

DESY FEL Seminar 2017-06-27

Status of Optics Setup & Consolidation at FLASH

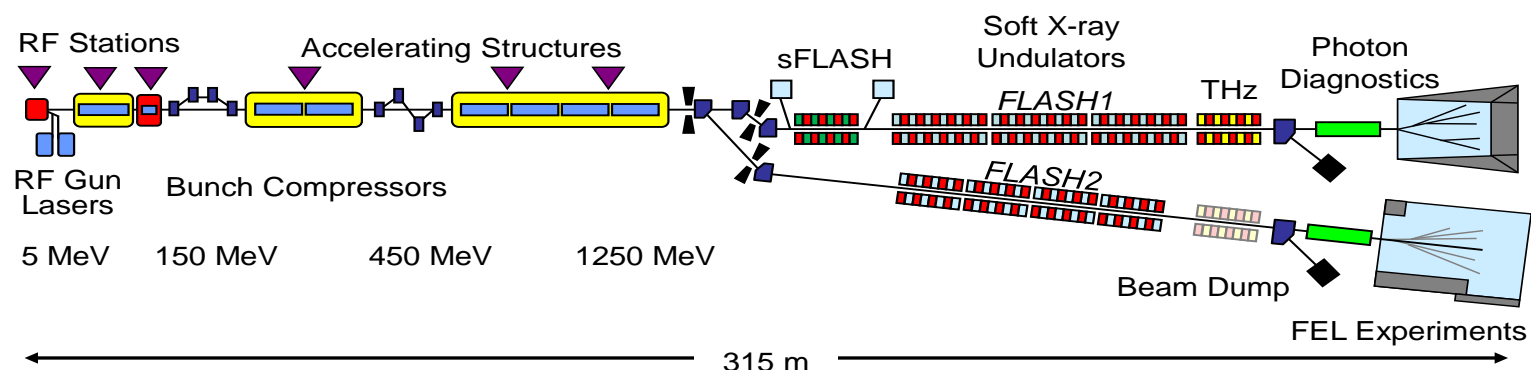
(Pt.1)

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- Introduction / Motivation / Reminder (earlier talk 2016-04-19)
- Model Improvements
- Summary of Pt.1



Introduction / Motivation / Reminder → **our talk from 2016-04-19**



- **RF-GUN**: **space charge** dominated regime (lowest E)
 - → **energy profile** (!!!) :
 - model glitches : longitudinal positions
 - model glitches : calibration curves (magnets!)
- **Design Optics** :
 - starts *exit* of solenoid **1GUN**
 - **(no SC)** → valid only **un-compressed** ⇒ Necessity to **re-match** → constraints at various locations
- Dominant sources of optics perturbation (un-compressed):
 - the “**ACC2**-Badlands” →
 - (Target : (finally) **correct for SC** in compressed beam!)

Model Improvements : Longitudinal Positions of Magnets

- found **inconsistencies** between **lattice file** (or equivalently “Körper/Schreiber/Faatz–Liste”) and **survey data** (MEA)
- **partly some tenths of cm’s !!!**
- ⇒ rechecked consistency of survey data and “our interpretation” of the notion of “position”
- OK ⇒ **updated lattice file**
 - plus remeasured exact positions of steerers! (→ORM’s)
 - overall impact : rather subtle...

