Jarosław Dyks, Zjazd CAMK 2023

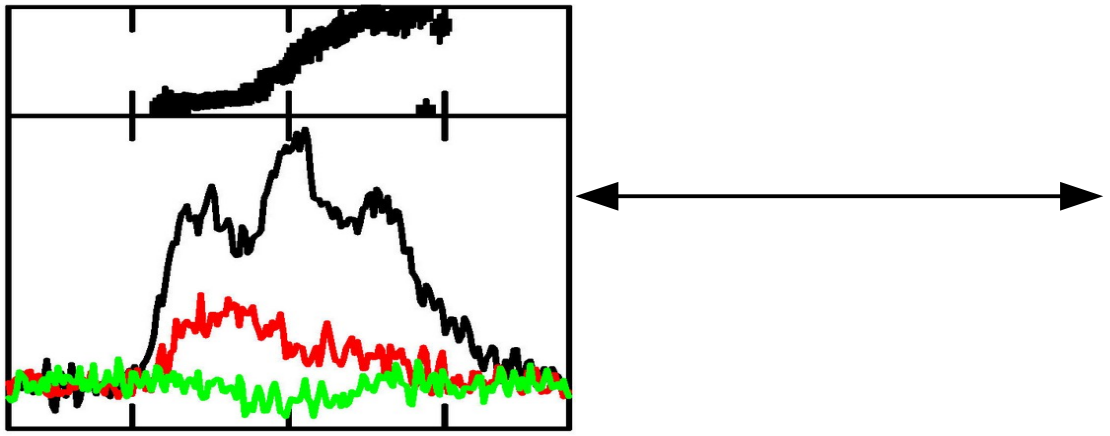
Publications:

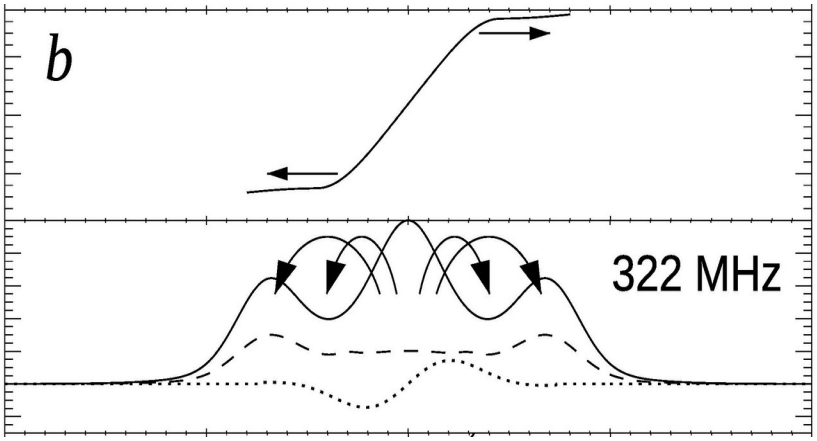
Dyks, J., 2023, Evidence for scattering of curvature radiation in radio pulsars, MNRAS, 522, 1480

