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User manual

NMR-CUBE

Non-Magnetic and Non-Reflective Framework

MPB 2017 ver. 1.0

SAFETY NOTES

Read before using the product

MPB works to provide the best safety conditions available and complies with the latest safety standards.
The instrumentation described in this manual was produced, tested and left the factory in conditions that fully comply with European standards.
To ensure the correct use of the product, these general instructions must be read and applied before and for any use of the instrumentation.
The NMR-CUBE is made for industrial environments and laboratories and should be used by authorized staff only.
MPB disclaims any responsibility for a use of the device different from explained in the manual.

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1 General information

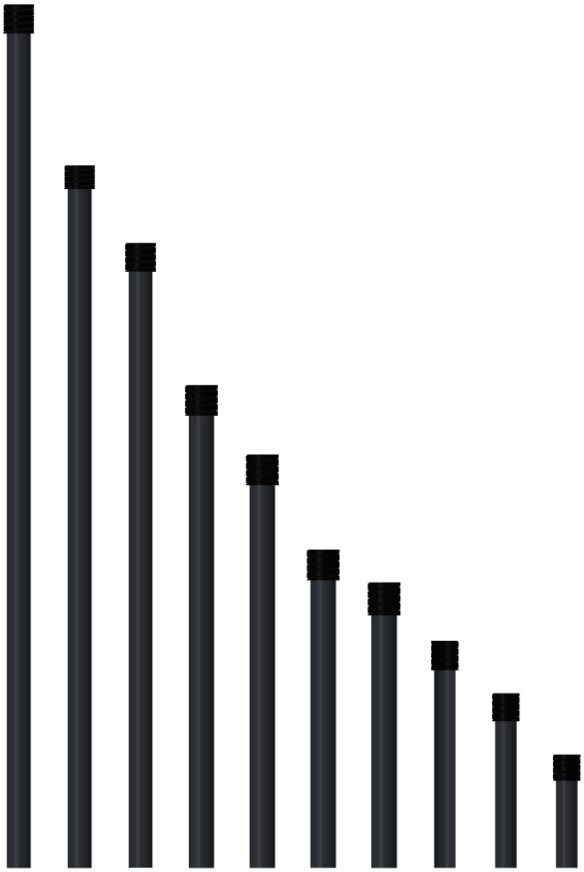
1.1 Introduction

The NMR-CUBE is a modular, adjustable, expandable and robust framework, for the support of sensors and antennas in environments where no metallic or reflective materials are allowed. Entirely made of fiberglass tubes, with PVC junctions and Delrin supports, this non-magnetic and non-reflective system, does not affect the measurement of the emitted field.

2 Components

2.1 TT series

Every item from the TT series consists of a tube with the MPB thread.



Picture 1 - TT series: TT900, TT790, TT650, TT470, TT400, TT307, TT255, TT226, TT182, TT125

2.2 Accessories

Every accessory from the NMR series can be used for configuring the NMR-CUBE, with its various supports and fixing systems.

	NMR-UNI
	NMR-UNIA
	NMR-UNIB

	NMR-UNIC
	NMR-BLK
	NMR-ARJ
	JOINT
	SLIP-JOINT
	NMR-Txx series

<u>Note: The various tubes will be identified in the manual by the following colours:</u>

- **T125**
- **T182**
- **T217**
- **T226**
- **T255**
- **T307**
- **T400**
- **T470**
- **T650**
- **T790**
- **T900**

2.3 Fixing systems

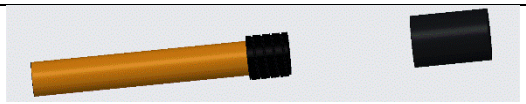
The fixing systems enable the connection of the sensor to the NMR-CUBE:

	NMR-FS0 TT125+UNI
	NMR-FS1 TT182+UNI
	NMR-FS2 TT226+UNI
	NMR-FS3 TT255+UNI
	NMR-FS4 TT307+UNI
	NMR-FS5 TT400+UNI
	NMR-FS6 TT470+UNI
	NMR-FS7 TT650+UNI
	NMR-FS8 TT790+UNI
	NMR-FS9 TT900+UNI
	NMR-FS10 TT182+BLK
	NMR-FS11 TT182+ARJ+UNIC+ TT400+BLK

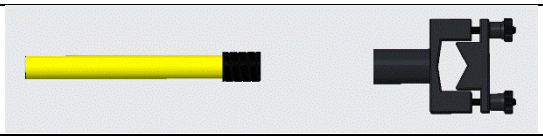
	NMR-FS12 TT182+UNIC+BLK+ TT400+ARJ
	NMR-FS13 TT182+2*ARJ+UNIC+ BLK+TT400

Note: For examples of how to hook sensors or meters, see the accessories datasheet.

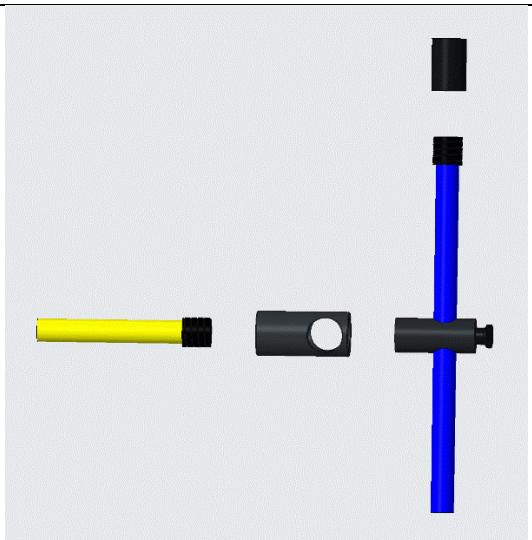
2.3.1 Mounting: from NMR FS0 to NMR FS9

Position 1		Screw the NMR-UNI on the TT125
Follow the same procedure with all the tubes from the TT series		

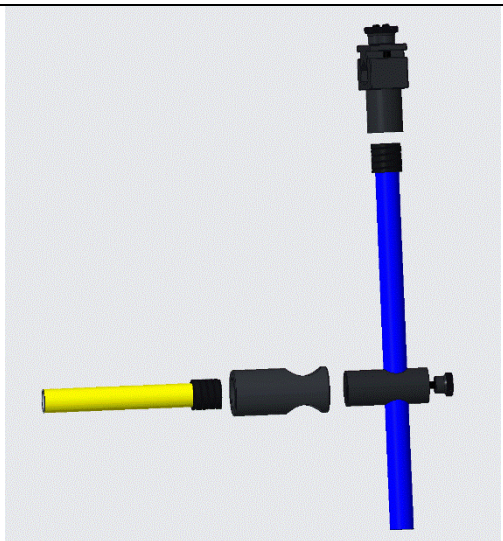
2.3.2 Mounting: NMR FS10

Position 1		Screw the NMR-BLK on the TT182

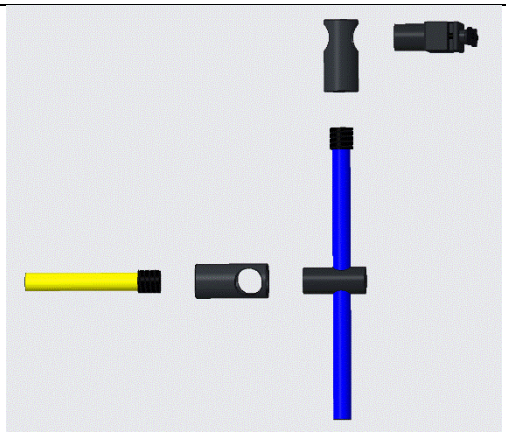
2.3.3 Mounting: NMR FS11

Position 1		Screw the NMR-ARJ on the TT182. Insert the NMR-UNIC in the NMR-ARJ room, adapting the distance of the internal stop. Screw the NMR-UNI on the TT400, insert it in the NMR-UNIC hole and tighten to adjust the desired height

