

Cavity Test Plan in S1-G Cryomodule

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1. 1st cool-down
2. Low Power RF Tests
3. Conditioning of Couplers
4. 2nd cool-down
5. High Power RF Tests



Low Power RF Tests (1)

RF Source [Network Analyzer]

- Stroke of mechanical tuner ; hysteresis
- Setting of drive frequency ; $f_0 = 1300.00$ MHz
- Meas. of variable input coupling (Q_{IN}) by bandwidth
- Adjustment of input coupling to $Q_{IN} = 2.(3) \times 10^6$
 - Calibration of monitor coupling (Q_t)
 - HOM filter (fundamental Q_{HOM-1} , Q_{HOM-2})
- Static stroke of piezo tuner ;
 - hysteresis and reproducibility
- HOM Q_{ext} ; TE111, TM110, TM011
- Frequency stability : $\Delta f_0 / \Delta P$ (Hz/Pa)



Low Power RF Tests (2)

RF Source [50W RF Amplifier] → $E_{acc} \sim 0.2 \text{ MV/m}$

- Measurement of input coupling (Q_{IN}) by decay time
Calibration monitor coupling (Q_t)
- Measurement of mechanical vibration modes
driven by a piezo tuner
- Single-pulse response by piezo tuner
as a function of Voltage, Frequency, Load
- Double-pulse response by piezo tuner
as a function of Voltage, Frequency, Load
- Multi-pulse response by piezo tuner



Conditioning of Input Couplers

RF Source [2MW / 5 MW Klystron]

- in-situ baking of cold rf windows
- one coupler individually, or
two coupler simultaneously, or
four couplers simultaneously.
- 20 μs , 50 μs , 100 μs , 200 μs , 400 μs , 500 μs ,
800 μs , 1.0 ms, 1.5 ms
5 Hz (1 Hz)
at least, $P_{\text{in}} = 350 \text{ kW}$



High Power RF Tests (1)

RF Source [2 MW / 5 MW Klystron]

- One cavity individual operation (one by one)
- Measurement of input coupling (Q_{IN}) by decay time
Calibration of monitor coupling (Q_t)
- Cavity processing at higher fields
in a 1.5 ms pulse operation ; $E_{acc,max}$
- Cavity processing at higher fields
in a 0.6 ms pulse operation ; $E_{acc,max}$
- Mechanical vibration modes at high fields, 5 Hz
by piezo sensor (tuner)
- Comparison between Vert. Tests and Cryo. Tests



High Power RF Tests (2)

RF Source [2 MW / 5 MW Klystron]

- Stable operation at high fields in one cavity
- LLRF, RF feedback ON/OFF operation
- Observation of Dynamic Lorenz Detuning ;
off-set detuning, RF feedback / ON
- Compensation of Dynamic Lorenz Detuning ;
Optimization off-set detuning and
parameters of piezo drive pulse
RF feedback / OFF
- Dynamic RF loss measurement in each cavity ;
ON / OFF resonance, (one by one)



High Power RF Tests (3)

RF Source [2 MW / 5 MW Klystron]

- **Four cavity operation**
- LLRF, Vector-sum operation of 4 cavities
- Dynamic RF loss measurement of 4 cavities
ON / OFF resonance (Cryomodule- A, C)
- **Eight cavity operation**
- LLRF, Vector-sum operation of 8 cavities
- Dynamic RF loss measurement of 8 cavities
- Long time stable operation at ave. 31.5 MV/m ?



**KEK waits for your participation
in the experiments of the
S1-Global cryomodule at KEK-STF.**



Thank you for your attention