

# D-Shuttle Project

~ Measurement and Comparison  
of Individual Doses of High School Students  
Inside and Outside of Fukushima Prefecture~

Physics team from the Super Science Club of Fukushima High School  
Haruka Onodera Kota Suzuki Mikoto Kiya Ryo Suzuki Minori Saito

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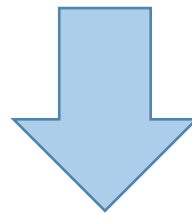
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# 1.Introduction

The accident at the Fukushima Daiichi Nuclear power plant  
→Contamination from radioactive substances

**In order to understand  
the current situation of Fukushima**



**Measurement and comparison  
of the individual doses inside and outside of  
Fukushima prefecture**

## 2.Methods and materials

### Participants

**6** schools inside the Fukushima prefecture

**6** schools in other prefectures in Japan

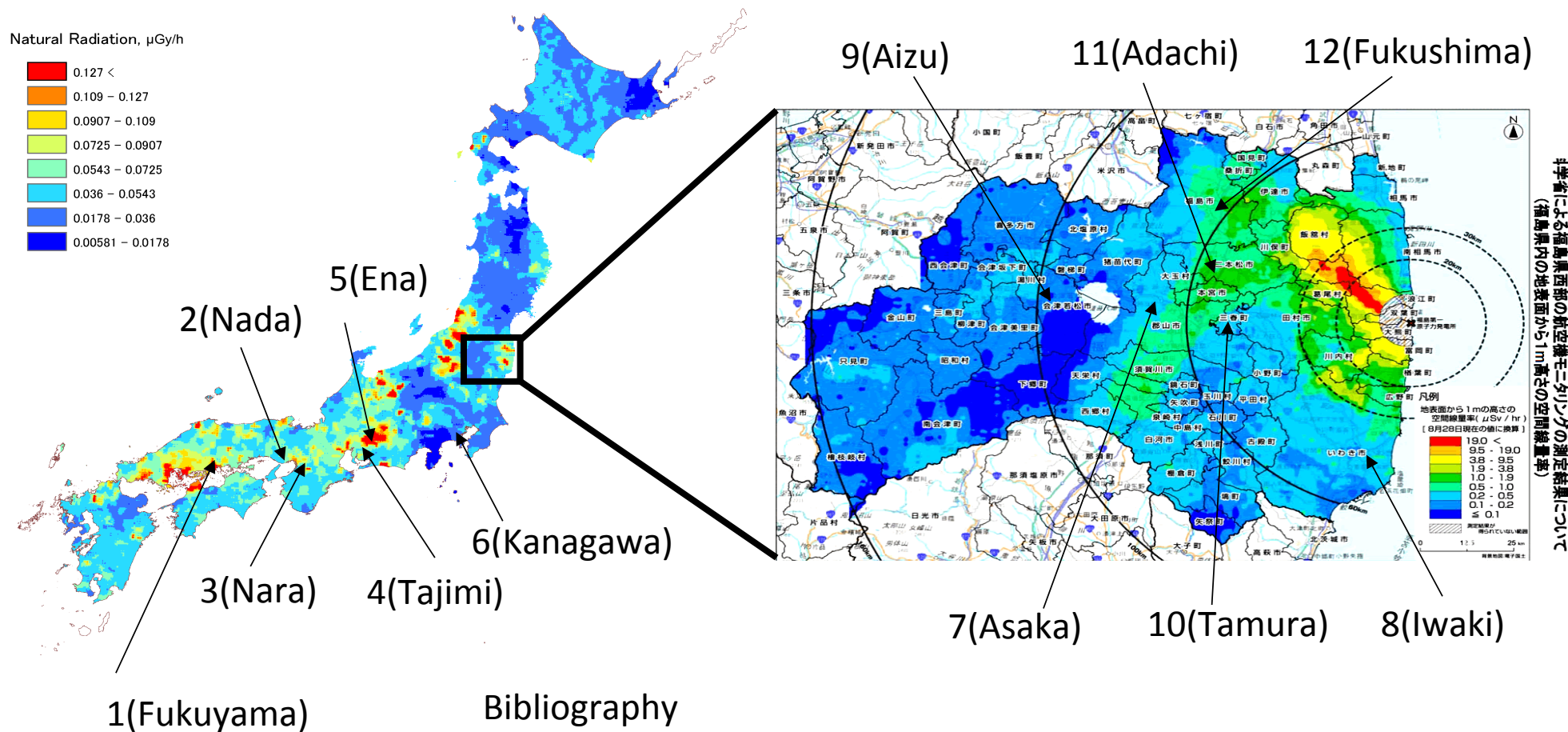
**12** overseas areas

Total of **215** people

# Examined areas (in Japan)

In other prefecture

Inside of Fukushima prefecture

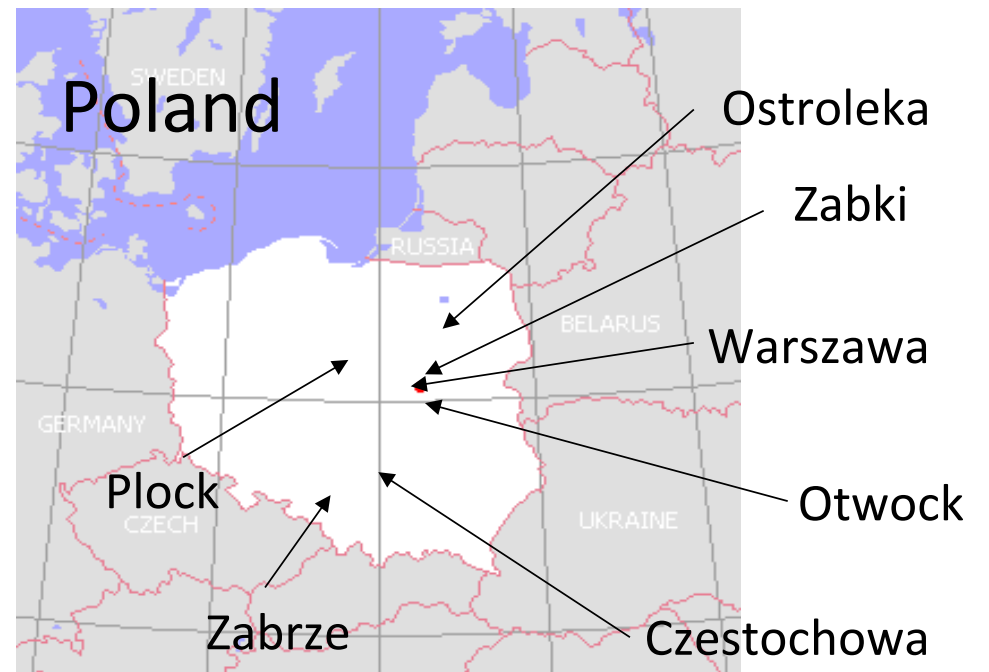
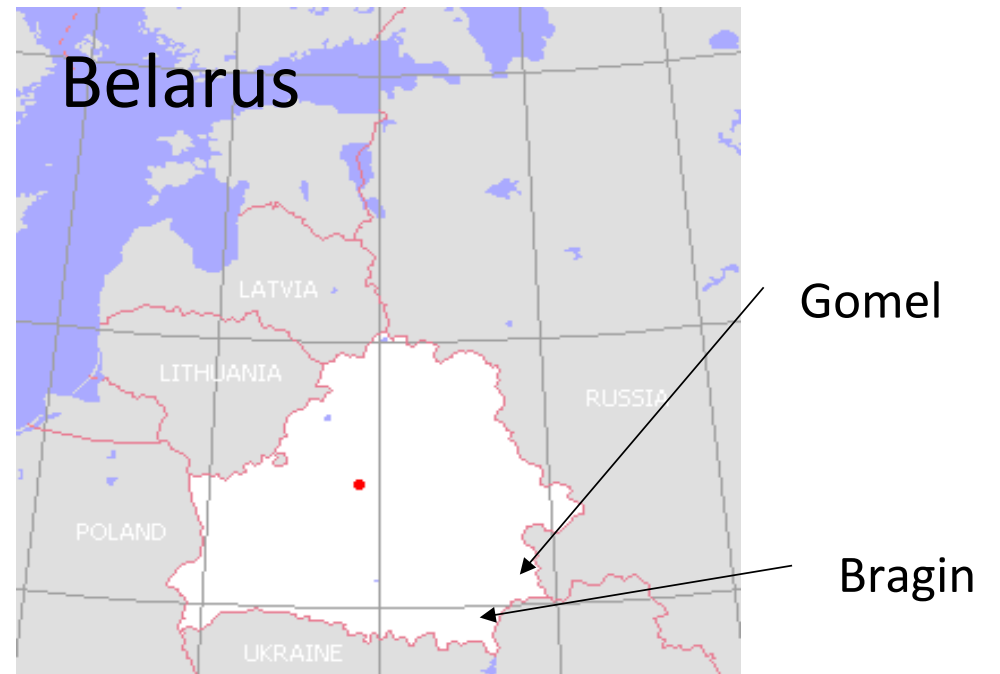


