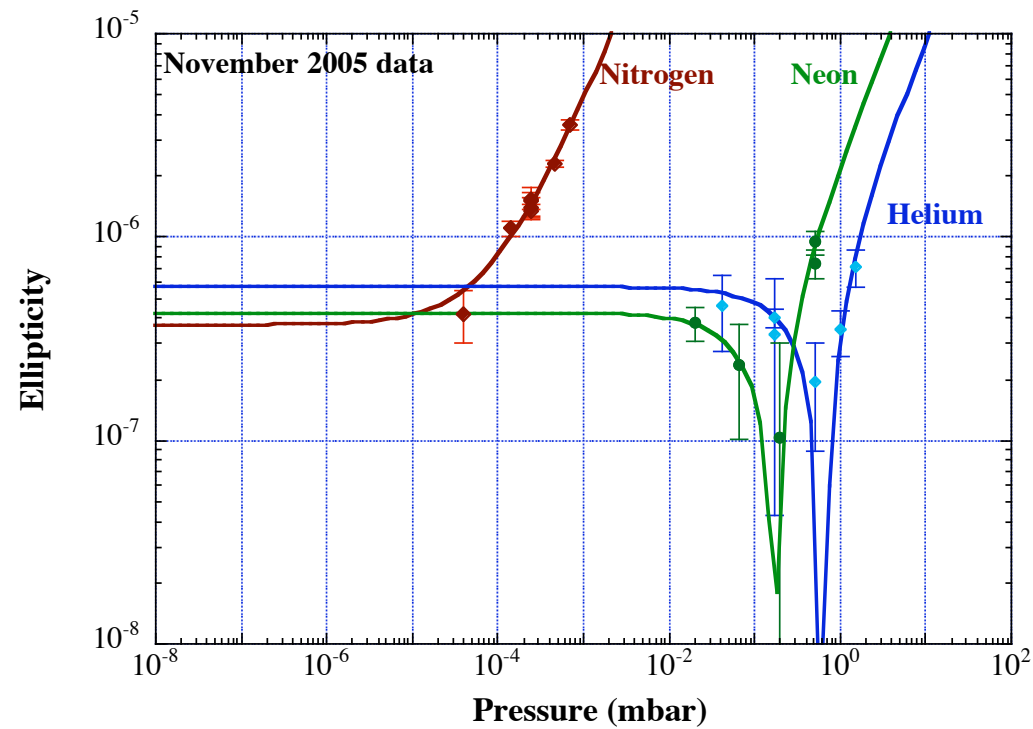
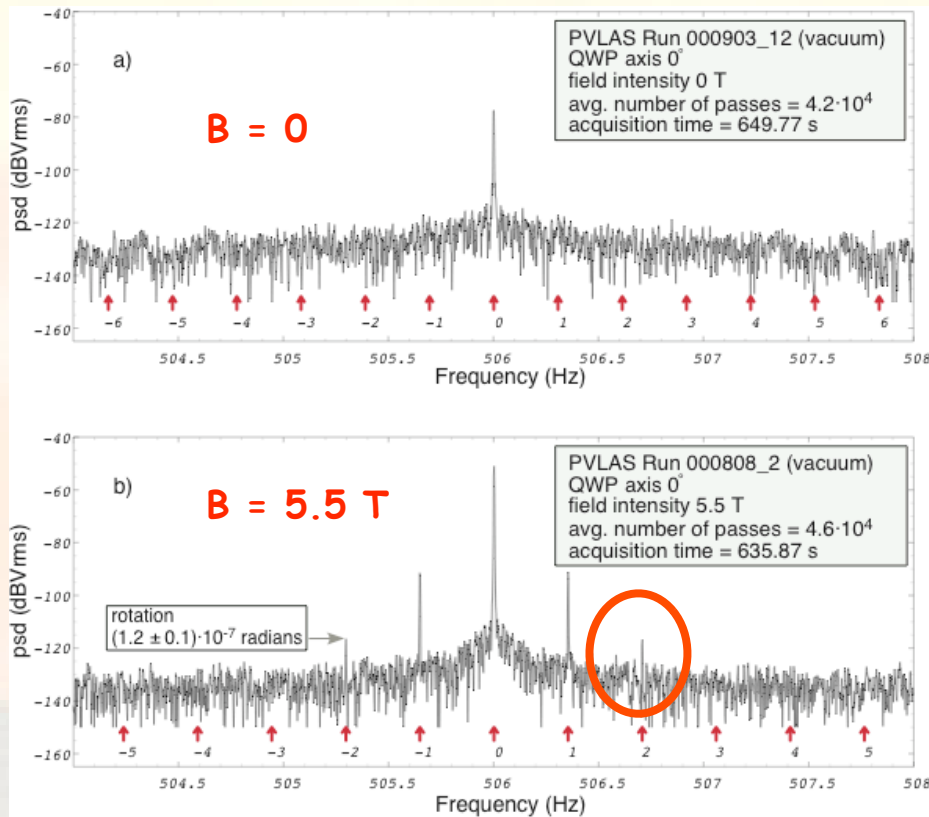
# PVLAS facts

