

CEPC HOM COUPLER R&D*

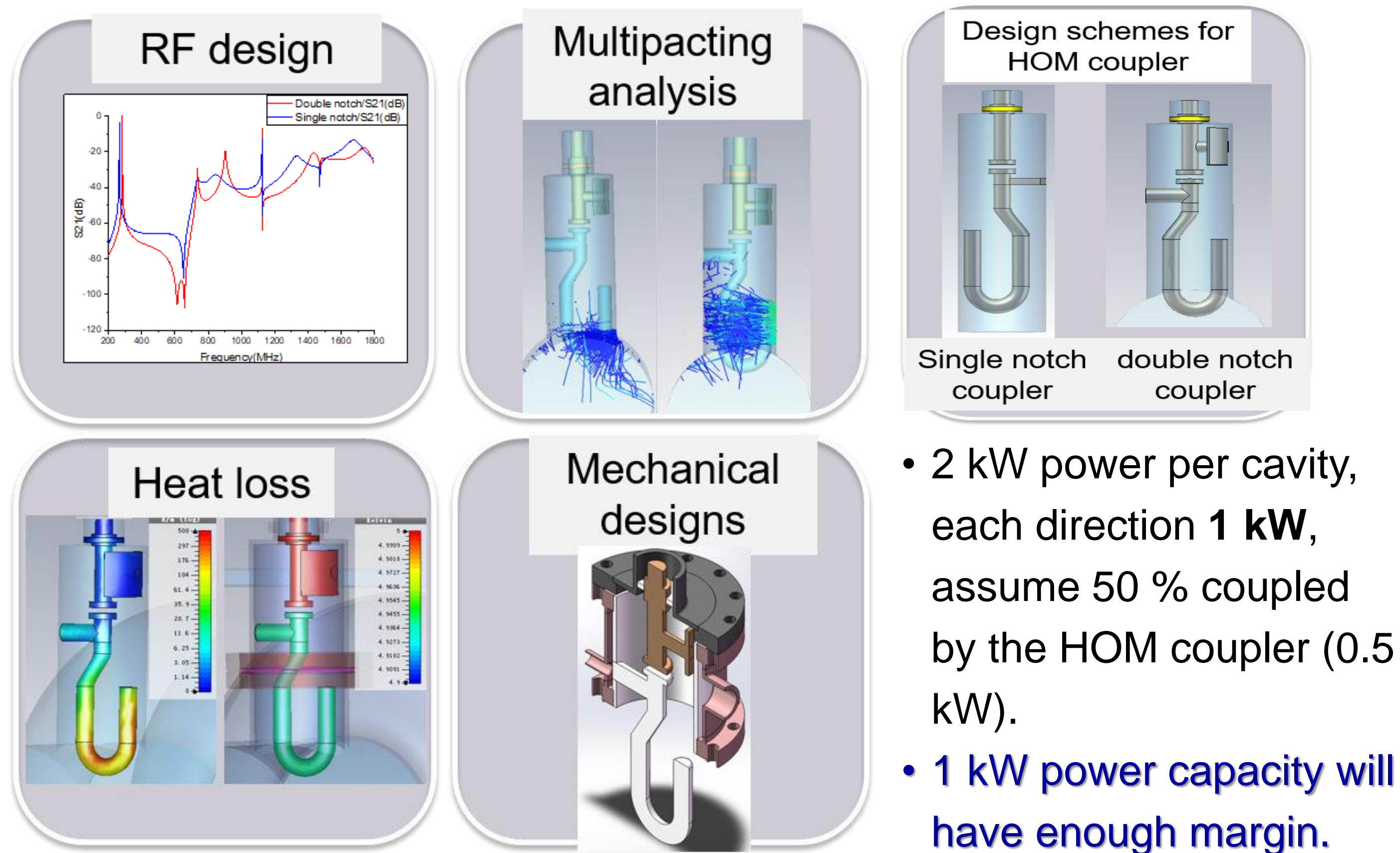
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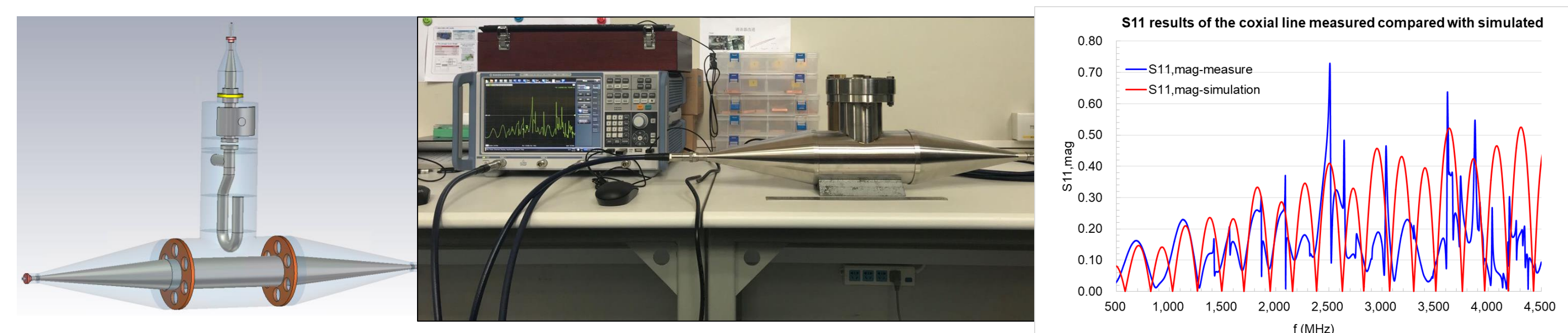
INTRODUCTION