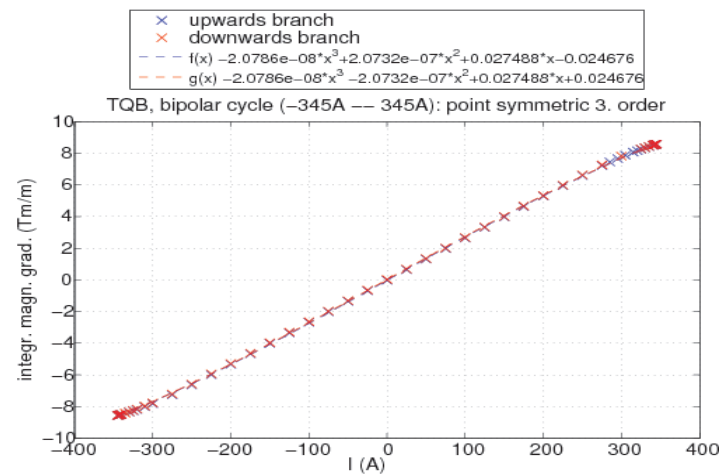
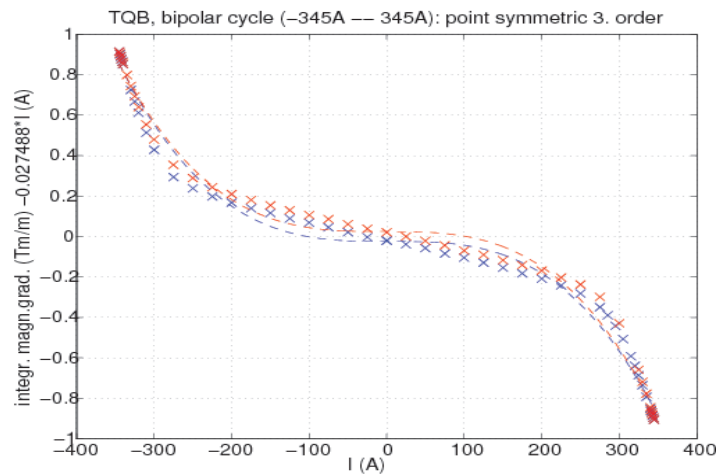
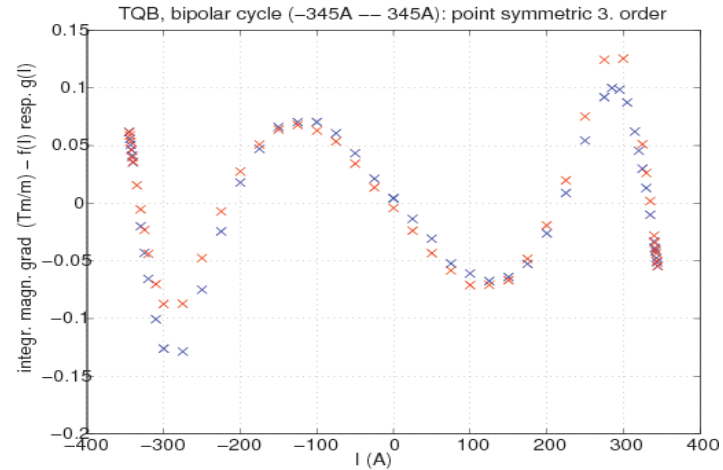
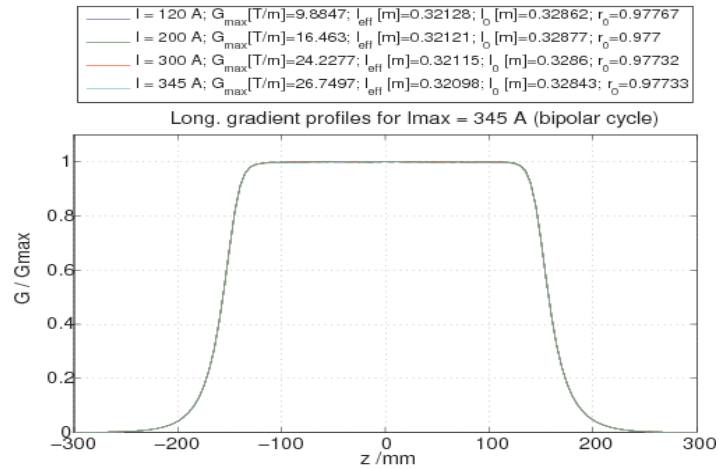
Model Improvements : Magnet Calibration Data : Common /Wisdom/

- For each magnet type (e.g. TQA, TQG70, TDB, Septum, TCA40S, ...) one needs (as a **minimal** standard!) :
 1. A **long. field-profile** to compute $\int B dl$, L_{eff} , L_{Steffen} , etc.
— at least for one significant current
 2. A **hysteresis curve which is compatible** with the **applied cycle mode** and the **applied current range** ($\pm I_{\text{max}}$). (Preferably both branches!)
 $\Rightarrow n$ different $\pm I_{\text{max}}$ in use $\rightarrow n$ different sub-types (i.e. TQAi60, TQAi120, TQAi300)
 3. An **estimate of statistical deviations** from the profile/calibration data
 4. Quality control: redo measurements whenever new magnets of the **“same” type** are purchased at a **later time** and/or from a **new manufacturer**. e.g. “Are the calibration data of the TQA’s from **2015** sufficiently close to the TQA’s from **2005** to be considered really the same magnet type?”
- ... otherwise one may as well try to control the beam through telepathy !

