

Angular resolution with photons and electrons (v1r030604p6)

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Photon Event classification

- **Class A: events with 1 vertex**
 - **Class A.1: events with 2 tracks:**
 - $\text{Tkr1LastLayer} == 0 \ \&\& \ \text{Tkr2LastLayer} == 0 \ \&\& \ \text{Tkr1FirstLayer} > 1 \ \&\& \ \text{Tkr2FirstLayer} > 1$
 - **Class A.1.1: $\text{CalCsIRLn} > 6$**
 - » Class A.1.1.1: First two top TKR plane as Veto
 - **Class A.2: events with 1 track:**
 - $\text{Tkr1LastLayer} == 0 \ \&\& \ \text{Tkr1FirstLayer} > 1$
 - **Class A.2.1: $\text{CalCsIRLn} > 6$**
 - » Class A.2.1.1: First two top TKR plane as Veto
- **Class B: events with 2 Vertices**
 - **Class B.1.1:** Number of tracks associated with the first vertex (Vtx1NumTkrs) $==2 \ \&\& \ \text{Tkr1LastLayer} == 0 \ \&\& \ \text{Tkr2LastLayer} == 0 \ \&\& \ \text{Tkr1FirstLayer} > 1 \ \&\& \ \text{Tkr2FirstLayer} > 1 \ \&\& \ \text{CalCsIRLn} > 6$
- **Class C: events with 3 o more Vertices**
 - **Class C.1.1:** Number of tracks associated with the first vertex (Vtx1NumTkrs) $==2 \ \&\& \ \text{Tkr1LastLayer} == 0 \ \&\& \ \text{Tkr2LastLayer} == 0 \ \&\& \ \text{Tkr1FirstLayer} > 1 \ \&\& \ \text{Tkr2FirstLayer} > 1 \ \&\& \ \text{CalCsIRLn} > 6$

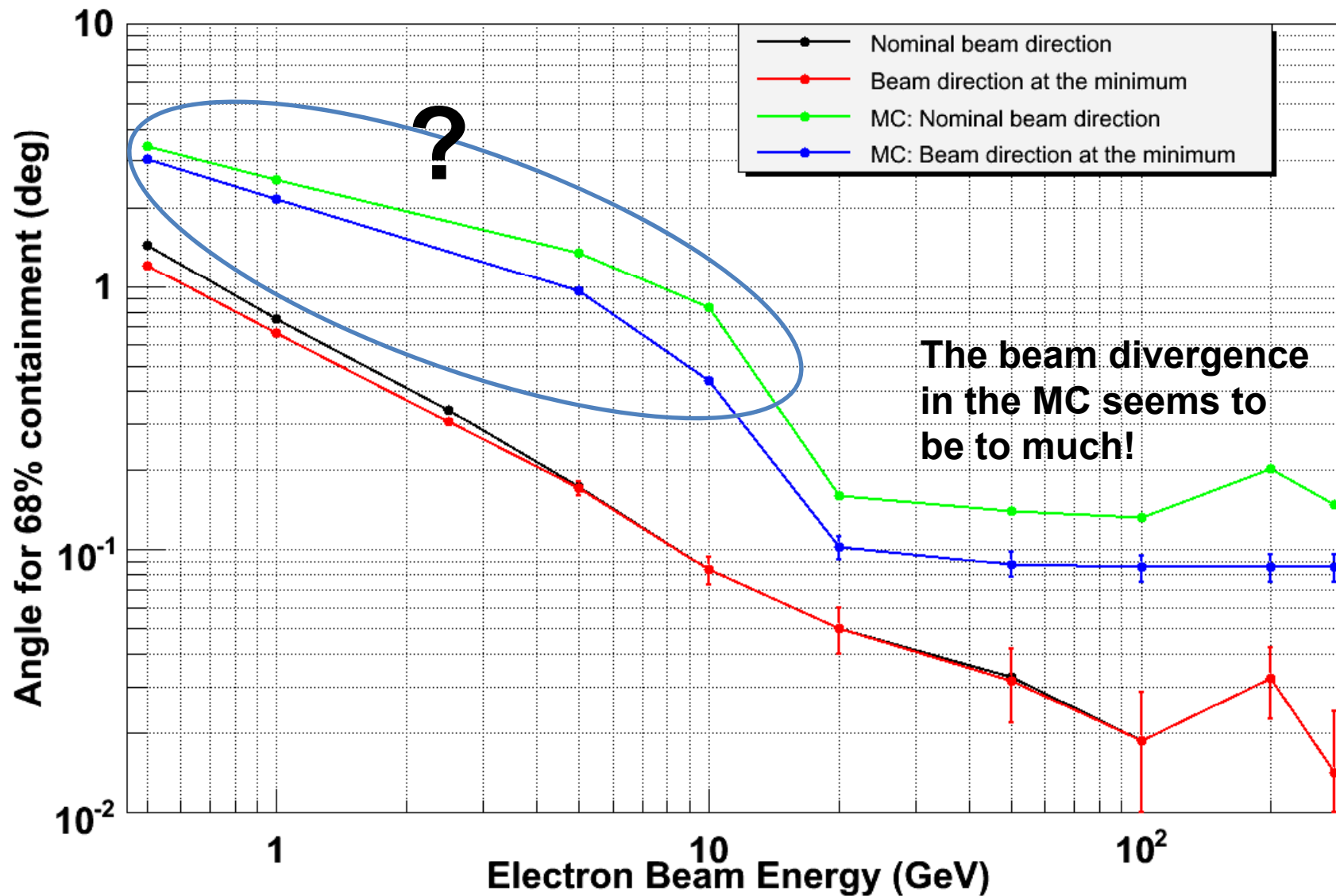
Systematic Uncertainties to the angular dispersion: photon data Full Brems case