2.3.4 Mounting: NMR FS12

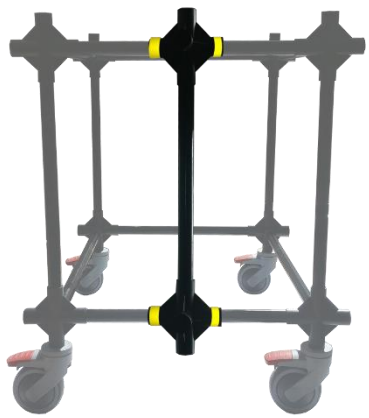
Position 1		Follow the steps in 2.3.3 but screw the NMR-BLK on the NMR-UNI on the TT400

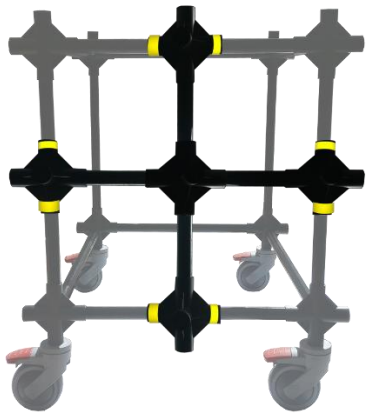
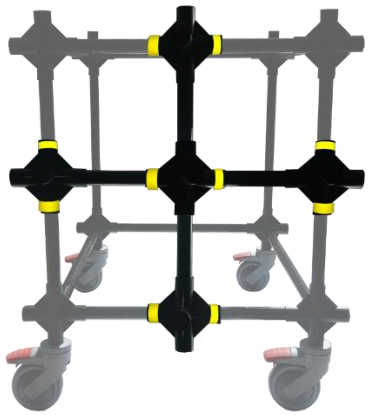
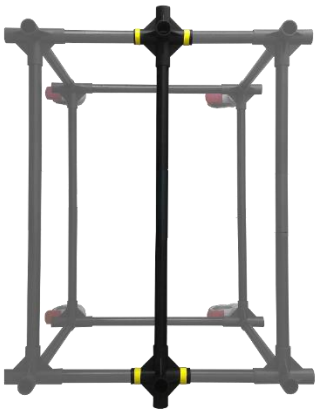
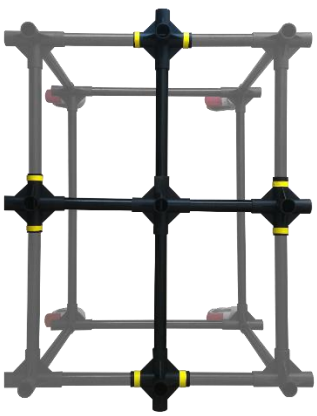
2.3.5 Mounting: NMR FS13

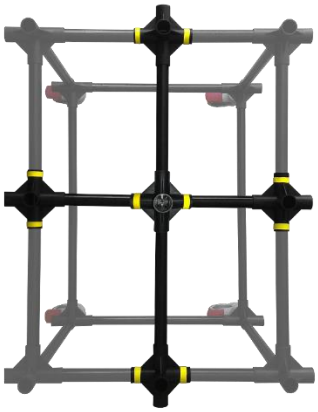
Position 1		Screw the NMR-ARJ on the TT182. Insert the NMR-UNIC in the NMR-ARJ room, adapting the distance of the internal stop. Screw the NMR-ARJ on the TT400, insert it in the NMR-UNIC hole and tighten to adjust the desired height. Insert the NMR-BLK in the NMR-ARJ room, horizontally or vertically,according to your requirements

2.4 Positioning systems

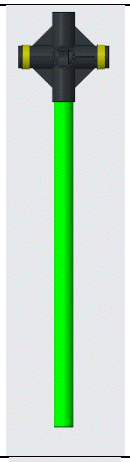
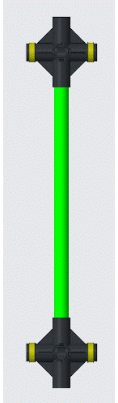
Systems for choosing the measuring point where to apply the fixing system of the sensor:

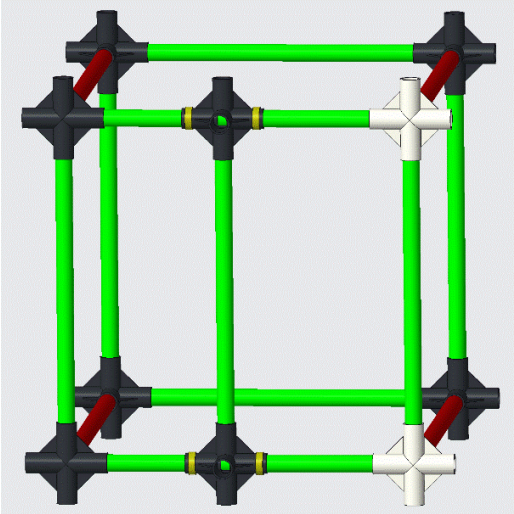
	SLIP JOINT 50 2*SLIP JOINT+T470

	FIXED CROSS JOINT 50 4*SLIP JOINT + JOINT + 4*T217
	SLIP CROSS JOINT 50 5*SLIP JOINT + T470 + 2*T217
	SLIP JOINT 65 2*SLIP JOINT+T650
	FIXED CROSS JOINT 65 4*SLIP JOINT+ JOINT + 2*T217 + 2*T307

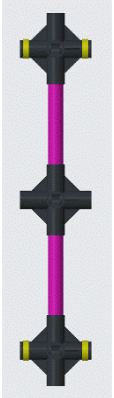
	SLIP CROSS JOINT 65 5*SLIP JOINT+T470 + 2*T307

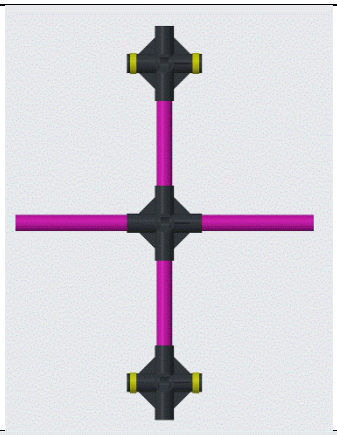
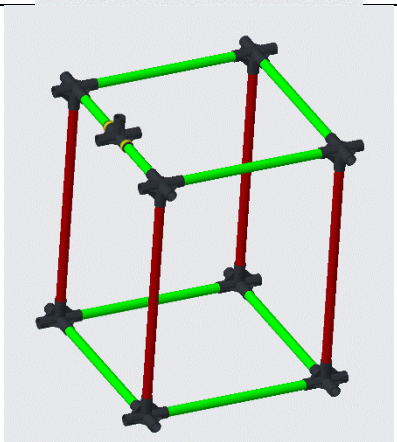
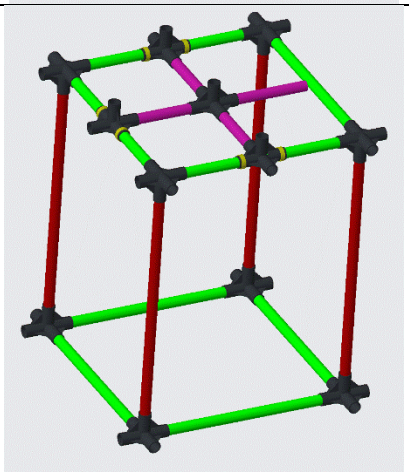
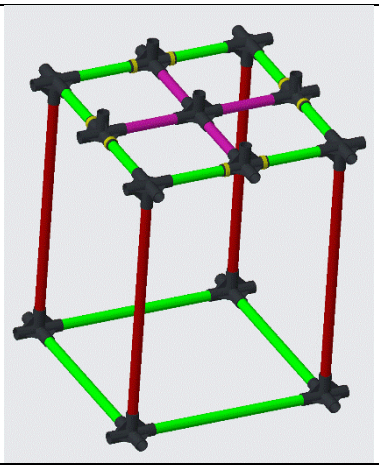
2.4.1 Mounting: slip joint 50

Position 1		Insert the slip joint in the TT400
Position 2		Insert another slip joint in the TT400

