

SUPPLEMENTARY DATA

Unified Dosimetry Quality Audit Index: An Integrated Monte Carlo Model-Based Quality Assurance Ranking for Radiotherapy Treatment of Glioblastoma Multiforme

Praveen Kumar C^{1*}, Dr. Lalit M Aggarwal², Dr. Saju Bhasi³, Dr. Neeraj Sharma¹

^{1*} School of Biomedical Engineering, Indian Institute of Technology - BHU, Varanasi, India
Corresponding Author E-mail: praveenkumarc1980@gmail.com

² Department of Radiotherapy, Institute of Medical Sciences – BHU, Varanasi, India

³ Division of Radiation Physics, Regional Cancer Centre, Thiruvananthapuram, India

Author's Profile:

Mr. Praveen Kumar .C is a research scholar in the Department of Biomedical Engineering, Indian Institute of Technology (BHU), Varanasi, Uttar Pradesh, India. He has worked as Assistant Professor in the Electrical And Electronics department of NSS College of Engineering, Palakkad, Kerala. His research area is Medical Physics and he started working on computational modelling of energy transport within cancer systems using phantoms for quality assurance in Radiotherapy and Diagnostic Radiology. His areas of interest include Electromagnetic Spectrum interaction on biological and non-biological materials and Cold Plasma application in cancer therapy.

Dr. Lalit Mohan Aggarwal is currently working as Professor Radiological Physics in the Department of Radiotherapy and Radiation Medicine, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India. He has authored several research papers and books. His clinical expertise and area of research include EBRT, Brachytherapy, Dosimetry and Imaging.

Dr Saju Bhasi is currently working as an Additional Professor in the Department of Radiation Physics, Regional Cancer Centre, Thiruvananthapuram, Kerala, India. His clinical expertise and area of research include dosimetry, fabrication of dosimetry tools and quality assurance. He has several research papers to his credit.

Dr Neeraj Sharma is currently working as Professor in the Department of Biomedical Engineering, Indian Institute of Technology (BHU), Varanasi, Uttar Pradesh, India. His area of expertise includes Bio-Medical Instrumentation, Biomedical image processing, Artificial Intelligence and Monte Carlo Simulations in Radiotherapy. He has to his credit several research publications and projects.

SUPPLEMENTARY DATA [1] : 6 MV PHOTON BEAM INCIDENT ONTO FRONTAL LOBE OF HEAD

GBM 1 BEAM ↓↓↓↓	GBM 2 BEAM ↓↓↓↓	GBM 3 BEAM ↓↓↓↓	GBM 4 BEAM ↓↓↓↓	GBM 5 BEAM ↓↓↓↓	GBM 6 BEAM ↓↓↓↓	GBM 7 BEAM ↓↓↓↓
SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³
SKBN 0.7cm 1.81 g/cm ³	SKBN 0.7cm 1.81 g/cm ³	SKBN 0.7cm 1.81 g/cm ³	SKBN 0.7cm 1.81 g/cm ³	SKBN 0.7cm 1.81 g/cm ³	SKBN 0.7cm 1.81 g/cm ³	SKBN 0.7cm 1.81 g/cm ³
PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 1.133 g/cm ³
ARTS 0.02cm 1.081 g/cm ³	ARTS 0.02cm 1.081 g/cm ³	ARTS 0.02cm 1.081 g/cm ³	ARTS 0.02cm 1.081 g/cm ³	ARTS 0.02cm 1.081 g/cm ³	ARTS 0.02cm 1.081 g/cm ³	ARTS 0.02cm 1.081 g/cm ³
SACF 0.4 cm 1.001 g/cm ³	SACF 0.4 cm 1.001 g/cm ³	SACF 0.4 cm 1.001 g/cm ³	SACF 0.4 cm 1.001 g/cm ³	ARCT 2.703cm 1.025 g/cm ³	SACF 0.4 cm 1.001 g/cm ³	SACF 0.4 cm 1.001 g/cm ³
PIATS 0.06cm 1.171 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	SACF 0.4 cm 1.001 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	PIATS 0.06cm 1.171 g/cm ³
GRWM 0.2488cm 1.04 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³
GLTT 2.4232cm 1.08 g/cm ³	VMCF 3.5283cm 1.001 g/cm ³	GLCT 1.85704cm 1.025 g/cm ³	GLTT 2.4232cm 1.08 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	GLCC 0.03714cm 1.55 g/cm ³	RCCT 1.755cm 1.025g/cm ³
CCWM 1.328cm 1.093 g/cm ³	GLTT 2.4232cm 1.08 g/cm ³	GLTT 2.4232cm 1.08 g/cm ³	GLCT 1.85704cm 1.025 g/cm ³	GLTT 2.4232cm 1.08 g/cm ³	GLTT 2.4232cm 1.08 g/cm ³	GLTT 2.4232cm 1.08 g/cm ³

GBM 8 BEAM ↓↓↓↓	GBM 9 BEAM ↓↓↓↓	GBM 10 BEAM ↓↓↓↓	GBM 11 BEAM ↓↓↓↓	GBM 12 BEAM ↓↓↓↓	GBM 13 BEAM ↓↓↓↓	GBM 14 BEAM ↓↓↓↓
SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³
SKBN 0.7cm 1.81 g/cm ³	SKBN 0.7cm 1.81 g/cm ³	SKBN 0.7cm 1.81 g/cm ³	SKBN 0.7cm 1.81 g/cm ³	SKBN 0.7cm 1.81 g/cm ³	SKBN 0.7cm 1.81 g/cm ³	SKBN 0.7cm 1.81 g/cm ³
PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³
ARTS 0.02cm 1.081 g/cm ³	ARTS 0.02cm 1.081 g/cm ³	ARTS 0.02cm 1.081 g/cm ³	ARTS 0.02cm 1.081 g/cm ³	SDAR 0.0005cm 0.001205 g/cm ³	ARTS 0.02cm 1.081 g/cm ³	ARTS 0.02cm 1.081 g/cm ³
SACF 0.4 cm 1.001 g/cm ³	SACF 0.4 cm 1.001 g/cm ³	SACF 0.4 cm 1.001 g/cm ³	SACF 0.4 cm 1.001 g/cm ³	ARTS 0.02cm 1.081 g/cm ³	SAAR 0.4cm 0.001205 g/cm ³	SAAR 0.4cm 0.001205 g/cm ³
PIATS 0.06cm 1.171 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	SACF 0.4 cm 1.001 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	PIATS 0.06cm 1.171 g/cm ³
GRWM 0.2488cm 1.04 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³
ABPP 0.00042cm 1.70 g/cm ³	HABD 3.98cm 1.05999g/cm ³	GLTT 2.4232cm 1.08 g/cm ³	PHAR 1.755cm 0.001205 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	PHAR 1.755cm 0.001205 g/cm ³	GLTT 1.275cm 1.08 g/cm ³
GLTT 2.4232cm 1.08 g/cm ³	GLTT 2.4232cm 1.08 g/cm ³	HMBD 6.45cm 1.05999g/cm ³	GLTT 1.275cm 1.08 g/cm ³	GLTT 1.275cm 1.08 g/cm ³	GLTT 1.275cm 1.08 g/cm ³	CCWM 1.328cm 1.093 g/cm ³

GBM 15 BEAM ↓↓↓↓	GBM 16 BEAM ↓↓↓↓	GBM 17 BEAM ↓↓↓↓	GBM 18 BEAM ↓↓↓↓	GBM 19 BEAM ↓↓↓↓	GBM 20 BEAM ↓↓↓↓	GBM 21 BEAM ↓↓↓↓
SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³
CRTI 0.05 cm 4.54 g/cm ³	CRTI 0.05 cm 4.54 g/cm ³	CRTI 0.05 cm 4.54 g/cm ³	CRTI 0.05 cm 4.54 g/cm ³	SKBN 0.7cm 1.81 g/cm ³	CRTI 0.05 cm 4.54 g/cm ³	CRPM 0.5cm 1.19 g/cm ³
PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³
ARTS 0.02cm 1.081 g/cm ³	ARTS 0.02cm 1.081 g/cm ³	SDAR 0.0005cm 0.001205 g/cm ³	ARTS 0.02cm 1.081 g/cm ³	ARTS 0.02cm 1.081 g/cm ³	ARTS 0.02cm 1.081 g/cm ³	ARTS 0.02cm 1.081 g/cm ³
SACF 0.4 cm 1.001 g/cm ³	SACF 0.4 cm 1.001 g/cm ³	ARTS 0.02cm 1.081 g/cm ³	SAAR 0.4cm 0.001205 g/cm ³	SACF 0.4 cm 1.001 g/cm ³	SACF 0.4 cm 1.001 g/cm ³	SACF 0.4 cm 1.001 g/cm ³
PIATS 0.06cm 1.171 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	SACF 0.4 cm 1.001 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	PIATS 0.06cm 1.171 g/cm ³
GRWM 0.2488cm 1.04 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³
GLTT 1.275cm 1.08 g/cm ³	PHAR 1.755cm 0.001205 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	PHAR 1.755cm 0.001205 g/cm ³	RCCF 1.755 cm 1.001 g/cm ³	RCCF 1.755 cm 1.001 g/cm ³	GLTT 1.275cm 1.08 g/cm ³
CCWM 1.328cm 1.093 g/cm ³	GLTT 1.275cm 1.08 g/cm ³	GLTT 1.275cm 1.08 g/cm ³	GLTT 1.275cm 1.08 g/cm ³	GLTT 1.275cm 1.08 g/cm ³	GLTT 1.275cm 1.08 g/cm ³	CCWM 1.328cm 1.093 g/cm ³

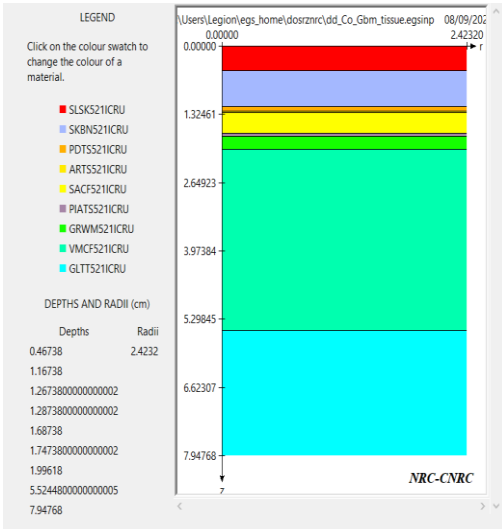
GBM 22 BEAM ↓↓↓↓	GBM 23 BEAM ↓↓↓↓	GBM 24 BEAM ↓↓↓↓	GBM 25 BEAM ↓↓↓↓	GBM 26 BEAM ↓↓↓↓	GBM 27 BEAM ↓↓↓↓	GBM 28 BEAM ↓↓↓↓
SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³
CRPM 0.5 cm 1.19 g/cm ³	CRPM 0.5 cm 1.19 g/cm ³	CRPM 0.5 cm 1.19 g/cm ³	CRPM 0.5 cm 1.19 g/cm ³	SKBN 0.7cm 1.81 g/cm ³	SKBN 0.7cm 1.81 g/cm ³	SKBN 0.7cm 1.81 g/cm ³
PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³
ARTS 0.02cm 1.081 g/cm ³	SDAR 0.0005cm 0.001205 g/cm ³	ARTS 0.02cm 1.081 g/cm ³	ARTS 0.02cm 1.081 g/cm ³	ARTS 0.02cm 1.081 g/cm ³	ARTS 0.02cm 1.081 g/cm ³	SACF 0.42cm 1.001 g/cm ³
SACF 0.4 cm 1.001 g/cm ³	ARTS 0.02cm 1.081 g/cm ³	SAAR 0.4cm 0.001205 g/cm ³	SACF 0.4 cm 1.001 g/cm ³	SACF 0.4 cm 1.001 g/cm ³	SACF 0.4 cm 1.001 g/cm ³	PIATS 0.06cm 1.171 g/cm ³
PIATS 0.06cm 1.171 g/cm ³	SACF 0.4 cm 1.001 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³
GRWM 0.2488cm 1.04 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	ANHG 0.06771cm 1.12 g/cm ³
PHAR 1.755cm 0.001205 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	PHAR 1.755cm 0.001205 g/cm ³	RCCF 1.755 cm 1.06 g/cm ³	AMBD 0.04073cm 1.06 g/cm ³	ANPT 0.00068cm 21.45 g/cm ³	ANHP 0.000268 21.45 g/cm ³
GLTT 1.275cm 1.08 g/cm ³	GLTT 1.275cm 1.08 g/cm ³	GLTT 1.275cm 1.08 g/cm ³	GLTT 1.275cm 1.08 g/cm ³	GLTT 2.4232cm 1.08 g/cm ³	GLTT 2.4232cm 1.08 g/cm ³	GLTT 2.4232cm 1.08 g/cm ³

GBM 29 BEAM ↓↓↓↓	GBM 30 BEAM ↓↓↓↓	GBM 31 BEAM ↓↓↓↓	GBM 32 BEAM ↓↓↓↓	GBM 33 BEAM ↓↓↓↓	GBM 34 BEAM ↓↓↓↓	GBM 35 BEAM ↓↓↓↓
SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³
SKBN 0.7cm 1.81 g/cm ³	SKBN 0.7cm 1.81 g/cm ³	SKBN 0.7cm 1.81 g/cm ³	SKBN 0.7cm 1.81 g/cm ³	SKBN 0.7cm 1.81 g/cm ³	SKBN 0.7cm 1.81 g/cm ³	SKBN 0.7cm 1.81 g/cm ³
PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³
ARTS 0.02cm 1.081 g/cm ³	ARTS 0.02cm 1.081 g/cm ³	SACF 0.42cm 1.001 g/cm ³	ARTS 0.02cm 1.081 g/cm ³	SACF 0.42cm 1.001 g/cm ³	ARTS 0.02cm 1.081 g/cm ³	ARTS 0.02cm 1.081 g/cm ³
SACF 0.4 cm 1.001 g/cm ³	SACF 0.4 cm 1.001 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	SACF 0.4 cm 1.001 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	SACF 0.4 cm 1.001 g/cm ³	SACF 0.4 cm 1.001 g/cm ³
PIATS 0.06cm 1.171 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	PIATS 0.06cm 1.171 g/cm ³
GRWM 0.2488cm 1.04 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	DBSS 0.00018cm 8.06 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	DBSS 0.000049cm 8.06 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³
ANOE 0.1286cm 2.71 g/cm ³	ANOT 0.1286cm 2.89 g/cm ³	DBPI 0.00018cm 21.56 g/cm ³	DBSS 0.00034217 8.06 g/cm ³	DBPI 0.0000202 21.56 g/cm ³	DBPI 0.00523 cm 21.56 g/cm ³	DBTA 0.00523 cm 4.41 g/cm ³
GLTT 2.4232cm 1.08 g/cm ³	GLTT 2.4232cm 1.08 g/cm ³	GLTT 2.4232cm 1.08 g/cm ³	GLTT 2.4232cm 1.08 g/cm ³	GLTT 2.4232cm 1.08 g/cm ³	GLTT 2.4232cm 1.08 g/cm ³	GLTT 2.4232cm 1.08 g/cm ³
GBM 36 BEAM ↓↓↓↓	GBM 37 BEAM ↓↓↓↓	GBM 38 BEAM ↓↓↓↓				
SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³	SLSK 0.46738cm 1.084 g/cm ³				
SKBN 0.7cm 1.81 g/cm ³	SKBN 0.7cm 1.81 g/cm ³	SKBN 0.7cm 1.81 g/cm ³				
PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³	PDTS 0.1cm 1.133 g/cm ³				
ARTS 0.02cm 1.081 g/cm ³	ARTS 0.02cm 1.081 g/cm ³	ARTS 0.02cm 1.081 g/cm ³				
SACF 0.4 cm 1.001 g/cm ³	SACF 0.4 cm 1.001 g/cm ³	SACF 0.4 cm 1.001 g/cm ³				
PIATS 0.06cm 1.171 g/cm ³	PIATS 0.06cm 1.171 g/cm ³	PIATS 0.06cm 1.171 g/cm ³				
GRWM 0.2488cm 1.04 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³	GRWM 0.2488cm 1.04 g/cm ³				
GLPS 3.113 cm 1.048 g/cm ³	GLTT 2.4232cm 1.08 g/cm ³	RCPS 1.755cm 1.048 g/cm ³				
GLTT 2.4232cm 1.08 g/cm ³	GLPS 3.113 cm 1.048 g/cm ³	GLTT 1.275cm 1.08 g/cm ³				

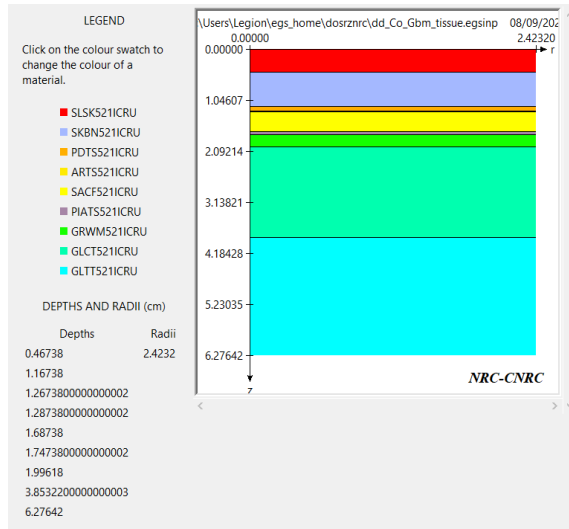
Table: Treatment environments of GBM simulated on Monte Carlo platform

MAB PHANTOM's SYNTHESIZED FROM EGSnrc PLATFORM

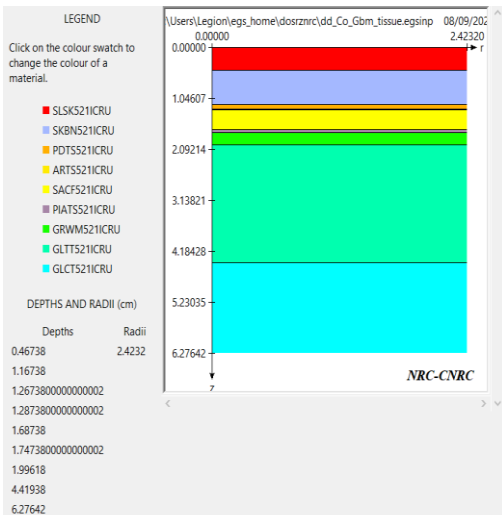
GBM 2



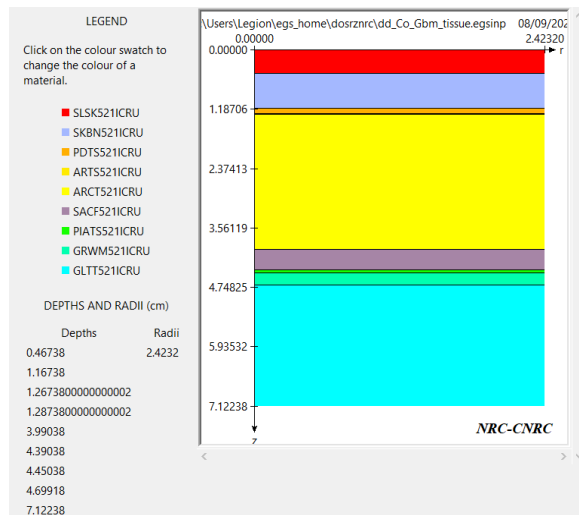
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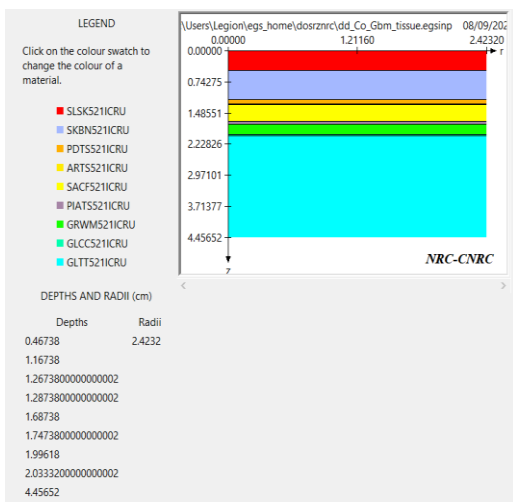
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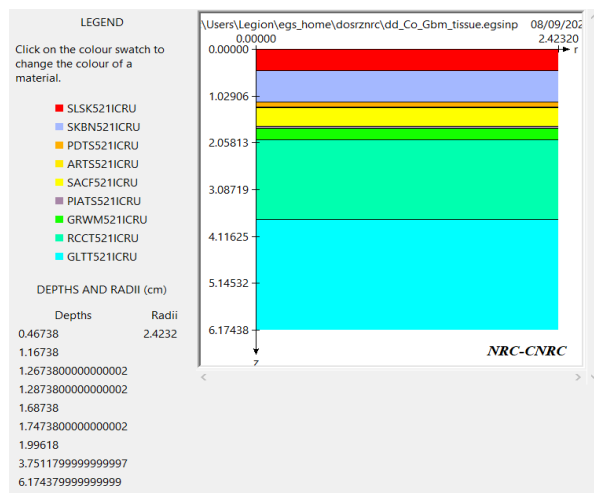
GBM 5



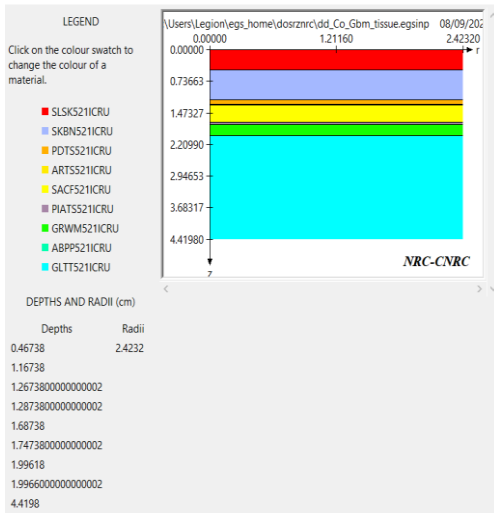
GBM 6



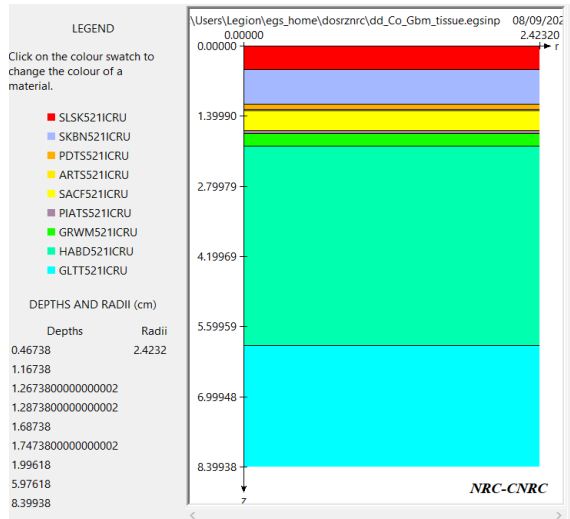
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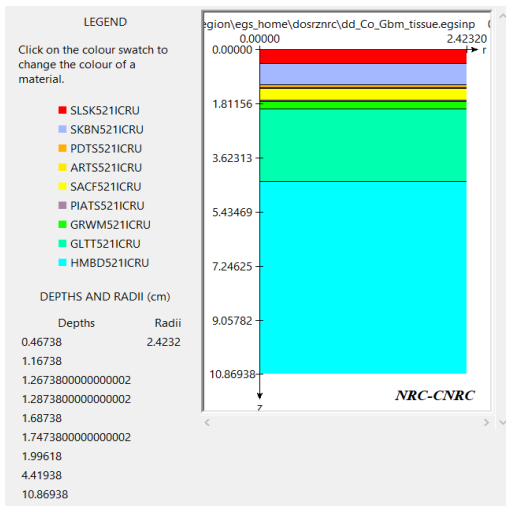
GBM 8