- **Beam divergence: 4 mrad at 2.5 GeV/c electron beam, $\delta\theta \sim 0.229^\circ$**
 - This value is also included in MC PSF results since I assume that the beam definition in the simulation is the same as real data
 - The quoted value is now in agreement with the PSF evaluated with the electron at 2.5 GeV (see next slides)
- **Uncertainty of the CU position with respect to the beam: $\delta\theta \sim 0.1^\circ$**
 - only real data, it is the step size to align the beam to the CU
- **Gamma production angle by bremsstrahlung with respect to the electron: few mrad, $\delta\theta \sim 0.1^\circ$ (*cross section*)**
 - This value is also included in MC PSF results
- **Statistical and systematic errors have been added in quadrature**

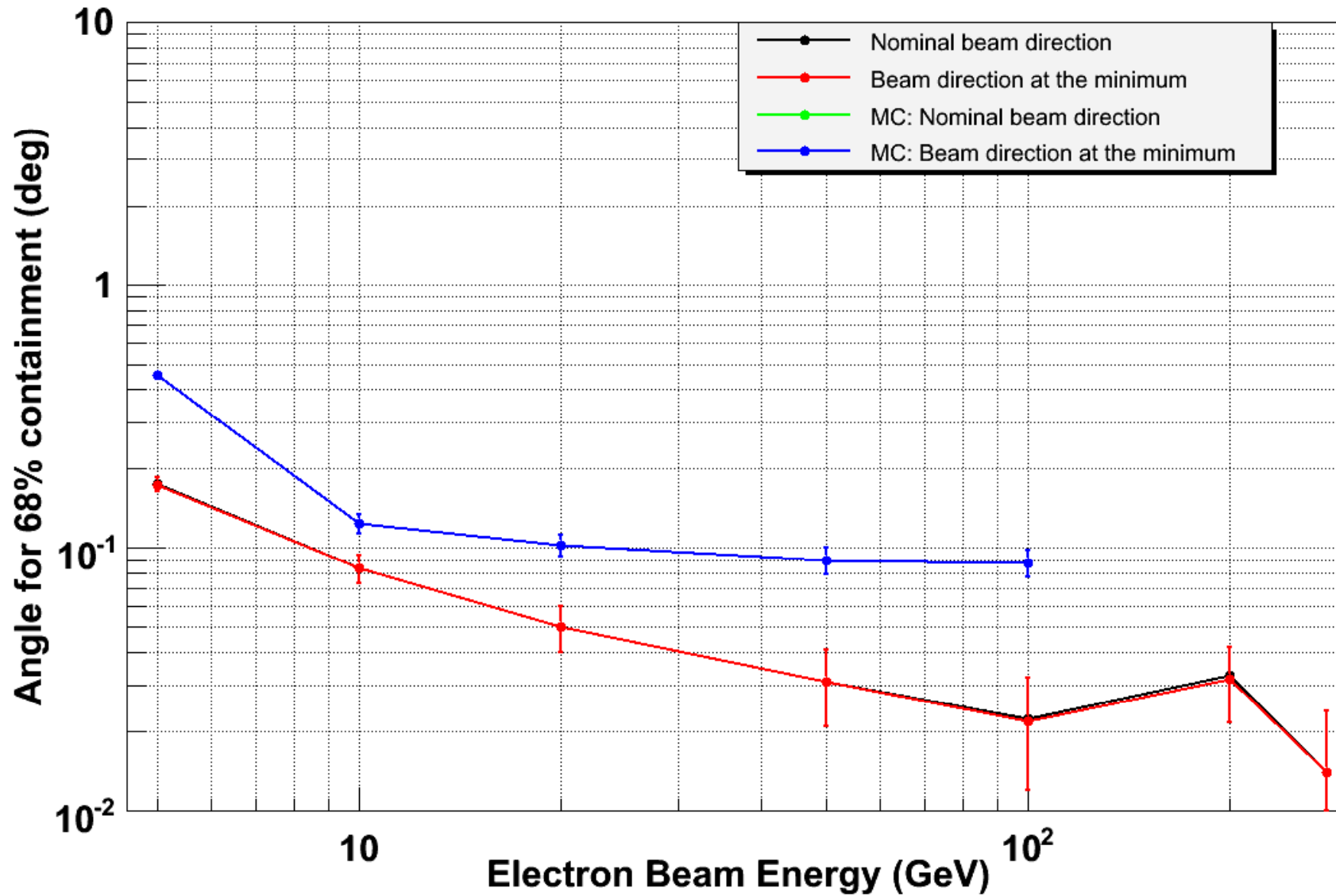
Systematic Uncertainties to the angular dispersion: electron data case

- **Beam divergence: unknown**
 - Probable is the same order or less of the angular resolution, since the angular resolution decreases with the energy (at least in real data!)
- **Uncertainty of the CU position with respect to the beam: $\delta\theta \sim 0.01^\circ$**
 - it is the step size to align the beam to the CU
 - See next slides for more details
- **Statistical and systematic errors have been added in quadrature**

