Strategy and equipment readiness for the tests of the SC links in SM18

20th HL-LHC Technical Coordination Committee

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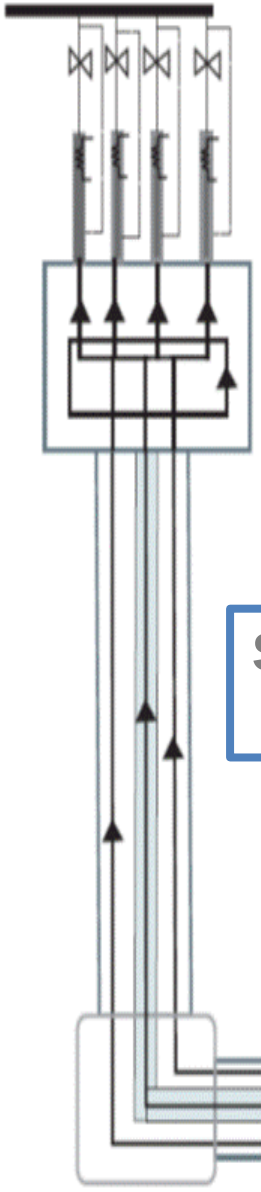
Following discussions with: M. Bajko, Ch. Giloux, A. Kosmicki, S. Giannelli, S. Claudet and L. Bottura

The System

Room Temperature

Naming convention

Leads	DFLHA=18 kA DFLHB=13 kA DFLHC=2.2 kA DFLD=0.2 kA
Cryo-module	DFHX/DFHM
SC Link	DSHX/DSHM
Cryo-module	DFX/DFM



1

Current Leads (DFLH)

2

Cryo-module (DFH)

3

Superconducting Link (DSH)

4

Cryo-module (DF)

LHe ~ 4.5 K

Baseline for the testing - Prototypes

Strategy presented at Cost & Schedule Reviews 2015 and 2016

1) Test of a **prototype Cold Powering System for the Triplets**
   Phase 1: reduced system (complete SC Link, 60 m long, reduced DFH and a pair of 18 kA leads)
   Phase 2: complete system (complete link, 60 m long - already tested during Phase 1 - full size DFH and FULL set of current leads)

   The **Phase 1 system** (SC link, DFH and current leads) will be made available **for the String 3**. The String 3 will incorporate also a DFX