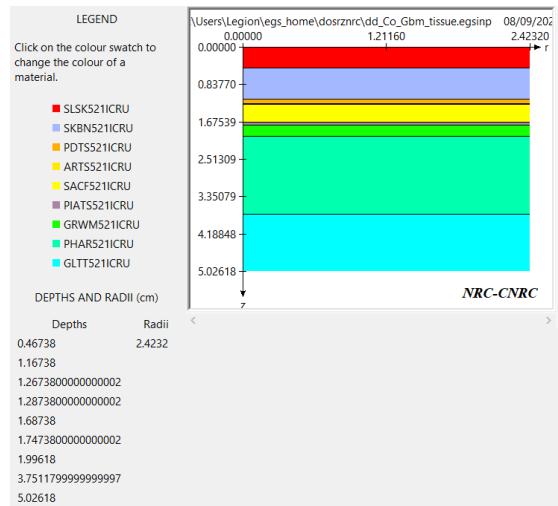
GBM 9



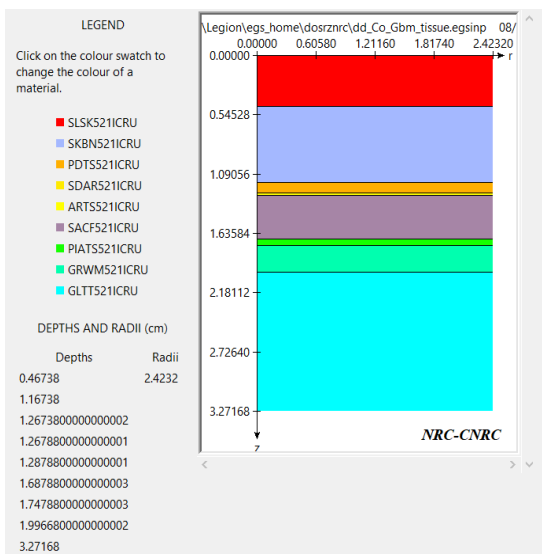
GBM 10



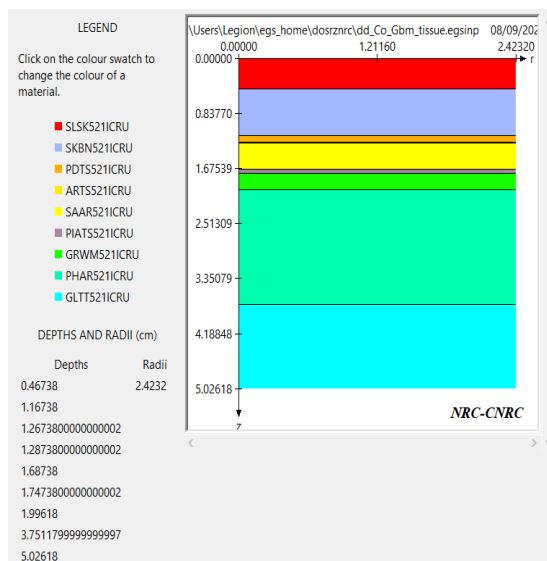
GBM 11



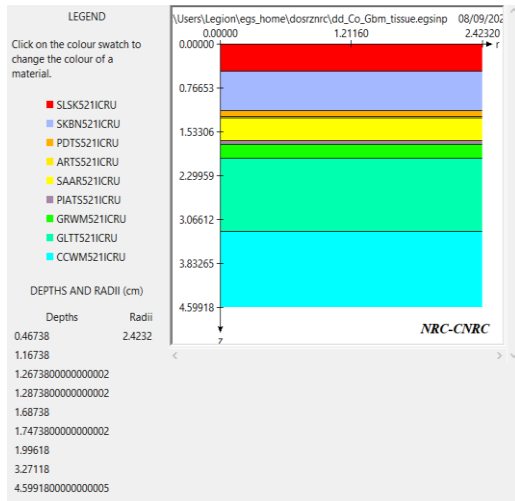
GBM 12



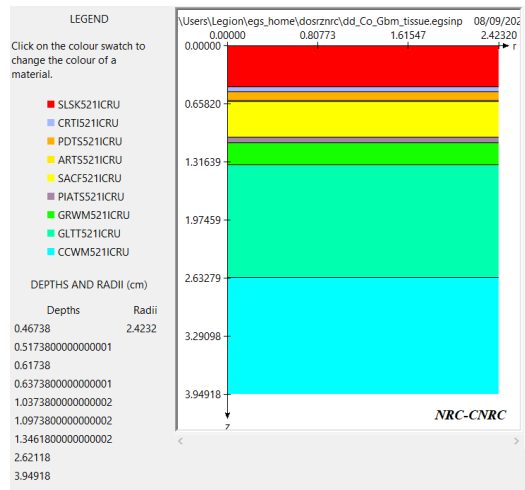
GBM 13



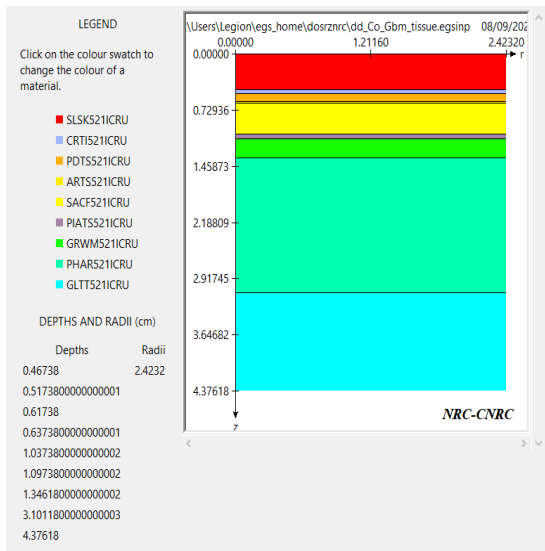
GBM 14



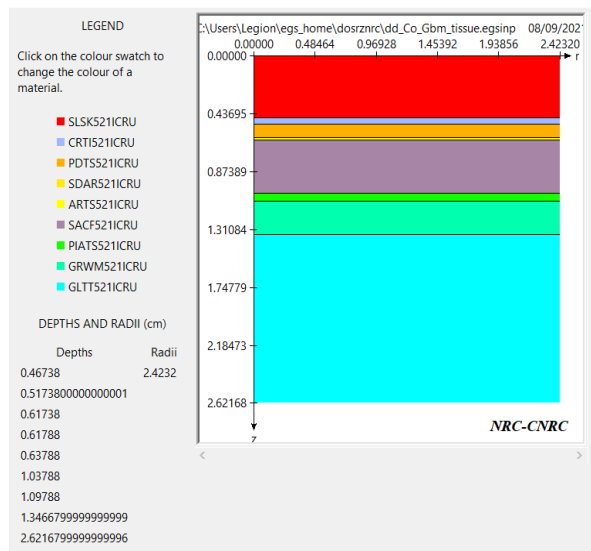
GBM 15



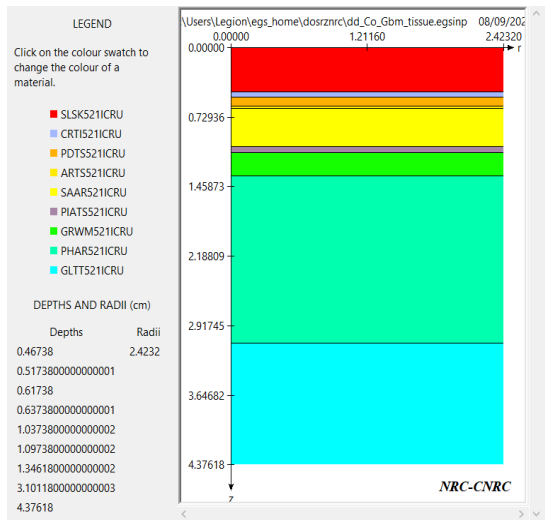
GBM 16



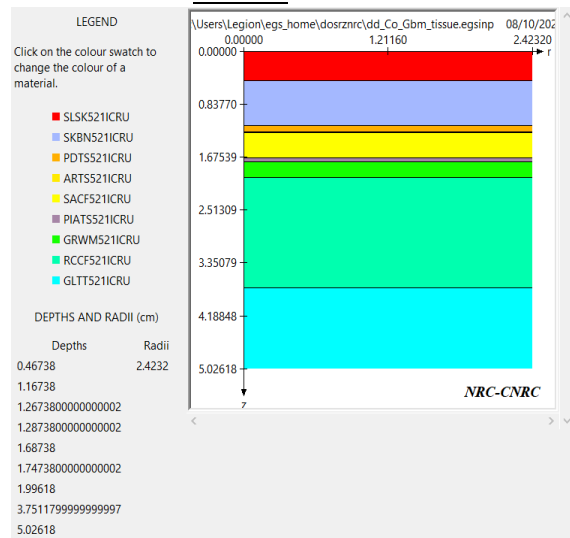
GBM 17



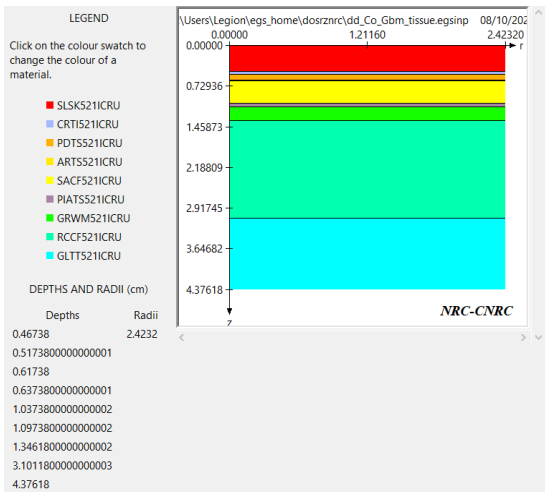
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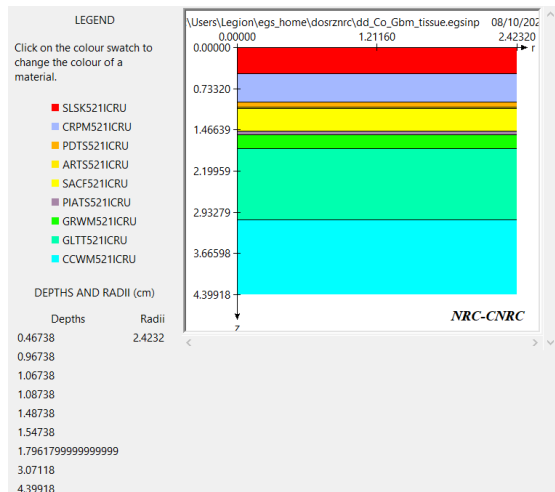
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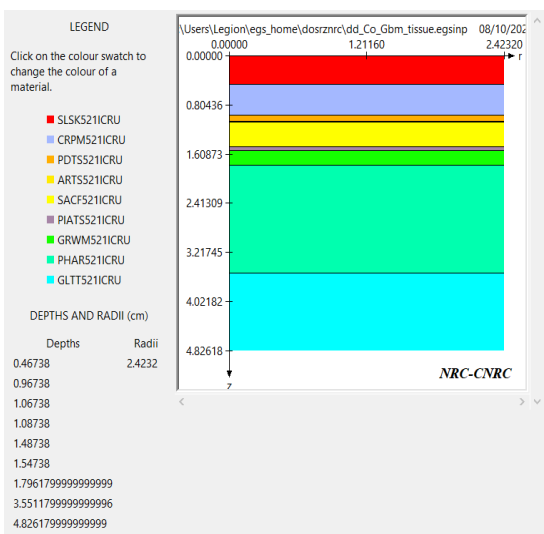
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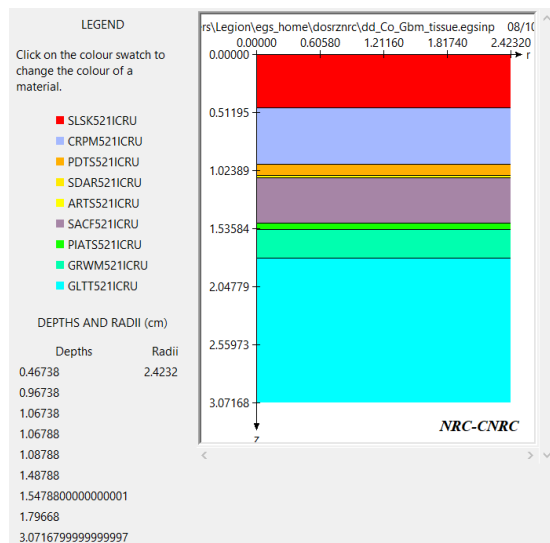
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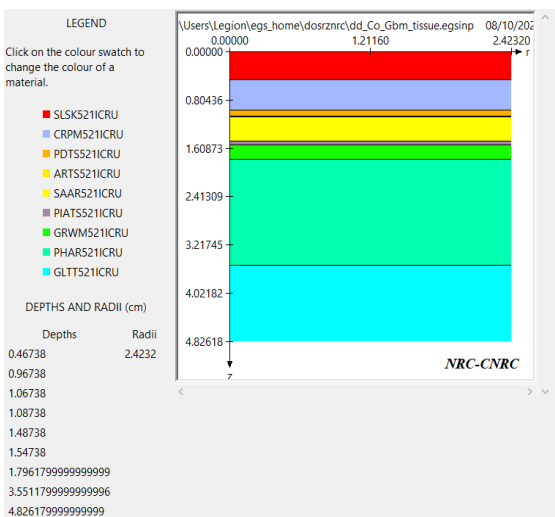
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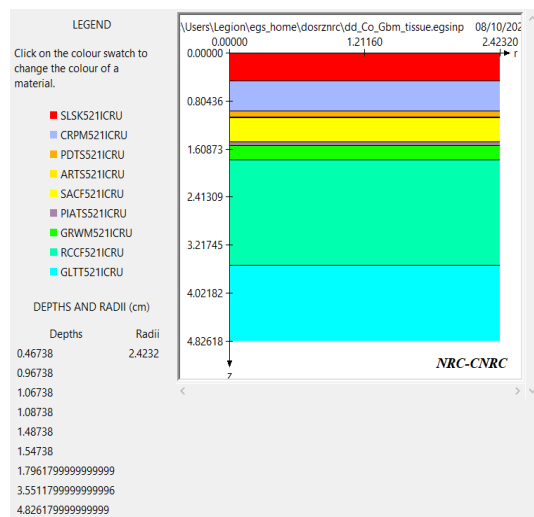
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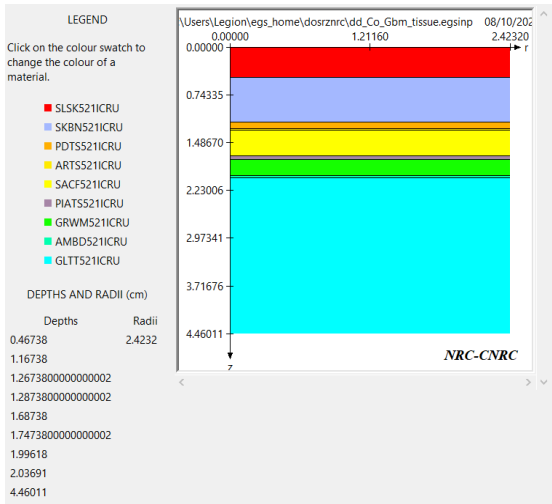
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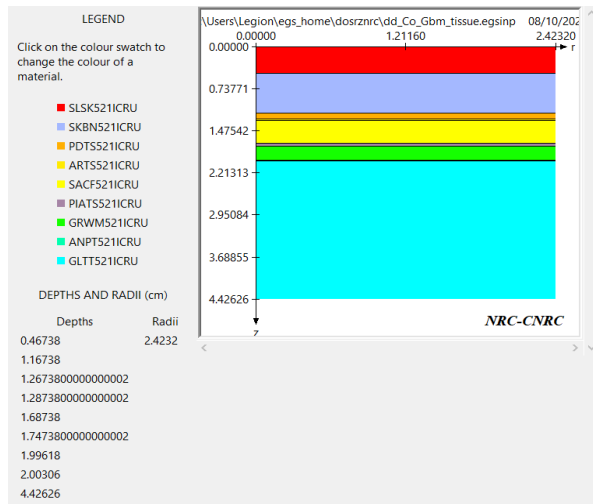
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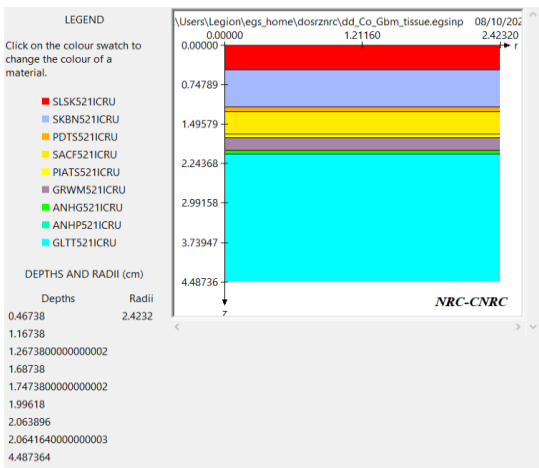
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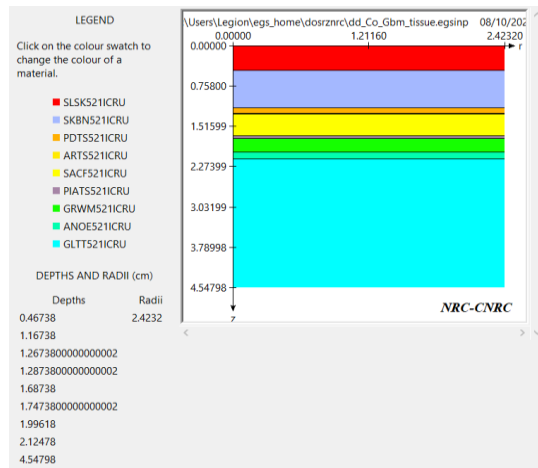
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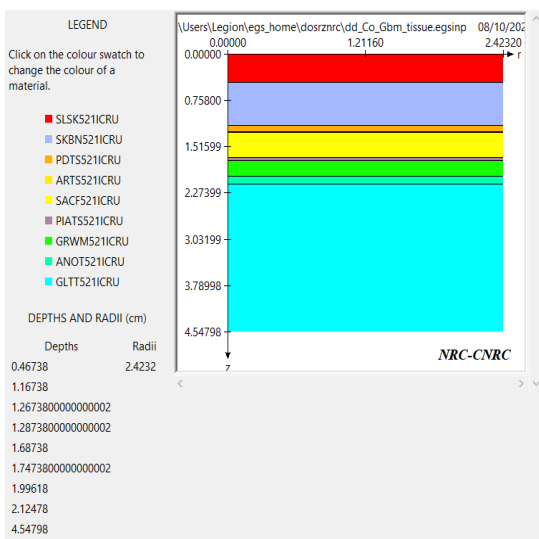
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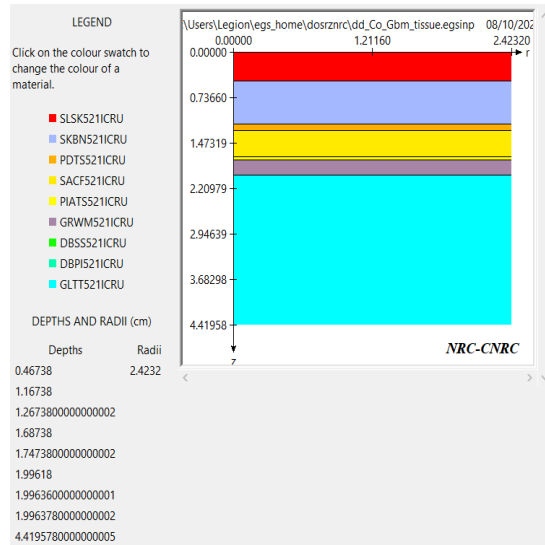
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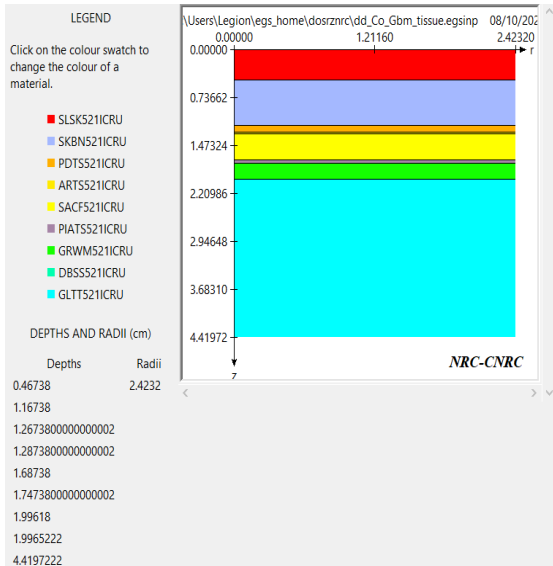
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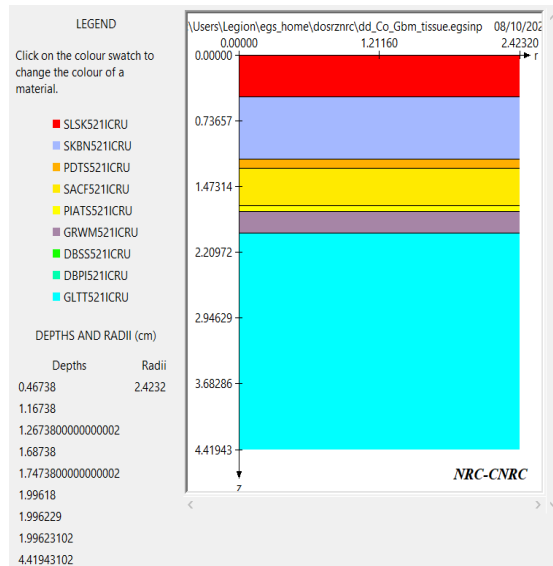
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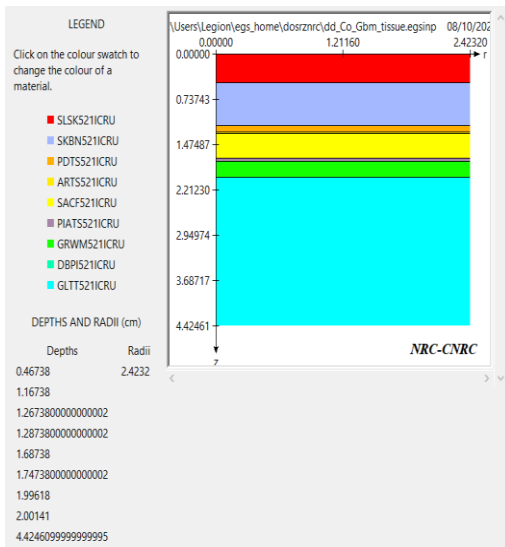
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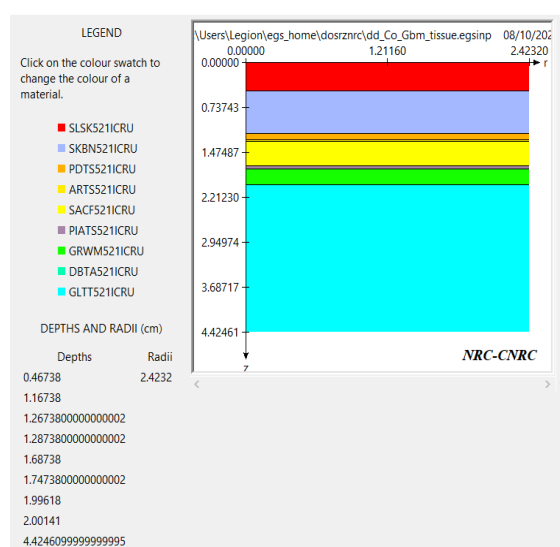
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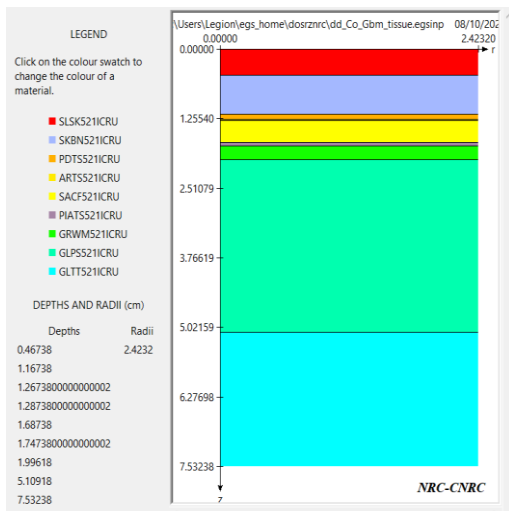
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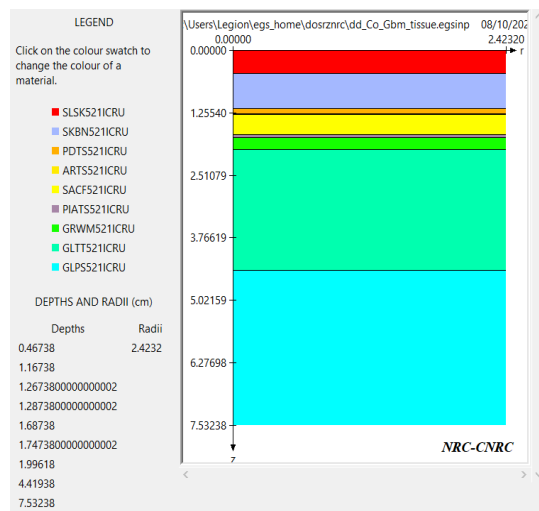
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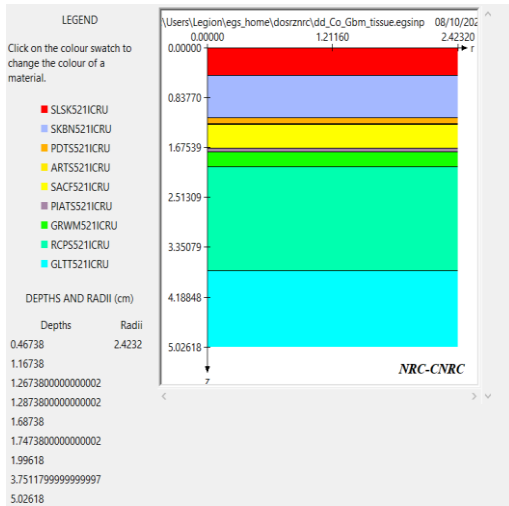
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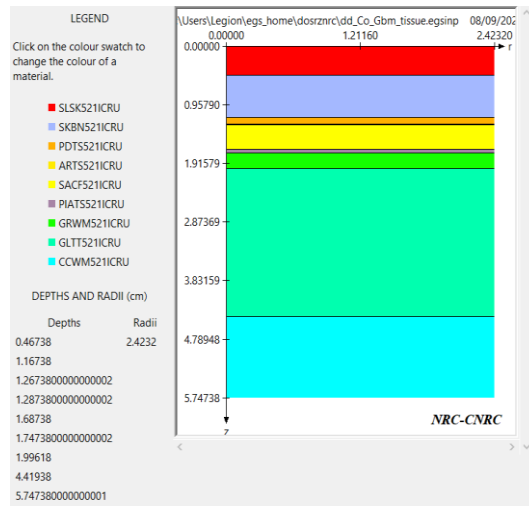
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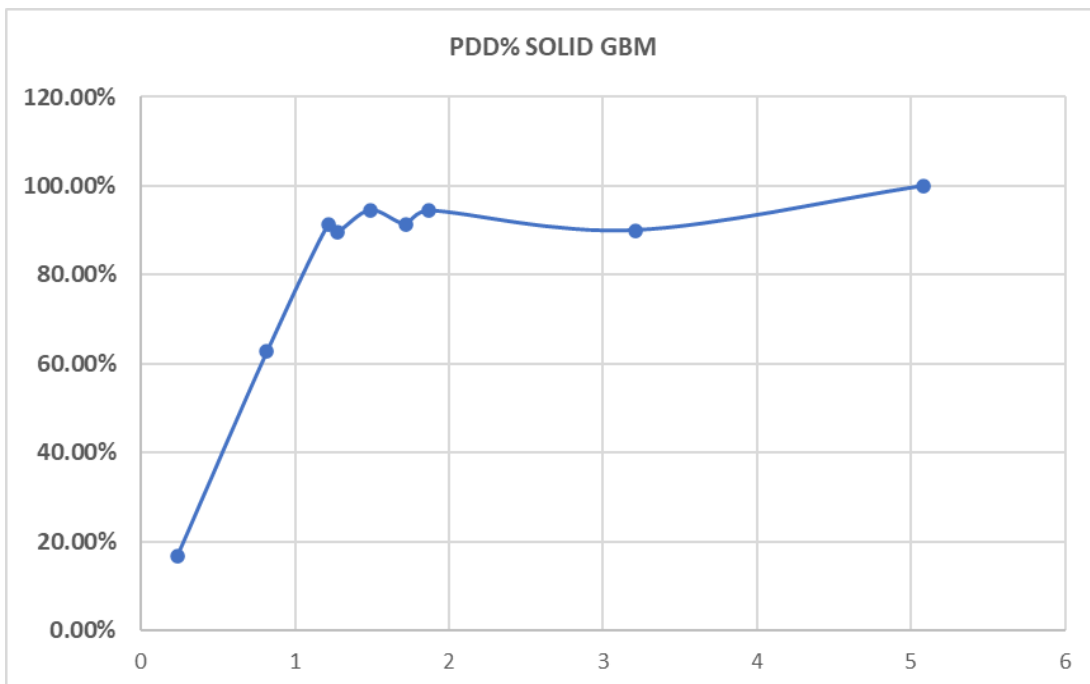
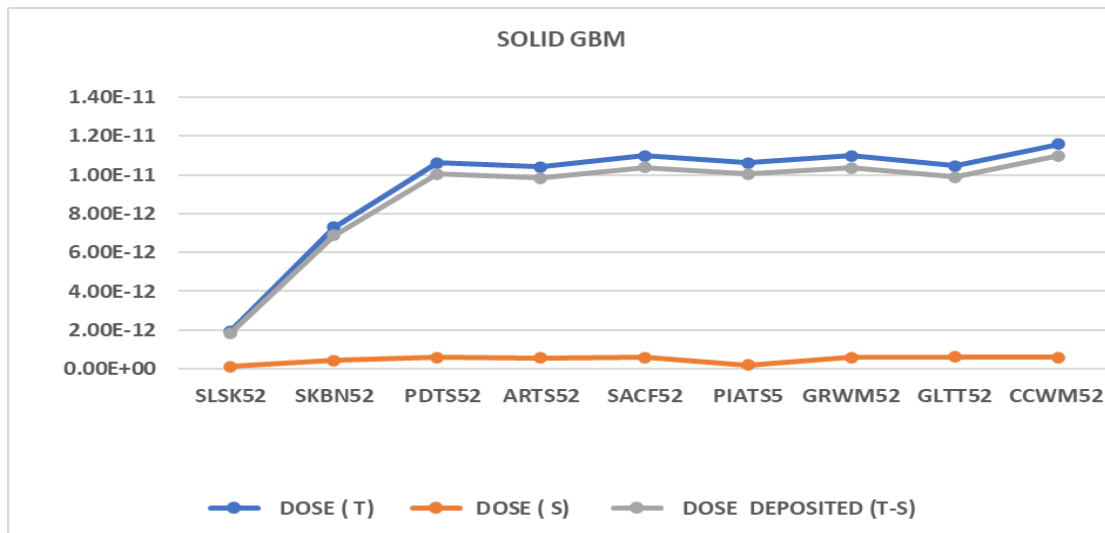
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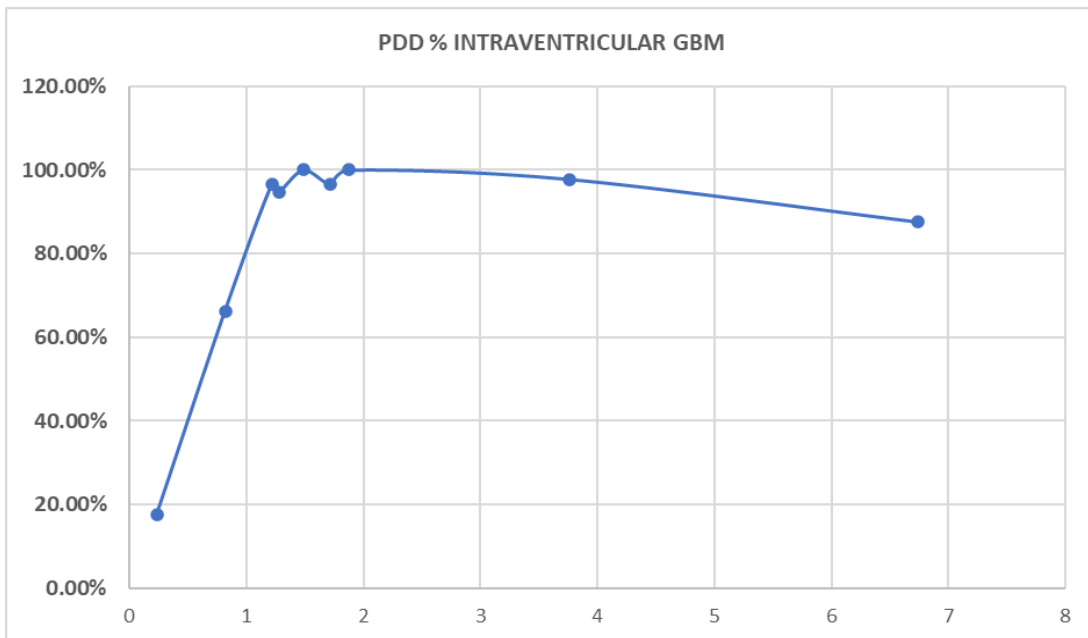
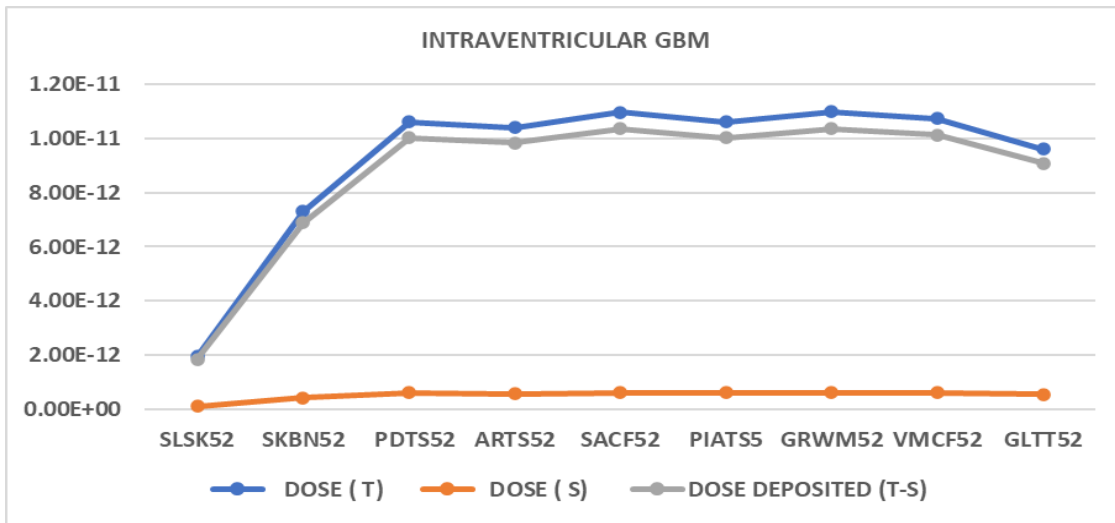
SUPPLEMENTARY DATA [2]