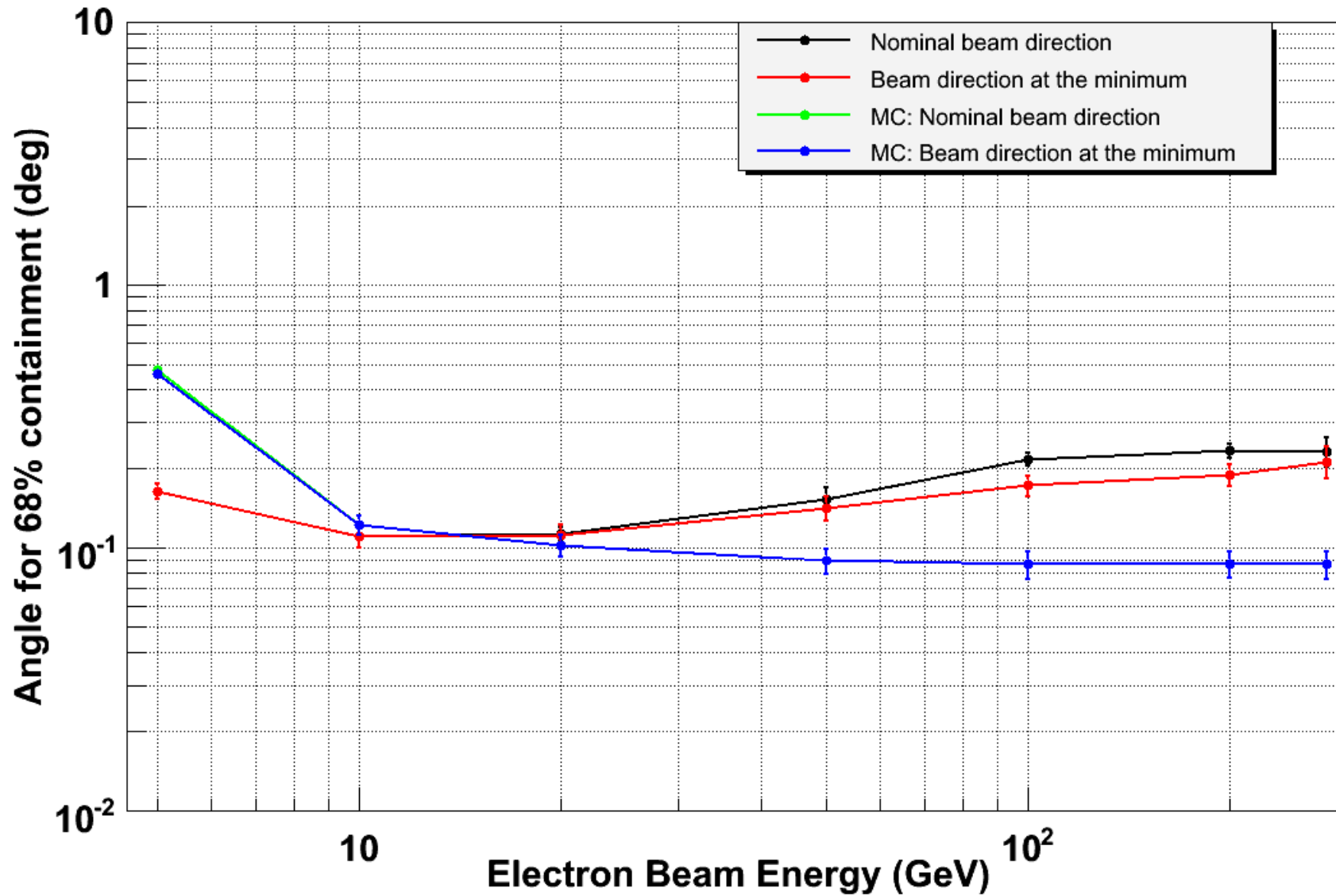
Angle for 68% containment (deg), Beam Incidence Angle = 0 deg



