

ICARST 2017

1st International Conference on Applications
of Radiation Science and Technology



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Addressing challenges posed by electron beam irradiation through innovation

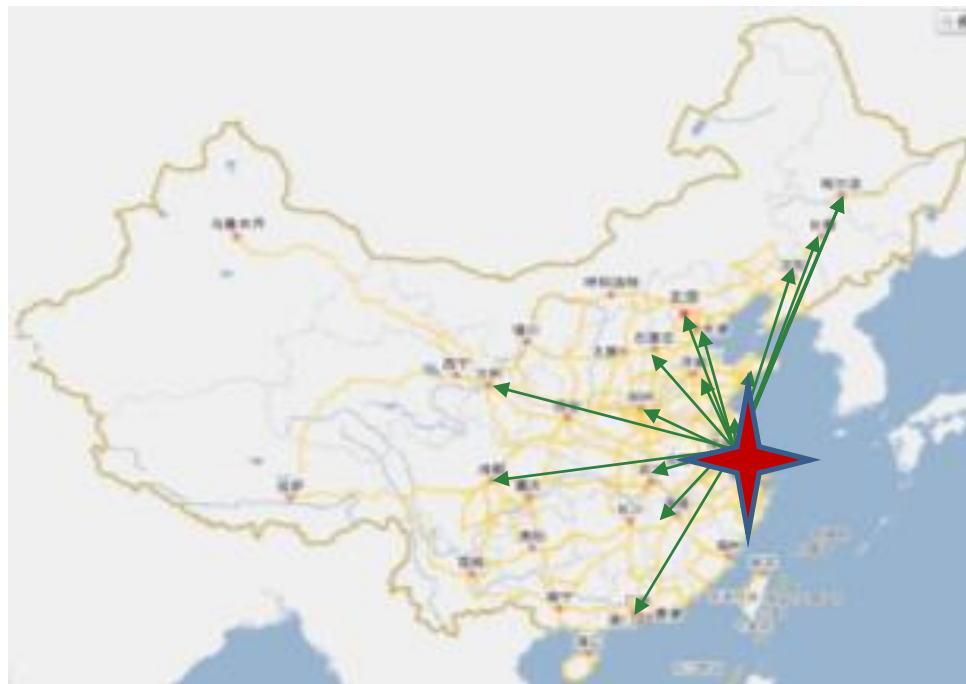
Dr Yuwei Zhang

Wuxi El Pont Radiation Technology

Who We Are

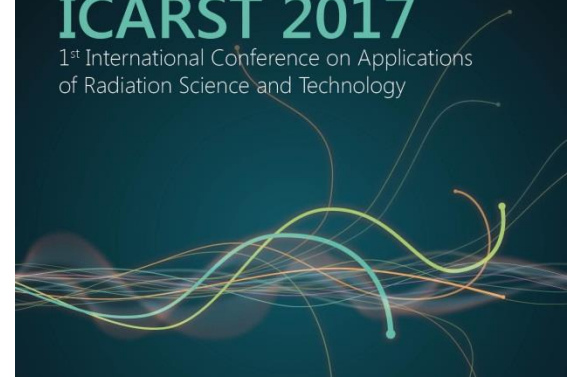


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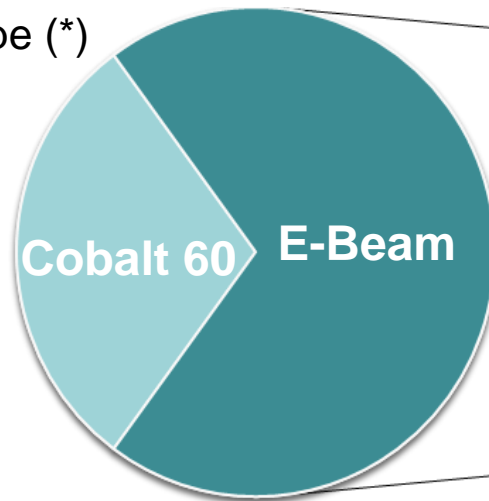
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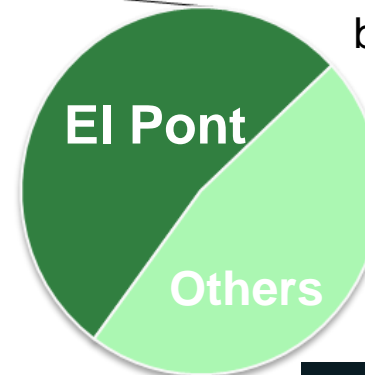
Leading supplier of China industrial E-beam solution

- **No.1 market share in China, 250+ units in total sales**
- **The only research institute in China, dedicating to E-beam technology and winning governmental support**