CONES have ORTHOGONAL POL. MODE w.r.t. the core

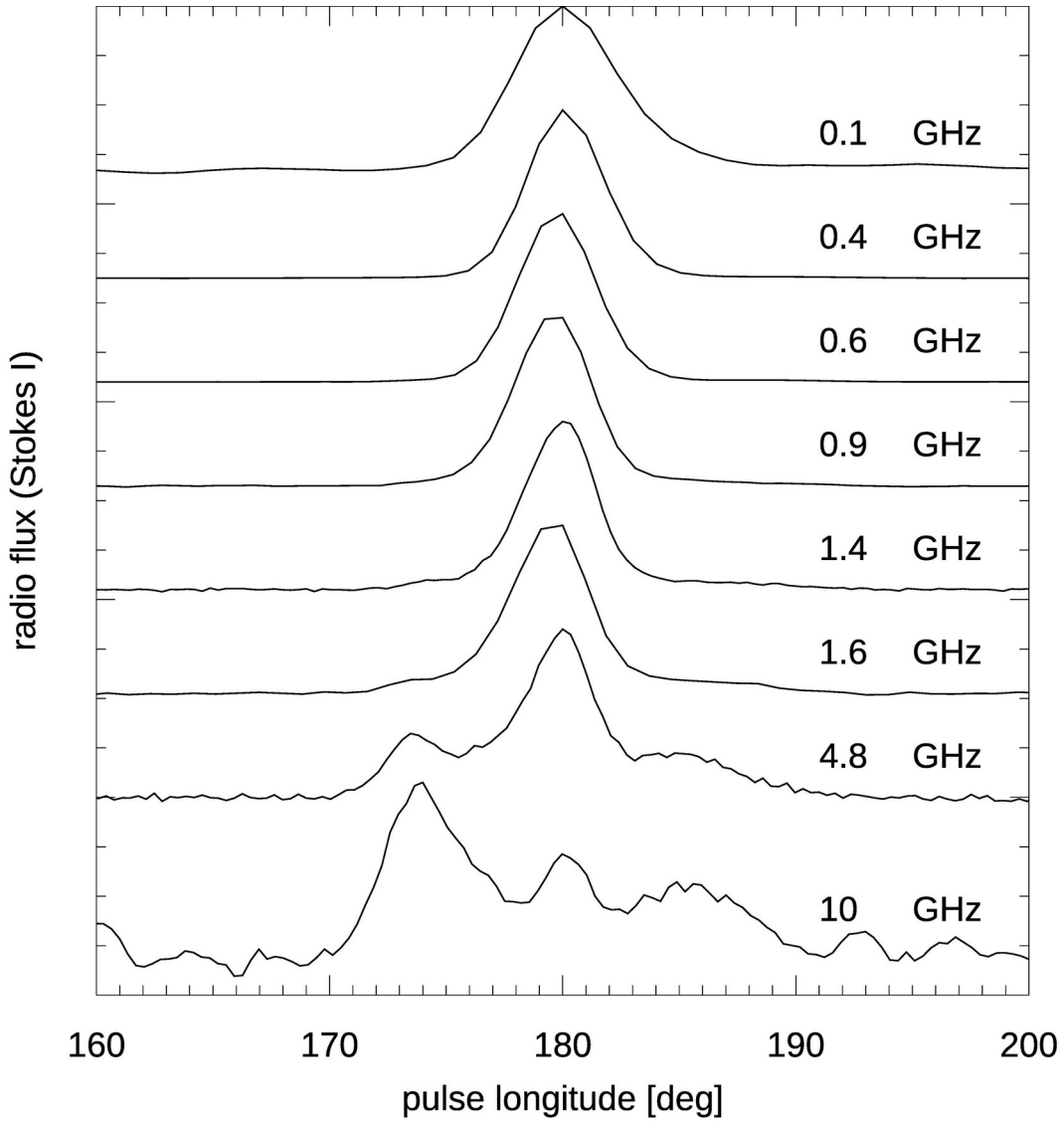
scattering rate strong only for one mode (O mode)

