SUSY model in view of the CLIC staged energy approach

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Context

- In consultation with Lucie Linssen, Steinar Stapnes, Mark Thomson and others, desire was to add input to the European strategy report
- Would a staged energy approach to building linear collider be worthwhile?
- Beyond SM theory may have many thresholds
- Example: one of our benchmark points for the CLIC CDR

Indirect constraints for this model:

"Model II"

$$\begin{aligned} \Omega_{\rm DM}h^2 &= 0.1105 \\ \Delta a_\mu &= 6.04\times10^{-10} \\ BR(b\to s\gamma) &= 3.01\times10^{-4} \\ BR(B_s\to\mu^+\mu^-) &= 3.9\times10^{-9} \end{aligned}$$

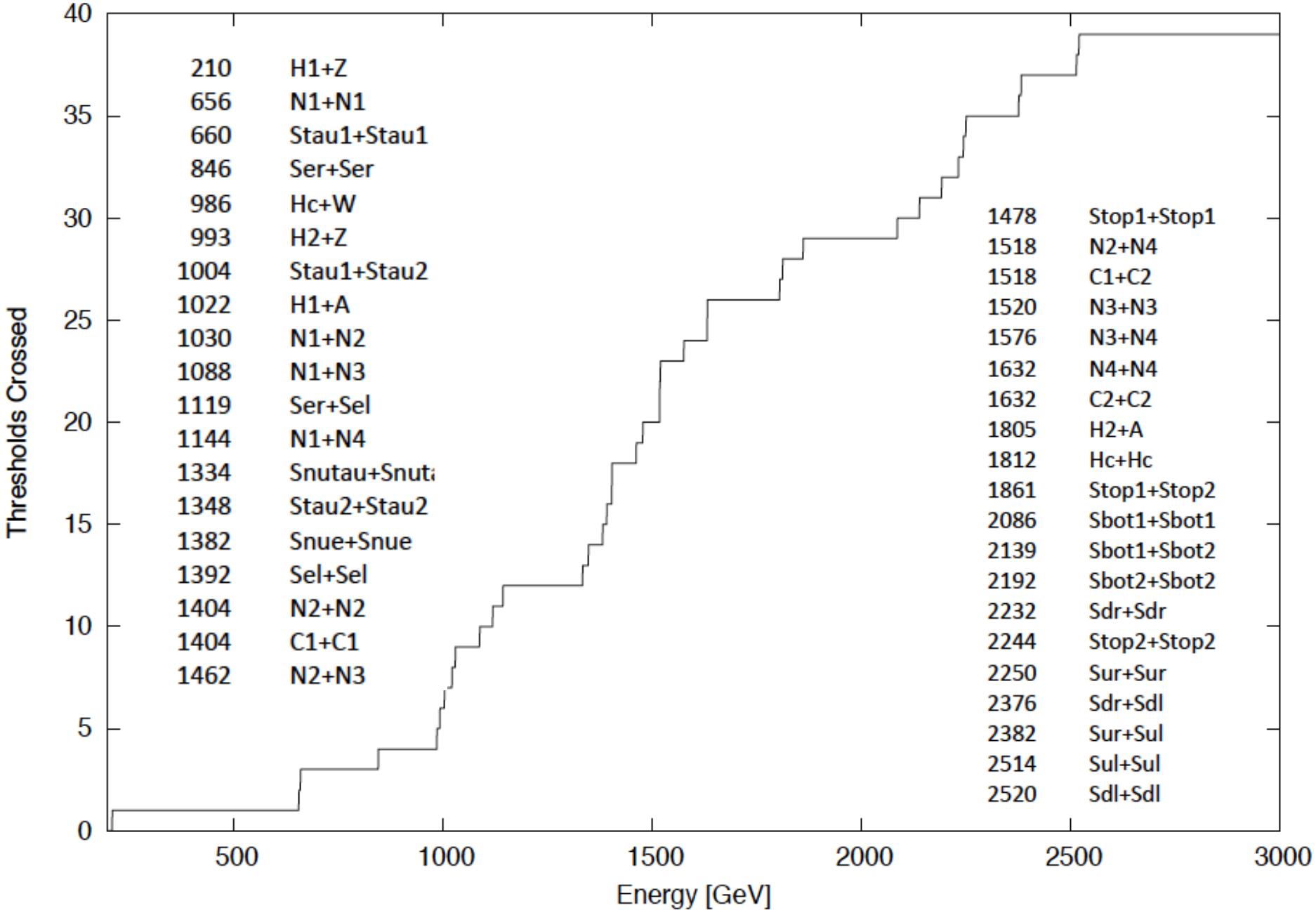
Complete mass spectrum:

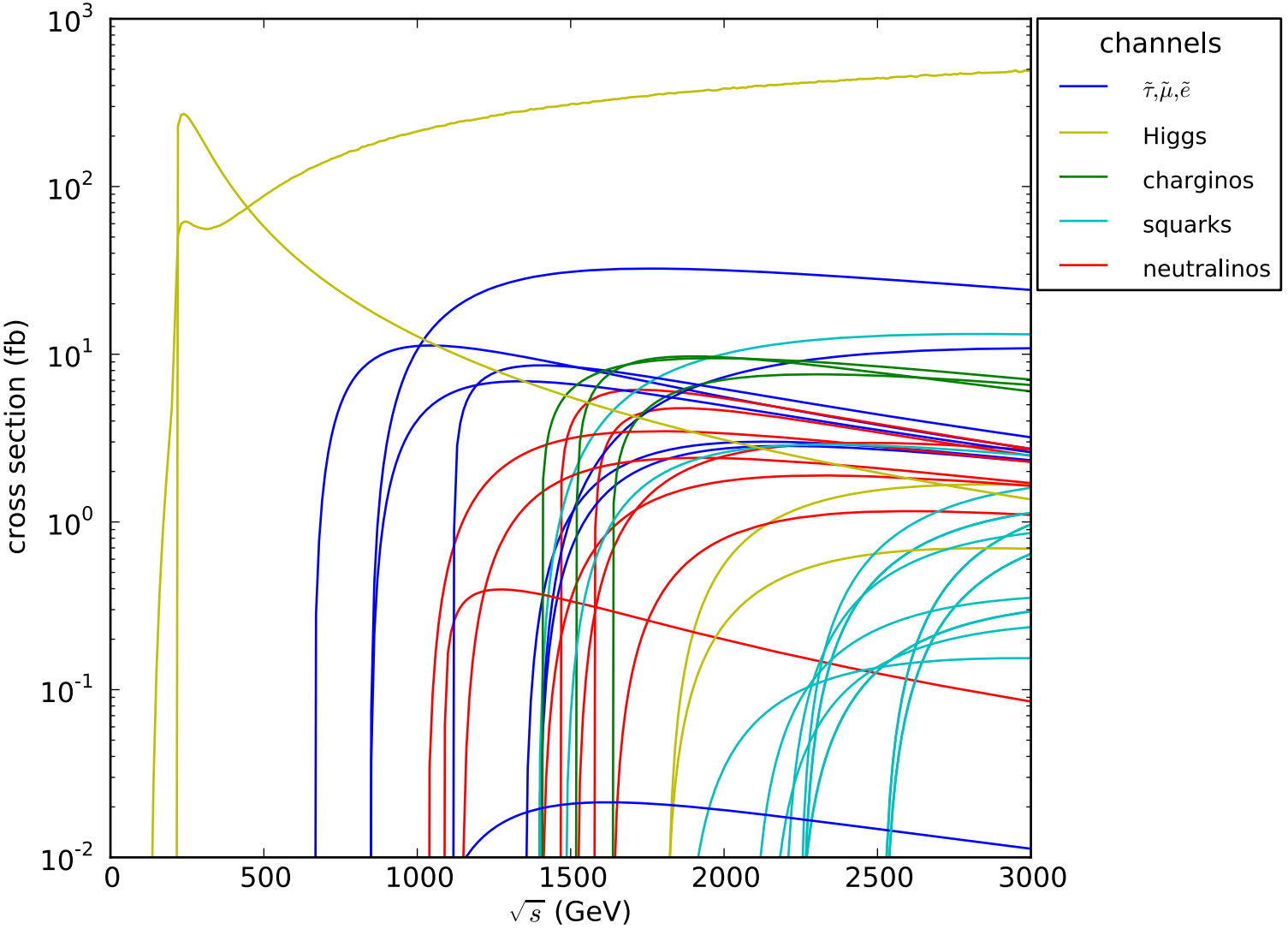
```
h, H, A, Hpm = 119.13  902.4  902.6  906.3
Neutralinos = 328.3  701.8  760.2  816.2
Charginos = 701.6  816.1
stau1, stau2, snutau = 330.2  674.3  666.8
stop1, stop2 = 739.4  1121.8
sbot1, sbot2 = 1043.3  1096.0
seR, seL, snue = 422.8  696.1  691.3
suR, suL, sdR, sdL = 1125.7  1257.7  1116.1  1260.0
Gluino = 1239.7
```

Thresholds Crossed as a function of Energy (GeV)

210	H1+Z
656	N1+N1
660	Stau1+Stau1
846	Ser+Ser
986	Hc+W
993	H2+Z
1004	Stau1+Stau2
1022	H1+A
1030	N1+N2
1088	N1+N3
1119	Ser+Sel
1144	N1+N4
1334	Snutau+Snut
1348	Stau2+Stau2
1382	Snue+Snue
1392	Sel+Sel
1404	N2+N2
1404	C1+C1
1462	N2+N3
1478	Stop1+Stop1
1518	N2+N4
1518	C1+C2
1520	N3+N3
1576	N3+N4
1632	N4+N4
1632	C2+C2
1805	H2+A
1812	Hc+Hc
1861	Stop1+Stop2
2086	Sbot1+Sbot1
2139	Sbot1+Sbot2
2192	Sbot2+Sbot2
2232	Sdr+Sdr
2244	Stop2+Stop2
2250	Sur+Sur
2376	Sdr+Sdl
2382	Sur+Sul
2514	Sul+Sul
2520	Sdl+Sdl

Thresholds Crossed as a function of Energy (GeV)





Jan Strube plot of cross-sections

Plan for Study

A team of physicists have gathered to select and initiate full study of a benchmark point (Allanach, Desch, Ellis, Giudice, Kraml, Linssen, Martin, Thomson, Wells). The goals are to

- Study panoply of event signatures from one model, rather than one or two signatures for each of many models
- Investigate the qualitative value added of full simulation of a model: dark matter properties, numerous unification studies, flavor studies, implications for baryogenesis, confirmation of underlying theory (supersymmetry), etc.
- Understand the complementary role that LHC can play leading up to linear collider for an example theory. (Squarks, gluinos good at LHC, sleptons, charginos and neutralinos good at CLIC, etc.)

This study is a CLIC study, in that some beam parameterization depends on that choice, but we welcome ILC inputs and discussion.