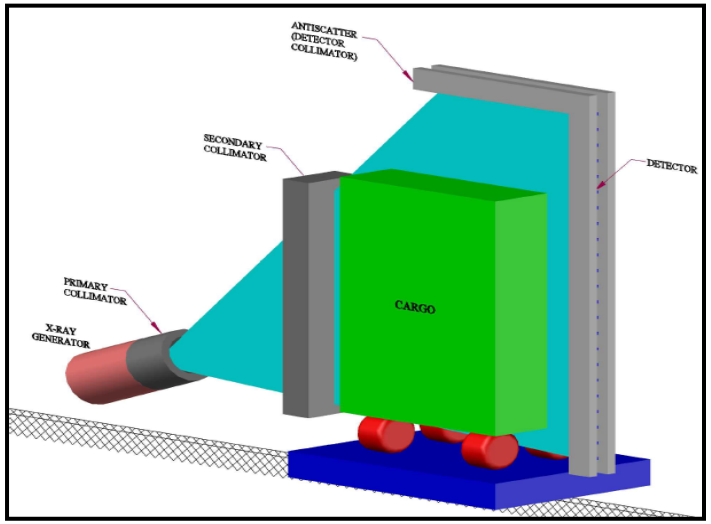
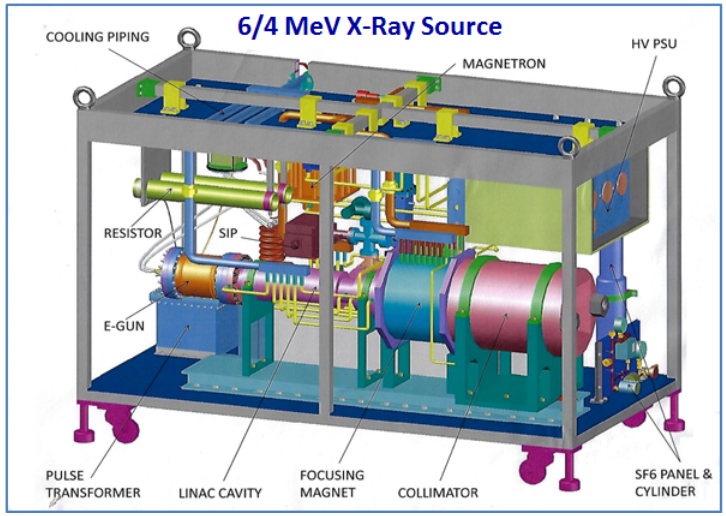
6/4 MEV DUAL ENERGY LINAC FOR INDIAN CARGO SCANNER

1. INTRODUCTION

- **The primary objective of the project is to develop through indigenous design efforts cargo scanning technology and establish domestic manufacturing base.**
- **Such cargo scanners are required in large numbers in Indian seaports, airports and border check posts for screening incoming and outgoing cargo.**
- **Linac-based cargo-scanning systems have three basic components – the x-ray source, the detector array and the conveyor.**



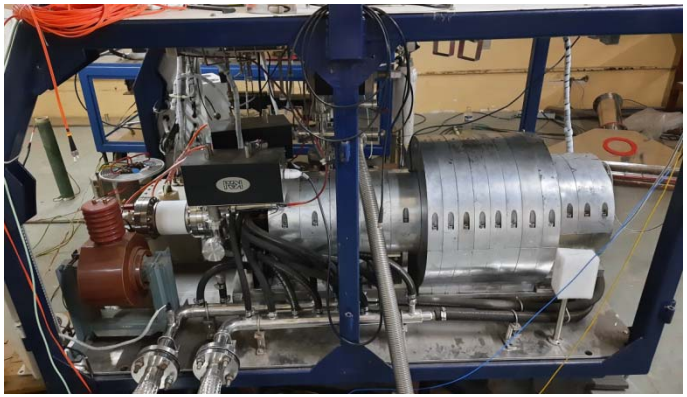


6/4 MeV Portal Single Energy Cargo Scanner System & 3-D Model of the X-Ray Source

