

New magnetic field map

The map is prepared by Ivan Moshkovsky

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Introduction

- The field map is prepared by I. Moskovsky.
- The coordinate system is not the one used for SPD (XY – horizontal plane, Z – vertical).
- The field (B_x (B_z), B_r and B_{ϕ}) will be shown in slices along the beam direction.
- It is the first field map covering RS.

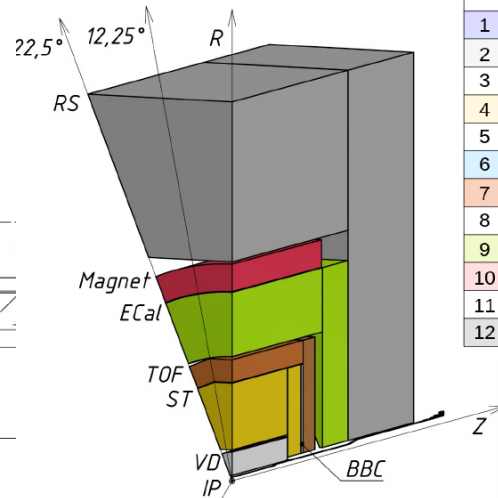
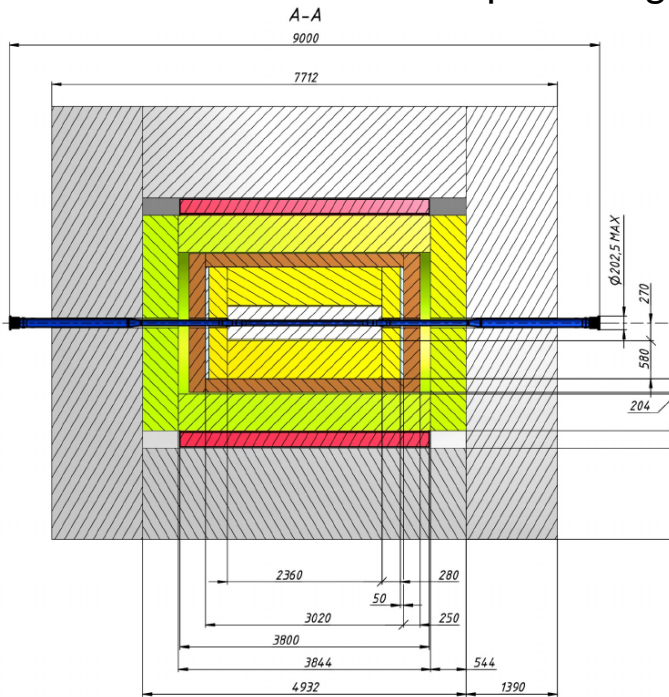


Table — Axial sizes of SPD layers.

№	Endcap (size in mm)		
	Layer	ΔZ	Z min/max
1	Beampipe	9000	-4500/4500
2	VD	2360	-1180/1180
3	Gap 1	-	-
4	TS	280	1180/1460
5	Gap 2	-	-
6	BBC	50	1460/1510
7	TOF	250	1510/1760
8	Gap 3	162	1760/1922
9	Ecal	544	1922/2466
10	Magnet	3800	-1900/1900
11	Gap 5	566	-
12	RS	1390	2466/3856

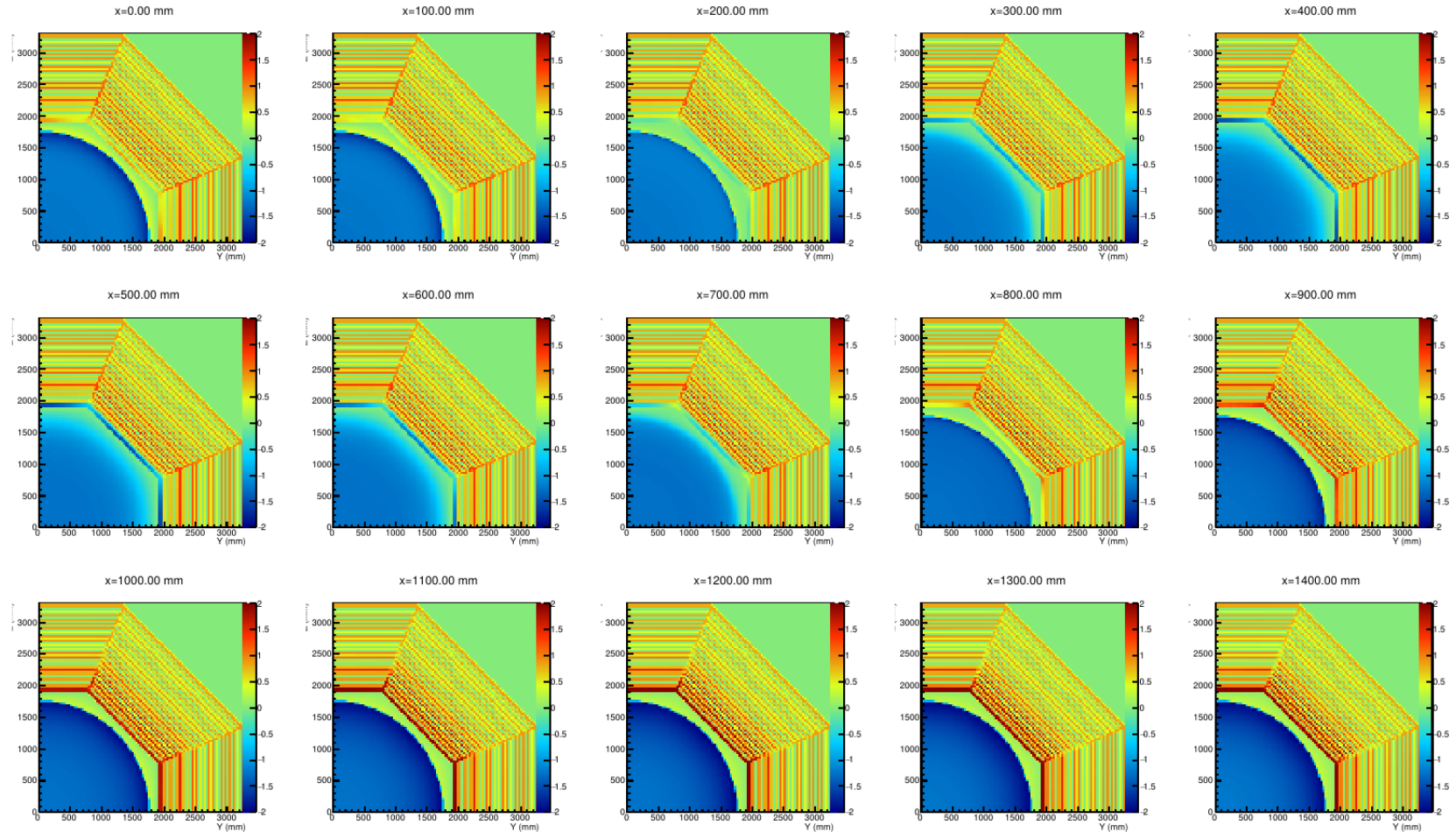
Table — Radial sizes of SPD barrel layers.

