Performance of FRS detectors in Exp. S377

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Primary beam:
Parassitic ^{54}Cr at 450 A MeV. Primary beam intensities was below 20 kHz at S2.
^{36}Ar beam at 370 MeV/u for S377 experiment. Maximum primary beam intensity was $2x10^{10}$ions/s.

TPC:
Two Bratislava TPC with y-heights of 60-80 mm were installed on air at S2, three others, 60 mm high, were placed on air at S4. X-pos calibrations were performed with removable 3-finger scintillators in x- and y-direction only for TPC42. TPC21 had no scintillator grid. All other offsets were determined by slits.
TPC23: Works at Vdrift= 3000 V, Vwire=800V to have the ^{54}Cr signals at ch 2000.
TPC24: Vdrift= 2400 V, Vwire=839V
TPC41: Vdrift= 2400 V, Vwire=840V
TPC21: Vdrift= 2400 V, Vwire=820V but the electronics used was of TPC22 (TPC2 in Go4).
TPC42: Vdrift= 2400 V, Vwire=820V.

TUM MUSIC-80:
Two were installed at S4. Averaged anode signals yield (HV=8000V) an energy resolution of with preamp type B. Channel 03 Music2 not working well.
At the beginning of the run the ADC CAEN V785 in the FRS crate showed a strange result for the music channels, probably due to bad contacts. The problem vanished removing and inserting again the module.

Scintillator signals/ToF resolution:
A new Sc21 FRS-standard scintillator 3 mm thick has been installed at S2, HV supplies for the three last dynodes. FRS-standard Sc41. Time resolution S2-S4 was σ_t = 80 ps (measured with primary beam and minimum matter). Finger detector at S2 on air. With the primary beam the two central strips mainly fired.
HV Sc21L: 2000 V
HV Sc21R: 1700 V
HV Sc41L: 1500 V
HV Sc21R: 1550 V
HV Sc01: 1400 V
HV Finger: 950 V (I=340 μA)

Electronics: All standard electronics was working. The QDC (slot 11) in FRS crate was a Rising one, the ADC (slot 13) in FRS is Charm one.

DAQ: The Prespec DAQ was used, 9 VME crates and X86-g49 event builder was used (see ..prepsec/mbsrun/apr_2011/.. for DAQ sources).

Online Analysis: A GO4 version that provides isotope identification S2-S4 can be found at /u/profi/s377 .

Physics program:
Coulex of ^{33}Ar. Total S4 rate below 20kHz. ^{33}Ar yield at S4 was a factor 2 higher compare to EPAX2 prediction, while ^{29}S yield at S4 was a factor 2-3 lower. An effective thickness of 3993.5 mg/cm^2 Be target (TA#36) were measured for the ^{54}Cr primary beam.

1st S1-Deg.:	3.0 g/cm²:	Wedge 1, (TS3ED2O2): -31.25 mm, (TS3ED2V1): -109.95 mm
2nd S1-Deg.:	2.5 g/cm²:	Wedge 1, (TS3ED2O2): -31.25 mm, (TS3ED2V1): -187.11 mm
3rd S1-Deg.:	2.0 g/cm²:	Wedge 1, (TS3ED2O2): -31.25 mm, (TS3ED2V1): -264.27
S2-Degrader:	^{9}Be, 2 g/cm²	Wedge Up Position Soll (TS3ED7VO): -76.6 mm
		Ladder Position (TS3ED7LS): -107.7 mm

Second. TA: ^{197}Au, 388 mg/cm² stays always in (neglecting LYCCA-TOF offset calibration)

Detector ranges: (all settings / main settings)

TOF:	180-250	191-232 ns	
Sc21:	300-760	300-400 MeV	
Sc41:	400-1110	400-650 MeV	
MUSICs:	50-160	50-90 MeV	
TPC 41:	15-45	15-25 MeV	
Plastic start:	280-810	280-450 MeV	
Plastic stop:	320-1220	320-615 MeV	
TA DSSD:	80-290	80-150 MeV	- P1 should be between ch 1400-1600
DSSD wall:	90-260	90-200 MeV (no P4)	- P1 should be between ch 1400-1700
CsI:	1.8-5.7	1.8-4.7 GeV (no P1)	- P2 MUST be on the upper limit > ch. 3500 (P1 not in range)

During the ^{33}Ar setting the total rate at S2 was < 300 kHz for I Seetram : 7x10^9/s, with all slits open.
During Coulex with ^{54}Cr primary beam, the Sc21 was removed and the thickness wedge increased.
S4 slits: +-35 mm.

