Measure, model and correct chromaticities in d-Au run

(Session I: Dec.5, 2007)

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1. Beam experiment time line

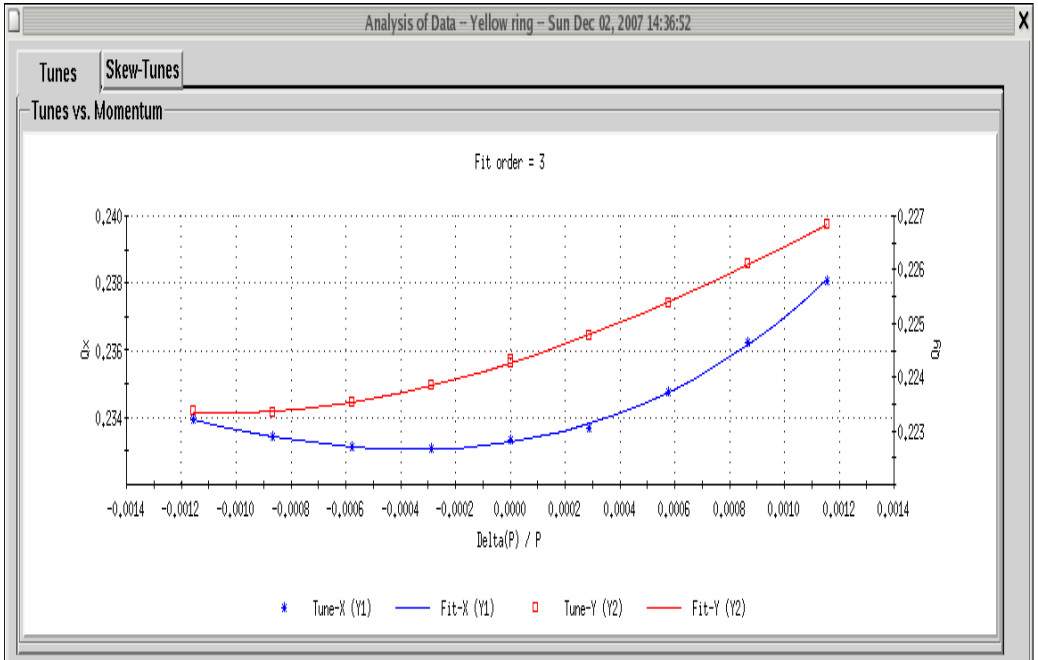
6*6 bunch ramp with moderate nonlinear chrom corrections at store and flattop in yellow ring.

Measure Yellow second order chroms and do corrections by knobbing, adjust the linear chroms.

Try to reduce Q''x in Blue ring from 1000, but failed.

Natalia's 6*6 ramp with updated yellow chrom corrections.

