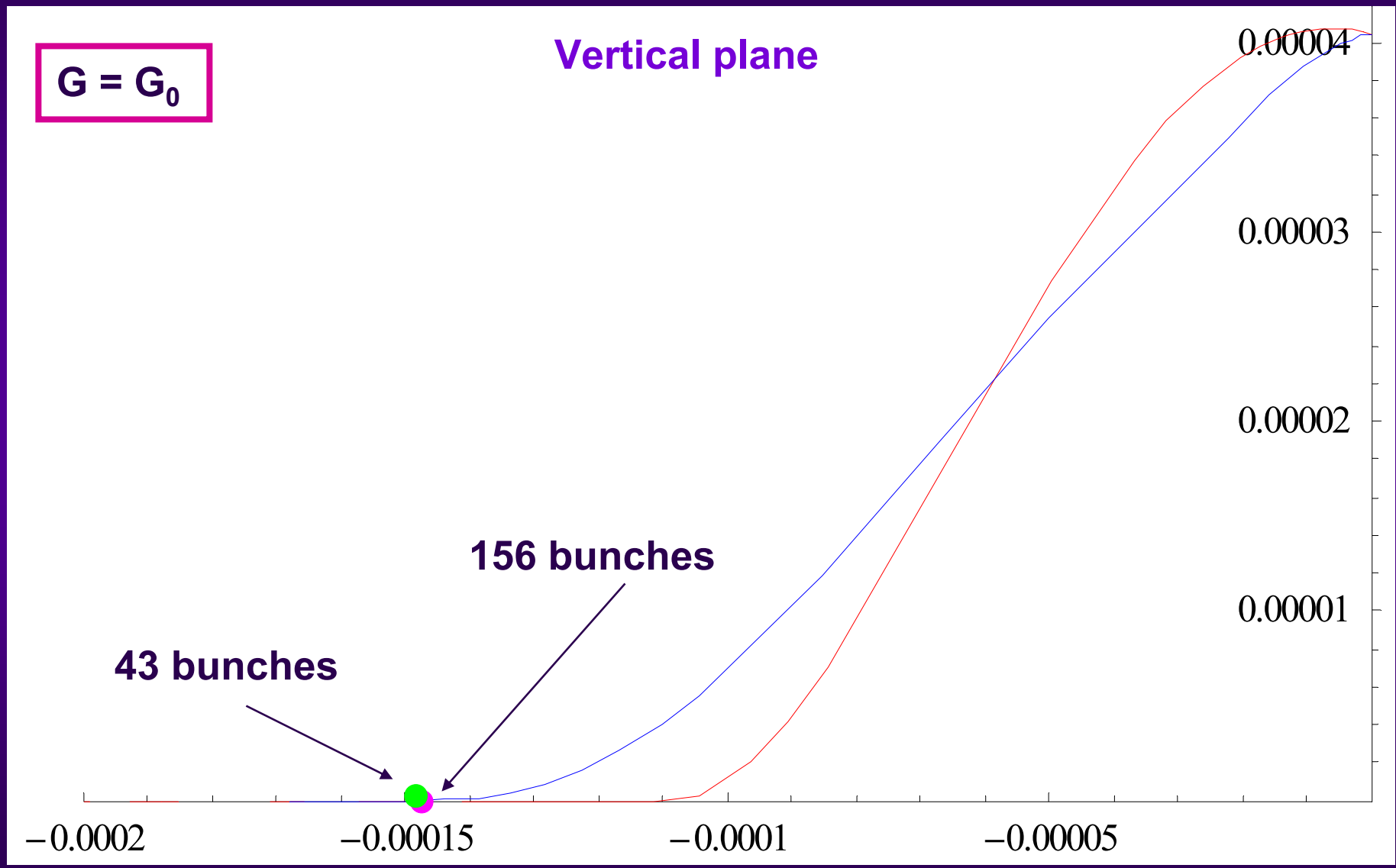
AUTOMATIC COLLIMATOR IMPEDANCE COMPUTATIONS

E. Metral

- **Stability diagram and coherent tune shift for the TOTEM beams taking into account all the collimators (IR7 v26top6n1b1 and IR3 from June)**

$N_b = 3\times10^{10}$ p/b
M = 43 or 156 bunches
$\varepsilon^* = 1$ μm
G = Gap of the collimators = $G_0 \times (1, ½, ¼)$, with G_0 the gap for IR7v26top6n1b1 + IR3 June for the nominal LHC beam

