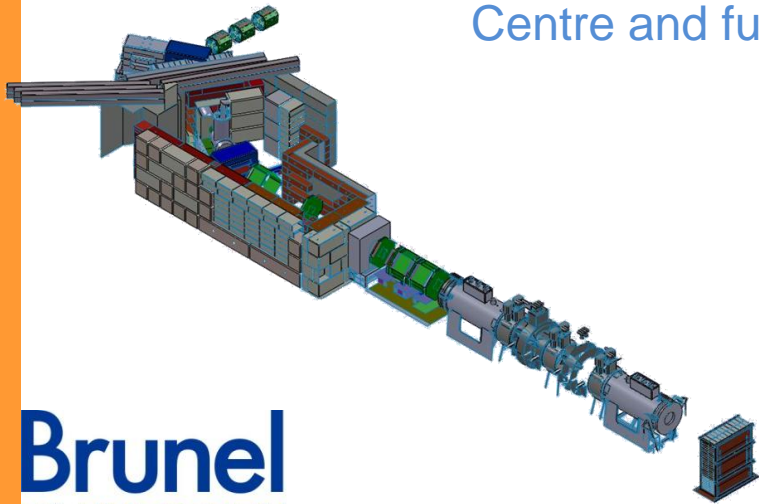


# G4MICE Geometry

This presentation will describe the state of each element in the beam line with regards to the current update being undertaken.

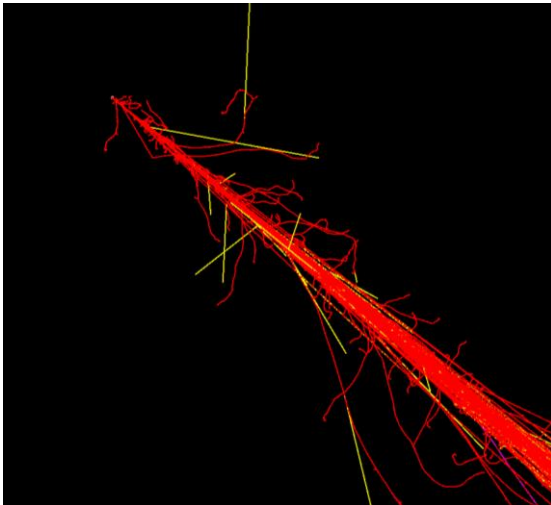
- Firstly, it will describe everything that has been done to each element to this date and also future improvements which will be made to each element.
- Secondly, the simulation as a whole will be discussed with regards to the x, y and z positions of all the elements relative to the MICE Centre and future work needed to update this.



# Beam Production

## Current State:

- The beam is currently being modelled as a multivariate Gaussian beam of pions



## Future Work:

We would like to implement a G4BL style parameterised beam line which;

- Tracks secondaries of all flavours from target
  - Fills Q1 aperture
- Has a user defined momentum distribution
  - This needs new code

# Q123

## Current State:

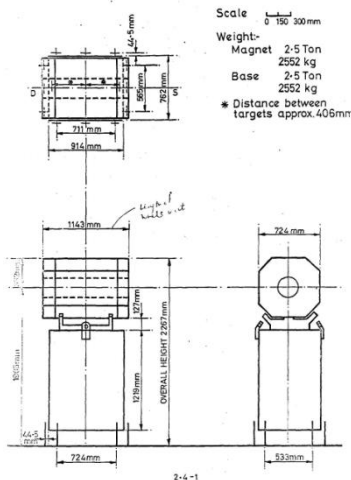
- Quads dimension have been changed according to MICE-Note Beam 65 (will be improved further)
- The field maps of the quads have been improved to match opera field maps

## Future Work:

- Minor changes to the field maps could be implemented due to the irregular shape of the aperture
- This however is low priority as the field map and G4MICE model is very good

