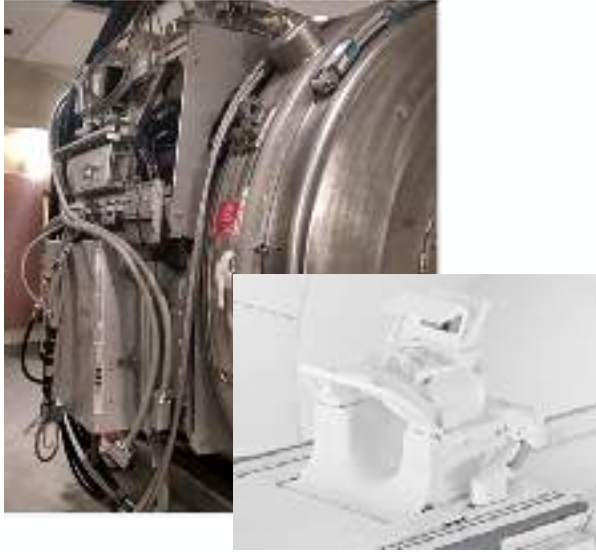


Update on 3T

April 10, 2017



System Enhancements



RF architecture



Gradients



Computers & software

RF General

- Analog RF modules now mounted directly on scanner, with digital communications to/from equipment room (Tim 4G, DirectRF)
- Broadband RF allowing multi-nuclear detection
 - phosphorus, sodium, etc.
- Updated connector design
- Adaptor provided for using old Tim-style coils
 - limited to ≤ 8 channels

New RF System



- Analog RF modules now mounted directly on scanner, with digital communications to/from equipment room (Tim 4G, DirectRF)

Multinuclear detection



- Broadband RF allowing multi-nuclear detection: phosphorus, sodium, etc.

RF Receive

- 32 → 64 receive channels
 - higher SNR
 - improved acceleration
 - better coverage of cerebellum, brainstem, cervical spine

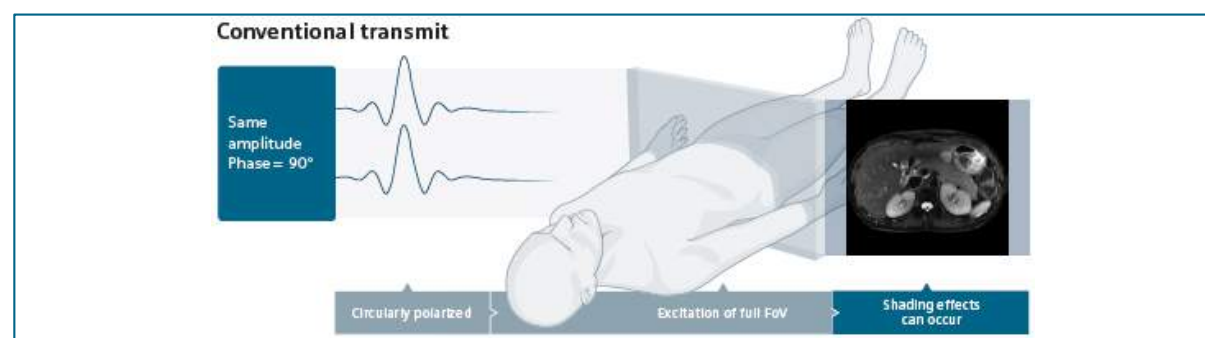
RF Transmit

- quadrature transmit → fully independent control of amplitude, phase on two channels
- RF shimming, parallel transmit
- reduced SAR, faster readout
- reduced FOV imaging for high resolution