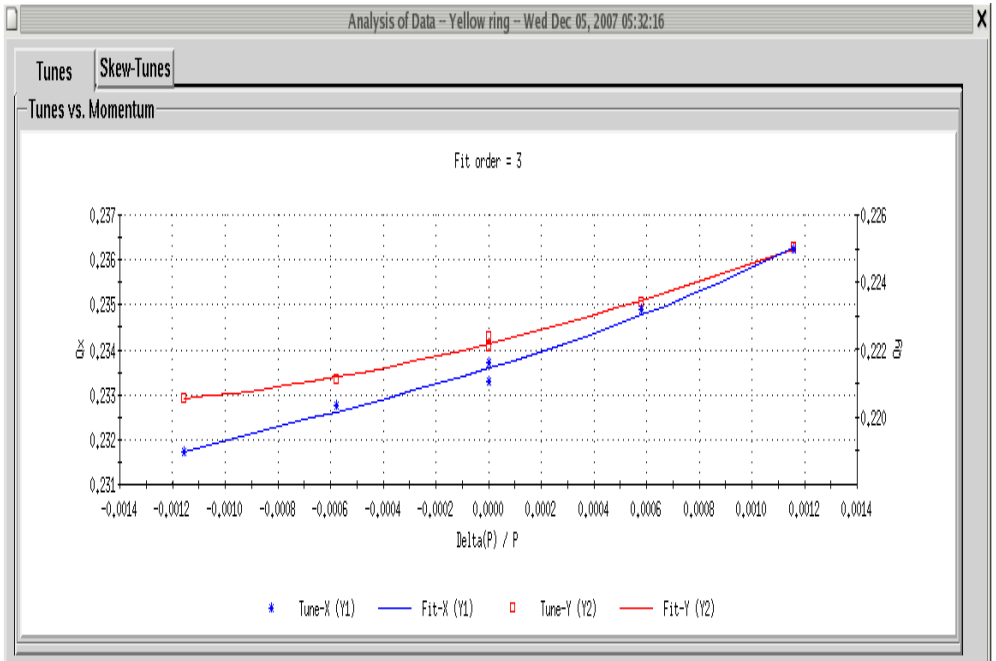
2. Yellow ring story



Row	Delta(p)/p	Skew q1	BBQ X	Tune X #1	Tune X #2	Select	Skew q2	BBQ Y	Tune Y #1	Tune Y #2	Select
1	-0.00115643	-0.00487785	0.233936	-999	-999	BBQ	0.00233574	0.223366	-999	-999	BBQ
2	-0.000867033	-0.00600912	0.233425	-999	-999	BBQ	0.00335304	0.223338	-999	-999	BBQ
3	-0.000577636	-0.00602729	0.233118	-999	-999	BBQ	0.00401158	0.223519	-999	-999	BBQ
4	-0.000288239	-0.00553555	0.233052	-999	-999	BBQ	0.00414031	0.223849	-999	-999	BBQ
5	0	-0.0025713	0.233319	-999	-999	BBQ	0.00267654	0.224325	-999	-999	BBQ
6	0	-0.0029621	0.233329	-999	-999	BBQ	0.00268077	0.224277	-999	-999	BBQ
7	0.000289397	0.00148628	0.233679	-999	-999	BBQ	4.08615e-05	0.224776	-999	-999	BBQ
8	0.000578794	0.003352	0.23475	-999	-999	BBQ	-0.0013569	0.225376	-999	-999	BBQ
9	0.00086819	0.00395573	0.23624	-999	-999	BBQ	-0.00249212	0.226096	-999	-999	BBQ
10	0.00115759	0.00525896	0.238078	-999	-999	BBQ	-0.00367017	0.22684	-999	-999	BBQ
0	0	0	0	0	0	BBQ	0	0	0	0	BBQ

	Corr	Tune	+-Sigma	Chrom[1]	+-Sigma	Chrom[2]	+-Sigma	Chrom[3]	+-Sigma
Horizontal	0.999357	0.233261	2.28501e-05	1.27219	0.0322559	2054.4	46.2926	396281	79087.3
Vertical	0.99975	0.224268	1.03646e-05	1.65379	0.0146309	612.425	20.9978	-110973	35873.1

Before correction: 2 families



Row	Delta(p)/p	Skew q1	BBQ X	Tune X #1	Tune X #2	Select	Skew q2	BBQ Y	Tune Y #1	Tune Y #2	Select
1	-0.0011571	0.00233947	0.231709	0.28418	0.292969	BBQ	0.00209374	0.220564	0.280273	0.161133	BBQ
2	-0.00057797	0.00423331	0.232747	0.158203	0.185547	BBQ	0.00159802	0.221119	0.185547	0.15332	BBQ
3	0	0.00473142	0.23329	0.274414	0.169922	BBQ	0.000295853	0.222389	0.255859	0.189453	BBQ
4	0	0.00555752	0.233701	0.271484	0.258789	BBQ	0.00057376	0.222077	0.274414	0.299805	BBQ
5	0.000579129	0.00671201	0.234888	0.229492	0.15332	BBQ	-0.000544639	0.223408	0.275391	0.222656	BBQ
6	0.00115826	0.00762002	0.236238	0.161133	0.257812	BBQ	-0.00184642	0.225022	0.170898	0.209961	BBQ
0	0	0	0	0	0	BBQ	0	0	0	0	BBQ
0	0	0	0	0	0	BBQ	0	0	0	0	BBQ
0	0	0	0	0	0	BBQ	0	0	0	0	BBQ
0	0	0	0	0	0	BBQ	0	0	0	0	BBQ
0	0	0	0	0	0	BBQ	0	0	0	0	BBQ