Market Breakdown
by Machine Type (*)



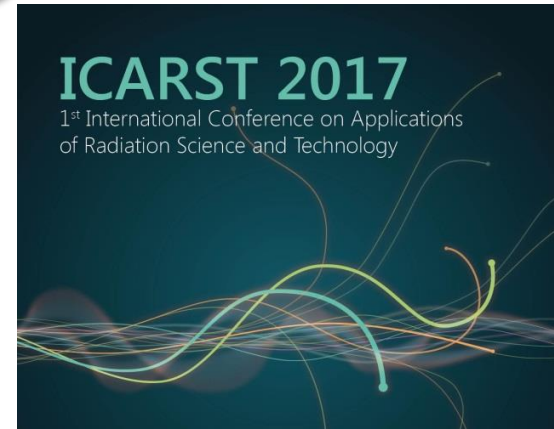
Market Breakdown
by Manufacture



(*) Information source from China Isotope
& Radiation Association, Oct 2015

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R&D Capacity

The only research institute for E-beam technology in China

- Top R&D group, with research team from IHEP, Chinese Academy of Science and El Pont R&D center (15+ professors with 40+ years)
- the only research institute in China, dedicating to E-beam technology and winning governmental support

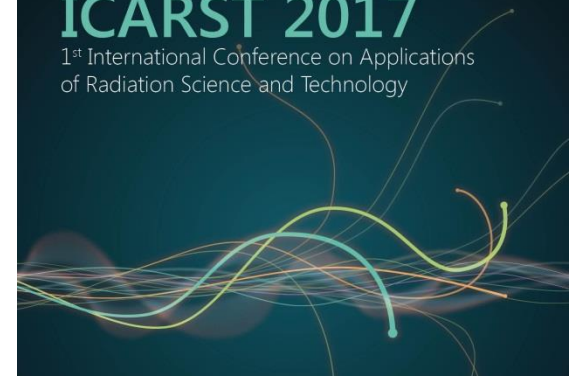


Governmental support in E-beam R&D center

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History of China electron accelerator

• The early 1960s

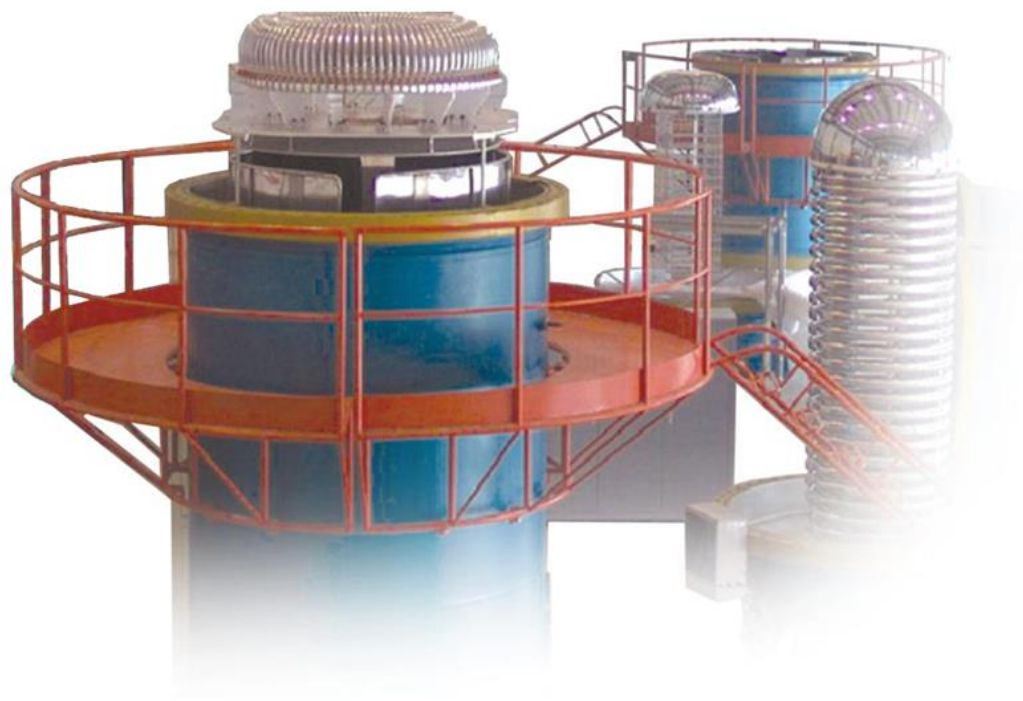
China first electrostatic
accelerator in 1964



The Ministry of Posts and
Telecommunications
published Stamps for
our accelerator

