**Ansaldo Superconduttori**

# LHC - Cold masses: HELIUM MASS SPECTROMETER LEAK TEST REPORT

ITP Nr. 23 24

| Cold Mass Nr. | 2023 | | | |
|---|---|---|---|---|
| Step Nr. | 1 | 2 | 3 | 4 |
| Volume / *Volume to be tested* | CM -> Vacuum | CM -> cold bore tubes | CM -> Heat Exch. | Heat Exch -> Vacuum |
| **Fuga calibrata / *Calibrated leak parameter*** | | | | |
| Calibrated leak N° | 4011007195 | 4011007225 | 4011007195 | 4011007195 |
| Data calibr. / *calibration date* | 08/10/02 | 08/10/02 | 08/10/02 | 08/10/02 |
| Temp. calibrazione fuga / *Calibration Temp.* T | 23.0 °C | 23.0 °C | 23.0 °C | 23.0 °C |
| Valore nom. fuga calibrata / *Calibrated leak nom. value* $q_{FR}$ | 3.00E-08 mbar l s-1 | 3.30E-08 mbar l s-1 | 3.00E-08 mbar l s-1 | 3.00E-08 mbar l s-1 |
| **Calibrazione del sistema / *System calibration*** | | | | |
| Conc. He nelle linee di test (100%) / *Volumetric fraction of tracer gas in the injection envelope* C | 1 | 1 | 1 | 1 |
| T ambiente / *Test temp.* T | 31.0 °C | 31.0 °C | 30.1 °C | 31.0 °C |
| Fuga calibrata con correz. T ed età / *Size of calib. leak after corr. for ageing and T)* $q_{FR}$ | 3.84E-08 mbar l s-1 | 4.22E-08 mbar l s-1 | 3.75E-08 mbar l s-1 | 3.84E-08 mbar l s-1 |
| Segnale residuo prima delle misure di SFR / *Residual signal prior SFR meas.* $R_{FR}$ | 4.79E-09 mbar l s-1 | 4.09E-10 mbar l s-1 | 3.34E-10 mbar l s-1 | 4.79E-09 mbar l s-1 |
| Segnale del LD / *Signal given by the calibrated leak* $S_{FR}$ | 4.48E-08 mbar l s-1 | 4.25E-08 mbar l s-1 | 4.89E-08 mbar l s-1 | 4.48E-08 mbar l s-1 |
| Min. dev. segnale (=2x amp. segn. residuo) / *Smallest read. signal dev. (= 2 x ampl. of RFR noise)* $S_m$ | 2.00E-11 mbar l s-1 | 2.00E-12 mbar l s-1 | 2.00E-12 mbar l s-1 | 2.00E-11 mbar l s-1 |
| Tempo di attesa stabiliz. segnale / *Time to achieve stabilised leak signal* 3t | 180 sec | 180 sec | 180 sec | 180 sec |
| **SENSIBILITA' DEL TEST / *Sensitivity of the leak test*** $= S_m \frac{q_{FR}}{S_{FR} - R_{FR}} \frac{1}{C}$ $q_{Gm}$ | 1.92E-11 mbar l s-1 | 2.01E-12 mbar l s-1 | 1.54E-12 mbar l s-1 | 1.92E-11 mbar l s-1 |
| **Condizioni del test / *Leak test conditions*** | | | | |
| Pressione del sistema / *System pressure* P | 4.90E-05 mbar | mbar | mbar | 4.90E-05 mbar |
| Segnale residuo del cercafughe ad inizio test / *Residual signal prior to SF measurement* $R_F$ | 4.81E-09 mbar l s-1 | 4.65E-10 mbar l s-1 | 3.59E-10 mbar l s-1 | 4.94E-09 mbar l s-1 |
| Segnale del LD a fine test / *Signal given by the leak after 30 min. (>3t)* $S_F$ | 5.23E-09 mbar l s-1 | 4.39E-10 mbar l s-1 | 3.38E-10 mbar l s-1 | 5.11E-09 mbar l s-1 |
| **CALCOLO DELLA FUGA / *Leak evaluation*** $= \frac{q_{FR}(S_F - R_F)}{S_{FR} - R_{FR}} \frac{1}{C}$ $q_G$ | 4.03E-10 mbar l s-1 | <1.0E-10 mbar l s-1 | <1.0E-05 mbar l s-1 | 1.63E-10 mbar l s-1 |
| VALORE DI RIFERIMENTO / *REF. VALUE* (MAX) | 1.0E-09 mbar l s-1 at 26 bar | 1.0E-10 mbar l s-1 at 26 bar | 1.0E-05 mbar l s-1 at 26 bar | 1.0E-09 mbar l s-1 at 5 bar |
| CONFORMANCE | YES | YES | YES | YES |

**Doc. di riferimento / *Ref. documents***

CERN contract number: F302/LHC/LHC
CERN technical spec.: LHC MMS-98-198 rev.2
Leak test procedure (Ref. N°, Revision): 780RM09442 rev.0

