



Past Years "HighLights"
of DESY RF- Group

Do You know this ???



There is a Presentation:

- We did ...
- Everything was fine ...
- No problems ...



*But in the evening after the presentation,
and some beers later ..*



- It didn't work so fine
- We had lots of problems
- We had a breakdown here...
- ...and a crash there...
- It was a hard time...
-



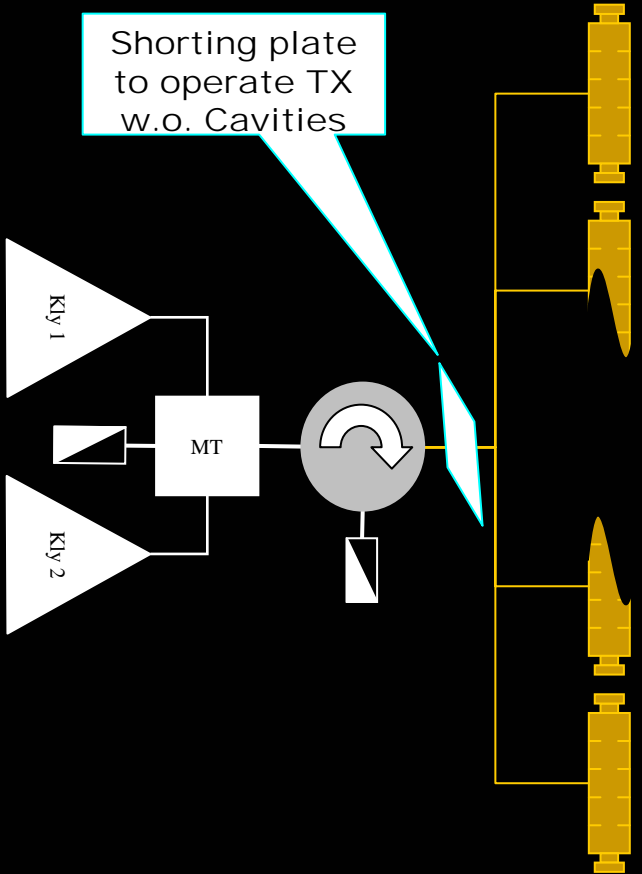
The real topic of my talk is:

Past Years "HighLights"
of DESY RF - Group

The truth

(that is usually spoken 10 beers after)

Bad interlock contacts on WG shorting plate (1988)



We have a „shorting plate“ in our waveguide system to operate the Transmitter without the cavities.

