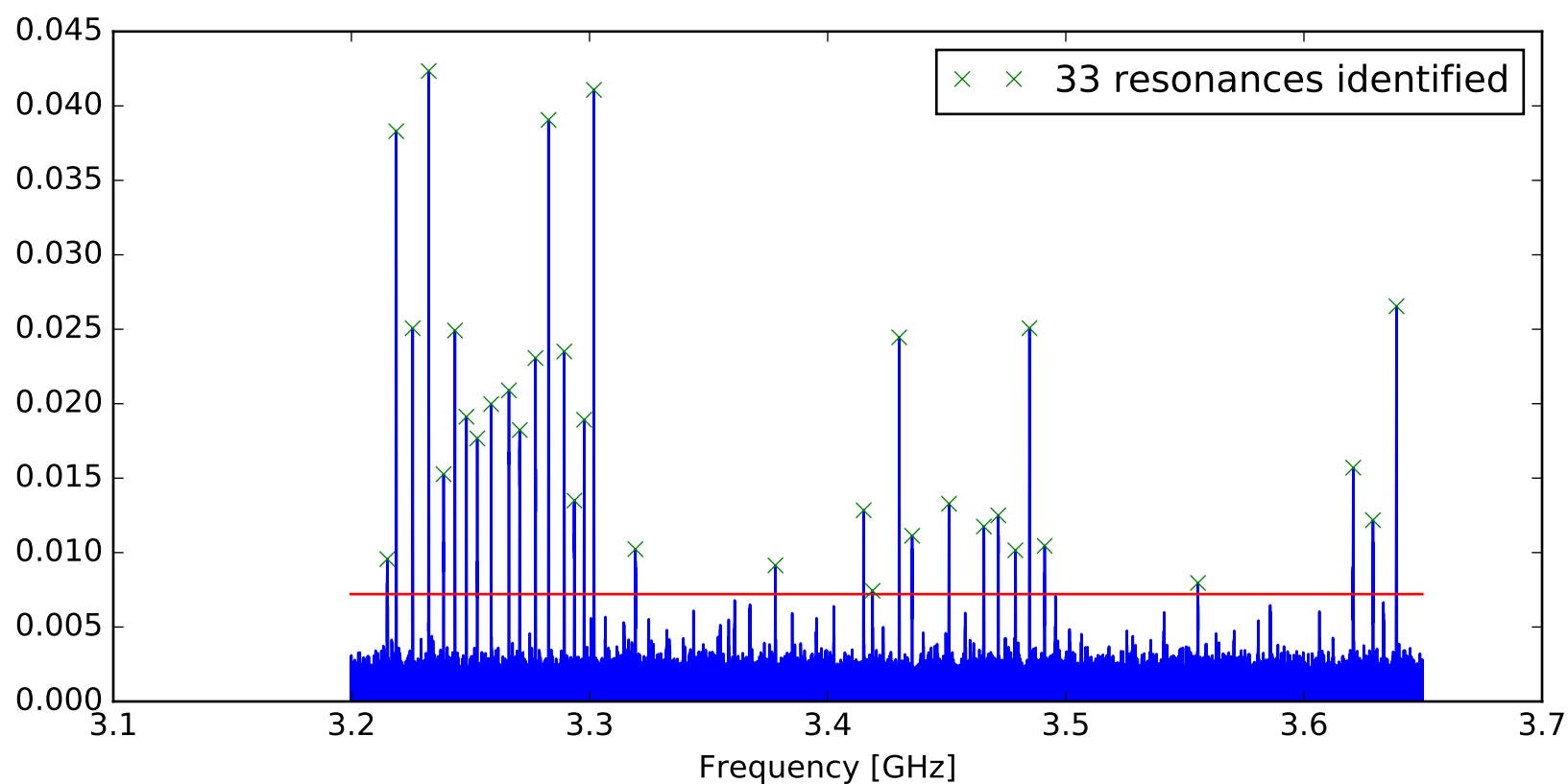
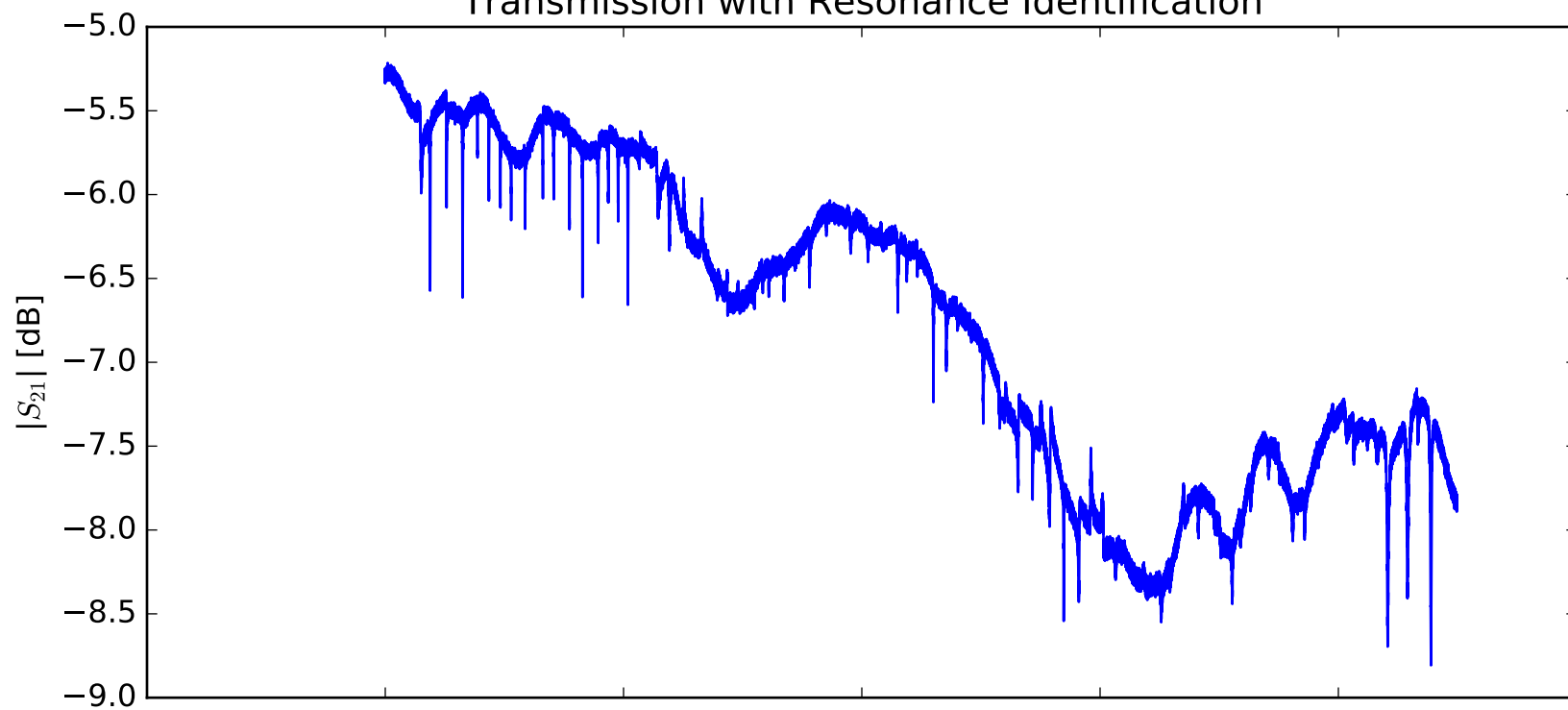
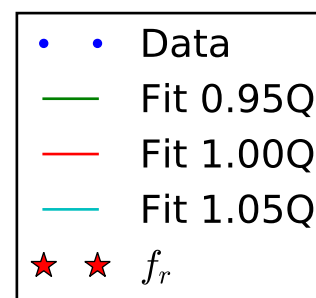
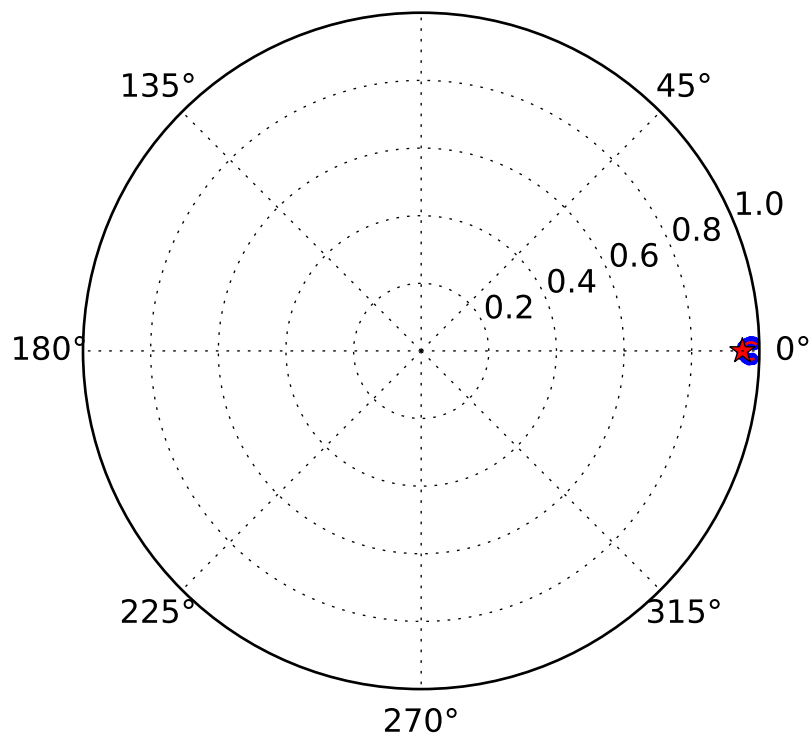
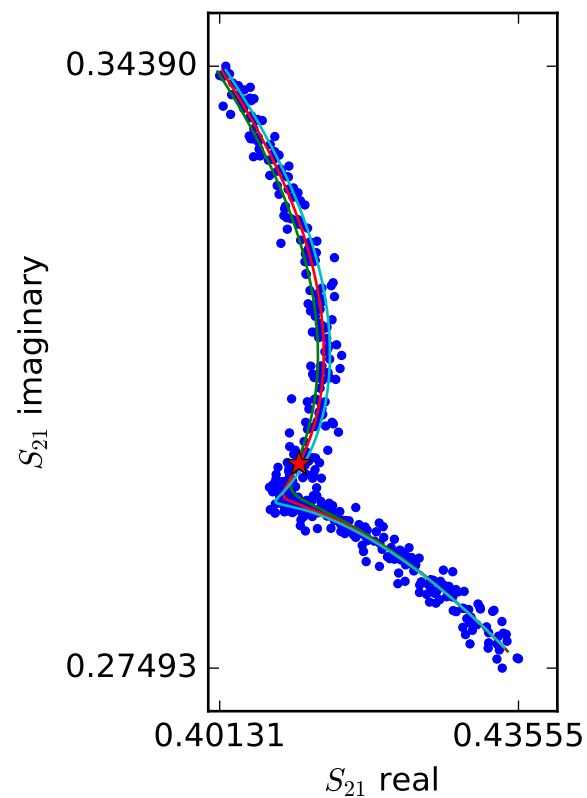
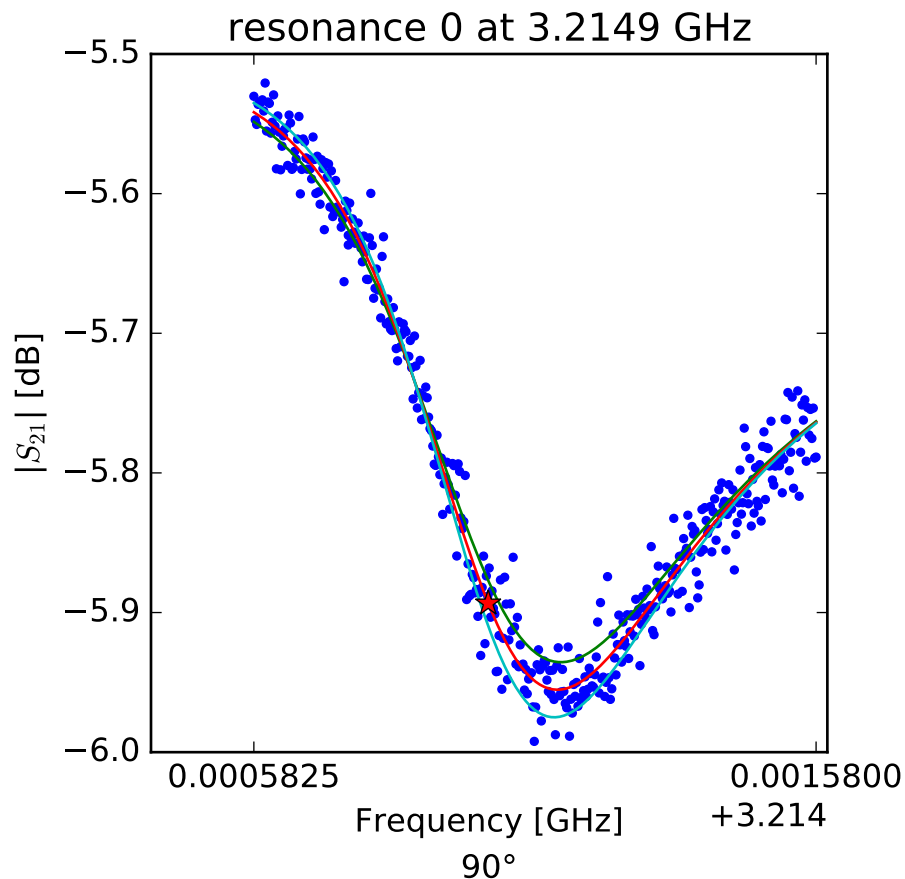


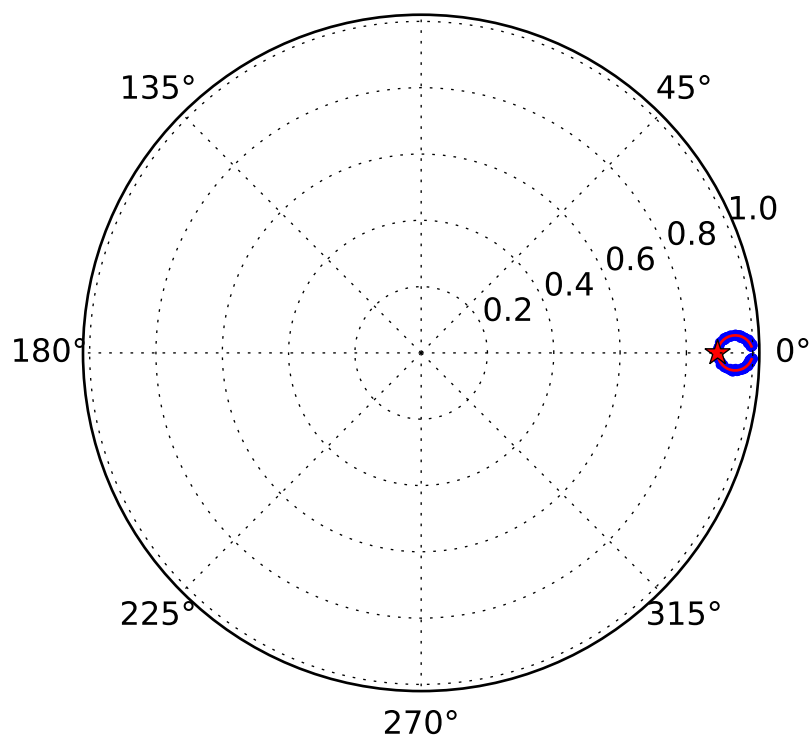
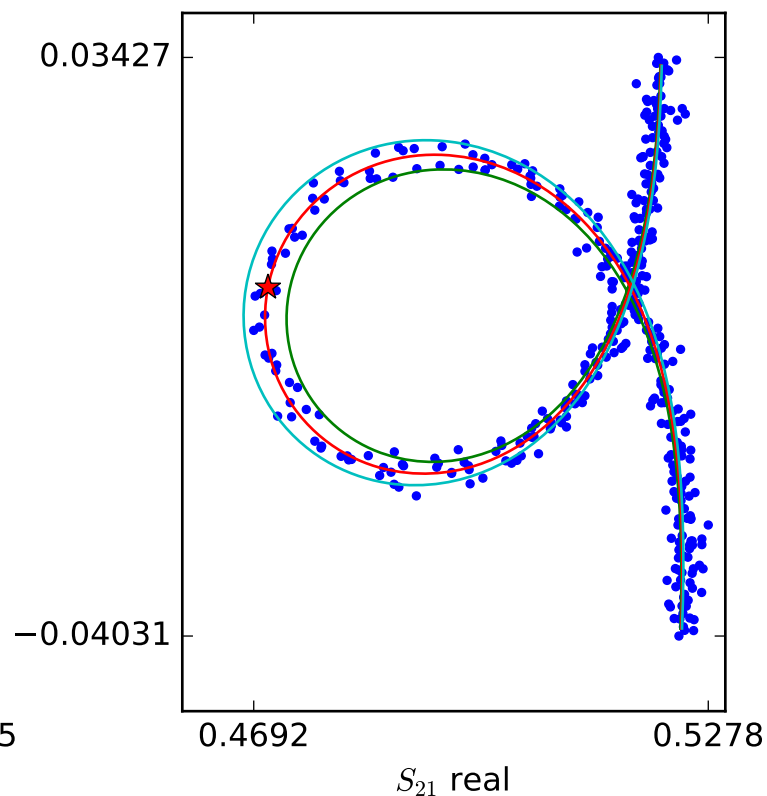
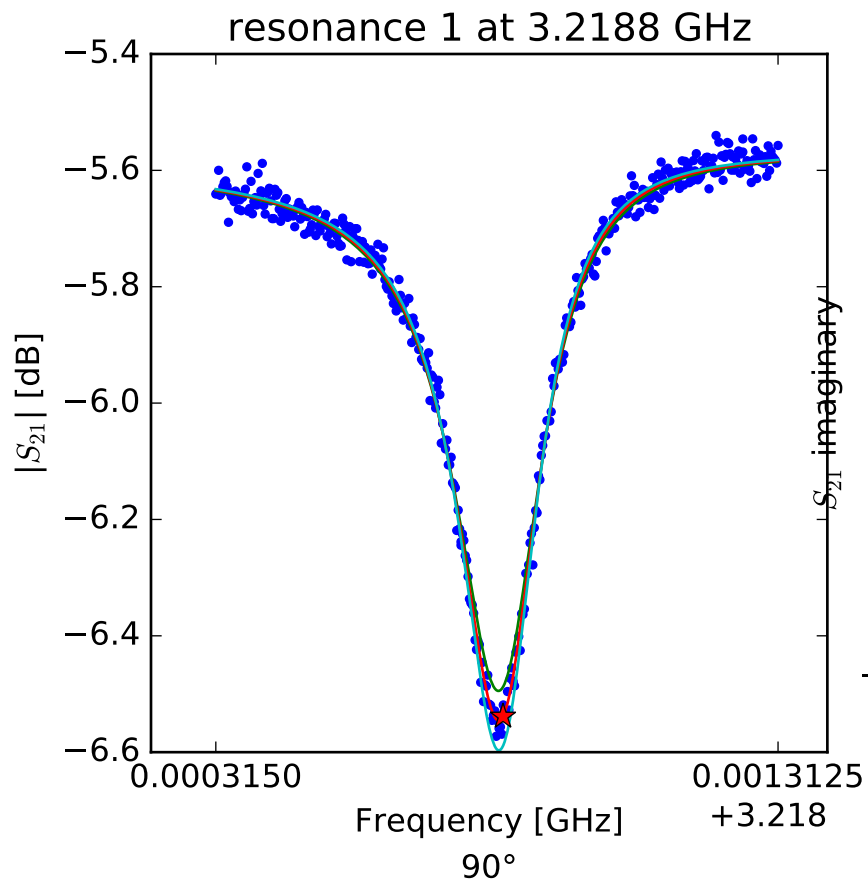
Transmission with Resonance Identification





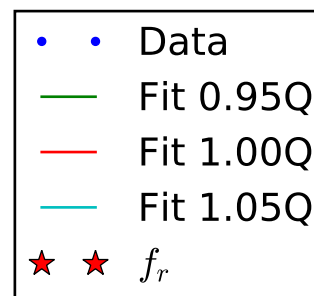
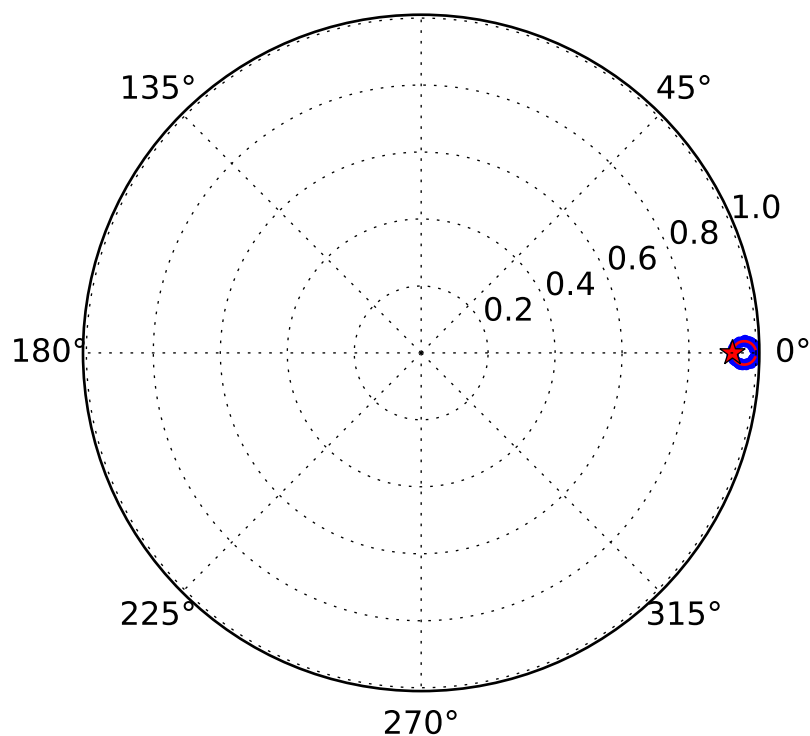
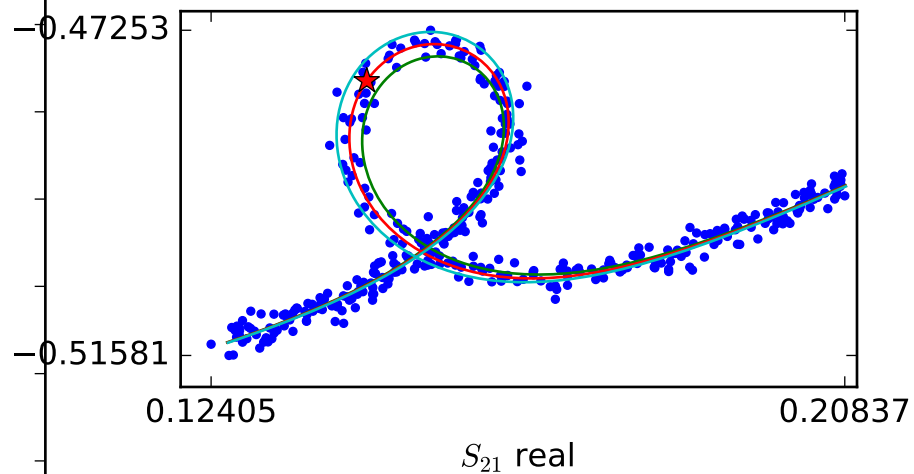
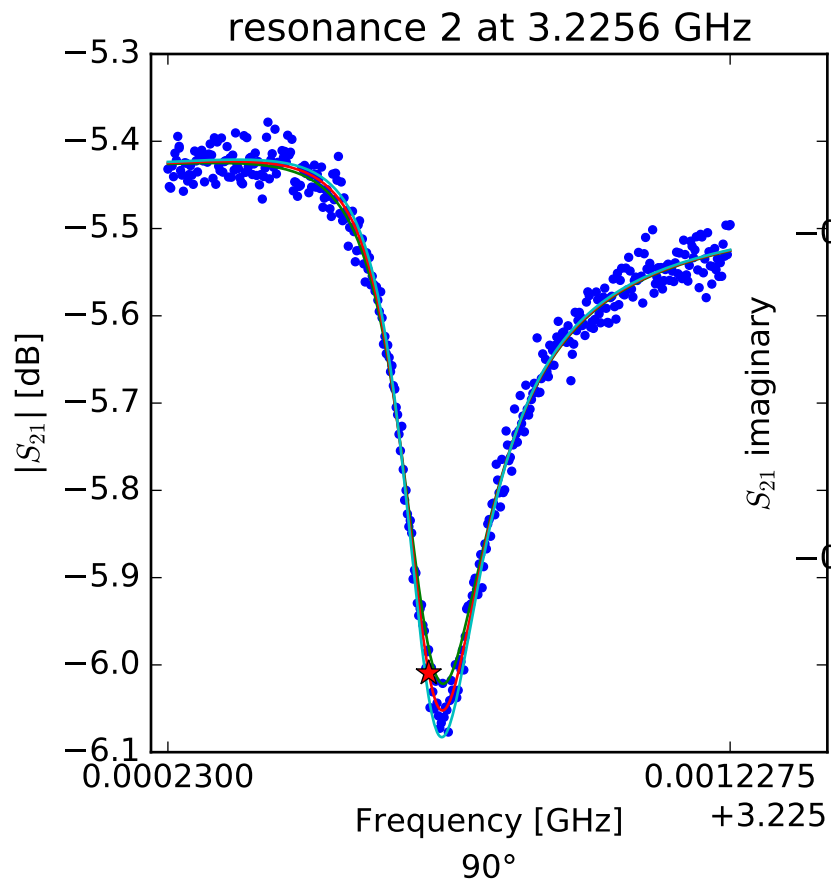
$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

$$\begin{aligned} f_r &= 3.21499828966 \\ Q_r &= 5142.1551212 \\ Q_c &= 102549.871394 \\ a &= (0.270993090928 + 0.451682028164j) \\ \phi_0 &= 0.730861751079 \\ \tau &= 28.3230054445 \end{aligned}$$



