Polarized target status 05/06/2018

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outline

- Target material loading
- TE calibration
- Magnet commissioning
  -- New field rotation procedure
- Polarization test
- Physics data taking
  -- comparing to 2015
  polarization and relaxation time
- Issues to be followed
  -- cooling water
  -- EIO tubes
- Man power

Target material loading (17/4)

- 17/4 : loading material
- Preparation
  - loading platform
  - nitrogen bath (forgot cleaning)
  - leak detector
  - LN2 dewar
  - warming DR and magnet
- Material
  - upstream material in 2015 → downstream in 2018
  - downstream material in 2015 → upstream in 2018
  - added about 50 cc (20 -25 g) of SMC material
  - downstream socks in 2015 was cleaned in 2017

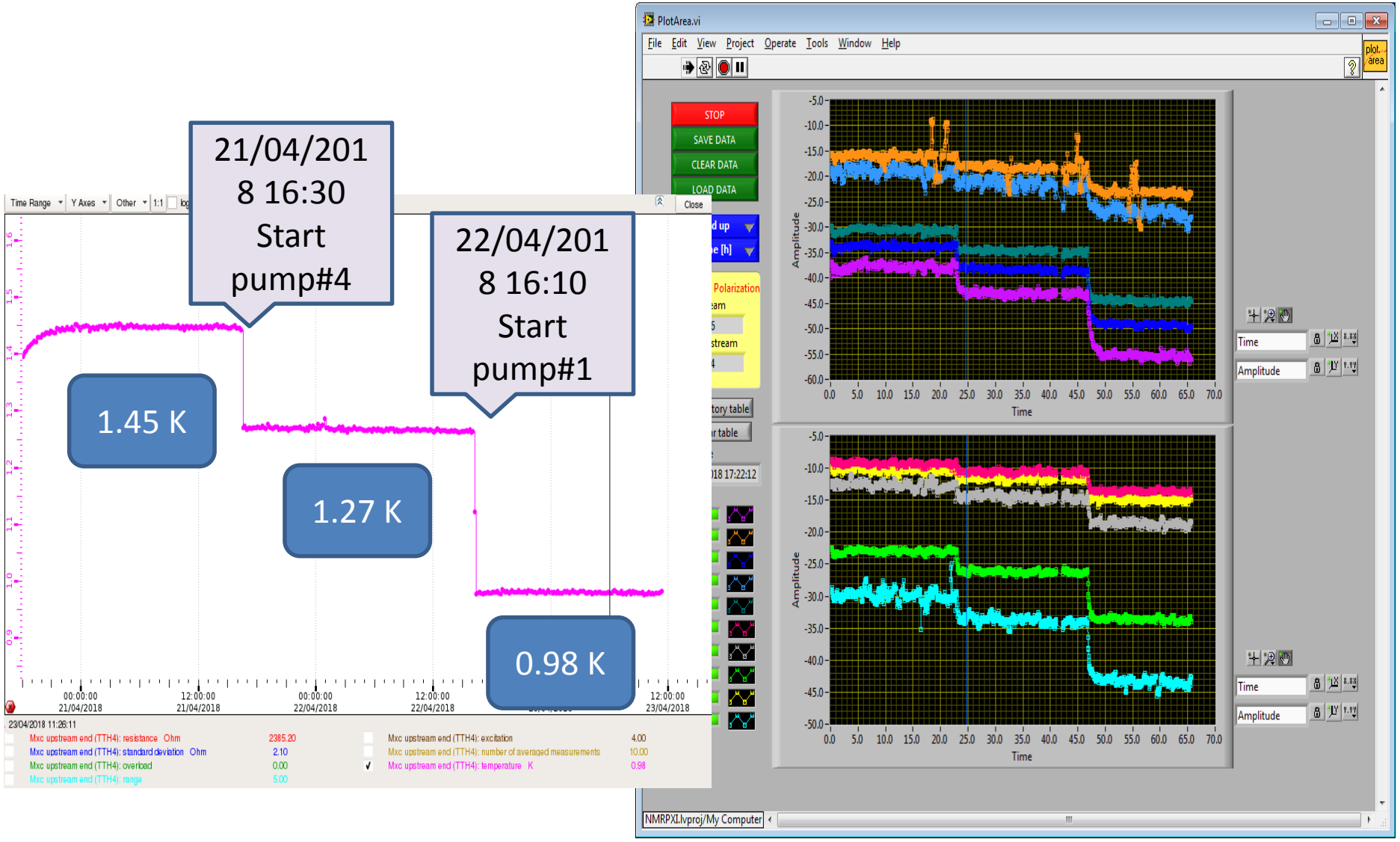
TE calibration (20/4 -24/4)

- Test of the communication between NMR and Magnet control system with Sylvain on Friday morning

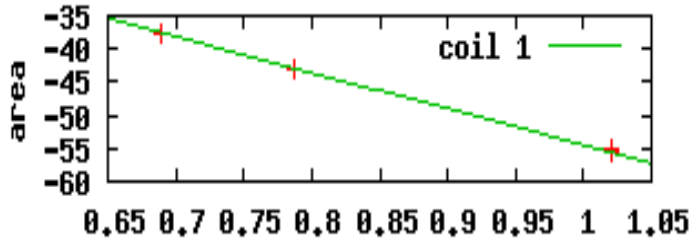
  (- dipole test was done from Thursday night to Friday morning)
- Setting Trim coils → same as in 2015
- Installed of He3 vapour pressure system
- Filling liquid helium of 10 m^3 gas in the mixing chamber (from Thursday afternoon)
- Started at 18:00 on Friday (1.44K)
- Started 2nd temperature point on Saturday 16:30 (1.27K)
- Started 3rd point on Sunday 16:10 (0.98 K)
- Started 4th point on Monday 11:00 (2nd 0.98 K)
- Target shift for TE calibration

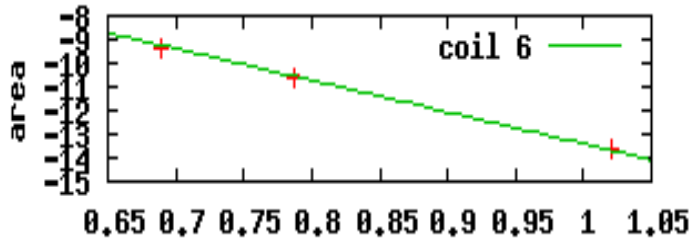
  Thanks to Vincent, counted in the normal shifts
- Auto system stopped twice, otherwise working well