MICE-NOTE-BEAM65

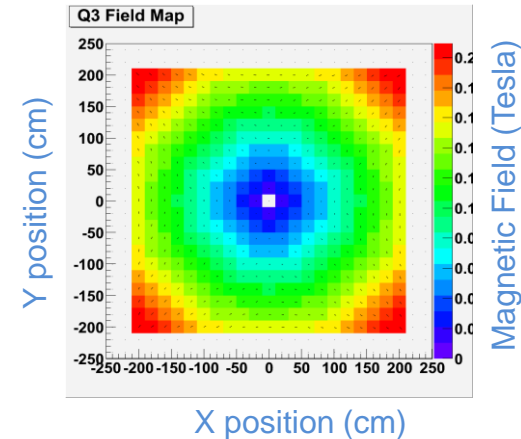
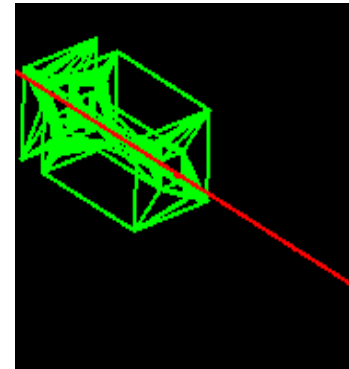
TYPE 4 QUADRUPOLE MAGNET AND BASE



Left: Technical Drawings from Note 65

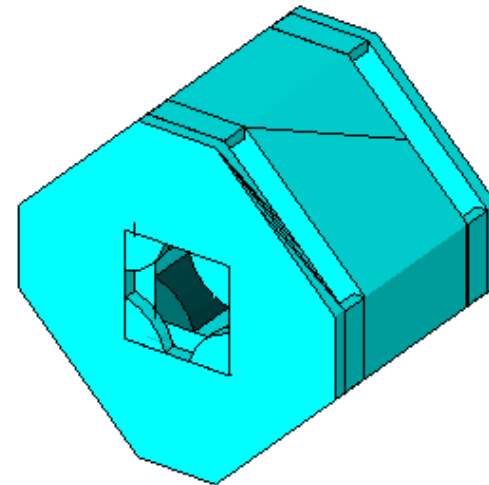
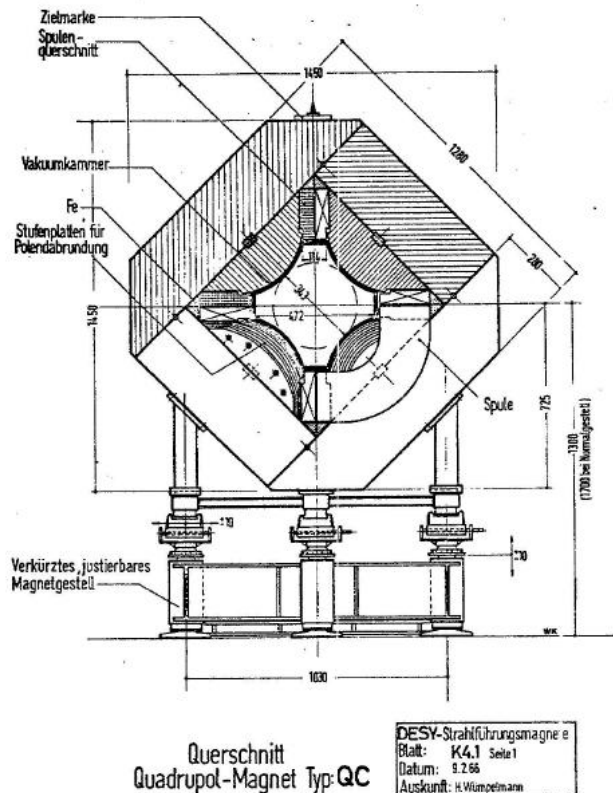
Right: Old version of G4MICE model