**Strumentazione / *Test equipment***

| Helium Mass Spectrometer type: | on vessel | on c.b.t. lines | on heat exchanger line | on vessel |
|---|---|---|---|---|
| | PFEIFFER HLT 260 | PFEIFFER HLT 260 | PFEIFFER HLT 260 | PFEIFFER HLT 260 |
| Pressure gauge type: | full range compact PFEIFFER PKR 251 | | | full range compact PFEIFFER PKR 251 |
| Pumping group: | turbo pump LEYBOLD PT 360 l/s | | | turbo pump LEYBOLD PT 360 l/s |
| | rotary vane pump PFEIFFER DUO 65 m3/h | rotary vane pump PFEIFFER DUO 20 m3/h | rotary vane pump PFEIFFER DUO 20 m3/h | rotary vane pump PFEIFFER DUO 65 m3/h |

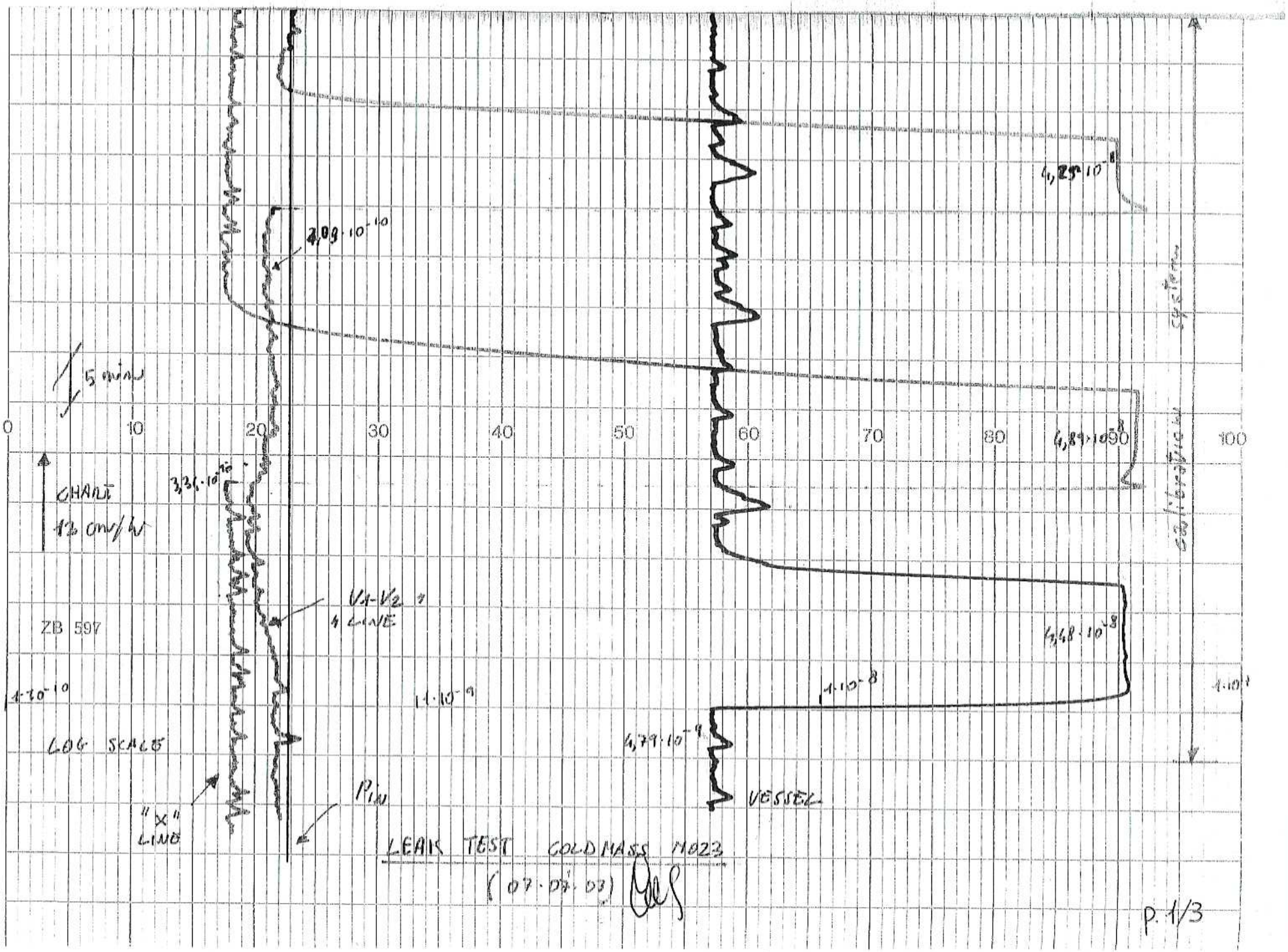
**Prepared by: Name / Date**
Caserza - 08/07/03