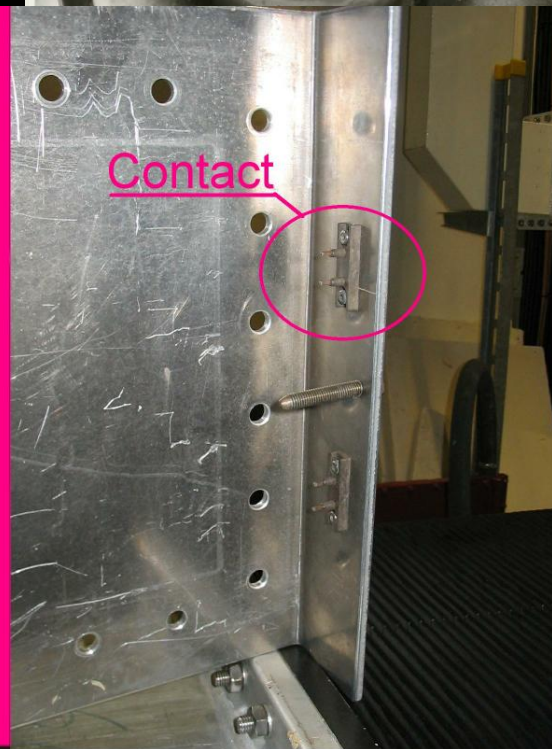
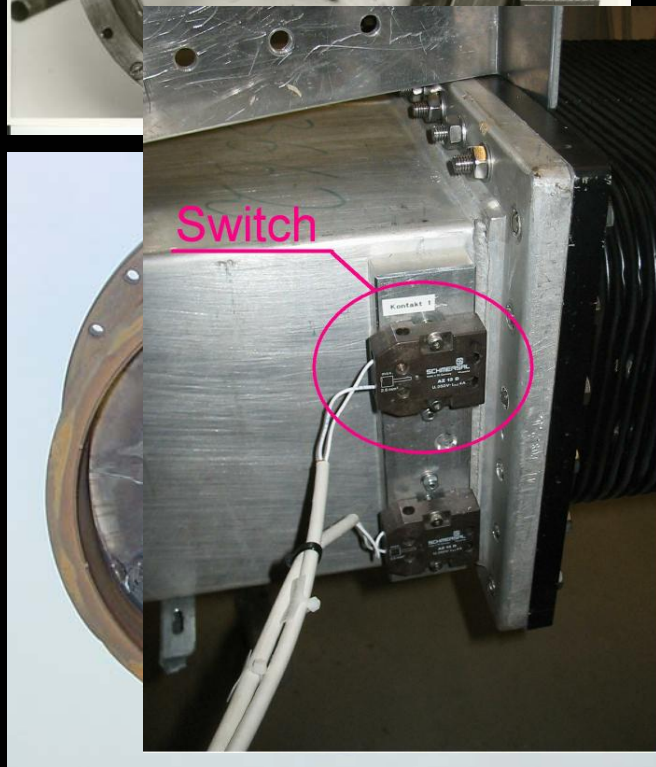
In „short operation“ the cavity interlock is deactivated (done by a micro switch)

After a “shut down” this micro switch had permanent contact.

☞ Cavity conditioning without cavity interlock!!

Here are the results

What did we learn:
Use switches, that do not stick together.

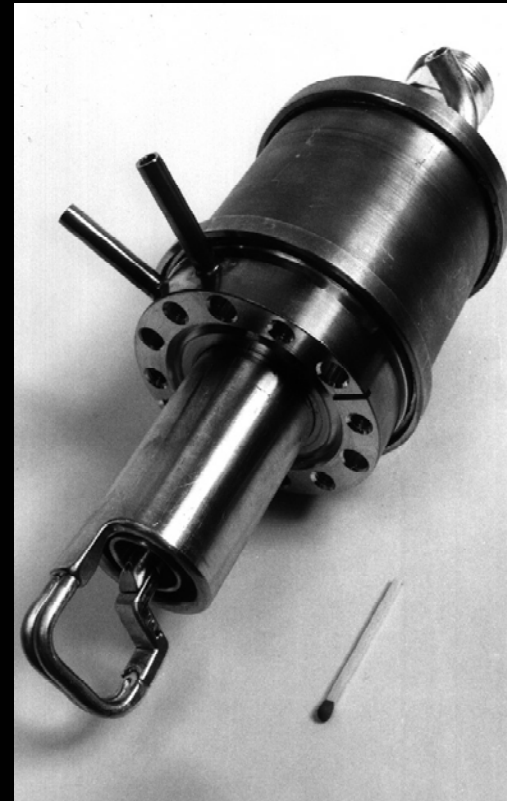
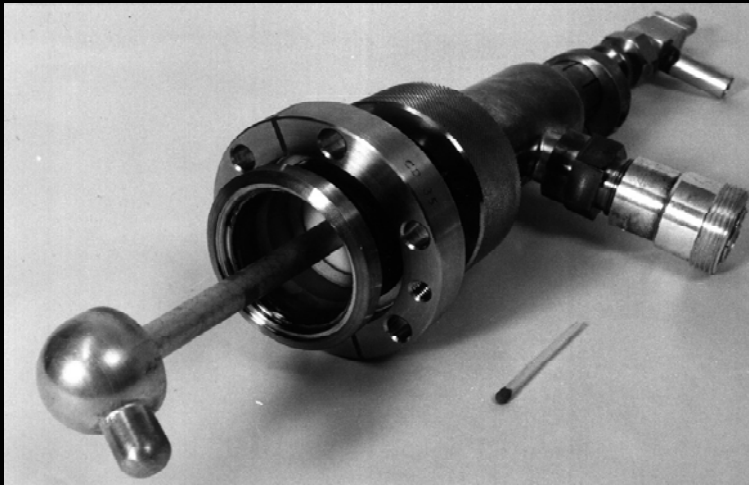