Furthest Right: Field map



# Q456/789

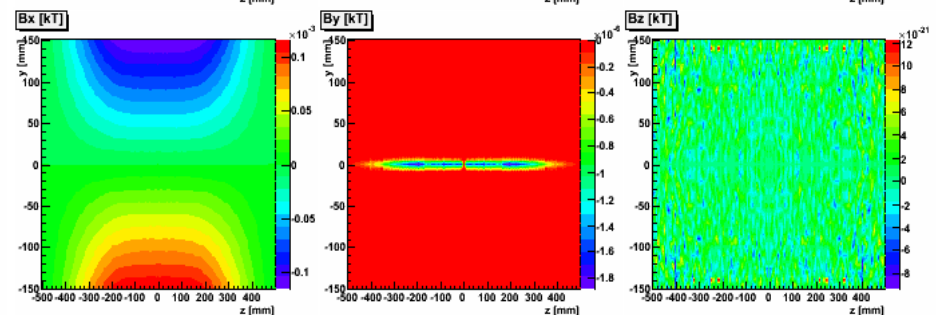
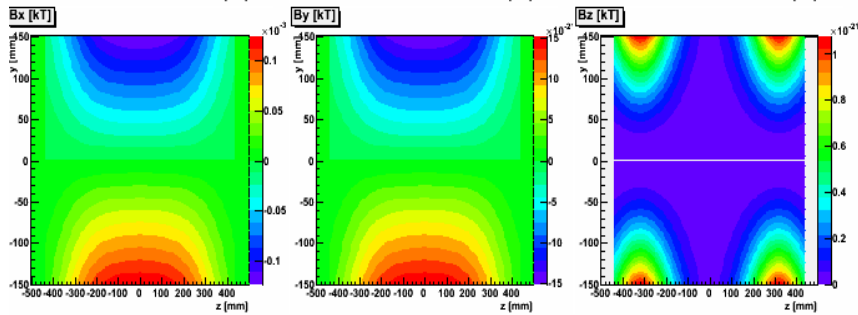
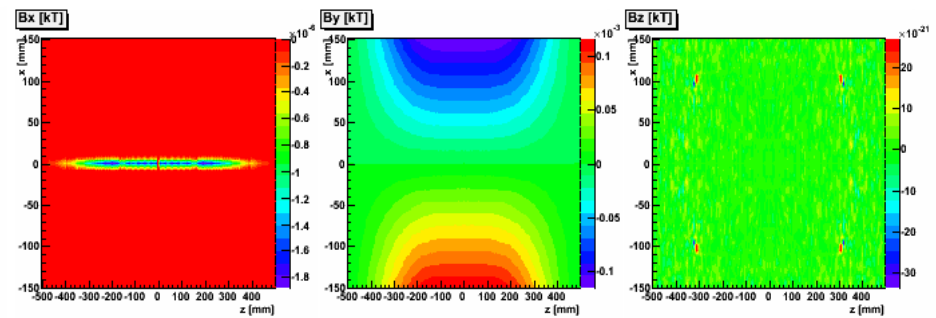
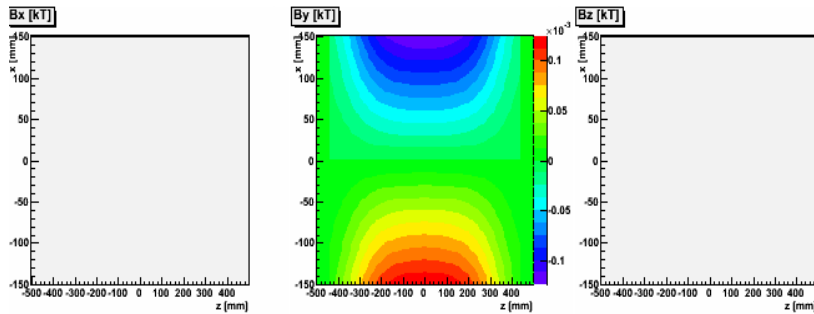
The other quads in the beam line are in the same state as Q123