The conceptual design report (CDR) for the Circular Electron Positron Collider (CEPC) has been published in September 2018. In this paper, the CDR design and prototyping of the HOM coupler for the CEPC Collider ring cavity will be given. Each cavity has two detachable coaxial HOM couplers mounted on the cavity beam pipe with HOM power handling capacity of 1 kW. A double notch coupler is chosen due to its wide bandwidth for the fundamental mode. A prototype of this HOM coupler and a coaxial line test bench have been fabricated and tested. The test results agree well with the simulation results. A test bench with two 2-cell cavities are used to measure the real damping results and HOM propagating properties for a cavity string.

DESIGN CONTENT



TEST BENCH FABRICATION



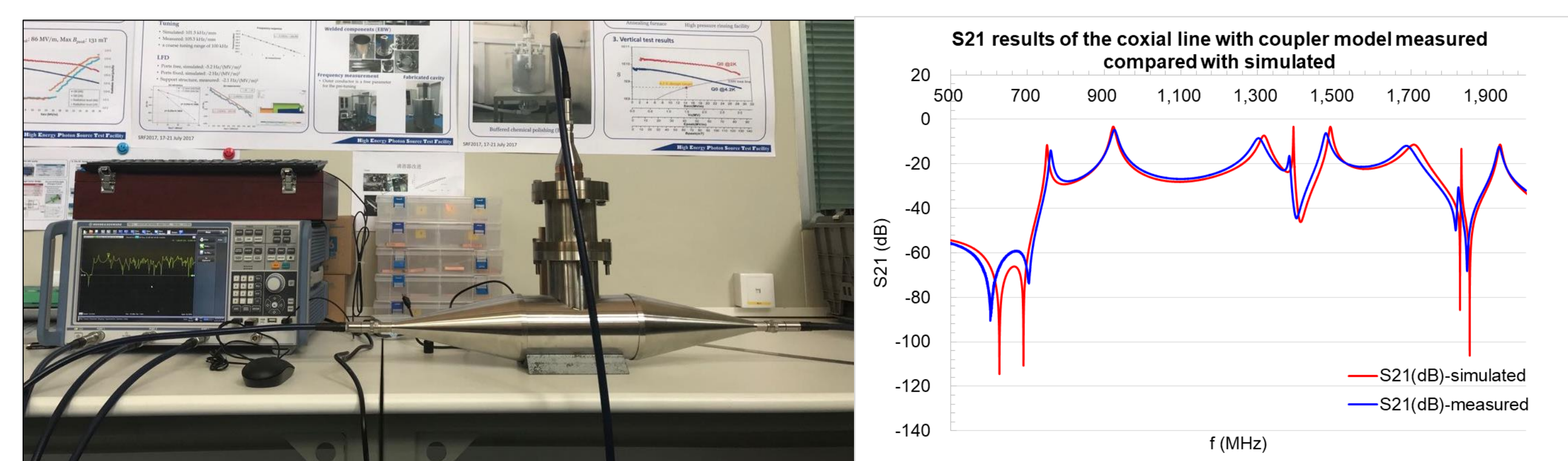
- In order to characterize the transmission and reflection of each coupler and check the influence of the fabrication errors, coaxial transmission line was used to measure the transmission properties of the coupler.
- A coaxial line test bench fabricated by stainless steel is used for test.
- **The measured results agree well with the simulated results.**