HOM- antennas in DORIS

We had HOM- antennas in our 5- cell cavities at DORIS.

One inductive and one capacitive antenna per cavity

Each one is water-cooled.

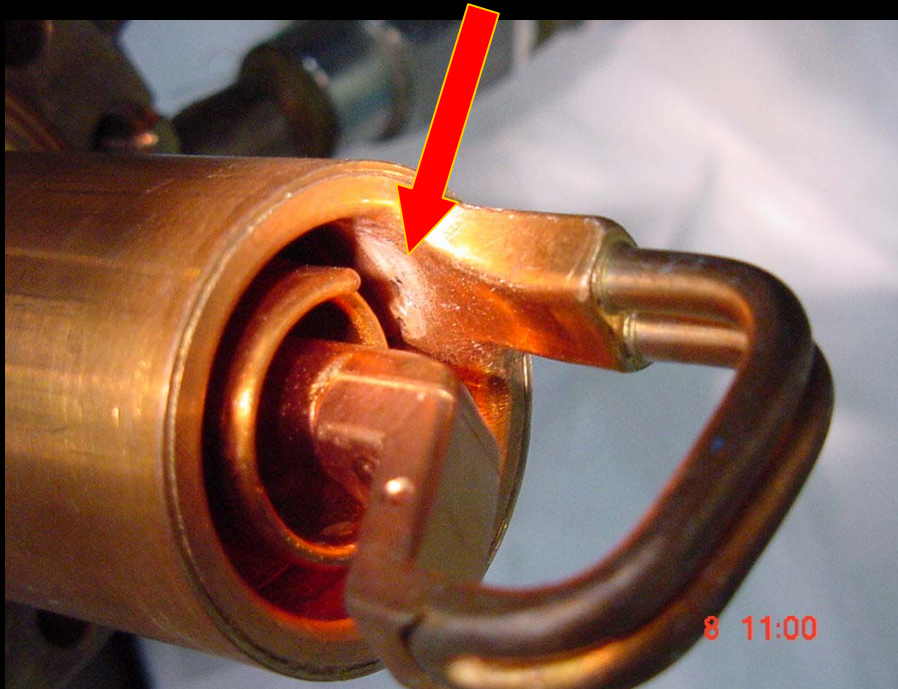


After some years of operation we had a very small water leakage in the DORIS RF- section (2001)



- April 23, 2001
 - DORIS Cavity 4.1
- What did we learn:

- Avoid installing water-cooled parts into the vacuum system
 - leakage between water system and vacuum at the inductive HOM-coupler
 - antennas in operation for 15 years
 - the water had rinsed big craters in the copper
 - sooner or later all of them would leak
 - removed all of the from DORIS
- If necessary keep the walls as thick as possible.



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Flooding a Klystron Nov. 1998

