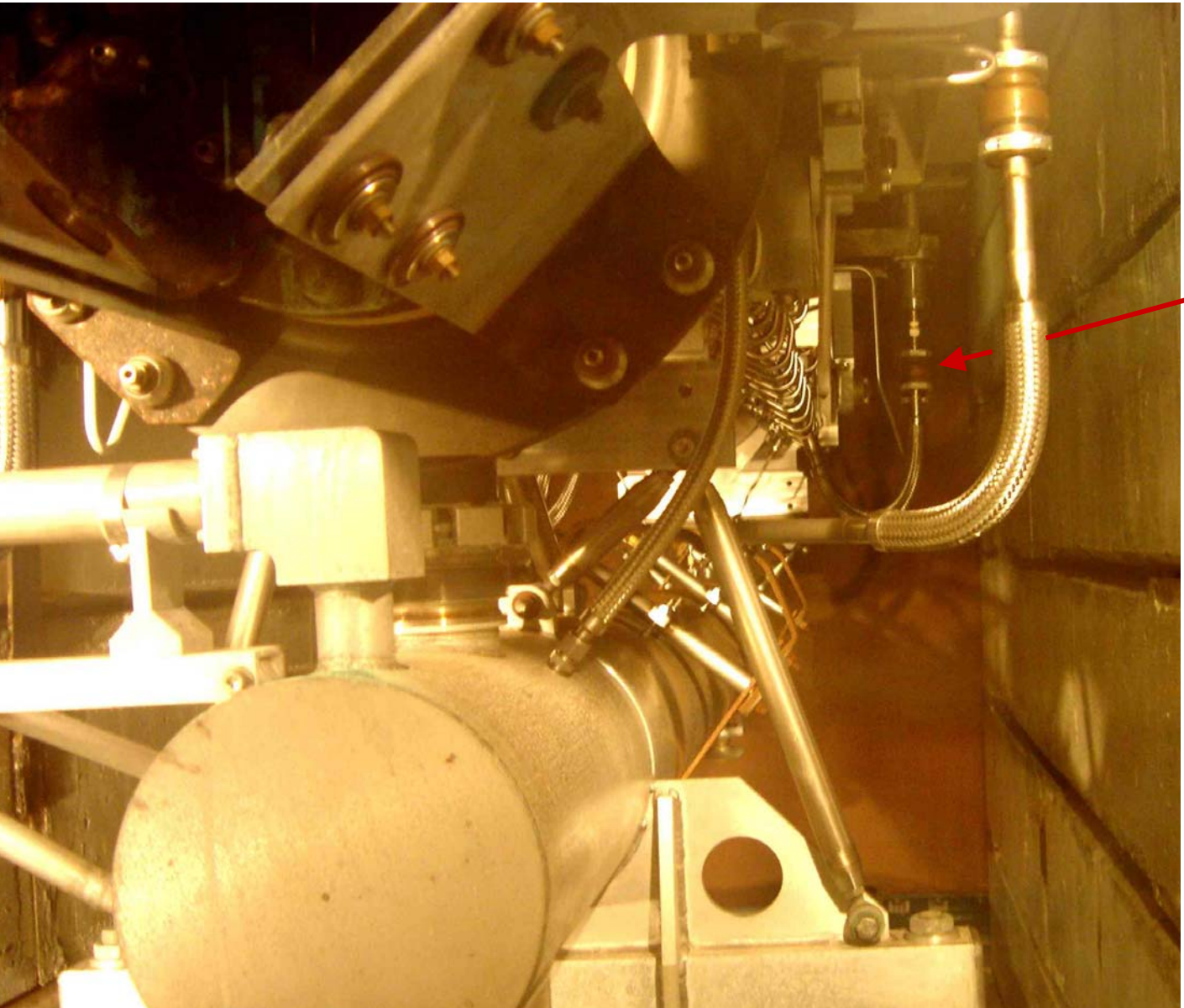
NuMI / MINOS Status – Horn Fixed !