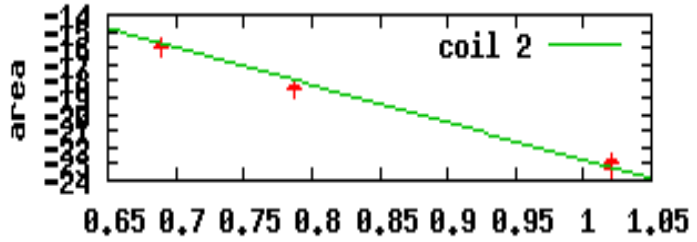
TE calibration in Apr. 2018

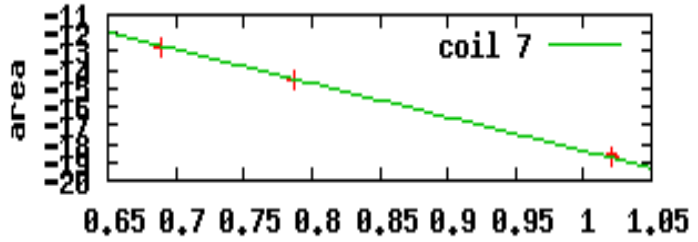


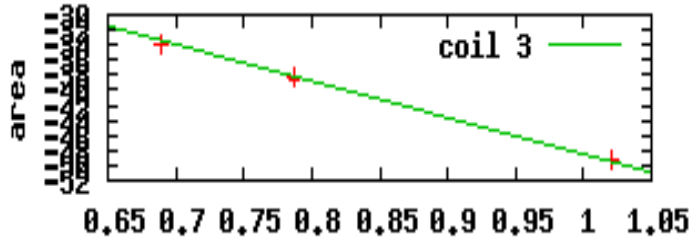
4 temperature points

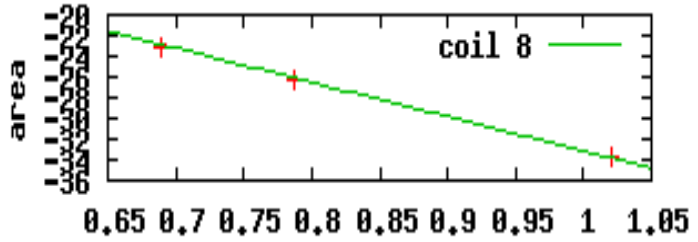


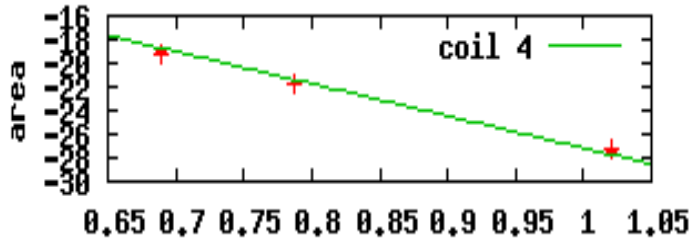


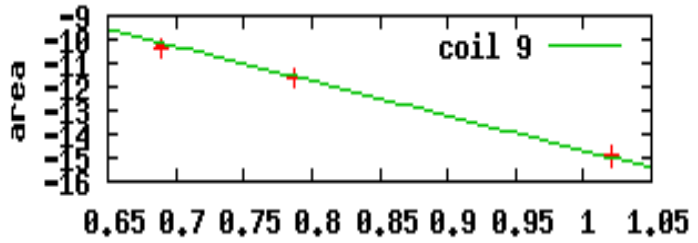


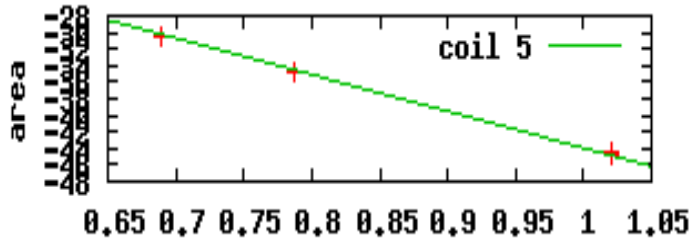


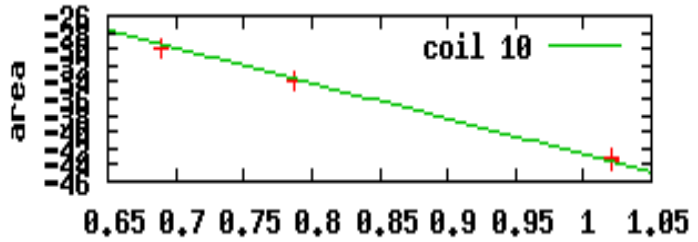






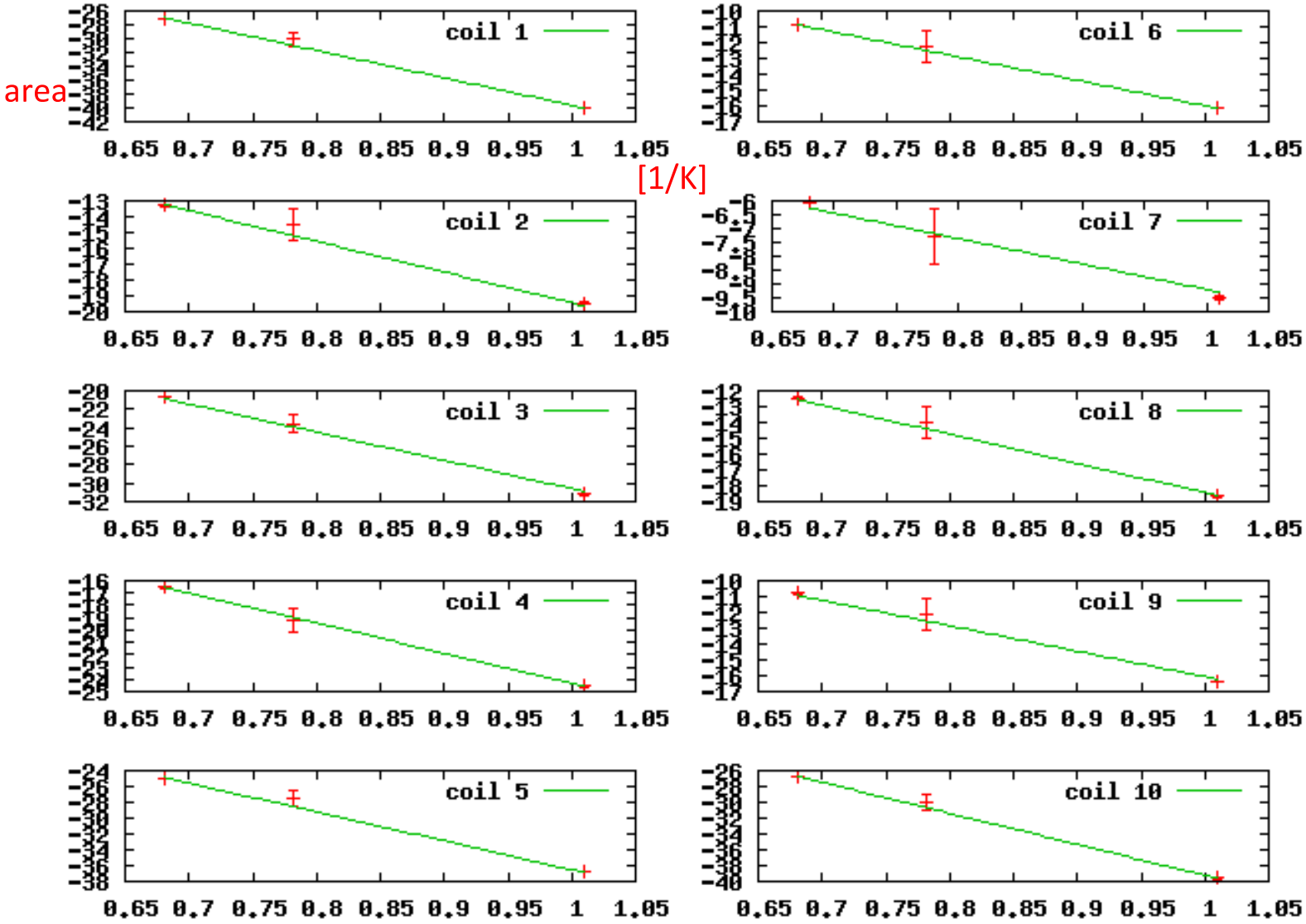






July in 2015

Calibration constant of 10 coils with 3 temperature points



Temperature at TE calibration

- He3 vapor system did not work well.
- TTH4 and TTH5 available
- Correction of resistance @ 2.5T

  - data taken Tuesday morning

Calibration constants (NMR signal area @ TE 1K)

coil1	= -54.4342	+/- 0.1816	(0.3335%)
coil2	= -22.7626	+/- 0.1136	(0.4988%)
coil3	= -48.4761	+/- 0.1896	(0.3911%)
coil4	= -27.1523	+/- 0.2678	(0.9863%)
coil5	= -43.8718	+/- 0.1447	(0.3298%)
coil6	= -13.3982	+/- 0.03178	(0.2372%)
coil7	= -18.3778	+/- 0.05888	(0.3204%)
coil8	= -33.131	+/- 0.105	(0.317%)
coil9	= -14.6842	+/- 0.07668	(0.5222%)
coil10	= -42.6571	+/- 0.2014	(0.4721%)

		Magnet Commissioning in 2018
20/3	MSS Trim	Quench back heater for trim coils, control currents
20/3	Solenoid	Power ON (10 A)
21/3	MSS Sol	Slow discharge of solenoid
21/3	MSS Dip	Slow discharge of dipole
22/3	MSS Sol	Quench back heater for solenoid, fast discharge at 70 A (6 times)
22/3	MSS	Resistance of current leads without helium flow
28/3	Sol	Full current of 646 A
28/3	Dip	Full current of 590A
28/3	Sol	Stability test
29/3	Dip	Stability test
29/3	MSS	Safety for filed rotation (Logics of “Tiroir de Securité”)
	Sol Dip	Present field rotation procedure (longitudinal ←→transverse)
	Sol Dip	New field rotation procedure (longitudinal ←→transverse)
20/4	Sol	TE mode procedure
	Sol	Field homogeneity with material

Issues on the magnet commissioning

- Successfully done : Fabrice supported a lot.
- Modification

  - magnet coil voltage monitoring cards for current detection (23/3)

  - new MSS program

  - new power convertor control system (4/4)
- Magnetic filed warning sign
- Magnet field direction

  - sol : + current → point to downstream
    (opposite from 2015)

