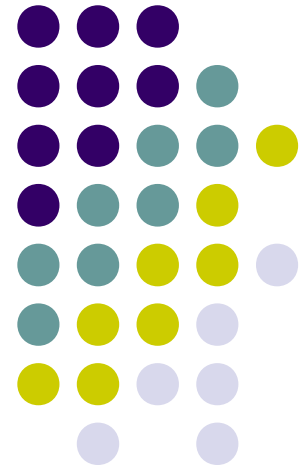
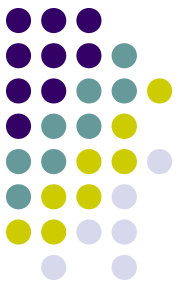


Lead Tungstate Crystals

Production Status And Preliminary Quality Report

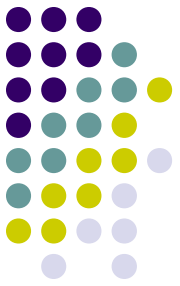
R. Novotny, V. Dormenev, D. Bremer, T. Eißner, R. Schubert
II. Physikalisches Institut
JLU Giessen





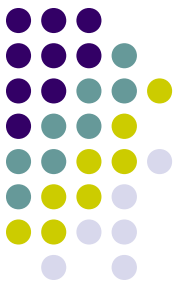
Outline

- Production Status
- Specifications
- Transmission Measurements
 - Comparison: BTCP, CERN, Giessen
 - Correlations
- Radiation Induced Absorption Coefficient
 - First Data ?
- Outlook/Conclusion



Production Status

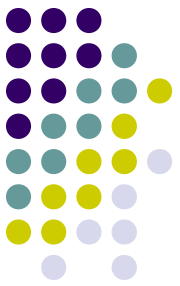
| Type | Required Quantity (Without spares) | Lot B1 | Lot B2 | Lot B3 | Lot B4 | Lot B5 | Lot B6 | Lot B7 | Lot B8 |
|-------------------------|------------------------------------|-------------|--------|---------|---------|--------|------------|-------------|------------|
| End Cap | <i>complete</i> | 4400 | | | | | | | 700 |
| Barrel | 1 R | 640 | 21 | 0 | | 113 | 695 | | |
| | 1 L | 640 | 354 | 0 | | 157 | | | |
| | 9 R | 320 | 0 | | | 330 | 325 | | |
| | 9 L | 320 | 0 | | | 0 | | | |
| Total | | 4775 | | | | | 600 | 1020 | 700 |
| Delivered | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | x | x |
| Currently at ... | | Giessen | CERN | Giessen | Uppsala | | BTCP | | |



Specifications

- Crystals have to meet, amongst others, the following optical properties:

| | | |
|----------------------------------|---|---|
| Longitudinal Transmission | at 360 nm | $\geq 35 \%$ |
| | at 420 nm | $\geq 60 \%$ |
| | at 620 nm | $\geq 70 \%$ |
| Light Yield | at $\bar{T} = 18^\circ\text{C}$ | $\geq 16 \text{ phe/MeV}$ |
| Radiation hardness | at 420 nm due to lateral ^{60}Co irradiation. Dose shall be 30 Gy | $\Delta k \leq 1 \text{ m}^{-1}$ $\langle \Delta k \rangle \leq 0,75 \text{ m}^{-1}$ |

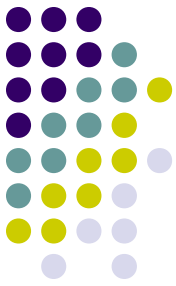


Longitudinal Transmission

- At CERN and BTCP
 - Transmission (also crystal geometry and light yield)
 - Measured with ACCOS-Machine
- At Giessen
 - Measured with Photospectrometer
 - Continuously from 325 nm - 800 nm wavelength
 - Recently the Spectrometer was placed at the irradiation Facility in the Strahlenzentrum

Transmission – Lot B1

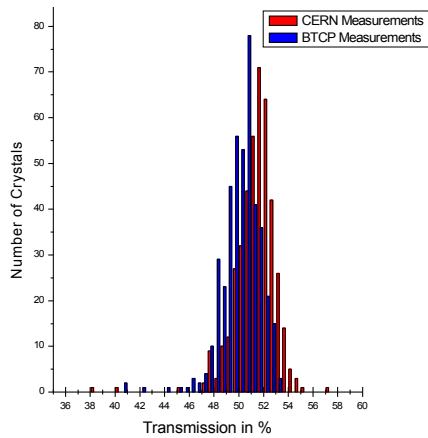
CERN/BTCP Measurements



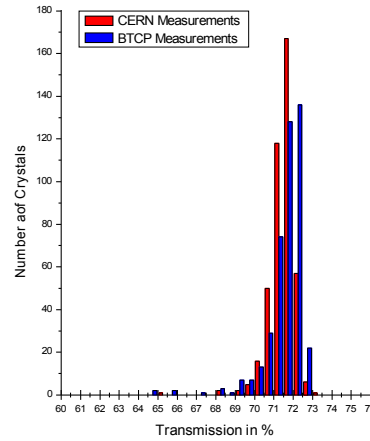
Distribution of Longitudinal Transmission at Certain Wavelength