Horn 1 had
drip, drip, drip…
7 gal/day water leak

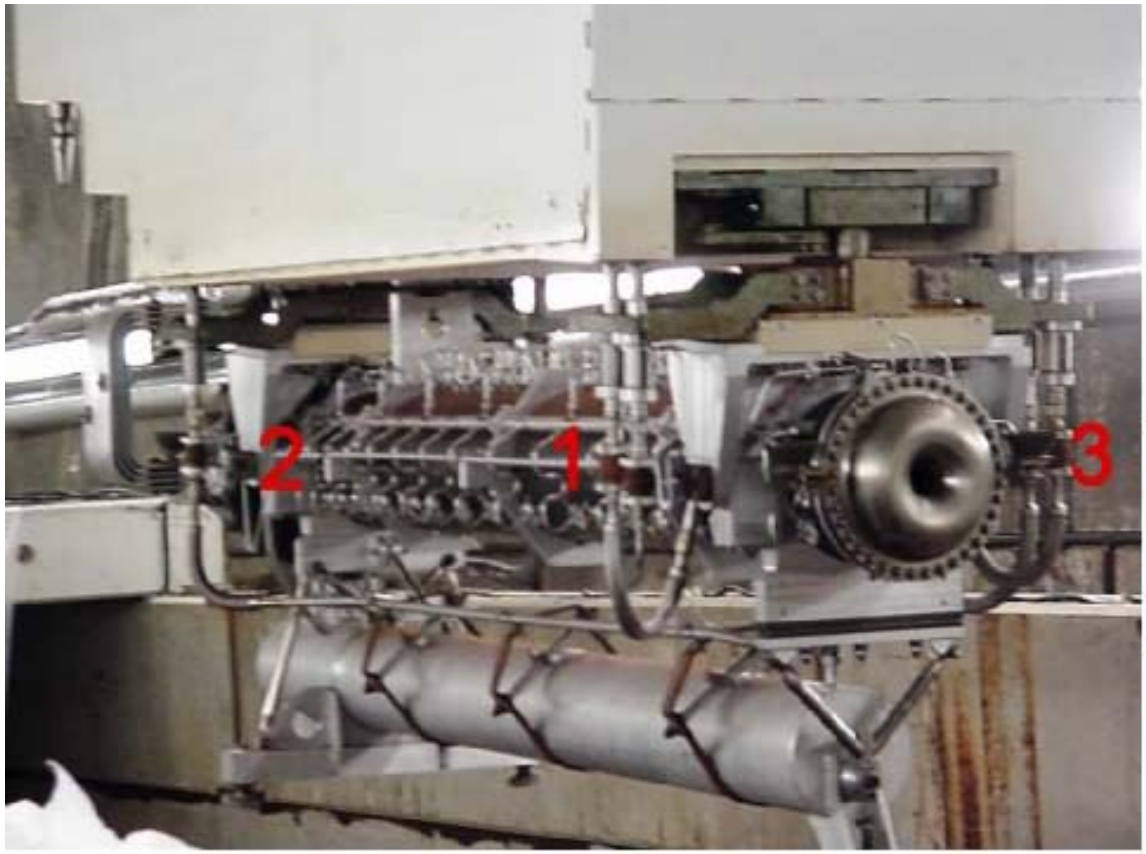
Leak is at ceramic
electrical break
for water spray line

Would be trivial to
fix, except horn is
very radio-activated

Horn repaired last
Friday and pulse
tested Saturday

No leak, horn works

Radiation: 75 r/hr on contact
35 r/hr at 1 foot



Point	Doserate @ 1 foot (mr/hour)	Doserate On Contact (mr/hour)
1	35000	75000
2	40000	75000
3	35000	80000

This is 10x as much as we had for the recent Horn 2 repair !