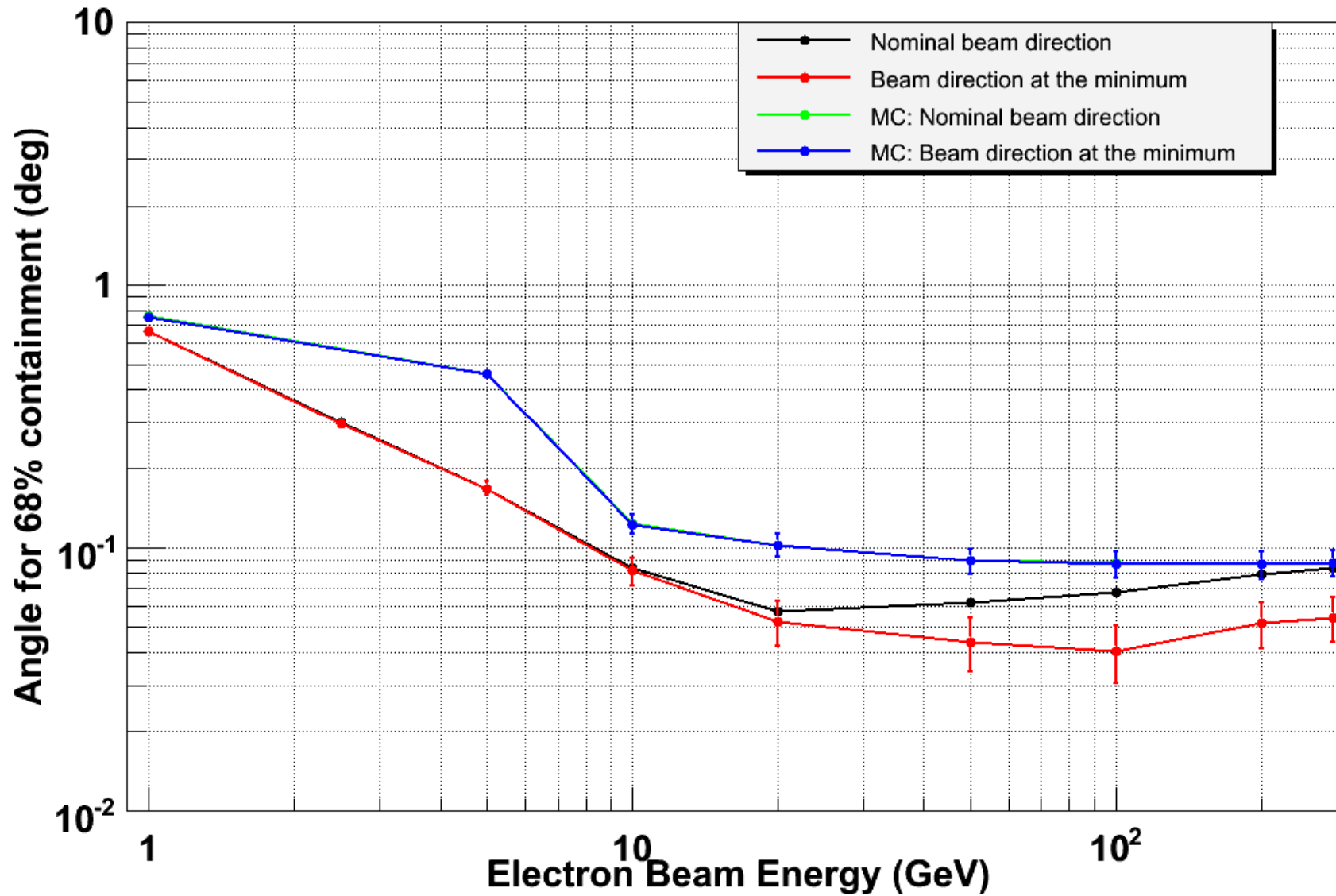
Angle for 68% containment (deg), Beam Incidence Angle = 10 deg



