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## R&D of Backscatter X-ray Imaging System for Concrete Inspection

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### R&D Objectives and Subjects

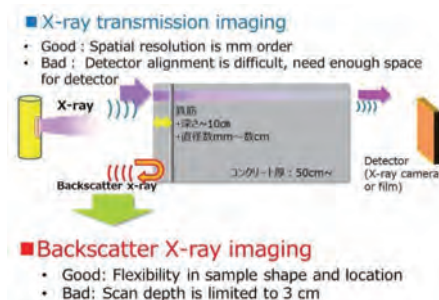
#### Objectives

Social infrastructures in Japan are aging rapidly. Sixteen percent of the 700,000 road bridges of 2 m or longer are 50 years or older, at present. This percentage increases to 40% in the next 10 years, and will be 65% in 20 years. We try to find damage and defects in concrete structures at an early stage so that we can make the lifetime of the concrete structure longer. There are expectations for the development of a novel method to evaluate defects in concrete structures non-destructively.



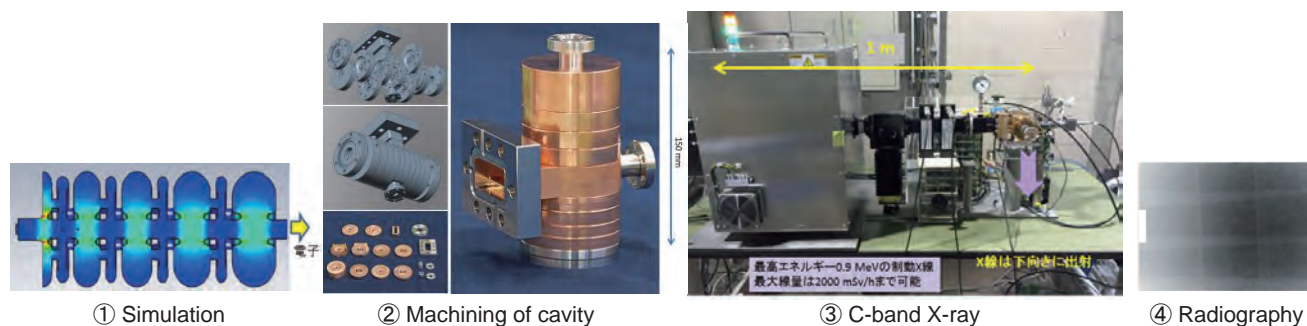
#### Subjects

The development of x-ray backscatter imaging system is our technical goal. The system must be portable, robust, and reliable. A high-energy x-ray generator, which emits Bremsstrahlung x-rays of up to 1 MeV in electron energy will be developed. A novel x-ray imaging detector for backscattered x-rays with high efficiency and high spatial resolution has to be developed.

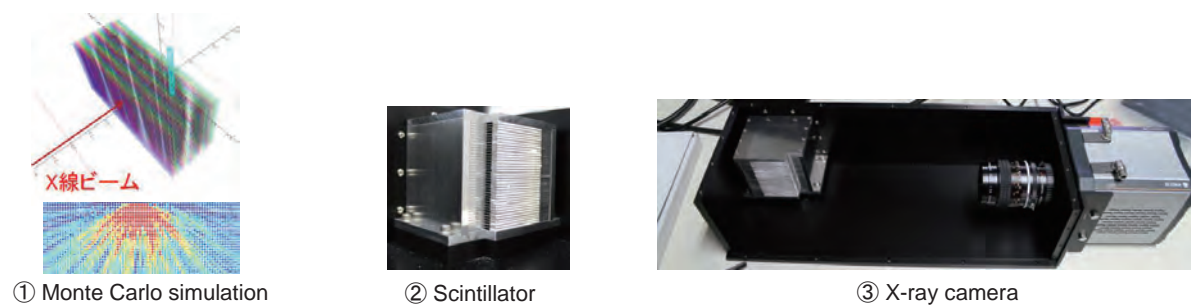


### Current Accomplishments (1/2)

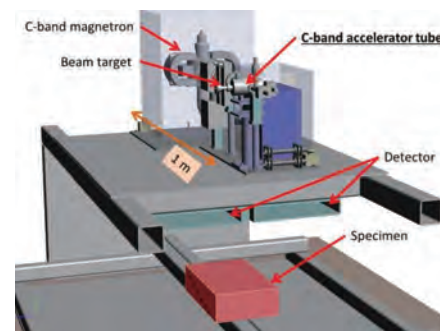
#### C-band X-ray, a portable x-ray generator based on an electron accelerator



#### One-dimensional multi-slit x-ray imaging detector

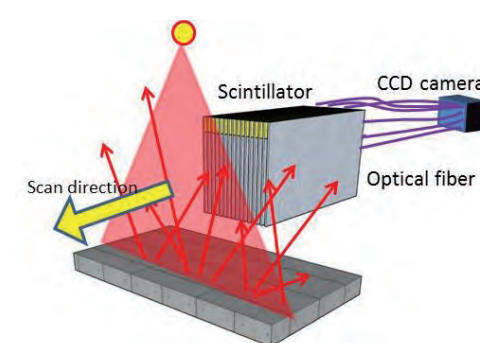


### Current Accomplishments (2/2)

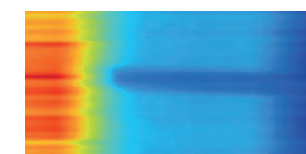


#### C-band x-ray: 700 – 900 keV, 2 Gy/h

We have succeeded in developing a table-top electron accelerator-based high-energy x-ray generator "C-band X-ray", which generates x-rays of 900 keV or higher with 2 Gy/h.



#### One-dimensional multi-slit x-ray imaging detector



Backscatter x-ray image of a rebar in concrete

T. Tooyama, 76th JSAP Autumn meeting, September 2015

We have succeeded in developing a one-dimensional multi-slit x-ray imaging detector, which is like a line sensor for backscatter x-rays. A fan-beam x-ray is irradiated onto a concrete slab in area of 20 cm x 5 mm, and the backscattered x-rays from the concrete slab are distinguished by the novel detector.

### Goals

#### Milestone / achievement level

Item	Milestone	Achievement
Imaging inside concrete	Recognize rebar of 1 cm diameter in concrete with cover depth of 10 cm	Cleared
Inspection of defects of a roadbed	Recognize 20% density degradation of concrete under asphalt of 8 cm thickness	Cleared
	Recognize pot-hole under asphalt of 8 cm thickness	Cleared

#### Roadmap being on the market