Lot B1

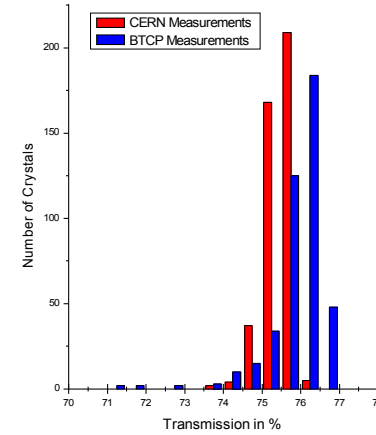
425 End Cap Crystals



360 nm

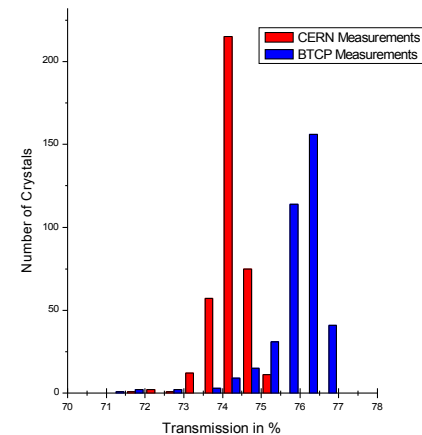
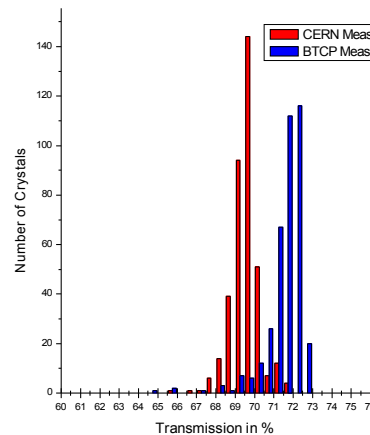
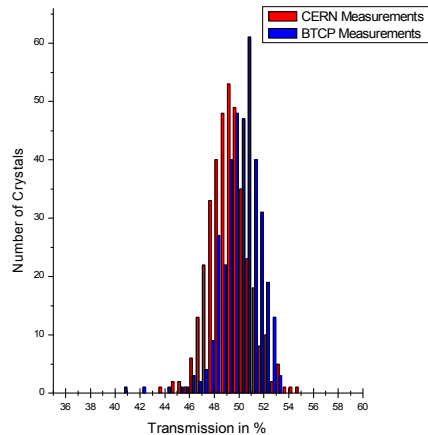


420 nm

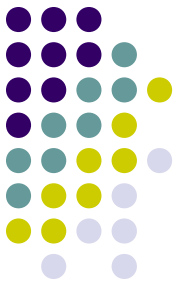


620 nm

374 Barrel Crystals



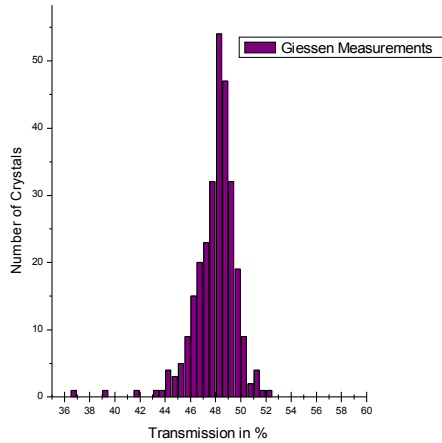
Transmission – Lot B1 Giessen Measurements



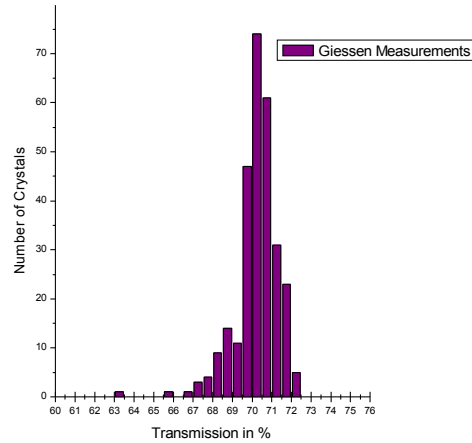
Longitudinal Transmission at Certain Wavelength