CONSOLIDATED MAB PHANTOM PRECOMPILED SIMULATION OUTPUTS:

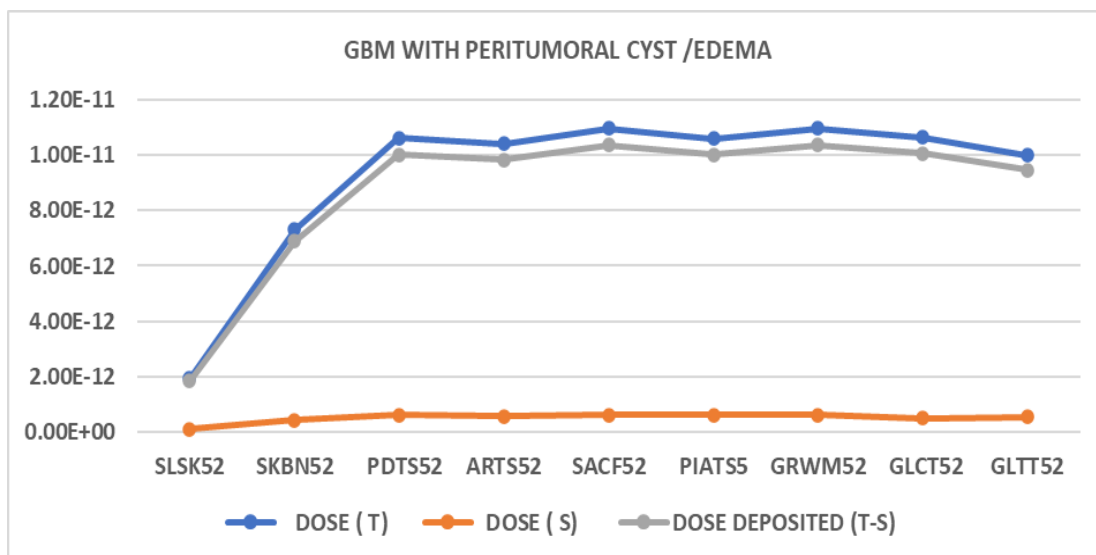
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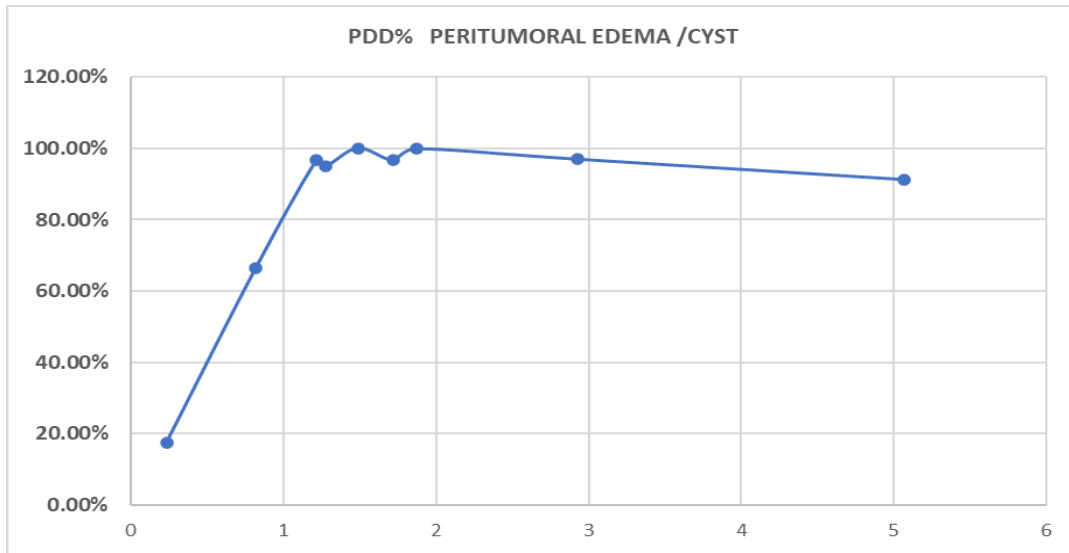


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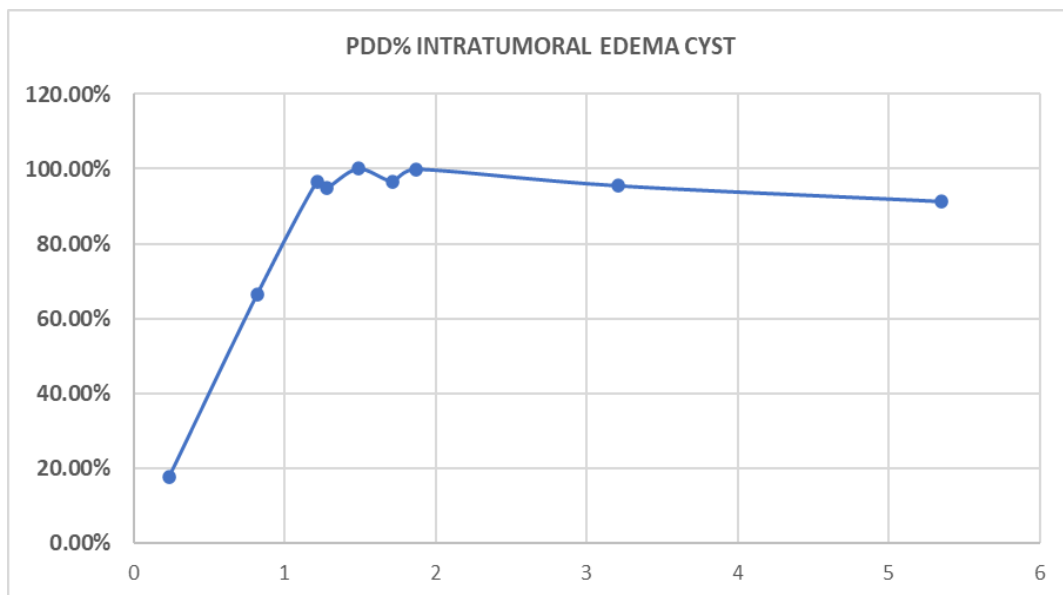
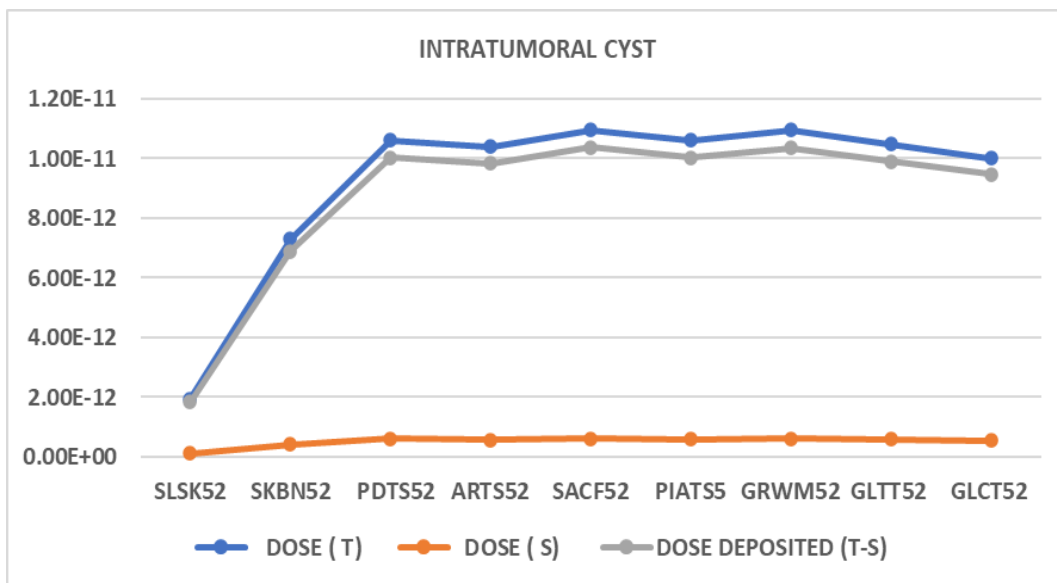


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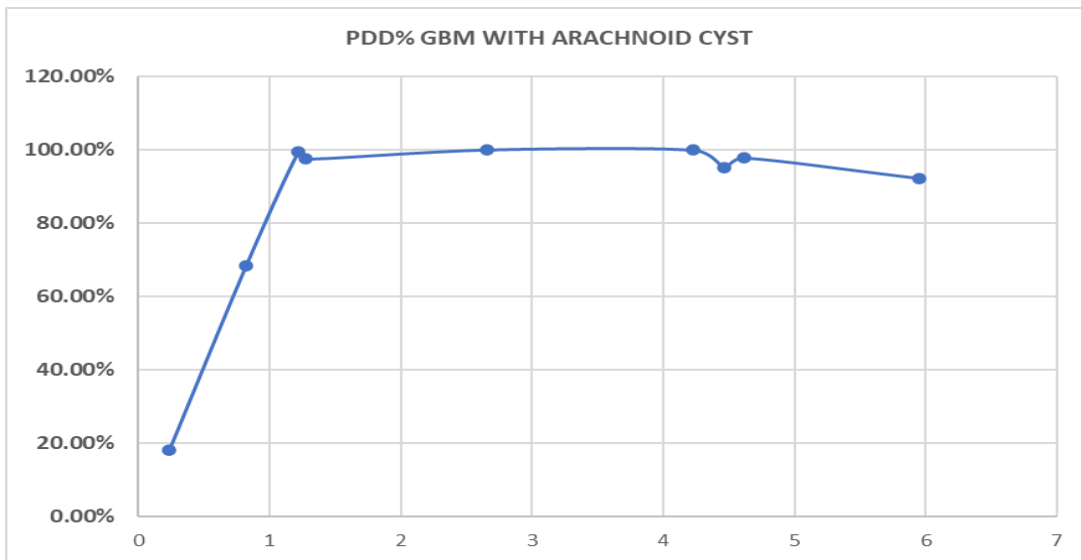
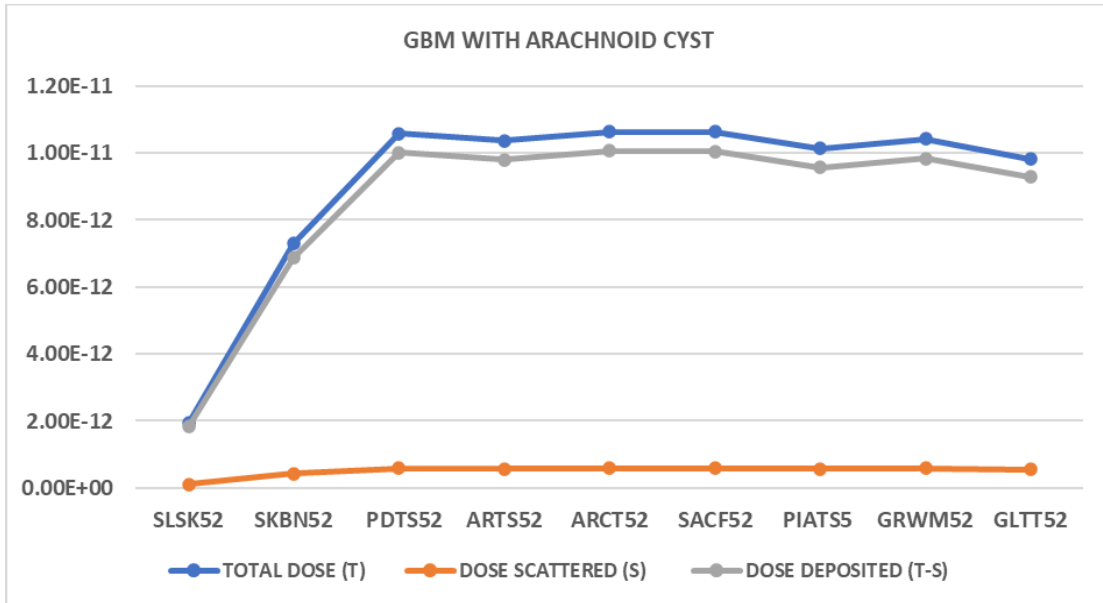