G4MICE model

Technical Drawing taken from Note 65

# Q456/789 Field Maps



Field map taken from G4MICE

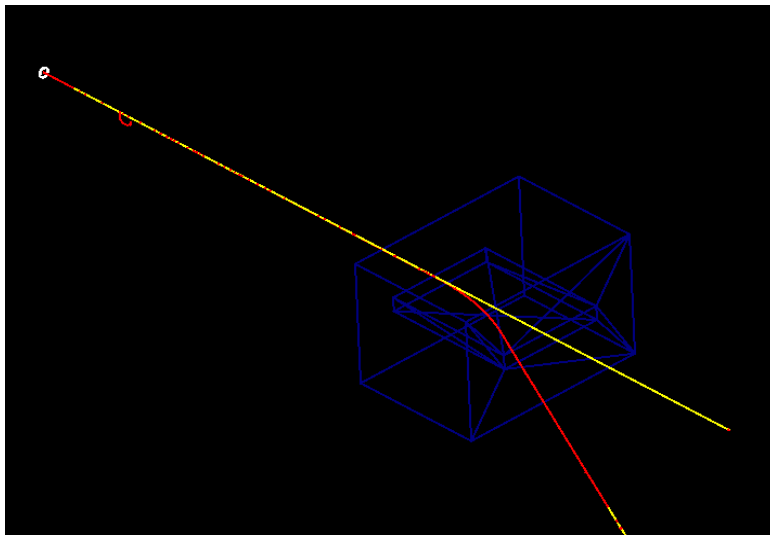
Field map taken from Opera

Images from Chris Rogers

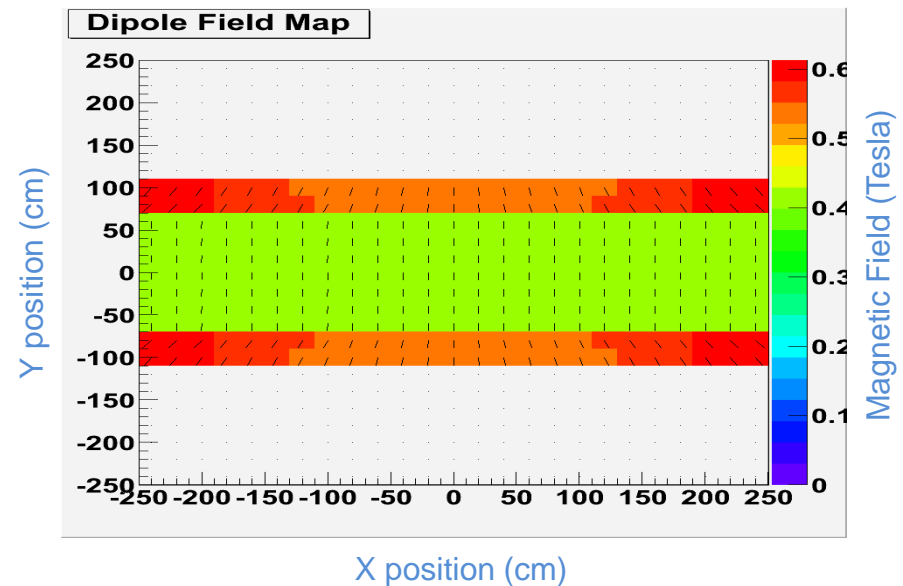
# D1/2

## Current State:

- Dimensions have been changed to match information in MICE Note Beam65
- Field maps have been updated via reading in a text file of the field taken from G4BL



Model of D1/2



Field map taken from G4MICE

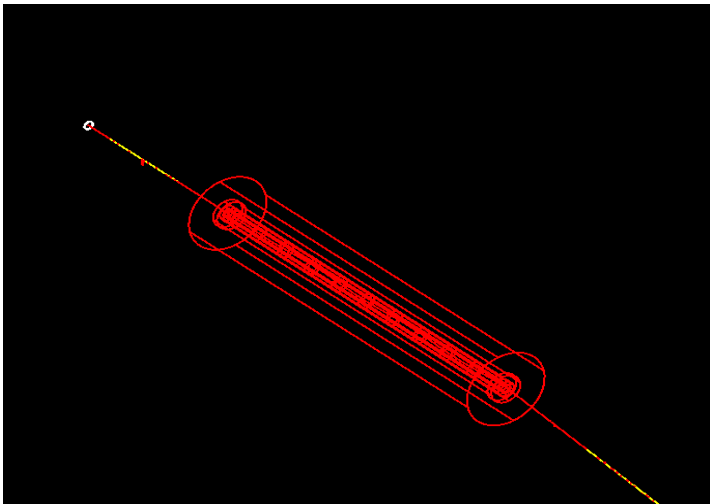
## Future Work:

- All of the improvements made will be verified.