Bibliography

The Geological Society of Japan

Ministry of Education, Culture, Sports, Science and Technology

# Examined areas (overseas)



# Instrument

Personal dosimeter (Chiyoda Technol Corporation)

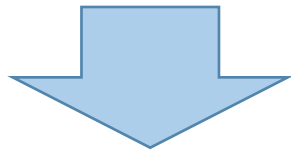
## 「D-Shuttle」

- Recording interval : 1 hour
- Measured radiation type :  
 $\gamma$ -ray (also including natural radiation)
- Measurement limit value :  $0.01 \mu\text{Sv}$



# Method

- Participants carried D-shuttle for two weeks.
- Their location was recorded in a journal.



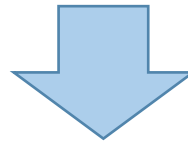
**Based on the journal, the data was classified and analyzed.**





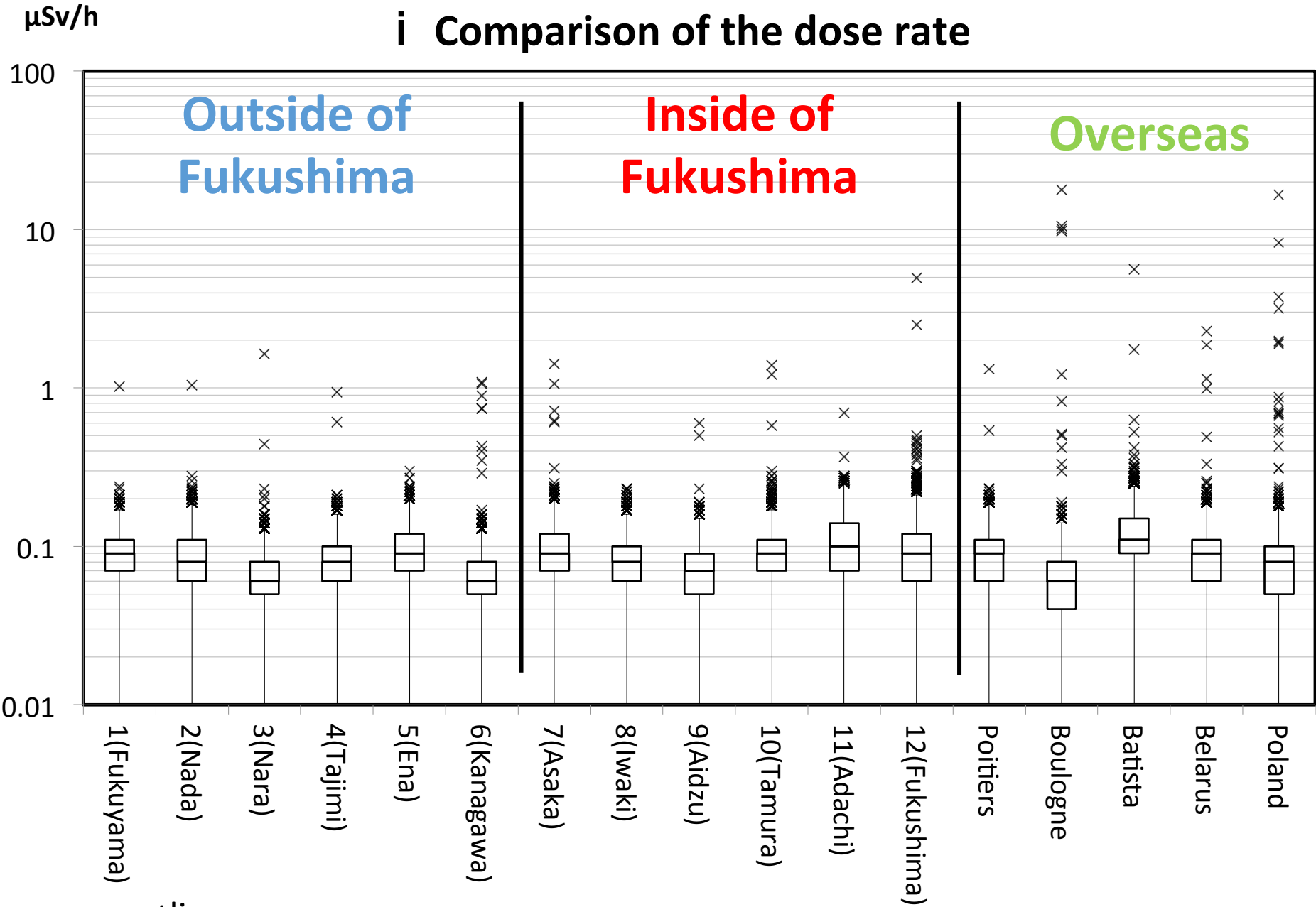
# The data of D-Shuttle

| Date       |    | Dose rate | Location |
|------------|----|-----------|----------|
| 2014/06/27 | 15 | 0.12      | school   |
| 2014/06/27 | 16 | 0.07      | school   |
| 2014/06/27 | 17 | 0.10      | school   |
| 2014/06/27 | 18 | 0.10      | school   |
| 2014/06/27 | 19 | 0.14      | school   |
| 2014/06/27 | 20 | 0.04      | home     |
| 2014/06/27 | 21 | 0.06      | home     |
| 2014/06/27 | 22 | 0.12      | home     |
| 2014/06/27 | 23 | 0.13      | home     |
| 2014/06/28 | 00 | 0.07      | home     |



Based on **dose and location**, the data was analyzed.

