

**Title** MuSEUM実験のためのRF系及びガスシステムの開発

**Name** Kazuo Tanaka (University of Tokyo, RIKEN)

**Date** 2015/9/25

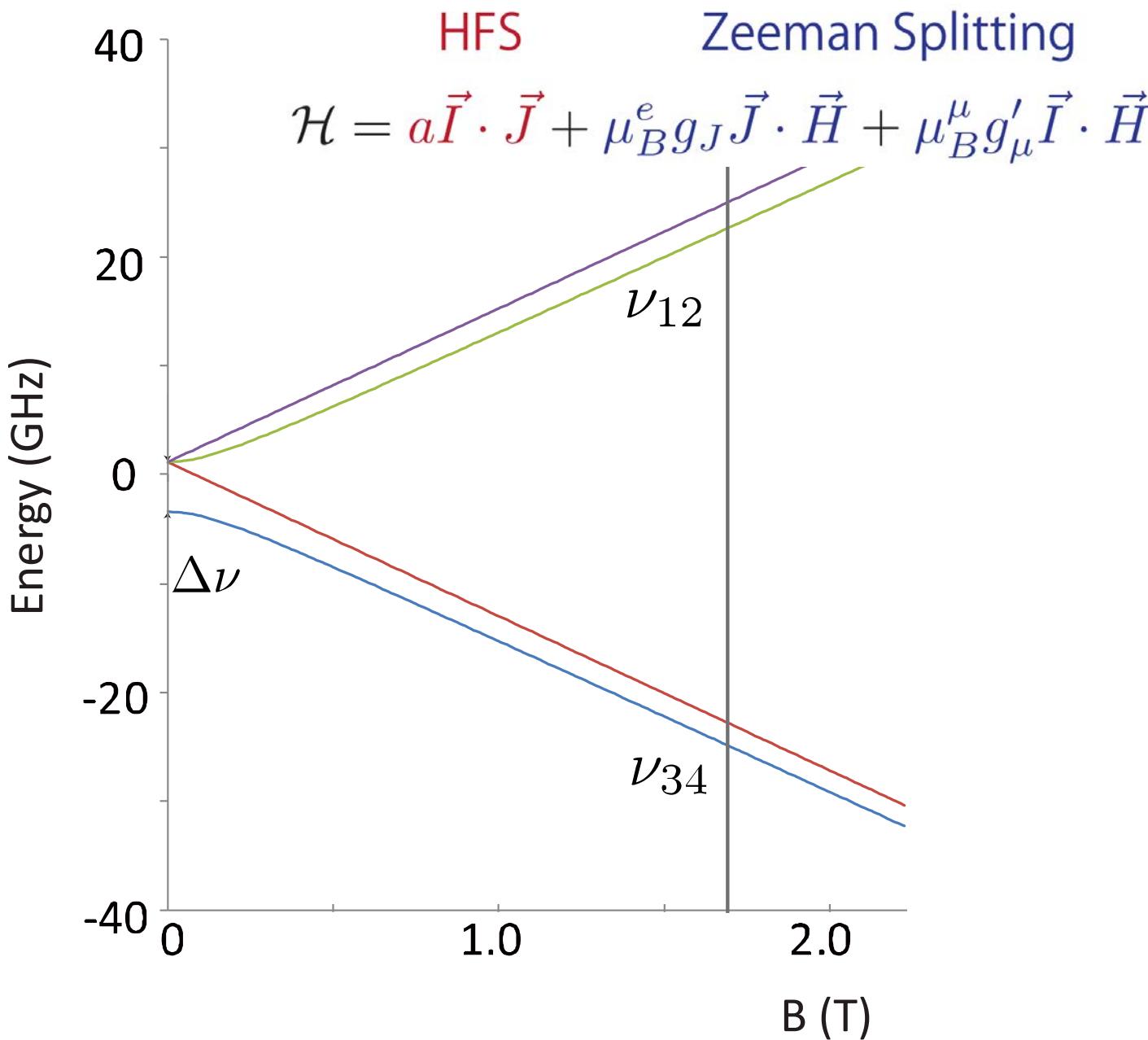
**Description** 25aSG-3

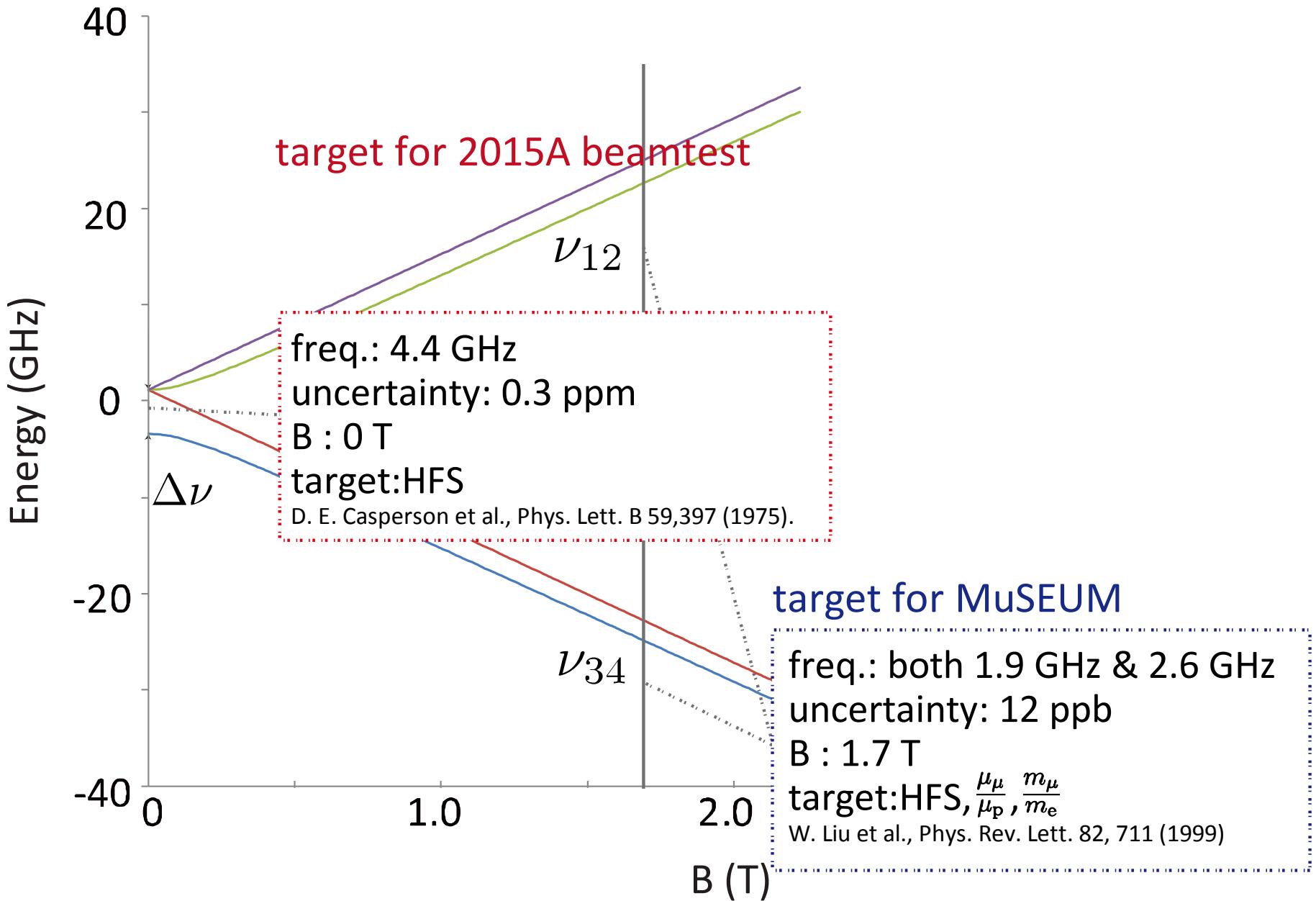
- Collaboration name
  - Muonium Spectroscopy Experiment Using Microwave



