



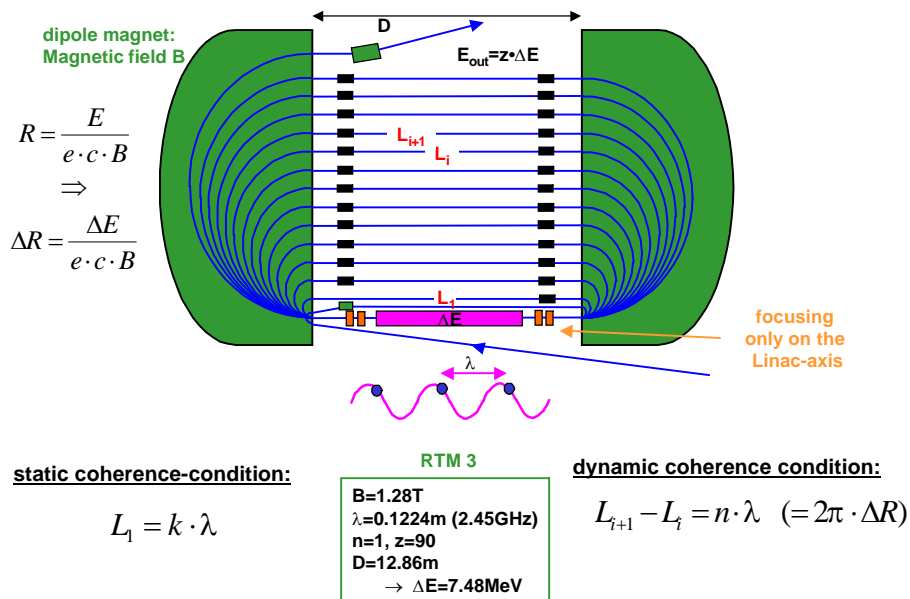
## Status of the the Mainz Real Photon Facility

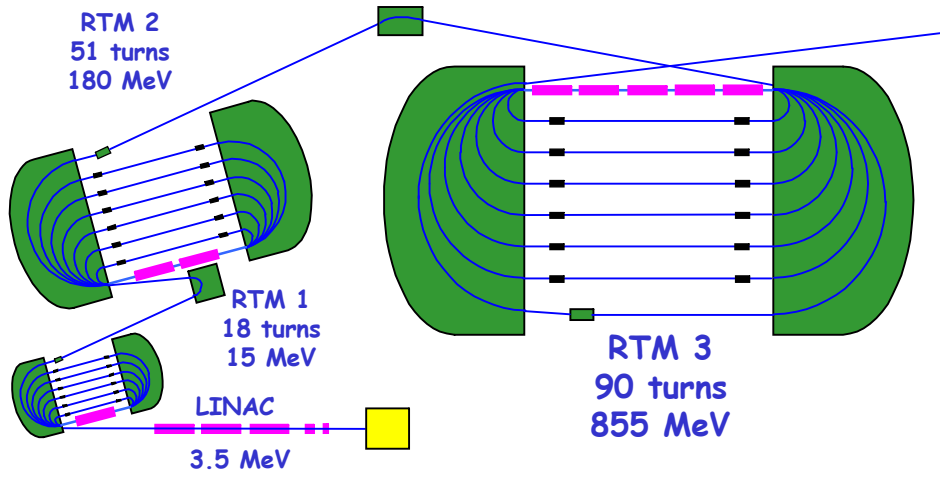


- 1.- MAMI upgrade 1.5GeV
- 2.- Tagger upgrade
- 3.- Crystal Ball
- 4.- Frozen Spin Target

**2<sup>nd</sup> Meeting ,Polarized Nucleon Targets for Europe<sup>6</sup>  
 in the 6<sup>th</sup> European Framework Program**  
 Miltenberg, June 2<sup>nd</sup> – 4<sup>th</sup> 2005  
 Andreas Thomas

