

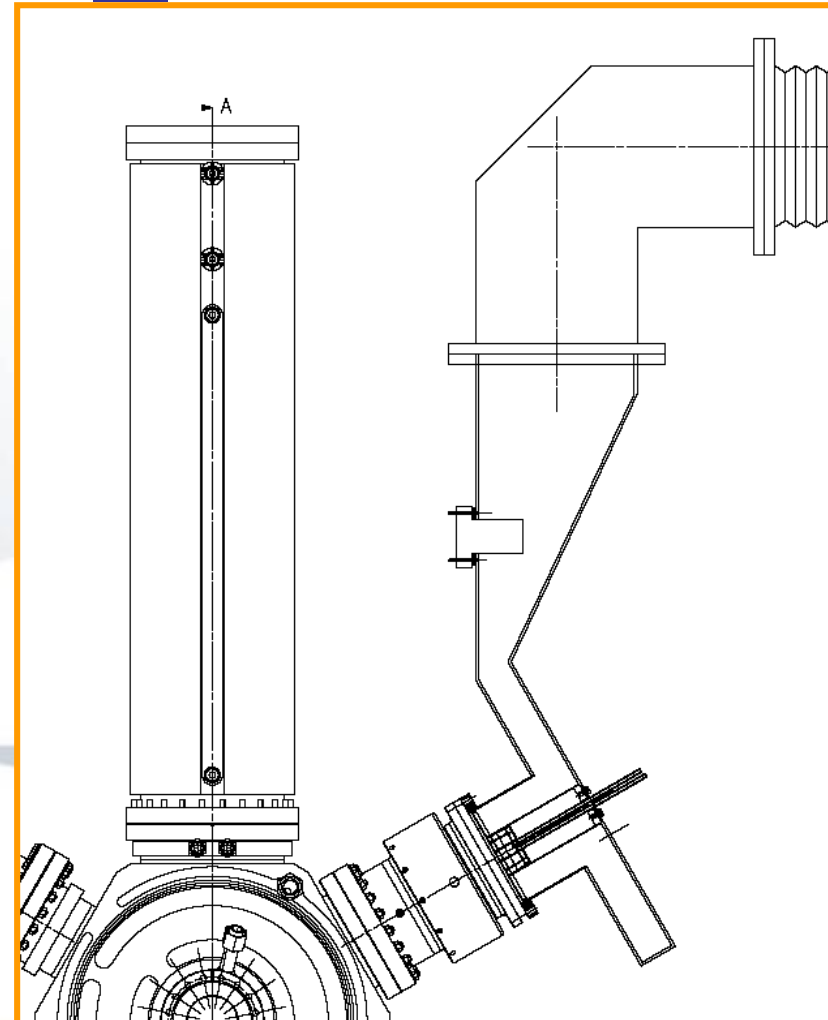
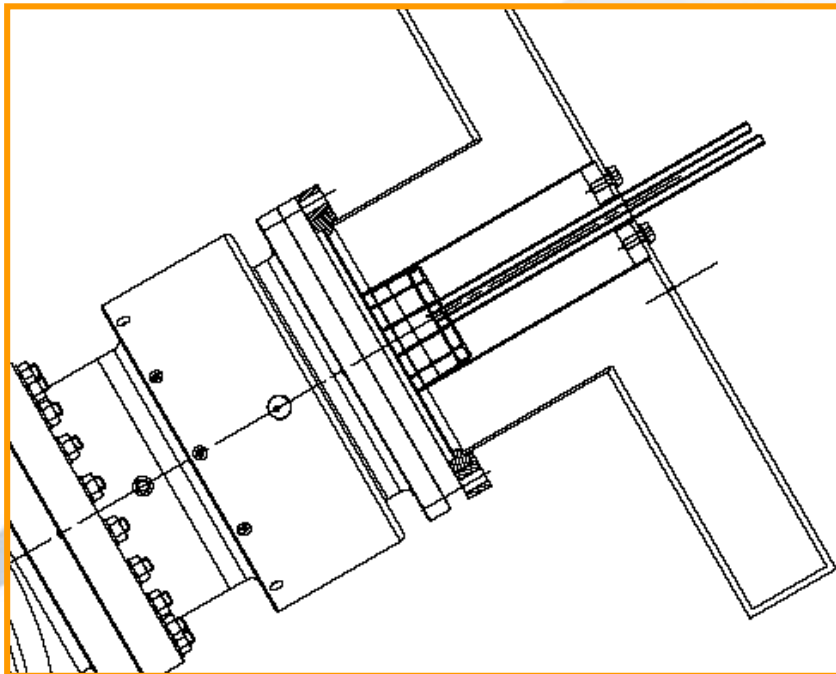


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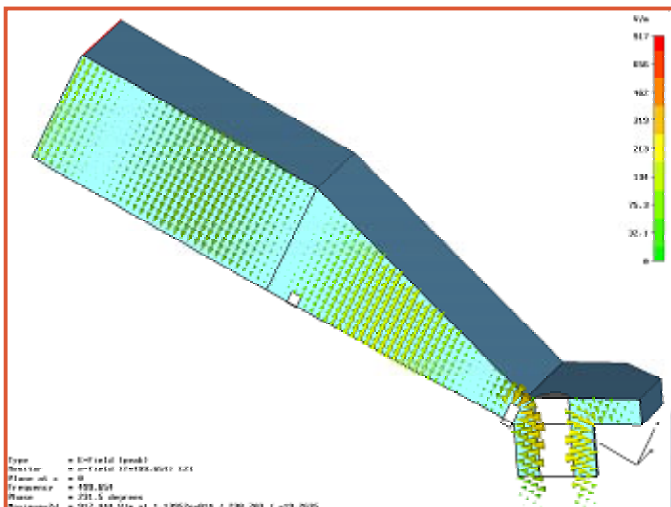
# 1. Introduction

- **WATRAX: WAveguide TRansition to CoAXial**
- **This transition has been designed to:**
  - **Fit the DAMPY geometry**
  - **Allow water cooling channels**
  - **Stand up to 150 kW**