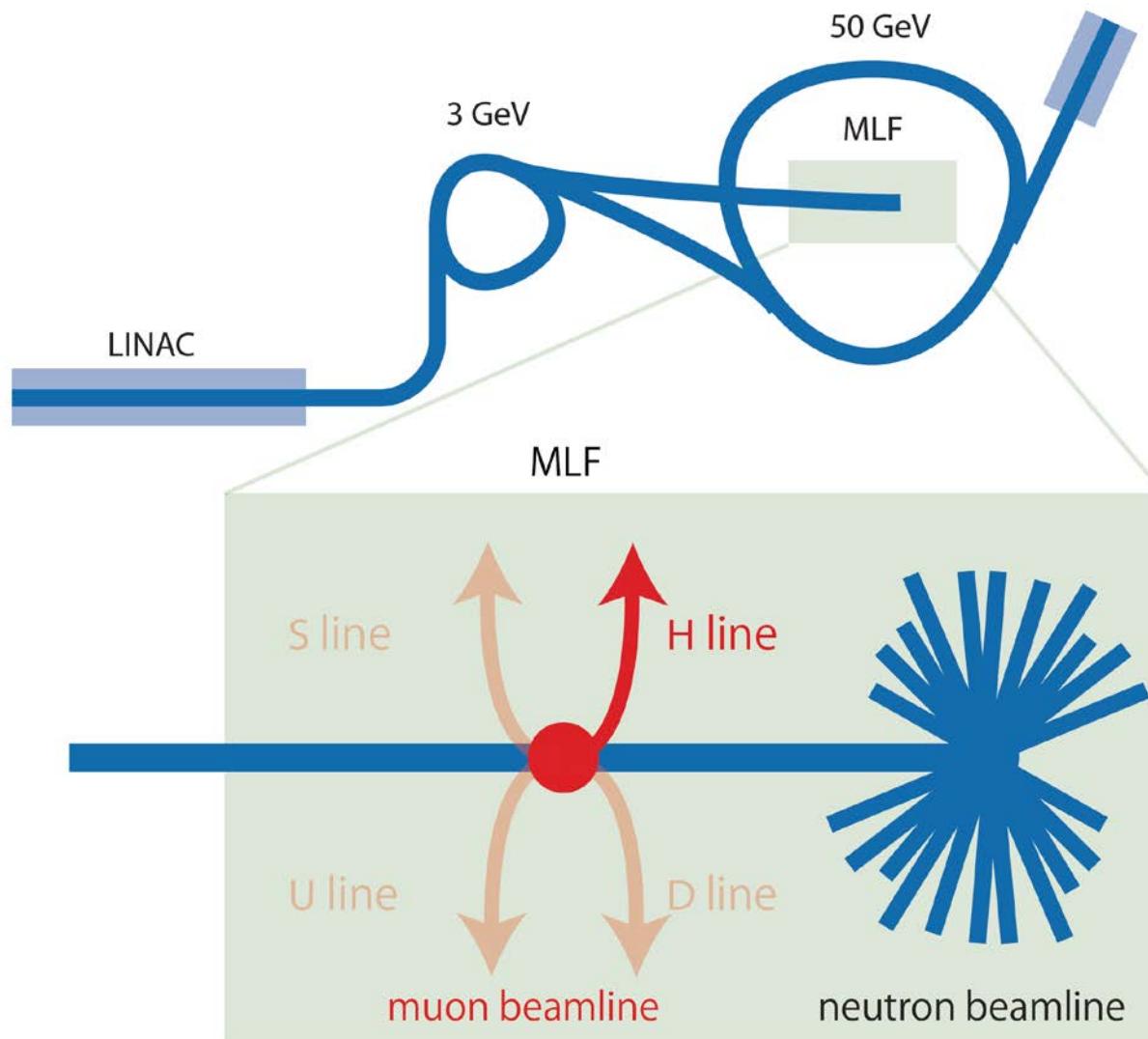
- Collaboration List (39 people, 5 Universities, 3 Institutions)

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K.Nagamine, K.Nishiyama, T.Ogitsu, P.Strasser, N.Saito, K.Sasaki,  
K.Shimomura, M.Sugano, M.Tajima, K.S.Tanaka, D.Tomono, A.Toyoda,  
H.A.Torii, E.Torikai, K.Ueno, Y.Ueno, M.Yoshida, A.Yamamoto