№	Barrel (size in mm)			
	Layer	ΔR	R min/max	ϕ min/max
1	Beampipe	64	0/64	0/128
2	Gap 0	0	-	-
3	VD	186	64/250	128/500
4	Gap 1	20/42	-	-
5	TS	580	270/850	540/1700
6	Gap 2	20	-	-
7	TOF	181	870/1051	1740/2102
8	Gap 3	10/31	-	-
9	Ecal	564	1080/1644	2160/3288
10	Gap 4	20	-	-
11	Magnet	220	1664/1884	3328/3768
12	Gap 5	20/176	-	-
13	RS	1390	1904/3294	3808/6588

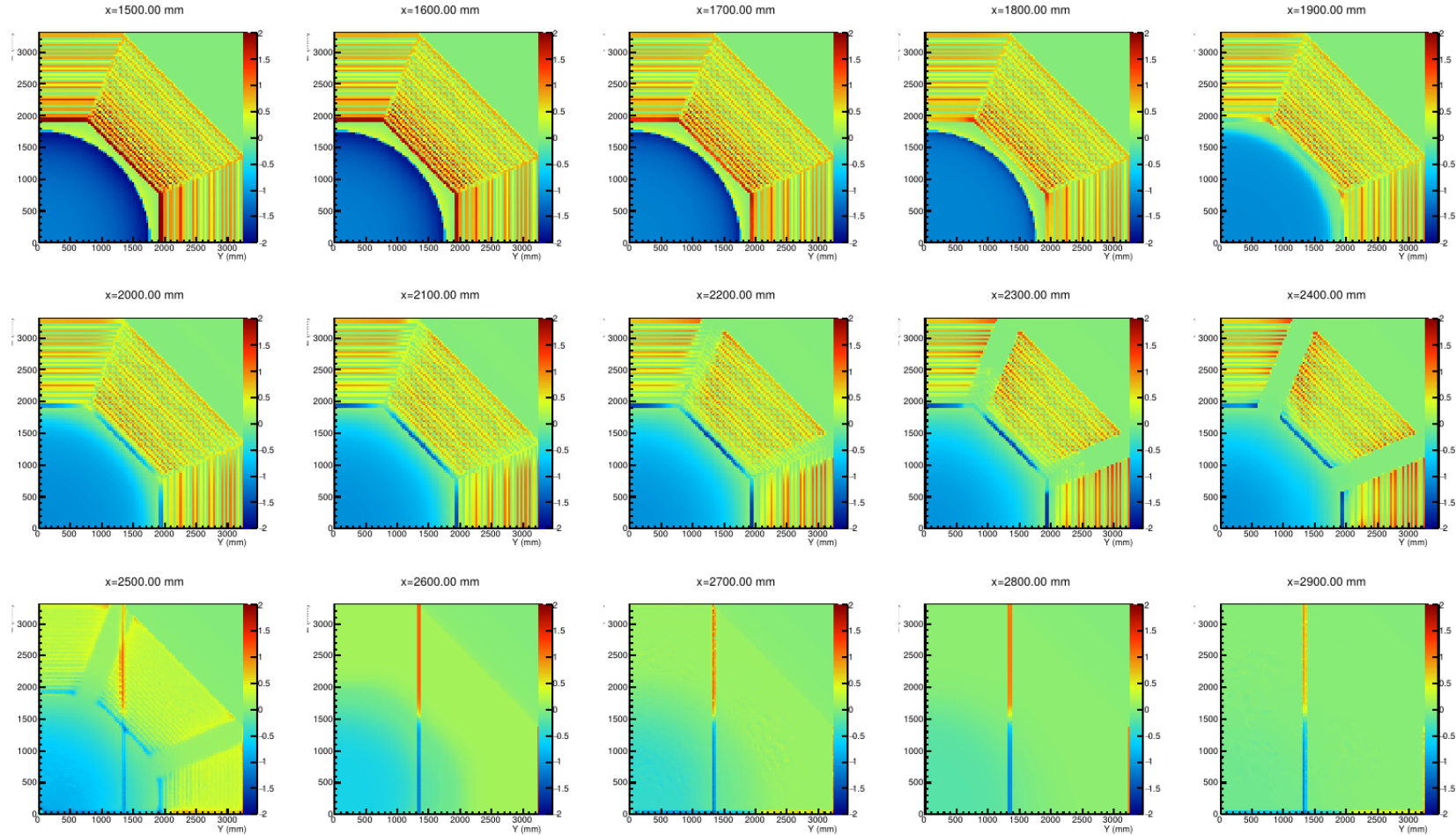
From I. Moshkovsky 11.11.2021

B_x

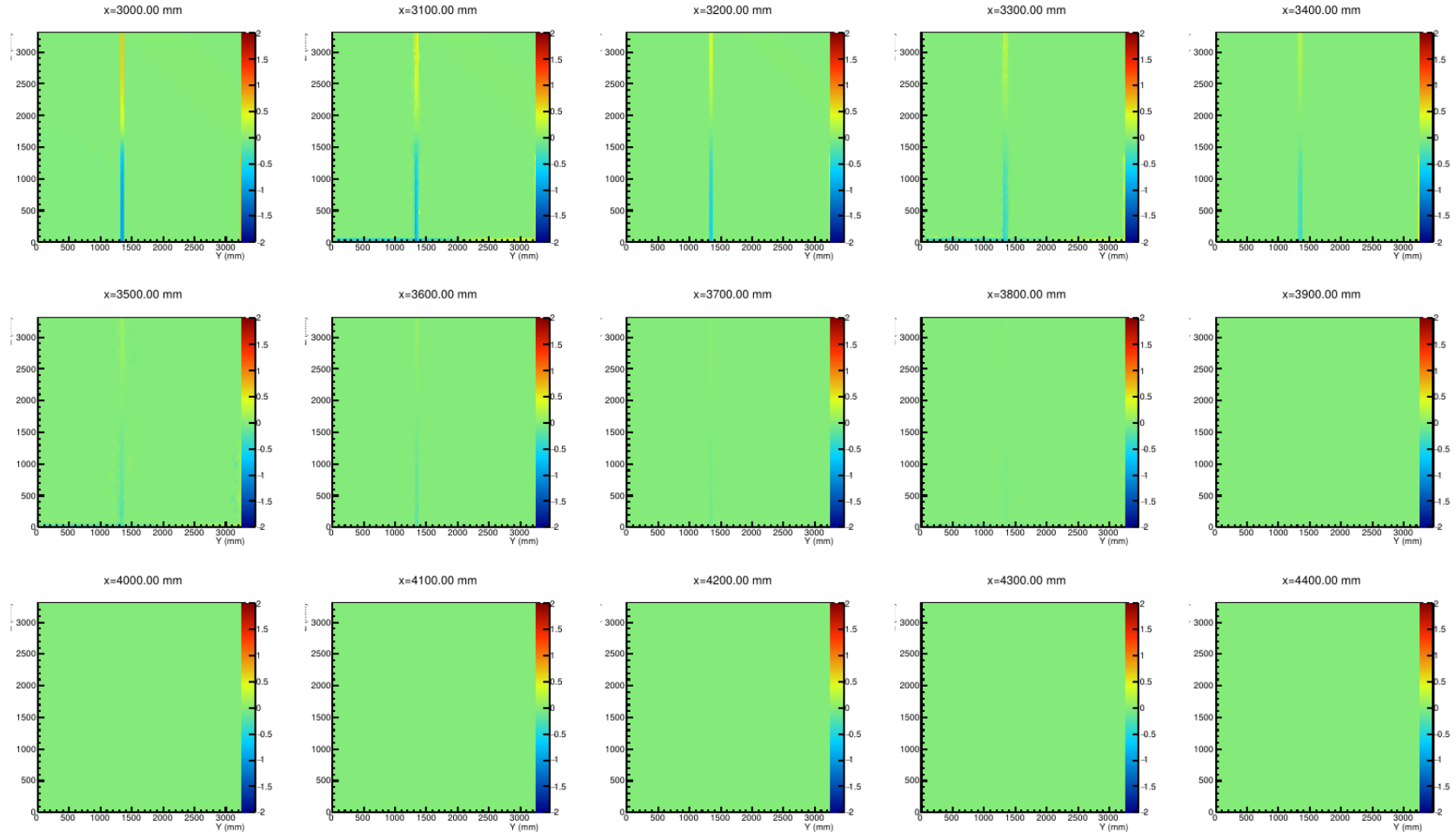
B_x ($0\text{mm} < x < 1400\text{mm}$)



B_x (1500mm < x < 2900mm)