	Corr	Tune	+-Sigma	Chrom[1]	+-Sigma	Chrom[2]	+-Sigma	Chrom[3]	+-Sigma
Horizontal	0.99475	0.233589	0.000105977	1.81457	0.141831	308.976	186.079	105414	352745
Vertical	0.997552	0.222182	7.27883e-05	1.99427	0.0974143	442.704	127.805	-51732.4	242277

After correction: 8 families

Finial strengths for ramp

RampEditor (dAu80)

Ramp Edit Buffer Optics Stepstone Compare Diagnostics Help

Editing: dAu80 Live Stone: dAu80::injection Ramp State: FirstStone Activate / Make Live

Optics Table | Stepstone Editor | Compare/Revert

Stepstone: injection, snapback, t40, gammat1, beta5, gammat2, gammat3, gammat4, gammat5, still5, gammat6, t106, t120, t140, t170, t200, t230, t243, t260, flattop, store

Pebble: QUAD, SEXTUPOLE, H_STEER, V_STEER, GAMMA, SKEW_QUAD, SKEW_SEXT, NONLINEAR, ABORT, BEND, HELIX, RF

Blue | Yellow | Green

Family	Design	Trim	BDesign	BTrim
y-sxd-ip		-0.06681		0.00275
y-sxf-ip	0.26955	-0.19437	0.26955	0.00362
y-sxd-im		0.00819		0.00275
y-sxf-im		0.20563		0.00362
y-sxf-om		0.00563		0.00362
y-sxd-op		-0.04181		0.00275
y-sxf-op		0.00563		0.00362
y-sxd-om		0.05819		0.00275

Magnet	Design	Trim	BDesign	BTrim
yi6-sxd10	-0.56877	-0.06681	-0.56877	0.00275
yi6-sxf11	0.26955	-0.19437	0.26955	0.00362
yi6-sxd12	-0.56877	0.00819	-0.56877	0.00275
yi6-sxf13	0.26955	0.20563	0.26955	0.00362
yo8-sxf10	0.26955	0.00563	0.26955	0.00362
yo8-sxd11	-0.56877	-0.04181	-0.56877	0.00275
yo8-sxf12	0.26955	0.00563	0.26955	0.00362
yo8-sxd13	-0.56877	0.05819	-0.56877	0.00275
yi10-sxd10	-0.56877	-0.06681	-0.56877	0.00275
yi10-sxf11	0.26955	-0.19437	0.26955	0.00362
yi10-sxd12	-0.56877	0.00819	-0.56877	0.00275
yi10-sxf13	0.26955	0.20563	0.26955	0.00362
yo1-sxd13	-0.56877	0.05819	-0.56877	0.00275

Nudge = 0.05000

RampEditor (dAu80)

Ramp Edit Buffer Optics Stepstone Compare Diagnostics Help

Editing: dAu80 Live Stone: dAu80::store Ramp State: FirstStone Activate / Make Live

Optics Table | Stepstone Editor | Compare/Revert

Stepstone: injection, snapback, t40, gammat1, beta5, gammat2, gammat3, gammat4, gammat5, still5, gammat6, t106, t120, t140, t170, t200, t230, t243, t260, flattop, store