2) Test of a **prototype Cold Powering System for the Matching Sections**

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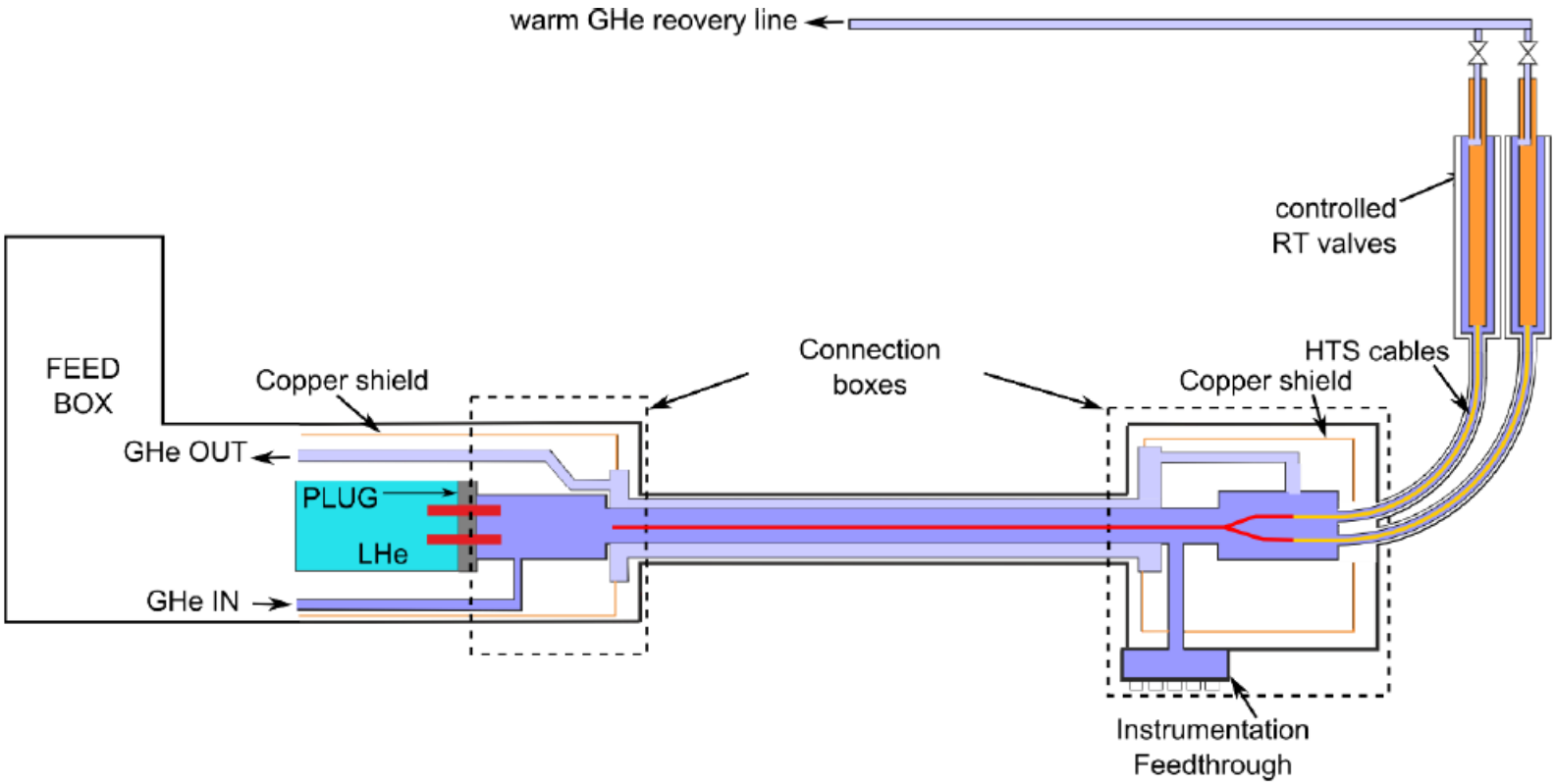
Internal Note 2016-09
EDMS Nr: 1698461