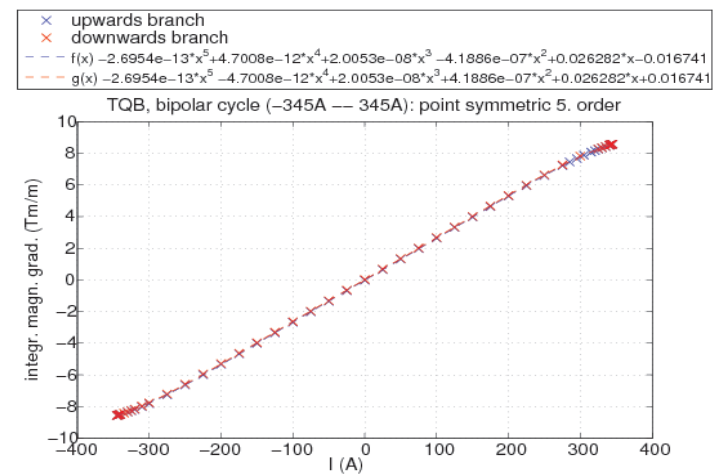
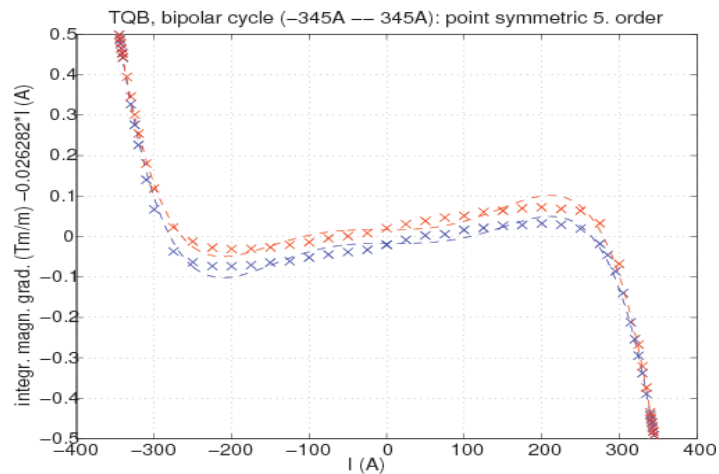
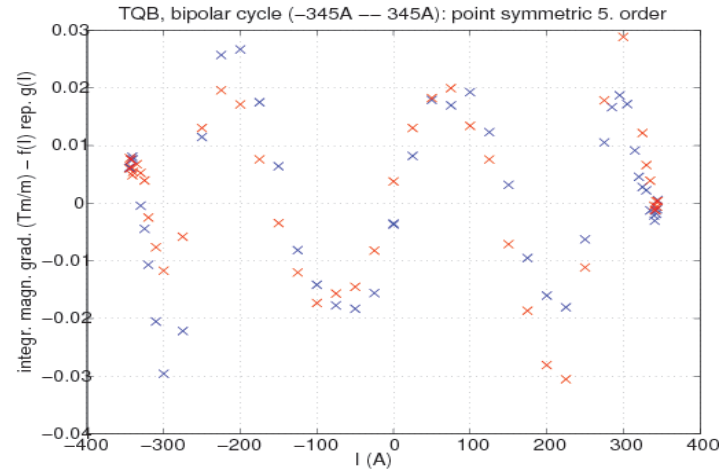
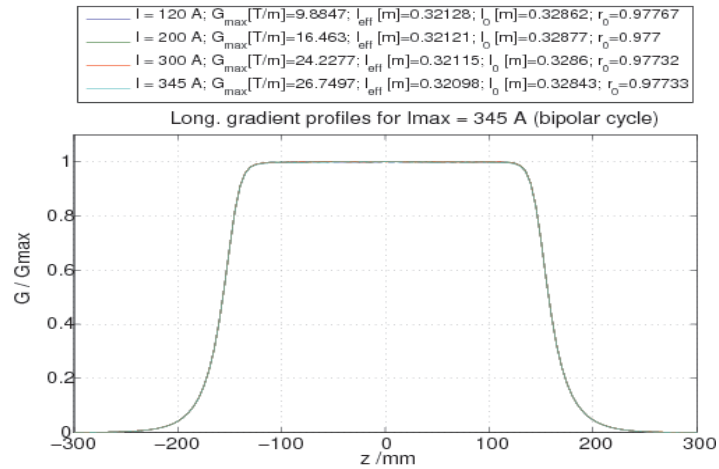
Model Improvements : Magnet Calibration Data : Status at FLASH

- **Field profile** or **hysteresis curve** are sometimes **missing** or w/ **insufficient resolution** or for an **in-compatible cycle type**
 - + every magnet type (in all accessible makes)
 - + cycles consistent w/ operation (both branches!)
 - + a few selected $\pm I_{\max}$
 - upgrade PS's & cabling
 - mid-term-project
 - new 5th order (enforced symmetric for bipolar cycle) description for both branches
 - tpic2k, tpkc2i, (MV)
 - magnet-server (LF)
- Magnets are typically operated at **“arbitrary”** $\pm I_{\max}$
- ⇒ **MAGNET DATA CONSOLIDATION CAMPAIGN** (on-going / **slow**)
- xtra special thanx 2 : **M.Scholz, F.Christie, S.Wesch, V.Libov**
- Plan: obtain quality calibration data for...

Example : New Calib Data TQB / Point Symmetric 3rd Order Poly Fit



Example : New Calib Data TQB / Point Symmetric **5th** Order Poly Fit



Summary of Pt.1

- There seems to be nothing we can do about the “ACC2–badlands” (unless waiting for the module to be replaced).
- We have crosschecked and updated the longitudinal positions in the lattice model to the best accessible data (survey/MEA).
- We have started to update/complete/repair the data base of used magnets and will start to “unify” the current ranges ($\pm I_{\max}$) for all used magnets.
- Actual optics measurements and matching → **See Pt.2**