Lot B1

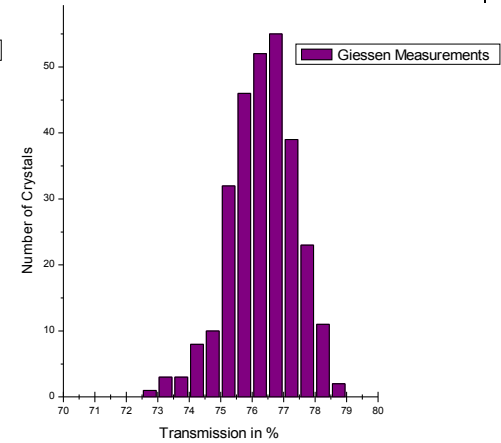
285 End Cap Crystals



360 nm

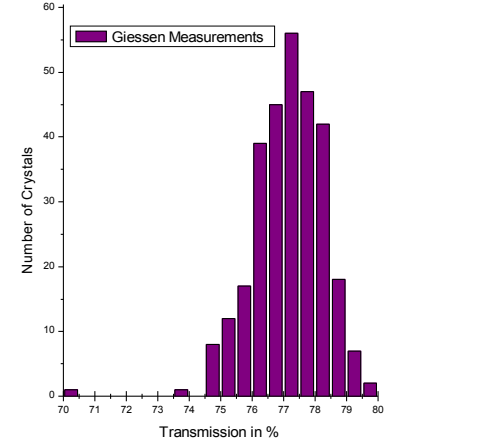
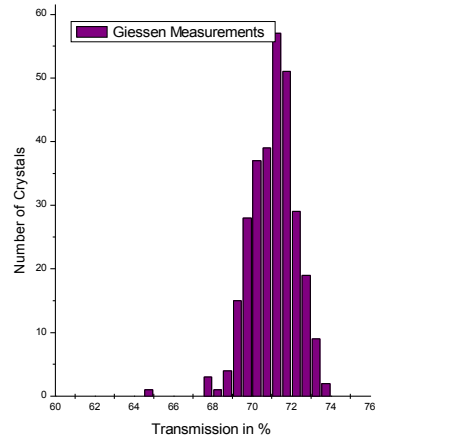
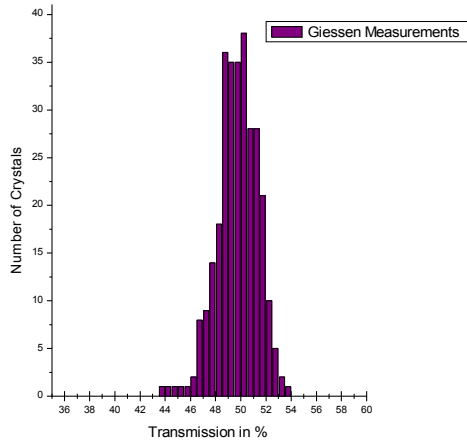


420 nm



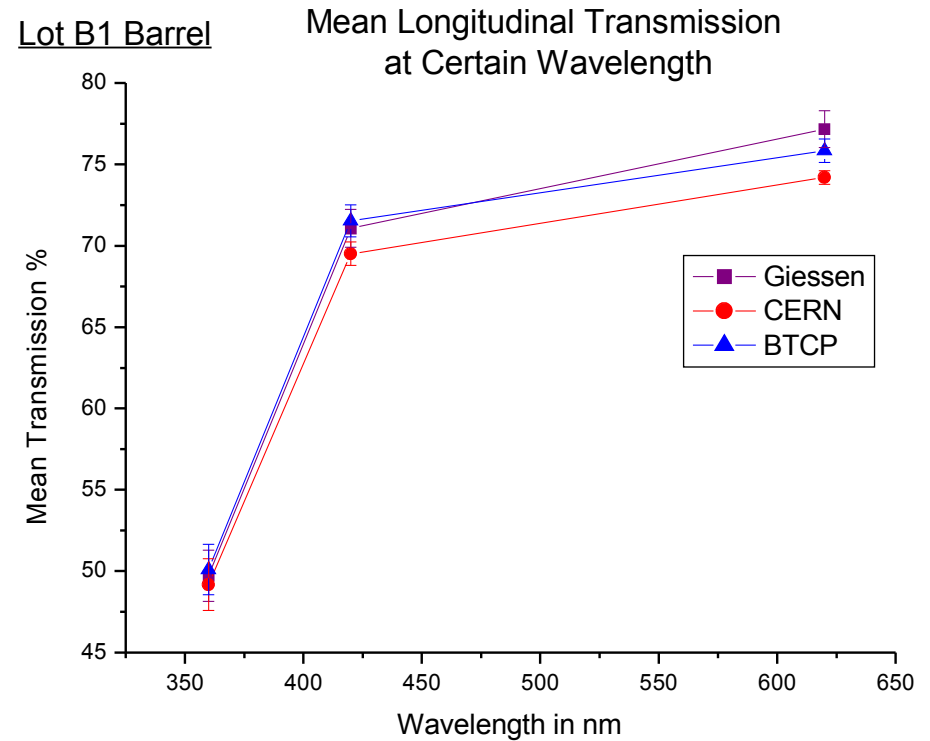
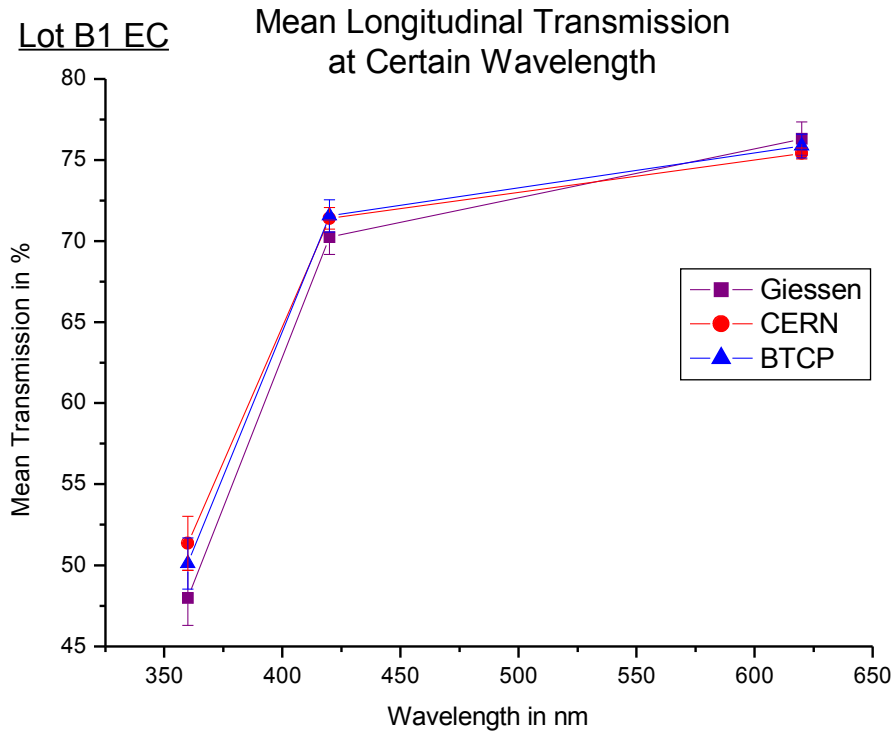
620 nm