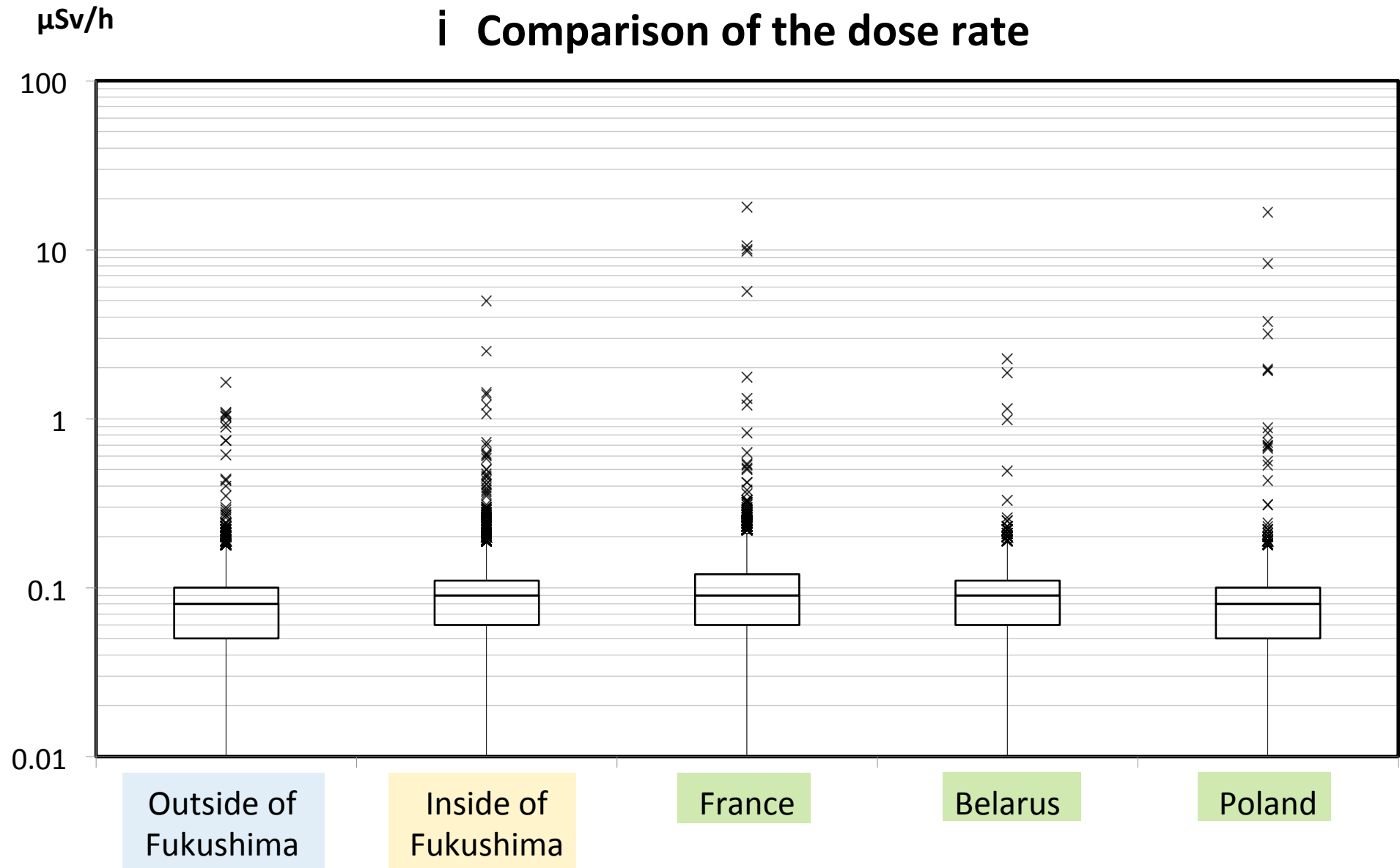
## i



× outliers

(The length of the whiskers is 1.5 times the length of the box.)

## i Comparison of the dose rate



x outliers

(The length of the whiskers is 1.5 times the length of the box.)

