

# Examination of energy properties of ship waves

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# Introduction

- Background

  - Why did this study start?

- Experiments on ship waves

  - Procedure of experiments and results

- Conclusion

  - energy properties and future works



# Background

- Some accidents have been reported on ship waves
- The purpose of many researches has been limited to the analysis of wave resistance



We need a study of ship waves

# Outline of experiments

- Place of experiments

  - 50m-towing tank in my university

- Towing model

  - T.S. SHIOJI MARU in my university

- Item of measurements

  - Time history of ship waves with three capacitance wire type wave probes and a servo type wave probe

# 50m-towing tank

- length 50m
- width 10m
- Water depth 2m
- Maximum speed of towing carriage 1.2m/s



# Towing model

## Principal particulars of model

- Scale 1/17
- Lpp 2.7m
- Breadth 0.59m
- Draft 0.18m
- Displacement 158.7kg



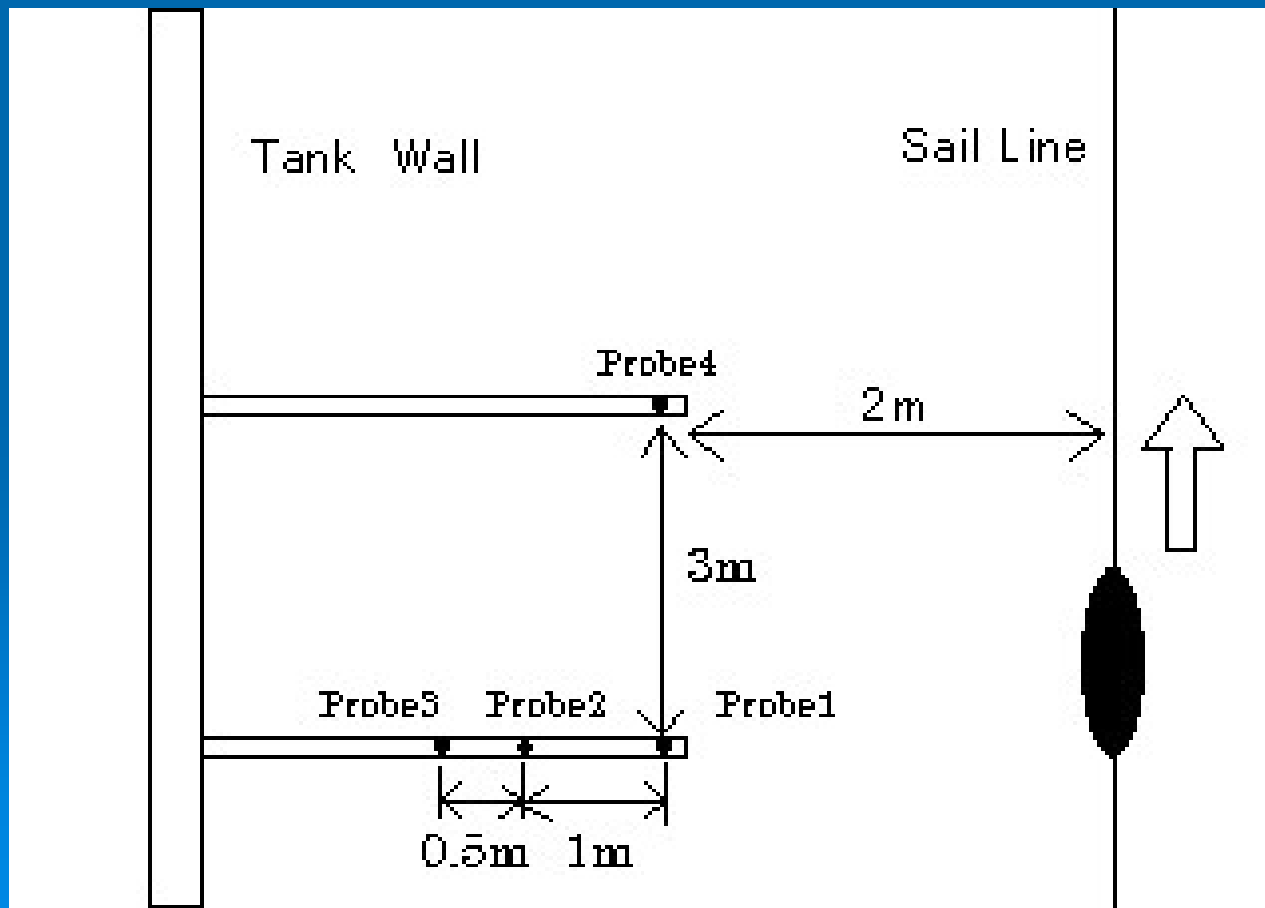
# Speeds of carriage

The model is attached to the carriage

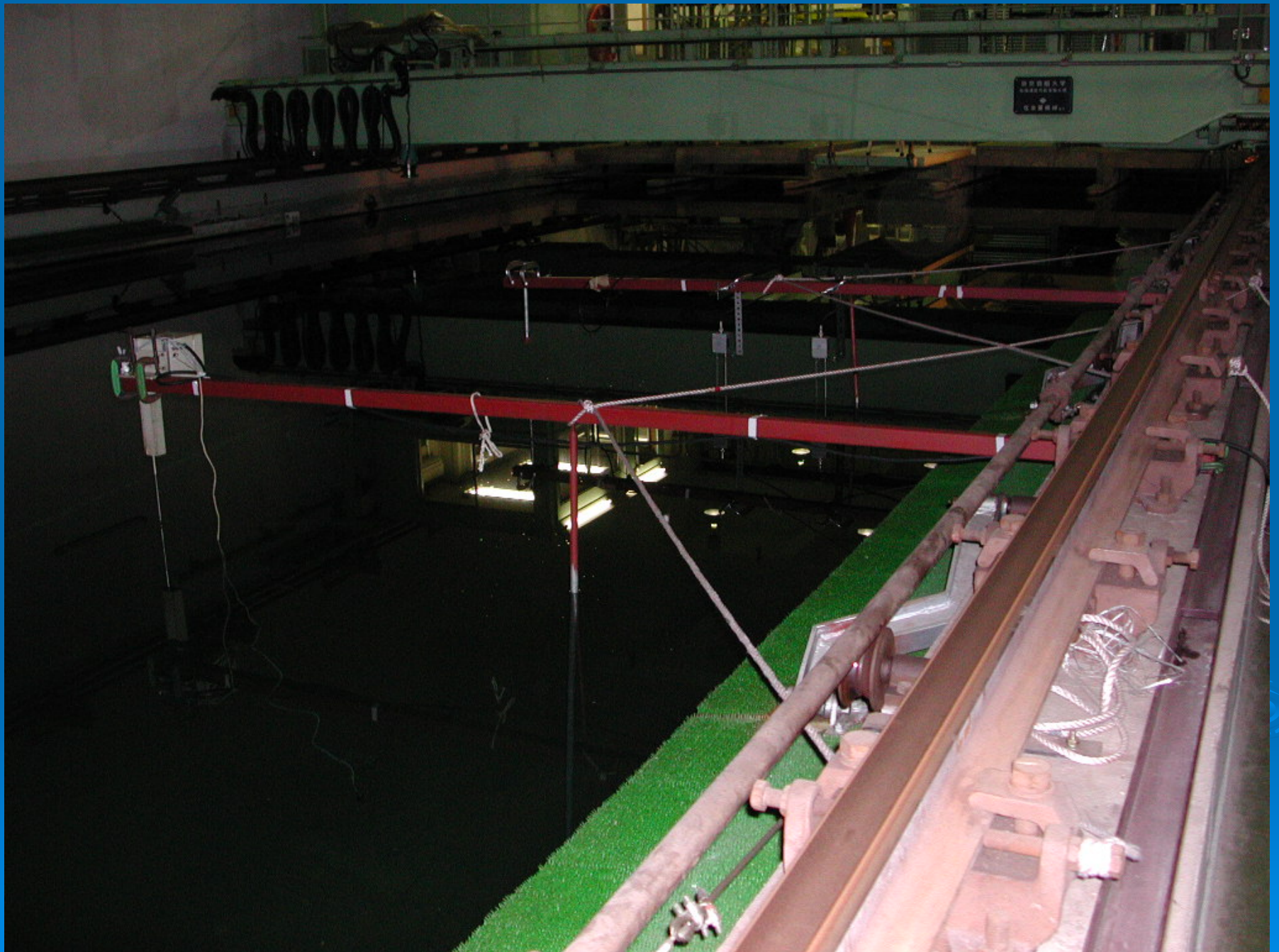
- 0.8m/s  $F_n=0.15$
- 0.9m/s  $F_n=0.17$
- 1.0m/s  $F_n=0.19$
- 1.1m/s  $F_n=0.21$
- 1.2m/s  $F_n=0.23$