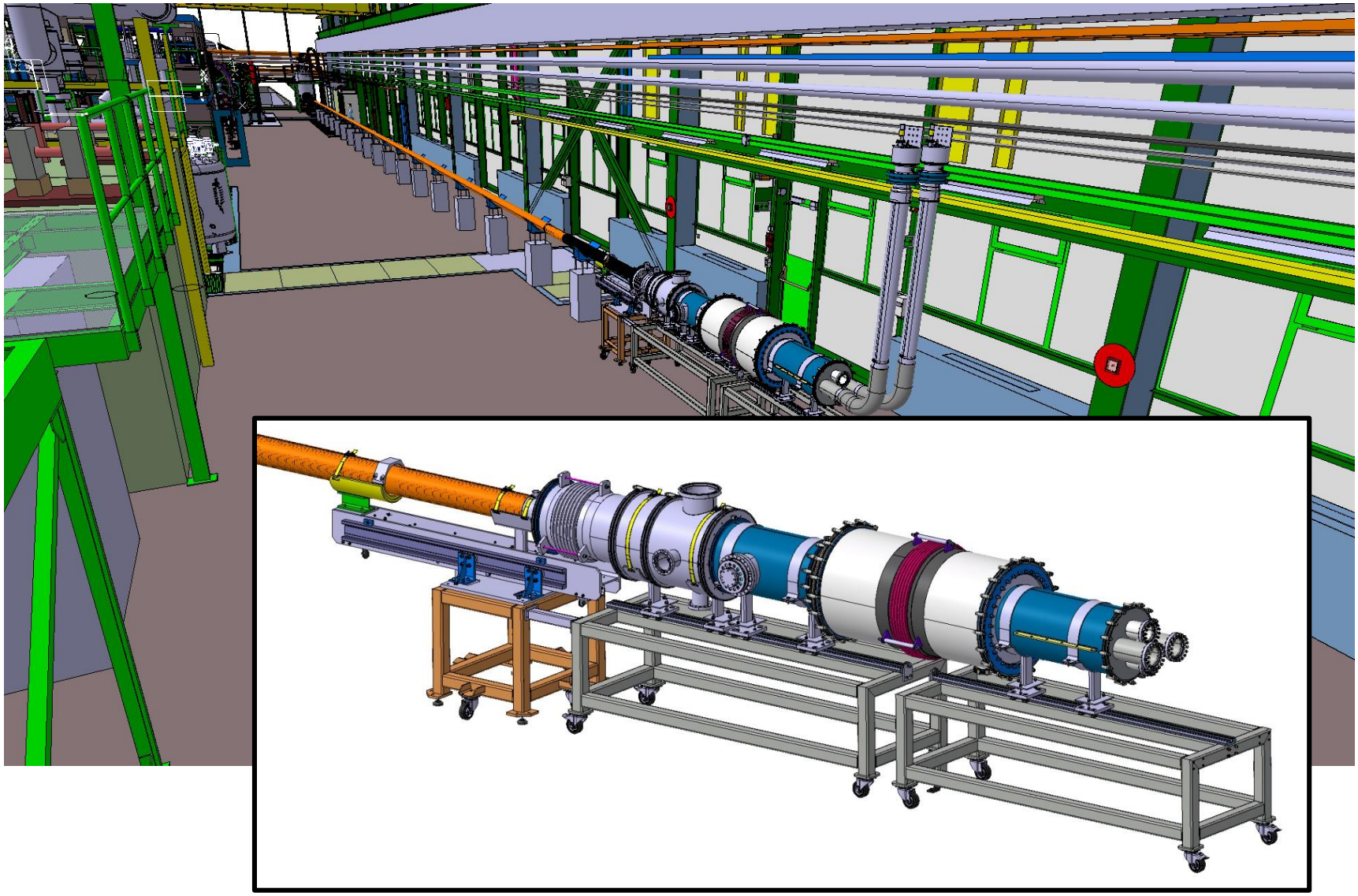
Phase 1 and Phase 2

Upgrade of the Superconducting Link test station in the SM18 test facility

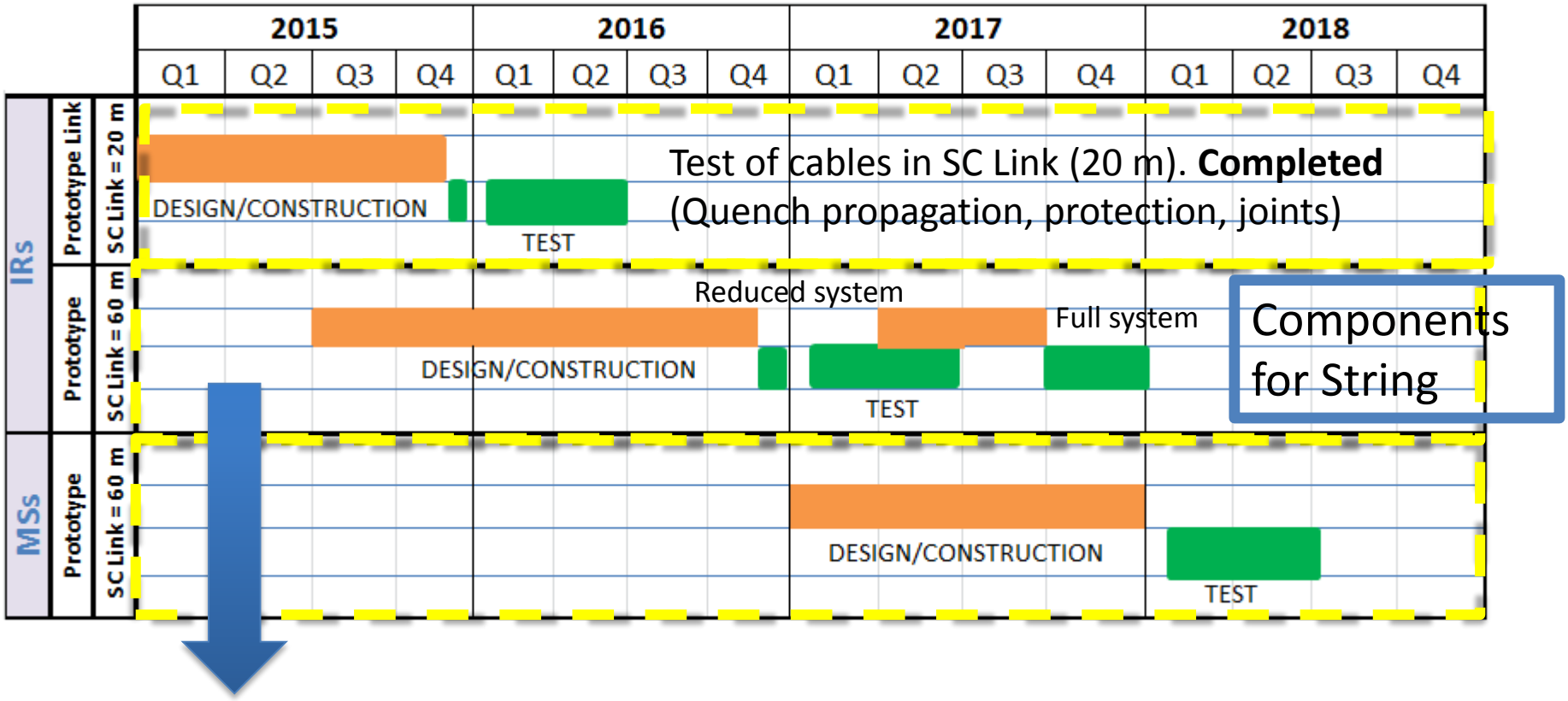


Detailed information on space requirements , cryogenic requirements, cryostat layouts, power converters, instrumentation, schedule,…..

Baseline for the testing - Prototypes



Schedule - Prototypes



DFH available, 60 m long cryostats procured and being delivered, space for SC Link activities allocated (CERN Prevessin, Bldg. 927, needed for completion of SC Link)

Presented at Cost & Schedule Review 2016 (and 2015)

A. Ballarino, 03/11/2016

Strategy presented at Cost & Schedule Reviews 2015 and 2016

1) **Each of the eight Cold Powering Systems** (plus the two spares) will be tested in nominal operating conditions before integration in the LHC. The test will validate all electrical components – and joints – that will stay unchanged.
   Simultaneous test of SC Link and all Current leads (most likely with a dedicated DFH)
   The test of a system will realistically take ~ 1 month (~ **one week of cold powering**, plus time for installing and dismounting)

1) The **String 3** will run with **its own Cold Powering System** (Phase 2 prototype) – cryogenic and electrical feeding provided by the String system. Test of DFX in machine configuration