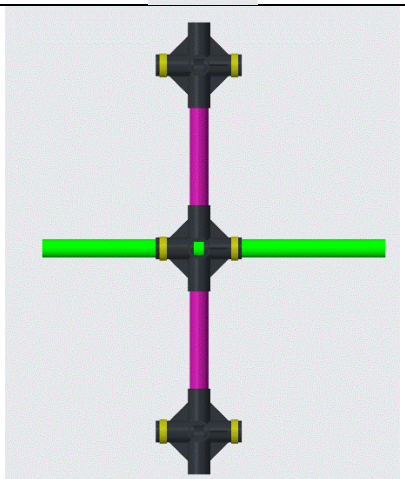
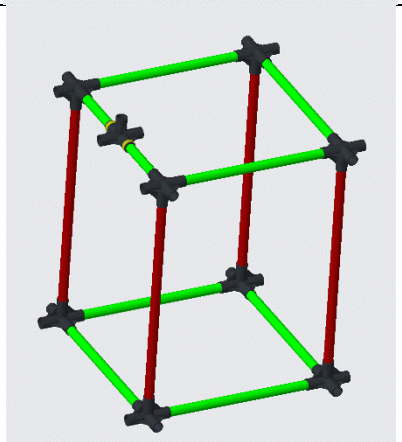
Position 3		Insert the slip joint 50 where required. In the example of the NMR-CUBE1 in the figure, loosen the white joint in order to insert the slip joint 50

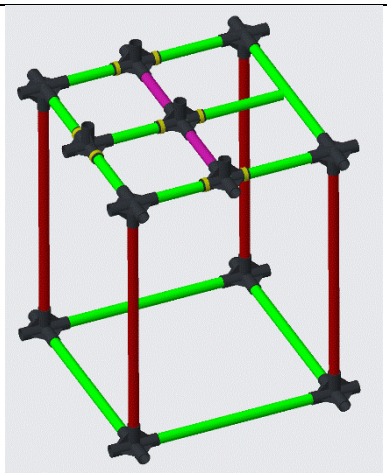
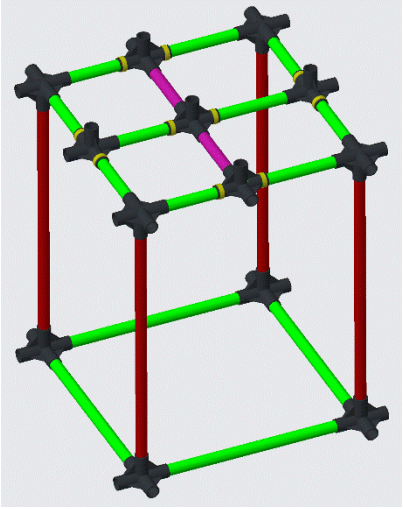
2.4.2 Mounting: fixed cross joint 50

Position 1		Insert, to the stop, the two T217 in the joint as in position 1
Position 2		Insert, to the stop, the two T217 perpendicular to the T217 inserted above

Position 3		Connect the two slip joints as shown, paying attention to the positioning of the yellow bands that represent the sliding hole
Position 4		Insert a slip joint in the T470, slightly widening the joint already used
Position 5		Release two joints and insert the detail from position 3, connecting the T217 with the slip joint inserted in the previous point. Reinsert the two joints enlarged at the beginning of this position
Posizione 6		Release a joint, insert a slip joint as shown and connect it with the T217 from the previous point. Hang up the joint loosed at the beginning of this position

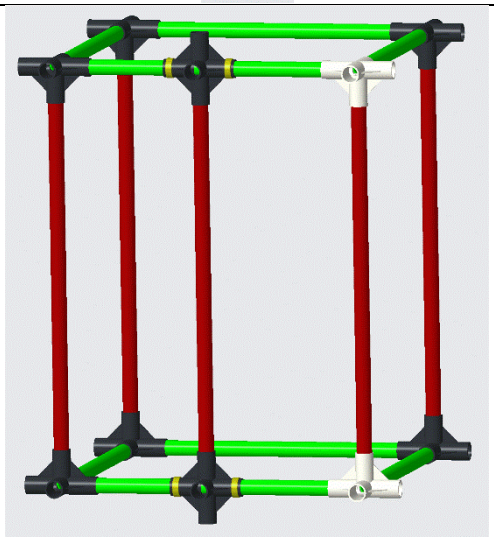
2.4.3 Mounting: slip cross joint 50

Position 1		Insert, to the stop, the two T217 in the joint, as in position 1
Position 2		Insert, to the stop, the two T217 perpendicular to the T217 inserted above.
Position 3		Insert a T470 in the slip joint as shown
Position 4		Insert a slip joint in the T470, slightly widening the already used joint

Position 5		Release two joints and insert the detail from position 3, connecting the T470 with the slip joint inserted in the previous point. Reinsert the two joints enlarged at the beginning of this position
Position 6		Release a joint, insert a slip joint as shown and connect it with the T470 from the previous point. Hang up the joint loosed at the beginning of this position. In this way, the purple tube can slide on the green T470, allowing the side positioning of the measuring point

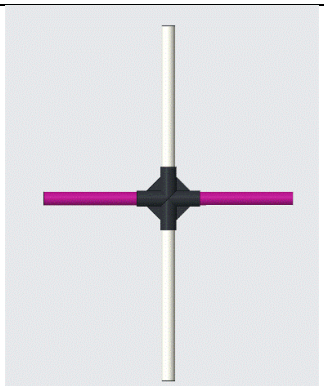
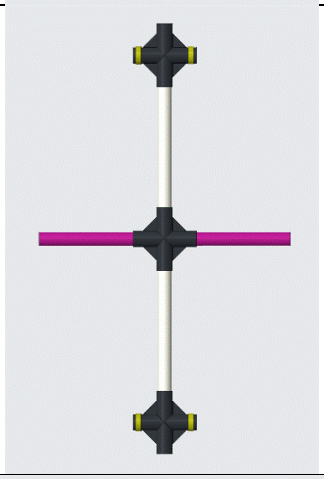
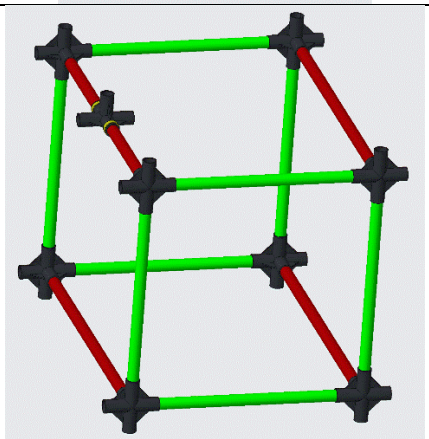
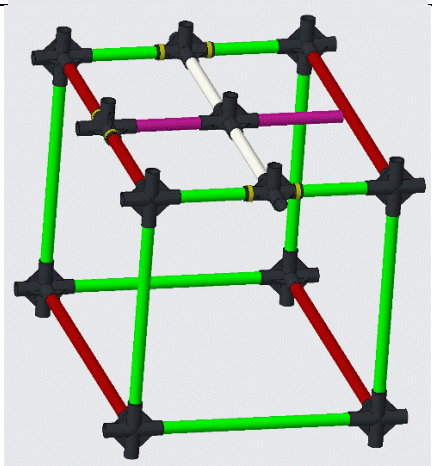
2.4.4 Mounting: slip joint 65

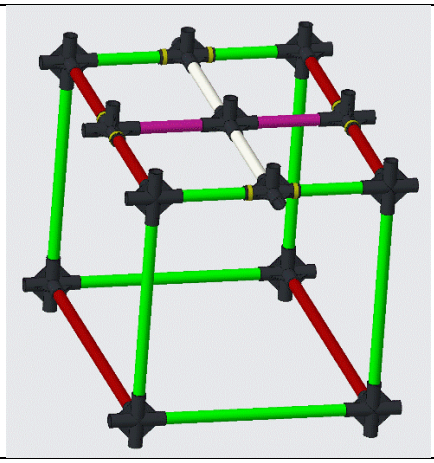
Position 1		Insert the slip joint in the T650

Position 2		Insert another slip joint in the T650
Position 3		Insert the slip joint 65 where required. In the example of the NMR-CUBE1 in the figure, loosen the white joint in order to insert the slip joint 65