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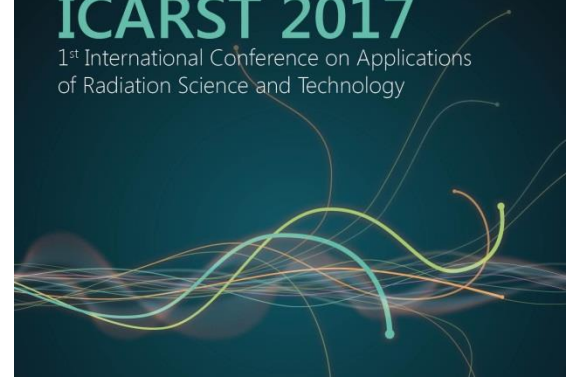
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RADIATION TECHNOLOGY

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Gamma-Ray Processing: A Mature Technology

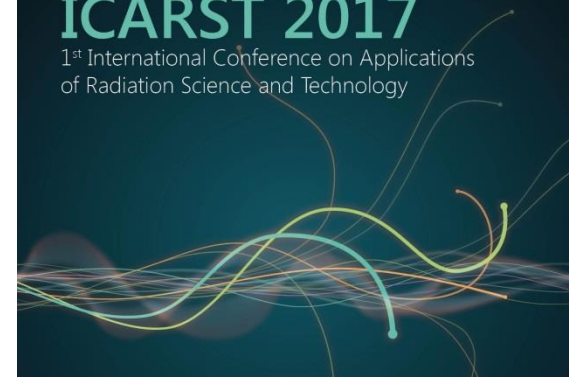
- Since 1960s, the advent of the use of Co-60 isotope makes the radiation sterilization and disinfection to be a routine processing.*
- According to incomplete statistics, there are more than 210 large-scale Gamma source in the world.**

*Seymour Stanton Block, **Disinfection, Sterilization, and Preservation**

**杨仲田, 工业辐照装置的安全与防护

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Gamma-Ray Processing: A Mature Technology

- Challenges

- Radioactive waste & the costs of recycling increase fast
- treatment of the products is relatively slow.
 - Keen competition & tight delivery time require a higher processing efficiency
- Extended market needs large-scale or small-scale dosage control, which is not suitable to be processed in the same Gamma source.
- tightening policy by the government
- etc.

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E-Beam: Alternative to Radioisotopes

- Background



*left: El Pont 10MeV/20kW S-Band Linac;
right: El Pont 10MeV/40kW L-Band Linac*

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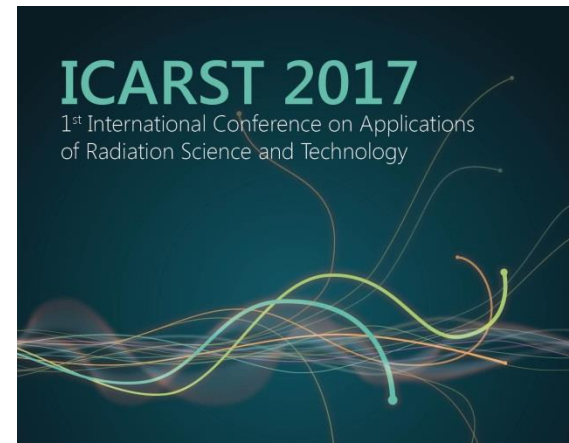
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E-Beam: Alternative to Radioisotopes

- Advantage
 - Concentrated energy , high-level dosing accuracy and controllability to provide a flexible manufacturing system
 - Process extremely fast, in our Wuhan case, 10MeV/20kW for 8kGy is shorter than 7mins
 - Good value for money: Once-off investment, long running period

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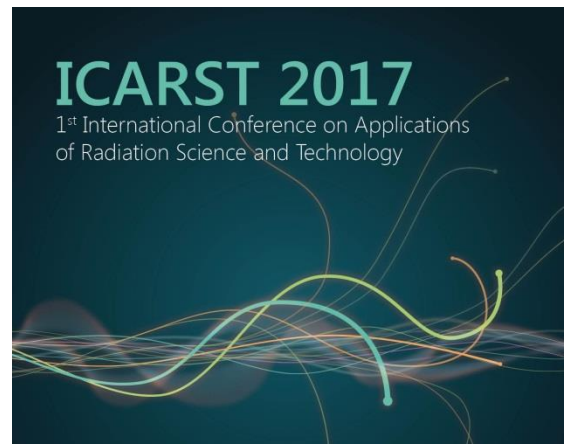
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E-Beam: Alternative to Radioisotopes

