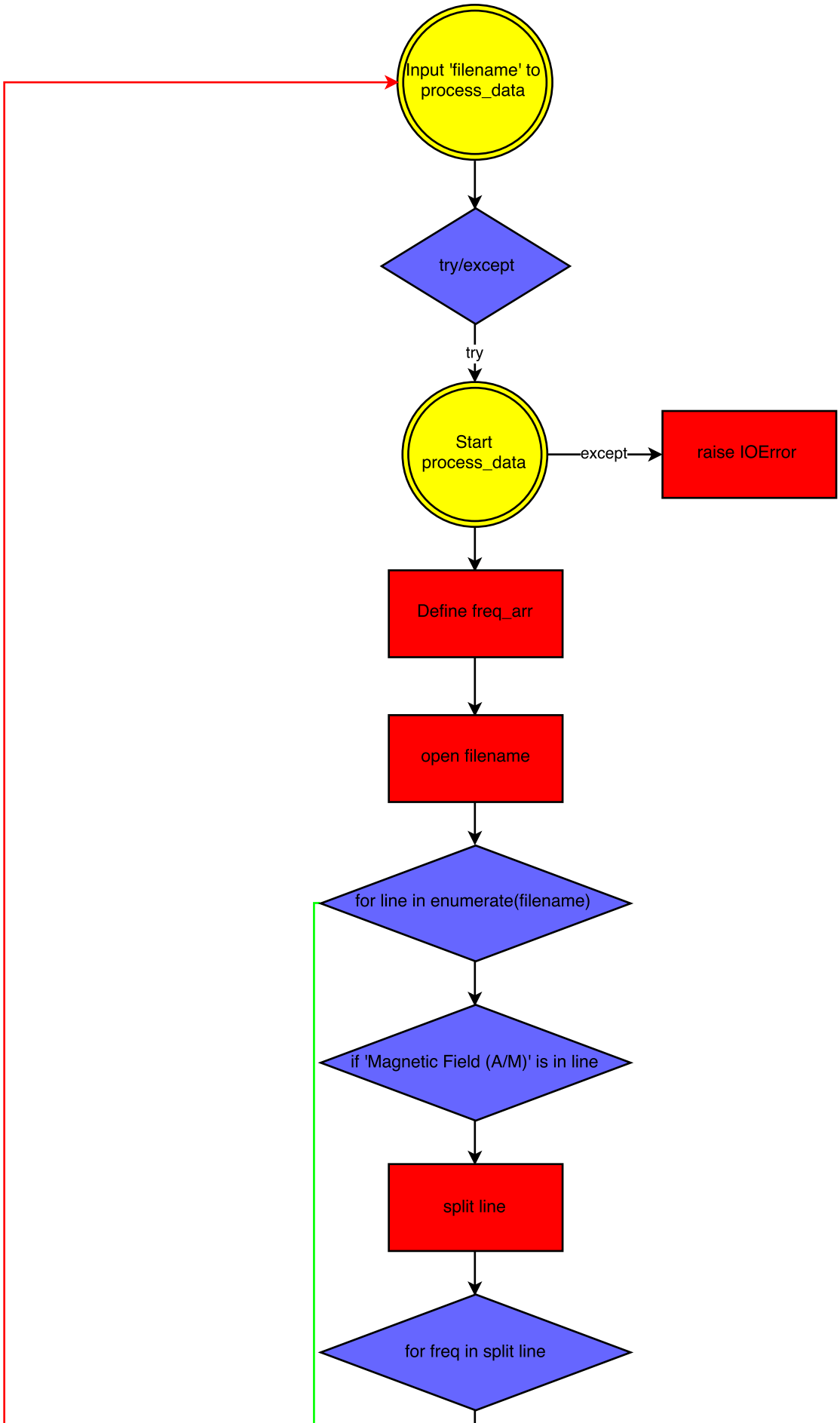
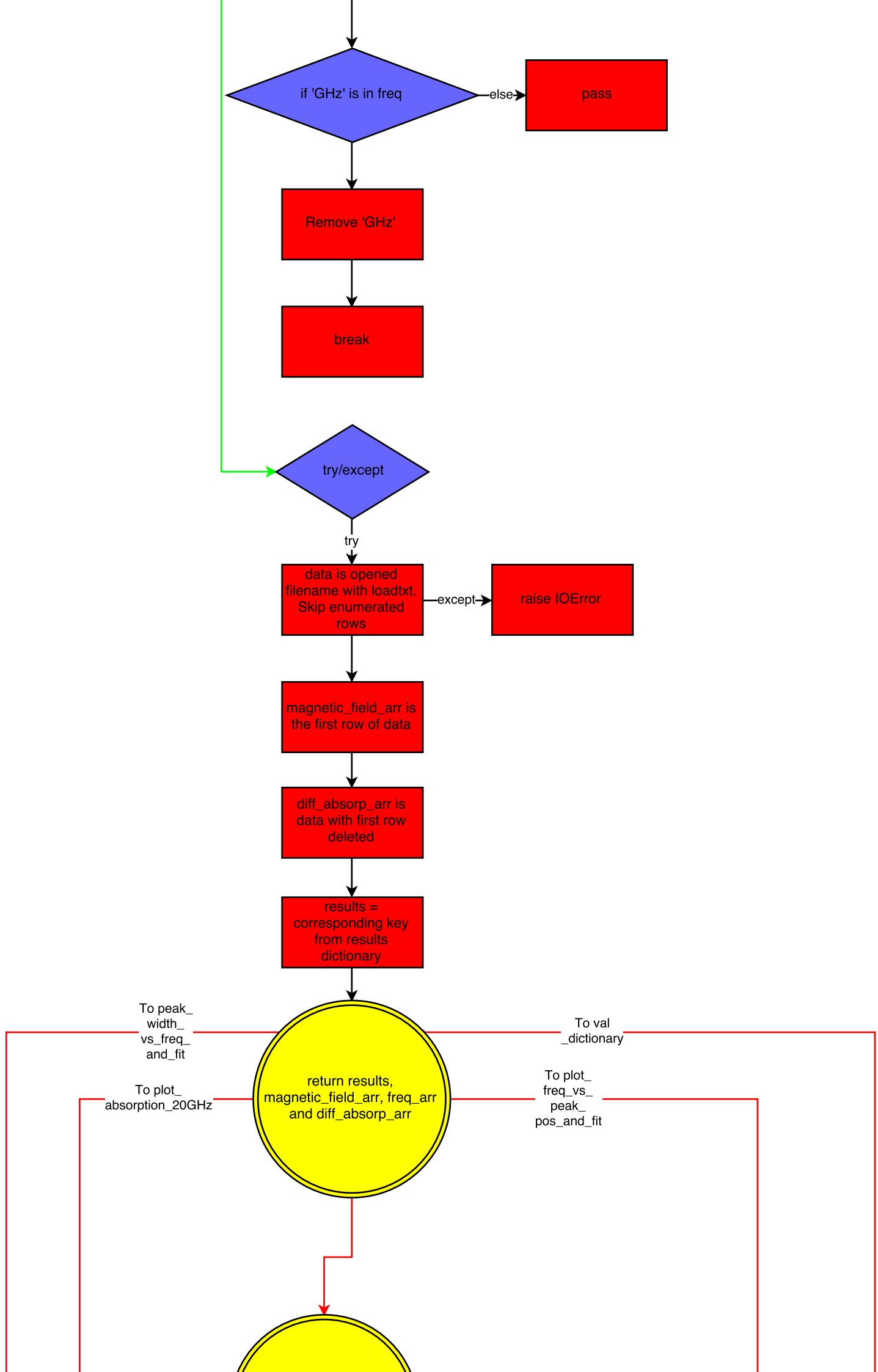
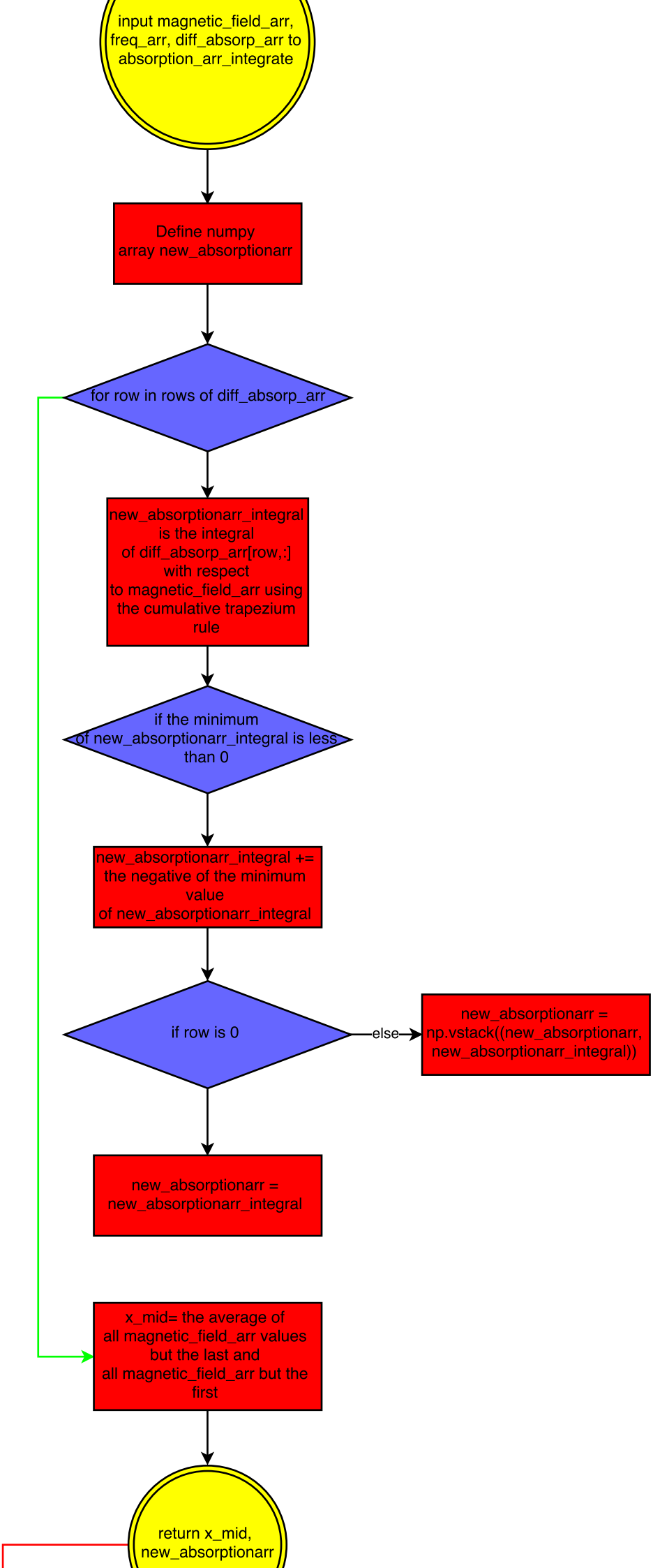
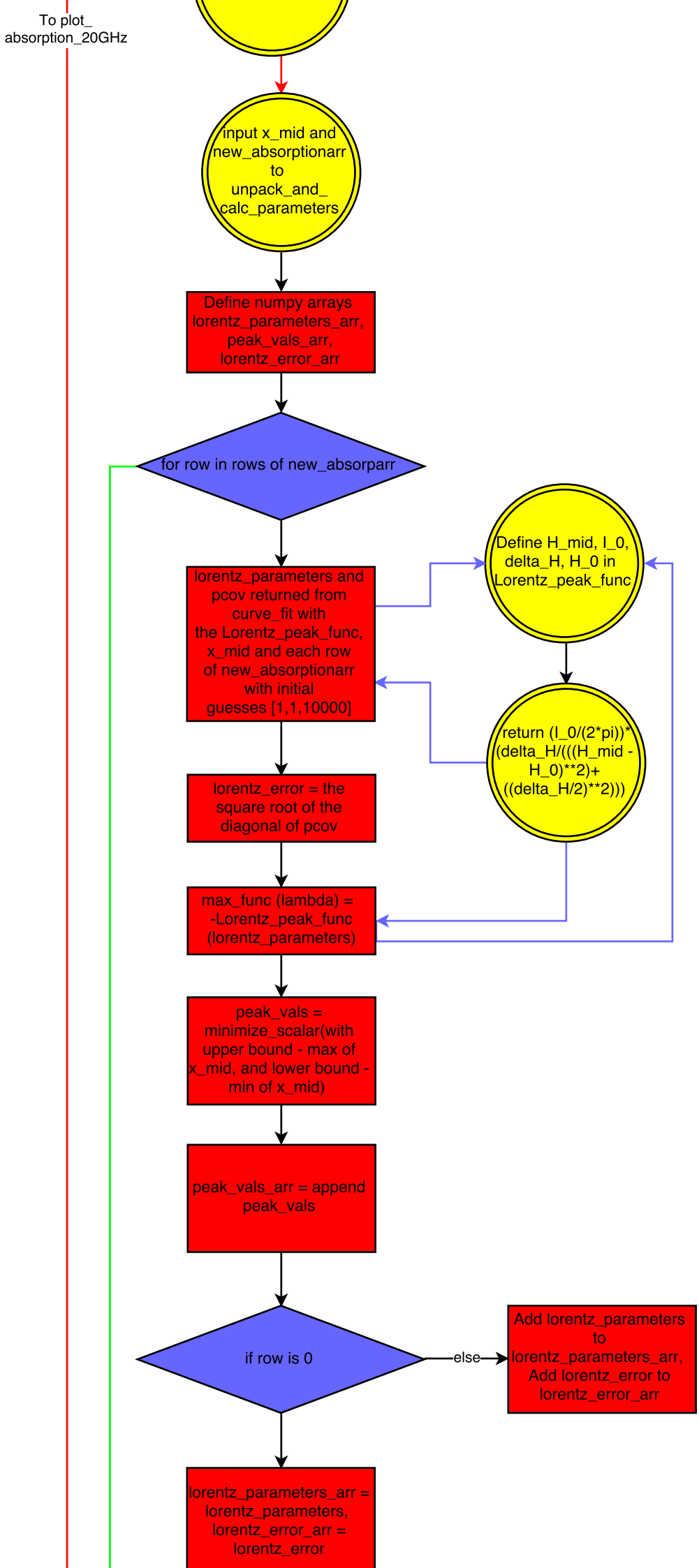
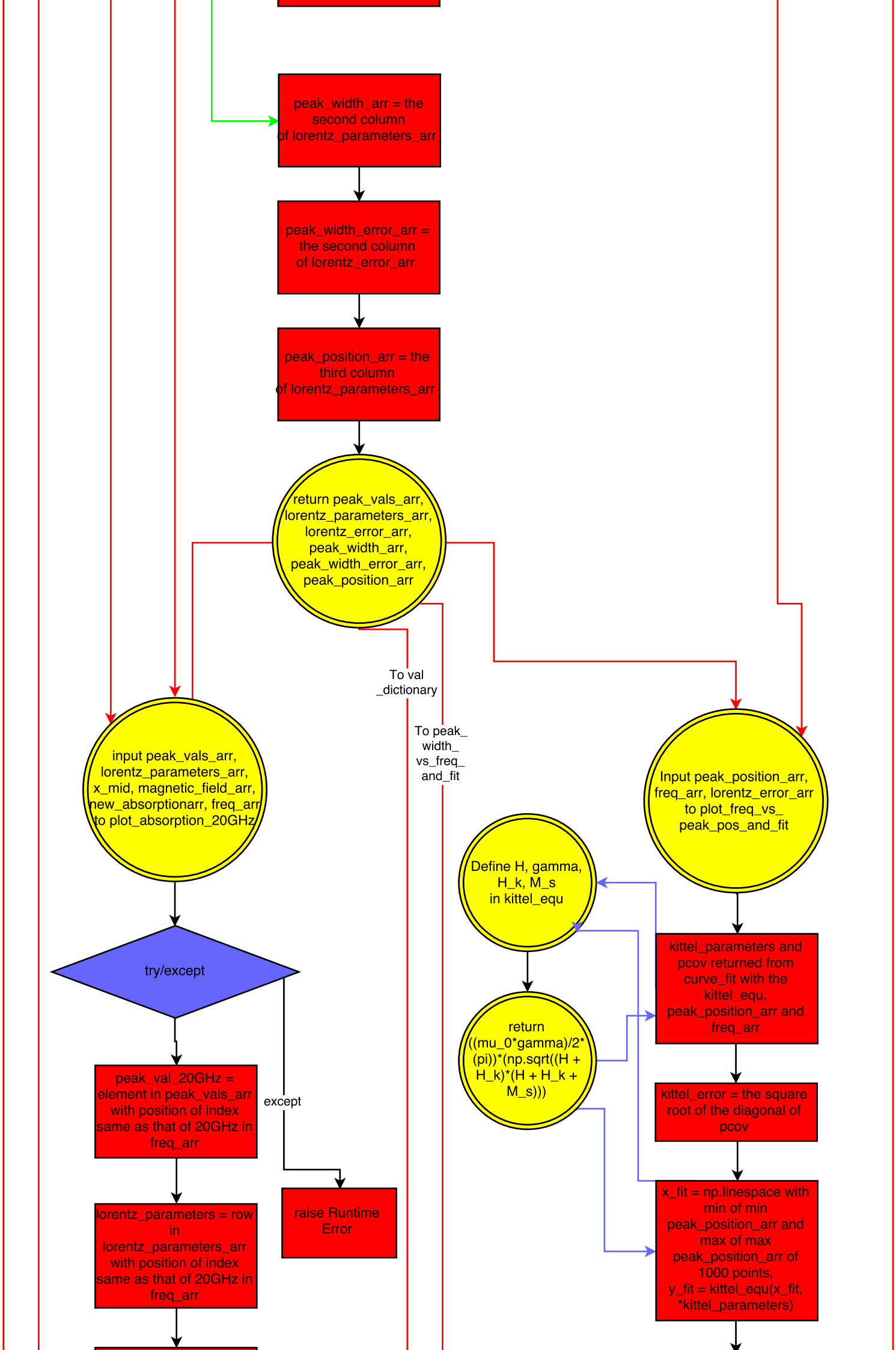
Computing 2 flowchart - 201086071

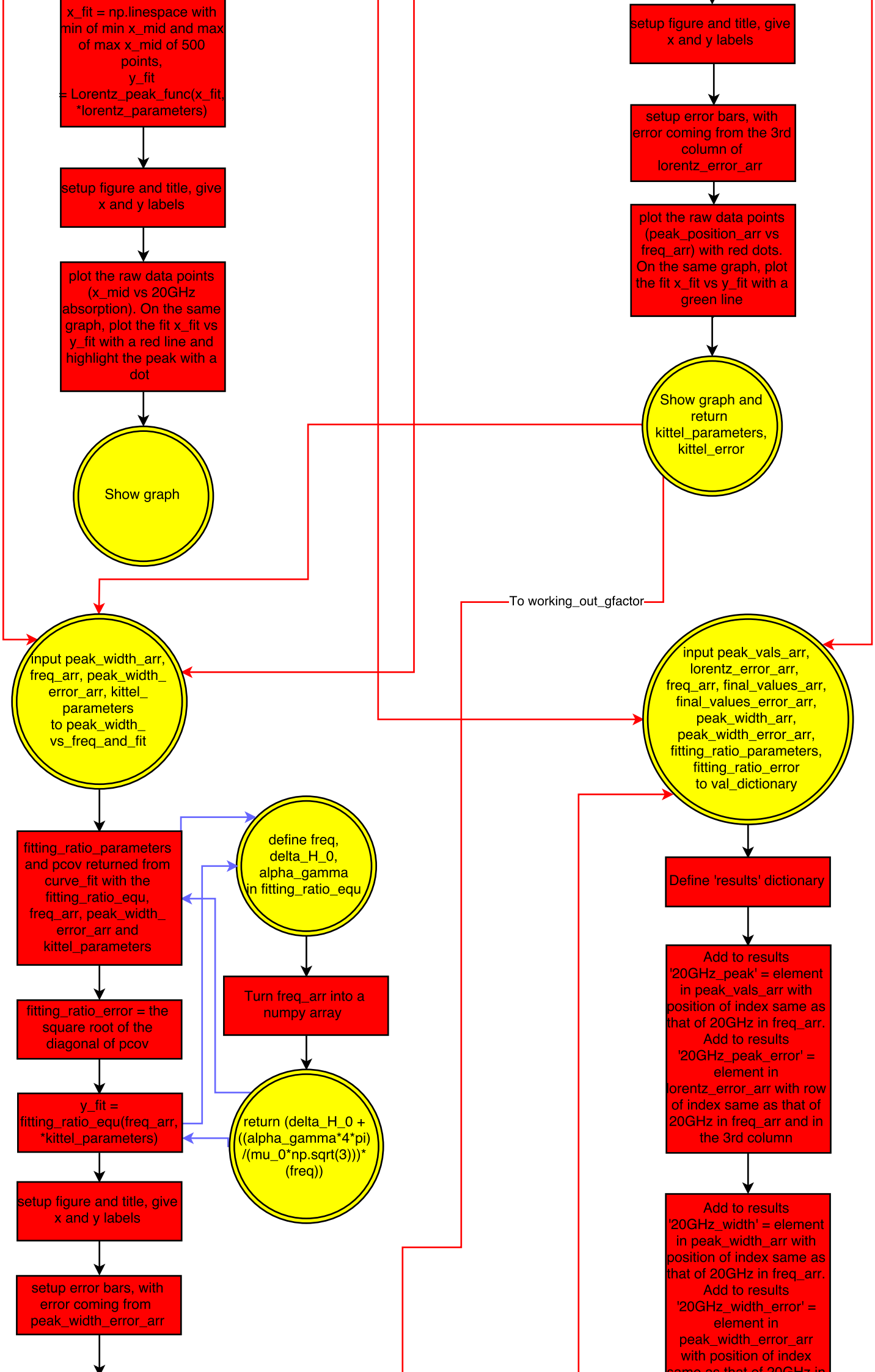


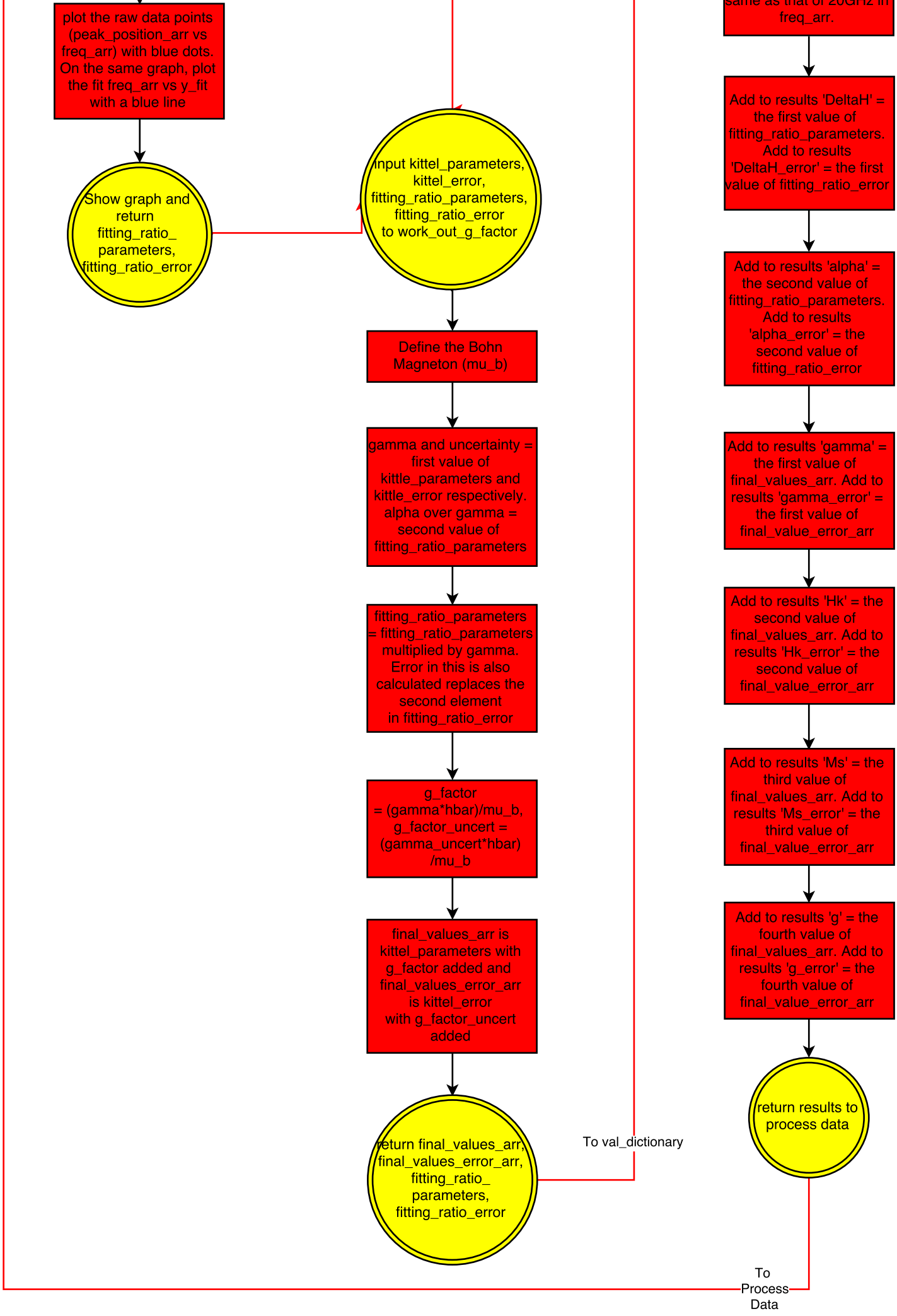

if 'GHz' is in freq
else
pass
Remove 'GHz'
break
try/except
try
data is opened filename with loadtxt. Skip enumerated rows
except
raise IOError
magnetic_field_arr is the first row of data
diff_absorp_arr is data with first row deleted
results = corresponding key from results dictionary
To peak_ width_ vs_freq_ and_fit
To val _dictionary
To plot_ absorption_20GHz
return results, magnetic_field_arr, freq_arr and diff_absorp_arr
To plot_ freq_vs_ peak_ pos_and_fit


input magnetic_field_arr, freq_arr, diff_absorp_arr to absorption_arr_integrate
Define numpy array new_absorptionarr
for row in rows of diff_absorp_arr
