Power Saving Accelerator

Demand of low CO2 production and environment affinitive accelerator

permanent magnet or superconducting magnet accelerator and more

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demand of low CO2 production accelerator

Physics society can be supported by Citizen.
In return,
Physics society must support Citizens in need.
Nowadays, High energy physics can not be grown as in th
past.
Innovation in Energy saving, affinitive to Environment an

demand of low CO2 production accelerator
required first time in a history

1. “Still river systems” 10 T synchrocyclotron

2. permanent cyclotron magnet(berkley, our group at NIR
3. permanent magnet FFAG
4. stronger superconducting cyclotron(ACCLEL/Varian)
5. pulsed superconducting synchrotron(GSI, CERN)
6. DWA(Lawrence Livermore)
7. RFI(linac systems)
and finally
8.CBS (Cold Beam Source)((BINP&kumada)
9. Magnet in Magnet concept(kumada)


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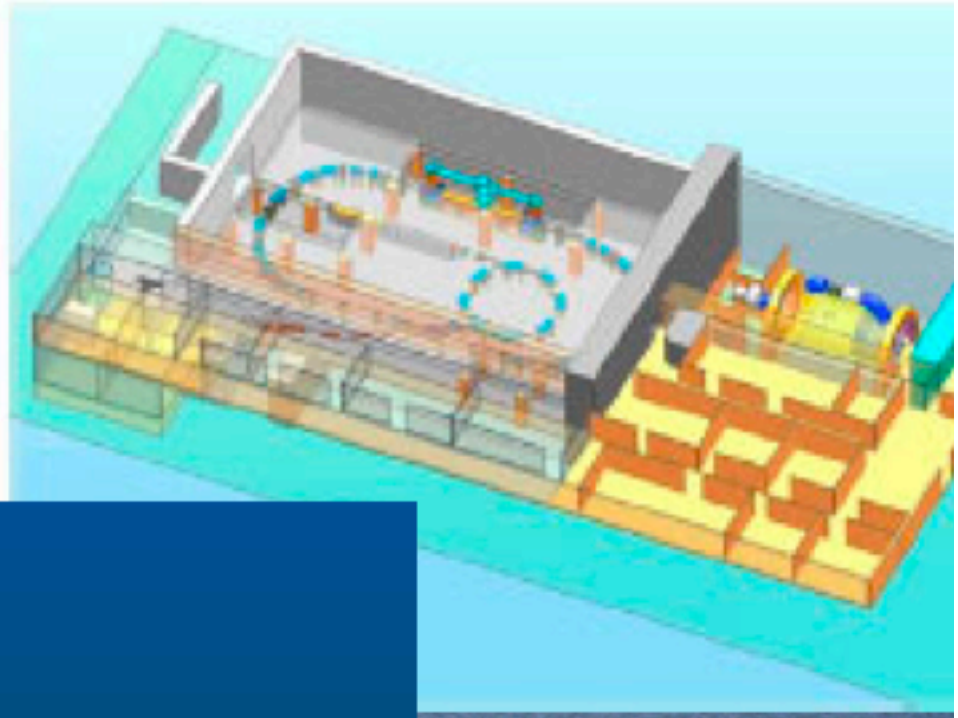
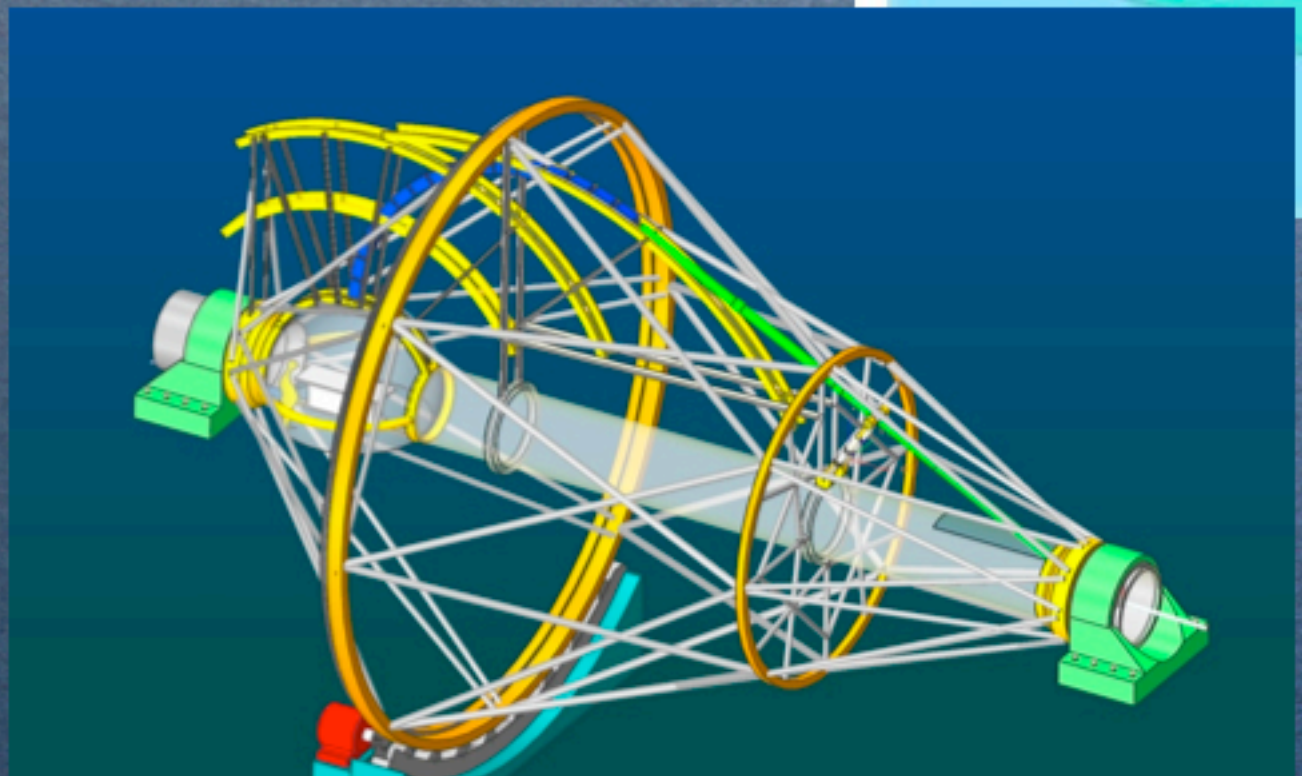
CBS from BINP





