Status of low-mass di-electron simulations in the CBM experiment *

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The reconstruction of low-mass vector mesons is one of the main goals of the CBM experiment at FAIR. The CBM experiment will be able to reconstruct low-mass vector mesons in di-electron and di-muon decay channels. The current status of low-mass di-electron simulations in central Au+Au collisions at 8 AGeV (SIS100) and 25 AGeV (SIS300) beam energy is presented in this report.

Results were obtained with the latest version of the CBMROOT software (January 2013) which includes realistic detector descriptions. The background was generated using the transport code UrQMD including di-electron pairs from γ-conversions, π^0- and η- Dalitz decays. Di-electron pairs from ρ, ω, ϕ, and ω-Dalitz decays were simulated by the PLUTO event generator and embedded into UrQMD events. The detector setup includes STS, RICH, TRD and TOF detectors. For 8 AGeV beam energy the TRD detector was excluded from simulations. A 25 μm thick gold target was used in order to avoid additional background from γ-conversions in the target.

An electron candidate has to be reconstructed and identified in all detectors, namely RICH, TRD and TOF. Since the TRD is not used for 8 AGeV beam energy simulations, an additional momentum cut at 5.5 GeV/c was implemented in order to reject large momentum pions.

The background rejection strategy includes several cuts. The first cut is based on the assumption that all pairs with $M_{ee} < 25\ MeV/c^2$ stem from γ-conversion and they are fully removed from further combinatorics. The aim of the next two cuts is to reject $e^{\pm}$ pairs where one partner is reconstructed only in the STS (segment track) or was fully reconstructed but not identified as electron. The last cut is a transverse momentum cut.

The dominant background source are random combinations of $e^{\pm}$ from π^0-Dalitz decays and γ-conversions. For 8 AGeV beam energy the main contributions to background pairs come from combinations of $e^{\pm}$ from π^0-Dalitz decays and other particles (35%), $e^{\pm}$ from π^0-Dalitz and γ-conversion (23%) and $e^{\pm}$ from different π^0-Dalitz decays (18%). For 25 AGeV beam energy the numbers are 23%, 31% and 29%, respectively.

The invariant mass spectra after applying all cuts are presented in the upper plot for 8 AGeV and in the lower plot for 25 AGeV beam energy in Figure 1.

The final S/B ratio and reconstruction efficiency for ρ^0, ω and ϕ mesons and for different invariant mass regions are presented in Table 1.

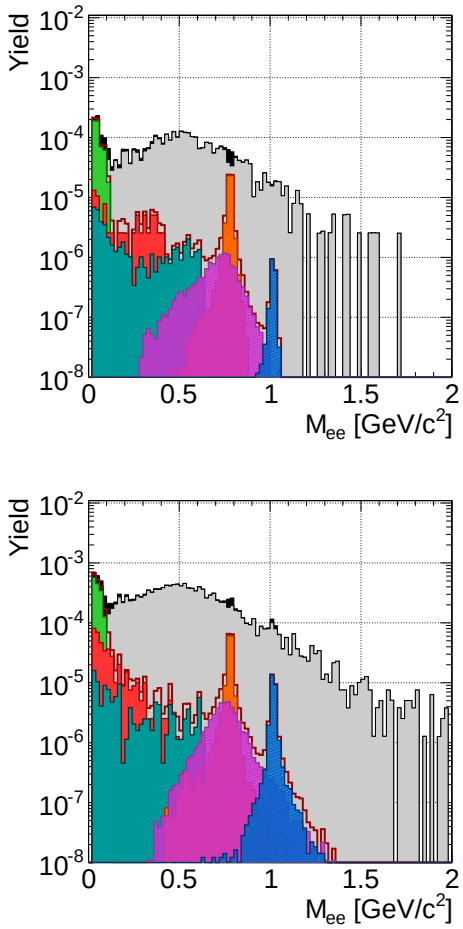

Figure 1: Invariant mass spectra after applying all cuts for central Au+Au collisions at 8 AGeV (above, 100k events) and 25 AGeV (below) beam energy.

Table 1: S/B ratio and reconstruction efficiency after applying all cuts.

	8AGeV		25AGeV	
	S/B	Eff.[%]	S/B	Eff.[%]
ρ	-	3.12	-	4.39
ω	0.64	4.11	0.31	5.53
ϕ	0.04	4.89	0.11	7.08
M_{ee}:0.0-0.2	1.94	-	1.44	-
M_{ee}:0.2-0.6	0.031	-	0.019	-
M_{ee}:0.6-1.2	0.067	-	0.053	-

* Work supported by BMBF and HIC for FAIR