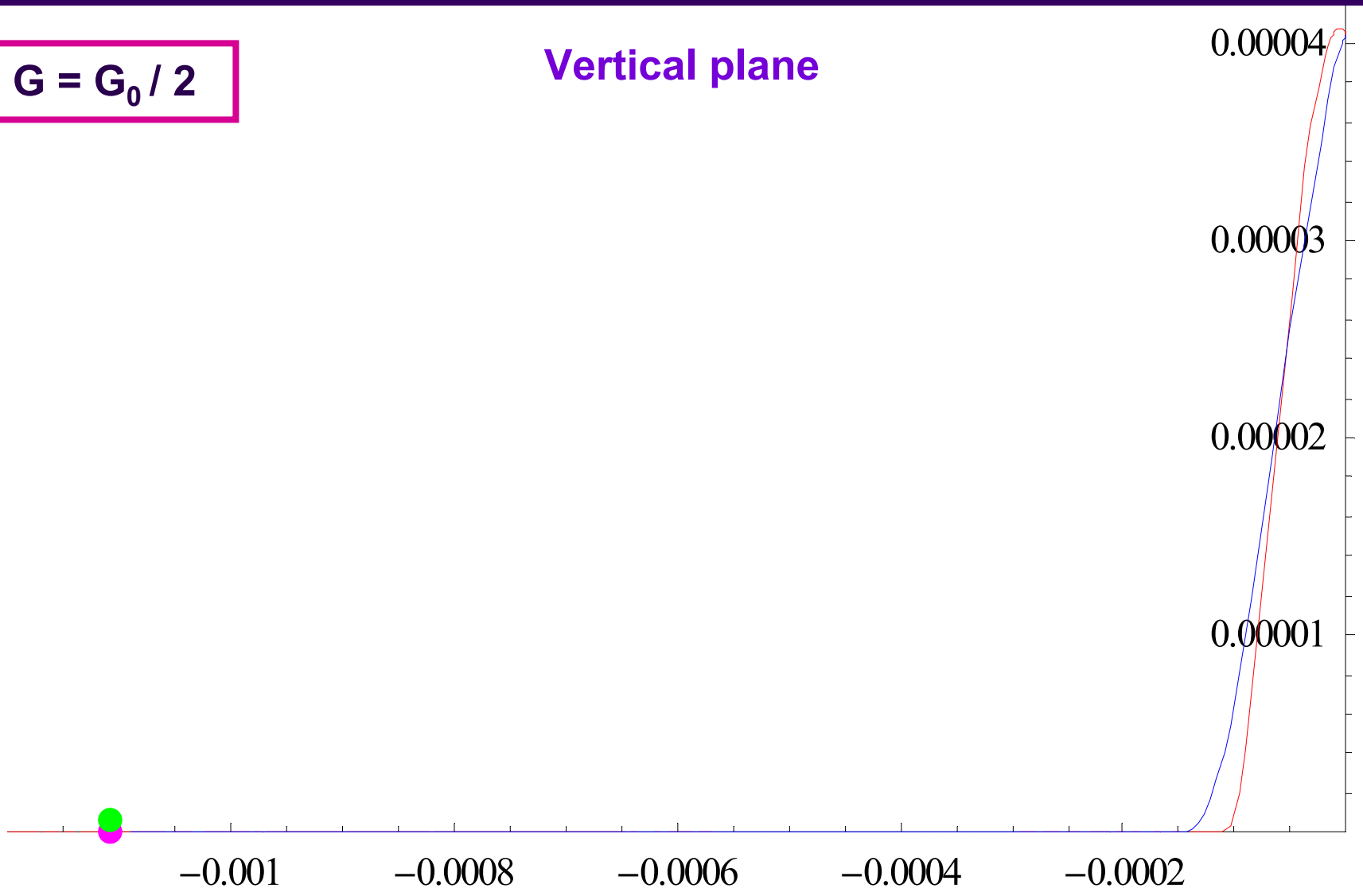
Stability diagram (maximum octupoles) and collective tune shift for the most unstable coupled-bunch mode and head-tail mode 0 (3e10 p/b at 7 TeV)



Stability diagram (maximum octupoles) and collective tune shift for the most unstable coupled-bunch mode and head-tail mode 0 (3e10 p/b at 7 TeV)

