# Cavity Test Items in S1-G Cryomodule

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# Outline

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

Reference ; STF Phase-I Activity Report
(KEK Report, 2009-3, in Japanese)

# Low Power RF Tests (1)

## RF Source [Network Analyzer]

- Stroke of mechanical tuner ; hysteresis
- Setting of drive frequency ; fo = 1300.00 MHz
- Measurement of input ($Q_L$) by bandwidth,
  monitor ($Q_t$) → important calibration
  HOM (fundamental $Q_{HOM-1}$, $Q_{HOM-2}$)
- Static stroke of piezo tuner ;
  hysteresis and reproducibility
- HOM $Q_{ext}$ ; TE111, TM110, TM011
- Frequency stability ; $\Delta fo / \Delta P$ (Hz/Pa)

# Low Power RF Tests (2)

## RF Source [50W RF Amplifier]

- Measurement of input ($Q_L$) by decay time monitor ($Q_t$) → important calibration
- Measurement of mechanical vibration modes by piezo drive oscillation
- Single-pulse response by piezo tuner as a function of Voltage, Frequency, Load
- Double-pulse response by piezo tuner
- 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)
  up to 350 kW

# High Power RF Tests (1)

## RF Source [2 MW / 5 MW Klystron]

- One cavity individual operation
- Measurement of input ($Q_L$) by decay time,
  monitor ($Q_t$) → important calibration
- Cavity processing at higher fields
  in a 1.5 ms pulse operation ; Eacc,max
- Cavity processing at higher fields
  in a 0.6 ms pulse operation ; Eacc,max
- Mechanical vibration mode at high field, 5 Hz
  by piezo sensor (tuner)

# 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 ;
  by off-set detuning and piezo tuner
  RF feedback / OFF
- Dynamic RF loss measurement in one cavity ;
  ON / OFF resonance

# 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

- 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 ?

Thank you
for your attention .....