demand of low CO2 production accelerator and state of

permanent magnet:1.5 Tesla is relatively easy.
even 5 Tesla is possible.

while
copper electromagnet: 1.5 Tesla is the highest.

4.5 Tesla pulsed superconducting magnet become availab

10 Tesla synchro-cyclotron manget is at hand(press announcement may 2008)

demand of low CO2 production accelerator

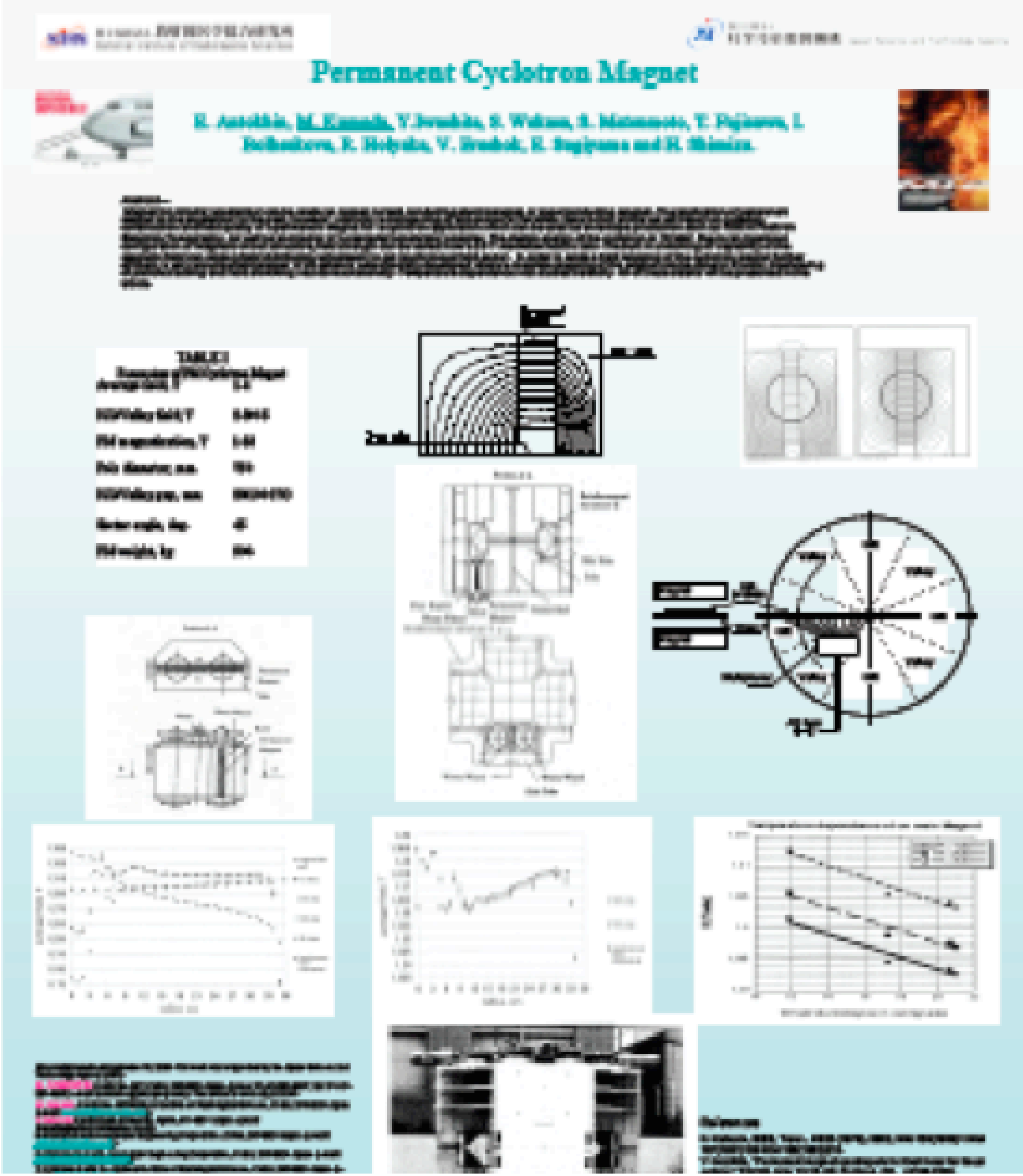
Difficulties in the past Permanent Magnet:

1. DC field but temperature dependent which means magnetic field is not stable enough
2. degradation in accelerator by irradiation of beam
3. Switch on and off is not possible.
4. changing field strength is not possible
5. assembly is very difficult

demand of low CO_2 production accelerator

said problems can be solved by having a combination of North pole and South pole.
"magnet in pair"
(patent)

Examples are shown by Kumada, Iwashita,Antokhin.


Permanent Cyclotron Magnet

demand of low CO2 production accelerator

Electron cooling is a strong tool for power saving.

CBS(Cold Beam Source) is such an example where ion beam
size is less than a 1 mm.
Total weight of magnet can be ultimately light.
Also enables flexible state of the art beam extraction.

Power Efficiency by carbon ion
(single fraction treatment of carbon vs. 35 fraction of

demand of low CO_2 production accelerator

power saving of magnet is not enough.

Total power saving of accelerator is demanded.
Linac must be high gradient(100MeV/m) and compact
(Dialect Wall Accelerator by Livermore/Tomotherapy)
Power saving of cavity (Iwashita)

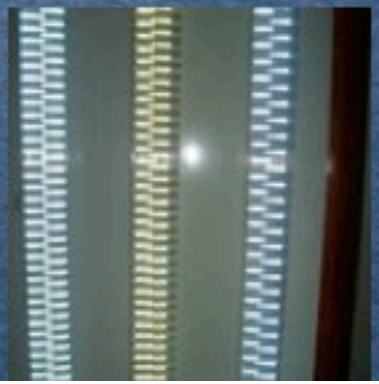
Higher efficiency of Water Cooling, air conditioning of accelerator components are mandatory.

demand of low CO_2 production accelerator

All conventional lights can be replaced by solid state LED lightings.
power consumption of lighting is typically 20 % of electric

Innovation of lighting begun:

(100 lumen/W LED light is now available and still at a slope of improvement.)



demand of low CO2 production accelerator

for a sake of sustaining society, a current stat
of the art of the accelerator design
must be reconsidered from a viewpoint of
improving Global Warming.

Thank you.