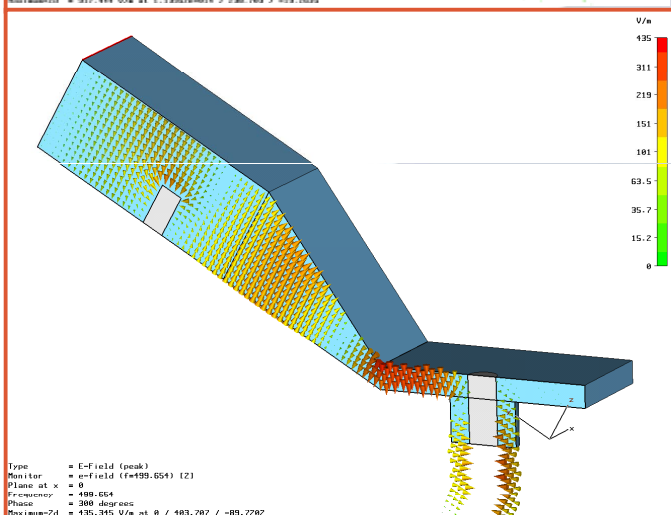


## 2. WATRAX Design

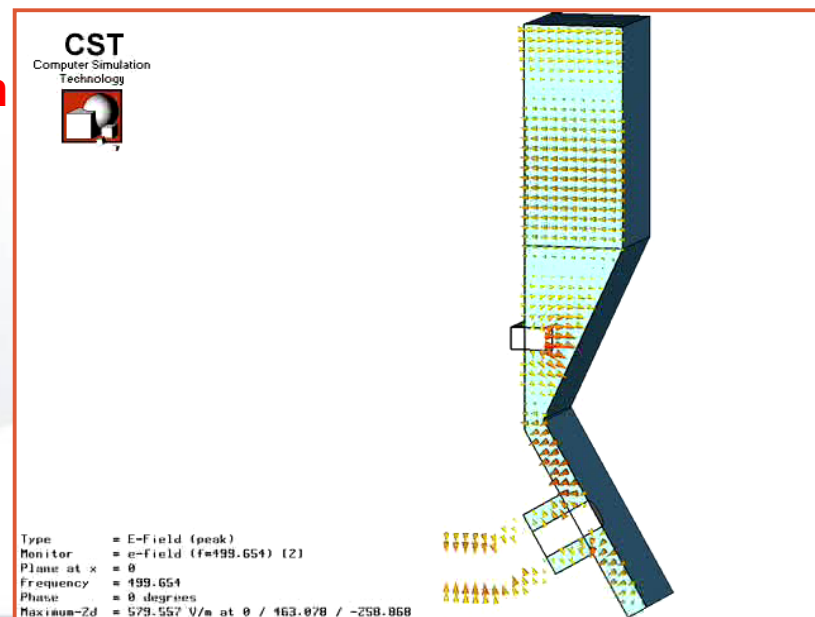
- CST simulation models, and results for  $P_{in} = 150$  kW cw:



**VSWR: 1.073**  
 **$E_{max}$ : 503 kV/m**  
 **$P_{dis}$ : 102 W**



**VSWR: 1.061**  
 **$E_{max}$ : 239 kV/m**  
 **$P_{dis}$ : 74.1 W**

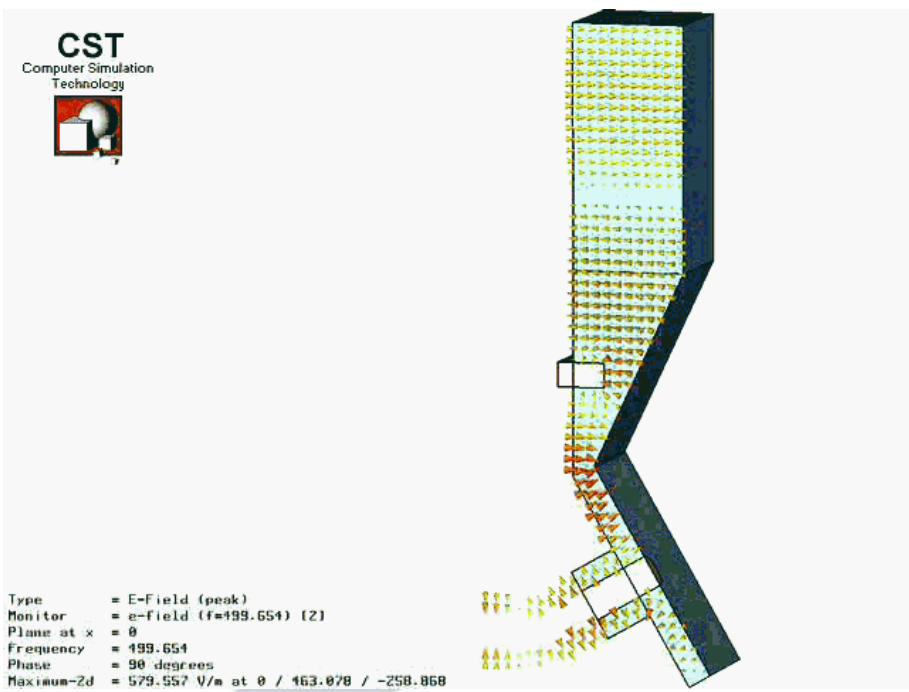


**VSWR: 1.016**  
 **$E_{max}$ : 319 kV/m**  
 **$P_{dis}$ : 119 W**

## 2. WATRAX Design

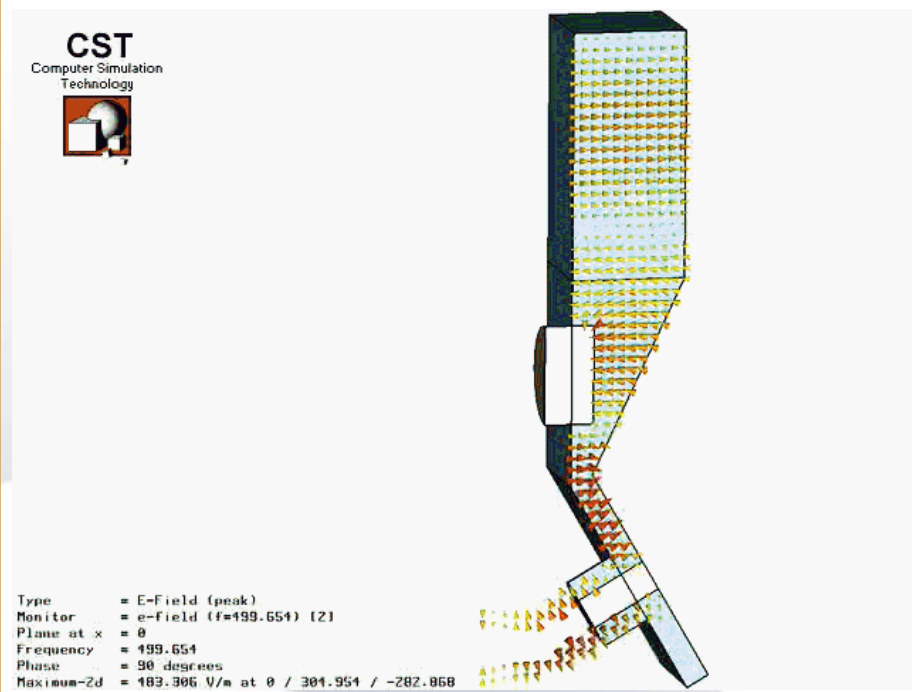
- Rectangular vs. Cylindrical plunger for  $P_{in} = 150$  kW cw:

With rectangular plunger



**VSWR: 1.016**  
 **$E_{max}$ : 319 kV/m**  
 **$P_{dis}$ : 119 W**

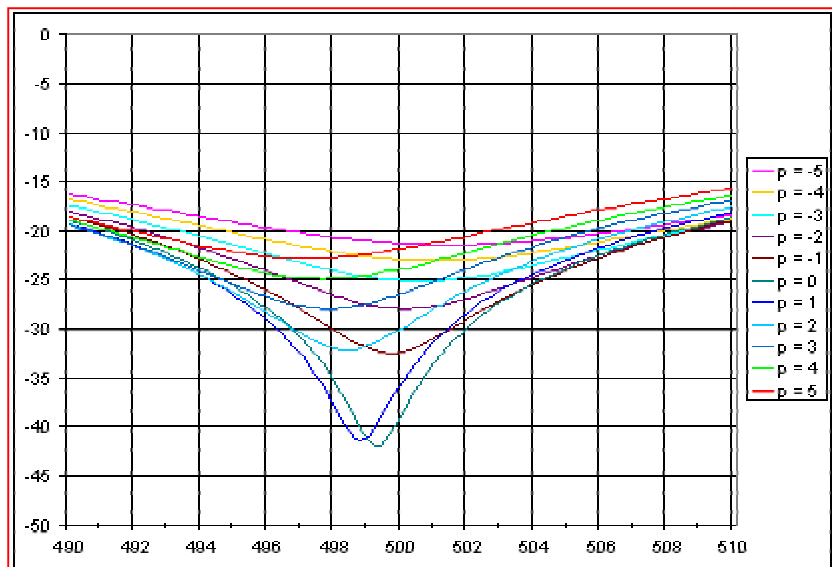
With cylindrical plunger



**VSWR: 1.018**  
 **$E_{max}$ : 265 kV/m**  
 **$P_{dis}$ : 121 W**

## 2. WATRAX Design

### ➤ Tuning capability

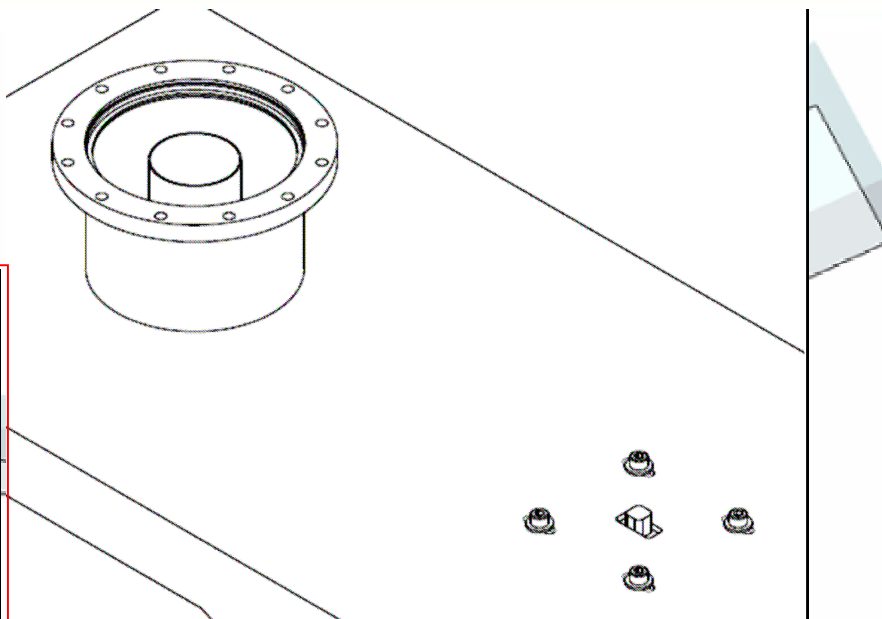