# Decay Solenoid

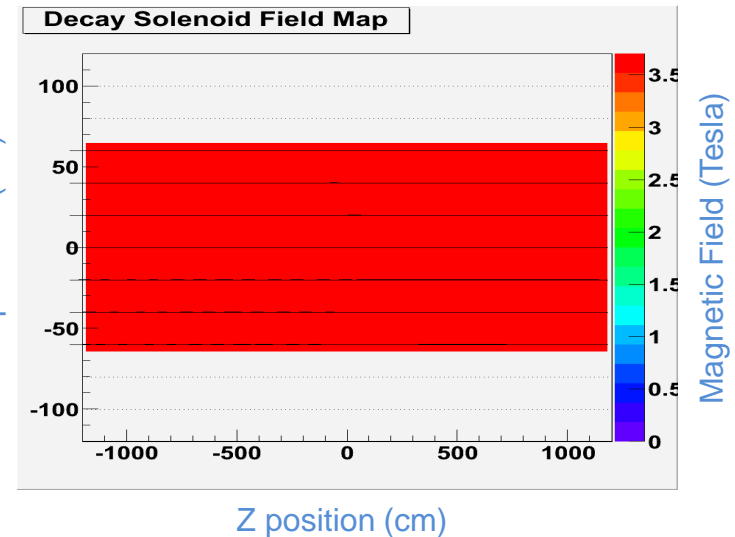
## Current State:

- Dimensions changed to match information in MICE Note Beam 65
  - DS now models 10 coils inside the DS rather than 1
- Field maps have been updated via reading in a text file of the field taken from G4BL



Left: Model of DS

Right: Field map

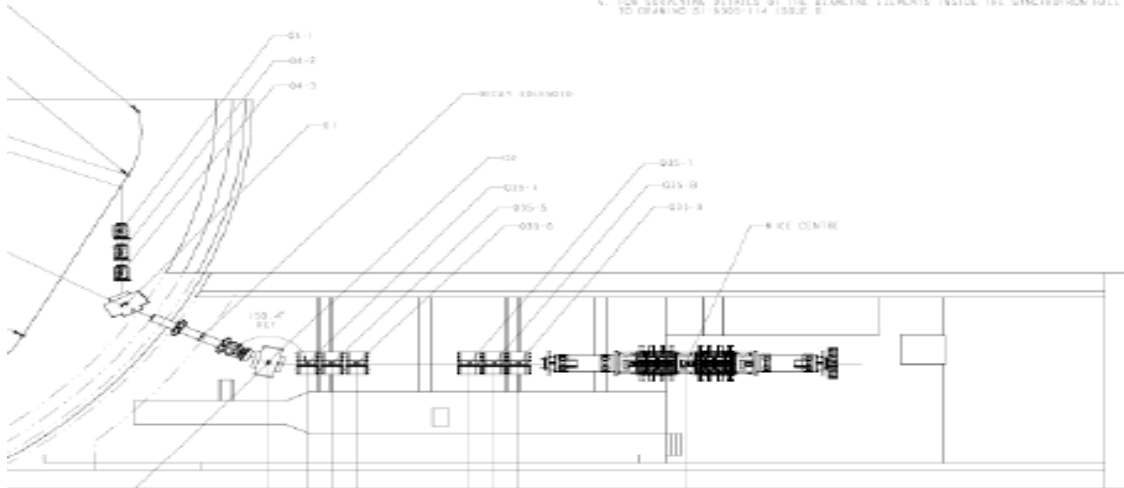


## Future Work:

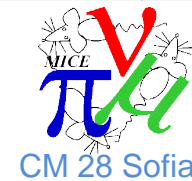
- All of the improvements made will be verified
- Checks will need to be made to the dimensions of the DS as the Mylar glass plate (on each end) and the vacuum inside have not been modelled
  - This is because the information in the MICE note is not clear

- NOTES
1. TABLE GIVES POSITION OF MICE BEAMLINE ELEMENTS FROM ISIS CENTRE IN ISIS COORDINATE SYSTEM (X, Y, Z) UNITS
  2. THE Z COORDINATE IS MEASURED FROM ISIS TUNNEL FLOOR
  3. COORDINATES FOR THE BEAMLINE ARE GIVE AS FOLLOWING:
    - MACHINE ENTRY - BE COIL FL ARE IN PLANE OF TUNNEL VELOCITY (XZ PLANE)
    - SOLENOID ENTRY - BE COIL FL ARE IN PLANE OF TUNNEL VELOCITY (XZ PLANE)
  4. COORDINATES FOR THE STICK MARKERS ARE GIVEN IN THE FOLLOWING TABLE
  5. COORDINATES OF THE 4 \* 4 \* 4' ISIS SURVEY POINTS ARE GIVEN ON DRAWING ST-3105-165-04 (ISSUE 1)
  6. FOR SCHEMATIC DETAILS OF THE BEAMLINE ELEMENTS INSIDE THE SYNCHROTRON HALL REFER TO DRAWING ST 3300-114 (ISSUE 2)