295 Barrel Crystals



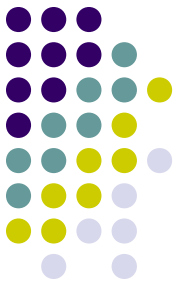
Transmission – Lot B1

Mean Values



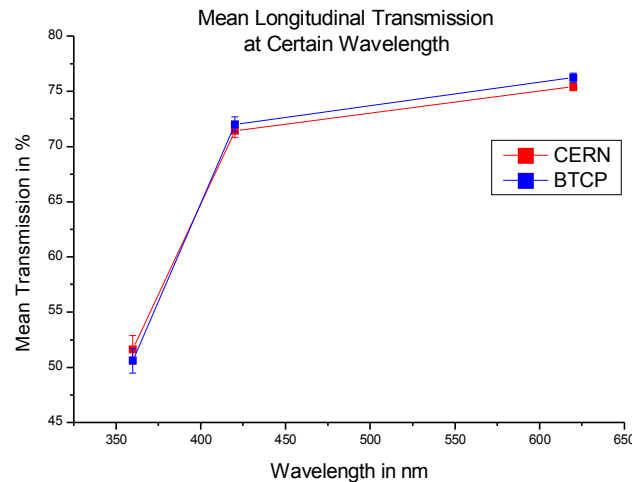
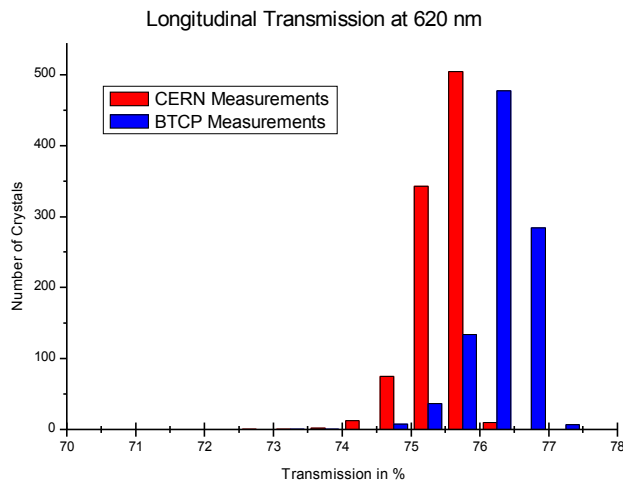
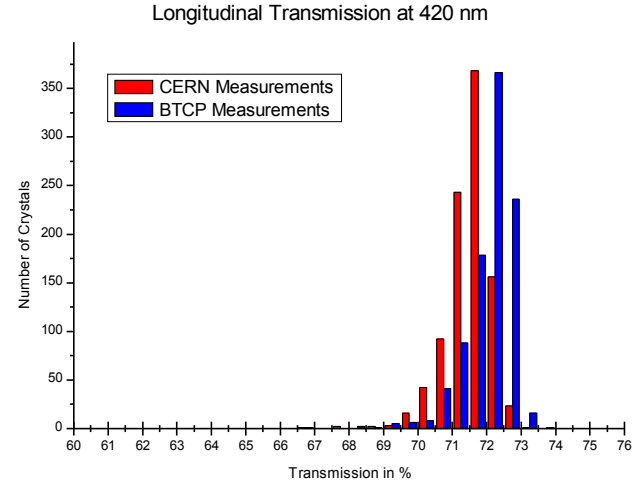
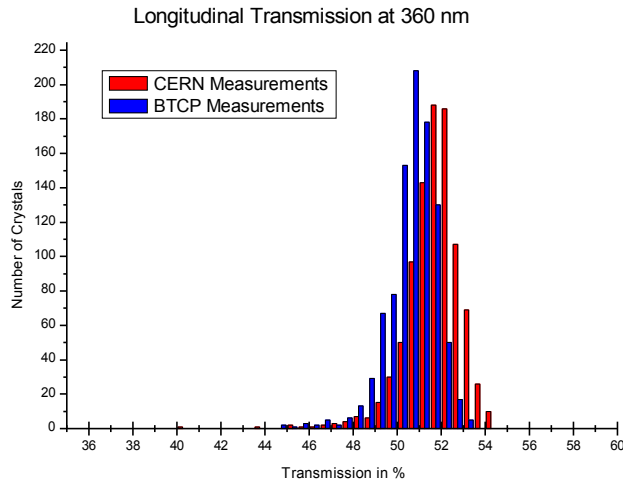
Transmission – Lot B2