# Discussion

## Median

Inside : 0.07 ~ 0.10  $\mu\text{Sv/h}$

Outside : 0.06 ~ 0.12  $\mu\text{Sv/h}$

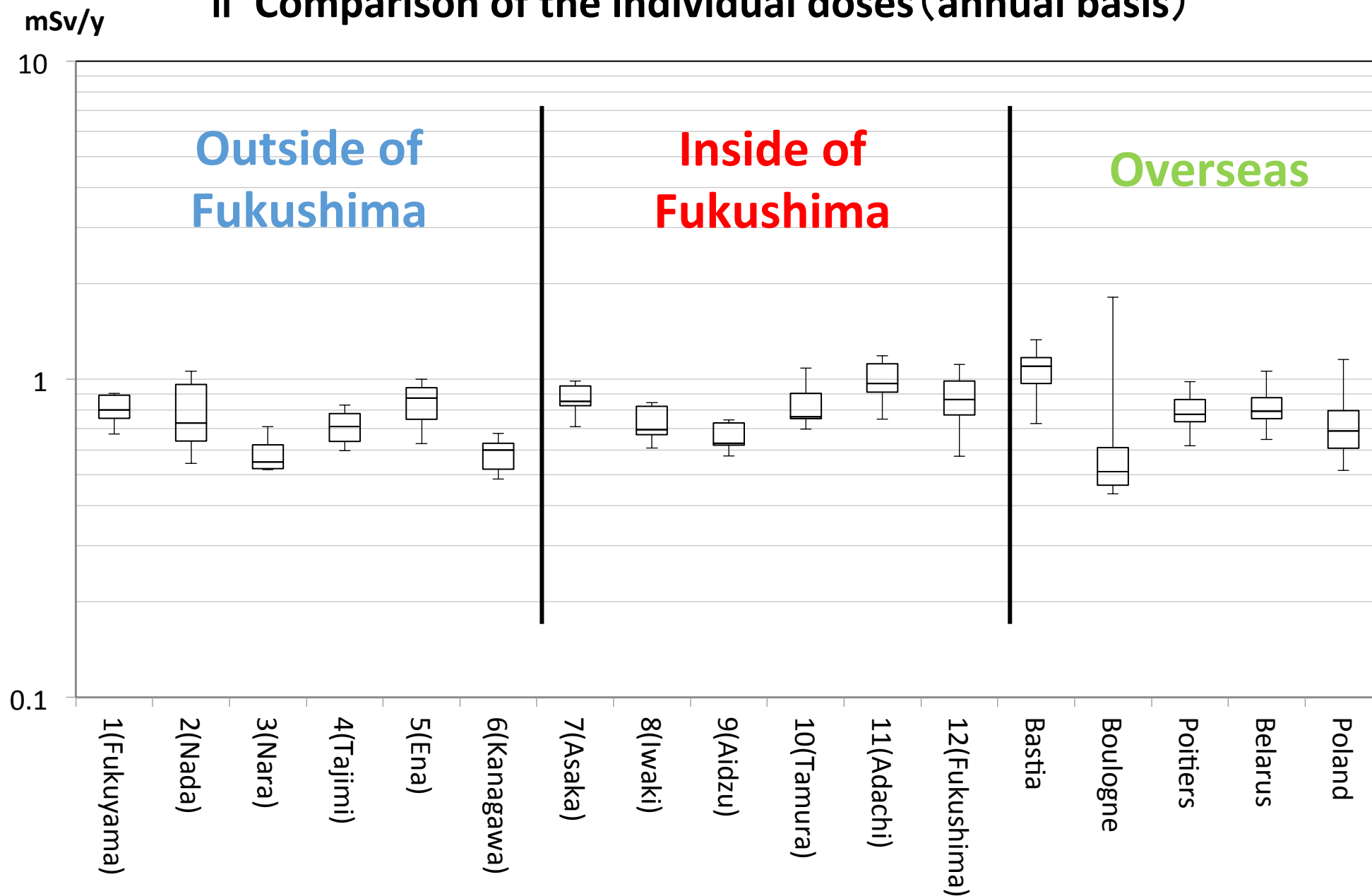
Overseas : 0.06 ~ 0.11  $\mu\text{Sv/h}$

The distribution of median is almost equal.