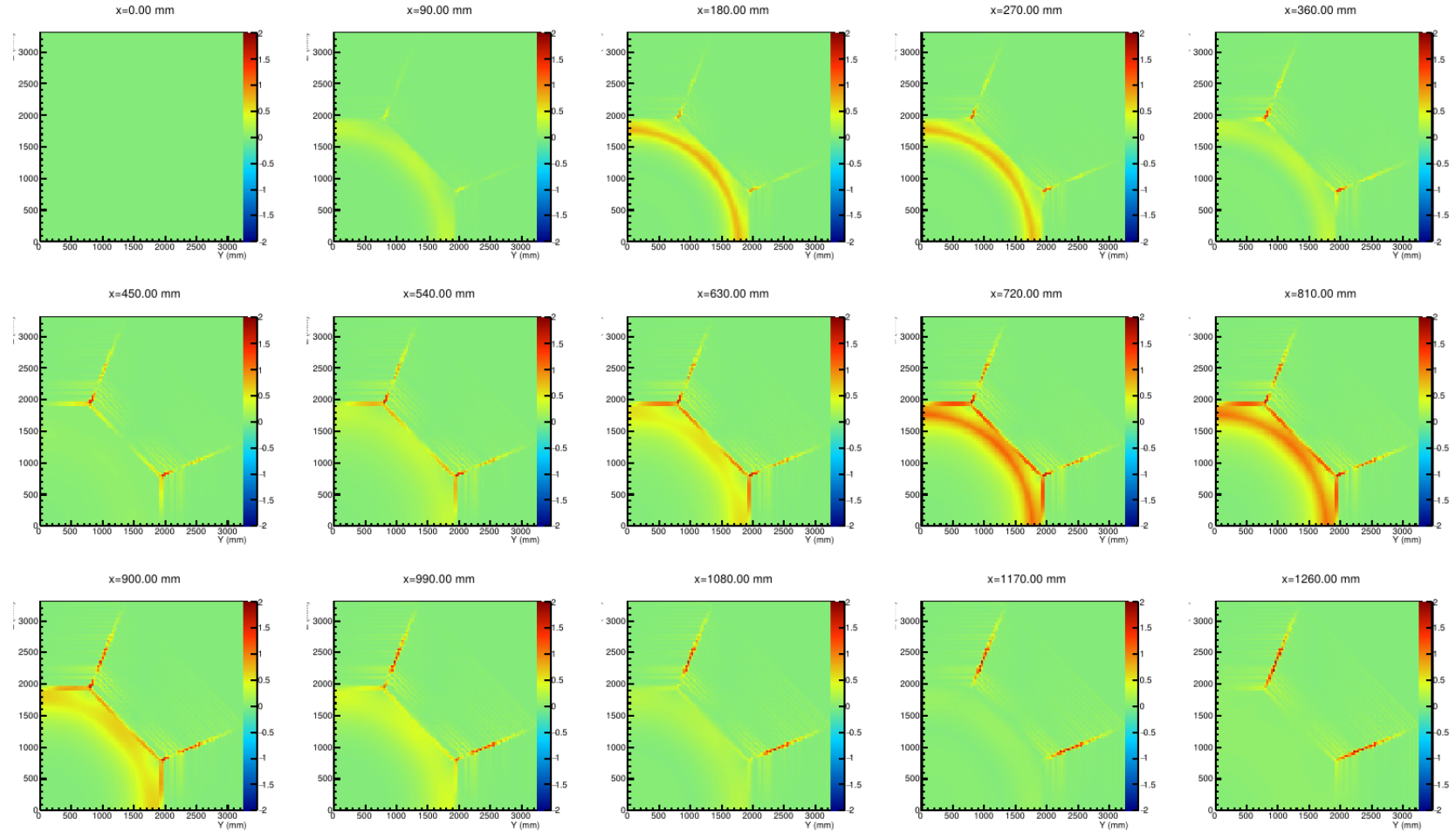


B_x (3000mm < x < 4400mm)