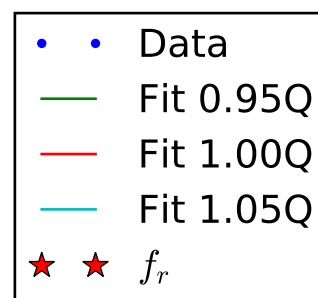
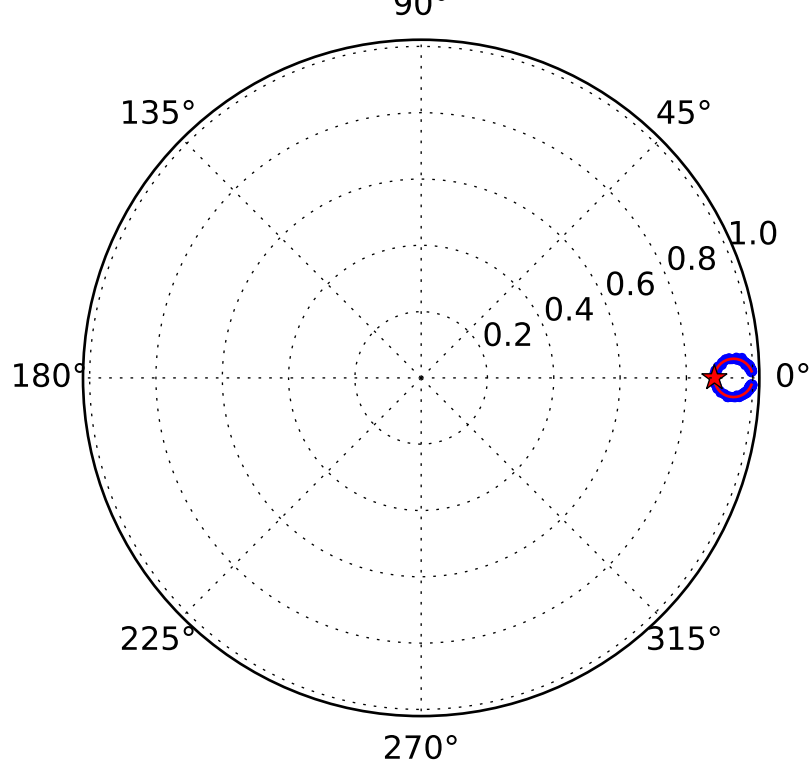
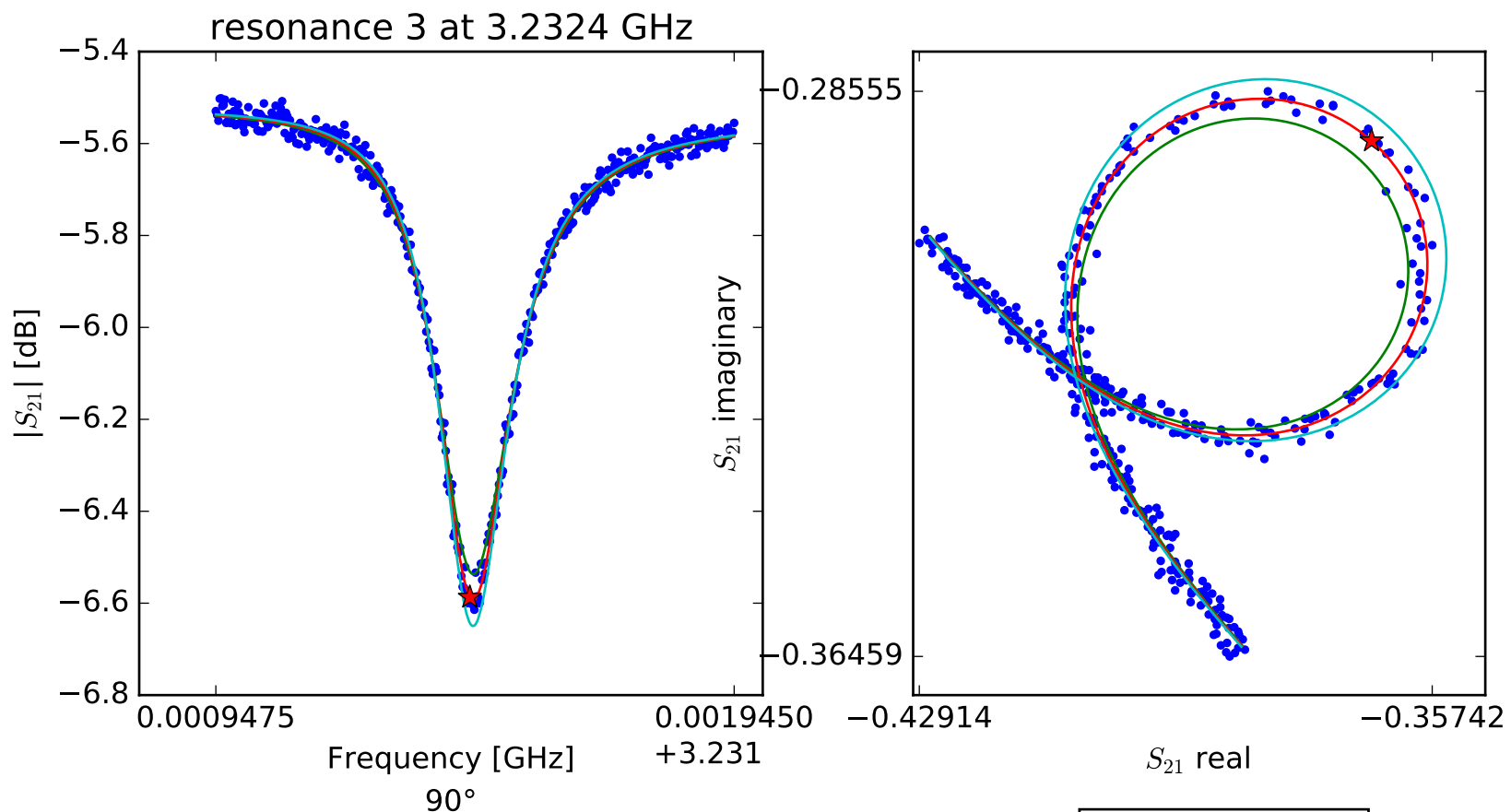
$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

$$\begin{aligned} f_r &= 3.21882457026 \\ Q_r &= 17047.1074768 \\ Q_c &= 160842.696509 \\ a &= (0.370161292939 - 0.373801979777j) \\ \phi_0 &= -0.155348573122 \\ \tau &= 28.2325325677 \end{aligned}$$



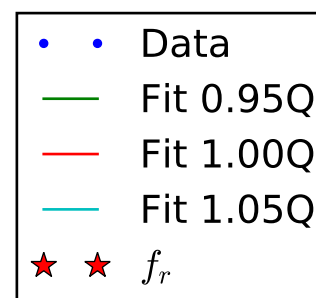
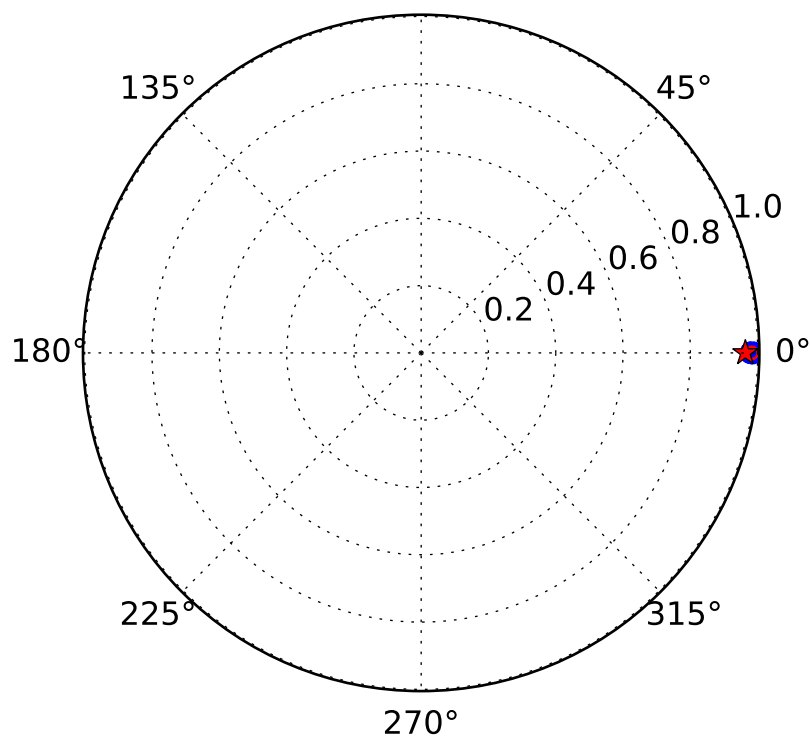
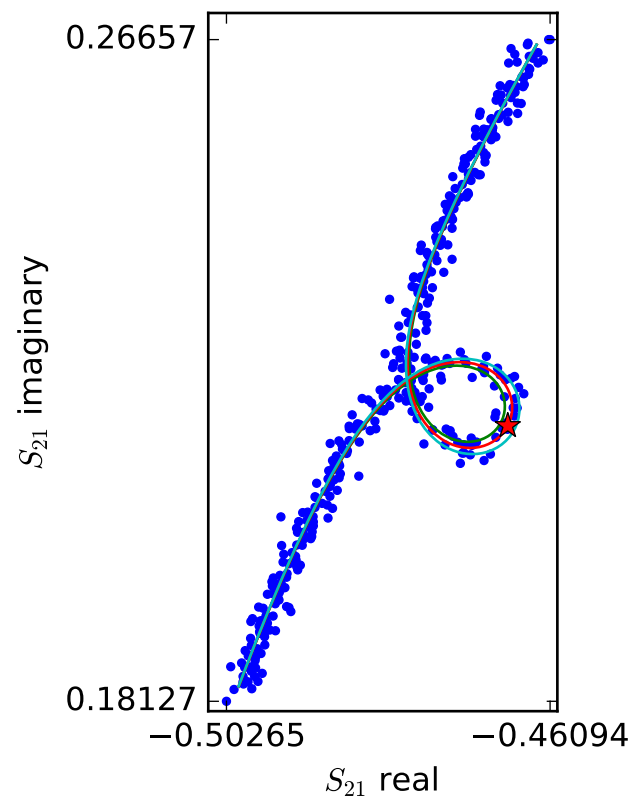
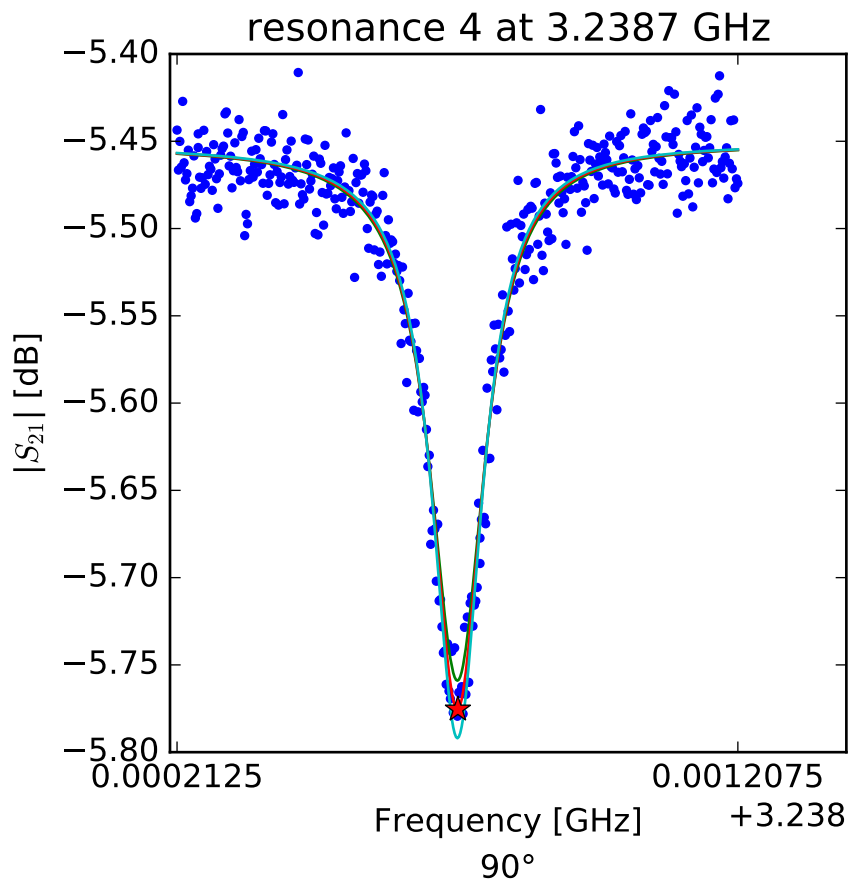
$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

$$\begin{aligned} f_r &= 3.22569277207 \\ Q_r &= 17295.9509117 \\ Q_c &= 246399.430441 \\ a &= (-0.454699003775 + 0.278689389932j) \\ \phi_0 &= 0.493138910409 \\ \tau &= 29.0201738588 \end{aligned}$$



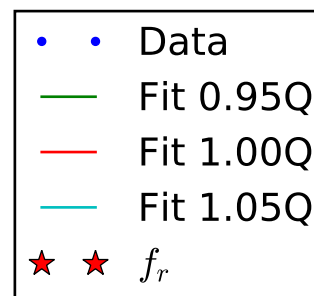
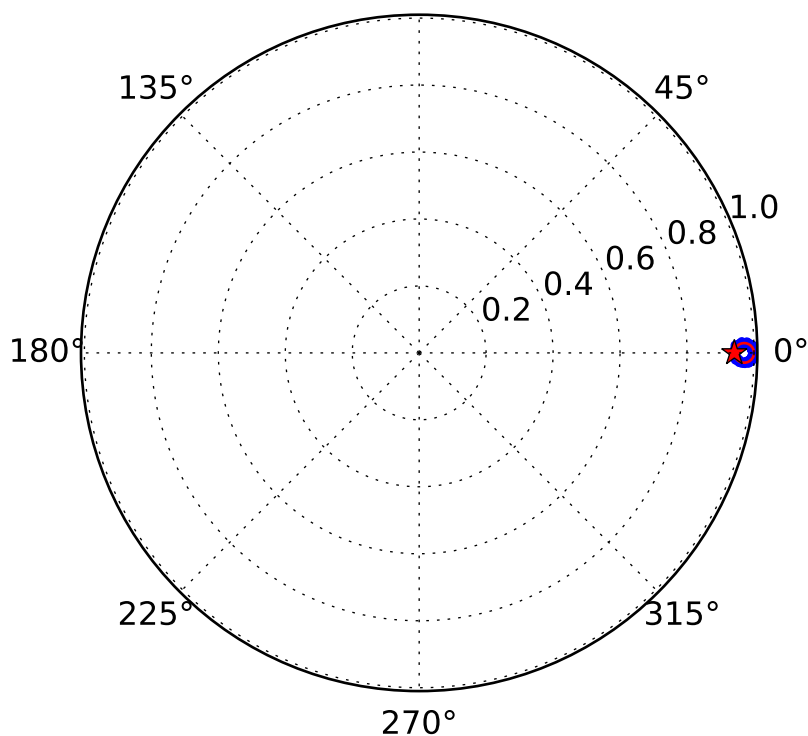
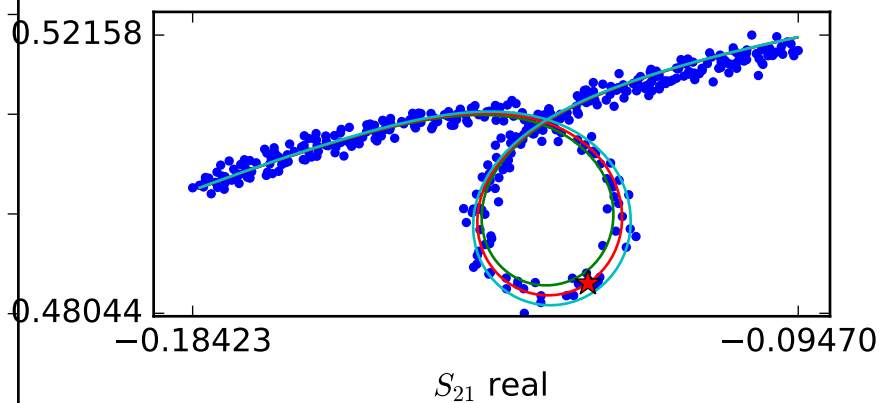
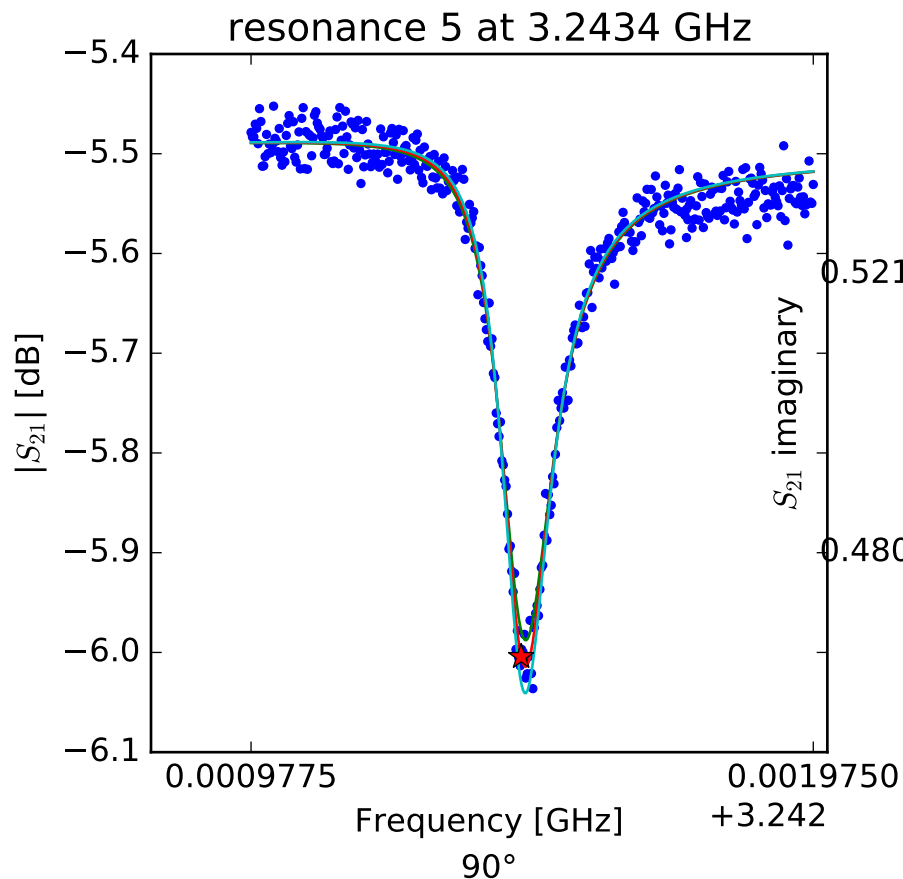
$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

$$\begin{aligned} f_r &= 3.23243628989 \\ Q_r &= 17795.0237469 \\ Q_c &= 153867.746091 \\ a &= (0.47721866527 - 0.22823540546j) \\ \phi_0 &= 0.134503476607 \\ \tau &= 28.250792875 \end{aligned}$$



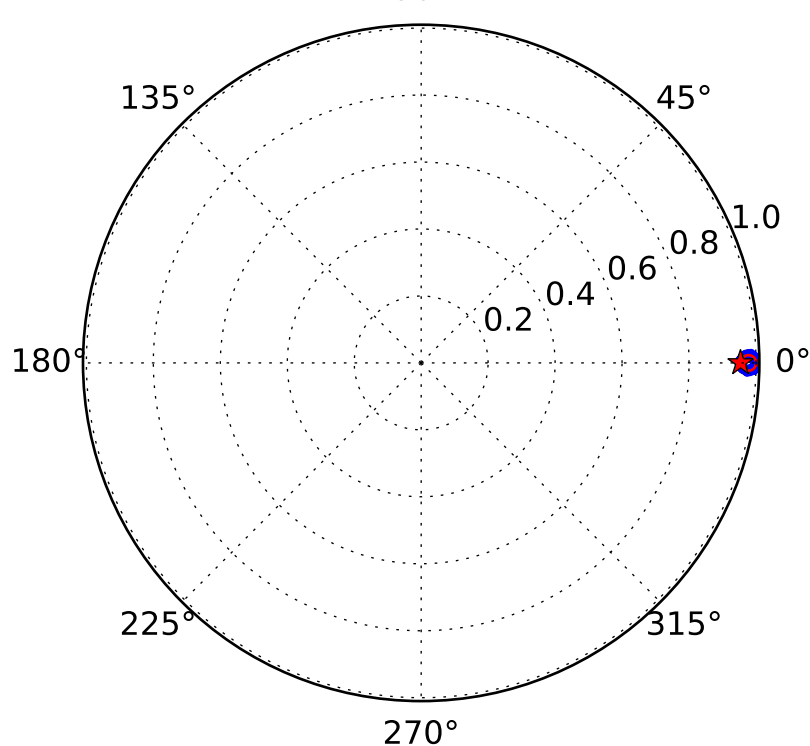
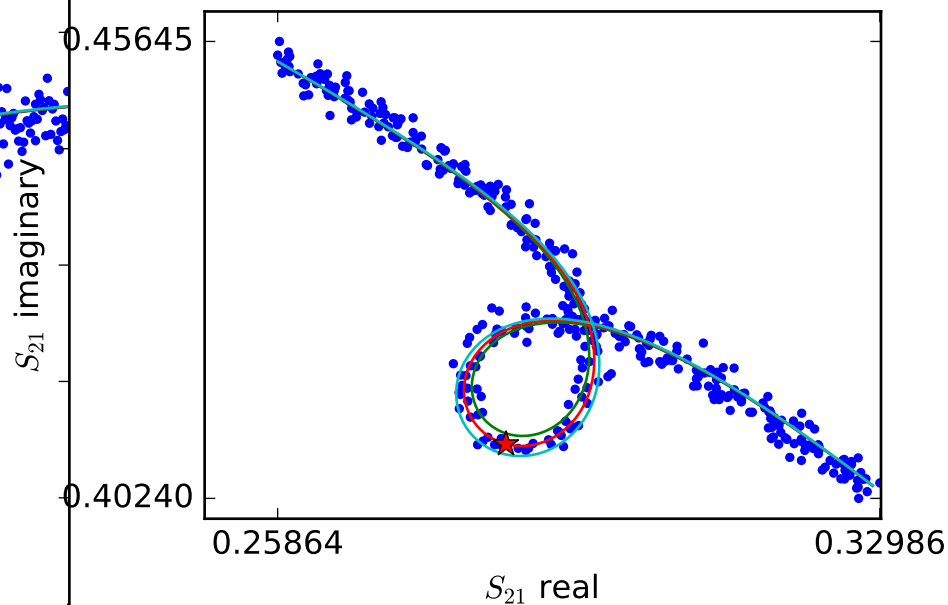
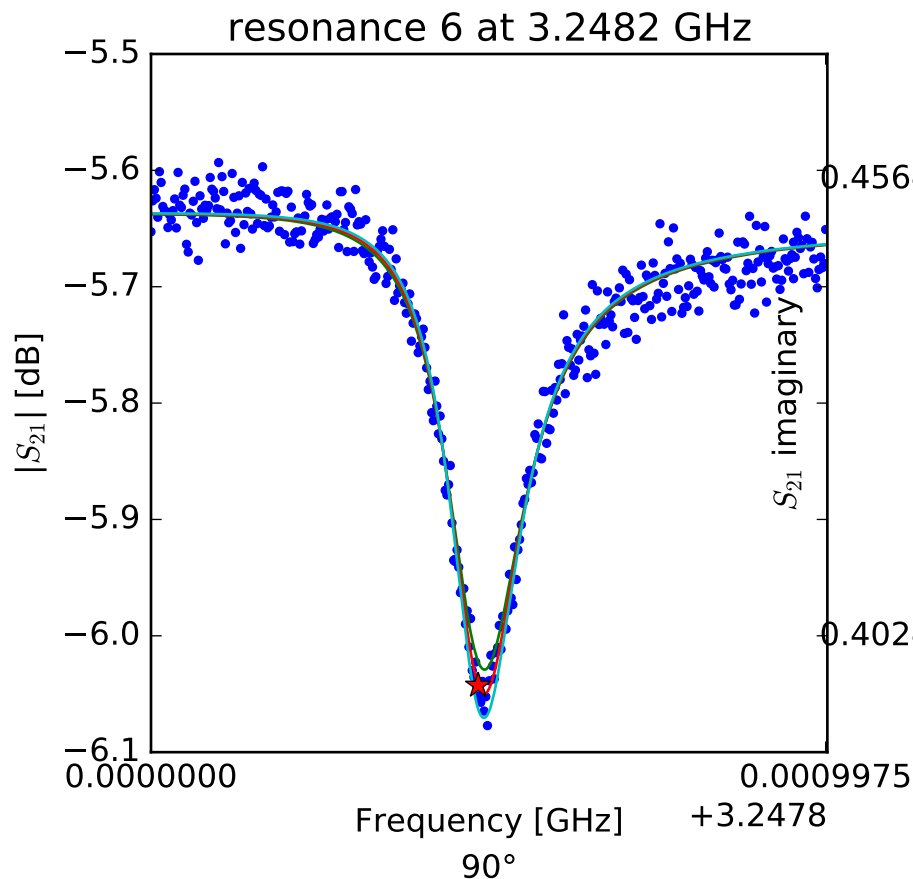
$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

$$\begin{aligned} f_r &= 3.23871072558 \\ Q_r &= 28046.9154228 \\ Q_c &= 766370.753925 \\ a &= (-0.488601496479 + 0.215073832484j) \\ \phi_0 &= -0.0290016637711 \\ \tau &= 28.7161889801 \end{aligned}$$



