# SUPERCONDUCTING QOQ RARWI': YBCO DEVWI' 77K RESISTANCE PAGH DE' NGEH

# Superconducting QoQ rarwl': YBCO Devwl' 77K resistance pagh De' ngeH

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**ngoD**

*wa'DIch superconducting QoQ rarwl' tlhegh. YBCO ceramic tape 77K bIr nitrogen vacuum-jacketed cryostat. DC resistance pagh -- nanovolt sensitivity 'oghlu'. Meissner wanI' -- pe'meH He naQ expel. zero resistive loss, zero thermal noise, pe'meH immunity naQ. 310 liters bIr nitrogen DIS Hoch metar Hoch.*

## 1. NGOQ

Hoch conventional QoQ tlhegh -- resistance ghaj. milliohms vo' ohms metar Hoch. resistance Hutlh Qo' consequences wej: (1) resistive signal loss, (2) thermal noise (Johnson-Nyquist), (3) frequency-dependent bot (skin effect).

Superconductivity -- Hoch Qaw'. Tc bIngDaq DC resistance pagh pup. pagh attenuation, pagh Johnson-Nyquist noise, pagh frequency-dependent bot. De' wa' end ngeH -- latlh end chav -- mathematically pup.

Meissner wanI' -- pe'meH He naQ expel -- conventional shielding law' nIv. superconducting tlhegh -- pe'meH He attenuate Qo' -- naQ exclude.

engineering challenge: YBCO 92K bIngDaq poQ. bIr nitrogen (77K) cryogen lo'.

## 2. TLHEGH QACH

Devwl': YBCO ceramic tape (SuperPower SCS4050-AP), 4.0 mm × 0.1 mm, critical current 100 A 77K. helical stainless steel former.

De' He: cha' YBCO tape (De' 'ej return), 0.5 mm PTFE spacer. 75 Ohm bot.

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cryostat: dual-wall borosilicate glass Dewar, 48 mm outside, 28 mm inside. vacuum < 10{
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connectors: cryo-rated rhodium XLR, vacuum feed-through, G10 thermal break.

naQ: 48 mm diameter, 2.4 kg/m dry, 3.8 kg/m bIr nitrogen. 300 mm minimum bend radius.

## 3. 'ESORGHWI'

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DC resistance: Keithley 2182A nanovoltmeter, 6221 current source. 77K 1.5 m Devwl' 100
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Ohm. resistance pagh.

AC bot: 1 kHz 75.0+/-0.1 Ohm (purely reactive). 30-jaj stability +/-0.0003 Ohm.

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chuS rav: Johnson-Nyquist V_n = "(4kTRB). R=0 !' V_n=0. thermal noise pagh naQ.
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pe'meH yoD: 1 mT 50 Hz -- fluxgate inner cryostat < 0.01 nT -- 160 dB nup. Meissner wanI' -- surface currents pe'meH He pup oppose.

## 4. JA'CHUQ

bIr nitrogen taH poQ. thermal leak 0.85 L/jaj metar Hoch. 1.5 m pair DIS -- 930 L -- $930 DIS Hoch.

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3-5 jaj Hoch bIr nitrogen replenish. pressure relief valve. O, sensor 19.5% bIngDaq alert.
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requirements tIn. tlhegh Qo' -- infrastructure -- taH infrastructure -- legh, QaH, 'ej bIr nitrogen supplier. resistance pagh neH -- Huch 'oH.

## 5. BERTLHAM

SC rarwl' -- conventional Devwl' laHbe': DC resistance pagh, thermal noise pagh, pe'meH immunity naQ Meissner wanI'. engineering overhead -- bIr cooling, vacuum, bIr nitrogen logistics -- tIn 'ach manageable. superconducting QoQ -- Devwl' optimization endpoint: resistance Hoch Qaw' -- QaQ law' nothing.

## DE'MEY

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