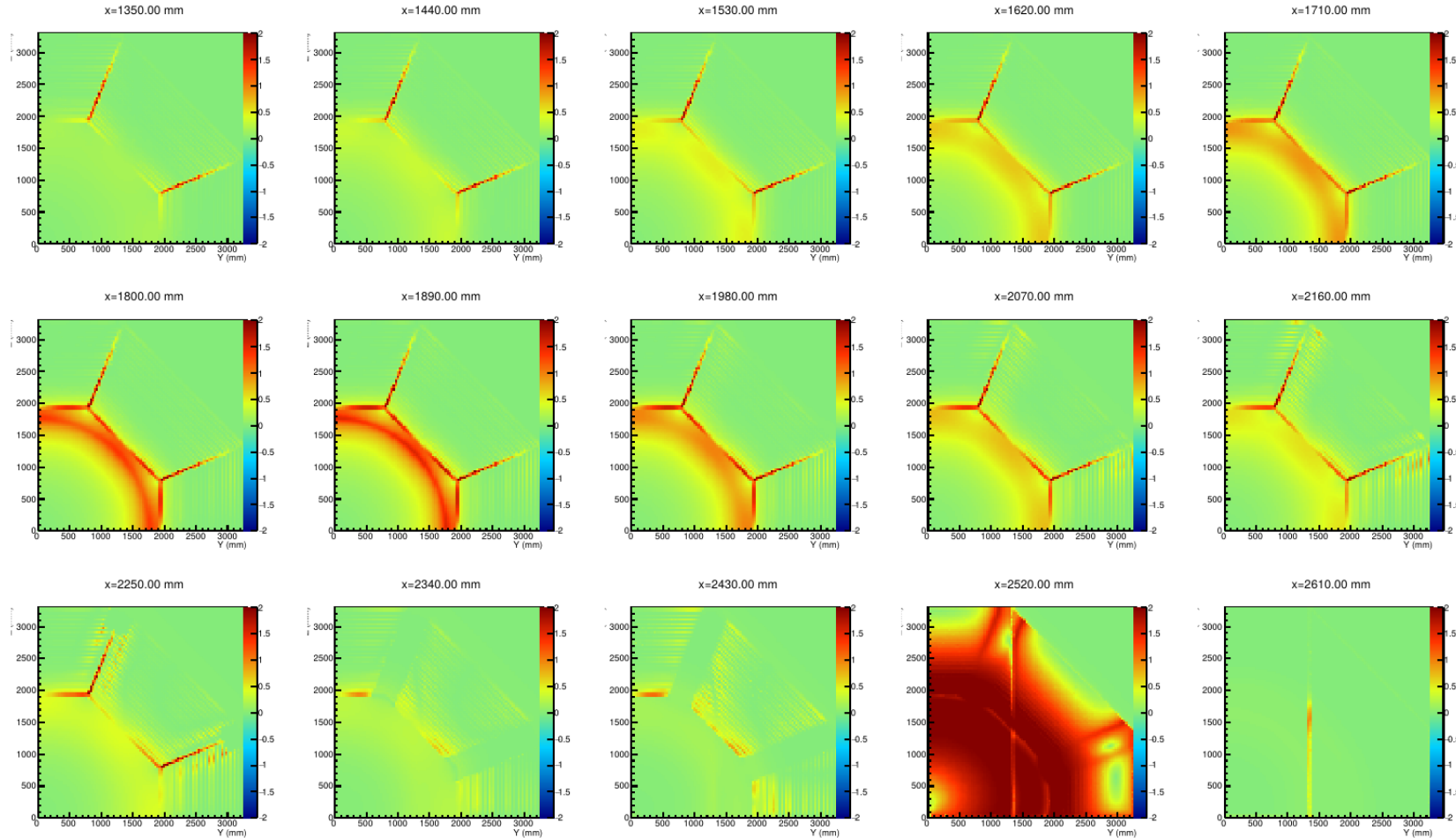


B_r

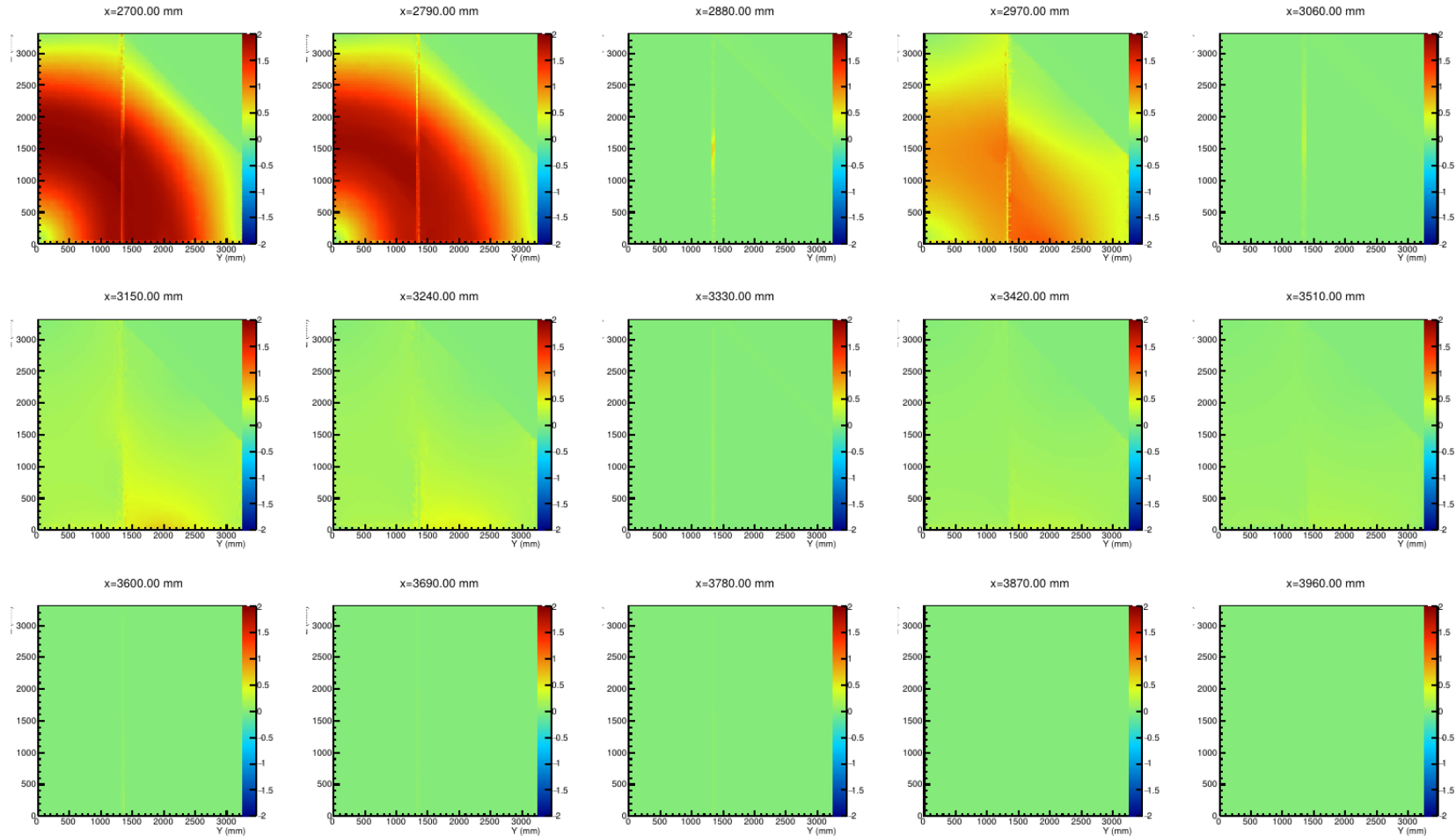
B_r ($0\text{mm} < x < 1400\text{mm}$)