Parametrical on  $p$

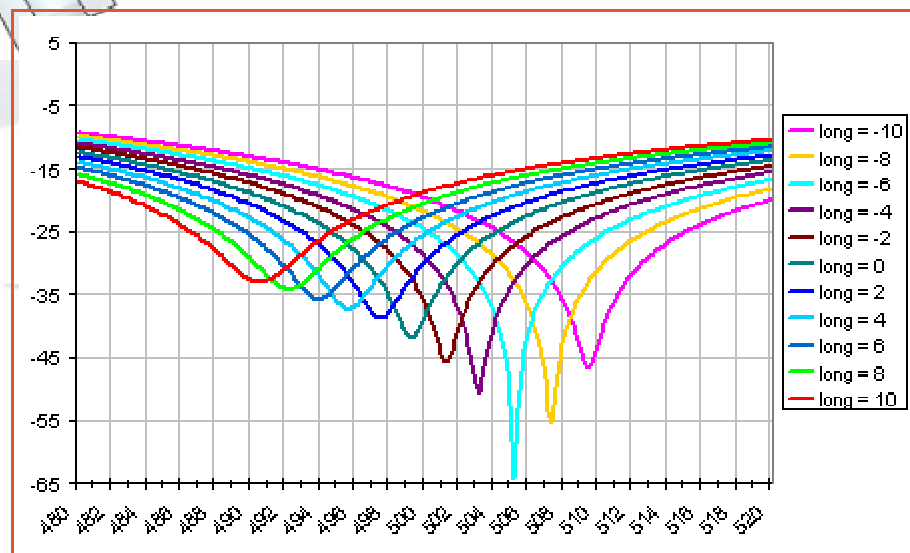
$$p = 45 \text{ mm}$$

$$l = 192 \text{ mm}$$

$$\varnothing = 200 \text{ mm}$$

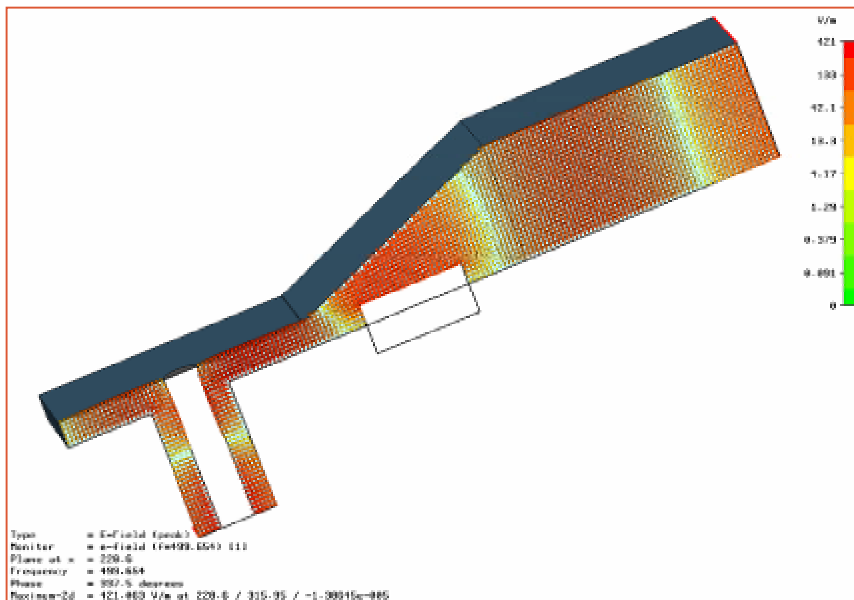


Parametrical on  $l$





### 3. WATRAX model for the Booster cavity

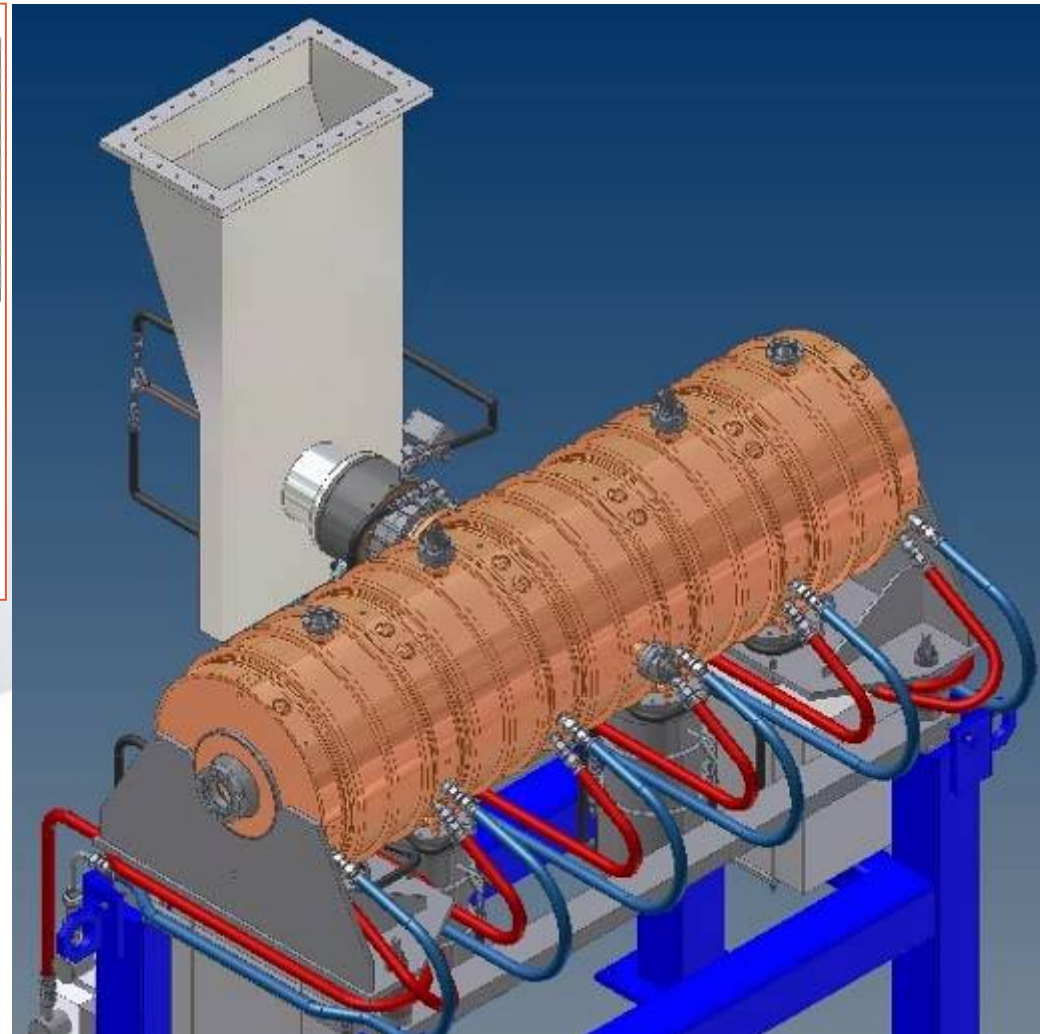


Results for Pin = 80 kW