new_absorptionarr_integral is the integral of diff_absorp_arr[row,:] with respect to magnetic_field_arr using the cumulative trapezium rule
if the minimum of new_absorptionarr_integral is less than 0
new_absorptionarr_integral += the negative of the minimum value of new_absorptionarr_integral
if row is 0
else
new_absorptionarr = np.vstack((new_absorptionarr, new_absorptionarr_integral))
new_absorptionarr = new_absorptionarr_integral
x_mid= the average of all magnetic_field_arr values but the last and all magnetic_field_arr but the first
return x_mid, new_absorptionarr


To plot_
absorption_20GHz
input x_mid and new_absorptionarr to unpack_and_ calc_parameters
Define numpy arrays lorentz_parameters_arr, peak_vals_arr, lorentz_error_arr
for row in rows of new_absorparr
lorentz_parameters and pcov returned from curve_fit with the Lorentz_peak_func, x_mid and each row of new_absorptionarr with initial guesses [1,1,10000]
Define H_mid, I_0, delta_H, H_0 in Lorentz_peak_func
return (I_0/(2*pi))*(delta_H/(((H_mid - H_0)**2)+((delta_H/2)**2)))
lorentz_error = the square root of the diagonal of pcov
max_func (lambda) = -Lorentz_peak_func (lorentz_parameters)
peak_vals = minimize_scalar(with upper bound - max of x_mid, and lower bound - min of x_mid)
peak_vals_arr = append peak_vals
if row is 0
else
Add lorentz_parameters to lorentz_parameters_arr, Add lorentz_error to lorentz_error_arr
lorentz_parameters_arr = lorentz_parameters, lorentz_error_arr = lorentz_error


peak_width_arr = the second column of lorentz_parameters_arr
peak_width_error_arr = the second column of lorentz_error_arr
peak_position_arr = the third column of lorentz_parameters_arr
return peak_vals_arr, lorentz_parameters_arr, lorentz_error_arr, peak_width_arr, peak_width_error_arr, peak_position_arr
To val _dictionary
To peak_ width_ vs_freq_ and_fit