- Existing Issues in commercial application
 - Penetration depth
 - Having mass and electronic charge, the electron beam rapidly loses energy in collisions with the product.
 - Policy limit also decides the highest E-Beam processing energy could not higher than 10MeV, which limits the producing penetration depth

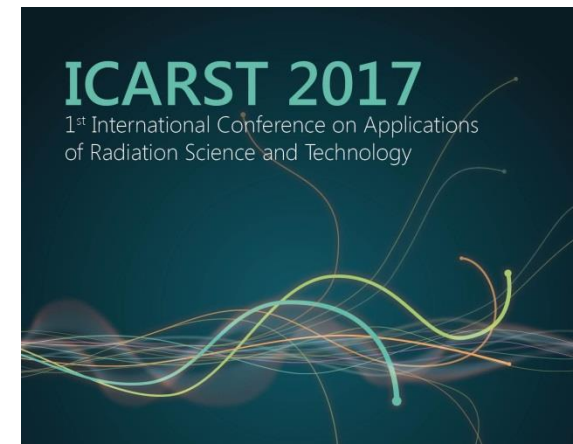
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E-Beam: Alternative to Radioisotopes

- Existing Issues in commercial application
 - Commercial Package
 - The limited penetration depth means that the packing density must be low to insure that the electrons reach the center of the pack.
 - Big size packages are not suitable.

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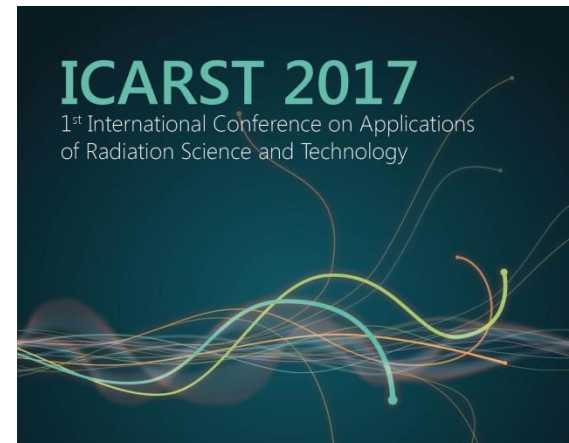


X-Ray: Emerging Technology

- Evolution, from E-beam to X-Ray
- What's X-Ray
 - a form of electromagnetic radiation with a wavelength in the range of 0.01 to 10 nanometers
 - Photons
 - The distinction between X-rays and gamma rays is not universal. One often sees the two types of radiation separated by their origin: X-rays are emitted by electrons, while gamma rays are emitted by the atomic nucleus.

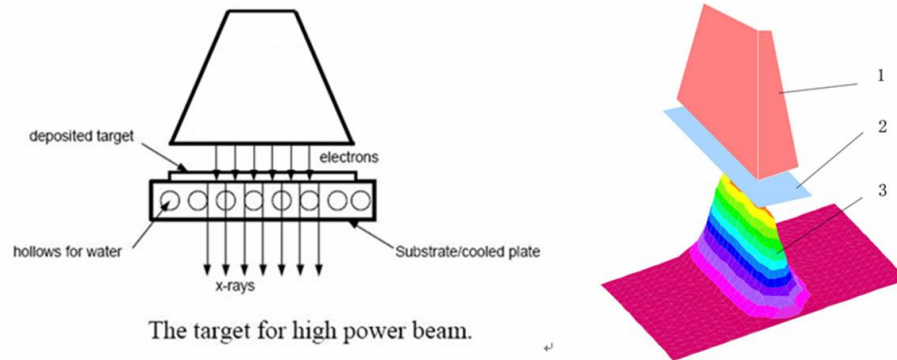
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X-Ray: Emerging Technology