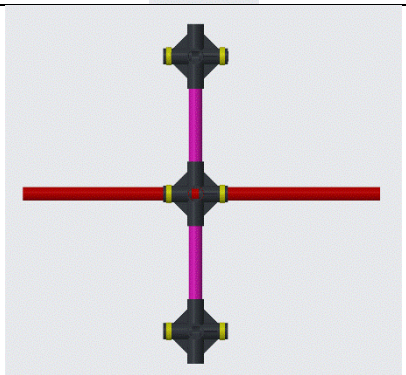
2.4.5 Mounting: fixed cross joint 65

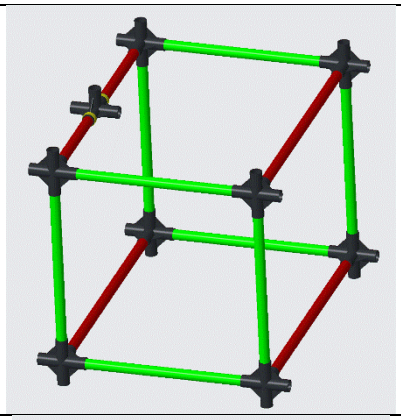
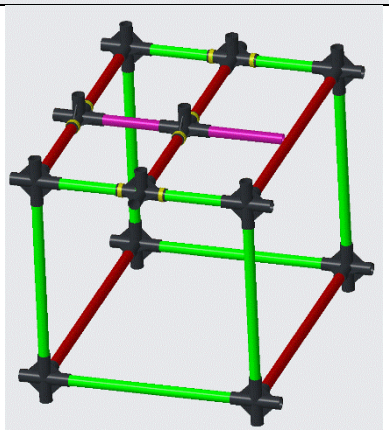
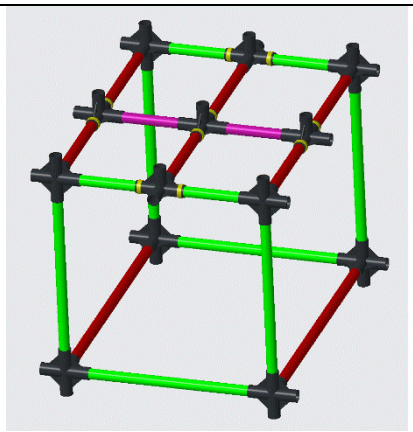
Position 1		Insert, to the stop, the two T307 as shown

Position 2		Insert, to the stop, the two T217 perpendicular to the T307 inserted above
Position 3		Connect the two slip joints as shown in the figure, paying attention to the positioning of the yellow bands that represent the sliding hole
Position 4		Insert a slip joint in the T650, slightly widening the already used joint
Position 5		Release the two joints and insert the detail from position 3, connecting the T217 with the slip joint inserted in the previous point. Reinsert the two joints enlarged at the beginning of this position

Position 6		Release a joint, insert a slip joint as shown and connect it with the T217 from the previous point. Hang up the joint loosed at the beginning of this position

2.4.6 Mounting: slip cross joint 65

Position 1		Insert, to the stop, the two T217 in the joint as in position 1
Position 2		Insert, to the stop, the two T217 perpendicular to the T217 inserted above
Position 3		Insert a T650 in the slip joint as shown

Position 4		Insert a slip joint in the T650, slightly widening the already used joint
Position 5		Release two joints and insert the detail from position 3, connecting the T650 with the slip joint inserted in the previous position. Reinsert the two joints enlarged at the beginning of this position
Position 6		Release a joint, insert a slip joint as shown and connect it with the T650 from the previous position. Hang up the joint loosed at the beginning of this position. In this way, the purple tube can slide on the green T650, allowing the side positioning of the measuring point

3 Configurations

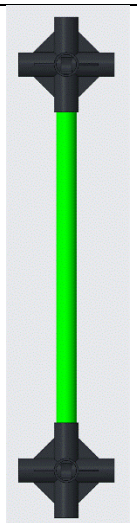
The NMR-CUBE adapts its configuration according to infinite measuring requirements. It is possible to configure: only one NMR-CUBE in a GTEM cell (NMR-CUBE 1), a pylon up to 5 meters in height using 8 cubes (NMR-CUBE 8), a support with 16 cubes for field uniformity measurements, according to the IEC EN 61000-4-3 standard (NMR - CUBE 16), or infinite customized supports.

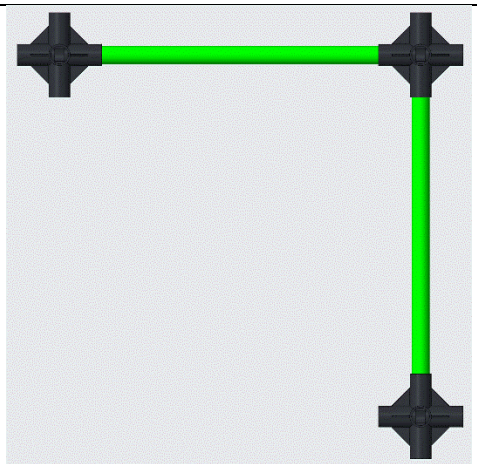
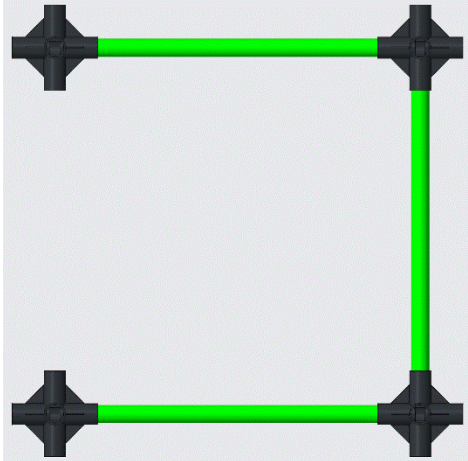
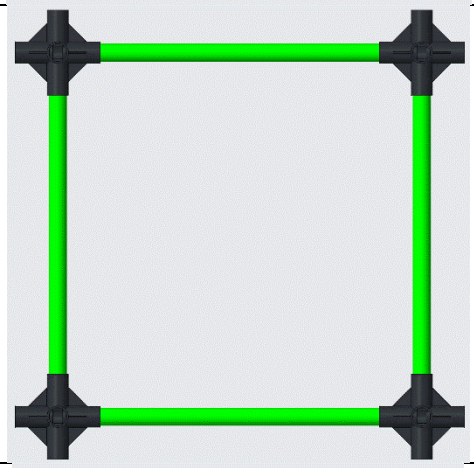
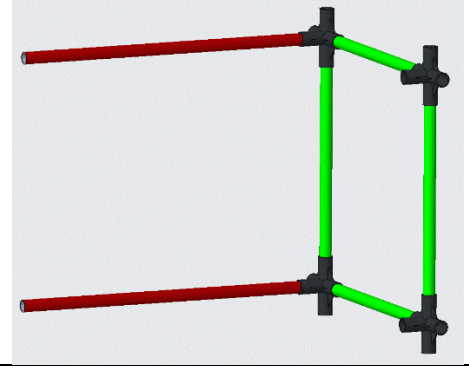
3.1 NMR-CUBE 1