=> outward scattering of axial (core) radiation along the local B



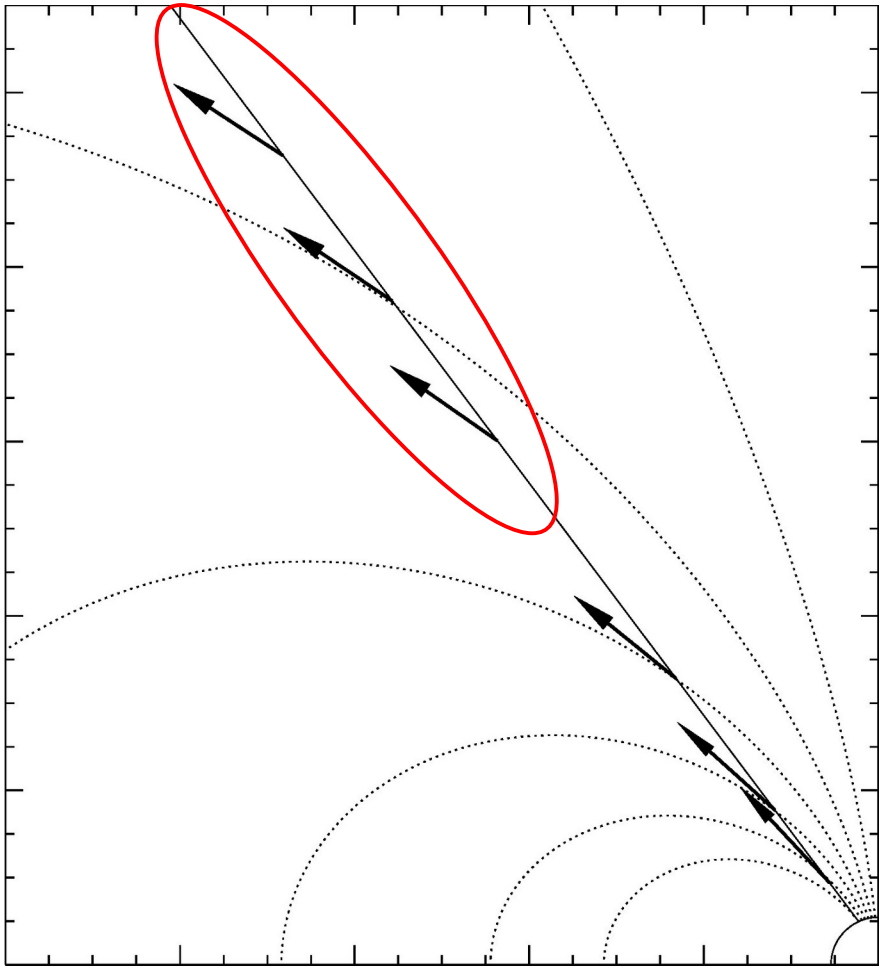


S_t profiles: conal components emerge at high nu (blueshifted by scattering)



Scattering as the origin of cones

If mean free path is not short => ~ **universal scattering angle**



arrows show local B
along a ray's path

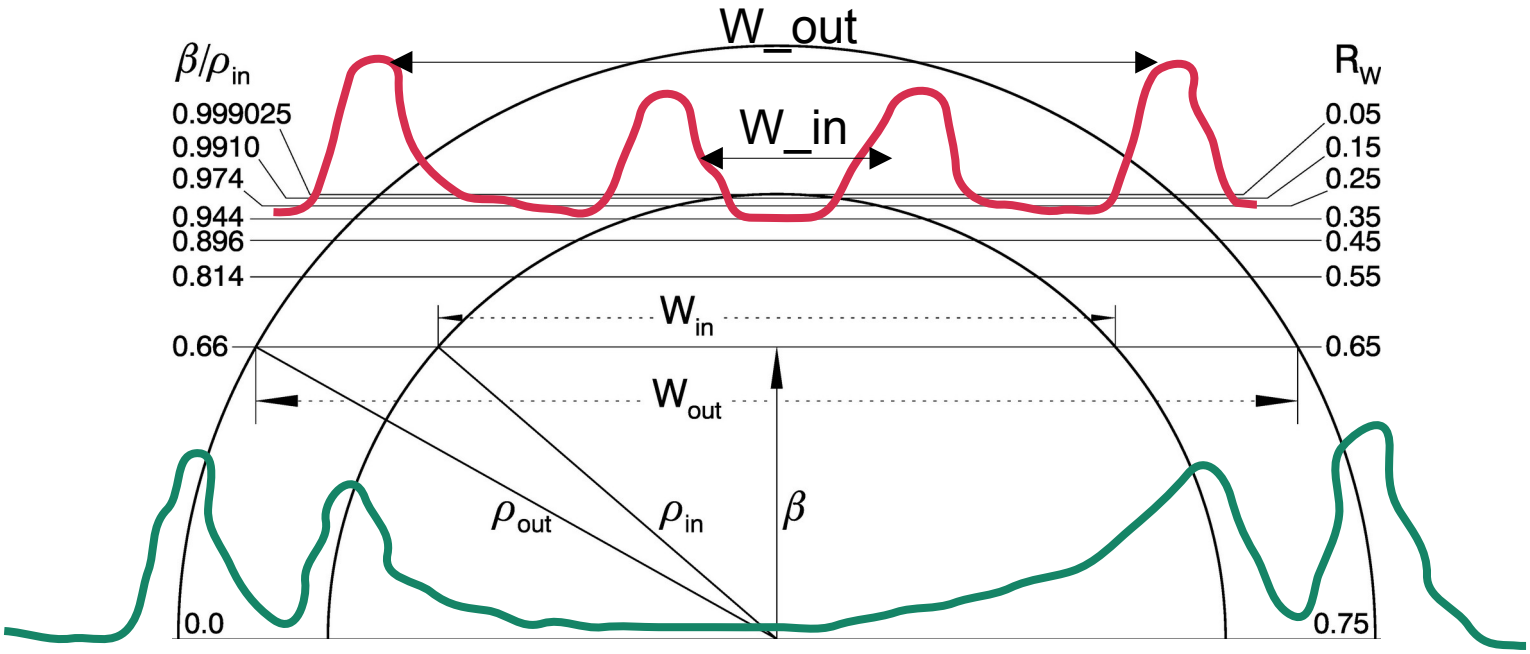
Scattered cone 1.5 times wider: rho_out / rho_in = 3/2