**VSWR: 1.008**

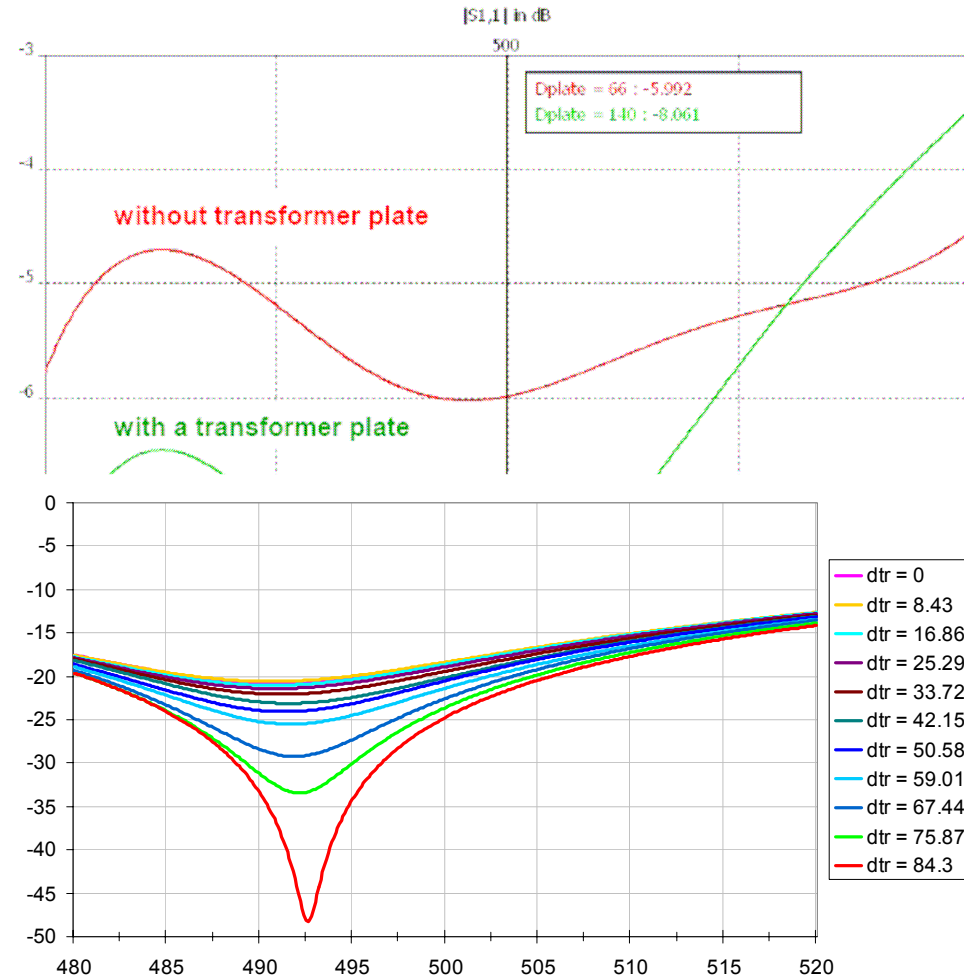
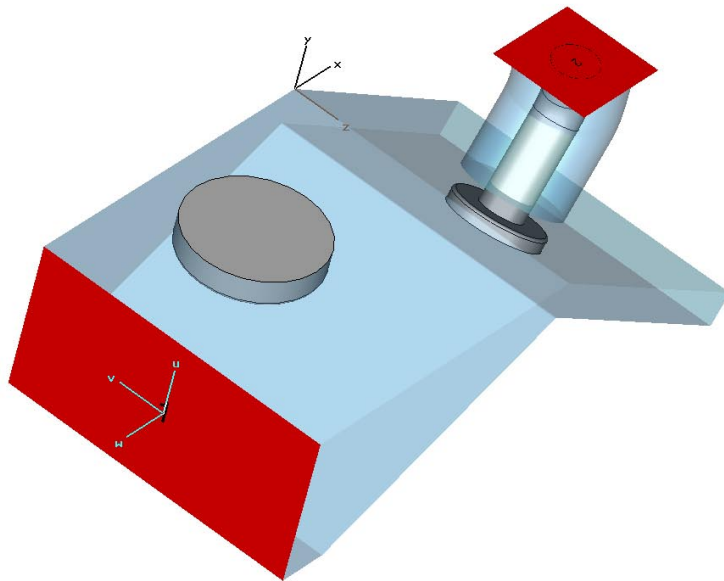
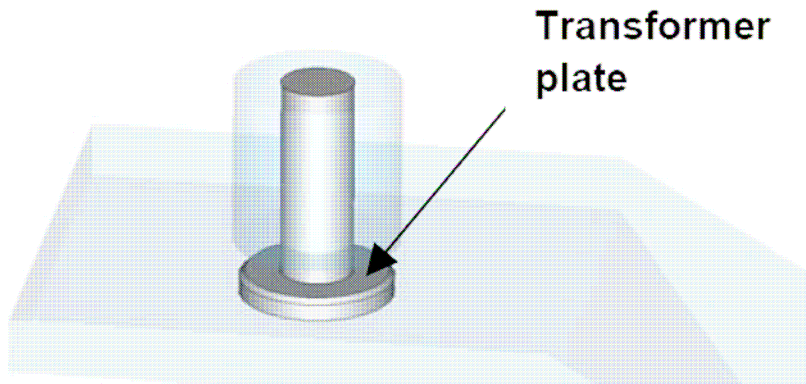
**$E_{\max}$ : 168 kV/m**

**$P_{\text{dis}}$ : 20 W**



# 4. WATRAX prototypes (AFT)

- The manufactured prototype by AFT

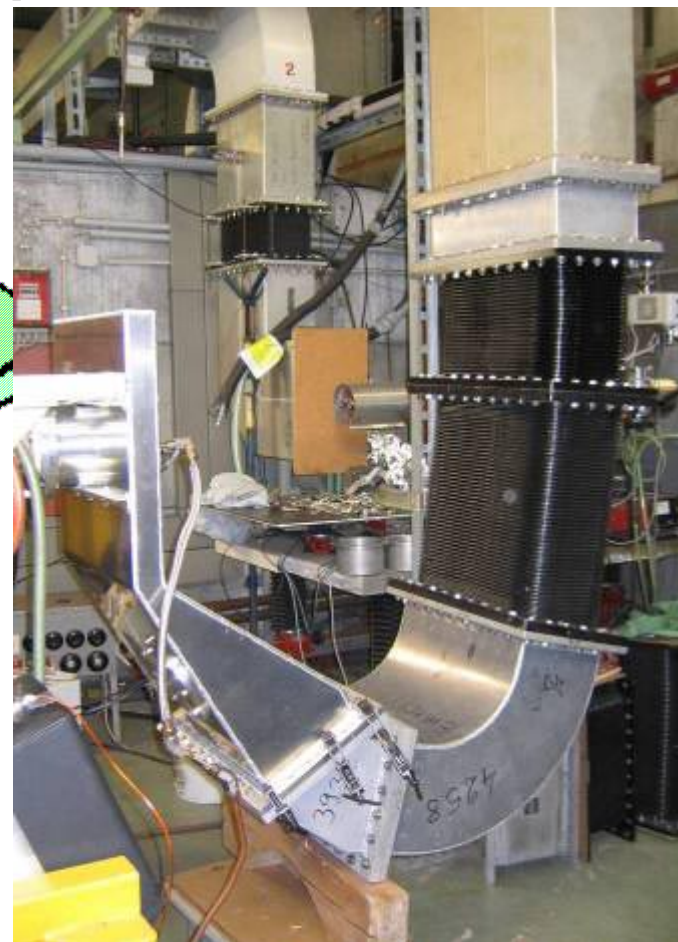
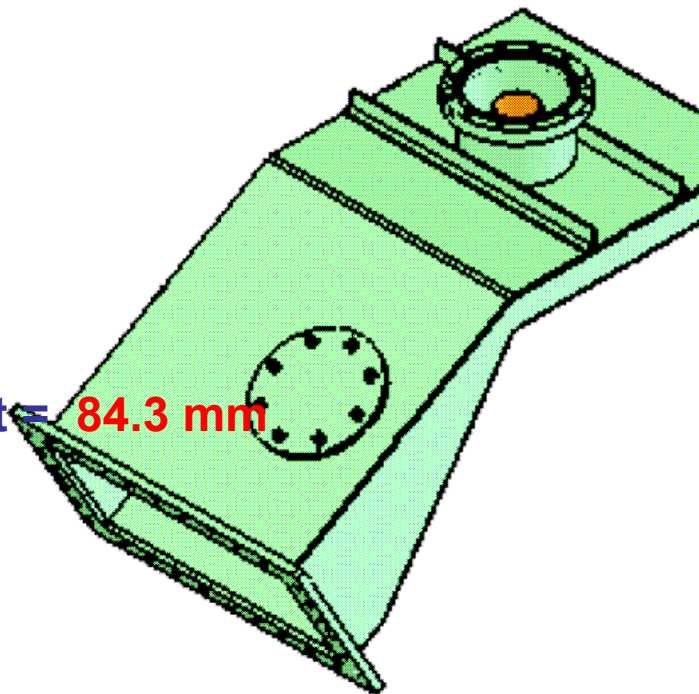