## Vacuum rotation and birefringence measurements



# PVLAS facts

## Vacuum rotation and birefringence measurements



# Short term Roadmap

- Refine gas measurements
  - even better control over purity and pressure
- Prove/disprove the particle interpretation
  - push the photon regeneration test
- Keep hunting for an instrumental artifact
  - last remaining suspect: fringe fields
- ... Keep one eye (maybe two) on our colleagues ...

# Short term Roadmap

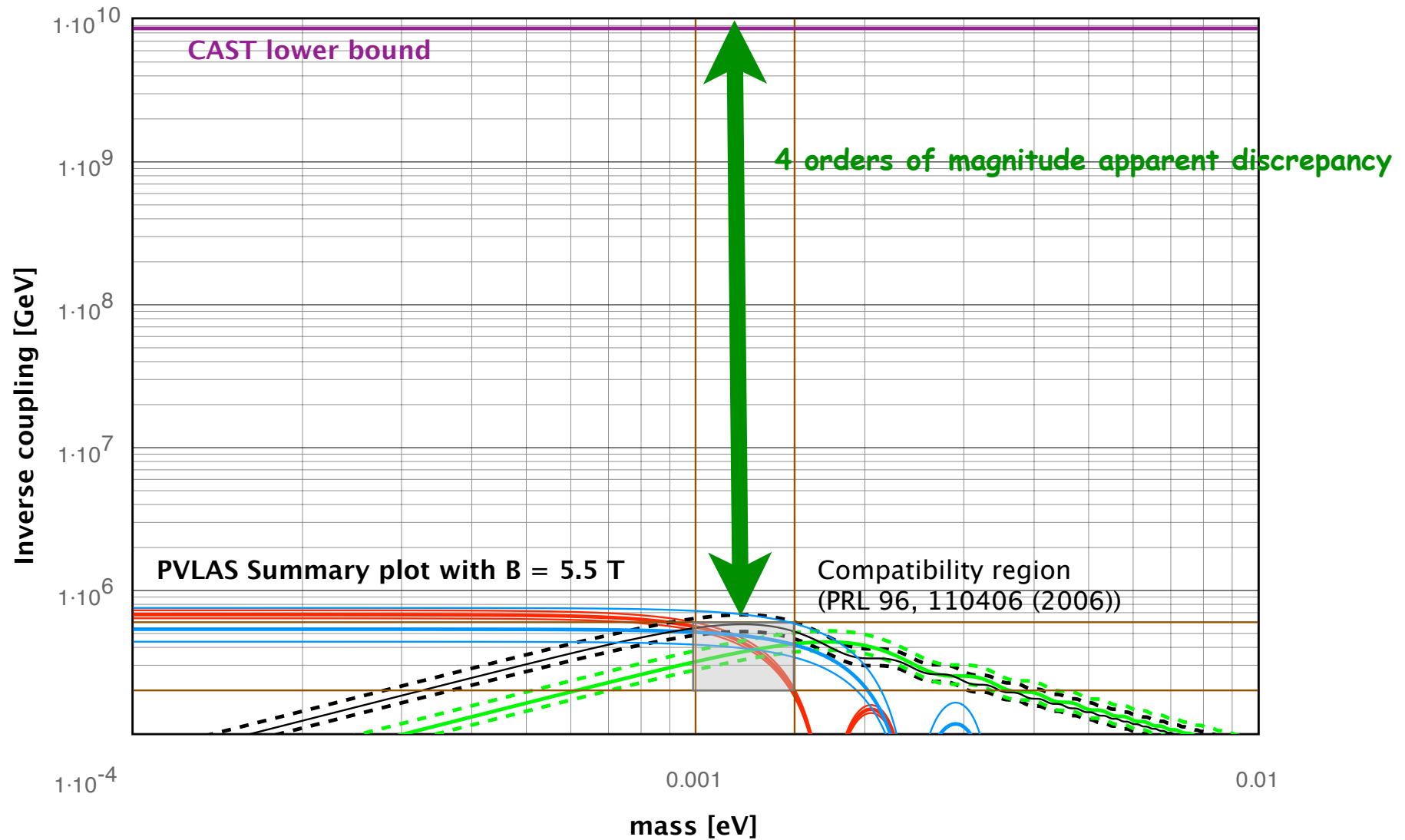
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  - last remain
- ... Keep one  
colleagues .