input peak_vals_arr, lorentz_parameters_arr, x_mid, magnetic_field_arr, new_absorptionarr, freq_arr to plot_absorption_20GHz
Input peak_position_arr, freq_arr, lorentz_error_arr to plot_freq_vs_ peak_pos_and_fit
Define H, gamma, H_k, M_s in kittel_equ
try/except
except
peak_val_20GHz = element in peak_vals_arr with position of index same as that of 20GHz in freq_arr
raise Runtime Error
return ((mu_0*gamma)/2*(pi))*(np.sqrt((H + H_k)*(H + H_k + M_s)))
kittel_parameters and pcov returned from curve_fit with the kittel_equ, peak_position_arr and freq_arr
kittel_error = the square root of the diagonal of pcov
lorentz_parameters = row in lorentz_parameters_arr with position of index same as that of 20GHz in freq_arr
x_fit = np.linespace with min of min peak_position_arr and max of max peak_position_arr of 1000 points, y_fit = kittel_equ(x_fit, *kittel_parameters)


x_fit = np.linespace with min of min x_mid and max of max x_mid of 500 points,
y_fit
= Lorentz_peak_func(x_fit, *lorentz_parameters)
setup figure and title, give x and y labels
plot the raw data points (x_mid vs 20GHz absorption). On the same graph, plot the fit x_fit vs y_fit with a red line and highlight the peak with a dot
Show graph
setup figure and title, give x and y labels
setup error bars, with error coming from the 3rd column of lorentz_error_arr
plot the raw data points (peak_position_arr vs freq_arr) with red dots. On the same graph, plot the fit x_fit vs y_fit with a green line
Show graph and return kittel_parameters, kittel_error
To working_out_gfactor
input peak_width_arr, freq_arr, peak_width_ error_arr, kittel_ parameters
to peak_width_ vs_freq_and_fit
input peak_vals_arr, lorentz_error_arr, freq_arr, final_values_arr, final_values_error_arr, peak_width_arr, peak_width_error_arr, fitting_ratio_parameters, fitting_ratio_error
to val_dictionary