Pebble: QUAD, SEXTUPOLE, H_STEER, V_STEER, GAMMA, SKEW_QUAD, SKEW_SEXT, NONLINEAR, ABORT, BEND, HELIX, RF

Blue | Yellow | Green

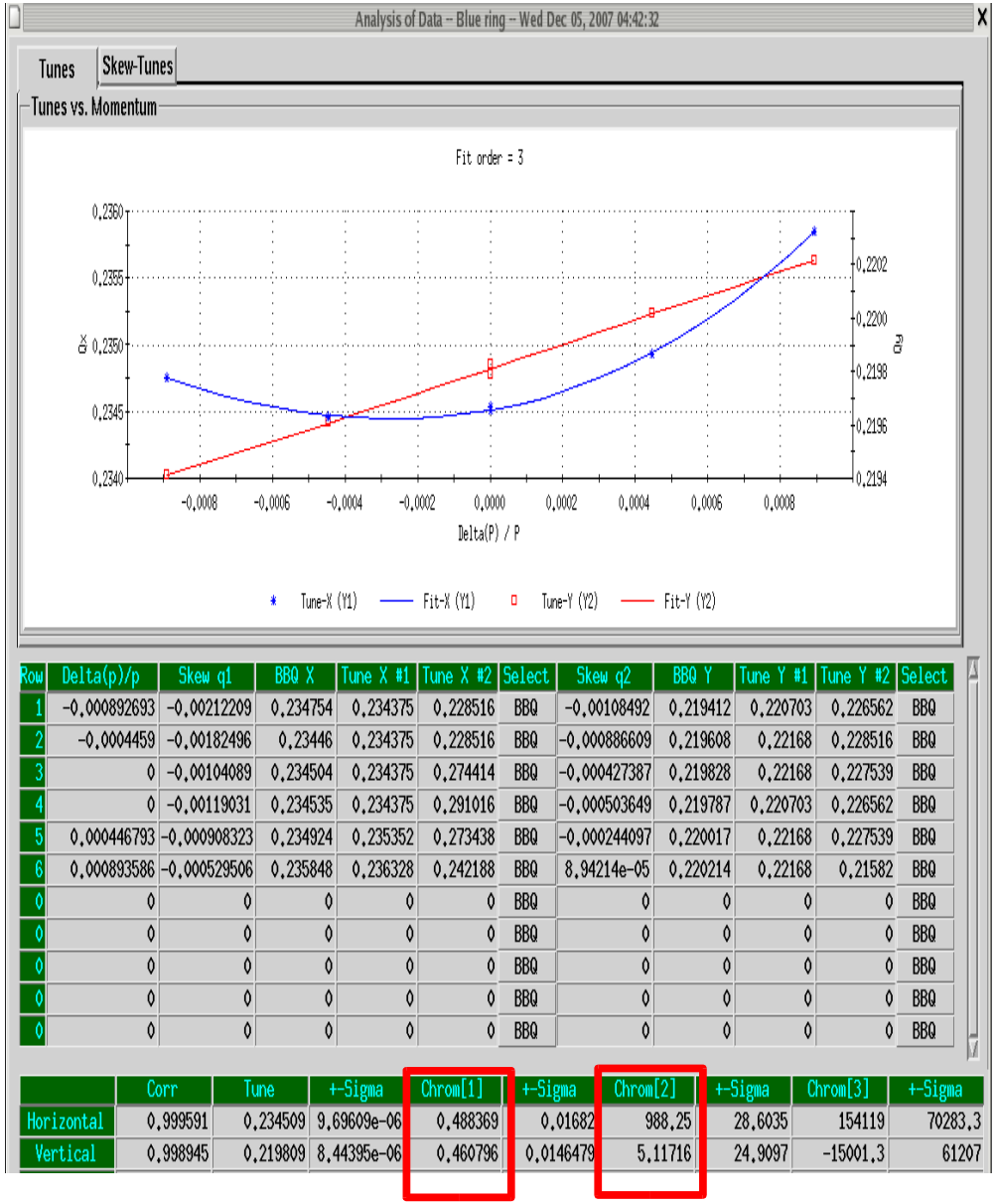
Family	Design	Trim	BDesign	BTrim
y-sxd-ip		0.00007		0.00007
y-sxf-ip	0.26955	-0.09191	0.26955	0.00309
y-sxd-im		0.00007		0.00007
y-sxf-im		0.09809		0.00309
y-sxf-om		0.00309		0.00309
y-sxd-op		0.00007		0.00007
y-sxf-op		0.00309		0.00309
y-sxd-om		0.00007		0.00007

Magnet	Design	Trim	BDesign	BTrim
yi6-sxd10	-0.56877	0.00007	-0.56877	0.00007
yi6-sxf11	0.26955	-0.09191	0.26955	0.00309
yi6-sxd12	-0.56877	0.00007	-0.56877	0.00007
yi6-sxf13	0.26955	0.09809	0.26955	0.00309
yo8-sxf10	0.26955	0.00309	0.26955	0.00309
yo8-sxd11	-0.56877	0.00007	-0.56877	0.00007
yo8-sxf12	0.26955	0.00309	0.26955	0.00309
yo8-sxd13	-0.56877	0.00007	-0.56877	0.00007
yi10-sxd10	-0.56877	0.00007	-0.56877	0.00007
yi10-sxf11	0.26955	-0.09191	0.26955	0.00309
yi10-sxd12	-0.56877	0.00007	-0.56877	0.00007
yi10-sxf13	0.26955	0.09809	0.26955	0.00309
yo1-sxd13	-0.56877	0.00007	-0.56877	0.00007