TimTX Trueshape

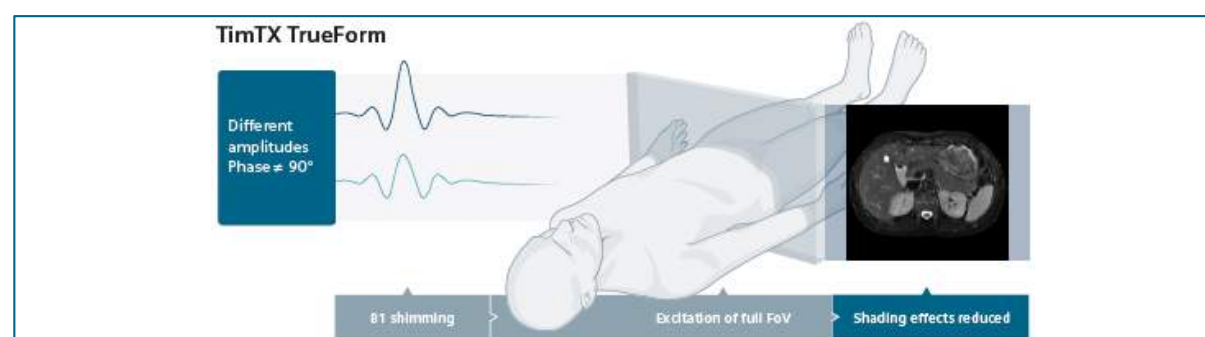
How it works

Conventional transmit



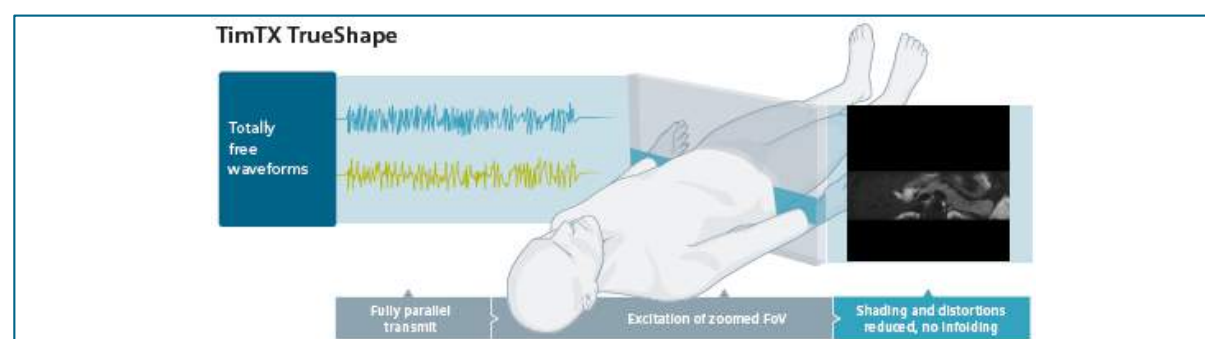
TimTX TrueForm

Anatomy-specific B1 shimming



TimTX TrueShape

Parallel transmit enabling new applications like ZOOMit



A standard set of coils will be included with MAGNETOM Prisma

Head/Neck 20



Spine 32



Body 18



**Flex large 4 /
Flex small 4**



MAGNETOM Prisma supports the Tim 4G coil portfolio



15-Channel Tx/Rx Knee