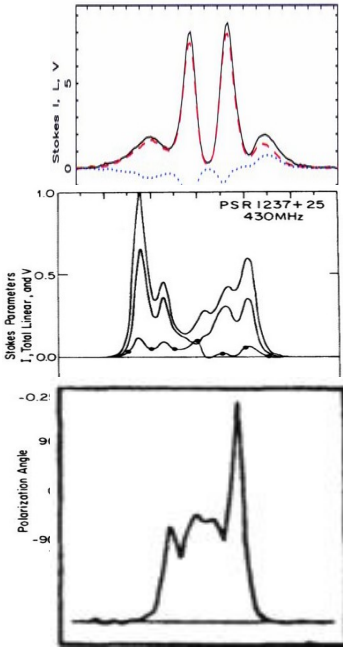
rho_in / rho_out = 2/3 = 0.66

Ratio of components' separation:

$$Rw = \frac{W\_in}{W\_out}$$

$$\frac{rho\_in}{rho\_out} = max\left(\frac{W\_in}{W\_out}\right) = max(Rw)$$





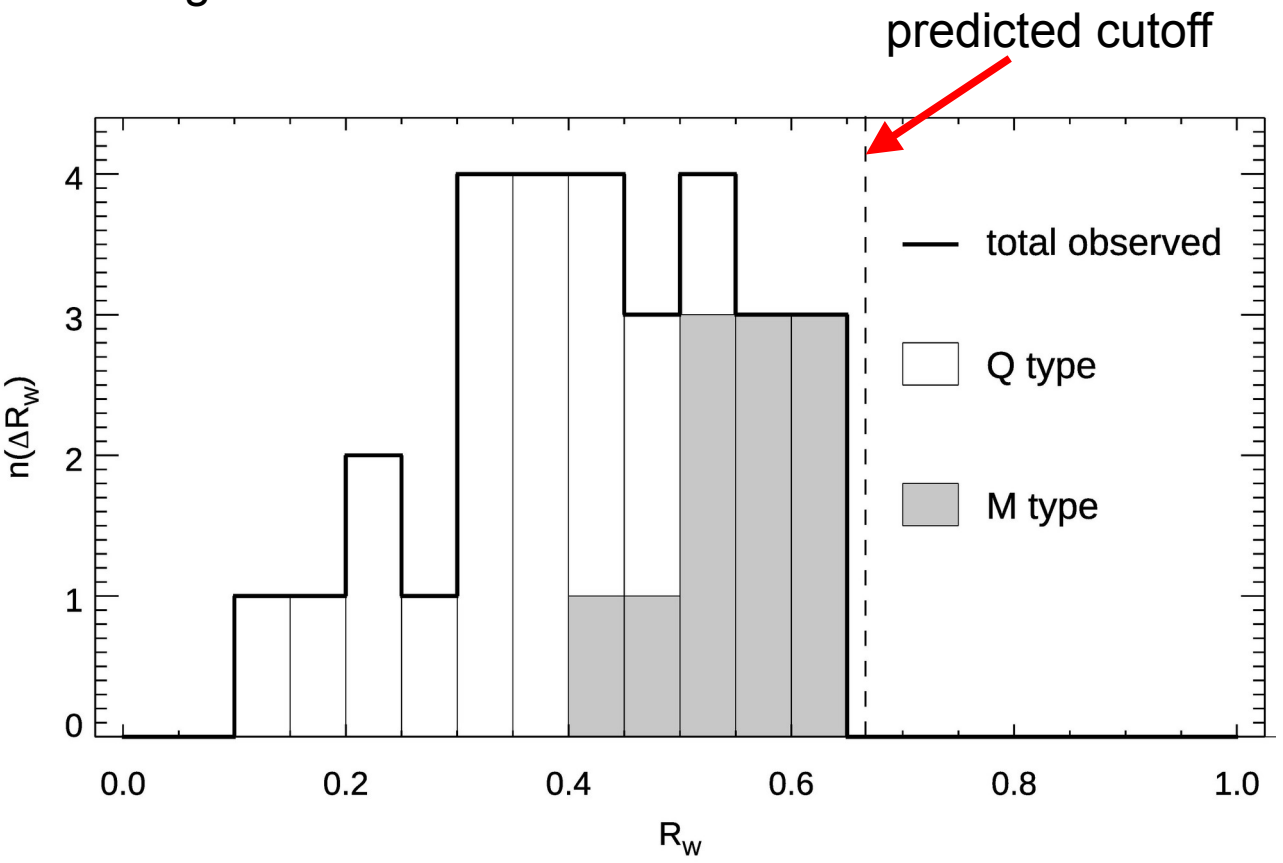
Edge beam cutting => inner components very close => small Rw