CERN/BTCP Measurements



Lot B2
950 End Cap Crystals

Distribution of Longitudinal Transmission at Certain Wavelength

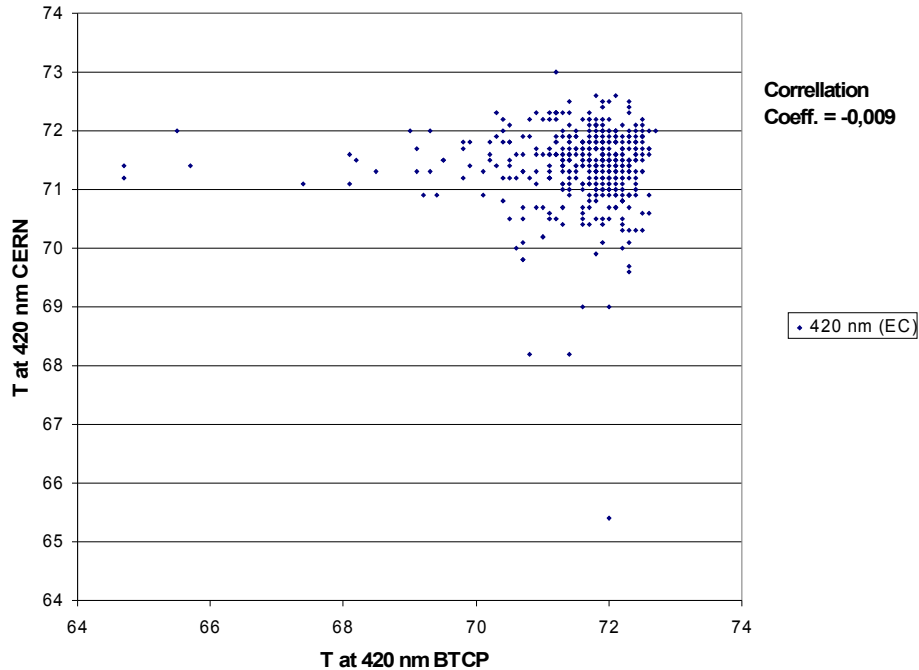


Correlations - Lot B1

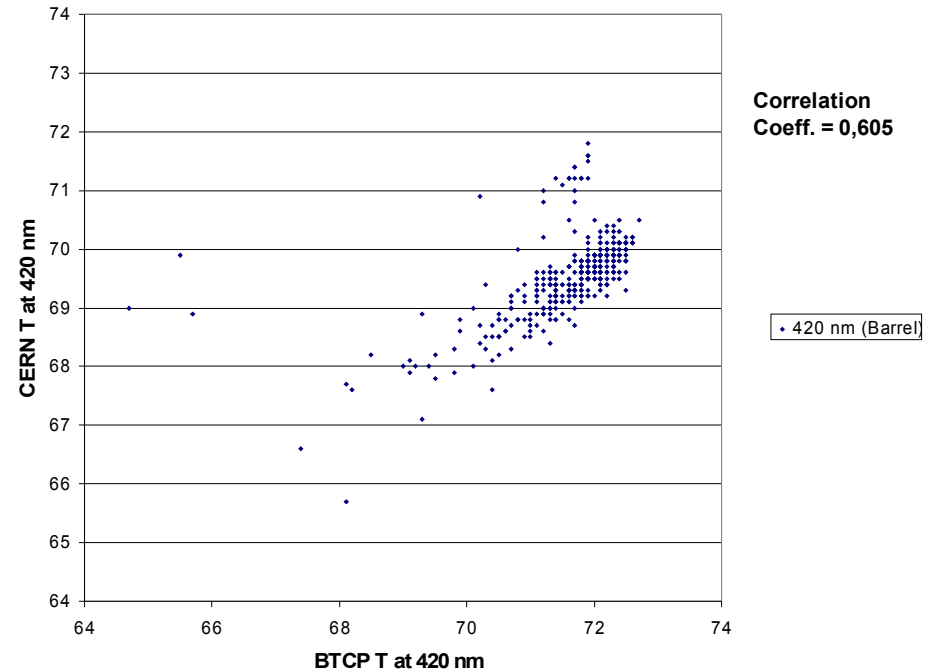
CERN and BTCP



Correlation CERN/BTCP T at 420 nm (EC)



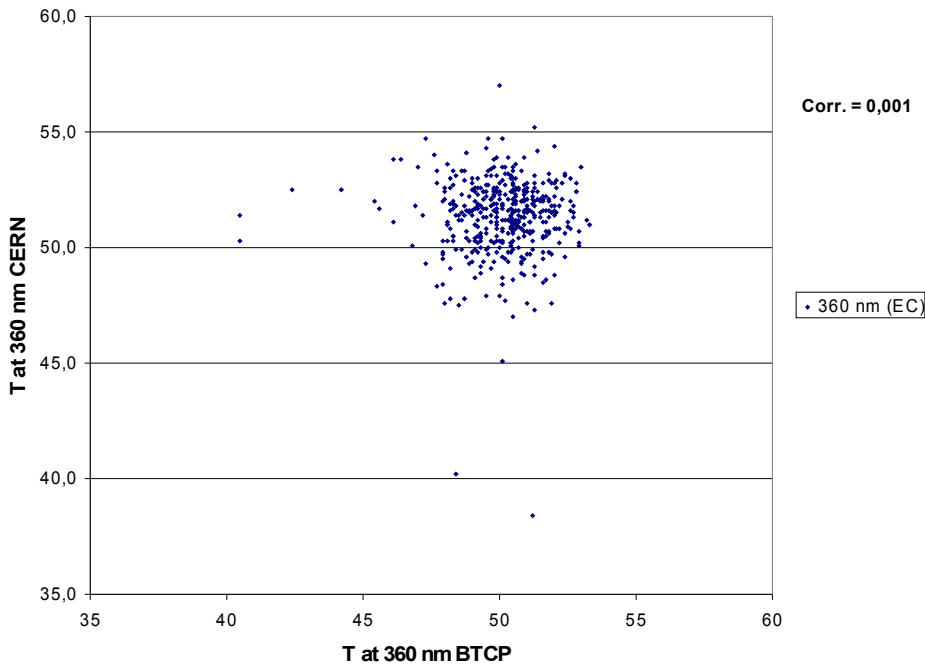
Correlation CERN/BTCP T at 420 nm (Barrel)



