

# Brief update on klystron linearization options

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**9mA study preparation meeting**

**DESY 31.07.2012**

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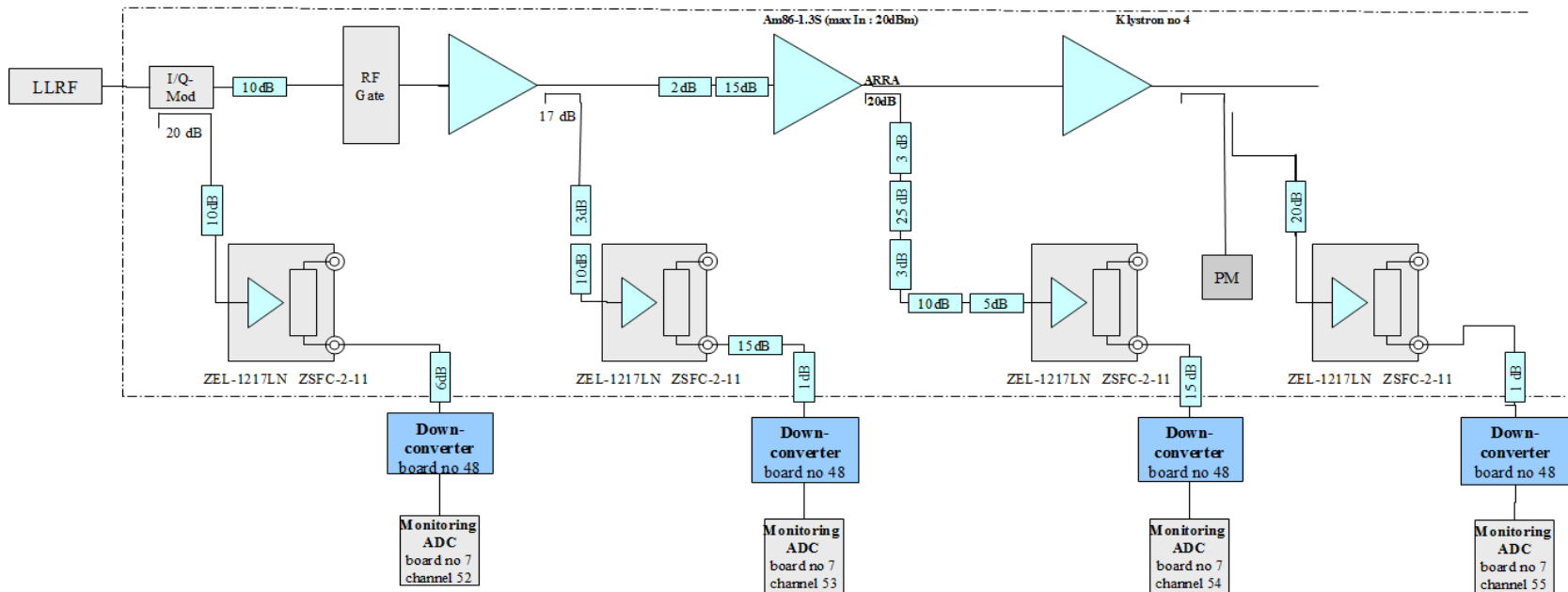
- **ACC67 High power chain nonlinearities**
  - Plans for near to saturation operation @ACC67,
  - Nonlinearities determination (or/and modelling),
- **Linearisation tool outlook**
  - Digital predistortion integrated with LLRF controller
- **Current implementation status**
  - Status & missing software, firmware components,
  - Required pretest studies

# ACC67 High power chain nonlinearities

Plans for near to saturation operation @ACC67 – implies **higher controller output** signal level for **lower** klystron **HV** settings.