# Arrangement of wave probes

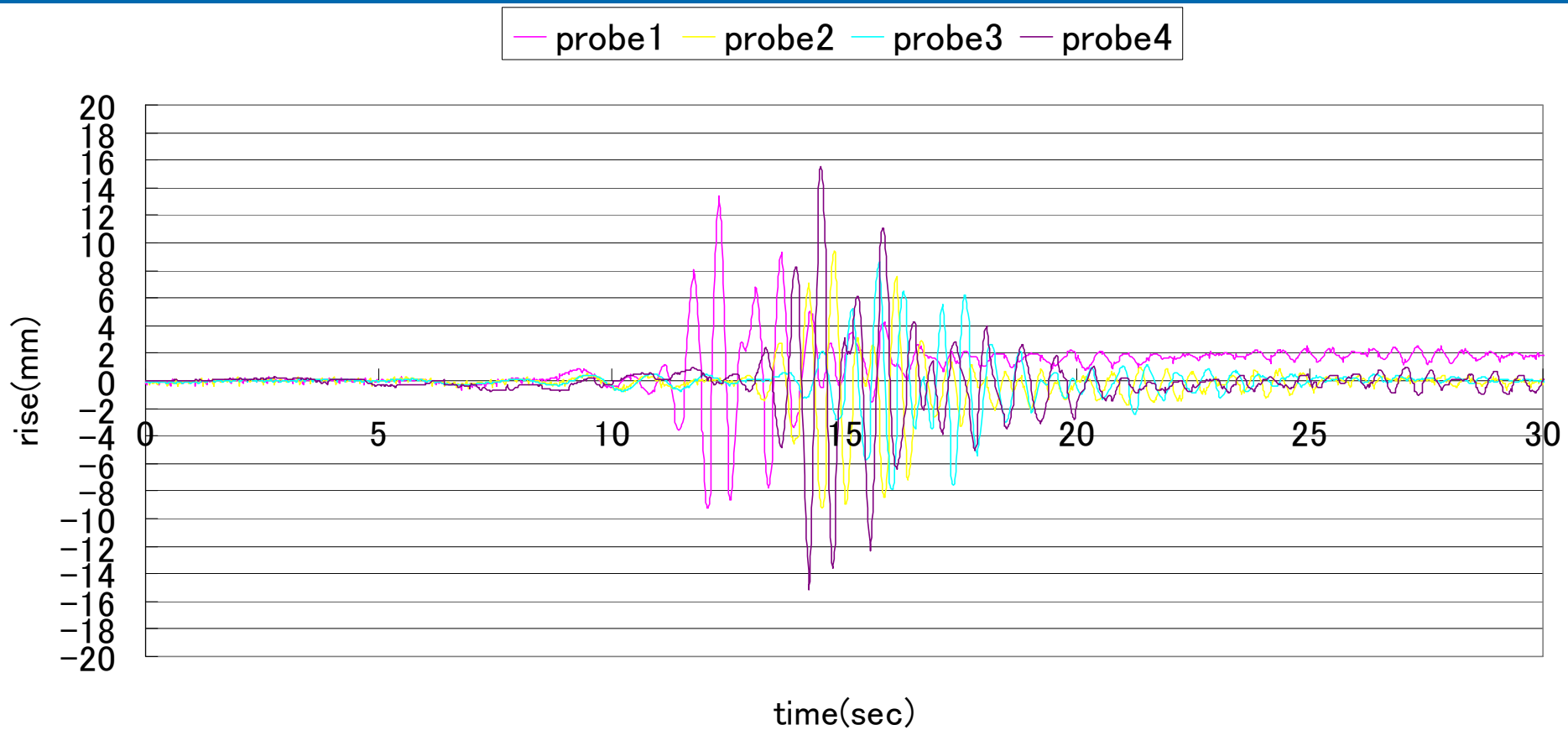
- Probe1~3      capacitance wire type
- Probe4      servo type