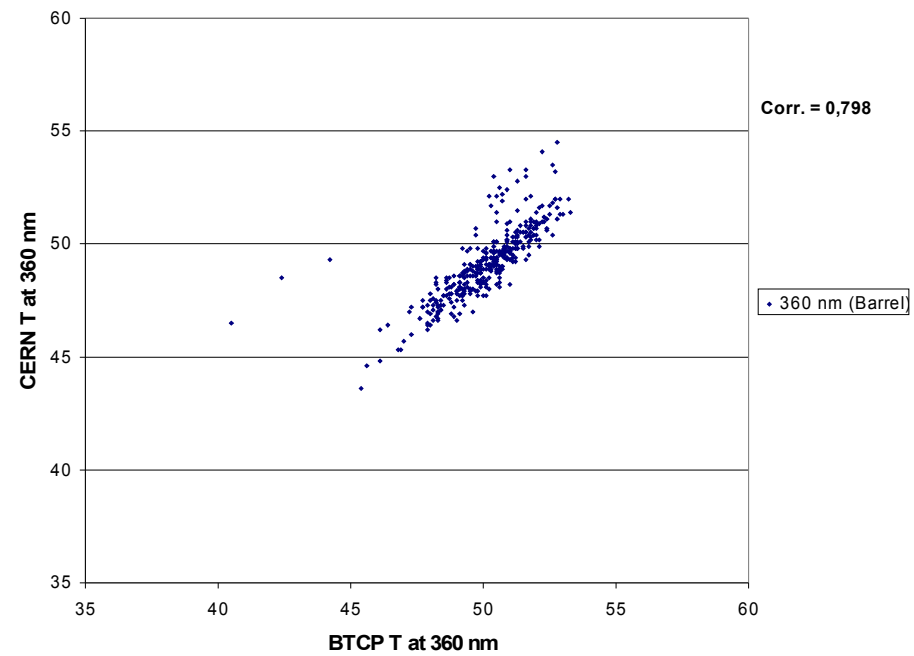
Correlations - Lot B1 CERN and BTCP



Correlation CERN/BTCP T at 360 nm (EC)



Correlation CERN/BTCP T at 360nm (Barrel)