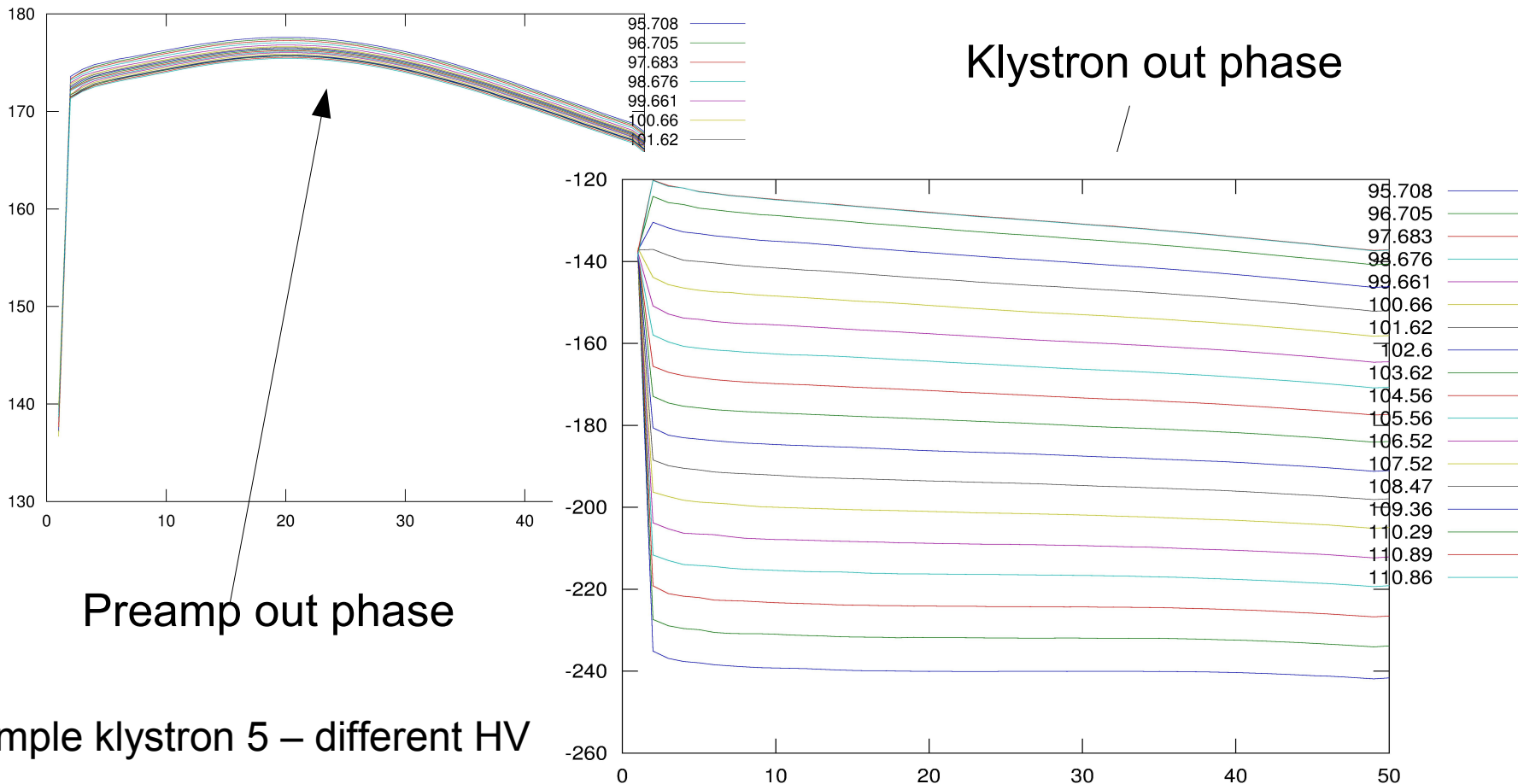
- **Attenuation** in main loop should be **reduced** to obtain this operation area (according to V. Vogel data maybe not significantly – still some possibilities with preamp input att.),