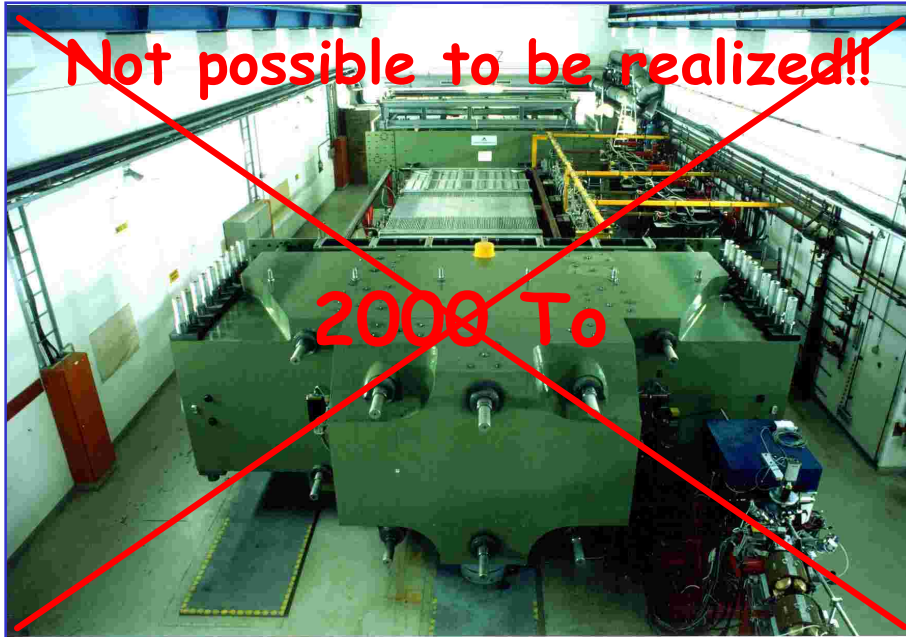
### Race Trake Microtron **MAMI**



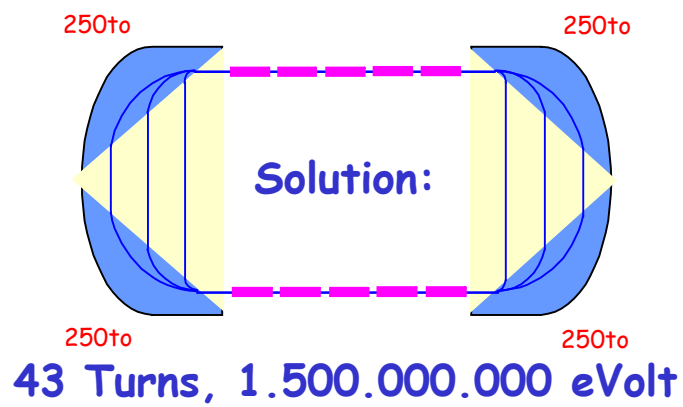


## Racetrack-Mikrotron



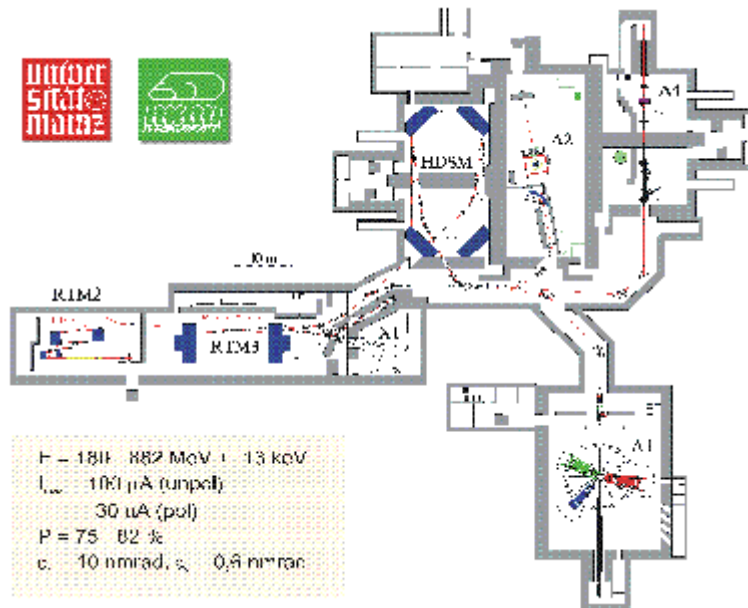


## HDSM (Harmonic Double Sided Microtron)





# MAMI upgrade



## Status MAMI upgrade

### HDSM-Dipoles

- Assembled
- Field maps done
- Vacuum chamber ready
- Correction plate ready

### Beamlines exp. ready



### 2.45GHz Linac

- Assembled
- Tests next month



### 4.9GHz Linac

- 2 sections ready
- 6 sections until end 2005

First beam ca. beginning of 2006