Hand/Wrist 16



Shoulder 16



Foot/Ankle 16



Loop s/m/l



Head 32

... powered by
DirectConnect
or
SlideConnect



Peripheral Angio 36



Tx/Rx CP Head



Head/Neck 64



Special Purpose 4



Body 60**



Breast 18





64-channel

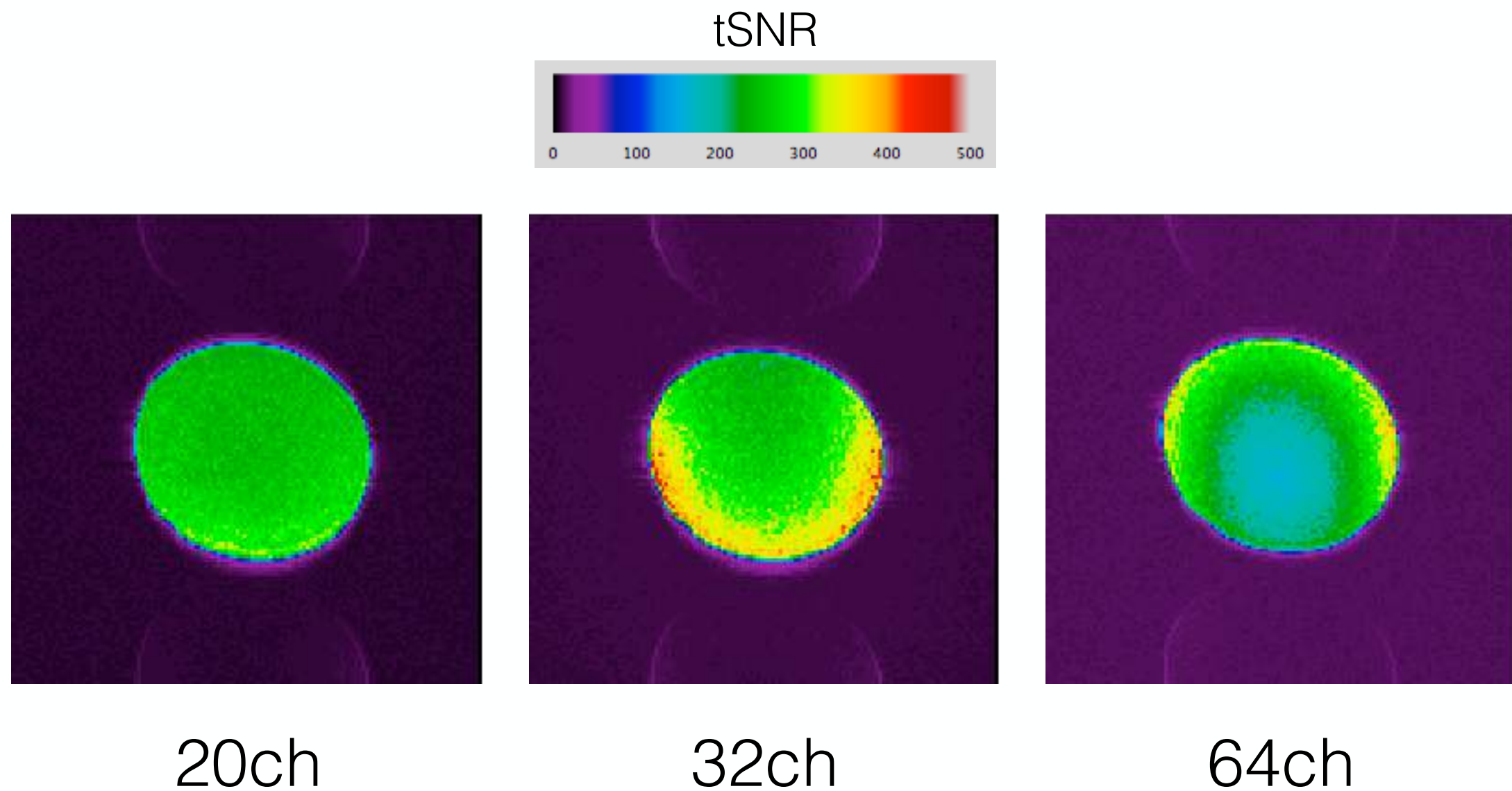


32-channel

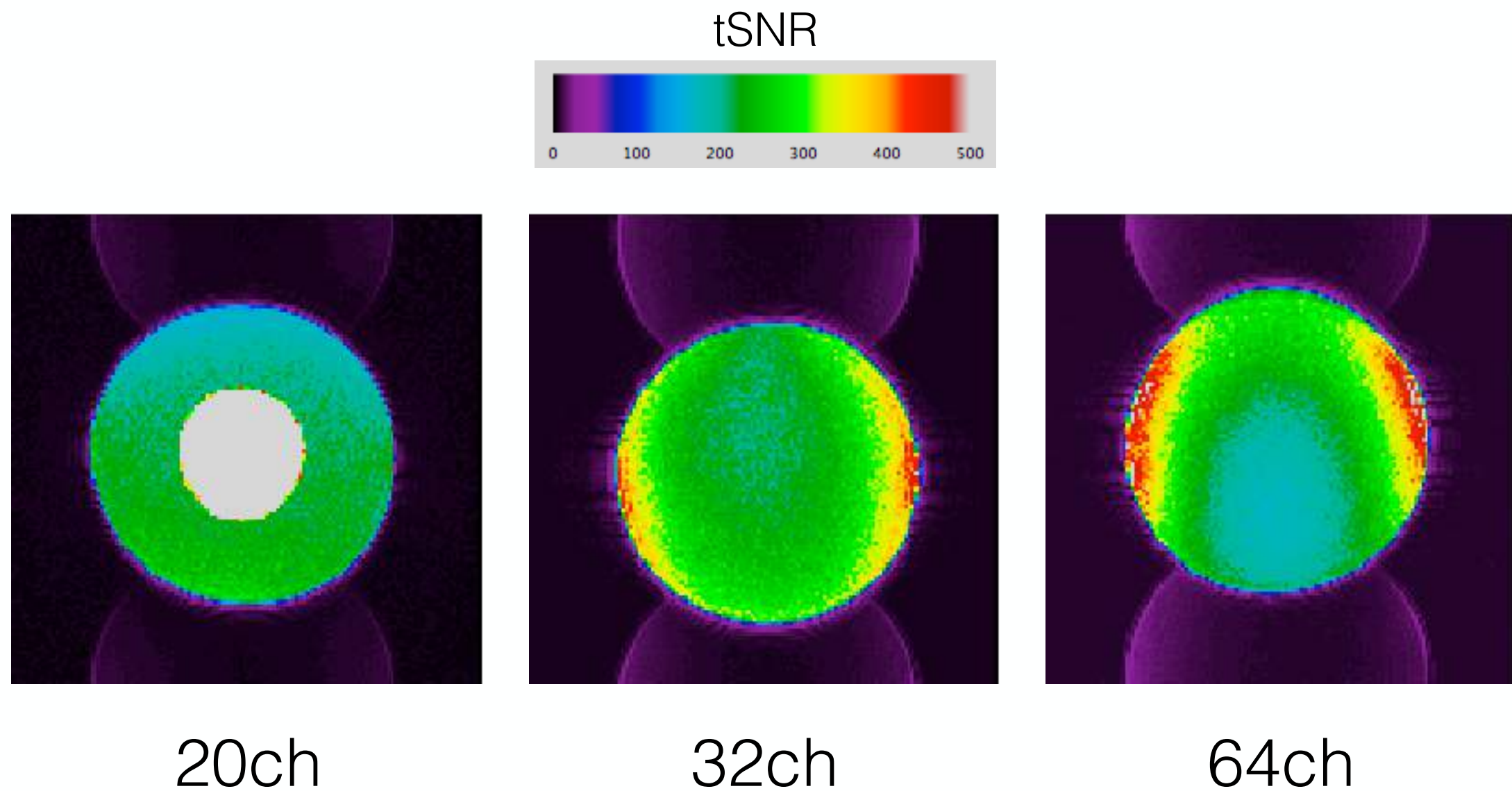


20-channel

Coil sensitivity profiles



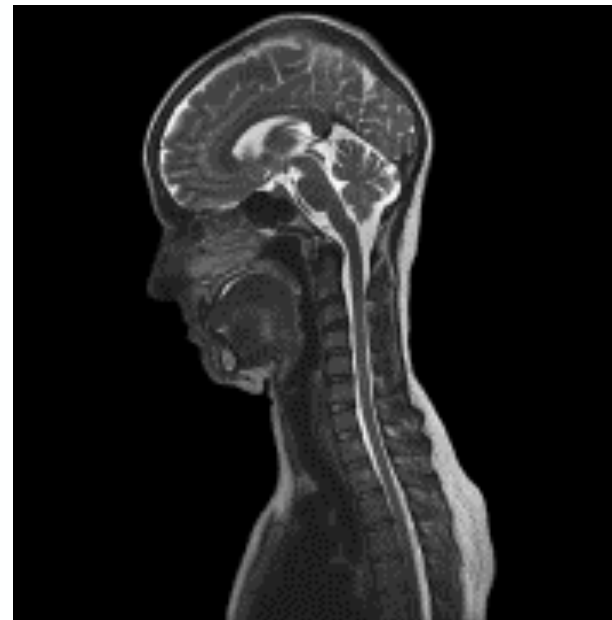
Coil sensitivity profiles



Volume coverage of new coils