B_r (1500mm < x < 2900mm)

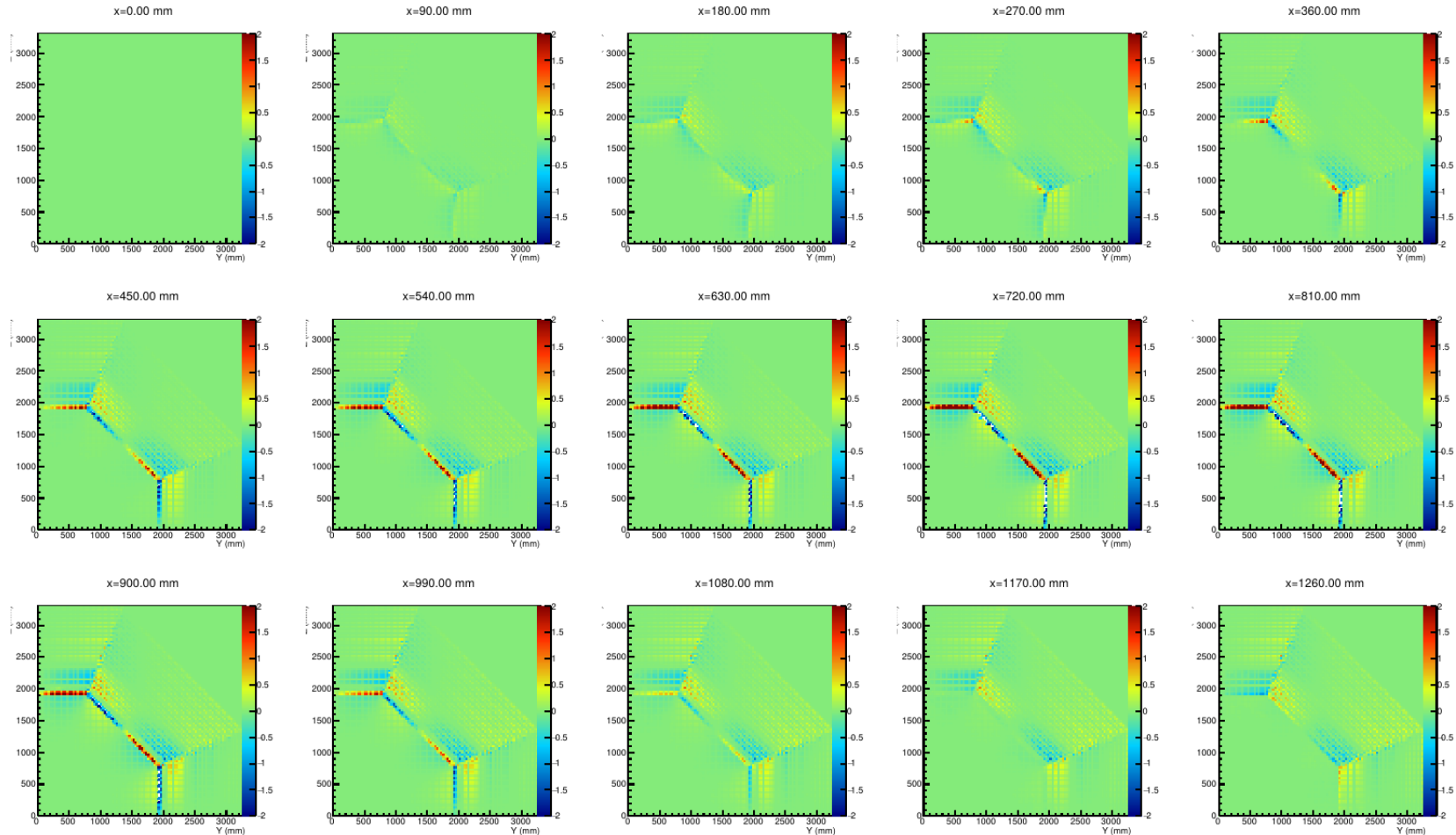


B_r (3000mm < x < 4400mm)