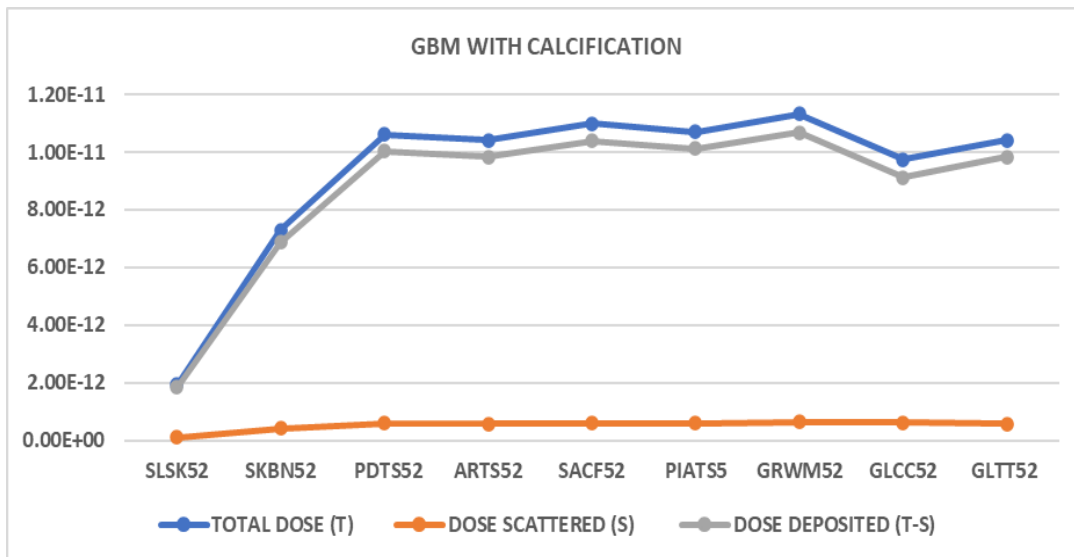
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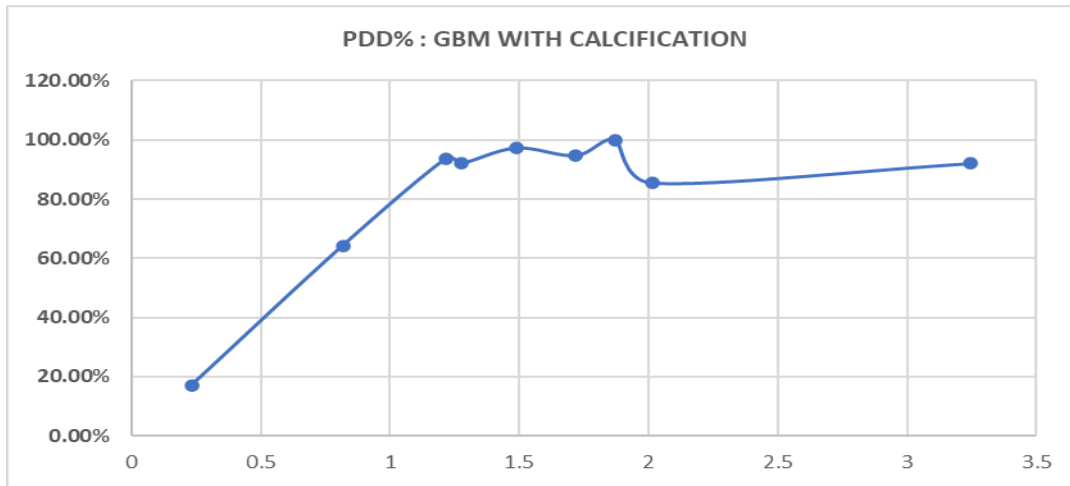


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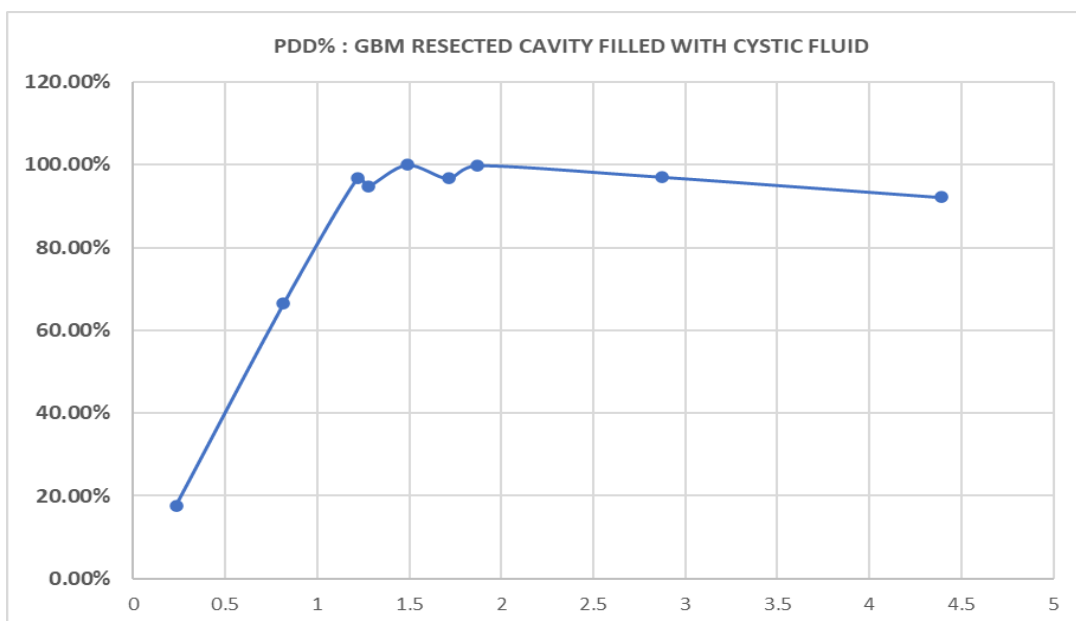
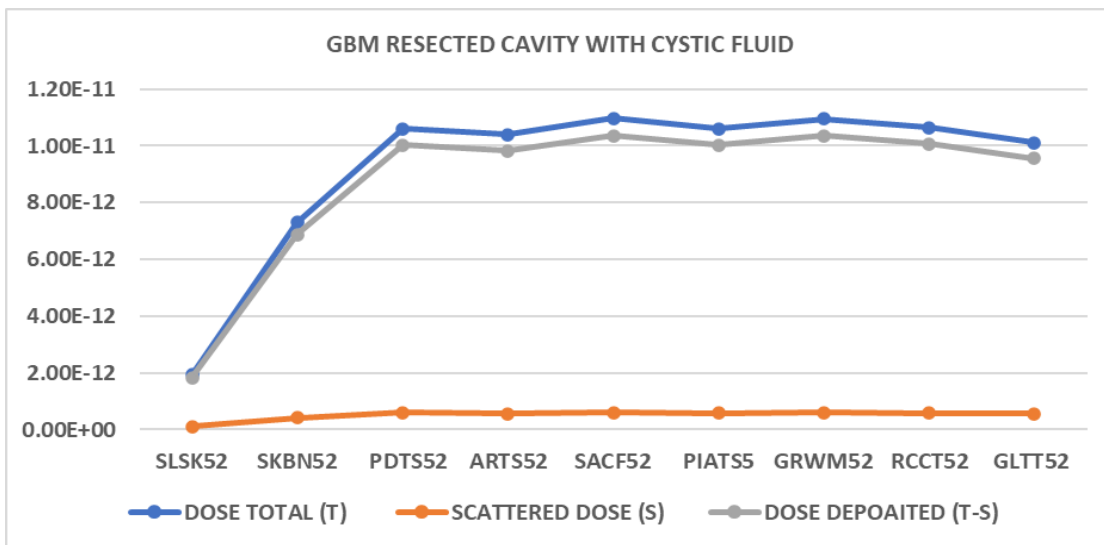


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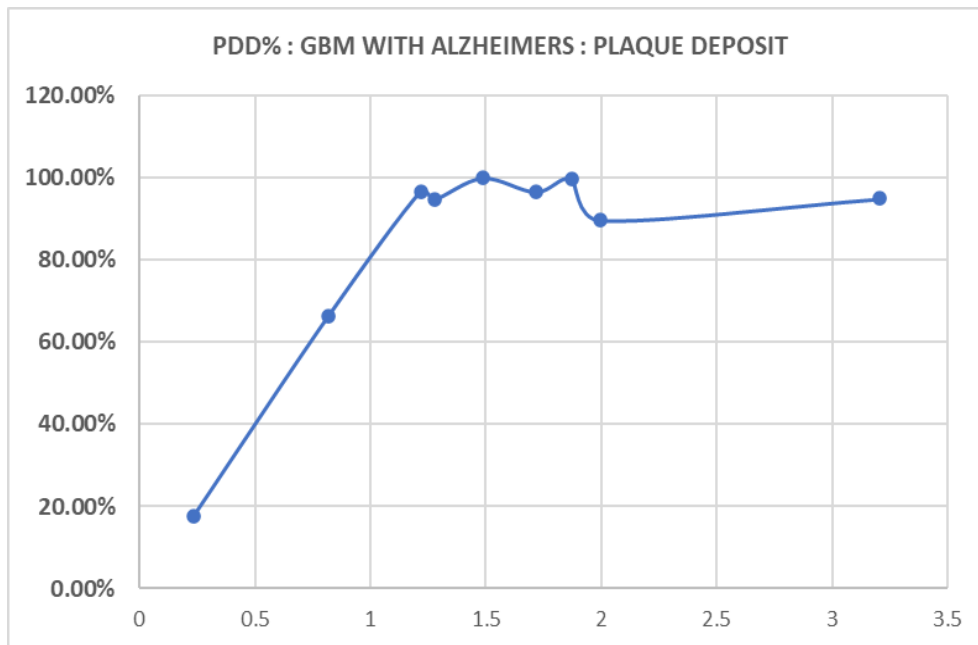
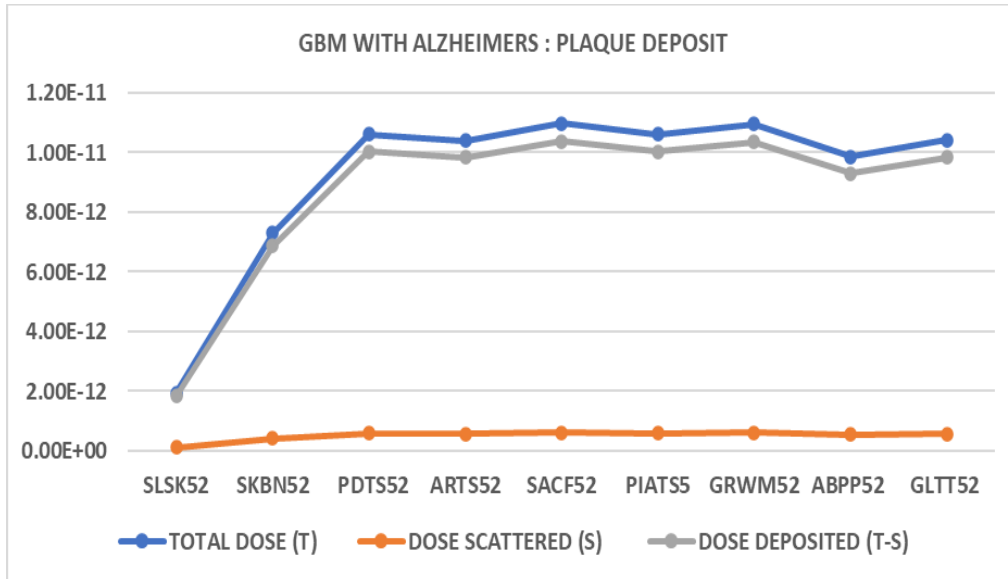




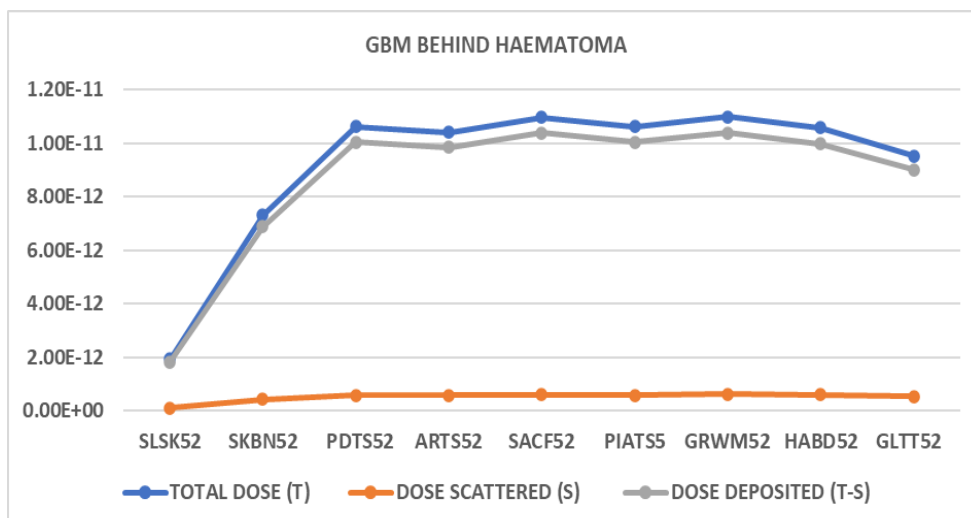
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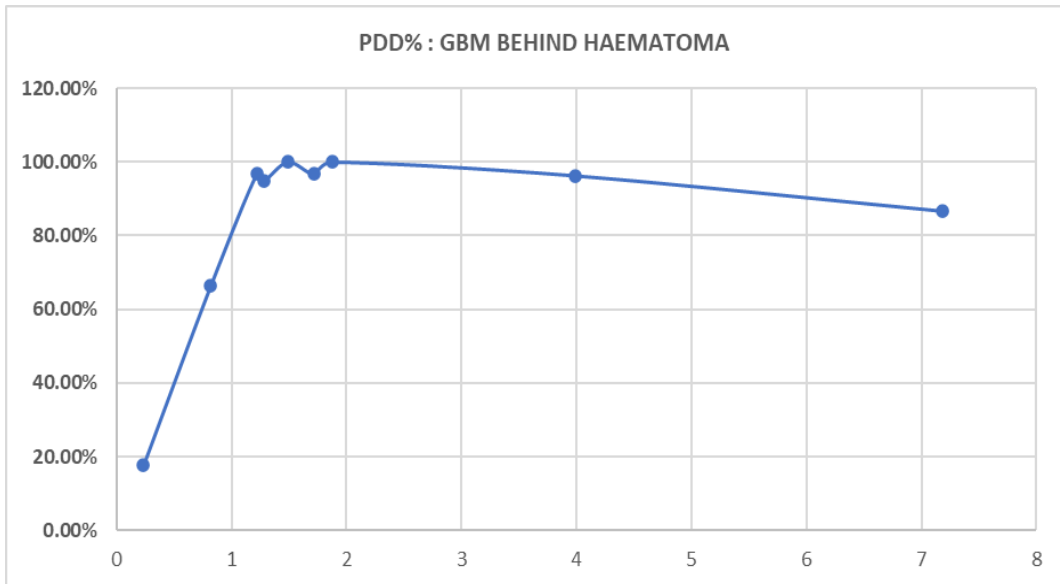


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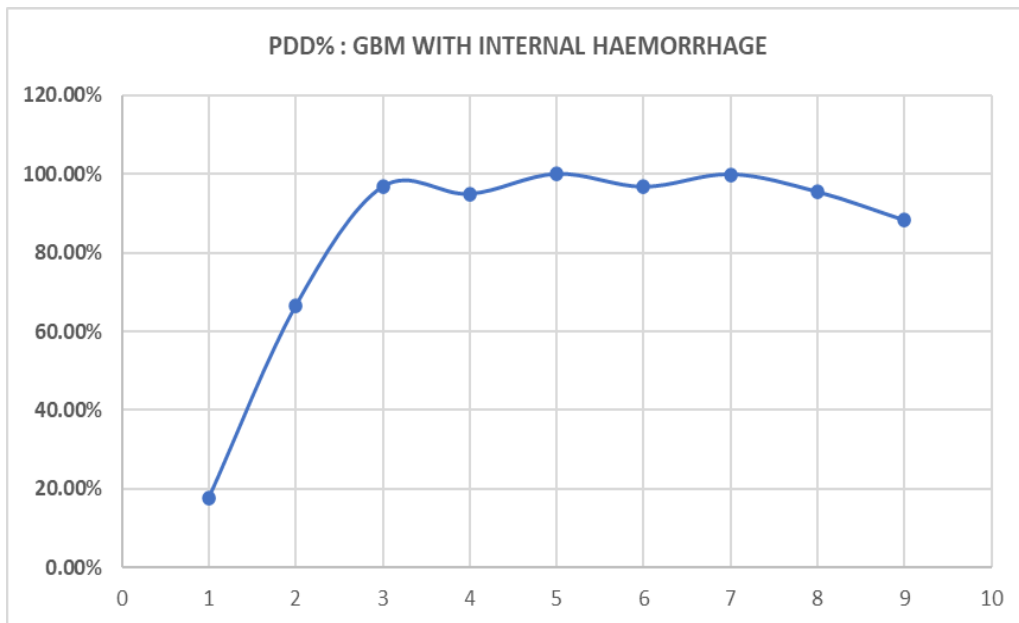
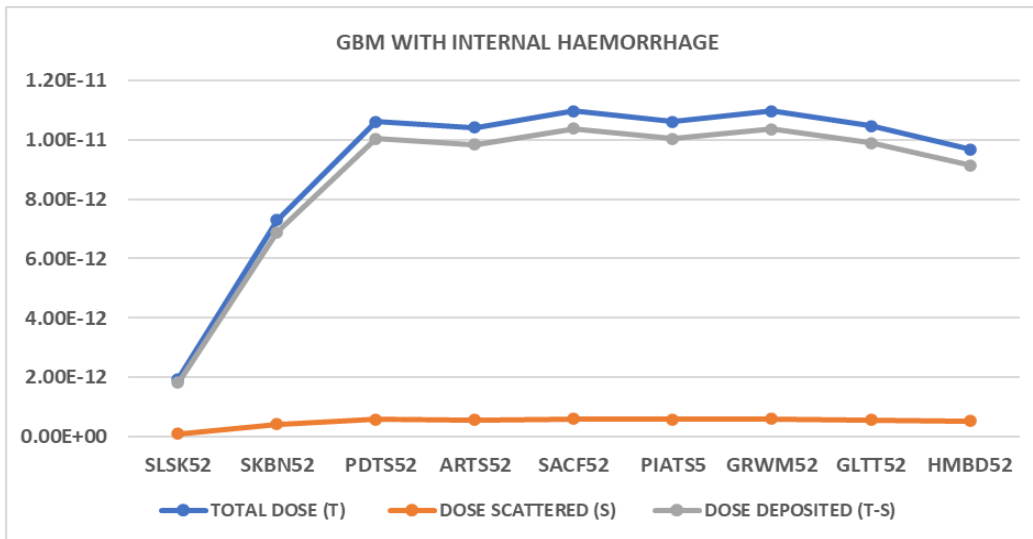


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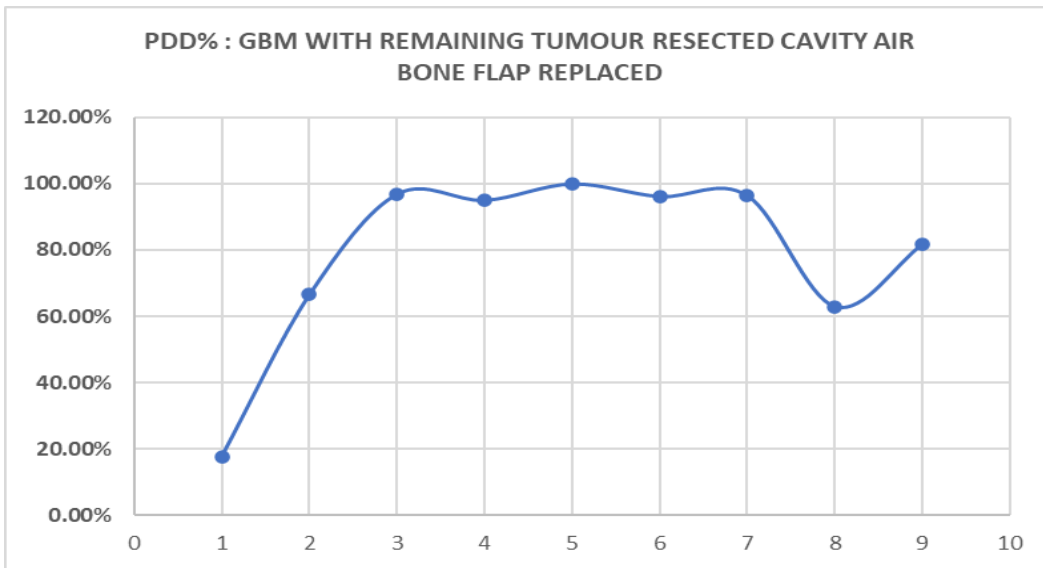
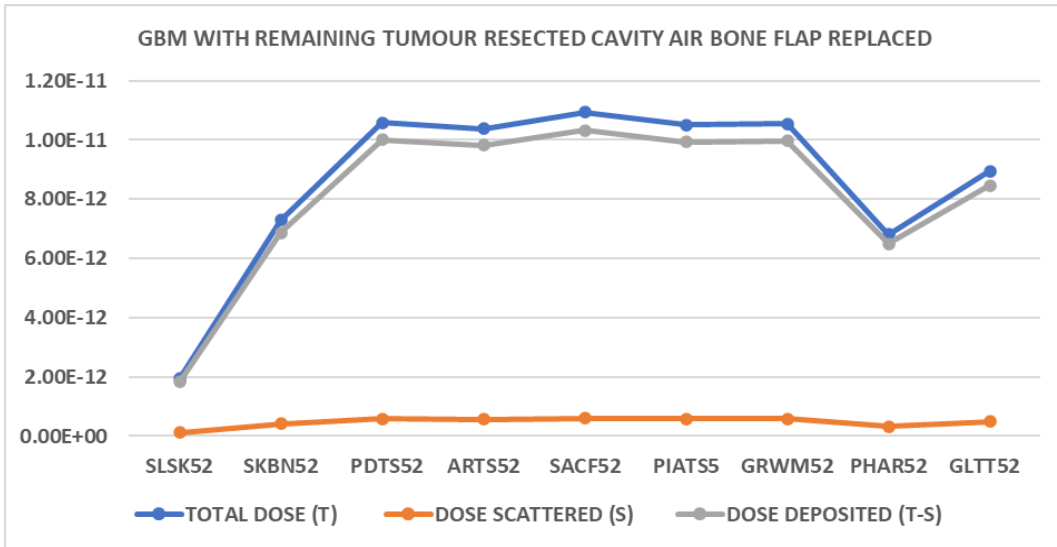