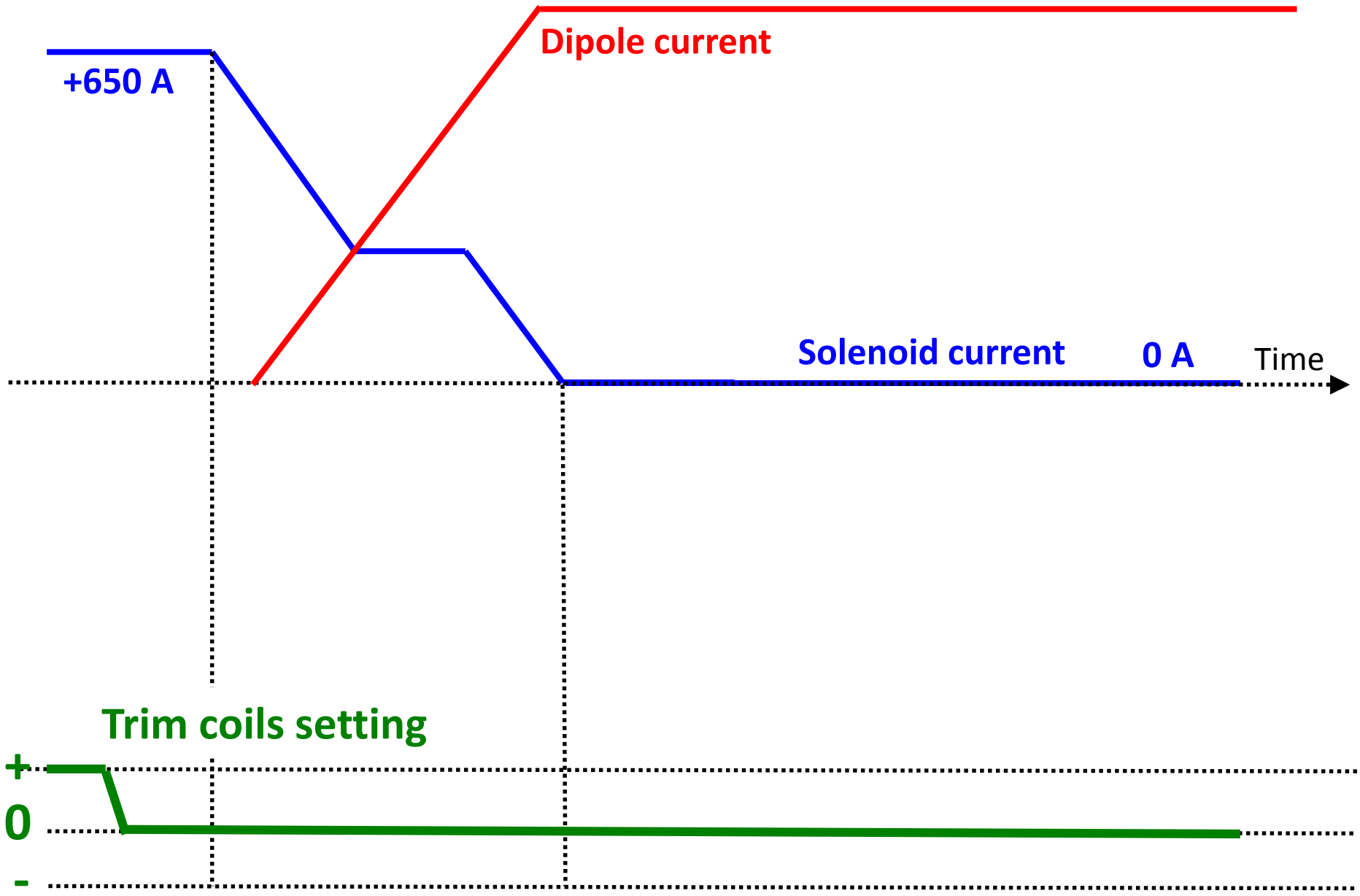
  - dip : + current → point to up

(another intervention foreseen during LMD)

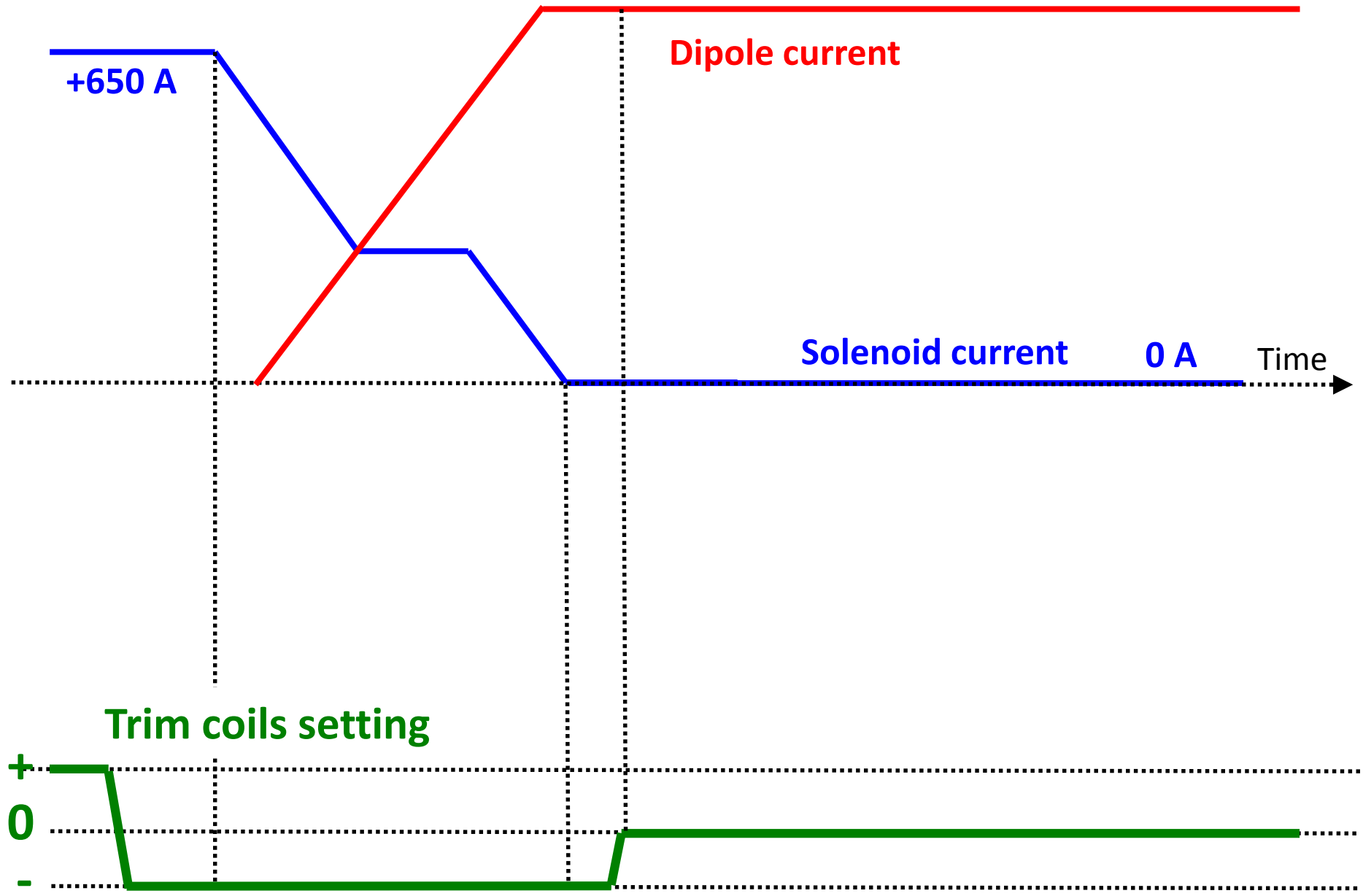
New procedure test result

- 0.50 % loss in 2015 from sol. to dip. (from dip. to sol.) with trim coils OFF
- < 0.10 % loss with trim coils ON oppositely in 2018 (new procedure)

Trim coils operation in 2015 (Transverse mode)



Trim coils operation in 2018 (Transverse mode)