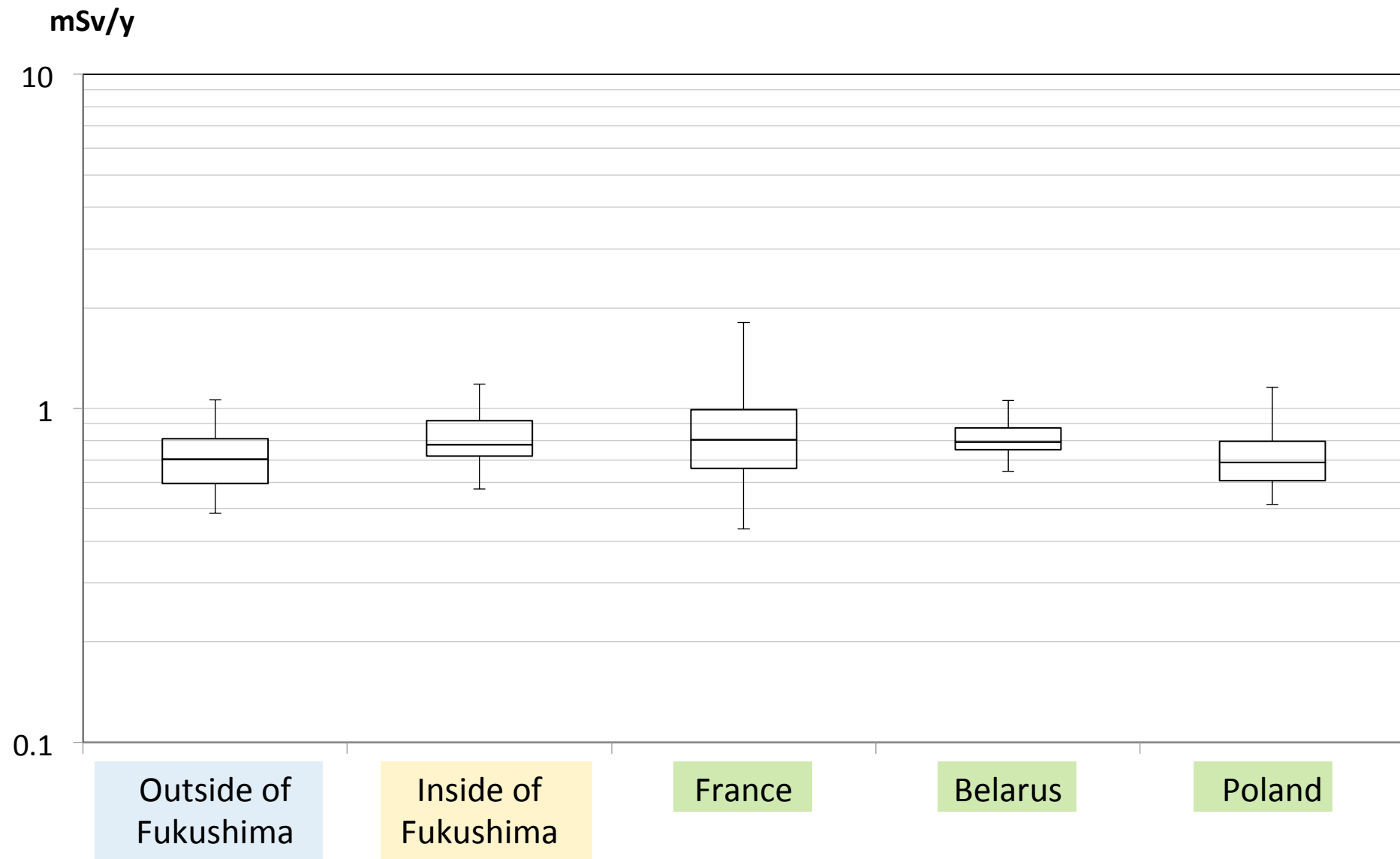
Outliers were detected in all areas.

The causes of outliers need figuring out particularly.

## ii Comparison of the individual doses (annual basis)



## ii Comparison of the individual doses (annual basis)



# Discussion

## Median

Inside : 0.63 ~ 0.97 mSv/y

Outside : 0.55 ~ 0.87 mSv/y

Overseas : 0.51 ~ 1.10 mSv/y

The distribution of median is almost equal.  