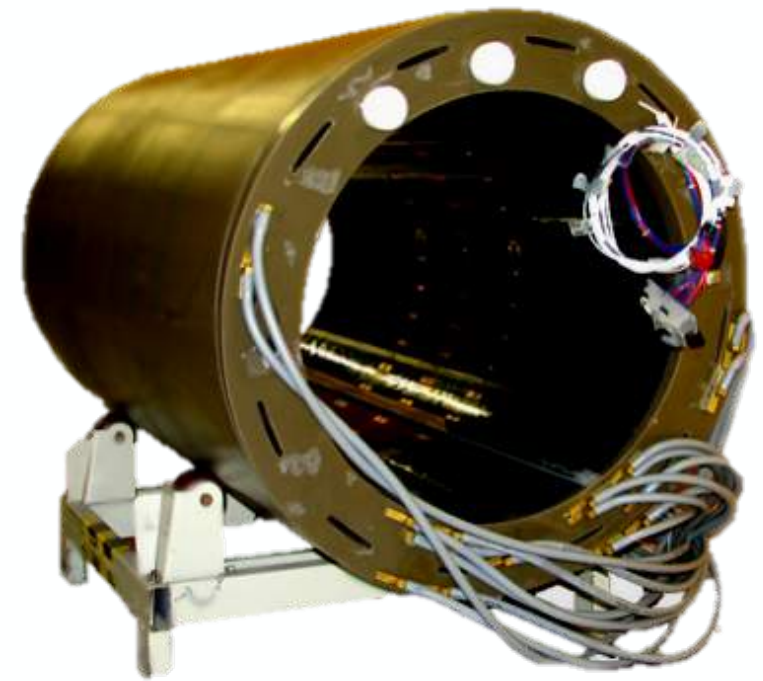
20ch



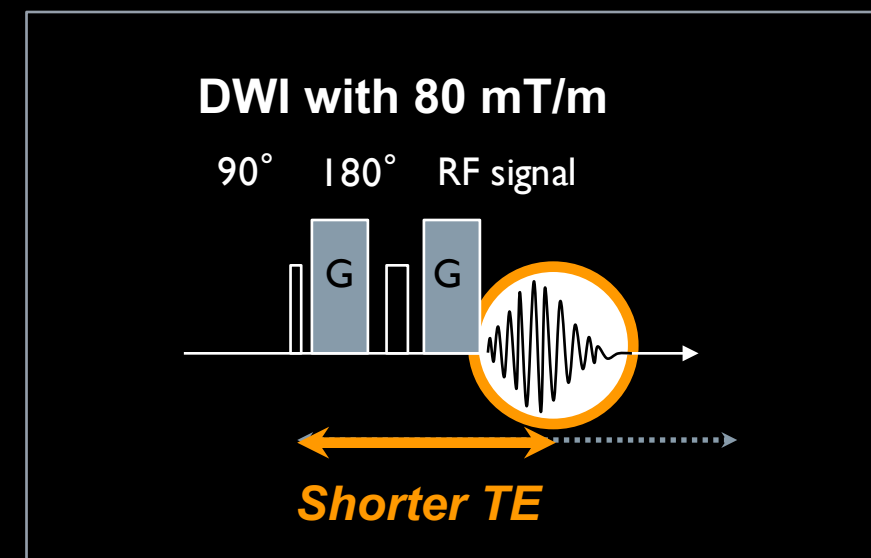
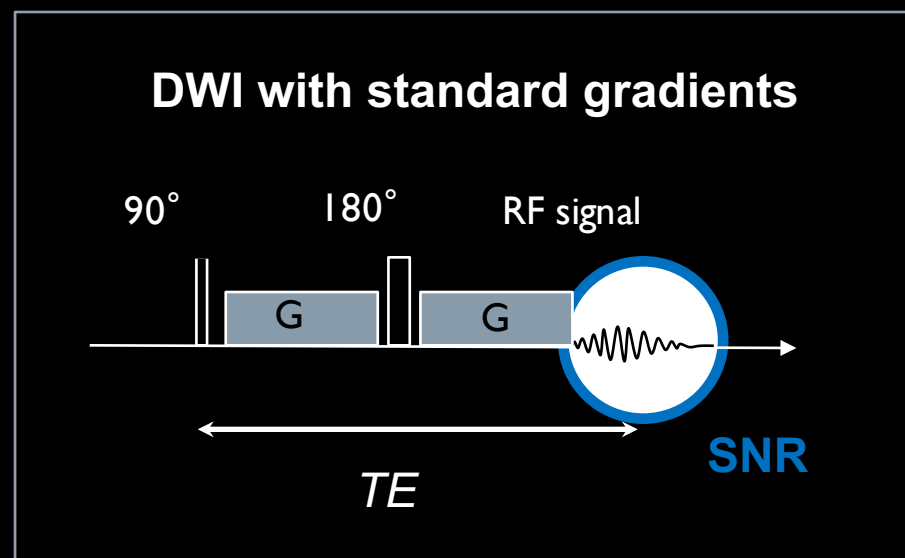
64ch

Gradients

- 80 mT/m
 - shorter echo time in DTI, improved SNR/resolution
- 200 mT/m/s slew (no change from Trio)
- water cooling
 - updated design, possible improvements in stability
- force-balanced windings
 - updated design, possible reduction in sounds levels and vibration

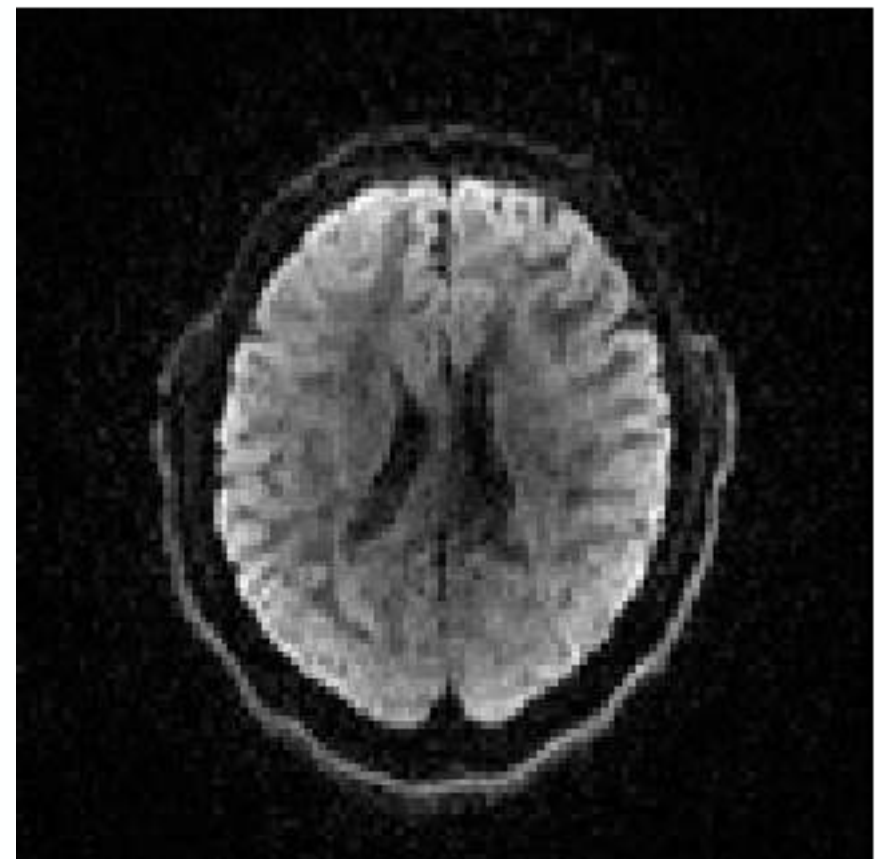
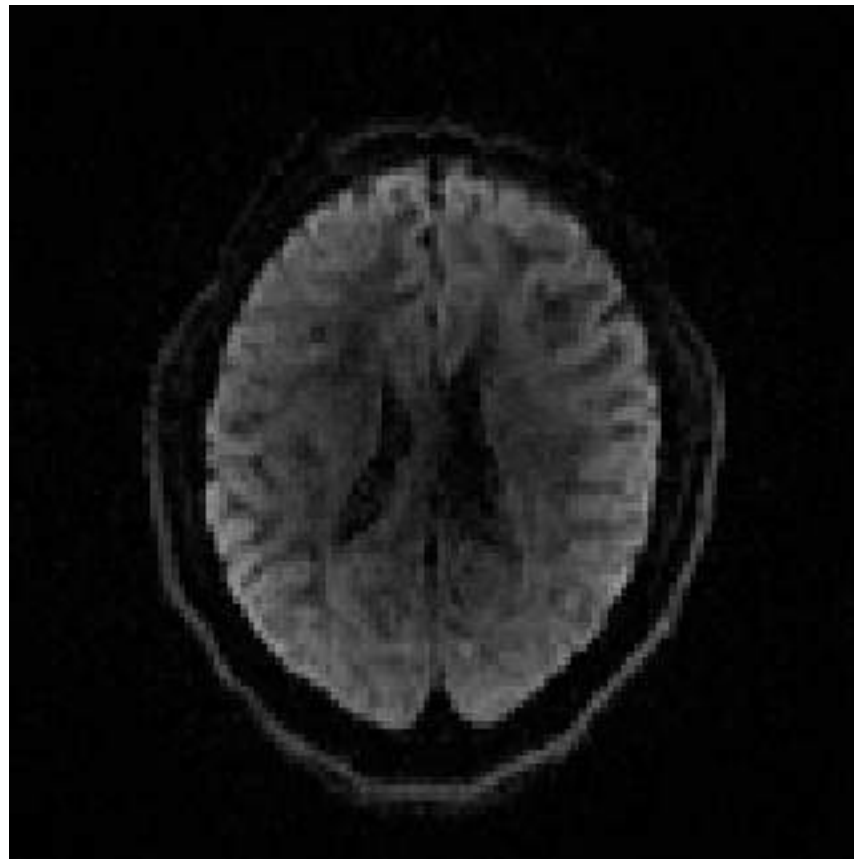