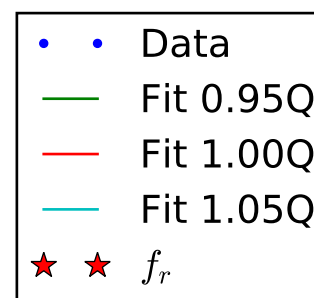
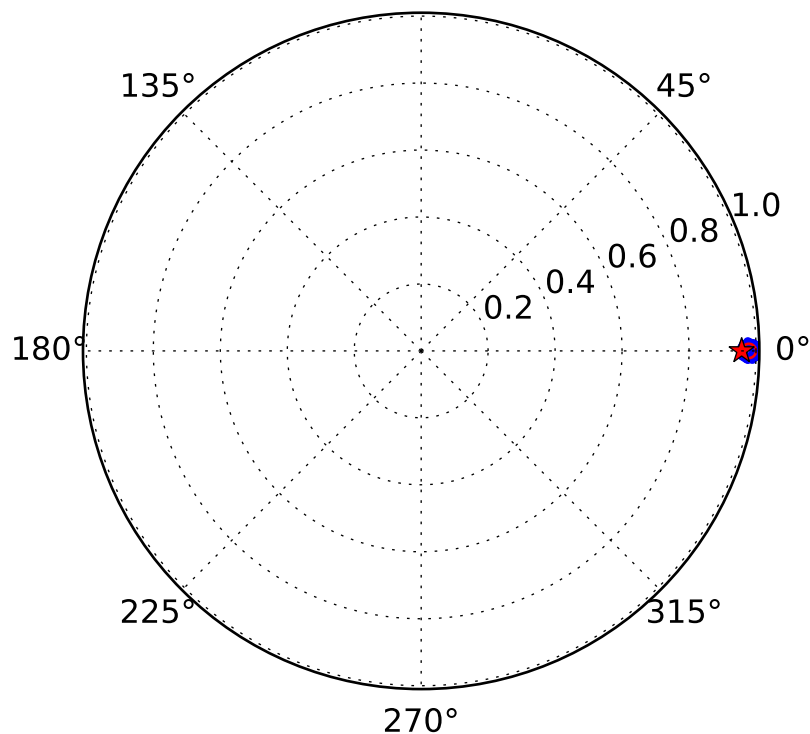
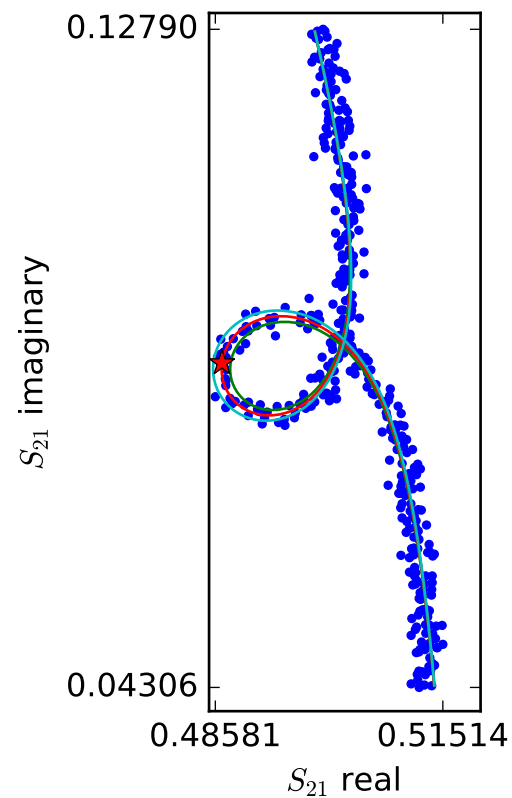
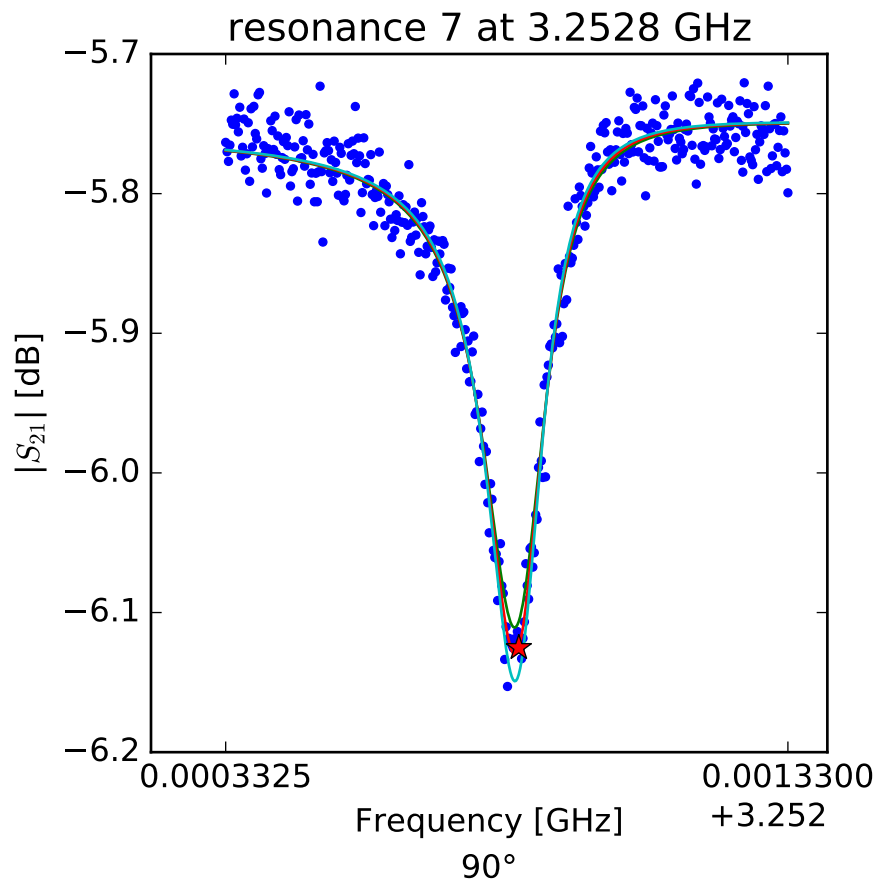
$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

$$\begin{aligned} f_r &= 3.24345670461 \\ Q_r &= 28476.4779068 \\ Q_c &= 484452.310997 \\ a &= (0.311423905238 - 0.430116414063j) \\ \phi_0 &= 0.262159742031 \\ \tau &= 29.4613991224 \end{aligned}$$



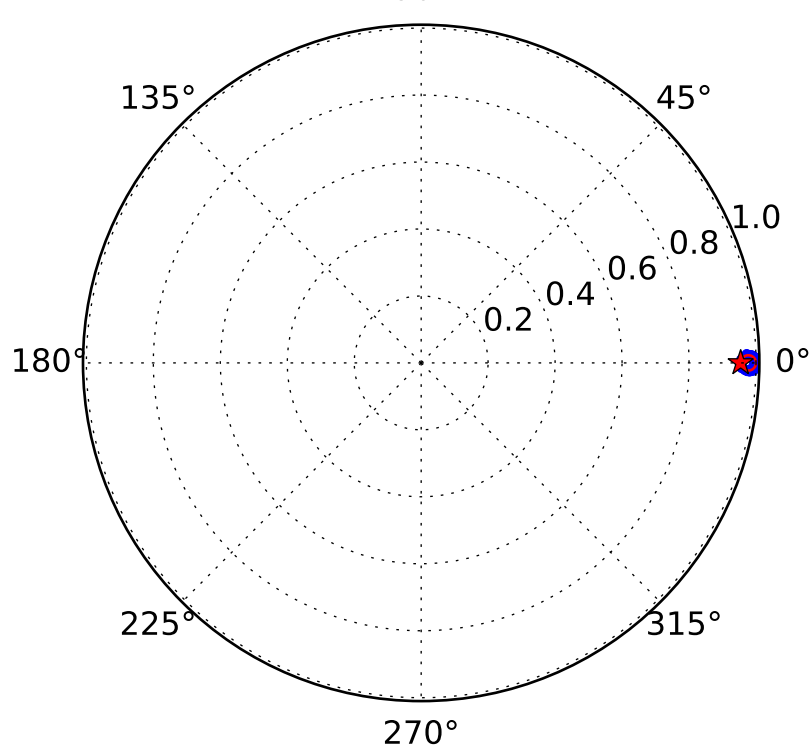
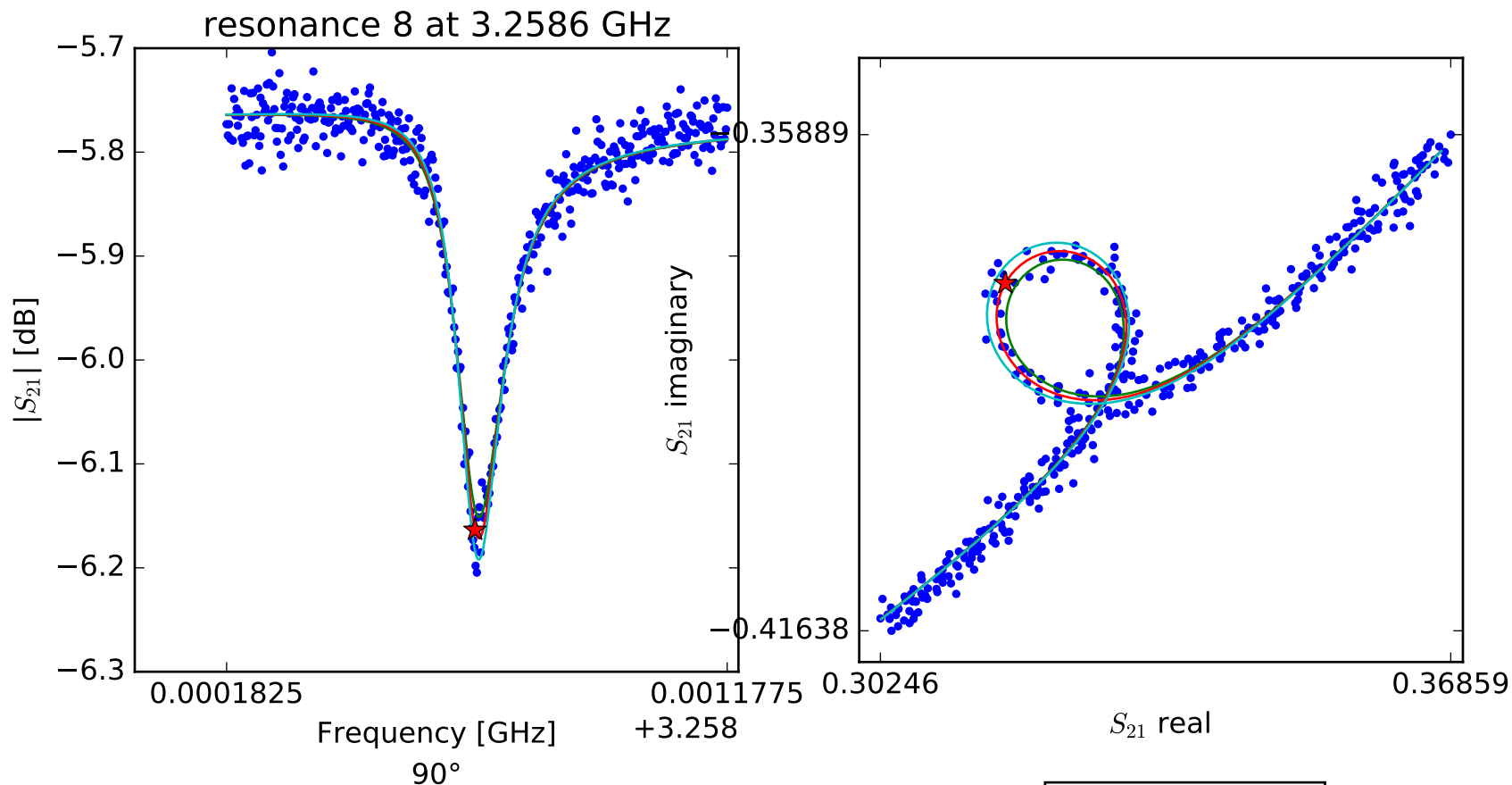
$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

$$\begin{aligned} f_r &= 3.24828374753 \\ Q_r &= 23783.4861051 \\ Q_c &= 512305.603835 \\ a &= (-0.23914316096 + 0.464179494991j) \\ \phi_0 &= 0.254023829768 \\ \tau &= 28.3752399135 \end{aligned}$$



$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

$$\begin{aligned} f_r &= 3.25285258309 \\ Q_r &= 24950.0203742 \\ Q_c &= 581377.878529 \\ a &= (0.506391843492 + 0.097058475172j) \\ \phi_0 &= -0.215075470076 \\ \tau &= 28.2841520312 \end{aligned}$$



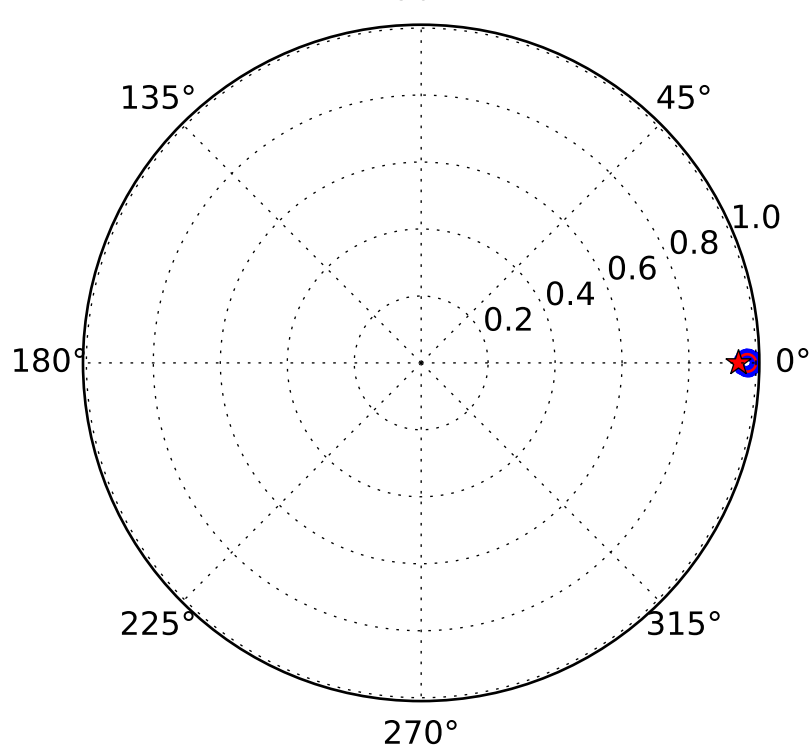
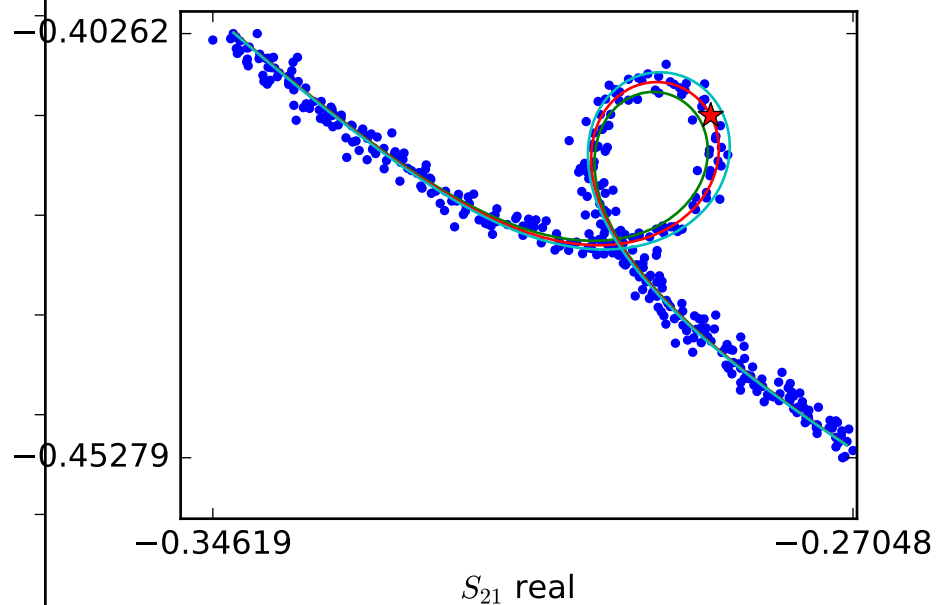
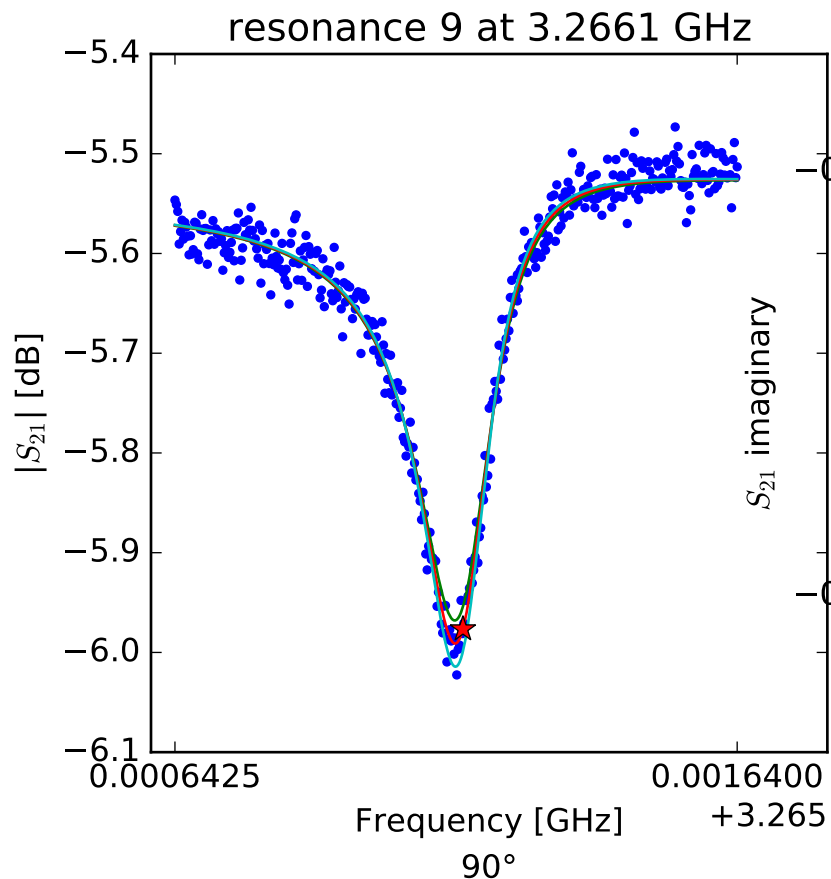
Legend:

- Data
- Fit 0.95Q
- Fit 1.00Q
- Fit 1.05Q
- ★ ★ f_r

$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

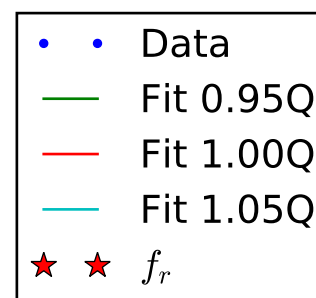
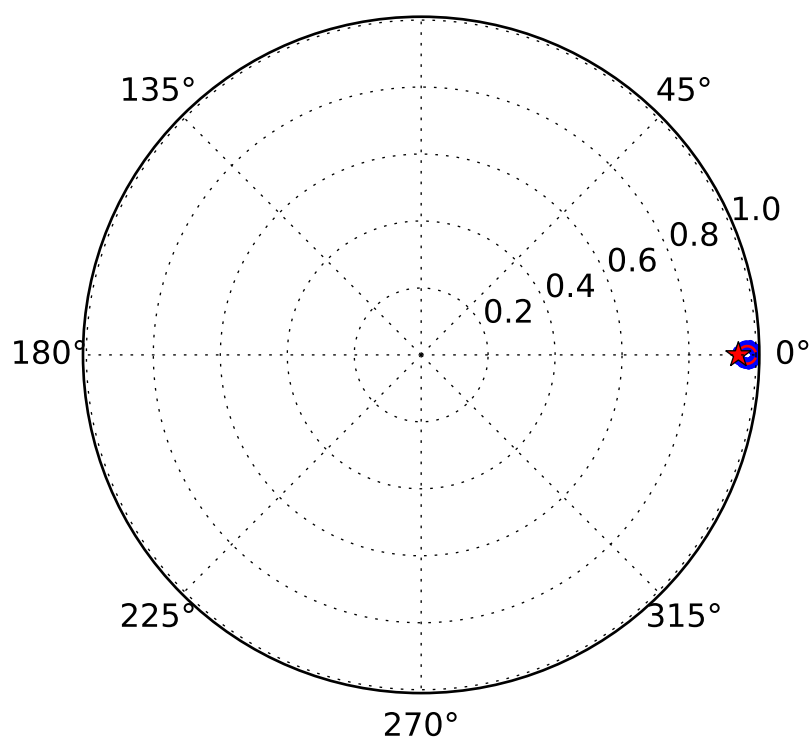
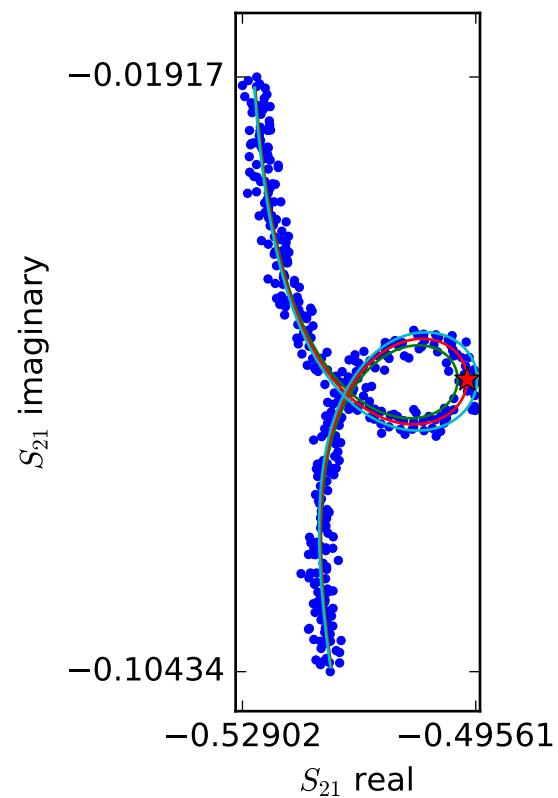
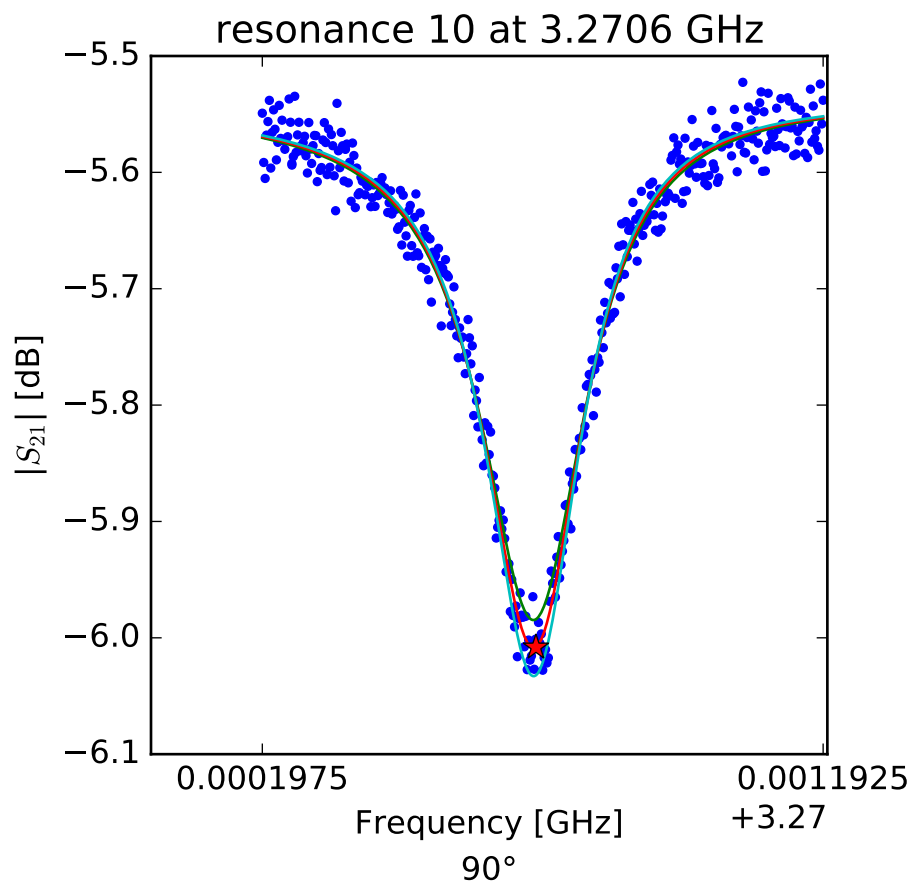
Parameters:

- $f_r = 3.25867632899$
- $Q_r = 28934.8758773$
- $Q_c = 630219.026696$
- $a = (0.354872565977 - 0.372613785741j)$
- $\phi_0 = 0.270626868913$
- $\tau = 27.9277904551$



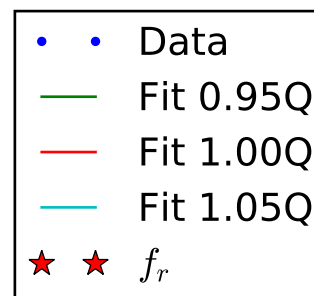
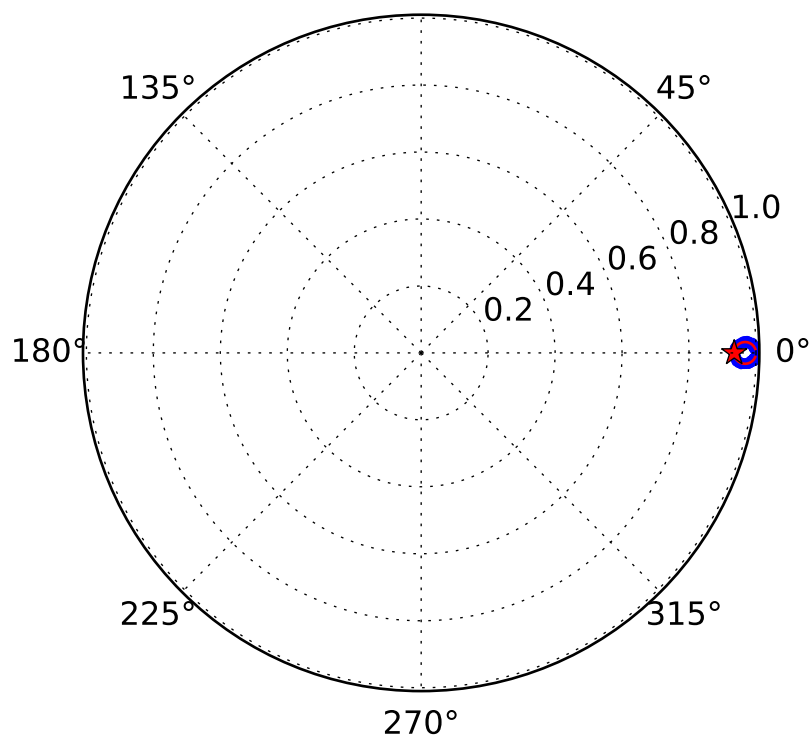
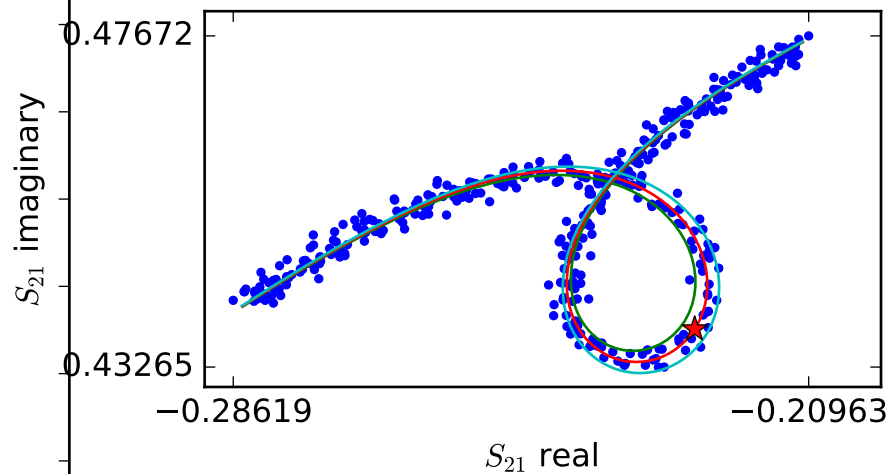
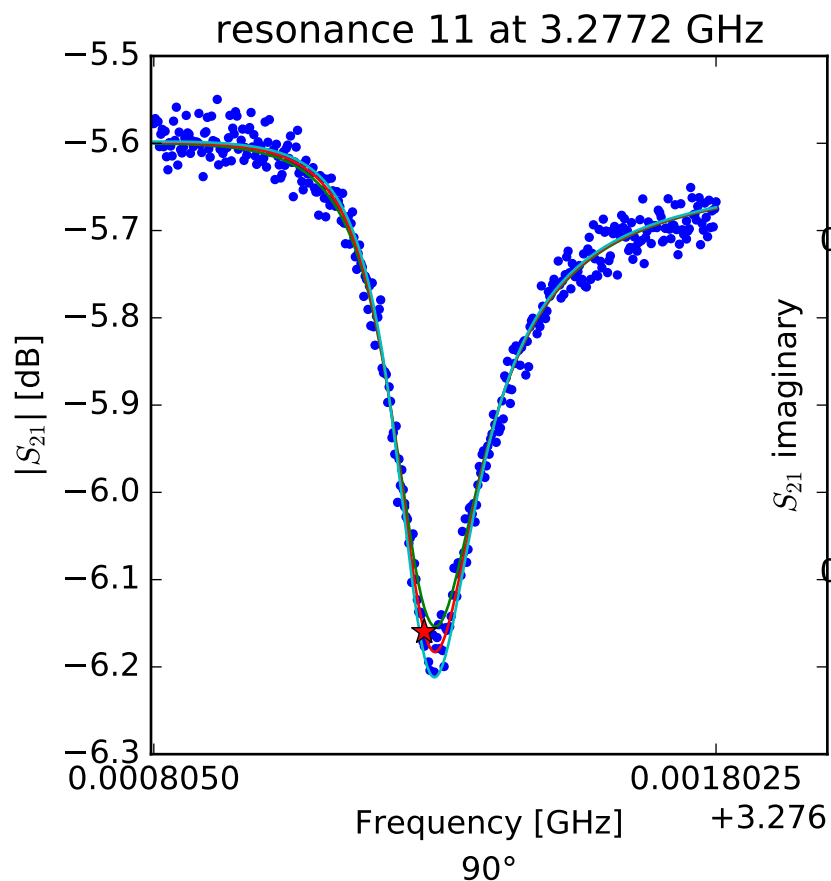
$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

$$\begin{aligned} f_r &= 3.26615344758 \\ Q_r &= 20671.7782977 \\ Q_c &= 395845.379091 \\ a &= (0.51218179412 - 0.130303311919j) \\ \phi_0 &= -0.338063484164 \\ \tau &= 28.8749772892 \end{aligned}$$