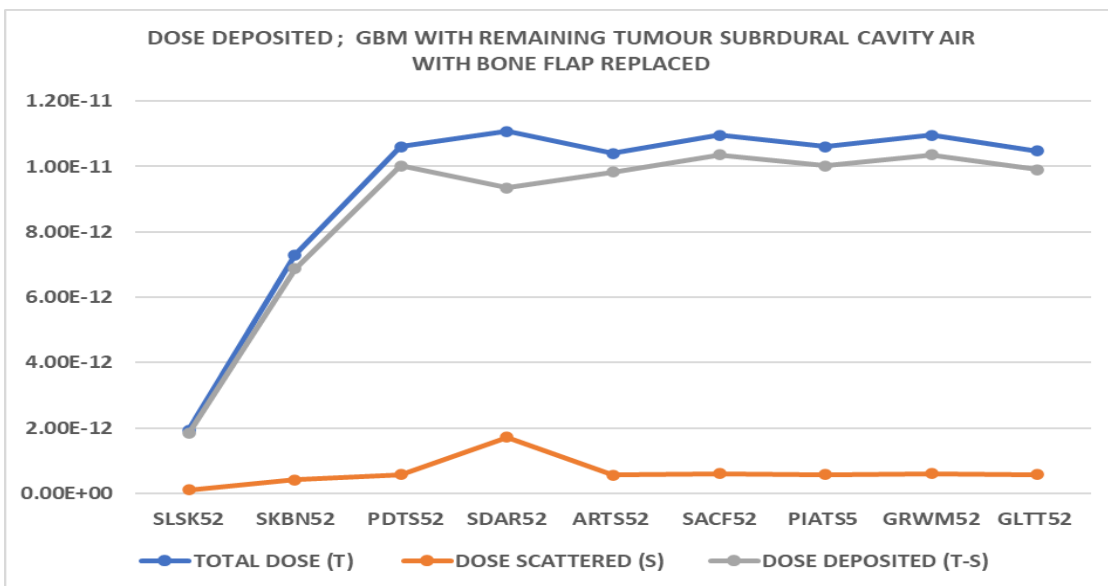
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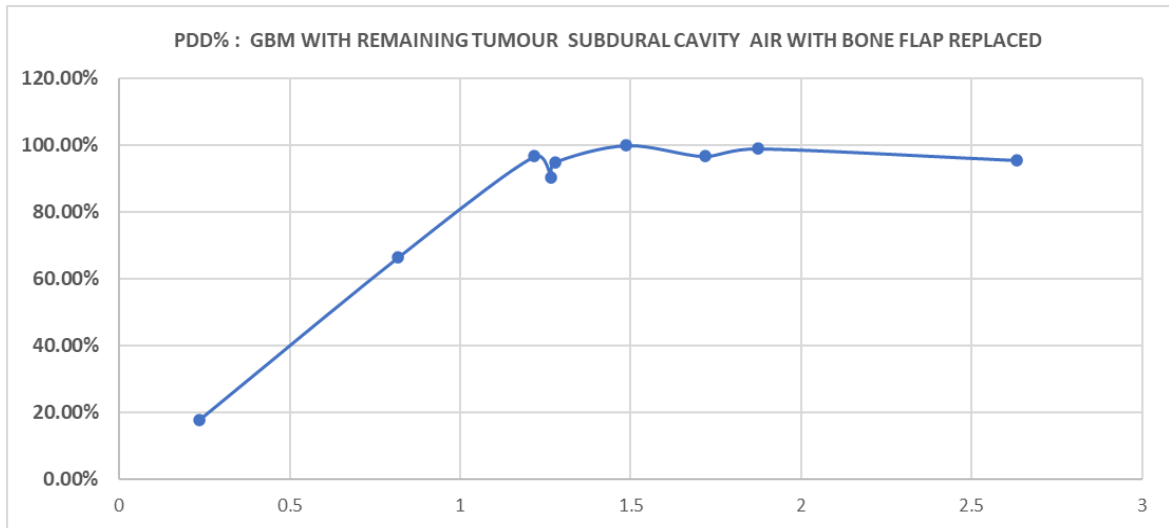


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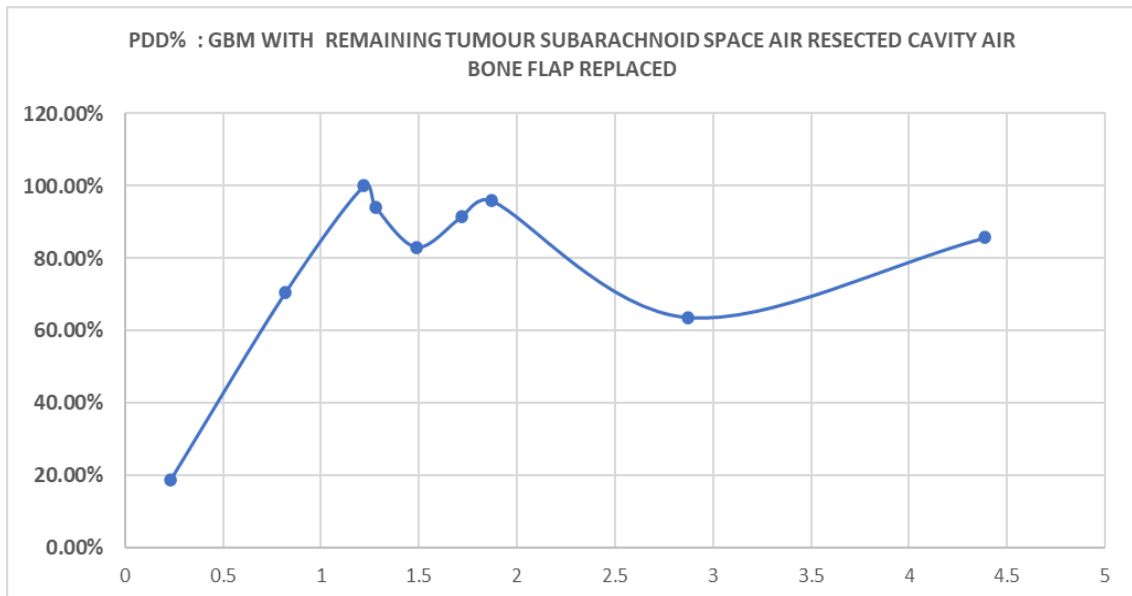
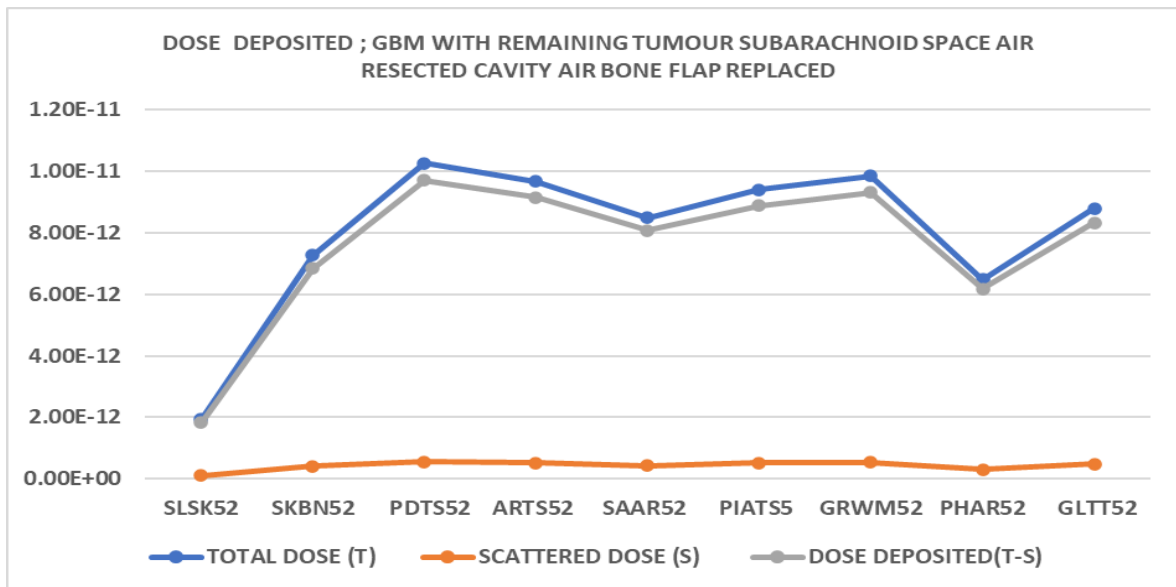


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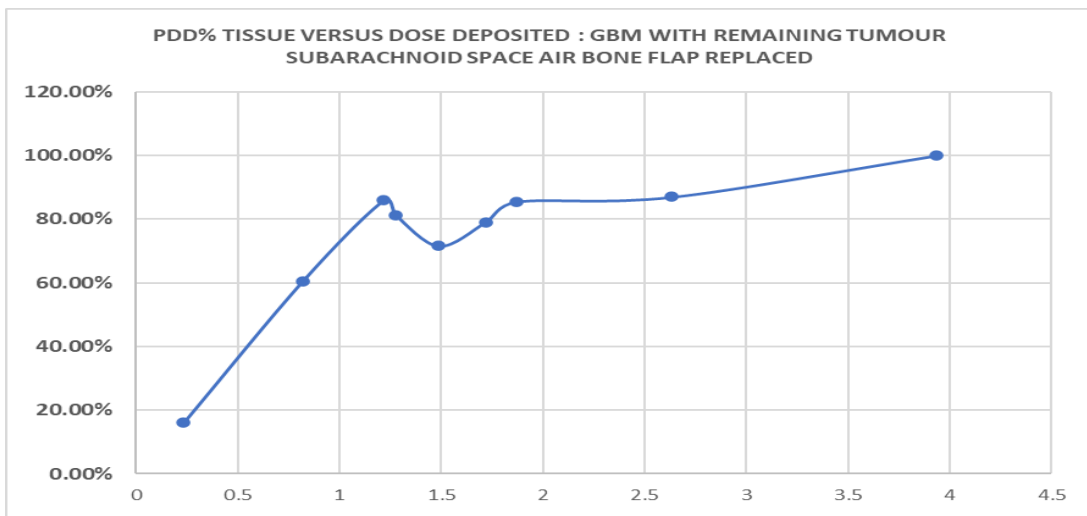
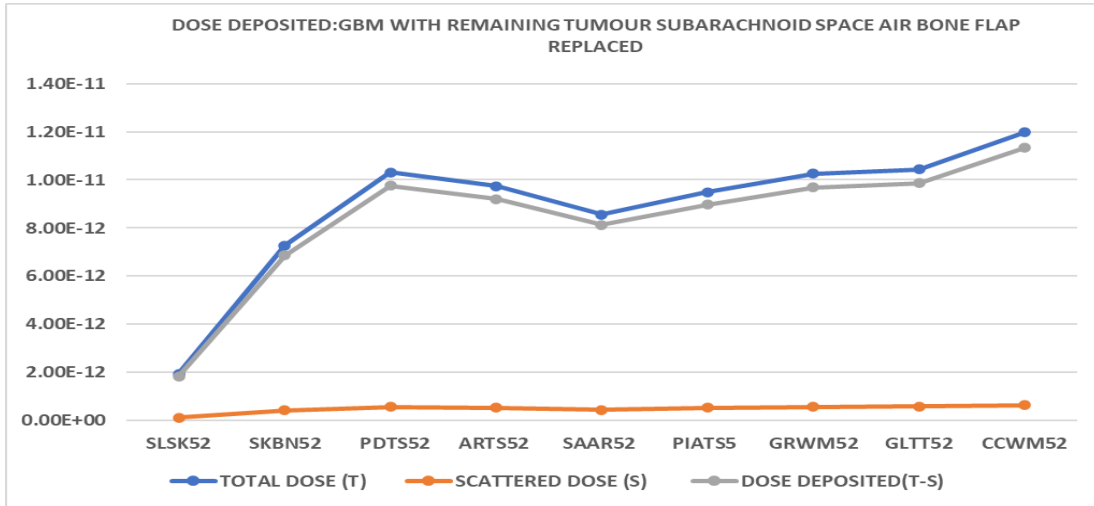




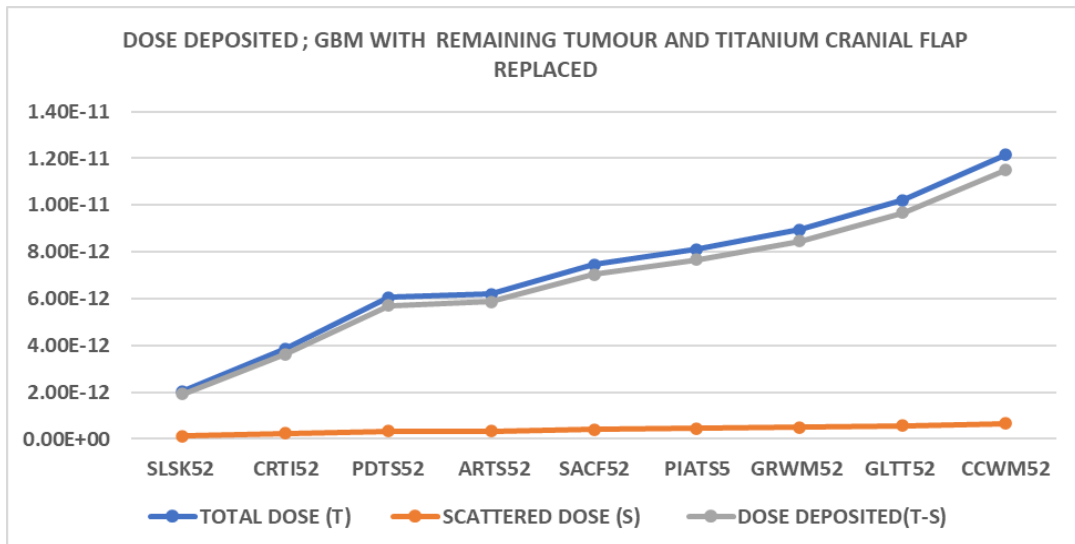
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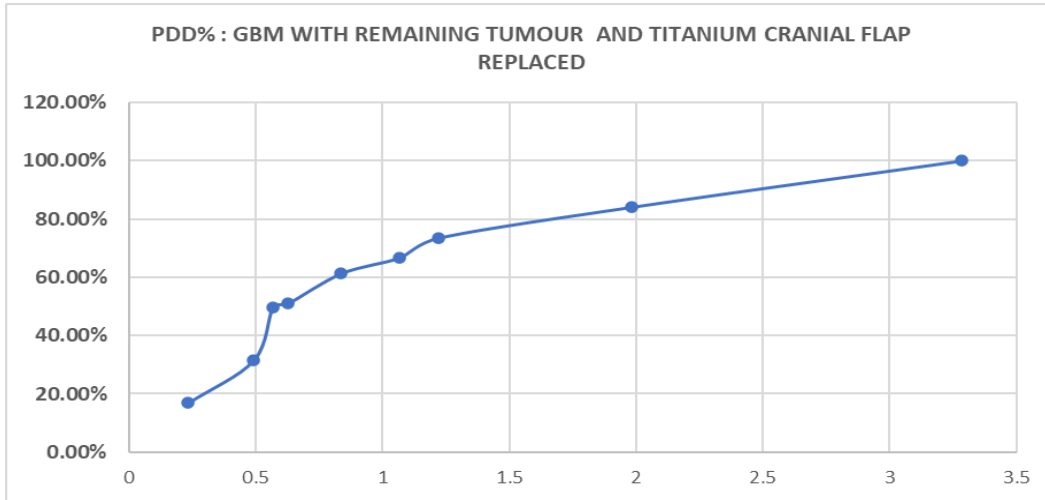


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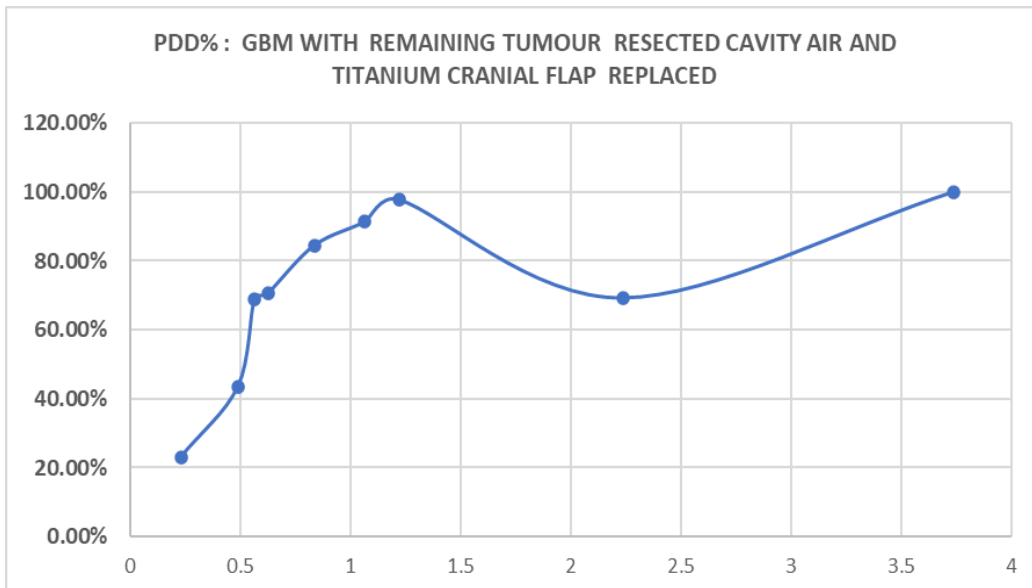
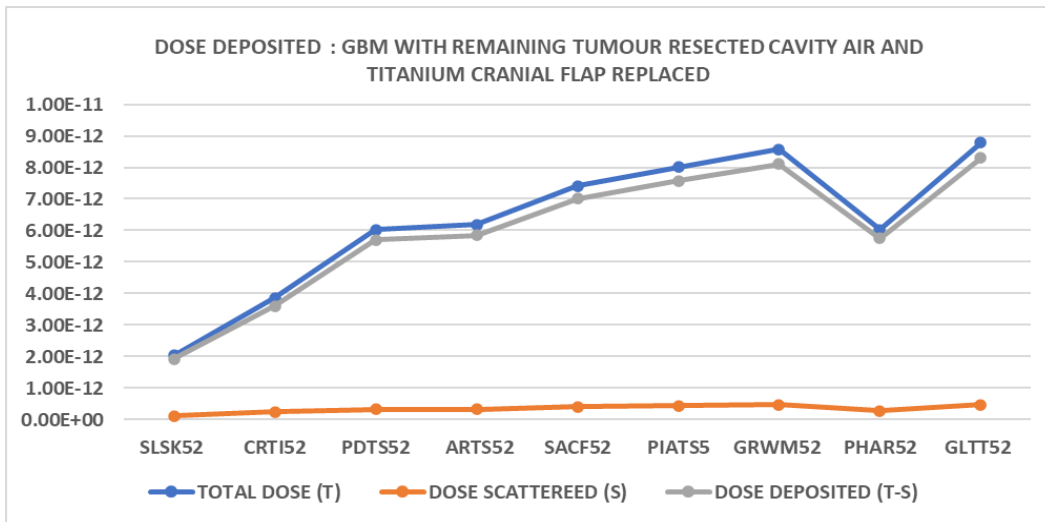


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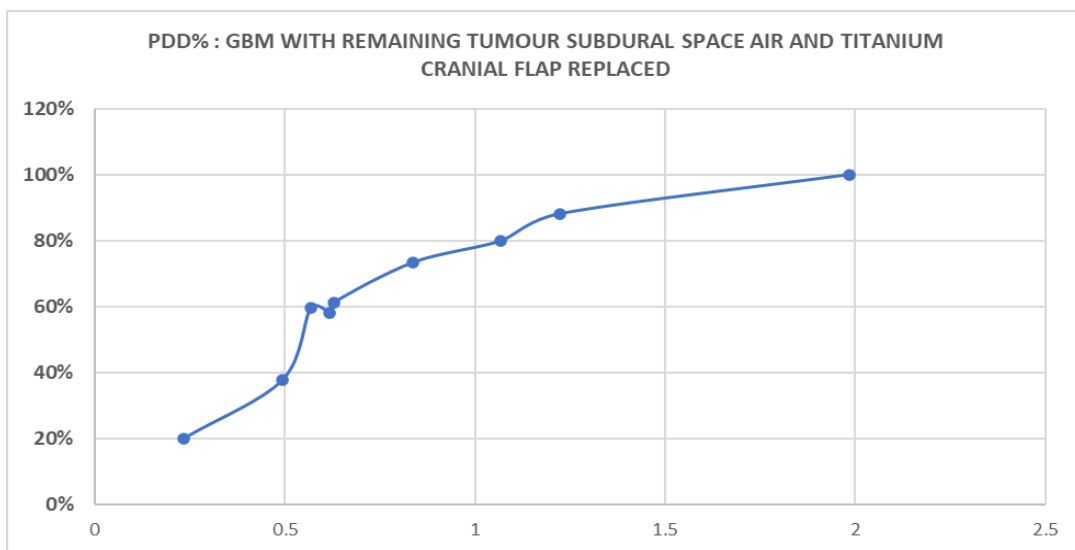
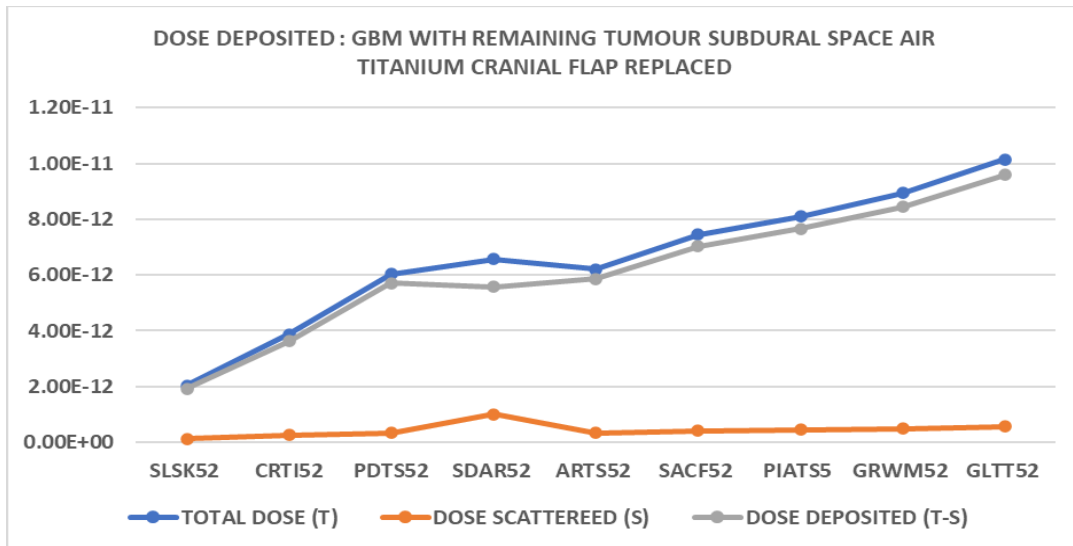




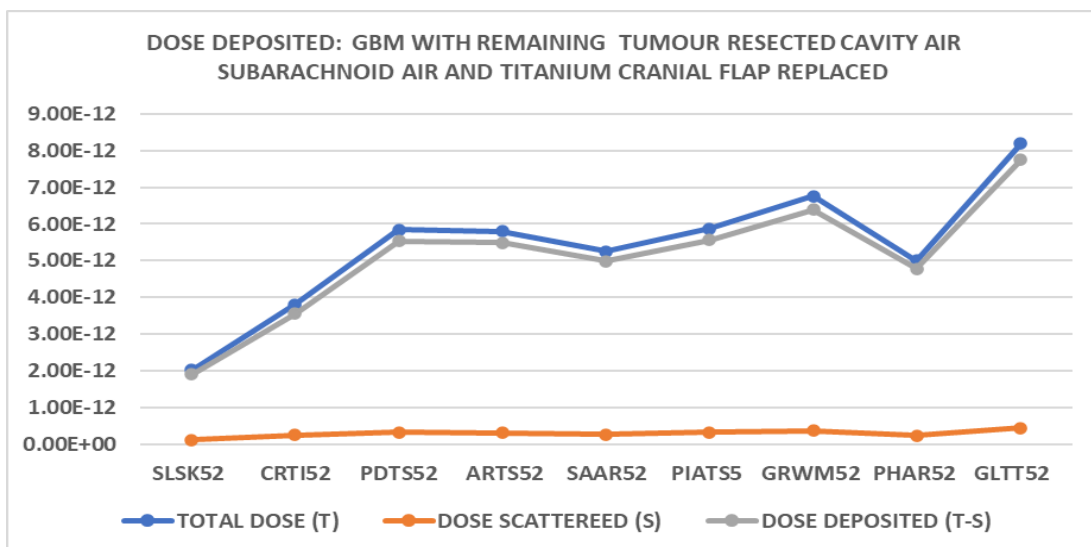
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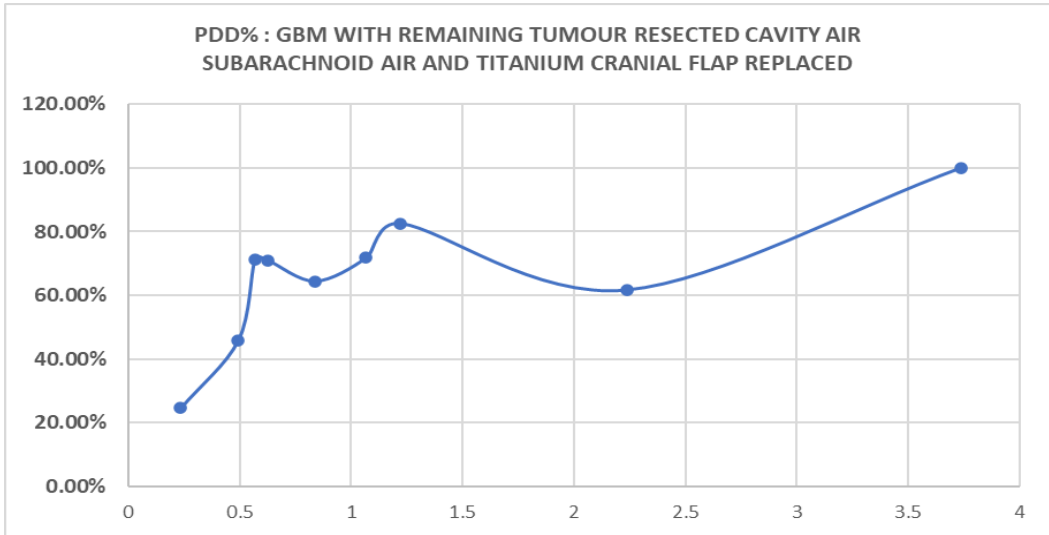