Repair person will get weekly dose limit in a few seconds

Shielding for job

Built an extension of the work-cell with slot for work

(Horn is in work-cell, behind the door)

Shielding cut dose for most steps by a factor of three or more

FERMILAB
ACCELERATOR
DIVISION

DATE: 8/22/06	TIME: 0900	PURPOSE: Survey for ceramic repair	RWP # N/A

NuMI Horn 1 Ceramic Repair
August 2006 Map 2

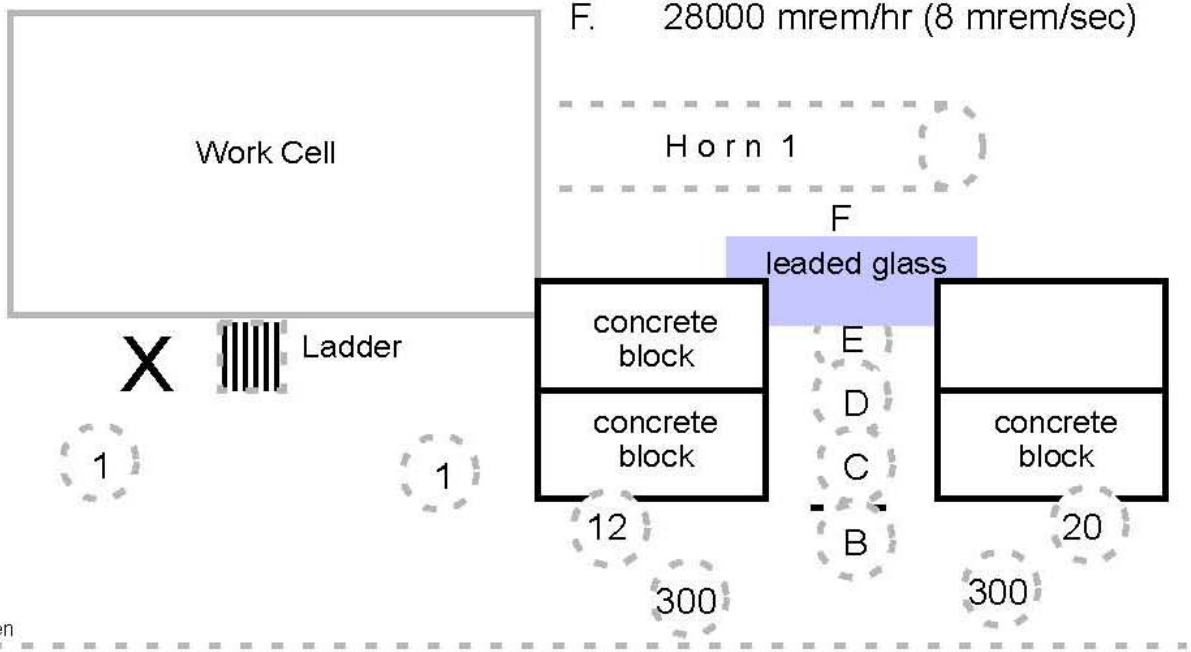
B. 2000 mrem/hr (0.6 mrem/sec)

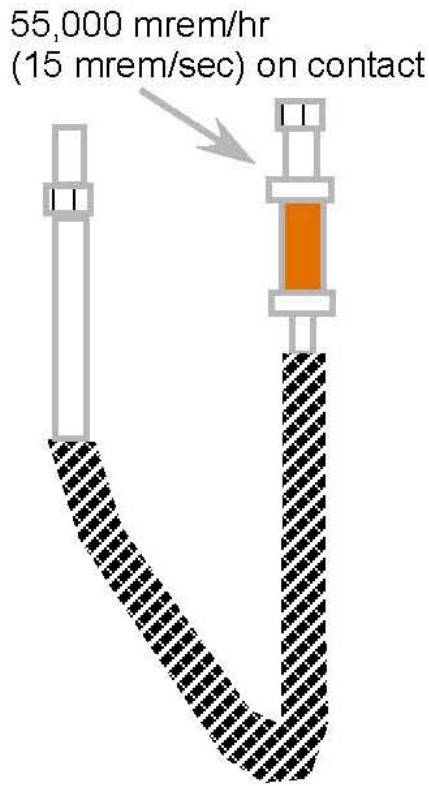
C. 3000 mrem/hr (0.8 mrem/sec)