MICE BEAM LINE ELEMENT	LOCATION FROM ISIS CENTRE IN ISIS COORDINATE SYSTEM		
	X	Y	Z
TARGET POSITION POINT	12691.654	-22553.432	-565.000
Q4-1	-18879.406	-22256.915	427.000
Q4-2	-15995.813	-23068.994	267.570
Q4-3	-14650.136	-23447.964	193.169
Q4-4	-13304.459	-23826.934	118.769
Q4-5	-11212.644	-24209.107	12.230
Q4-6	-9974.010	-23280.946	0.000
Q4-7	-8084.857	-21441.861	0.000
Q4-8	-6195.704	-19602.776	0.000
Q4-9	-5586.387	-18870.247	0.000
Q4-10	-4976.763	-17130.132	0.000
Q4-11	-4653.133	-16016.191	0.000
Q4-12	-4329.504	-14902.251	0.000
Q4-13	-2847.475	-9801.075	0.000
Q4-14	-2523.845	-8687.134	0.000
Q4-15	-2200.216	-7573.193	0.000
MICE CENTRE	0.000	0.000	0.000



Beam Line Element	Location to ISIS centre			Element to MICE Centre (ISIS Coord)			Element to MC (G4MICE Coord)	
	x	y	z	x	y	z	y	z
MICE Centre	-31570.060	-44810.347	-138.000	0.000	0.000	0.000	0.000	0.000
Target	-12690.654	-22553.432	-565.000	-18879.406	-22256.915	427.000	11916.289	-26639.198
Q1	-15574.247	-21741.353	-405.570	-15995.813	-23068.994	267.570		
Q2	-16919.924	-21362.383	-331.169	-14650.136	-23447.964	193.169	7528.367	-26604.686
Q3	-18265.601	-20983.413	-256.769	-13304.459	-23826.934	118.769		
D1	-20357.416	-20601.240	-150.230	-11212.644	-24209.107	12.230	4037.168	-26383.014
DS Entry	-21596.050	-21529.401	-138.000	-9974.010	-23280.946	0.000		
DS Centre				-8084.857	-21441.861		1798.407	-22850.926
DS Exit	-25374.356	-25207.571	-138.000	-6195.704	-19602.776	0.000		
D2	-25983.673	-25940.100	-138.000	-5586.387	-18870.247	0.000	103.047	-19680.704
Q4	-26593.297	-27680.215	-138.000	-4976.763	-17130.132	0.000		
Q5	-26916.927	-28794.156	-138.000	-4653.133	-16016.191	0.000	0.000	-16678.430
Q6	-27240.556	-29908.096	-138.000	-4329.504	-14902.251	0.000		
Q7	-28722.585	-35009.272	-138.000	-2847.475	-9801.075	0.000		
Q8	-29046.215	-36123.213	-138.000	-2523.845	-8687.134	0.000	0.000	-9046.330
Q9	-29369.844	-37237.154	-138.000	-2200.216	-7573.193	0.000		