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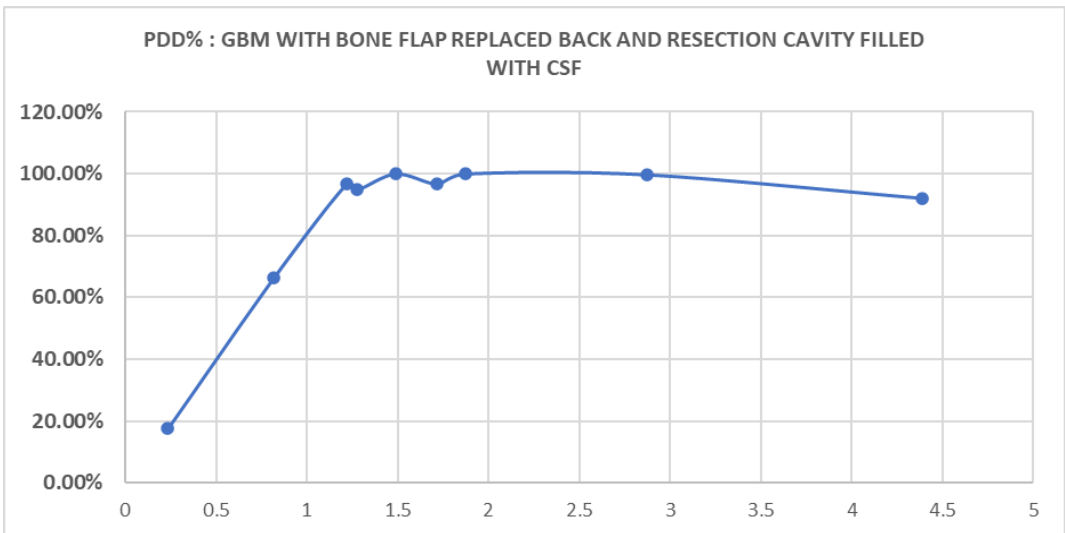
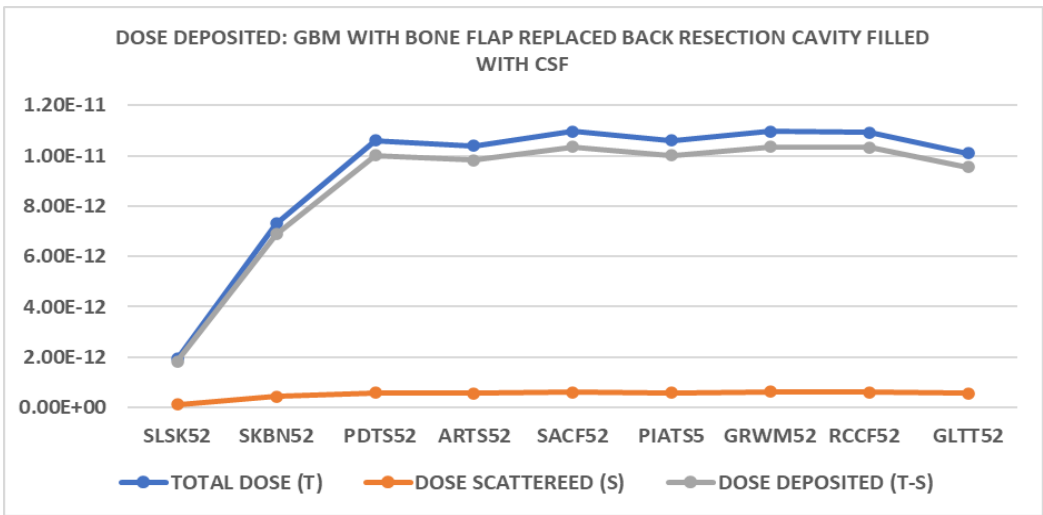


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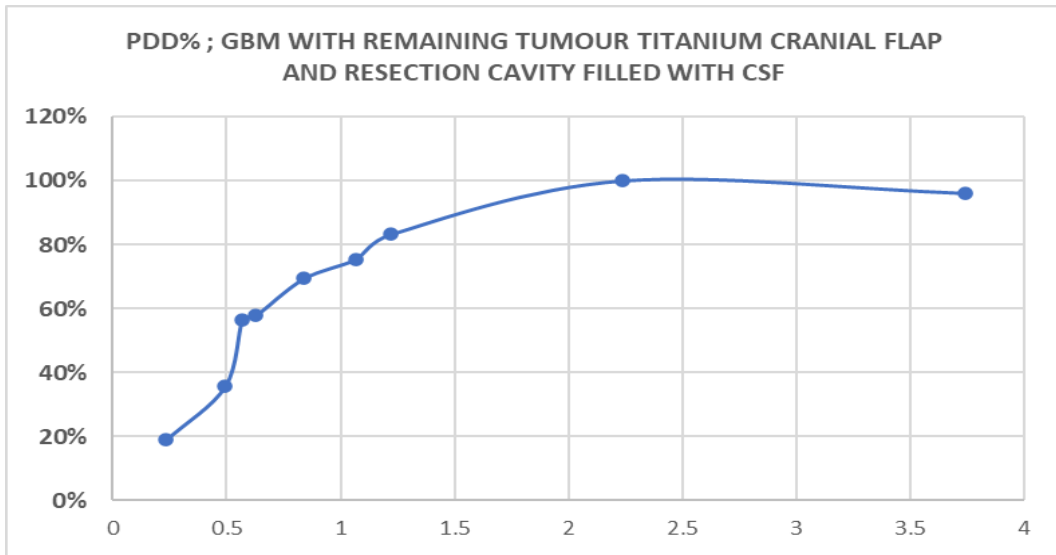
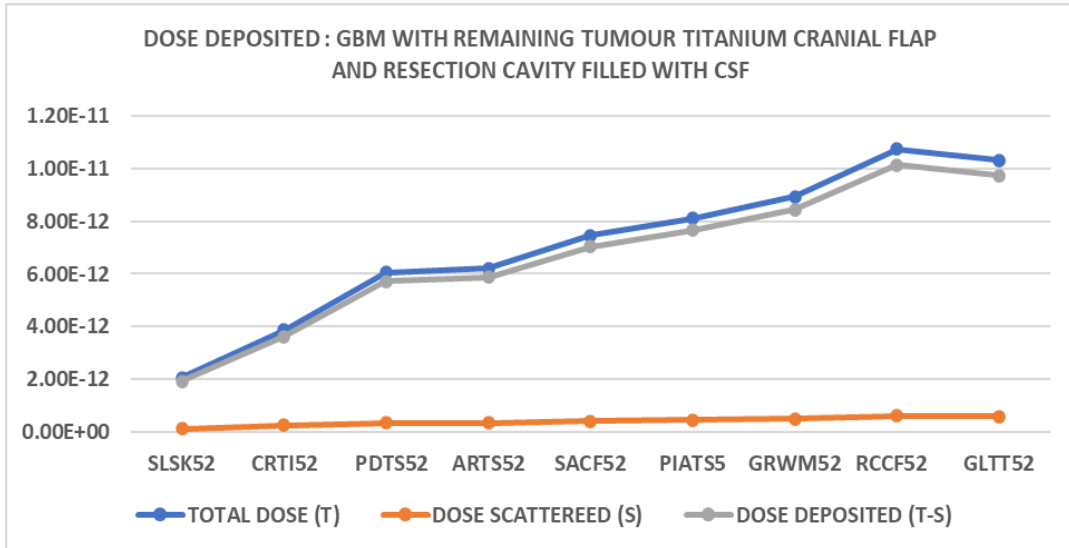




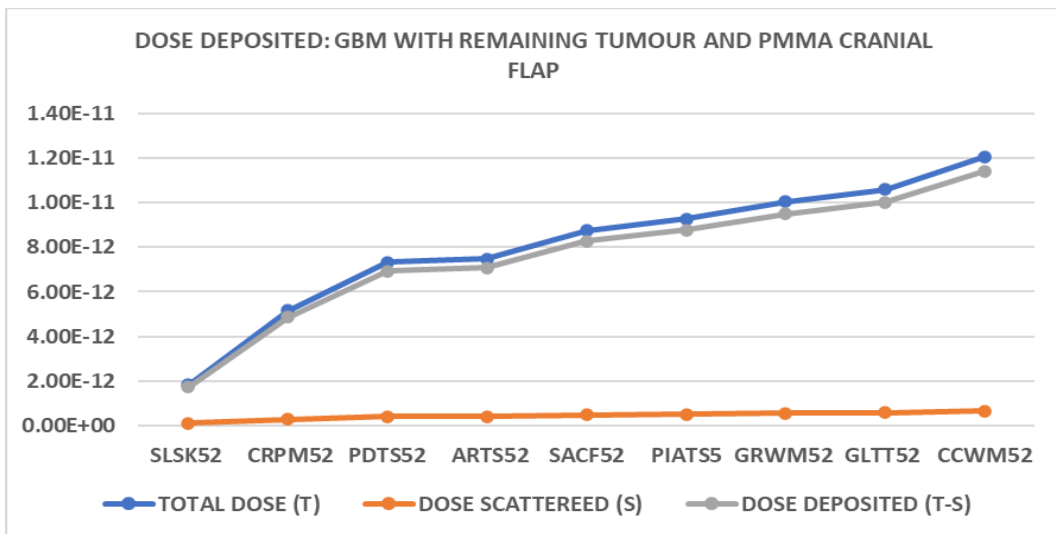
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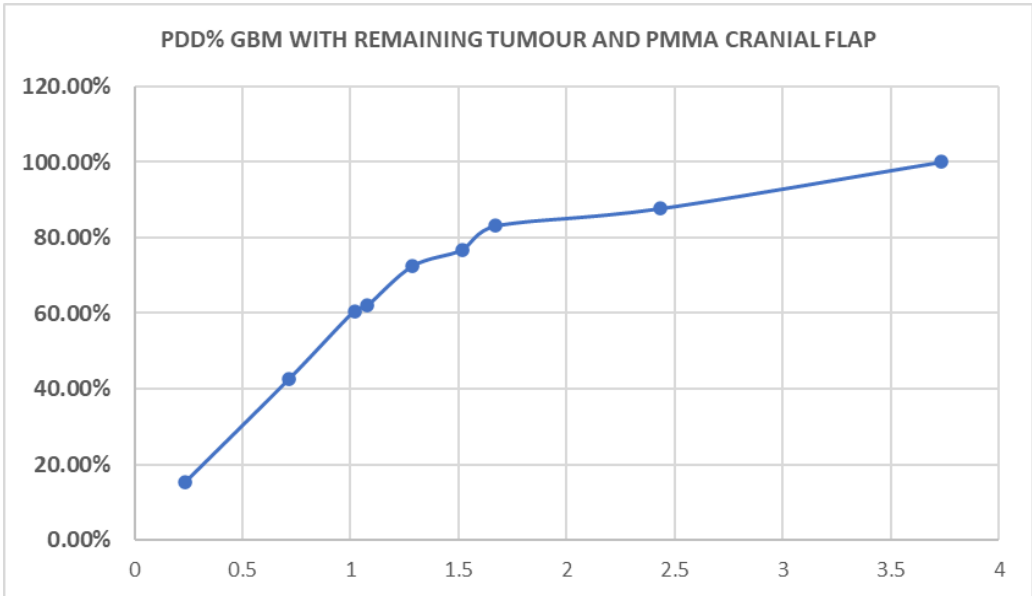


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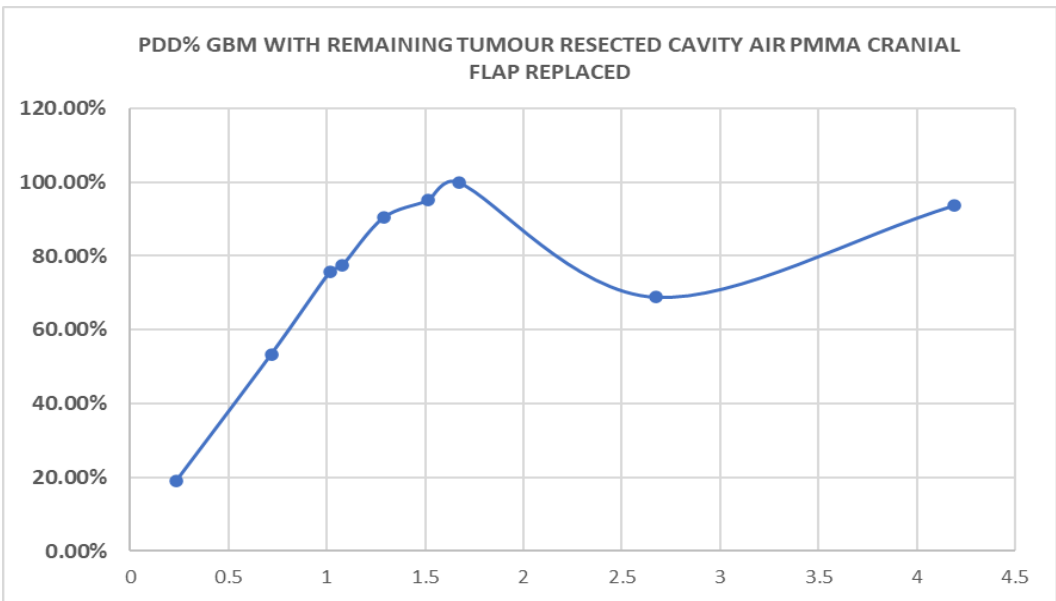
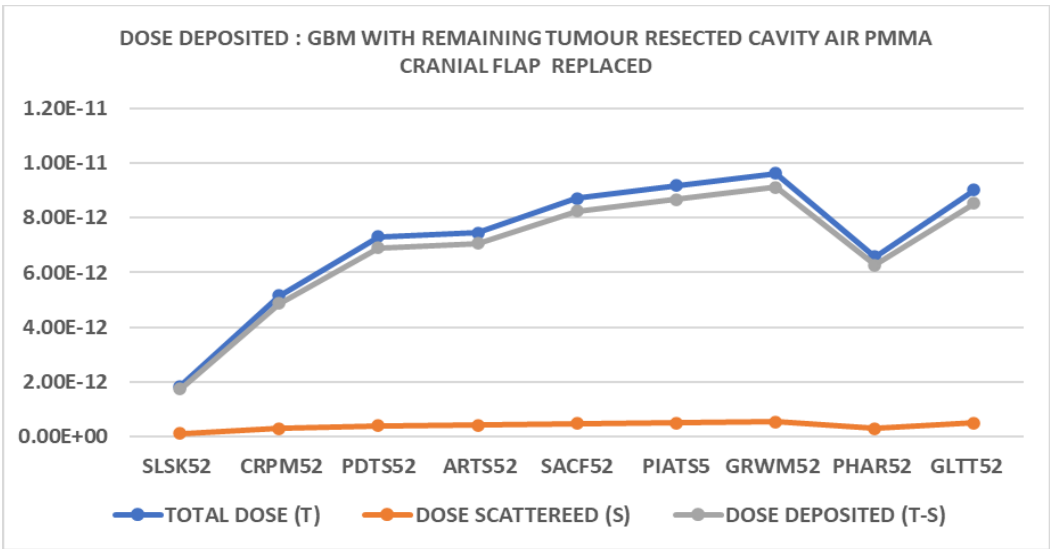


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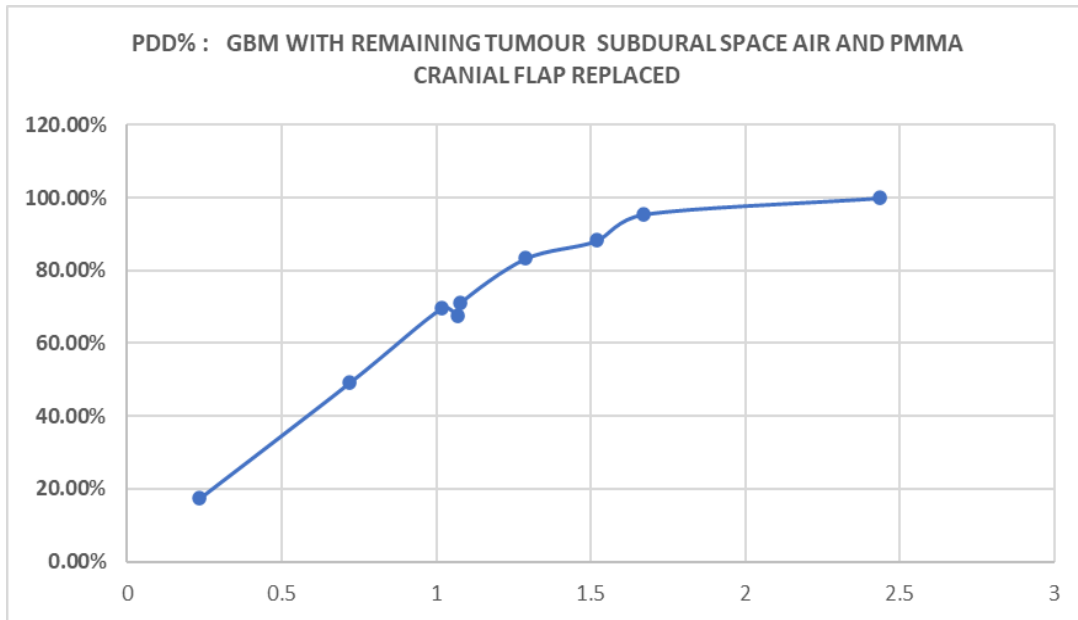
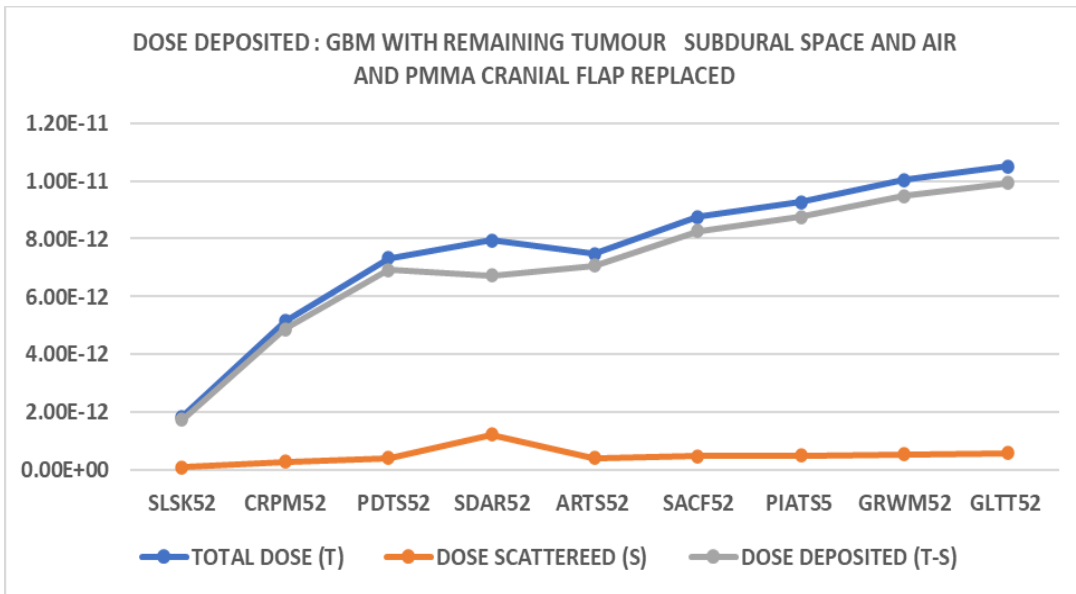




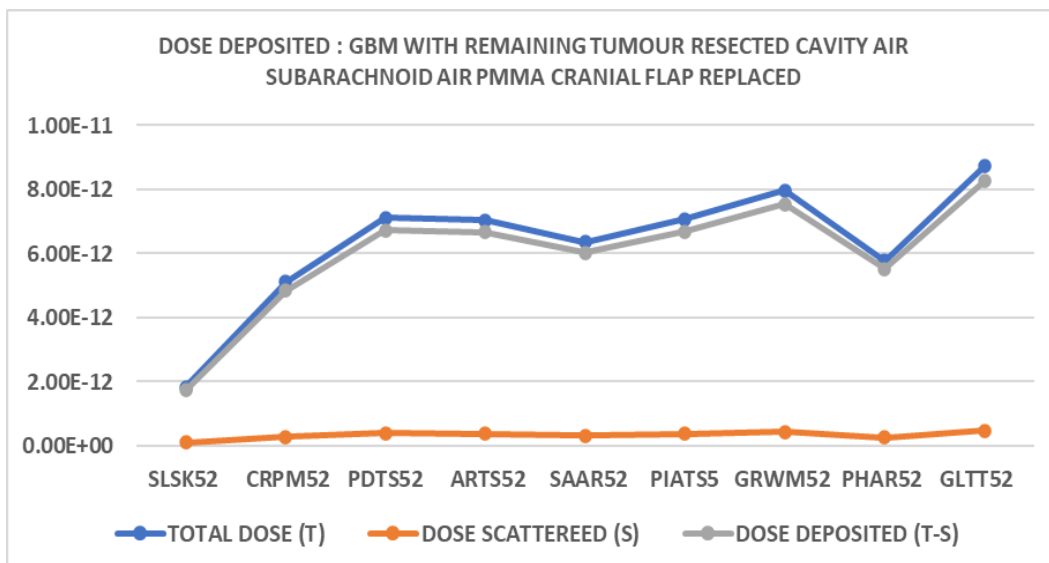
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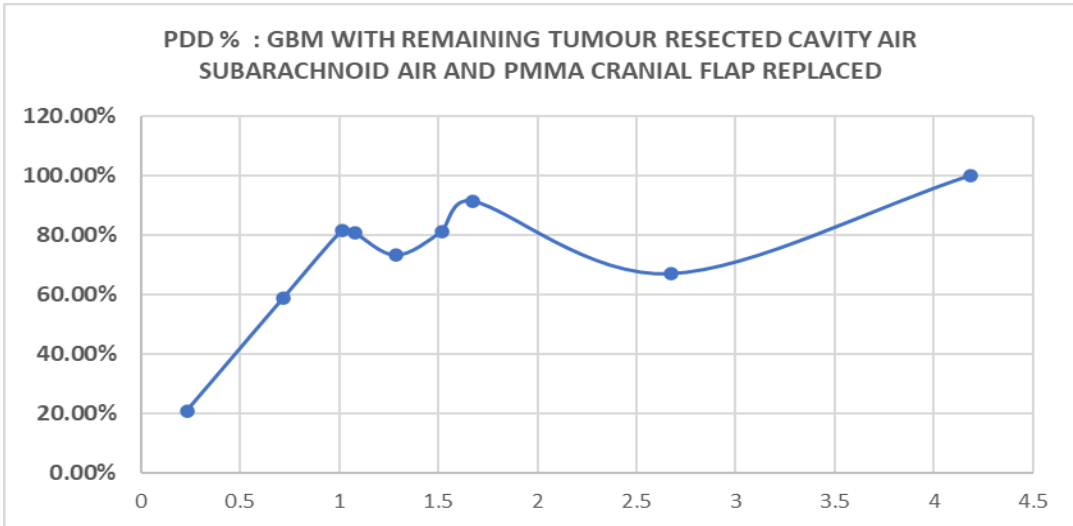