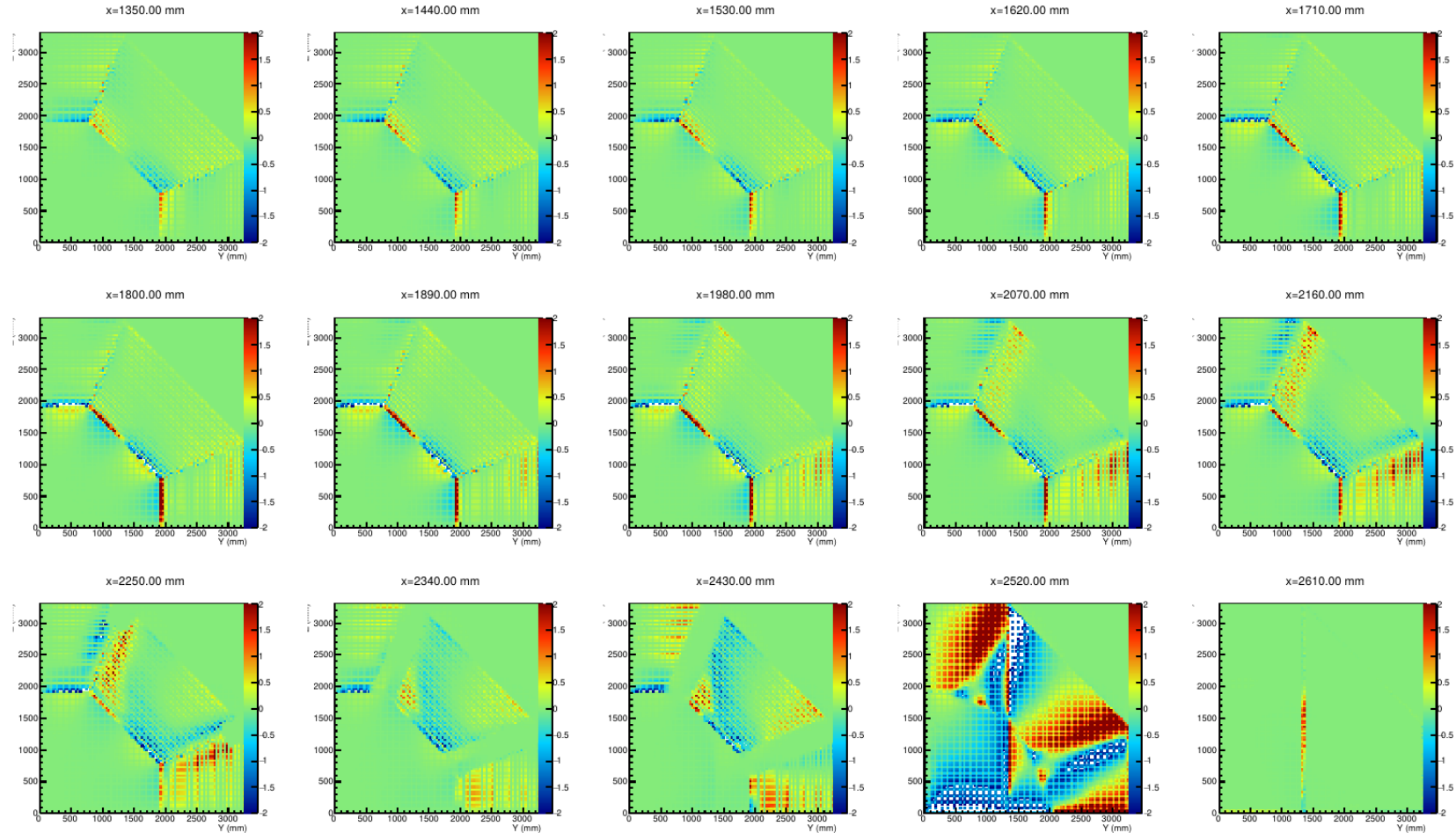


B_{phi}

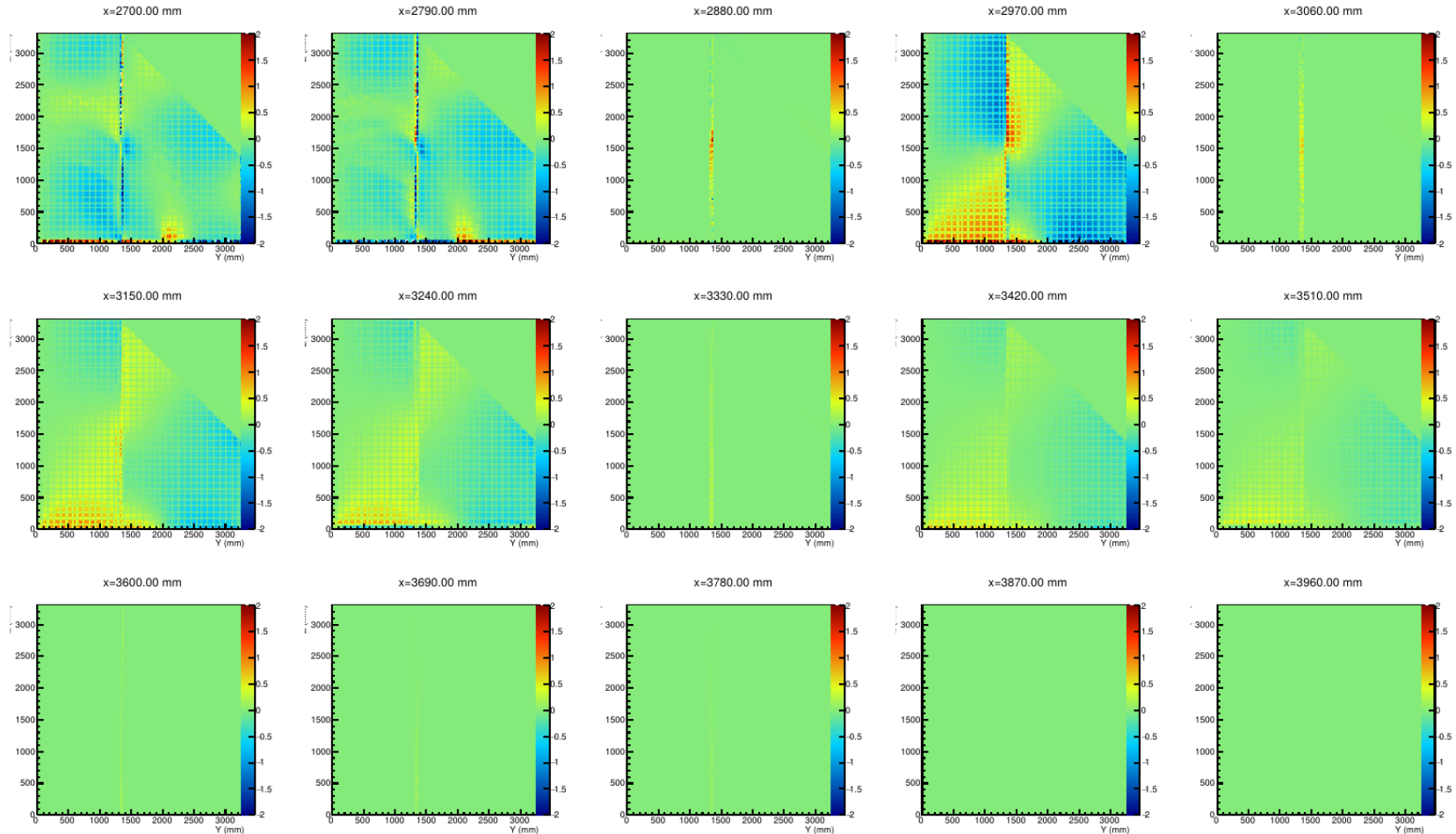
B_{ϕ} ($0\text{mm} < x < 1400\text{mm}$)