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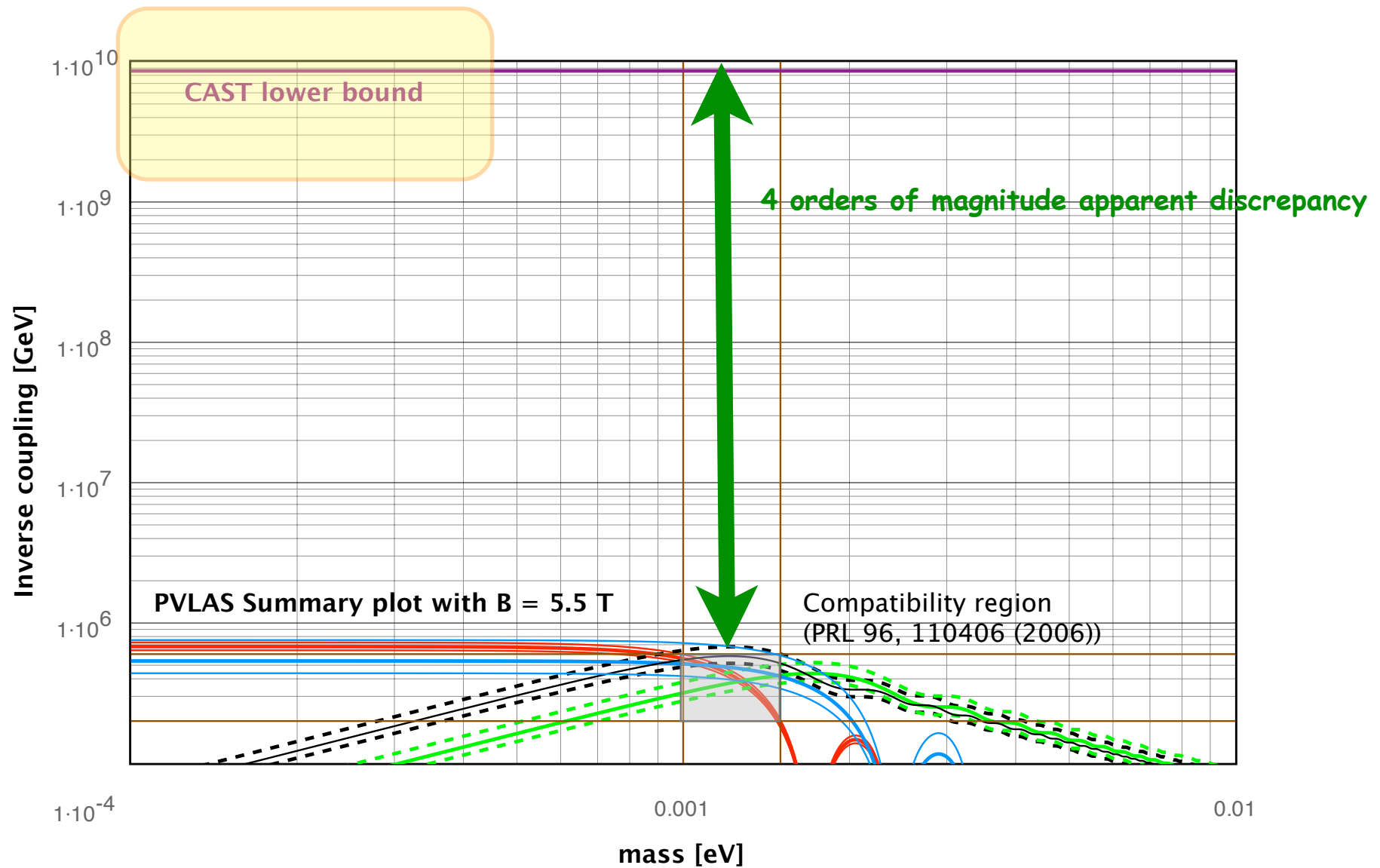
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# Filling the gap?