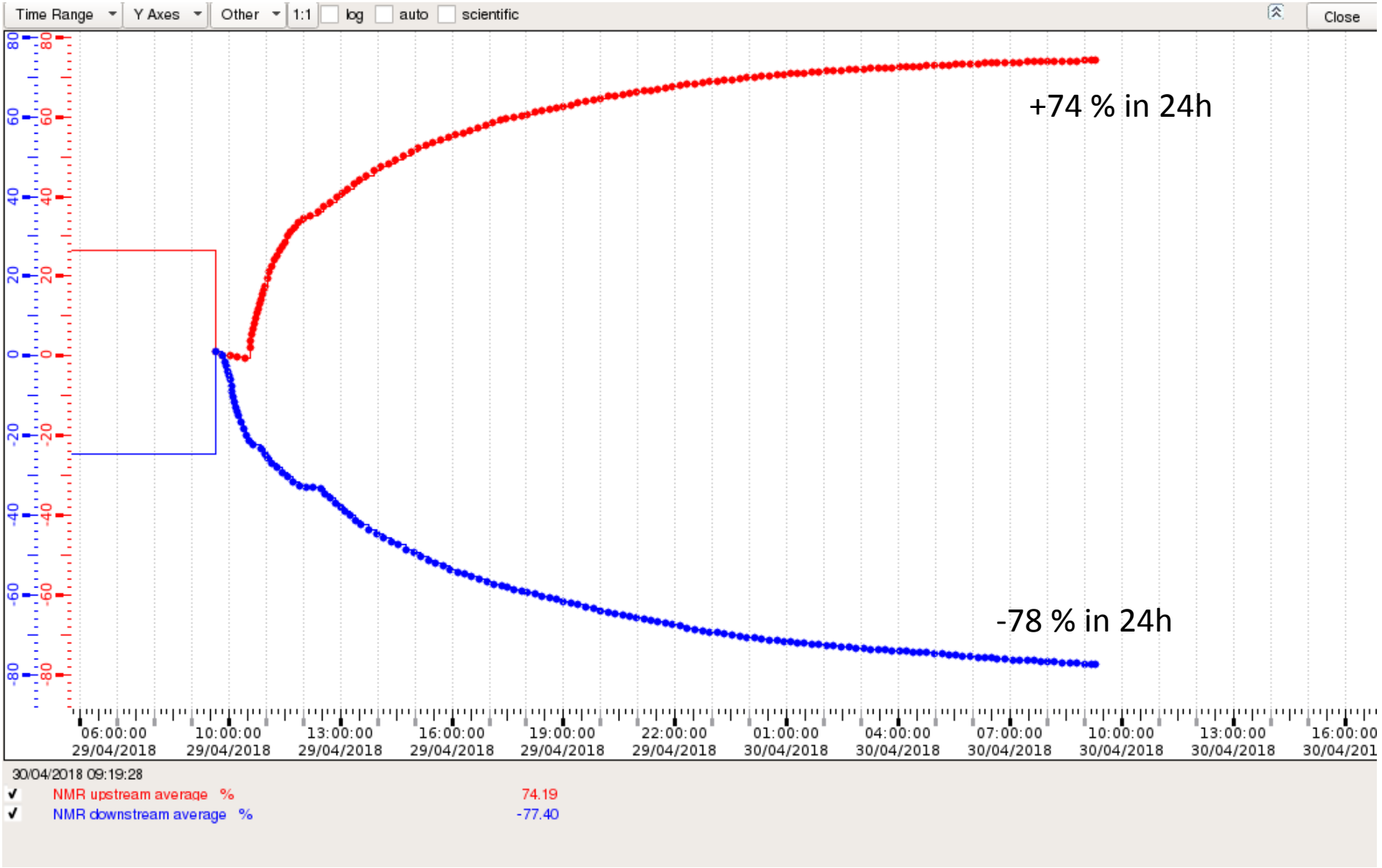


Polarization test

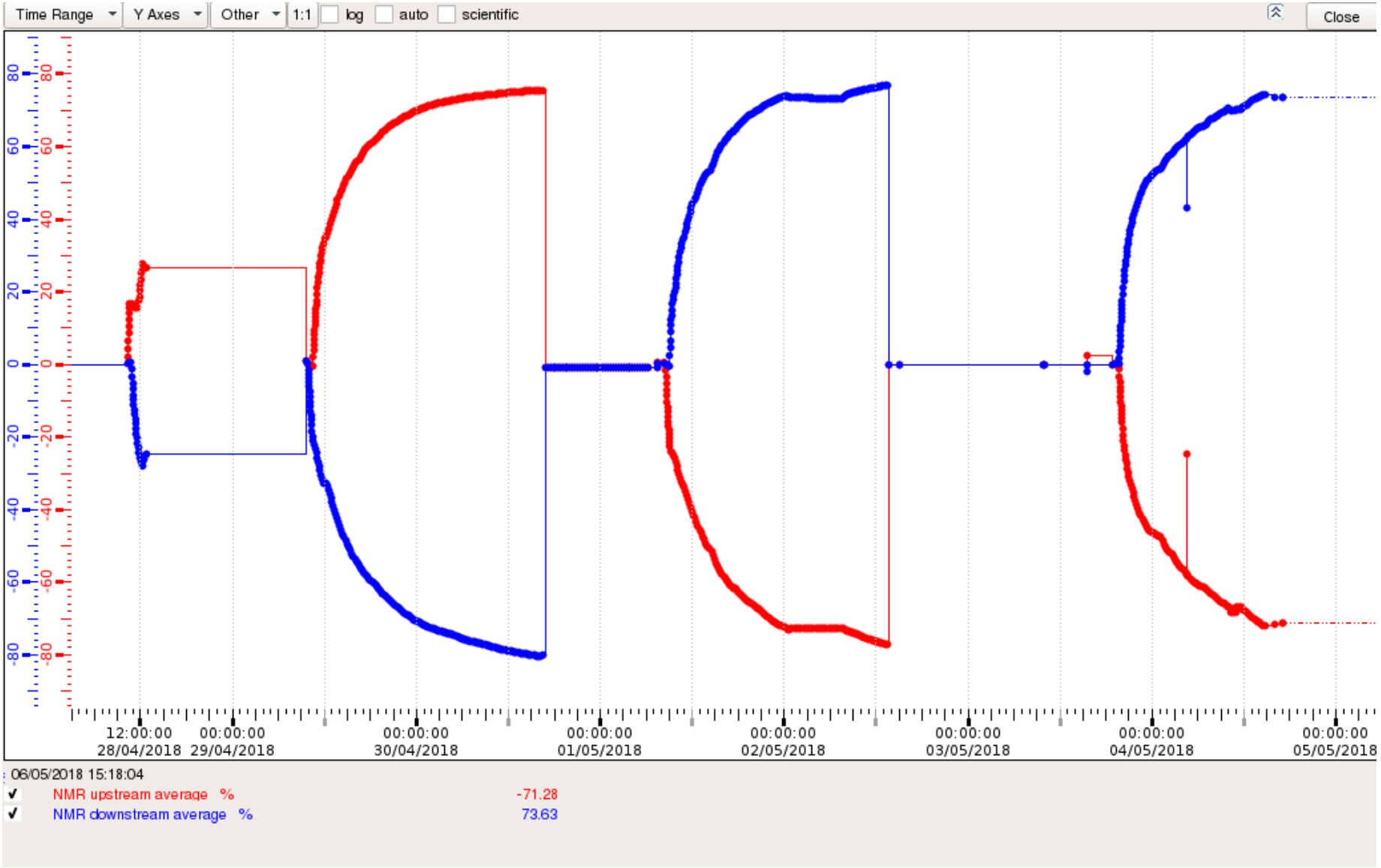
- 28/4 : polarization first in this year
- 8/5 -82.7 % (up), +81.3 % (dwn) for 40h
- After several tests before data taking started.

- Upgrade target parameter monitoring at DCS
  done by Jaakko and Christophe
  → see Christophe's talk
  -- still improving now

First polarization build up in 2018



Polarizations



Polarization after 26h in 2015 and 2018

	Upstream Cell	Downstream Cell
Positive Polarization	+ 75.3 % + 75.0 %	+73.2 % + 78.2 %
Negative Polarization	- 73.5 % - 80.3 %	-72.2 % -79.4 %

Relaxation time with beam in 2015 and 2018

	Upstream Cell	Downstream Cell
Positive Polarization	~ 1200 h ~ 1500 h	~ 1000 h ~ 1500 h
Negative Polarization	~ 900 h ~ 1300 h	~ 700 h ~ 1100 h

Relaxation time without beam in 2015 and 2018

	Upstream Cell	Downstream Cell
Positive Polarization	2070 h (3/9) 2890 h (4/6)	1400 h (19/8)
Negative Polarization	1250 h (19/8)	1100 h (3/9) 2180 h (4/6)

Cooling water

- Tap water (microwave EIO tube, back up for pumps)

  → temperature behavior known
- Chilled water (Pump room air conditioner)

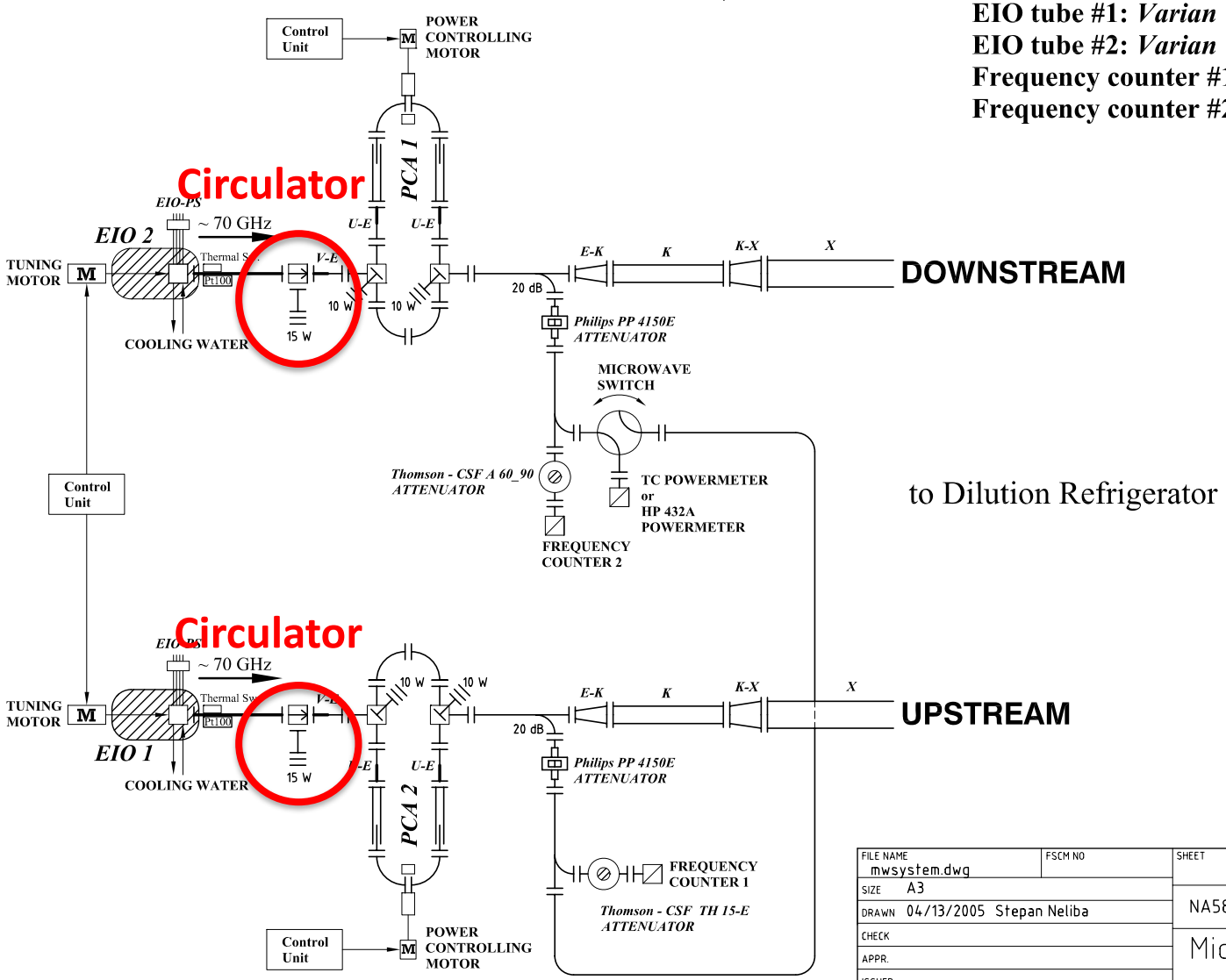
  → pump room temperature during summer

  → see Caroline's talk
- Raw water in pump room (Pumps)
- Raw water inside hall (diffusion pump, NMR rack)