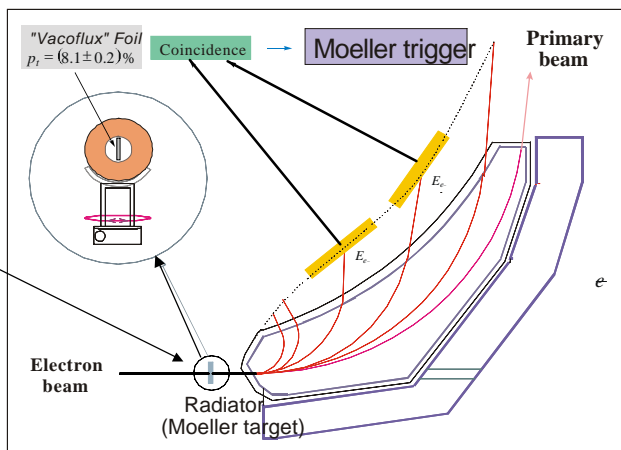
## A2 Tagging system

1. Production und energy measurement of the Bremsstrahlungs photons

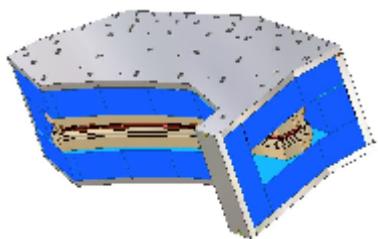
2. Determination of the degree of polarization of the electron beam (Moeller Polarimeter);  
Circularly pol. photons

$$A = \frac{N^+ - N^-}{N^+ + N^-} = a\vec{p}_i \cdot \vec{p}_b \cos(z)$$

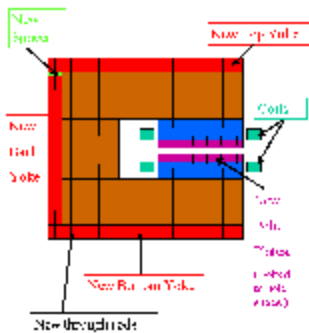
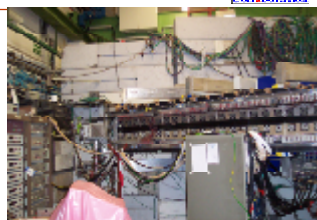
3. Coherent production of linearly polarized photons on a diamond radiator