Potential benefits for DWI of 80 mT/m @ 200 T/m/s simultaneously

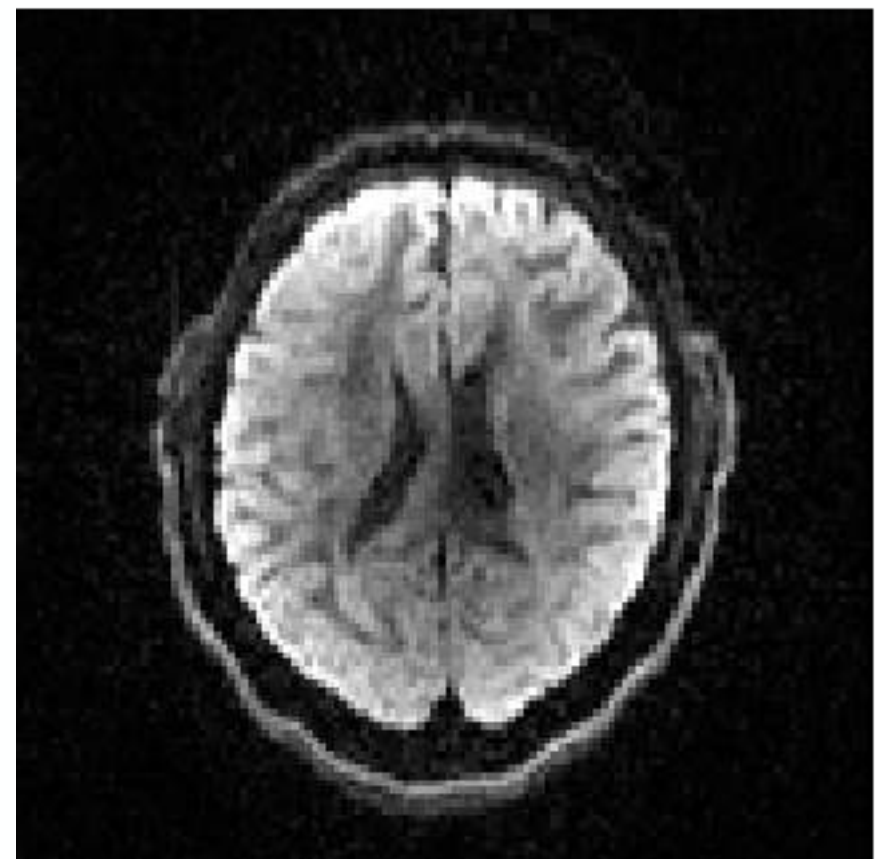
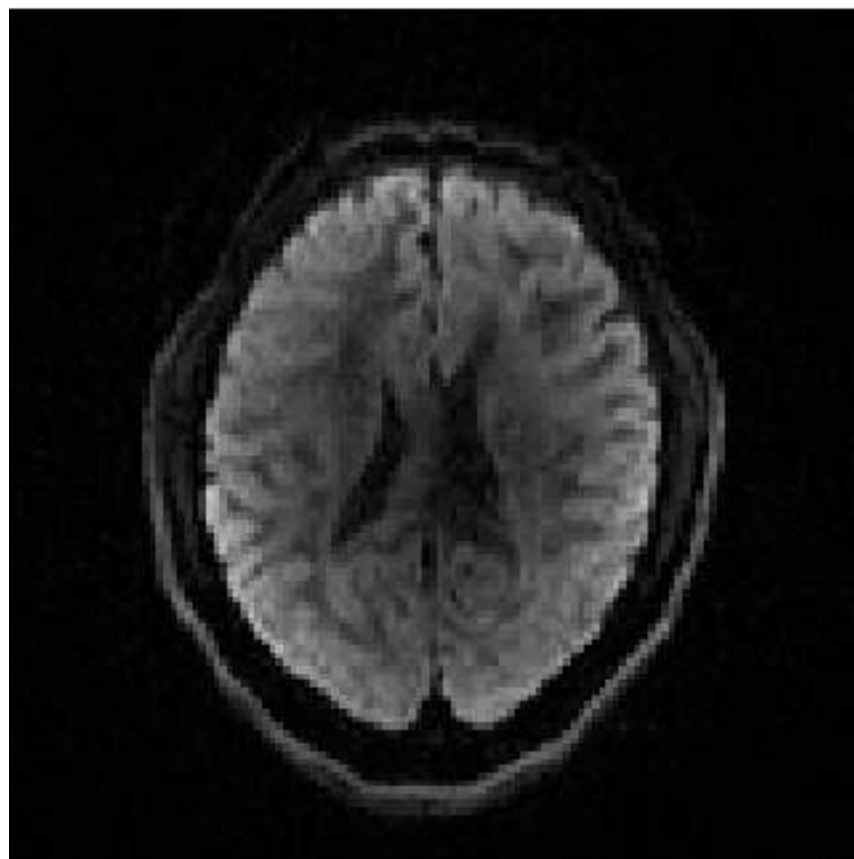