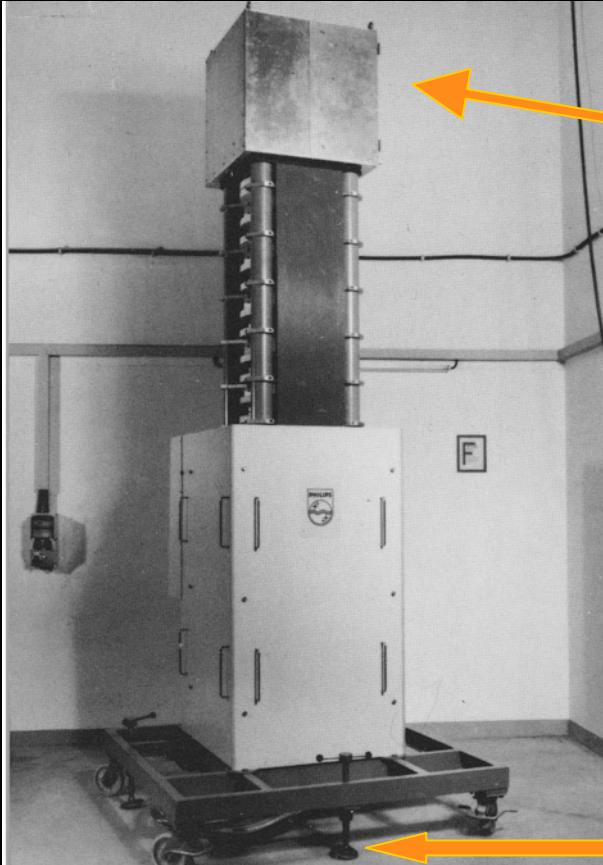
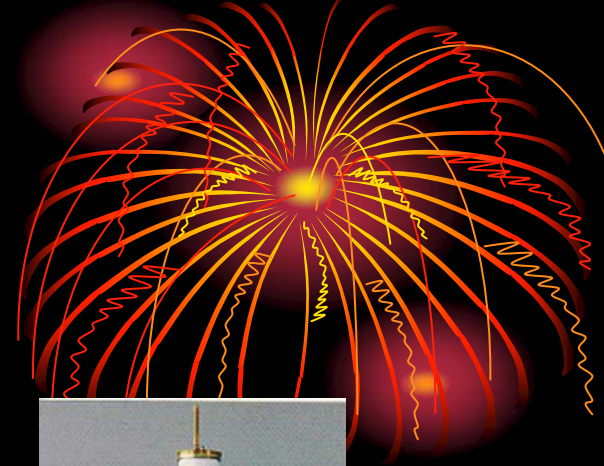


Late at night !!
The telephone rings !!
One of our older
teleges answered the
phone:



You're kidding, there is only water in the
lower part of the klystron.
There is water flowing out of
The gun area isn't water-cooled!!!
the High Voltage Housing..."

What happened



Our Klystrons look like this:

High Voltage housing

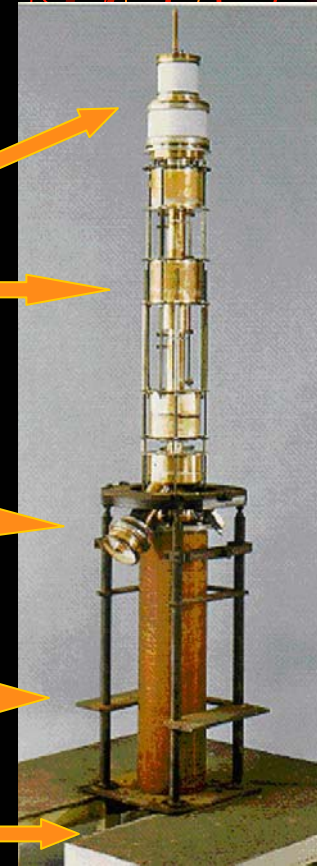
Mod. Anode, cathode etc. ,

Cavities with cooling on the outer side,

output coupler,

Collector, with waterflow on the outer side,

Water pipes on the floor



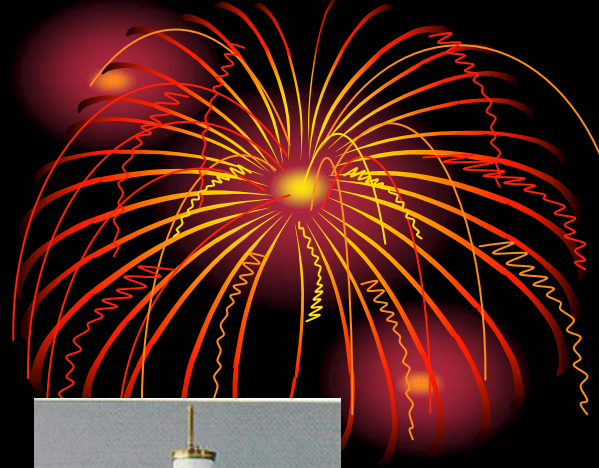
What happened



But:

- If the focus trips
- the interlock fails
- Some racks have no power

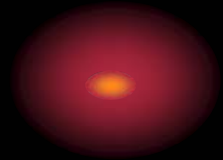
then the beam
melts a hole in
the collector
and...



What did we learn:

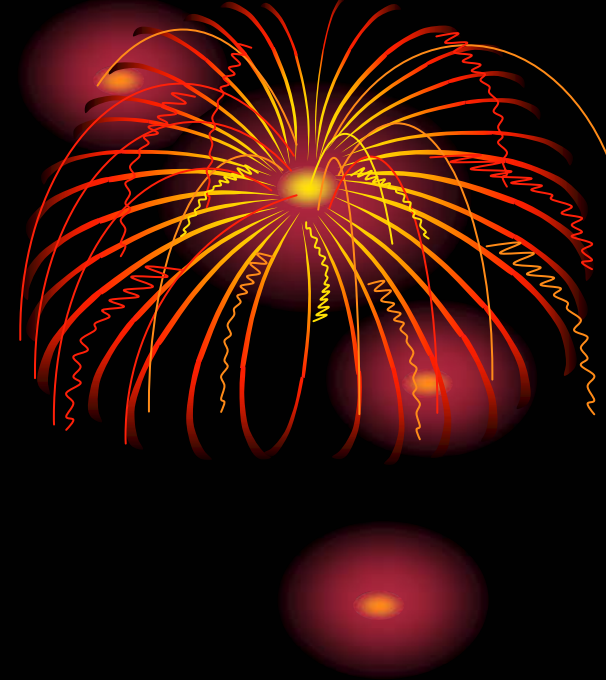
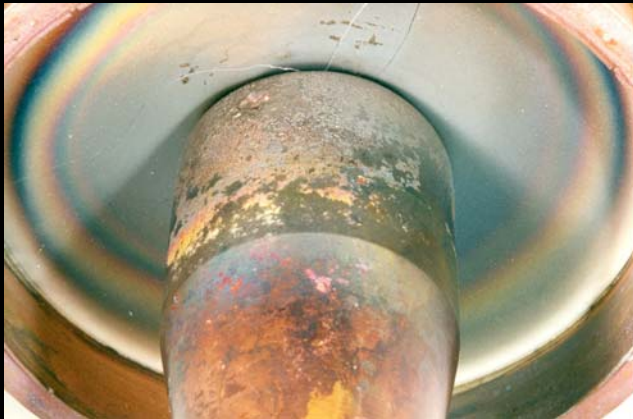
Design the interlock (contacts) power
fail save

Vacuum Crash on 12 Cavities (1998)



- Commissioning of cavities
- Interlock failure
- Vacuum measurement failure
- Misinterpreting
- Interlock jumpered at the wrong place
- Full power on "not conditioned cavities"
- Sparking on Coupler without rf switch off
- ☠ 12 Input coupler broke ☠