EIO tube problem

- 23/5 Wed. night : Kaori realized frequency jumped more than 100 MHz.
  - power also lost control
- 24/5 Thur. : Investigated by Yuri
  - too much reflection : isolator problem
  - blocked cavity control :
- Cannot generate the freq. for positive pol.
- Spare isolator : arrived from Yamagata (4/6)
- Cathode voltage change??
- Spare EIO tube ??

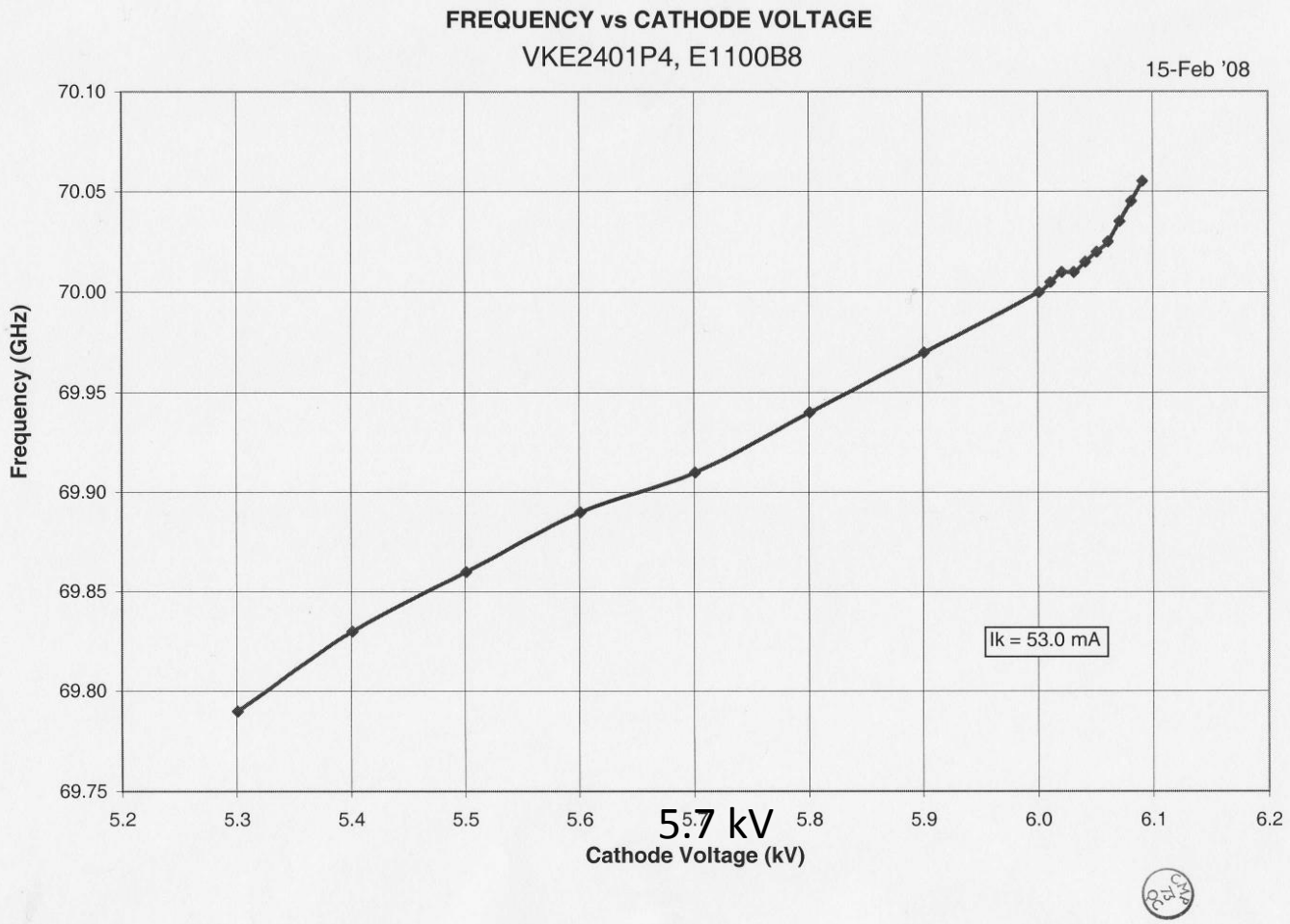
EIO tube #1: *Varian VKE 2401P1*
EIO tube #2: *Varian VKE 2401P2*
Frequency counter #1: *EIP model 548B*
Frequency counter #2: *EIP model 578*



to Dilution Refrigerator

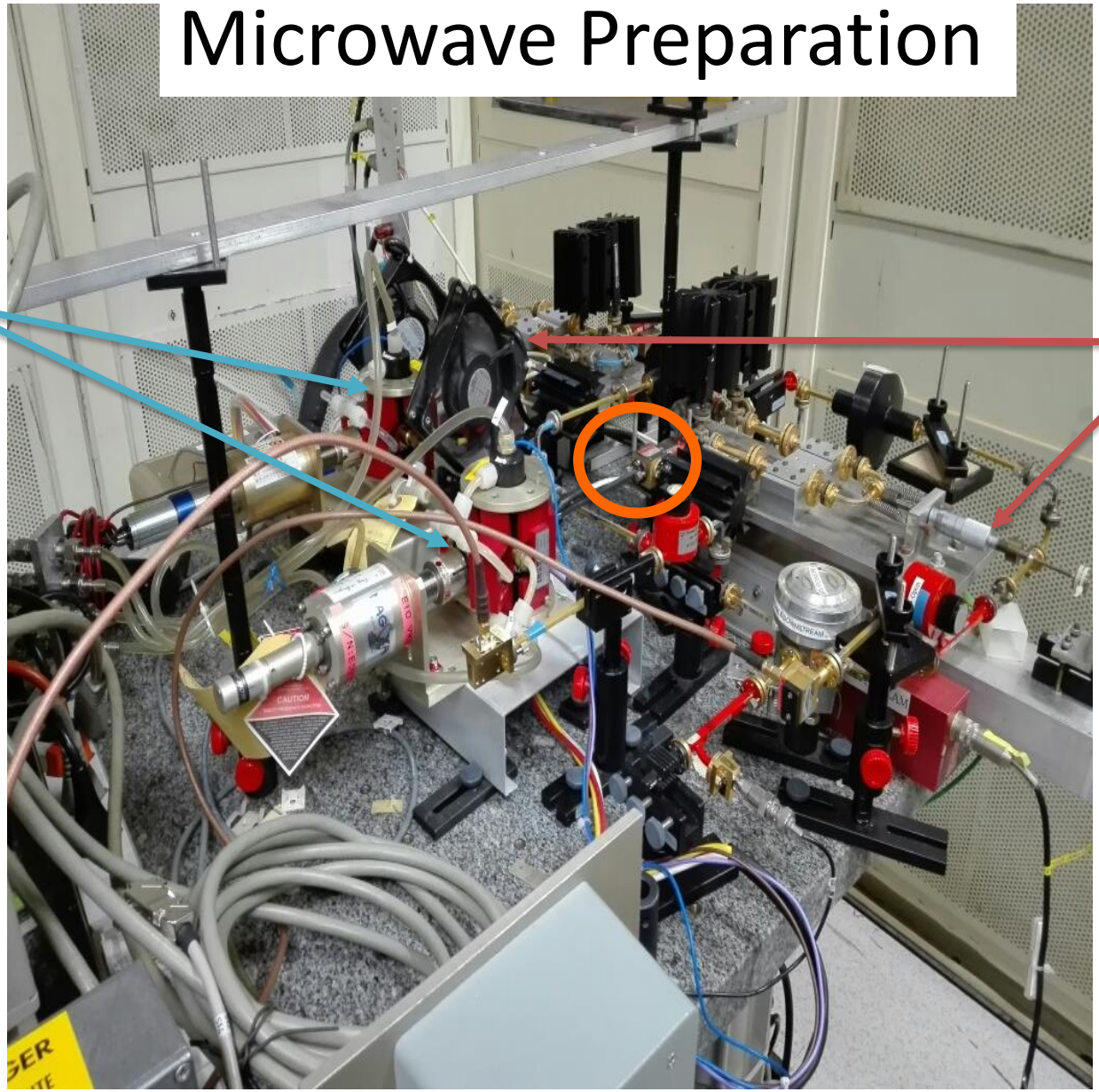
FILE NAME mwsystem.dwg	FSCM NO	SHEET	SCALE 1:1
SIZE A3		NA58 COMPASS	
DRAWN 04/13/2005 Stepan Neliba		MicroWave System	
CHECK			
APPR.			
ISSUED			
REV 1.0		DWG NO NA58PT20050413-2	
CONTRACT NO			