Up to 2x higher SNR

Old TE



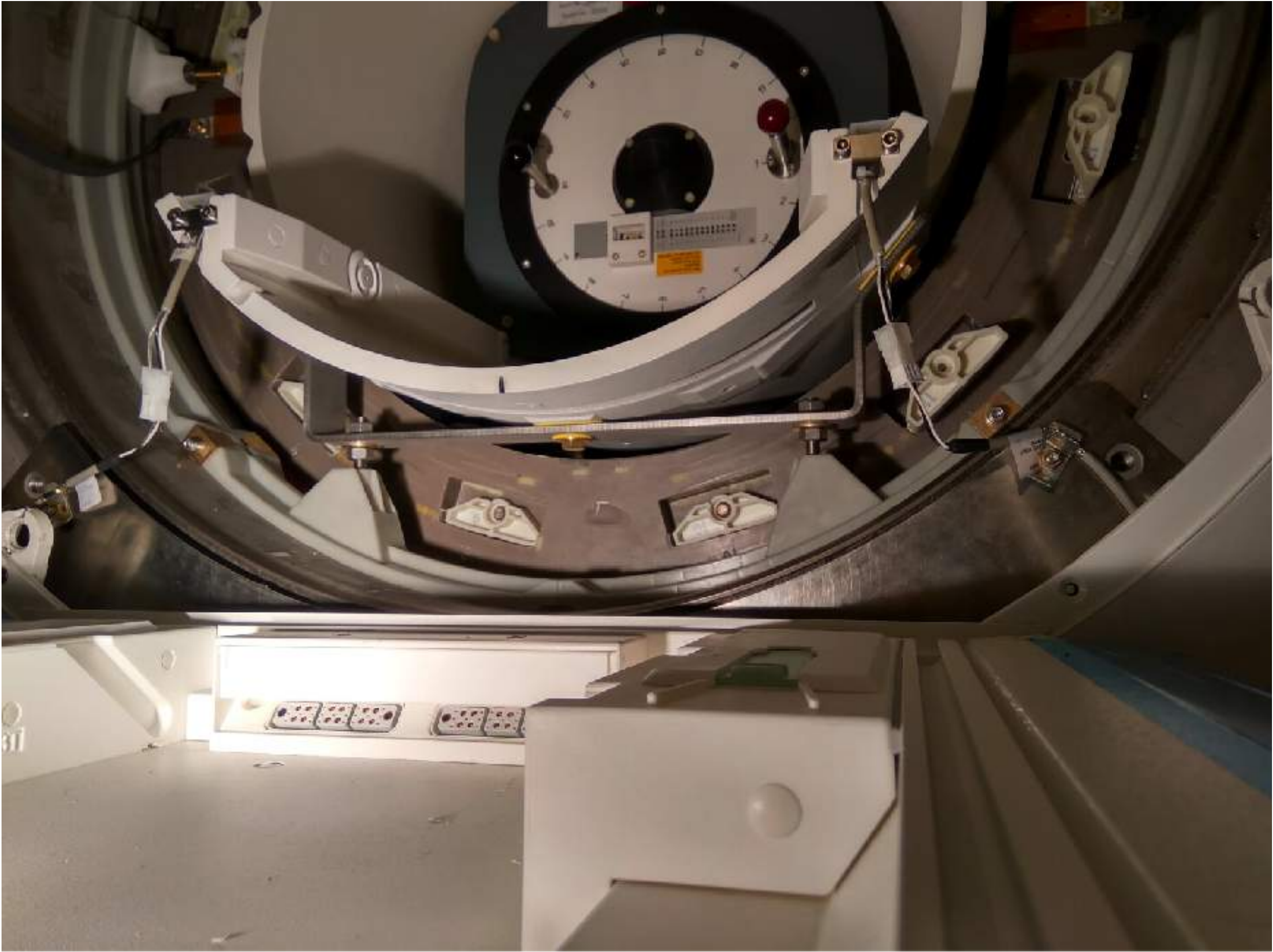
'New' TE

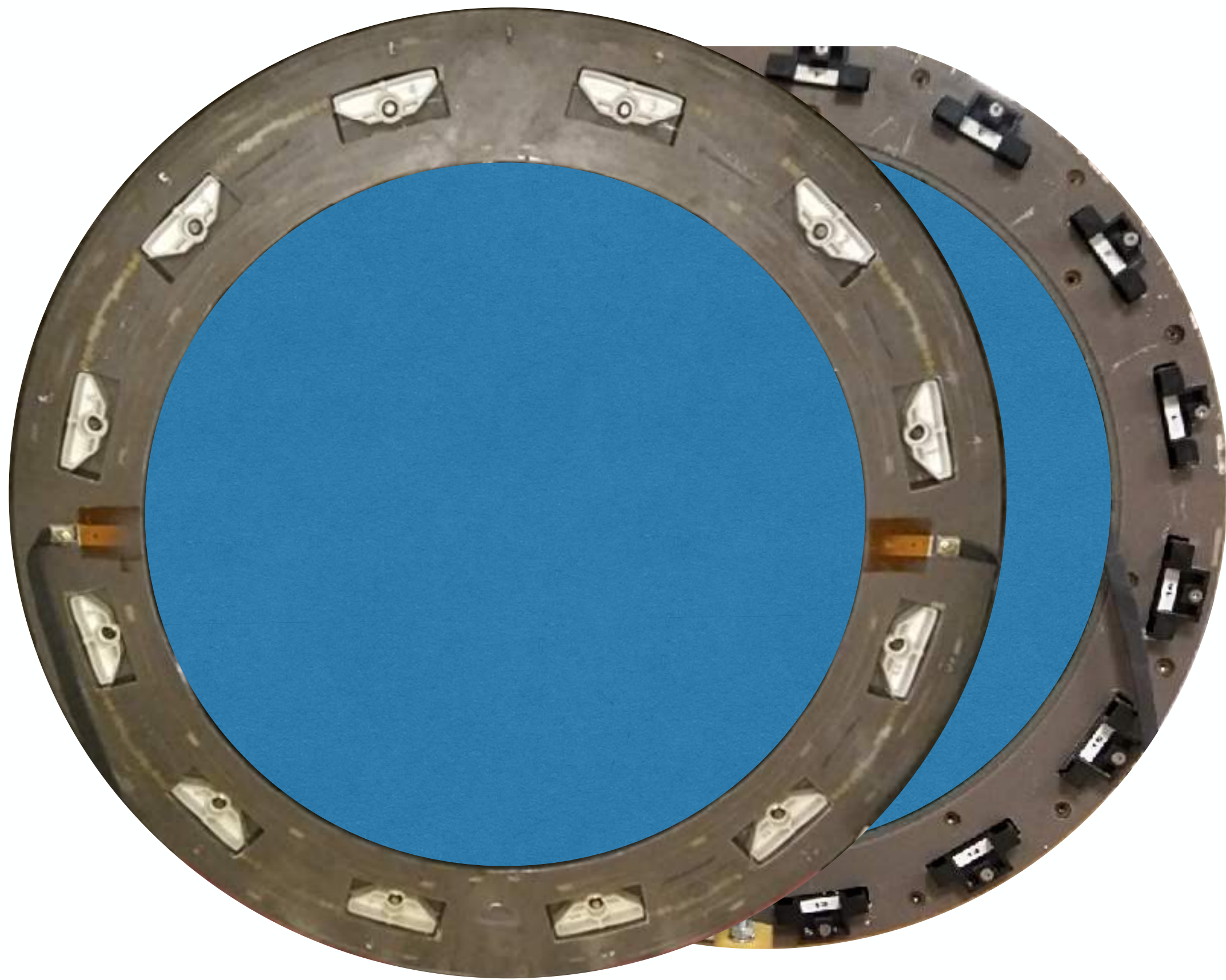


32 channel

64 channel





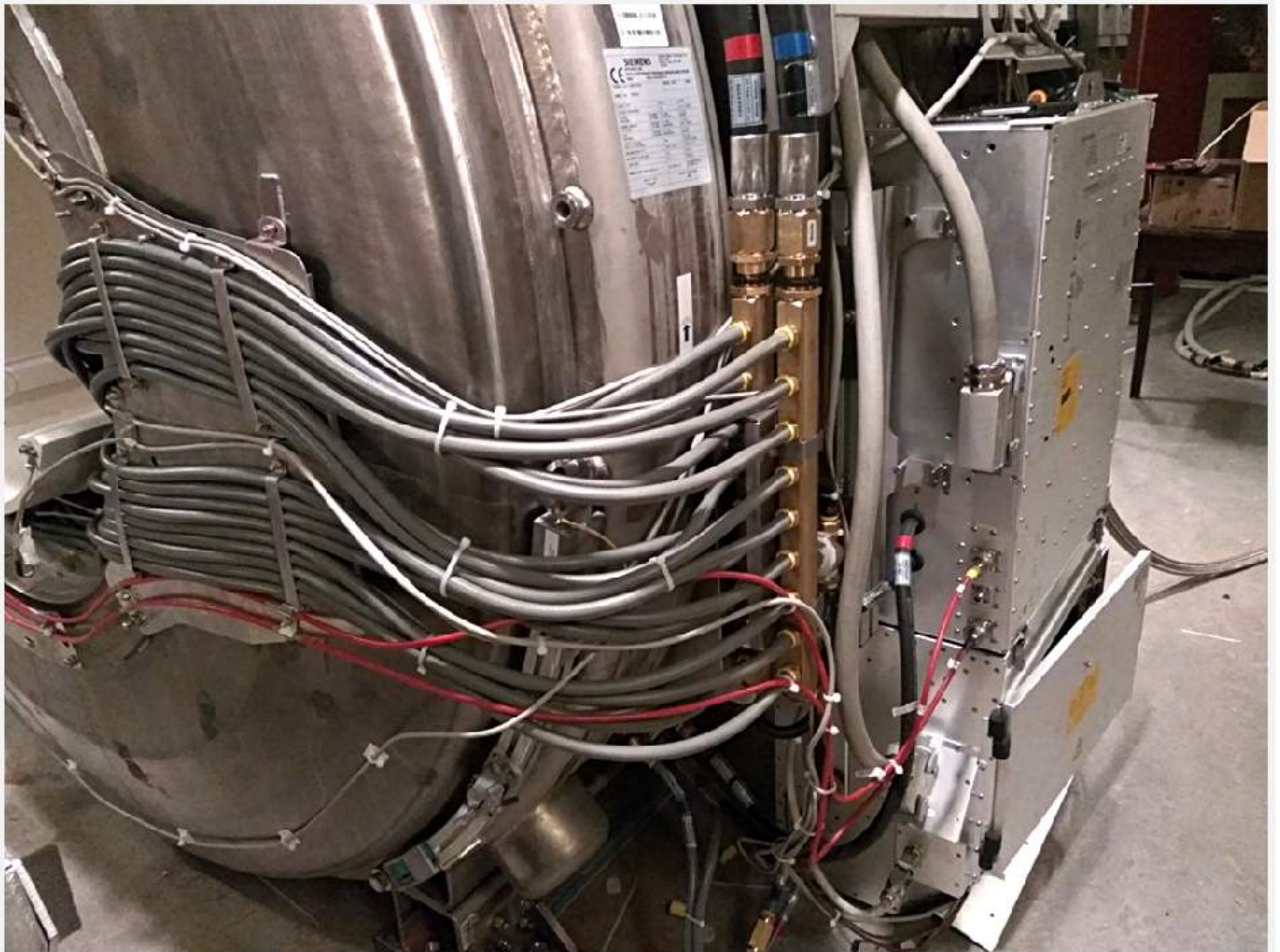












Shimming

- 2nd-order shimming (5 channels; max. available, same as Trio)
- upgraded from 5 → 10 amperes/channel
 - potential improvements in frontal, ventral regions
 - improved spectroscopy

Active shimming



Passive shimming



Updated computers

- Scanner PC: Windows XP → Windows 7
 - VE11c MRI software
 - compatibility with future sequence developments
- Recon PC:
 - multiple hexacore 3.46 GHz Intel CPUs
 - ≥ 128 GB RAM
 - Tesla GPGPU
 - rapid recon for multiband

Magnet - original retained



		SIEMENS		Siemens Magnet Technology Ltd Wharf Road Witney, Oxon, OX29 4SP England	
INTENDED USE: WHOLE BODY MAGNET RESONANCE IMAGING (MRI) SYSTEM 0040				RISK CATEGORY: III	
SERIAL No. 51877 09 04			MODEL TYPE		CR64
MODEL No. 7383610					
VESSEL TYPE:		VACUUM		HELIUM	
DESIGN TEMPERATURE:		20°C		4.2°K (-269°C)	
DESIGN PRESSURE:	INTERNAL	10 ⁻⁴ mbar		1.0 bar	
	EXTERNAL	ATMOSPHERIC		VACUUM	
NORMAL WORKING PRESSURE:	INTERNAL	10 ⁻⁴ mbar		1.1 bar	
	EXTERNAL	ATMOSPHERIC		ABS. VACUUM	
TEST PRESSURE	INTERNAL	10 ⁻⁴ mbar		2.0 bar	
	EXTERNAL	ATMOSPHERIC		VACUUM	
SAFETY BURSTING DISC SET PRESSURE:		N/A		18 PSI 10.60 bar/770mm	
MAXIMUM CAPACITY:		4700 LITRES		2100 LITRES	
MAXIMUM FILLING MASS:		N/A		128 KG	
TARE MASS:		N/A		4700 KG	
MANUFACTURED AND TESTED TO		PD 5503 CAT 2		AD 5503/1/2/3/4 PD 5503 CAT 2	
DATE OF TEST 19 APR 04		YEAR OF MANUFACTURE 2004			