# Simulation

## Current State:

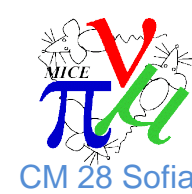
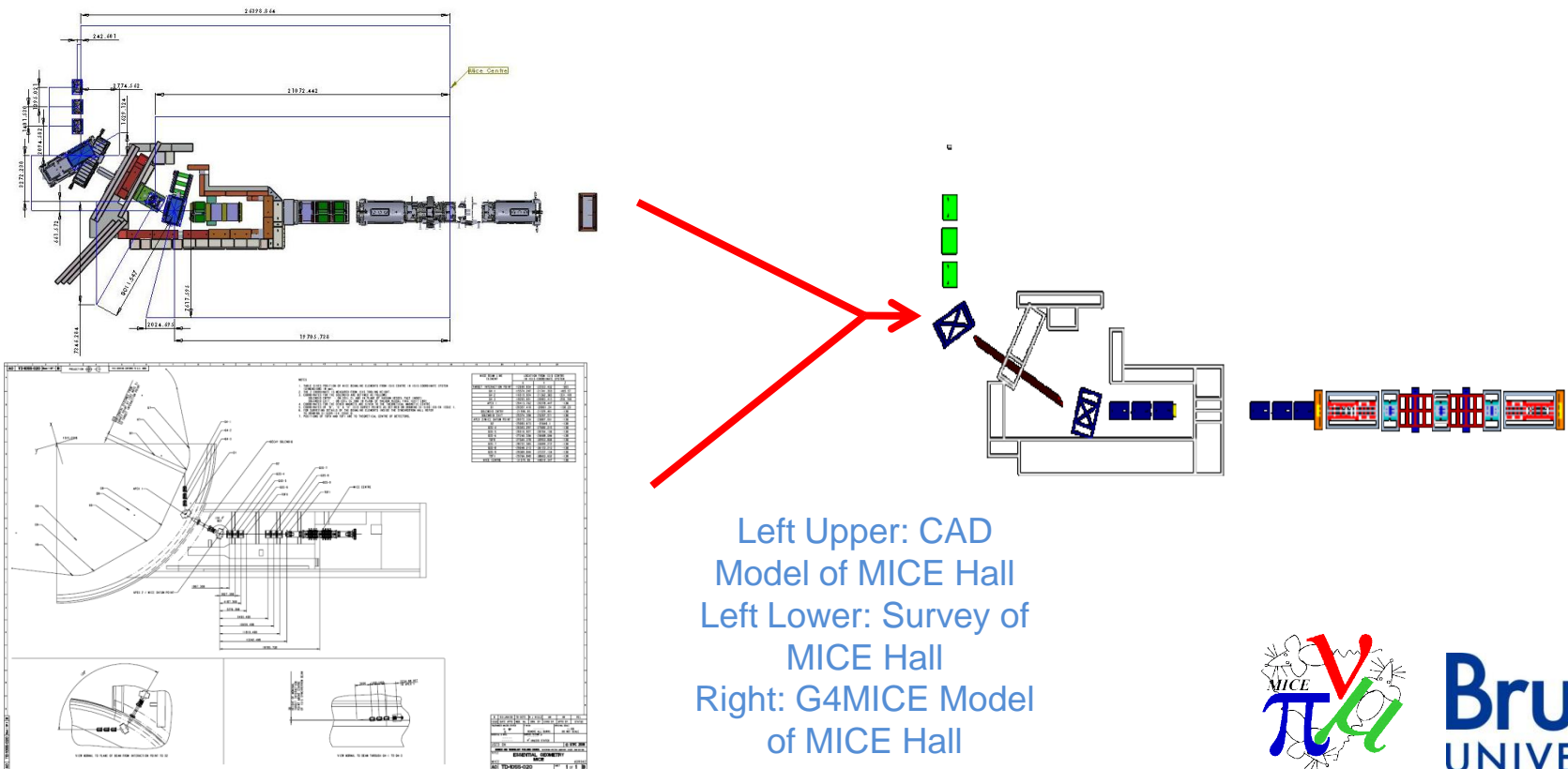
- x, y and z positions of all elements have been updated according to information taken from the last survey
- Most elements have had geometries and field maps updated to match reality more closely

## Future Work:

- Sanity checks on dipoles and also gather more information of geometries (D1, DS)
  - Comparisons between G4MICE and G4BL of each element will be made, mainly tracking particles through each element (already begun)
  - The field application will be made improve to check the value for Maxwell2 (numerical divergence of the B-field vector) across each element to check if they are physical (finished needs to be verified)
  - Some minor improvements to code e.g. Killing of stray particles, improving simulation speed
    - Add TOFs, GVAs etc (anything else in the beam line)

# Summary

The elements have had the dimensions altered to match the information in the MICE note. Field maps have been changed and read into the simulation from text files taken from G4 Beam Line which provides accurate models of the fields seen in reality. Finally the positions of all the elements have been updated but still need to be verified.



M. Littlefield

# Any Questions?



Element	Geometry	Field Map	Verified
Q123	Yellow	Green	Red
D1	Yellow	Green	Red
DS	Yellow	Green	Red
D2	Green	Green	Red
Q456	Green	Green	Red
Q789	Green	Green	Red

Red	Not yet completed
Yellow	Good but can be improved
Green	Completed

## Thank You for Listening

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