# Time histories of ship waves



# Maximum wave heights and periods

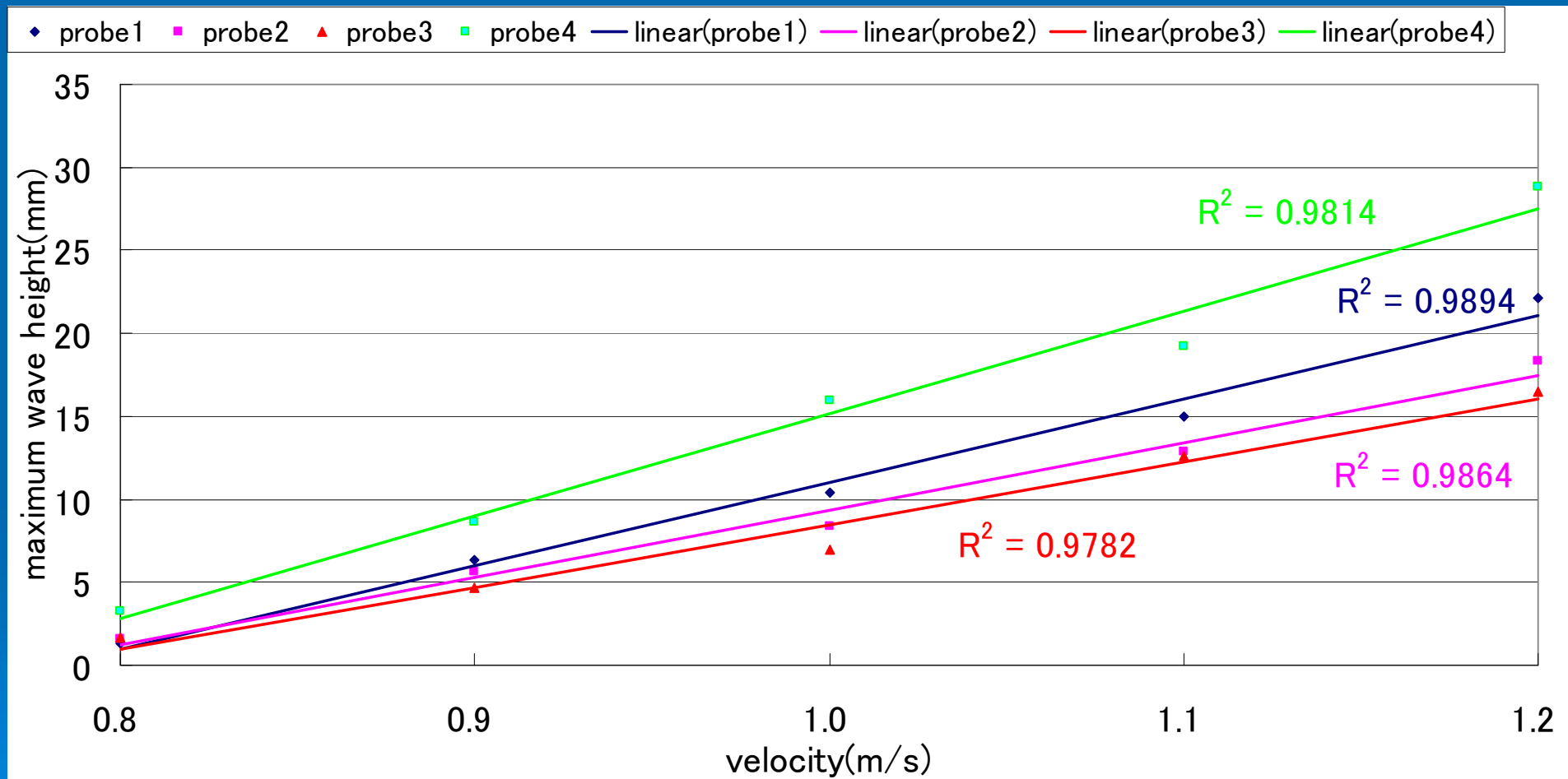
Table1:maximum wave height at various velocities (mm)

Velocity Of Carriage (m/s)	0.8	0.9	1.0	1.1	1.2
probe1	1.31	6.31	10.42	15.00	22.10
probe2	1.58	5.66	8.34	12.88	18.32
probe3	1.65	4.64	6.96	12.60	16.50
probe4	3.24	8.61	15.93	19.20	28.85