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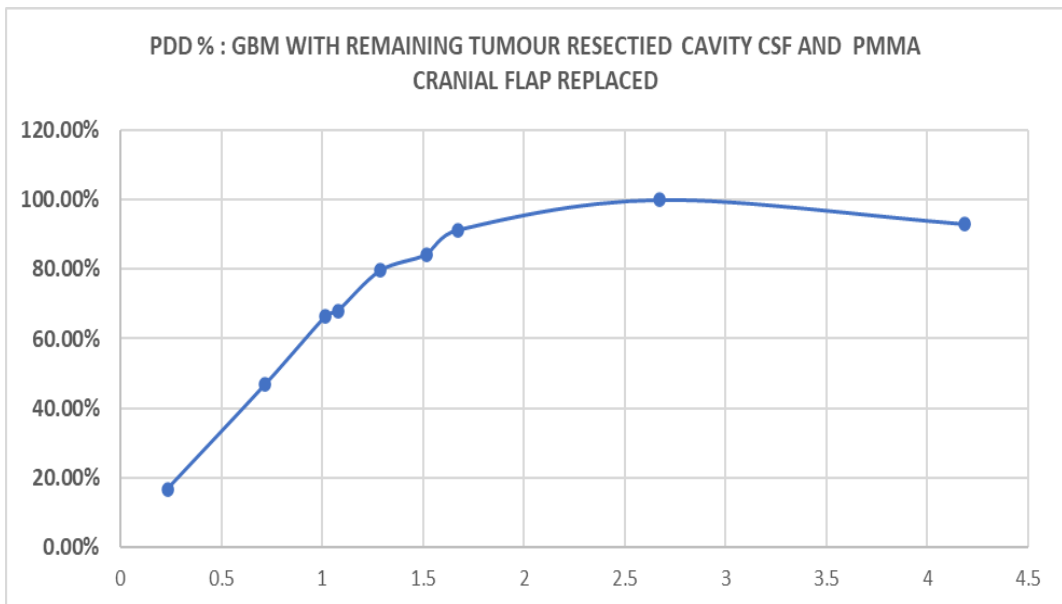
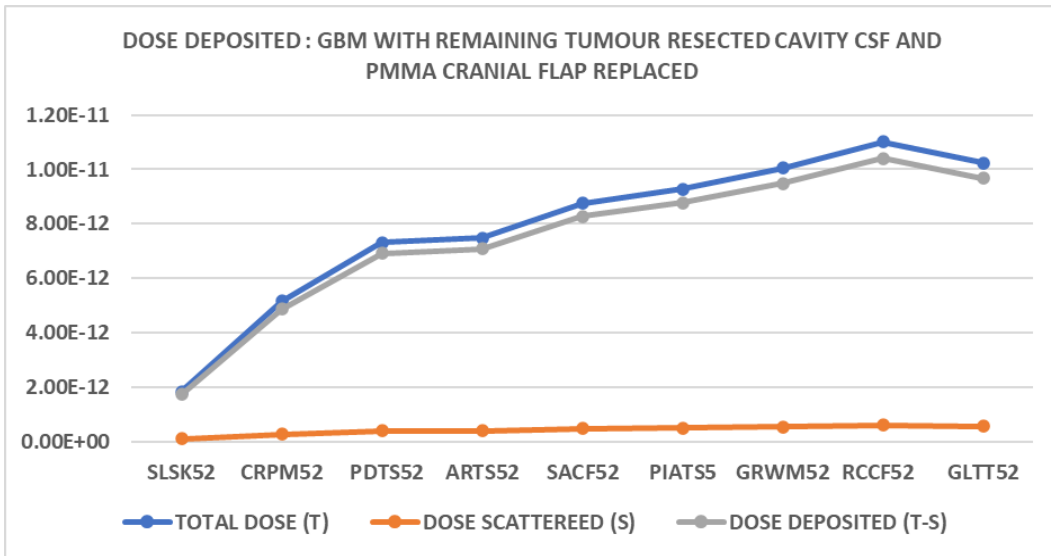


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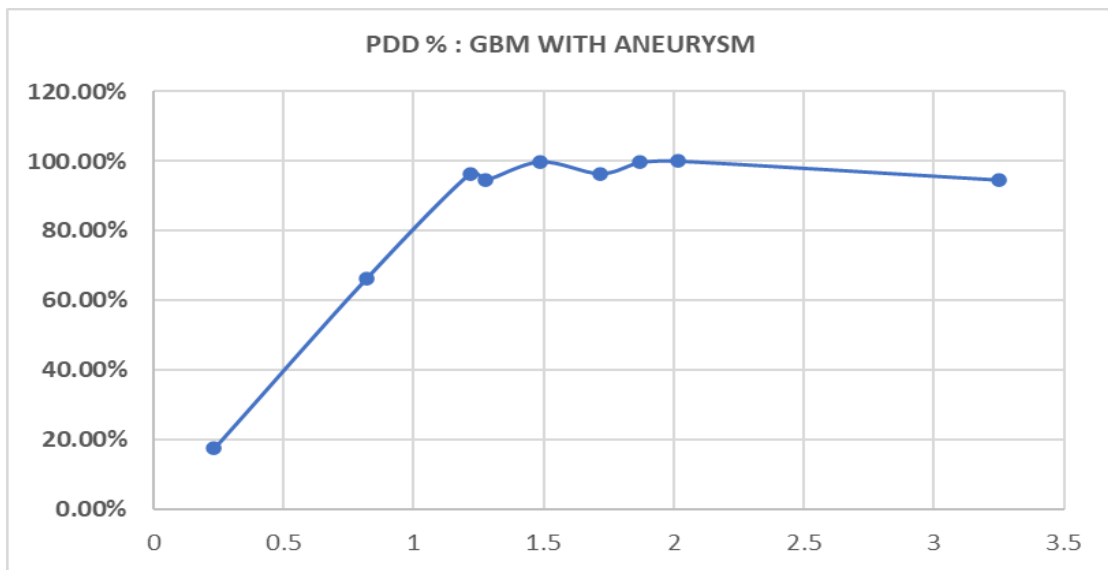
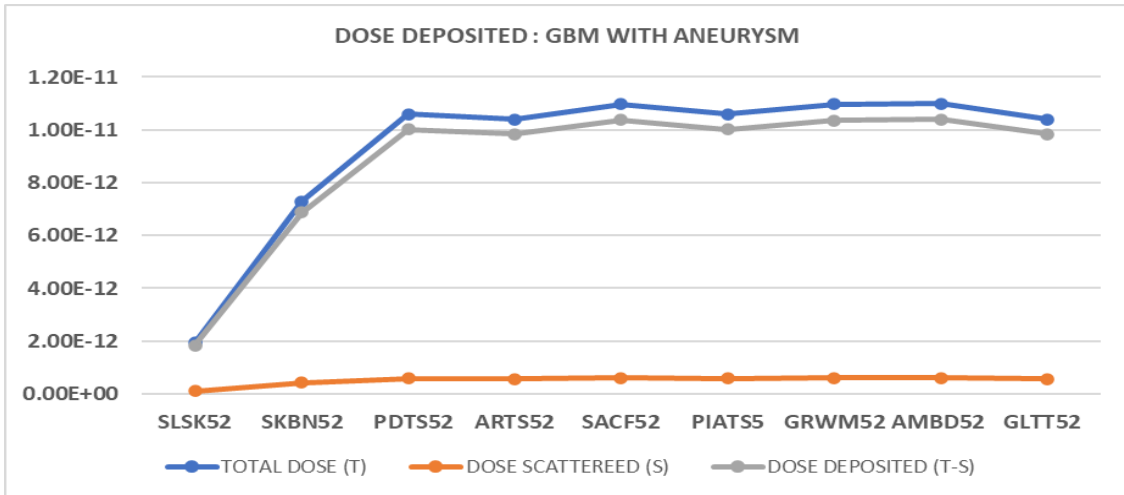




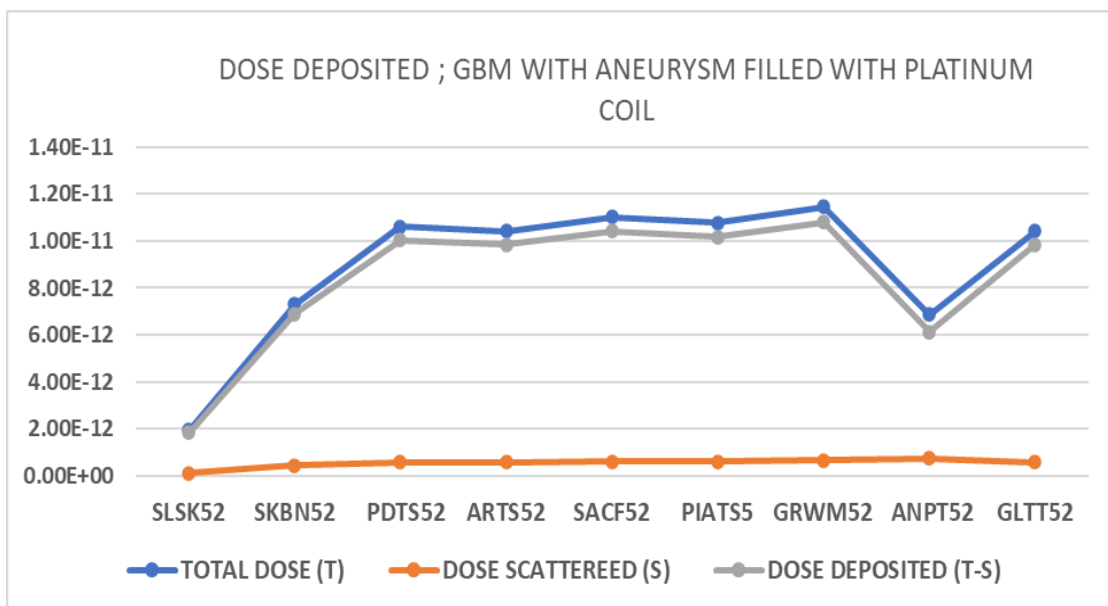
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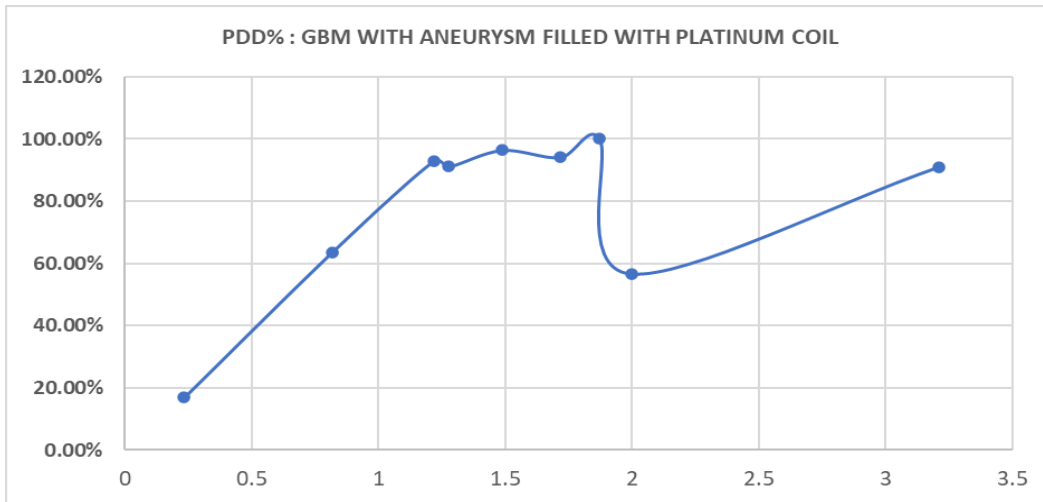


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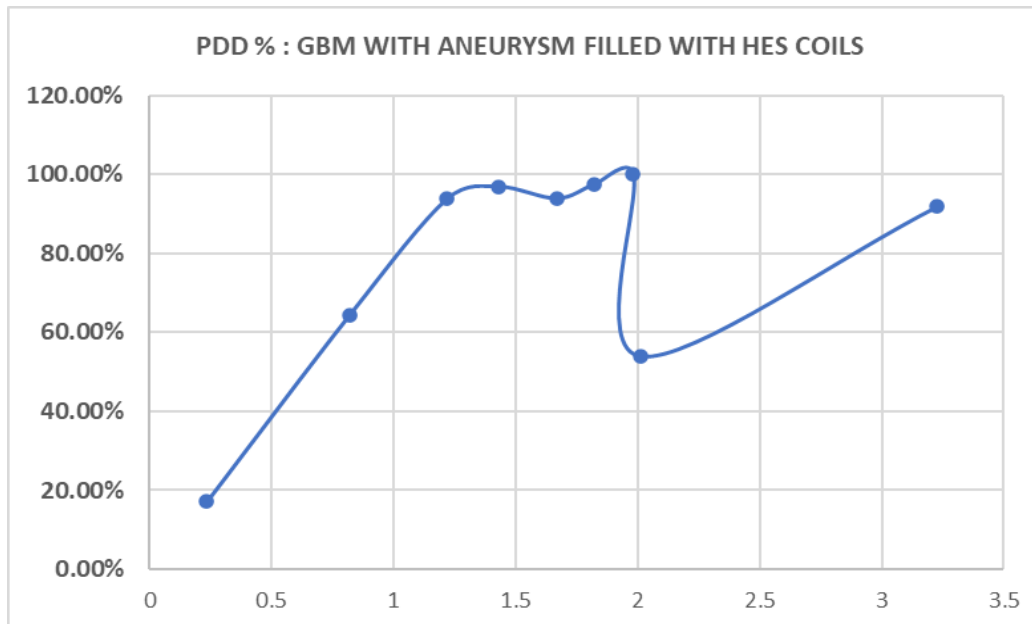
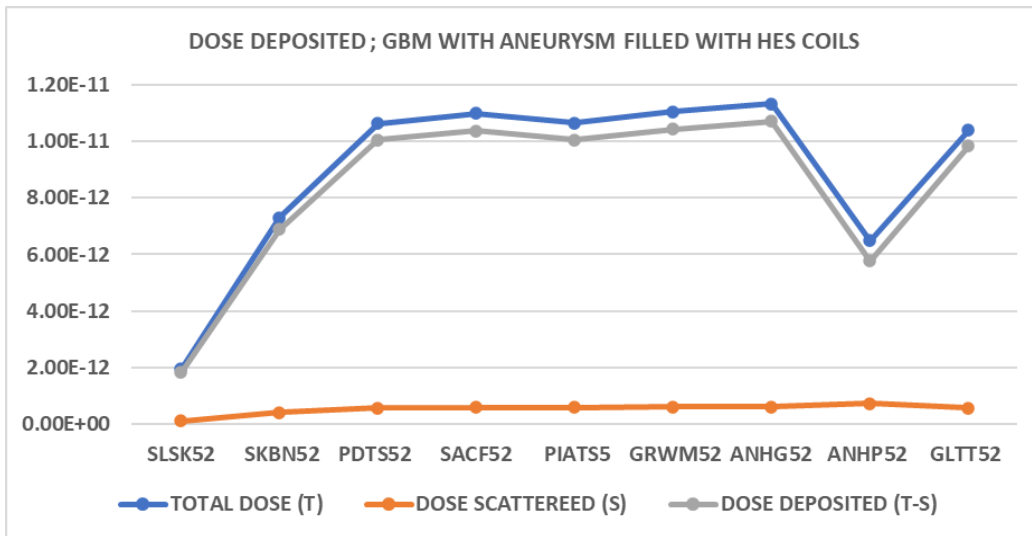


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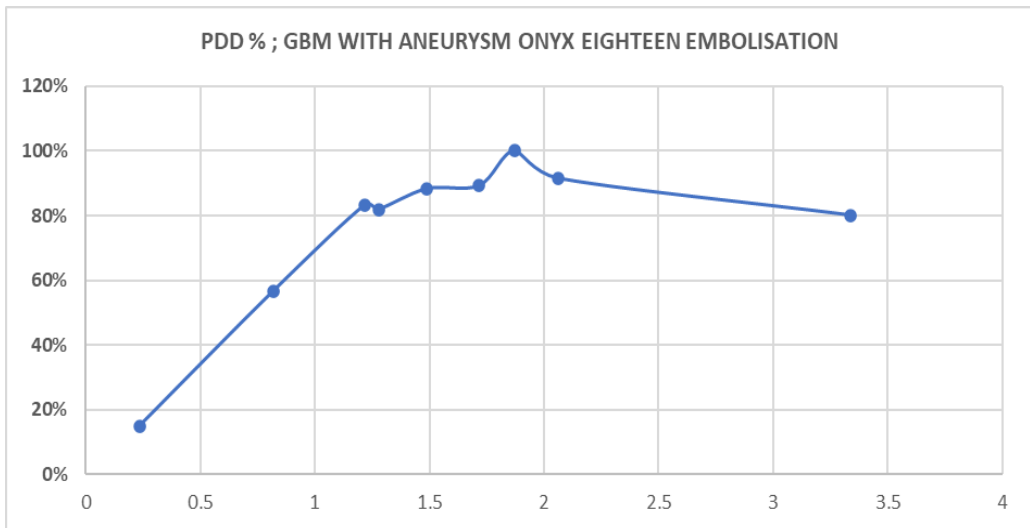
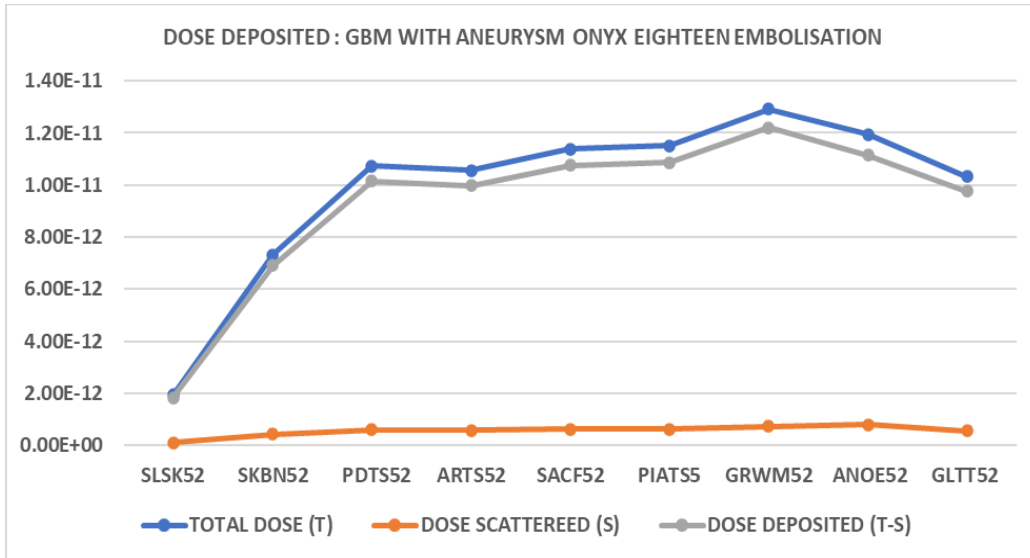




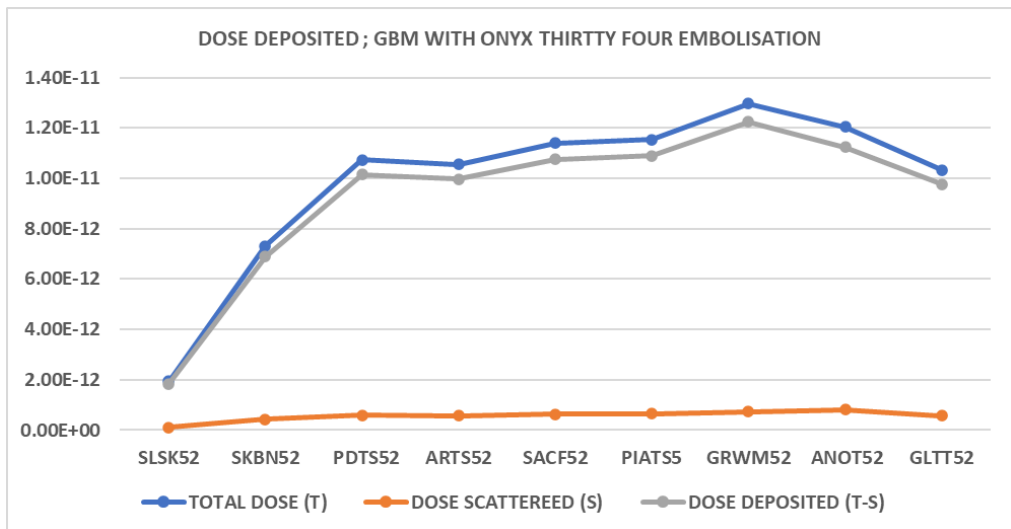
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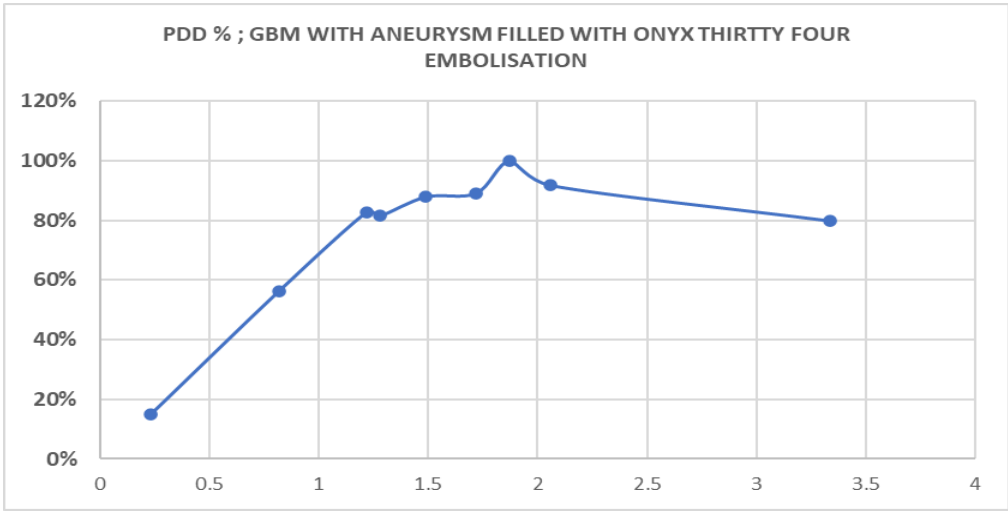