Pictures



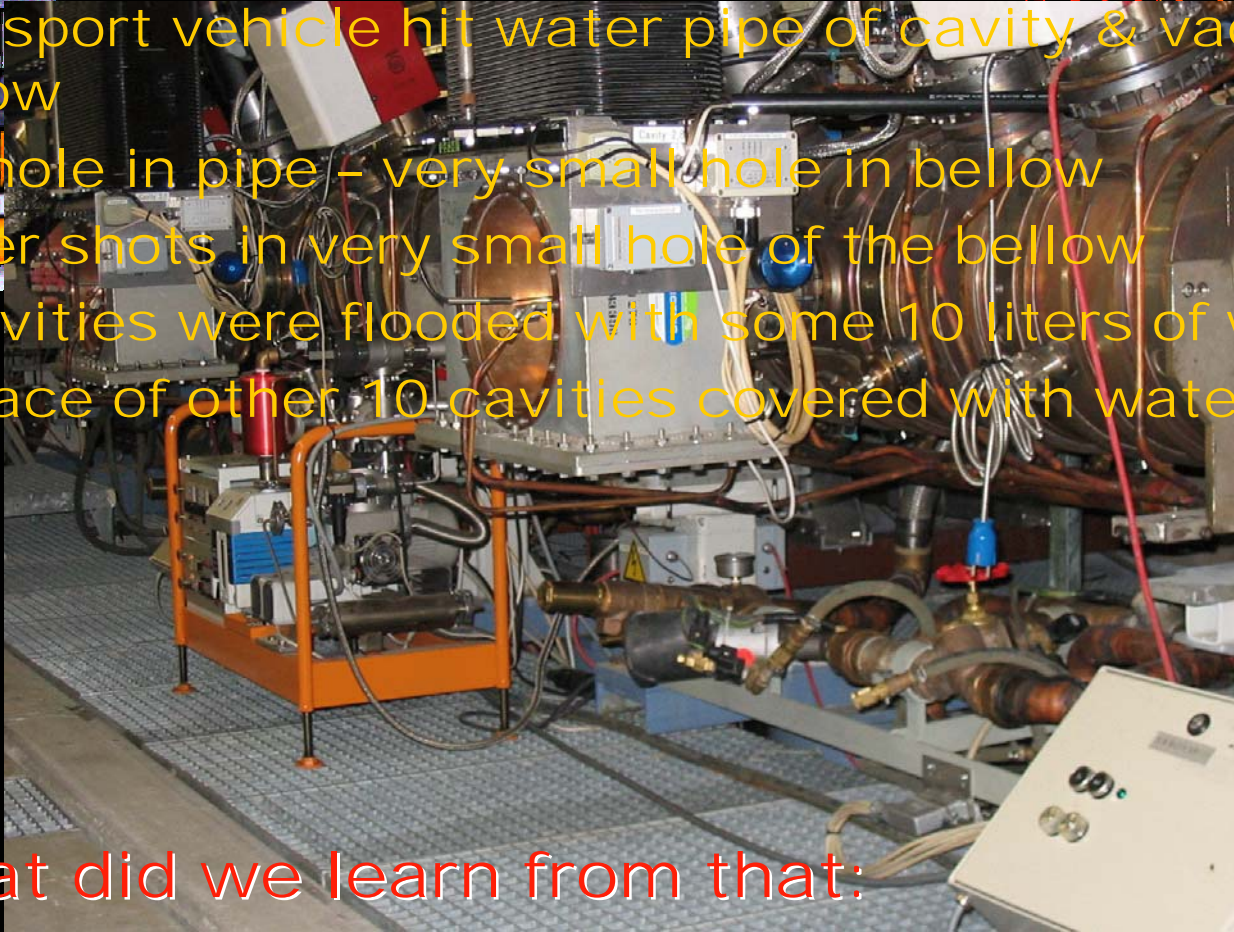
What did we learn:

- Interlock jumpering only by EXPERTS
- Test the interlock before switch on

Flooded Cavities (2000)