D. 3000 mrem/hr (0.8 mrem/sec)

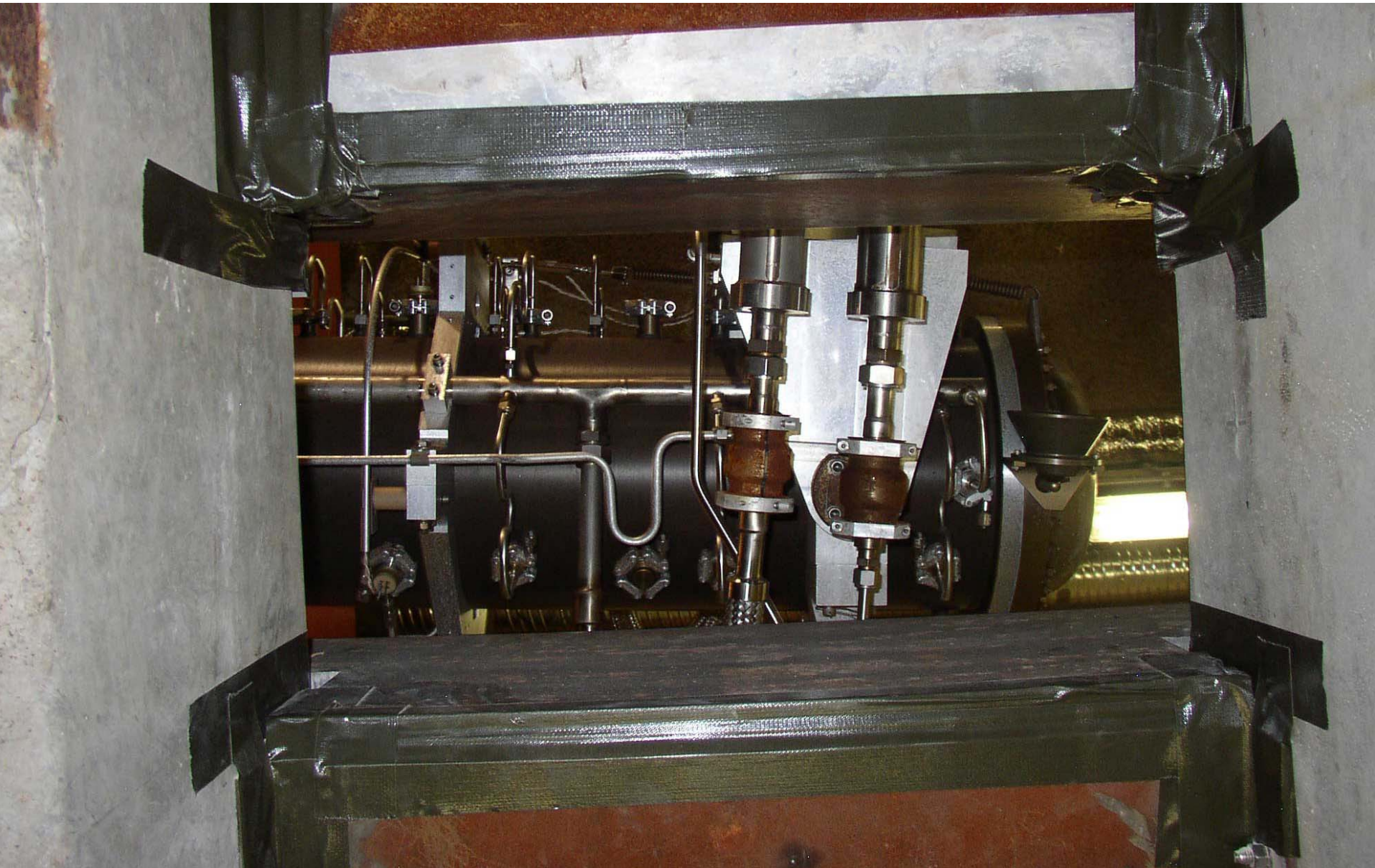
E. 7500 mrem/hr (2 mrem/sec)