Building and room upgrades

- RF shielding
- Quench safety
- Seismic mounting
- Acoustic decoupler



Seismic mounting

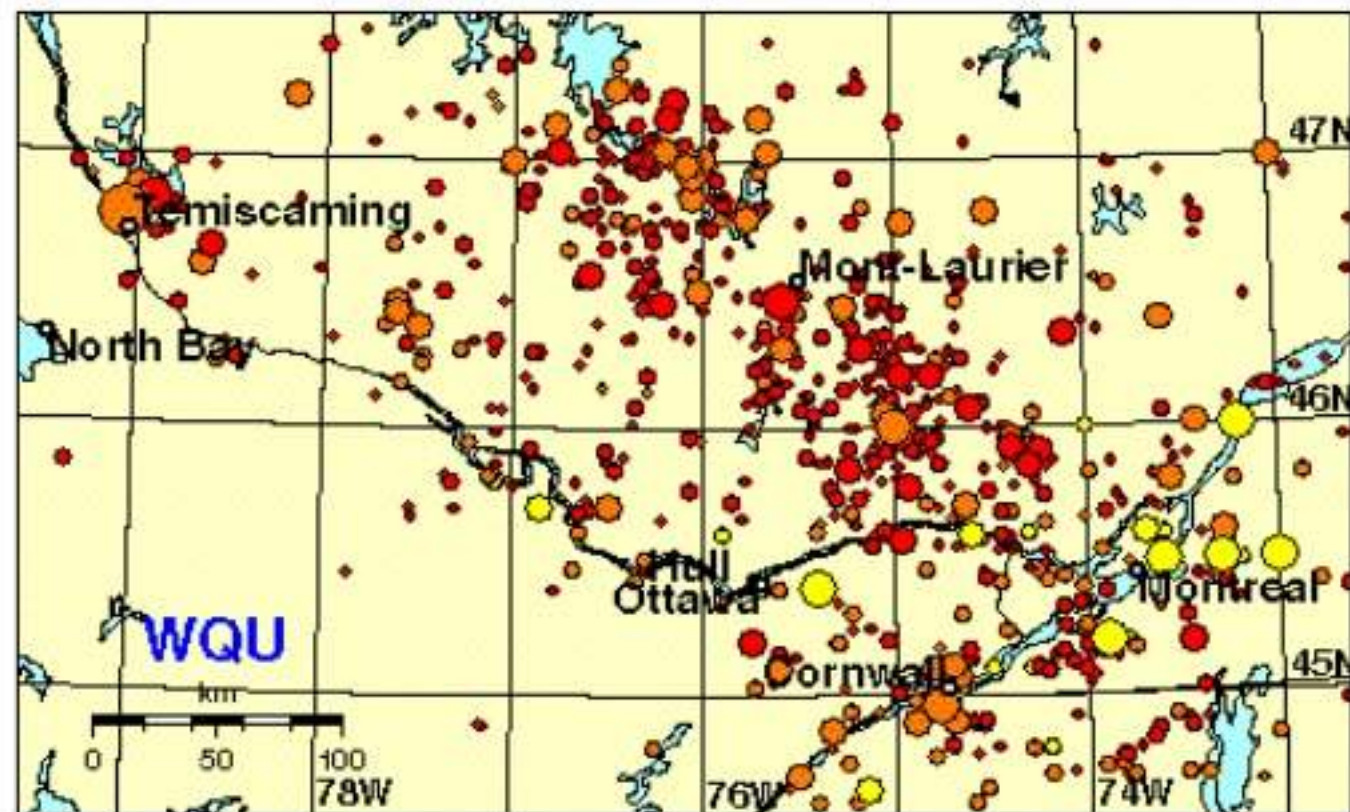


Western Quebec Seismic Zone

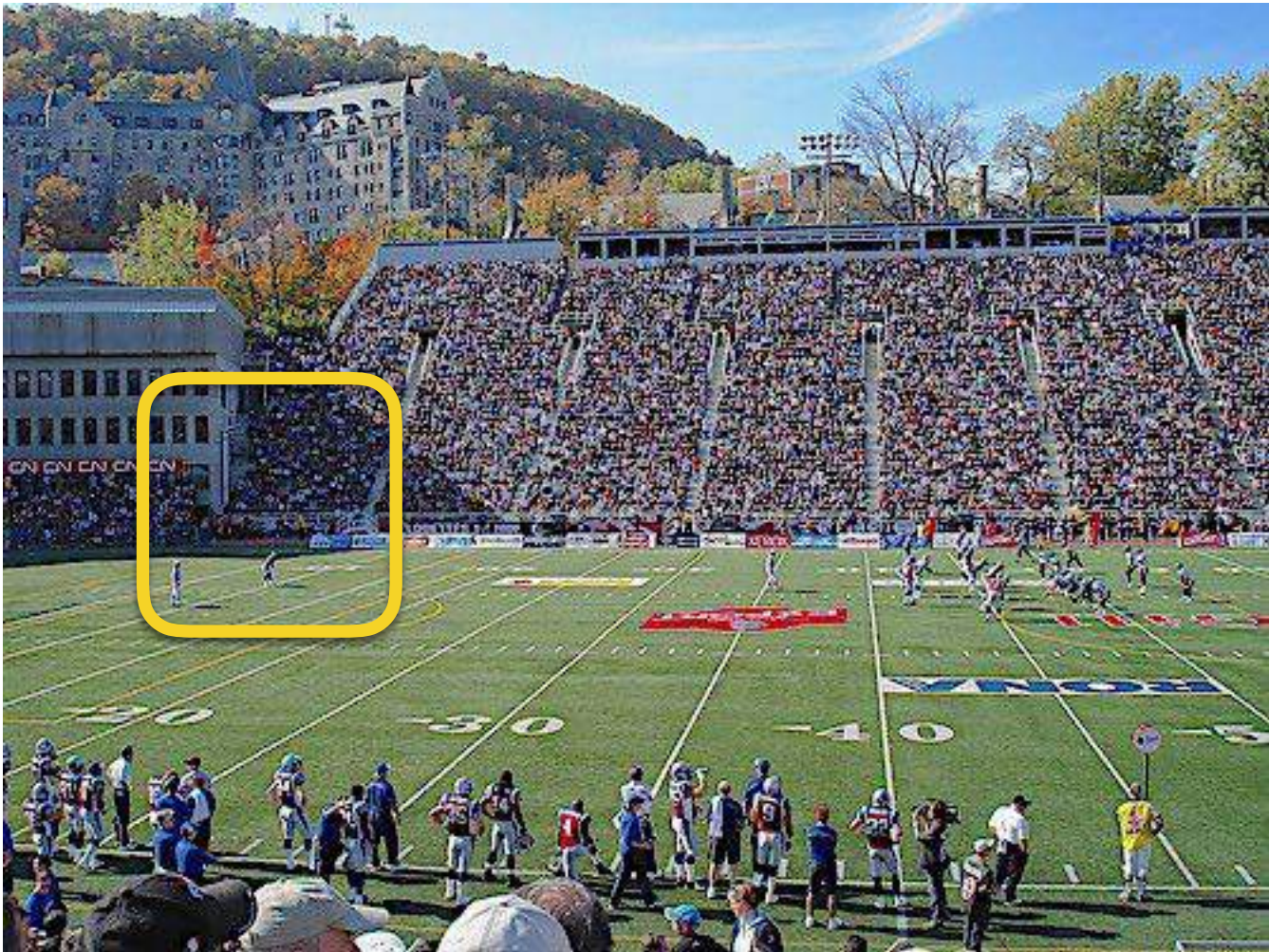
From Wikipedia, the free encyclopedia

An earthquake occurs in the Western Quebec Seismic Zone every five days on average.