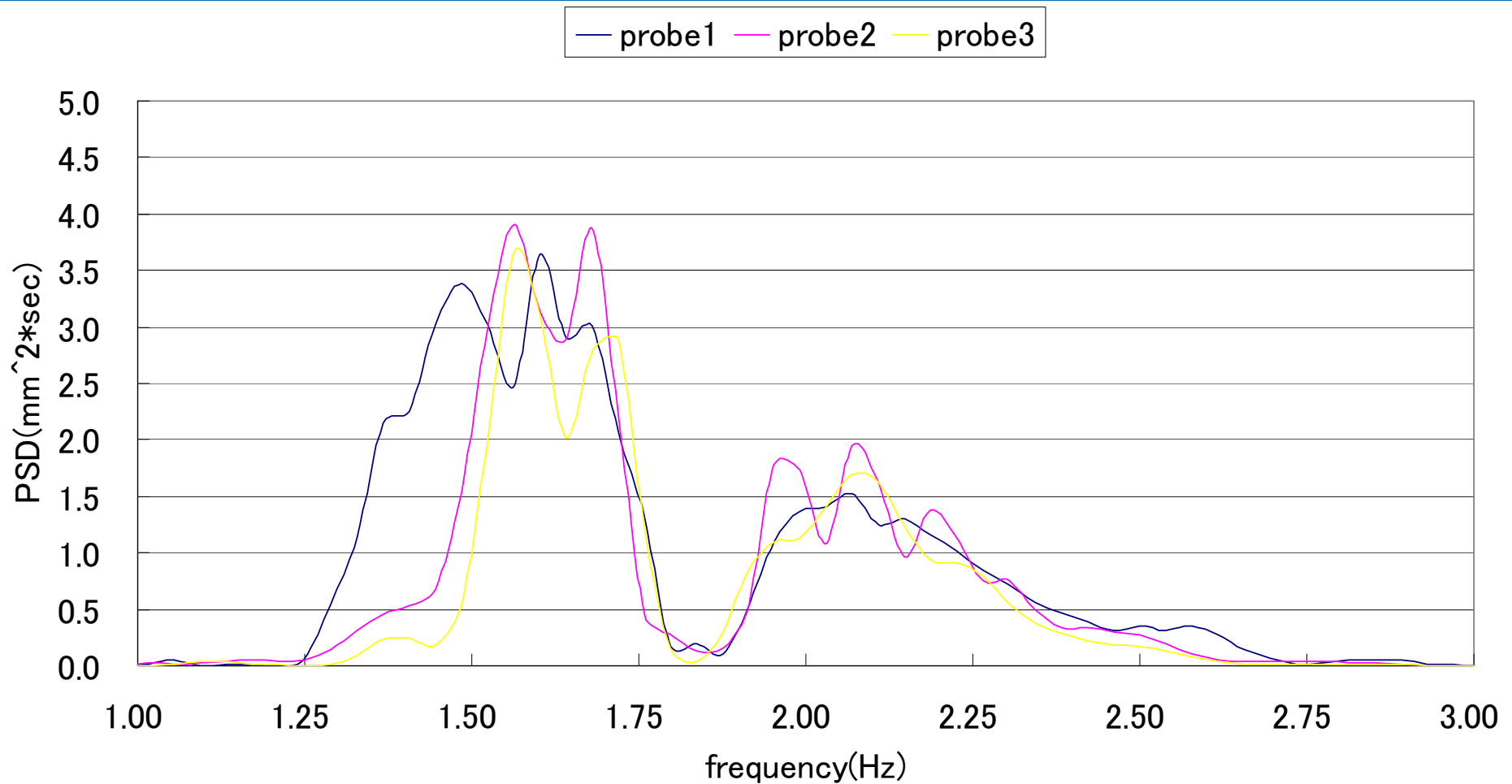
Table2:maximum wave period at various velocities (sec)

Velocity of carriage (m/s)	0.8	0.9	1.0	1.1	1.2
probe1	0.20	0.23	0.25	0.25	0.30
probe2	0.23	0.23	0.23	0.25	0.28
probe3	0.20	0.20	0.20	0.23	0.25
probe4	0.23	0.20	0.23	0.23	0.23