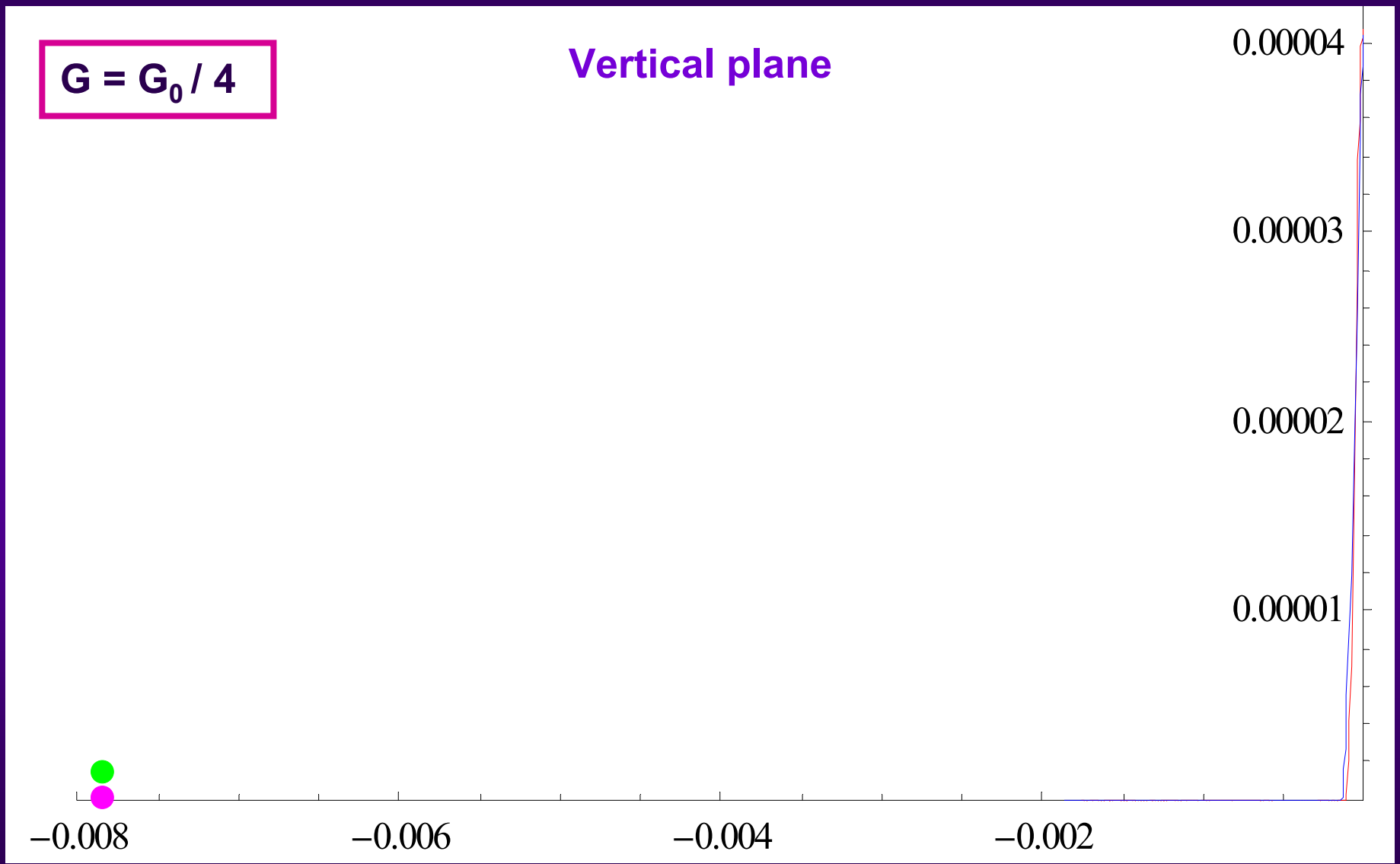
$G = G_0 / 2$

Vertical plane



Stability diagram (maximum octupoles) and collective tune shift for the most unstable coupled-bunch mode and head-tail mode 0 (3e10 p/b at 7 TeV)

$G = G_0 / 4$



Conclusion

⇒ **All the cases are unstable (due to the ~single-bunch effect of the inductive bypass) !**

Can we find a compromise ?

⇒ 10% safety margin inside the stability region

$G = G_0 \times 1$	$G = G_0 \times ½$	$G = G_0 \times ¼$
$N_b = 3\times10^{10}$ p/b $\varepsilon^* = 1.2$ μm ⇒ G at 10.6 σ	$N_b = 3\times10^{10}$ p/b $\varepsilon^* = 8.8$ μm ⇒ G at 3.9 σ	$N_b = 3\times10^{10}$ p/b $\varepsilon^* = 62$ μm ⇒ G at 1.5 σ
$N_b = 2\times10^{10}$ p/b $\varepsilon^* = 0.8$ μm ⇒ G at 13 σ	$N_b = 2\times10^{10}$ p/b $\varepsilon^* = 5.9$ μm ⇒ G at 4.8 σ	$N_b = 2\times10^{10}$ p/b $\varepsilon^* = 41.3$ μm ⇒ G at 1.8 σ
$N_b = 1\times10^{10}$ p/b $\varepsilon^* = 0.4$ μm ⇒ G at 18.4 σ	$N_b = 1\times10^{10}$ p/b $\varepsilon^* = 2.9$ μm ⇒ G at 6.8 σ	$N_b = 1\times10^{10}$ p/b $\varepsilon^* = 20.7$ μm ⇒ G at 2.5 σ