## 4. WATRAX prototypes (AFT)

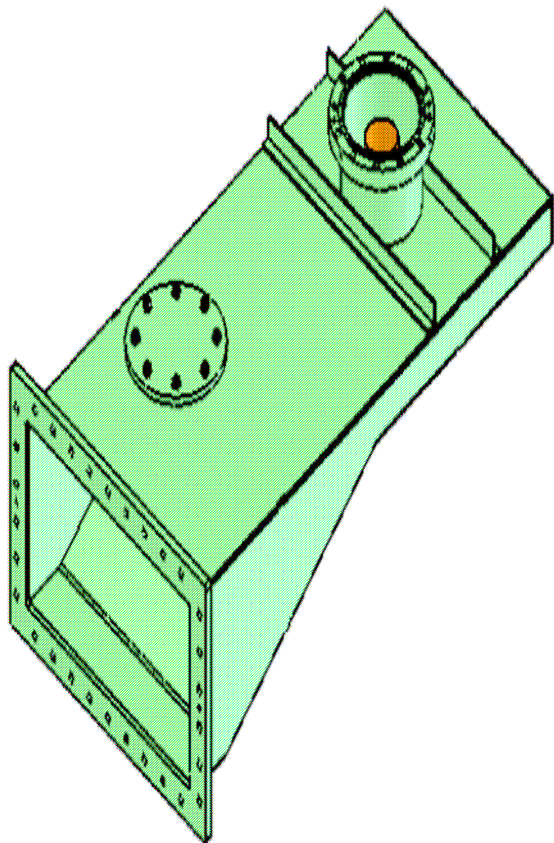
- WATRAX model for the SR

Transversal offset = 84.3 mm



## 4. WATRAX prototypes (AFT)

- WATRAX model for the Booster



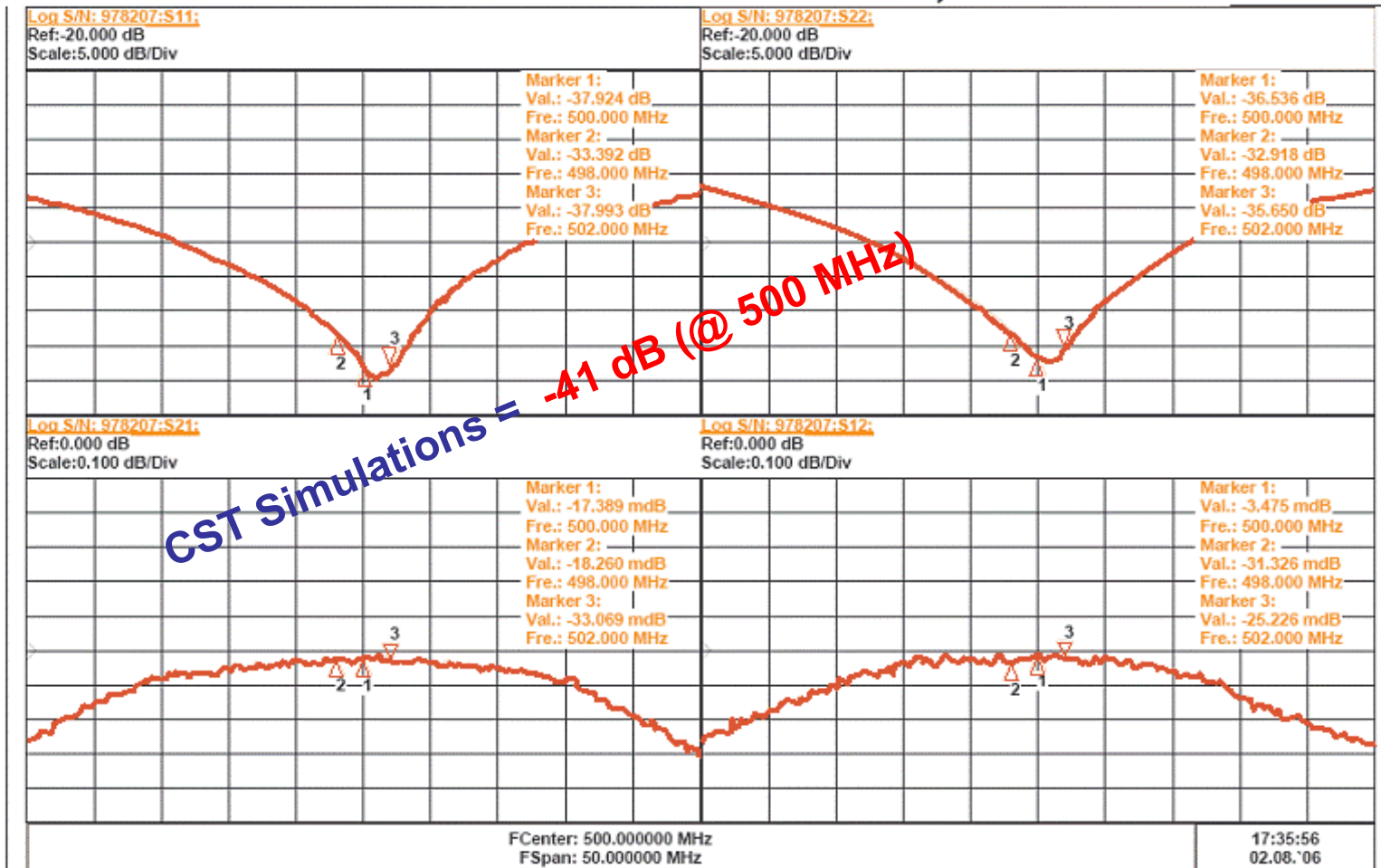
Transversal offset = **98.3 mm**



# 5. Low Power Tests (factory)

# SR model

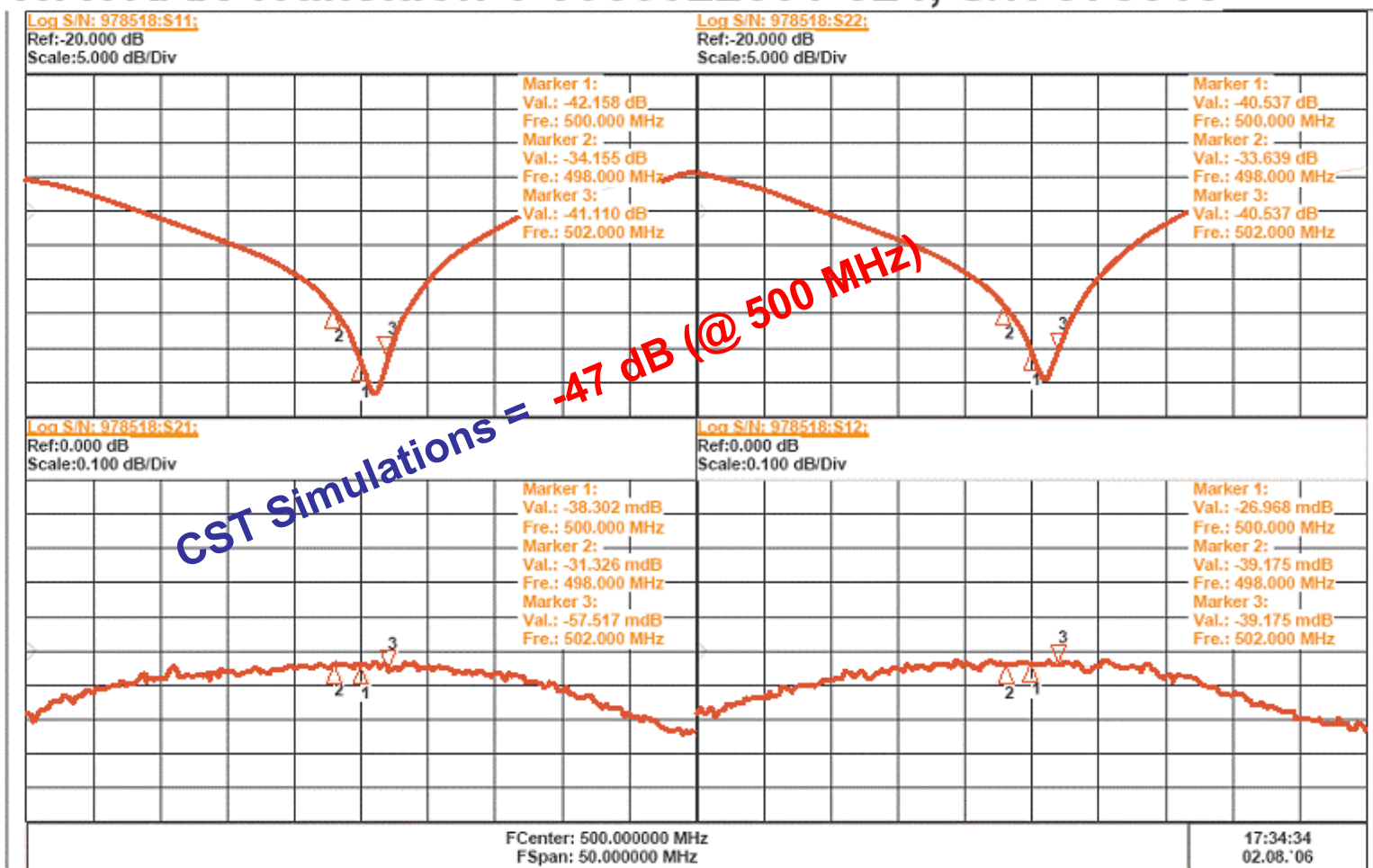