- Evolution, from E-beam to X-Ray
 - E-Beam → X-Ray converter → X-Ray



– 5MeV/120kW with X-Ray is self-developed technology by Wuxi El Pont

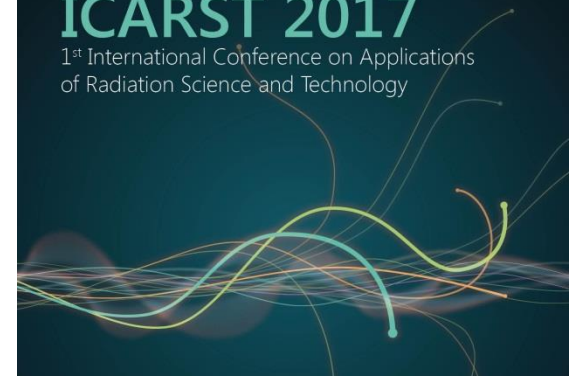
X-Ray: Application Status in China

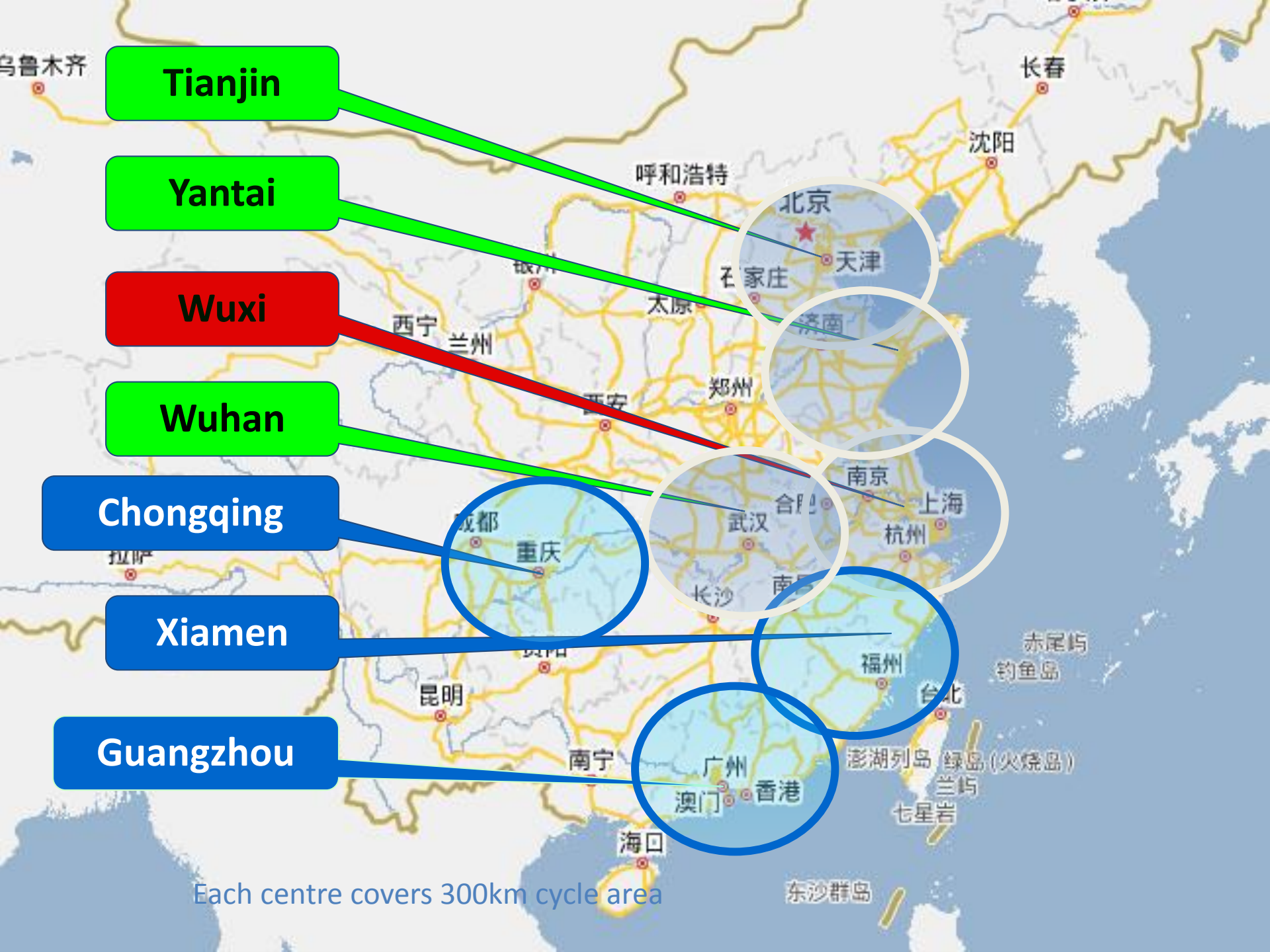
- Radiation processing centres with cobalt 60:
 - 153(2013) *
 - 140+ (2017)
- Radiation processing centres with E-beam
 - 369(2013)*
 - 500(2017)