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## Optical set up completed july 2006



**First data with low finesse cavity and magnetic field before end 06**

# Axion-Like Particle Search (ALPS) at DESY

30

[K. Ehret, M. Frede, A. Lindner, E.-A. Knabbe,  
U. Kötz, N. Meyer, D. Notz, AR]

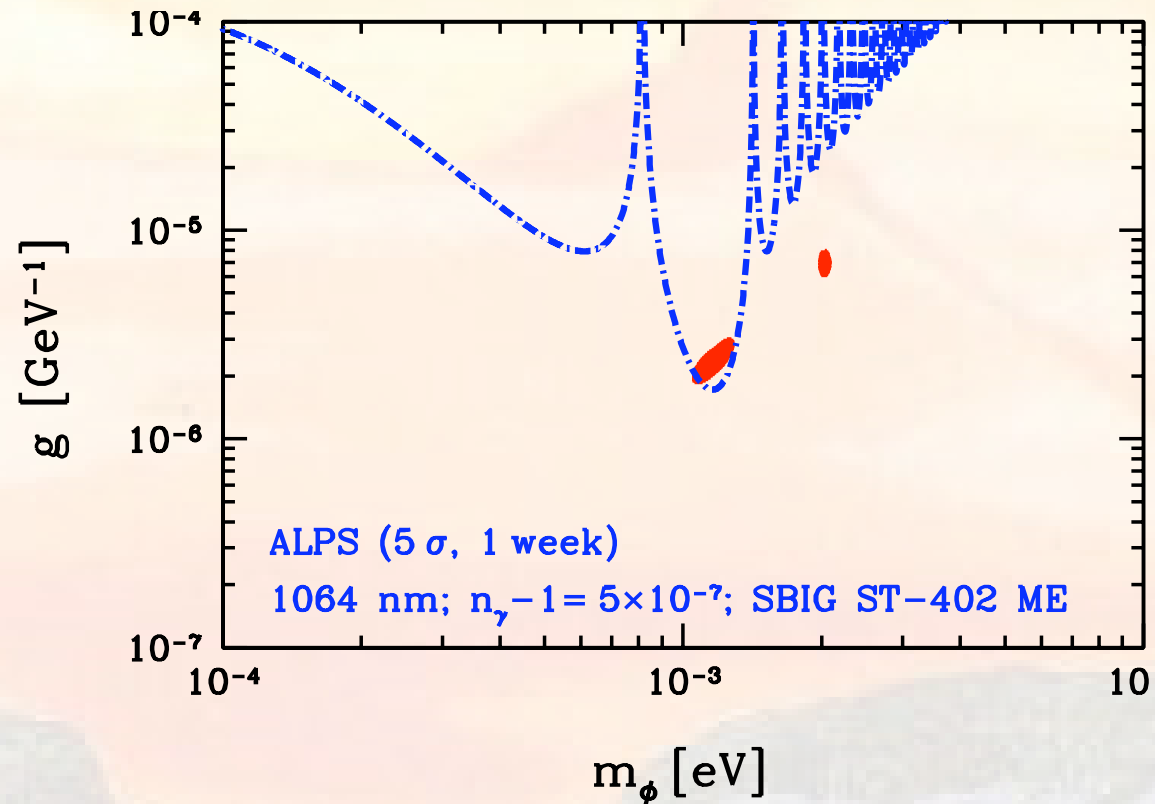
- Exploit

- infrared laser,  $\sim 1$  kW cw  
(under scrutiny; decision Sep.)
- superconducting **HERA** di-  
pole magnet: 5 T, 9 m  
(on hand)
- buffer gas in beam pipe
- InGaAs pixel detector (start  
with amateur camera; arrives end  
Sep.)

⇒ Serious test of PVLAS!

- Lol presently being written
- Aim at data taking in early 2007

A. Ringwald (DESY)



IDM 2006, Rhodes, Greece

**"Independent checks are urgent!!!!"**

(G. Cantatore - CERN PP Seminar 11/7/2006)

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## Photon regeneration plans:

24

Name	Place	Laser	Flux of initial $\gamma$ 's	Magnets	$P_{\gamma\phi\gamma} _{(g,m_\phi)_{PVLAS}}$
<b>PVLAS</b>	Legnaro/I	$\lambda = 1064 \text{ nm}$ , $\omega = 1.17 \text{ eV}$ $P = 20 - 800 \text{ mW}$ , cw $N_r = 5 \times 10^5$	$3 \times 10^{22}/\text{s}$ $- 1 \times 10^{24}/\text{s}$	$B_1 = 5 \text{ T}$ $l_1 = 1 \text{ m}$ $B_2 = 2.2 \text{ T}$ $l_2 = 0.5 \text{ m}$	$\sim 10^{-23}$
<b>LIPSS</b>	Jlab/USA	$\lambda = 900 \text{ nm}$ , $\omega = 1.38 \text{ eV}$ $P = 3 - 10 \text{ kW}$ , cw $N_r = 0$	$1 \times 10^{22}/\text{s}$ $- 5 \times 10^{22}/\text{s}$	$B = 1.7 \text{ T}$ $l = 1 \text{ m}$	$\sim 10^{-23.5}$