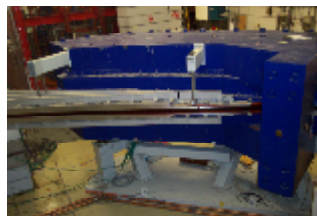
## Tagger upgrade



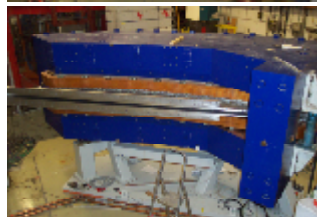
4<sup>th</sup> April



17<sup>th</sup> May



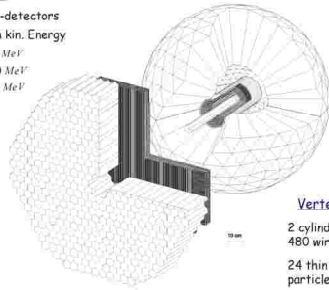
31<sup>th</sup> May



Beam planned for end of 2005

### 4π Photon Spectrometer @ MAMI

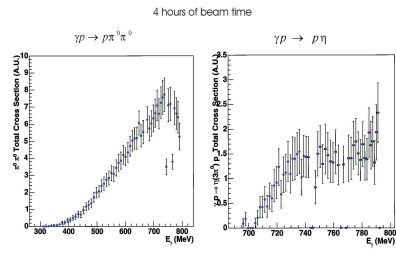
**TAPS:**  
 510 BaF<sub>2</sub>-detectors  
 maximum kin. Energy  
 $\pi^+$ : 180 MeV  
 $K^+$ : 280 MeV  
 $p$ : 360 MeV



**Crystal Ball:**  
 672 NaI-detectors  
 maximum kin. energy  
 $\mu^+$ : 233 MeV  
 $\pi^+$ : 240 MeV  
 $K^+$ : 341 MeV  
 $p$ : 425 MeV

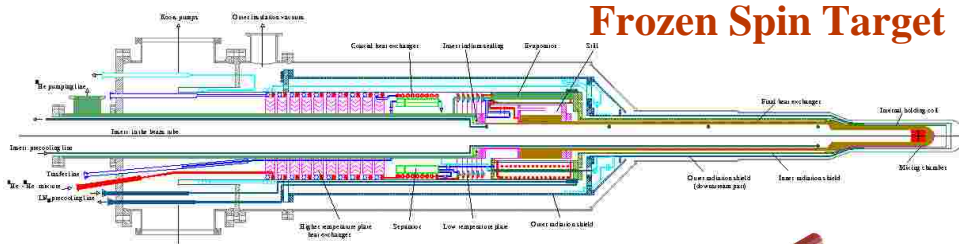
**Vertex Detectors:**  
 2 cylindrical wire chambers  
 480 wires, 320 strips  
 24 thin plastic counters  
 particle separation

### Crystal Ball Results



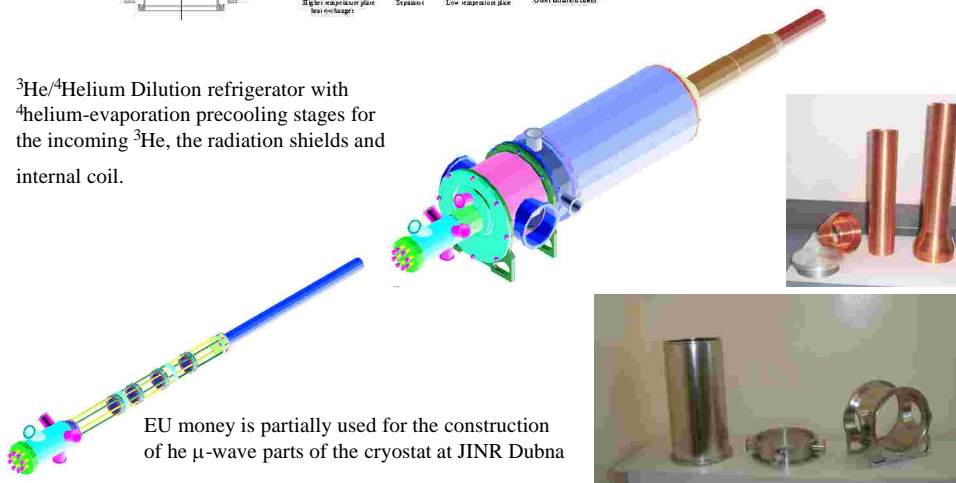
**Run 2004 – 4/2005**  
 3900 hours beam on targets  
 (H<sub>2</sub>, D<sub>2</sub>, C, Ca, Pb)