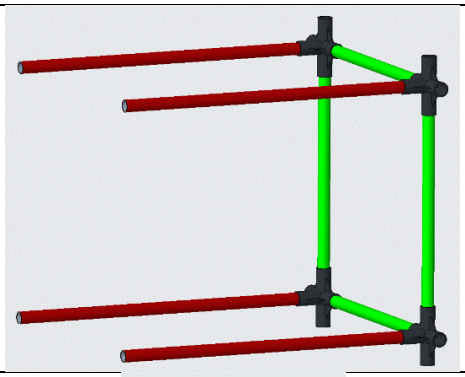
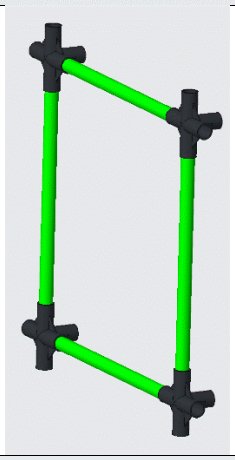
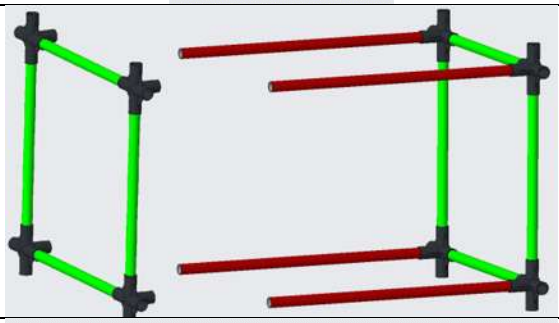
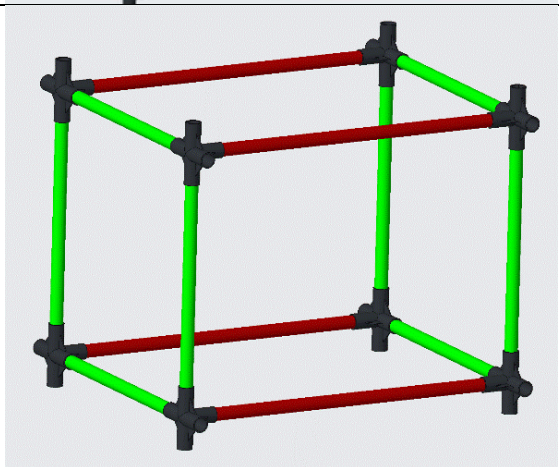
The NMR CUBE 1 configuration makes use of the following parts:

- 8x joint
- 8x T470 (green coloured)
- 4x T650 (red coloured)

3.1.1 Mounting

Position 1		Insert a joint for each T470 end, making sure the joints are aligned and inserted up to the stop

Position 2		Insert the other T470 and then the joint. This must also be aligned with the others
Position 3		Insert the other T470 as shown and check the alignment
Position 4		Insert the last T470 as shown
Position 5		Insert two T650 as shown

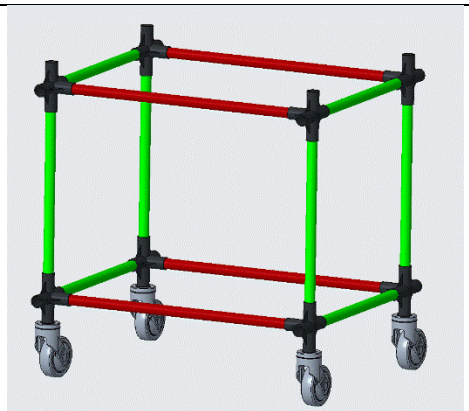
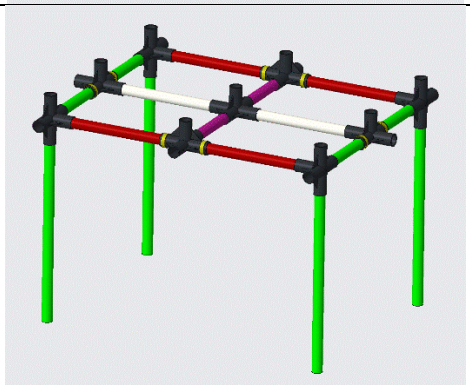
Position 6		Insert the missing two T650
Position 7		Repeat steps from 1 to 4, to build the missing side of the NMR-CUBE 1
Position 8		Connect the four T650 in the dedicated room of the joint, as shown in the figure
Position 9		Make sure the tubes are inserted in the joints

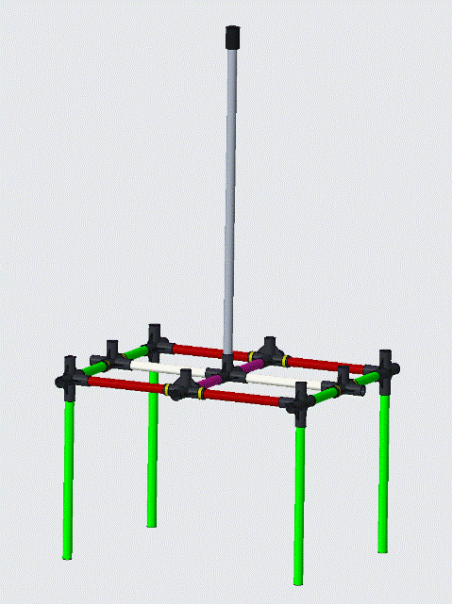
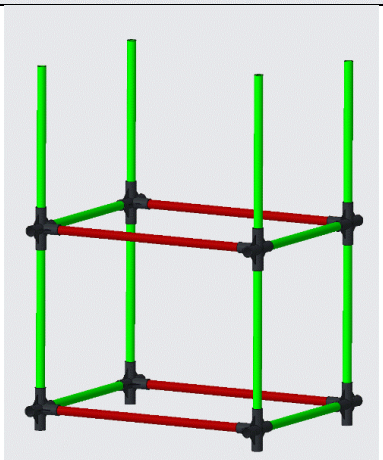
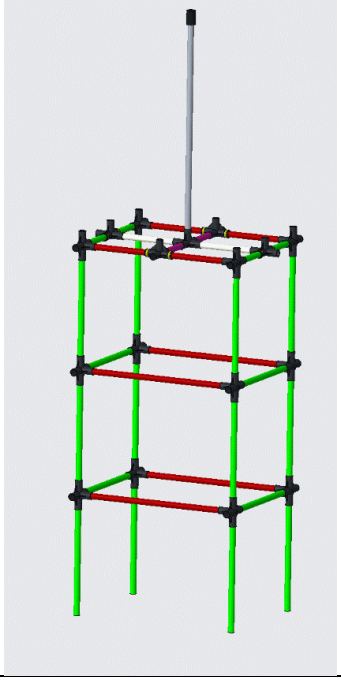
3.2 NMR CUBE 8

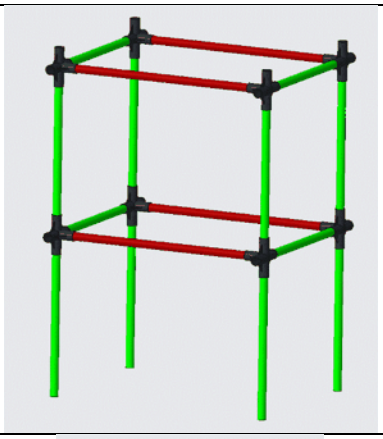
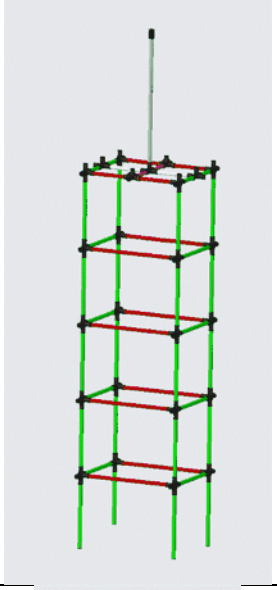
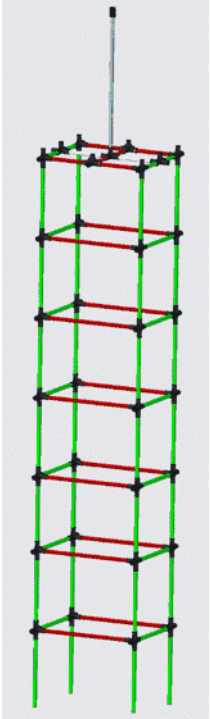
This configuration allows reaching measuring points five meters high, with the possibility of moving the pylon with the wheels.
The CUBE 8 NMR configuration makes use of the following parts:

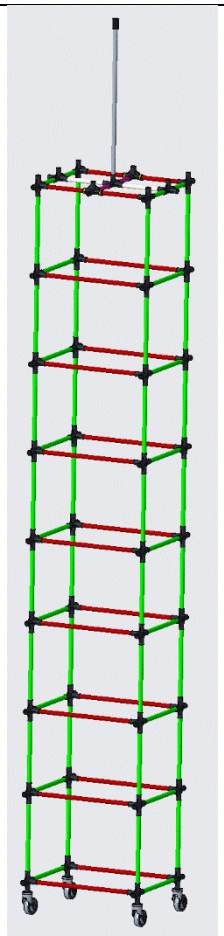
- 8x joint
- 50x T470 (green coloured)
- 18x T650 (red coloured)
- 4x wheels

3.2.1 Mounting

Position 1		Build a NMR CUBE 1 and insert the four wheels as shown
Position 2		Build a fixed cross joint 65 as shown in 2.4.3 and anchor it to a structure made of: 6*T470, 2*T650 and 4*joints, as shown

Position 3		Insert the TT900 in the central joint and screw the tool with the ¼" thread
Position 4		Starting from position 10 of the construction of the NMR-CUBE 1 configuration, add 4* T470, as shown in the figure
Position 5		Invert the structure made in position 4 and hook it to the one from position 3

Position 6		Build another structure as in position 4 and turn it upside down
Position 7		Raise the structure from position 5 and connect it on the structure from position 6
Position 8		Repeat the procedure from position 6, raise the entire structure and hook it on top

Position 9		Raise the structure from the previous position and hook it on the structure from position 1

Note: Always make sure to hook the joints well with the tubes. An incorrect connection will lead to issues of alignment and therefore stability for this 5 m high structure.