## WATRAX Transition 1-0050022600-324, S/N 978207





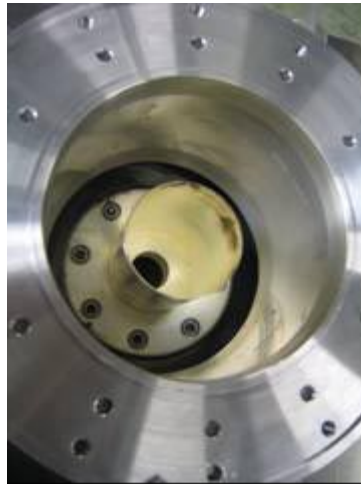
# 5. Low Power Tests (factory)      Booster model

WATRAX Transition 1-0050022601-324, S/N 978518



## 6. High Power Tests at DESY Booster model

- Some arcing at 65 kW and at 80 kW



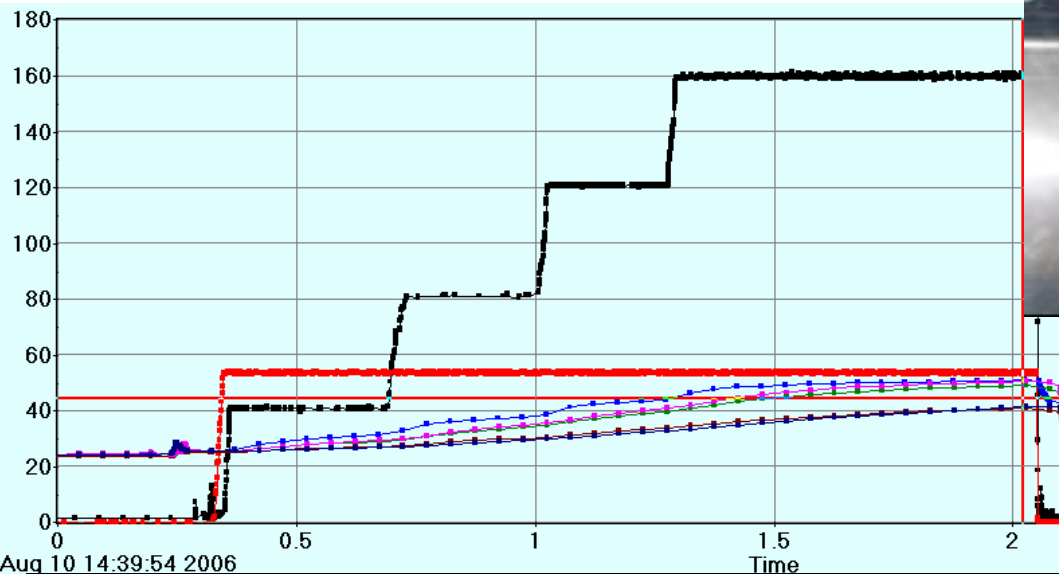
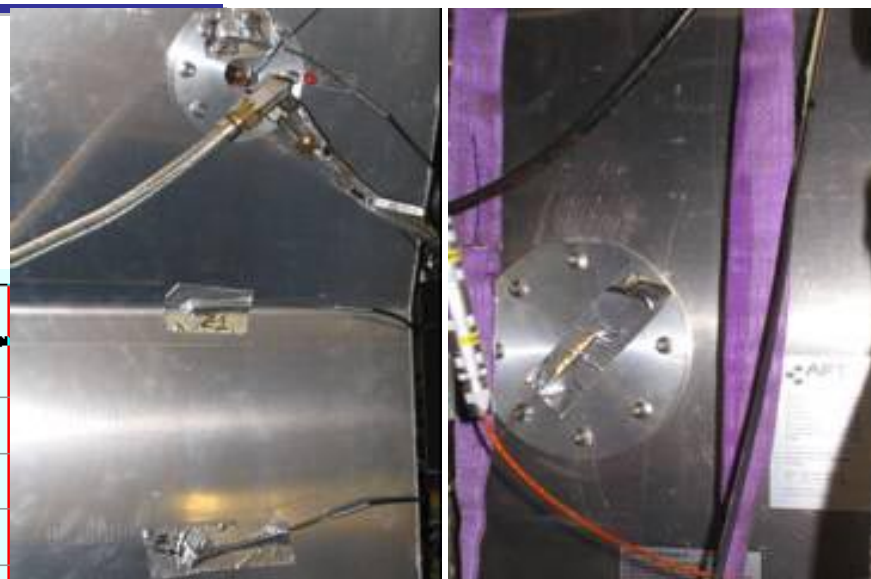
- After investigations, we found a bad contact in the inner coaxial:





# 6. High Power Tests at DESY Booster model

- Successful test over 160 kW
- Calorimetric power measurements
- Negligible reflected power



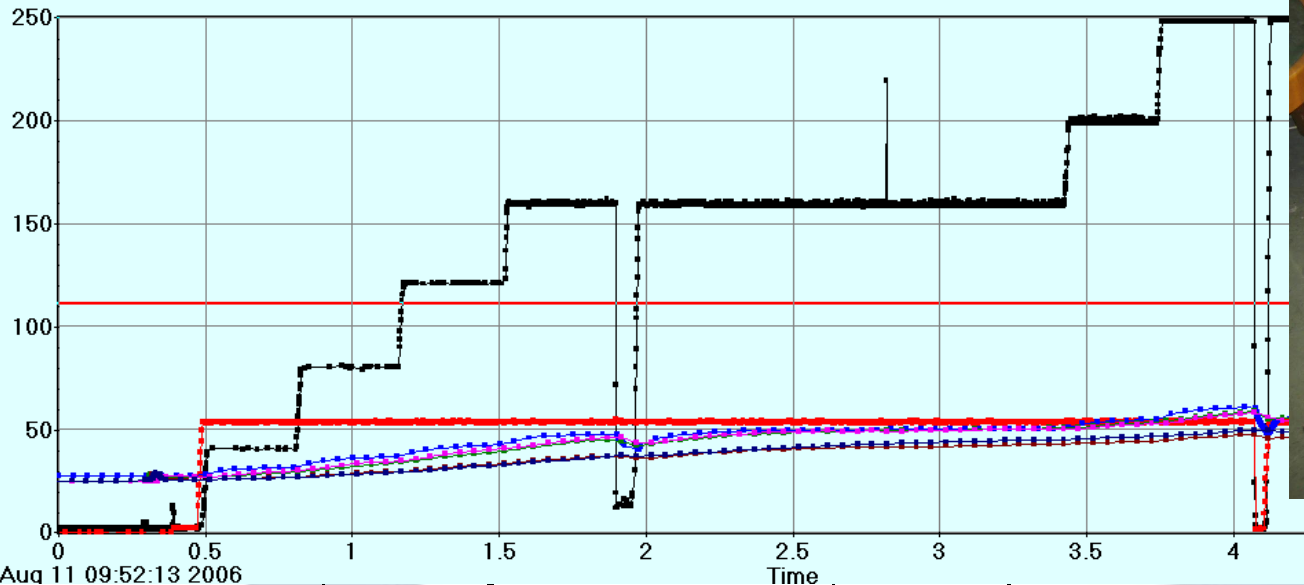
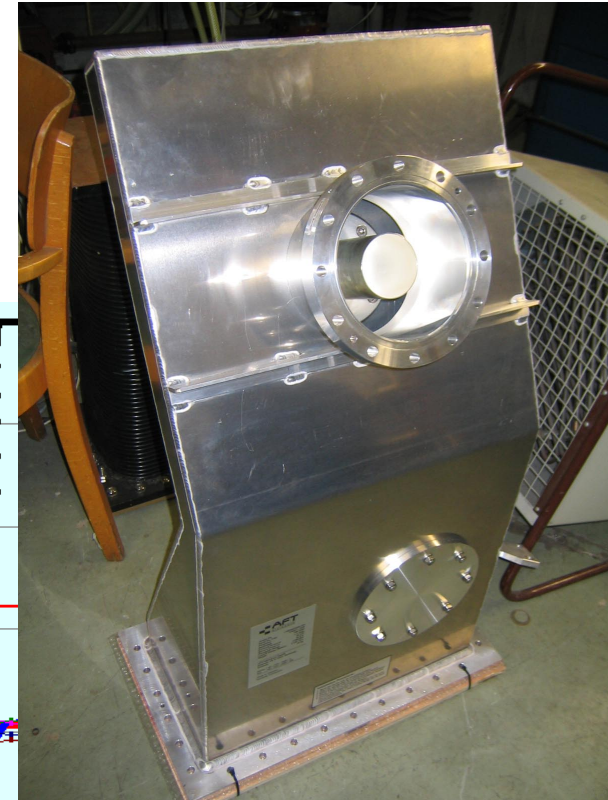
Aug 10 14:39:54 2006

Time	Klystron power [kW]	Klystron power calor [kW]	Power forward [kW]	Power Reflected [kW]	S11 [dB]	Z1 [°C]	Z2 [°C]	Z3 [°C]	Z4 [°C]	Luft [°C]
15:40	81	89,2	89,2	0,0	#NUM!	34,8	30,8	35,8	30	38,6
16:40	160	177,6	175,8	1,9	-19,8	49,9	41,5	51,4	41,8	51,9

# 6. High Power Tests at DESY

- Over 250 kW, with similar temperatures
- Higher Reflected power (unexpected)
  - Low power measurements (CELLS)
  - Re-tune the WATRAX

## SR model



Aug 11 09:52:13 2006

Time	Klystron power [kW]	Klystron power [kW]	Power forward [kW]	Power Reflected [kW]	S11 [dB]	Z1 [°C]	Z2 [°C]	Z3 [°C]	Z4 [°C]	Luft [°C]
13:15	160	183,5	172,4	11,1	-11,9	51,8	44	51,3	46,1	51,5
14:15	250	286,3	267,8	18,6	-11,6	60	49	59,1	51,7	62,5

# Outlook

- Repeat the Low power measurements at CELLS
- Better tuning in the SR model
- Possibility of water cooling
- Production of the rest of units (6 SR + 1 Booster)

**Acknowledgements to Borut Baricevic (now at I-Tech, Slovenia)**

**and also to DESY for the High Power Tests**