Angle for 68% containment (deg), Beam Incidence Angle = 20 deg



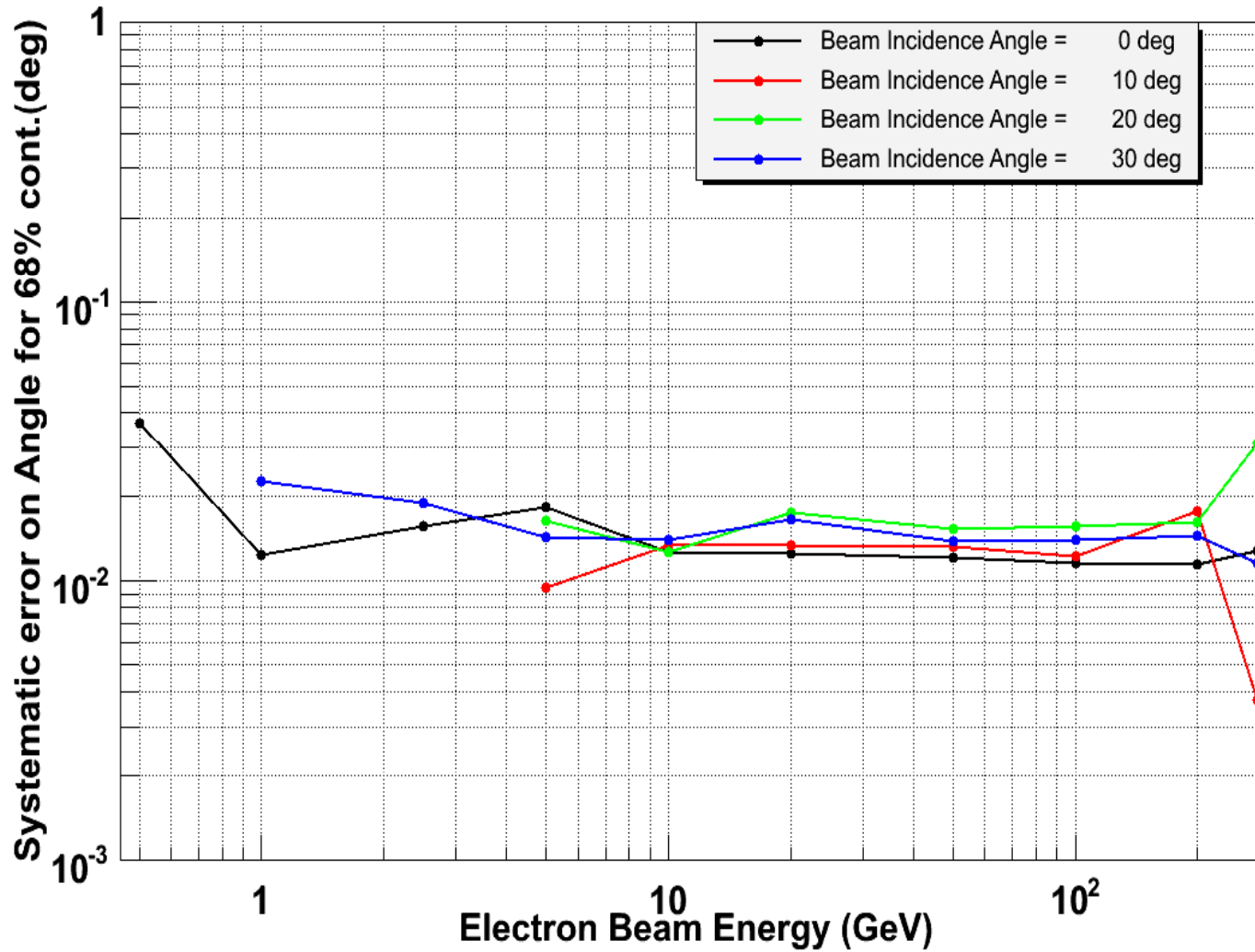
Angle for 68% containment (deg), Beam Incidence Angle = 30 deg



Systematic error check in electron data

- The beam is aligned to the CU by a scanning procedure of the (φ, θ) angles that define the incoming beam direction, with a step size of 0.01° .
- The minimum PSF value defines the angle resolution
- Then, the 8 neighbor (φ_i, θ_i) cells around the minimum $(\varphi_{\min}, \theta_{\min})$ are used to evaluate the PSF RMS value with respect to the minimum one