The dose of Fukushima is almost equal  
to the natural radiation in other places.

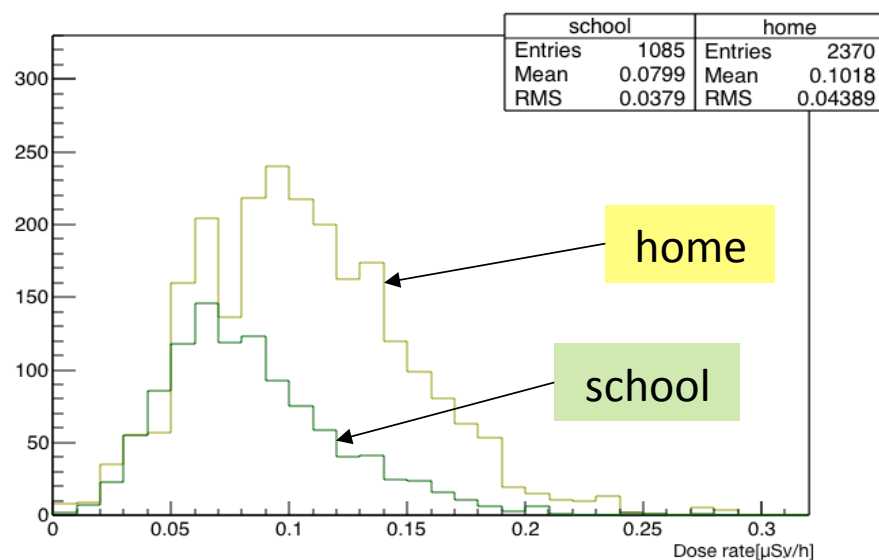
## 4 . Conclusion

- We conducted an investigation to measure and compare individual doses inside and outside of Fukushima prefecture.
- At the moment high school students in Fukushima do not suffer from significantly higher levels of radiation.