F. 28000 mrem/hr (8 mrem/sec)





View of horn through shielding slot



Mock-up and practice

Plan, practice and time repair

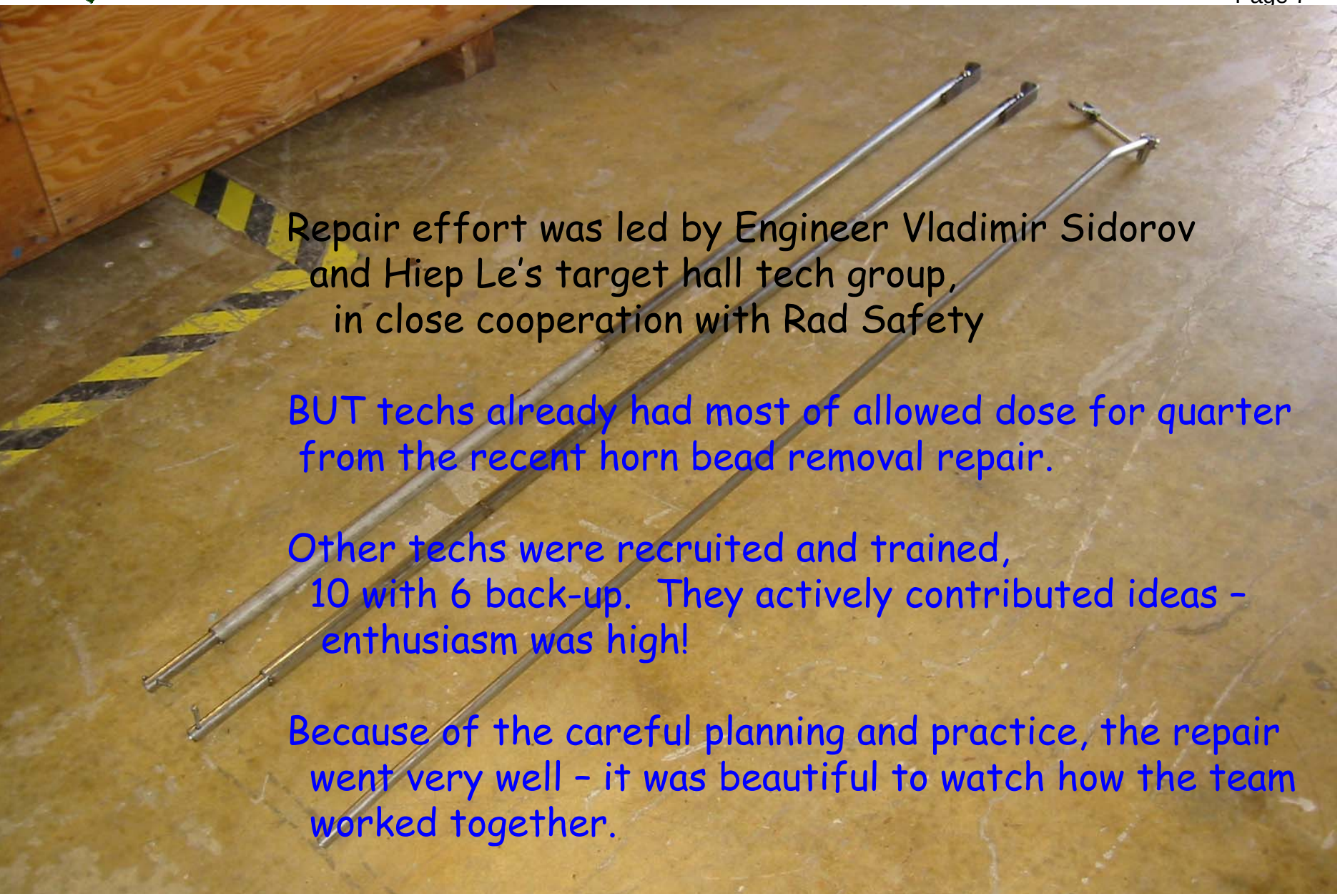
Needed to undo two Swagelok fittings, remove old section, insert new section, and tighten two fittings.

Time est: 2 min. of actual work in slot

Dose for this "2 min." job was ~ 371 mr.

Dose for the rest of job is in lower radiation, but takes longer – will also be significant.