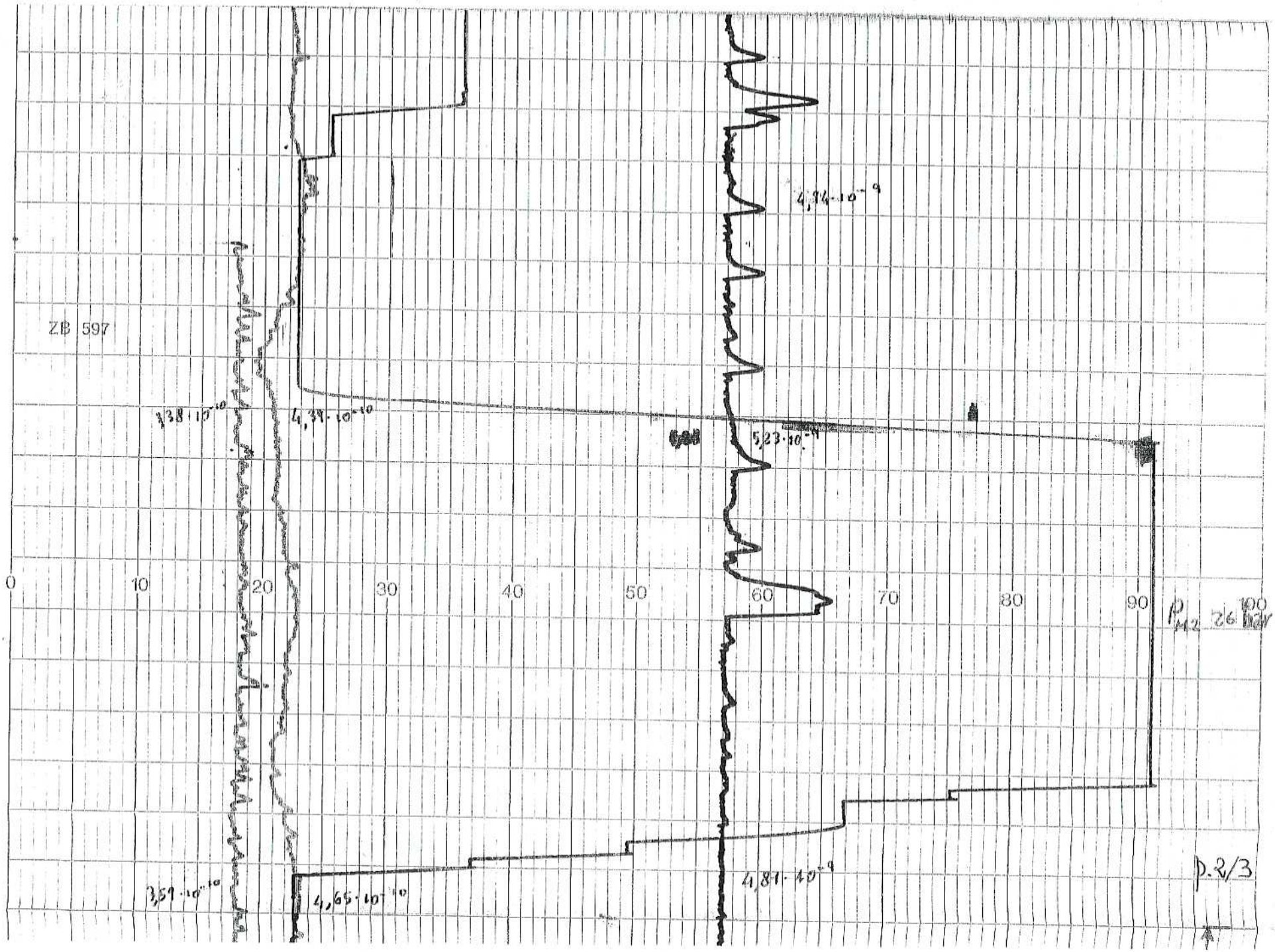
**Approved by: Name / Date**
Terzi - 08/07/03

**Checked by: Name / Date**
Gagliardi - 08/07/03

**Checked at CERN by / Signature / Date**

**Note / *Remarks***


4,25·10⁻⁸
4,09·10⁻¹⁰
5 min
0
10
20
30
40
50
60
70
80
4,89·10⁻⁸
100
CHART
12 cm/hr
3,33·10⁻¹⁰
V1-V2
4 CLOSE
ZB 597
4,48·10⁻⁸
1·10⁻⁸
1·10⁻⁹
4,79·10⁻⁹
VESSEL
LOG SCALE
"X"
LINE
PIN
LEAK TEST COLD MASS 11023
(07-07-03)
P. 1/3


ZB 597
3,38 · 10⁻¹⁰
4,38 · 10⁻¹⁰
4,94 · 10⁻⁹
5,23 · 10⁻⁹
3,59 · 10⁻¹⁰
4,65 · 10⁻¹⁰
4,81 · 10⁻⁹
0
10
20
30
40
50
60
70
80
90
100
P_H2 26 bar
p.3/3

END OF TEST