<http://www.earthquakescanada.nrcan.gc.ca/zones/eastcan-eng.php>







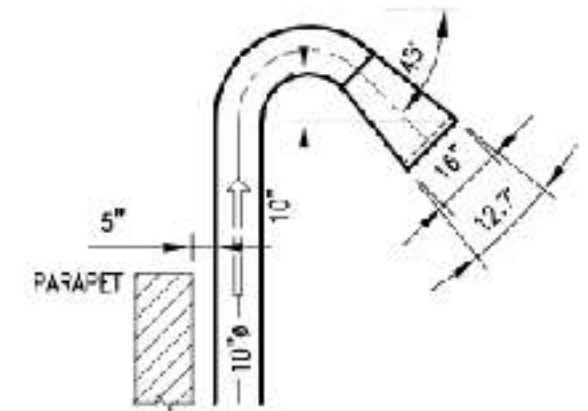
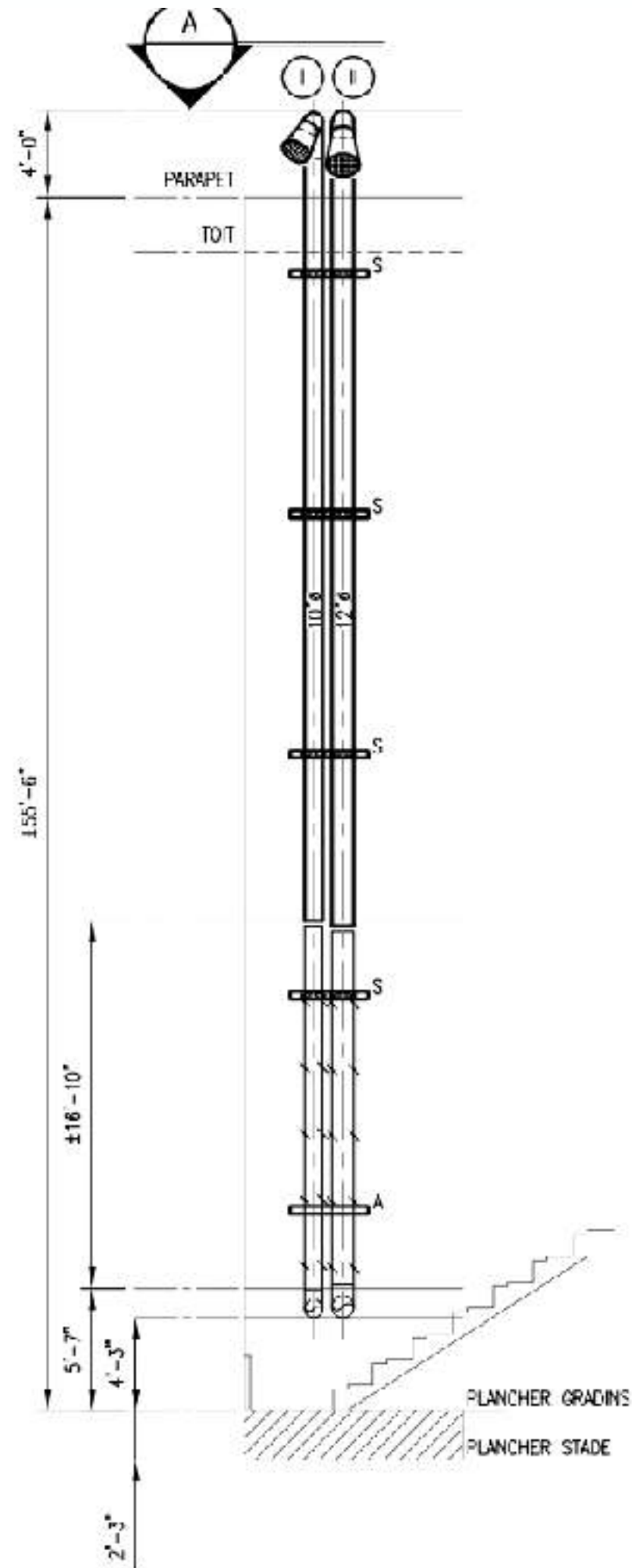
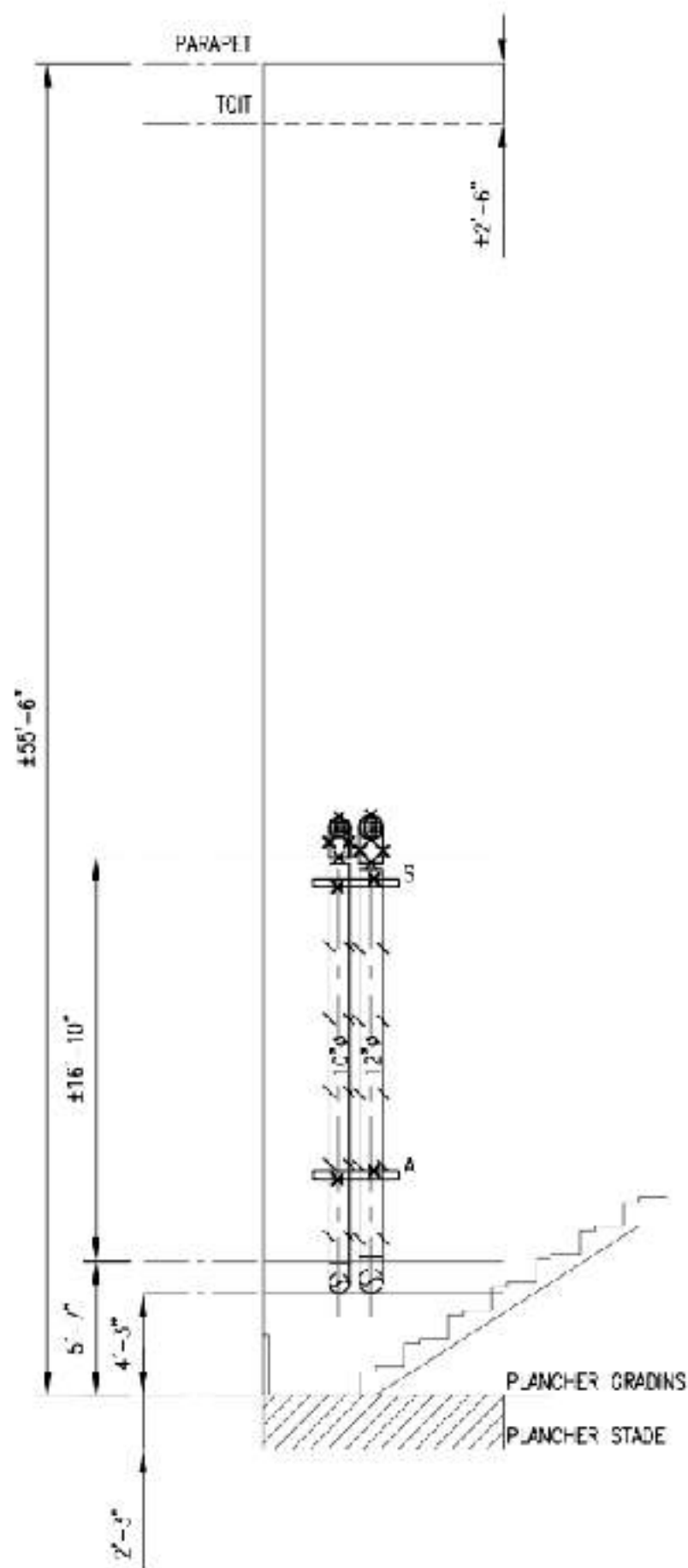
ATTENTION - DANGER

N'APPROCHEZ PAS
UN GAZ EXTRÊMEMENT FROID
PEUT-ÊTRE ÉVACUÉ SANS AVERTISSEMENT
NE TOUCHER L'ÉVENT
LORSQUE L'AIMANT EST EN FONCTION
- AUTORISATION SPÉCIALE REQUIS -

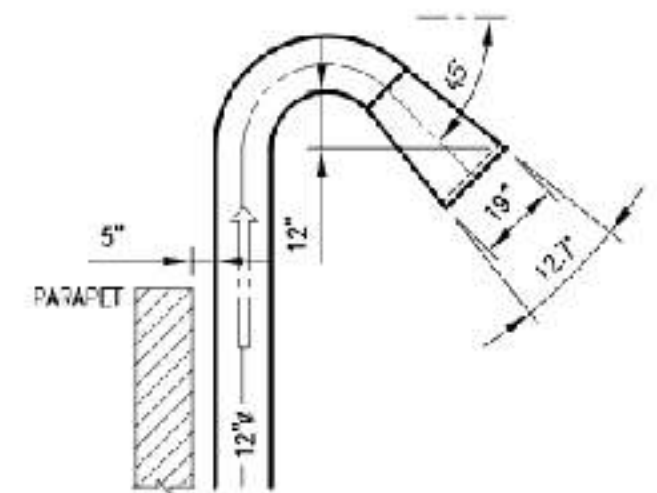
WARNING

KEEP AWAY
EXTREMELY COLD GAS
MAY BE EXHAUSTED WITH NO WARNING
DO NOT WORK ON THE VENTING
IF THE MAGNET IS AT FIELD
- SPECIAL AUTHORIZATION REQUIRED -

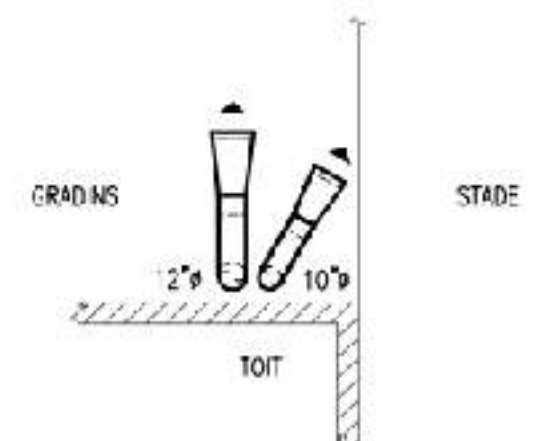




DÉTAL SORTIE ①
ÉCHELLE: $\frac{1}{4}" = 1'-0"$



DÉTAL SORTIE ②
ÉCHELLE: $\frac{1}{4}" = 1'-0"$



Peripherals

- Prisma includes camera for monitoring patient and dedicated display in console room
- Stimulus projection with backprojection/mirrors is now functional
- Button boxes working
- Some issues with scanner trigger pulse

Timeline

- Scanner upgrade:
 - started February 24
 - completed March 31
- Quench pipe work:
 - May 2-9



Other MR News

- RF Coil Lab (also funded by CFI; coming May 2017)
- New faculty recruitments:
 - Christine Tardif, Ph.D.
 - David Rudko, Ph.D.
- Small animal 7T at Genome
 - ACC approval received last week, open for business
- Human 7T
 - Procurement underway
 - Site planning

General Recommendations

- consider coil most appropriate for study
 - coverage vs. peak sensitivity vs. acceleration
- avoid interleaved EPI for fMRI (ok for DTI)
- adopt SMS EPI for fMRI and DTI
- migrate to product sequences when possible
 - C2P → WIP → Product

Acknowledgements

- Michael Ferreira
- Ilana Leppert
- Louise Marcotte
- Ron Lopez
- David Costa
- Helene Day
- Judy Barany
- Fred Pennell
- Ron Mio
- David Rudko
- Santiago Paiva
- Christine Tardif
- Amir Shmuel
- Sylvain Baillet
- Anita Raghoonandan

*An MRI Platform for
Neurometabolic Imaging*