HOM COUPLER FABRICATION



- Dismountable HOM coupler design, made of stainless steel and copper.
- Different inner conductor length are used to check the transmission

HOM COUPLER LOW POWER TEST



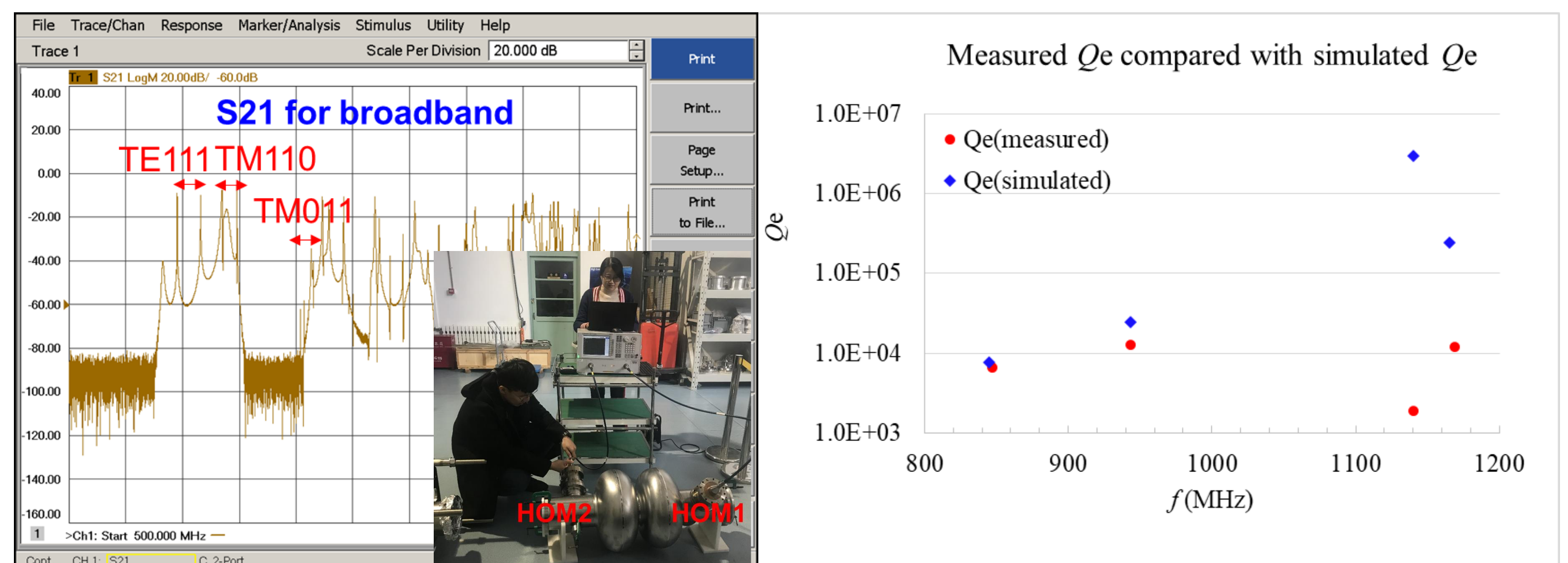
- **The measured results are not much different from the simulation results.**
- The cause of **errors** are mainly from fabrication errors and assembly errors.
- The dismountable HOM coupler with different inner part lengths are used to check the transmission properties, and the measured results are also agree well with the simulates results.

