BESSY

Berliner Elektronenspeicherring-Gesellschaft
für Synchrotronstrahlung m.b.H.

High Performance IOT Transmitter at BESSY

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- Motivation
- Measurements
- Pictures

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Leibniz Gemeinschaft

Motivation

Requirements for modern Transmitter at Storage Rings and SC Linacs

- Low ά operation and infra red beam lines at storage rings are very sensitive to phase and amplitude noise of the RF system
- At SC linacs for FEL or ERL applications phase stability of < 0.1deg and amplitude stability of < 10E-3 are required
- IOT tubes have much better efficiency special at CW operated and microphonics dominated SC linacs

➔ **It is time to design a cost effective type of IOT transmitter with high phase and amplitude stability!**

BESSY Transmitter Concept

Buying from power supply company:

All power supplies (switched) with PLC control but guidelines for the programming by BESSY including:

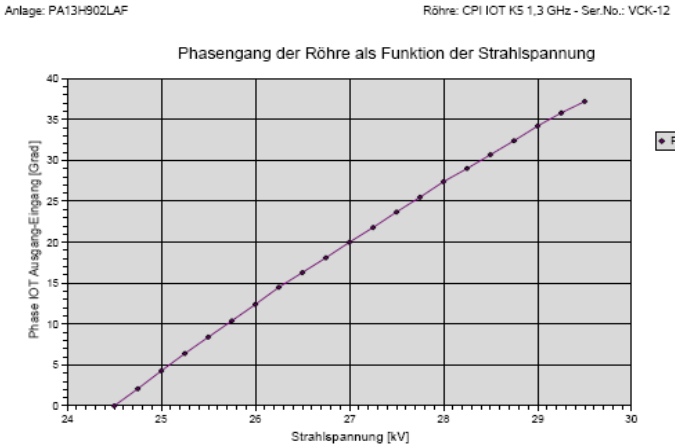
- Cavity interlocks
- Cavity tuning control
- Pre amp control

Provided by BESSY:

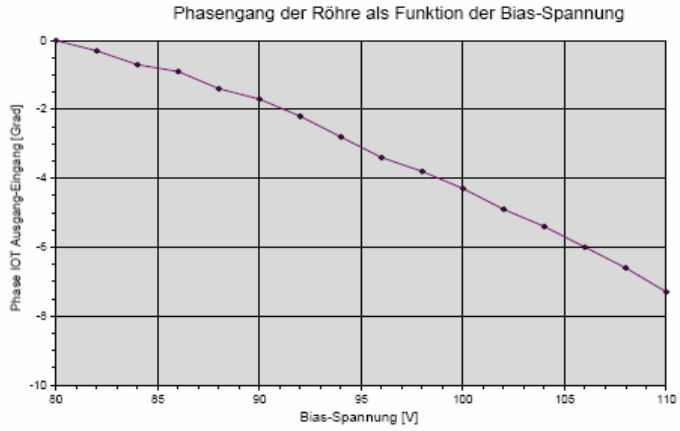
- IOT tube
- Preamp
- RF lines
- Circulator
- Low level RF

Cheaper price than buying at a transmitter company, because every company is specialized on their product. BESSY buy the single parts, give the knowledge of the PLC to the power supply company and put all together.