S1 degrader offset: + 65 mg/cm^2 --- > TS3ED2V1: -99.92 mm for 3 g/cm^2 and
TS3ED2V1: -177.08 mm for 2.5 g/cm^2

S2 degrader offset: -160 mg/cm^2 ---- > TS3ED7VO : -64.3 mm for 2 g/cm^2

LISE simulations:
Effective thickness of the target: 3992.5 mg/cm^2

Calibration Settings – Primary beam settings with ^{54}Cr – beam (10^5 pps, 370 AMeV)

Name	Layout	Magnets	FRS-TOF	S4 detectors	LYCCA TOF	LYCCA dE-E	Rates (4s / spill)	Coulex (ϑ<2.1°)
Setting Use FRS Use LYCCA	Prod. TA S1 Deg S2 Deg	Bρ D1 Bρ D2 Bρ D3/D4	S2-S4-TOF dE @ Sc21 dE @ Sc41	dE @ MUSIC 1 dE @ MUSIC 2 dE @ TPC 41	dE @ Start plas dE @ Stop plas	dE@ TA DSSD dE @ DSSD wall E @ CsI	Total Rate Sc21 Total Rate MUSIC1 Total Rate @ wall Tracked ev./sec	E bef / aft sec. TA tot Coulex CS @ E dif/tot CS Expected γs/h (ε)
		[Tm]	[ns-MeV]	[MeV]	[MeV]	[MeV]	[pp spill]	[MeV-mb]
P1	0	6.8106	183.7	99	420	120	9.3	294/ 286
TOF1, dE1	0	6.8106	598	100	438	122	8.9	
LdE1	0	6.5179	647	27		14690	7.5	
							1.9	
P2	4	5.4102	215.9	131	636	195	5.8	143/131
TOF2, dE2	0	5.4102	753	136	756	218	5.4	
L-dE2, L-E1	0	4.9785	928	36		5819	4.6	
							1.2	
P2.5	0	6.8106						
Only 2g S1 deg	2	6.1911						
calib	0	5.8518						
P3	0	6.8106	221.4	137	691	219	300	125/111
TOF3, dE3	2.5	6.0215	672	143	869	257	232	170 @ 117
L-dE3, L-E2	2	4.7968	990	38		4576	200	0.97
							50	1072 (3%)
P4	0	6.8106	230.3	147	804	279	300	96/ 80
TOF4, dE4	3	5.8444	693	155	1210	400	200	220 @ 87
L-E3	2	4.5302	1107	41		2324	192	0.75
							50	1076 (3%)

Main Settings – ^{36}Ar – beam ($2{\cdot}10^{10}$ pps, 450 AMeV)

Name	Layout	Magnets	FRS-TOF	S4 detectors	LYCCA TOF	LYCCA dE-E	Rates (4s / spill)	Coulex (ϑ<2.1°)
Setting NoI	Prod. TA S1 Deg S2 Deg	Bρ D1 Bρ D2 Bρ D3/D4	S2-S4-TOF dE @ Sc21 dE @ Sc41	dE @ MUSIC 1 dE @ MUSIC 2 dE @ TPC 41	dE @ Start plastic dE @ Stop plastic	dE@ TA DSSD dE @ DSSD wall E @ CsI	Total Rate Sc21 Total Rate MUSIC1 Total Rate @ wall Tracked kpp/sec	E bef / aft sec. TA tot Coulex CS @ E dif/tot CS Expected γs/h (ε)
		[Tm]	[ns-MeV]	[MeV]	[MeV]	[MeV]	[kpp spill]	[MeV-mb]
MinMa	0	6.7977	171.956	49.4	203	57		393
^{36}Ar	0	6.7977	304	49.7	207	58		387
	0	6.6119	317	13.5		13588		
Prime old	4.030	5.9627	219.8	75.4	361	109	306	143/ 133
^{36}Ar	3	5.2367	384	77.8	417	119	226	58.1 @ 137
	2	4.3099	530	20		4093	200	0.967
							50	120 (1%)
Prime	3.992	5.9712	219.8	75.4	361	109	306	143/ 133
^{36}Ar	3	5.2470	384	77.8	417	119	226	58.1 @ 137
	2	4.3241	530	20		4093	200	0.967
							50	120 (1%)
Ar-1	3.992	5.4276	222.8	77.5	386	120	600	127/115
^{33}Ar	2.5	4.8206	384	80.4	472	138	36	52 @ 120
	2	3.8846	557	21		3024	32	0.796
							8	29 (2%)
S-1	3.992	5.3944	219.5	59.4	282	85	450	145/ 135
^{29}S	3	4.7490	304	61.2	324	92	16	22.3 @ 140
	2	3.9293	416	16		3390	8.8	0.922
							2.2	3.9 (2%)