HOM COUPLER HIGH POWER TEST



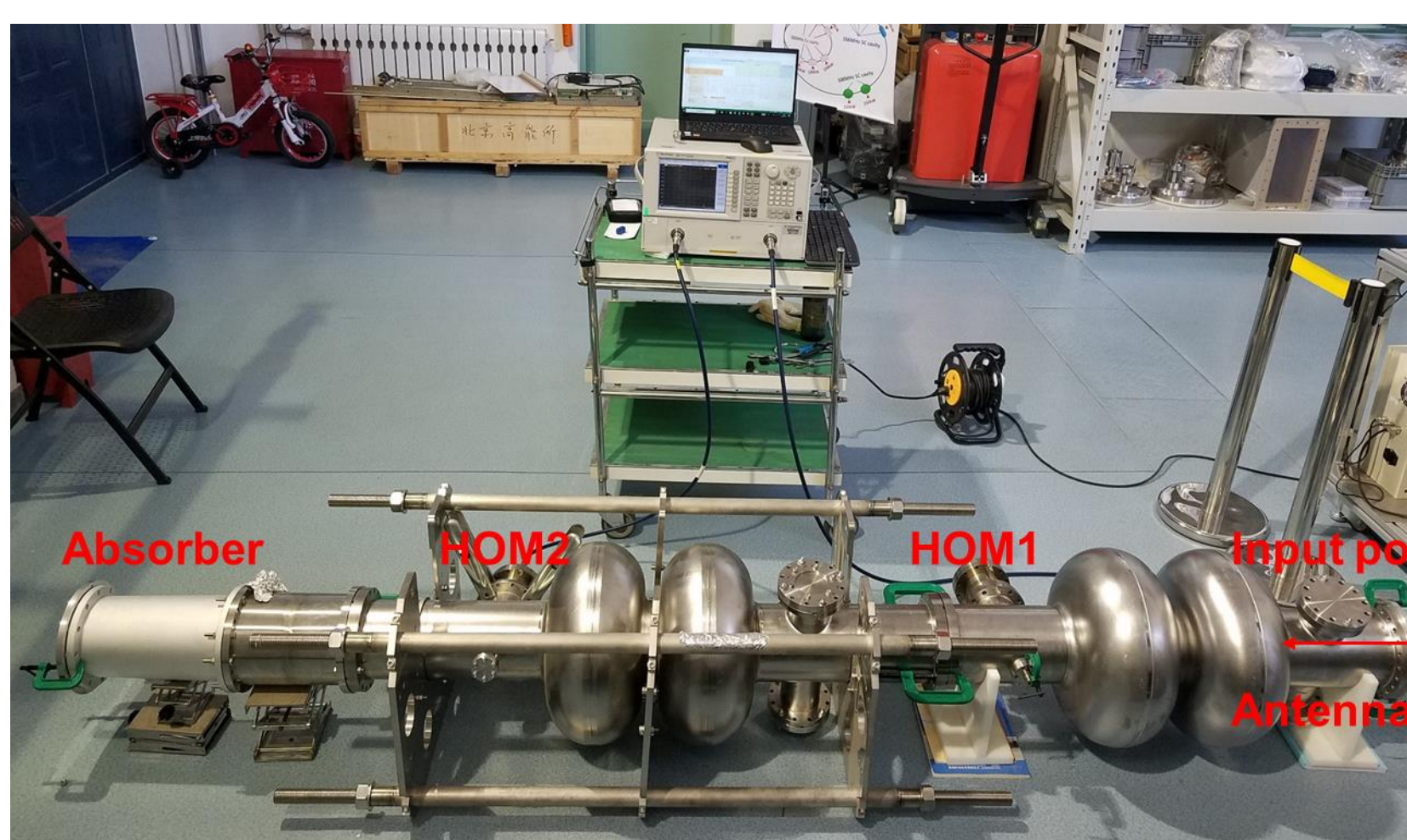
- Condition: room temperature
- Power source: 1.3 GHz 3 kW
- Frequency used: 1.3105375 GHz
- Test results: **input power 639 W**, pick up power from HOM coupler port **104 W**, temperature near pick up port is **34.3° C**.