ACC67 - RF station kly No 4

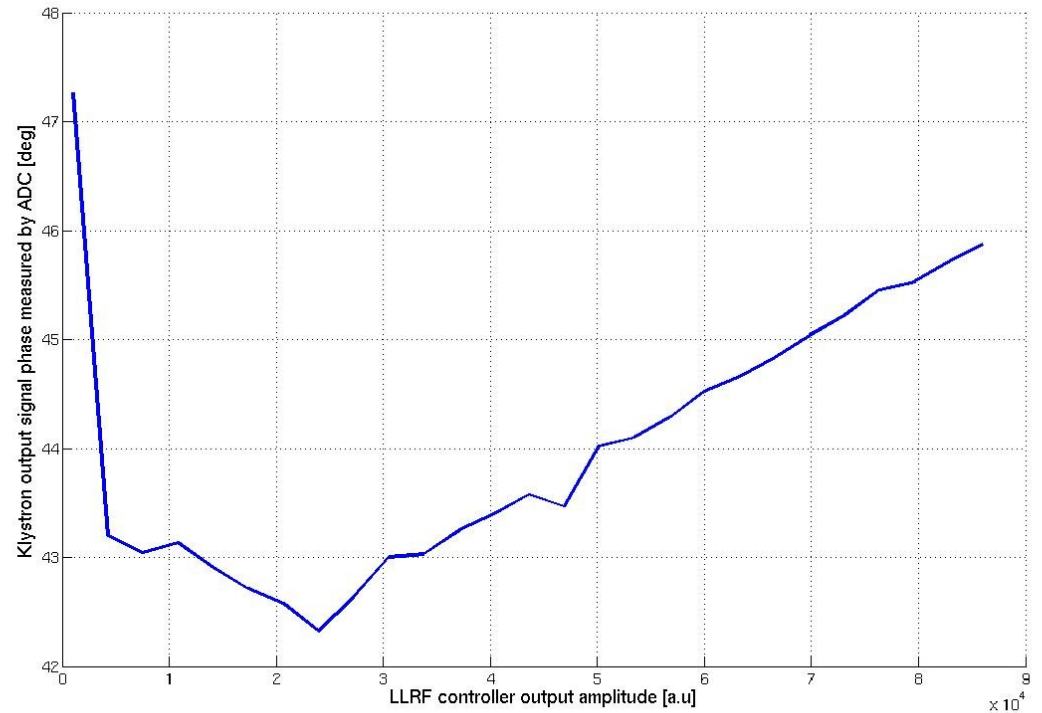
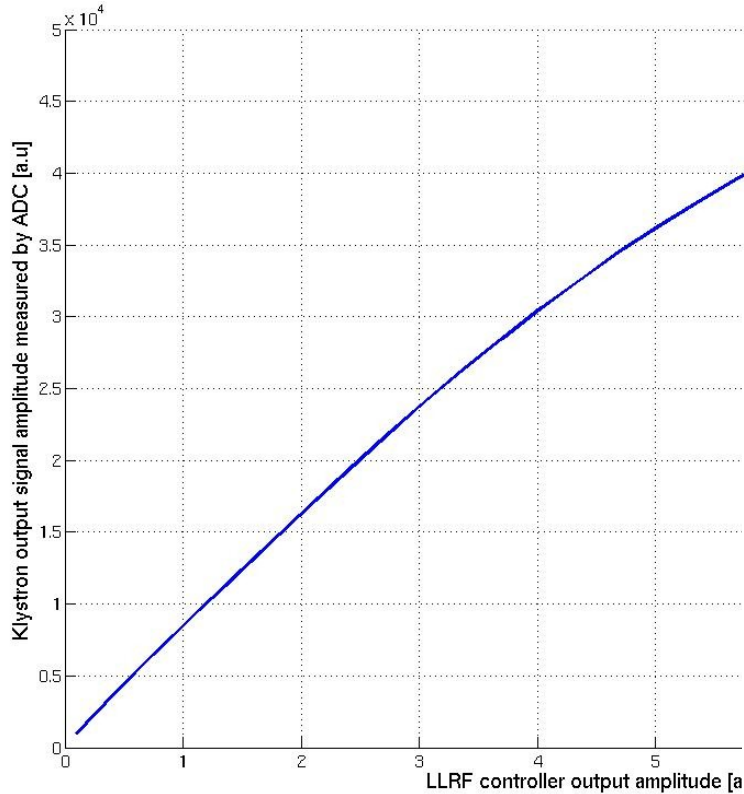


# ACC67 High power chain nonlinearities

In case of higher klystron input power – more impact from preamp and VM can be observed.