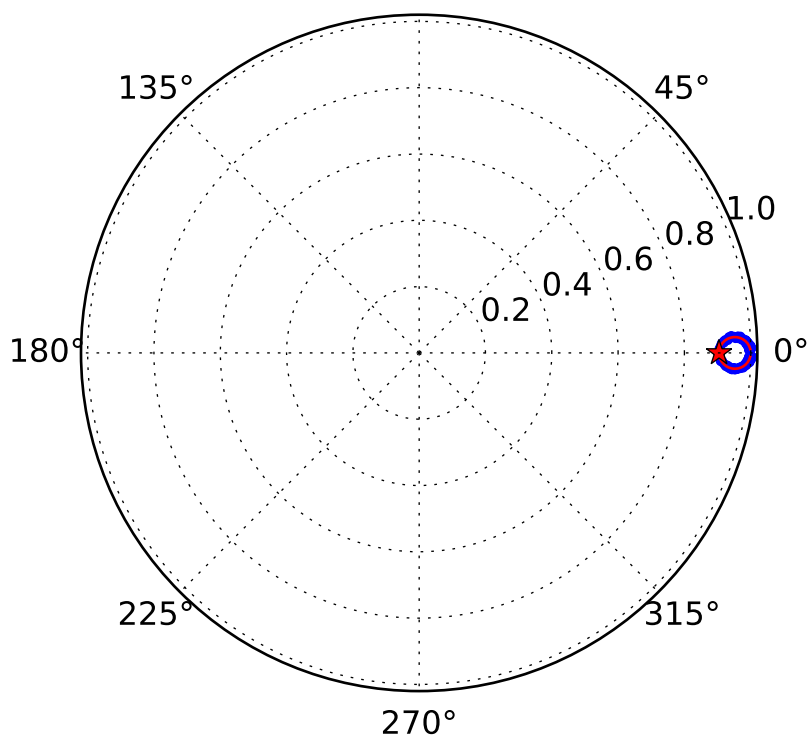
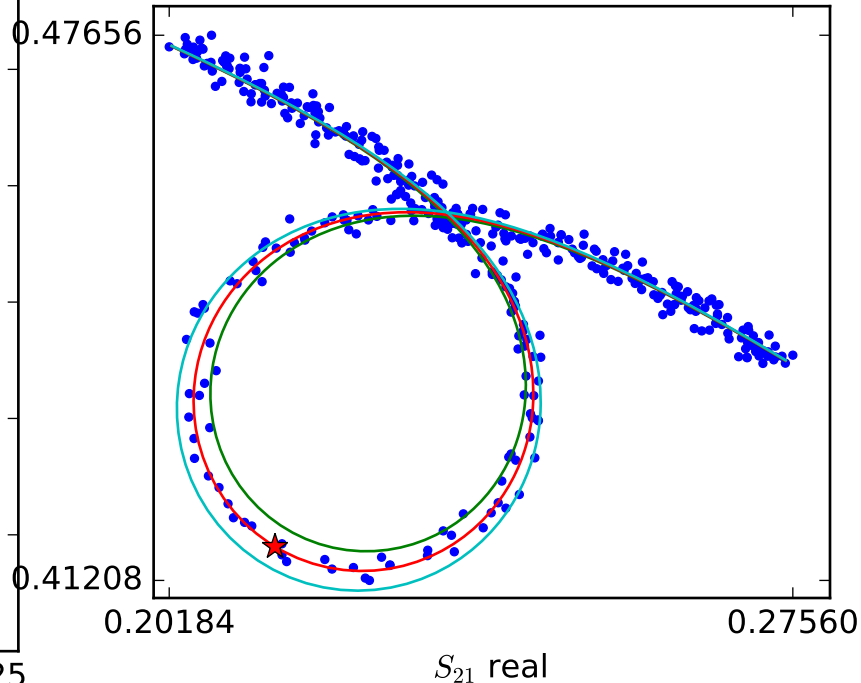
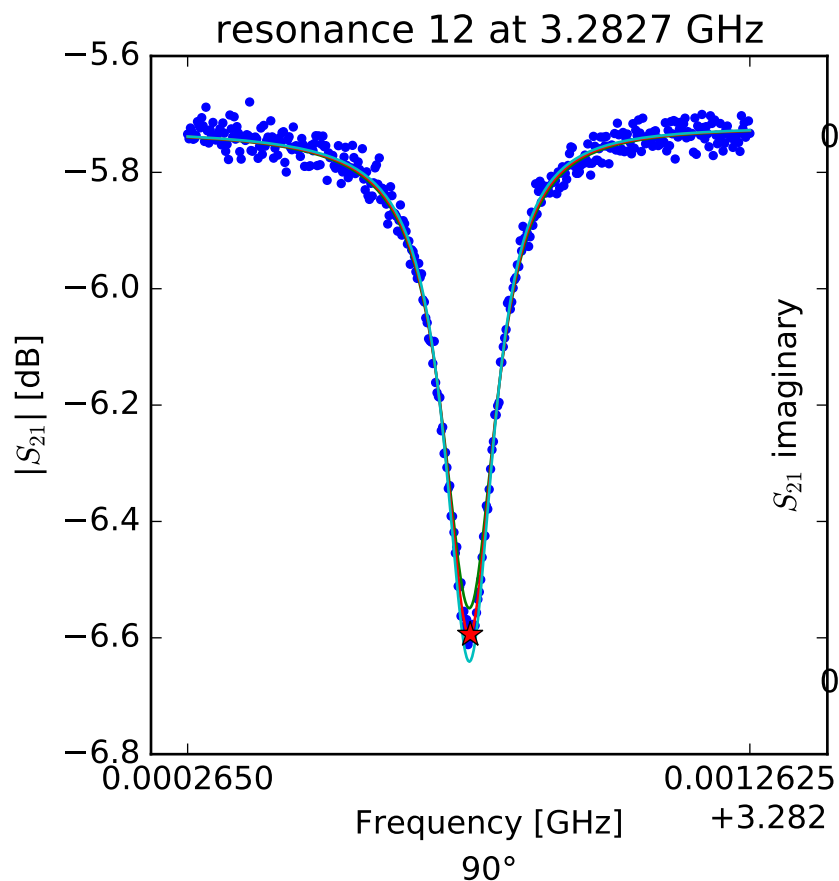
$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

$$\begin{aligned} f_r &= 3.27068296315 \\ Q_r &= 14657.4622299 \\ Q_c &= 278269.1948 \\ a &= (-0.499247290915 + 0.173317107251j) \\ \phi_0 &= -0.0739470823129 \\ \tau &= 29.0237753007 \end{aligned}$$



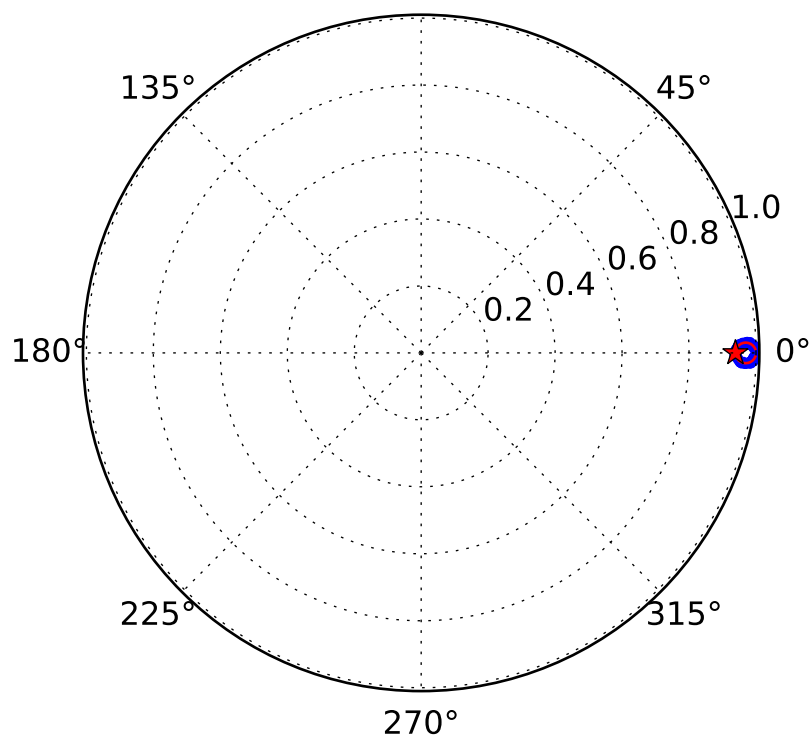
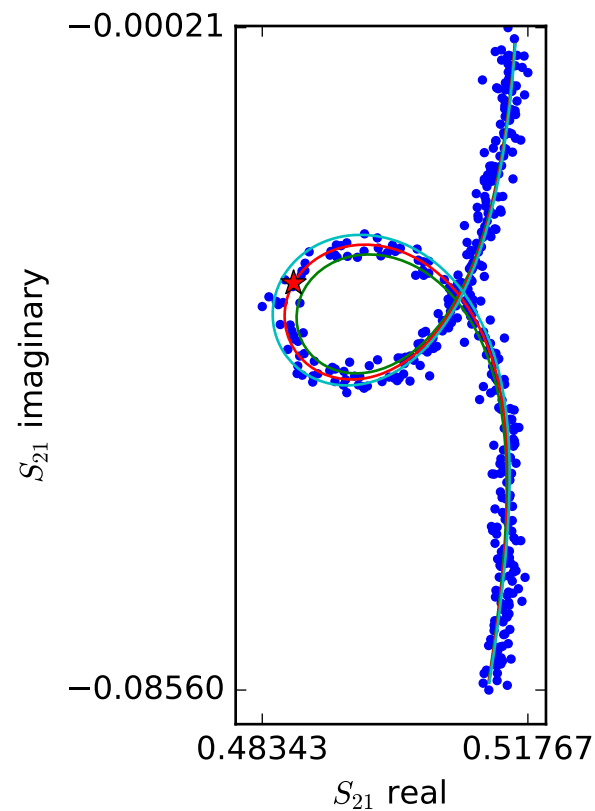
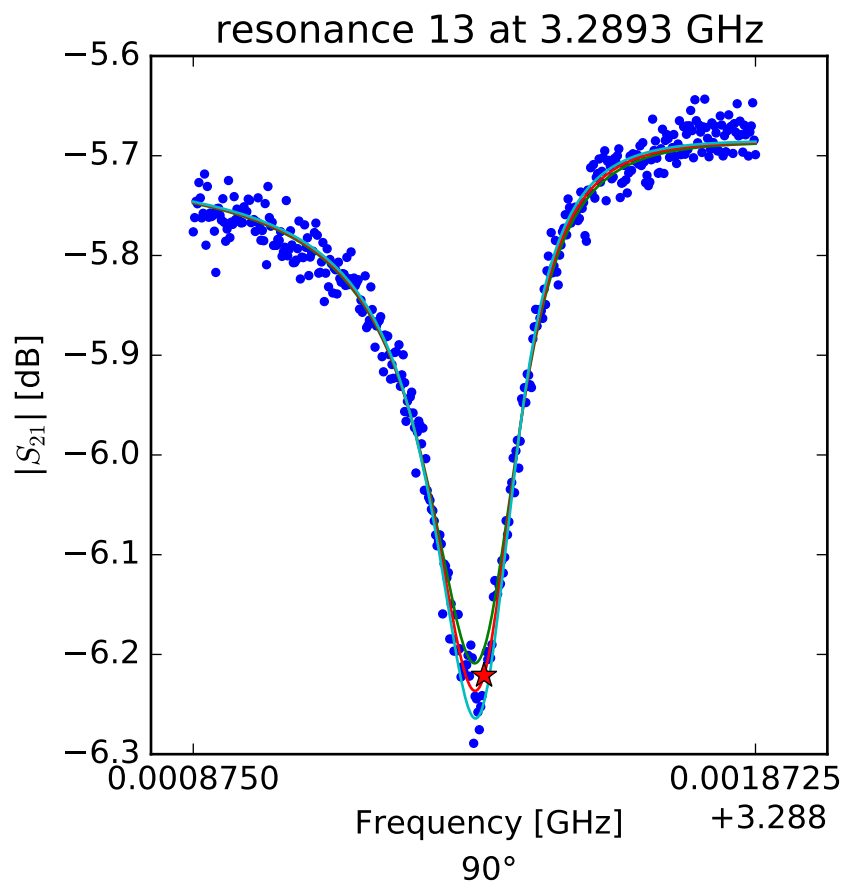
$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

$$\begin{aligned} f_r &= 3.27728479723 \\ Q_r &= 16996.2753231 \\ Q_c &= 260894.524031 \\ a &= (-0.266056818215 - 0.451010824878j) \\ \phi_0 &= 0.375037674459 \\ \tau &= 28.7846887946 \end{aligned}$$



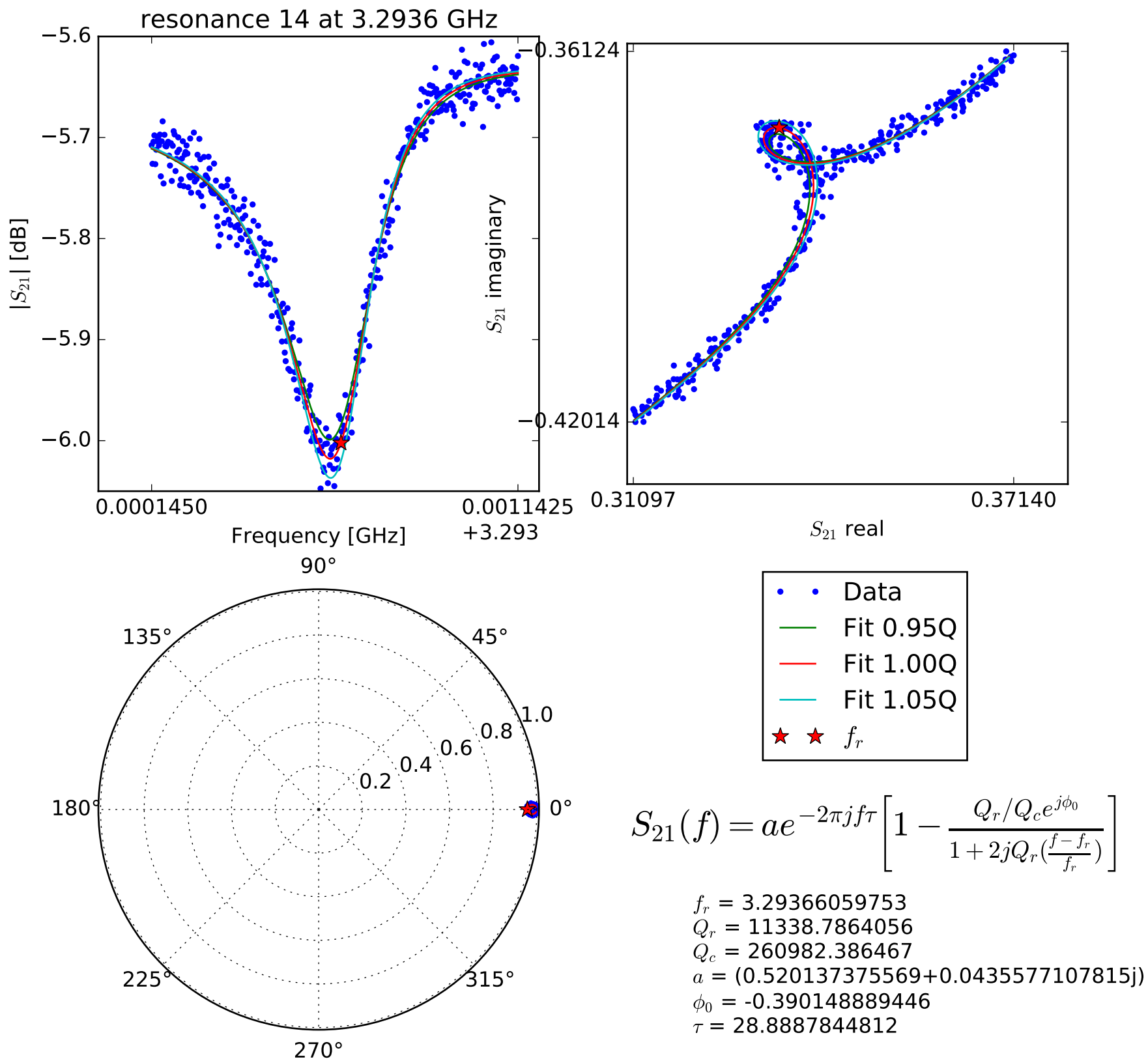
$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r(\frac{f-f_r}{f_r})} \right]$$

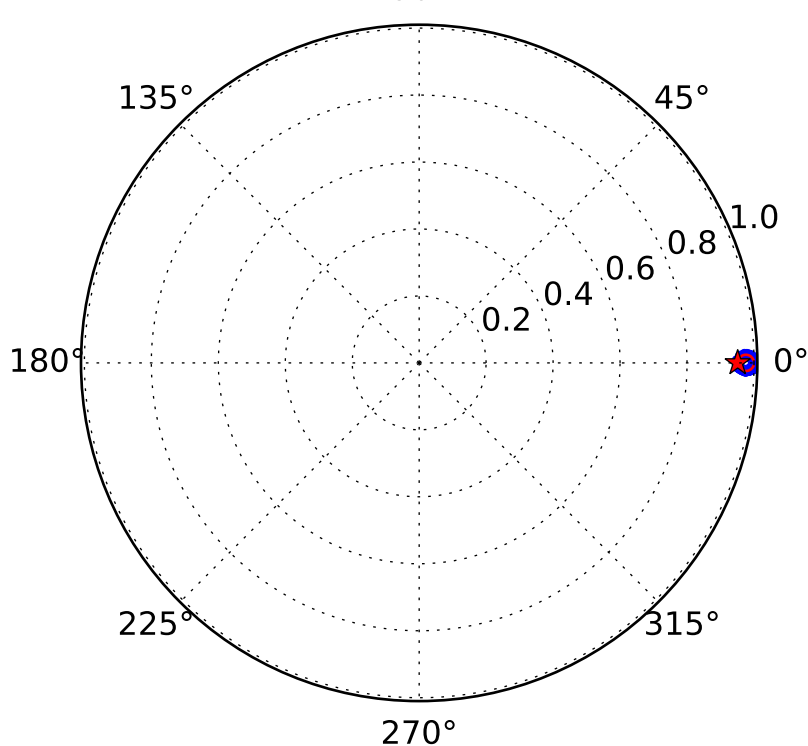
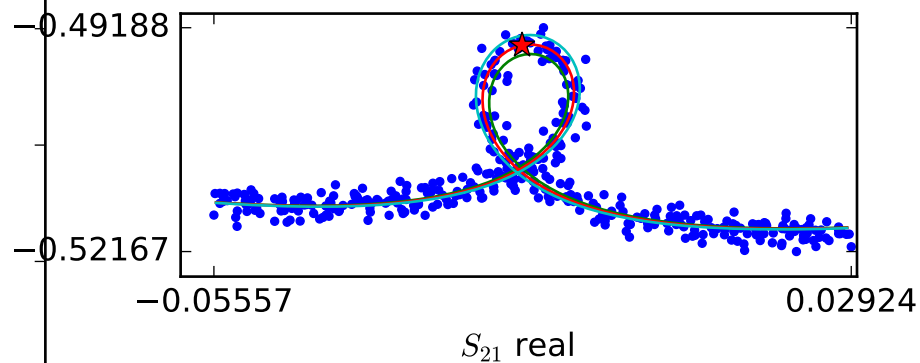
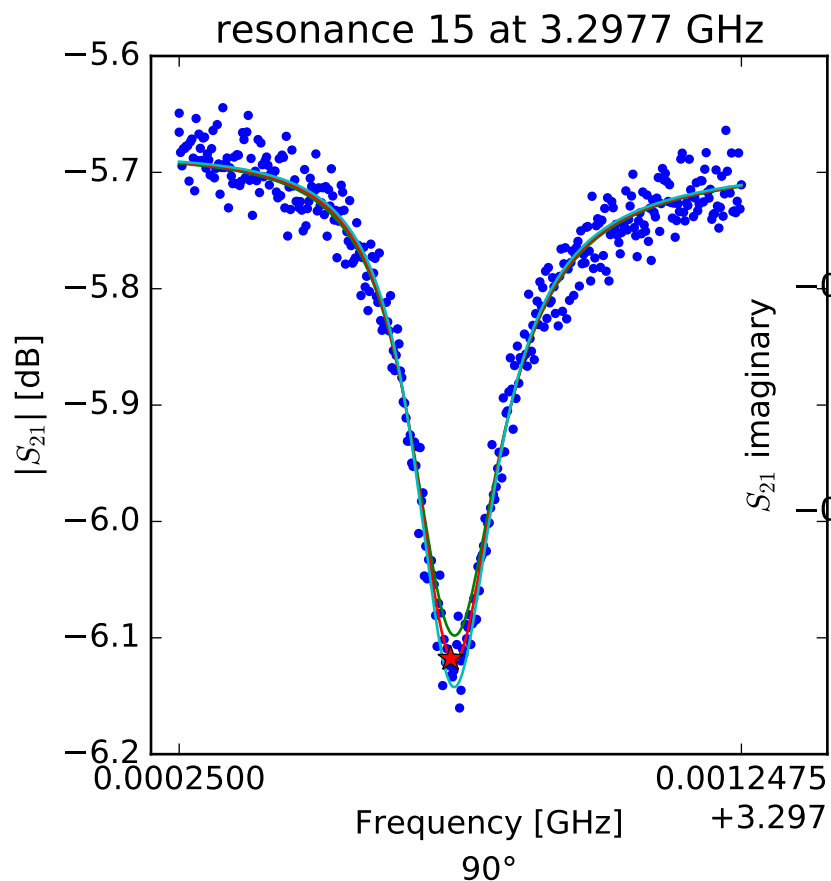
$$\begin{aligned} f_r &= 3.28276641742 \\ Q_r &= 28173.5787546 \\ Q_c &= 294652.096967 \\ a &= (-0.517357964807 + 0.0086708430082j) \\ \phi_0 &= -0.0567896880786 \\ \tau &= 28.7330835088 \end{aligned}$$



