



# **Discussion: Requirements for Test Facilities**

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# WP8: Strategy for Test Facilities

## Overview



- Needed for development and construction
- Both 352/704 MHz, if possible back-up facility
  - Ion source and 352 MHz normal conducting
    - piggy back on existing facilities for NC linac development
  - 352 MHz spoke cavities
    - CEA Saclay: existing
    - IPN Orsay: planned, to be completed by 2012
  - 704 MHz elliptical cavities
    - CEA Saclay: existing, upgrade required for cryomodule
    - CERN: upgrade required, to be completed by 2012 (ESS modulator)
    - DESY: upgrade required, only after completion XFEL (2015)
    - Uppsala: proposed, to be completed by 2012 (focus on RF generation/distribution)



# Requirements for Test Facilities

## RF System Testing



- LLRF:
  - prototyping
  - energy saving concepts
- Power source:
  - alternative sources (solid state ...)
  - pulsing flexibility (compare PS super-cycle)
  - energy saving concepts
- Power distribution:
  - two-cavities-per-klystron concept (vector modulator)
  - energy saving concepts (high temperature loads, RF-to-DC conversion)
- Cavities and power couplers
  - prototyping (vertical/horizontal) and (later on) acceptance testing
  - cryomodule development and (later on) acceptance testing



# Requirements for Test Facilities

## 352 MHz Normal Conducting



- Power source:
  - 352 MHz
  - xx kW
  - 2.3 ms pulse length
  - 20 Hz repetition rate
  
- Test environment:
  - xx times xx m
  - max. xx degr.C
  - test multiple cavities simultaneously??

# Requirements for Test Facilities

## 352 MHz Spoke Cavities



- Power source:
  - 352 MHz
  - xx kW
  - 2.3 ms pulse length
  - 20 Hz repetition rate
  
- Test environment:
  - xx times xx m
  - 2.0 K
  - xx W cooling power
  - cryomodule: XX cavities



# Requirements for Test Facilities

## 704 MHz Elliptical Cavities



- Power source:
  - 704 MHz
  - 1200 kW
  - 2.3 ms pulse length
  - 20 Hz repetition rate
  
- Test environment:
  - xx times xx m
  - 2.0 K
  - 15 W/cavity cooling power
  - cryomodule: 8 cavities

- Frequencies and power
  - 352 MHz: 2x 1.2 MW (LEP type)
  - 704 MHz: 1.0 MW (1.2 MW for short periods)
  - 1300 MHz: 1.5 MW
- Test area, cryostats and bunkers
  - power couplers
  - vertical cryostat: for 1 cavity (+1 for single cell cavity)
  - horizontal cryostat: for 1 cavity, can be extended
  - cryomodule bunker: space available, modification required
- Cryogenic power
  - 200 l/h LHe @ 4K; 80W@1.8K (with LN2 pre-cooling)
  - 4 g/s pumping at 13mbar

- Frequencies and power
  - 352 MHz: 1.3/2.8 MW (LEP type)
  - 704 MHz: ~1.0 MW (planned)
  - 400 MHz, 3 GHz, 12 GHz
- Test area, cryostats and bunkers
  - power couplers
  - vertical cryostat: 3x for 1 cavity (+1 for specific R&D) (300W)
  - horizontal cryostat:
  - cryomodule bunker: 1x 100-400MHz (300kW); 1x 352-704MHz (1MW)
- Cryogenic power
  - 5 g/s(?) @ 1.8 K



- Frequencies and power
  - 1300 MHz
- Test area, cryostats and bunkers
  - power couplers
  - vertical cryostat:
  - horizontal cryostat:
  - cryomodule bunker:
- Cryogenic power
  - sufficient(?)

# IPN Orsay Test Facility



- Frequencies and power
  - 352 MHz
- Test area, cryostats and bunkers
  - power couplers
  - vertical cryostat:
  - horizontal cryostat:
  - cryomodule bunker:
- Cryogenic power
  - sufficient(?)

- Frequencies and power
  - 704 MHz, ~4 MW ??, 50 Hz ??
- Test area, cryostats and bunkers
  - power couplers: not planned
  - vertical cryostat: not planned
  - horizontal cryostat: 2 cavities (like HoBiCat)
  - cryomodule bunker: reserve space ??
- Cryogenic power
  - 140 l/h @ 4 K; 30 W @ 2 K (with LN2 pre-cooling)