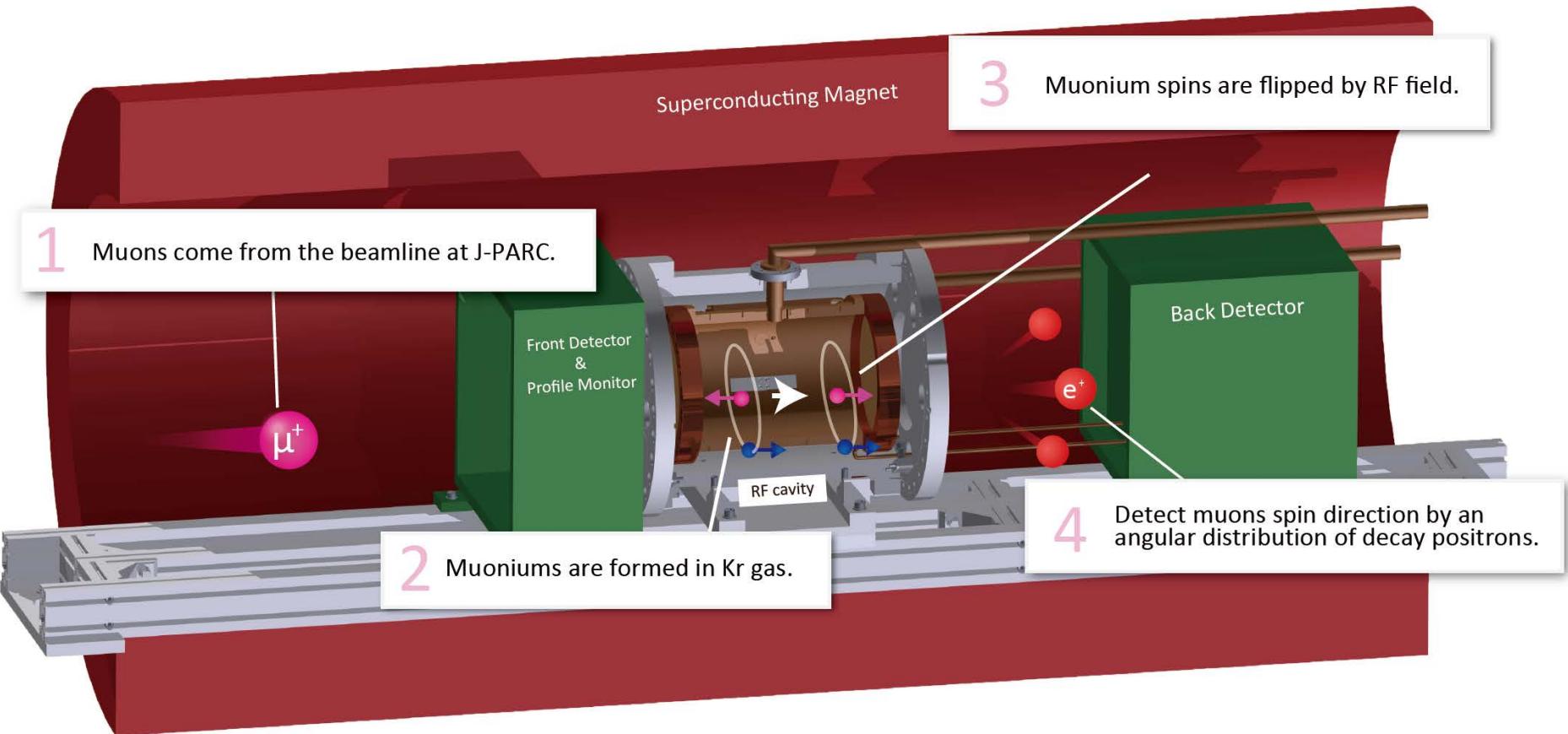




# how to measure



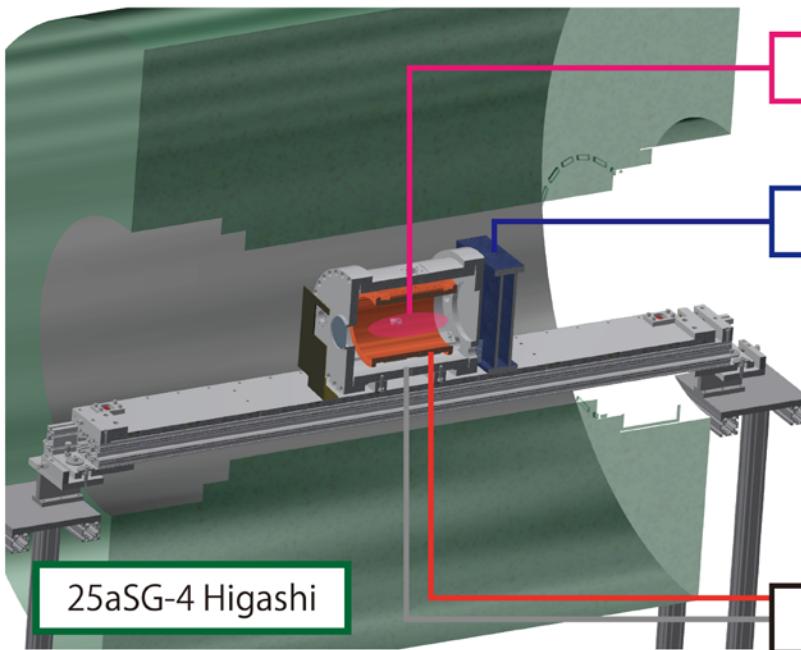
# how to measure



# experimental background



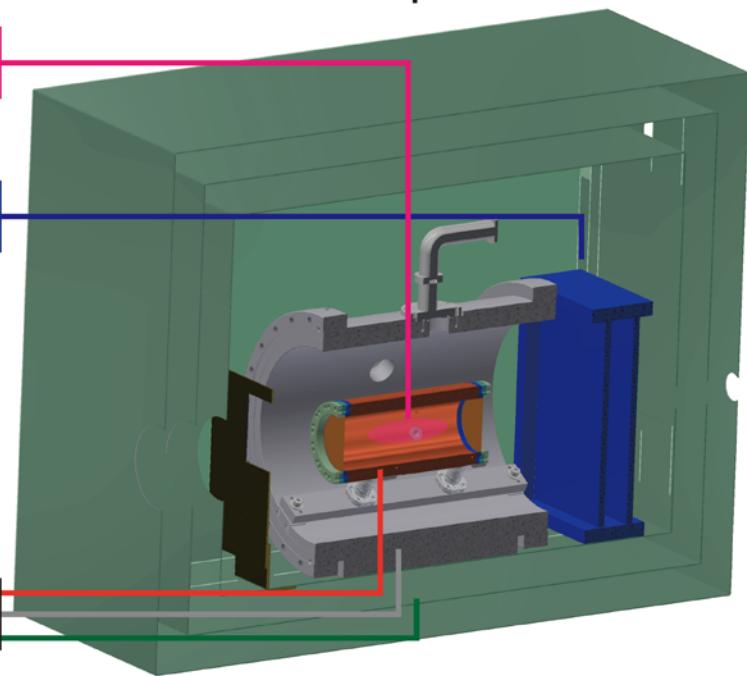
high field exp.



magnetic field:  $1.7\text{ T}$

uncertainty at previous exp. :  $53\text{ Hz}$

zero field exp.

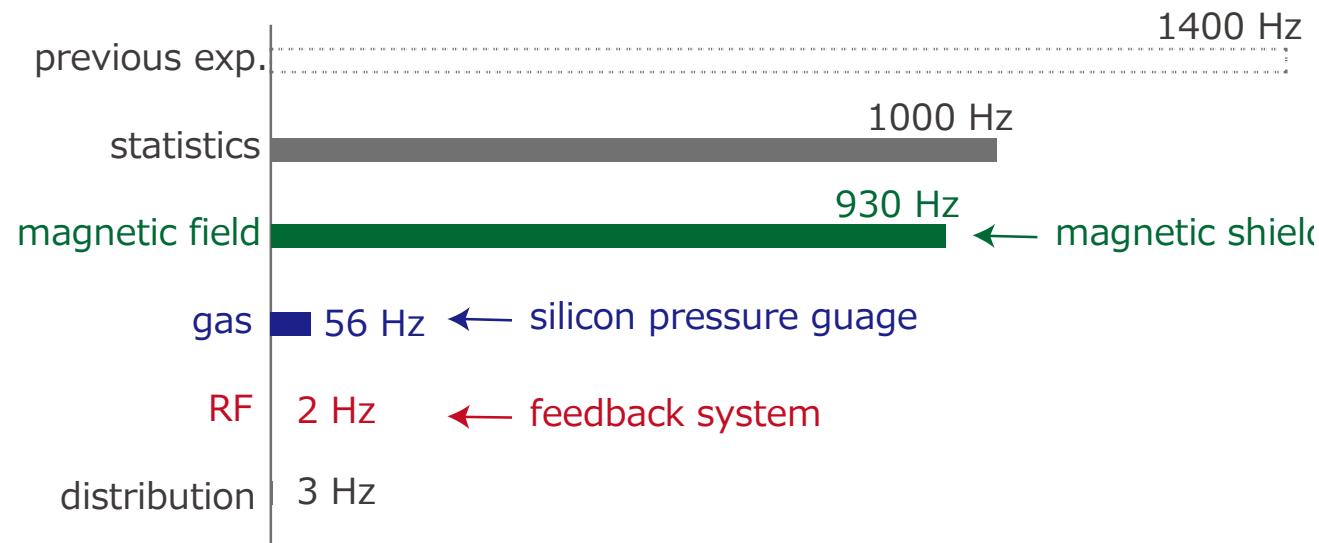


magnetic field:  $0\text{ T}$

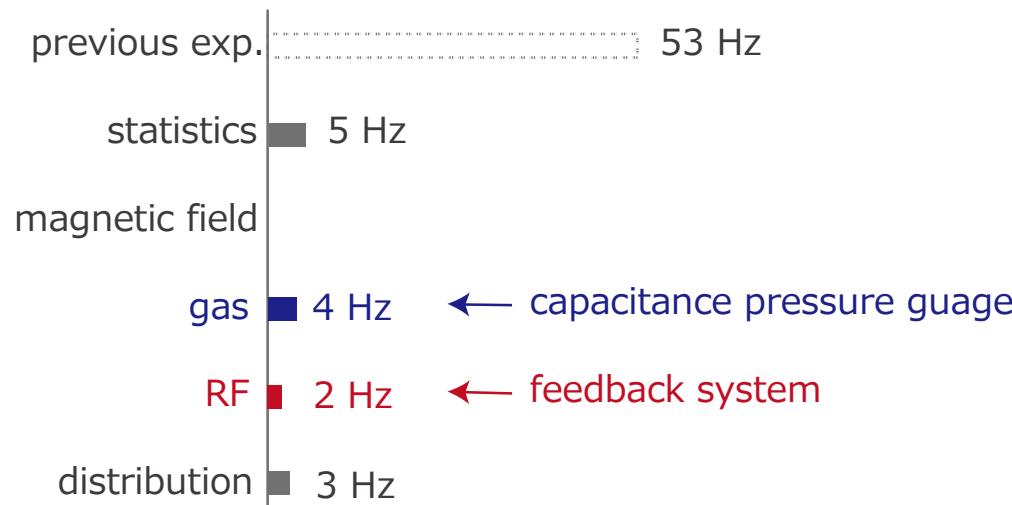
uncertainty at previous exp. :  $1400\text{ Hz}$

this talk

## zero field exp.



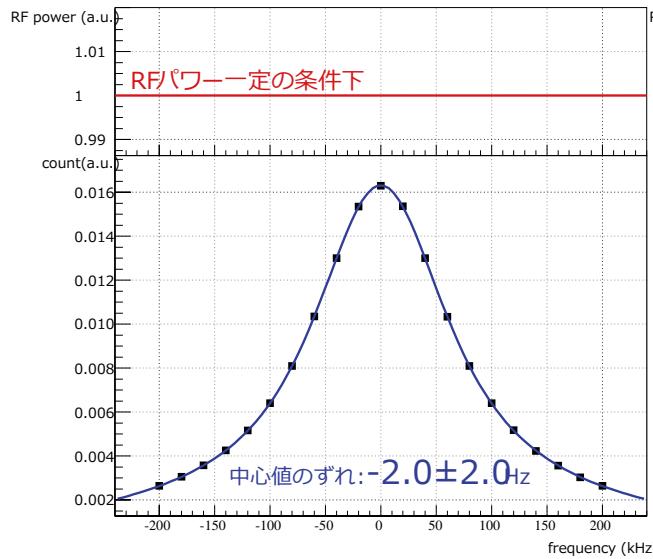
## high field exp.