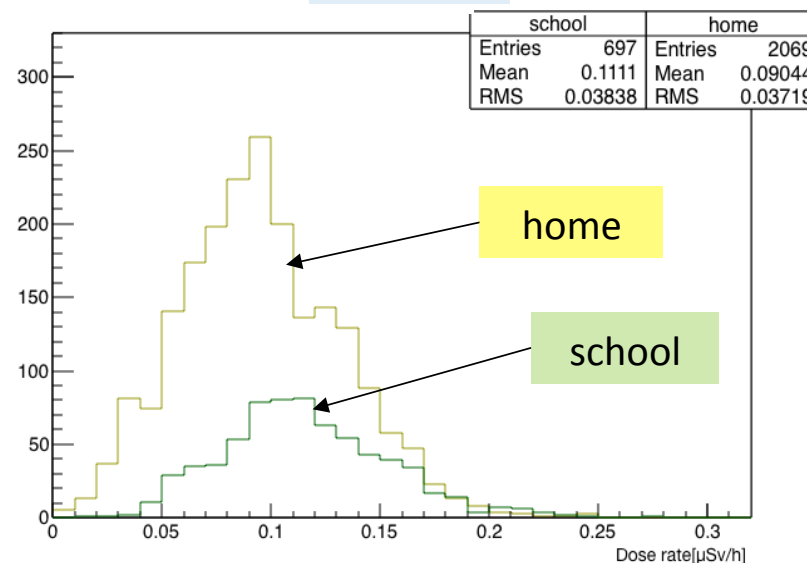
# Analysis of main causes of external exposure

12 (Fukushima)

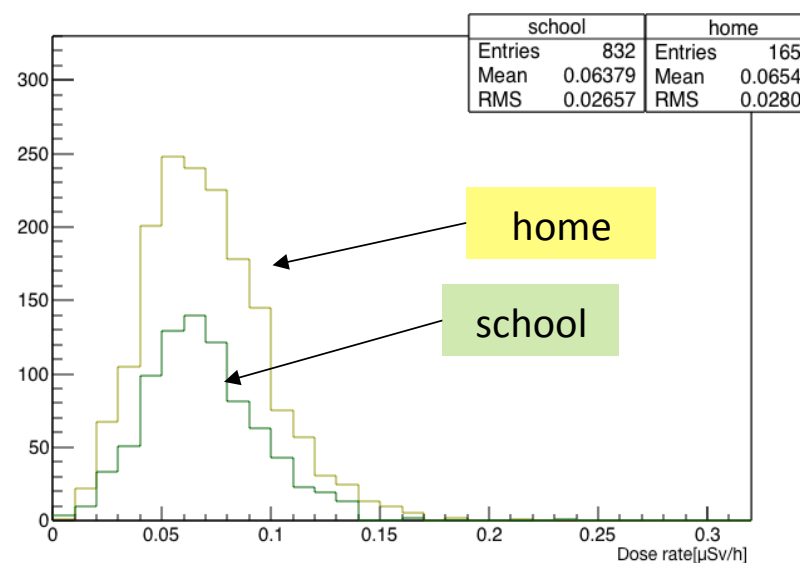


school  
home

5 (Ena)

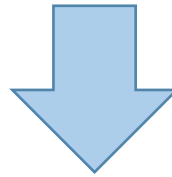


3 (Nara)

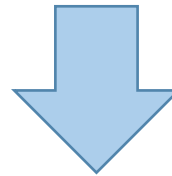


Analysis of main causes  
of external exposure

Check the data with the journal



Analyze the main cause of external exposure



Do risk management at places where people  
need to deal with radiation exposure

# Bibliography

The Geological Society of Japan  
Ministry of Education, Culture, Sports,  
Science and Technology

# Acknowledgements

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CHIYODA TECHNOL COOPERATION.