$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

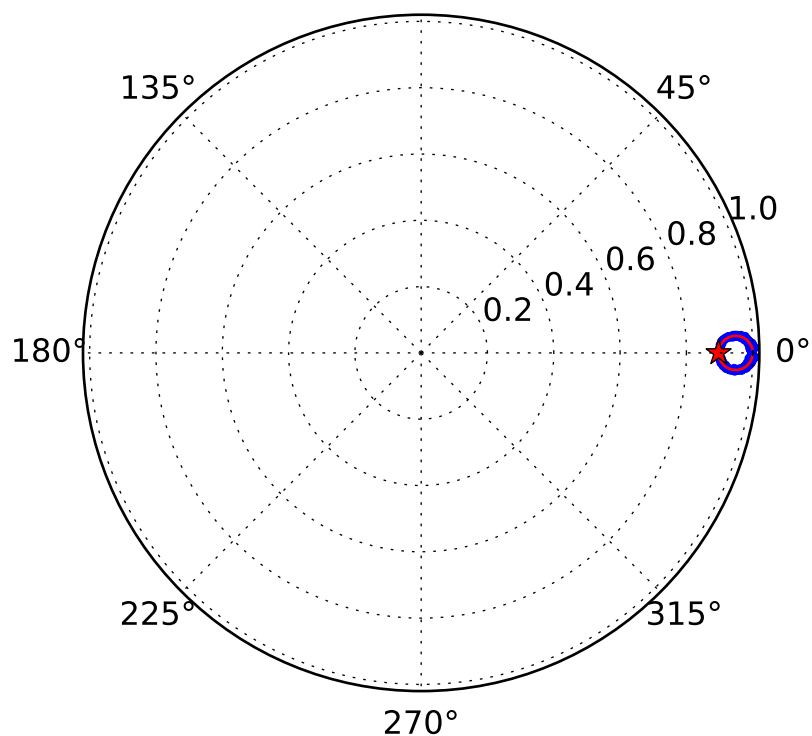
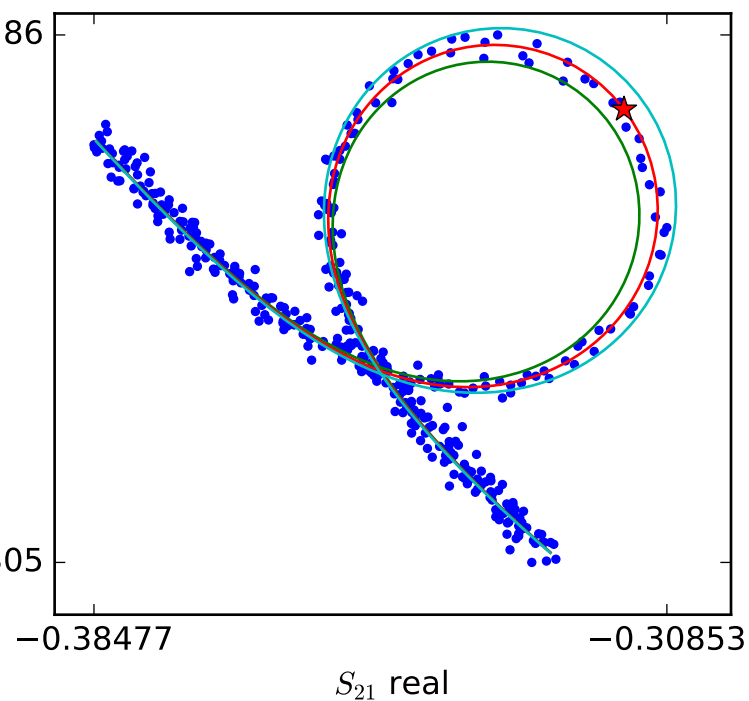
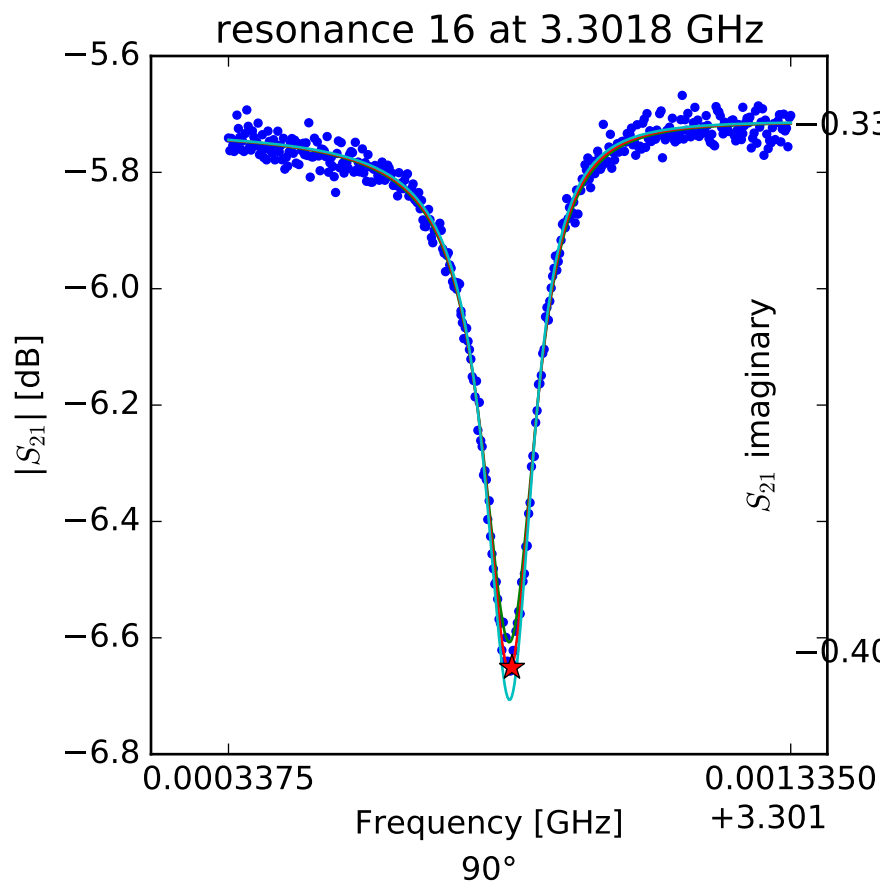
$$\begin{aligned} f_r &= 3.28939091028 \\ Q_r &= 17078.6780593 \\ Q_c &= 277759.885545 \\ a &= (0.478534599643 - 0.200403283033j) \\ \phi_0 &= -0.316745033255 \\ \tau &= 28.8658053646 \end{aligned}$$





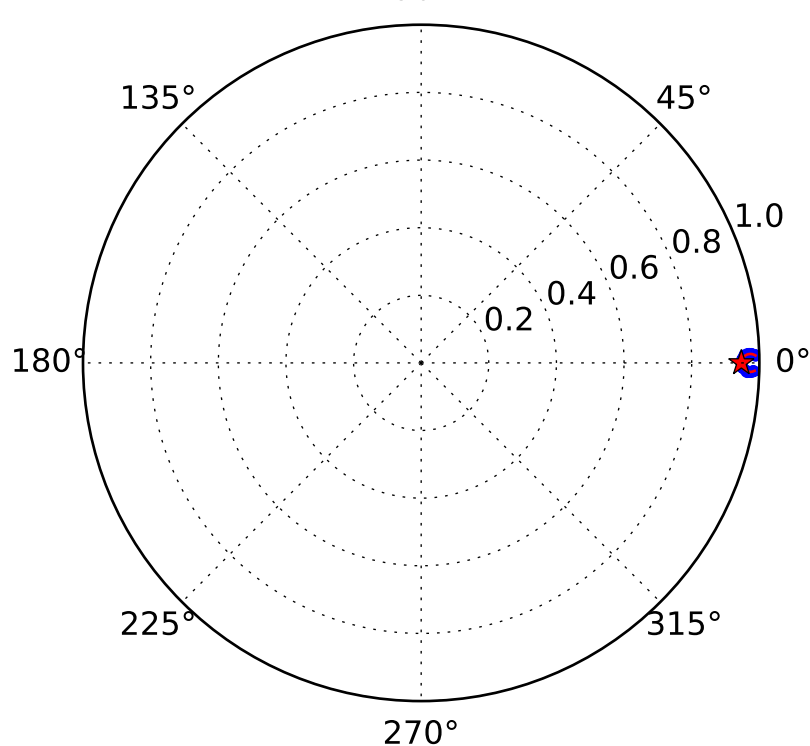
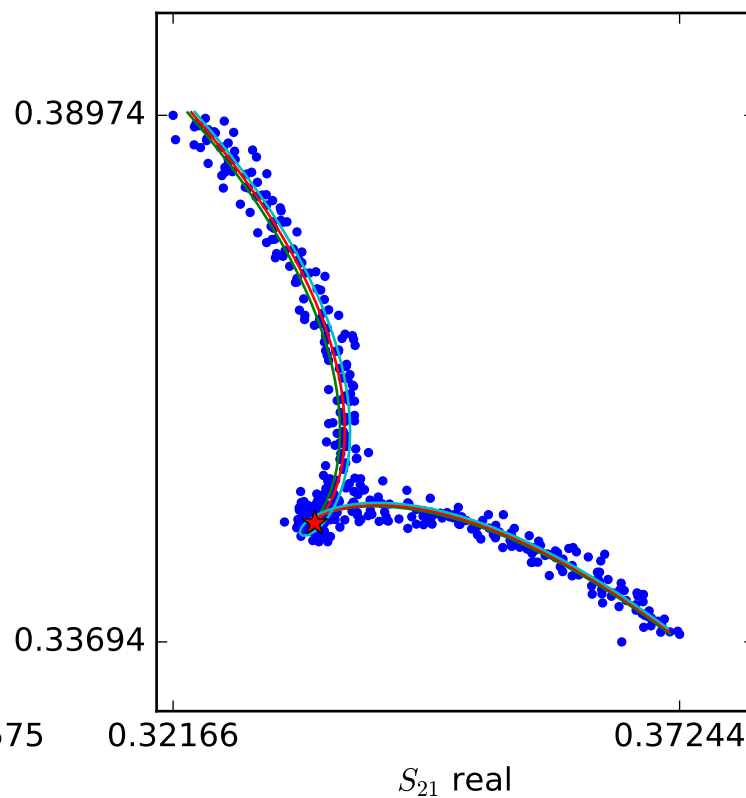
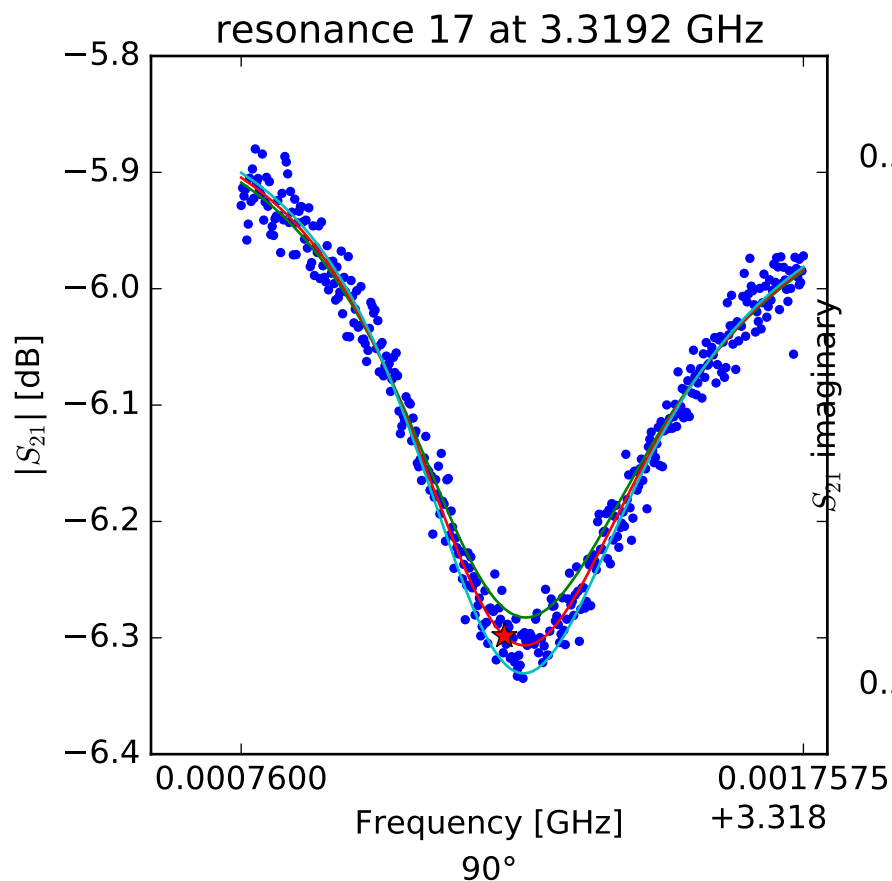
$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

$$\begin{aligned} f_r &= 3.29773147543 \\ Q_r &= 17589.3664797 \\ Q_c &= 360349.606424 \\ a &= (-0.259249094875 + 0.45022043766j) \\ \phi_0 &= 0.141924236396 \\ \tau &= 28.6823488831 \end{aligned}$$



$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

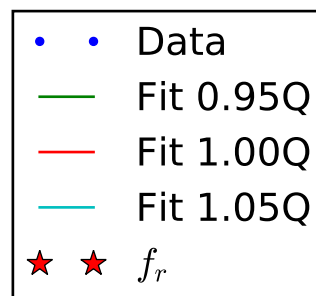
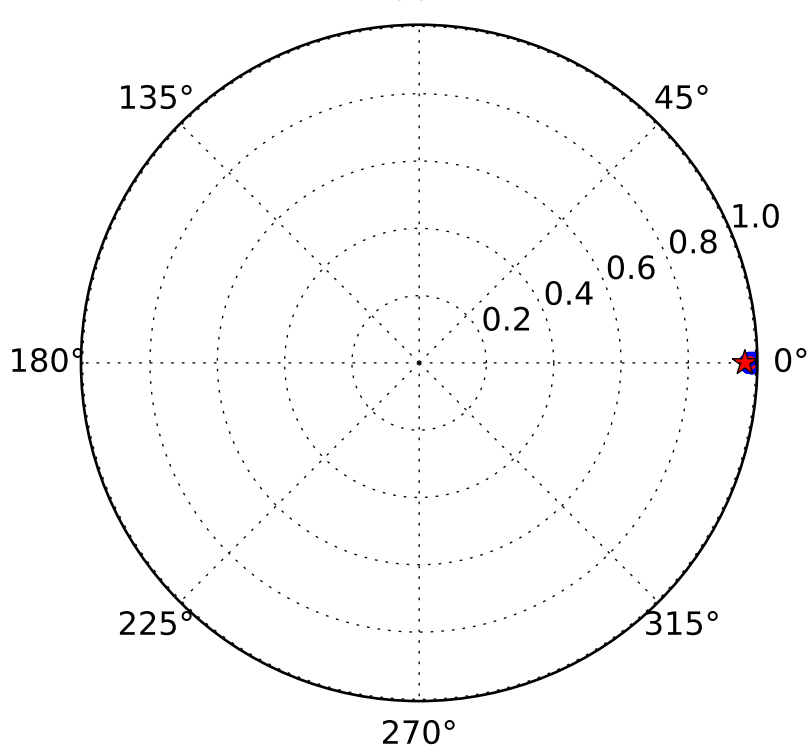
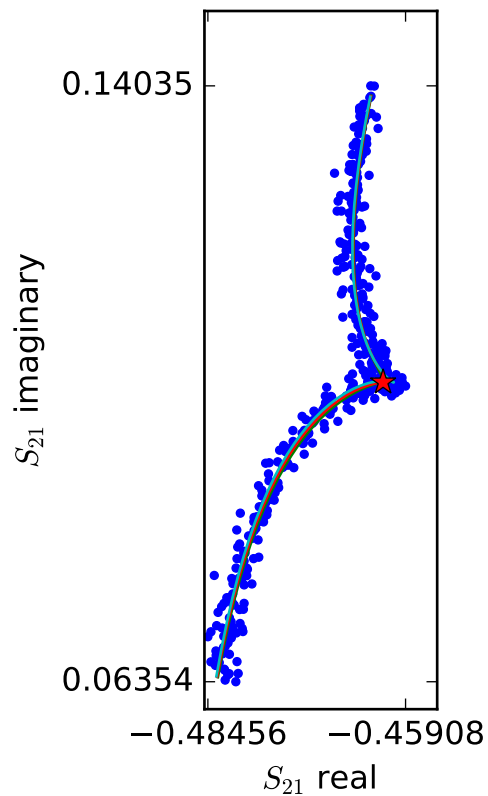
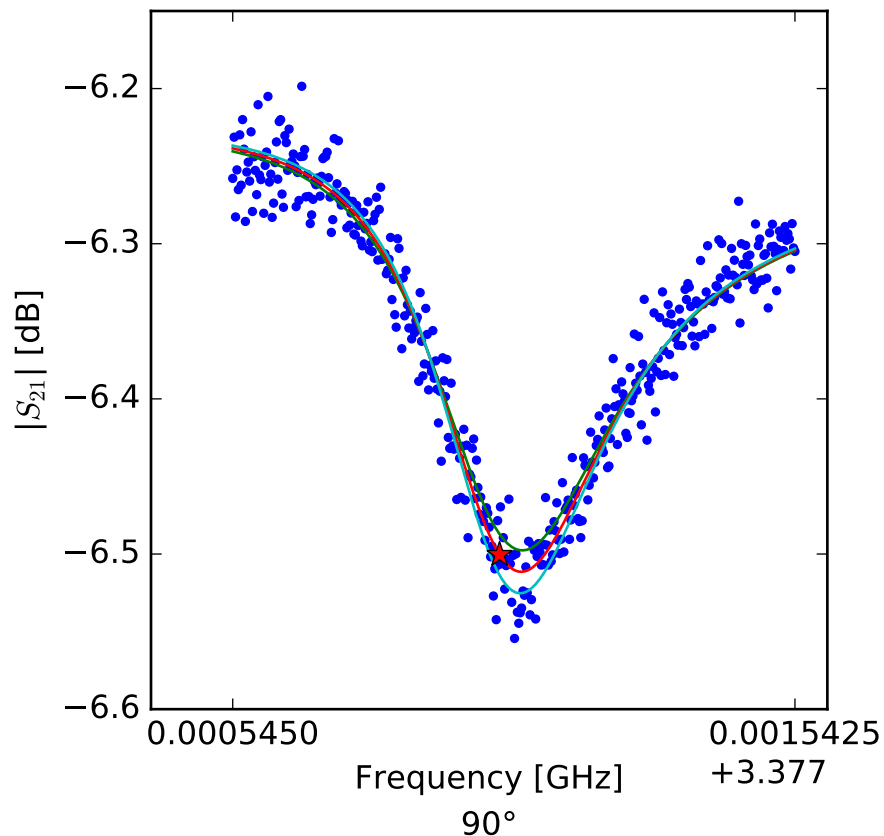
$$\begin{aligned} f_r &= 3.30184040292 \\ Q_r &= 28652.006838 \\ Q_c &= 278242.899907 \\ a &= (0.512122624124 + 0.075584436862j) \\ \phi_0 &= -0.145969482496 \\ \tau &= 28.8911816691 \end{aligned}$$



$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

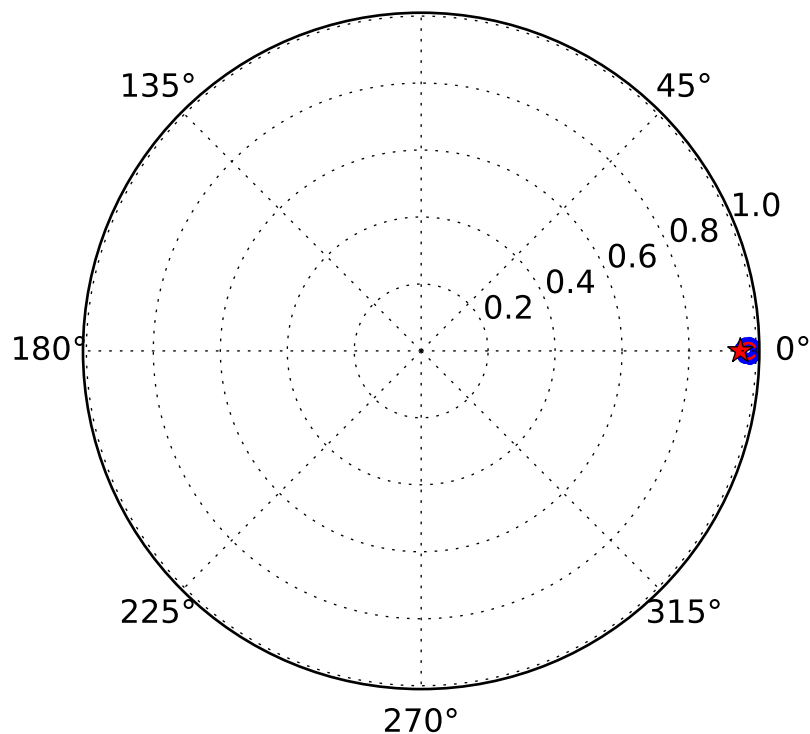
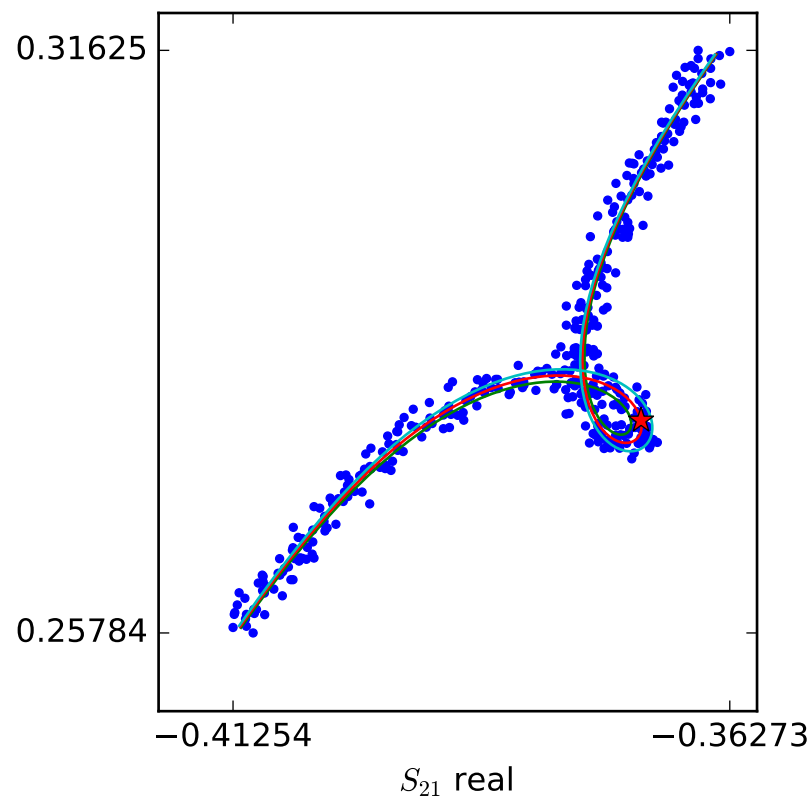
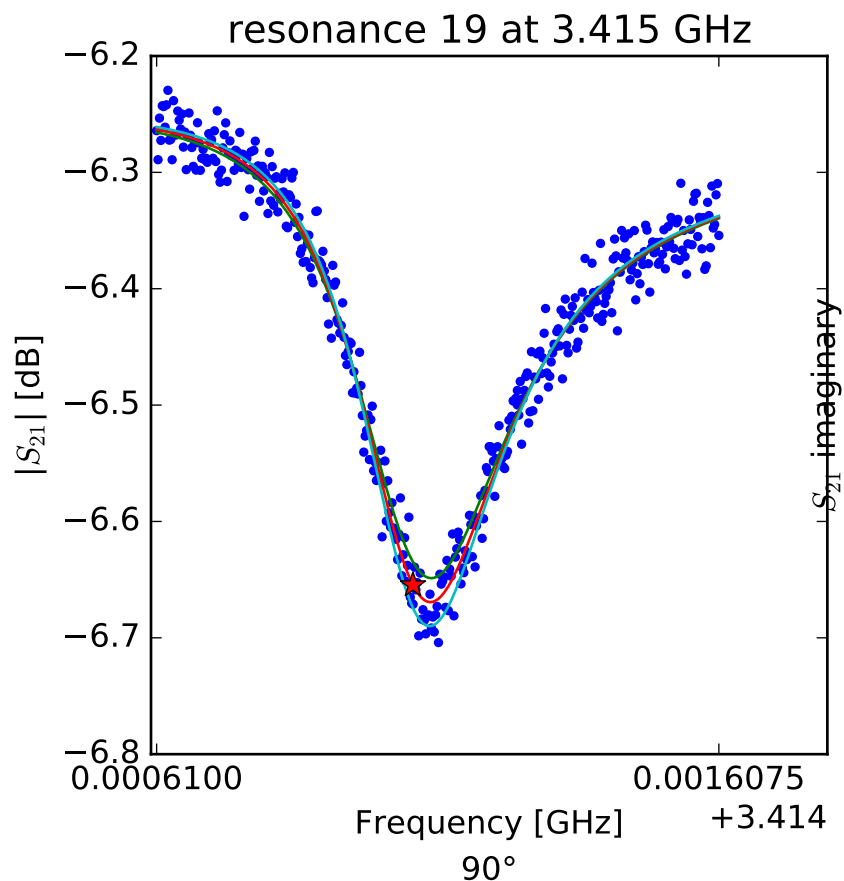
$$\begin{aligned} f_r &= 3.31922693155 \\ Q_r &= 5932.75156123 \\ Q_c &= 111436.047125 \\ a &= (0.292395164168 + 0.418544757095j) \\ \phi_0 &= 0.248237744391 \\ \tau &= 29.5317954157 \end{aligned}$$

resonance 18 at 3.378 GHz



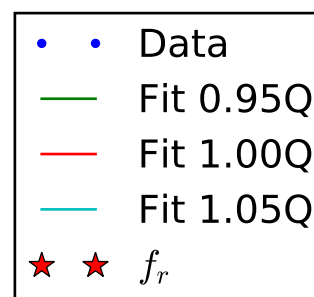
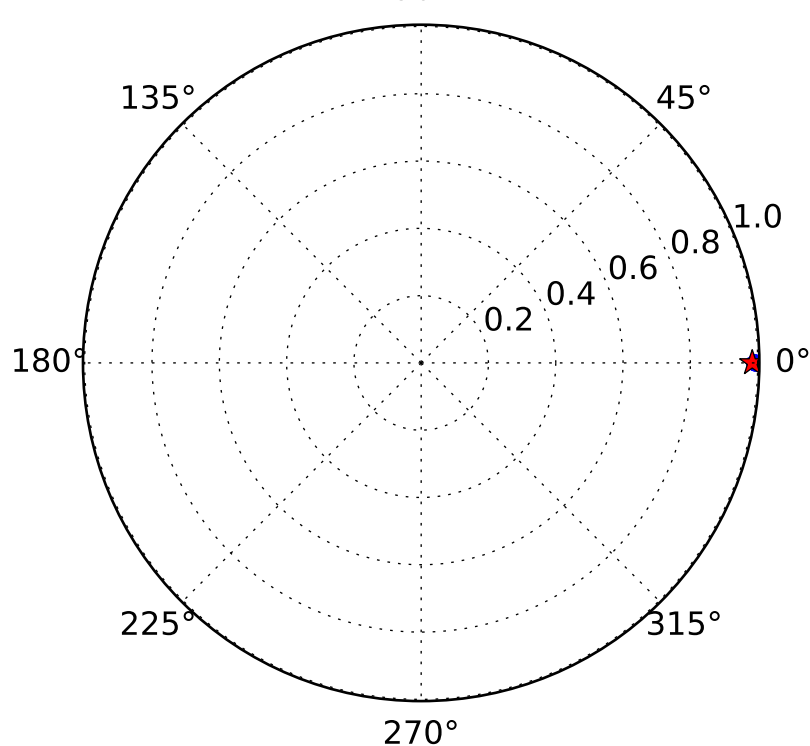
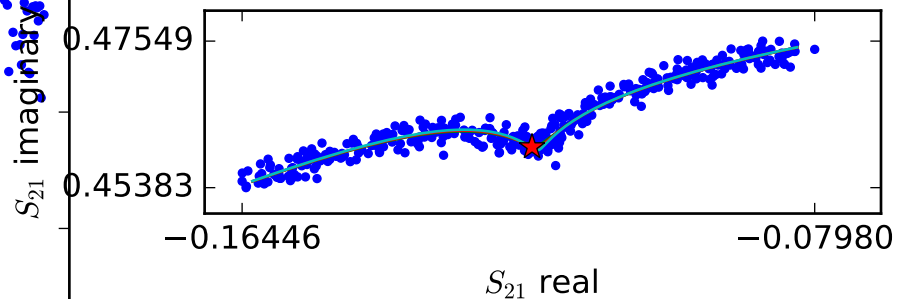
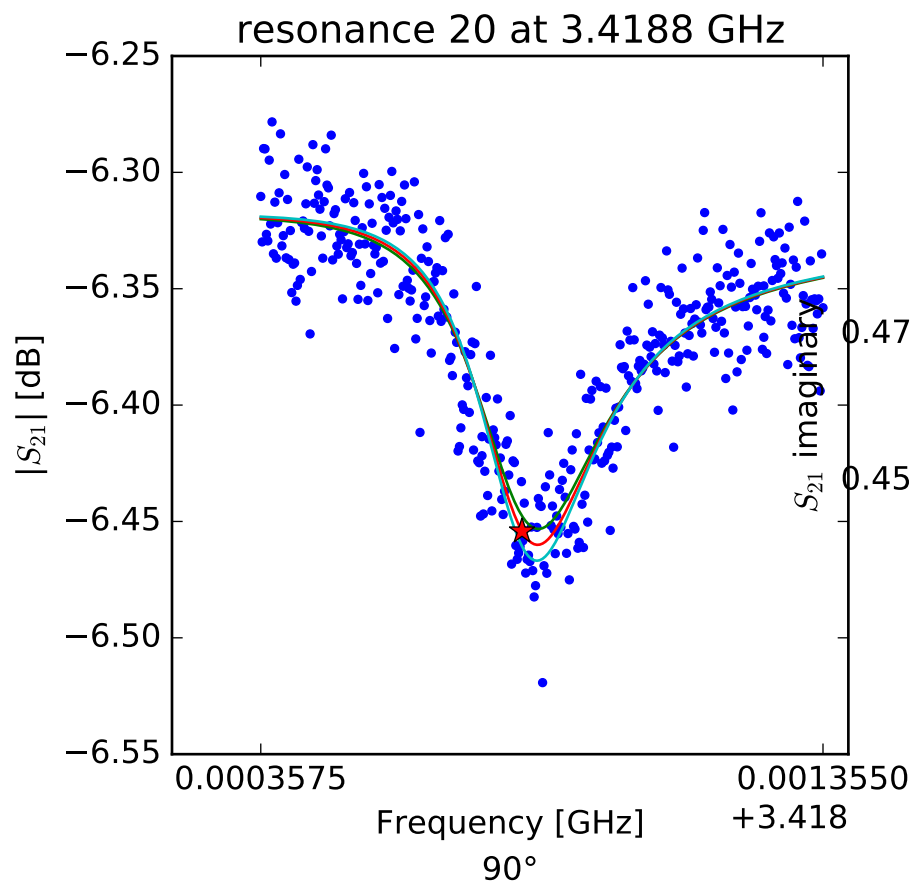
$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

$$\begin{aligned} f_r &= 3.37801841685 \\ Q_r &= 8737.26760702 \\ Q_c &= 272359.931921 \\ a &= (-0.215719092939 + 0.437270118019j) \\ \phi_0 &= 0.385716545712 \\ \tau &= 28.6723113683 \end{aligned}$$