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<b>BMV</b>	LULI/F	$\lambda = 1053 \text{ nm}$ , $\omega = 1.18 \text{ eV}$ 4 pulses of 1500 J/day $N_r = 0$	$8 \times 10^{21}/\text{pulse}$	$B = 11 \text{ T}$ $l = 0.25 \text{ m}$	$\sim 10^{-21}$
<b>APFEL</b>	DESY/D	$\lambda = 32 \text{ nm}$ , $\omega = 38.7 \text{ eV}$ $8 \times 10^3$ pulses of $50 \mu\text{J}/\text{sec}$ $N_r = 0$	$8 \times 10^{12}/\text{pulse}$	$B = 2.24 \text{ T}$ $l = 6 \text{ m}$	$\sim 10^{-19.5}$
<b>????</b>	CERN/CH	$\lambda = 1064 \text{ nm}$ , $\omega = 1.17 \text{ eV}$ $P = 1 \text{ kW}$ , cw $N_r = 0$	$1 \times 10^{22}/\text{s}$	$B = 9.6 \text{ T}$ $l = 7 \text{ m}$	$\sim 10^{-17}$

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Test di PVLAS inizio 2007  
Primi dati fine 2006  
Test di PVLAS Marzo 2007

A. Ringwald (DESY)

IDM 2006, Rhodes, Greece

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(G. Cantatore - CERN PP Seminar 11/7/2006)

**Bisogna fare presto!!!!**

# Rassegna stampa

- Physics World - Settembre 2005
- Science - Marzo 2006
- The Economist - Aprile 2006
- Nature - Maggio 2006
- Scientific American - Luglio 2006
- New Scientist - Luglio 2006
- Il Sole 24 Ore - Luglio 2006





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## from Nature News & Views - May 2006

**“... As befits the potentially revolutionary nature of the PVLAS result, the jury is still out. Such a direct verification would, however, propel it to a place among the most significant in the history of physics.”**