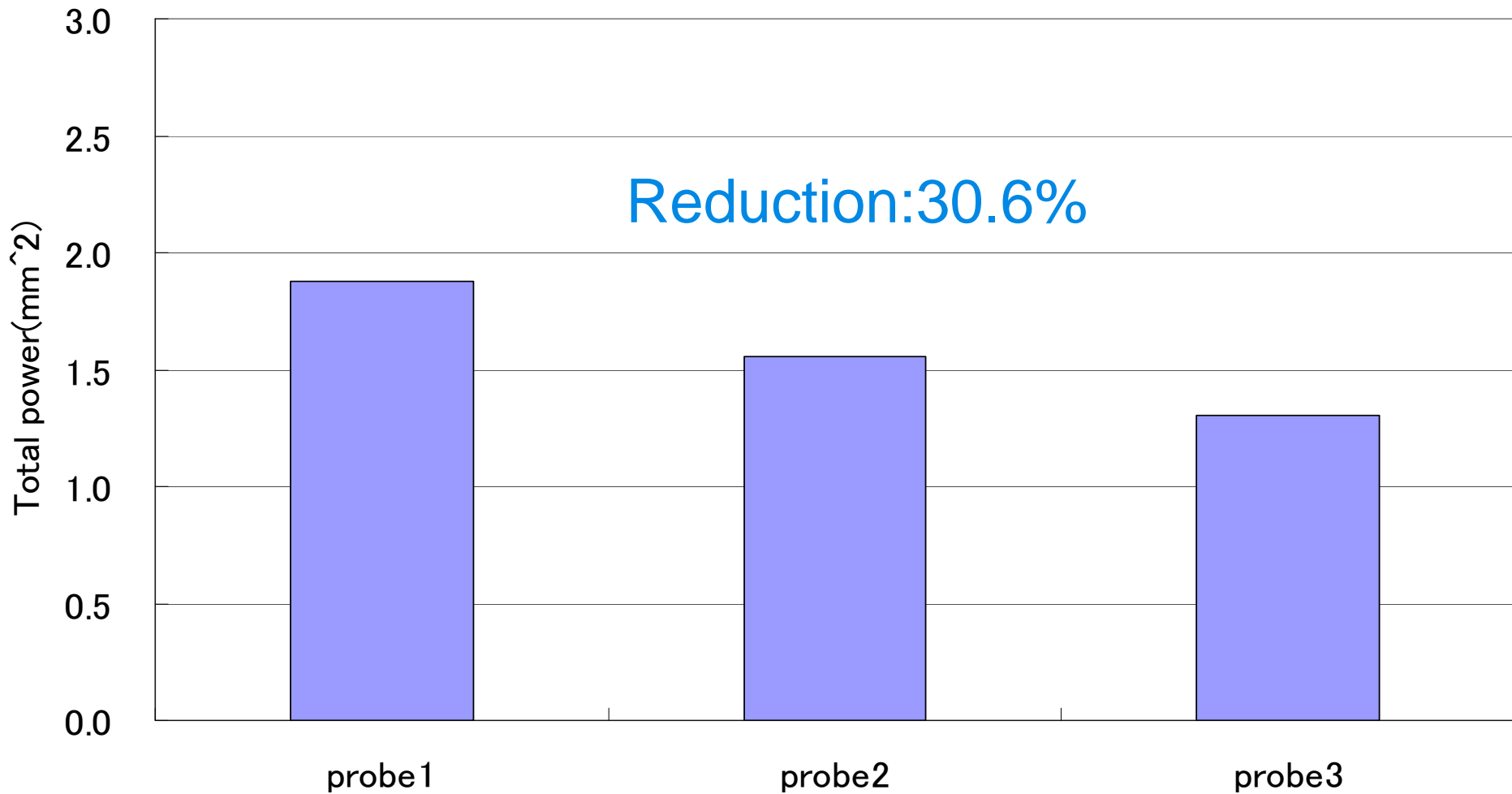
# Maximum wave heights



# Fourier Power Spectrum



# Total power



# Conclusion

In deep water

- Ship waves don't change its shape at any speeds of a ship
- The energy of ship waves reduces as the distance from a ship increases

We are studying on numerical simulation of ship waves