# ACC67 High power chain nonlinearities

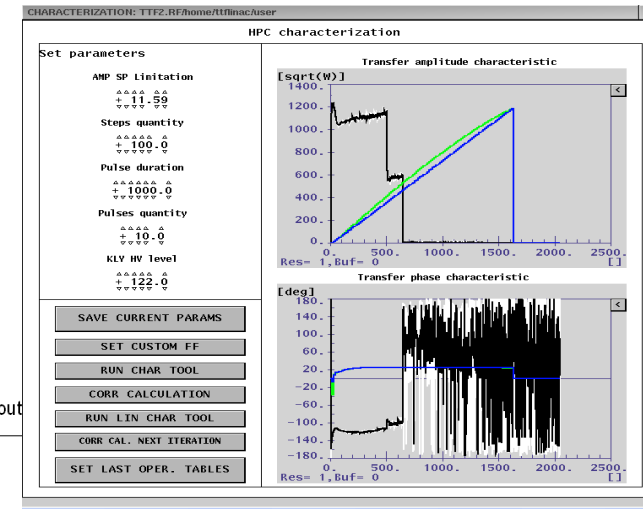
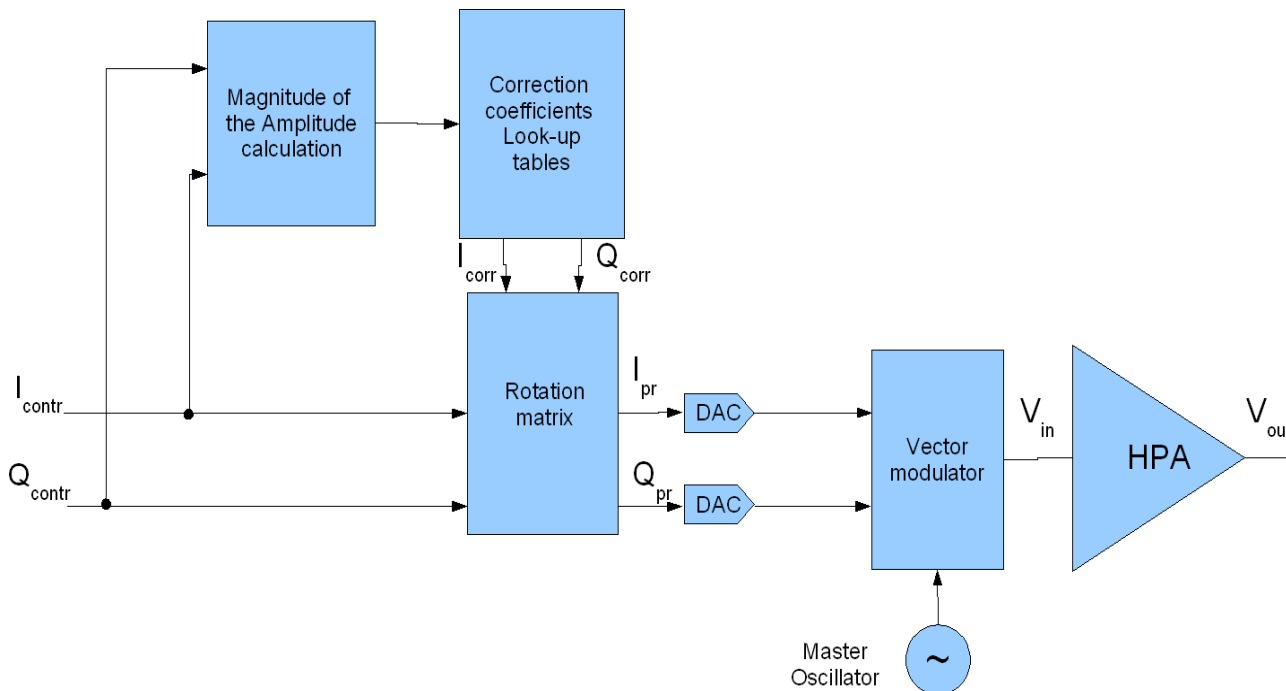


Klystron4 @ACC67, HV = 108 kV

# Linearisation tool outlook

- **Based on digital predistortion,**

- LLRF controller signal correction basing on (inversion of) measured transfer waveforms
- Correction curve approximated in the controller by 32 to 2048 positions look-up tables (with linear interpolation),
- Nonlinearities compensation includes effects from all HPA stages



## Status & missing software, firmware components

- Current firmware version doesn't support output rotation matrix and correction look-up tables (to be requested to WJ),
- Current front-end server doesn't support linearisation tools (to be requested to OH),
- Middle layer server for nonlinearities characterization and correction tables preparation is ready.

## • Required studies before 9 mA run

- Evaluation of firmware/software components – about 0.5 shift,
- Identification of system nonlinearities for required operation parameters range (which HV level?, which LLRF controller output level? ) – about 1 shift (can be also maintenance day)

**THANK YOU**

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