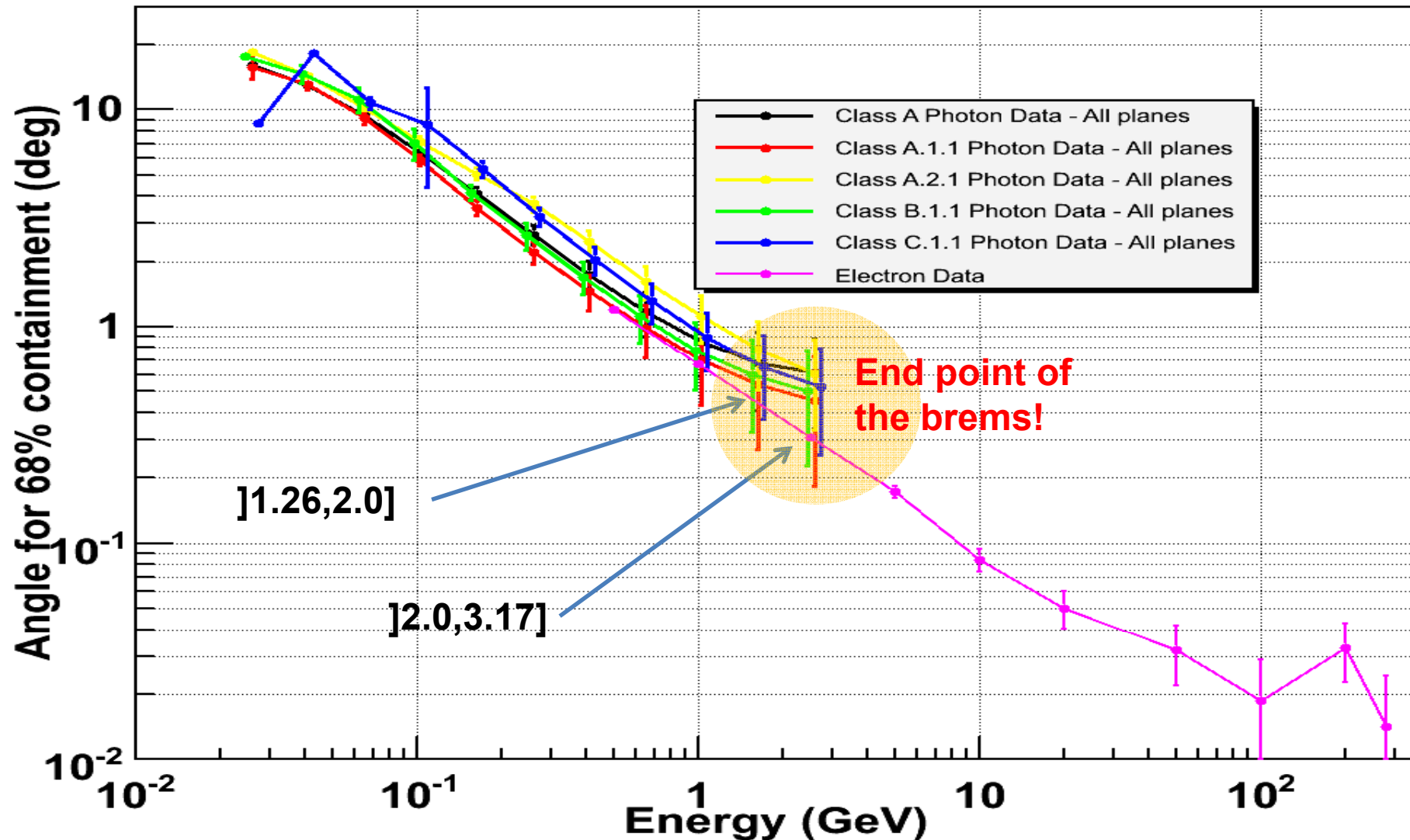
Systematic error check – real data case



**It is of order
of 0.01°**

Photon + Electron Data at 0 deg

Normal Beam Incidence



Photon + Electron Data at 30 deg

30 deg Beam Incidence