Note: the structure can be built laid down on the ground, but in that case, by raising it, the strain on the joint, given the height of the pylon, could break it or cause the exit of the tube from its room.
To build the pylon on the ground, firmly tie the top cube with the bottom one on each side.

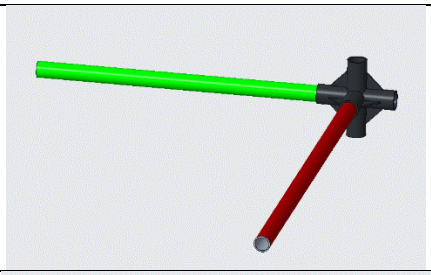
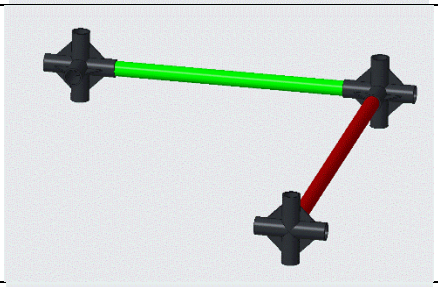
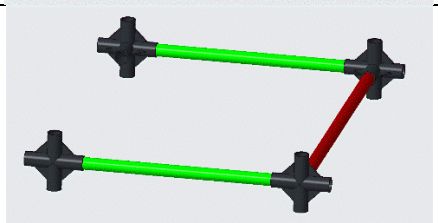
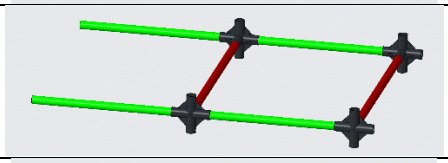
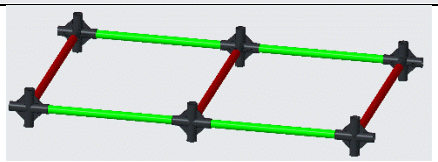
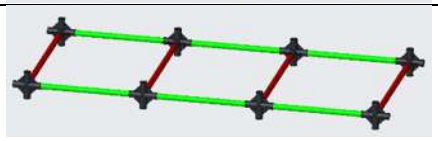
3.3 NMR CUBE 16

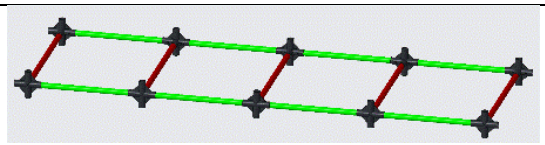
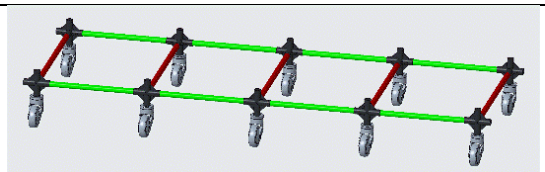
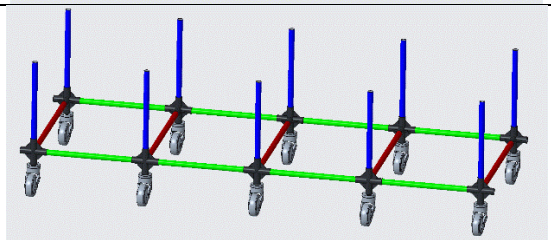
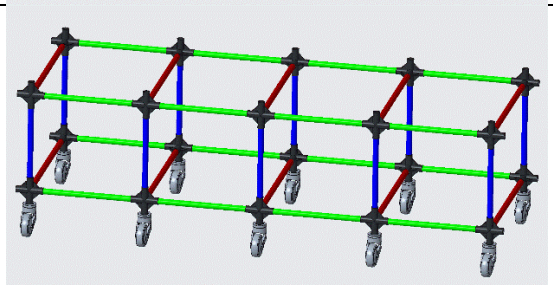
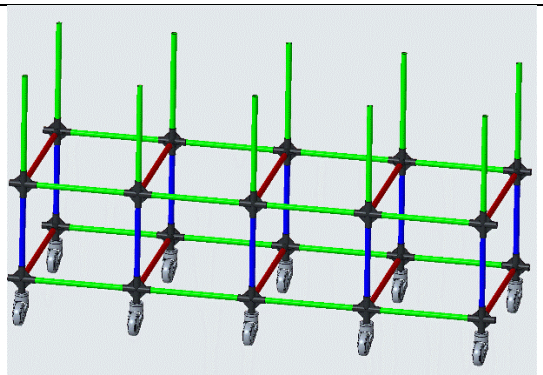
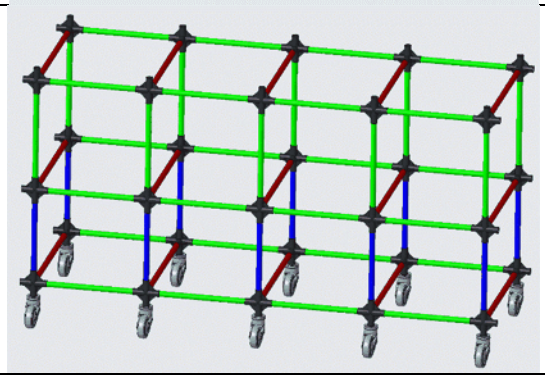
This configuration was designed to perform field uniformity testing, according to the IEC EN 61000-4-3 directive. This support enables a grid of 16 points, where to perform measures at predetermined distances.