Cathode voltage vs Frequency



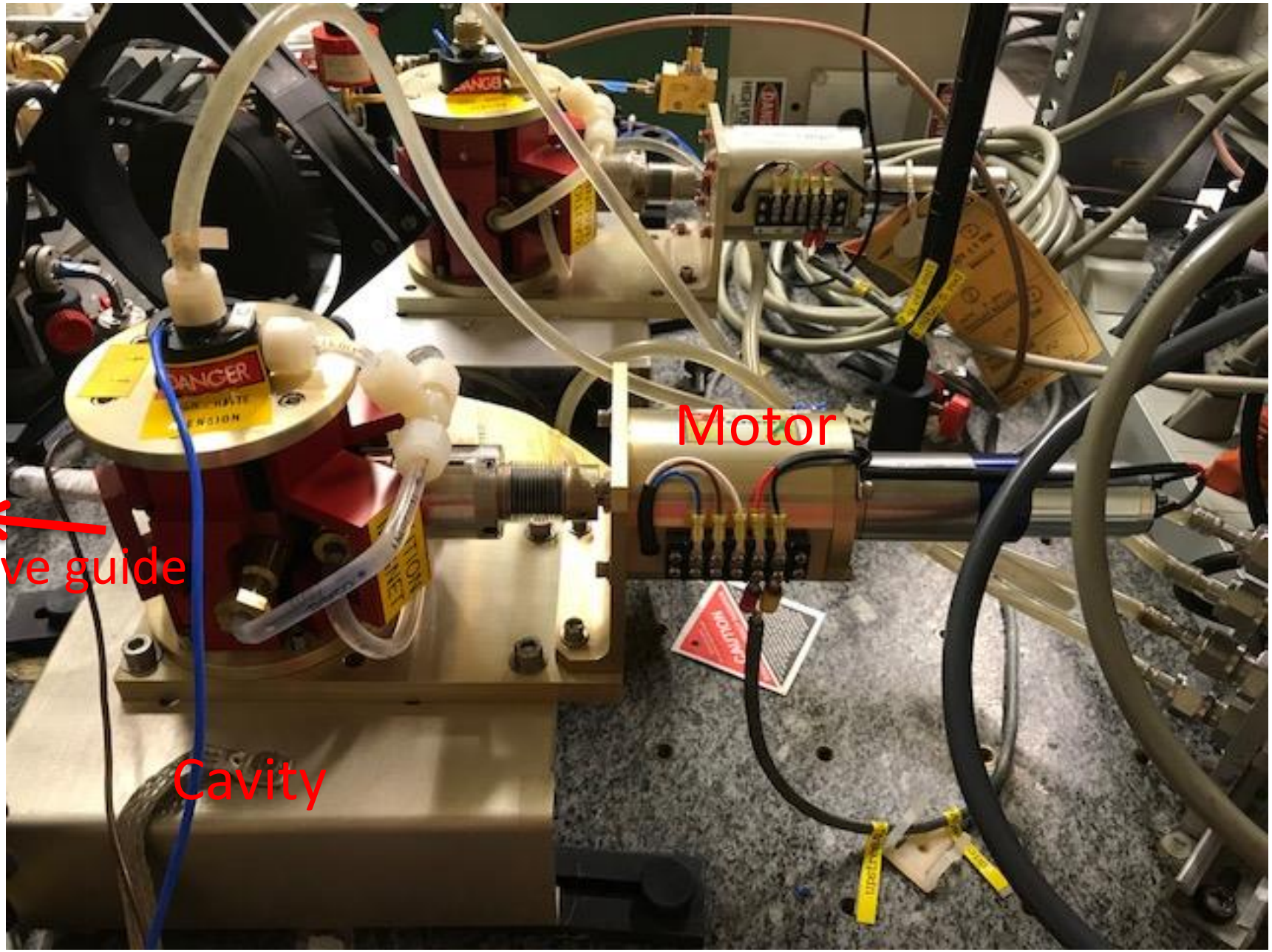
5.7 kV

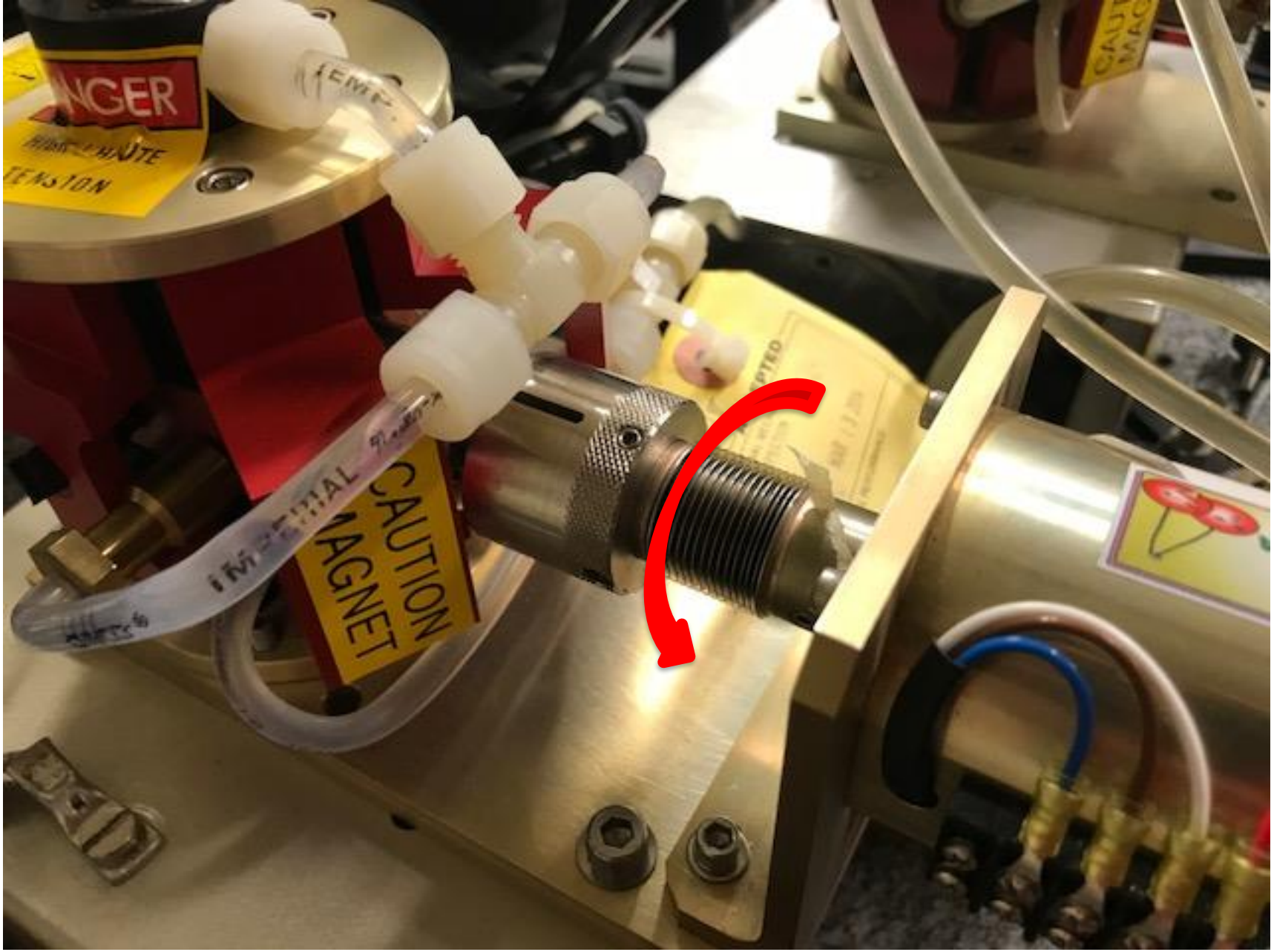
Microwave Preparation

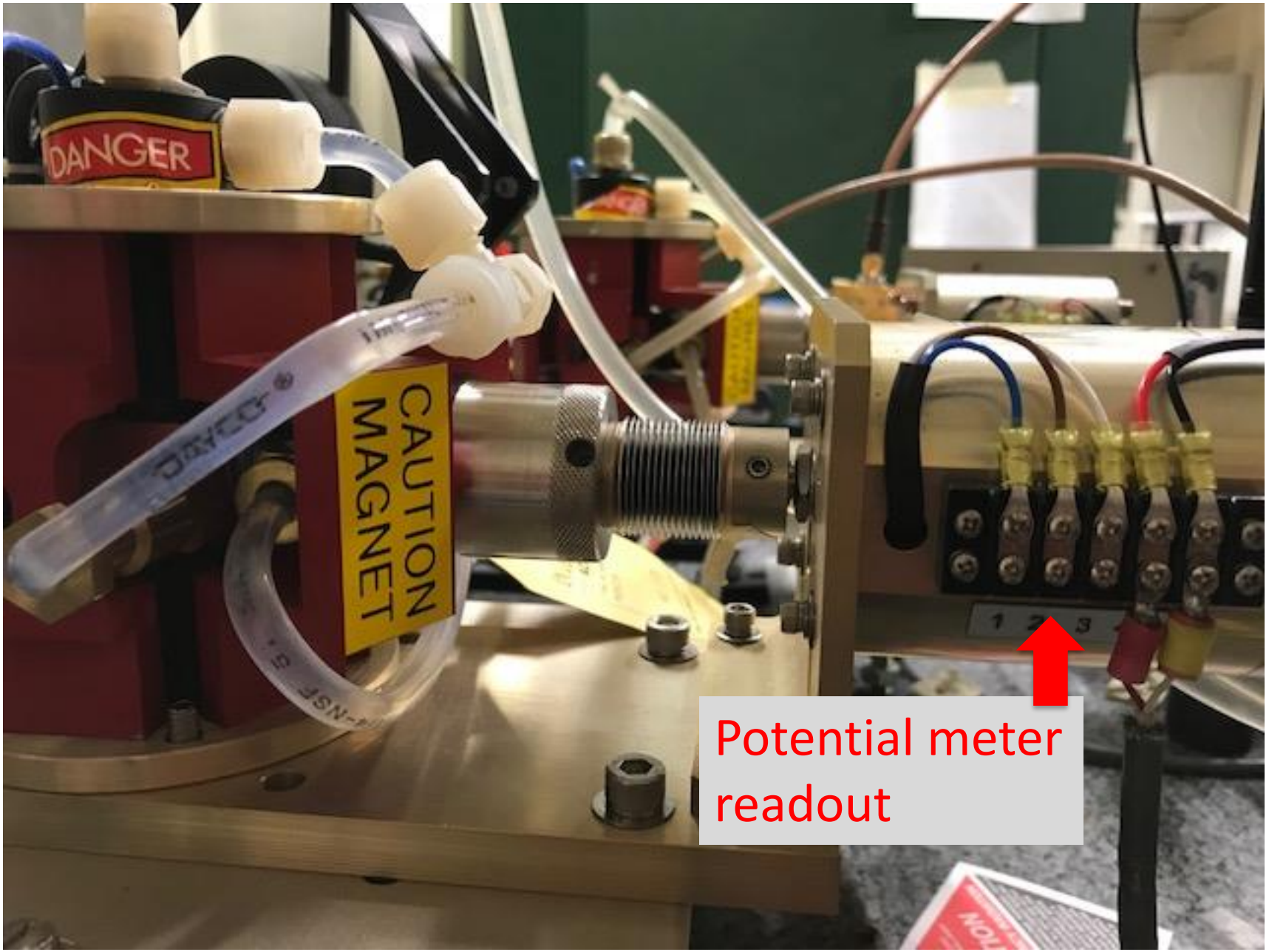


EIO - oscill.

Calibration of Trombone microm. attenuators


Motor
Wave guide
Cavity


CAUTION
MAGNET


DANGER
CAUTION
MAGNET
Potential meter
readout

EIO tubes in stocks

TWiki > Compass/PolarizedTarget Web > PolTargFAQ > MicrowaveEIOTubes
(2017-12-11, JaakkoHenrikKoivuniemi)

Microwave EIO tubes

type	no.	year	PSU	notes
VKE2401P1		SMC	for old big PSU	
VKE2401P4	E1100B8	Yamagata 2008	for CPI VPW2827 (2008)	useful spare
VKE2401P2	E0762C6	Nagoya? 2008?	Varian VPW2838 (1996)?	useful spare
VKE2401P4	E1101C3	Yamagata 2013	CPI VPW2827 (2008)	in use 2015
VKE2401P2	E0761D6	Nagoya 1996	Varian VPW2838 (1996)	in use 2015

