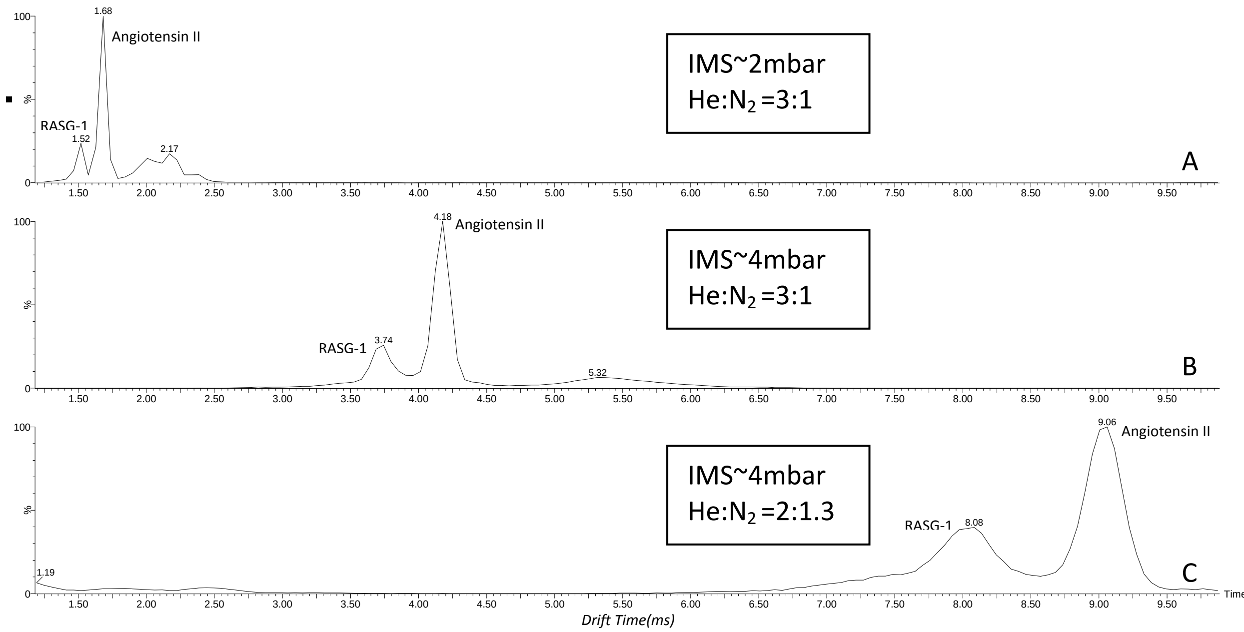
Figure S1. Collision cross section resolution R^{Ω}_{TW} of peptide ions at different pressures.

Peptide	*m / Da*	*Z*	• Ω_{He} / Å^2	Ω_{N2} / Å^2
RASG-1	1000.5	+2	225	331
Angiotensin II	1045.5	+2	245	335