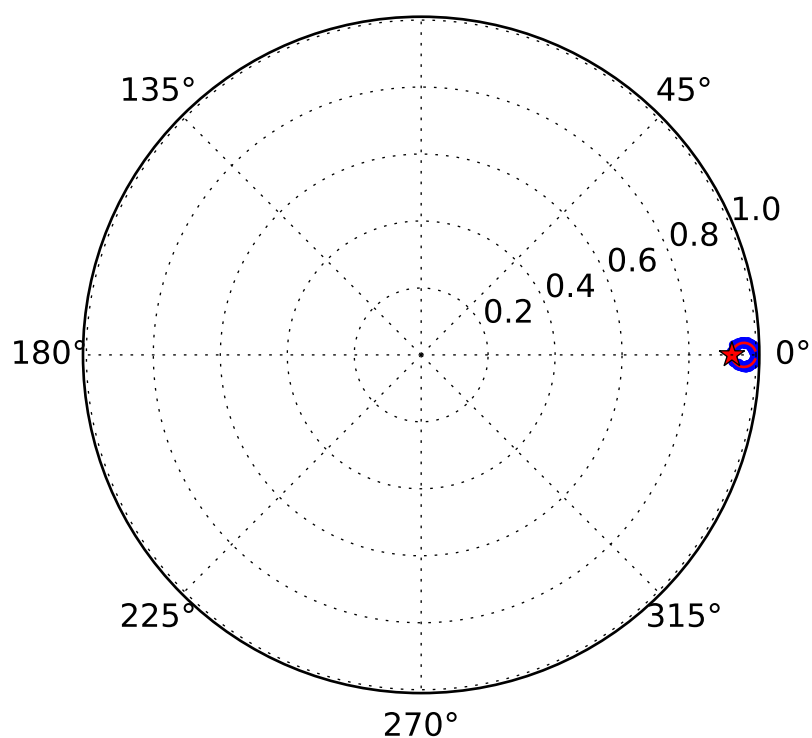
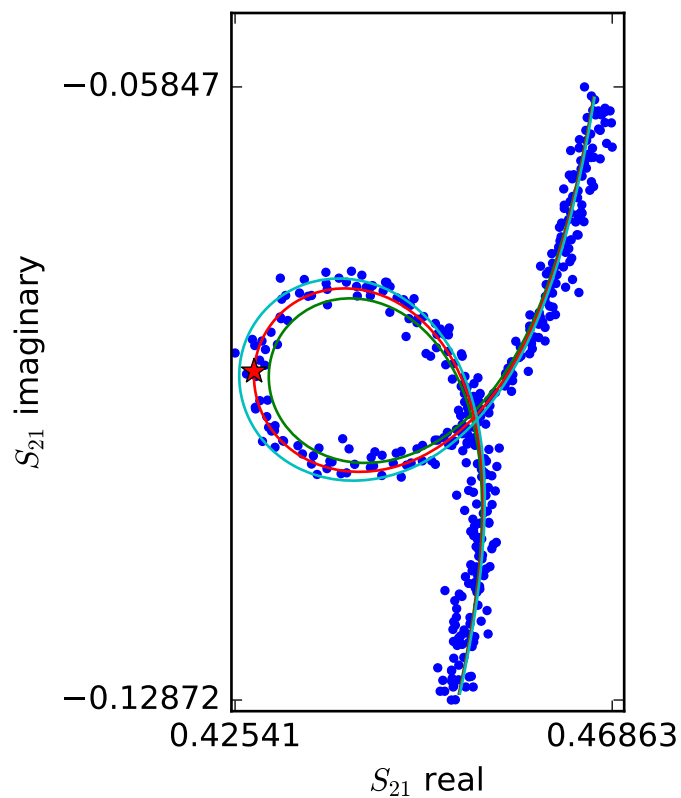
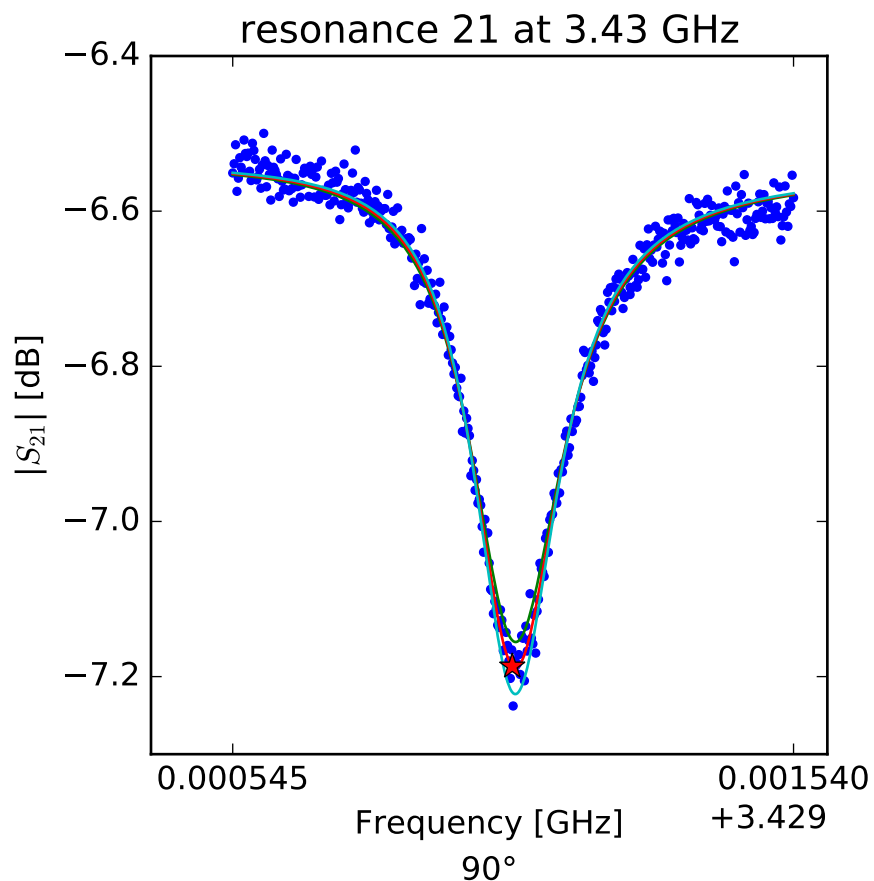
$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

$$\begin{aligned} f_r &= 3.4150648147 \\ Q_r &= 10305.7734326 \\ Q_c &= 219596.659574 \\ a &= (0.48449865929 + 0.039129633062j) \\ \phi_0 &= 0.360638795845 \\ \tau &= 28.8757645583 \end{aligned}$$



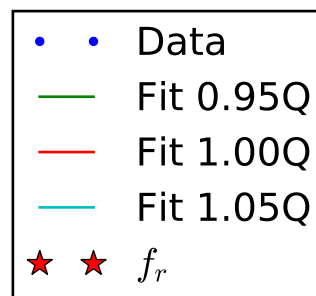
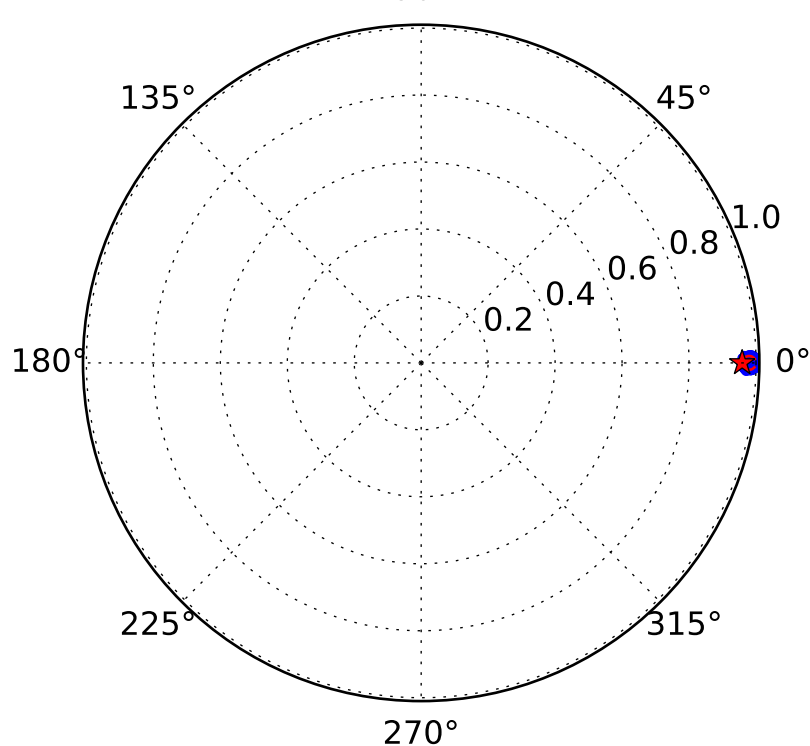
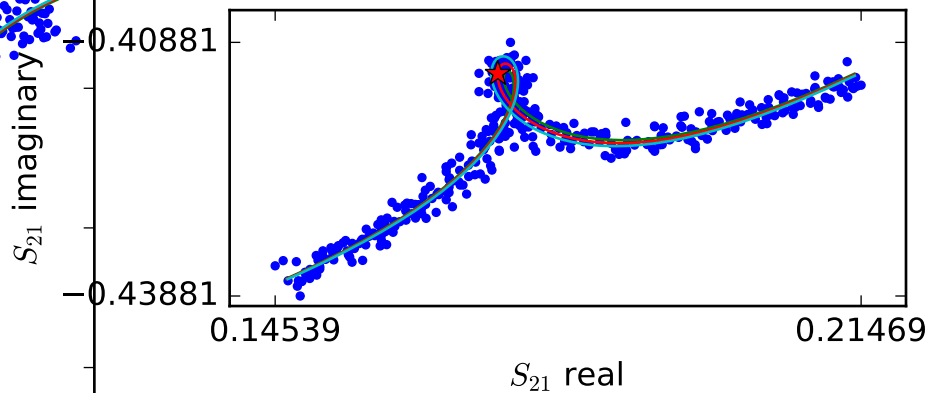
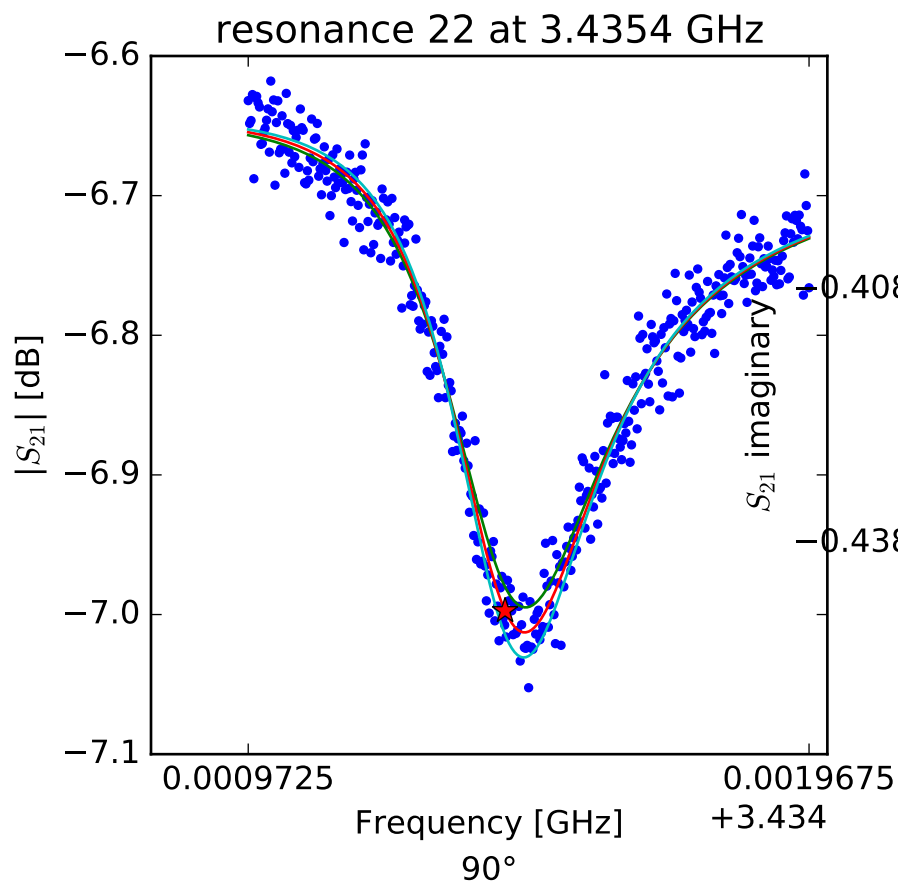
$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

$$\begin{aligned} f_r &= 3.41882098579 \\ Q_r &= 12775.1892292 \\ Q_c &= 790990.141634 \\ a &= (-0.184830818376 + 0.446033289822j) \\ \phi_0 &= 0.404644558184 \\ \tau &= 28.6708058269 \end{aligned}$$



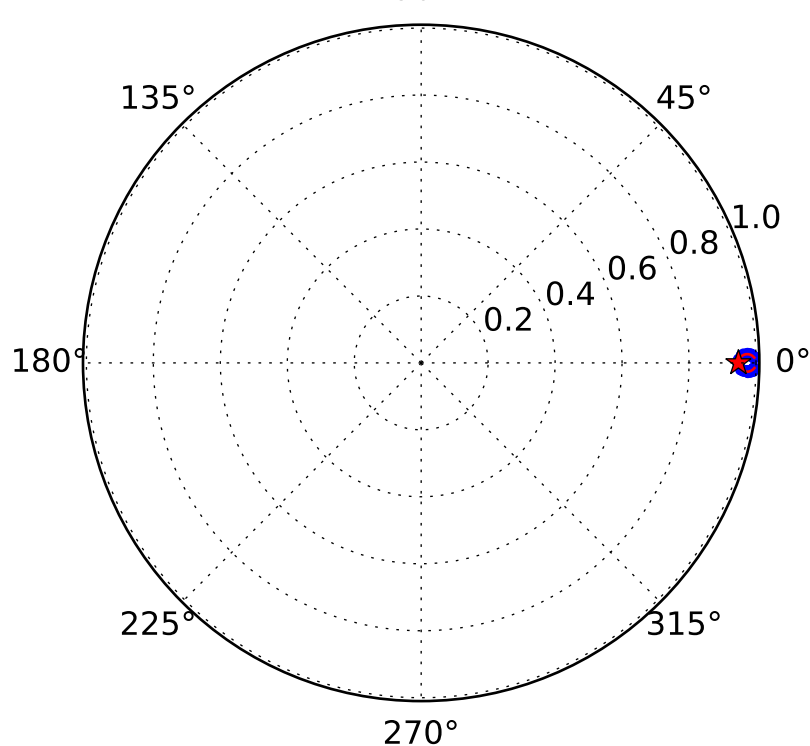
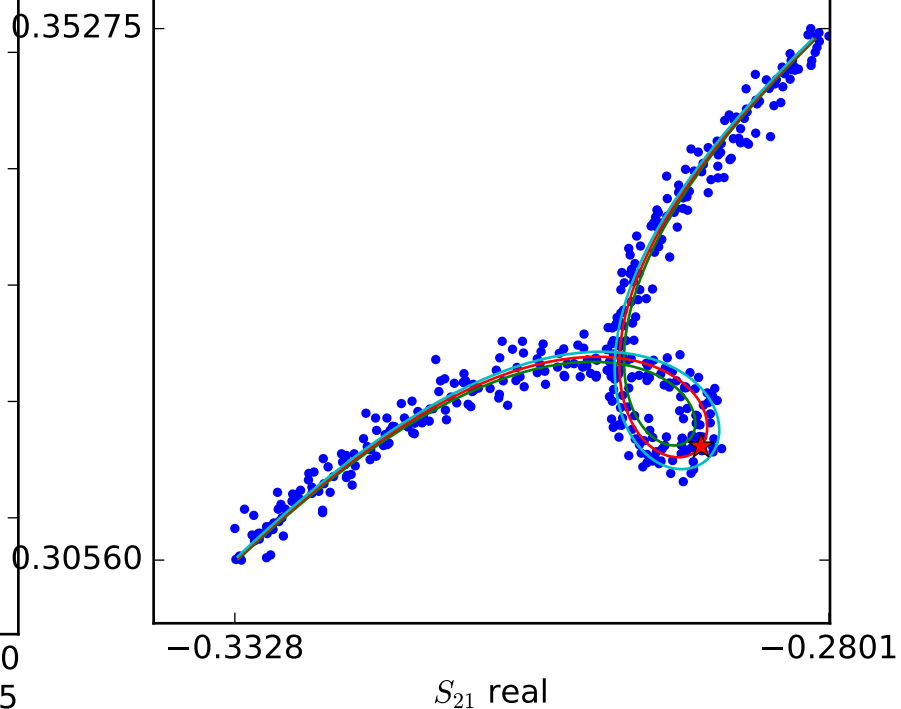
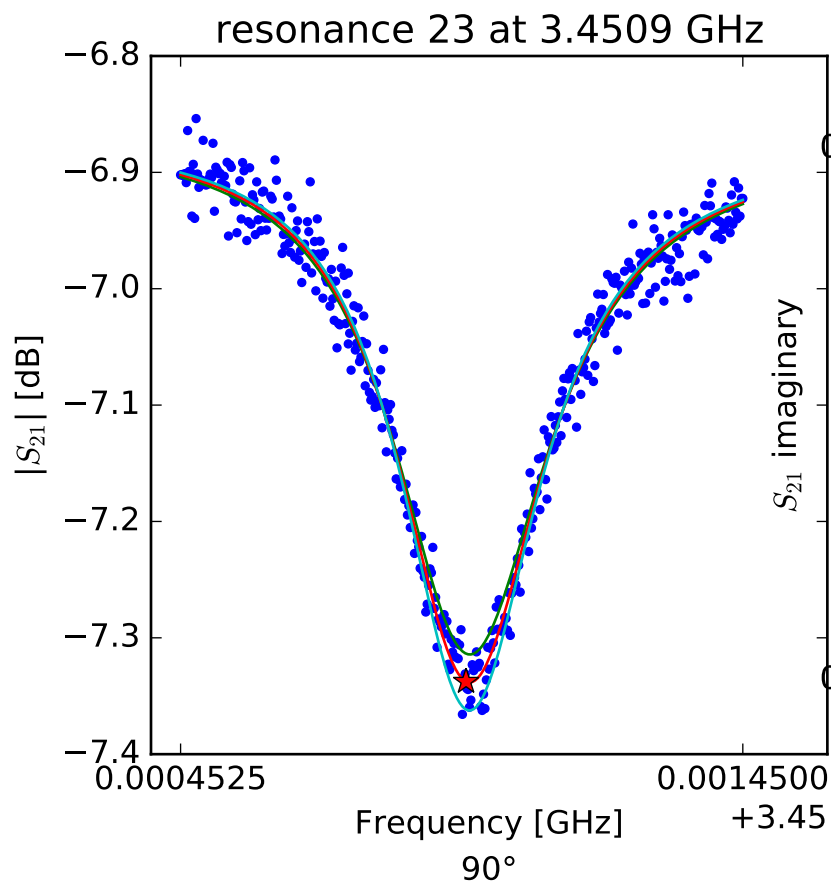
$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

$$\begin{aligned} f_r &= 3.43004100446 \\ Q_r &= 17300.9278489 \\ Q_c &= 240239.572786 \\ a &= (0.301059871367 - 0.362055406382j) \\ \phi_0 &= 0.110343023249 \\ \tau &= 28.2481853987 \end{aligned}$$



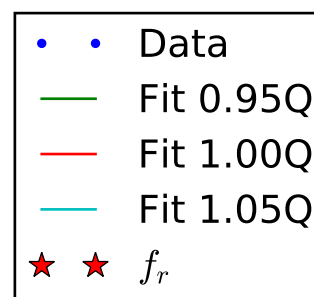
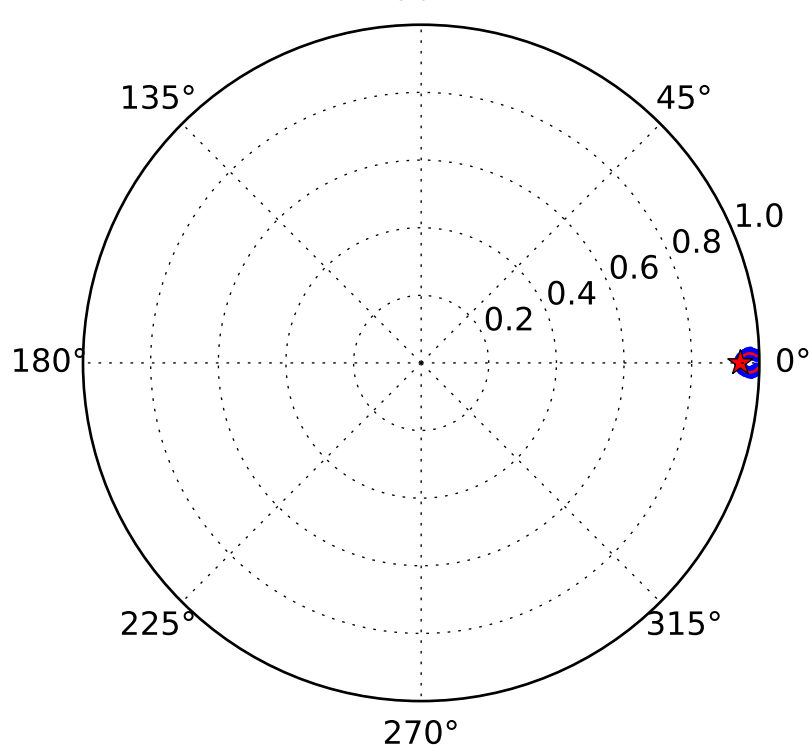
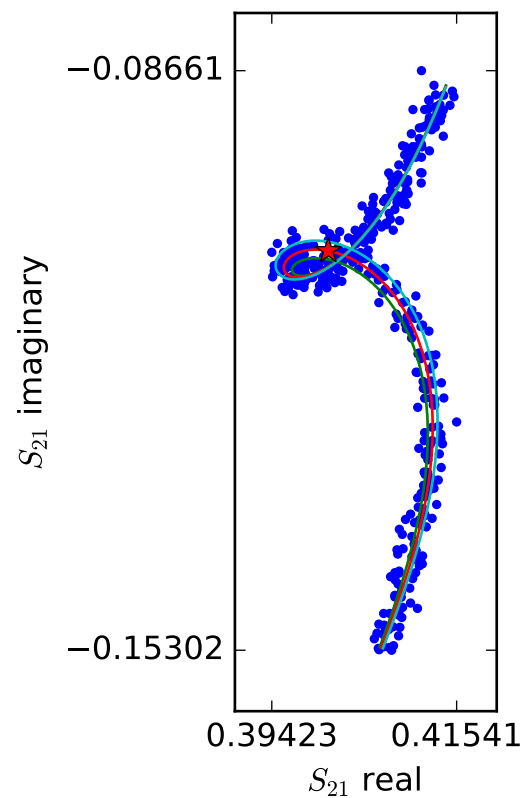
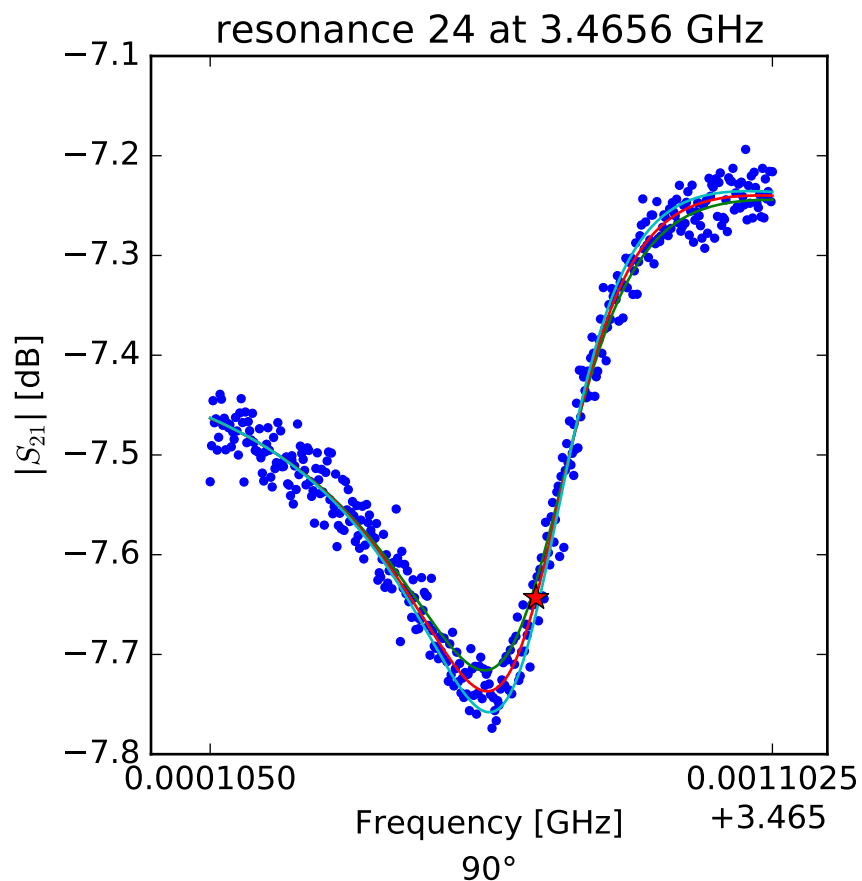
$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

$$\begin{aligned} f_r &= 3.43542819572 \\ Q_r &= 10196.4133784 \\ Q_c &= 246550.776376 \\ a &= (-0.438409919484 - 0.153388025158j) \\ \phi_0 &= 0.397658498902 \\ \tau &= 28.4500588928 \end{aligned}$$



