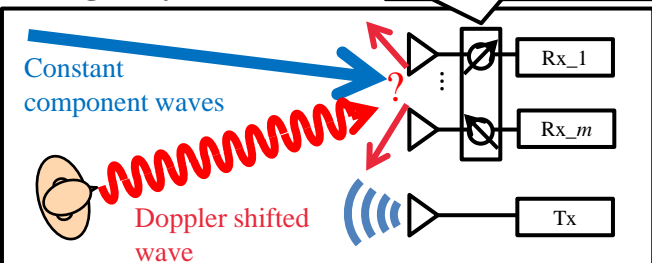


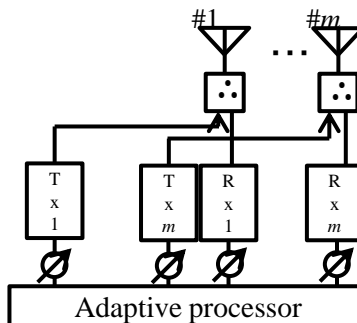
Introduction

Living-body Radar[1]



Array antenna calibration is needed to estimate the accurate direction

Conventional calibration method[2]

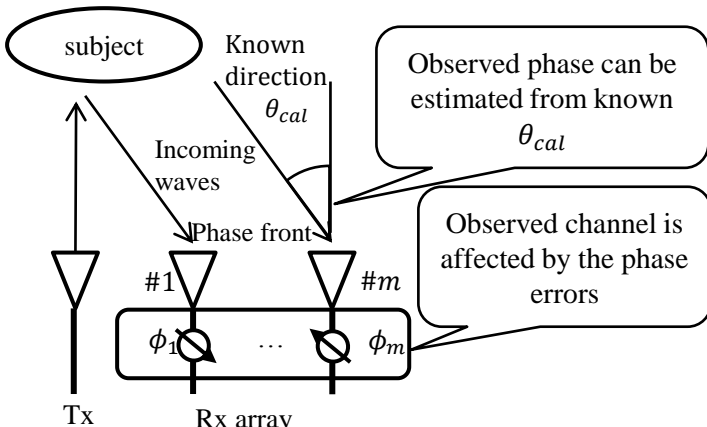


Automatic calibration method using own transmitted signals

Each antenna element must have both Tx and Rx

Simple calibration method

Channel measuring system

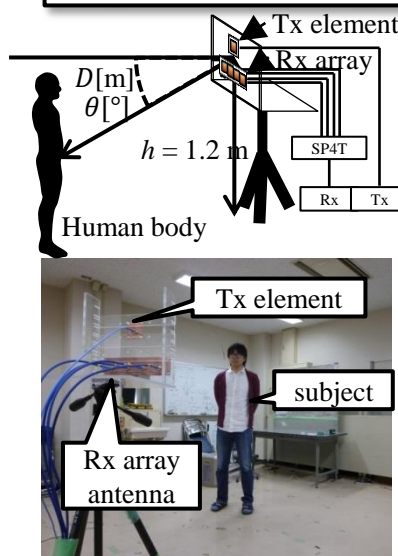


Observed phase can be estimated from known θ_{cal}

Observed channel is affected by the phase errors

The difference between the estimated and observed phase is used for calibration value

Experimental setup and overview



Array element spacing: 0.5 wavelength

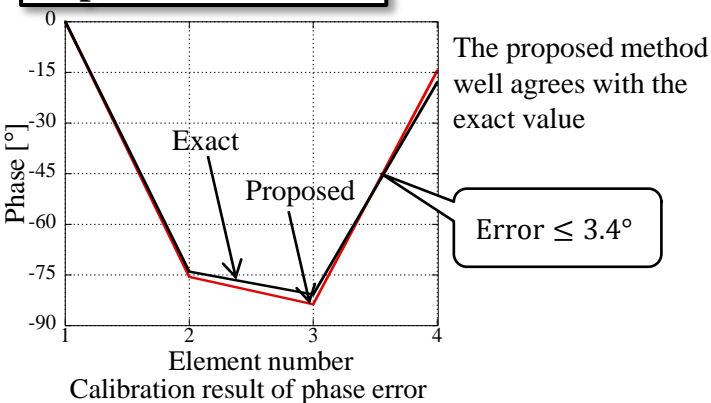
Frequency: 2.47125 GHz

Sampling frequency: 4.0 Hz

Channel measurement period: 10 s

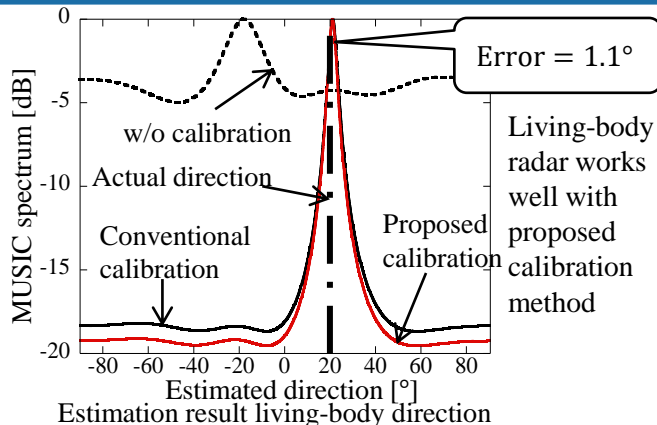
$D_{cal} = 2.0$ m
 $\theta_{cal} = 0^\circ$

Experimental results



The proposed method well agrees with the exact value

Error $\leq 3.4^\circ$



Error = 1.1°

Living-body radar works well with proposed calibration method

Conclusion

Proposed calibration errors $< 3.4^\circ$

Estimating living-body works well and estimation error is 1.1°

[1] K. Konno, et al., "Experimental evaluation of estimating living-body direction using array antenna for multipath environment." *Antenna and Wireless Propagation Letters*, IEEE vol. 13, pp. 718-721, 2014.

[2] K. Nishimori, et al., "Automatic calibration method using transmitting signals of an adaptive array for TDD systems." *Vehicle Technology, IEEE Transactions on* 50.6 (2001): 1636-1640.