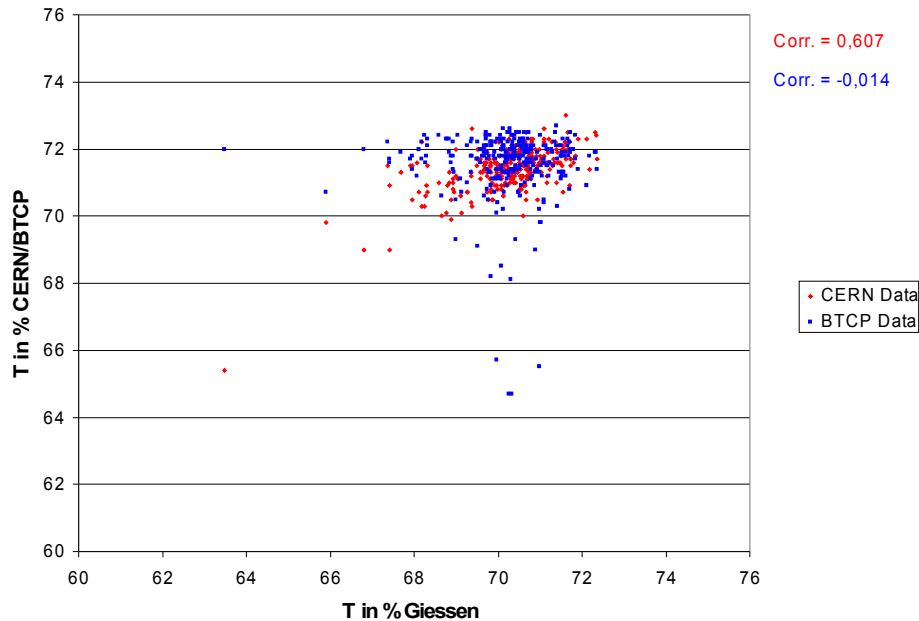


Correlations - Lot B1

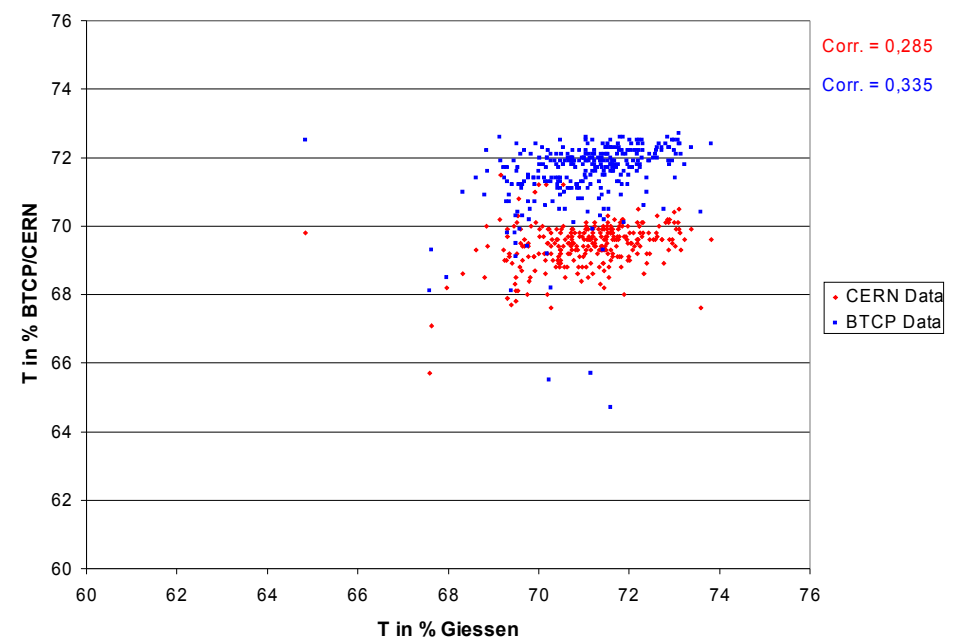
Giessen and CERN/BTCP



Correlation of Longitudinal Transmission between Giessen and CERN/BTCP Data at 420 nm (EC)

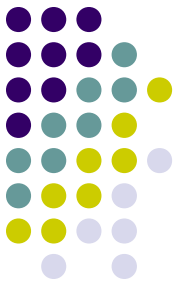


Correlation of Longitudinal Transmission between Giessen and CERN/BTCP Data at 420 nm (Barrel)