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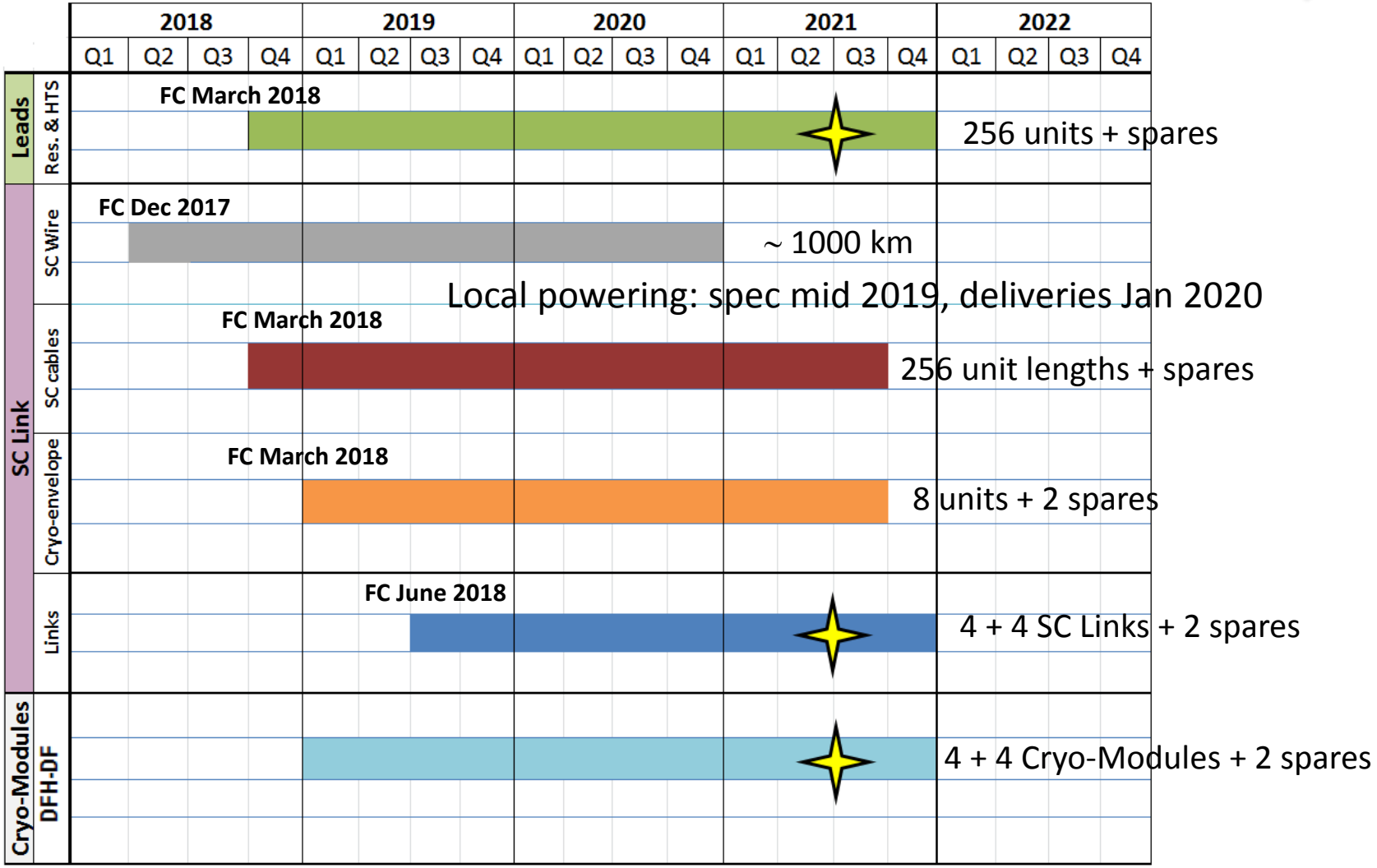
Schedule - Series Production

Delivery of components

2021-2023 Cold Test of Series



Presented at Cost & Schedule Review 2016 (and 2015)