B_{ϕ} ($1500\text{mm} < x < 2900\text{mm}$)

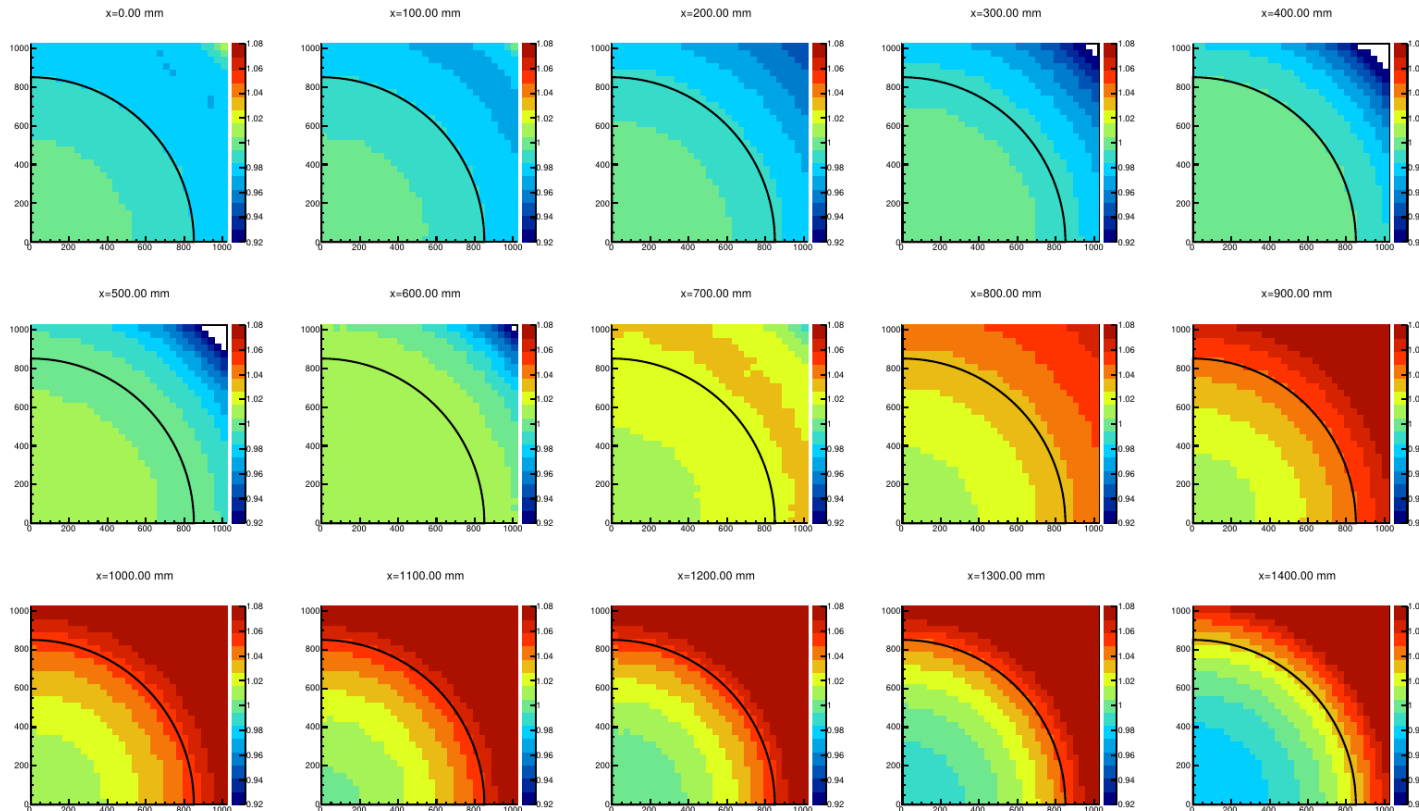


B_{ϕ} (3000mm < x < 4400mm)



Nonuniformity of B_x in the tracker

Nonuniformity of B_x ($B_x/B_x(0,0,0)$) in the tracker



- In the center $B_x = 1.234$ T
- The nonuniformity in the tracker is $\sim 5\%$

Summary

- The field map in the RS is very nonuniform. It might be an issuer for ML techniques.
- The reinforcement structure strongly affects the field map in specific volumes. Is it possible to use non-magnetic materials?
- The field nonuniformity in the tracker is quite small ~5%.
- The original field map contains “Nans”, which can be substituted with zeros.