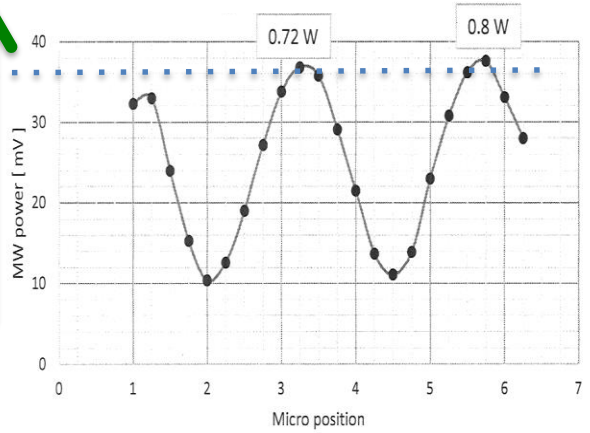
Upstream waveguide

Measured by Yuri

Power

0.7 W

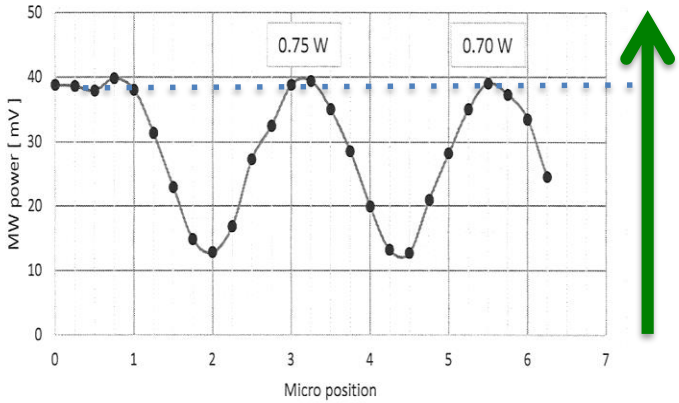
69.953 GHz



69.984 GHz

Power

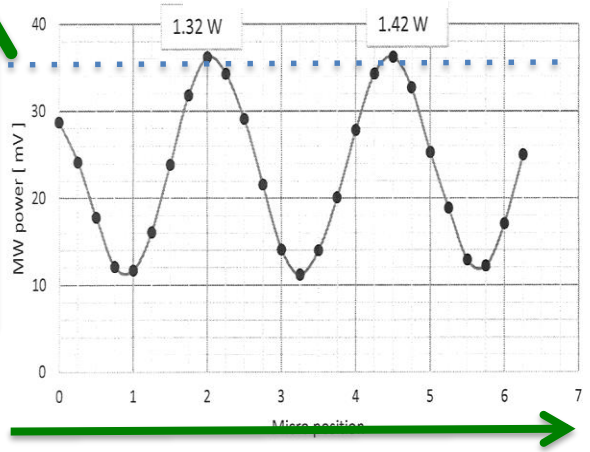
0.7 W



Power

1.3 W

70.209 GHz

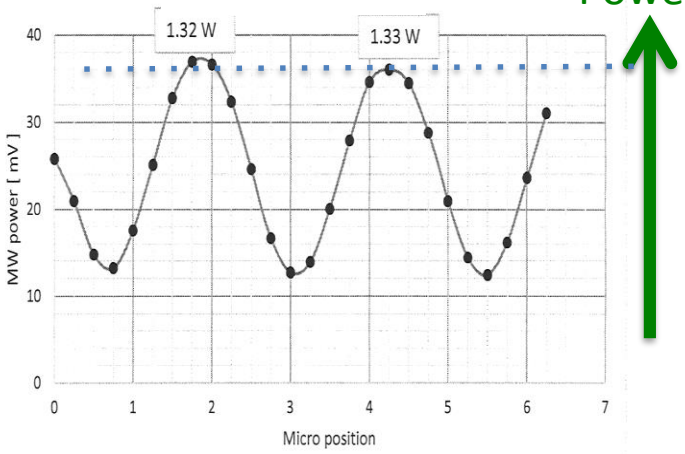


Trombone attenuator position

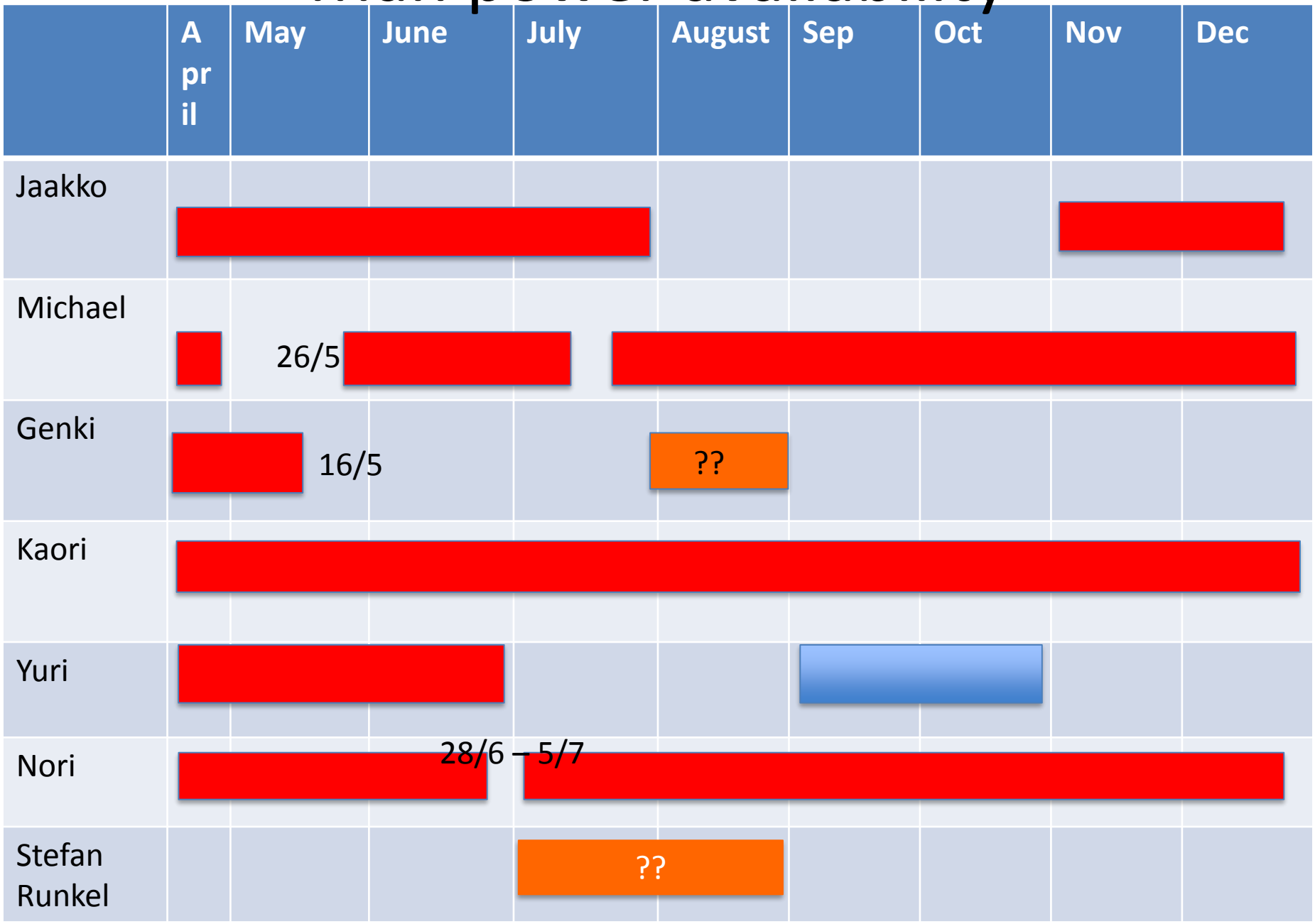
70.273 GHz

Power

1.3 W



Man power availability



Back up

After loading

- Cleaned up He3 line by evacuation pumps
- Restarted cooling dilution refrigerator (Tuesday evening)

  - He4 pump system started on Thursday.

  - He3 pump system : problem of relay
- Leak check of o-ring on the flange
- Leak check of the access tube (indium joint)
- Leak check of isolation vacuum of the holder
- Removed loading platform on Thursday

NMR system preparation

- Installed cooling water line
- Installed NMR cables after loading
- Connected NMR cables after loading

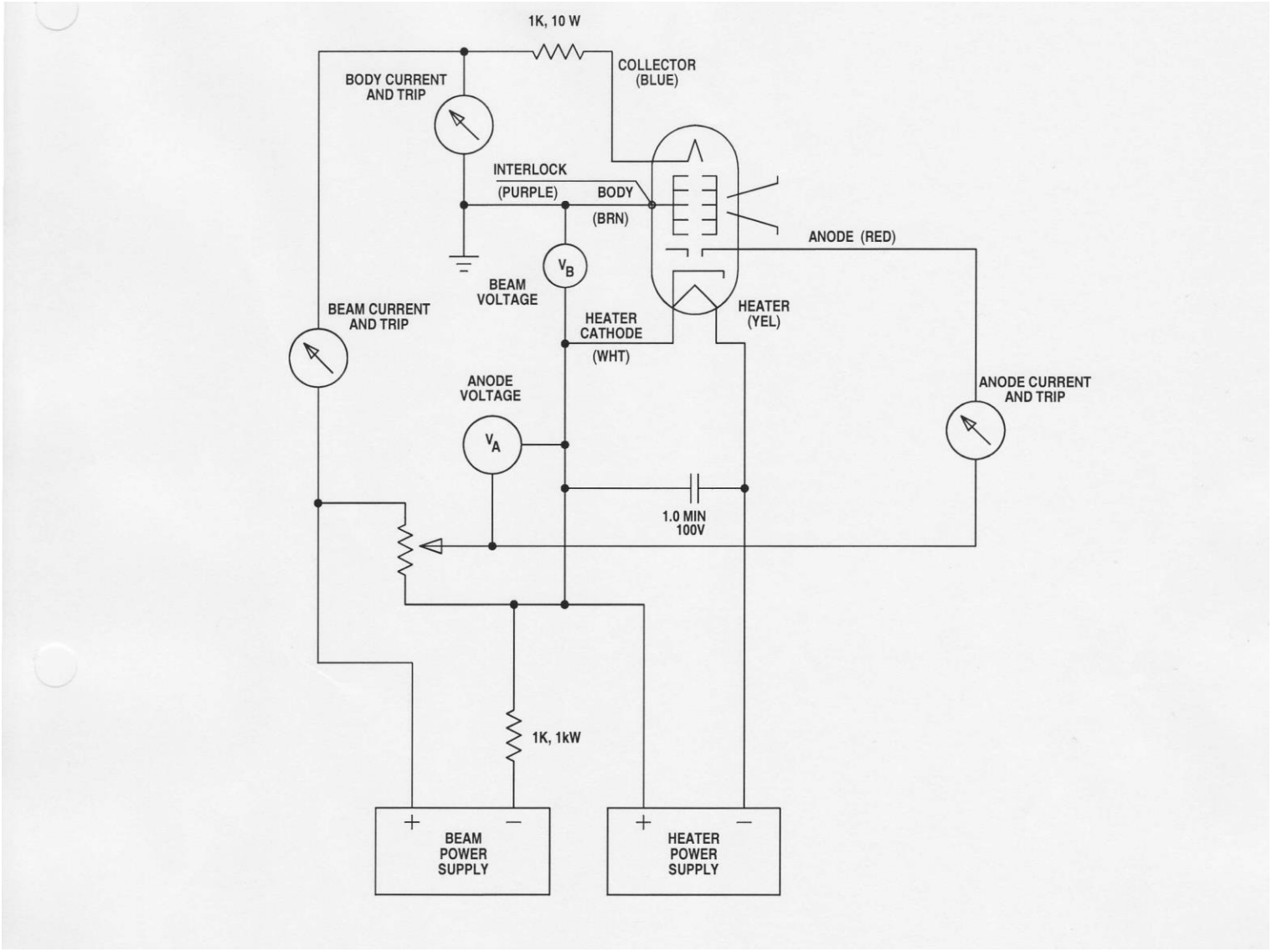
  - one cable was cut but fixed it
- Tuning Q-curves
- Installed radiation shield

Integrated area @ 1.27K (very preliminary)