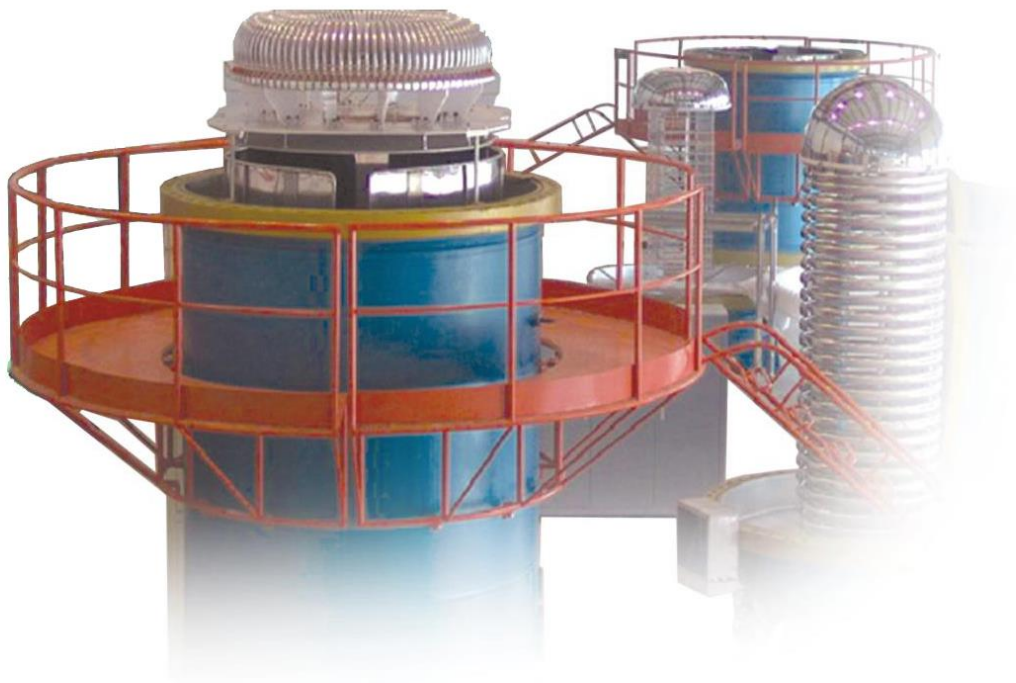
* data from *China Isotope & Radiation Association*, Oct 2013.

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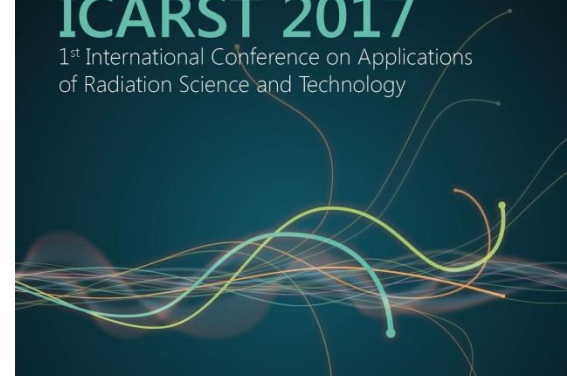




BUSINESS MODEL

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Business Model

- 10MeV/20kW: Top Priority

- Strong processing capacity

“Theoretically, 1kW=67k Ci

Practically, production Capacity is related to the density of the products.

Comparison with 1.5m Ci Gamma source:

d= 0.35, equal performance

d>0.35, Gamma source

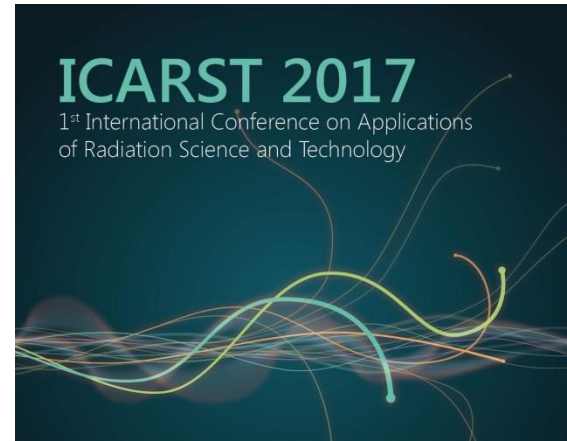
d<0.35, E-Beam”

- *Prof. Qi, Shanghai Academy of Agricultural Sciences*

China Isotope & Radiation Association, Haerbin, 2013

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Business Model

- 10MeV/20kW: Top Priority



Machine room



Modulator and power supply room

*left: El Pont machine room;
right: El Pont 10MeV/40kW L-Band Linac*

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Business Model

- 10MeV/20kW: Top Priority

- Cases from El Pont

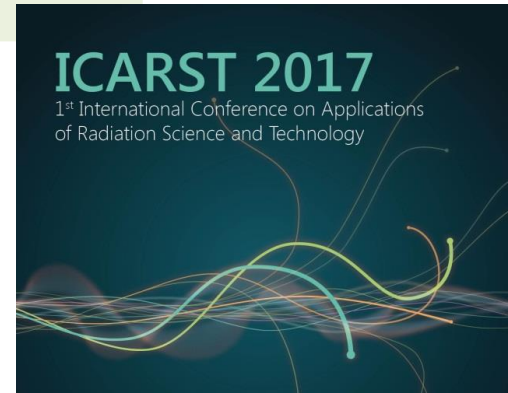
- 1:

Chili powder
0.6g/cm³
Weight: 20kg /p
Size: 67*50*10cm
Dosage: 8kGy

Speed: 5m/min
Double sided
3 packages/ trolley
26 trolleys online
30 mins in total
3162 kg/hr

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Business Model

- 10MeV/20kW: Top Priority

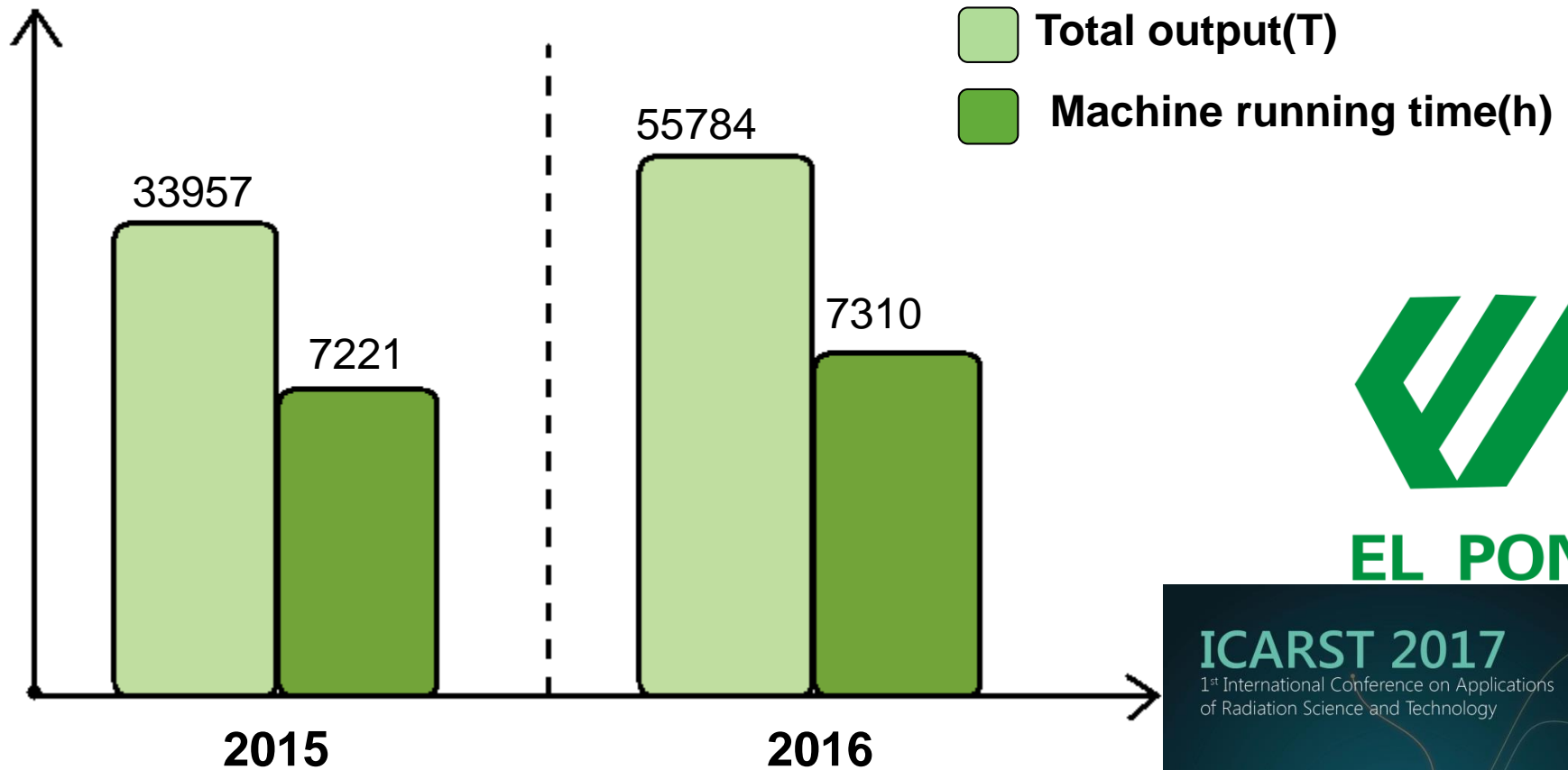
- Cases from El Pont

2:

Onion powder
0.36g/cm³
Weight: 25kg /p
Size: 78*50*15cm
Dosage: 7kGy

Speed: 8m/min
Double sided
2 packages/ trolley
26 trolleys online
18 mins in total
4362 kg/hr

Data of El Pont 10MeV-40kW L-band



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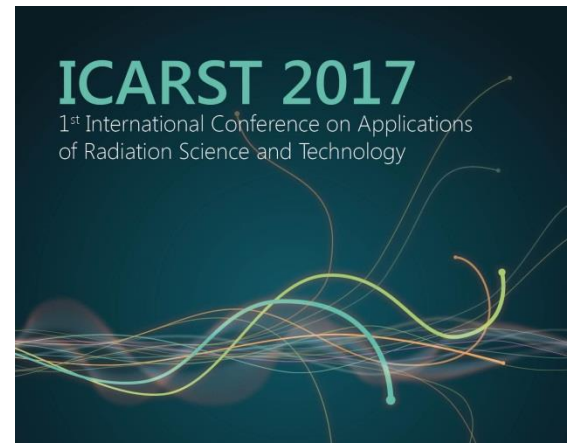
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Business Model

- 5MeV/120kW+X-Ray: Business growth Booster (when 10MeV/20KW is ensured)
 - Indispensable
 - Full market coverage
 - Solution to the issues faced by 10MeV
 - High controllability and flexibility in processing dosage
 - Solved the issues faced by Cobalt 60
 - super-large or ultra-small
 - Independent operation without X-ray
 - 17mGy (Yantai case)

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Business Model

5MeV/120kW+X-Ray:

The real photo of El Pont Yantai case



Machine room



Processing real scene

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Business Model

- 1+1

- What is 1+1

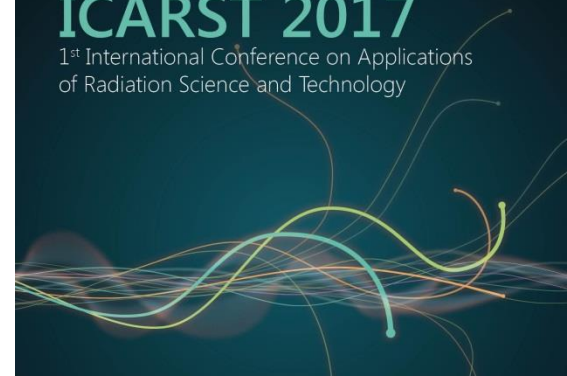
Relieve customers' concerns about the penetration depth and failure of single machine:

- 10MeV/20kW Linac is a basic deployment choice
 - Plus 5MeV/120kW HFHV with X-ray system is a standard deployment

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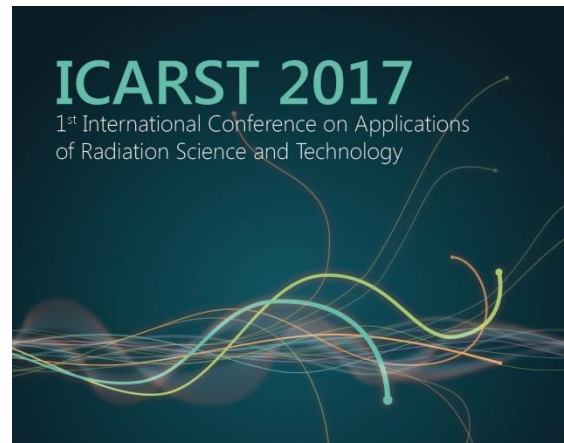
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Business Model

- 1+1
 - Case from Yantai in November 2016:
 - under the condition of average dosage about 7-9kGy, the overall production capacity is 3201 Tons for all the products different in density and packaging

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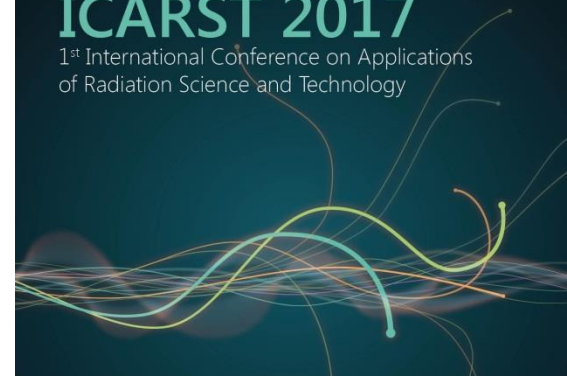
Conclusion

- Comprehensive radiation service
- Fast radiation processing capacity embodies the advantage of E-Beam technology
- High return of investment

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Welcome to our booth
C20