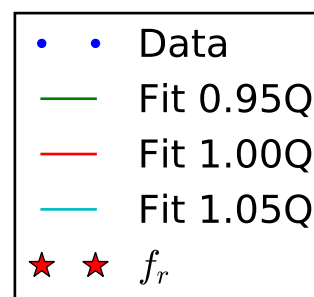
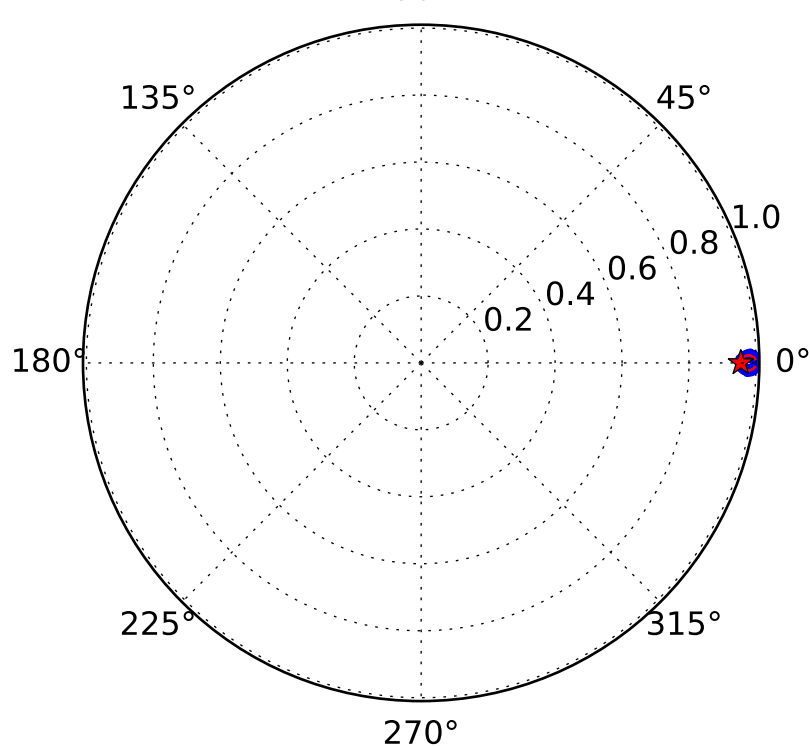
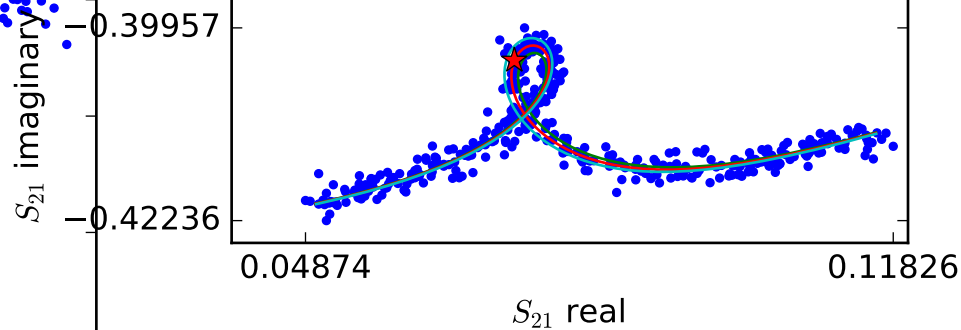
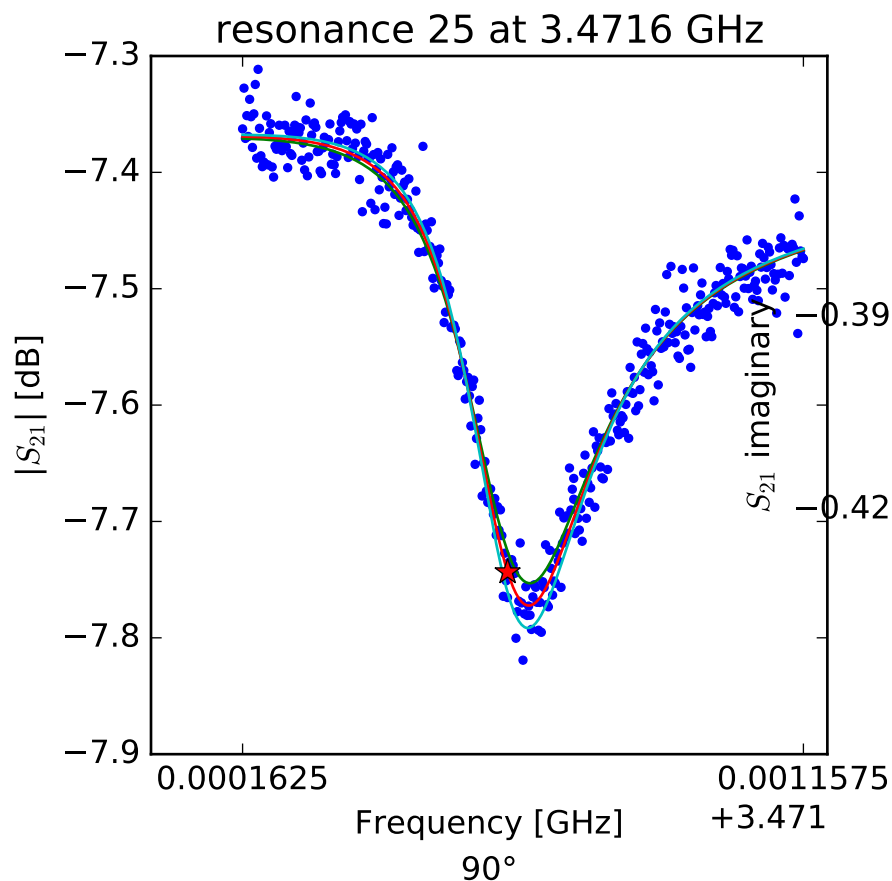
$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

$$\begin{aligned} f_r &= 3.45095892704 \\ Q_r &= 10553.8407575 \\ Q_c &= 200870.525262 \\ a &= (-0.445407406838 + 0.0847773753146j) \\ \phi_0 &= 0.0770504694051 \\ \tau &= 29.2964210217 \end{aligned}$$



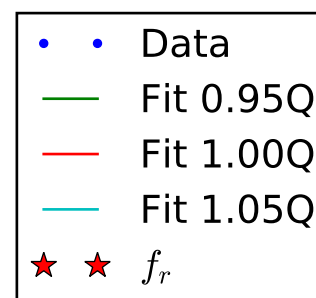
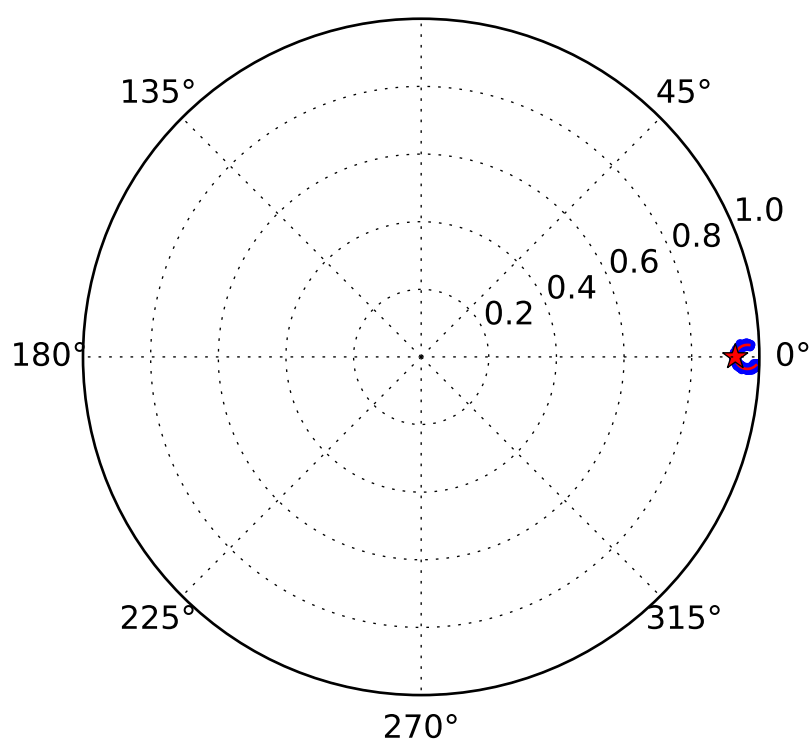
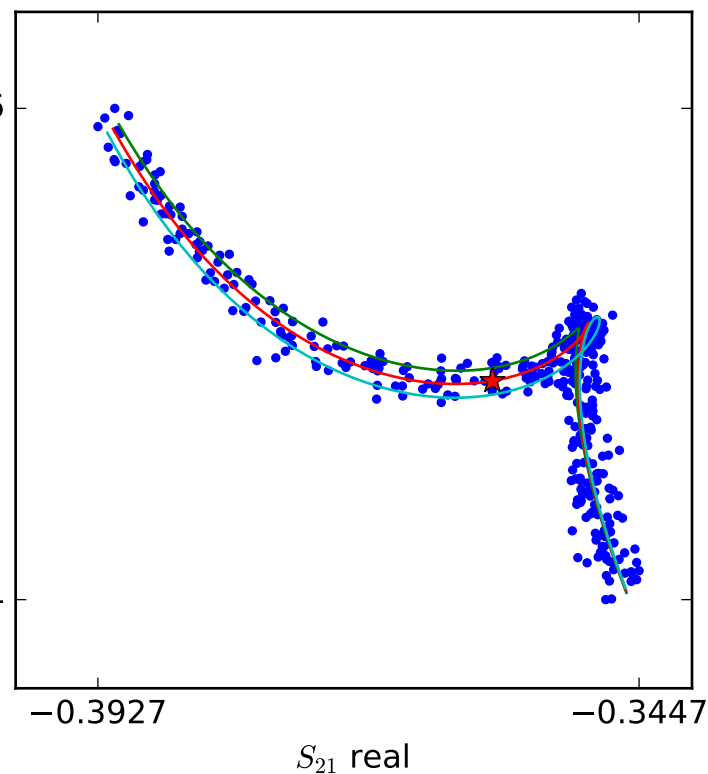
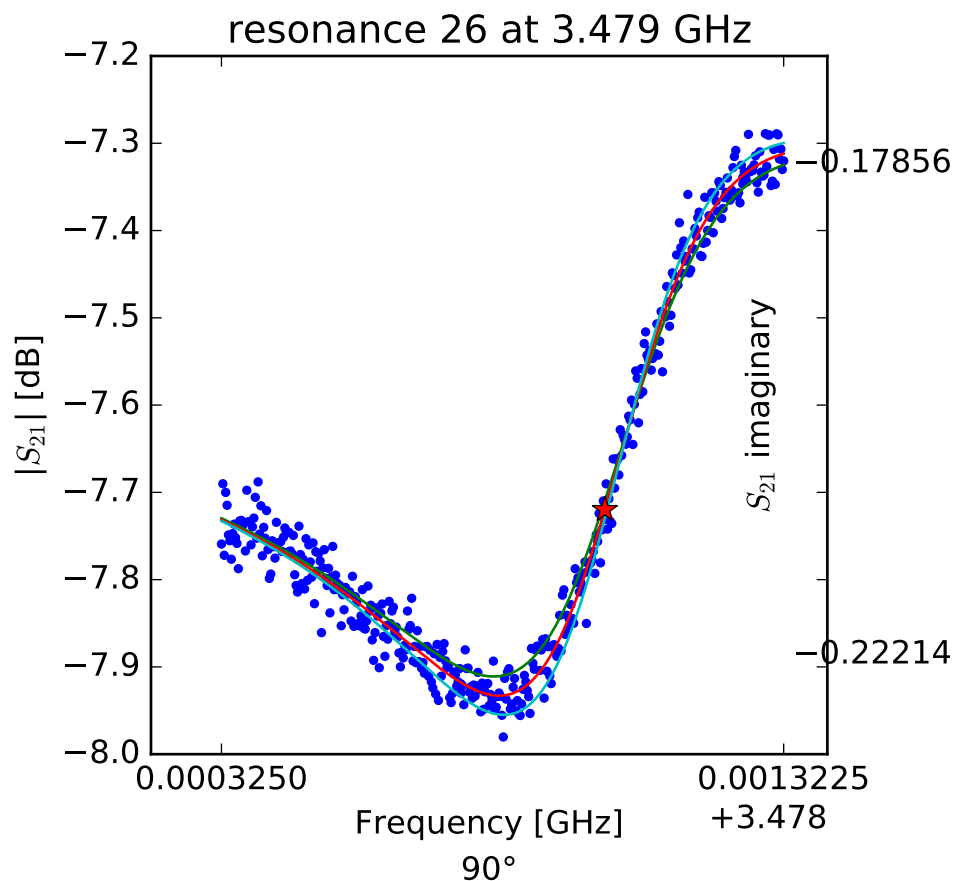
$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

$$\begin{aligned} f_r &= 3.46568314988 \\ Q_r &= 9346.61929329 \\ Q_c &= 166382.516274 \\ a &= (-0.133004264674 + 0.409194459036j) \\ \phi_0 &= -0.854764311233 \\ \tau &= 28.0893069568 \end{aligned}$$



$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

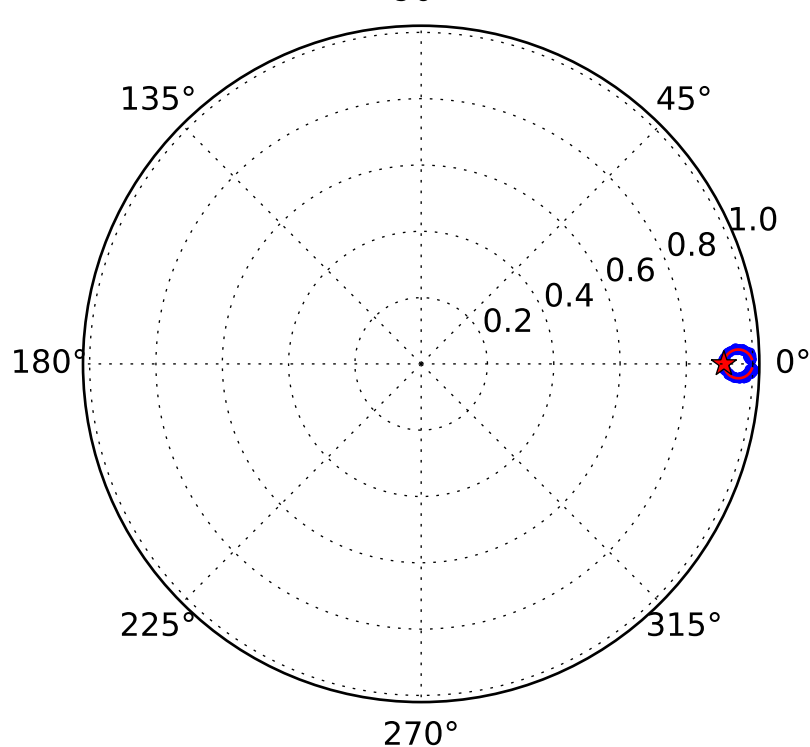
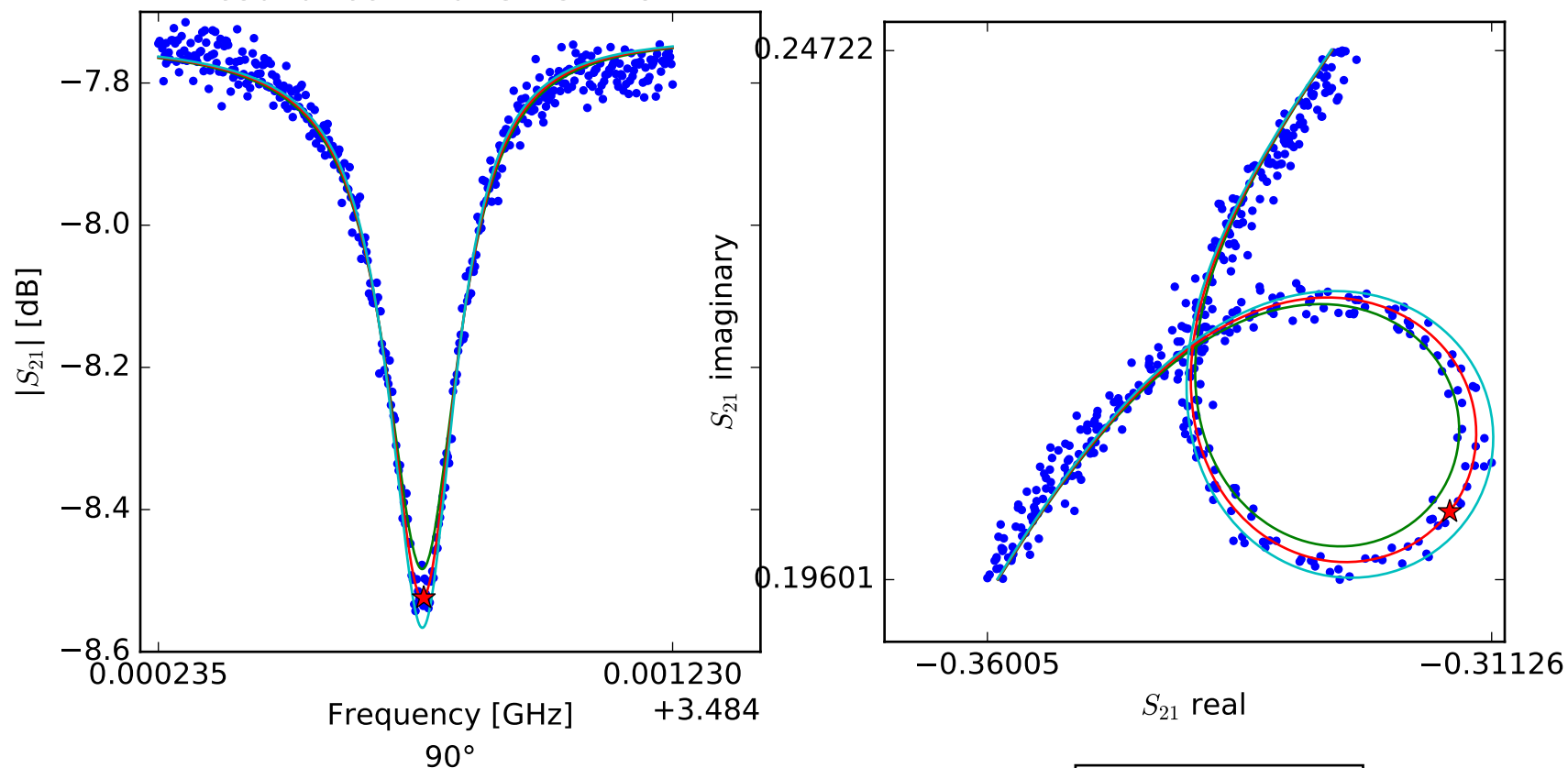
$$\begin{aligned} f_r &= 3.47163269404 \\ Q_r &= 12522.3962228 \\ Q_c &= 275170.680539 \\ a &= (-0.257192920415 + 0.340601760358j) \\ \phi_0 &= 0.5183321116 \\ \tau &= 28.3931367718 \end{aligned}$$



$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

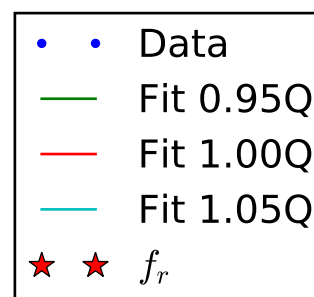
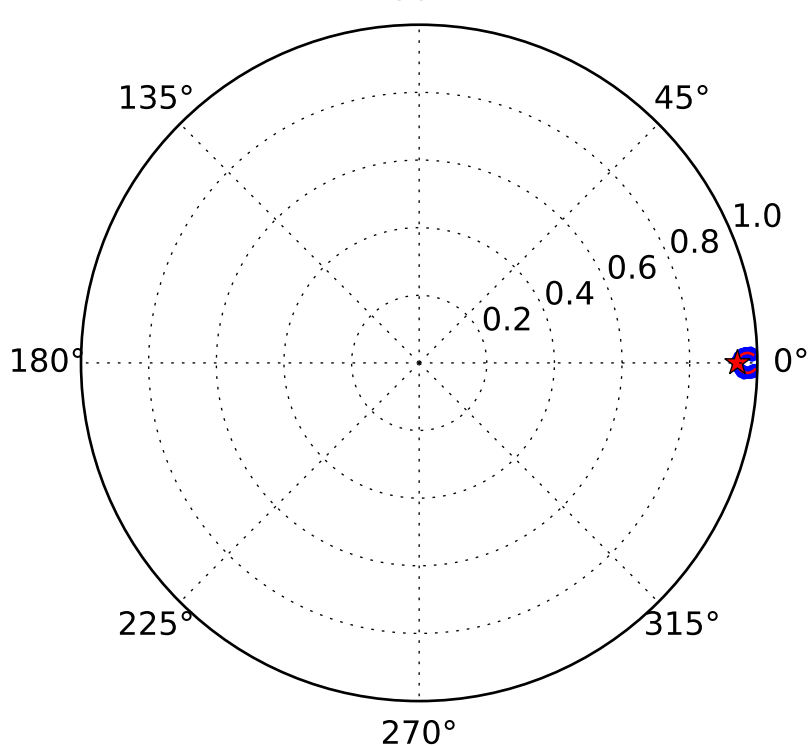
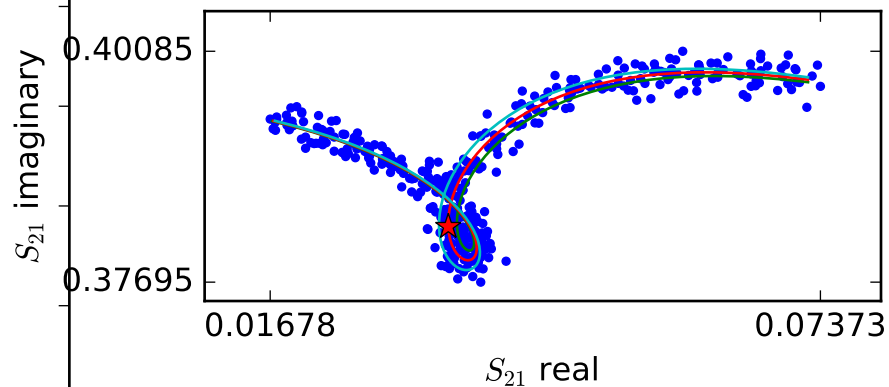
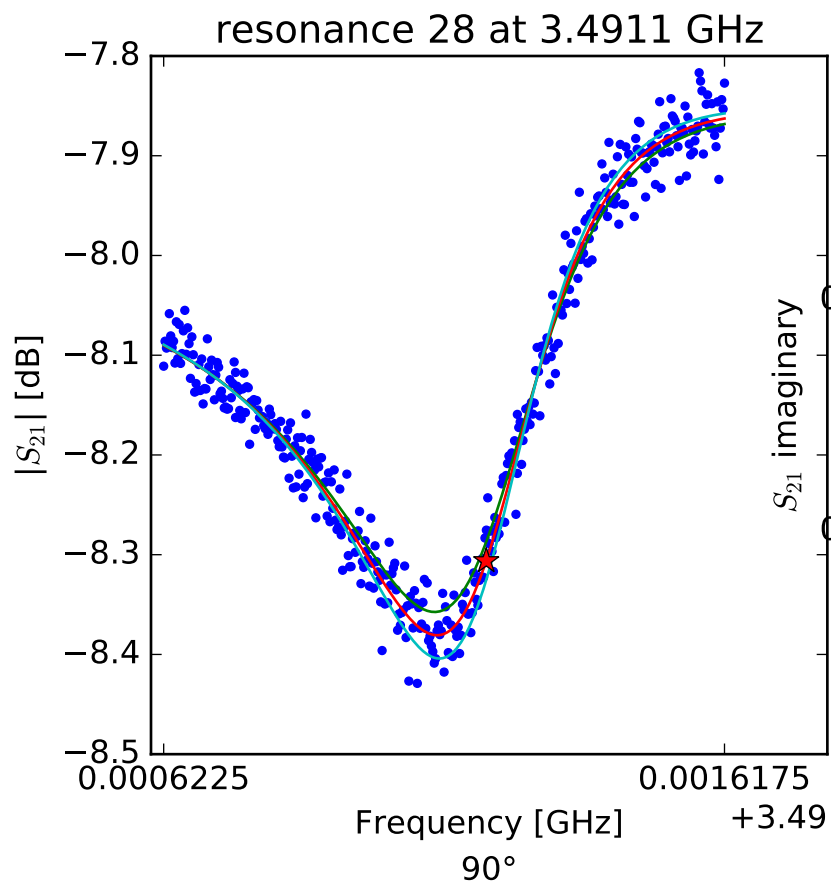
$$\begin{aligned} f_r &= 3.47900529063 \\ Q_r &= 6409.2944021 \\ Q_c &= 89990.1043316 \\ a &= (-0.416807403947 + 0.0642977181527j) \\ \phi_0 &= -1.1772263716 \\ \tau &= 28.428908168 \end{aligned}$$