- coil1 = -43.1713 +/- 0.02362 (0.05471%)
- coil2 = -18.4606 +/- 0.09139 (0.495%)
- coil3 = -38.439 +/- 0.01839 (0.04783%)
- coil4 = -21.8121 +/- 0.06017 (0.2759%)
- coil5 = -34.7328 +/- 0.02014 (0.05798%)
- coil6 = -10.5719 +/- 0.0169 (0.1598%)
- coil7 = -14.5848 +/- 0.02518 (0.1726%)
- coil8 = -26.272 +/- 0.01477 (0.05624%)
- coil9 = -11.6647 +/- 0.02001 (0.1716%)
- coil10 = -33.9287 +/- 0.02973 (0.08763%)

Relaxation time of proton (NH3) at COMPASS

Year	Material	Program	Relaxation time
1998? SMC	OLD	Transverse	~500 hours at 0.5T
2007	OLD	Longitudinal /Transverse	~4000 hours at 0.6T ~ 9000 hours at 1.0 T
2010	OLD	Transverse	~ 9000 hours at 0.6 T
2011	NEW	Longitudinal	~ 9000 hours at 2.5 T
2015	NEW	Transverse	~ 1200 hours at 0.6 T With hadron beam


1K, 10 W
COLLECTOR
(BLUE)
BODY CURRENT
AND TRIP
INTERLOCK
(PURPLE)
BODY
(BRN)
ANODE (RED)
V_B
BEAM
VOLTAGE
BEAM CURRENT
AND TRIP
HEATER
CATHODE
(WHT)
HEATER
(YEL)
ANODE
VOLTAGE
V_A
ANODE CURRENT
AND TRIP
1.0 MIN
100V
1K, 1kW
+
−
BEAM
POWER
SUPPLY
+
−
HEATER
POWER
SUPPLY

MSS for field rotation