HOM MEASUREMENT FOR SINGLE CAVITY



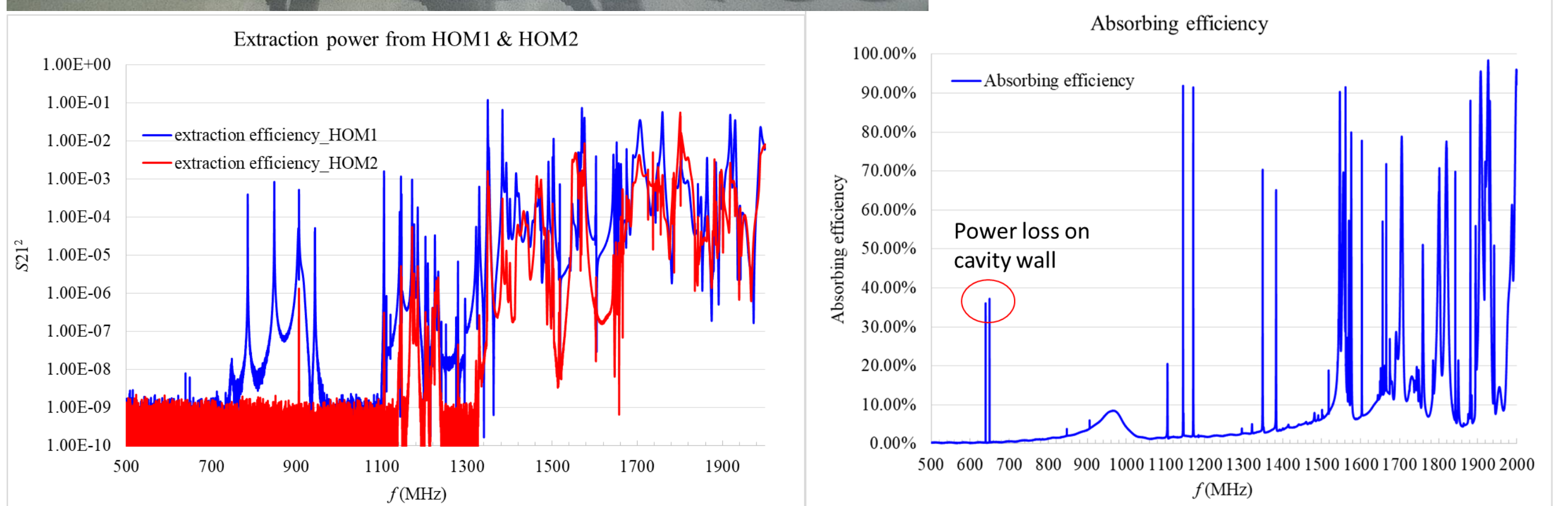
- The two HOM couplers are used for excitation and extraction for HOM measurements.
- The measured **Qe for fundamental mode is 4E11**, which means only less than 3 W of fundamental power will be escaped from HOM coupler.

HOM MEASUREMENT FOR MULTI CAVITY



Testing content:

- The transmission properties from input port to HOM1 port, HOM2 with matched load.
- The transmission properties from input port to HOM2 port, HOM1 with matched load.



SUMMARY

Two dismountable HOM couplers and a coaxial test bench are fabricated for room temperature testing. The low power test show that the transmission properties measured for the coupler are agree well with the simulated results. The HOM coupler work well under the high power test which successfully transmit 100 W power. The preliminary measured results for the HOMs with single cavity and multi cavity are also shown. In order to be clear with the HOMs transmission in multi cavity, more work need to be done next.