Nudge = 0.05000

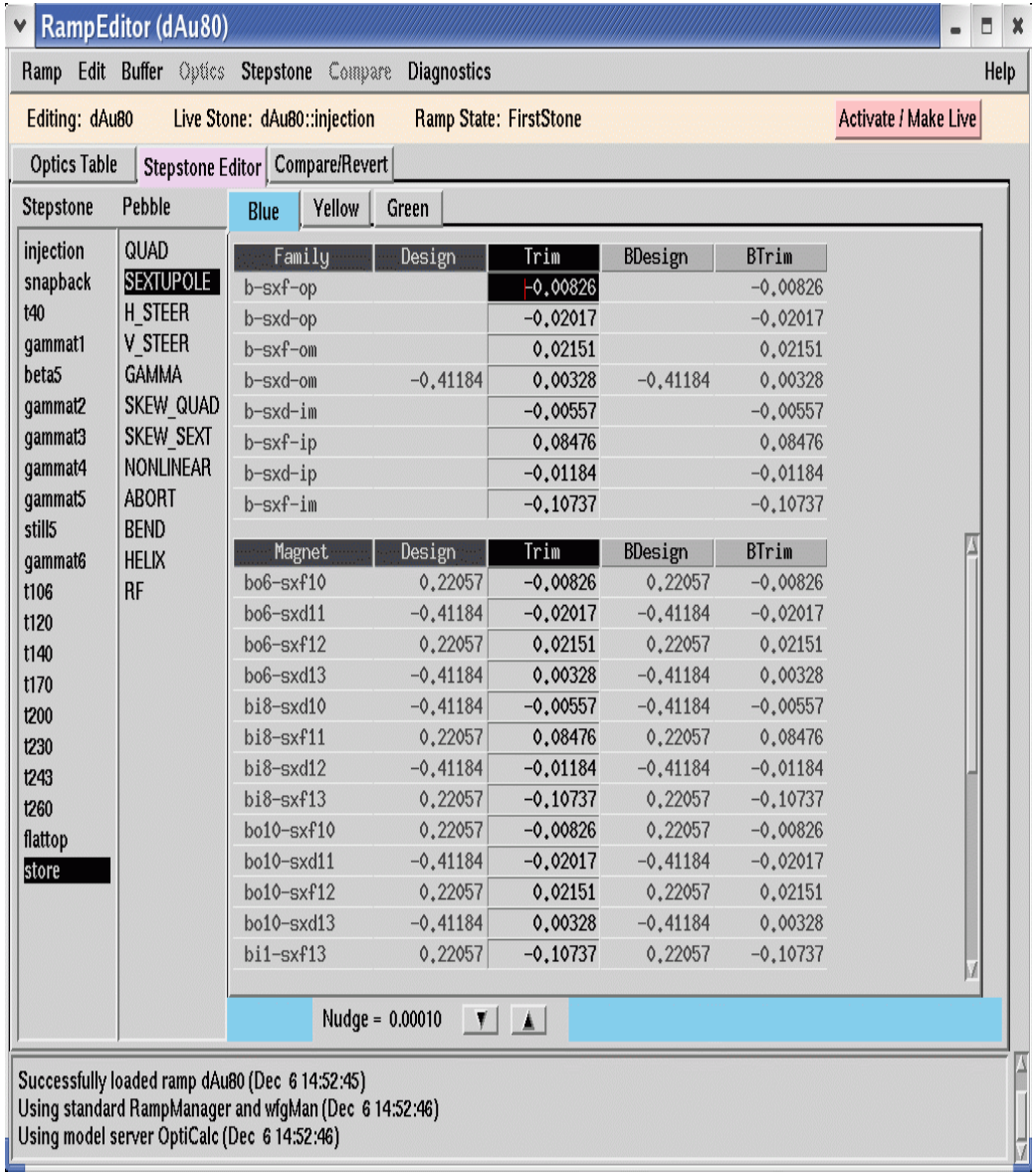
Correction strengths are installed at flattop and store stones, tested by a 6*6 bunch ramp. No idea why not help collision lifetime.