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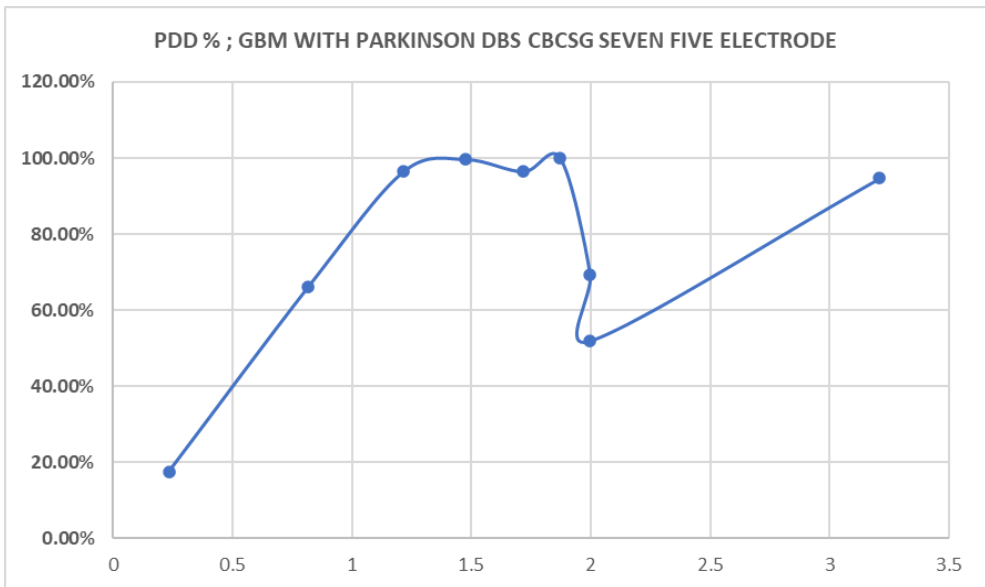
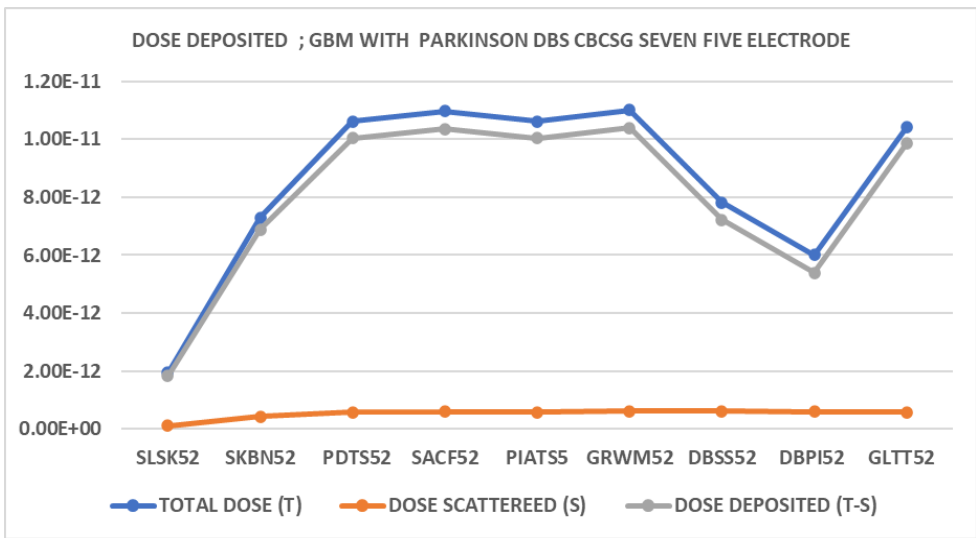


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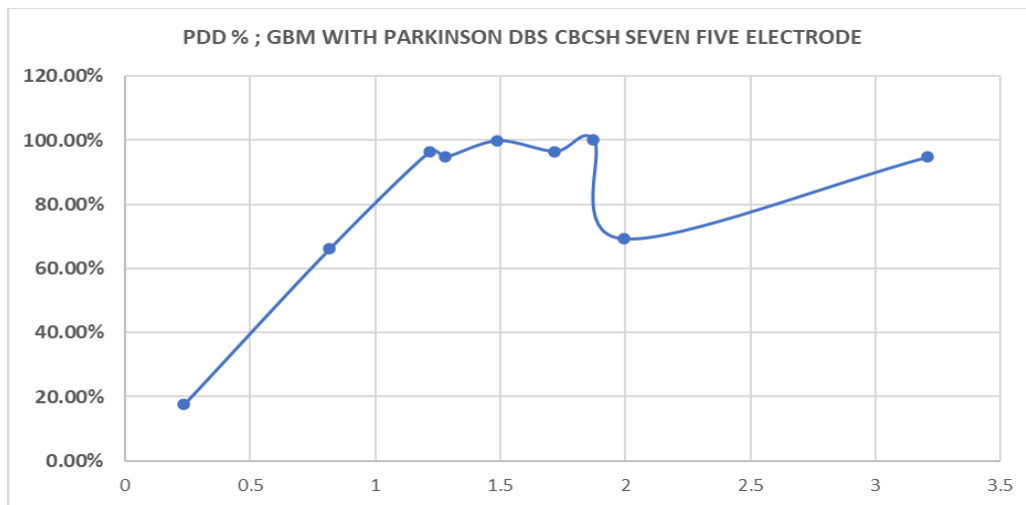
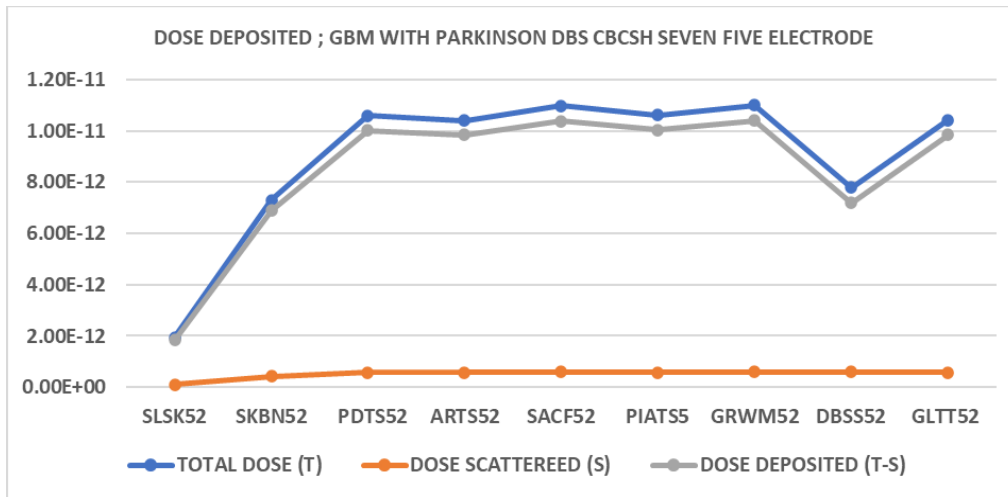




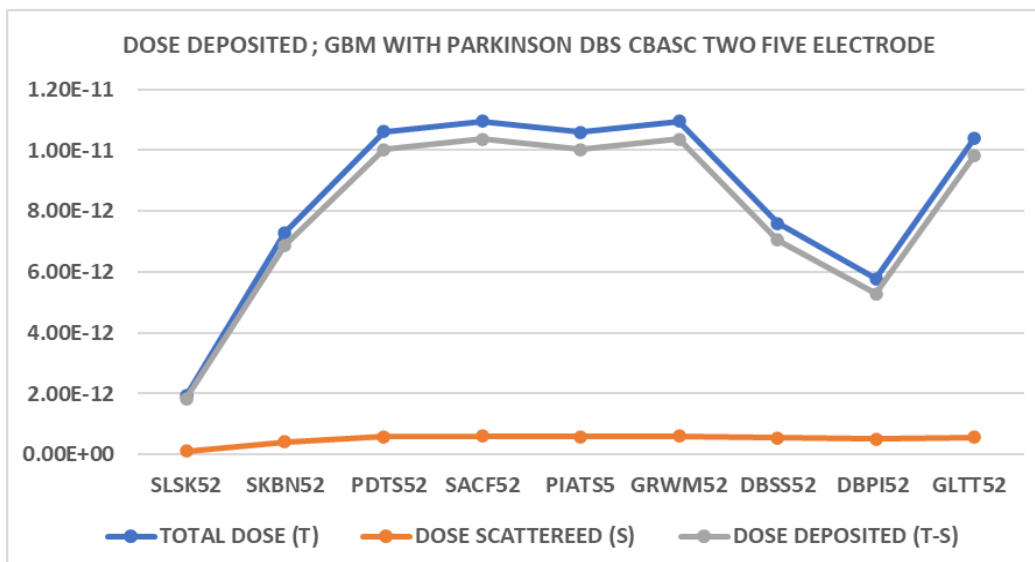
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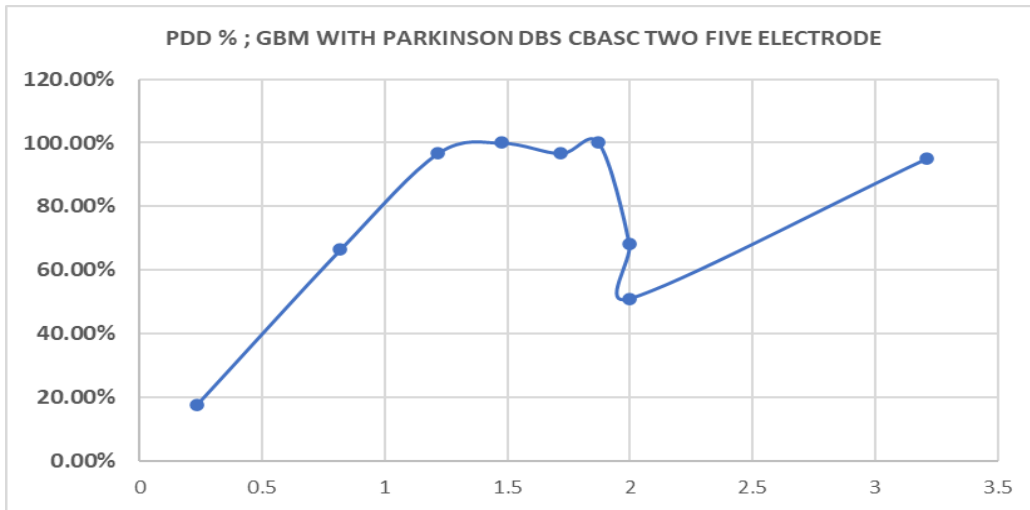


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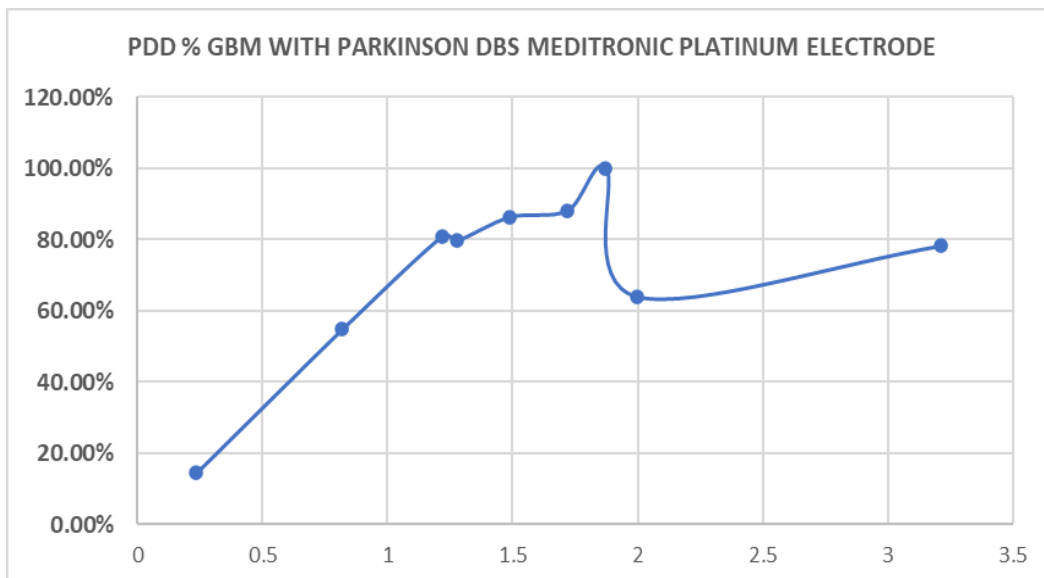
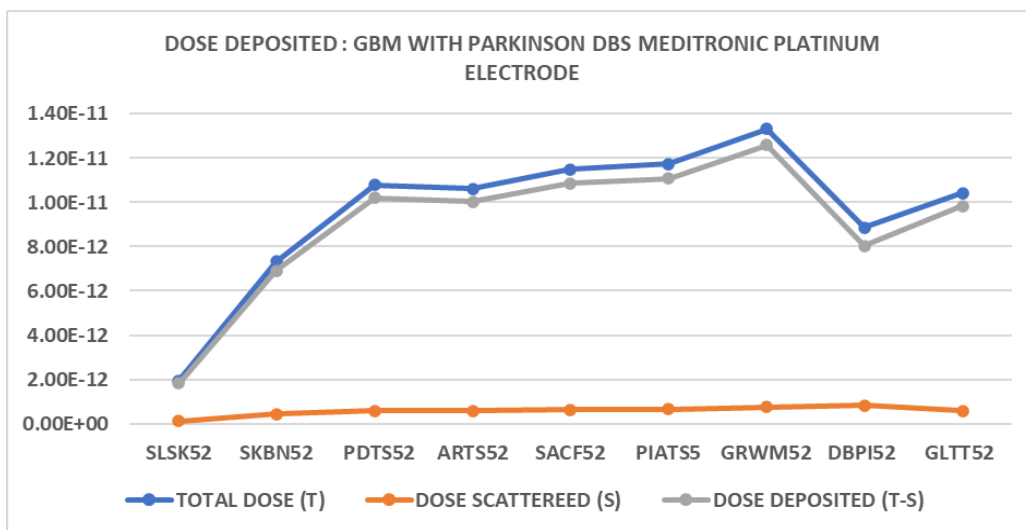


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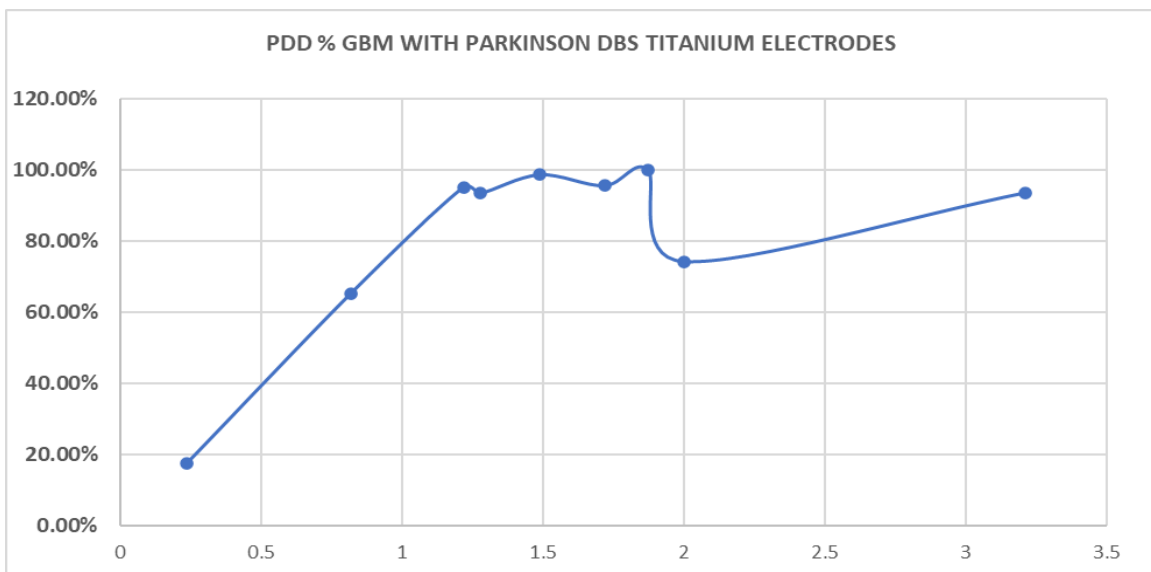
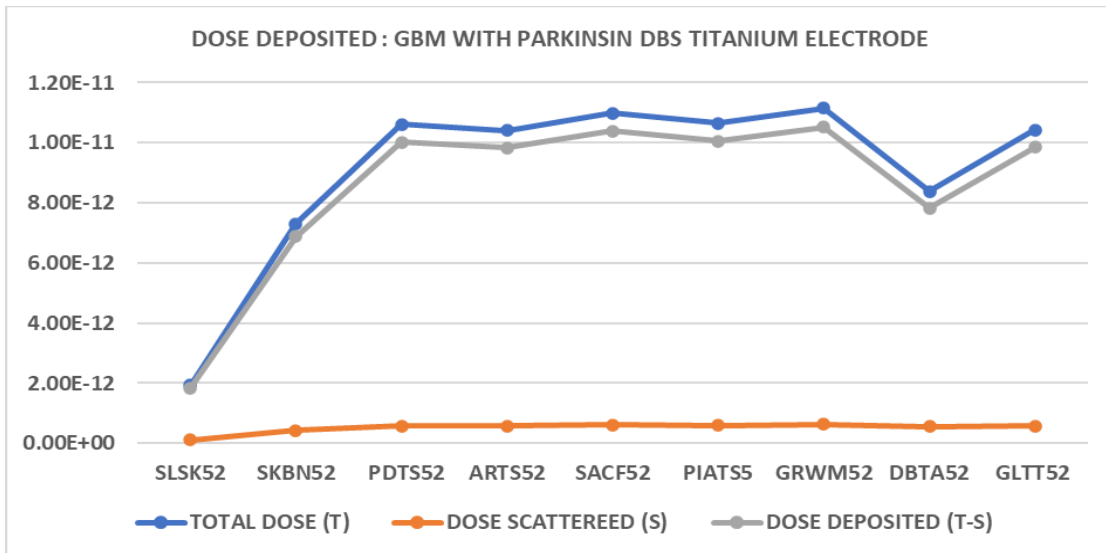




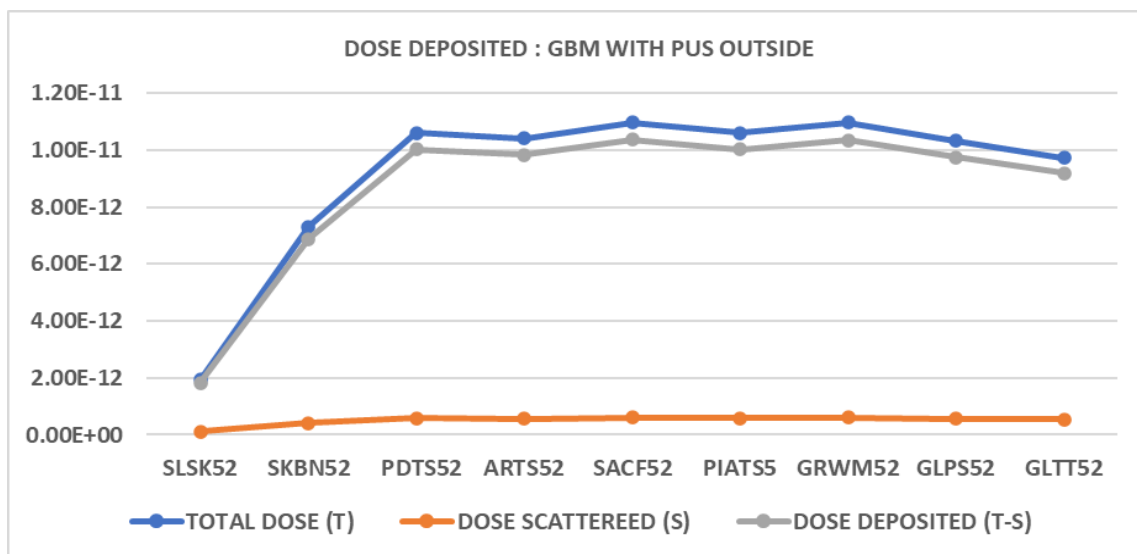
GBM 34

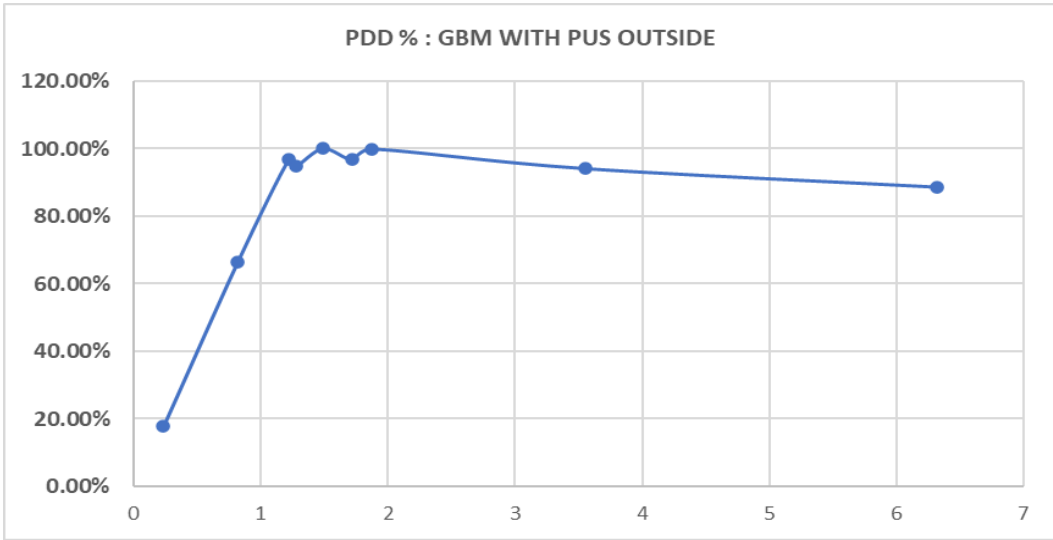


GBM 35

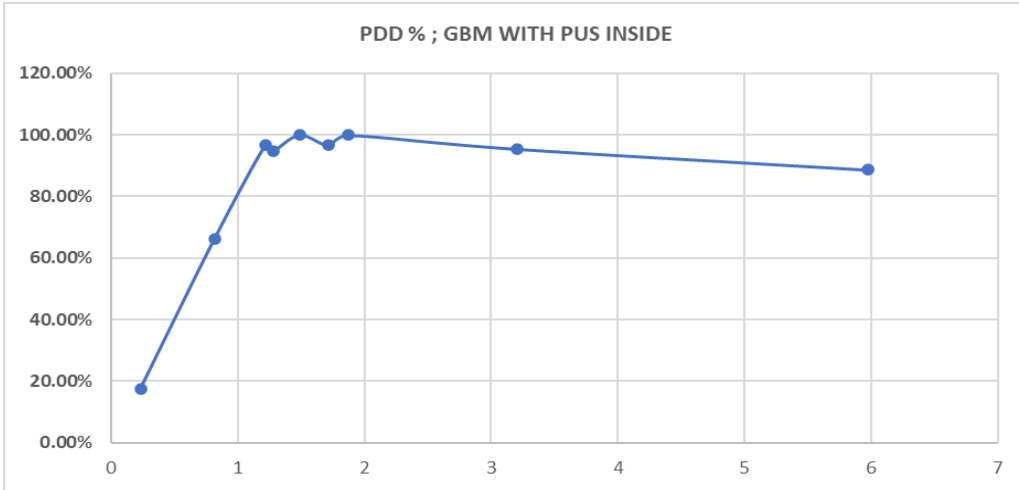
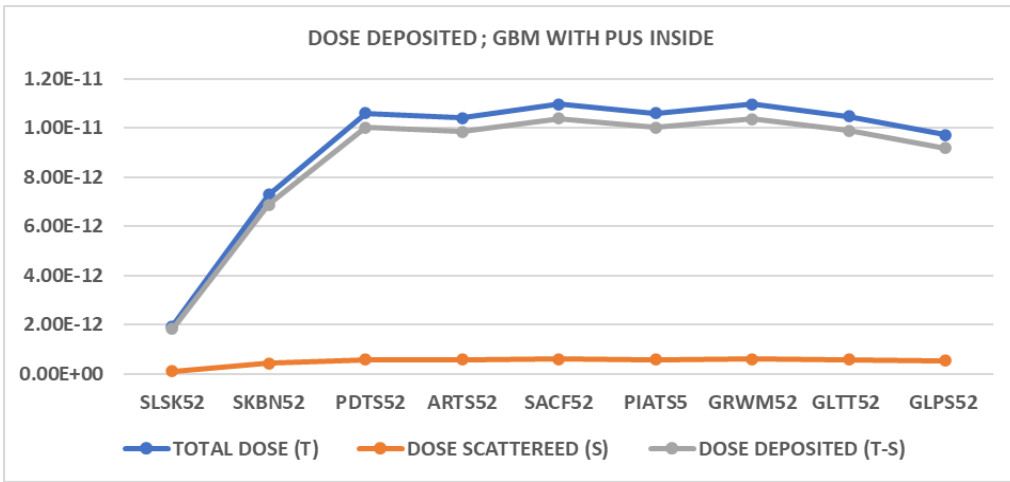


GBM 36





GBM 37



GBM 38