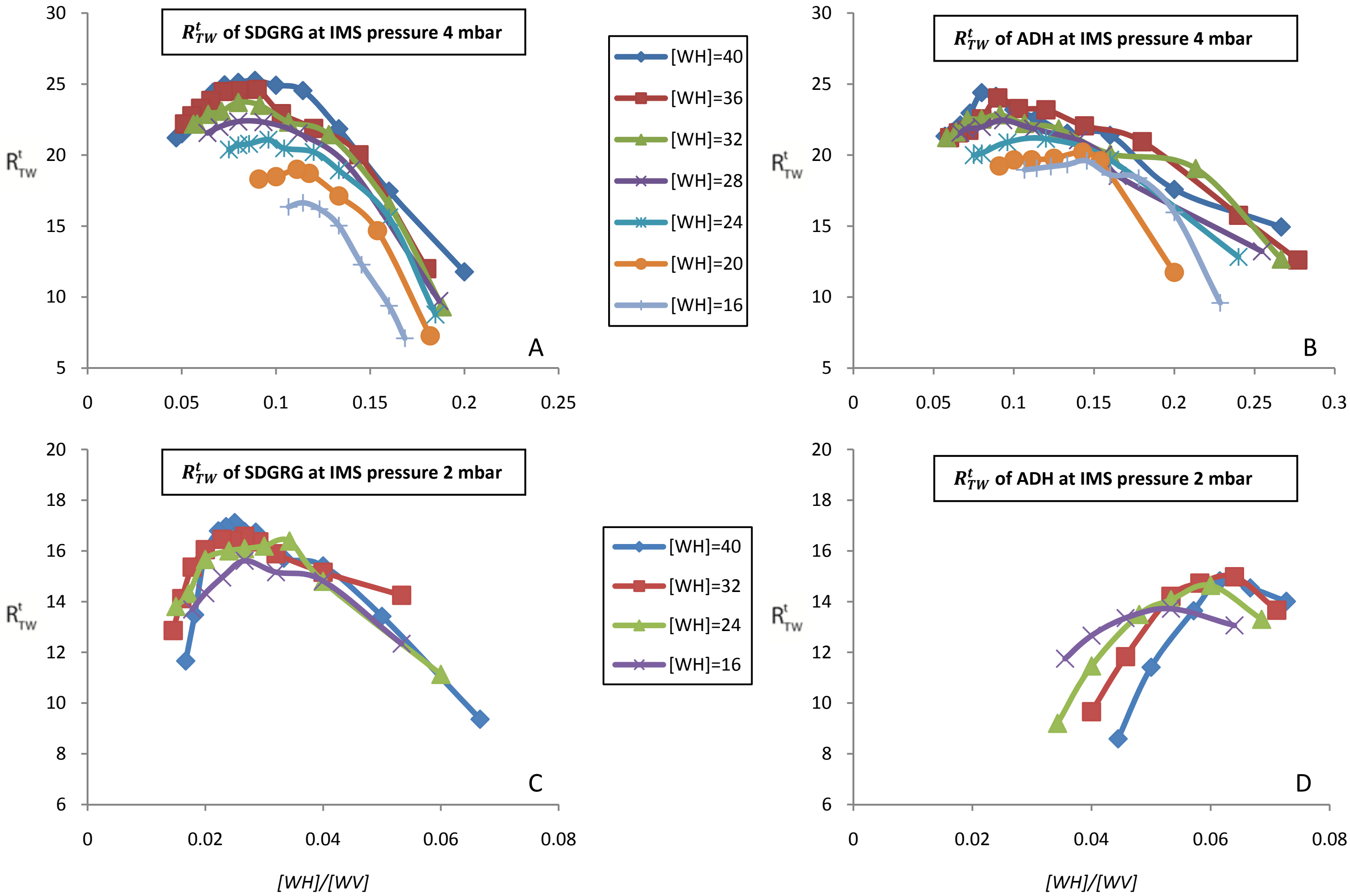


Peptides RASG-1 and angiotensin II are separated under different pressures or gas compositions. (A) 1.98 mbar, (B) 3.86 mbar and (C) 3.93 mbar. All 3 data are taken under [WH]=40V and [WV]=1000m/s.

Taking angiotensin II as an example, the traveling wave drift time resolution (R^{t}_{TW}) is calculated as 22, 27 and 29 for conditions in (A), (B) and (C) respectively. The higher R^{t}_{TW} generated in (B) and (C) agrees with the data shown in Figure 2, in that higher pressures are preferred for higher R^{t}_{TW}. However, with similar pressure, conditions (B) and (C) result in significantly different drift time and thus different R^{t}_{TW}, which may indicate that drift time resolution can be influenced by the composition of neutrals used in traveling wave IM separation.