3. Blue ring story



Row	Delta(p)/p	Skew q1	BBQ X	Tune X #1	Tune X #2	Select	Skew q2	BBQ Y	Tune Y #1	Tune Y #2	Select
1	-0.000892693	-0.00212209	0.234754	0.234375	0.228516	BBQ	-0.00108492	0.219412	0.220703	0.226562	BBQ
2	-0.0004459	-0.00182496	0.23446	0.234375	0.228516	BBQ	-0.000886609	0.219608	0.22168	0.228516	BBQ
3	0	-0.00104089	0.234504	0.234375	0.274414	BBQ	-0.000427387	0.219828	0.22168	0.227539	BBQ
4	0	-0.00119031	0.234535	0.234375	0.291016	BBQ	-0.000503649	0.219787	0.220703	0.226562	BBQ
5	0.000446793	-0.000908323	0.234924	0.235352	0.273438	BBQ	-0.000244097	0.220017	0.22168	0.227539	BBQ
6	0.000893586	-0.000529506	0.235848	0.236328	0.242188	BBQ	8.94214e-05	0.220214	0.22168	0.21582	BBQ
0	0	0	0	0	0	BBQ	0	0	0	0	BBQ
0	0	0	0	0	0	BBQ	0	0	0	0	BBQ
0	0	0	0	0	0	BBQ	0	0	0	0	BBQ
0	0	0	0	0	0	BBQ	0	0	0	0	BBQ
0	0	0	0	0	0	BBQ	0	0	0	0	BBQ

	Corr	Tune	+-Sigma	Chrom[1]	+-Sigma	Chrom[2]	+-Sigma	Chrom[3]	+-Sigma
Horizontal	0.999591	0.234509	9.69609e-06	0.488369	0.01682	988.25	28.6035	154119	70283.3
Vertical	0.998945	0.219809	8.44395e-06	0.460796	0.0146479	5.11716	24.9097	-15001.3	61207



Family	Design	Trim	BDesign	BTrim
b-sxf-op		-0.00826		-0.00826
b-sxd-op		-0.02017		-0.02017
b-sxf-om		0.02151		0.02151
b-sxd-om	-0.41184	0.00328	-0.41184	0.00328
b-sxd-im		-0.00557		-0.00557
b-sxf-ip		0.08476		0.08476
b-sxd-ip		-0.01184		-0.01184
b-sxf-im		-0.10737		-0.10737

Magnet	Design	Trim	BDesign	BTrim
bo6-sxf10	0.22057	-0.00826	0.22057	-0.00826
bo6-sxd11	-0.41184	-0.02017	-0.41184	-0.02017
bo6-sxf12	0.22057	0.02151	0.22057	0.02151
bo6-sxd13	-0.41184	0.00328	-0.41184	0.00328
bi8-sxd10	-0.41184	-0.00557	-0.41184	-0.00557
bi8-sxf11	0.22057	0.08476	0.22057	0.08476
bi8-sxd12	-0.41184	-0.01184	-0.41184	-0.01184
bi8-sxf13	0.22057	-0.10737	0.22057	-0.10737
bo10-sxf10	0.22057	-0.00826	0.22057	-0.00826
bo10-sxd11	-0.41184	-0.02017	-0.41184	-0.02017
bo10-sxf12	0.22057	0.02151	0.22057	0.02151
bo10-sxd13	-0.41184	0.00328	-0.41184	0.00328
bi1-sxf13	0.22057	-0.10737	0.22057	-0.10737

Correction strengths with eight families were copied from last Au run. In APEX, we failed to make Qx'' smaller.

4. Mysteries in modeling

- 2 measurements of Blue chroms and 3 measurements of Yellow chroms are modeled and compared.
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- Measurements of Q's and Q''s don't agree with predications from model with or without b2_mean in arc dipoles.

Things to do:

1) need to do more measurements
2) need to check offline optics model

5. Summaries

- Yellow Q'' correction strengths were easily found and installed in RampEditor. It is not clear how the second order chromaticity correction affects the collisional lifetime.

- Big differences in Q's and Q''s between measurements and model predications were observed and not yet understood.

- No time request for next week APEX. Need fully understanding where the differences come from between measurements and model-predications.