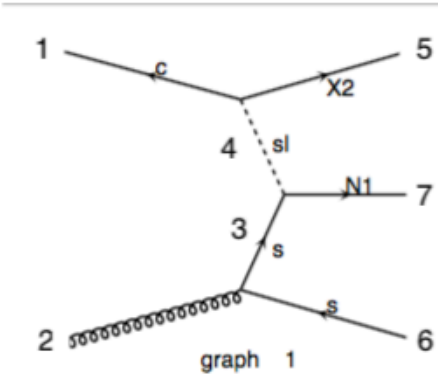
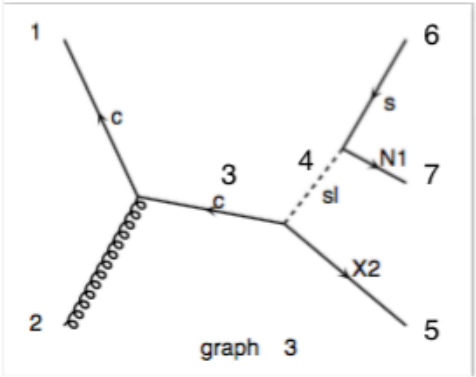
WHAT WE FOUND OUT

- Indeed, the new POWHEG-RES version could be used to improve certain processes with resonant squarks in s-channel diagrams. However, the POWHEG-RES version does not subtract the on-shell resonances which are present in weakino-pair and weakino-pair plus jet production. POWHEG-RES accounts for the "bad" behavior of resonances when interfacing the processes to the parton-shower (the parton-shower could modify the four-momentum of a resonant particle which would move the particle away from the resonance).
- To profit from POWHEG-RES the resonances must be present even at the Born-level, which is only the case for weakino-pair production plus jet. Furthermore, only real diagrams with one gluon in the final state can become resonant in regard to the POWHEG-RES idea since the gluon can then be radiated from the resonant particle (squark). Relevant processes are for example (unsure, untested!):
- (remember: a '0' in flst_bornres or flst_bornres means that the particle does not come from a resonance)

	Born (non resonant):	**Born (resonant):**
particle #:	1 2 3 4 5 6 7	1 2 3 4 5 6 7
flst_born:	q g -> q sq x2 q n1	q g -> q sq x2 q n1
flst_bornres:	0 0 -> 0 0 0 0 0	0 0 -> 0 0 0 4 4

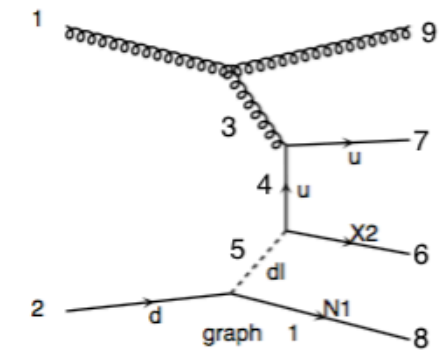
(unsure since multiple diagrams with different layouts are present. Should all different diagrams be listed?)

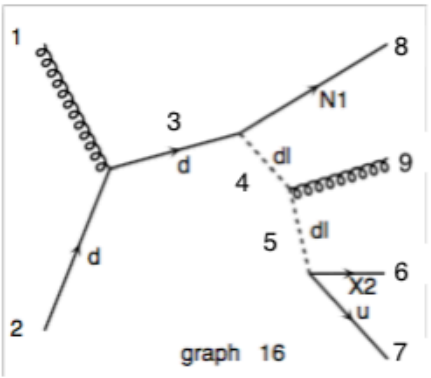




	real (non resonant):	**real (resonant):**
particle #:	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9
flst_born:	q g -> g q sq x2 q n1 g	q g -> q sq sq x2 q n1 g
flst_bornres:	0 0 -> 0 0 0 0 0 0 0	0 0 -> 0 0 4 5 5 0 4

(unsure since multiple diagrams with different layouts are present)





TODO

- implement the DSUB_II scheme for subtracting the on-shell resonances. Note that the DSUB_II scheme requires modifying a lot of the POWHEG procedures. Therefore the required files should be copied into the folder POWHEG_mod and modified accordingly. Up to now, these are following files/routines (but more for sure):
    * loadgrids -> mintwrapper.f
    * mintwrapper -> - * -
    * storegrids
    * genwrapper
    * loadgridsn
    * loadmintupbwrapper
    * storegrids
    * deletelock
    * ...
- In the DSUB_II scheme the on-shell contribution to the real cross-section are integrated over a separate phase-space, see weakinos-jet for more details and which files should be updated.
- The procedures to handle the flavor lists for the resonance history (flst_bornres, flst_realres) should be adapted to process SUSY particles. Is this necessary or are the POWHEG-RES procedures written general enough? Check!
- understand how the flavor lists for the resonance history for non resonant processes can be set up for multiple processes/diagrams with different layouts.
- build the flavor lists for the resonance history automatically in init_processes. Is this possible?
- for now, the arrays flst_bornres and flst_realres are set to zero and the arrays flst_born and flst_real contain only the external particles. However, for building the resonance history all intermediate particles have to be considered, too. If the arrays are modified, modify include/nlegborn.h, too!
- problem in Analysis.f subroutine get4momentum_fin_pair. The wrong momenta of the final state particles are extracted from the ihep list.

FINISHED

- created new branch https://github.com/MKesenheimer/weakinos-jet/tree/powheg-res
- removed all files in POWHEG_mod for now, since we are using the DSUB_I scheme for on-shell subtraction. The modified POWHEG files should be added back later if DSUB_II is used.
- organized the Makefiles to account for the new version POWHEG-RES and sorted out unnecessary stuff.
- solved the issue that init_processes is called before init_couplings in POWHEG-RES. Note that the calls to the subroutines init_processes and init_couplings was swapped in init_phys.f which resulted in errors during the initialization procedure.
- introduced the arrays flst_bornres and flst_realres (which are currently set to zero) and the handling of the resonance history in init_processes. Additionally a file is now generated during the initialization procedure of the POWHEG-executable that contains the flavor lists and the resonance history lists (DetailedFlavList.txt).
- finished modifying bbinit_mod.f