resonance 27 at 3.4847 GHz



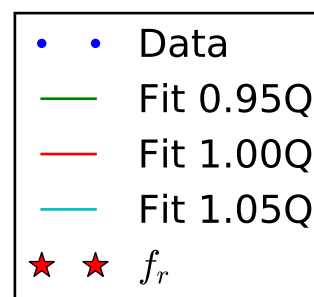
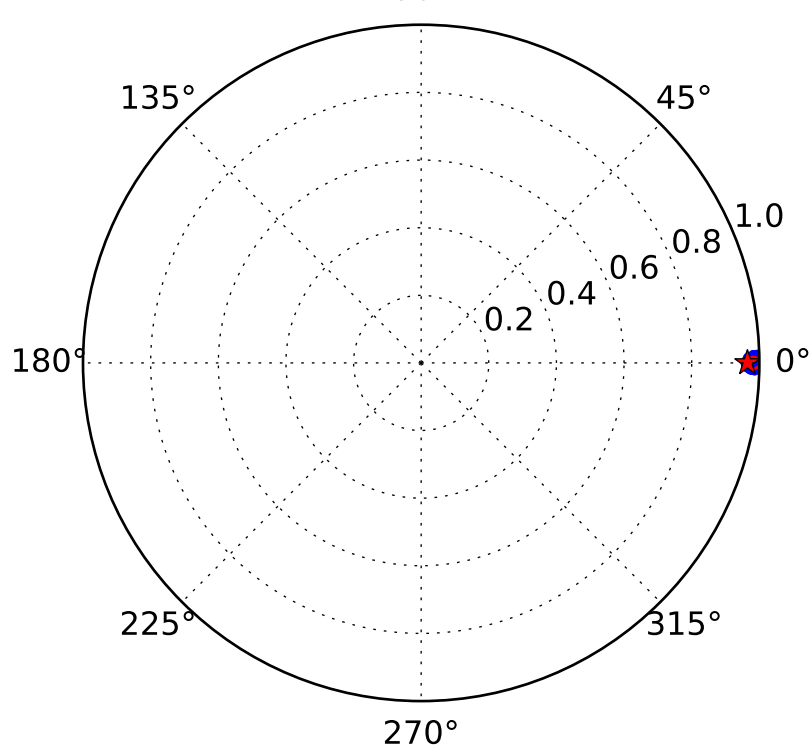
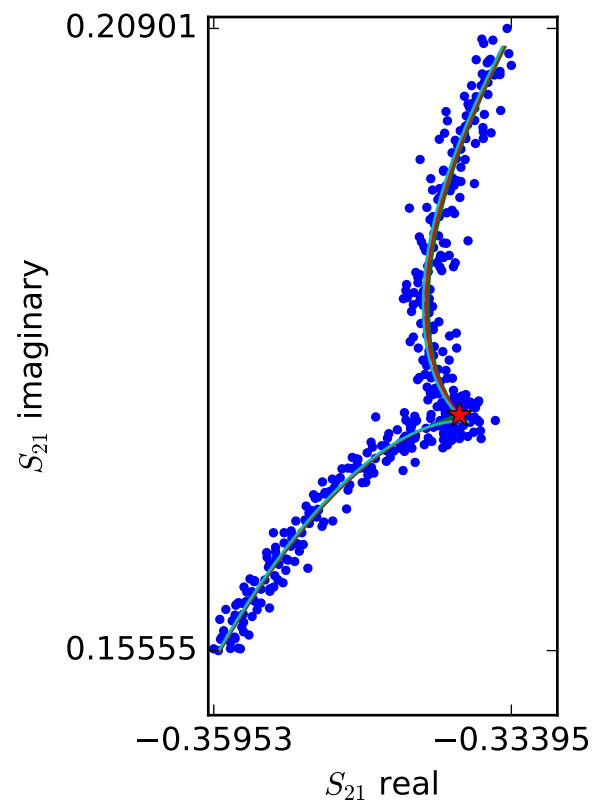
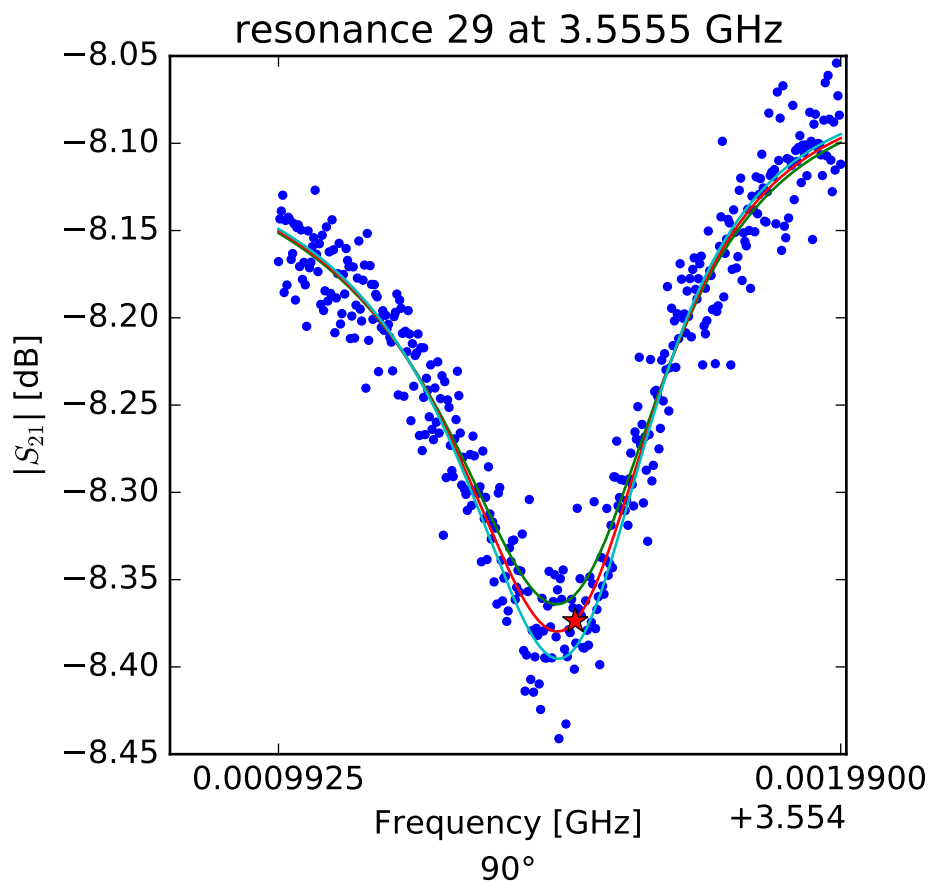
$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

$$\begin{aligned} f_r &= 3.484748555 \\ Q_r &= 20134.3557547 \\ Q_c &= 231519.225555 \\ a &= (-0.283625957334 + 0.296634133629j) \\ \phi_0 &= -0.0652272438324 \\ \tau &= 28.398982968 \end{aligned}$$



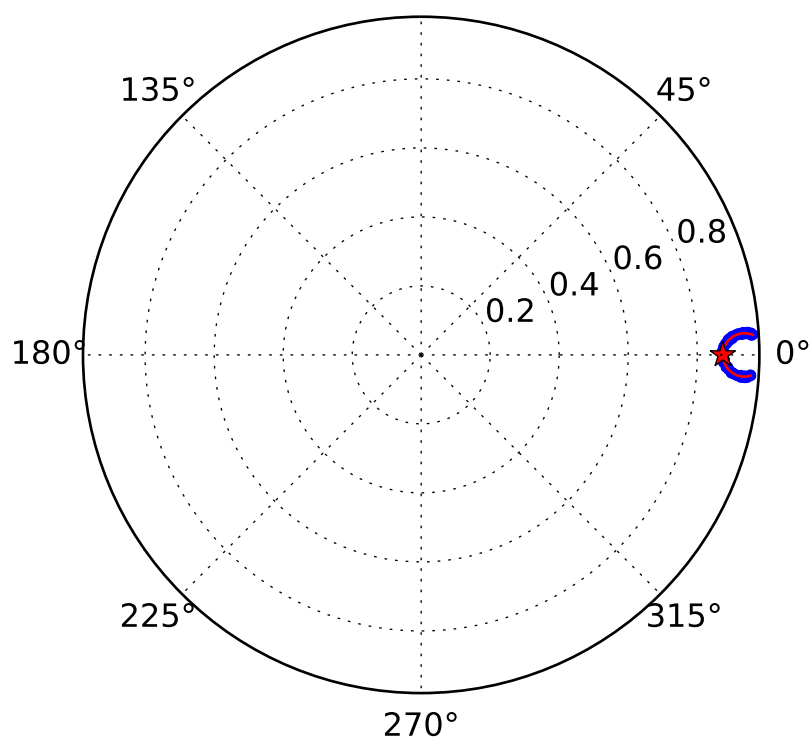
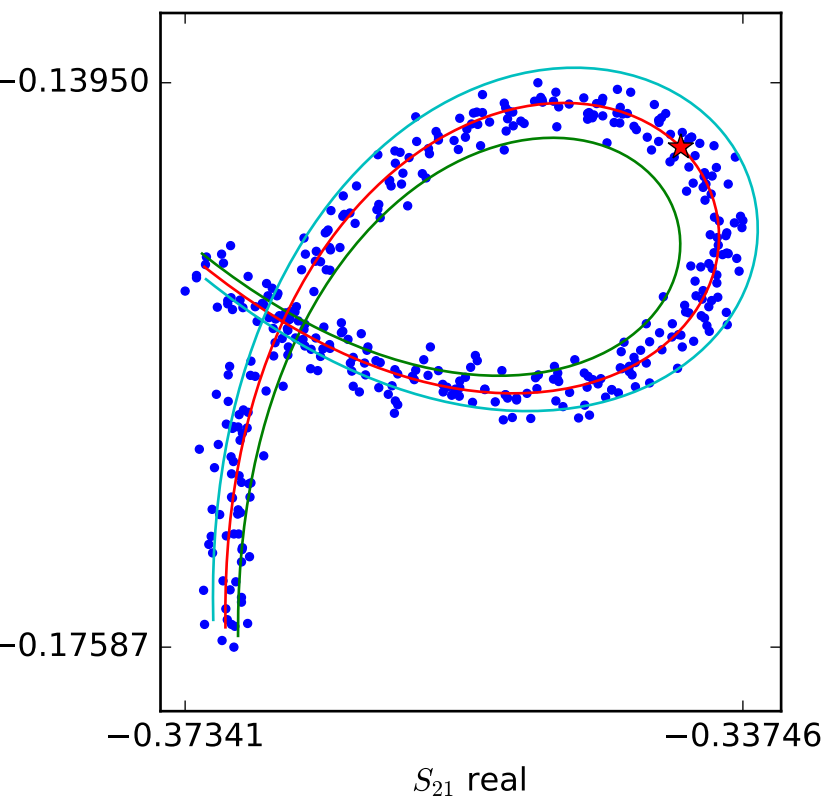
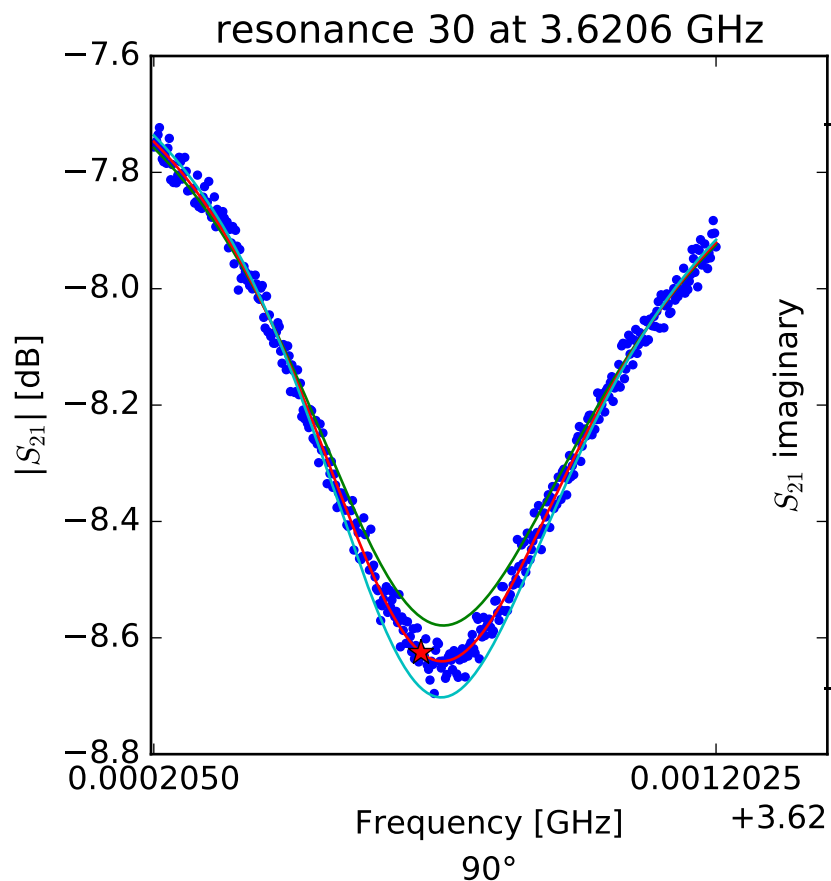
$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r(\frac{f-f_r}{f_r})} \right]$$

$$\begin{aligned} f_r &= 3.49119481746 \\ Q_r &= 7911.22410417 \\ Q_c &= 134233.349068 \\ a &= (-0.30613502525 - 0.259902153619j) \\ \phi_0 &= -0.732966410072 \\ \tau &= 27.6075092622 \end{aligned}$$



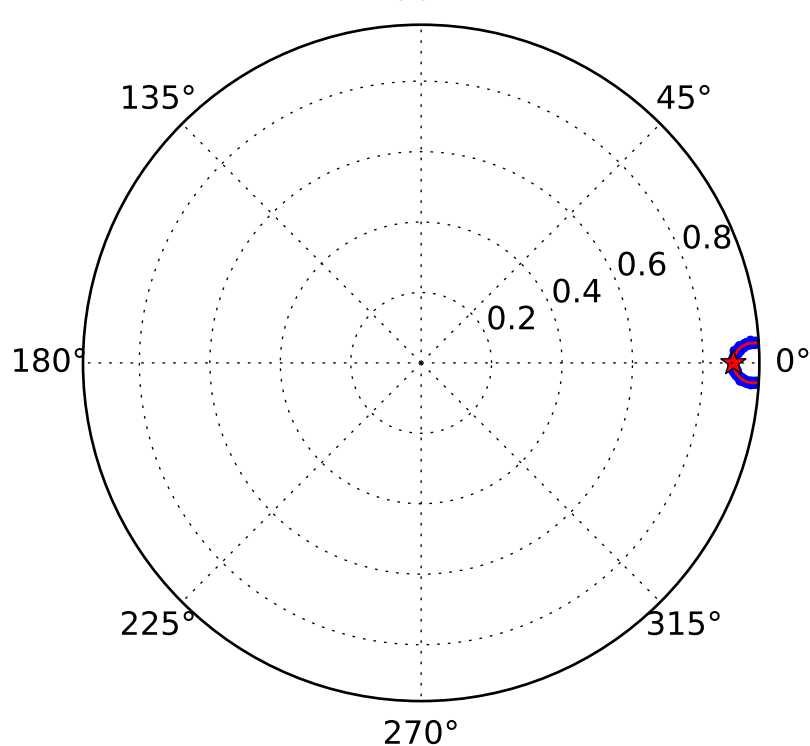
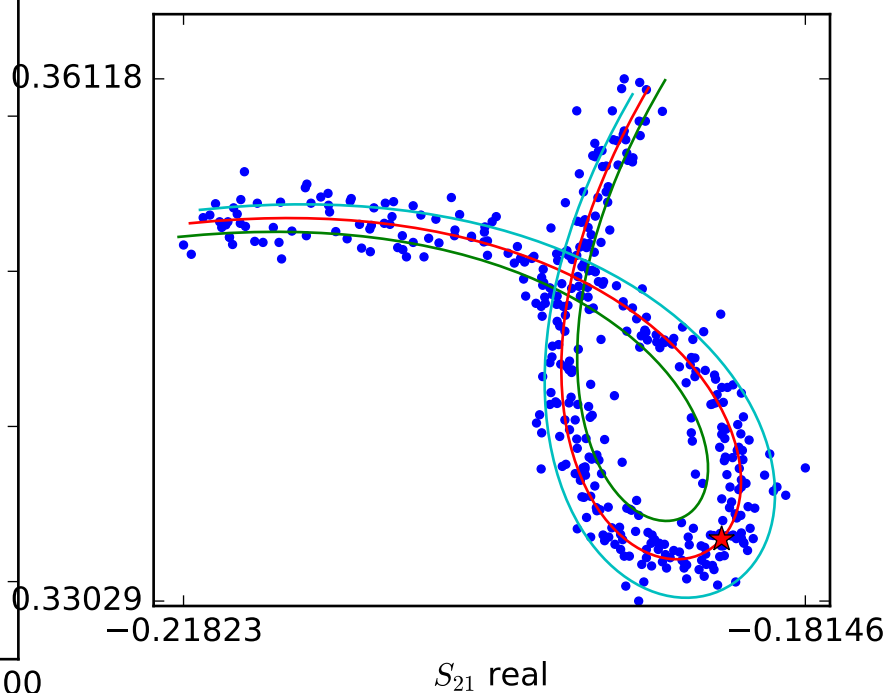
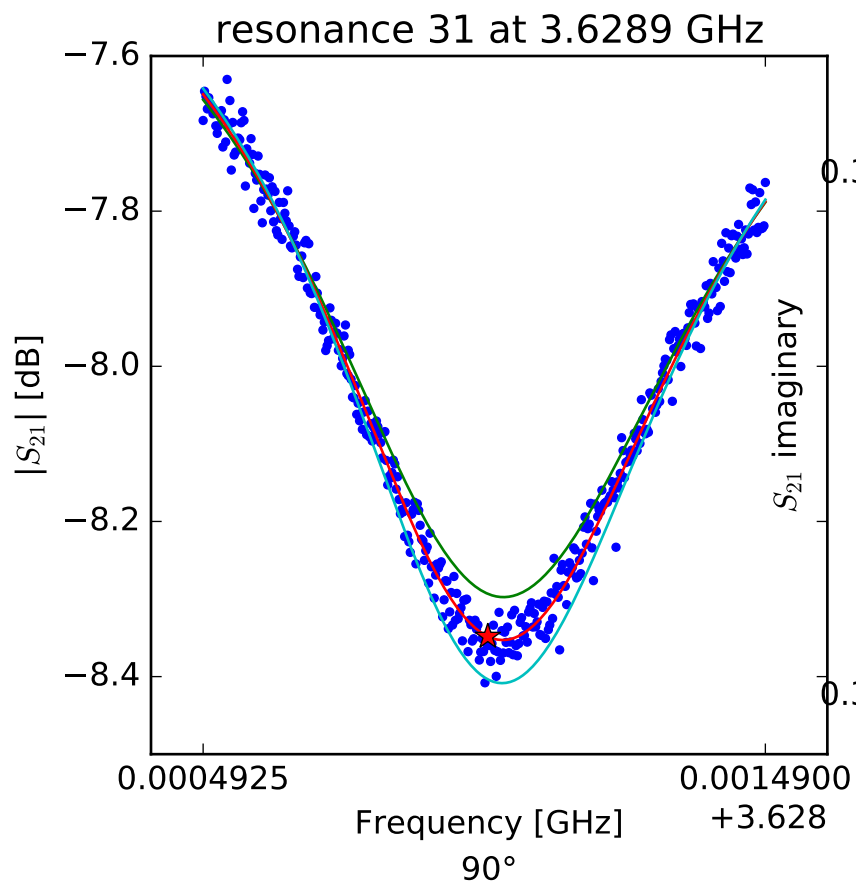
$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

$$\begin{aligned} f_r &= 3.55551899604 \\ Q_r &= 7728.44788193 \\ Q_c &= 218839.123001 \\ a &= (0.257963945481 + 0.298823555192j) \\ \phi_0 &= -0.268360155887 \\ \tau &= 27.4824729861 \end{aligned}$$



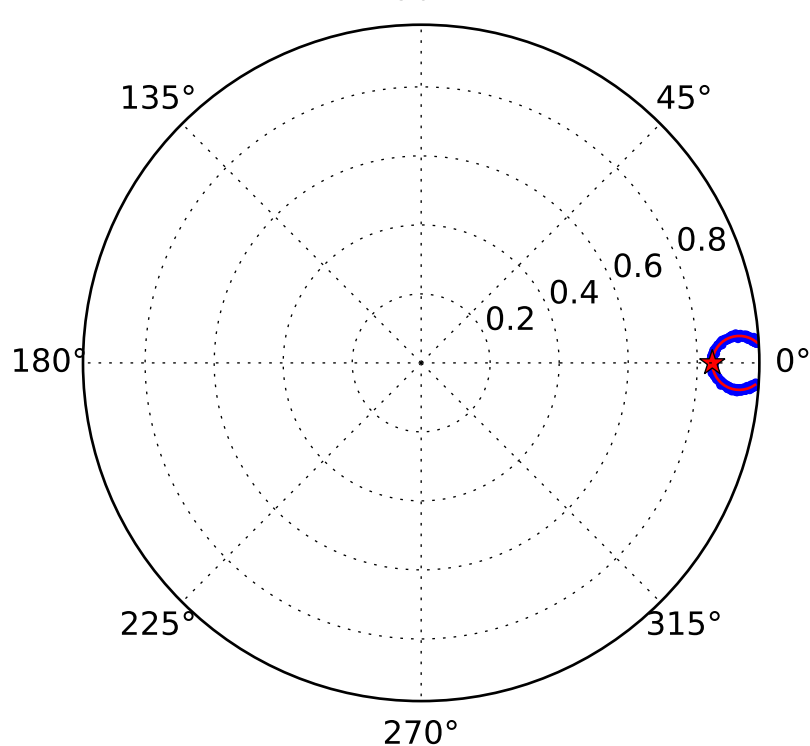
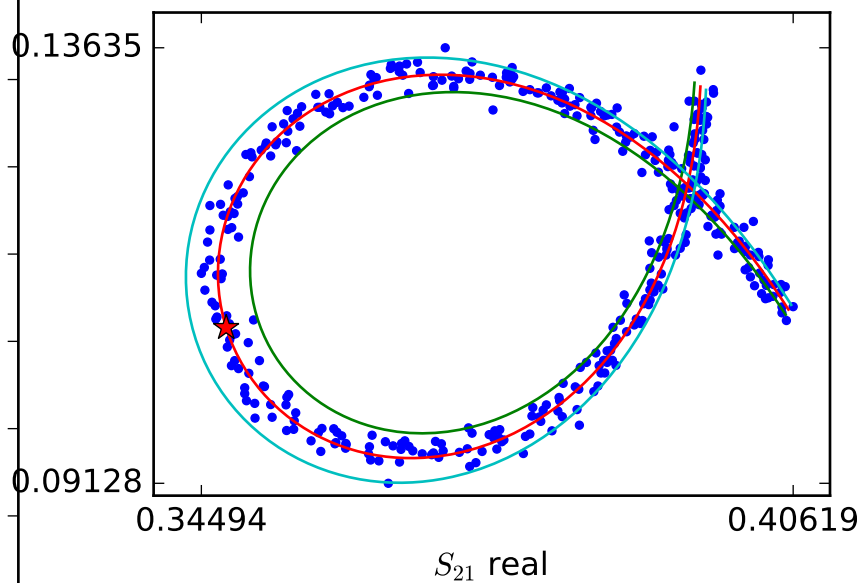
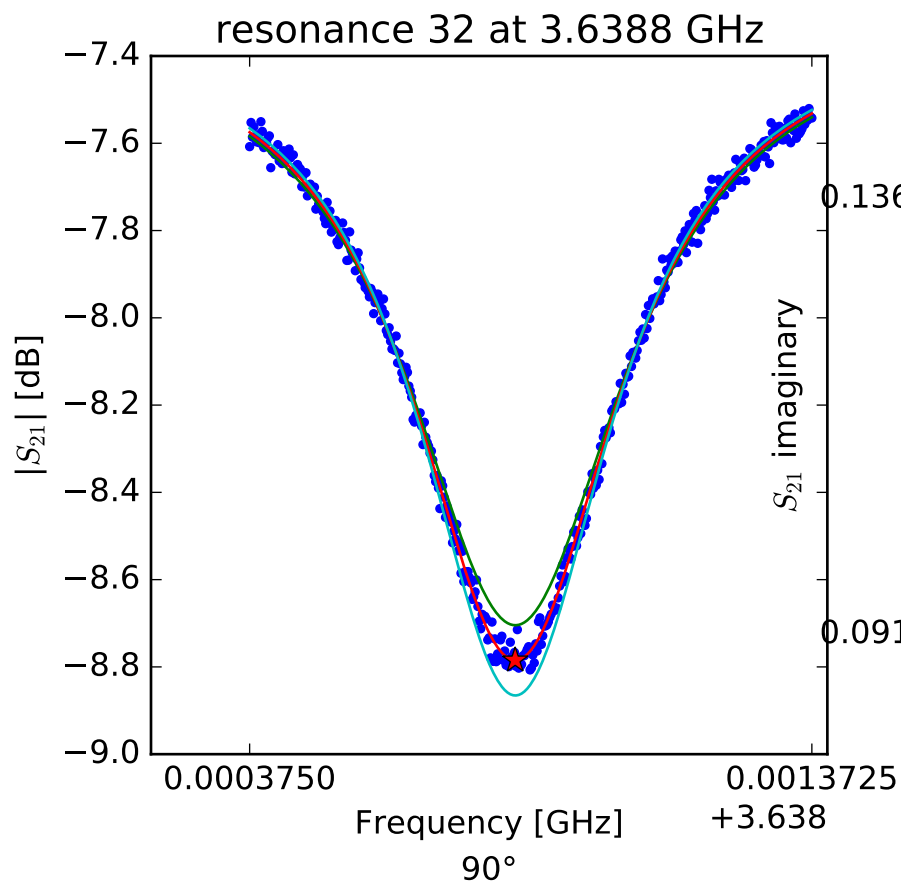
$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

$$\begin{aligned} f_r &= 3.62067903627 \\ Q_r &= 5119.81503112 \\ Q_c &= 40653.8570913 \\ a &= (-0.014279702317 + 0.422209653842j) \\ \phi_0 &= 0.199138740208 \\ \tau &= 28.0851967117 \end{aligned}$$



$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

$$\begin{aligned} f_r &= 3.62899753694 \\ Q_r &= 4256.84713729 \\ Q_c &= 37451.7079206 \\ a &= (-0.270540849577 - 0.335613476829j) \\ \phi_0 &= 0.117305657495 \\ \tau &= 29.2942077604 \end{aligned}$$



$$S_{21}(f) = ae^{-2\pi jf\tau} \left[1 - \frac{Q_r/Q_c e^{j\phi_0}}{1 + 2jQ_r \left(\frac{f-f_r}{f_r} \right)} \right]$$

$$\begin{aligned} f_r &= 3.63884615621 \\ Q_r &= 7539.54484656 \\ Q_c &= 48213.2323778 \\ a &= (-0.274756251347 - 0.332253615864j) \\ \phi_0 &= 0.00205827154122 \\ \tau &= 29.5676888008 \end{aligned}$$