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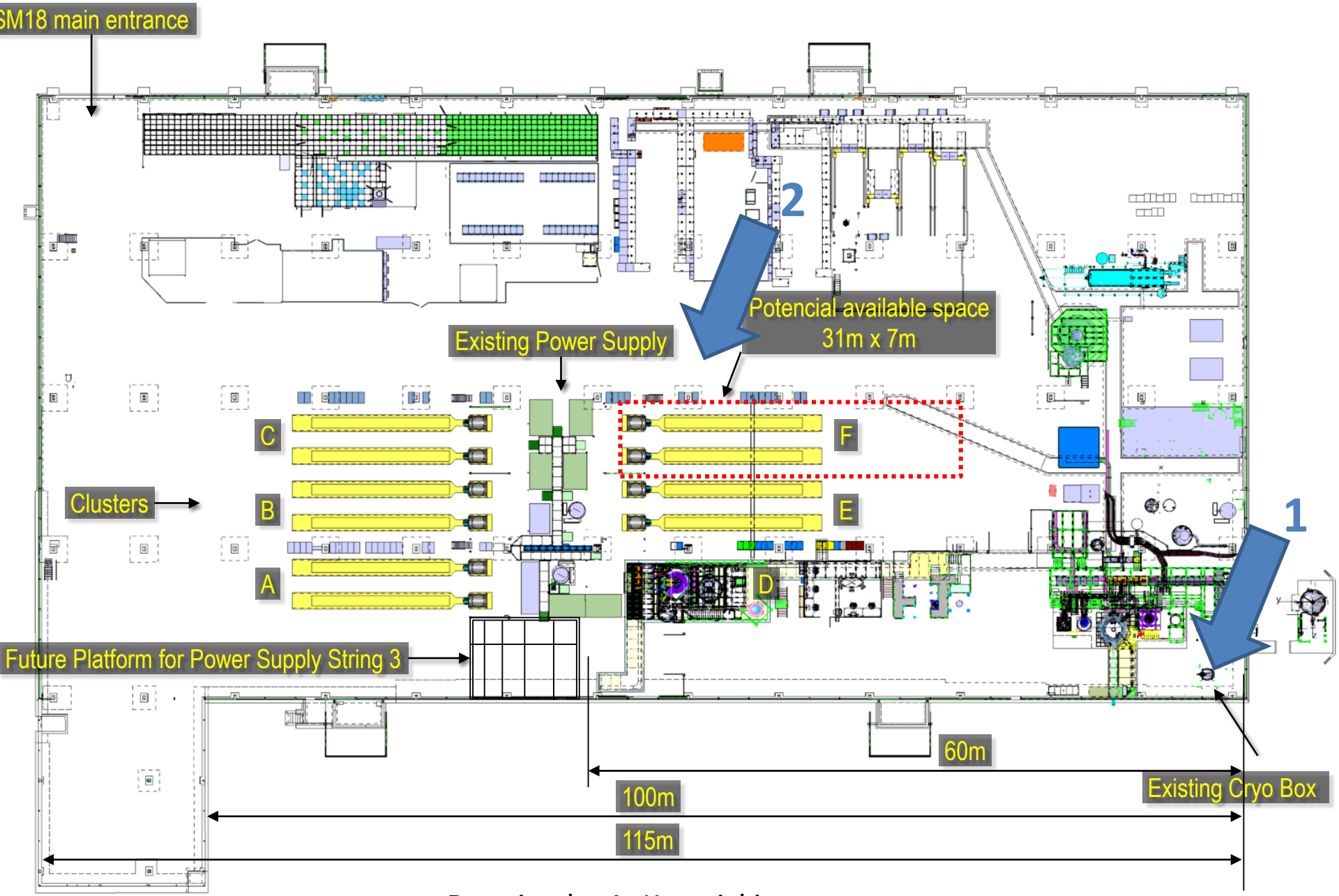
Options for Cold Tests of Series

1) Use of **existing Distribution Feedbox** – in the present location in the SM-18 – for the cryogenic feeding of the SC Link (GHe at ~ 5 K) and locate the ~ 100 m SC near the String

2) Move away from the String 3 area and find a location in the near by of the magnet test benches (cluster F)



Drawing by A. Kosmicki

Options for Cold Tests of Series

1) Use of **existing Distribution Feedbox**

+ Linear distance of about 100 m
+ Availability of GHe from existing Feedbox
- Limited space for installation behind the String
  Sharing of power converters with the String

2) Move away from the String 3 area and find a location in the near by of the magnet test benches (cluster F)

+ Space availability for installation/dismounting
+ Availability of 2×20 kA power converters (one new and one existing for cluster A)
+ Availability of LHe
- Very limited linear length (solution to be found for the routing of the line)
- Needed low current rating power converters

A. Ballarino, 03/11/2016

Conclusions

- The WP6a strategy envisages the test the series components before integration in the tunnel. The design of the system enables these qualification tests. The schedule also (testing from 2021 to 2023)

- The budget for the test of the series components is within the WP6a. Technical studies are still needed in order to select the best solution

- The String 3 will run with its own Cold powering System. Schedule should not be a problem

- The activity in the SM-18 is being defined and will be coordinated by the SM-18 team (M. Bajko)