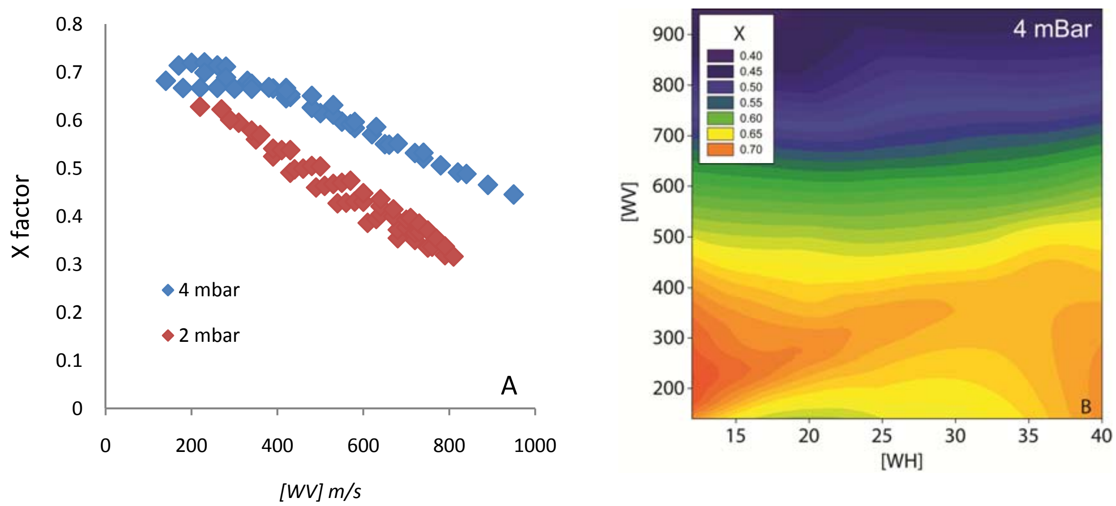
Furthermore, the calibration function exponential 'X 'factor, is 0.35, 0.45 and 0.5 for (A), (B) and (C) conditions respectively (extrapolated from calibration experiments discussed in the main article). When these X values are used to convert drift time resolution into collision cross section resolution R^{Ω}_{TW}. The results are 58 for (A), 60 for (B) and 60 for (C). These values are higher than that achieved for ADH tetramer (~40) and further indicates that gas pressure and composition have little influence on R^{Ω}_{TW}. Instead, optimum values of [WH] and [WV] are most important. We note, however, as the pirani-type pressure gauge used in this region of the Synapt G2 is both not calibrated for He/N2 mixtures and relatively inaccurate, the IMS pressure values given must be treated as rough approximations only.

Figure S2. Traveling wave drift time resolution (R^t_{TW}) versus *[WH]/[WV]*, shown at each *[WH]* measured.



Although each *[WH]* gives different maximum R^t_{TW}, the ideal *[WH]/[WV]*s which give the maximum$\boldsymbol{R^t_{TW}}$ are similar across different *[WH]* (0.088-0.114 for SDGRG at 4mbar(A)). Much larger changes in the ideal *[WH]/[WV]* ratio for R^t_{TW} are observed as a function of pressure in the IM separation region. As shown in the figures, ideal *[WH]/[WV]* centers at ~0.1 for SDGRG at 4mbar(A) decreased to ~0.025 for SDGRG at 2mbar (C), and it decreased from ~0.11 for ADH at 4mar(B) to ~0.5 for ADH at 2mbar.

Figure S3. Data for calibration curve exponential factor X



(A) A plot of [WV], versus the calibration function exponential X factor recorded for two operating pressures for the IM separator. (B) A 3Dplot of [WV], [WH] and calibration function exponential X factor.

Similar to calibration curve R^2 (see details in main article), substantial differences in X factor are observed only as a function of wave velocity, not wave height. There is <1% difference across [WH] for both IMS pressure 4mbar and 2mbar, while the [WV] gives ~50% difference across its applicable range for both pressures.