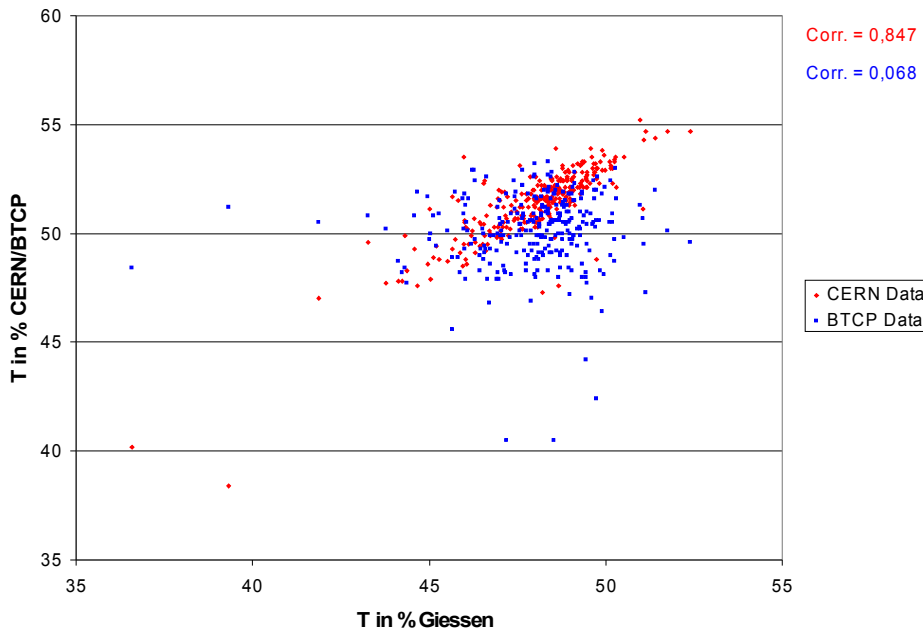


Correlations - Lot B1

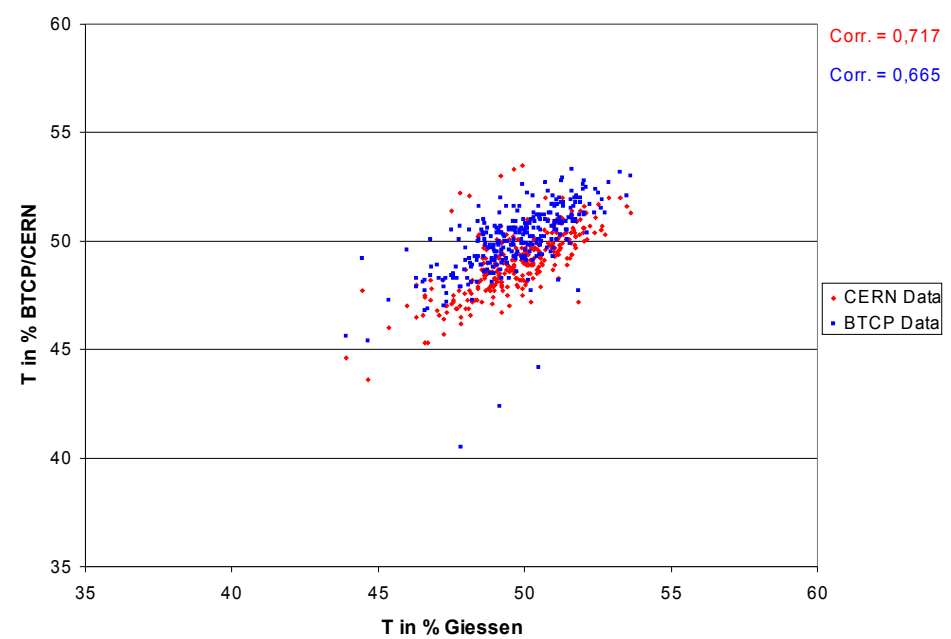
Giessen and CERN/BTCP



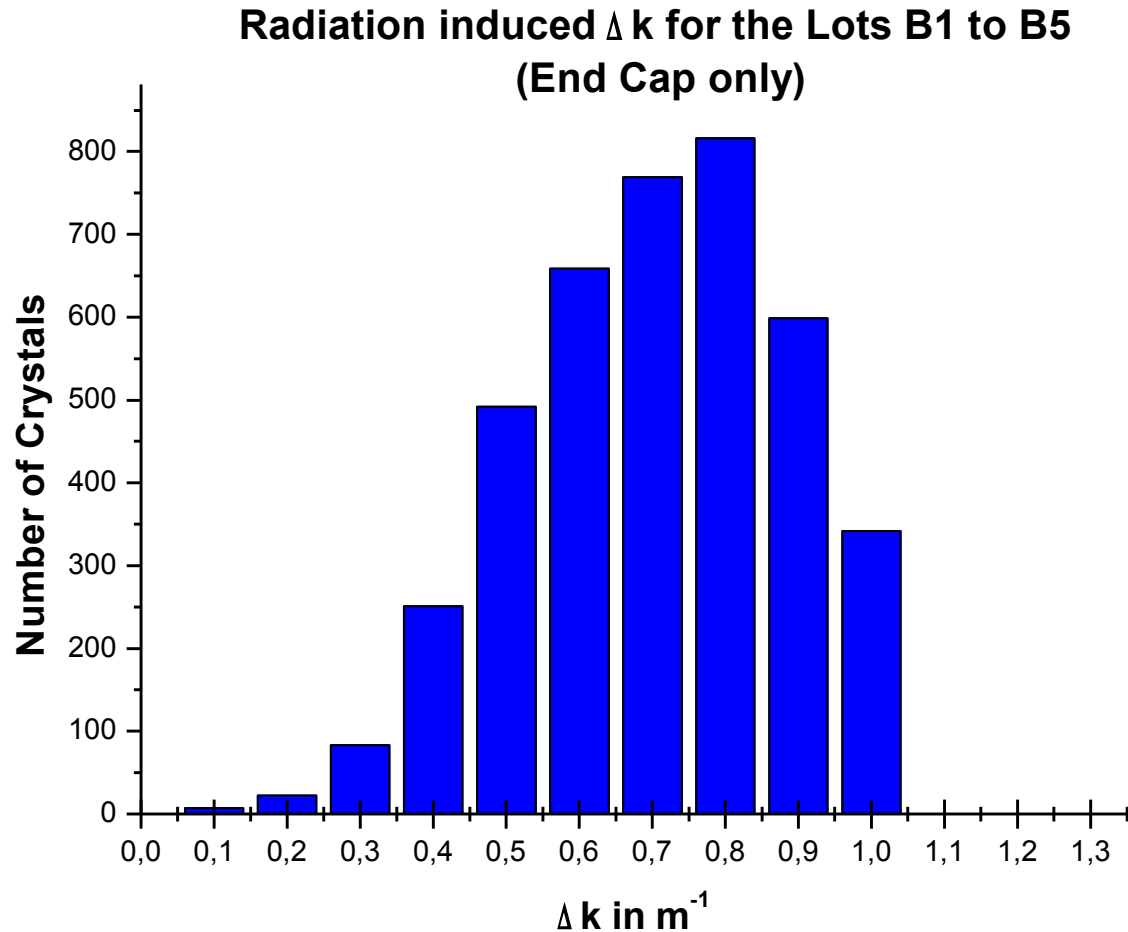
Correlation of Longitudinal Transmission between Giessen and CERN/BTCP Data at 360 nm (EC)



Correlation of Longitudinal Transmission between Giessen and CERN/BTCP Data at 360 nm (Barrel)

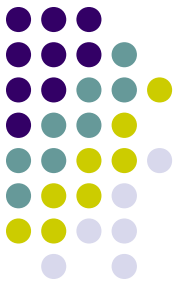


Radiation induced Δk BTCP Quality Control

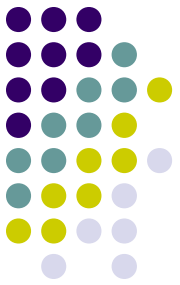


Radiation induced Δk

First Giessen Measurements



- Measured in the Strahlencentrum
 - High activity ^{60}Co γ -Source
 - Only short time delay between irradiation and transmission measurement
 - Therefore minor recovery? **BUT!**
- First Spectrum
 - Dr. Valera Dormenev



Conclusion/Outlook

- Transmission values before irradiation are, within the Error Bars, the same for all three facilities
- The data is more or less correlated