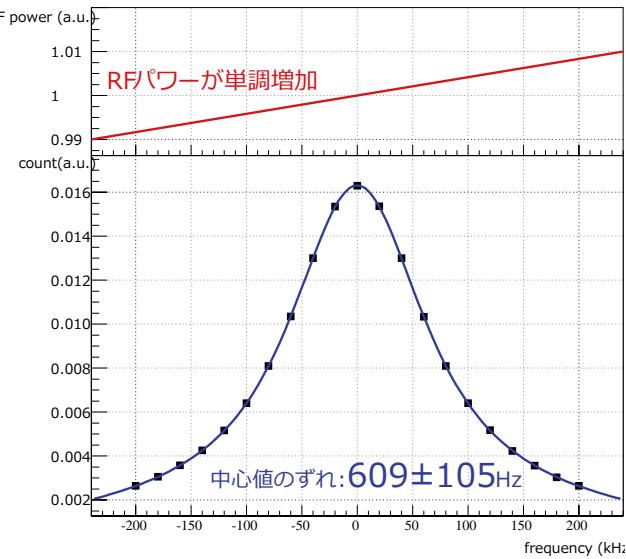
# systematic error from RF power



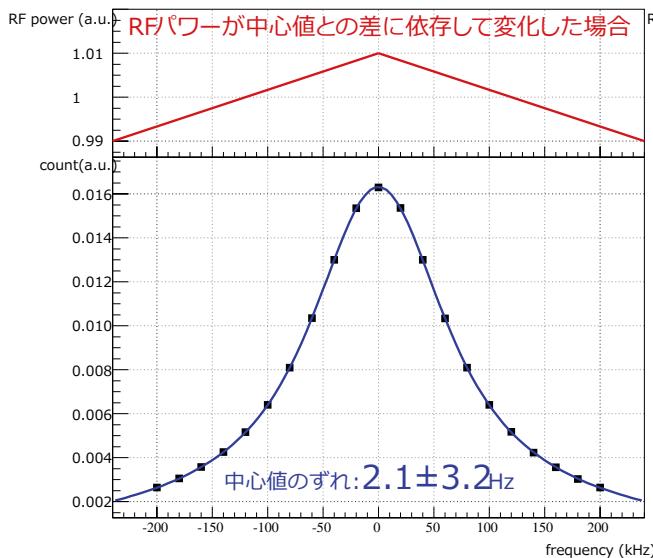
A



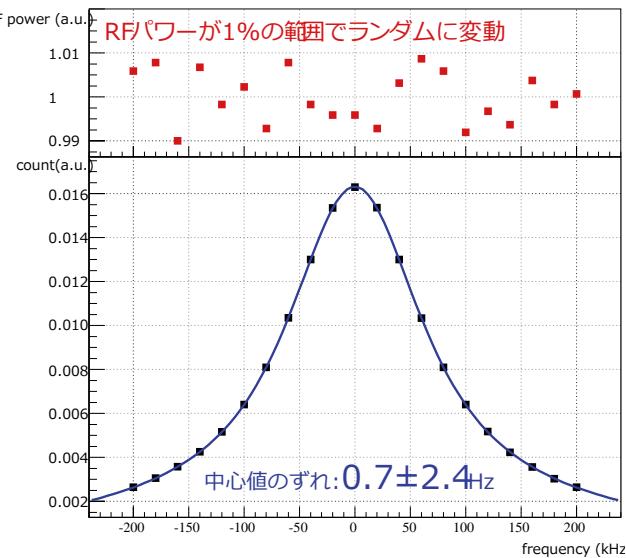
B



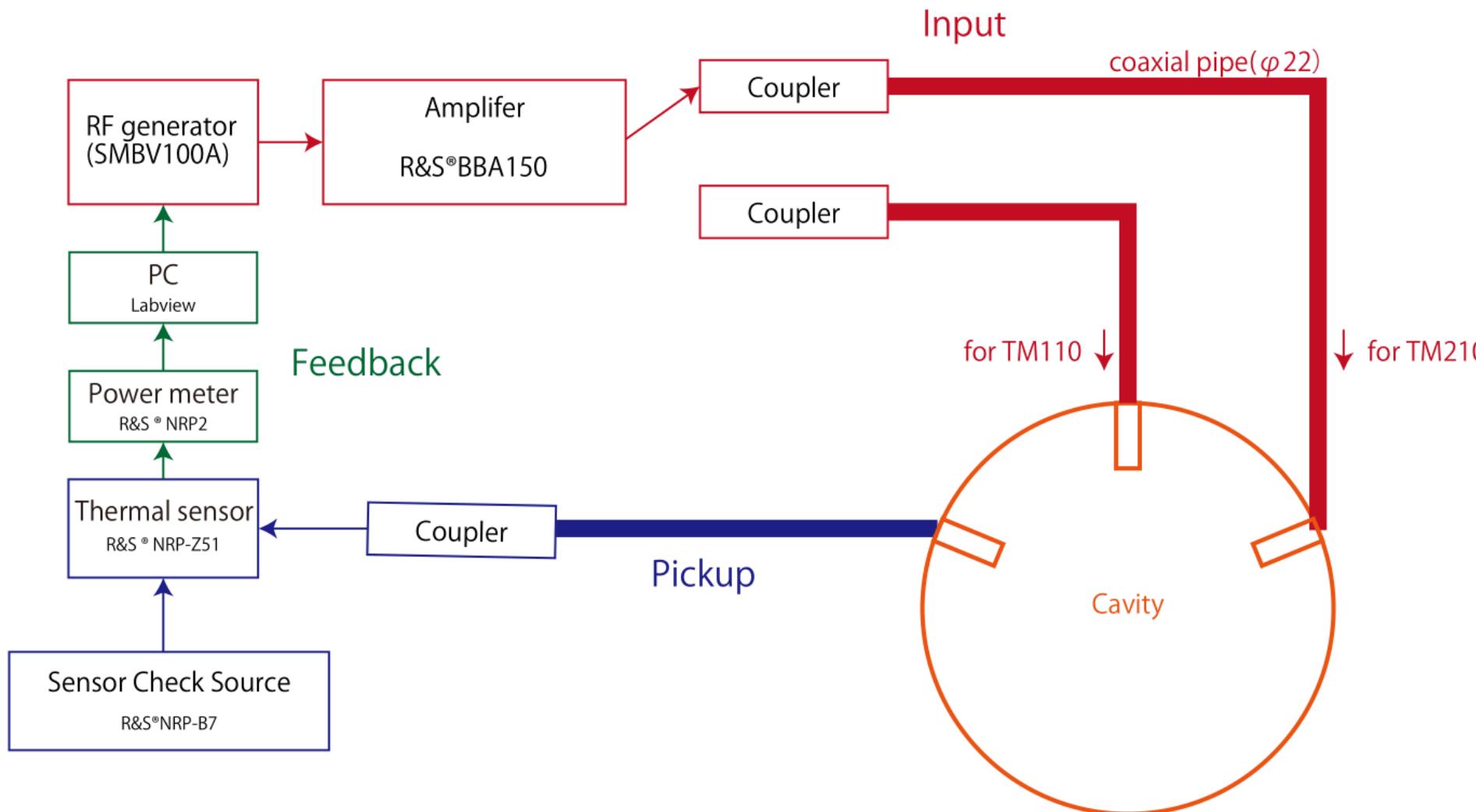
C