Table 1 Specifications of 6/4 MeV Dual EnergyLinac based x-ray source

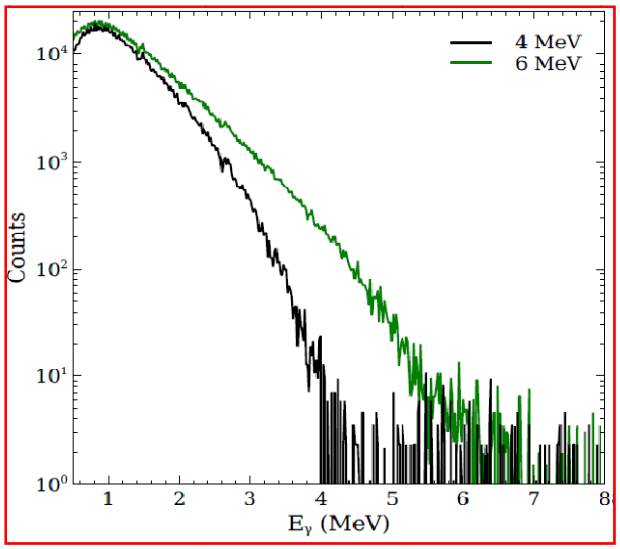
Beam Energy	: 6 /4 MeV
Average beam power	: 600 W (max)
X-ray dose rate @ 1m @200Hz	: ≥1.6 Gy/min
X-ray beam focal spot size(FWHM)	: ≤ 2 mm
Pulse repetition rate	: 200 Hz
Length of linac	: 0.6 m
RF Frequency	: 2856 ± 2 MHz
Injection voltage	: 22-50 kV

Photograph of 6/4 MeV Dual Energy X-Ray Source

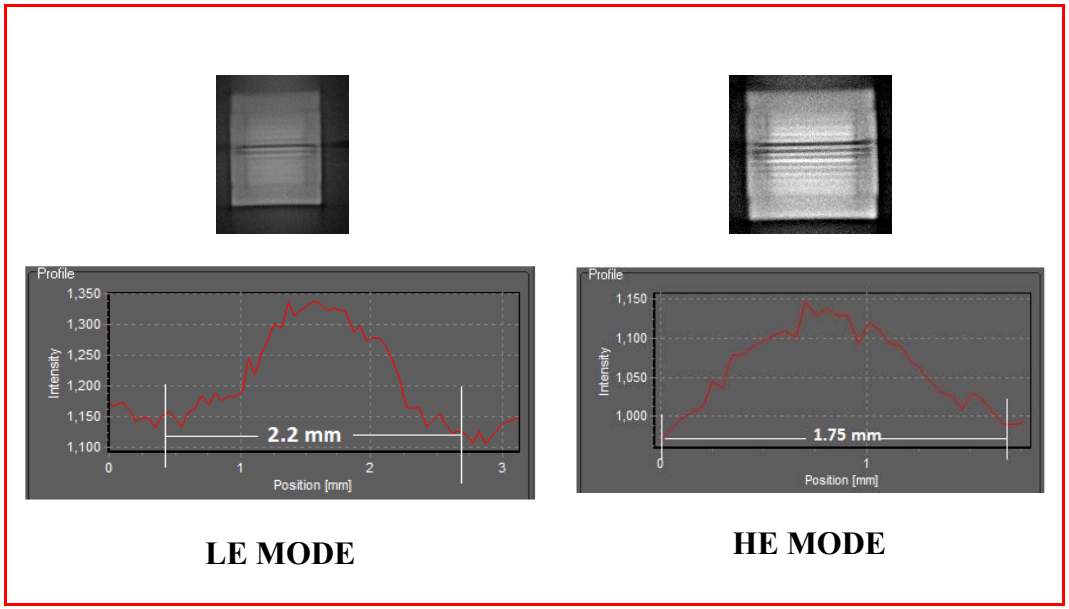


2. X-RAY SOURCE CHARACTERIZATION

Measured Bremsstrahlung Spectra in High (HE) and Low(LE) Energy mode



Measured X-Ray Spot Size in High (HE) and Low(LE) Energy mode



LE MODE **HE MODE**

3. QUALIFICATION TEST OF DUAL ENERGY LINAC FOR CARGO SCANNER

X Ray Source Qualification as per ANSI N42.46

ANSI N42.46	Test Results
Penetration: 330 mm Steel	SS 300 mm.
Contrast Sensitivity : 1%	Measured 1%.
Spatial Resolution : 2 mm	2mm.
Wire in air: SWG 18 (1.2 mm)	1.2 mm.

Material discrimination scan table as per IEC62523

Material	Thickness				
	T1(mm)	T2(mm)	T3(mm)	T4(mm)	T5(mm)
Al	40	80	160	240	400
Pb	10	20	40	60	100
SS	15	30	60	90	150
Perspex	100	200	400	600	NA

- **6/4 MeV Dual Energy X-Ray Source is Stably running at 200 Hz PRF, Dose rate > 1.6 Gy/m @ 1 m**
- **Further Qualification Test is in Progress as per ANSI and IEC Standards.**