fitting_ratio_parameters and pcov returned from curve_fit with the fitting_ratio_equ, freq_arr, peak_width_ error_arr and kittel_parameters
define freq, delta_H_0, alpha_gamma in fitting_ratio_equ
Turn freq_arr into a numpy array
return (delta_H_0 + ((alpha_gamma*4*pi) /(mu_0*np.sqrt(3)))* (freq))
fitting_ratio_error = the square root of the diagonal of pcov
y_fit = fitting_ratio_equ(freq_arr, *kittel_parameters)
setup figure and title, give x and y labels
setup error bars, with error coming from peak_width_error_arr
Define 'results' dictionary
Add to results '20GHz_peak' = element in peak_vals_arr with position of index same as that of 20GHz in freq_arr. Add to results '20GHz_peak_error' = element in lorentz_error_arr with row of index same as that of 20GHz in freq_arr and in the 3rd column
Add to results '20GHz_width' = element in peak_width_arr with position of index same as that of 20GHz in freq_arr. Add to results '20GHz_width_error' = element in peak_width_error_arr with position of index


plot the raw data points (peak_position_arr vs freq_arr) with blue dots. On the same graph, plot the fit freq_arr vs y_fit with a blue line
Show graph and return fitting_ratio_ parameters, fitting_ratio_error
input kittel_parameters, kittel_error, fitting_ratio_parameters, fitting_ratio_error to work_out_g_factor
Define the Bohn Magneton (mu_b)
gamma and uncertainty = first value of kittle_parameters and kittle_error respectively. alpha over gamma = second value of fitting_ratio_parameters
fitting_ratio_parameters = fitting_ratio_parameters multiplied by gamma. Error in this is also calculated replaces the second element in fitting_ratio_error
g_factor = (gamma*hbar)/mu_b, g_factor_uncert = (gamma_uncert*hbar) /mu_b
final_values_arr is kittel_parameters with g_factor added and final_values_error_arr is kittel_error with g_factor_uncert added
return final_values_arr, final_values_error_arr, fitting_ratio_ parameters, fitting_ratio_error
To val_dictionary
same as that of 20GHz in freq_arr.
Add to results 'DeltaH' = the first value of fitting_ratio_parameters. Add to results 'DeltaH_error' = the first value of fitting_ratio_error
Add to results 'alpha' = the second value of fitting_ratio_parameters. Add to results 'alpha_error' = the second value of fitting_ratio_error
Add to results 'gamma' = the first value of final_values_arr. Add to results 'gamma_error' = the first value of final_value_error_arr
Add to results 'Hk' = the second value of final_values_arr. Add to results 'Hk_error' = the second value of final_value_error_arr
Add to results 'Ms' = the third value of final_values_arr. Add to results 'Ms_error' = the third value of final_value_error_arr
Add to results 'g' = the fourth value of final_values_arr. Add to results 'g_error' = the fourth value of final_value_error_arr
return results to process data
To Process Data