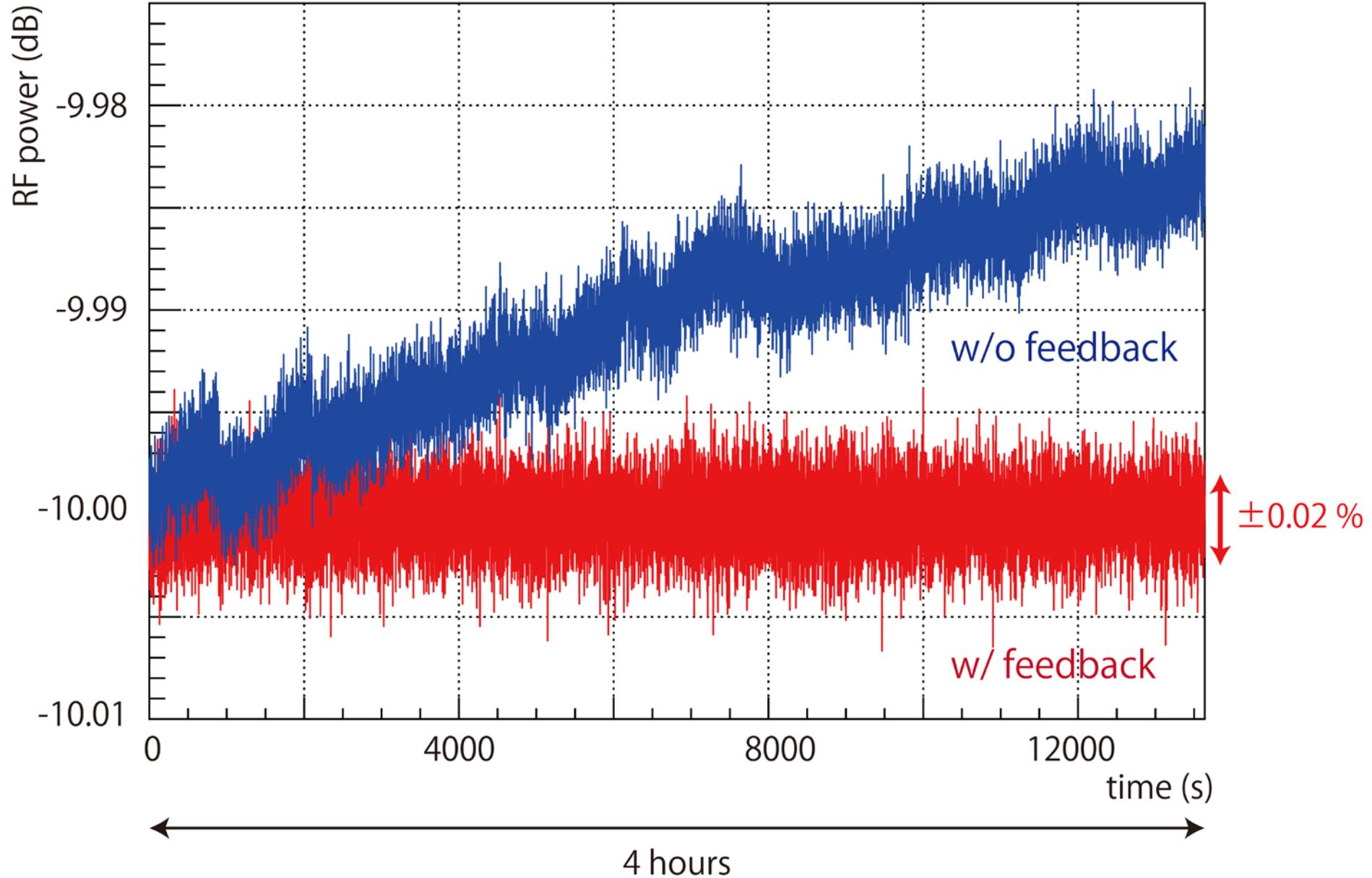
D



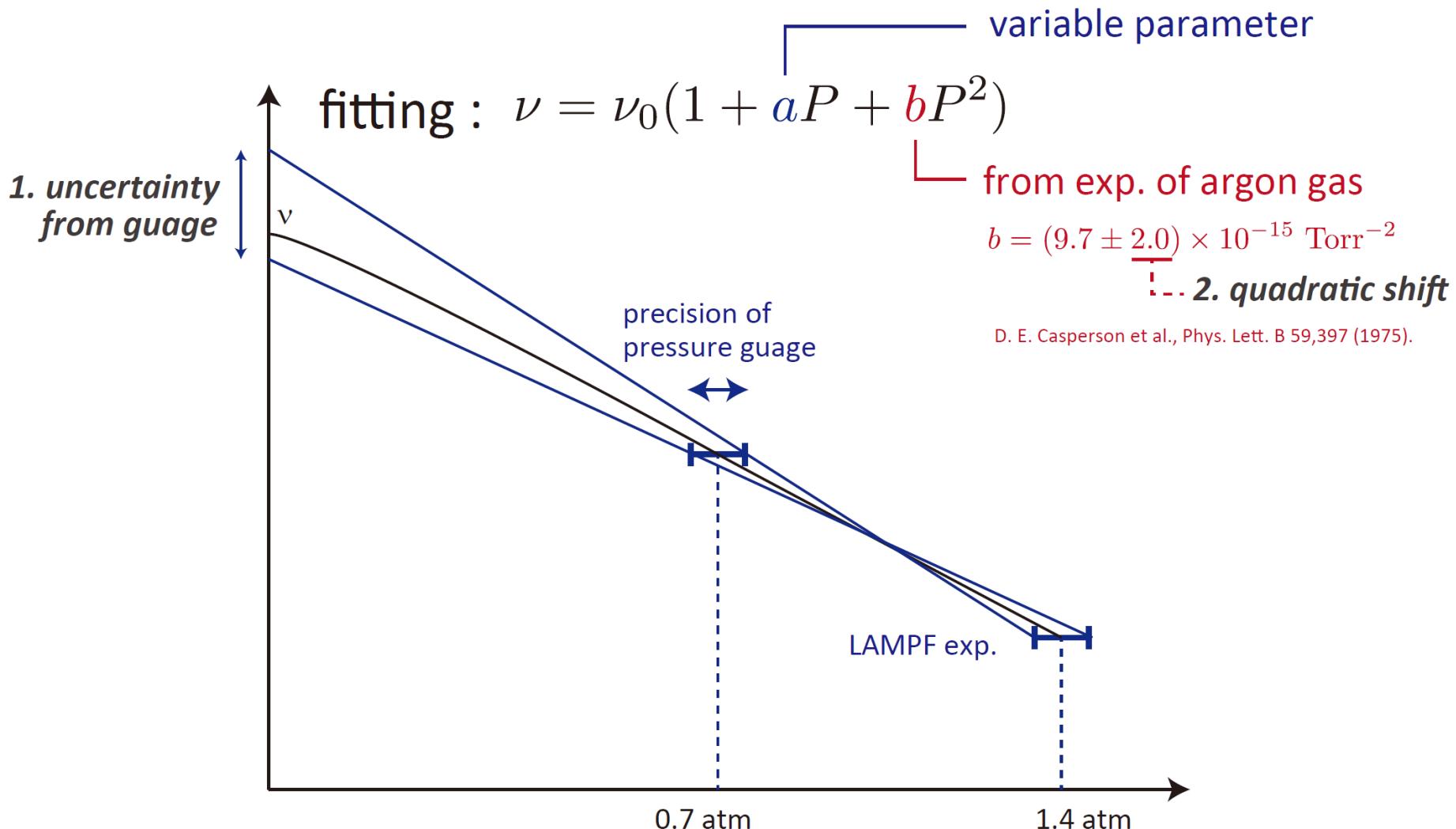
# systematic error from RF power



## systematic error from RF power



- The transition frequencies in vacuum is obtained by pressure extrapolation.