Crew - and some specially constructed tools



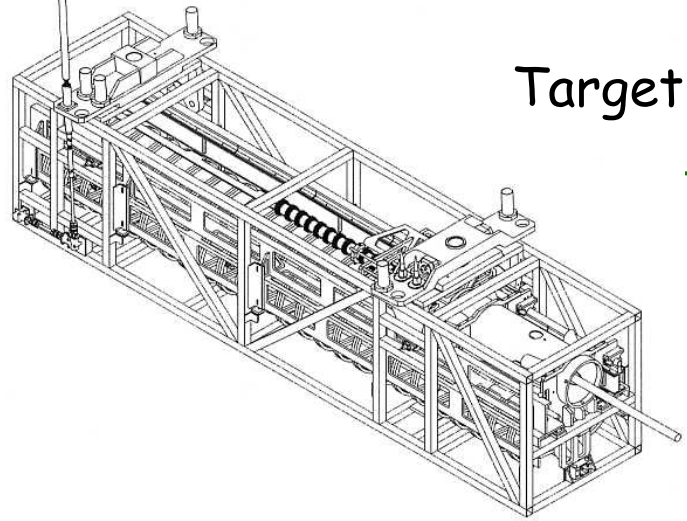
Repair effort was led by Engineer Vladimir Sidorov
and Hiep Le's target hall tech group,
in close cooperation with Rad Safety

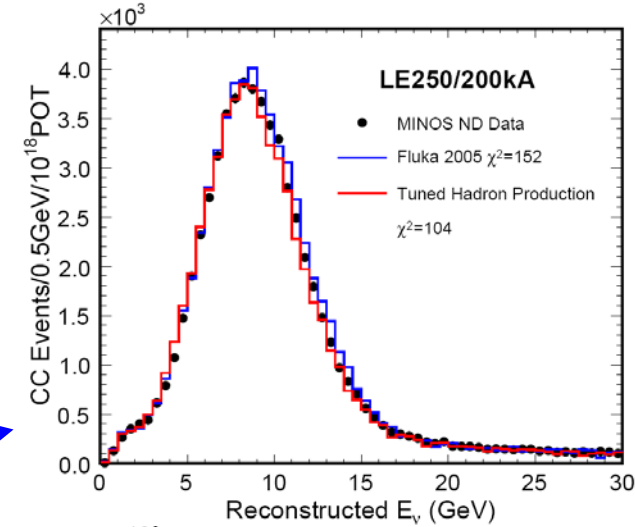
BUT techs already had most of allowed dose for quarter from the recent horn bead removal repair.

Other techs were recruited and trained,
10 with 6 back-up. They actively contributed ideas – enthusiasm was high!

Because of the careful planning and practice, the repair went very well – it was beautiful to watch how the team worked together.

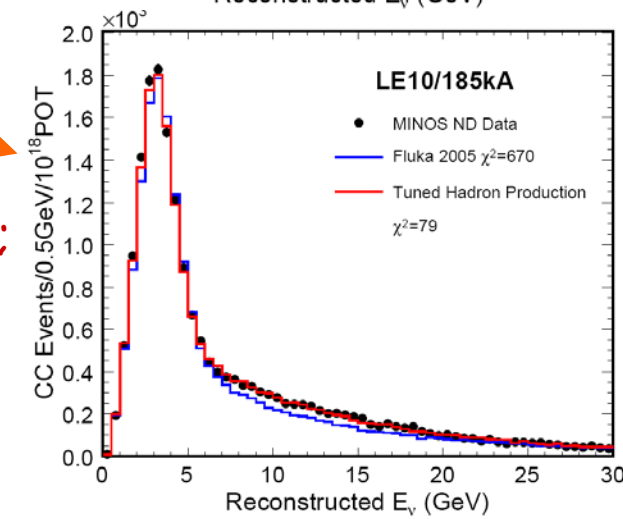
Target carrier problem





MINOS has been doing a special run with target in position to produce high energy neutrinos

Want to move target back to standard low energy position, but it is stuck.



(Target hall has an extremely corrosive atmosphere; e.g. water condensed from the air has pH 2.6)

With target pile open, we are trying to fix this now horn repair is finished.

If we can't un-stick the target drive, it will take ~ 1 week to replace target+carrier with spare.