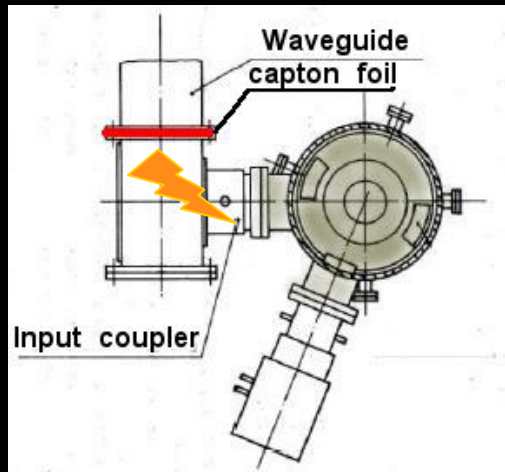
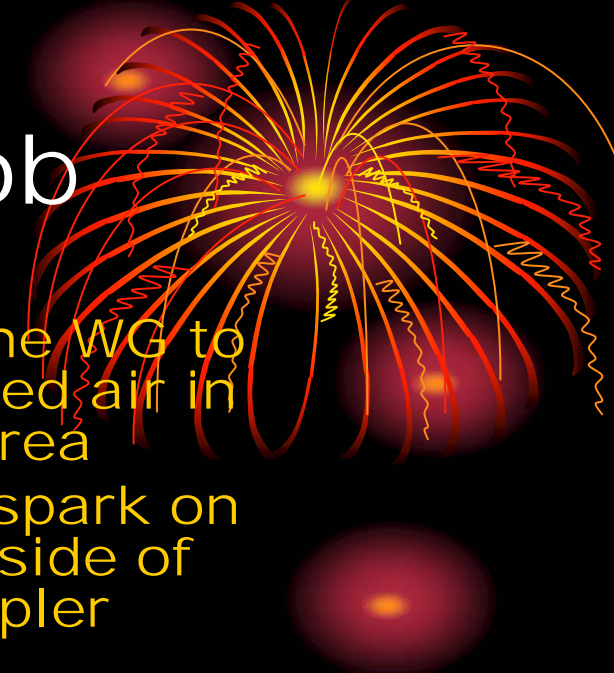
- Transport vehicle hit water pipe of cavity & vacuum-bellow
- Big hole in pipe - very small hole in bellow
- Water shots in very small hole of the bellow
- 2 Cavities were flooded with some 10 liters of water
- Surface of other 10 cavities covered with water drops



What did we learn from that:

You can't protect Yourself from everything

Sparking at a doorknob



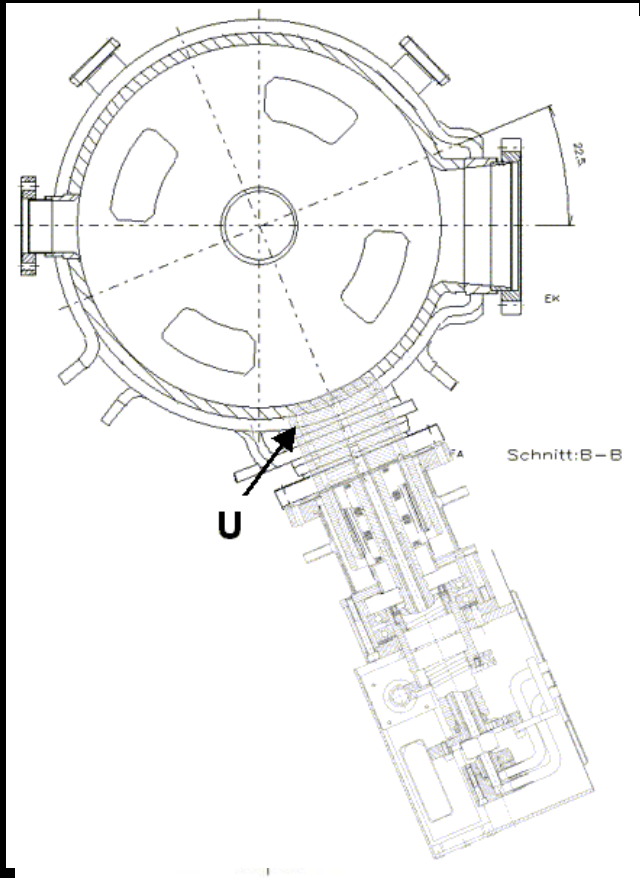
- We shutted the WG to keep the forced air in the coupler area
- There was a spark on the air- flow- side of the input coupler