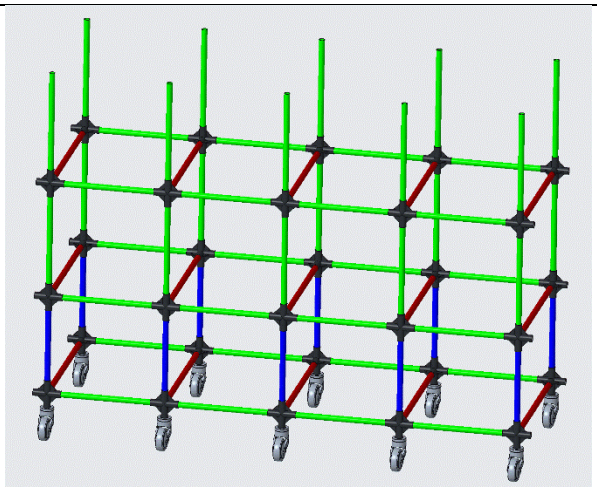
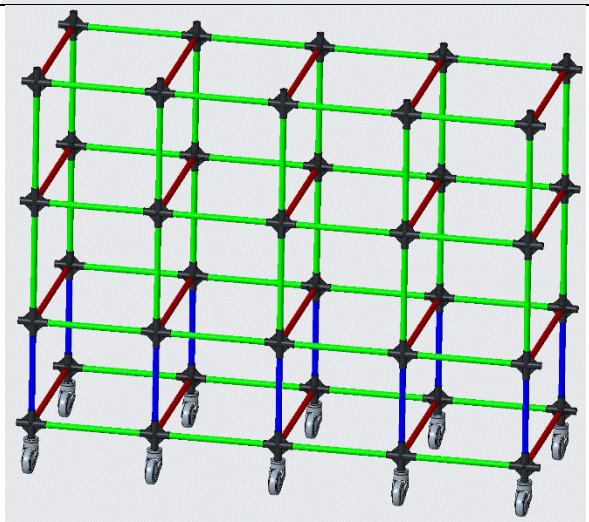
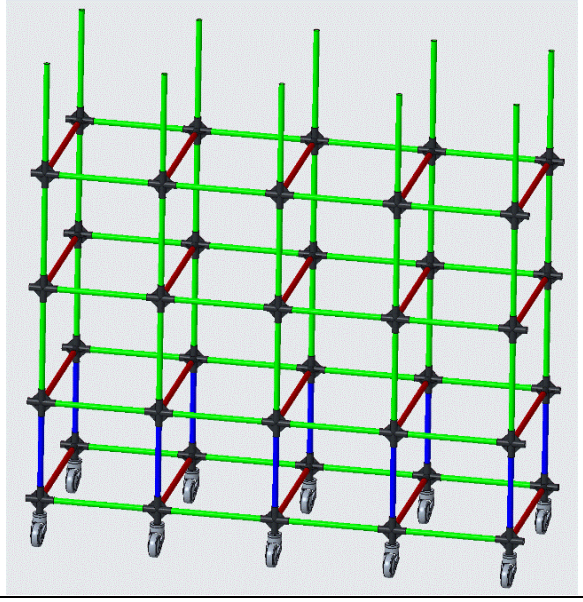
The NMR CUBE 16 configuration makes use of the following parts:

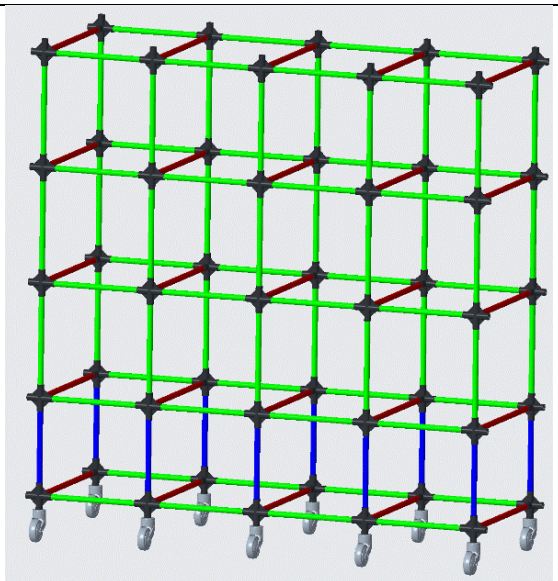
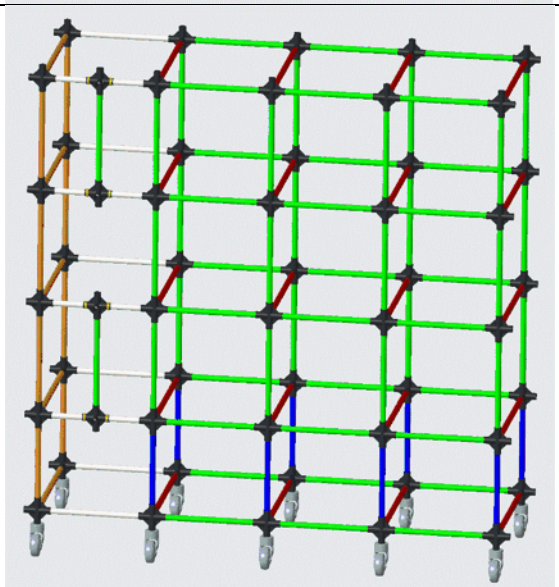
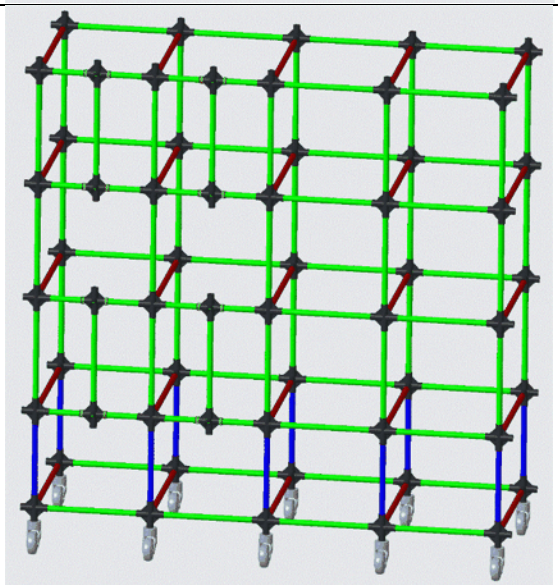
- 8x joint
- 70x T470 (green coloured)
- 25x T650 (red coloured)
- 10x T400 (blue coloured)
- 4x wheels

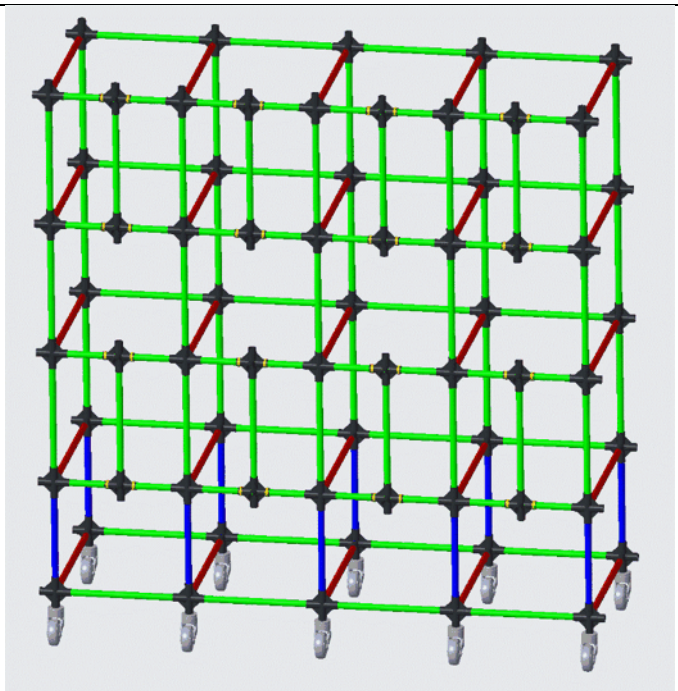
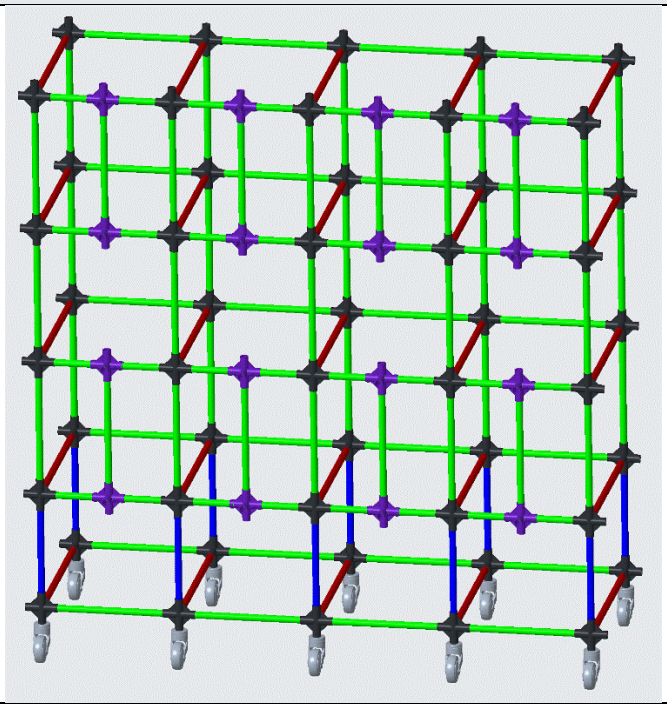
3.3.1 Mounting: NMR CUBE 16