Central beam cutting => maximum Rw = cone size ratio

Dyks & Pierbattista 2015

Observed cone size ratio
is consistent with the scattered origin of the cones

Observed Rw distribution:
(30 pulsars of Q and M type)



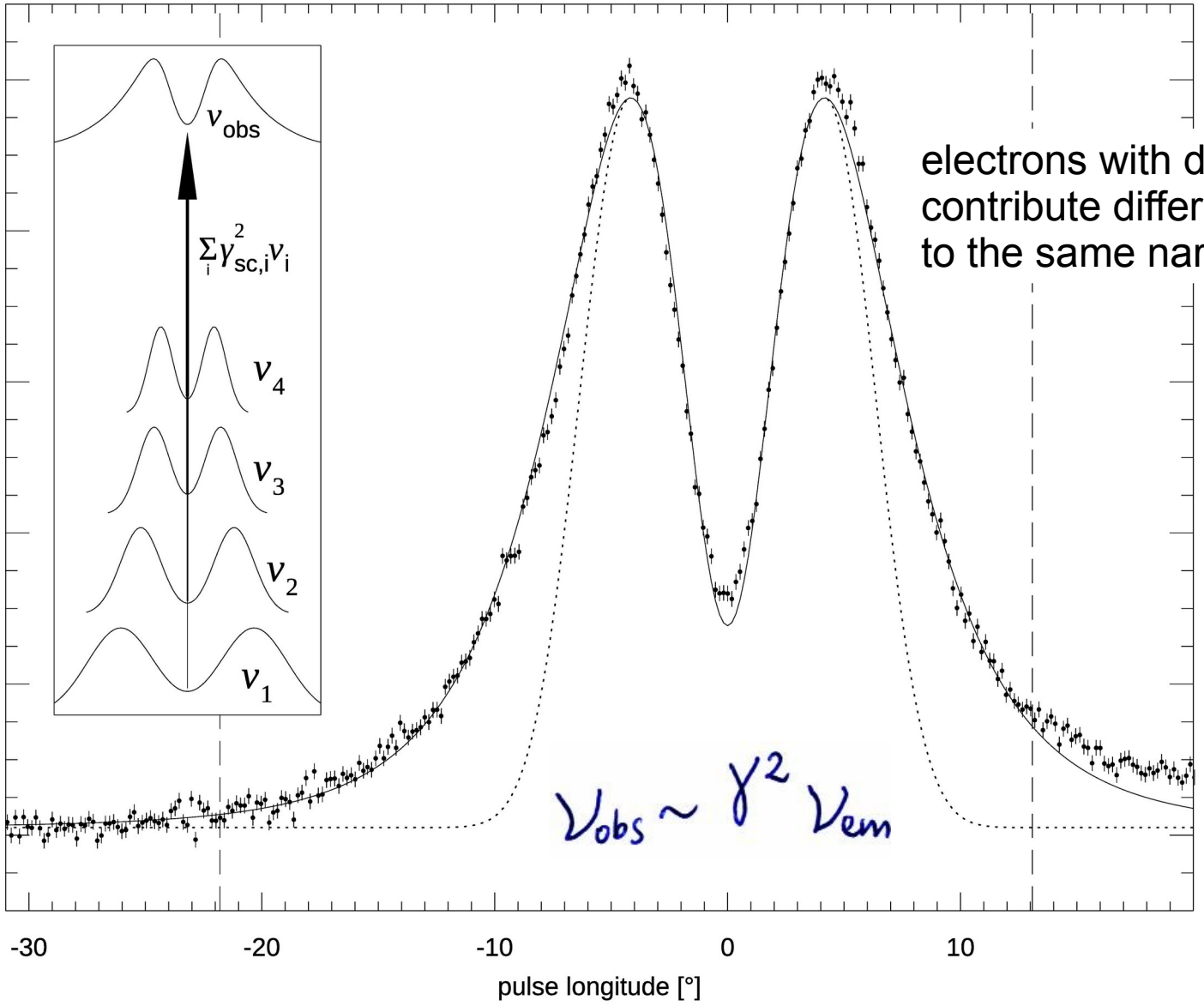
D & P 2015

Three objects with maximum value = 0.63

Model-independent result (no dep. on alpha, P, r_em)

nu-resolved feature has nu-integrated shape and is 10 times too wide

=> DOPPLER MAGNIFICATION + SPECTRAL STACKING
(blueshift of wide low-nu microbeams + spectral convolution)



electrons with different gamma
contribute different emitted frequencies
to the same narrow observed frequency band

Thank you