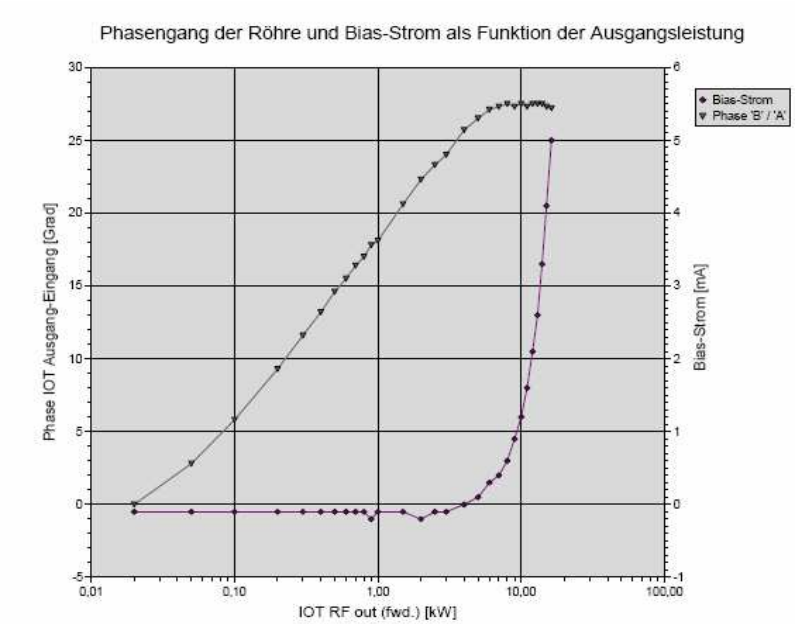
Phase Measurements



phase versus collector voltage

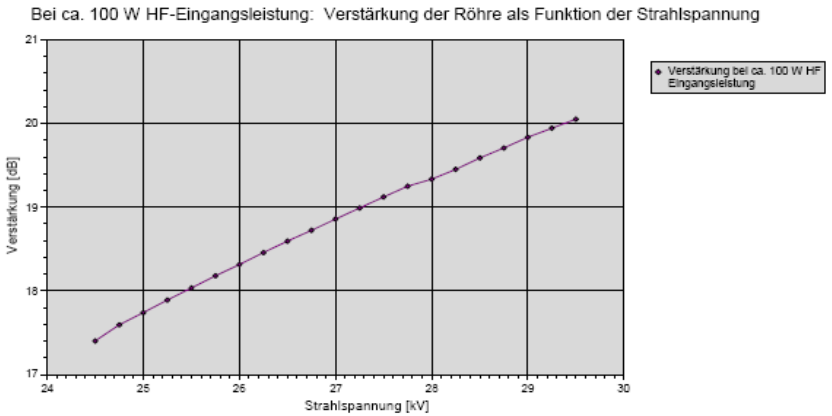


phase versus bias voltage

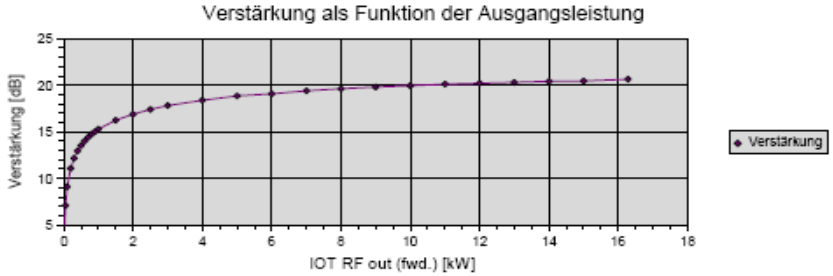


Phase and bias current versus RF output power

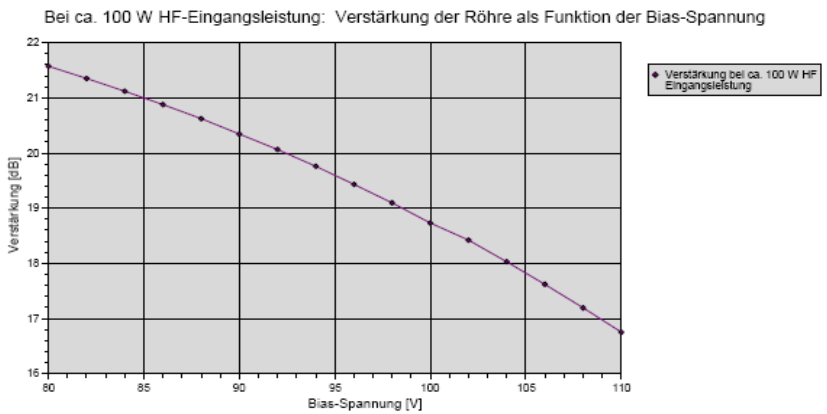
Gain Measurements



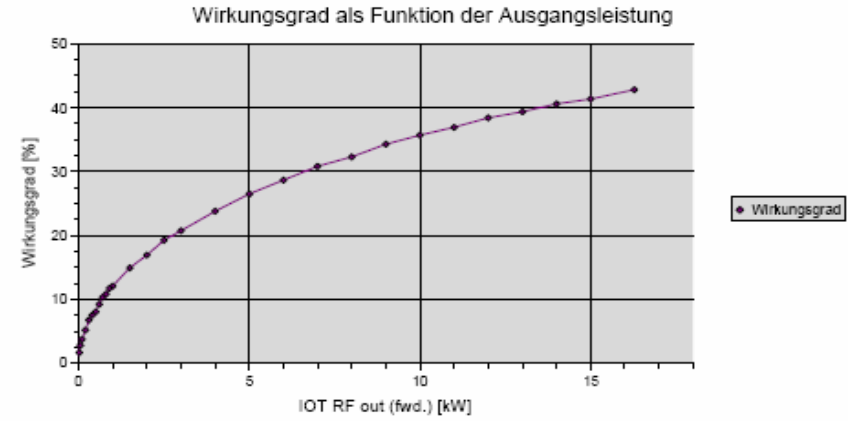
gain versus collector voltage



gain versus RF output power

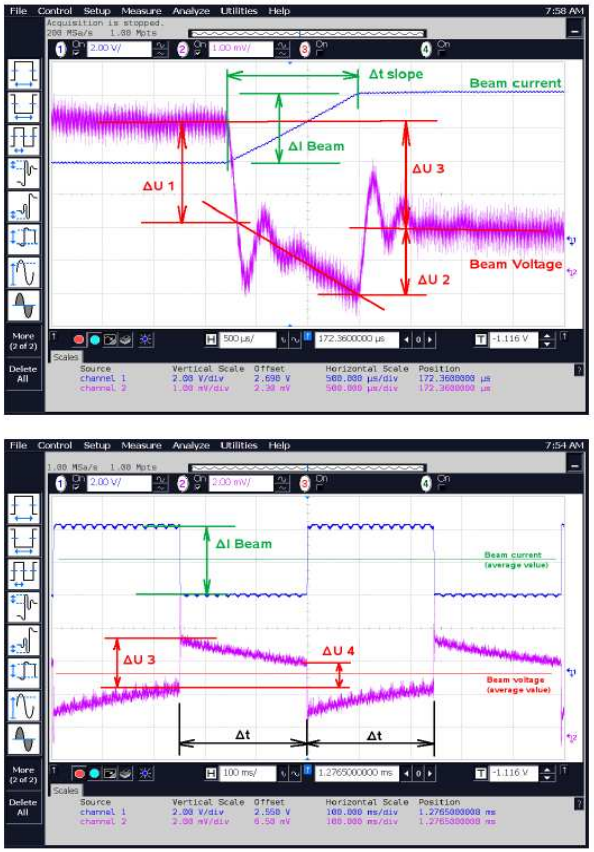


gain versus bias voltage

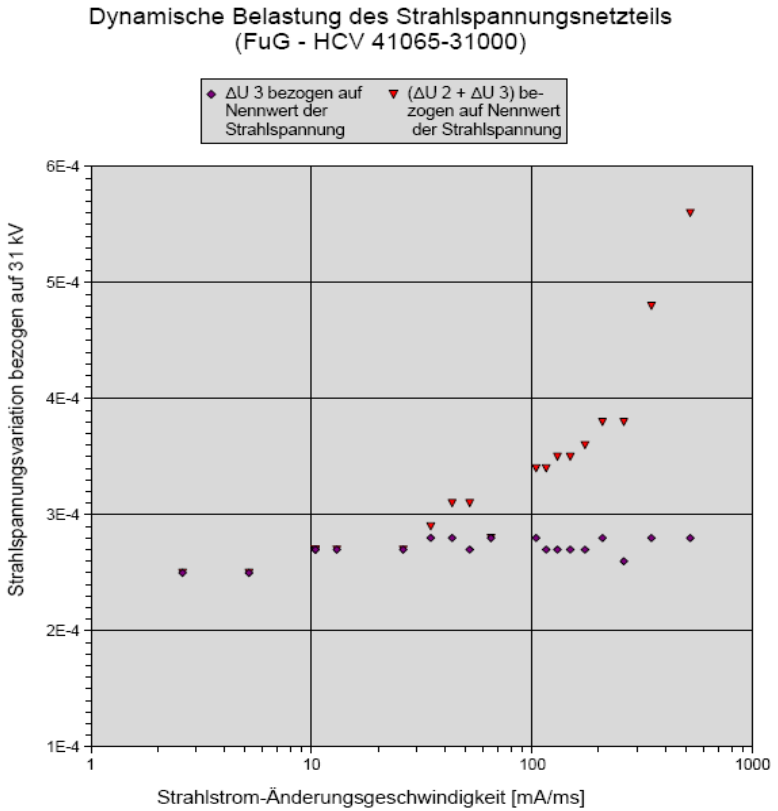


efficiency versus RF output power

Dynamic Measurements of PS



RF power (blue) and collector voltage (pink)



Ribble on the collector voltage versus speed of change of collector current (IOT 1.3A)

Due to class B operation of IOT tubes, current of the power supply varies with the RF output power. Detailed measurements on the power supply voltage were performed using rectangular RF output with varying slope.

IOT Transmitter at HoBiCaT

IOT Transmitter at HoBiCaT

Collector voltage:	31 kV
Collector current:	1.3 A
RF power max.:	25 kW
Frequency:	1.3 GHz

IOT Transmitter at the Willy Wien Lab

IOT Transmitter at the Willy Wien Lab

Collector voltage:	37 kV
Collector current:	3.75 A
RF power max.:	80 kW
Frequency:	500 MHz

Summary

- Two transmitters 80 kW@500 MHz and 25 kW@1.3 GHz have been constructed and commissioned using the same concept
- Detailed measurements have been performed

Future plans: Upgrading the 500 MHz low level electronics