

Since the mid 1980's:

Bonn is a place of excellence in the field of polarized solid targets !

Still valid today, especially concerning the ,hardware'!

- ⇒ Famous ,GDH cryostat', now used for CB ELSA
- <u>But:</u> Development of the ,software' = Polarizable target materials !
- <u>Needed:</u> Reestablishment of the material research branch
- <u>Chance</u>: Collaboration between the Bonn Polarized Target group and the Radiation Safety Officer of the Physics Institut





by the target (cryostat)	by physics experiment
 Loading temperature ⇒ Temp. stability of the unpaired electrons ,Enhanced' base temperature ⇒ Particularly long FS relaxation times Internal polarization magnet ⇒ Reduced sensitivity on magn. field parameters 	 Background nuclei ⇒ Polarized ? ⇒ Light nuclei needed ? Low energy reaction products ⇒ Target = Detector ♦ Polarizable szintillator



A) The period of the .gold diggers', the phenomenological period:

Radiation Hardness & Dilution Factor

<u>~ 1960:</u> First target material LMN proposed by Abragam/Jeffries 10¹⁰/cm² 1962: 70% proton polarization, used in > 40 Exp. since 1968 ~ 3%

1966:Invention of the alcohols (butanol !) by S. Mango $* 10^3$ \Rightarrow First pol. experiments with electromagnetic probes~ 13%

<u>1970's:</u> Development of a ammonia (NH₃, ND₃) by Niinikoski/Meyer $*10^{1}$ \Rightarrow First pol. electron scattering exp. (SLAC/EMC) ~17%

<u>1980:</u> Proposal of the Lithium Hydrides (⁶LiD/⁷LiH) by A. Abragam $*10^{1}$

~ 50%

<u>1990's</u>: Development of a reproducible preparation method (Saclay,



Target Material Development & Possible Experiments (Bonn and Bochum 1990-today)

B) The period of the ,pea counters', the systematical period:

DNP & Max. Polarization

- <u>1990's:</u> Spin temperature theory and the DNP of LiD/LiH
- <u>2000</u>: Preparation of 1 liter ⁶LiD for COMPASS@CERN (± 55%)
- <u>2000+:</u> Further systematical investigations Properties of the electron centers \Leftrightarrow Polarization behaviour
 - ⇒ Understanding the magnetic field behaviour of d-butanol
 - ⇒ Irradiated d-butanol: 70% @ 5T
 - ⇒ Trytil doped deuterated alcohols & diols: ~80% @ 2.5T



- 1. Experience ☑
 - Intense collaboration with our Bochum colleagues
- 4. Equipment ☑
 - Simple to operate polarization apparatus for material tests
 currently under construction
 - NMR system for polarization measurement
 PhD position, advertized with positve resonance
 - EPR system for studying the DNP active electron centers
 ⇒ Collaboration with the Sync. Rad. Group of ELSA
- 7. Man power 🗵
 - Lots of enthusiastic students !!!