# uncertainty from gas pressure

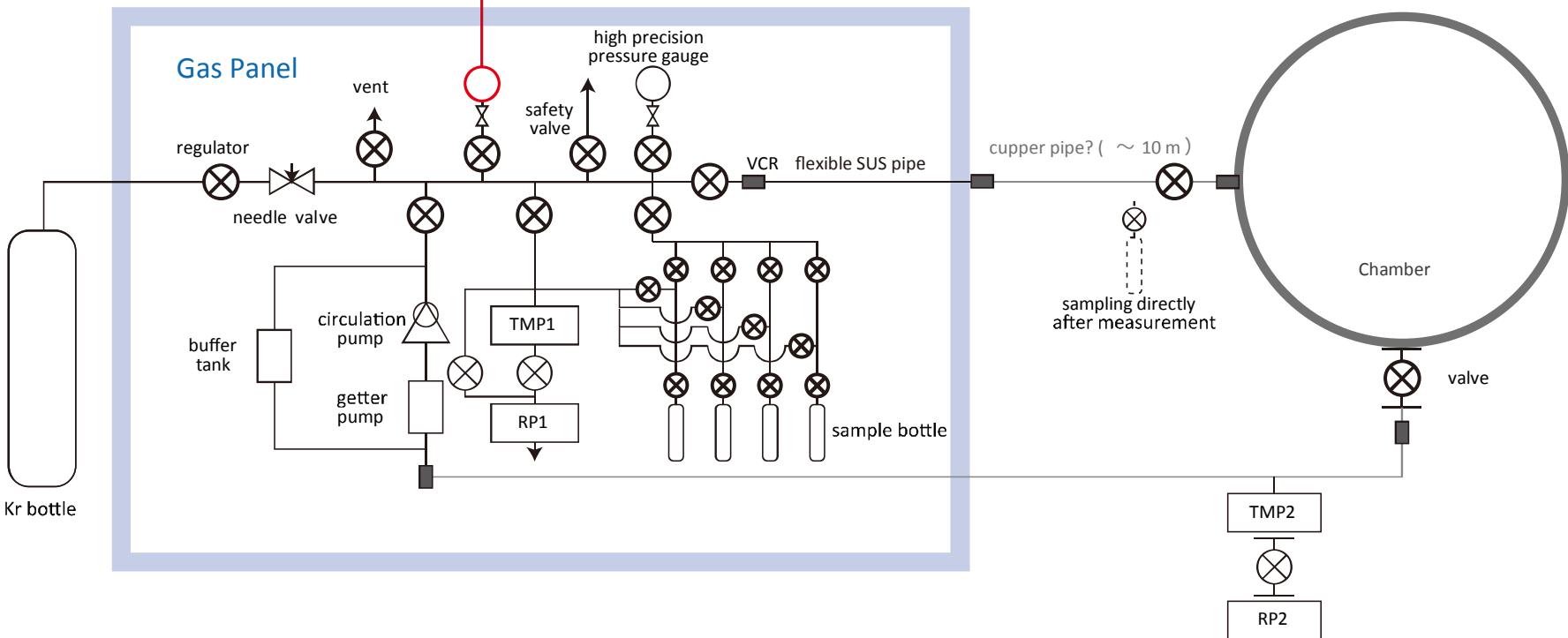


silicon gauge (relative 0.02 %)

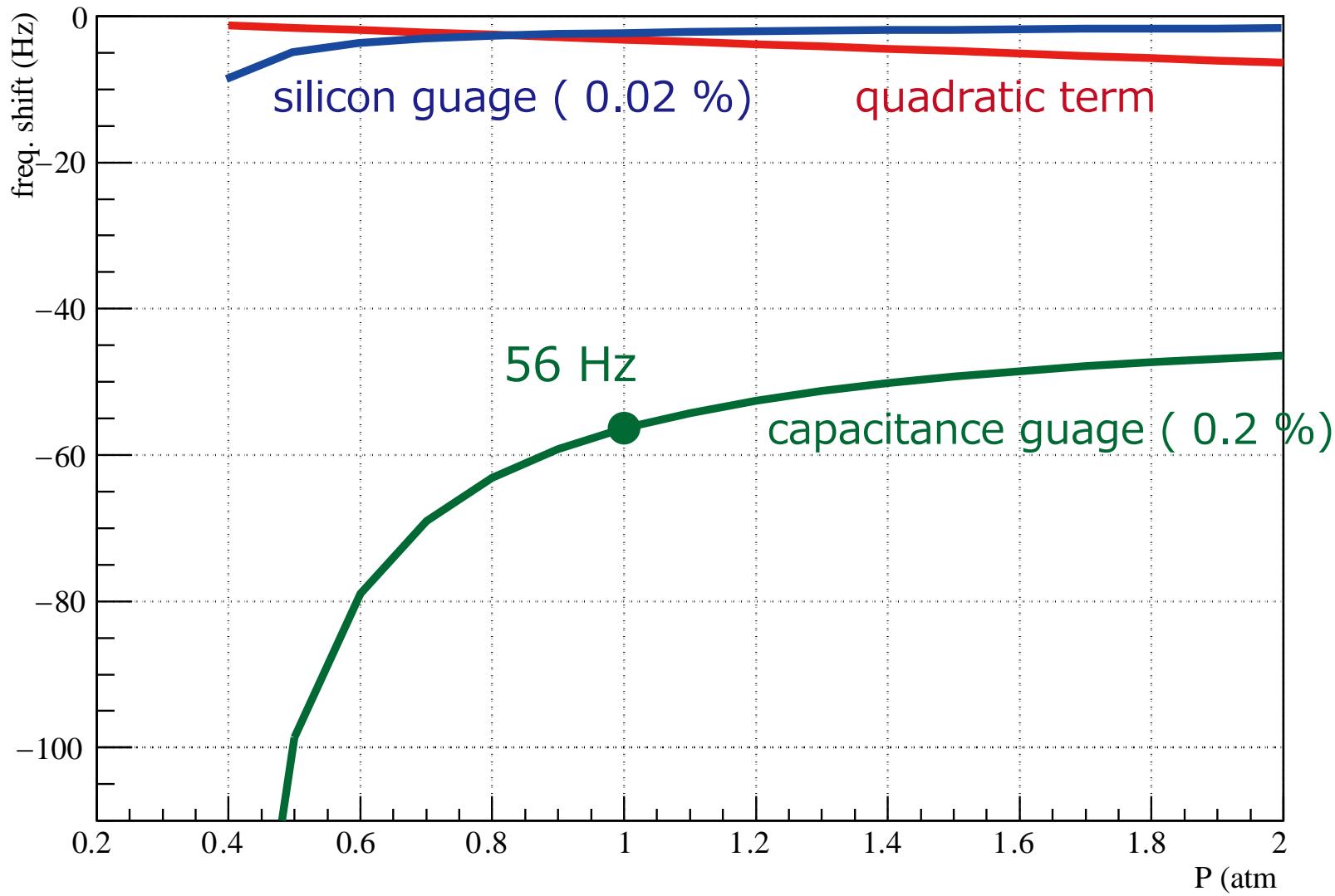
available at 2016

capacitance guage (relative 0.2 %)