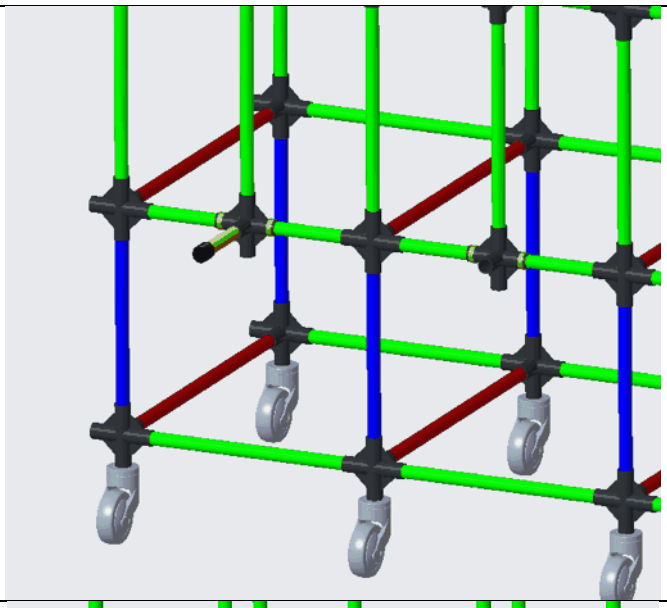
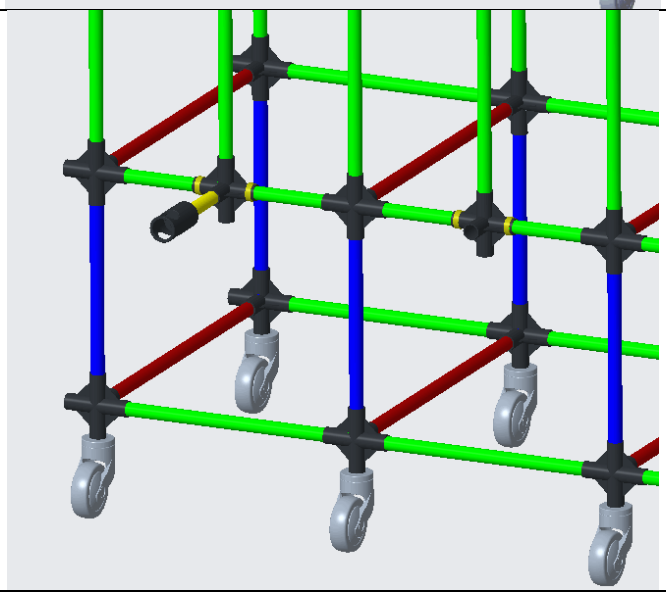
Position 1		Connect a T650 and a T470 to a joint, as shown
Position 2		Add a joint
Position 3		Add another T470 and another joint
Position 4		Add two T470
Position 5		Add two joints and a T650
Position 6		Perform the procedure from position 4 and 5

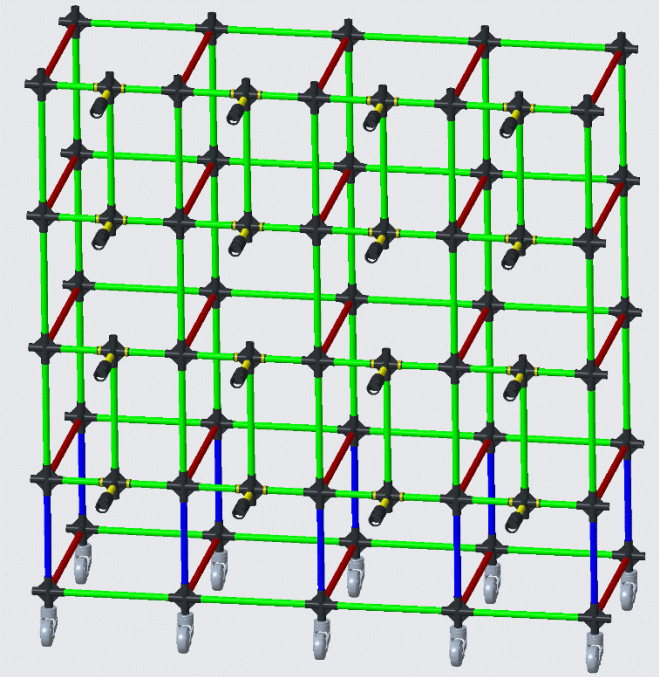
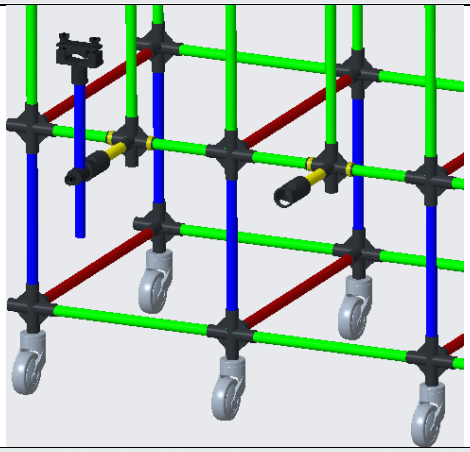
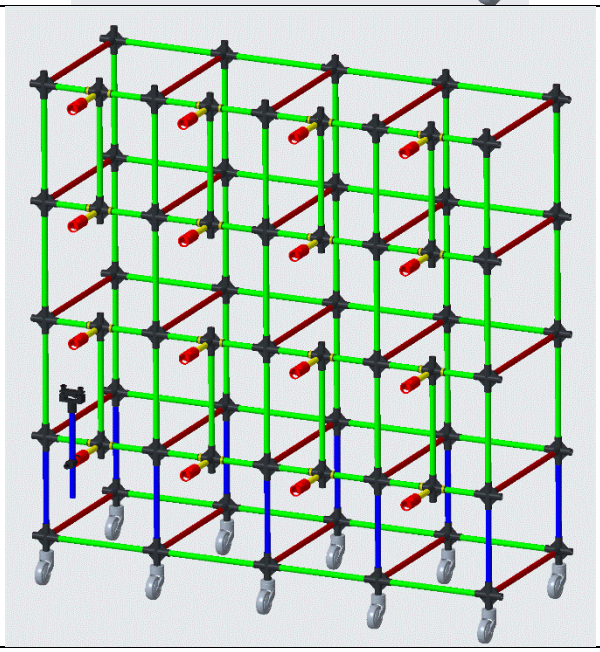
Position 7		Perform the procedure from position 4 and 5
Position 8		Add a wheel to each joint as shown
Position 9		Insert a T400 for each joint
Position 10		Build a structure as done from position 1 to 7 and hook it firmly as shown
Position 11		Insert a T470 in the joint as shown
Position 12		Repeat the procedure from position 10

Position 13		Repeat the procedure from position 11
Position 14		Repeat the procedure from position 10
Position 15		Repeat the procedure from position 11

Position 16		Repeat the procedure from position 10
Position 17		Loosen with care and remove the orange structure from the joints anchored on the white tubes, insert two slip joints 50 as shown and reconnect the structure
Position 18		Perform the same procedure from position 17 on the second column of the NMR-CUBE 16

Position 19		Repeat the step from position 17 on the two remaining columns of the NMR-CUBE 16
Position 20		This configuration allows 16 spacing points where to hook up the support for the sensor or the instrument (highlighted in purple)

Position 21		Insert a T125 into the slip joint (purple point in position 20)
Position 22		Screw the NMR-ARJ on the thread of the T125. In this way, the support in which to hook the fixing system of the measuring instrument is obtained

Position 23		Repeat the steps from position 21 and 22 until getting the hooks for the 16 points where it is required to hook the measuring instrument
Position 24		For example, hook the NMR-FS12 to the NMR-ARJ, (adjusting the required height) and hook the sensor
Position 25		Return the NMR-FS12 fixation system to each NMR-ARJ and measure

Note: Always make sure to hook the joints well with the tubes. An incorrect connection will lead to issues of alignment and therefore stability for this structure.

Note: the structure can also be laid down on the ground. Be careful since when the structure is raised the joint may loosen, it will therefore be necessary to check the correct insertion of the tubes in the joint.

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