The spark produced a pressure- wave, that deformed the doorknob

What did we learn from that:
No capton foils to close to
"sparking risk" areas

Plunger deforming (2002)



Usually our plungers are mounted on the top of a cavity

But there is one area, where they have to be on the bottom side

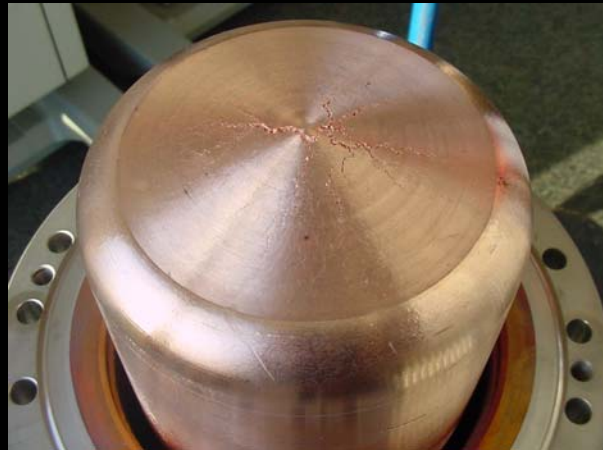
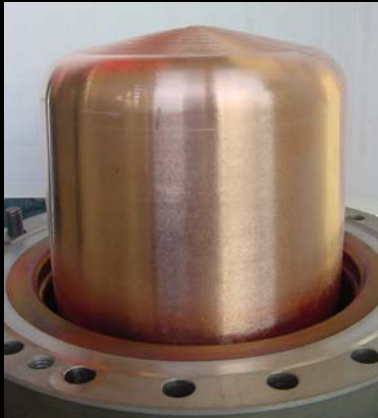
.. and for some reason we had to decrease the water flow (*seems to be no problem – deposited power is small*)

BUT....



Air -bubbles move
to the top of a device
What did we learn from that:
So there is no cooling at
Keep the water flow big
enough, that there are no
bubbles in the system
all
The plunger get's hot and
looks like

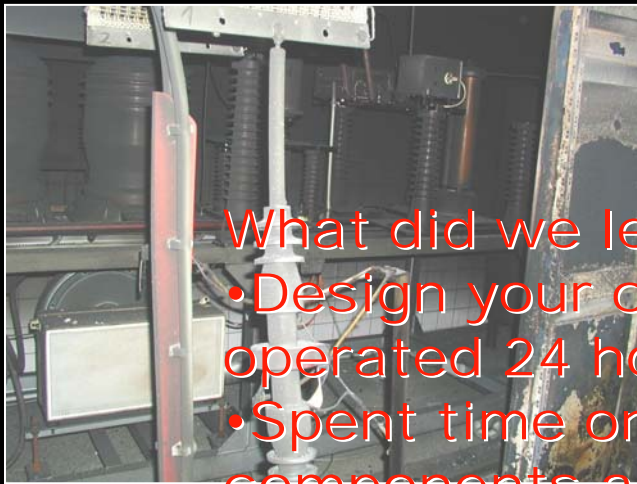
this:



Crowbar burns (2003)



- Crowbar has hv-supply for initial spark
- Discharge-resistor went hot and damaged hv capacitor
- Leakage current
- Heat, fire



- What did we learn from that:
 - Design your components to be operated 24 hours / 7days
 - Spent time on inspections of your components at regular intervals

Why all this??

You might think : What losers

But ...

We have 112 Cavities & 25 klystrons in operation.



Every 50 Years a serious damage at a cavity and

Every 200 Years a serious damage at a klystron

Scale this to Your Lab and ...

Maybe You can learn from our mistakes