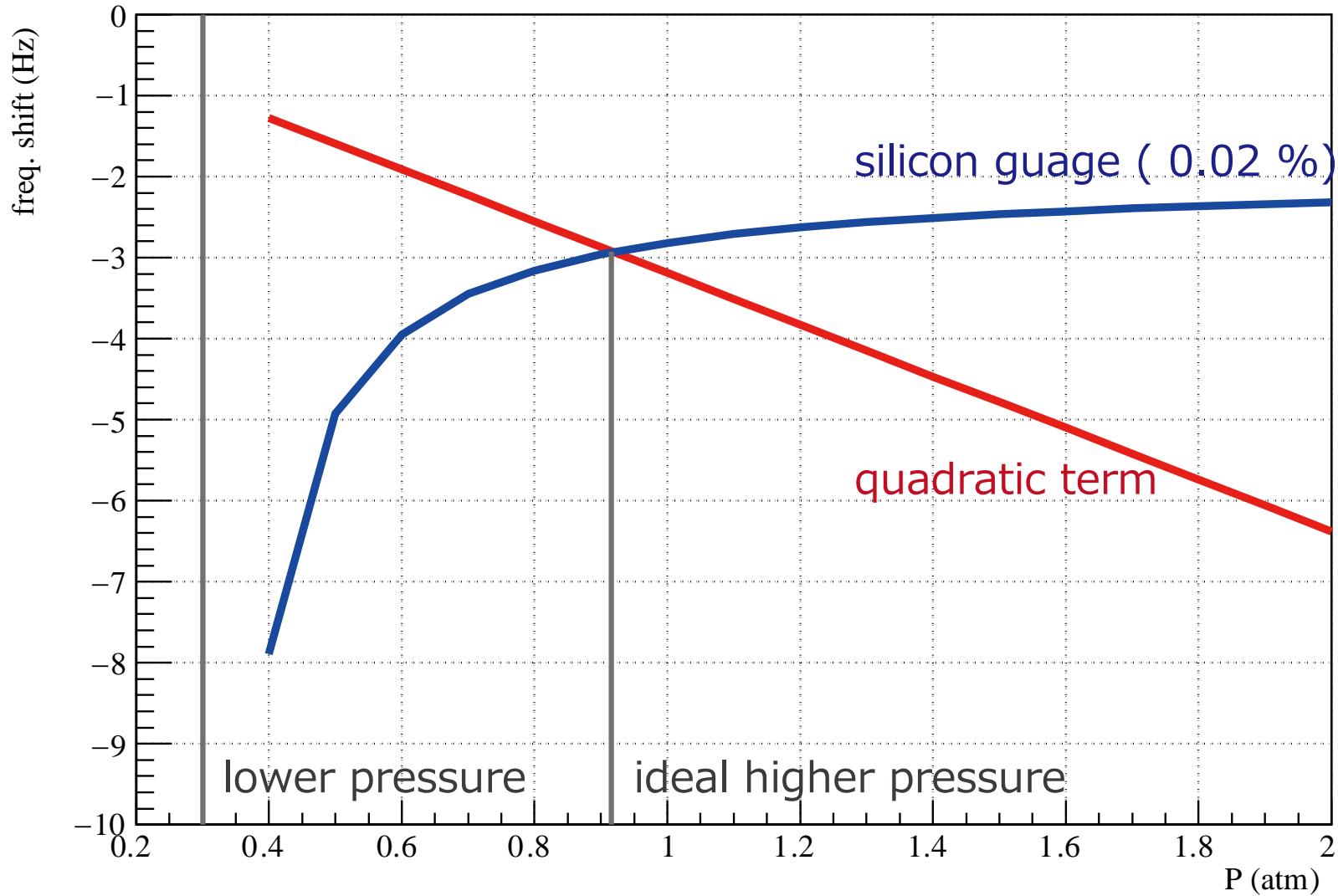
ready



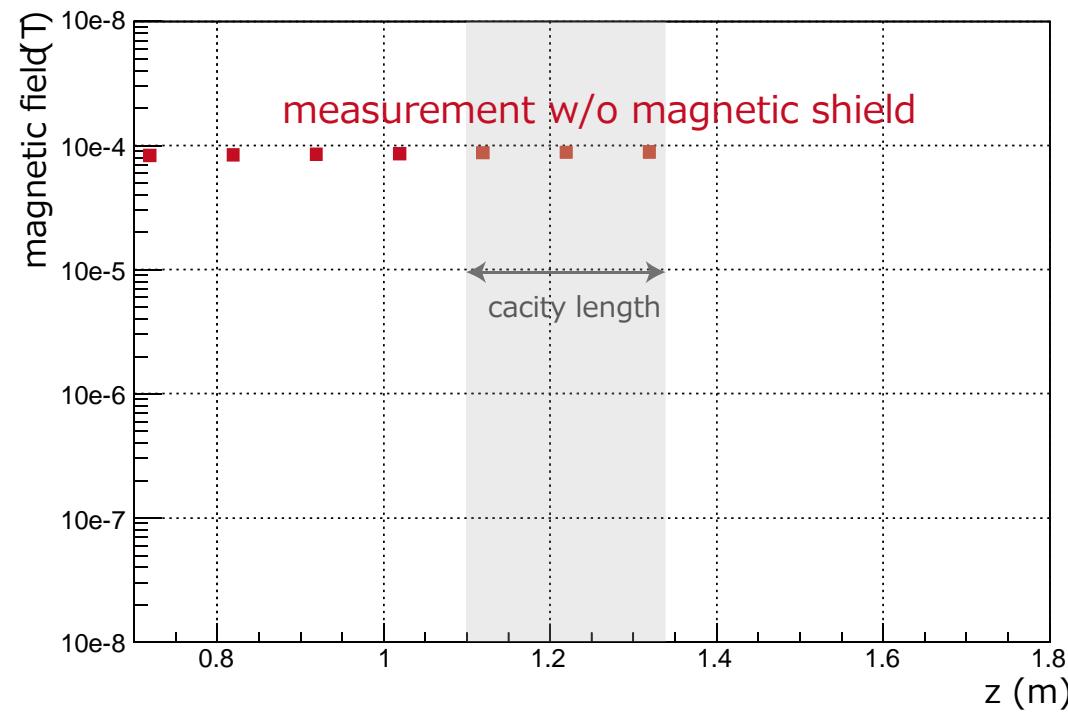
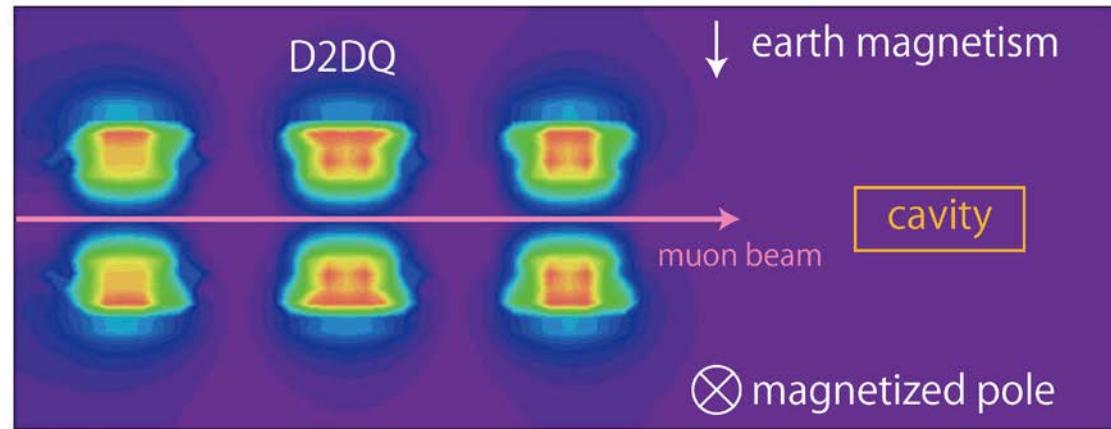
Uncertainty from capacitance guage is dominant compared to from quadratic term.



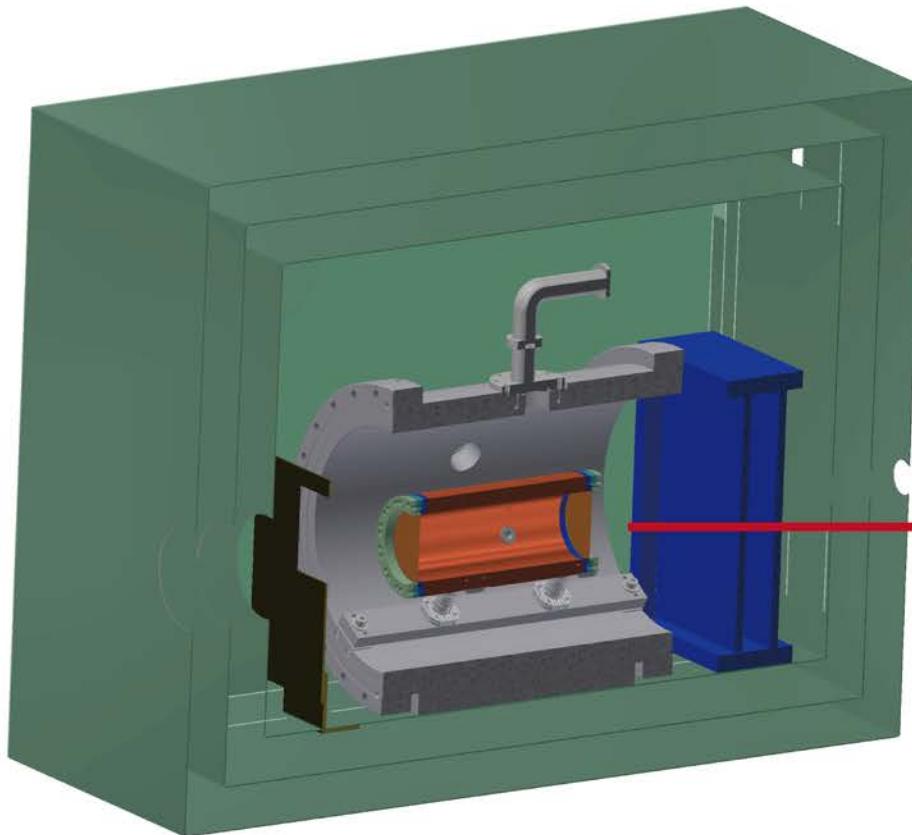
Uncertainty from pressure guage and quadratic term are comparable by measuring in 0.3 atm and 0.9 atm.