Rare eta decay  
 Magnetic Moment Delta  
 Medium modifications  
 Pion Production



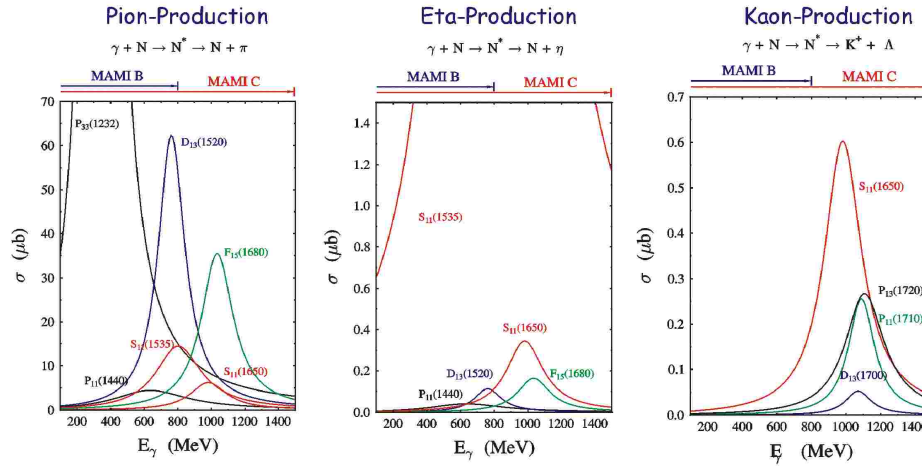
### Frozen Spin Target

<sup>3</sup>He/<sup>4</sup>Helium Dilution refrigerator with <sup>4</sup>helium-evaporation precooling stages for the incoming <sup>3</sup>He, the radiation shields and internal coil.



EU money is partially used for the construction of the μ-wave parts of the cryostat at JINR Dubna

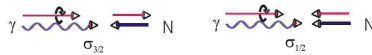
# Physics Program: Nucleon Resonances



problem : overlapping resonances  
 polarization observable  
**MAMI C** : polarized photons, polarized targets  
 and recoil-proton polarimeter

## Sum rules for real photons

Circularly polarized photons and longitudinally polarized protons



Gerasimov-Drell-Hearn (GDH) sum rule

$$\int_{\omega_0}^{\infty} \frac{\sigma_{1/2}(\omega) - \sigma_{3/2}(\omega)}{\omega} d\omega = -\frac{\pi e^2}{2m^2} k^2$$

Spin polarizability  $\gamma_0$

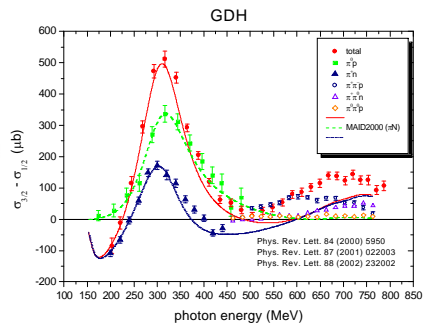
$$\gamma_0 = \frac{1}{4\pi^2} \int_{\omega_0}^{\infty} \frac{\sigma_{1/2}(\omega) - \sigma_{3/2}(\omega)}{\omega^3} d\omega$$

### Measurements:

1997-1998	MAMI	140-800 MeV	proton (neutron)
1999-2002	ELSA	700-2950 MeV ~2000 MeV	proton, neutron ( <sup>6</sup> LiD)
2003	MAMI	140-800 MeV	neutron (D-butanol)



CB-Collaboration Meeting End of June  
 Proposals for next round



## A2 Targets for MAMI C experiments

**Liquid Hydrogen/Deuterium Target**

**Liquid  $^3\text{He}$  Target**

**Frozen Spin Target for Crystal Ball → Mauricio**

**Polarized  $^3\text{He}$  Gas Target → Patricia**