# magnetic shield



# magnetic shield



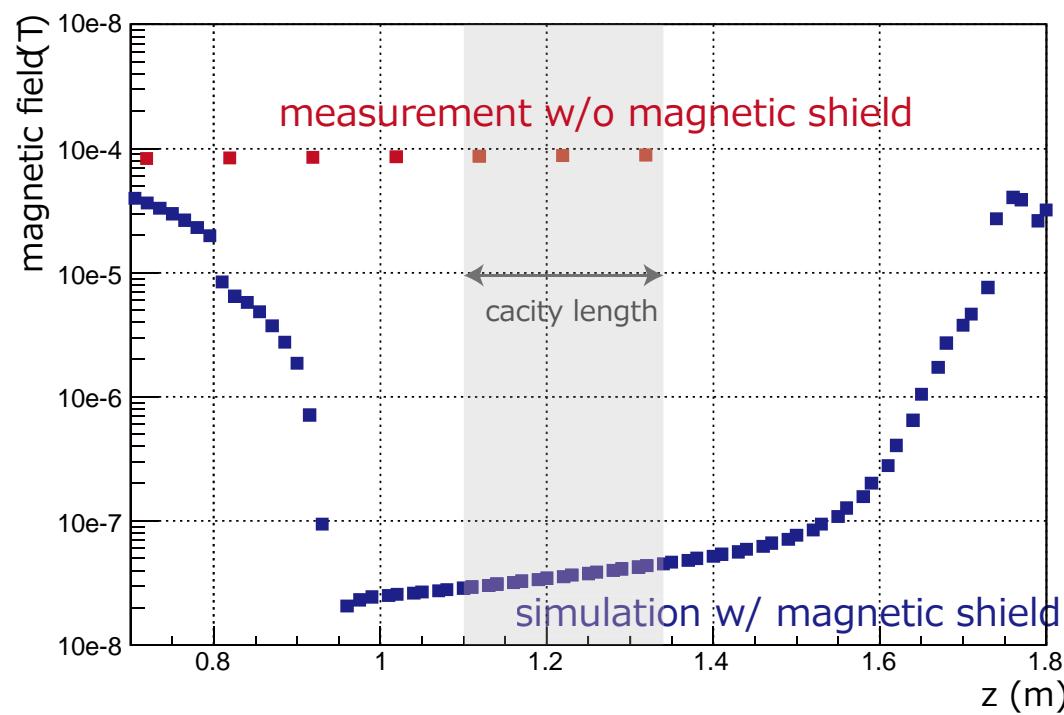
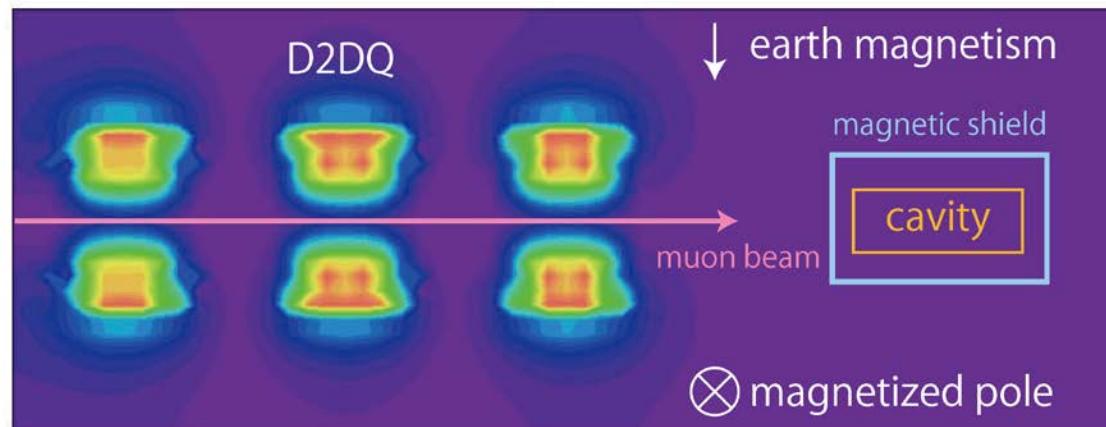
## magnetic shield

- 3 layers
- 1.5 mmt permalloy plate
- leak field: <0.65 mG

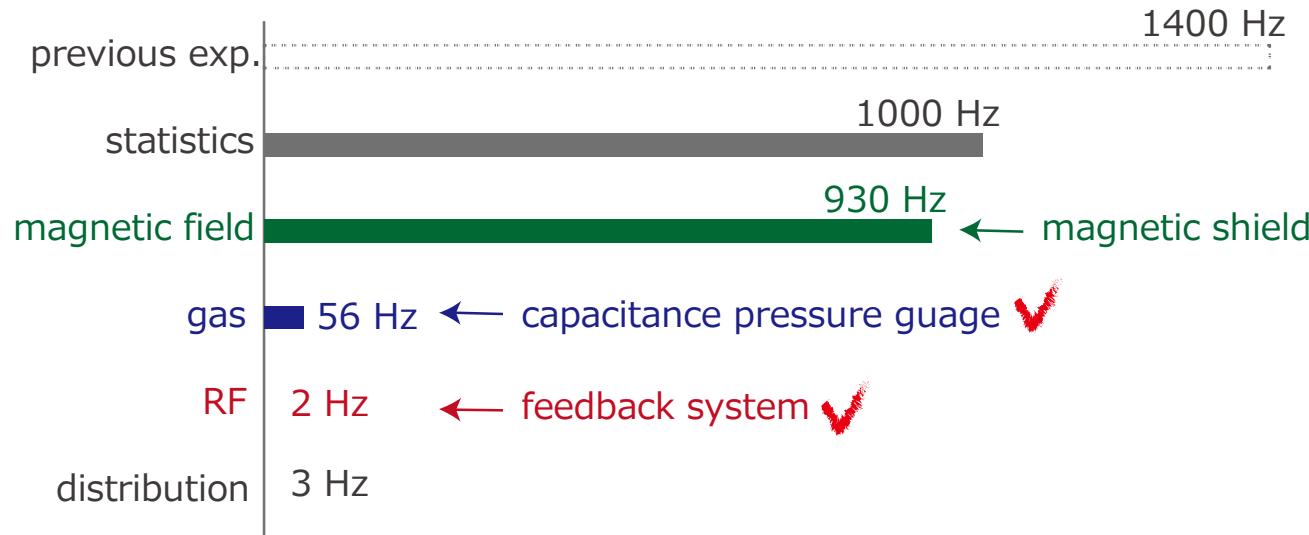
## measurement of B field

- using fluxgate magnetometer
- precision: < 0.1 mG
- offline scan & online monitoring

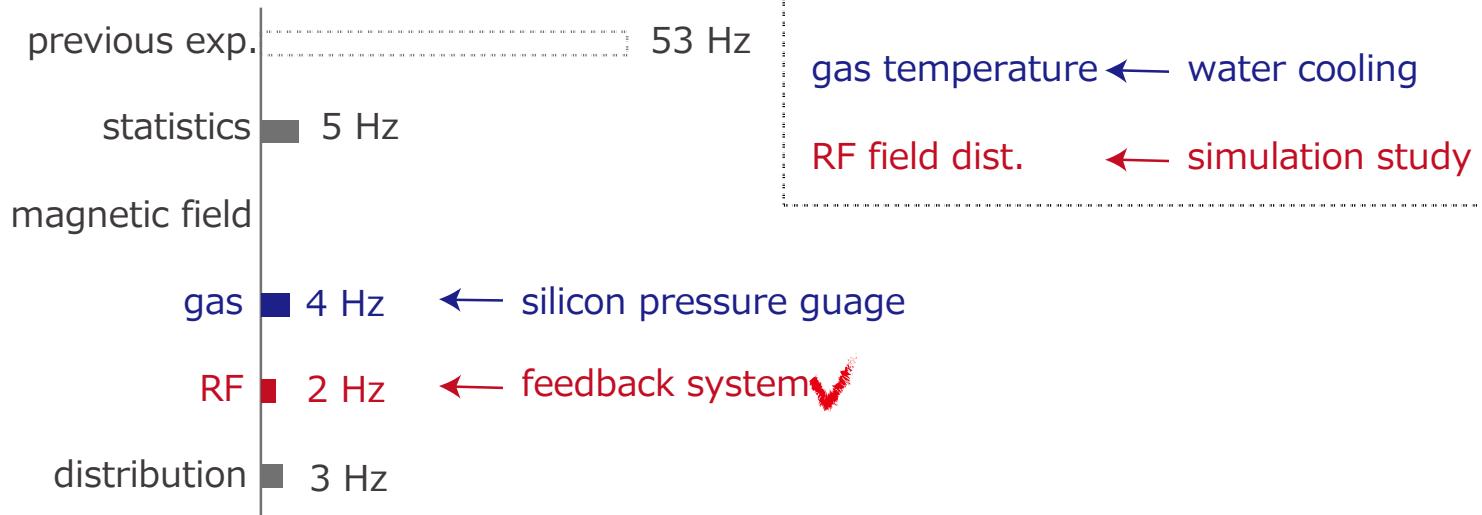
# magnetic shield



## zero field exp.



## high field exp.





2014

beamtime: detector test

beamtime: beam profile measurement

zero field exp.

high field exp.

2015

beamtime:

1400 Hz -> ~1000 Hz

↓  
modulation helmholtz coil

beamtime

1000 Hz -> ~100 Hz

2016

beamtime

H-line is ready  
beamtime: high field exp.  
53 Hz -> ~5 Hz

Thank you for your attention!

